Initial Study

JS West Liquid Propane Project

Prepared for:

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PROJECT INFORMATION

This document is the Initial Study for the potential environmental effects of the City of Kerman's (City) JS West Liquid Propane Project (Project). The City of Kerman will act as the Lead Agency for this project pursuant to the California Environmental Quality Act (CEQA) and the CEQA Guidelines. Copies of all materials referenced in this report are available for review in the project file during regular business hours at 850 S. Madera Avenue, Kerman, CA 93630.

Project title

JS West Liquid Propane Project

Lead agency name and address

City of Kerman
850 S. Madera Avenue
Kerman, CA 93630

Contact person and phone number

Olivia Pimentel, Assistant Planner
City of Kerman
(559) 846-9384

Project location

The City of Kerman is located in Fresno County in the heart of the San Joaquin Valley. The proposed Project lies north of west Church Avenue, between south Del Norte Avenue and south Madera Avenue. The proposed liquid propane gas terminal will be located on approximately 17 acres of currently vacant land, assigned Assessor's Parcel Numbers 023-060-55S, -56S, and -98ST. The City of Kerman lies just south of SR 180 and is bisected by SR 145.

Figure 1 – Location Map

Figure 2 – Project Vicinity

Figure 3 – Site Aerial

Project sponsor's name/address

JS West and Companies Inc.
501 9th Street
Modesto, CA 95354

General plan designation

Heavy Manufacturing & Service Commercial

Zoning

M-2 (Heavy Manufacturing) & CS (Service Commercial)

Project Description

The Project consists of the construction of a new railroad track spur to house a liquid propane gas terminal for the distribution of propane. A Conditional Use Permit is required for hazardous material handling in the M-2 zone.

Project Components

- Construction of railroad tracking for rail car storage, as well as two to three rail spurs.
- Installation of fencing for security, in compliance with Kerman Municipal Code 17.40.040 and 17.78.070.
- Installation of site lighting, as per standards set by the Kerman Improvement Standards Manual.
- Installation of paving and three additional parking stalls (one accessible and two standard) for on-site employees, consistent with Kerman Municipal Code 17.74 requirements.
- Installation of a temporary utility shed and portable toilet facility for employee use.

Project Operations

The proposed liquid propane gas terminal would be utilized for the distribution of propane. San Joaquin Valley Rail Road would deliver full propane gas tanks via rail car twice per week and would haul away empty tanks. The site would store approximately three to 14 rail cars at any given time. Rail cars would be unloaded on a daily basis, for transferal into up to six 90,000-gallon storage tanks on site (540,000 total gallons of liquid propane gas storage). Transport vehicles would arrive to draw propane gas from the storage tanks into the truck for delivery to customers.

Loading and unloading of propane gas, as well as transport vehicle supplying, would occur during 24-hour operational periods. Up to 25 delivery trucks would withdraw propane gas from the storage tanks per 24-hour period and the facility would employ up to three additional employees.

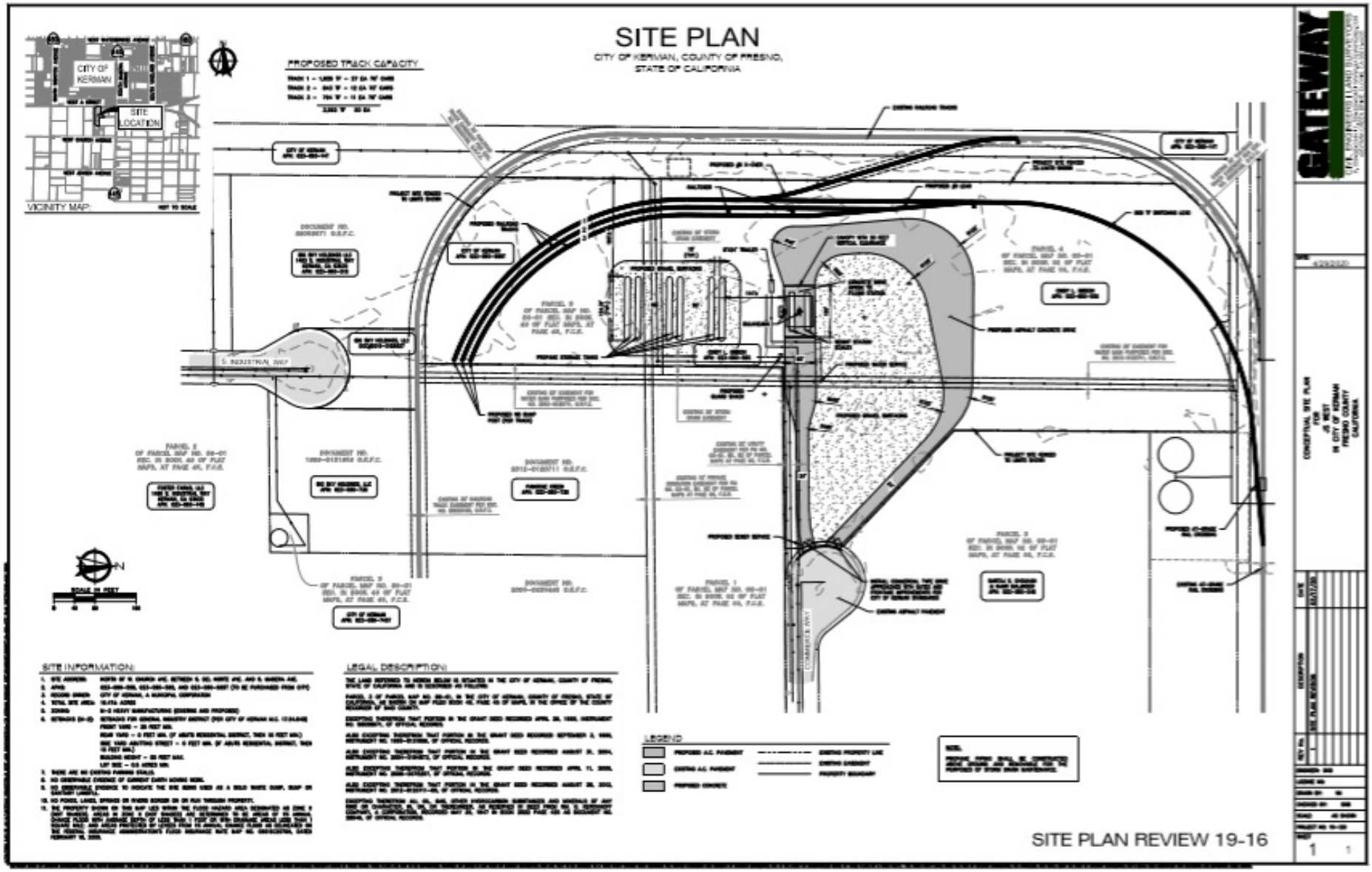
Surrounding Land Uses/Existing Conditions

The proposed Project site is currently vacant.

Lands surrounding the proposed Project are described as follows:

- North: Commercial and railroad tracks.
- South: Industrial and railroad tracks.
- East: Vacant and Industrial.
- West: Agricultural and railroad tracks.

Figure 4 –Site Plan



Other Public Agencies Involved

- State of California Native American Heritage Commission
- San Joaquin Valley Air Pollution Control District
- Central Valley Regional Water Quality Control Board
- U.S. Department of Transportation
- Occupation Safety & Health Administration

Tribal Consultation

The City of Kerman has not received any project-specific requests from any Tribes in the geographic area with which it is traditionally and culturally affiliated with or otherwise to be notified about projects in the City of Kerman.

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED

The environmental factors checked below would be potentially affected by this project, involving at least one impact that is a "Potentially Significant Impact" as indicated by the checklist on the following pages.

☐ Aesthetics	☐ Agriculture Resources and Forest Resources	☐ Air Quality
☐ Biological Resources	☒ Cultural Resources	☐ Energy
☒ Geology / Soils	☐ Greenhouse Gas Emissions	☐ Hazards & Hazardous Materials
☐ Hydrology / Water Quality	☐ Land Use / Planning	☐ Mineral Resources
☐ Noise	☐ Population / Housing	☐ Public Services
☐ Recreation	☐ Transportation	☐ Tribal Cultural Resources
☐ Utilities / Service Systems	☐ Wildfire	☐ Mandatory Findings of Significance

DETERMINATION

On the basis of this initial evaluation:

☐ I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

☒ I find that although the proposed project could have a significant effect on the environment,

there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

☐ I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

☐ I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

City of Kerman _____ Date _____

ENVIRONMENTAL CHECKLIST

I. AESTHETICS

Would the project:

	Potentially Significant Impact	Less than Significant With Mitigation Incorporation	Less than Significant Impact	No Impact
a. Have a substantial adverse effect on a scenic vista?	☐	☐	☒	☐
b. Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☒	☐
c. In non-urbanized areas, substantially degrade the existing visual character or quality of public views of the site and its surroundings? (Public views are those that are experienced from publicly accessible vantage point). If the project is in an urbanized area, would the project conflict with applicable zoning and regulations governing scenic quality?	☐	☐	☒	☐
d. Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☒	☐

ENVIRONMENTAL SETTING

The City of Kerman is located in the central portion of the San Joaquin Valley. The site resides in a primarily industrial area, with large industrial facilities dominating the visual landscape. The Project site is generally flat and bounded to the north, west and south by railroad tracks. Agricultural land uses lie to the west beyond the tracks, though the area is largely zoned for industrial purposes. The area beyond the tracks to the north is utilized by service commercial business. Immediately east of the Project site, industrial businesses have been developed on either side of south Madera Avenue/State Route (SR) 145. SR 145 is less than one-quarter mile to the east. Additional industrial land uses and a church lie to the south, beyond the tracks. There are no adopted scenic resources or scenic vistas in the area.

The existing visual character of the site consists of vacant land with minimal vegetation. Views of the proposed Project site area are not likely to be visible from any nearby roadways due to intervening land uses.

RESPONSES

a. Have a substantial adverse effect on a scenic vista?

b. Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?

Less Than Significant Impact. A scenic vista is defined as a viewpoint that provides expansive views of highly valued landscape for the benefit of the general public. Views of the Coastal Range and Sierra Nevada Mountains are the only natural and visual resource in the Project area. Views of these distant mountains, are afforded only during clear conditions due to poor air quality in the valley. Distant views of these mountains would largely be unaffected by the development of the Project because of the nature of the Project, distance and limited visibility of these features. The City of Kerman does not identify views of these features as required to be "protected."

The Project site is within an urbanized area of southern Kerman. There are no scenic vistas or other protected scenic resources on or near the site. Visual character of the site is addressed further in Response C. below.

There are no scenic highways near the proposed site.

Therefore, the Project has less than significant impact on scenic vistas or designated scenic resources or highways.

Mitigation Measures: None are required.

c. In non-urbanized areas, substantially degrade the existing visual character or quality of public views of the site and its surroundings? (Public views are those that are experienced from publicly accessible vantage point). If the project is in an urbanized area, would the project conflict with applicable zoning and regulations governing scenic quality?

Less Than Significant Impact. The proposed Project would alter the existing visual character of public views of the site from vacant land to minimal additional visual characteristics. The Project design, which includes lighting, paving, fencing and additional railroad tracks, would be subject to the City's Design

Guidelines adopted for the City's General Plan. Per the City's Design Guidelines, detailed site plans and any building materials will be submitted by the Project developer to the City of Kerman. The plans shall be required prior to issuance of any permits. The review shall be substantially based on the site plans and elevations illustrated within this document.

The proposed Project will require removal of minimal vegetation on the vacant parcels.

The improvements such as those proposed by the Project are typical of City industrial areas and are generally expected from residents of the City. These improvements would not substantially degrade the visual character of the area and would not diminish the visual quality of the area, as they would be consistent with the existing visual setting. The proposed Project itself is not visually imposing against the scale of the existing adjacent industrial/commercial buildings and nature of the surrounding area.

Therefore, the Project would have less than significant impacts on the visual character of the area.

Mitigation Measures: None are required.

d. Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?

Less Than Significant Impact. Nighttime lighting is necessary to provide and maintain safe, secure, and attractive environments; however, these lights have the potential to produce spillover light and glare and waste energy, and if designed incorrectly, could be considered unattractive. Light that falls beyond the intended area is referred to as "light trespass." Types of light trespass include spillover light and glare. Minimizing all these forms of obtrusive light is an important environmental consideration. A less obtrusive and well-designed energy efficient fixture would face downward, emit the correct intensity of light for the use, and incorporate energy timers.

Spillover light is light emitted by a lighting installation that falls outside the boundaries of the property on which the installation is sited. Spillover light can adversely affect light-sensitive uses, such as residential neighborhoods at nighttime. Because light dissipates as it travels from the source, the intensity of a light fixture is often increased at the source to compensate for the dissipated light. This can further increase the amount of light that illuminates adjacent uses. Spillover light can be minimized by using only the level of light necessary, and by using cutoff type fixtures or shielded light fixtures, or a combination of fixture types.

Glare results when a light source directly in the field of vision is brighter than the eye can comfortably accept. Squinting or turning away from a light source is an indication of glare. The presence of a bright

light in an otherwise dark setting may be distracting or annoying, referred to as discomfort glare, or it may diminish the ability to see other objects in the darkened environment, referred to as disability glare. Glare can be reduced by design features that block direct line of sight to the light source and that direct light downward, with little or no light emitted at high (near horizontal) angles, since this light would travel long distances. Cutoff-type light fixtures minimize glare because they emit relatively low-intensity light at these angles.

Currently the sources of light in the Project area are from adjacent uses, including commercial and industrial security lighting to the east, north and south. The Project would necessitate parking lot and security lighting, in additional to operational nighttime lighting, as the Project intends to operate on a 24-hour basis. Such lighting that would be subject to City standards. Accordingly, potential impacts would be considered ***less than significant***.

Mitigation Measures: None are required.

II. AGRICULTURE AND FOREST RESOURCES

Would the project:

	Potentially Significant Impact	Less than Significant With Mitigation Incorporation	Less than Significant Impact	No Impact
a. Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	☒
b. Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☐	☒
c. Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?	☐	☐	☐	☒
d. Result in the loss of forest land or conversion of forest land to non-forest use?	☐	☐	☐	☒
e. Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?	☐	☐	☐	☒

ENVIRONMENTAL SETTING

The City of Kerman is located in Fresno County in the heart of the San Joaquin Valley. The City's General Plan contains several policies intended to protect agricultural resources. The Project site, however, does

not contain any agricultural resource and therefore, the City's policies are not applicable. Agricultural land uses less than one-quarter of a mile to the west are the nearest agricultural areas.

RESPONSES

a. Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?

b. Conflict with existing zoning for agricultural use, or a Williamson Act contract?

c. Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?

d. Result in the loss of forest land or conversion of forest land to non-forest use?

e. Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?

No Impact. There are no agricultural resources or forest lands present on the Project site, which currently consist of industrial and commercial land uses, specifically zoned M-2 and CS (Heavy Manufacturing and Service Commercial). The Project consists of a liquid gas terminal and the associated improvements. The proposed Project would not conflict with the City of Kerman's land use designations upon approval. There are no existing agricultural uses or operations within the Project boundaries. The proposed Project would not convert prime farmland, conflict with an existing agricultural use, or result in the conversion of existing farmland. Additionally, no Williamson Act contracted lands would be impacted due to the Project, and the Project site is not subject to a Williamson Act contract.

The proposed Project does not conflict with any forest land or Timberland Production or result in any loss of forest land. The proposed Project does not include any changes which will affect the existing environment by conversion of farmland or forest land. Therefore, the Project has *no impact* on agricultural and forest resources.

Mitigation Measures: None are required.

III. AIR QUALITY

Would the project:

	Potentially Significant Impact	Less than Significant With Mitigation Incorporation	Less than Significant Impact	No Impact
a. Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☒	☐
b. Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard?	☐	☐	☒	☐
c. Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☒	☐
d. Result in other emissions (such as those leading to odors or adversely affecting a substantial number of people)?	☐	☐	☒	☐

ENVIRONMENTAL SETTING

The climate of the City of Kerman and the San Joaquin Valley is characterized by long, hot summers and stagnant, foggy winters. Precipitation is low and temperature inversions are common. These characteristics are conducive to the formation and retention of air pollutants and are in part influenced by the surrounding mountains which intercept precipitation and act as a barrier to the passage of cold air and air pollutants.

The proposed Project lies within the San Joaquin Valley Air Basin, which is managed by the San Joaquin Valley Air Pollution Control District (SJVAPCD or Air District). National Ambient Air Quality Standards (NAAQS) and California Ambient Air Quality Standards (CAAQS) have been established for the following criteria pollutants: carbon monoxide (CO), ozone (O_3), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), particulate matter (PM_{10} and $PM_{2.5}$), and lead (Pb). The CAAQS also set standards for sulfates, hydrogen sulfide, and visibility.

Air quality plans or attainment plans are used to bring the applicable air basin into attainment with all state and federal ambient air quality standards designed to protect the health and safety of residents

within that air basin. Areas are classified under the Federal Clean Air Act as either "attainment", "non-attainment", or "extreme non-attainment" areas for each criteria pollutant based on whether the NAAQS have been achieved or not. Attainment relative to the State standards is determined by the California Air Resources Board (CARB). The San Joaquin Valley is designated as a State and Federal extreme non-attainment area for O3, a State and Federal non-attainment area for PM2.5, a State non-attainment area for PM10, and Federal and State attainment area for CO, SO2, NO2, and Pb.

Standards and attainment status for listed pollutants in the Air District can be found in Table 1. Note that both state and federal standards are presented.

Table 1 - Standards and Attainment Status for Listed Pollutants in the Air District

	Federal Standard	**California Standard**
Ozone	0.075 ppm (8-hr avg)	0.07 ppm (8-hr avg) 0.09 ppm (1-hr avg)
Carbon Monoxide	9.0 ppm (8-hr avg) 35.0 ppm (1-hr avg)	9.0 ppm (8-hr avg) 20.0 ppm (1-hr avg)
Nitrogen Dioxide	0.053 ppm (annual avg)	0.30 ppm (annual avg) 0.18 ppm (1-hr avg)
Sulfur Dioxide	0.03 ppm (annual avg) 0.14 ppm (24-hr avg) 0.5 ppm (3-hr avg)	0.04 ppm (24-hr avg) 0.25 ppm (1hr avg)
Lead	1.5 µg/m3 (calendar quarter) 0.15 µg/m3 (rolling 3-month avg)	1.5 µg/m3 (30-day avg)
Particulate Matter (PM10)	150 µg/m3 (24-hr avg)	20 µg/m3 (annual avg) 50 µg/m3 (24-hr avg)
Particulate Matter (PM2.5)	15 µg/m3 (annual avg)	35 µg/m3 (24-hr avg) 12 µg/m3 (annual avg)

µg/m3 = micrograms per cubic meter

Additional State regulations include:

CARB Portable Equipment Registration Program – This program was designed to allow owners and operators of portable engines and other common construction or farming equipment to register their equipment under a statewide program so they may operate it statewide without the need to obtain a permit from the local air district.

U.S. EPA/CARB Off-Road Mobile Sources Emission Reduction Program – The California Clean Air Act (CCAA) requires CARB to achieve a maximum degree of emissions reductions from off-road mobile sources to attain State Ambient Air Quality Standards (SAAQS); off- road mobile sources include most construction equipment. Tier 1 standards for large compression-ignition engines used in off-road mobile sources went into effect in California in 1996. These standards, along with ongoing rulemaking, address emissions of nitrogen oxides (NOX) and toxic particulate matter from diesel engines. CARB is currently developing a control measure to reduce diesel PM and NOX emissions from existing off-road diesel equipment throughout the state.

California Global Warming Solutions Act – Established in 2006, Assembly Bill 32 (AB 32) requires that California's GHG emissions be reduced to 1990 levels by the year 2020. This will be implemented through a statewide cap on GHG emissions, which was phased in beginning in 2012. AB 32 requires CARB to develop regulations and a mandatory reporting system to monitor global warming emissions levels.

RESPONSES

a. Conflict with or obstruct implementation of the applicable air quality plan?

b. Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard?

c. Expose sensitive receptors to substantial pollutant concentrations?

Less Than Significant Impact. The proposed Project lies within the San Joaquin Valley Air Basin (SJVAB). At the Federal level, the SJVAB is designated as extreme nonattainment for the 8-hour ozone standard, attainment for PM_{10} and CO, and nonattainment fort $PM_{2.5}$. At the State level, the SJVAB is designated as nonattainment for the 8-hour ozone, PM_{10}, and $PM_{2.5}$ standards. Although the Federal 1-hour ozone standard was revoked in 2005, areas must still attain this standard, and the SJVAPCD

recently requested an EPA finding that the SJVAB has attained the standard based on 2011-2013 data[1]. To meet Federal Clean Air Act (CAA) requirements, the SJVAPCD has multiple air quality attainment plan (AQAP) documents, including:

- Extreme Ozone Attainment Demonstration Plan (EOADP) for attainment of the 1-hour ozone standard (2004);
- 2007 Ozone Plan for attainment of the 8-hour ozone standard;
- 2007 PM_{10} Maintenance Plan and Request for Redesignation; and
- 2008 $PM_{2.5}$ Plan.

Because of the region's non-attainment status for ozone, $PM_{2.5}$, and PM_{10}, if the project-generated emissions of either of the ozone precursor pollutants (ROG or NOx), PM_{10}, or $PM_{2.5}$ were to exceed the SJVAPCD's significance thresholds, then the project uses would be considered to conflict with the attainment plans. In addition, if the project uses were to result in a change in land use and corresponding increases in vehicle miles traveled, they may result in an increase in vehicle miles traveled that is unaccounted for in regional emissions inventories contained in regional air quality control plans.

The annual significance thresholds to be used for the Project for construction and operational emissions are as follows[2]:

- 10 tons per year ROG;
- 10 tons per year NOx;
- 15 tons per year PM_{10}; and
- 15 tons per year $PM_{2.5}$.

The project will result in both construction emissions and operational emissions as described below.

Short-Term (Construction) Emissions

Site preparation and project construction would involve excavating, grading, and various activities needed to construct the Project. During construction, the Project could generate pollutants such as hydrocarbons, oxides of nitrogen, carbon monoxide, and suspended PM. A major source of PM would be windblown dust generated during construction activities. Sources of fugitive dust would include disturbed soils at the construction site and trucks carrying uncovered loads of soils. Vehicles leaving the site could deposit dirt and mud on local streets, which could be an additional source of airborne dust

[1] San Joaquin Valley Air Pollution Control District. Guide to Assessing and Mitigating Air Quality Impacts. March 19, 2015. Page 28. http://www.valleyair.org/transportation/GAMAQI_3-19-15.pdf. Accessed May 2020.

[2] San Joaquin Valley Air Control District – Air Quality Threshold of Significance – Criteria Pollutants. http://www.valleyair.org/transportation/0714-GAMAQI-Criteria-Pollutant-Thresholds-of-Significance.pdf. Accessed May 2020.

after it dries. PM10 emissions would vary from day to day, depending on the nature and magnitude of construction activity and local weather conditions. PM10 emissions would depend on soil moisture, the silt content of soil, wind speed, and the amount of operating equipment. Larger dust particles would settle near the source, while fine particles would be dispersed over greater distances from the construction site. These emissions would be temporary and limited to the immediate area surrounding the construction site.

Operational Emissions

Operational emissions would consist of outputs generated by transporting railcars, running equipment to transfer liquid propane gas, and any emissions associated with transport vehicles and staff coming to and from the project site. The Project intends to staff three employees, who will be expected to drive their personal vehicles. A maximum of 25 transport trucks per day are anticipated to withdraw propane for distribution to customers.

Total Project Emissions

The estimated annual construction emissions are provided below. The California Emissions Estimator (CalEEMod), Version 2016.3.2, was used to estimate construction emissions resulting from the liquid propane gas terminal construction. Any and all excavated soils will remain on-site. Modeling results are provided in Table 2 and the CalEEMod output files are provided in Appendix A.

Table 2 - Proposed Project Construction and Operation Emissions

	VOC (ROG) (tons/year)	NO_x (tons/year)	PM_{10} (tons/year)	$PM_{2.5}$ (tons/year
2020 Terminal Construction Emissions	0.2478	2.2880	0.3582	0.2086
2021 Terminal Construction Emissions	2.2182	1.1644	0.1127	0.0645
Annual Operational Emissions	1.5888	2.1995	0.5902	0.1788
Total Project Emissions	**4.0548**	**5.6519**	**1.0611**	**0.4519**
Annual Threshold of Significance	10	10	15	15
Significant?	**No**	**No**	**No**	**No**

Source: CalEEMod results (Appendix A). Crawford & Bowen Planning (2020)

As demonstrated in Table 2, estimated construction emissions would not exceed the SJVAPCD's significance thresholds for ROG, NOx, PM_{10}, and $PM_{2.5}$. As a result, the Project uses would not conflict with emissions inventories contained in regional air quality attainment plans and would not result in a significant contribution to the region's air quality non-attainment status[3]. Likewise, the Project would not result in a cumulatively considerable net increase of any criteria pollutant within the SJVAPCD

[3] San Joaquin Valley Air Pollution Control District. Guide to Assessing and Mitigating Air Quality Impacts. March 19, 2015. Page 65. http://www.valleyair.org/transportation/GAMAQI_3-19-15.pdf. Accessed May 2020.

jurisdiction. Finally, the Project would also not expose sensitive receptors to substantial pollutant concentrations. Due to its location in an industrial portion of the City of Kerman, the Project site is not near any sensitive receptors, the nearest residence being over 400 feet to the north. It will not cumulatively increase any criteria pollutant and will not result in substantial pollutant concentrations.

Any impacts to air resources would be considered ***less than significant***.

Mitigation Measures: None are required.

d. Result in other emissions (such as those leading to odors adversely affecting a substantial number of people?

Less than Significant Impact. The proposed Project is located in an industrial portion of the City of Kerman. During construction, the various diesel-powered vehicles and equipment in use on-site would create localized odors. These odors would be temporary and are not likely to be noticeable for extended periods of time beyond the Project site. The potential for diesel odor impacts is therefore considered less than significant.

As such, the proposed Project is not expected to produce any offensive odors that would result in frequent odor complaints. Any impacts would be ***less than significant.***

Mitigation Measures: None are required.

IV. BIOLOGICAL RESOURCES

Would the project:

	Potentially Significant Impact	Less than Significant With Mitigation Incorporation	Less than Significant Impact	No Impact
a. Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☐	☒	☐
b. Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☐	☐	☒
c. Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☐	☐	☒
d. Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☐	☐	☒

e.	Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	☒
f.	Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☐	☒

ENVIRONMENTAL SETTING

The proposed Project site is located in a portion of the central San Joaquin Valley that has, for decades, experienced intensive agricultural and urban disturbances. Current agricultural endeavors in the region include dairies, groves, and row crops.

Like most of California, the Central San Joaquin Valley experiences a Mediterranean climate. Warm dry summers are followed by cool moist winters. Summer temperatures usually exceed 90 degrees Fahrenheit, and the relative humidity is generally very low. Winter temperatures rarely raise much above 70 degrees Fahrenheit, with daytime highs often below 60 degrees Fahrenheit. Annual precipitation within the proposed Project site is about 10 inches, almost 85% of which falls between the months of October and March. Nearly all precipitation falls in the form of rain and storm-water readily infiltrates the soils of the surrounding the sites.

Native plant and animal species once abundant in the region have become locally extirpated or have experienced large reductions in their populations due to conversion of upland, riparian, and aquatic habitats to agricultural and urban uses. Remaining native habitats are particularly valuable to native wildlife species including special status species that still persist in the region. According to the 2007 Kerman General Plan Update, most of the Kerman area is dominated by urban development, however; the City is entirely surrounded by agricultural land mixed with farmhouses and small ranches. These uses may attract the San Joaquin kit fox for foraging habitat.

The site is currently vacant. The Project site's surrounding lands consist primarily of industrial and commercial businesses, with agricultural lands lying to the west.

No aquatic or wetland features occur on the proposed Project site; therefore, jurisdictional waters are considered absent from the site.

RESPONSES

a. Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?

Less than Significant Impact. The site is currently vacant and disked for fire suppression. The Project site is highly disturbed and completely lacking in substantial vegetation, such as trees, brush or shrubs. This factor suggests that the Project site is extremely unlikely to serve as nesting habitat for bird species or any animal or plant species. Additionally, no wetlands or waters of the U.S. or water of the State were found within the Project area. No mitigation measures are recommended, and thus any impacts remain ***less than significant***.

Mitigation Measures: None are required.

b. Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?

c. Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?

No Impact. There are no natural waterways, sensitive natural communities, or protected wetlands on the subject site. As such, there is ***no impact.***

Mitigation Measures: None are required.

d. Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?

No Impact. There are no natural waterways or natural vegetation on the subject site, and the site is not used for movement of wildlife species or for a migratory wildlife corridor, nor is the site used for native wildlife nursery sites. The site is regularly disked and highly disturbed. There would be ***no impact*** to native species movement.

Mitigation Measures: None are required.

e. Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?

No Impact. The City of Kerman is near two ecological reserves; the Kerman Ecological Reserve and the Alkali Sink Ecological Reserve, both of which lie within 12 miles of Kerman. The implementation of the 2040 General Plan will not directly impact these reserves and no mitigation is proposed for development within the City of Kerman Planning Area. As such, the proposed Project would not conflict with any of the adopted policies and there is ***no impact.***

Mitigation Measures: None are required.

f. Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?

No Impact. The proposed Project site is not within an area set aside for the conservation of habitat or sensitive plant or animal species pursuant to a Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan. As such, there is ***no impact***.

Mitigation Measures: None are required.

V. CULTURAL RESOURCES

Would the project:

	Potentially Significant Impact	Less than Significant With Mitigation Incorporation	Less than Significant Impact	No Impact
a. Cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?	☐	☐	☐	☒
b. Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?	☐	☒	☐	☐
c. Disturb any human remains, including those interred outside of formal cemeteries?	☐	☒	☐	☐

ENVIRONMENTAL SETTING

A record search of site files and maps was conducted at the Southern San Joaquin Valley Archaeological Information Center (IC), California State University, Bakersfield (see Appendix B). A Sacred Lands File Request was also submitted to the Native American Heritage Commission (NAHC). These investigations determined that small portions of property around the Project had been previously surveyed, and that segments of one historic structure, a historic era railroad, is within one-half mile of the proposed Project site.

No cultural resources were identified within the Project area or surrounding sites.

RESPONSES

a. Cause a substantial adverse change in the significance of a historical resource pursuant to §15064.5?

No Impact. As discussed above, no historic resources were identified within or adjacent to the project site. There is ***no impact***.

Mitigation Measures: None are required.

b. Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?

c. Disturb any human remains, including those interred outside of formal cemeteries?

Less Than Significant Impact With Mitigation. The project area is highly disturbed, consisting of vacant land. There are no known or visible cultural or archaeological resources, paleontological resources, or human remains that exist on the surface of the project area. Therefore, it is determined that the project has low potential to impact any sensitive resources and no further cultural resources work is required unless project plans change to include work not currently identified in the project description.

Although no cultural or archaeological resources, paleontological resources or human remains have been identified in the project area, the possibility exists that such resources or remains may be discovered during Project site preparation, excavation and/or grading activities. Mitigation Measures CUL – 1 and CUL – 2 will be implemented to ensure that Project will result in ***less than significant impacts with mitigation***.

Mitigation Measures:

CUL – 1 Should evidence of prehistoric archeological resources be discovered during construction, the contractor shall halt all work within 25 feet of the find and the resource shall be evaluated by a qualified archaeologist. If evidence of any archaeological, cultural, paleontological and/or historical deposits is found, hand excavation and/or mechanical excavation shall proceed to evaluate the deposits for determination of significance as defined by the CEQA guidelines. The archaeologist shall submit reports, to the satisfaction of the City of Kerman, describing the testing program and subsequent results. These reports shall identify any program mitigation that the project proponent shall complete in order to mitigate archaeological impacts (including resource recovery and/or avoidance testing and analysis, removal, reburial, and curation of archaeological resources).

CUL – 2 In order to ensure that the proposed project does not impact buried human remains during project construction, the City shall be responsible for on-going monitoring of project construction. If buried human remains are encountered during construction, further excavation or disturbance of the site or any nearby area reasonably suspected to overlie adjacent remains shall be halted until the Fresno County coroner is contacted and the coroner has made the determinations and notifications required pursuant to Health and Safety Code Section 7050.5. If the coroner determines that Health and Safety Code

Section 7050.5(c) require that he give notice to the Native American Heritage Commission, then such notice shall be given within 24 hours, as required by Health and Safety Code Section 7050.5(c). In that event, the NAHC will conduct the notifications required by Public Resources Code Section 5097.98. Until the consultations described below have been completed, the landowner shall further ensure that the immediate vicinity, according to generally accepted cultural or archaeological standards or practices where Native American human remains are located, is not disturbed by further development activity until the landowner has discussed and conferred with the Most Likely Descendants on all reasonable options regarding the descendants' preferences and treatments, as prescribed by Public Resources Code Section 5097.98(b). The NAHC will mediate any disputes regarding treatment of remains in accordance with Public Resources Code Section 5097.94(k). The landowner shall be entitled to exercise rights established by Public Resources Code Section 5097.98(e) if any of the circumstances established by that provision become applicable.

VI. ENERGY

Would the project:

	Potentially Significant Impact	Less than Significant With Mitigation Incorporation	Less than Significant Impact	No Impact
a. Result in potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation?	☐	☐	☒	☐
b. Conflict with or obstruct a state or local plan for renewable energy or energy efficiency?	☐	☐	☒	☐

ENVIRONMENTAL SETTING

California's total energy consumption is second-highest in the nation, but, in 2016, the state's per capita energy consumption ranked 48th, due in part to its mild climate and its energy efficiency programs. In 2017, California ranked second in the nation in conventional hydroelectric generation and first as a producer of electricity from solar, geothermal, and biomass resources while also in 2017, solar PV and solar thermal installations provided about 16% of California's net electricity generation.[4]

Energy usage is typically quantified using the British thermal unit (BTU). As a point of reference, the approximately amounts of energy contained in common energy sources are as follows:

Energy Source	BTUs[5]
Gasoline	120,429 per gallon
Natural Gas	1,037 per cubic foot
Electricity	3,412 per kilowatt-hour

[4] U.S. Energy Information Administration. Independent Statistics and Analysis. California Profile Overview. https://www.eia.gov/state/?sid=CA#tabs-1. Accessed May 2020.
[5] U.S. Energy Information Administration. Energy Units and Calculators Explained. https://www.eia.gov/energyexplained/index.php?page=about_energy_units. Accessed May 2020.

California electrical consumption in 2016 was 7,830.8 trillion BTU[6], as provided in Table 3, while total electrical consumption by Fresno County in 2018 was 26.109 trillion BTU.[7]

Table 3 – 2016 California Energy Consumption[8]

End User	BTU of energy consumed (in trillions)	Percentage of total consumption
Residential	1,384.4	17.7
Commercial	1,477.2	18.9
Industrial	1,854.3	23.7
Transportation	3,114.9	39.8
Total	**7,830.8**	--

The California Department of Transportation (Caltrans) reports that approximately 25.1 million automobiles, 5.7 million trucks, and 889,024 motorcycles were registered in the state in 2017, resulting in a total estimated 339.8 billion vehicles miles traveled (VMT).[9]

Applicable Regulations

California Energy Code (Title 24, Part 6, Building Energy Efficiency Standards)

California Code of Regulations Title 24, Part 6 comprises the California Energy Code, which was adopted to ensure that building construction, system design and installation achieve energy efficiency. The California Energy Code was first established in 1978 by the CEC in response to a legislative mandate to reduce California's energy consumption, and apply to energy consumed for heating, cooling, ventilation, water heating, and lighting in new residential and non-residential buildings. The standards are updated periodically to increase the baseline energy efficiency requirements. The 2013 Building Energy Efficiency Standards focus on several key areas to improve the energy efficiency of newly constructed buildings and additions and alterations to existing buildings and include requirements to enable both demand reductions during critical peak periods and future solar electric and thermal system installations. Although it was not originally intended to reduce greenhouse gas (GHG) emissions, electricity production by fossil fuels results in GHG emissions and energy efficient buildings require less electricity. Therefore, increased energy efficiency results in decreased GHG emissions.

[6] U.S. Energy Information Administration. Independent Statistics and Analysis. California Profile Overview. https://www.eia.gov/state/?sid=CA#tabs-1. Accessed May 2020.
[7] California Energy Commission. Electricity Consumption by County. http://ecdms.energy.ca.gov/elecbycounty.aspx. Accessed May 2020.
[8] U.S. Energy Information Administration. Independent Statistics and Analysis. California Profile Overview. https://www.eia.gov/state/?sid=CA#tabs-1. Accessed May 2020.
[9] Caltrans. 2017. California Transportation Quick Facts. http://www.dot.ca.gov/drisi/library/qf/qf2017.pdf. Accessed May 2020.

California Green Building Standards Code (Title 24, Part II, CALGreen)

The California Building Standards Commission adopted the California Green Buildings Standards Code (CALGreen in Part 11 of the Title 24 Building Standards Code) for all new construction statewide on July 17, 2008. Originally a volunteer measure, the code became mandatory in 2010 and the most recent update (2019) will go into effect on January 1, 2020. CALGreen sets targets for energy efficiency, water consumption, dual plumbing systems for potable and recyclable water, diversion of construction waste from landfills, and use of environmentally sensitive materials in construction and design, including eco-friendly flooring, carpeting, paint, coatings, thermal insulation, and acoustical wall and ceiling panels. The 2019 CALGreen Code includes mandatory measures for non-residential development related to site development; water use; weather resistance and moisture management; construction waste reduction, disposal, and recycling; building maintenance and operation; pollutant control; indoor air quality; environmental comfort; and outdoor air quality. Mandatory measures for residential development pertain to green building; planning and design; energy efficiency; water efficiency and conservation; material conservation and resource efficiency; environmental quality; and installer and special inspector qualifications.

Clean Energy and Pollution Reduction Act (SB 350)

The Clean Energy and Pollution Reduction Act (SB 350) was passed by California Governor Brown on October 7, 2015, and establishes new clean energy, clean air, and greenhouse gas reduction goals for the year 2030 and beyond. SB 350 establishes a greenhouse gas reduction target of 40 percent below 1990 levels for the State of California, further enhancing the ability for the state to meet the goal of reducing greenhouse gas emissions by 80 percent below 1990 levels by the year 2050.

Renewable Portfolio Standard (SB 1078 and SB 107)

Established in 2002 under SB 1078, the state's Renewables Portfolio Standard (RPS) was amended under SB 107 to require accelerated energy reduction goals by requiring that by the year 2010, 20 percent of electricity sales in the state be served by renewable energy resources. In years following its adoption, Executive Order S-14-08 was signed, requiring electricity retail sellers to provide 33 percent of their service loads with renewable energy by the year 2020. In 2011, SB X1-2 was signed, aligning the RPS target with the 33 percent requirement by the year 2020. This new RPS applied to all state electricity retailers, including publicly owned utilities, investor-owned utilities, electrical service providers, and community choice aggregators. All entities included under the RPS were required to adopt the RPS 20 percent by year 2020 reduction goal by the end of 2013, adopt a reduction goal of 25 percent by the end of 2016, and meet the 33 percent reduction goal by the end of 2020. In addition, the Air Resources Board,

under Executive Order S-21-09, was required to adopt regulations consistent with these 33 percent renewable energy targets.

RESPONSES

a. Result in potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation?

b. Conflict with or obstruct a state or local plan for renewable energy or energy efficiency?

Less Than Significant Impact. The proposed Project includes construction and operation of a liquid propane gas terminal and the associated improvements. The Project at build-out will consume amounts of energy in the short-term during Project construction, and also in the long-term during Project operation.

During construction, the Project would consume energy in two general forms: (1) the fuel energy consumed by construction vehicles and equipment; and (2) bound energy in construction materials, such as asphalt, steel, concrete, pipes, and manufactured or processed materials such as lumber and glass. Title 24 Building Energy Efficiency Standards provide guidance on construction techniques to maximize energy conservation and it is expected that contractors and owners have a strong financial incentive to use recycled materials and products originating from nearby sources in order to reduce materials costs. As such, it is anticipated that materials used in construction and construction vehicle fuel energy would not involve the wasteful, inefficient, or unnecessary consumption of energy.

Operational Project energy consumption would occur for multiple purposes, including but not limited to, motorized equipment utilized for propane transfer, site lighting, and vehicle use. CalEEMod was utilized to generate the estimated energy demand of the proposed Project, and the results are provided in Table 4 and in Appendix A.

Table 4 – Annual Project Energy Consumption

Land Use	Electricity Use in kWh/year	Natural Gas Use in kBTU/year
Industrial	2,822,300	5,434,200

The proposed Project would be required to comply with Title 24 Building Energy Efficiency Standards, which provide minimum efficiency standards related to various building features, including appliances, water and space heating and cooling equipment, building insulation and roofing, and lighting. Implementation of Title 24 standards significantly increases energy savings, and it is generally assumed that compliance with Title 24 ensures projects will not result in the inefficient, wasteful, or unnecessary

consumption of energy. However, it is unlikely that permanent structures and buildings will be necessary to Project operations.

As discussed in Impact XVII – Transportation/Traffic, at build-out the Project will generate a maximum of 28 (three employee and 25 transport trucks) daily trips. The length of these trips and the individual vehicle fuel efficiencies are not known; therefore, the resulting energy consumption cannot be accurately calculated. Adopted federal vehicle fuel standards have continually improved since their original adoption in 1975 and assists in avoiding the inefficient, wasteful, and unnecessary use of energy by vehicles. The Project would also be consolidating and locating facilities to accept deliveries by rail, rather than brining in supplies by truck, which is more efficient and does not result in unnecessary consumption of energy resources.

As discussed previously, the proposed Project would be required to implement and be consistent with existing energy design standards at the local and state level. The Project would be subject to energy conservation requirements in the California Energy Code and CALGreen. Adherence to state code requirements would ensure that the Project would not result in wasteful and inefficient use of non-renewable resources due to building operation.

Therefore, any impacts are ***less than significant***.

Mitigation Measures: None are required.

VII. GEOLOGY AND SOILS

Would the project:

	Potentially Significant Impact	Less than Significant With Mitigation Incorporation	Less than Significant Impact	No Impact
a. Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving:				
i. Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.	☐	☐	☒	☐
ii. Strong seismic ground shaking?	☐	☐	☒	☐
iii. Seismic-related ground failure, including liquefaction?	☐	☐	☒	☐
iv. Landslides?	☐	☐	☒	☐
b. Result in substantial soil erosion or the loss of topsoil?	☐	☐	☒	☐
c. Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?	☐	☐	☒	☐
d. Be located on expansive soil, as defined in Table 18-1-B of the most recently adopted Uniform Building Code creating	☐	☐	☒	☐

	substantial direct or indirect risks to life or property?				
e.	Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?	☐	☐	☐	☒
f.	Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☒	☐	☐

ENVIRONMENTAL SETTING

The City of Kerman is situated in the center of the Great Valley of California. According to the 2007 Kerman General Plan Update, this area is an almost-flat, northwest-southeast trending basin, which is approximately 450 miles long and 50 miles wide. Mesozoic platonic, volcanic and metamorphic rocks of the Sierra Nevadas border the Great Valley basin on the east and the sedimentary rocks of the Coast Ranges on the western edge. The geologic formations found in and around the Kerman area are primarily the low alluvial fans of the perennial San Joaquin and Kings Rivers, and the multiple streams which comprise the Fresno alluvial fan sequence.

There are no known active earthquake faults in the City of Kerman. According to the 2007 Kerman General Plan Update, the greatest seismic threat to the region is posed by a complex thrust fault system, deep in the Sierran Block Boundary Zone, which is thought to be the source of the most notable earthquake recoded in the region (recorded in May 1983, 6.7 Rs). The nearest active fault near Kerman is the San Andreas, over 60 miles west.

According to the City's General Plan, much of the Planning area contains a combination of three major soil groups: Hanford, Traver and Hesperia. These soil types are generally considered well-drained.

RESPONSES

a-i. Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.

a-ii. Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving strong seismic ground shaking?

a-iii. Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving seismic-related ground failure, including liquefaction?

a-iv. Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving landslides?

Less Than Significant Impact. The proposed project site is not located in an earthquake fault zone as delineated by the 1972 Alquist-Priolo Earthquake Fault Zoning Map Act. The nearest known potentially active fault is the San Andreas Fault, located over sixty miles west of the site. No active faults have been mapped within the project boundaries, so there is no potential for fault rupture. It is anticipated that the proposed Project site would be subject to some ground acceleration and ground shaking associated with seismic activity during its design life. The Project site would be engineered and constructed in strict accordance with the earthquake resistant design requirements contained in the latest edition of the California Building Code (CBC) for seismic zone II, as well as Title 24 of the California Administrative Code, and therefore would avoid potential seismically induced hazards on planned structures. The Project site has a generally flat topography, and is not at risk of landslide. The impact of seismic hazards on the project would be ***less than significant.***

Mitigation Measures: None are required.

b. Result in substantial soil erosion or the loss of topsoil?

Less Than Significant Impact. The proposed Project will construct railroad tracking, paved areas, parking areas, fencing and lighting on approximately 17 acres. The Project site has a generally flat topography and is in an established urban area. Construction activities associated with the Project involves ground preparation work for the paved and parking areas. These activities could expose barren soils to sources of wind or water, resulting in the potential for erosion and sedimentation on and off the Project site. During construction, nuisance flow caused by minor rain could flow off-site. The City and/or contractor would be required to employ appropriate sediment and erosion control BMPs as part of a Stormwater Pollution Prevention Plan (SWPPP) that would be required by the California National Pollution Discharge Elimination System (NPDES). In addition, soil erosion and loss of topsoil would be minimized through implementation of the SVJAPCD fugitive dust control measures (See Section III). Once construction is complete, the Project would not result in soil erosion or loss of topsoil. Compliance with state regulations will ensure that impacts remain ***less than significant.***

Mitigation Measures: None required.

c. Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?

d. Be located on expansive soil, as defined in Table 18-1-B of the most recently adopted Uniform Building Code creating substantial risks to life or property?

- **Less Than Significant Impact.** See Section VI a. above. The site is not at significant risk from ground shaking, liquefaction, or landslide and is otherwise considered geologically stable. Liquefaction typically occurs when there is shallow groundwater, low-density non-plastic soils, and high-intensity ground motion. Groundwater depths in the City of Kerman have been mapped at 110 feet below the ground surface and soils in the City generally consist of sandy loam which is generally not conducive to liquefaction. The City of Kerman is relatively flat which precludes the occurrence of landslides. Subsidence is typically related to over-extraction of groundwater from certain types of geologic formations where the water is partly responsible for supporting the ground surface; however, the City of Kerman is not recognized by the U.S. Geological Service as being in an area of subsidence.[10] Impacts are considered ***less than significant***.

Mitigation Measures: None required.

e. Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?

No Impact. The Project does not include the construction, replacement, or disturbance of septic tanks or alternative wastewater disposal systems. The Project will not be tying into the existing sewer services and will instead utilize temporary portable toilets for staff. Therefore, there is ***no impact.***

Mitigation Measures: None are required.

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[10] U.S. Geological Service. Areas of Land Subsidence in California. https://ca.water.usgs.gov/land_subsidence/california-subsidence-areas.html. Accessed May 2020.

f. Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?

Less Than Significant Impact with Mitigation. There are no unique geologic features in the Project vicinity. Although there are no knows paleontological resources located in the project area, site development does have the potential to directly or indirectly destroy an unknown paleontological resource. Mitigation measures CUL-1 and CUL-2 are included to reduce any impacts to a less than significant level.

Mitigation Measures: CUL-1 and CUL-2

VIII. GREENHOUSE GAS EMISSIONS

Would the project:	Potentially Significant Impact	Less than Significant With Mitigation Incorporation	Less than Significant Impact	No Impact
a. Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	☐	☐	☒	☐
b. Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?	☐	☐	☒	☐

ENVIRONMENTAL SETTING

Various gases in the earth's atmosphere play an important role in moderating the earth's surface temperature. Solar radiation enters earth's atmosphere from space and a portion of the radiation is absorbed by the earth's surface. The earth emits this radiation back toward space, but the properties of the radiation change from high-frequency solar radiation to lower-frequency infrared radiation. GHGs are transparent to solar radiation but are effective in absorbing infrared radiation. Consequently, radiation that would otherwise escape back into space is retained, resulting in a warming of the earth's atmosphere. This phenomenon is known as the greenhouse effect. Scientific research to date indicates that some of the observed climate change is a result of increased GHG emissions associated with human activity. Among the GHGs contributing to the greenhouse effect are water vapor, carbon dioxide (CO_2), methane (CH_4), ozone, Nitrous Oxide (NO_x), and chlorofluorocarbons. Human-caused emissions of these GHGs in excess of natural ambient concentrations are considered responsible for enhancing the greenhouse effect. GHG emissions contributing to global climate change are attributable, in large part, to human activities associated with the industrial/manufacturing, utility, transportation, residential, and agricultural sectors. In California, the transportation sector is the largest emitter of GHGs, followed by electricity generation. Global climate change is, indeed, a global issue. GHGs are global pollutants, unlike criteria pollutants and TACs (which are pollutants of regional and/or local concern). Global climate change, if it occurs, could potentially affect water resources in California. Rising temperatures could be anticipated to result in sea-level rise (as polar ice caps melt) and possibly change the timing and amount of precipitation, which could alter water quality. According to some, climate change could result in more extreme weather patterns; both heavier precipitation that could lead to flooding, as well as more extended drought periods. There is uncertainty regarding the timing, magnitude, and nature of the potential changes to water resources as a result of climate change; however, several trends are evident.

Snowpack and snowmelt may also be affected by climate change. Much of California's precipitation falls as snow in the Sierra Nevada and southern Cascades, and snowpack represents approximately 35 percent of the state's useable annual water supply. The snowmelt typically occurs from April through July; it provides natural water flow to streams and reservoirs after the annual rainy season has ended. As air temperatures increase due to climate change, the water stored in California's snowpack could be affected by increasing temperatures resulting in: (1) decreased snowfall, and (2) earlier snowmelt.

RESPONSES

a. Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?

b. Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?

Less Than Significant Impact. The U.S. Environmental Protection Agency published a rule for the mandatory reporting of greenhouse gases from sources that in general emit 25,000 metric tons or more of carbon dioxide (CO2) per year. As shown in the modeling results (Appendix A), the Project will produce the following CO2:

2020 Terminal Construction	367.11 MT/yr
2021 Terminal Construction	223.36 MT/yr
Total Project Construction Emissions	590.47 MT/yr

This represents less than two and a half percent of the reporting threshold. As such, any impacts resulting from conflicting a GHG plan, policy, or regulation, or significantly impacting the environment as a result of project development is considered ***less than significant.***

Mitigation Measures: None are required.

IX. HAZARDS AND HAZARDOUS MATERIALS

Would the project:

	Potentially Significant Impact	Less than Significant With Mitigation Incorporation	Less than Significant Impact	No Impact
a. Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☒	☐
b. Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☐	☒	☐
c. Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☐	☒
d. Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☐	☒
e. For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard or excessive noise for people residing or working in the project area?	☐	☐	☒	☐
f. Impair implementation of or physically interfere with an adopted emergency	☐	☐	☐	☒

IX. HAZARDS AND HAZARDOUS MATERIALS **Would the project:**	Potentially Significant Impact	Less than Significant With Mitigation Incorporation	Less than Significant Impact	No Impact
response plan or emergency evacuation plan?				
g. Expose people or structures either directly or indirectly to a significant risk of loss, injury or death involving wildland fires?	☐	☐	☐	☒

ENVIRONMENTAL SETTING

The area immediately surrounding the proposed Project consists of industrial, commercial and agricultural land uses. The site is currently vacant and disked for fire suppression.

RESPONSES

a. Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?

b. Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?

Less than Significant Impact. This impact is associated with hazards caused by the routine transport, use, or disposal of hazardous materials or through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment. Proposed Project construction activities may involve the use and transport of hazardous materials. These materials may include fuels, oils, mechanical fluids, and other chemicals used during construction. Transportation, storage, use, and disposal of hazardous materials during construction activities would be required to comply with applicable federal, state, and local statutes and regulations. Compliance would ensure that human health and the environment are not exposed to hazardous materials. In addition, the Project would be required to comply with the National Pollutant Discharge Elimination System (NPDES) permit program through the submission and implementation of a Stormwater Pollution Prevention Plan during construction activities to prevent contaminated runoff from leaving the project site. Therefore, no significant impacts would occur during construction activities.

The operational phase of the proposed Project would occur after construction is completed. The proposed Project includes land uses that are considered compatible with the surrounding uses. The primary component of the proposed Project includes the routine transport and storage of hazardous materials in the form of liquid propane gas. A Conditional Use Permit is required for hazardous material handling in the M-2 zone (Heavy Manufacturing). A Fire Safety Analysis (see Appendix C) was performed and has concluded that the Project will not present a reasonably foreseeable release of hazardous materials, because of the extensive safety measures and precautions that will be implemented during Project operations. The following tables were provided by the Fire Safety Analysis (FAS). In the FAS, Tables 4 through 7 detail the code-required control hardware installed in each propane gas storage container and all facility piping, in order to ensure safety during service operations. Table 8 outlines the incorporated equipment utilized for additional safety measures used during operations. Table 9 indicates the use of low emission transfer hoses, which result in a 50% reduction in separation distances between transfer points in the facility piping. Table 10 indicates the safety systems utilized against the risk of tampering or from accidental collisions. Table 11 indicates the passive and active control methods utilized for ignition source control.

Table 4 – Requirements for Transfer Lines of 1 ½-inch Diameter or Larger, Liquid-into-Containers[11]

A	B	C	D	E	F
Item #	Appurtenance (Either No. 1 or No. 2)**	Appurtenance Provided with the Feature	Installed in the facility? Yes	Installed in the facility? No	NFPA 58 Section Reference (2014 edition)
1	Emergency shutoff valve (ESV) (Ref § 6.12)	Installed within 20 ft. of lineal pipe from the nearest end of the hose or swivel-type connections.	☑	☐	6.12.2
		Automatic shutoff through thermal (fire) actuation element with maximum melting point of 250 °F.	☑	☐	6.12.6
		Temperature-sensitive element (fusible link) installed within 5 ft. from the nearest end of the hose or swivel-type piping connected to liquid transfer line.	☑	☐	6.12.6
		Manually operated remote shutoff feature provided for ESV.	☑	☐	6.12.12.1
		Manual shutoff device provided at a remote location, not less than 25 ft., and not more than 100 ft. from the ESV in the path of egress.	☑	☐	6.12.12.2
		An ESV is installed on each leg of a multi-leg piping each of which is connected to a hose or a swivel-type connection on one side and to a header of 1½ inch in diameter or larger on the other side.	☑	☐	6.12.5 and 6.19.2.6 (1)
		Breakaway protection is provided such that in any pull-away break will occur on the hose or swivel-type connection side while retaining intact the valves and piping on the plant side.	☑	☐	6.12.8
2	Backflow check valve (BCK)**	Installed downstream of the hose or swivel-type connection.	☑	☐	6.12.3
		BCK is designed for this specific application.	☑	☐	6.12.4
		A BCK is installed on each leg of a multi-leg piping each of which is connected to a hose or a swivel type connection on one side and to a header of 1½ inch in diameter or larger on the other side.	☑	☐	6.12.5
		Breakaway protection is provided such that in any pull-away break will occur on the hose or swivel-type connection side while retaining intact the valves and piping on the plant side.	☑	☐	6.12.8
3	Debris protection ++	Liquid inlet piping is designed or equipped to prevent debris and foreign material from entering the system.	☑	☐	6.19.2.5
4	Emergency discharge control	Flow-through facility hose used to transfer LP-Gas from non-metered cargo tank vehicle into containers will stop within 20 seconds of a complete hose separation without human intervention.	☑	☐	6.19.2.6 (3)

** In lieu of an emergency shutoff valve, the backflow check valve (BCK) is only permitted when flow is only into the container and shall have a metal-to-metal seat or a primary resilient seat with metal backup, not hinged with a combustible material (6.12.3, 6.12.4).

++ Retrofit required for existing facilities by July 1, 2011.

[11] Fire Safety Analysis Manual for LP-Gas Storage Facilities. National Fire Protection Association and National Propane Gas Association. Based on the 2014 Edition of NFPA 58 *Liquefied Petroleum Gas Code.* Page A-6, Form 5.3.

Table 5 – Requirements for Transfer Lines of 1½-inch Diameter or Larger, Liquid Withdrawal from Containers[12]

A	B	C	D	E	F
Item #	Appurtenance	Appurtenance Provided with the Feature	Installed in the facility?		NFPA 58 Section Reference (2014 Edition)
			Yes	No	
1	Emergency shutoff valve (ESV) (Ref § 6.12)	Installed within 20 ft. of lineal pipe from the nearest end of the hose or swivel-type connections.	☑	☐	6.12.2
		Automatic shutoff through thermal (fire) actuation element with maximum melting point of 250 ºF.	☑	☐	6.12.6
		Temperature-sensitive element installed within 5 ft. from the nearest end of the hose or swivel-type piping connected to liquid transfer line.	☑	☐	6.12.6
		Manually operated remote shutoff feature provided for ESV.	☑	☐	6.12.12.1
		Manual shutoff device provided at a remote location, not less than 25 ft., and not more than 100 ft. from the ESV in the path of egress.	☑	☐	6.12.12.2
		An ESV is installed on each leg of a multi-leg piping each of which is connected to a hose or a swivel-type connection on one side and to a header of 1½ inch in diameter or larger on the other side.	☑	☐	6.12.5 and 6.19.2.6 (1)
		Breakaway protection is provided such that in any pull-away break will occur on the hose or swivel-type connection side while retaining intact the valves and piping on the plant side.	☑	☐	6.12.8
		Number of ESV's in liquid withdrawal service	One ESV Installed in Each Tank		

Note: If more than one ESV is installed in the facility, use one Form 5.4 for each ESV.

[12] Fire Safety Analysis Manual for LP-Gas Storage Facilities. National Fire Protection Association and National Propane Gas Association. Based on the 2014 Edition of NFPA 58 *Liquefied Petroleum Gas Code.* Page A-7, Form 5.4.

Table 5 (Continued)[13]

A	B	C	D	E	F
Item #	Appurtenance	Appurtenance Provided with the Feature	Installed in the facility?		NFPA 58 Section Reference (2014 edition)
			Yes	No	
2	Backflow check valve (BCK)**	Installed downstream of the hose or swivel-type connection	X		6.12.3
		BCK is designed for this specific application.	X		6.12.4
		A BCK is installed on each leg of a multi leg piping each of which is connected to a hose or a swivel type connection on one side and to a header of 1½ inch in diameter or larger on the other side.	X		6.12.5
		Breakaway protection is provided such that in any pull-away break will occur on the hose or swivel-type connection side while retaining intact the valves and piping on the plant side.	X		6.12.8
3	Debris Protection++	Liquid inlet piping is designed or equipped to prevent debris and foreign material from entering the system.	X		6.19.2.5
4	Emergency discharge control	Flow through facility hose used to transfer LP-Gas from non-metered cargo tank vehicle into containers will stop within 20 seconds of a complete hose separation without human intervention.	X		6.19.2.6 (3)

** In lieu of an emergency shutoff valve, the backflow check valve (BCK) is only permitted when flow is only into the container and shall have a metal-to-metal seat or a primary resilient seat with metal backup, not hinged with a combustible material (6.12.3, 6.12.4).

++ Retrofit required for existing facilities by July 1, 2011.

[13] Fire Safety Analysis Manual for LP-Gas Storage Facilities. National Fire Protection Association and National Propane Gas Association. Based on the 2014 Edition of NFPA 58 *Liquefied Petroleum Gas Code.* Page 5-23, Form 5.4 continued.

Table 6 – Requirements for Transfer Lines of 1½-inch Diameter or Larger, Liquid Withdrawal from Containers[14]

A	B	C	D	E	F
Item #	Appurtenance	Appurtenance Provided with the Feature	Installed in the facility?		NFPA 58 Section Reference (2014 Edition)
			Yes	No	
1	Emergency shutoff valve (ESV) (Ref § 6.12)	Installed within 20 ft. of lineal pipe from the nearest end of the hose or swivel-type connections.	X		6.12.2
		Automatic shutoff through thermal (fire) actuation element with maximum melting point of 250 ºF.	X		6.12.6
		Temperature sensitive element installed within 5 ft from the nearest end of the hose or swivel type piping connected to liquid transfer line.	X		6.12.6
		Manually operated remote shutoff feature provided for ESV.	X		6.12.12.1
		Manual shutoff device provided at a remote location, not less than 25 ft., and not more than 100 ft. from the ESV in the path of egress.	X		6.12.12.2
		An ESV is installed on each leg of a multi leg piping each of which is connected to a hose or a swivel type connection on one side and to a header of 1½ inch in diameter or larger on the other side.	X		6.12.5 and 6.19.2.6 (1)
		Breakaway protection is provided such that in any pull-away break will occur on the hose or swivel-type connection side while retaining intact the valves and piping on the plant side.	X		6.12.8
		Number of ESV's in liquid withdrawal service			

Note: If more than one ESV is installed in the facility, use one Form 5.5 for each ESV.

[14] Fire Safety Analysis Manual for LP-Gas Storage Facilities. National Fire Protection Association and National Propane Gas Association. Based on the 2014 Edition of NFPA 58 *Liquefied Petroleum Gas Code.* Page 5-24, Form 5.5.

Table 7 – Requirements for Vapor Transfer Lines 1¼-inch Diameter or Larger[15]

A	B	C	D	E	F
Item #	Appurtenance	Appurtenance Provided with the Feature	Installed in the facility? Yes	Installed in the facility? No	NFPA 58 Section Reference (2014 edition)
1	Emergency shutoff valve (ESV) (Ref § 6.12)	Installed within 20 ft. of lineal pipe from the nearest end of the hose or swivel-type connections.	X		6.12.2
		Automatic shutoff through thermal (fire) actuation element with maximum melting point of 250 °F	X		6.12.6
		Temperature sensitive element installed within 5 ft from the nearest end of the hose or swivel type piping connected to liquid transfer line.	X		6.12.6
		Manually operated remote shutoff feature provided for ESV.	X		6.12.12.1
		Manual shutoff device provided at a remote location, not less than 25 ft., and not more than 100 ft. from the ESV in the path of egress.	X		6.12.12.2
		An ESV is installed on each leg of a multi leg piping each of which is connected to a hose or a swivel type connection on one side and to a header of 1-1/4 inch in diameter or larger on the other side.	X		6.12.5 and 6.19.2.6 (1)
		Breakaway protection is provided such that in any pull-away break will occur on the hose or swivel-type connection side while retaining intact the valves and piping on the plant side.	X		6.12.8
2	Backflow check valve (BCK)**	Installed downstream of the hose or swivel-type connection	X		6.12.3
		BCK is designed for this specific application.	N/A	N/A	6.12.4
		A BCK is installed on each leg of a multi leg piping each of which is connected to a hose or a swivel type connection on one side and to a header of 1-1/4 inch in diameter or larger on the other side.	N/A	N/A	6.12.5
		Breakaway protection is provided such that in any pull-away break will occur on the hose or swivel-type connection side while retaining intact the valves and piping on the plant side.	X		6.12.8

** In lieu of an emergency shutoff valve, the backflow check valve (BCK) is only permitted when flow is only into the container and it shall have a metal-to-metal seat or a primary resilient seat with metal backup, not hinged with a combustible material (6.12.3, 6.12.4).

[15] Fire Safety Analysis Manual for LP-Gas Storage Facilities. National Fire Protection Association and National Propane Gas Association. Based on the 2014 Edition of NFPA 58 *Liquefied Petroleum Gas Code.* Page 5-25, Form 5.6.

Table 8 – Evaluation of Redundant Fail-Safe Design[16]

A	B		C	D	E	F
Item #	Description		Features	Installed in the facility?		NFPA 58 Section Reference (2014 edition)
				Yes	No	
1	Container sizes for which the appurtenances are provided		Appurtenances and redundant fail-safe equipment are provided for each container of water capacity 2,001 gal. through 30,000 gal.	X		6.28.3 and 6.28.4
2	Liquid or vapor withdrawal (1-1/4 in. or larger)		Internal valve having internal excess-flow valve	X		6.28.3.1 and 6.28.3.2
			Positive shutoff valve installed as close as practical to the internal valve	X		6.28.3.4
3	Liquid or vapor inlet		Internal valve having internal excess-flow valve or backflow check valve	X		6.28.3.5
			Positive shutoff valve installed as close as possible to the internal valve or the back-flow check valve	X		6.28.3.5
4	Railcar transfer	Flow into or out of railroad tank car	Approved emergency shutoff valves installed in the transfer hose or the swivel-type piping at the tank car end	X		6.19.2.6 (1) and 6.28.4
		Flow only into railroad tank car	Approved emergency shutoff valve or backflow check valve installed in the transfer hose or the swivel-type piping at the tank car end	N/A	N/A	6.19.2.6 (2) and 6.28.4
5	Cargo tank transfer		Protection provided in accordance with 6.12	X		6.28.4.1
6	Automatic closure of all primary valves (IV & ESV) in an emergency		By thermal (Fire) actuation	X		6.28.4.2
			Actuated by a hose pull-away due to vehicle motion	X		6.28.4.2
7	Manually operated remote shutdown of IV and ESV		Remote shutdown station within 15 ft of the point of transfer	X		6.28.4.3 (A)
			Another remote shutdown station between 25 ft and 100 ft of the transfer point	X		6.28.4.3 (B)
			Shutdown stations will shut down electrical power supply to the transfer equipment and all primary valves (Internal & Emergency Valves).	X		6.28.4.3
			Signs complying with the requirements of 6.26.4.3 (C) provided	X		6.28.4.3 (C)

Note: If the facility does not have a rail terminal, write the word NA in both the "Yes" column and the "No" column in item 4 of this Form in the railroad tank car row. Similar option is also available if there is no cargo tank vehicle transfer station.

[16] Fire Safety Analysis Manual for LP-Gas Storage Facilities. National Fire Protection Association and National Propane Gas Association. Based on the 2014 Edition of NFPA 58 *Liquefied Petroleum Gas Code.* Page 5-27, Form 5.7.

Table 9 – Evaluation of Low Emission Transfer Equipment[17]

A	B	C		D	E	F
Item #	Description	Features		Installed in the facility?		NFPA 58 Section Reference (2014 Edition)
				Yes	No	
1	Transfer into permanently mounted ASME containers on vehicles	Delivery nozzle and filler valve- Max. liquid release after transfer of 4 cm^3 (0.24 in^3).	Fixed maximum liquid level gage not used during transfer operations	X		6.28.5.3 (A) & (B)
2	Transfer into stationary ASME containers. delivery valve and nozzle combination	During product transfer or post transfer uncoupling of the hose, liquid product volume released to the atmosphere	Does not exceed 4 cm^3 (0.24 in^3) from a hose of nominal size 1 in or smaller	X		6.28.5.4 (A)
			Does not exceed 15 cm^3 (0.91 in^3) from a hose of nominal size larger than 1 in.	X		6.28.5.4 (B)
3	Transfer into stationary ASME containers maximum filling limit	Do containers of less than 2,001 gal (w.c.) have an overfilling prevention device or another approved device?		N/A	N/A	6.28.5.4 (F)
		Do containers 2,001 gal (w.c.) or greater have a float gage or other non-venting device?		N/A	N/A	6.28.5.4 (E)
4	Transfer into stationary ASME containers fixed maximum liquid level gage	Not used during routine transfer operations but used to calibrate other non-venting liquid level gages in the container		X		6.28.5.4 (C) & (D)

Note: 1) If the facility does not have a particular feature described in items 2 or 3, write "NA" in both the "Yes" and "No" columns corresponding to its row .

[17] Fire Safety Analysis Manual for LP-Gas Storage Facilities. National Fire Protection Association and National Propane Gas Association. Based on the 2014 Edition of NFPA 58 *Liquefied Petroleum Gas Code.* Page 5-28, Form 5.8.

Table 10 – Evaluation of Physical Protection and Other Measures[18]

A	B	C	D	E	F
#	Item	Features	Installed in the facility?		NFPA 58 Section Reference (2014 Edition)
			Yes	No	
1	Lighting‡	Provide lighting for nighttime operations to illuminate storage containers, container being loaded, control valves, and other equipment	X		6.19.5
2	Vehicle impact protection	Protection against vehicular (traffic) impacts on containers, transfer piping and other appurtenances is designed and provided commensurate with the size of vehicles and type of traffic in the facility. (Example protection systems include but not limited to (1) Guard rails, (2) Steel bollards or crash posts, (3) Raised sidewalks.	X		6.6.1.2 and 6.9.3.10
3	Protection against corrosion	Provide protection against corrosion where piping is in contact with supports or corrosion causing substances.	X		6.9.3.11, 6.9.3.14, and 6.17
Complete only 4A or 4B					
4 A	Perimeter Fence	Is an industrial type or chain link fence of at least 6 ft high or equivalent protection provided to enclose (all around) container appurtenances, pumping equipment, loading and unloading and container filling facilities?	X		6.19.4.2
		Are at least two means of emergency egress (gates) from the enclosure provided? **NOTE: Write "N.A." (not applicable) if** (i) The area enclosed is less than 100 ft^2, or (ii) The point of transfer is within 3 ft of the gate, or containers are not filled within the enclosure	X		6.19.4.2 (A)
		Is a clearance of at least 3 feet all around to allow emergency access to the required means of egress provided?	X		6.19.4.2 (B)
	Guard Service	If a guard service is provided, does this service cover the LP-Gas plant and are the guard personnel provided with appropriate LP-Gas related training, per section 4.4 of NFPA 58?	N/A	N/A	6.19.4.3
4 B	Lock-in-Place devices	Are Lock-in-Place devices provided to prevent unauthorized use or operation of any container appurtenance, system valves, or equipment in lieu of the fence requirements above?	X		6.19.4.2 (C)

Note: Fill only items 1, 2, 3, and 4A or 4B. Indicate with "NA" when not filling the "Yes" or "No" column.

‡ Indicate with "NA" if the facility is not operated at night.

[18] Fire Safety Analysis Manual for LP-Gas Storage Facilities. National Fire Protection Association and National Propane Gas Association. Based on the 2014 Edition of NFPA 58 *Liquefied Petroleum Gas Code.* Page 6.1, Form 6.1.

Table 11 – Assessment of Sources of Ignition and Adjacent Combustible Materials[19]

A	B	C	D	E
#	Sources of Ignition and Requirements Pertaining to Adjacent Combustible Materials	Is the Facility compliant?		NFPA 58 Section Reference (2014 Edition)
		Yes	No	
1	Are combustible materials not closer than 10 ft. from each container?	X		6.4.4.3
2	Is a distance at least 20 ft. provided between containers and tanks containing flammable liquids with flash point less than 200 °F (ex., gasoline, diesel)?	X		6.4.4.6
3	Are electrical equipment and wiring installed per Code requirements?	X		6.23.2
4	Is open flame equipment located and used according to Code?	X		6.23.3.1
5	Are ignition control procedures and requirements during liquid transfer operations complied with?	X		7.2.3.2
6	Is an approved, portable, dry chemical fire extinguisher of minimum capacity 18 Lbs. and having a B:C rating provided in the facility?	X		6.27.4.2
7	Is an approved, portable, dry chemical fire extinguisher of minimum capacity 18 Lbs. and having a B:C rating provided on each truck or trailer used to transport propane?	X		9.3.5 and 9.4.7
8	Is the prohibition on smoking within the facility premises strictly enforced?	X		7.2.3.2 (B) and 9.4.10

Note: Insert "NA" in both "Yes" and "No" columns of any items that are not applicable.

[19] Fire Safety Analysis Manual for LP-Gas Storage Facilities. National Fire Protection Association and National Propane Gas Association. Based on the 2014 Edition of NFPA 58 *Liquefied Petroleum Gas Code.* Page 6.2, Form 6.2.

By incorporating the aforementioned safety measures into the proposed Project design, the Project would not create a significant hazard through the routine transport, use, or disposal of hazardous materials, nor would a significant hazard to the public or to the environment through the reasonably foreseeable upset and accidental conditions involving the likely release of hazardous materials into the environment occur.

Therefore, the proposed Project will not create a significant hazard to the public or the environment and any impacts would be ***less than significant***.

Mitigation Measures: None are required.

c. Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?

No Impact. No schools are located within 0.25 mile of the Project site. This condition precludes the possibility of activities associated with the proposed Project exposing schools within a 0.25-mile radius of the project site to hazardous materials. ***No impact*** would occur.

Mitigation Measures: None are required.

d. Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?

No Impact. The proposed Project site is not located on a list of hazardous materials sites complied pursuant to Government Code Section 65962.5 (Geotracker[20] and DTSC Envirostor[21] databases). One hazardous materials site was listed by both databases, approximately 0.5 miles to the east of the Project site; the Helena Chemical Company at 1075 south Vineland Avenue. While the site is listed as "open" as it is being assessed, it is not anticipated to have a negative effect on the proposed Project site due to distance and intervening land

[20] California State Water Resources Control Board, Geotracker Database. https://geotracker.waterboards.ca.gov/map/?global_id=AGW080012083 Accessed May 2020.
[21] California Department of Toxic Substances Control. Envirostor Database. https://www.envirostor.dtsc.ca.gov/public/profile_report?global_id=10280018 Accessed May 2020.

uses. As such, ***no impacts*** would occur that would create a significant hazard to the public or the environment.

Mitigation Measures: None are required.

e. For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard or excessive noise for people residing or working in the project area?

Less than Significant Impact. There are two private airstrips in the Project vicinity. Bland Field Airstrip is located just under two miles southeast of the Project site while the DuBois Ranch Airport lies approximately four miles to the southwest. The closest commercial airport is Fresno-Yosemite International Airport, located approximately 20 miles east, in the city of Fresno. The proposed site is not located inside any adopted Airport Land Use Plan's Safety Zone. The proposed land use could potentially contribute to the severity of an aircraft accident, however the Project itself would not result in a safety hazard to aircraft. According to the National Transportation Safety Board[22], only one aviation accident has occurred in the Kerman area since January 1, 2000. The data summary indicates that the airplane did not become airborne and the accident was nonfatal. Accidents related to private planes flying to and from the nearby private airstrips are expected to be extremely unlikely. Thus, any impacts are ***less than significant***.

Mitigation Measures: None are required.

f. Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?

No Impact. The Project will not interfere with any adopted emergency response or evacuation plan. There is ***no impact.***

Mitigation Measures: None are required.

[22] National Transportation Safety Board, Aviation Accident Database and Synopses. https://www.ntsb.gov/_layouts/ntsb.aviation/Results.aspx?queryId=dcd4bd78-5e4b-499c-8e9b-3dd3a9bc28bf Accessed May 2020.

g. Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?

No Impact. There are no wildlands on or near the Project site. There is ***no impact***.

Mitigation Measures: None are required.

X. HYDROLOGY AND WATER QUALITY

Would the project:

	Potentially Significant Impact	Less than Significant With Mitigation Incorporation	Less than Significant Impact	No Impact
a. Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality?	☐	☐	☒	☐
b. Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?	☐	☐	☒	☐
c. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would:	☐	☐	☒	☐
i. Result in substantial erosion or siltation on- or off- site;	☐	☐	☒	☐
ii. substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or offsite;	☐	☐	☒	☐
iii. create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff; or	☐	☐	☒	☐
iv. impede or redirect flood flows?	☐	☐	☒	☐

X. HYDROLOGY AND WATER QUALITY

Would the project:

	Potentially Significant Impact	Less than Significant With Mitigation Incorporation	Less than Significant Impact	No Impact
d. In flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation?	☐	☐	☒	☐
e. Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?	☐	☐	☒	☐

ENVIRONMENTAL SETTING

The City of Kerman obtains its water from a five deeps wells, located at depths of 300 to 900 feet, penetrating the vast aquifer underlying the San Joaquin Valley. Production capacity remains at a level of 5,700 gallons per minute (gpm). The wells contain a static water level from 85-90 feet. City staff have confirmed that over the past 10 to 15 years the depth of the groundwater for the City of Kerman has remained stable.

The City of Kerman will provide water to the Project site, if and when permanent buildings are proposed for development; at present, no water service infrastructure is required as the Project will utilize temporary portable toilets for staff usage during operations.

RESPONSES

a. Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality?

Less Than Significant Impact. The Project has the potential to impact water quality standards and/or waste discharge requirements during construction (temporary impacts) and operation. Impacts are discussed below.

Construction

Although the proposed Project site is small in scale, grading, excavation and loading activities associated with construction activities could temporarily increase runoff, erosion, and sedimentation. Construction

activities also could result in soil compaction and wind erosion effects that could adversely affect soils and reduce the revegetation potential at construction sites and staging areas.

Three general sources of potential short-term construction-related stormwater pollution associated with the proposed project are: 1) the handling, storage, and disposal of construction materials containing pollutants; 2) the maintenance and operation of construction equipment; and 3) earth moving activities which, when not controlled, may generate soil erosion and transportation, via storm runoff or mechanical equipment. Generally, routine safety precautions for handling and storing construction materials may effectively mitigate the potential pollution of stormwater by these materials. These same types of common sense, "good housekeeping" procedures can be extended to non-hazardous stormwater pollutants such as sawdust and other solid wastes.

Poorly maintained vehicles and heavy equipment leaking fuel, oil, antifreeze, or other fluids on the construction site are also common sources of stormwater pollution and soil contamination. In addition, grading activities can greatly increase erosion processes. Two general strategies are recommended to prevent construction silt from entering local storm drains. First, erosion control procedures should be implemented for those areas that must be exposed. Secondly, the area should be secured to control offsite migration of pollutants. These Best Management Practices (BMPs) would be required in the Stormwater Pollution Prevention Plan (SWPPP) to be prepared prior to commencement of Project construction. When properly designed and implemented, these "good-housekeeping" practices are expected to reduce short-term construction-related impacts to less than significant.

In accordance with the National Pollution Discharge Elimination System (NPDES) Stormwater Program, the Project will be required to comply with existing regulatory requirements to prepare a SWPPP designed to control erosion and the loss of topsoil to the extent practicable using BMPs that the Regional Water Quality Control Board (RWQCB) has deemed effective in controlling erosion, sedimentation, runoff during construction activities. The specific controls are subject to the review and approval by the RWQCB and are an existing regulatory requirement.

Therefore, any impacts are ***less than significant.***

Mitigation Measures: None are required.

b. Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?

Less Than Significant Impact. Project demands for groundwater resources in connection with the proposed Project would not substantially deplete groundwater supplies and/or otherwise interfere with

groundwater recharge efforts being implemented by the City of Kerman. The proposed Project is not anticipated to result in additional demands for groundwater resources beyond those considered in the adopted City of Kerman General Plan, and the site is appropriately designated and zoned for industrial activity. Any impacts would be ***less than significant***.

Mitigation Measures: None are required.

c. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would:

i. result in substantial erosion or siltation on- or offsite;

ii. substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or offsite;

iii. create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff; or

iv. impede or redirect flood flows?

Less Than Significant Impact. The Project includes minor changes to the existing stormwater drainage pattern of the area through the installation of under two acres of impermeable (concrete/asphalt) surfaces and will be required by the City to be graded to facilitate proper stormwater drainage. Standard construction practices and compliance with state and federal regulations, city ordinances and regulations, The Uniform Building Code, and adherence to professional engineering design approved by the City of Kerman will reduce or eliminate potential drainage impacts from the Project.

As discussed in Impact X(c), the proposed Project is within Flood Zone "X" which is outside the 0.2% annual chance floodplain. Accordingly, the chance of flooding at the site is remote. Any impacts related to this analysis area are ***less than significant.***

Mitigation Measures: None required.

d. In flood hazard, tsunami or seiche zones, risk release of pollutants due to project inundation?

e. Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?

Less Than Significant Impact. According to FEMA Flood Map 06019C2075H, the Project is within Zone X, which is identified as experiencing 0.2% Annual Chance Flood Hazard and 1% Annual Chance Flood (with average depth of less than one foot or with drainage areas less than one square mile). In addition, the Project does not include any housing or structures that would be subject to flooding either from a watercourse or from dam inundation. There are no bodies of water near the site that would create a potential risk of hazards from seiche, tsunami or mudflow. The Project will not conflict with any water quality control plans or sustainable groundwater management plan. There will be ***a less than significant impact*** associated with Project implementation.

Mitigation Measures: None are required.

XI. LAND USE AND PLANNING

Would the project:

	Potentially Significant Impact	Less than Significant With Mitigation Incorporation	Less than Significant Impact	No Impact
a. Physically divide an established community?	☐	☐	☒	☐
b. Cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☒	☐

ENVIRONMENTAL SETTING

The proposed Project site is in the southern portion of the City of Kerman. The proposed liquid propane gas terminal vicinity is heavily disturbed with primarily industrial, commercial and agricultural uses. The site is currently vacant, see Figure 3 – Aerial Map. The Project area is zoned M-2 (Heavy Manufacturing) and CS (Service Commercial).

RESPONSES

a. Physically divide an established community?

Less Than Significant Impact. The construction and operation of the Project would not cause any land use changes in the surrounding vicinity nor would it divide an established community, as the proposed use within an industrial area is considered acceptable. A Conditional Use Permit is required for hazardous material handling in zone M-2. Impacts are ***less than significant***.

Mitigation Measures: None are required.

b. Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the General Plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?

Less Than Significant Impact. The proposed Project includes construction and operation of liquid propane gas terminal. The immediate vicinity of the proposed Project site is comprised of industrial, commercial and agricultural land uses. The area is highly disturbed. The proposed Project has no characteristics that would physically divide the City of Kerman. Access to the existing surrounding establishments will remain.

The proposed liquid propane gas terminal would not conflict with current zoning in and around the Project site and would not conflict with any applicable land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect. Impacts are ***less than significant***.

Mitigation Measures: None are required.

XII. MINERAL RESOURCES

Would the project:

	Potentially Significant Impact	Less than Significant With Mitigation Incorporation	Less than Significant Impact	No Impact
a. Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	☒
b. Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?	☐	☐	☐	☒

ENVIRONMENTAL SETTING

According to the 2007 Kerman General Plan Update, there are no significant mineral resources within the planning area. No known mining of mineral resources has occurred in the City of Kerman. Raisin City field represents the closest significant mineral resource, which is an oil field for petroleum extraction about five miles south of Kerman.

RESPONSES

a. Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?

b. Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?

No Impact. There are no known mineral resources in the proposed Project area and the site is not included in a State classified mineral resource zones. Therefore, there is ***no impact***.

Mitigation Measures: None are required.

XIII. NOISE

Would the project:

	Potentially Significant Impact	Less than Significant With Mitigation Incorporation	Less than Significant Impact	No Impact
a. Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☐	☒	☐
b. Generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☒	☐
c. For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒

ENVIRONMENTAL SETTING

Noise is most often described as unwanted sound. Although sound can be easily measured, the perception of noise and the physical response to sound complicate the analysis of its impact on people. The City of Kerman is impacted by a multitude of noise sources. Mobile sources of noise, especially cars and trucks, are the most common and significant sources of noise in most communities, and they are predominant sources of noise in the City. Commercial, industrial, and institutional land uses throughout the City (i.e., schools, fire stations, utilities) also generate stationary-source noise. The Project is located in an area with a mix of uses. The predominant noise sources in the Project area include traffic on local roadways, noise associated with nearby commercial and industrial businesses, and potentially agricultural noise from the nearby fields to the west of the Project site. There are no sensitive receptors in the immediate area; the closest residences are located approximately one-quarter mile to the north.

RESPONSES

a. Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?

b. Generation of excessive groundborne vibration or groundborne noise levels?

Less than Significant Impact.

Short-term (Construction) Noise Impacts

Proposed Project construction related activities will involve temporary noise sources. Typical construction related equipment include graders, trenchers, small tractors and excavators. During the proposed Project construction, noise from construction related activities will contribute to the noise environment in the immediate vicinity. Activities involved in construction will generate maximum noise levels, as indicated in Table 5, ranging from 79 to 91 dBA at a distance of 50 feet, without feasible noise control (e.g., mufflers) and ranging from 75 to 80 dBA at a distance of 50 feet, with feasible noise controls.

Table 5
Typical Construction Noise Levels

Type of Equipment	dBA at 50 ft	
	Without Feasible Noise Control	With Feasible Noise Control
Dozer or Tractor	80	75
Excavator	88	80
Scraper	88	80
Front End Loader	79	75
Backhoe	85	75
Grader	85	75
Truck	91	75

The distinction between short-term construction noise impacts and long-term operational noise impacts is a typical one in both CEQA documents and local noise ordinances, which generally recognize the reality that short-term noise from construction is inevitable and cannot be mitigated beyond a certain level. Thus, local agencies frequently tolerate short-term noise at levels that they would not accept for permanent noise sources. A more severe approach would be impractical and might preclude the kind of construction activities that are to be expected from time to time in urban environments. Most residents of urban areas recognize this reality and expect to hear construction activities on occasion.

Long-term (Operational) Noise Impacts

The primary source of on-going noise from the proposed Project will be from railcars being moved along railways, motorized equipment used in liquid propane transfer, and transport vehicles traveling to and from the site. Twelve trucks per 24-hour period is the maximum number expected and is not anticipated to contribute a significant amount to ambient noise levels. The area is active with industrial and commercial businesses, and as such the proposed Project will not introduce a new significant source of noise that isn't already in the area. Thus, any impacts would be ***less than significant***.

Mitigation Measures: None are required.

c. For a project located within the vicinity of a private airstrip or an airport land use plan, or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?

No Impact. The Project is not located within an airport land use plan, nor is it within two miles of a public airport or public use airport. Therefore, there is ***no impact***.

Mitigation Measures: None are required.

XIV. POPULATION AND HOUSING

Would the project:

	Potentially Significant Impact	Less than Significant With Mitigation Incorporation	Less than Significant Impact	No Impact
a. Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☐	☒
b. Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒

ENVIRONMENTAL SETTING

The City of Kerman's 2000 population was 8,551, up by 3,103 people from the 1990 census figure of 5,448. The State Department of Finance, which provides population projections for cities and counties in California, estimated Kerman's population to be 40,561 as a high estimate in 2027, and 26,613 as a low estimate.[23]

The current status of the Project site is vacant land. There is no new housing associated with the Project.

The Project site is located in an area dominated by industrial, commercial, and agricultural uses. The nearest residences are approximately one-quarter mile to the north.

RESPONSESs

a. Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?

b. Displace substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere?

[23] 2007 Kerman General Plan Update, Part II, Chapter 1: Human Environment, 1-7 and 1-8.

No Impact. There are no new homes associated with the proposed Project and there are no residential structures currently on-site. The proposed Project would be an industrial service operation that would temporarily provide construction jobs in the Kerman area, which could be readily filled by the existing employment base, given the City's existing unemployment rates. The proposed Project will not affect any regional population, housing, or employment projections anticipated by City policy documents. There is ***no impact***.

Mitigation Measures: None are required.

XV. PUBLIC SERVICES

Would the project:

	Potentially Significant Impact	Less than Significant With Mitigation Incorporation	Less than Significant Impact	No Impact
a. Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:				
Fire protection?	☐	☐	☒	☐
Police protection?	☐	☐	☒	☐
Schools?	☐	☐	☐	☒
Parks?	☐	☐	☐	☒
Other public facilities?	☐	☐	☐	☒

ENVIRONMENTAL SETTING

The Project site is located in a primarily industrial area in the southern portion of the City of Kerman. The immediate vicinity is comprised of agricultural uses to the west, commercial businesses to the north, and industrial businesses to the east and south of the site. The area is served by North Central Fire Protection, Kerman Police Department, the Kerman Unified School District and other public facilities.

RESPONSES

a. Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:

Fire protection?

Less than Significant Impact. North Central Fire Protection offers a full range of services including fire prevention, suppression, emergency medical care, hazardous materials, urban search, and rescue response, as well as emergency preparedness planning and public education coordination within the Kerman City Limits. The Kearney Park Station located eight miles east provides backup assistance as needed, and the Biola Station located nine miles northeast may also respond to emergency events in Kerman.

North Central Fire Protection is able to respond to emergency call in within two to three minutes. The station employs two full-time personnel and two medical professionals, in addition to ten volunteer fire fighters. The North Central Fire Protection station maintains two 1,250 gpm (gallons per minute) fire engines, a 65-foot aerial ladder (750 gpm) and a paramedic rescue vehicle.

The proposed Project would be served by the current North Central Fire Station, which is located at 15850 west Kearney Boulevard, Kerman, approximately 0.9 miles northwest of the Project site.

The Project would be required to comply with all applicable fire and building safety codes (California Building Code and Uniform Fire Code) to ensure fire safety elements are incorporated into final Project design, including the providing designated fire lanes marked as such. Appropriate fire safety considerations will be included as part of the final design of the Project. Thus, the impact would be ***less than significant.***

Police Protection?

Less than Significant Impact. Protection services would be provided to the Project site from the existing Kerman Police Department, which is approximately 0.4 miles northeast of the Project site at 850 south Madera Avenue, Kerman. The Kerman Police Department provides a full range of police services and is staffed by a chief, four sergeants, one detective, thirteen full-time sworn officers, three Community Service Officers and ten reserve officer positions. Kerman also has a mutual aid agreement with the Fresno County Sheriff's Department, which has a substation located in San Joaquin. The Project site is located in an area currently served by the Kerman Police Department; the Department would not need to expand its existing service area or construct a new facility to serve the Project site. As such, the Project would have a ***less than significant impact*** on police protection services.

Schools?

No Impact. The direct increase in demand for schools is normally associated with new residential projects that bring new families with school-aged children to a region. The proposed Project does not contain any residential uses. The proposed Project, therefore, would not result in an influx of new

students in the Project area and is not expected to result in an increased demand upon District resources and would not require the construction of new facilities. There is ***no impact***.

Parks?

No Impact. The Project would not result in an increase in demand for parks and recreation facilities because it would not result in an increase in population. Accordingly, the proposed Project would have ***no impacts*** on parks.

Other public facilities?

No Impact. The proposed Project is within the land use and growth projections identified in the City's General Plan and other infrastructure studies. The Project, therefore, would not result in increased demand for, or impacts on, other public facilities such as library services. Accordingly, ***no impact*** would occur.

Mitigation Measures: None are required.

XVI. RECREATION

Would the project:

	Potentially Significant Impact	Less than Significant With Mitigation Incorporation	Less than Significant Impact	No Impact
a. Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☐	☒
b. Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	☐	☐	☐	☒

ENVIRONMENTAL SETTING

The City of Kerman has a standard of providing four acres of parkland for every 1,000 persons, according to the 2007 Kerman General Plan Update. Private parks are not factored into the standard. The City currently maintains nine parks; Plaza Veterans Park, B Street Park, Wooten Park, Kiwanis Park, Katey's Kids Park, Rotary Park, Lions Park, Kerckhoff Park and Soroptimist Park. In addition to the city's parks, the athletic fields on the campuses of Kerman's school district provides recreational opportunities after school hours.

RESPONSES

a. Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?

b. Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?

No Impact. The proposed Project does not include the construction of residential uses and would not directly or indirectly induce population growth. Therefore, the proposed Project would not cause physical deterioration of existing recreational facilities from increased usage or result in the need for new or expanded recreational facilities. The Project would have ***no impact*** to existing parks.

Mitigation Measures: None are required.

XVII. TRANSPORTATION/ TRAFFIC

Would the project:

	Potentially Significant Impact	Less than Significant With Mitigation Incorporation	Less than Significant Impact	No Impact
a. Conflict with a program plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities?	☐	☐	☒	☐
b. Would the project conflict or be inconsistent with CEQA Guidelines section 15064.3, subdivision (b)?	☐	☐	☒	☐
c. Substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☒	☐
d. Result in inadequate emergency access?	☐	☐	☒	☐

ENVIRONMENTAL SETTING

The proposed Project lies north of west Church Avenue, between south Del Norte Avenue and south Madera Avenue in the City of Kerman, California. The proposed liquid propane gas terminal will be located on approximately 17 acres of currently vacant land. Kerman lies just south of SR 180 and is bisected by SR 145.

RESPONSES

a. Conflict with a program plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities?

b. Would the project conflict or be inconsistent with CEQA Guidelines section 15064.3, subdivision (b)?

c. Substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?

d. Result in inadequate emergency access?

Less Than Significant Impact. The proposed Project applicant intends to construct and operate a liquid propane gas terminal and the associated improvements. There would be up to three permanent employees to remain posted onsite. Any personnel assigned to the Project would be expected to generate minimal vehicle trips to and from the site. In addition, a maximum of 25 transport vehicles per day are expected to travel to and from the site. This operational aspect is not anticipated to deteriorate the performance of the existing circulation system. The Project will not conflict with any circulation program, plan, ordinance or policy. Emergency access will not be impacted, nor will the site plan increase hazards to the local roadways. Therefore, this impact is ***less than significant***.

XVIII. TRIBAL CULTURAL RESOURCES

	Potentially Significant Impact	Less than Significant With Mitigation Incorporation	Less than Significant Impact	No Impact
Would the project:				
a. Cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:				
i. Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k), or	☐	☐	☒	☐
ii. A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code section 5024.1. In applying the criteria set forth in subdivision (c) of the Public Resources Code section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.	☐	☐	☒	☐

RESPONSES

a). Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:

i) Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k), or

ii) A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resource Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.

Less than Significant Impact. A Tribal Cultural Resource (TCR) is defined under Public Resources Code section 21074 as a site, feature, place, cultural landscape that is geographically defined in terms of size and scope, sacred place, and object with cultural value to a California Native American tribe that are either included and that is listed or eligible for inclusion in the California Register of Historic Resources or in a local register of historical resources, or if the City of Kerman, acting as the Lead Agency, supported by substantial evidence, chooses at its discretion to treat the resource as a TCR. As discussed above, under Section V, Cultural Resources, criteria (b) and (d), no known archeological resources, ethnographic sites or Native American remains are located on the proposed Project site. As discussed under criterion (b) implementation of Mitigation Measure CUL-1 would reduce impacts to unknown archaeological deposits, including TCRs, to a less than significant level. As discussed under criterion (d), compliance with California Health and Safety Code Section 7050.5 would reduce the likelihood of disturbing or discovering human remains, including those of Native Americans.

The Native American Heritage Commission (NAHC) has performed a Sacred Lands File search for sites located on or near the Project site, with negative results. The NAHC also provided a consultation list of tribal governments with traditional lands or cultural places located within the project area. An opportunity has been provided to Native American tribes listed by the Native American Heritage Commission during the CEQA process as required by AB 52. Any impacts to TCR would be considered ***less than significant***.

Mitigation Measures: No additional measures are required.

XIX. UTILITIES AND SERVICE SYSTEMS

Would the project:

	Potentially Significant Impact	Less than Significant With Mitigation Incorporation	Less than Significant Impact	No Impact
a. Require or result in the relocation or construction of new or expanded water, wastewater treatment or storm water drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects?	☐	☐	☒	☐
b. Have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry and multiple dry years?	☐	☐	☒	☐
c. Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☒	☐
d. Generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals?	☐	☐	☒	☐
e. Comply with federal, state, and local management and reduction statutes and regulations related to solid waste?	☐	☐	☒	☐

ENVIRONMENTAL SETTING

The Project will be required to connect to water, sewer, stormwater and wastewater services provided by the City of Kerman and may be subject to water use fees and/or development fees to be provided such

service, if and when any permanent buildings are constructed. The Project may require solid waste disposal services.

The City of Kerman contracts with Allied Waste Management Services for solid waste collection. Allied Waste utilizes the American Avenue Landfill, approximately 6 miles southwest of the City.

RESPONSES

a. Require or result in the relocation or construction of new or expanded water, wastewater treatment or storm water drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects?

b. Have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry and multiple dry years?

c. Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?

d. Generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals?

e. Comply with federal, state, and local management and reduction statutes and regulations related to solid waste?

Less than Significant Impact. The proposed Project includes the construction and operation of a liquid propane gas terminal and the associated improvements. The proposed Project would not require service for sewage disposal, water, but may potentially require solid waste disposal. The City of Kerman's utilities and service systems would not be affected by the construction and operation of the liquid propane gas terminal. Any impacts would be ***less than significant***.

Mitigation Measures: None are required.

XX. WILDFIRE

If located in or near state responsibility areas or lands classified as very high fire hazard severity zones, would the project:	Potentially Significant Impact	Less than Significant With Mitigation Incorporation	Less than Significant Impact	No Impact
a. Substantially impair an adopted emergency response plan or emergency evacuation plan?	☐	☐	☒	☐
b. Due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to, pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire?	☐	☐	☒	☐
c. Require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment?	☐	☐	☒	☐
d. Expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes?	☐	☐	☒	☐

ENVIRONMENTAL SETTING

The City of Kerman's planning area is composed of urbanized portions of land and the surrounding agricultural fields. North Central Fire Protection District serves the entire area and is generally located about three minutes away from any service area in Kerman. According to the 2007 Kerman General Plan Update, Kerman has established a good record in terms of fire safety. The City has enacted Fire Development Impact Fees to provide funding for the potential development of an additional Fire Station and equipment, in order to better serve the growing community.

The proposed Project site's elevation is approximately 212 feet above sea level in an area of intense urban uses. The proposed Project lies north of west Church Avenue, between south Del Norte Avenue and south Madera Avenue in southern Kerman. The proposed liquid propane gas terminal will be

located on approximately 17 acres of currently vacant land. The immediate vicinity is comprised of commercial businesses to the north, agricultural uses to the west, and industrial businesses to the east and south.

RESPONSES

a. Substantially impair an adopted emergency response plan or emergency evacuation plan?

b. Due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to, pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire?

c. Require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment?

d. Expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes?

Less Than Significant Impact. The proposed Project is located in an area developed with commercial, agricultural and industrial uses, which precludes the risk of wildfire. The area is flat in nature which would limit the risk of downslope flooding and landslides, and limit any wildfire spread.

To receive building permits, the proposed Project would be required to be in compliance with the adopted emergency response plan. As such, any wildfire risk to the project structures or people would be ***less than significant.***

Mitigation Measures: None are required.

XXI. MANDATORY FINDINGS OF SIGNIFICANCE

Would the project:

	Potentially Significant Impact	Less than Significant With Mitigation Incorporation	Less than Significant Impact	No Impact
a. Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☐	☒	☐	☐
b. Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?	☐	☐	☒	☐
c. Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☒	☐	☐

RESPONSES

a. Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of

a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?

Less than Significant Impact With Mitigation. The analyses of environmental issues contained in this Initial Study indicate that the proposed Project is not expected to have substantial impact on the environment or on any resources identified in the Initial Study. Mitigation measures have been incorporated in the Project to reduce all potentially significant impacts to ***less than significant***.

b. Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?

Less than Significant Impact. CEQA Guidelines Section 15064(i) states that a Lead Agency shall consider whether the cumulative impact of a project is significant and whether the effects of the project are cumulatively considerable. The assessment of the significance of the cumulative effects of a project must, therefore, be conducted in connection with the effects of past projects, other current projects, and probable future projects. Due to the nature of the Project and consistency with environmental policies, incremental contributions to impacts are considered less than cumulatively considerable. The proposed Project would not contribute substantially to adverse cumulative conditions, or create any substantial indirect impacts (i.e., increase in population could lead to an increase need for housing, increase in traffic, air pollutants, etc.). The impact is ***less than significant***.

c. Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?

Less than Significant Impact With Mitigation. The analyses of environmental issues contained in this Initial Study indicate that the project is not expected to have substantial impact on human beings, either directly or indirectly. Mitigation measures have been incorporated in the Project to reduce all potentially significant impacts to ***less than significant.***

LIST OF PREPARERS

Crawford & Bowen Planning, Inc.

- Emily Bowen, LEED AP, Principal Environmental Planner
- Travis Crawford, AICP, Principal Environmental Planner

Persons and Agencies Consulted

City of Kerman

- Olivia Pimentel, Assistant Planner
- Andy Chamberlain, Contract City Planner

Appendix A

CalEEMod Output Files

JS West Propane Facility

San Joaquin Valley Unified APCD Air District, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Unrefrigerated Warehouse-Rail	300.56	1000sqft	6.90	300,564.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.7	**Precipitation Freq (Days)**	45
Climate Zone	3			**Operational Year**	2022
Utility Company					
CO2 Intensity (lb/MWhr)	0	**CH4 Intensity (lb/MWhr)**	0	**N2O Intensity (lb/MWhr)**	0

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use -

Construction Phase - The site is vacant and will not include any demolition activities.

Table Name	Column Name	Default Value	New Value

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2020	0.2478	2.2880	1.8125	4.1200e-003	0.2524	0.1059	0.3582	0.1095	0.0991	0.2086	0.0000	367.1062	367.1062	0.0633	0.0000	368.6876
2021	2.2182	1.1644	1.0946	2.5100e-003	0.0618	0.0509	0.1127	0.0168	0.0478	0.0645	0.0000	223.3629	223.3629	0.0367	0.0000	224.2812
Maximum	**2.2182**	**2.2880**	**1.8125**	**4.1200e-003**	**0.2524**	**0.1059**	**0.3582**	**0.1095**	**0.0991**	**0.2086**	**0.0000**	**367.1062**	**367.1062**	**0.0633**	**0.0000**	**368.6876**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2020	0.2478	2.2880	1.8125	4.1200e-003	0.2524	0.1059	0.3582	0.1095	0.0991	0.2086	0.0000	367.1059	367.1059	0.0633	0.0000	368.6874
2021	2.2182	1.1644	1.0946	2.5100e-003	0.0618	0.0509	0.1127	0.0168	0.0478	0.0645	0.0000	223.3627	223.3627	0.0367	0.0000	224.2811
Maximum	**2.2182**	**2.2880**	**1.8125**	**4.1200e-003**	**0.2524**	**0.1059**	**0.3582**	**0.1095**	**0.0991**	**0.2086**	**0.0000**	**367.1059**	**367.1059**	**0.0633**	**0.0000**	**368.6874**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
1	5-6-2020	8-5-2020	1.0280	1.0280
2	8-6-2020	11-5-2020	0.9317	0.9317
3	11-6-2020	2-5-2021	0.8996	0.8996
4	2-6-2021	5-5-2021	0.8137	0.8137
5	5-6-2021	8-5-2021	2.2465	2.2465
		Highest	2.2465	2.2465

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	1.3831	3.0000e-005	2.7700e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	5.3700e-003	5.3700e-003	1.0000e-005	0.0000	5.7200e-003
Energy	0.0293	0.2664	0.2238	1.6000e-003		0.0203	0.0203		0.0203	0.0203	0.0000	289.9895	289.9895	5.5600e-003	5.3200e-003	291.7127
Mobile	0.1765	1.9331	1.8193	9.1600e-003	0.5621	7.7900e-003	0.5699	0.1512	7.3500e-003	0.1585	0.0000	850.7928	850.7928	0.0550	0.0000	852.1684
Waste						0.0000	0.0000		0.0000	0.0000	57.3510	0.0000	57.3510	3.3894	0.0000	142.0848
Water						0.0000	0.0000		0.0000	0.0000	22.0506	0.0000	22.0506	2.2648	0.0535	94.6068
Total	**1.5888**	**2.1995**	**2.0458**	**0.0108**	**0.5621**	**0.0281**	**0.5902**	**0.1512**	**0.0276**	**0.1788**	**79.4016**	**1,140.7876**	**1,220.1892**	**5.7148**	**0.0588**	**1,380.5785**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	1.3831	3.0000e-005	2.7700e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	5.3700e-003	5.3700e-003	1.0000e-005	0.0000	5.7200e-003
Energy	0.0293	0.2664	0.2238	1.6000e-003		0.0203	0.0203		0.0203	0.0203	0.0000	289.9895	289.9895	5.5600e-003	5.3200e-003	291.7127
Mobile	0.1765	1.9331	1.8193	9.1600e-003	0.5621	7.7900e-003	0.5699	0.1512	7.3500e-003	0.1585	0.0000	850.7928	850.7928	0.0550	0.0000	852.1684
Waste						0.0000	0.0000		0.0000	0.0000	57.3510	0.0000	57.3510	3.3894	0.0000	142.0848
Water						0.0000	0.0000		0.0000	0.0000	22.0506	0.0000	22.0506	2.2648	0.0535	94.6068
Total	**1.5888**	**2.1995**	**2.0458**	**0.0108**	**0.5621**	**0.0281**	**0.5902**	**0.1512**	**0.0276**	**0.1788**	**79.4016**	**1,140.7876**	**1,220.1892**	**5.7148**	**0.0588**	**1,380.5785**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Site Preparation	Site Preparation	5/6/2020	5/19/2020	5	10	
2	Grading	Grading	5/20/2020	6/16/2020	5	20	
3	Building Construction	Building Construction	6/17/2020	5/4/2021	5	230	
4	Paving	Paving	5/5/2021	6/1/2021	5	20	
5	Architectural Coating	Architectural Coating	6/2/2021	6/29/2021	5	20	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 10

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 450,846; Non-Residential Outdoor: 150,282; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Architectural Coating	Air Compressors	1	6.00	78	0.48
Grading	Excavators	1	8.00	158	0.38
Building Construction	Generator Sets	1	8.00	84	0.74
Building Construction	Cranes	1	7.00	231	0.29
Building Construction	Forklifts	3	8.00	89	0.20
Paving	Pavers	2	8.00	130	0.42
Paving	Rollers	2	8.00	80	0.38
Grading	Rubber Tired Dozers	1	8.00	247	0.40
Building Construction	Tractors/Loaders/Backhoes	3	7.00	97	0.37
Grading	Tractors/Loaders/Backhoes	3	8.00	97	0.37
Site Preparation	Tractors/Loaders/Backhoes	4	8.00	97	0.37
Grading	Graders	1	8.00	187	0.41
Paving	Paving Equipment	2	8.00	132	0.36
Site Preparation	Rubber Tired Dozers	3	8.00	247	0.40
Building Construction	Welders	1	8.00	46	0.45

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Site Preparation	7	18.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Grading	6	15.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	9	126.00	49.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Paving	6	15.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Architectural Coating	1	25.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Site Preparation - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0903	0.0000	0.0903	0.0497	0.0000	0.0497	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0204	0.2121	0.1076	1.9000e-004		0.0110	0.0110		0.0101	0.0101	0.0000	16.7153	16.7153	5.4100e-003	0.0000	16.8505
Total	**0.0204**	**0.2121**	**0.1076**	**1.9000e-004**	**0.0903**	**0.0110**	**0.1013**	**0.0497**	**0.0101**	**0.0598**	**0.0000**	**16.7153**	**16.7153**	**5.4100e-003**	**0.0000**	**16.8505**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	3.8000e-004	2.6000e-004	2.6200e-003	1.0000e-005	7.2000e-004	1.0000e-005	7.2000e-004	1.9000e-004	0.0000	2.0000e-004	0.0000	0.6461	0.6461	2.0000e-005	0.0000	0.6466
Total	**3.8000e-004**	**2.6000e-004**	**2.6200e-003**	**1.0000e-005**	**7.2000e-004**	**1.0000e-005**	**7.2000e-004**	**1.9000e-004**	**0.0000**	**2.0000e-004**	**0.0000**	**0.6461**	**0.6461**	**2.0000e-005**	**0.0000**	**0.6466**

3.2 Site Preparation - 2020

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0903	0.0000	0.0903	0.0497	0.0000	0.0497	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0204	0.2121	0.1076	1.9000e-004		0.0110	0.0110		0.0101	0.0101	0.0000	16.7153	16.7153	5.4100e-003	0.0000	16.8505
Total	**0.0204**	**0.2121**	**0.1076**	**1.9000e-004**	**0.0903**	**0.0110**	**0.1013**	**0.0497**	**0.0101**	**0.0598**	**0.0000**	**16.7153**	**16.7153**	**5.4100e-003**	**0.0000**	**16.8505**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	3.8000e-004	2.6000e-004	2.6200e-003	1.0000e-005	7.2000e-004	1.0000e-005	7.2000e-004	1.9000e-004	0.0000	2.0000e-004	0.0000	0.6461	0.6461	2.0000e-005	0.0000	0.6466
Total	**3.8000e-004**	**2.6000e-004**	**2.6200e-003**	**1.0000e-005**	**7.2000e-004**	**1.0000e-005**	**7.2000e-004**	**1.9000e-004**	**0.0000**	**2.0000e-004**	**0.0000**	**0.6461**	**0.6461**	**2.0000e-005**	**0.0000**	**0.6466**

3.3 Grading - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0655	0.0000	0.0655	0.0337	0.0000	0.0337	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0243	0.2639	0.1605	3.0000e-004		0.0127	0.0127		0.0117	0.0117	0.0000	26.0588	26.0588	8.4300e-003	0.0000	26.2694
Total	**0.0243**	**0.2639**	**0.1605**	**3.0000e-004**	**0.0655**	**0.0127**	**0.0783**	**0.0337**	**0.0117**	**0.0454**	**0.0000**	**26.0588**	**26.0588**	**8.4300e-003**	**0.0000**	**26.2694**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	6.3000e-004	4.3000e-004	4.3700e-003	1.0000e-005	1.2000e-003	1.0000e-005	1.2100e-003	3.2000e-004	1.0000e-005	3.3000e-004	0.0000	1.0769	1.0769	3.0000e-005	0.0000	1.0777
Total	**6.3000e-004**	**4.3000e-004**	**4.3700e-003**	**1.0000e-005**	**1.2000e-003**	**1.0000e-005**	**1.2100e-003**	**3.2000e-004**	**1.0000e-005**	**3.3000e-004**	**0.0000**	**1.0769**	**1.0769**	**3.0000e-005**	**0.0000**	**1.0777**

3.3 Grading - 2020

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0655	0.0000	0.0655	0.0337	0.0000	0.0337	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0243	0.2639	0.1605	3.0000e-004		0.0127	0.0127		0.0117	0.0117	0.0000	26.0587	26.0587	8.4300e-003	0.0000	26.2694
Total	**0.0243**	**0.2639**	**0.1605**	**3.0000e-004**	**0.0655**	**0.0127**	**0.0783**	**0.0337**	**0.0117**	**0.0454**	**0.0000**	**26.0587**	**26.0587**	**8.4300e-003**	**0.0000**	**26.2694**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	6.3000e-004	4.3000e-004	4.3700e-003	1.0000e-005	1.2000e-003	1.0000e-005	1.2100e-003	3.2000e-004	1.0000e-005	3.3000e-004	0.0000	1.0769	1.0769	3.0000e-005	0.0000	1.0777
Total	**6.3000e-004**	**4.3000e-004**	**4.3700e-003**	**1.0000e-005**	**1.2000e-003**	**1.0000e-005**	**1.2100e-003**	**3.2000e-004**	**1.0000e-005**	**3.3000e-004**	**0.0000**	**1.0769**	**1.0769**	**3.0000e-005**	**0.0000**	**1.0777**

3.4 Building Construction - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.1505	1.3622	1.1962	1.9100e-003		0.0793	0.0793		0.0746	0.0746	0.0000	164.4431	164.4431	0.0401	0.0000	165.4461
Total	**0.1505**	**1.3622**	**1.1962**	**1.9100e-003**		**0.0793**	**0.0793**		**0.0746**	**0.0746**	**0.0000**	**164.4431**	**164.4431**	**0.0401**	**0.0000**	**165.4461**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0138	0.4235	0.0803	9.9000e-004	0.0231	2.3300e-003	0.0254	6.6600e-003	2.2300e-003	8.8900e-003	0.0000	93.9399	93.9399	7.4200e-003	0.0000	94.1253
Worker	0.0378	0.0257	0.2609	7.1000e-004	0.0715	5.1000e-004	0.0720	0.0190	4.7000e-004	0.0195	0.0000	64.2261	64.2261	1.8400e-003	0.0000	64.2721
Total	**0.0516**	**0.4492**	**0.3412**	**1.7000e-003**	**0.0946**	**2.8400e-003**	**0.0974**	**0.0257**	**2.7000e-003**	**0.0284**	**0.0000**	**158.1660**	**158.1660**	**9.2600e-003**	**0.0000**	**158.3974**

3.4 Building Construction - 2020

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.1505	1.3622	1.1962	1.9100e-003		0.0793	0.0793		0.0746	0.0746	0.0000	164.4429	164.4429	0.0401	0.0000	165.4459
Total	**0.1505**	**1.3622**	**1.1962**	**1.9100e-003**		**0.0793**	**0.0793**		**0.0746**	**0.0746**	**0.0000**	**164.4429**	**164.4429**	**0.0401**	**0.0000**	**165.4459**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0138	0.4235	0.0803	9.9000e-004	0.0231	2.3300e-003	0.0254	6.6600e-003	2.2300e-003	8.8900e-003	0.0000	93.9399	93.9399	7.4200e-003	0.0000	94.1253
Worker	0.0378	0.0257	0.2609	7.1000e-004	0.0715	5.1000e-004	0.0720	0.0190	4.7000e-004	0.0195	0.0000	64.2261	64.2261	1.8400e-003	0.0000	64.2721
Total	**0.0516**	**0.4492**	**0.3412**	**1.7000e-003**	**0.0946**	**2.8400e-003**	**0.0974**	**0.0257**	**2.7000e-003**	**0.0284**	**0.0000**	**158.1660**	**158.1660**	**9.2600e-003**	**0.0000**	**158.3974**

3.4 Building Construction - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0836	0.7670	0.7293	1.1800e-003		0.0422	0.0422		0.0397	0.0397	0.0000	101.9204	101.9204	0.0246	0.0000	102.5351
Total	**0.0836**	**0.7670**	**0.7293**	**1.1800e-003**		**0.0422**	**0.0422**		**0.0397**	**0.0397**	**0.0000**	**101.9204**	**101.9204**	**0.0246**	**0.0000**	**102.5351**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	6.9500e-003	0.2377	0.0434	6.1000e-004	0.0143	6.7000e-004	0.0150	4.1300e-003	6.4000e-004	4.7700e-003	0.0000	57.6754	57.6754	4.4000e-003	0.0000	57.7855
Worker	0.0216	0.0141	0.1466	4.3000e-004	0.0443	3.1000e-004	0.0446	0.0118	2.8000e-004	0.0121	0.0000	38.4185	38.4185	1.0200e-003	0.0000	38.4438
Total	**0.0285**	**0.2519**	**0.1900**	**1.0400e-003**	**0.0586**	**9.8000e-004**	**0.0596**	**0.0159**	**9.2000e-004**	**0.0168**	**0.0000**	**96.0939**	**96.0939**	**5.4200e-003**	**0.0000**	**96.2293**

3.4 Building Construction - 2021

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0836	0.7670	0.7293	1.1800e-003		0.0422	0.0422		0.0397	0.0397	0.0000	101.9203	101.9203	0.0246	0.0000	102.5350
Total	**0.0836**	**0.7670**	**0.7293**	**1.1800e-003**		**0.0422**	**0.0422**		**0.0397**	**0.0397**	**0.0000**	**101.9203**	**101.9203**	**0.0246**	**0.0000**	**102.5350**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	6.9500e-003	0.2377	0.0434	6.1000e-004	0.0143	6.7000e-004	0.0150	4.1300e-003	6.4000e-004	4.7700e-003	0.0000	57.6754	57.6754	4.4000e-003	0.0000	57.7855
Worker	0.0216	0.0141	0.1466	4.3000e-004	0.0443	3.1000e-004	0.0446	0.0118	2.8000e-004	0.0121	0.0000	38.4185	38.4185	1.0200e-003	0.0000	38.4438
Total	**0.0285**	**0.2519**	**0.1900**	**1.0400e-003**	**0.0586**	**9.8000e-004**	**0.0596**	**0.0159**	**9.2000e-004**	**0.0168**	**0.0000**	**96.0939**	**96.0939**	**5.4200e-003**	**0.0000**	**96.2293**

3.5 Paving - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0126	0.1292	0.1465	2.3000e-004		6.7800e-003	6.7800e-003		6.2400e-003	6.2400e-003	0.0000	20.0235	20.0235	6.4800e-003	0.0000	20.1854
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0126**	**0.1292**	**0.1465**	**2.3000e-004**		**6.7800e-003**	**6.7800e-003**		**6.2400e-003**	**6.2400e-003**	**0.0000**	**20.0235**	**20.0235**	**6.4800e-003**	**0.0000**	**20.1854**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	5.8000e-004	3.8000e-004	3.9700e-003	1.0000e-005	1.2000e-003	1.0000e-005	1.2100e-003	3.2000e-004	1.0000e-005	3.3000e-004	0.0000	1.0395	1.0395	3.0000e-005	0.0000	1.0402
Total	**5.8000e-004**	**3.8000e-004**	**3.9700e-003**	**1.0000e-005**	**1.2000e-003**	**1.0000e-005**	**1.2100e-003**	**3.2000e-004**	**1.0000e-005**	**3.3000e-004**	**0.0000**	**1.0395**	**1.0395**	**3.0000e-005**	**0.0000**	**1.0402**

3.5 Paving - 2021

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0126	0.1292	0.1465	2.3000e-004		6.7800e-003	6.7800e-003		6.2400e-003	6.2400e-003	0.0000	20.0235	20.0235	6.4800e-003	0.0000	20.1854
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0126**	**0.1292**	**0.1465**	**2.3000e-004**		**6.7800e-003**	**6.7800e-003**		**6.2400e-003**	**6.2400e-003**	**0.0000**	**20.0235**	**20.0235**	**6.4800e-003**	**0.0000**	**20.1854**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	5.8000e-004	3.8000e-004	3.9700e-003	1.0000e-005	1.2000e-003	1.0000e-005	1.2100e-003	3.2000e-004	1.0000e-005	3.3000e-004	0.0000	1.0395	1.0395	3.0000e-005	0.0000	1.0402
Total	**5.8000e-004**	**3.8000e-004**	**3.9700e-003**	**1.0000e-005**	**1.2000e-003**	**1.0000e-005**	**1.2100e-003**	**3.2000e-004**	**1.0000e-005**	**3.3000e-004**	**0.0000**	**1.0395**	**1.0395**	**3.0000e-005**	**0.0000**	**1.0402**

3.6 Architectural Coating - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	2.0897					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	2.1900e-003	0.0153	0.0182	3.0000e-005		9.4000e-004	9.4000e-004		9.4000e-004	9.4000e-004	0.0000	2.5533	2.5533	1.8000e-004	0.0000	2.5576
Total	**2.0919**	**0.0153**	**0.0182**	**3.0000e-005**		**9.4000e-004**	**9.4000e-004**		**9.4000e-004**	**9.4000e-004**	**0.0000**	**2.5533**	**2.5533**	**1.8000e-004**	**0.0000**	**2.5576**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	9.7000e-004	6.4000e-004	6.6100e-003	2.0000e-005	2.0000e-003	1.0000e-005	2.0100e-003	5.3000e-004	1.0000e-005	5.4000e-004	0.0000	1.7324	1.7324	5.0000e-005	0.0000	1.7336
Total	**9.7000e-004**	**6.4000e-004**	**6.6100e-003**	**2.0000e-005**	**2.0000e-003**	**1.0000e-005**	**2.0100e-003**	**5.3000e-004**	**1.0000e-005**	**5.4000e-004**	**0.0000**	**1.7324**	**1.7324**	**5.0000e-005**	**0.0000**	**1.7336**

3.6 Architectural Coating - 2021

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	2.0897					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	2.1900e-003	0.0153	0.0182	3.0000e-005		9.4000e-004	9.4000e-004		9.4000e-004	9.4000e-004	0.0000	2.5533	2.5533	1.8000e-004	0.0000	2.5576
Total	**2.0919**	**0.0153**	**0.0182**	**3.0000e-005**		**9.4000e-004**	**9.4000e-004**		**9.4000e-004**	**9.4000e-004**	**0.0000**	**2.5533**	**2.5533**	**1.8000e-004**	**0.0000**	**2.5576**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	9.7000e-004	6.4000e-004	6.6100e-003	2.0000e-005	2.0000e-003	1.0000e-005	2.0100e-003	5.3000e-004	1.0000e-005	5.4000e-004	0.0000	1.7324	1.7324	5.0000e-005	0.0000	1.7336
Total	**9.7000e-004**	**6.4000e-004**	**6.6100e-003**	**2.0000e-005**	**2.0000e-003**	**1.0000e-005**	**2.0100e-003**	**5.3000e-004**	**1.0000e-005**	**5.4000e-004**	**0.0000**	**1.7324**	**1.7324**	**5.0000e-005**	**0.0000**	**1.7336**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.1765	1.9331	1.8193	9.1600e-003	0.5621	7.7900e-003	0.5699	0.1512	7.3500e-003	0.1585	0.0000	850.7928	850.7928	0.0550	0.0000	852.1684
Unmitigated	0.1765	1.9331	1.8193	9.1600e-003	0.5621	7.7900e-003	0.5699	0.1512	7.3500e-003	0.1585	0.0000	850.7928	850.7928	0.0550	0.0000	852.1684

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Unrefrigerated Warehouse-Rail	504.95	504.95	504.95	1,474,200	1,474,200
Total	504.95	504.95	504.95	1,474,200	1,474,200

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Unrefrigerated Warehouse-Rail	9.50	7.30	7.30	59.00	0.00	41.00	92	5	3

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Unrefrigerated Warehouse-Rail	0.511925	0.031902	0.170344	0.119204	0.018408	0.005097	0.021580	0.111258	0.001794	0.001564	0.005229	0.000954	0.000741

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Mitigated	0.0293	0.2664	0.2238	1.6000e-003		0.0203	0.0203		0.0203	0.0203	0.0000	289.9895	289.9895	5.5600e-003	5.3200e-003	291.7127
NaturalGas Unmitigated	0.0293	0.2664	0.2238	1.6000e-003		0.0203	0.0203		0.0203	0.0203	0.0000	289.9895	289.9895	5.5600e-003	5.3200e-003	291.7127

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Unrefrigerated Warehouse-Rail	5.4342e+006	0.0293	0.2664	0.2238	1.6000e-003		0.0203	0.0203		0.0203	0.0203	0.0000	289.9895	289.9895	5.5600e-003	5.3200e-003	291.7127
Total		**0.0293**	**0.2664**	**0.2238**	**1.6000e-003**		**0.0203**	**0.0203**		**0.0203**	**0.0203**	**0.0000**	**289.9895**	**289.9895**	**5.5600e-003**	**5.3200e-003**	**291.7127**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Unrefrigerated Warehouse-Rail	5.4342e+006	0.0293	0.2664	0.2238	1.6000e-003		0.0203	0.0203		0.0203	0.0203	0.0000	289.9895	289.9895	5.5600e-003	5.3200e-003	291.7127
Total		**0.0293**	**0.2664**	**0.2238**	**1.6000e-003**		**0.0203**	**0.0203**		**0.0203**	**0.0203**	**0.0000**	**289.9895**	**289.9895**	**5.5600e-003**	**5.3200e-003**	**291.7127**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Unrefrigerated Warehouse-Rail	2.8223e +006	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Unrefrigerated Warehouse-Rail	2.8223e +006	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	1.3831	3.0000e-005	2.7700e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	5.3700e-003	5.3700e-003	1.0000e-005	0.0000	5.7200e-003
Unmitigated	1.3831	3.0000e-005	2.7700e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	5.3700e-003	5.3700e-003	1.0000e-005	0.0000	5.7200e-003

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.2090					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	1.1739					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	2.6000e-004	3.0000e-005	2.7700e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	5.3700e-003	5.3700e-003	1.0000e-005	0.0000	5.7200e-003
Total	**1.3831**	**3.0000e-005**	**2.7700e-003**	**0.0000**		**1.0000e-005**	**1.0000e-005**		**1.0000e-005**	**1.0000e-005**	**0.0000**	**5.3700e-003**	**5.3700e-003**	**1.0000e-005**	**0.0000**	**5.7200e-003**

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.2090					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	1.1739					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	2.6000e-004	3.0000e-005	2.7700e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	5.3700e-003	5.3700e-003	1.0000e-005	0.0000	5.7200e-003
Total	**1.3831**	**3.0000e-005**	**2.7700e-003**	**0.0000**		**1.0000e-005**	**1.0000e-005**		**1.0000e-005**	**1.0000e-005**	**0.0000**	**5.3700e-003**	**5.3700e-003**	**1.0000e-005**	**0.0000**	**5.7200e-003**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	22.0506	2.2648	0.0535	94.6068
Unmitigated	22.0506	2.2648	0.0535	94.6068

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Unrefrigerated Warehouse-Rail	69.5045 / 0	22.0506	2.2648	0.0535	94.6068
Total		**22.0506**	**2.2648**	**0.0535**	**94.6068**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Unrefrigerated Warehouse-Rail	69.5045 / 0	22.0506	2.2648	0.0535	94.6068
Total		**22.0506**	**2.2648**	**0.0535**	**94.6068**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	57.3510	3.3894	0.0000	142.0848
Unmitigated	57.3510	3.3894	0.0000	142.0848

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Unrefrigerated Warehouse-Rail	282.53	57.3510	3.3894	0.0000	142.0848
Total		**57.3510**	**3.3894**	**0.0000**	**142.0848**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Unrefrigerated Warehouse-Rail	282.53	57.3510	3.3894	0.0000	142.0848
Total		**57.3510**	**3.3894**	**0.0000**	**142.0848**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Appendix B

CHRIS Results

California Historical Resources Information System

Fresno
Kern
Kings
Madera
Tulare

Southern San Joaquin Valley Information Center
California State University, Bakersfield
Mail Stop: 72 DOB
9001 Stockdale Highway
Bakersfield, California 93311-1022
(661) 654-2289
E-mail: ssjvic@csub.edu
Website: www.csub.edu/ssjvic

To: Emily Bowen
Crawford Bowen Planning, Inc.
113 N. Church Street, Suite 302
Visalia, CA 93291

Record Search 20-188

Date: May 11, 2020

Re: City of Kerman JS West Liquid Propane Project

County: Fresno

Map(s): Kerman 7.5'

CULTURAL RESOURCES RECORDS SEARCH

The California Office of Historic Preservation (OHP) contracts with the California Historical Resources Information System's (CHRIS) regional Information Centers (ICs) to maintain information in the CHRIS inventory and make it available to local, state, and federal agencies, cultural resource professionals, Native American tribes, researchers, and the public. Recommendations made by IC coordinators or their staff regarding the interpretation and application of this information are advisory only. Such recommendations do not necessarily represent the evaluation or opinion of the State Historic Preservation Officer in carrying out the OHP's regulatory authority under federal and state law.

The following are the results of a search of the cultural resource files at the Southern San Joaquin Valley Information Center. These files include known and recorded cultural resources sites, inventory and excavation reports filed with this office, and resources listed on the National Register of Historic Places, the OHP Built Environment Resources Directory, California State Historical Landmarks, California Register of Historical Resources, California Inventory of Historic Resources, and California Points of Historical Interest. Due to processing delays and other factors, not all of the historical resource reports and resource records that have been submitted to the OHP are available via this records search. Additional information may be available through the federal, state, and local agencies that produced or paid for historical resource management work in the search area.

PRIOR CULTURAL RESOURCE STUDIES CONDUCTED WITHIN THE PROJECT AREA AND THE ONE-HALF MILE RADIUS

According to the information in our files, there has been one previous cultural resource study conducted within the project area, FR-01799. There have been four additional previous cultural resource studies conducted within the one-half mile radius, FR-00576, 02188, 02281, and 02414.

KNOWN/RECORDED CULTURAL RESOURCES WITHIN THE PROJECT AREA AND THE ONE-HALF MILE RADIUS

There are no recorded resources within the project area. There is one recorded resource within the one-half mile radius, P-10-003930, an historic era railroad.

There are no recorded cultural resources within the project area or radius that are listed in the National Register of Historic Places, the California Register of Historical Resources, the California Points of Historical Interest, California Inventory of Historic Resources, or the California State Historic Landmarks.

COMMENTS AND RECOMMENDATIONS

We understand this project consists of construction of a new railroad track spur to house a liquid propane gas terminal for the distribution of propane with the City of Kerman. Further, we understand the project area is currently vacant and has not been previously developed. The previous cultural resources study conducted in this project area, FR-01799, was completed in 2002. Due to changes in field methods and technology, a cultural resource study is typically only valid for up to five years. Therefore, prior to any ground disturbance activities, we recommend a qualified, professional consultant conduct a field survey of the entire project area to determine if cultural resources are present. A list of qualified consultants can be found at www.chrisinfo.org.

We also recommend that you contact the Native American Heritage Commission in Sacramento. They will provide you with a current list of Native American individuals/organizations that can assist you with information regarding cultural resources that may not be included in the CHRIS Inventory and that may be of concern to the Native groups in the area. The Commission can consult their "Sacred Lands Inventory" file in order to determine what sacred resources, if any, exist within this project area and the way in which these resources might be managed. Finally, please consult with the lead agency on this project to determine if any other cultural resource investigation is required. If you need any additional information or have any questions or concerns, please contact our office at (661) 654-2289.

By:

Celeste M. Thomson, Coordinator **Date:** May 11, 2020

Please note that invoices for Information Center services will be sent under separate cover from the California State University, Bakersfield Accounting Office.

Appendix C

Fire Safety Analysis

Fire Safety Analysis Manual

for

LP-Gas Storage Facilities

Based on the 2014 Edition of NFPA 58 Liquefied Petroleum Gas Code

Developed by the National Fire Protection Association and the National Propane Gas Association

Funded by a Grant from the Propane Education & Research Council

PRC-005025

Fire Safety Analysis Manual
For
LP-Gas Storage Facilities

Based on the 2014 Edition of NFPA 58 *Liquefied Petroleum Gas Code*

The official position of the NFPA on all aspects regarding propane storage facility safety is in NFPA 58, the *Liquefied Petroleum Gas Code*. This manual is not intended to replace NFPA 58.

The Propane Education & Research Council (PERC) is a non-profit 501(c)6 trade organization authorized by the Propane Education and Research Act of 1996 (PERA), Public Law 104-284. PERC was created "to enhance consumer and employee safety and training, to provide for research and development of clean and efficient propane utilization equipment, and to inform and educate the public about safety and other issues associated with the use of propane."

PERC is governed by a twenty-one member Board of Directors appointed by the National Propane Gas Association (NPGA) and the Gas Processors Association (GPA). PERC program beneficiaries include propane retail marketers, producers, transporters' and agricultural cooperatives, as well as representatives of allied service and supply industries (industry members).

The recommendations, standards, or recommended practices, as reflected in this document, were developed by independent consultants retained by PERC. While PERC administers the process of obtaining the information, it does not independently test or verify the accuracy of the information or methods used to collect the data that supports the conclusions or recommendations reflected in this document.

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The procedures and information in this document are intended to implement the standards set forth in the documents referenced with capabilities of the personnel and equipment available. It does not create new standards or criteria for compliance. The order of steps

in any procedure may or may not be of importance. This material is not sold nor is it a product of any consulting or engineering activity.

Users of this document should consult the law of their individual jurisdictions for codes, standards and legal requirements applicable to them. This document is not intended nor should it be construed to (1) set forth policies or procedures which are the general custom or practice in the propane industry; (2) to establish the legal standards of care owed by propane distributors to their customers; or (3) to prevent the user from using different methods to implement applicable codes, standards or legal requirements.

By disseminating or publishing this document, PERC is not undertaking to render any professional or other service to or on behalf of any person or entity. PERC, NPGA, GPA and the industry members are not undertaking to perform any duty owed by any person or entity to any third party. Anyone reading or using this document should rely on his or her own judgment or, as appropriate, should seek the advice of a competent professional in determining the exercise of reasonable care in any and all circumstances.

Origin and Development of the Fire Safety Analysis Manual

The requirement for a Fire Safety Analysis (FSA) was introduced in the 1976 edition of NFPA 58, along with the requirement for emergency shutoff valves at locations where hoses and swivel type piping were used (for connection to cargo tank vehicles and rail cars). A Fire Safety Analysis was required for new propane storage plants with capacities of more than 4,000 gallons located in "heavily populated or congested areas".

This requirement was basically unchanged until the 2001 edition of NFPA 58, where the FSA was required for all propane storage plants with capacities of more than 4,000 gallons, with a three year period for existing facilities to be brought into compliance. As the majority of plants requiring a FSA did not have one in 2001, the need for guidance on how to conduct the FSA became apparent. Prior to 2001, the FSA was usually conducted by an independent consultant with knowledge of propane and fire safety. The concept of a consistent methodology was identified by a propane marketer in New England, Jim Hurley of Eastern Propane. The first two editions of the Manual were dedicated to Jim in recognition of his vision.

The recommendation resulted in NFPA working with NPGA to submit a proposal to PERC to develop a FSA manual to assist marketers in complying with the FSA requirement. When the project was approved, NPGA established an advisory committee and worked with NFPA to develop the manual.

Since the 2001 edition of the manual, it has been updated thrice to retain correct numbers of the paragraphs referenced in NFPA 58, as they are sometimes revised and renumbered. No technically substantive changes have been made to the manual since the first edition was published.

The models used in the Fire Safety Analysis (FSA) Manual to determine the distances to hazards (presented in Table B-1 of the FSA Manual) are based on published models in the literature. These models have been published in government reports, journal articles[1,2] , EPA-suggested procedures[3] and engineering monographs and books. The models used are considered conservative and have been simplified for the purposes of the FSA Manual.

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1 A general reference on hazard distance assessment models is: Lees, F.P. (Editor), "*Loss Prevention in the Process Industries*," 2nd Edition, Vol 1, 2 & 3, Butterworth Heinemann Publishers, Oxford, England, 1996.

2 Raj, P.K.*,"Exposure of a liquefied gas container to an external fire*," Journal of Hazardous Materials, v 122, Issues 1-2, p 37-49, June 2005.

3 US EPA, "*Technical Guidance for Hazard Analysis*," Emergency Planning for Extremely Hazardous Substances, EPA/FEMA/DOT, December 1987.

Acknowledgments

This fifth edition of the Fire Safety Analysis (FSA) Manual, based on the 2014 edition of NFPA 58, is a continuation of the effort to fulfill a need for an easily used and simple aid for the members of propane industry to fulfill their obligations under NFPA 58 (2001, 2004, 2008, 2011 and 2014 editions) which require developing a written FSA. The project was funded by the Propane Education & Research Council through the National Propane Gas Association (NPGA). The National Fire Protection Association (NFPA) was the principal contractor for the first edition of the manual. Technology & Management Systems, Inc. (TMS) developed the technical analyses and several chapters of the first edition of the manual, as a subcontractor to NFPA.

Mr. Theodore C. Lemoff, Principal Gases Engineer, was the principal investigator at NFPA. Dr. Phani K. Raj was the principal investigator and analyst at TMS. Mr. Bruce Swiecicki, P.E., Senior Technical Advisor at NPGA, served as a staff technical reviewer.

In preparation for the first edition, NPGA assembled an Advisory Committee consisting of representatives from the propane industry, a Fire Department of a major city in the US and a Fire Protection Engineer. The Committee provided technical inputs and guidance to the project team on industry safety practices, types of information that an authority having jurisdiction and emergency responders would want to see in an FSA, an insight into the levels of understanding of various issues related to FSA in the industry, etc. The Advisory Committee set not only the direction of the project but made policy decisions related to the scope of the FSA manual. Except for the contractors, every member of the Advisory Committee had a vote and many decisions were made on the basis of a Committee vote. The Advisory Committee consisted of the following (voting) members.

1	Michael Merrill **(Chairman)**	Suburban Propane LP	Whippany, NJ
2	Mr. Greg Benton	Georgia Gas Distributors	Atlanta, GA
3	Mr. Billy Cox	O'Nealgas Inc.	Choudrant, LA
4	Mr. James Howe	Howe Engineers, Inc.	West Falmouth, MA
5	Mr. Jerry Lucas	Heritage Propane Partners, LP	Sallisaw, OK
6	Mr. Rob Scott	Scott & Associates	Kingsburg, CA
7	Mr. Cliff Slisz	Ferrellgas	Liberty, MO
8	Mr. Scott Stookey	City of Phoenix Fire Department	Phoenix, AZ
9	Mr. Ron Stover	Mutual Liquid Gas & Equipment	Gardena, CA
10	Mr. Robert Wallace	Dowdle Butane Gas Co Inc	Maryville, TN
11	Mr. Brent Wolcott	Ag Valley Coop	Edison, NE

Mr. Theodore Lemoff and Dr. Phani Raj participated in the deliberations of the meetings of the Advisory Committee as non-voting members.

About the Authors

Phani K. Raj, Ph.D.
Dr. Raj is the President of Technology & Management Systems, Inc. (TMS). He holds S.M. and Ph.D. degrees in Mechanical Engineering as well as an MBA degree.

He has over 30 years professional experience in conducting safety research and assessing risks in the storage, transportation, handling and utilization of hazardous materials, including energy fluids. His research has included the development of mathematical models to describe the accidental release behavior of chemicals and flammable materials. In addition, he has developed easy to follow safety guideline documents and hazard assessment manuals for a number of clients including the Federal Agencies and industrial clients.

Dr. Raj developed a number of models for the "Chemical Hazard Response Information System" (CHRIS), which the U.S. Coast Guard and the National Response Center use for assisting in case of hazardous material emergencies. He is the author of CHRIS Manual III "Hazard Assessment Handbook."

Since 1996 he has been a member of the NFPA's Technical Committee on Liquefied Petroleum Gases which writes NFPA 58, *Liquefied Petroleum Gas Code*. He was a member of the Committee Transportation of Hazardous Materials (of the National Research Council), and emeritus member of the Editorial Board of the Journal of Hazardous Materials. He has held the post of visiting lecturer at MIT and taught, in the Chemical Engineering Department, a graduate level course. He is the principal author of over 100 technical reports and over 40 technical papers.

Theodore C. Lemoff, PE
Mr. Lemoff is retired from the National Fire Protection Association (NFPA). While at NFPA, he served as the Principal Gases Engineer. He holds a Bachelor of Engineering degree in Chemical Engineering and is a registered professional engineer in Massachusetts.

He has over 40 years experience in the fire safety and the chemical industry, including 25 years at NFPA working in the flammable gases area. He served as the staff liaison and secretary to the NFPA Technical Committee on Liquefied Petroleum Gases, responsible for NFPA 58, and for other NFPA codes and standards on flammable gases.

Mr. Lemoff is a member of the American Institute of Chemical Engineers, the Society of Fire Protection Engineers, the Society of Gas Engineers, and the American Society of Plumbing Engineers.

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CHAPTER 1

Introduction

1.1 Background

The Fire Safety Analysis (FSA) is a self-conducted audit of the safety features of a propane installation and an assessment of the means to minimize the potential for inadvertent propane releases from storage containers and during transfer operations. The assessment also includes an evaluation of the capabilities of local emergency response agencies as well as an analysis of potentially hazardous exposures from the installation to the neighborhood and from the surroundings to the LP-Gas facility.

Since 1976, NFPA 58, *Liquefied Petroleum Gas Code* (hereinafter referred to as the "code" or "NFPA 58") has required that a facility operator or owner conduct a FSA for propane facilities having ASME containers of aggregate storage greater than 4,000 gallons water capacity. The FSA requirement was changed in the 2001 edition to require a written FSA. The requirements for fire protection are indicated in the 2014 edition of NFPA 58 in §6.27, which addresses fire protection requirements for industrial plants, bulk plants and dispensing stations. Specifically §6.27.2 ("Planning") and §6.27.3("Protection of ASME Containers") require, in part, the following:

6.27.2.1 The planning for the response to incidents including the inadvertent release of LP-Gas, fire, or security breach shall be coordinated with local emergency response agencies.

6.27.2.2 Planning shall include consideration of the safety of emergency personnel, workers, and the public.

6.27.3.1 Fire protection shall be provided for installations with an aggregate water capacity of more than 4000 gal (15.2 m^3) and for ASME containers on roofs.

6.27.3.2 The modes of fire protection shall be specified in a written fire safety analysis for new installations, for existing installations that have an aggregate water capacity of more than 4000 gallons (15.2 m^3)and for ASME containers on roofs. Existing installations shall comply with this requirement within 2 years of the effective date of this code.

6.27.3.3 The fire safety analysis shall be submitted by the owner, operator, or their designee to the authority having jurisdiction and local emergency responders.

6.27.3.4 The fire safety analysis shall be updated when the storage capacity or transfer system is modified.

The FSA and required assessment of the installation provides several important benefits:

1) A structured assessment by which each facility can be evaluated for conformity of installed equipment with code requirements.

2) A means to evaluate the capability of systems and equipment installed to control and contain potential LP-Gas releases during day-to-day operations.

3) An approach to evaluate the informational needs of the facility, based on factors such as the type and frequency of transfer operations, size of the storage containers, location of the facility with respect to other buildings and the existing procedures and systems in place.

4) A means to describe product control and fire protection features which exceed the comprehensive requirements of NPFA 58[1].

5) A tool for facilitating a cooperative and effective dialogue with local emergency response agencies and authorities having jurisdiction.

1.2 Scope of the Manual

The manual addresses a number of subjects, including:

(1) A review of the product control measures required in the NFPA 58, "Liquefied Petroleum Gas Code"
(2) Local conditions of hazards within the facility site
(3) Exposures to and from other properties
(4) Effectiveness of local fire departments
(5) Effective control of leakage, fire and exposure
(6) Illustrative examples using four different sizes of typical LP-Gas facilities

This FSA manual is intended for use by propane plant owners or operators, consultants, authorities having jurisdiction (AHJs) and emergency response personnel. The manual addresses the process by which a FSA can be conducted for a LP-Gas facility containing one or more stationary ASME containers.

The FSA manual is designed to provide a guide for identifying the requirements in NFPA 58 and determining compliance with them. Section 6.27.3.5 of NFPA 58 provides that:

> The fire safety analysis shall be an evaluation of the total product control system, such as the emergency shutoff and internal valves equipped for remote closure and automatic shutoff using thermal (fire) actuation, pull away protection where installed, and the optional requirements of Section 6.28.

The philosophy of NFPA 58 is to minimize fires by minimizing the accidental release of propane if an incident should occur. Or put in simple terms, "no fuel, and no fire."

The manual **does not** address the following:

[1] All reference, henceforth, to the "code" in this document should be construed as referring to NFPA 58, 2014 edition.

1. Marine terminals, refrigerated LP-Gas storage and the transportation of LP-gas by either rail tank cars or by cargo tank trucks. Marine terminals are governed by the OSHA Process Safety Management regulations and the US EPA Risk Management Plan regulations; refrigerated storage of LP-gas is a high-volume operation requiring special considerations; and, the transportation of LP-gas is addressed by Title 49 of the Code of Federal Regulations, *Transportation*.[i]
2. Storage of LP-Gas in salt domes and caverns.
3. Installations of ASME LP-gas containers on roofs of buildings. This type of installation, for which a fire safety analysis is required, is excluded from the scope of this manual primarily because of the rarity of such installations in the United States.
4. Cylinder filling operations at a dispensing facility, unless the storage threshold for LP-Gas has been exceeded, requiring an FSA to be prepared.
5. The use of facility employees performing as a "fire brigade."

The above facilities may be required to comply with other safety analysis requirements.

1.3 Need for a FSA Manual

Neither NFPA 58 nor the "Liquefied Petroleum Gas Code Handbook"[ii] provide detailed guidance on how to prepare or develop a written FSA. Since each industrial plant, bulk plant, or dispensing stationpresents unique physical and operational characteristics, the fire safety analysis is a tool used to assess the level of fire safety performance that a specific industrial plant, bulk plant or dispensing station can be expected to provide. This FSA will also provide essential information on the facility and its operation to the local authority having jurisdiction (AHJ) and local emergency response agency.

An informal survey was taken of AHJ's on the fire safety analyses used for existing and new plants in their jurisdictions (conducted by the author) at the time the first edition of this manual was being prepared. It indicated that there was no uniformity either in content, the details of information, or final assessment of the facility in the FSAs submitted. They ranged from a single page submission for a medium size bulk plant to very detailed assessment including risk assessment and management plan for a 30,000 gallon bulk storage facility. Without a guidance manual, potential confusion would almost certainly occur as each AHJ would be required to establish an individual set of criteria that would meet the FSA in their area. Thus, the need in the LP-Gas industry for assistance with the following tasks was clearly established.

1) Providing a FSA template that allows for consideration of different size installations
2) Establishing a uniform approach and defining common elements
3) Developing simplified checklists and an example-based methodology for completing the analysis
4) Utilizing technically-based guidance and support

The intent of this FSA manual is to provide an easy-to-use procedure for LP-gas facility owners or operators who are most familiar with the equipment technology and system operations and therefore qualified to complete the document. Knowledge of fire science and engineering

principles is not required for this document to be useable by an owner, operator or an AHJ, because those principles have already been factored into the assessment criteria contained within the FSA.

By utilizing the expertise of industry, engineering and fire service representatives in the development of the material to follow, this manual provides a comprehensive, uniform, objective approach that was designed to provide for the uniform and objective application of FSA requirements by the AHJs. Further, the joint input of the Propane Education & Research Council (PERC), National Propane Gas Association (NPGA), and the National Fire Protection Association (NFPA) provides additional assurance of the manual's depth, credibility and broad-based consensus.

This FSA manual has been developed based on the requirements of NFPA 58, 2014 edition. Using this manual to perform a FSA at a facility constructed to meet the requirements of prior editions of NFPA 58 or other state-specific codes may produce conflicts between actual facility construction and the checklists in this manual. The code or standard in effect at the time of construction of the facility should be used as the source of requirements to perform the FSA. Checklist items contained within this manual can be revised to indicate the appropriate code items required at the time of facility construction.

1.4 LP-Gas Safety Record and Risks

The LP-Gas industry has a long history of safe operations. With the requirement in the 1976 edition of NFPA 58 to retrofit LP-Gas plants with emergency shutoff valves (ESVs) in transfer lines, the safety of LP-Gas facilities was further improved.

The FSA provided in this manual, in addition to other safety programs currently enacted at any workplace, is intended to reduce or eliminate the risk of fatality or injury to both the plant employees and the public. In an effort to identify the level of risk a propane installation poses to the general public, as well as employees and emergency responders, the U.S. Department of Energy (DOE) instituted a study[iii] in 1981. Accident data from a variety of sources was analyzed, including: the US Department of Transportation hazardous material incident report database, reports of the National Transportation Safety Board, National Fire Protection Association, technical journals and other sources. Data analyzed for the period 1971 through 1979 addressed LP-Gas transportation and product releases from stationary storage facilities. The special focus of the study was the fatalities suffered by employees and the general public. The study concluded that a fatality to the general public as a direct result of an LPG transportation or storage incident involving the loss of product is very small and the risk (expressed in expected number of fatalities per year) is smaller than that from natural phenomena (lightning, tornadoes, objects falling from the sky, etc).

An analysis conducted by the National Fire Protection Association[iv] of LP-Gas fire damage and casualty data during the period between 1980 and 1999 also indicates that the LP-Gas storage facility operations in the US are very safe. The number of reported fires at LP-Gas bulk storage facilities remains small and has fallen since 1980, but substantial variation exists from year to year. During the five-year period from 1994 through 1998, an estimated 49 fires, on average,

were reported per year at LP-Gas bulk storage facilities. These fires caused an annual average of one civilian death, five civilian injuries and $754,000 in direct property damage. In 1999, an estimated 58 reported fires on these properties caused four civilian injuries and $722,000 in direct property damage. The 58 fires reported in 1999 accounted for .003% of all fires reported that year.

1.5 Organization of the FSA Manual

The manual has been organized to address the requirements outlined in the 2014 edition of NFPA 58, Sections 6.27 and 6.28.

Chapter 2 discusses the requirements of the 2014 edition of NFPA 58 in regard to product control requirements, and their evolution. The philosophy and the advantages of product control systems are discussed. Also included are the various appurtenances used in a typical LP-Gas facility. More detailed information on the types of valves, their functions and example photographs of various appurtenances are provided in Appendix B. Chapter 3 provides an overview of the FSA process including its principal elements.

The input of data into the FSA procedure begins with Chapter 4. In Chapter 4, basic information about the LP-Gas facility is input into appropriate tables and a decision is made (based on the data provided) as to the extent of the analysis that should be completed. The assessment of conformity with code requirements of the product control requirements for containers and in transfer piping is performed in Chapter 5. To aid this assessment a series of sketches of possible configurations of container appurtenances (satisfying 2014 code requirements) are provided. Note that several section references have been changed from the published edition of the 2014 edition due to the acceptance of Tentative Interim Amendment 14-3, which is reprinted with permission in Appendix C. When necessary, the year when specific equipment was required by the code is also indicated on the sketches to facilitate application of the Manual to facilities constructed to the requirements in previous editions of NFPA 58. The analysis of the local conditions of hazard is presented in Chapter 6, followed by the assessment in Chapter 7 of the hazard exposure to off-site properties and persons. Also, the potential exposure to LP-Gas installations from off-site activities is covered in Chapter 7.

The evaluation of the capabilities of the local emergency responder (usually the fire department) and the availability of water to fight in-plant fires and exposures are presented in Chapter 8. Summary of evaluations and actions that may need to be initiated for proposed LP-Gas facilities are presented in Chapter 9. The use of this manual in preparing a written FSA for a LP-Gas facility is demonstrated with examples of four different generic cases. Several different sizes of facilities are considered.

A set of blank forms required to perform a FSA is provided in Appendix A. The results of calculating the hazard distances for a set of credible LP-gas release scenarios are provided in Appendix B. Also provided in Appendix B are the thermodynamic properties of propane and the values of other parameters used in calculating the hazard distances.

[i] U. S. Code of Federal Regulations, Title 49, Transportation
[ii] Liquefied Petroleum Gas Handbook, Beach, 2014, NFPA, Quincy MA
[iii] LPG Land Transportation and Storage Safety, Department of Energy report No. DOE/EV/06020-TS 9/18/81"
[iv] Fires at LP-Gas Bulk Storage Plants Statistical Analysis, NFPA, 2003, Quincy, MA

CHAPTER 2

LP-Gas Storage Container Safety Features

The fundamental premise on which the requirements for LP-Gas facility safety specified in several recent editions of NFPA 58 is based is the following:
If product release can be either controlled or eliminated, safety is effectively addressed.

A product release creates the potential for the occurrence of a fire. Therefore, the focus of both NFPA 58 and the Fire Safety Analysis Manual is on the need to design systems (incorporating product controls) to ensure, to the extent possible with current technology and procedures, the elimination of the accidental release of LP-gas from storage or during transfer operations.

2.1 A Historical Perspective

In the late 1960's and the early 1970's there were a number of fires and BLEVEs (Boiling Liquid Expanding Vapor Explosions) of propane and other liquefied petroleum gases resulting from derailments of railcars carrying propane and other flammable liquefied gases. These incidents involved fire fighter fatalities and highlighted the need for safety improvements. As a result, the U. S. Department of Transportation (DOT) implemented new regulations for the tank cars used to transport propane and other liquefied flammable gases, and made them mandatory and retroactive in 1980. These improvements included:

- Head shields to reinforce the pressure vessel on the railcar
- "Shelf" couplers to reduce the potential for railcars to be uncoupled during a derailment
- Thermal protection to reduce the potential for the tank to experience a rise in temperature due to flame impingement

Since these improvements in rail car safety were made in the 1980's, there have been no fire fighter fatalities from any railroad tank car BLEVEs and the number of these incidents has been greatly reduced, to the authors' knowledge.

In 1973, product control requirements to prevent the uncontrolled release of LP-gas from storage containers consisted primarily of manually operated valves, backflow check valves and excess-flow check valves.

On July 3, 1973 a propane incident occurred in Kingman, Arizona involving a propane fire at a propane tank car unloading area in a propane bulk storage plant. Though the plant's equipment conformed to the requirements of NFPA 58 and other safety standards for flammable materials at that time, the incident resulted in the death of several fire fighters and one plant employee.

A direct result of this incident (and others that occurred at approximately the same time) was the addition of a new fire protection requirement in the 1976 edition of NFPA 58. The requirement stated that planning "for the effective measures for control of inadvertent LP-Gas release or fire" shall be done and coordinated with local emergency responders. In addition, the primary consideration of a fire safety analysis at that time was the use of water as a suppressing agent to control fires. The requirements today are very similar to those original requirements except in two areas.

- As of the 2001 edition, fire safety analyses are required to be written;
- The primary consideration in performing such an analysis has changed from the emphasis of using water for fire control to the emphasis of avoiding product release altogether using technology and training.

This modern approach takes advantage of the inherent safety present in a controlled environment such as a bulk plant, as well as the safety features of the most current product control hardware.

In early editions of NFPA 58, the primary consideration of water as the means to control a fire was based on the fact that at that time, there were few reliable ways to stop the flow of LP-gas after failures in the system and the need to apply water quickly to storage containers being impinged by flames was important.

Another significant change in the 1976 edition of NFPA 58 was the requirement for including an emergency shutoff valve (ESV) in the transfer lines used between stationary storage containers of over 4,000 gallons capacity and cargo tank vehicles. This revision was intended to prevent product release from storage containers in the event of a vehicle pulling away with its hoses still connected. All existing plants were required to comply with this requirement by the end of 1980. Since this retrofit program was completed, there has not been, to the knowledge of the authors, a pull-away accident involving an ESV installation that resulted in serious consequences.

The 1980's enjoyed a reduced number of propane incidents in the U. S., and the next major product control enhancement was the revision to introduce an optional requirement for internal tank valves in containers over 2,000 gallons in the 1992 edition of NFPA 58. These tank valve requirements included:

Vapor and Liquid Withdrawal Openings in Tanks

1. Positive shutoff valve in line with excess flow valve installed in the tank, or
2. Internal valve with integral excess flow shutoff capability

Vapor and Liquid Inlet Openings in Tanks

1. Positive shutoff valve in combination with either an excess flow valve or backflow check valve installed in the tank, or
2. Internal valve with integral excess flow valve, or
3. Internal valve with remote means of closure

These revisions were made to enhance the operational features of product control hardware. Internal valves are capable of being closed from a remote location (using a cable, pneumatic, or hydraulic device) and by thermal activation, which is accomplished using an element that melts when it is subjected to fairly moderate temperatures (in the 200ºF - 250º F range).

The 2001 edition of NFPA 58 was further revised to require internal valves for liquid connections to containers over 4,000 gallons, with remote and thermal shutoff activation. This change was the result of the Committee desiring improved safety performance with this advanced hardware, due to the following incidents:

- **Sanford, NC**. A hose separation resulted in the loss of the contents of a transport vehicle (9700 gallons water capacity). The contents within the storage containers were also lost because of a failed check valve.
- **Albert City, Iowa**. An exposed liquid pipe installed in violation of the code between an 18,000 gallon water capacity storage container and a vaporizer was broken when a recreational vehicle accidentally drove over it. The leaking gas found a source of ignition and impinged on the container, resulting in a BLEVE.
- **Truth or Consequences, NM**. A small, parked truck rolled into a propane bulk storage plant, breaking plant piping. The resulting fire caused the failure of several cylinders.

These improvements in product control are considered critically important, and in addition to requiring them for all new installations after 2001, the requirements were made retroactive to all existing installations, allowing 10 years for the conversion. All existing containers over 4,000 gallons water capacity will be retrofit with an internal valve or similar protection on all liquid connections. Alternatively, the use of an emergency shutoff valve (ESV) as close to the container as practical is also allowed, in recognition that some containers cannot accommodate an internal valve without extensive modification. The ESV has the same remote and thermal activation closing features as an internal valve.

2.2 Current LP-Gas Storage Container Safety Features

As of the 2001 edition, NFPA 58 requirements for product release control include the provision for a number of different types of valves or appurtenances in the product storage containers, transfer piping network and at liquid transfer facility locations. Generally, code requirements for product control appurtenances on containers used in industrial plants and bulk plants, as well as dispensing stations, are more stringent than for residential and commercial use containers.

In the 2014 edition of NFPA 58, changes to the definitions of “Bulk Plant” and “Industrial Plant” clarified the intent of the NFPA Technical Committee on Liquefied Petroleum Gases by stating that each of those types of facilities utilize only containers greater than 4,000 gallons water capacity. Therefore, modifications were made to Chapter 5 of this manual to remove references to containers between 2,000 and 4,000 gallons water capacity. The manual does retain information on containers less than 4,000 gallons water capacity due to

the fact that some dispensing stations may be utilizing more than one container less than 4,000 gallons, but with an aggregate capacity greater than 4,000 gallons.

Unless product is being transferred, product control valves are normally in the closed position. However, some of the installations require an automatic shutoff feature when either a fire (or heat) is sensed or when other abnormal conditions occur. The product control valves include the following:

Positive shutoff valve: A shutoff valve that, in the closed position, does not allow the flow of product in either direction. [NFPA 58, 3.3.75.7]

Backflow check valve: This valve allows flow in one direction only and is used to allow a container to be filled while preventing product from flowing out of the container.

Excess-flow valve: A valve designed to close when the liquid or vapor passing through it exceeds a prescribed flow rate. [NFPA 58, 3.3.75.3]

Internal valve: A container primary shutoff valve that can be closed remotely, which incorporates an internal excess flow valve with the seat and seat disc located within the container so that they remain in place should external damage occur to the valve. [NFPA 58, 3.3.75.6]

Emergency shutoff valve: A shutoff valve incorporating thermal and manual means of closing that also provides for a remote means of closing. [NFPA 58, 3.3.75.2]

Hydrostatic pressure relief valve: A type of relief valve that is set to open and relieve pressure in a liquid hose or pipe segment between two shutoff valves when the pressure exceeds the setting of the valve.

Container pressure relief valve: A type of pressure relief device designed to open and then close to prevent excess internal fluid pressure in a container without releasing the entire contents of the container. The valve is located in the vapor space of the container.

Bulk storage installations incorporate several product release control appurtenances. This fire safety analysis manual outlines alternative schematics for the various facilities covered (4,000 gallons or less and greater than 4,000 gallons water capacity).

CHAPTER 3

Principal Elements of the Fire Safety Analysis

The principal elements of the Fire Safety Analysis (FSA) required by NFPA 58 (in §6.27, and container protection requirements in §6.27.3) are described in this chapter. This manual for performing the FSA addresses the following LP-Gas facility-related items:

1. Effectiveness of Product Control measures
2. Local conditions of hazard within the container site, including congestion within the site
3. Exposure to off-site properties and populations and the impact of neighboring industrial activity on the facility
4. Effectiveness of the local Fire Department that may respond to an emergency within the facility
5. Requirements for and availability of adequate water supply
6. Full compliance with Code requirements for existing LP-Gas facilities and corrective actions to be implemented for a proposed facility to address any deficiencies

The details of how each of the above items is evaluated in performing the FSA are indicated in Chapter 4 though Chapter 9. Shown below is a brief review of the various steps involved in conducting the FSA.

3.1 Important Steps in Conducting the Analysis

The development of a Fire Safety Analysis (FSA) involves a number of important steps. These steps are indicated in Table 3.1. Also shown in Table 3.1 are the chapters in this manual where the referenced analysis steps are discussed in detail.

Each set of FSA requirements is presented in one or more tables and fill-in forms. The tables provide either factual information or calculated results; the user obtains information from the tables for further analyses. The fill-in forms specify NFPA 58 requirements or other assessment parameters, and provide two columns, one with a "Yes" column heading and the other with a "No" heading. In some cases either schematic or pictorial representations are provided to clarify a requirement. The fill-in forms require some information input from the user, either checking a "Yes" column or a "No" column or writing a numerical value. Also provided are notes under each table or fill-in form, which explains conditions, if any, associated with the table or the form or how a calculation is performed for entering data into the form.

Appropriate explanations are provided in the text either preceding a form or after the form, if any action is necessary depending upon the values/contents in the forms. A blank copy of each form presented in Chapter 4 through Chapter 9 is provided in Appendix A. These can be reproduced and used for any number of LP-Gas facilities.

The FSA for a LP-Gas facility is conducted by systematically completing the forms in Chapter 4 through Chapter 9. The person completing the FSA must indicate a "Yes" or "No" in the appropriate column for each requirement, depending upon whether the LP-Gas facility fulfills the specific requirement. Any items, which may need to be undertaken to correct a deficiency in a proposed (as opposed to existing) LP-Gas facility are referred to in Chapter 9.

Once the FSA is complete, the forms together with information about the facility, can be filed to satisfy the "written" requirement of NFPA 58, §6.27.3.2 & 6.27.3.3. Any emergency planning for the facility is required to be coordinated with the local fire department or equivalent responding authority (§ 6.27.2.1).

3.2 Completing the FSA

Chapters 4 through 9 provide a framework with which the Fire Safety Analysis can be conducted to satisfy the requirements of NFPA 58. It is important to note the following in performing the analysis using the tables, fill-in forms and steps indicated in the following chapters.

1 All references to the "Code" in this manual are to the 2014 edition of the NFPA 58 "Liquefied Petroleum Gas Code."

2 If a LP-Gas facility was built to satisfy the requirements of an edition of NFPA 58 earlier than the 2014 edition, then you may obtain a copy of the appropriate edition of the Fire Safety Analysis Manual and use that resource for your evaluation. If you must use this manual and an appurtenance or other requirement is specified in one or more of the forms in this manual (developed based on the 2014 edition), and this requirement was not in the edition to which the facility was built, then it is recommended that the "Yes" and "No" column corresponding to the particular appurtenance or requirement be left blank or marked "NA," to signify the requirement is not applicable to the facility in question.

3 If the facility for which the analysis is being performed was constructed to satisfy the requirements of a previous edition of NFPA 58, it must still comply with all requirements that have been made applicable retroactively in later editions of the code, through the 2014 edition. Such retroactive provisions are indicated where they are applicable.

Table 3.1
Description of the Various Steps in Performing the FSA

Step #	FSA Steps	Chapter where described
1	Gather data on the volume of LP-Gas stored and other information pertinent to the facility.	Chapter 4
2	Perform simple calculations and determine whether the facility is subject to the requirements for developing an FSA.	
3	Evaluate the product control appurtenances and other safety features of the facility relative to the requirements of the NFPA 58 code.	Chapter 5
4	Assess the appurtenance requirements for containers of different capacities and compare them to the actual installation.	
5	Evaluate the requirements for valves on transfer piping and compare them to the valves provided in the facility.	
6	Assess conformance to the code of a Redundant and Fail-Safe Product Control System, if such a system is provided in the facility.	
7	Evaluate the code conformance of the Low Emission Transfer Equipment if installed in the facility.	
8	Analyze the protection measures against local conditions of hazard. That is, assess whether all requirements of the code for the physical protection of containers and transfer piping are implemented.	Chapter 6
9	Analyze the code requirements for the control of ignition sources and whether these requirements are complied with.	
10	Assess conformance to the code requirements for separation distances between (i) containers of different sizes and property lines and, (ii) LP-Gas transfer points and other exposures.	
11	Evaluate conformance to the code requirements for Special Protection Systems, if they are provided on containers in the facility.	
12	Evaluate the potential hazards to off-site populations and property from propane releases in the facility. This step includes selecting credible LP-Gas release scenarios and assessing the distance (and area) over which the hazard exists.	Chapter 7
13	Assess whether any off-site populations, especially people in institutional occupancies, are potentially subject to the LP-Gas release hazards	
14	Evaluate whether there exists a hazard from other industrial operations around the LP-Gas facility	
15	Evaluate the effectiveness of the local Fire Department, including the availability and capability of response personnel, training level, equipment and response time to an emergency in the facility.	Chapter 8
16	Evaluate the amount of water needed to cool containers exposed to a fire and the adequacy of the facility (or locally available) water supply.	
17	For a proposed facility, develop corrective actions to address deficiencies found.	Chapter 9 (Only applicable for proposed facilities)
18	Assess, based on specific criteria, the need to provide Redundant and Fail-Safe Product Control Systems.	
19	Assess, based on specific criteria, the need to provide Low Emission Transfer Systems.	
20	Assess when Special Protection Systems are needed	
21	Evaluate alternative approaches to using water in a special protection system	

CHAPTER 4

Facility Information

In this chapter basic information on the LP-Gas facility is recorded and a decision is made on whether the facility is required to have a completed Fire Safety Analysis (FSA) performed. If it is determined that a FSA is required, additional information on the facility is recorded.

4.1 Initial Data for the LP-Gas Facility

Complete Form 4.1 to provide basic information on the facility.

Form 4.1
Initial Data on the LP-Gas Facility

A	B	C
Item #	**Information Item**	**Data**
1	Name of the LP-Gas Facility Owner or Operator	JS West and Companies Inc.
2	Contact Name:	Dwight Frey
3	Contact Telephone & Fax Numbers	209-577-3221 X 284 Off. 209-985-9597 Cell
4	Contact Email Address	
5	Mailing Address	Street 1: 501 9th Street
		Street 2:
		City, State, Zip: Modesto, CA 95354

4.2 Facility Storage Capacity and Other Details

Complete Form 4.2. Multiply Column B by its corresponding entry in Column C, write the answer in the corresponding cell in Column D, then sum all the entries in Column D and write it in Row 2, Column D. This number is the "Aggregate Water Capacity" of the facility.

Form 4.2
Facility Storage Capacity [1,2,3]

A	B	C	D
Item #	Individual Container Water Capacity (w.c.) (gallons)	Number of containers	Total Water Capacity (w.c.) of each container size (gallons)
1	500		
	1,000		
	2,000		
	4,000		
	10,000		
	18,000		
	30,000		
	60,000		
	Other: 90,000	6	540,000
	Other:		
	Other:		
	Other:		
2	**Aggregate Water Capacity[4]**		540,000

Notes: **(1)** Column D = Column B x Column C.

(2) Parked bobtails, transports and tank cars should not be considered for aggregate capacity calculations.

(3) Do not consider containers that are not connected for use.

(4) For the purpose of this manual, "Aggregate Water Capacity" means any group of single ASME storage containers separated from each other by distances less than those stated in the aboveground containers column of Table 6.3.1.1.

If the aggregate water capacity of the LP-Gas facility is less than or equal to 4,000 gallon (w.c.), no further assessment is required.

YOU CAN STOP HERE.

If the aggregate water capacity of the facility is greater than 4,000 gallons, continue the analysis.

4.3 Additional Facility Information

Complete Form 4.3 below and record additional information on the facility.

Complete also the remainder of Fire Safety Analysis indicated in Chapter 5 through Chapter 8 (plus Chapter 9 for proposed facilities).

Form 4.3
Additional Information on the LP-Gas Facility

☐ Existing Facility; Built to NFPA 58 Edition 2017 ☑ Proposed Facility

a) Name of the Facility (if applicable): JS West and Companies Kerman Facility

b) Type of LP-Gas Facility: ☐ Commercial ☐ Industrial ☑ Bulk Plant

c) Facility is located in: ☐ City Industrial Zone ☐ Suburban Area ☐ Rural Area ☐ City Commercial Zone

d) Facility neighbors§: ☑ Agri Fields ☐ Commercial Bldgs. ☐ Flammable Liquids Storage (Check all that apply) ☐ Industrial Activity (metal fabrication, cutting and welding, etc.) ☐ Manufacturing ☐ Others (explain) _____

e) Geographic Location of Facility/Address: See Attached Street Plan

f) Landmarks, if any: NONE

g) LP-Gas liquid supply by: (Check all that apply) ☐ Bobtail ☐ Truck Transport ☑ Rail Tank Car ☐ Pipeline

h) LP-Gas Distribution by: ☐ Liquid Piping ☑ Truck Transport ☐ Vapor Piping Plant
(Check all that apply): ☑ Bobtail ☐ Dispensing or Vehicle Liquid Fueling

i) Number of Vehicle Entrances: ☐ One ☐ Two ☐ More than two

j) Type of Access Roads to the Facility:

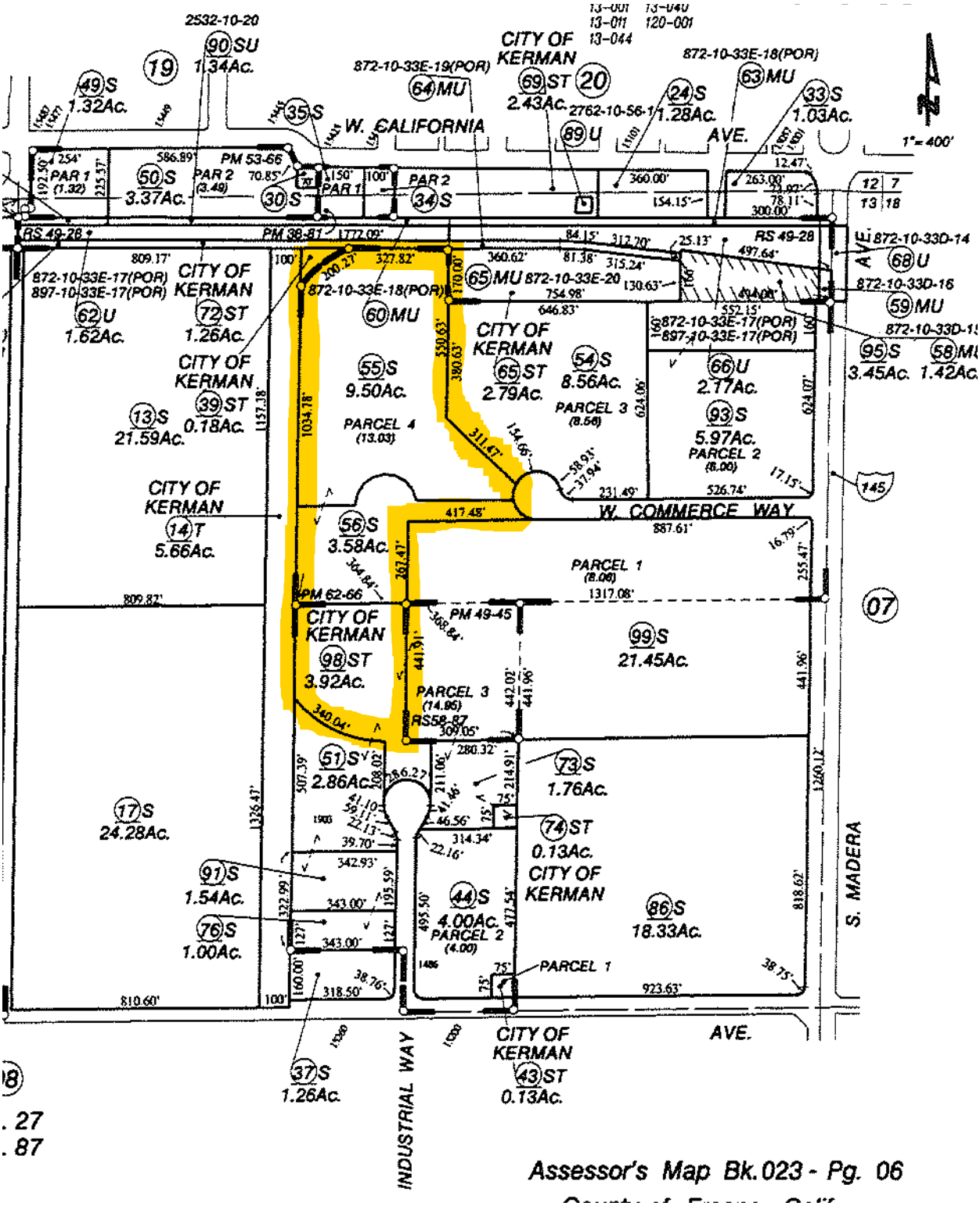
	Rural	City or Town	Highway
(One check per line) Entrance 1:	☐ Dirt road	☐ Gravel road	☑ Paved
(One check per line) Entrance 2:	☐ Dirt road	☐ Gravel road	☐ Paved

k) Staff presence: ☐ Not staffed ☑ Only during transfer operations ☐ Staffed always (24/7) ☐ Only during business hours ☐ Other (Explain) _____

l) Location and distances to Assembly, Educational or Institutional Occupancies surrounding the facility, if any, within 250 feet from the facility boundary in the direction of the assets:
None Noted For This Location

m) Overview plot plan of the facility attached? ☐ Yes ☑ No

§ All properties either abutting the LP-Gas facility or within 250 feet of the container or transfer point nearest to facility boundary.



Assessor's Map Bk. 023 - Pg. 06

CHAPTER 5

Analysis of Product Control Measures In Containers and Transfer Piping

5.1 Product Control Measures in Containers

NFPA 58 requires the installation of several product control safety devices both on containers and in transfer piping to minimize the accidental release of LP-Gas, either liquid or vapor. The requirements for product control equipment depend on the following:

- The size of individual containers,
- The type of service,
- Whether the containers in a facility are individually filled or filled through a common liquid manifold,
- Whether the product is transferred from the storage container as a liquid or vapor (or both).

A facility may have LP-Gas containers of different sizes; it is therefore necessary to evaluate compliance with the code requirements on a container-by-container basis as well as on a facility basis.

In this chapter, the appurtenance requirements of the code are listed for LP-Gas containers of different sizes and configured for different types of service. A series of forms are provided which indicate the code-required product control hardware for container and facility piping. The forms also provide space to record the product control equipment actually installed on the containers as well as transfer piping at the facility. These forms must be completed as a part of this Fire Safety Analysis.

Complete Forms 5.1, 5.2 or 5.3 depending upon the size of the individual containers in the facility. Then, perform an analysis of the product control appurtenances for each container located in the facility.

Table 5.1
Container Size-Dependent Evaluations

If the LP-Gas facility contains individual containers in the volume range (gallons w.c.)		Type of Service	Perform the analysis specified in Section
Greater than	And Less than or equal to		
0	2,000	All service types	5.1.1
2,000	4,000	Other than bulk or industrial plant	5.1.1
2,000	4,000	Bulk or industrial plant	5.1.2
4,000	-	All service types	5.1.3

5.1.3 Individual Containers Having a Water Capacity Greater than 4,000 Gallons

The product control appurtenances for containers larger than 4,000 gallons water capacity are similar to those for the more than 2,000 through 4,000 gallon water capacity containers. However, there are retrofit requirements for existing containers without internal valves in liquid service that were to be completed by July 1, 2011.

The compliance with the code requirements for appurtenances in this container size range must be evaluated for LP-Gas flow both into the container (vapor and liquid) and out of the container (vapor and liquid). Several different appurtenance service configurations meet these requirements. These are indicated in Form 5.3. *Note: Container appurtenances shown are illustrative of product control equipment only. See NFPA 58 for all container appurtenances required. Illustrations are not intended to be used for system design purposes.*

Enter the information in Form 5.3 by following the steps indicated below

1 Select the first container in the facility having a water capacity greater than 4,000 gallons. Enter this as container number 1 in Column A of Form 5.3 below.
2 Complete each of the rows identified as the vapor inlet, vapor outlet, liquid inlet and liquid outlet service for this container.
3 Select the appurtenance configuration for vapor service which most closely corresponds to the design used in the facility. Figure 5-2 shows different vapor inlet configurations. Enter in column D the configuration number that corresponds to the design used in the facility.
4 Count all "Yes" in the schematic sketch corresponding to this configuration and which provide for vapor inlet into the container. This is the number of required appurtenances that should be provided according to the code. Enter this number in column E of the row corresponding to "Vapor Inlet."
5 Check "Yes" corresponding to each appurtenance that is installed on this container. If the appurtenance is not provided, then check "No". Count the total number of boxes with installed appurtenance marked "Yes" in the facility. Record this number in column F of the same row.
6 Repeat steps 3, 4 and 5 for each vapor outlet configuration (using Figure 5-3), liquid inlet configuration (using Figure 5-6) and liquid outlet configuration (using Figure 5-7).
7 Repeat steps 1 through 6 for each container of water capacity greater than 4,000 gallons located at the facility.

Form 5.2

Compliance with Code Requirements for Appurtenances on Containers Having a Water Capacity Greater Than 4,000 Gallons

A	B	C	D		E	F	G
Container #	**LP-Gas inlet to and outlet from the container****		**Enter Configuration Number**		**Total Number of Product Control Appurtenances**		**NFPA 58 Section Reference (2014 edition)**
					Required by NFPA 58 (applicable edition)	**Installed on the container**	
All 6 Containers are the same	**Vapor**	Inlet	5-2	3	1	1	5.7.4.2, Table 5.7.4.2 and 5.7.4.3
		Outlet	5-3	2	1	1	
	Liquid	Inlet	5-6	2	1	2	
		Outlet	5-7	1	1	2	
	Vapor	Inlet	5-2				
		Outlet	5-3				
	Liquid	Inlet	5-6				
		Outlet	5-7				
	Vapor	Inlet	5-2				
		Outlet	5-3				
	Liquid	Inlet	5-6				
		Outlet	5-7				
	Vapor	Inlet	5-2				
		Outlet	5-3				
	Liquid	Inlet	5-6				
		Outlet	5-7				

****** If the container does not provide an opening for the specific function listed, enter 0 (zero) in columns E and F corresponding to that row.

If in Form 5.2 any one of the numbers in column F is less than the number in Column E of the corresponding row, these items must be addressed and brought into compliance with the specific edition of NFPA 58 that the facility was constructed to.

Note: Container appurtenances shown are illustrative of product control equipment only. See NFPA 58 for all container appurtenances required. Illustrations are not intended to be used for system design purposes.

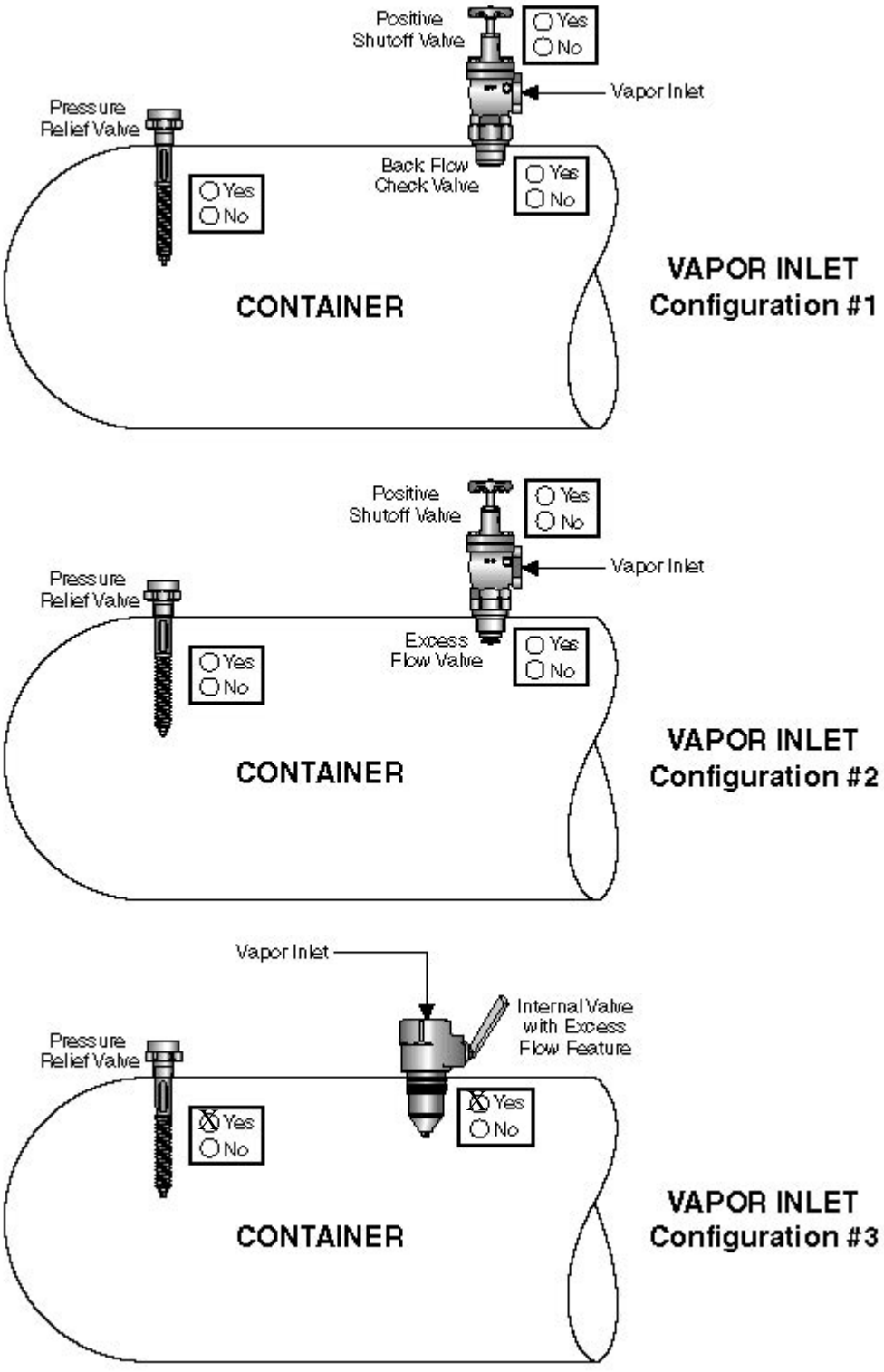


Figure 5-2: Vapor Inlet Appurtenances on Containers of Water Capacity Greater Than 2,000 Gallons in bulk and industrial plants

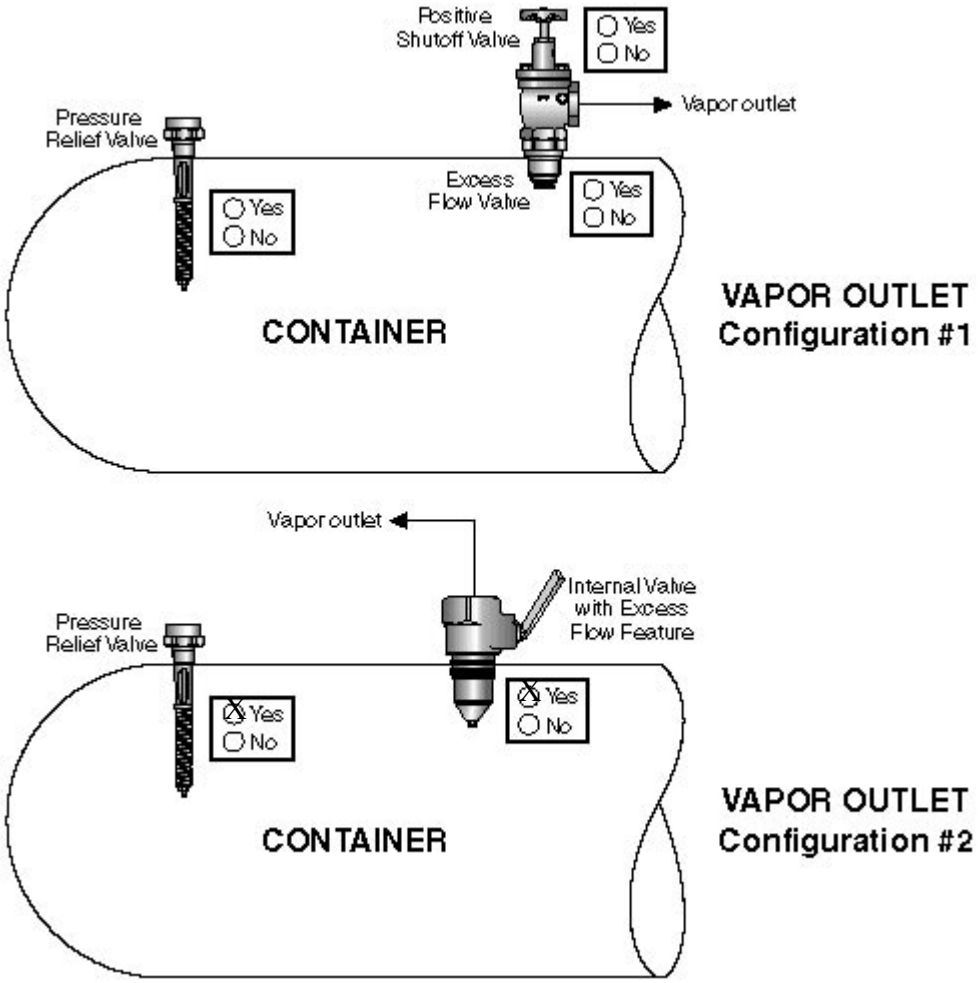


Figure 5-3: Vapor Outlet Appurtenances on Containers of Water Capacity Greater Than 2,000 Gallons in bulk and industrial plants

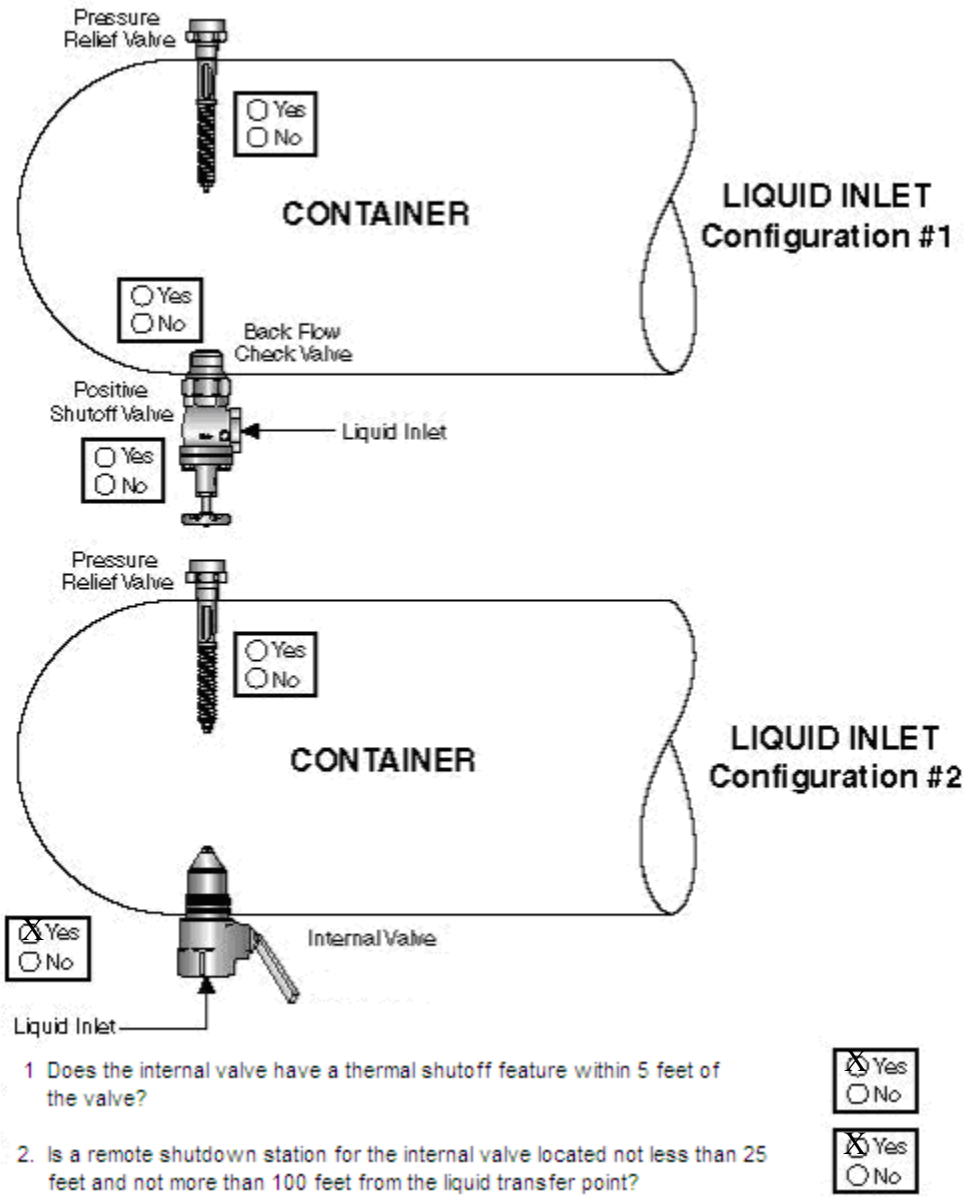
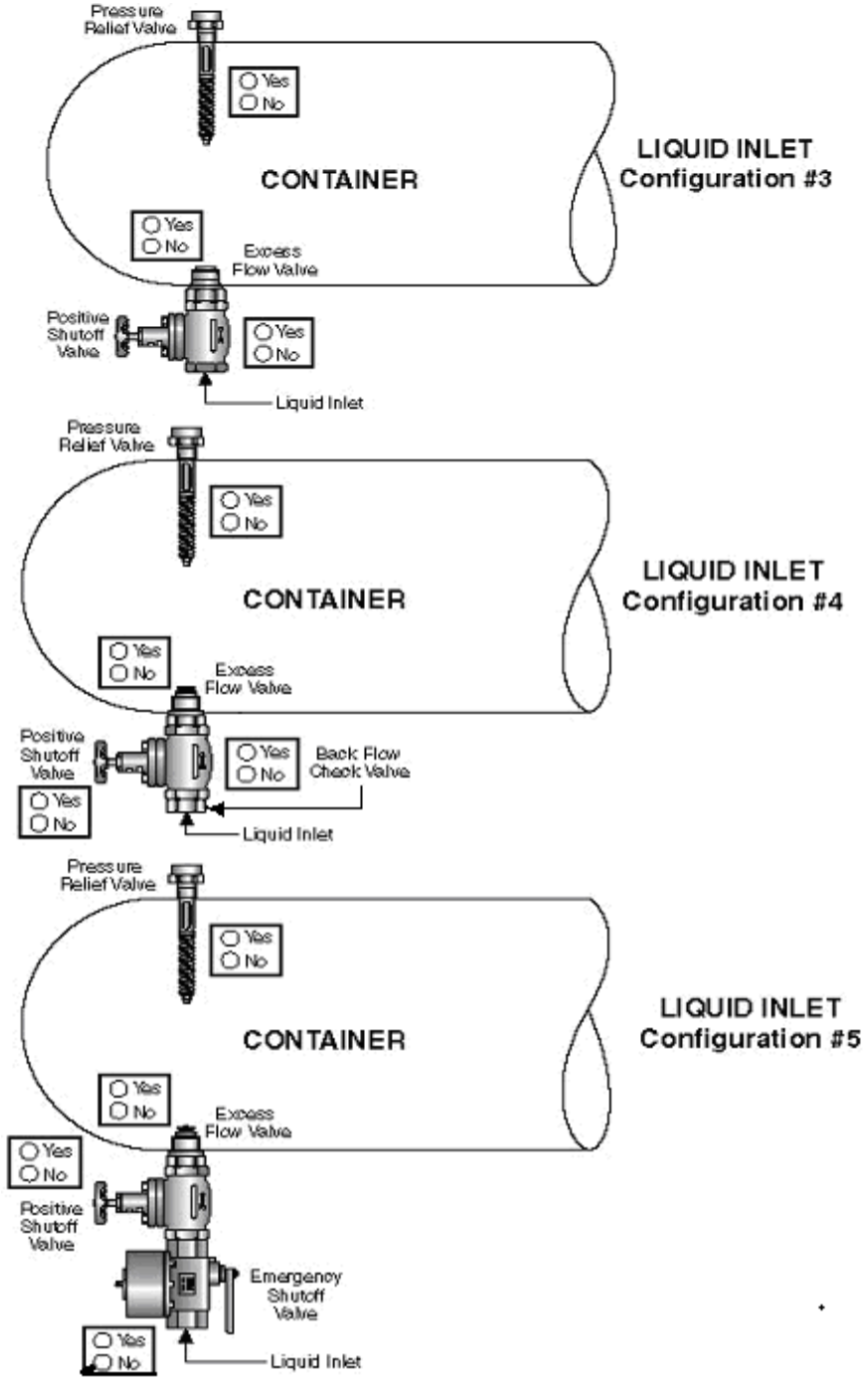


Figure 5-6A Liquid Inlet Valves on Containers With Water Capacity Greater Than 4,000 Gallons in New installations

(*NOTE: Prior to July 1, 2011 existing installations may utilize Configurations 3, 4 or 5 of Fig 5-6B, or either configuration in Figure 5-6A. After July 1, 2011, installations must comply with Configurations 4 or 5 below, or Configuration 1 or 2 in Figure 5-6A.)*



Note: *The emergency shutoff valve in configuration #5 must be equipped for remote closure. This valve must be installed in the line upstream as close as practical to the positive shutoff valve/excess- flow valve combination.*

Figure 5-6B: Liquid Inlet Valves on Containers With Water Capacity Greater Than 4,000 Gallons in Existing installations

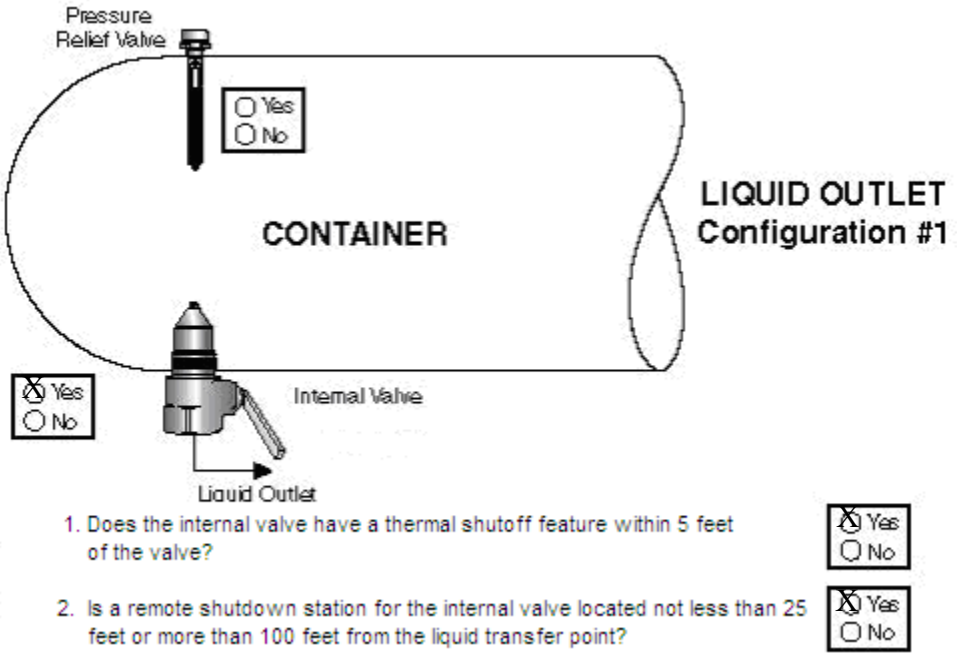


Figure 5-7A: Liquid Outlet Valves on Containers with Water Capacity Greater Than 4,000 Gallons in New installations

5.2 Product Control Measures in Transfer Piping

5.2.1 Manifolded and Remotely Filled Containers

The containers in some LP-Gas facilities, especially in bulk plants, may be remotely filled with an inlet manifold connected to one or more containers. The vapor withdrawal or liquid withdrawal from containers may also be through a common manifold. In such cases, there are several appurtenance requirements to control the potential release of product.

If the facility contains a liquid transfer line header (manifold) 1½-inch diameter or larger, and a pressure equalizing vapor line that is 1¼-inch diameter or larger, then continue with the analysis in this section by completing Form 5.4, Form 5.5 and Form 5.6. Otherwise, skip this section and go to section 5.3. *Note: Container appurtenances shown are illustrative of product control equipment only. See NFPA 58 for all container appurtenances required. Illustrations are not intended to be used for system design purposes.*

Form 5.3
Requirements for Transfer Lines of 1½-inch Diameter or Larger, Liquid-into-Containers

A	B	C	D	E	F
Item #	**Appurtenance (Either No. 1 or No. 2)****	**Appurtenance Provided with the Feature**	**Installed in the facility?**		**NFPA 58 Section Reference (2014 edition)**
			Yes	**No**	
1	Emergency shutoff valve (ESV) (Ref § 6.12)	Installed within 20 ft. of lineal pipe from the nearest end of the hose or swivel-type connections.	☑	☐	6.12.2
		Automatic shutoff through thermal (fire) actuation element with maximum melting point of 250 °F.	☑	☐	6.12.6
		Temperature-sensitive element (fusible link) installed within 5 ft. from the nearest end of the hose or swivel-type piping connected to liquid transfer line.	☑	☐	6.12.6
		Manually operated remote shutoff feature provided for ESV.	☑	☐	6.12.12.1
		Manual shutoff device provided at a remote location, not less than 25 ft., and not more than 100 ft. from the ESV in the path of egress.	☑	☐	6.12.12.2
		An ESV is installed on each leg of a multi-leg piping each of which is connected to a hose or a swivel-type connection on one side and to a header of 1½ inch in diameter or larger on the other side.	☑	☐	6.12.5 and 6.19.2.6 (1)
		Breakaway protection is provided such that in any pull-away break will occur on the hose or swivel-type connection side while retaining intact the valves and piping on the plant side.	☑	☐	6.12.8
2	Backflow check valve (BCK)**	Installed downstream of the hose or swivel-type connection.	☑	☐	6.12.3
		BCK is designed for this specific application.	☑	☐	6.12.4
		A BCK is installed on each leg of a multi-leg piping each of which is connected to a hose or a swivel type connection on one side and to a header of 1½ inch in diameter or larger on the other side.	☑	☐	6.12.5
		Breakaway protection is provided such that in any pull-away break will occur on the hose or swivel-type connection side while retaining intact the valves and piping on the plant side.	☑	☐	6.12.8
3	Debris protection ++	Liquid inlet piping is designed or equipped to prevent debris and foreign material from entering the system.	☑	☐	6.19.2.5
4	Emergency discharge control	Flow-through facility hose used to transfer LP-Gas from non-metered cargo tank vehicle into containers will stop within 20 seconds of a complete hose separation without human intervention.	☑	☐	6.19.2.6 (3)

****** In lieu of an emergency shutoff valve, the backflow check valve (BCK) is only permitted when flow is only into the container and shall have a metal-to-metal seat or a primary resilient seat with metal backup, not hinged with a combustible material (6.12.3, 6.12.4).

++ Retrofit required for existing facilities by July 1, 2011.

Form 5.4
Requirements for Transfer Lines of 1½-inch Diameter or Larger, Liquid Withdrawal from Containers

A	B	C	D	E	F
Item #	**Appurtenance**	**Appurtenance Provided with the Feature**	**Installed in the facility?**		**NFPA 58 Section Reference (2014 Edition)**
			Yes	**No**	
1	Emergency shutoff valve (ESV) (Ref § 6.12)	Installed within 20 ft. of lineal pipe from the nearest end of the hose or swivel-type connections.	☑	☐	6.12.2
		Automatic shutoff through thermal (fire) actuation element with maximum melting point of 250 °F.	☑	☐	6.12.6
		Temperature-sensitive element installed within 5 ft. from the nearest end of the hose or swivel-type piping connected to liquid transfer line.	☑	☐	6.12.6
		Manually operated remote shutoff feature provided for ESV.	☑	☐	6.12.12.1
		Manual shutoff device provided at a remote location, not less than 25 ft., and not more than 100 ft. from the ESV in the path of egress.	☑	☐	6.12.12.2
		An ESV is installed on each leg of a multi-leg piping each of which is connected to a hose or a swivel-type connection on one side and to a header of 1½ inch in diameter or larger on the other side.	☑	☐	6.12.5 and 6.19.2.6 (1)
		Breakaway protection is provided such that in any pull-away break will occur on the hose or swivel-type connection side while retaining intact the valves and piping on the plant side.	☑	☐	6.12.8
		Number of ESV's in liquid withdrawal service	One ESV Installed in Each Tank		

Note: If more than one ESV is installed in the facility, use one Form 5.4 for each ESV.

Form 5.4 (continued)

A	B	C	D	E	F
Item #	**Appurtenance**	**Appurtenance Provided with the Feature**	**Installed in the facility?**		**NFPA 58 Section Reference (2014 edition)**
			Yes	**No**	
2	Backflow check valve (BCK)**	Installed downstream of the hose or swivel-type connection	X		6.12.3
		BCK is designed for this specific application.	X		6.12.4
		A BCK is installed on each leg of a multi leg piping each of which is connected to a hose or a swivel type connection on one side and to a header of 1½ inch in diameter or larger on the other side.	X		6.12.5
		Breakaway protection is provided such that in any pull-away break will occur on the hose or swivel-type connection side while retaining intact the valves and piping on the plant side.	X		6.12.8
3	Debris Protection++	Liquid inlet piping is designed or equipped to prevent debris and foreign material from entering the system.	X		6.19.2.5
4	Emergency discharge control	Flow through facility hose used to transfer LP-Gas from non-metered cargo tank vehicle into containers will stop within 20 seconds of a complete hose separation without human intervention.	X		6.19.2.6 (3)

****** In lieu of an emergency shutoff valve, the backflow check valve (BCK) is only permitted when flow is only into the container and shall have a metal-to-metal seat or a primary resilient seat with metal backup, not hinged with a combustible material (6.12.3, 6.12.4).

++ Retrofit required for existing facilities by July 1, 2011.

Form 5.5

Requirements for Transfer Lines of 1½-inch Diameter or Larger, Liquid Withdrawal From Containers

A	B	C	D	E	F
Item #	**Appurtenance**	**Appurtenance Provided with the Feature**	**Installed in the facility?**		**NFPA 58 Section Reference (2014 Edition)**
			Yes	**No**	
1	Emergency shutoff valve (ESV) (Ref § 6.12)	Installed within 20 ft. of lineal pipe from the nearest end of the hose or swivel-type connections.	X		6.12.2
		Automatic shutoff through thermal (fire) actuation element with maximum melting point of 250 °F.	X		6.12.6
		Temperature sensitive element installed within 5 ft from the nearest end of the hose or swivel type piping connected to liquid transfer line.	X		6.12.6
		Manually operated remote shutoff feature provided for ESV.	X		6.12.12.1
		Manual shutoff device provided at a remote location, not less than 25 ft., and not more than 100 ft. from the ESV in the path of egress.	X		6.12.12.2
		An ESV is installed on each leg of a multi leg piping each of which is connected to a hose or a swivel type connection on one side and to a header of 1½ inch in diameter or larger on the other side.	X		6.12.5 and 6.19.2.6 (1)
		Breakaway protection is provided such that in any pull-away break will occur on the hose or swivel-type connection side while retaining intact the valves and piping on the plant side.	X		6.12.8
		Number of ESV's in liquid withdrawal service			

Note: If more than one ESV is installed in the facility, use one Form 5.5 for each ESV.

Form 5.6
Requirements for Vapor Transfer Lines 1¼-inch Diameter or Larger

A	B	C	D	E	F
Item #	Appurtenance	Appurtenance Provided with the Feature	Installed in the facility?		NFPA 58 Section Reference (2014 edition)
			Yes	No	
1	Emergency shutoff valve (ESV) (Ref § 6.12)	Installed within 20 ft. of lineal pipe from the nearest end of the hose or swivel-type connections.	X		6.12.2
		Automatic shutoff through thermal (fire) actuation element with maximum melting point of 250 °F	X		6.12.6
		Temperature sensitive element installed within 5 ft from the nearest end of the hose or swivel type piping connected to liquid transfer line.	X		6.12.6
		Manually operated remote shutoff feature provided for ESV.	X		6.12.12.1
		Manual shutoff device provided at a remote location, not less than 25 ft., and not more than 100 ft. from the ESV in the path of egress.	X		6.12.12.2
		An ESV is installed on each leg of a multi leg piping each of which is connected to a hose or a swivel type connection on one side and to a header of 1-1/4 inch in diameter or larger on the other side.	X		6.12.5 and 6.19.2.6 (1)
		Breakaway protection is provided such that in any pull-away break will occur on the hose or swivel-type connection side while retaining intact the valves and piping on the plant side.	X		6.12.8
2	Backflow check valve (BCK)**	Installed downstream of the hose or swivel-type connection	X		6.12.3
		BCK is designed for this specific application.	N/A	N/A	6.12.4
		A BCK is installed on each leg of a multi leg piping each of which is connected to a hose or a swivel type connection on one side and to a header of 1-1/4 inch in diameter or larger on the other side.	N/A	N/A	6.12.5
		Breakaway protection is provided such that in any pull-away break will occur on the hose or swivel-type connection side while retaining intact the valves and piping on the plant side.	X		6.12.8

****** In lieu of an emergency shutoff valve, the backflow check valve (BCK) is only permitted when flow is only into the container and it shall have a metal-to-metal seat or a primary resilient seat with metal backup, not hinged with a combustible material (6.12.3, 6.12.4).

If a checkmark is made in the "No" column of any one of Form 5.4, Form 5.5 or Form 5.6, then these items must be addressed and brought into compliance with the specific edition of NFPA 58 that the facility was constructed to.

If the LP-Gas facility is designed using ALTERNATE PROVISIONS for the installation of ASME CONTAINERS, then continue the analysis below. Otherwise skip section 5.3 and go to Chapter 6.

5.3 Alternate Provisions for the Installation of ASME Containers

Facilities may be provided with redundant fail-safe product control measures (section 5.3.1) and incorporate equipment designed for low emissions during transfer operations (section 5.3.2). These types of (redundant and fail-safe) product control measures and low emission transfer equipment provide additional safety and qualify the facility for the following benefits:

- Reduced separation distances from adjacent properties, and
- Mitigation of the need for special protection requirements.

Note that the reduced separation distance applies only to underground and mounded containers 2,001 through 30,000 gallons where all the requirements of NFPA 58 Section 6.28 (summarized in Forms 5.7 and 5.8) are complied with.

5.3.1 ASME Container Appurtenances and Redundant Fail-Safe Product Control Systems

If the facility incorporates redundant, fail-safe equipment, complete Form 5.7 below. The evaluation will indicate whether the design of the facility complies with the requirements for redundant and fail-safe product control systems. If redundant, fail-safe equipment are not provided, skip this section.

Form 5.7
Evaluation of Redundant Fail-Safe Design

A	B		C	D	E	F
Item #	Description		Features	Installed in the facility?		NFPA 58 Section Reference (2014 edition)
				Yes	No	
1	Container sizes for which the appurtenances are provided		Appurtenances and redundant fail-safe equipment are provided for <u>each</u> container of water capacity 2,001 gal. through 30,000 gal.	X		6.28.3 and 6.28.4
2	Liquid or vapor withdrawal (1-1/4 in. or larger)		Internal valve having internal excess-flow valve	X		6.28.3.1 and 6.28.3.2
			Positive shutoff valve installed as close as practical to the internal valve	X		6.28.3.4
3	Liquid or vapor inlet		Internal valve having internal excess-flow valve or backflow check valve	X		6.28.3.5
			Positive shutoff valve installed as close as possible to the internal valve or the back-flow check valve	X		6.28.3.5
4	Railcar transfer	Flow into or out of railroad tank car	Approved emergency shutoff valves installed in the transfer hose or the swivel-type piping at the tank car end	X		6.19.2.6 (1) and 6.28.4
		Flow only into railroad tank car	Approved emergency shutoff valve or backflow check valve installed in the transfer hose or the swivel-type piping at the tank car end	N/A	N/A	6.19.2.6 (2) and 6.28.4
5	Cargo tank transfer		Protection provided in accordance with 6.12	X		6.28.4.1
6	Automatic closure of all primary valves (IV & ESV) in an emergency		By thermal (Fire) actuation	X		6.28.4.2
			Actuated by a hose pull-away due to vehicle motion	X		6.28.4.2
7	Manually operated remote shutdown of IV and ESV		Remote shutdown station within 15 ft of the point of transfer	X		6.28.4.3 (A)
			Another remote shutdown station between 25 ft and 100 ft of the transfer point	X		6.28.4.3 (B)
			Shutdown stations will shut down electrical power supply to the transfer equipment and all primary valves (Internal & Emergency Valves).	X		6.28.4.3
			Signs complying with the requirements of 6.26.4.3 (C) provided	X		6.28.4.3 (C)

Note: If the facility does not have a rail terminal, write the word NA in both the "Yes" column and the "No" column in item 4 of this Form in the railroad tank car row. Similar option is also available if there is no cargo tank vehicle transfer station.

If the LP-Gas facility is provided with LOW EMISSION TRANSFER EQUIPMENT, then continue the analysis below. Otherwise skip section 5.3.2 and go to Chapter 6.

5.3.2 Low Emission Transfer Equipment

If the facility is designed with low emission transfer hoses and associated equipment, complete Form 5.8 below. Compliance with Section 6.28.5 of NFPA 58 results in a 50% reduction in the separation distances between transfer points described in Table 6.5.2.1 and Section 6.25.4.3. If the facility does not have low emission transfer equipment engineered into the facility design, skip this section.

Form 5.8
Evaluation of Low Emission Transfer Equipment

A	B	C		D	E	F
Item #	Description	Features		Installed in the facility?		NFPA 58 Section Reference (2014 Edition)
				Yes	No	
1	Transfer into permanently mounted ASME containers on vehicles	Delivery nozzle and filler valve- Max. liquid release after transfer of 4 cm^3 (0.24 in^3).	Fixed maximum liquid level gage not used during transfer operations	X		6.28.5.3 (A) & (B)
2	Transfer into stationary ASME containers. delivery valve and nozzle combination	During product transfer or post transfer uncoupling of the hose, liquid product volume released to the atmosphere	Does not exceed 4 cm^3 (0.24 in^3) from a hose of nominal size 1 in or smaller	X		6.28.5.4 (A)
			Does not exceed 15 cm^3 (0.91 in^3) from a hose of nominal size larger than 1 in.	X		6.28.5.4 (B)
3	Transfer into stationary ASME containers maximum filling limit	Do containers of less than 2,001 gal (w.c.) have an overfilling prevention device or another approved device?		N/A	N/A	6.28.5.4 (F)
		Do containers 2,001 gal (w.c.) or greater have a float gage or other non-venting device?		N/A	N/A	6.28.5.4 (E)
4	Transfer into stationary ASME containers fixed maximum liquid level gage	Not used during routine transfer operations but used to calibrate other non-venting liquid level gages in the container		X		6.28.5.4 (C) & (D)

Note: 1) If the facility does not have a particular feature described in items 2 or 3, write "NA" in both the "Yes" and "No" columns corresponding to its row .

If separation distance reductions are intended, checkmarks made in the "No" column of either Form 5.7 or Form 5.8 must be addressed and brought into compliance with the specific edition of NFPA 58 that the facility was constructed to.

CHAPTER 6

Analysis of Local Conditions of Hazard

6.1 Physical Protection Measures

Protection should be provided for LP-gas facilities, systems and appurtenances against the risk of tampering and from the accidental collision of vehicles with containers and/or transfer lines. Requirements to prevent such tampering or accidents are specified in the code. Compliance requirements for the facility are indicated in Form 6.1. Complete all forms in this chapter. (**NOTE:** See NFPA 58 for complete requirements.)

Form 6.1
Evaluation of Physical Protection and Other Measures

A	B	C	D	E	F
#	Item	Features	Installed in the facility?		NFPA 58 Section Reference (2014 Edition)
			Yes	No	
1	Lighting‡	Provide lighting for nighttime operations to illuminate storage containers, container being loaded, control valves, and other equipment	X		6.19.5
2	Vehicle impact protection	Protection against vehicular (traffic) impacts on containers, transfer piping and other appurtenances is designed and provided commensurate with the size of vehicles and type of traffic in the facility. (Example protection systems include but not limited to (1) Guard rails, (2) Steel bollards or crash posts, (3) Raised sidewalks.	X		6.6.1.2 and 6.9.3.10
3	Protection against corrosion	Provide protection against corrosion where piping is in contact with supports or corrosion causing substances.	X		6.9.3.11, 6.9.3.14, and 6.17
Complete only 4A or 4B					
4 A	Perimeter Fence	Is an industrial type or chain link fence of at least 6 ft high or equivalent protection provided to enclose (all around) container appurtenances, pumping equipment, loading and unloading and container filling facilities?	X		6.19.4.2
		Are at least two means of emergency egress (gates) from the enclosure provided? **NOTE: Write "N.A." (not applicable) if** (i) The area enclosed is less than 100 ft^2, or (ii) The point of transfer is within 3 ft of the gate, or containers are not filled within the enclosure	X		6.19.4.2 (A)
		Is a clearance of at least 3 feet all around to allow emergency access to the required means of egress provided?	X		6.19.4.2 (B)
	Guard Service	If a guard service is provided, does this service cover the LP-Gas plant and are the guard personnel provided with appropriate LP-Gas related training, per section 4.4 of NFPA 58?	N/A	N/A	6.19.4.3
4 B	Lock-in-Place devices	Are Lock-in-Place devices provided to prevent unauthorized use or operation of any container appurtenance, system valves, or equipment in lieu of the fence requirements above?	X		6.19.4.2 (C)

Note: Fill only items 1, 2, 3, and 4A or 4B. Indicate with "NA" when not filling the "Yes" or "No" column.
‡ Indicate with "NA" if the facility is not operated at night.

6.2 Ignition Sources and Control

The potential for the ignition of LP-Gas vapors released in a facility is reduced by eliminating as many ignition sources as possible, designing electrical equipment to reduce or eliminate sparking and ensuring that during transfer operations known ignition sources are turned off. The ignition source control involves both passive methods as well active methods. Form 6.2 is used to evaluate whether your facility satisfies the code requirements for ignition source control. (**NOTE:** See NFPA 58 for complete requirements.)

Form 6.2
Assessment of Sources of Ignition and Adjacent Combustible Materials

A	B	C	D	E
#	Sources of Ignition and Requirements Pertaining to Adjacent Combustible Materials	Is the Facility compliant?		NFPA 58 Section Reference (2014 Edition)
		Yes	No	
1	Are combustible materials not closer than 10 ft. from each container?	X		6.4.4.3
2	Is a distance at least 20 ft. provided between containers and tanks containing flammable liquids with flash point less than 200 ºF (ex., gasoline, diesel)?	X		6.4.4.6
3	Are electrical equipment and wiring installed per Code requirements?	X		6.23.2
4	Is open flame equipment located and used according to Code?	X		6.23.3.1
5	Are ignition control procedures and requirements during liquid transfer operations complied with?	X		7.2.3.2
6	Is an approved, portable, dry chemical fire extinguisher of minimum capacity 18 Lbs. and having a B:C rating provided in the facility?	X		6.27.4.2
7	Is an approved, portable, dry chemical fire extinguisher of minimum capacity 18 Lbs. and having a B:C rating provided on each truck or trailer used to transport propane?	X		9.3.5 and 9.4.7
8	Is the prohibition on smoking within the facility premises strictly enforced?	X		7.2.3.2 (B) and 9.4.10

Note: Insert "NA" in both "Yes" and "No" columns of any items that are not applicable.

6.3 Separation Distances

6.3.1 Separation Distances between Container and Important Buildings, Other Properties and Transfer Points

The separation distance provisions in NFPA 58 are minimum requirements and are intended to buy time in an emergency and to implement appropriate response. The requirements are dependent upon the size of the container. Complete the appropriate section of Form 6.3. (**NOTE:** See NFPA 58 for complete requirements.)

Form 6.3

Separation Distances from Containers to Buildings, Property Lines that can be Built upon, Inter-container Distances, and Aboveground Flammable or Combustible Storage Tanks

A	B	C	D	E	F	G
#	Container Size Range in gal (W.C.)	Separation between a property line, important building or other property and the nearest container which is	Minimum Distance (ft)	Is the Facility compliant? Yes	Is the Facility compliant? No	NFPA 58 Section Reference (2014 Edition)
1	501 through 2,000	Aboveground	25	N/A	N/A	6.3.1, 6.3.2 and Table 6.3.1.1
		Underground or Mounded	10	N/A	N/A	
		Between containers	3	N/A	N/A	
2	2,001 through 30,000	Aboveground	50	N/A	N/A	
		Underground or Mounded	50	N/A	N/A	
		Between containers	5	N/A	N/A	
3	30,001 through 70,000	Aboveground	75	N/A	N/A	
		Underground or Mounded	50	N/A	N/A	
		Between containers	¼ sum of diameters of adjacent containers	N/A	N/A	
4	70,001 through 90,000	Aboveground	100	X		
		Underground or Mounded	50	N/A	N/A	
		Between containers	¼ sum of diameters of adjacent containers	N/A	N/A	
5	All sizes greater than 125 gal	Separation distance between an aboveground LP-Gas container and an aboveground storage tank containing flammable or combustible liquids of flash points below 200 °F.	20	N/A	N/A	6.4.4.6 and 6.4.4.7

If the LP-Gas plant is provided with every one of the redundant and fail-safe product control-design equipment indicated in Form 5.6, then the minimum distance in column D of Form 6.3 can be reduced to 10 feet for underground and mounded containers of water capacity 2,001 gal to 30,000 gal

Note: If any of the container sizes indicated in the above form are not present in the facility, enter "NA" in both Yes and No columns.

6.3.2 Separation Distances between Transfer Points and other Exposures

If the liquid transfer point is not on the container but is at a remote location complete Form 6.4. **Do not complete Form 6.4 when the filling is through a container valve**.
(**NOTE:** See NFPA 58 for complete requirements.)

Form 6.4
Separation Distances between Points of Transfer and other Exposures

A	B		C	D	E	F	G
#	Type of Exposure within or outside the facility boundary		Check if exposure is present	Minimum Distance (ft)	Is the Facility compliant?		NFPA 58 Section Reference (2014 Edition)
					Yes	No	
1	Buildings, mobile homes, recreational vehicles, and modular homes with at least 1-hour fire-rated walls			10	N/A	N/A	Section 6.5.2 and Table 6.5.2.1
2	Buildings with other than at least 1-hour fire-rated walls		X	25	X		
3	Building wall openings or pits at or below the level of the point of transfer			25	N/A	N/A	
4	Line of adjoining property that can be built upon		X	25	X		
5	Outdoor places of public assembly, including school yards, athletic fields, and playgrounds			50	N/A	N/A	
6	Public ways, including public streets, highways, thoroughfares, and sidewalks	From points of transfer in LP-Gas dispensing stations and at vehicle fuel dispensers.	X	10	X		
		From other points of transfer	X	25	X		
7	Driveways		X	5	X		
8	Mainline railroad track centerlines		X	25	X		
9	Containers other than those being filled			10	N/A	N/A	
10	Flammable and Class II combustible liquid dispensers and the fill connections of non-stationary containers			10	N/A	N/A	
11	Flammable and Class II combustible liquid aboveground containers and filling connections of underground containers			20	N/A	N/A	
12	LP-Gas dispensing device located close to a Class I liquid dispensing device.			10	N/A	N/A	6.25.4.3

NOTE: Place a checkmark in column C against an exposure that is present in or around the facility. Fill columns E or F for only those rows for which there is a checkmark in column C.

If the facility contains low emission transfer equipment (i.e, all equipment identified in Form 5.7 are installed and are in working order), then the minimum separation distances in column D of Form 6.4 can be reduced to one half of the indicated values.

If the containers in the LP-Gas facility are provided with SPECIAL PROTECTION MEASURES, then continue the analysis below. Otherwise skip Forms 6.5 and 6.6 and go to Section 6.5. Also see Chapter 9.

6.4 Special Protection

In the event that a proposed installation is adjacent to a property containing extremely high combustible fuels and the location of the storage containers is such that exposure of the containers to a fire on the adjacent property would severely impact the integrity of the containers, special protection methods may be utilized to reduce the exposure hazard to the containers. Installed special protection systems must comply with section 6.27.5 of NFPA 58, which addresses both passive and active protection systems.

- Passive approaches include insulating the outside of the containers, mounding above grade or burying the container.
- Active special protection includes fixed water spray systems or placement of monitor nozzles at strategic locations with respect to the containers to be protected.

Complete form 6.5 to determine compliance of the installation with the code. Similarly, Form 6.6 indicates the requirements for active protection. This Form also should be completed as part of the fire safety analysis process.
(**NOTE:**. See NFPA 58 for complete requirements.)

Form 6.5
Special Protection Measures –Passive Systems

A	B	C	D		E
#	Special Protection Option	Question	Is the Facility compliant?		NFPA 58 Section Reference (2014 Edition)
			Yes	No	
1	Container Insulation	Insulation provided on each of the containers?	N/A	N/A	6.27.5.1
		Insulation material complies with the requirements of NFPA 58?	N/A	N/A	6.27.5.1 and 6.27.5.2
2	Mounding of containers	Each container in the facility is mounded?	N/A	N/A	6.27.5.3
		Mounding complies with each requirement under section 6.6.6.3 of NFPA 58.	N/A	N/A	6.6.6.3 and 6.27.5.3
3	Burying of containers	Each container in the facility is buried?	N/A	N/A	6.27.5.4
		Buried containers comply with each requirement under section 6.6.6.1 of NFPA 58.	N/A	N/A	6.6.6.1 and 6.27.5.4

Form 6.6
Special Protection Measures –Active Systems

#	Special Protection Option	Question	Is the Facility compliant?		NFPA 58 Section Reference (2014 Edition)
			Yes	No	
1	Water spray systems	Are fixed water spray systems, complying with NFPA 15[1] requirements, used for each container in the facility?	N/A	N/A	6.27.6.1
		Do fire responsive devices actuate water spray system automatically?	N/A	N/A	6.27.6.2
		Can the water spray systems be actuated manually also?	N/A	N/A	6.27.6.2
2	Monitor nozzle systems	Are the monitor nozzles located and arranged so that the water stream can wet the surfaces of all containers exposed to a fire?	N/A	N/A	6.27.6.3
		Can the water stream from a monitor nozzle reach and wet the entire surface of, at least, one half of a length from one end of each of the containers it is designed to protect? [1]	N/A	N/A	6.27.6.3
		Do fixed monitor nozzles comply with NFPA 15[2] requirements?	N/A	N/A	6.27.6.1
		Do fire responsive devices actuate the monitor nozzles?	N/A	N/A	6.27.6.2
		Can the monitor nozzles can be actuated manually also?	N/A	N/A	6.27.6.2

1. See discussion in Section 8.2
2. Refer to Chapter 8 for a discussion on NFPA 15, *Standard for Water Spray Fixed Systems for Fire Protection*

6.5 Vehicular Protection

In the event that an installation is located where an immediate threat due to vehicular traffic is present, a barrier or other suitable protection may be necessary.

Form 6.7
Protection Against Vehicular Impact

#	System Protected	Is physical protection provided?		Type of physical protection installed	NFPA 58 Section Reference (2014 Edition)
		Yes	No		
1	Storage containers	X		Crash Posts or K Rail	6.6.1.2, 6.6.6.1(B), 6.6.6.1(C), 6.9.3.10, and 6.25.3.13
2	Transfer stations	X		Crash Posts or K Rail	
3	Entryway into plant	X		Gated Entrance and Exit	

CHAPTER 7

Exposure To and From Other Properties, Population Density

7.1 Exposure to Off-Site Properties and Persons From In-Plant Propane Releases

Types of Propane Fires: A propane release inside the LP-Gas facility may affect adjacent properties and off-site populations if the release is of a sufficiently large size. An immediately ignited release will result in a local fire. Depending upon the characteristics of the release and ignition two types of local fires can occur, namely, a pool fire on any liquid pool of propane on the ground or a burning rising fireball.

If the released propane is not immediately ignited, then a dispersing cloud (or plume) of vapor will form. The cloud or plume will move in the direction of the wind. Because of the mixing of air with the dispersing propane, propane concentration decreases continuously both with downwind distance as well as in the crosswind direction. This cloud or plume can be ignited at any distance downwind by an ignition source when the concentration at the point of ignition is within the Lower Flammability Limit (LFL) to Upper Flammability Limit (UFL) range. For propane the range of flammable concentrations in air is between 2.15% and 9.6% by volume.

Ignition of a dispersing vapor cloud or plume may result in a flashback type of vapor fire. In extremely rare cases, and only when the physical conditions are conducive, with partial or full confinement of the propane-air mixture of proper concentration and its ignition, a vapor explosion can occur, resulting in a blast wave. If the dispersing cloud is not ignited it poses no hazard to the surrounding area.

Propane vapor at ambient pressure and temperature is heavier than air. Hence, any vapor released will tend to flow towards and accumulate in low-lying areas adjacent to the release location. If a building or other semi-confined area exists adjacent to the release location wherein the vapor can accumulate in the lower parts of the building, a potential explosion hazard will result.

Hazardous Effects of a Fire: The effect of a propane fire on an off-site property will depend on the type and material of construction of the structure and its distance from the fire and fire size. Similarly, the number of off-site persons adversely impacted by a fire inside a LP-Gas facility will also depend on, (in addition to the characteristics of the fire and the distance between the fire and the population) the type of population, the timeliness of notification, the effectiveness of the evacuation planning and implementation, etc.

Release Cases: In this manual, a number of mathematical models were developed for credible accident scenarios, to describe the effects of the release of propane inside LP-Gas facilities and its subsequent behavior. These models were used to calculate potential hazard areas for each scenario of release. Each potential release discussed has very low probability of occurrence. However, because of the flammability of propane, such releases may pose hazards. The hazard distance (to a

property outside the facility boundary or to off-site persons) from a propane release within the facility will depend on the size and duration of release, and the type of fire that occurs.

The calculated distance to which a hazard extends under each scenario of release and for each hazard behavior is indicated in Table 7.1.

To assess the hazards posed to offsite population from in-plant releases of propane it is necessary to:

1. Note the type of occupancies surrounding the facility, and
2. Describe in detail the characteristics and density of the population surrounding the facility.

To evaluate the impact on the surrounding population from an in-plant propane release, complete Form 7.2 using the results indicated in Table 7.1.

Table 7.1
Distances to Various Types of Propane Hazards Under Different Release Models**

Model #	Details of the Propane Release Model Releases from or due to		Vapor Dispersion Distance to LFL (ft)	Explosion Hazard Distance (ft)	Fire Ball Radiation Distance (ft)
1a	Bobtail hose failure. Release of the entire inventory in the hose, quickly.	1" ID x 150 ft hose length	250	110	50
1b		1" ID x 120 ft hose length	230	103	45
1c		1" ID x 75 ft hose length	190	90	40
2a	Release of the inventory in a transfer piping 1" x 30 ft @ 20 gpm for 10 min., due to failed excess flow valve.		135	120	25
2b	Release of the inventory in a transfer piping 2" x 30 ft @80 gpm for 10 mins.		230	252	48
2c	Release of the inventory in a transfer piping 2" x 80 ft. @ 70 gpm for 10 mins.		328	235	74
2d	Release of the inventory in a transfer piping 2.5" x 30 ft @80 gpm for 10 mins.		269	252	59
2e	Release of the inventory in a transfer piping 3" x 30 ft @100 gpm for 10 mins.		312	287	69
2f	Release of the inventory in a transfer piping 3" x 18 ft @100 gpm for 10 mins.		256	284	55
2g	Release of the inventory in a transfer piping 3" x 80 ft @100 gpm for 10 mins		455	284	106
2h	Release of inventory from transfer piping 4" x 30 ft. + 200 gpm for 10 minutes		407	410	89
3	Release from the container pressure relief valve		No ignitable vapor concentration at ground level		
4	Release from a 1" ID x 150 ft transfer piping to a vaporizer and reduced flow from a partially open excess flow valve @ 20 gpm for 10 min.		250	120	50
5	Leak from a corrosion hole in a transfer pipe at a back		110	120	5

	pressure of 130 psig (corresponding to 80 °F) for 60 min. Hole size is ¼" ID.			
6a	Release of the entire inventory in a 2" ID x 20 ft., transfer hose.	195	90	40
Model #	**Details of the Propane Release Model Releases from or due to**	**Vapor Dispersion Distance to LFL (ft)**	**Explosion Hazard Distance (ft)**	**Fire Ball Radiation Distance (ft)**
6b	Release of the entire inventory in a 2.5 inch dia. transfer hose x 16 ft. length	215	98	45
6c	Release of the entire inventory in a 3-inch dia. transfer hose x 12 ft. length	230	100	46
6d	Release of the entire inventory in a 1.25-inch diameter transfer hose x 20 ft. in length	138	66	27
7a	Transport hose blow down: Hose size 2" ID, 20 ft length release for 3min., from a Transport after the tank is filled.	25	30	<5
7b	Transport hose blow down: Hose size 2.5" ID, 16 ft length release for 3min., from a Transport after the tank is filled.	25	29	<5
7c	Transport hose blow down: Hose size 3" ID, 16 ft length release for 3min., from a Transport after the tank is filled.	31	36	<5

** Results from models described in Appendix B.

Form 7.1

Types of Occupancies[1] Near or Surrounding the LP-Gas Facility

Type of Occupancies	**Model # from Table 7.1**	**Hazard Distance[2] (feet)**	**Is Occupancy located within the hazard distance from the Facility?**	
			Yes	**No**
Assembly Occupancies (Places of worship, Libraries, Theaters and Auditoriums, Food or Drink Bars, Sports Stadiums, Amusement Parks, Transportation Centers, etc. with 50 or more people).	2c	235		X
Institutional Occupancies (Elderly Persons Home or Nursing Home, Hospitals, Alcohol & Drug Rehabilitation Centers, Prisons)	N/A	N/A	N/A	N/A
Educational Occupancies (Elementary Schools, Day Care facilities, etc).	N/A	N/A	N/A	N/A

NOTES: (1) Different types of occupancies are defined in NFPA 5000

(2) Table 7.1 provides a number of scenarios that can result in propane release, and the resulting area exposed for different ignition mechanisms. Determine the scenarios that are applicable to the facility, for the quantities that can be released, and enter the greatest value from Table 7.1. Use the hose diameters and length that will be used at the facility if they differ from the ones in Table 7.1 and recalculate the hazard distances using a spreadsheet method that is available at npga.org. Some scenarios may not be applicable to an installation because of other mitigation measures implemented, such as a hose management procedure to minimize the possibility of hose failure.

7.2 Exposure to the Propane Facility From External Events

A large fire or an explosion occurring outside the plant boundary may have detrimental effects on the plant equipment, containers or electrical systems. The most likely scenario is that the LP-Gas plant equipment is affected by intense heat radiation from the external fire.
In order to assess the effects on in-plant personnel, equipment, containers and safety systems from exposure to off-site hazards it is necessary to:

1 Identify industrial or other operations surrounding the LP-Gas plant and also note the type of occupancies surrounding the plant;
2 Discuss with owners of facilities or operations surrounding the LP-Gas plant any potential detrimental effect due to their presence or operations upon the LP-Gas plant;
3 Implement suitable precautions and develop quick notification or other effective communication system protocol between the LP-Gas plant and its neighboring industrial plants, to minimize the potential detrimental effects on a proposed LP-Gas plant from surrounding operations.

The description of the LP-Gas plant surroundings was specified in Form 4.2. Form 7.2 should be completed as a part of the Fire Safety Analysis to note any outside hazards that may affect the integrity of the LP-gas system.

Form 7.2
Exposure to LP-Gas Facility from External Hazards

A	B	C	D
Item #	**Type of Neighboring Operation**	**Hazard exists to the LP-Gas Facility**	
		Yes	**No**
1	Petroleum and other hazardous material storage, wholesale dispensing, etc.		X
2	Metal cutting, welding, and metal fabrication		X
3	Industrial Manufacturing that can pose external hazards		X
4	Ports, rail yards and trans-shipment terminals handling flammable and explosive materials.		X
5	Other operations that may pose hazards (gasoline and other hazardous material dispensing stations, fertilizer storage, etc).	N/A	N/A

NOTE: If a particular activity indicated in column B does not exist, fill both "Yes" and "No" columns with "NA."

Where a "Yes" has been checked in either Form 7.1 or Form 7.2:
1) For an existing facility, communicate this information to local emergency responders for inclusion in their emergency planning.
2) For a proposed facility, implement the actions indicated in Chapter 9.

External Fire Effects on LPG Containers: An evaluation of the effects of thermal radiation from fires outside the facility on LP containers in the LPG plant was conducted to provide guidance to those using this manual. (This evaluation, the associated mathematical model and detailed results with and without the effects of wind have been published in a peer reviewed technical journal)[1]. The maximum temperature attained by the vapor-wetted wall of a propane container exposed to heat radiation from an external, non-impinging fire was calculated for various sizes of containers. The assumptions made in regard to the size and location of the external fire included the following:

- The fire used in the model was a highly radiative liquid hydrocarbon pool fire. The value assumed for the heat radiation emanating from this liquid pool fire was greater than that from fires occurring due to the burning of wooden buildings, tires, forest trees, and other flammable liquids such as oil fires, which burn with high degree of smoke production.

- A fire diameter of 100 ft (30.5 m) was used for duration of 30 minutes. This is a very large fire.

- The edge of the fire was located at distances to buildings required by Table 6.3.1.1 of NFPA 58 and consistent with the size of the container nearest to the plant boundary.

- Convective cooling of the heated surface and the effects of reflective paint on the containers were included.

- Bending of the fire plume towards the containers due to the effects of wind was also included.

The maximum temperatures calculated for the steel surface of the container in contact with vapor in different size containers were as follows:

Container Size Gal. (W.C.)	Maximum Temperature attained in 30 min exposure
1,000	660 ºF
2,000	648 ºF
4,000	507 ºF
12,000	507 ºF
18,000	437 ºF
30,000	384 ºF
60,000	340 ºF

[1] Raj, P.K., "Exposure of a liquefied gas container to an external fire," Journal of Hazardous Materials, v122, Issues 1-2, p 37-49, June 2005.

The temperature at which the yield strength of steel of a propane tank begins to decrease is close to 800 ºF. Based on this, there is no threat of propane tank failure from thermal radiation from an external fire occurring at the minimum separation distances specified in Table 6.3.1.1 of NFPA 58.

CHAPTER 8

Evaluation of Fire Services and Water Supply Requirements

In this chapter the procedure for evaluating the capability and resources of the local fire department (FD) that would respond to an emergency at the LP-Gas facility is discussed. This evaluation includes the training of FD personnel, availability of suitable fire apparatus and equipment, and determination of water requirements if such a system were to be installed at the facility.

8.1 Details of the Fire Service

Use Form 8.1 to record the relevant data on personnel and resources from the local FD or fire company that is responsible for the area where the LP-Gas facility is located. This is a good opportunity to establish a working relationship with the fire department as you will need their support as you go forward with this planning and evaluation process and they will need to understand the facility to provide maximum assistance should an incident occur at the facility.

Analyzing the data from Form 8.1: The designation of the fire fighters as career personnel or volunteers has no bearing on the expertise of the department. The purpose of items 4 and 5 in Form 8.1 is to help determine how fast the initial help might be available. Career fire fighters are in the station and available to respond. Volunteer fire fighters may have to come from home or their place of business. Career fire fighters can normally have a piece of fire apparatus responding within one minute of receiving the call, volunteers may take 4-5 minutes to reach the station before they can respond.

Item # 6 helps determine the level of skill of the fire fighters in the fire department. NFPA 1001, *Standard for Fire Fighter Professional Qualifications*, defines the expertise required of a fire fighter to be qualified to Levels I and II. A Level I fire fighter can do general fire fighting tasks under close supervision and a Level II fire fighter can do those and more tasks under general supervision.

Item # 7A is critical to determining if an effective operation can be conducted. For fighting a fire, at least two fire fighters are required for each 125 gpm hose line used. In addition, an incident commander, a safety officer, additional supervisory officers (depending on the size of the incident), and an operator for each piece of fire apparatus that is being used (pumping or performing some other function) is required. Also required is a rapid intervention crew (RIC) of 2 fire fighters when the first firefighting crew is deployed into a hazardous area, with that team growing to 4 fire fighters when the second and subsequent crews enter the hazardous area. The role of the RIC is to perform a rescue of one or more fire fighters that may be injured during the operation.

Item # 7B and Item # 7C help determine the training and knowledge of the fire fighters in hazardous materials and the specific hazards of LP-Gas. NFPA 472 is *Standard for Competence of Responders to Hazardous Materials/Weapons of Mass Destruction Incidents*.

Form 8.1

Data on the Responding Fire Department

A	B		C
Item #	**Data Item**		**Data Entry**
1	Name of the Fire Department (FD).		
2A	Name of the person in the FD assisting with the data acquisition.		
2B	Position of the person in the FD assisting with the data acquisition.		
3A	Date on which FD data was collected.		
3B	Name of the person collecting the data.		
4	Number of fire fighters on duty at any time.		
5	Average number of fire fighters available for response.		
6A	Number of fire fighters qualified to	"Fire Fighter I" level.	
6B		"Fire Fighter II" level.	
7A	Number of fire fighters who would:	Respond on the first alarm to the facility.	
7B		Respond on the first alarm and who are qualified to the operations level requirements of NFPA 472 or <u>similar</u> local requirements	
7C		Respond on the first alarm with specific knowledge and training on the properties of LP-Gas and LP-Gas fires.	
8A	Number of fire apparatus that have the capability to deploy a 125 gpm hose line supplied by onboard water for at least 4 minutes, and, which:	Are in service in the department.	
8B		Would respond on a first alarm.	

Item # 8A and Item # 8B help determine the capability of fire apparatus that will or could respond to an incident. A 125 gpm hose line is a typical hose line used for firefighting where the fire fighters are expected to advance and maneuver the line while it is flowing.

Response time: Another important consideration of the effectiveness of the Fire Department to respond to an incident is the time it takes the FD to reach the LP-Gas facility. Many fire departments have multiple fire stations or use mutual aid fire companies from other communities to assist them so resources are coming from different locations. It is therefore important to determine the total time for not only the first arriving apparatus but for subsequently arriving apparatus dispatched on the first alarm as well. You will need to work with the fire department and gather this information as well.

Using Form 8.2, determine the time for all resources that would be dispatched on the first alarm to an emergency at the facility. Start by identifying and listing in column A the fire companies that would respond on a first alarm to an emergency. Then, for each company record the time it would take to receive and handle an alarm, for the company to turnout, and the time to respond. If the fire department does not have data that can help, some good averages to use are:

- **Alarm Receipt & Handling Time** - 1 minute for the fire department first receiving the alarm and 3 minutes for mutual aid fire departments,
- **Turnout Time** - 1 minute if the apparatus is staffed by career fire fighters and 4 minutes if the apparatus is staffed by volunteer fire fighters,
- **Travel Time** - 2 minutes for each mile the fire apparatus must travel in an urban/suburban setting and 1.5 minutes for each mile the fire apparatus must travel in a rural setting.

Total the times in columns B, C, and D for each company and enter the sum in Column E. This response time will give you an idea of how long it will take resources to reach the facility gate. Fire fighters must then determine the nature and severity of the emergency, determine how they are going to deal with the emergency, maybe establish a water supply from a hydrant or other source, and implement their attack. This can take anywhere from a couple of minutes to upwards of 30 minutes.

8.2 Water Needs and Availability

The requirements for water to cool a container exposed to a fire are indicated in NFPA 15. A flow rate of 0.25 gpm/ft^2 (10 liter/min/m^2) is specified as being adequate to cool a LP-Gas container exposed to a fire. Since a majority of the containers in the LP-Gas facilities have container penetration for liquid inflow or liquid outflow at only one end of the container and since any product leak occurring at one end and a subsequent fire will affect only the end zone of a container, it has been assumed that the container surface within only one half length of the container needs to be cooled for an effective prevention of damage to the container. Also, calculate the total volume of water required on the basis of a stream flow time of 10 minutes.

Based on these parameters and the surface area of various size ASME containers, the cooling water rate requirements for each container size are determined using Form 8.3. Complete Form 8.3 with information relevant to the facility. Start by identifying the largest container at the facility. Assume that a fire occurs at the end of that container where the appurtenances for

product inflow and outflow are located, and determine whether other containers are within 50 feet of this largest container.

Identify the largest container at the facility and all stationary containers within 50 feet of the largest container. Record in column F of Form 8.3 the largest container. Next, record in Column F the two containers that are within 50 feet of the largest, **and** which have the most surface area exposed to the end of the largest container at which the appurtenances are installed. These are the containers, which are most likely to be affected by a fire occurring at the appurtenances of the largest container. Multiply the number of containers recorded in Column F by the required water flow rate per container in Column E and enters the result in Column G. Sum the values in Column G and enter the sum in Cell 2a, Column G. Round this number up to the next multiple of 125 (i.e. 725 gpm would round up to 750 gpm). This is done because the application of water by the fire department is generally going to be in increments of 125 gpm. Enter that figure in Cell 2b, Column G.

You have now determined the application rate for cooling water that is necessary if the largest container is subjected to fire. Add 250 gpm (Cell 3, Column G) for use by fire fighters to protect personnel when approaching the container or its valves to control the flow of product. Sum the numbers in Cells 2b and 3 of Column G. Enter that number in Cell 4, Column G.

To determine the total volume of water required for a 10-minute application time, multiply the total water flow rate in Cell 4, Column G by 10 and enter that figure into Cell 4, Column H.

Form 8.2

Response Time data for the Fire Departments

A	B	C	D	E
Company or Department	**Time in Minutes for**			
	Alarm Receipt & Handling	**Turnout**	**Travel**	**Total Time**

Note: Number in Column E = Sum of numbers from Columns B through D.

Form 8.3

Water Flow Rate and Total Water Volume Required to Cool Containers Exposed to a Fire

A	B	C	D	E	F	G	H
Item #	**ASME Container Size (gallons)**	**Total Surface Area of each Container[1] (ft^2)**	**Surface Area of each container to be Cooled (ft^2)**	**Water flow rate required per container (gpm)**	**Number of containers of the size indicated‡**	**Total Water flow rate required (gpm)**	**Total volume of water required for 10 min (gal)**
1	500	86	43	10.8			
	1,000	172	86	21.5			
	2,000	290	145	36.3			
	4,000	374	187	46.8			
	6,500	570	285	71.3			
	9,200	790	395	98.8			
	12,000	990	495	123.8			
	18,000	1,160	580	145.0			
	30,000	1,610	805	201.3			
	45,000	2,366	1,183	295.8			
	60,000	3,090	1,545	386.3			
	90,000	4,600	2,300	575.0			
	Other Size						
2a	Calculated water flow rate for container protection						
2b	Water flow rate rounded up to nearest multiple of 125						
3	Water for fire fighter protection, if required					250	
4	Total water flow rate and volume						

Note: Column D = (1/2) x Column C Column E = 0.25 (gpm/ft^2) x Column D ;

Column G = Column F x Column E Column H = 10 x Column G

Line 2a, Column G and Column H are the sum of numbers in each row above line 2 of each column.

Line 4, Column G and Column H are the sum of numbers in rows 2b and 3.

‡ Consider only 3 containers for water supply evaluations even if the number of containers in a group is more than 3. See Section 8.2.

1 ASME container approximate dimensions

The total water requirement for the facility is indicated in item 4, column G (water flow rate) and column H (total water volume or quantity) of Form 8.3. If multiple groups of containers are present in the facility, repeat the calculations in Form 8.3 for each group of containers. The total water requirement for the facility is the largest value for any single group of containers.

Water Availability Evaluation

If a water system is installed, Form 8.3 calculates the total water requirement for a 10-minute duration. This time period allows for manual shutdown, rescue of any injured, and the possibility of dispersing unignited gas.

If there is a public or private water supply with hydrants available within 1000 feet of the container or containers on which water will be applied, determine the available flow rate from that system with 20 psi residual pressure. The water company may have flow test data or it may be necessary to conduct flow tests. If that flow rate is equal to or greater than the needed flow rate determined using Form 8.3, you can assume your water supply is adequate. If the hydrant flow rate is less than the needed flow rate, determine what other sources of water are available. Sources fall into two categories: water on fire apparatus responding to the incident, and water in rivers, ponds or lakes near the facility. Start by talking with the fire department about whether they have a tanker shuttle capability. Some departments have well-organized operations that can deliver 250 gpm or more on a continuous basis using tanker shuttles. This may be the only capability available or it may be a supplement to a weak hydrant system. Be sure to determine how long it would take to get the water shuttle established.

If there is a river, pond or lake in the area, the fire department may be capable of drafting from that water source and pumping water through hose lines to the facility. There are a number of things that need to be considered before relying on this type of water supply.

1. Can a fire apparatus get close enough to the water source to reach the water with the suction hose it carries (normally 20 feet) and not have the lift (distance from the surface of the water to the center of the pump) greater than 10 feet?
2. Is the water source available year round? Does it dry up in the summer or freeze in the winter? The strainer on the suction hose needs to be at least 2 feet below the surface of the water.
3. Is the water source of adequate size or flow to supply the water needed?
4. Does the fire department have the hose and pumping apparatus to relay the water from the source to the fire?
5. How long will it take to set up this relay?

These factors should be evaluated and discussed with the fire department before any decision is made to use such a supply. It might also be useful to have the fire department conduct an actual timed drill to deliver the needed water supply to the facility site using the normally responding complement of personnel and equipment.

Complete Form 8.4 to document the water supply that will be available to the facility site.

Form 8.4

Evaluation of Water Availability in or Near the LP-Gas Facility

A	B	C	D		
Item #	**Water from…**	**Available?**	**Quantitative information**		
1	Public supply or from another piped-in supply through one or more fire hydrants in or near the facility	☐ Yes ☐ No	Hydrant data	Distance from Container(s) on which water will be applied (feet)	Available water flow rate from all hydrants(1) (gpm)
			Hydrant 1		
			Hydrant 2		
			Hydrant 3		
2	A nearby static water source (stream, pond, lake, etc).	☐ Yes ☐ No	Distance to water source = _____ Feet Time to set up relay = _____ min. Rate of delivery = _____ gpm		
3	Only through mobile water tanker shuttle.	☐ Yes ☐ No	Time to set up shuttle = _____ min. Sustainable flow rate = _____ gpm		

(1) Obtain the available flow rate from the local municipal water authority or the entity that supplies water to the hydrant or conduct a test to determine total available flow rate.

Having the water available does not guarantee that the fire department has the resources to apply the water in a timely manner. Completed Form 8.2 will indicate how much time it will take for the fire department to have initial resources at the facility and how long before additional resources will be on-site. If the capability to apply cooling water within the first 10 minutes of initial fire exposure to the container is not present, extremely dangerous conditions could begin to develop. Note that it will take several minutes after the apparatus arrives at the facility gate before cooling water is actually applied to the containers and that hand held hose lines will be used with water supplied from the water tank on the apparatus. Even if hydrants are available, the staffing on the first arriving fire apparatus will probably not be sufficient to establish a water-supply from the hydrant. Depending on the hydrant system and the fire department's standard operating guidelines, it may be necessary to connect a pumper to the hydrant. If the distance is over 1000 ft. it may also be necessary to use hose from more than one fire apparatus to reach the hydrant and in some cases, to use intermediate pumpers in the hose line to boost the pressure.

Form 8.1 contains information on responding apparatus capable of applying 125 gpm for 4 minutes. This is adequate to begin operations for a single container of 30,000 gallons or less water capacity if no other adjacent containers are exposed to the fire. However, a continuous water supply then has to be established within that 4 minutes or other apparatus must be available with onboard water to continue the cooling until a continuous water supply is set up. A larger facility or multiple containers exposing each other is a different situation. In those cases, cooling water may need to be applied using larger hand held hose lines or ground monitors to achieve the reach necessary with the water stream. Both of these require considerably more water than may be supplied by 125 gpm hose lines. Unless a hydrant system with an adequate flow rate is readily available, the time needed to establish an adequate water supply from remote hydrants, a relay operation from a static water source, or a sustainable tanker shuttle operation will greatly exceed the initial 10 minutes of fire exposure to the container and dangerous conditions could begin to develop. For these facilities, a fixed water spray system is the only practical means by which adequate protection can be provided to installations consisting of multiple 30,000 gallon or larger containers.

Using the data you have gathered, it is recommended that you discuss with the fire department the resources available to protect the facility. This would include evaluating the knowledge and training of the fire fighters who would be arriving at the facility.

1) For an existing facility, communicate this information to local responders for inclusion in their emergency planning.

2) For a proposed new facility, refer to Chapter 9

CHAPTER 9

Evaluation Summary for a Proposed New LP-Gas Facility

In this chapter the results of analyses performed in Chapter 4 through Chapter 8 for a proposed (new) LP-Gas facility are summarized. If noncompliance with NFPA 58-2014 is found, the design must be altered to bring the proposed facility into compliance. In some cases, several alternative approaches for complying with the code are presented.

Complete Form 9.1, Form 9.2 and Form 9.3 (and if necessary, Form 9.4 and Form 9.5) and implement any necessary changes to the design to bring the new facility into compliance with the code.

Form 9.1
Analysis Summary on Product Control and Local Conditions of Hazard

A	B	C	D	E
Item #	**CHAPTER Title**	**Section & Title**	**Reference FORM #**	**Number of "No" checked**
1	Product Control Measures in Containers & Transfer Piping	5.1: Product Control in Containers	5.1 or 5.2	0
		5.2 Product Control in Transfer Piping	5.3	0
			5.4	0
			5.5	0
			5.6	0
			5.7	0
2	Analysis of Local Conditions of Hazard	6.1 Physical Protection Measures	6.1	0
		6.2 Ignition Source Control	6.2	0
		6.3.1 Separation distances; Container and outside exposures	6.3	0
		6.3.2 Separation distances; Transfer points and outside exposures	6.4	0
		6.4 Special Protection Measures	6.5	0
			6.6	0

§ The number of "No" for Forms from Chapter 5 is the difference between the required number of appurtenances according to NFPA 58-2014, and a lesser number found to be actually installed on the container or the transfer piping.

If, in any row of column E ("No") of Form 9.1, the entry number is greater than zero, the proposed LP-Gas facility is not in compliance with the requirements of NFPA 58-2014 for product control appurtenances or other safety measures. The design of the proposed facility must be modified to conform to the code requirements. In addition, the following items should be noted.

- If there are any "No" checks in Form 6.3, then the separation distance requirements for containers are not satisfied. An option that may be considered is the reduction in separation distance to 10 feet for underground and mounded containers by providing "Redundant and Fail-Safe Product Control Measures." In this case, complete Form 9.4 below to ensure that each requirement of "Redundant and Fail-Safe Product Control Measures" is provided.

- If there are any "No" checks in Form 6.4, then the separation distance requirements for transfer points are not satisfied. In this case, relocate the transfer points so that the separation distances conform to the code requirements or provide the Low Emission Transfer Equipment. Complete Form 9.5 below and ensure that all requirements for Low Emission Transfer Equipment are fulfilled.

Form 9.2
Analysis Summary on Exposure from and to the LP-Gas Facility

A	B	C	D	E
Item #	**CHAPTER Title**	**Section & Title**	**Reference FORM #**	**Number of "Yes" checked**
1	Exposure to and from Other Properties	7.1 Exposure to off-site properties and persons from in-plant propane releases	7.1	0
		7.2 Exposure to propane facility from external events.	7.2	0

If the entry number in column E ("Yes"), Form 9.2 corresponding to Form 7.1 is greater than zero, consider one or more of the following design alternatives.

1 Consider moving the container or the transfer point to a different location, if possible and space exists, so that the property or the person is beyond the hazard distance.
2 Provide "Redundant and Fail-safe Product Control Measures". Complete Form 9.4 to ensure compliance.
3 Institute other technical measures such as installing gas and flame detectors (connected to facility shut down systems), sounding alarm outside facility premises, etc.
4 Institute administrative controls such as additional training for personnel, more frequent inspections of hoses and transfer piping, etc.

If the entry number in column E ("Yes"), Form 9.2 corresponding to Form 7.2 is greater than zero, consider one or more of the following design alternatives.

1 Implement procedures to monitor neighboring activity.
2 Install means in the adjacent plant to shut down the LP-Gas plant in case of an emergency in that plant.

Form 9.3
Analysis Summary on Fire Department Evaluations

A	B	C	D	E	F
Item #	**CHAPTER Title**	**Section & Title**	**Reference FORM #**	**Number "zeros" entered in Column C, Lines 6 through 8 of Form 8.1**	**Number of "Yes" checked in Column C of Form 8.4**
1	Fire department capability, adequacy of water supply and Emergency Planning	8.1 Data on the Fire Department	8.1		
2		8.2 Fire response water needs and availability	8.4		

If the entry number in row 1, Column E of Form 9.3 is greater than zero, consider one or more of the following design alternatives.

1 Discuss with the local Fire Department the needs of the LP-Gas facility and the evaluation results on the capability and training inadequacies of the Department.

2 Consider developing a cadre of personnel within the LP-Gas facility to respond to emergencies.

3 Institute container special protection system based on active protection approaches or passive approaches. Complete Form 9.6 and Form 9.7 below.

If the entry number in row 2, Column F of Form 9.3 is equal to zero, consider one or more of the following design alternatives.

1 Provide special protection (other than water spray or monitor systems) to containers, satisfying the requirements of section 6.27.5 of NFPA 58, 2014 edition. Complete Form 9.6 to ensure compliance.

2 Consider implementing the various options indicated in Table 9.1.

Form 9.4
Redundant and Fail-Safe Design for Containers

A	B		C	D	E	F
Item #	Description		Features	Proposed for the facility?		NFPA 58 Section Reference (2014 Edition)
				Yes	No	
1	Container sizes for which the appurtenances are provided		Appurtenances and redundant fail-safe equipment are provided for each container of water capacity 2,001 gal through 30,000 gal	X		6.28.3 and 6.28.4
2	Liquid or vapor withdrawal (1-1/4 in. or larger)		Internal valve having internal excess flow valve	X		6.28.3.1 and 6.28.3.2
			Positive shutoff valve installed as close as possible to the internal valve	X		6.28.3.4
3	Liquid or vapor inlet		Internal valve having internal excess flow valve or Backflow check valve	X		6.28.3.5
			Positive Shutoff Valve installed as close as possible to the Internal Valve or the back flow check valve	X		6.28.3.5
4	Railcar transfer	Flow into or out of railroad tank car	Emergency shutoff valve installed in the transfer hose or the swivel-type piping at the tank car end.	X		6.19.2.6 (1) and 6.28.4.1
		Flow only into railroad tank car	Emergency shutoff valve or backflow check valve installed in the transfer hose or the swivel-type piping at the tank car end.	N/A	N/A	6.19.2.6 (2) and 6.28.4.1
5	Cargo tank transfer		Protection provided in accordance with 6.28.4.1	X		6.28.4.1
6	Automatic closure of all primary valves (IV & ESV) in an emergency		By thermal (Fire) actuation	X		6.28.4.2
			Actuated by a hose pull-away due to vehicle motion	X		6.28.4.2
7	Manually operated remote shutdown of IV and ESV		Remote shutdown station within 15 ft of the point of transfer?	X		6.28.4.3 (A)
			Another remote shutdown station between 25 ft and 100 ft of the transfer point?	X		6.28.4.3 (B)
			Shutdown stations will shut down electrical power supply to the transfer equipment and all primary valves (Internal and Emergency Valves)	X		6.28.4.3
			Signs complying with the requirements of 6.28.4.3 (C) provided?	X		6.28.4.3 (C)

Note: If your facility does not have a rail terminal, write the word NA in both the "Yes" column and the "No" column in item 4 of the form in the railroad tank car row. Similar option is also available if there is no cargo tank vehicle transfer station.

Form 9.5
Evaluation of Low Emission Transfer Equipment

A	B	C		D	E	F
Item #	**Description**	**Features**		**Proposed for the facility?**		**NFPA 58 Section Reference (2014 Edition)**
				Yes	**No**	
1	Transfer into permanently mounted ASME containers on vehicles	Delivery nozzle and filler valve-max. liquid release after transfer of 4 cm^3 (0.24 in^3).	Fixed maximum liquid level gage not used during transfer operations	N/A	N/A	6.28.5.3 (A) & (B)
2	Transfer into stationary ASME containers delivery valve and nozzle combination	During product transfer or post transfer uncoupling of the hose, liquid product volume released to the atmosphere	Does not exceed 4 cm^3 (0.24 in^3) from a hose of nominal size 1 in or smaller	N/A	N/A	6.28.5.4 (A)
			Does not exceed 15 cm^3 (0.91 in^3) from a hose of nominal size larger than 1 in.	N/A	N/A	6.28.5.4 (B)
3	Transfer into stationary ASME containers maximum filling limit	Do containers less than 2,001 gal (w.c.) have an overfilling prevention device or another approved device?		N/A	N/A	6.28.5.4 (F)
		Do containers 2,001 gal (w.c.) or greater have a float gage or other non-venting device?		N/A	N/A	6.28.5.4 (E)
4	Transfer into stationary ASME containers fixed maximum liquid level gage	Not used during routine transfer operations but may be used in calibrating other non-venting liquid level gauges in the container		N/A	N/A	6.28.5.4 (C) & (D)

Note: If the facility does not have a particular feature described in items 2 or 3, write "NA" in both the "Yes" and "No" columns corresponding to its row .

Form 9.6
Special Protection Measures – Passive Systems

A	B	C	D		E
Item #	Special Protection Option	Question	Proposed for the facility?		NFPA 58 Section Reference (2014 Edition)
			Yes	No	
1	Container insulation	Insulation provided on each of the containers?	N/A	N/A	6.27.5.1
		Insulation material complies with the requirements of NFPA 58?	N/A	N/A	6.27.5.1 and 6.27.5.2
2	Mounding of containers	Each container in the facility is mounded?	N/A	N/A	6.27.5.3
		Mounding complies with each requirement under section 6.6.6.3 of NFPA 58.	N/A	N/A	6.6.6.3 and 6.27.5.3
3	Burying of containers	Each container in the facility is buried?	N/A	N/A	6.27.5.4
		Buried containers comply with each requirement under section 6.6.6.1 of NFPA 58.	N/A	N/A	6.6.6.1 and 6.27.5.4

Form 9.7
Special Protection Measures – Active Systems

Item #	Special Protection Option	Question	Is the Facility compliant?		NFPA 58 Section Reference (2014 Edition)
			Yes	No	
1	Water spray systems	Are fixed water spray systems, complying with NFPA 15 requirements, used for each container in the facility?	N/A	N/A	6.27.6.1
		Do fire responsive devices actuate water spray system automatically?	N/A	N/A	6.27.6.2
		Can the water spray systems be actuated manually also?	N/A	N/A	6.27.6.2
2	Monitor nozzle systems	Are the monitor nozzles located and arranged so that the water stream can wet the surfaces of all containers exposed to a fire?	N/A	N/A	6.27.6.3
		Can the water stream from a monitor nozzle reach and wet the entire surface of, at least, one half of a length from one end of each of the containers it is designed to protect?	N/A	N/A	6.27.6.3
		Do fixed monitor nozzles comply with NFPA 15 requirements?	N/A	N/A	6.27.6.1
		Do fire responsive devices actuate the monitor nozzles?	N/A	N/A	6.27.6.2
		Can the monitor nozzles be actuated manually also?	N/A	N/A	6.27.6.2

Equivalent Protection to a Water Supply for Industrial and Bulk Facilities

In the case where water supply is not available in or near the LP-Gas facility, or is inadequate or it is prohibitively expensive to connect to a public or private water supply hydrant, alternative methods for providing protection should be considered. In lieu of providing a water supply, several alternatives are indicated in Table 9.1, which can offer an equivalency to a water supply system.

The intent of the controls identified in Table 9.1 is to maintain the entire system as a gas tight entity. These methods include reducing the service life of equipment, increasing the design pressure rating of the system beyond the requirements of NFPA 58, or providing early detection and isolation of the system to ensure product control. This list is not exhaustive and is not ranked in an order of priority.

Table 9.1
Suggested Alternative Methods for Industrial and Bulk Plants That Do Not Pose a Hazard But Lack a Water Supply

Item #	Possible options to implement when adequate water supply is not available
1	Reduce the service life of hoses.
2	Increase frequency of equipment inspection.
3	Establish a service life program for the maintenance of the container pressure relief devices. This could include the installation of a listed multiple port valve and certifying that the relief devices are properly set and maintained every 5 to 10 years.
4	Increase the design strength of the piping and fitting systems.
5	Install emergency shutoff valves in conjunction with container internal valves.
6	Install emergency shutoff valves downstream of transfer pump outlets and upstream of the vapor and liquid valves at the bulkhead.
7	Install pneumatic tubing along the facility boundary to serve as a perimeter fire detection system. This would provide protection of the facility against exposure fires.
8	Provide optical flame detection or linear heat detection, or a gas detection system connected to an isolation valve installed downstream of every liquid and vapor nozzle on the container. This system could also be monitored to send a signal to an alarm company that notifies the fire department of an event.
9	Increase the separation distances of internal facility exposures to the container. These exposures would include a site dumpster, idle or waste pallets and combustibles, and increasing the parking distances between the bobtails and transports in relation to the container.
10	Relocate overhead power lines away from all container and cylinder storage areas to protect against ignition in the event of a line dropping due to wind or power pole impact.
11	Eliminate all combustible vegetation within 30 feet of the LP-Gas container. This can be accomplished using gravel, or paving the site yard.
12	Install tanks using the mounding or burial method.

Glossary and Acronyms

GLOSSARY

Advisory Committee: An advisory panel of members from the propane industry, set up by the NPGA to review the technical work and provide guidance during the preparation of this FSA manual.

Bulk Plant: A facility whose primary purpose is to store large quantities of LP-Gas and distribute it by trucks, bobtails or cylinders.

Commercial Plant: A facility in which LP-Gas is stored on site and used in an office building, a restaurant, a building construction site, an apartment complex, a fast-food place, etc.

Facility: A facility refers to a stationary plant handling, storing or transferring LP-Gas.

High Value Populations: Schools, hospitals, retirement homes, police or fire stations, playgrounds, churches, swimming pools, etc.

Industrial Plant: A facility in which LP-Gas is stored on site and used in a factory, a fabrication shop, a repair garage, a warehouse, a place where a product is manufactured or produced, an agricultural processing plant, a chemical process plant, etc.

Installation: An installation is a facility containing one or more LP-Gas ASME storage tanks used to store LP-Gas in the form a pressurized of

ACRONYMS

AHJ	Authority having jurisdiction
EPA	US Environmental Protection Agency
EAP	Emergency Action Plan (for the LP-Gas plant)
FD	Fire Department (Local) nearest to the Plant
FSA	Fire Safety Analysis (Performed to satisfy the requirements of NFPA 58, section 6.25)
NFPA	National Fire Protection Association
NPGA	National Propane Gas Association
OSHA	US Occupational Safety and Health Administration (of the US Dept. of Labor)
PERC	Propane Education & Research Council

Appendix B

Results of Hazard Distance Calculations For Different LPG Release Scenarios

In this Appendix are presented the results obtained by exercising various mathematical models to calculate the hazard distances for several scenarios of LPG releases from the containers, transfer piping, hoses and pressure relief valves.

TABLE B·1
LPG Release Cases[1] for Hazard Assessment
Recommended for use in the FSA Manual by authors

Aggregate Storage Gal.	Case # #	0etails	Hose I0 in	Hose Len·gth ft	Instantaneously Released Propane Total Quantity gal	Instantaneously Released Propane Total Quantity Lb.	Flashed Vapor+ Aerosol[2] Lb[3]	Continuously Released Propane Time Min.	Continuously Released Propane Rate gpm	Continuously Released Propane Rate lbl min	Continuously Released Propane Flashed Vapor + Aerosol[2] Lbsl min	Total Mass Released Lb	Assumed to be in Vapor + aerosol phase Lb	Assumed to be in liquid[3] phase on ground Lb
4,001 to 8,000	1	Bobtail hose failure, Release of inventory in hose.	1.0	150.0	6.1	25.1	17.5	NA	NA	NA	NA	25.1	17.5	7.6
	2	Transfer piping 1" x 30 ft + 20 gpm, 10 min.	1.0	30.0	1.2	5.0	3.5	10.0	20.0	82.1	57.2	825.8	576.0	249.9
	3	PRV release @ 275 psig, 30 sec.	----	----	----	----	----	0.5	----	1,021.0	----	510.5	510.5	----
8,001 to 18,000	4	Bobtail hose failure	1.0	150.0	6.1	25.1	17.5	NA	NA	NA	NA	25.1	17.5	7.6
	5	1 in x 150 ft transfer piping to a vaporizer + partial flow from an excess flow valve @ 20 gpm for 10 mins	1.0	150.0	6.1	25.1	17.5	10.0	20.0	82.1	57.2	845.9	590.0	256.0
	6	Leak from a 1/4 inch dia pipe corrosion hole, 60 min	0.25	0.0	0.0	0.0	0.0	60.0	18.8	77.2	53.8	4,629.0	3,228.3	1,400.7
	7	PRV release at 12,390 scfm air, one hour						60.0	----	1,240.2		74,413.5	74,413.5	
> 18,000	8	2 inch transfer hose, 20 ft. long	2.0	20.0	3.3	13.7	9.6	NA	NA	NA	NA	13.7	9.6	4.2
	9	Transport Hose Blowdown: Hose size 2" dia, 20 ft length x 3min after the tank is filled.	2.0	20.0	0.0	0.0	0.0	3.0	1.1	4.5	3.1	13.5	9.4	4.1
	10	PRV release at 12,390 scfm air for one hour						60.0	----	1,240.2		74,413.5	74,413.5	

Notes to Table B·1:

1. Assumes that storage temperature is 80 ^{o}F for all containers. The pressure in the container is the saturation pressure of LPG at 80 ^{o}F, which is 130 psig.

2. The mass of aerosol in a vapor + aerosol cloud is assumed to be one half of the liquid mass formed after flashing. That is the mass of vapor + aerosol is X + (1-X)*0.5, where X is the mass fraction of aerosol formed by the flashing process.

3. Instantaneously released mass of liquid released after the flash process

4. The volume flow rate of propane through the PRV is proportional to the inverse square root of the propane vapor density, assuming that the pressure drop and the orifice size are equal. Hence to convert from air flow SCFM to propane flow SCFM multiply air flow SCFM by sqrt(1/1.46). Also, the velocity of gases exiting the PRV is calculated assuming a 2 inch diameter at the exit section.

5. Pressure relief valve discharge based on a 1-1/16 in lift in a 1.75 in. diameter valve seat. Rated at 12,200 SCFM air.

Table B-2

Distances to LFL Concentrations and Hazard Areas

Case #	Oetails	Putt Type Oispersion[1]				Plume Type Oispersion				Explosion[2] Hazard Oistance	Fire Ball[4] Oist.
		Maximum Downwind Travel Distance (tt)	Maximum Radius of LFL Concn. Contour (tt)	Downwind Distance to Maximum LFL Radius (tt)	Max Ground Hazard Area (tt^2)	Maximum Values for Downwind Travel Distance (tt)	Cross-wind width (tt)	Down - wind Distance to Max. Width (tt)	Ground Hazard Area[5]. (tt^2)	(tt)	(tt)
1	Bobtail hose failure.	251	10.4	147.6	342	....	....	....	....	111	53
2	Transfer piping 1" x 30 ft + 20 gpm for 10 min.	135	5.8	78.7	107	115	8	66	475	120	26
3	PRV release 275 psig for 30 sec. 1/16 in lift x 1.75 in ID seat (Rated flow 10200 SCFM air).	----	----	----	----	----	----	----	----	----	----
4	Bobtail hose failure	251	10.4	147.6	342	----	----	----	----	111	53
5	1 in x 150 ft length transfer piping to a vaporizer + reduced flow from a partially open excess flow valve at 20 gpm for 10 mins	251	10.4	147.6	342	115	8	66	475	120	53
6	Leak from a 1/4 inch dia corrosion hole in a pipe: 60 min at a pressure corresponding to 80 ^{o}F (130 psig)[6]	----	----	----	----	112	8	75	439	117	4
7	PRV release at 12,390 scfm air for one hour	----	----	----	----	----	----	----	----	----	----
8	2 inch dia transfer hose x 20 ft. long failure.	194	8.3	114.8	218	----	----	----	----	91	41
9	Transport Hose Blowdown: 2" dia Hose, 20 ft long x 3min from a Transport after tank filling.	----	----	----	----	26	8	75	103	28	2
10	PRV release at 12,390 scfm air for one hour	----	----	----	----	----	----	----	----	----	----

NOTES to Table B·2

1. Dispersion of vapors: Assumes that the flashed vapor+ aerosol together disperse as a heavy gas in "F" stability weather at a wind speed of 1.5 m/s (3.4 mph).
If a puff of vapor is released followed by a long duration (at least 5-minute spill time) release then the dispersion hazard is calculated using both the puff calculations and the continuous plume calculations.

2. **Vapor explosion:** Assumed hazard criterion is 1 psi overpressure (Ref: eqn C-1, Offsite Consequence Analysis Guidance, EPA 1999).

If the release occurs instantaneously (as a puff of vapor + aerosols) then the mass used for the explosion hazard calculation is the total mass of flashed vapor + entrained liquid aerosols. If the release occurs over a longer period of time (continuous release), then the mass of vapor that can participate in a vapor cloud explosion is the mass of vapor + entrained aerosol released over the duration of time taken for the vapor concentration to decrease from 100% to LFL in the dispersing plume. This time is equal to the maximum downwind LFL distance divided by the wind speed.

3. **Radiation From pool Fire**: Pool depth is assumed to be 0.5 cm for instantaneously liquid. Also, it is assumed that all liquid formed after the flash forms a pool. In the case of continuous release the pool diameter is determined by a balance between evaporation due to fire and the full spill rate without consideration of the flashing. The evaporation rate for relatively small pool fires is given by the formula: liquid regression rate (cm/min) = 0.0076 * (lower heat of combustion/latent heat of evaporation)

[Reference: Burgess, D. and M. Hertzberg, "Radiation from Pool Flames," Heat Transfer in Flames (Ed: Afghan and Beer), Scripta Book Co, Washington, DC, 1974.

Radiation effect is calculated using equation 10-1 of Offsite Consequence Analysis Guidance, EPA 1999. The thermal radiation hazard is based on a radiant intensity of 5 kW/m^2.

4. **Fire ball**: The hazard distance is approximately proportional to the square root of the mass of propane released. Table 30 of Offsite Consequence Analysis Guidance, EPA 1999.indicates that for 1000 lb propane release the distance is about 264 ft. The results in OCAG (Table 30) is correlated as, X (ft) = 12.83 * $(M \text{ in Lbs})^{0.441}$

The mass used is the total release in the case of instantaneous release. In the case of continuous release, the total mass used is the mass released first instantaneously + the continuous release over the period of time equal to the dispersion time to LFL centerline concentration in the plume.

5. **Hazard area tor plume dispersion** is calculated as the sum of two triangular areas. The first triangle is from origin to the maximum LFL. downwind distance. The second triangle is from maximum LFL width location to maximum downwind distance.

6. **The hazard distances** from explosion and the fireball are calculated using the mass of vapor in the dispersion plume where the plume ground level concentration is above the LFL concentration. This is equal to the product of the release rate and the duration of time it takes for vapor released at the source to reach the downwind distance where the ground level concentration is equal to the LFL. The vapor is assumed to move at wind speed.

7. **Ground level hazard area from propane releases from relief valves**: Results from the investigation by Cornwell, et al., (Ref 1 below) of the dispersion of LPG vapors released from pressure relief valves (PRVs) on LP containers indicate that for release velocities greater than 100 ft/s no LFL concentrations were found at any level below the exit section of the PRV riser pipe. It is based on the results of the work of Cornwell, et al., that the ground level concentration is assumed to be below LFL and, therefore, the hazard distance is shown as zero in Table B-2, case # 7 and case # 10 for releases from PRVs.

Note that in the 2011 edition of NFPA 58, the requirement for a 7-foot extension stack on the relief valve for containers greater than 2,000 gallons water capacity was removed. However, based on the information contained in citation 1 below and information received from relief valve manufacturers that demonstrates velocities from relief valves are much greater than 100 ft./s, there appears to be no reason to change the result for relief valve discharge that appear in Table 7.1.

TABLE B·3
Various Parameters and their Values Used in the Cases

Parameter Description	Value	Unit	Reference #
Pi = Circumference to diameter ratio of a circle	3.141593		
Coefficient of discharge for a hole in transfer piping	0.62		(2)
Wind speed for F stability weather	1.5	m/s	
Burning rate of a LPG liquid pool	0.890026	cm/min	(3)
	0.0292	ft/min	
Release rate from a 1/4 inch corrosion hole	18.79816	gpm	
	2.512788	ft^3/min	
Area of liquid pool	86.0534	ft^2	
Diameter of pool fire (fire on the liquid pool)	10.46741	ft	
Distance (X) to a thermal radiation level of 5 kW/m^2 (For this radiation level from a LPG pool fire with 40% radiation efficiency the X/d ratio is 4.71)	49.30148	ft	

Reterences:

(1) Cornwell, J.B., D.W. Johnson, and W.E. Martinsen, "Relief Valves and Vents: How Exit Conditions Affect Hazard Zones," Presented at the American Institute of Chemical Engineers 1990 Summer National Meeting, San Diego, California, August, 1990. Also available at, http://www.questconsult.com/relief.html

(2) Chemical Engineers' Handbook, 5th edition, p 5-13, Fig 5-18, 1973.

(3) Afghan & Beer (editors), "Heat Transfer in Flames", chapter on Radiation from Pool Fires authored by Burgess & Hertzberg, p417, Scriptya Book Co. Washington DC, 1974.

TABLE B·4

Thermodynamic Properties of Propane

Property 1tem	81 Units			Conventional Units		
	Pure Propane	Commercial Propane	Units	Pure Propane	Commercial Propane	Units
Chemical formula	CH_2 $(CH_3)_2$			CH_2 $(CH_3)_2$		
Molecular weight	44.097		kg/k mole	44.097		lb/lb mole
Critical Pressure	1,422.12		kN/m^2	206.26		psia
Critical Temperature	598.56		K	617.4		^{o}f
Vapor pressures at various temperatures						
50 ^{o}f	635.6		kN/m^2	92.2		psia
60 ^{o}f	741.4		kN/m^2	107.5		psia
70 ^{o}f	859.6		kN/m^2	124.7	145.0	psia
80 ^{o}f	991.3		kN/m^2	143.8		psia
90 ^{o}f	1,137.0		kN/m^2	164.9		psia
100 ^{o}f	1,297.9		kN/m^2	188.3	218.0	psia
110 ^{o}f	1,475.1		kN/m^2	213.9		psia
120 ^{o}f	1,669.3		kN/m^2	242.1		psia
Boiling Temperature at atm pressure (NBT)	231.3		K	-43.73	-44	^{o}f
freezing Temperature	85.7		K	-305.8		^{o}f
Density of Liquid at NBT (saturated cond)	582.5		kg/m^3	36.36		lb/ft^3
Density of Liquid at 60 ^{o}f	503.8		kg/m^3	31.45	31.45	lb/ft^3
				4.20	4.20	lb/gal
Density of Liquid at 80 ^{o}f	491.8		kg/m^3	30.70		lb/ft^3
				4.10		

Property Item	81 Units			Conventional Units		
	Pure Propane	Commercial Propane	Units	Pure Propane	Commercial Propane	Units
Density of saturated vapor at NBT	2.432		kg/m^3	0.15181		lb/ft^3
Density of vapor at 60 °f (@ 1 atm pressure)	1.937		kg/m^3	0.1210	0.1155	lb/ft^3
Vapor specific density at STP (1 atm & 68 °f) w.r.t. air	1.46			1.46		
Specific heat of liquid @ 60 °f	2,637.2		J/kg K	0.63	0.63	Btu/lb °f
Specific heat ratio of vapor (C_p/C_v)	1.14			1.14		
Heat of Vaporization @ NBT	427.98		kJ/kg	184		Btu/lb
Heat of Combustion (lower heat)	46.30		MJ/kg	19905.5		Btu/lb
Heat of Combustion (higher heat)	50.12		MJ/kg	21548		Btu/lb
Lower flammability Limit %	2.15		%	2.15		---
Upper flammability Limit %	9.6			9.6		
Liquid Enthalpy @ saturated at indicated Temp (Enthalpy is 0 @ -40 °f)						
-44 °f	-4.75		kJ/kg	-2.04		Btu/lb
60 °f	134.85		kJ/kg	57.976		Btu/lb
70 °f	149.40		kJ/kg	64.232		Btu/lb
80 °f	164.23		kJ/kg	70.605		Btu/lb
90 °f	179.36		kJ/kg	77.11		Btu/lb
100 °f	194.83		kJ/kg	83.763		Btu/lb
110 °f	210.70		kJ/kg	90.584		Btu/lb
120 °f	227.01		kJ/kg	97.597		Btu/lb

TABLE B-5
Calculation of the mass traction of
LPG and n-Butane, which Flashes to Vapor
When released from pressurized storage

Release From a storage Temperature º (°F)	% Mass of released Liquid, which flashes to vapor directly	
	Propane	n- Butane
60	32.6	9.0
70	36.0	12.3
80	39.5	15.5
90	43.0	18.9
100	46.6	24.2
110	50.3	26.0
120	54.2	29.6