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HAZARD CONSEQUENCES ANALYSIS
VALLEY CENTER STORAGE PROJECT
29523 VALLEY CENTER ROAD
VALLEY CENTER, SAN DIEGO COUNTY, CALIFORNIA

by
Haley & Aldrich, Inc.
San Diego, California

for
Chambers Group, Inc.
San Diego, California

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Table of Contents

		Page
List of Figures		**ii**
SECTION 1.0 – Introduction		**1**
1.1	PROJECT OVERVIEW	2
1.2	PROJECT SITE AND LOCATION	2
1.3	PROJECT DESCRIPTION	3
1.4	PROJECT CONSTRUCTION	4
	1.4.1 Construction Schedule, Sequence and Phasing	5
	1.4.2 Construction Personnel and Equipment	5
1.5	PURPOSE	6
1.6	PROJECT SETTING	7
	1.6.1 Surrounding Area	7
	1.6.2 Meteorological Conditions	7
SECTION 2.0 – Design Measures and Fire Mitigation Measures		**9**
SECTION 3.0 – Potential Air Toxics Emissions		**11**
3.1	CHARACTERIZATION OF AIR TOXICS	12
	3.1.1 Hydrogen Chloride	12
	3.1.2 Hydrogen Fluoride	12
	3.1.3 Hydrogen Cyanide	13
	3.1.4 Carbon Monoxide	14
3.2	ESTIMATED EMISSIONS	15
SECTION 4.0 – Offsite Consequence Analysis		**16**
4.1	METHODOLOGY	16
4.2	RESULTS	17
References		**18**

Figures
Appendix A - ALOHA Modeling Files
Appendix B - Peer Review

List of Figures

Figure No.	Title
1	Project Location
2	Project Site
3	Wind Rose
4	Wind Frequency Distribution
5	Estimated Maximum Toxic Endpoint

SECTION 1.0 – Introduction

This Hazard Consequences Analysis (Analysis) presents the results of an offsite consequence analysis associated with the operation of the Valley Center Storage Project; a 140-megawatt (MW) lithium-ion battery energy storage system (BESS) facility proposed by Valley Center ESS, LLC (Developer), in the unincorporated community of Valley Center, San Diego County, California (Project). Under normal operations, BESS do not store or generate hazardous materials in quantities that would represent a risk to offsite receptors. However, this Analysis was conducted to determine potential impacts resulting from the release of toxics from an unlikely but credible fire or thermal runaway event at the Project site. BESS thermal runaway/fire events may generate hazardous substances such as hydrogen chloride, hydrogen fluoride, hydrogen cyanide, and carbon monoxide, which may be released to the environment during such an event.

For the purposes of this Analysis, "offsite" means any activity or receptors located beyond the boundaries of the Project site. The Project is not subject to 40 Code of Federal Regulations Part 68 (EPA's Chemical Accident Prevention Provisions), as there is no regulated substance present above any threshold quantity as defined in the regulation nor is it subject to California Accidental Release Prevention Program (CalARP) regulations. Nevertheless, this Analysis has been conducted consistent with the U.S. Environmental Protection Agency's (EPA) 2009 "Risk Management Program Guidance for Offsite Consequence Analysis" and guidance from CalARP, as suggested in Section 5.1 of the San Diego County's 2007 "Guidelines for Determining Significance, Hazardous Materials and Existing Contamination."

This Analysis was conducted using EPA's "Areal Location Hazardous Atmospheres" ([ALOHA]; Version 5.4.7, September 2016) hazards modeling program to determine distances to the toxic endpoints for release scenarios. The distance to the toxic endpoint is the distance a toxic vapor cloud, heat from a fire, or blast waves from an explosion will travel before dissipating to the point where serious injuries from short-term exposures will no longer occur. The supporting ALOHA hazards modeling program output files for the Analysis are provided in Appendix A.

The evaluation of BESS and air toxic releases during a credible fire event is relatively new, with limited emissions data and limited similar hazards analyses. While available information is recent and subject to ongoing study, this Analysis represents the current understanding of the subject matter, subject to the limitations of available data at the time this Analysis was prepared.

The Project's preventative measures and state-of-the-art fire and safety systems, as more fully described in Section 2 of this Analysis, make a thermal runaway event very rare. Furthermore, in the unlikely event of thermal runaway, the Project's preventative measures and systems are designed to limit the event to a single battery module as well as reduce the duration and intensity of an event if it occurs. The Project is subject to the requirements of Chapter 12 of the 2019 California Fire Code and will utilize pre-engineered battery storage systems and equipment certified under UL 9540, the established Standard for Energy Storage Systems and Equipment. The UL 9540 rating establishes the design limit of a thermal runaway events to a single battery module.

While the design failure event for this Project, pursuant to UL 9540, is a thermal runaway/fire event involving a single battery module, this Analysis studies a conservative case thermal runaway/fire event involving 1.5 battery racks. As final manufacturer design and vendor has not been completed, a conservative estimate of 30 battery modules per rack was assumed.

.DNV-GL is an internationally recognized testing, certification and advisory service to the energy and BESS industry. Its testing and reports on ESS fire and safety are used throughout the industry. Many of the DNV-GL 2017 Report findings have been incorporated into the NFPA 855 and the UL 9540 standards and the Report (and the 1.5 rack basis for a credible thermal runaway/fire event) has been accepted by the County of San Diego related to Hazards Consequences Analysis for BESS projects similar to the Project. DNV-GL's Report estimated the limit of failure of a BESS as 1.5 battery racks (referred to as modules in their Report) in cases where, like the Project, the system includes adequate separations, cascading protections, and suppression systems to limit failure to a single cell or module or at least a single rack. DNV-GL found that "the probability of failure for multiple racks should be very low for systems with these active and passive barriers to catastrophic failure." The requirements of UL 9540A meets the safety recommendations of DNV GL's Report, making the runaway event of 1.5 racks sufficiently conservative. The Developer is considering a vendor configuration that is characterized by multiple battery cells within isolated "packs." Based on material provided by the vendor, these packs are similar in nature to a single large battery module. As there are fewer than eight battery strings per cabinet unit and the strings are electrically similar to a rack, the pack configuration would have fewer affected packs in a thermal runaway event than modules in the rack configuration. Therefore, this Analysis covering 1.5 racks of 30 modules per rack is more conservative than a similar credible thermal runaway event involving packs.

1.1 PROJECT OVERVIEW

The Developer plans to construct, own and operate the Valley Center Storage Project, a lithium-ion based battery energy storage facility capable of delivering up to 140 megawatts (MW) for approximately 4 hours on an 8.93-acre parcel and associated utility and access easement in Valley Center, San Diego County (the Project). The Project will interconnect to the existing, adjacent San Diego Gas & Electric (SDG&E) 69kV Valley Center Substation via an approximately 0.3-mile underground generation tie line (gen-tie line). The Project will be comprised of sets of four battery enclosures (each enclosure approximately 31.6 feet long by 5.7 feet wide by 8.6 feet high) that will house the integrated Battery Energy Storage System (BESS) including battery cells, modules, racks, a fully integrated fire and safety systems, HVAC systems, and other electrical systems. The batteries will be charged from the CAISO (California Independent System Operator) grid via the Project's interconnection to the SDG&E Valley Center Substation. Energy stored in the Project will then be discharged back into the grid when the energy is needed, providing essential electricity reliability services to the local area. The Project plans to start construction in the fourth quarter of 2020 and begin operations by August 1, 2021.

1.2 PROJECT SITE AND LOCATION

The Project site is located at 29523 Valley Center Road, Valley Center, California on a parcel of private land (APN 189-013-20-00) within unincorporated Valley Center in San Diego County (Figure 1). San Diego County (County) identifies land use and zoning of the Project site as Medium Impact Industrial (I-2) and General Impact Industrial (M54) use regulation. Permitted uses in the Medium Impact Industrial zone are manufacturing, processing, and assembly; warehousing and distribution; large equipment supply and sales; and other industrial or commercial activities. The M54 use regulation allows for unenclosed commercial and industrial operations having potential nuisance characteristics such as construction, sales and services. The County has identified the Project as a Minor Impact Utility, defined as public utilities which have a local impact on surrounding properties and are necessary to provide essential services. All Minor Impact Utilities, including the Project, are permitted by right within the M54 use regulation (County of San Diego Zoning Ordinance).

Additionally, the Project Area is located in an area under County Special Area Regulations, Designator B: Community Design Review Area, where visual impacts criteria must be met through a limited Site Plan approval process. These regulations are intended to ensure that added consideration is provided to visual impacts in areas of special interest. Surrounding land uses include Limited Impact Industrial to the north, Semi-Rural Residential (SR-4 and SR-2) to the east and south, and Medium Impact Industrial to the west (Figure 2).

The Project site is defined as the 8.93-acre parcel and the Project-controlled access easement. The Project Area is described as the Project site and the off-site underground gen-tie line alignment.

1.3 PROJECT DESCRIPTION

The Project will be comprised of lithium ion battery modules housed in cabinets within up to 58 sets of 4 non-walk-in enclosures on dedicated foundations that will be capable of charging and delivering up to 140MW for approximately 4 hours. Each enclosure will contain integrated battery, heat/fire and safety management systems including electrical and mechanical controls, ventilation systems, HVAC, fire alarm detection and heat management systems. From the BESS containers, low voltage cables will connect to low profile, pad- inverter/transformers located adjacent to the BESS units, and to a control center enclosure called a Power Distribution Center (PDC). The Project will meet all criteria pursuant to the municipal and California Fire Code. All Project equipment will be set back at least 30 feet from property boundaries, fire access roads will be a minimum of 24’ in width with appropriate turn-around capabilities, among other fire and safety systems and practices.

Major Project equipment and facilities include:

- Up to 58 sets of 4 BESS enclosures including battery modules and integrated battery, fire and safety management systems.
- Up to 58 pad-mounted inverter/transformers located adjacent to each set of BESS enclosures to convert direct current into alternative current and step the units’ voltage up to 34.5 kV.
- 2 PDC enclosures which are modular electrical equipment enclosures housing energy management systems, communications/SCADA equipment, and other electrical equipment.
- A BSU (Battery Step-Up Transformer), circuits will enter the BSU from the PDC at 34.5 kV where voltage will be stepped up to 69kV.
- An approximately 0.3-mile 69kV gen-tie line will be constructed from the Project BSU north across Valley Center Road to SDG&E 69kV Valley Center Substation across one of four alignment options (described further below).
- Security lighting and fencing
- Stormwater drainage and retention basins
- Signage

The exact size and quantity of the battery storage containers and inverter transformers may vary depending on the battery and BESS manufacturer(s) selected for the Project.

Access to the Project site is provided from Valley Center Road via a permanent Project-controlled easement. The site access road will comply with County regulations and be stabilized using gravel in order to provide access to operational, fire department, and emergency vehicle access to the facility. Project site equipment and facilities (with the exception of stormwater drainage and retention basins) will be surrounded by a solid, 8-foot tall vinyl fence or a similar solid fence. The fence will be built flush with the ground and have the appearance of a paneled wood fence. Existing fences surrounding the property boundary will remain. Existing fences surrounding and adjacent to the property boundary will remain. The Project design will adhere to County Guidelines, including the Valley Center Design Guidelines. Lighting at the Project site will be installed per County requirements.

The Project will be un-manned during operations, with no buildings or parking areas. The Project would not require restroom facilities. Any operational water that may be required for routine maintenance would be trucked in from offsite or sourced by a new Valley Center Municipal Water District (VCMWD) service. A fire hydrant will be located at or near the site entrance. No groundwater would be used for any purposes during construction or operational phases of the Project.

The Project will interconnect to the existing, adjacent SDG&E 69kV Valley Center Substation via a Project-constructed underground gen-tie line that, upon leaving the Project site will cross Valley Center Road heading north onto SDG&E property for approximately 0.3 miles. Four alignment options are being considered and evaluated for the gen-tie line (Figure 1). All four options leave the Project site access easement, cross under Valley Center Road and then:

- Option A: enters SDG&E's property and heads north, adjacent to existing SDG&E underground circuits within SDG&E's property and enters the substation at the point of interconnect.
- Option B: enters SDG&E's property following Option A, but travels across the property in a northwesterly direction until reaching the substation.
- Option C: follows the southern and western property boundaries within SDG&E's property until turning easterly to access the substation from the west.
- Option D: follows the west-bound Valley Center Road right-of-way before entering SDG&E's property, following Option C in the easterly direction to access the substation.

All four options are approximately the same length.

The Project will be operated, monitored and dispatched remotely on a day-to-day basis. Crews of two to four person's will periodically visit the site (approximately twice per month) for routine inspection and maintenance of the facilities and site. The Developer will own and maintain the gen-tie line up to the point where the gen-tie line enters SDG&E property, where ownership and maintenance responsibilities will be transferred to SDG&E.
The facility is anticipated to have a Project life of approximately 30 years. At the end of the Project life, most of the Project's enclosures, batteries, and electrical equipment (breakers, transformers, inverters) would be removed and recycled. Equipment foundations and pads would be demolished and removed.

1.4 PROJECT CONSTRUCTION

Project construction includes site preparation and grading, installation of drainage and retention basins, foundations/supports, setting battery enclosures, wiring and electrical system installation, and assembly of the accessory components including inverter transformers and generation step-up transformers. The Project would require the grading of approximately 3,000 cubic yards of soils, balanced on site (no net import or export). The approximately 0.3-mile gen-tie line will be installed underground by the Project to the SDG&E 69kV Valley Center substation.

1.4.1 Construction Schedule, Sequence and Phasing

In accordance with the County Noise Ordinance, Project construction will occur between the hours of 7:00AM and 7:00PM Monday through Saturday. Construction of the Project is anticipated to occur over approximately 6 months, beginning as early as fourth quarter 2020. Project construction would likely occur in two phases:

- Phase 1 – Installation of battery storage enclosures and associated civil, electrical and structural features placed outside of the floodplain. During Phase 1, ancillary features, such as graveled access roads and underground electrical components, that are not considered “encroachment” would be installed within the floodplain.

- Phase 2 – Installation of remaining battery storage enclosures and associated civil, electrical and structural features placed within the floodplain; includes features, such as pad-mounted switchgear, step-up transformer(s), and a control center enclosure, that could be considered “encroachment” within the floodplain.

The two construction phases would likely be executed consecutively; Phase 1 followed by Phase 2. However, for the purposes of preparing a worst-case CEQA analysis, technical analyses were completed assuming the two construction phases would occur simultaneously over a period of approximately 6-12 months.

The sequence of construction activities for the BESS would generally occur as follows (with activities limited within the floodplain as described in Phase 1 and Phase 2 above):

1. Equipment staging and mobilization
2. Site preparation and grading
3. Preparation of equipment foundations
4. Site compaction and gravel as necessary
5. Excavating footings and pads
6. Pour-in-place concrete footings, pad foundations, and/or piers
7. Install below-ground conduit banks
8. Install PCS, power distribution systems, and pad-mounted transformers
9. Install below-ground and above-ground conduit
10. Install safety features, permanent fencing and security lighting
11. Commissioning

The approximately 9 acre-feet of water required during the duration of construction is expected to be provided by VCMWD through a temporary use agreement.

1.4.2 Construction Personnel and Equipment

Construction personnel are expected to consist of approximately 10 to 15 workers on average, depending on the construction activities. Project laydown and construction staff parking is expected to be located on-site to the extent practicable. The Project may need to utilize an offsite temporary use area, up to approximately 2 acres in size, for equipment storage during construction. Should it be needed, the temporary use area would be located within 2 miles of the Project site, on a site that has been previously disturbed, and where temporary equipment storage is an allowable use and compatible with the existing uses on the property. The technical analyses prepared for the Project have been conducted assuming use of a temporary offsite area following these parameters. If it is determined that use of a temporary offsite area is needed during Project construction, the selected location will be submitted to the County and shown to be consistent with the technical analyses performed for the Project.

Typical equipment expected to be used during Project construction and commissioning:

- Excavator (2)
- Backhoe (2)
- Dozer (1)
- Roller/Compactor (1)
- Dump truck (2)
- Concrete mixer (3)
- Flatbed-mounted utility crane (1)
- Portable generator and welding equipment (1)
- Forklift (1)
- Pickup trucks (4)
- Utility line trucks (2)

1.5 PURPOSE

While the Project is not subject to CalARP, this Analysis has been conducted to be consistent with Section 5.1 of the San Diego County's 2007 "Guidelines for Determining Significance, Hazardous Materials and Existing Contamination," which states that facilities that would handle regulated substances subject to CalARP regulations and are located within 0.25-mile from a school or day care are required to prepare a hazard assessment to determine the effects of the regulated substance on surrounding land uses in the event of a release. According to these guidelines, the requirement for a hazard assessment is typically satisfied by preparing an Offsite Consequence Analysis following EPA's 2009 "Risk Management Program Guidance for Offsite Consequence Analysis," as supplemented by guidance from CalARP.

There is a single daycare, located at 29235 Valley Center Road, approximately 0.24-mile from the northwest corner of the Project site. In addition, there are existing residences located to the north, east and west of the Project site. As a result of being within 0.25-mile of a daycare facility, and as part of Site Plan review, San Diego County requested this hazard consequences analysis to evaluate the potential for adverse effects to people or the environment related to hazards and hazardous materials.

The objectives of this Analysis are to:

- Identify Project safety design measures and fire risk mitigation measures.
- Determine the distance from the Project BESS to the nearest sensitive receptors;
- Identify and characterize the quantities and locations of hazardous chemicals that could be released during a thermal runaway/fire event from the Project BESS;

- Conduct plume dispersion modeling using EPA's ALOHA (Version 5.4.7, September 2016) hazards modeling program to determine distances to the toxic endpoints for the release scenario; and
- Determine potential impacts and safety risks at the nearest receptors to Project BESS.

1.6 PROJECT SETTING

The Project's general location is within the industrial/commercially corridor of the unincorporated community of Valley Center, in northern San Diego County. Figure 1 shows the general Project location.

1.6.1 Surrounding Area

The Project's surrounding industrial/commercial area of unincorporated Valley Center includes several storage facilities, propane gas distributors, and the adjacent SDG&E electrical distribution substation. Adjacent commercial operations are co-located with residences both west and north of the Project site, all located on industrially-zoned parcels. Also located north of the Project site, across Valley Center Road, is the SDG&E 69kV Valley Center Substation. Rural agriculturally zoned properties are located east and south of the Project site.

As stated in Section 1.2 above, a daycare facility is located approximately 0.24-mile northwest of the Project site. The nearest school to the Project site is Valley Center Elementary School, located approximately 0.4-mile from Project site - outside of the 0.25-mile study area. The nearest residence to Project BESS is located adjacent to the Project's western property line.

1.6.2 Meteorological Conditions

Air impacts are a function of the rate of emissions and source characteristics under the influence of meteorological conditions and topographic features which affect pollutant movement and dispersion. Atmospheric conditions such as wind speed, wind direction, atmospheric stability, and air temperature gradients interact with the physical features of the landscape to determine the movement and dispersal of air pollutants and consequently affect air quality. Climate within the San Diego Air Basin area often varies dramatically over short geographical distances with cooler temperatures on the western coast gradually warming to the east as prevailing winds from the west heats up. Most of southern California is dominated by high-pressure systems for much of the year, which keeps San Diego County mostly sunny and warm. Typically, during the winter months, the high-pressure system drops to the south and brings cooler, moister weather from the north. It is common for inversion layers to develop within high-pressure areas, which mostly define pressure patterns over the air basin. These inversions are caused when a thin layer of the atmosphere increases in temperature with height.

An inversion acts like a lid preventing vertical mixing of air through convective overturning. This type of inversion is typically thousands of feet above the ground, too high to affect a dispersing gas cloud. While some low-level inversions, which may be indicated by the presence of ground level fog, may occur in the Project area, it is exceedingly rare to have an inversion height below 1,000 feet, which even at that height would not have an effect on adjacent receptors.

Meteorological trends within the Valley Center area are generally similar to that of Escondido daytime highs ranging between 65ºF in the winter to approximately 88ºF in the summer with August usually being the hottest month. Median temperatures range from approximately 57ºF in the winter to approximately 78ºF in the summer. Precipitation is generally about 16.2 inches per year (WRCC, 2018). Prevailing wind patterns for the area vary during any given month during the year and also vary depending on the time of day or night. The predominant pattern though throughout the year is usually from the west or westerly (WRCC, 2018).

To estimate the average wind speed and direction, hourly surface data was reviewed. Neither Valley Center nor Escondido have hourly surface weather stations. The nearest hourly surface weather stations to the project are the McClellan Palomar Airport and the Ramona Airport. The Ramona Airport, while not the nearest station, is considered most representative because of its proximity and similar inland distance. Based on hourly meteorological data from the Ramona Airport from 2009 through 2014[1], the wind is predominantly calm, with wind speeds of less than 0.5 meters per second recorded about 41 percent of the time. When the wind is blowing it is primarily from the west and west-northwest (about 28 percent of recorded hours, or about 47 percent of all non-calm hours) with a high frequency of low wind conditions (2.1 to 5.7 meters per second [m/s] or 4.7 to 12.7 miles per hour [mph]).

San Diego County is also subject to periodically subject to Santa Ana wind conditions. Santa Ana winds consist of strong down slope winds that blow through the mountain passes in southern California. These winds, which can easily exceed 40 miles per hour (18 m/s), are warm and dry. Stronger wind speeds typically enhance dispersion and dissipate releases more rapidly than low-wind conditions. However, as the Santa Ana wind is a frequent and period condition, this scenario is included in this analysis.

Figure 3 displays the wind rose during this period, and the frequency distribution is depicted graphically as shown in Figure 4.

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https://ww2.arb.ca.gov/resources/documents/harp-aermod-meteorological-files

SECTION 2.0 – Design Measures and Fire Mitigation Measures

The 2019 California Fire Code was published July 1, 2019, with an effective date of January 1, 2020. The 2019 California Fire Code, Title 24, Part 9, Chapter 12, Energy Systems, requires prepackaged and pre-engineered stationary storage battery systems to be listed in accordance with UL 9540, Standard for Energy Storage Systems and Equipment. This standard was developed for energy storage systems and are intended for installation and use in accordance with the National Electrical Code, NFPA 70, the Canadian Electrical Code, Part I Safety Standard for Electrical Installations, CSA C22.1, the National Electrical Safety Code, IEEE C2, the International Fire Code, ICC IFC, the International Residential Code, ICC IRC, the National Fire Code of Canada, NRC NFC, the Fire Code, NFPA 1, and the Standard for the Installation of Stationary Energy Storage Systems, NFPA 855.

The Project is subject to the requirements of Chapter 12 of the 2019 California Fire Code and will utilize pre-engineered battery storage systems listed under UL 9540. UL 9540 serves as the system certification and does so by incorporating and making references to many other codes. It references over 60 other rules, including UL 1973 (batteries), UL 1741 (inverters), ASME B31 (power piping), ASME B & PV (boiler & pressure vessel), ASHRAE 62.1 (ventilation), NFPA 70 (electrical). Aspects of the code relevant to this Project are summarized below.

UL 9540 contains safety standards for the system's construction (e.g., frame and enclosure, including mounting, supporting materials, barriers and more); the insulation, wiring, switches, transformers, spacing and grounding; safety standards for performance of over twenty different elements, such as tests for temperature, volatility, impact, overload of switches, and an impact drop test; and standards for manufacturing, ratings, markings, and instruction manuals. In addition to the many individual standards referenced, UL 9540 compliance requires a Failure Mode and Effects Analysis (FMEA) be performed and requires a test to ensure safe compatibility of the system's parts. Hence, the standard embodies both a "forest and trees" approach, ensuring that the components are certified, that the system as a whole is certified as safe, and that an FMEA has identified the set of things that might still go wrong, and taken action to mitigate those risks.

Chapter 12 of the 2019 California Fire Code also requires the use of an Energy Management System, for monitoring and balancing cell voltages, currents and temperatures. The system must transmit an alarm signal if potentially hazardous temperatures or other conditions such as short circuits, over voltage or under voltage are detected. The fire code also requires the use of appropriate fire-extinguishing and smoke detection systems, which will be incorporated into each of the Project's BESS enclosures.

UL 9540 incorporates the UL 1973 standard, in which a battery manufacturer must prove that a failed cell inside will not cause a fire outside the system. The Project will meet the UL 9540 and industry standards for adequate separations, cascading protections, and suppression systems to limit failure to a single cell. As described above, the design thermal runaway/fire event for batteries compliant with UL 9540 was determined to involve one (1) battery module. However, for the purposes of this Analysis is a more conservative 1.5 battery rack was studied per DNV GL's 2017 Report "Considerations for ESS Fire Safety." The DNV-GL Report is recognized throughout the industry and many of the recommendations of DNV GL's 2017 Report have been incorporated into NFPA 855 and the UL 9540A standard, supporting this scenario as a credible thermal runaway event.

UL has also introduced a comprehensive testing method, UL 9540A, Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage, designed to subject battery technologies to a variety an adverse conditions in order to determine if a thermal runaway event is achievable at the cell, unit, enclosure, and installation level and the impact of the event and ensuing fire at those levels. The results from the UL 9540A Test Method can also be used to address building code and fire safety concerns involving BESS installation, ventilation requirements, effectiveness of protection, and fire response methods. While UL 9540A has not been adopted by the California Fire Code, it provides technology specific data that can be used to determine appropriate fire protection measures. All BESS technologies proposed for the facility will either meet the UL 9540 standard or incorporate technology appropriate mitigation measures as informed by the UL 9540A Test Method.

SECTION 3.0 – Potential Air Toxics Emissions

Based upon testing data in available publications (the DNV GL Report, National Fire Protection Association studies), there are four hazardous substances that are potentially released during an accidental event within a BESS that may have an impact on nearby receptors. The hazardous substances include hydrogen chloride (HCl), hydrogen fluoride (HF), hydrogen cyanide (HCN), and carbon monoxide (CO).

The following describes the potential air toxics, potential effects from acute inhalation exposure, Emergency Response Planning Guidelines (ERPG) values, and Acute Exposure Guideline Levels (AEGLs). The descriptions of health effects are summarized from the National Institute of Health PubChem database. ERPGs are developed by the Emergency Response Planning committee of the American Industrial Hygiene Association (AIHA). AEGLs are developed by the National Academy of Sciences. Both the ERPGs and AEGLs have three levels, categorized by severity of impact.

The ERPG values are defined as follows:

- ERPG-1 is the maximum airborne concentration below which nearly all individuals could be exposed to for up to one hour without experiencing more than mild, transient adverse health effects or without perceiving a clearly defined objectionable odor.
- ERPG-2 is the maximum airborne concentration below which nearly all individuals could be exposed to for up to one hour without experiencing or developing irreversible or other serious health effects or symptoms which could impair an individual's ability to take protective action.
- ERPG-3 is the maximum airborne concentration below which nearly all individuals could be exposed to for up to one hour without experiencing or developing life-threatening health effects.

The AEGL values are defined as:

- AEGL-1 is the airborne concentration (expressed as ppm or mg/m3) of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic non-sensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.
- AEGL-2 is the airborne concentration (expressed as ppm or mg/m3) of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.
- AEGL-3 is the airborne concentration, expressed as parts per million (ppm) or milligrams per cubic meter (mg/m3), of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.

The distance of toxic endpoints (See Section 4) uses the ERPG-2 and AEGL-2 values per EPA guidance to evaluate potential risk to nearby receptors or first responders.

3.1 CHARACTERIZATION OF AIR TOXICS

3.1.1 Hydrogen Chloride

HCl is a colorless, corrosive gas with a pungent, suffocating odor. It is heavier than air and may accumulate in low-lying areas. When exposed to air it forms white fumes due to condensation with atmospheric moisture. These fumes consist of hydrochloric acid which forms when HCl dissolves in water. HCl forms corrosive hydrochloric acid on contact with body tissue. Inhaling the fumes can cause coughing, choking, inflammation of the nose, throat, and upper respiratory tract, and in severe cases, pulmonary edema, circulatory system failure, and death.

Inhalation is an important exposure route to HCl. Its odor and highly irritating properties generally provide adequate warning for acute, high-level exposures. Concentrated HCl can be corrosive to the skin, eyes, nose, mucous membranes, and respiratory and gastrointestinal tracts. Inhaling HCl can lead to pulmonary edema. Other effects of exposure include shock, circulatory collapse, metabolic acidosis, and respiratory depression. HCl gas is intensely irritating to the mucous membranes of the nose, throat, and respiratory tract. Brief exposure to 35 parts per million (ppm) causes throat irritation and levels of 50 to 100 ppm are barely tolerable for 1 hour. The greatest impact is on the upper respiratory tract; exposure to high concentrations can rapidly lead to swelling and spasm of the throat and suffocation.

Most seriously exposed persons have immediate onset of rapid breathing, blue coloring of the skin, and narrowing of the bronchioles. Patients who have massive exposures may develop an accumulation of fluid in the lungs. Exposure to HCl can lead to Reactive Airway Dysfunction Syndrome, a chemically- or irritant-induced type of asthma. Children may be more vulnerable to corrosive agents than adults because of the relatively smaller diameter of their airways. Children may also be more vulnerable to gas exposure because of increased minute ventilation per kilogram and failure to evacuate an area promptly when exposed. EPA has not classified HCl or hydrochloric acid for carcinogenicity.

The ERPG values for HCl are:

- ERPG-1: 3 ppm;
- ERPG-2: 20 ppm; and
- ERPG-3: 150 ppm.

The AEGL 30-minute values for HCl are:

- AEGL-1: 1.8 ppm;
- AEGL-2: 43 ppm; and
- AEGL-3: 210 ppm.

3.1.2 Hydrogen Fluoride

HF is a colorless, corrosive gas or liquid (it boils at 19.5 degrees Celsius [°C]) that is made up of a hydrogen atom and a fluorine atom. It fumes strongly, readily dissolves in water, and both the liquid and vapor will cause severe burns upon contact. HF is also a very irritating gas, not as dangerous as fluorine, but large amounts of it can also cause death. The dissolved form is called hydrofluoric acid, a colorless fuming mobile aqueous solution with a pungent odor. It is corrosive to metals and tissue and highly toxic by ingestion and inhalation. Exposure to fumes or very short contact with liquid may cause severe painful burns; it penetrates skin to cause deep-seated ulceration that may lead to gangrene.

Hydrofluoric acid is a clear, colorless liquid, miscible with water, with an acrid, irritating odor. It is an extremely corrosive liquid and vapor that can cause severe injury via skin and eye contact, inhalation, or ingestion. Dilute solutions deeply penetrate before dissociating, thus causing delayed injury and symptoms. Skin contact results in painful deep-seated burns that are slow to heal. Burns from dilute (less than 50 percent) hydrogen fluoride solutions do not usually become apparent until several hours after exposure. Hydrofluoric acid and HF vapor can cause severe burns to the eyes, which may lead to permanent damage. At 10 to 15 ppm, HF vapor is irritating to the eyes, skin, and respiratory tract. Exposure to higher concentrations can result in serious damage to the lungs. Hydrofluoric acid has not been reported to be a human carcinogen.

Acute inhalation exposure to gaseous HF can cause severe respiratory damage in humans, including severe irritation and pulmonary edema. Irritation of the eyes, nose, and upper and lower respiratory tract, lacrimation, sore throat, cough, chest tightness, and wheezing have been reported. Damage to the lungs, liver, and kidneys has been observed in animals acutely exposed to HF by inhalation. Acute animal tests in rats, mice, guinea pigs, and monkeys have demonstrated HF to have moderate to high acute toxicity from inhalation exposure. EPA has not classified hydrogen fluoride or hydrofluoric acid for carcinogenicity.

The ERPG values for HF are:

- ERPG-1: 2 ppm;
- ERPG-2: 20 ppm; and
- ERPG-3: 50 ppm.

The AEGL 30-minute values for HF are:

- AEGL-1: 1.0 ppm;
- AEGL-2: 34 ppm; and
- AEGL-3: 62 ppm.

3.1.3 Hydrogen Cyanide

HCN is a colorless, extremely poisonous gas above temperature at 26° C. It is a chemical asphyxiant as it interferes with the normal use of oxygen by nearly every organ of the body. Exposure to HCN can be rapidly fatal. It has whole-body (systemic) effects, particularly affecting those organ systems most sensitive to low oxygen levels: the central nervous system (brain), the cardiovascular system (heart and blood vessels), and the pulmonary system (lungs). It is used commercially for fumigation, electroplating, mining, chemical synthesis, and for producing synthetic fibers, plastics, dyes, and pesticides. HCN gas has a distinctive bitter almond odor (others describe a musty "old sneakers smell"), but a large proportion of people cannot detect it; the odor does not provide adequate warning of hazardous concentrations.

HCN is extremely toxic to humans. Acute inhalation exposure to 100 milligrams per cubic meter or more of HCN will cause death in humans. Acute exposure to lower concentrations (6 to 49 milligrams per cubic meter) of HCN will cause a variety of effects in humans, such as weakness, headache, nausea, increase rate of respiration, and eye and skin irritation.

Tests involving acute exposure of rats and mice have shown HCN to have extreme acute toxicity from inhalation exposure. EPA has not classified HCN or hydrocyanic acid for carcinogenicity.

The ERPG values for HCN are:

- ERPG-1: Not Appropriate;
- ERPG-2: 10 ppm; and
- ERPG-3: 25 ppm.

The AEGL 30-minute values for HCN are:

- AEGL-1: 2.5 ppm;
- AEGL-2: 10 ppm; and
- AEGL-3: 21 ppm.

3.1.4 Carbon Monoxide

CO is a poisonous, colorless, odorless, and tasteless gas. It is the product of the incomplete combustion of carbon-containing compounds, notably in internal combustion engines. It consists of one carbon atom covalently bonded to one oxygen atom and is a gas at room temperature. CO is a significantly toxic gas and is the most common type of fatal poisoning in many countries. Exposures can lead to significant toxicity of the central nervous system and heart.

When CO is not ventilated, it binds to hemoglobin, which is the principal oxygen-carrying compound in blood; this produces a compound known as carboxyhemoglobin. The traditional belief is that carbon monoxide toxicity arises from the formation of carboxyhemoglobin, which decreases the oxygen-carrying capacity of the blood and inhibits the transport, delivery, and use of oxygen by the body. The affinity between hemoglobin and CO is approximately 230 times stronger than the affinity between hemoglobin and oxygen, so hemoglobin binds to carbon monoxide in preference to oxygen. The resultant oxygen deprivation causes headache, dizziness, decreased pulse and respiratory rates, unconsciousness, and death. EPA has not classified CO for carcinogenicity.

The ERPG values for CO are:

- ERPG-1: 200 ppm;
- ERPG-2: 350 ppm; and
- ERPG-3: 500 ppm.

The AEGL 30-minute values for CO are:

- AEGL-1: N/A;
- AEGL-2: 150 ppm; and
- AEGL-3: 600 ppm.

3.2 ESTIMATED EMISSIONS

The modeled release assumes a constant emission rate in kilograms per second for a thermal runaway event lasting 30 minutes, after which it is assumed that the event would be controlled. For the purpose of evaluating potential risk to first responders in a controlled event, the DNV GL Report identified a 30-minute release rate as conservative, accounting for an average of emissions rate that is higher than the low-level emissions leading up to peak failure, and lower than the peak emissions. DNV GL's calculated average 30-minute release rate was identified in Table 2 of the DNV GL Report. The release rate was calculated per battery module. Fire testing showed that even small battery modules had residual mass remaining after a burn event, indicating that the number of cells involved in a fire event had a greater impact on total emissions than the size of an individual module.

The DNV GL Report "Considerations for ESS Fire Safety" (as Table 2 within publication), documents the average release rate (in kilograms per second) of the air toxics described above for thermal runaway events and fires involving battery materials over a 30-minute period. The DNV GL Report evaluated several types and manufacturers of battery systems including lithium ion batteries. These values were used to estimate the toxics release rate of a credible fire event. Consistent with "Considerations for ESS Fire Safety", it was assumed that the event would involve 1.5 single battery racks (Table 3). As final manufacturer design and vendor has not been completed, a conservative estimate of 30 battery modules per rack was assumed.

Table 3. Emission Release Rates

Materials	30-minute Release Rate (kg/s) for 1 Battery Module	30-minute Release Rate (kg/s) for 1.5 Battery RACKS (45 Modules)
HCl	2.36E-07	1.06E-05
HF	1.74E-07	7.83E-06
HCN	1.74E-07	7.83E-06
CO	2.00E-07	9.00E-06

kg/s = kilograms per second

SECTION 4.0 – Offsite Consequence Analysis

An offsite consequence analysis was conducted using emission rate estimates as described in Section 2.5 and the ALOHA model as described in the sections below.

4.1 METHODOLOGY

The EPA's "Risk Management Program Guidance for Offsite Consequence Analysis" and the CalARP both recommend conducting an offsite consequence analysis to represent release scenarios that are possible (although unlikely) to occur under a variety of weather and wind conditions to determine the distance to a toxic or flammable endpoint. Modeling assumptions and meteorological conditions that were used for conducting this offsite consequence analysis are specified in the California Code of Regulations, Title 19, Chapter 4.5, Article 2735.1 et seq.

The offsite consequences analysis was conducted based on the following conditions:

- The credible fire event involves the toxic release from 1.5 battery modules over a 30-minute period.
- Nighttime conditions - wind speed of 1.5 m/s (3.4 mph) from the west and atmospheric stability class F (very stable atmospheric conditions).
- Daytime conditions - wind speed of 3.9 m/s (8.7 mph) from the west and atmospheric stability class C (slightly unstable atmospheric conditions), representative of normal windy daytime conditions.
- Santa Ana wind conditions of 18 m/s (40 mph) from the east and atmospheric stability class
- Default release temperature of 77 degrees Fahrenheit (°F) for toxic gas releases.
- No ambient temperature inversion was included in the consequence analysis; although the San Diego County area does periodically experience inversions with mixing heights of less than 3,000 feet.
- Humidity of 50 percent, except during Santa Ana winds, where humidity is assumed to be 5 percent.
- Height of release – ground level.
- Surface roughness – rural; as determined based on the density and height of obstructions.
- Passive mitigation, such as the release inside of the container, was considered. Active mitigation measures, such as fire suppression, were also considered.

ALOHA uses location and elevation information to estimate sun angle using the location's latitude and longitude and the time of day and atmospheric pressure using the location's elevation. Site-specific project location data were used for input into ALOHA.

ALOHA allows the user to specify up to three toxic Levels of Concern. Modeling was conducted to identify maximum estimated distances to the ERPG-2 and AEGL-2. As ALOHA only automatically imports values for 60-minute AEGLs, the 30-minute AEGLS were input manually.

The offsite consequence analysis was conducted according to EPA's "Risk Management Program Guidance for Offsite Consequence Analysis" and guidance from the CalARP. Plume analysis and exposure impacts were conducted using USEPA's ALOHA hazards modeling program. Based on information about a chemical release, ALOHA estimates how quickly the chemical will escape from containment and form a hazardous gas cloud, and also how that release rate may change over time. ALOHA can then model how that hazardous gas cloud will travel downwind, including both neutrally buoyant and heavy gas dispersion. Additionally, if the chemical is flammable, ALOHA simulates pool fires, boiling liquid expanding vapor explosions, vapor cloud explosions, jet fires, and flammable gas clouds (where flash fires might occur). ALOHA evaluates different types of hazards (depending on the release scenario); toxicity, flammability, thermal radiation, and overpressure. ALOHA produces a threat zone estimate, which shows the area where a particular hazard (such as toxicity or thermal radiation) is predicted to exceed a specified level of concern at some time after the release begins. ALOHA is able to determine a threat zone under different weather and wind scenarios.

4.2 RESULTS

The nighttime release scenario is under more stable meteorological conditions and represents the more conservative release scenario. A daytime release scenario and Santa Ana wind condition were also evaluated as an alternative release scenarios.

A toxic release from 1.5 battery racks (45 modules) was assumed to be triggered by a fire event and result in a release of HCl, HF, HCN, and CO:

- Using nighttime meteorological conditions, modeling results indicate that the distance to the toxic endpoint at ERPG-2 and AEGL-2 would be less than 17 yards (51 feet) with HCN's release controlling.
- Using daytime meteorological conditions, modeling results indicate that the distance to the toxic endpoint at ERPG-2 and AEGL-2 would be less than10.9 yards (33 feet), which is the minimum distance the model can produce.
- Under Santa Ana conditions, modeled only for the controlling pollutant, HCN, modeling results indicate that the distance to the toxic endpoint at ERPG-2 and AEGL-2 would be less than10.9 yards (33 feet), which is the minimum distance the model can produce.

The results of the offsite consequence analysis show that potential concentrations at the ERPG-2 or AEGL-2 thresholds may extend to a toxic endpoint distance of approximately 51 feet from the toxic release during the unlikely but credible fire event during the nighttime scenario and may require shelter in place and/or evacuation of receptors within this toxic endpoint distance. The first 30 feet are entirely within the project boundary. No schools or daycares are located within the potential impact area. The extent of the estimated maximum toxic endpoint is depicted in Figure 5.

This report has been peer reviewed by an independent third party and their verification letter is presented in Appendix B.

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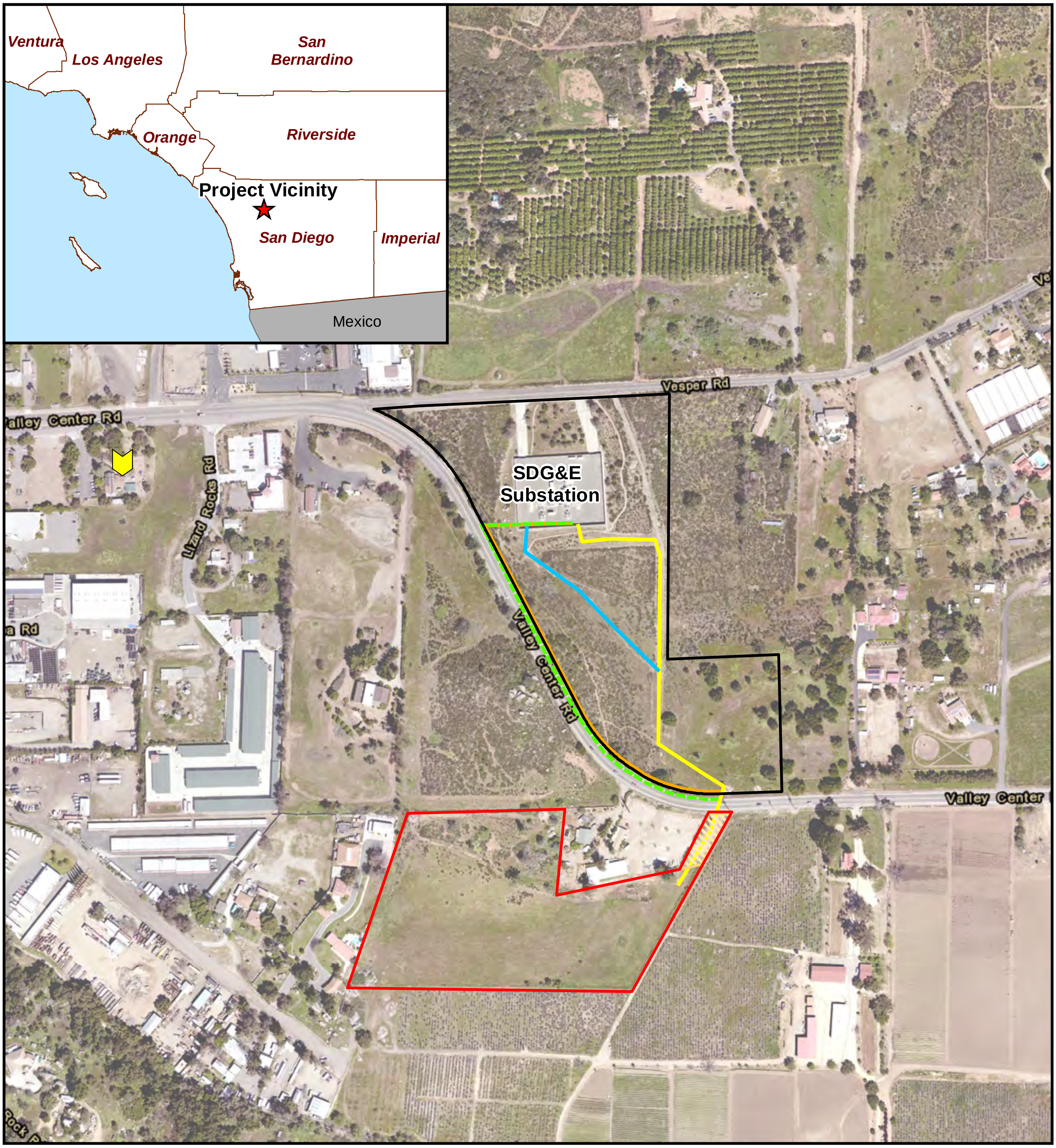
FIGURES



Project Site

Daycare Facility

SDG&E Property Boundary

Private Access Easement

Preliminary Underground 69kV Alignment

Option A

Option B

Option C

Option D

N

0 150 300 600

Feet

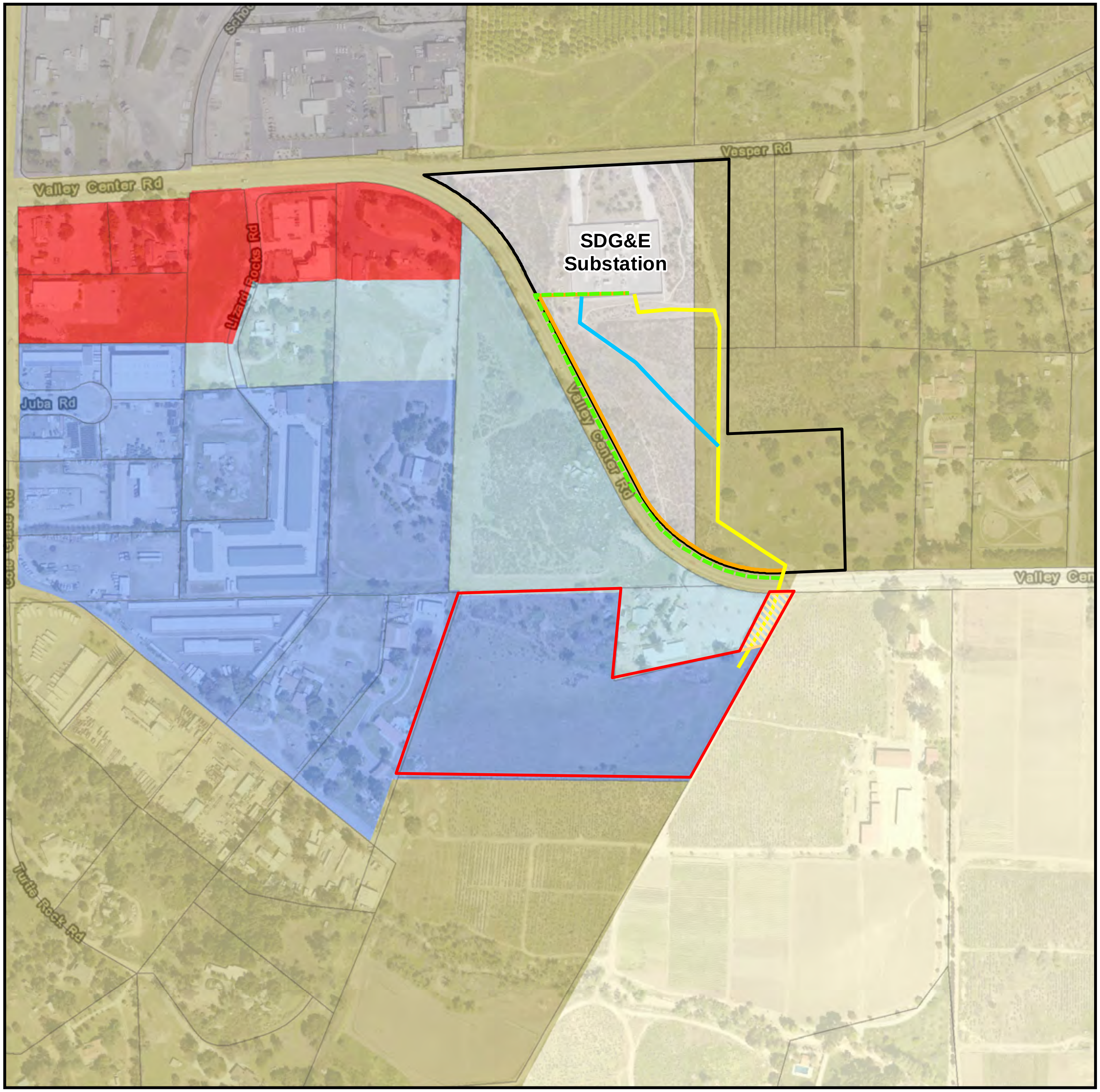
Figure 1

Valley Center Storage Project
Project Site

Name: 21206 PLAN Fig 1 Project Site.Mxd
Print Date: 4/28/2020, Author: pcarlos

CHAMBERS GROUP

Figure 2
Valley Center Storage Project
Land Use Zoning



Project Site
SDG&E Property Boundary
Private Access Easement

Preliminary Underground 69kV Alignment

Option A
Option B
Option C
Option D

Zoning Designation

Semi-Rural Residential (SR-2)
Semi-Rural Residential (SR-4)
General Commercial
Limited Impact Industrial
Medium Impact Industrial
Public/Semi-Public Facilities
Public Agency Lands

N

0 150 300 600
Feet

Name: 21206 PLAN Fig 2 Land Use Zoning.Mxd
Print Date: 4/28/2020, Author: pcarlos

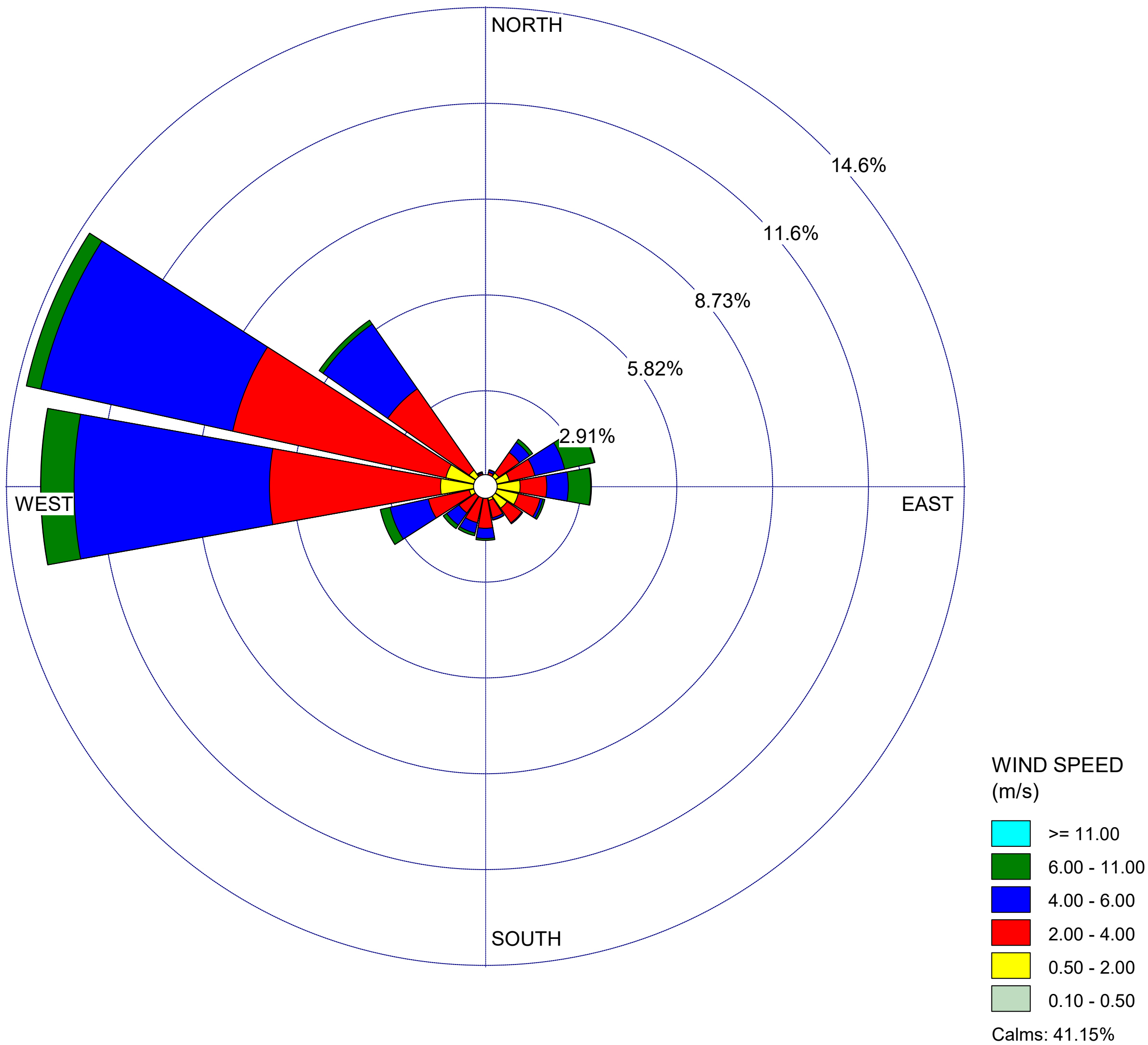
CHAMBERS GROUP

WIND ROSE PLOT:

Windrose for Ramona Airport 2009-2014

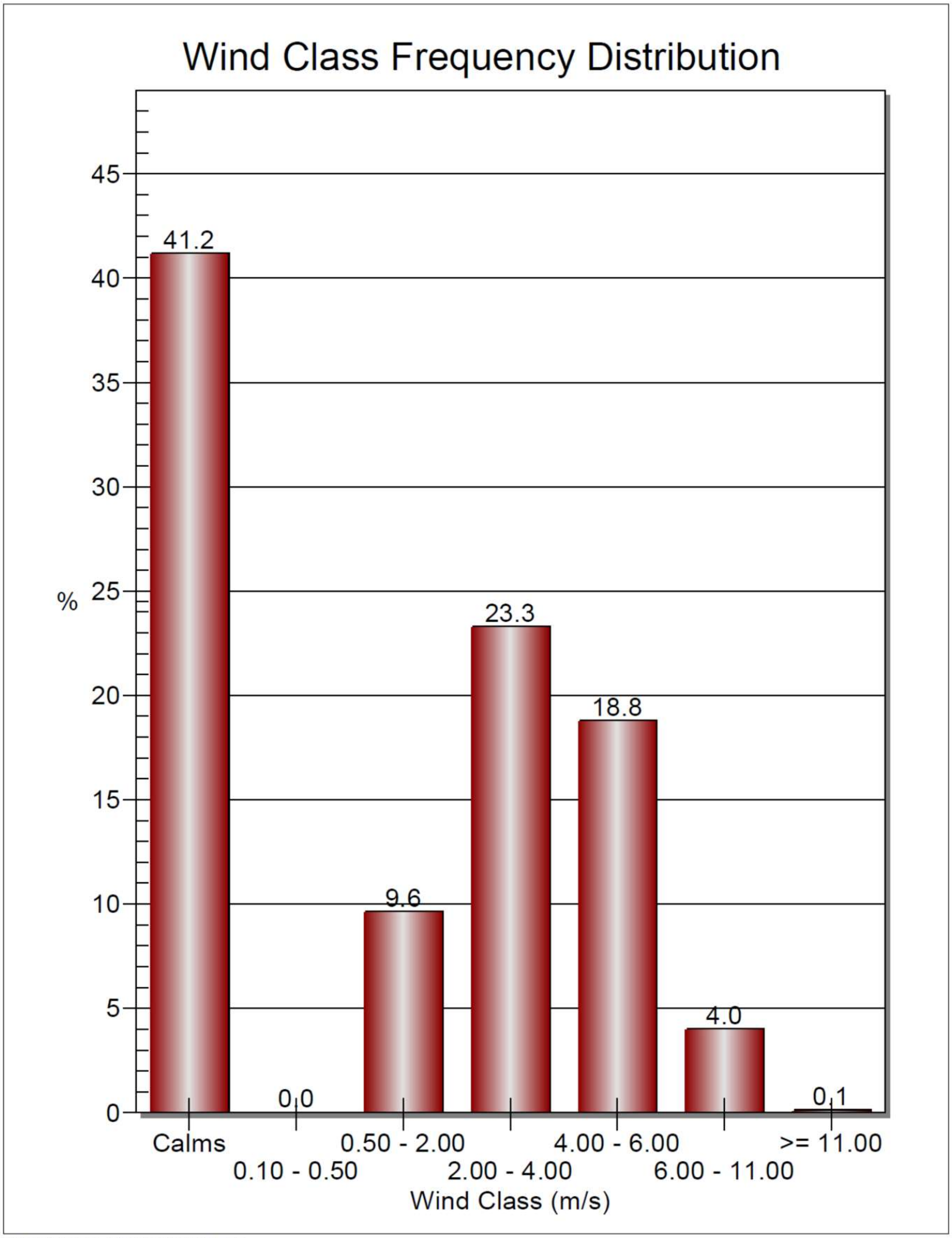
DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:	DATA PERIOD: **Start Date: 1/1/2009 - 00:00** **End Date: 1/2/2014 - 23:59**		
	CALM WINDS: **41.15%**	TOTAL COUNT: **42481 hrs.**	HALEY ALDRICH
	AVG. WIND SPEED: **2.19 m/s**	DATE: **3/27/2020**	PROJECT NO.:

WRPLOT View - Lakes Environmental Software



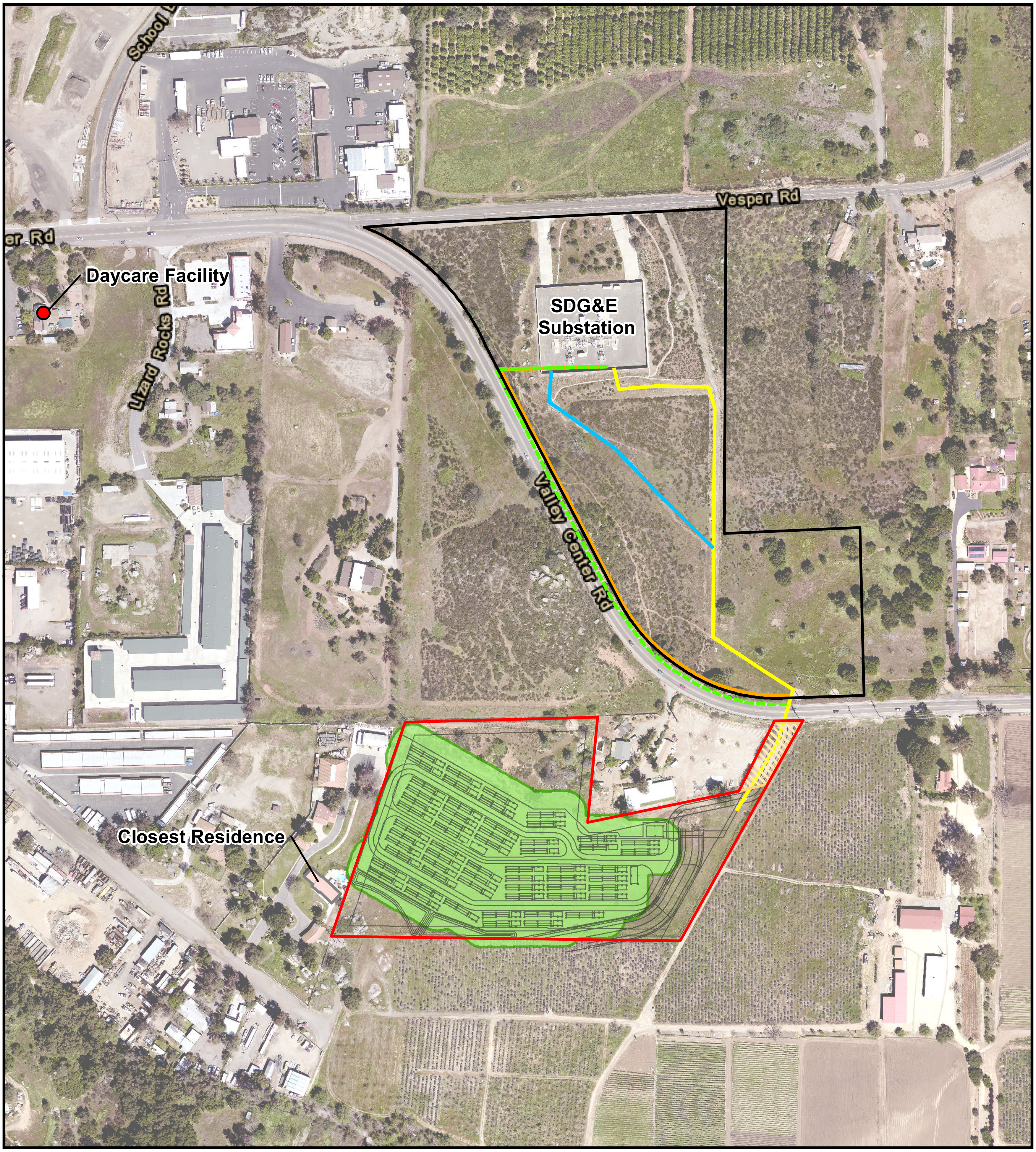
WRPLOT View 9.7.0 - Lakes Environmental Software

HALEY ALDRICH

Valley Center Battery Storage

Wind Class Frequency Distribution

FIGURE 4



Project Site

SDG&E Property Boundary

Private Access Easement

Estimated Maximum Toxic Endpoint (51 ft)

Preliminary Underground 69kV Alignment

Option A

Option B

Option C

Option D

N

0 100 200 400

Feet

Figure 5

Valley Center Storage Project

Estimated Maximum Toxic Endpoint

Representative of modeling results using nighttime meteorological conditions

Name: 21206 PLAN Fig 1 Estimated Maximum Toxic Endpoint.Mxd
Print Date: 6/12/2020, Author: pcarlos

APPENDIX A

ALOHA Modeling Files

```
SITE DATA:
  Location: VALLEY CENTER, CALIFORNIA
  Building Air Exchanges Per Hour: 0.85 (unsheltered single storied)
  Time: March 27, 2020  1212 hours PDT (user specified)

CHEMICAL DATA:
  Warning: HYDROGEN CHLORIDE can react with water and/or water vapor.  This
  can affect the evaporation rate and downwind dispersion.  ALOHA cannot
  accurately predict the air hazard if this substance comes in contact with
  water.
  Chemical Name: HYDROGEN CHLORIDE
  CAS Number: 7647-1-0                   Molecular Weight: 36.46 g/mol
  AEGL-1 (60 min): 1.8 ppm   AEGL-2 (60 min): 22 ppm   AEGL-3 (60 min): 100 ppm
  IDLH: 50 ppm
  Ambient Boiling Point: -122.7° F
  Vapor Pressure at Ambient Temperature: greater than 1 atm
  Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
  Wind: 3.9 meters/second from W at 3 meters
  Ground Roughness: open country         Cloud Cover: 5 tenths
  Air Temperature: 77° F                 Stability Class: C
  No Inversion Height                    Relative Humidity: 50%

SOURCE STRENGTH:
  Direct Source: 1.06e-5 kilograms/sec
  Source Height: 0
  Release Duration: 30 minutes
  Release Rate: 0.0014 pounds/min
  Total Amount Released: 0.042 pounds
  Note: This chemical may flash boil and/or result in two phase flow.

THREAT ZONE:
  Model Run: Gaussian
  Red   : less than 10 meters(10.9 yards) --- (20 ppm = ERPG-2)
  Note: Threat zone was not drawn because effects of near-field patchiness
     make dispersion predictions less reliable for short distances.
  Orange: less than 10 meters(10.9 yards) --- (43 ppm)
  Note: Threat zone was not drawn because effects of near-field patchiness
     make dispersion predictions less reliable for short distances.
```

```
SITE DATA:
  Location: VALLEY CENTER, CALIFORNIA
  Building Air Exchanges Per Hour: 0.38 (unsheltered single storied)
  Time: June 8, 2020  0000 hours PDT (user specified)

CHEMICAL DATA:
  Warning: HYDROGEN CHLORIDE can react with water and/or water vapor.  This
  can affect the evaporation rate and downwind dispersion.  ALOHA cannot
  accurately predict the air hazard if this substance comes in contact with
  water.
  Chemical Name: HYDROGEN CHLORIDE
  CAS Number: 7647-1-0                     Molecular Weight: 36.46 g/mol
  AEGL-1 (60 min): 1.8 ppm   AEGL-2 (60 min): 22 ppm   AEGL-3 (60 min): 100 ppm
  IDLH: 50 ppm
  Ambient Boiling Point: -122.7° F
  Vapor Pressure at Ambient Temperature: greater than 1 atm
  Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
  Wind: 1.5 meters/second from W at 3 meters
  Ground Roughness: open country           Cloud Cover: 5 tenths
  Air Temperature: 77° F                   Stability Class: F
  No Inversion Height                      Relative Humidity: 50%

SOURCE STRENGTH:
  Direct Source: 1.06e-5 kilograms/sec
  Source Height: 0
  Release Duration: 30 minutes
  Release Rate: 0.0014 pounds/min
  Total Amount Released: 0.042 pounds
  Note: This chemical may flash boil and/or result in two phase flow.

THREAT ZONE:
  Model Run: Gaussian
  Red   : 12 yards --- (20 ppm = ERPG-2)
  Note: Threat zone was not drawn because effects of near-field patchiness
     make dispersion predictions less reliable for short distances.
  Orange: less than 10 meters(10.9 yards) --- (43 ppm)
  Note: Threat zone was not drawn because effects of near-field patchiness
     make dispersion predictions less reliable for short distances.
```

```
SITE DATA:
  Location: VALLEY CENTER, CALIFORNIA
  Building Air Exchanges Per Hour: 0.85 (unsheltered single storied)
  Time: March 27, 2020  1212 hours PDT (user specified)

CHEMICAL DATA:
  Warning: HYDROGEN FLUORIDE can react with water and/or water vapor.  This
  can affect the evaporation rate and downwind dispersion.  ALOHA cannot
  accurately predict the air hazard if this substance comes in contact with
  water.
  Chemical Name: HYDROGEN FLUORIDE
  CAS Number: 7664-39-3                  Molecular Weight: 20.01 g/mol
  AEGL-1 (60 min): 1 ppm   AEGL-2 (60 min): 24 ppm   AEGL-3 (60 min): 44 ppm
  IDLH: 30 ppm
  Ambient Boiling Point: 64.8° F
  Vapor Pressure at Ambient Temperature: greater than 1 atm
  Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
  Wind: 3.9 meters/second from W at 3 meters
  Ground Roughness: open country         Cloud Cover: 5 tenths
  Air Temperature: 77° F                 Stability Class: C
  No Inversion Height                    Relative Humidity: 50%

SOURCE STRENGTH:
  Direct Source: 7.83e-6 kilograms/sec
  Source Height: 0
  Release Duration: 30 minutes
  Release Rate: 0.00104 pounds/min
  Total Amount Released: 0.031 pounds
  Note: This chemical may flash boil and/or result in two phase flow.
     Use both dispersion modules to investigate its potential behavior.

THREAT ZONE:
  Model Run: Gaussian
  Red   : less than 10 meters(10.9 yards) --- (20 ppm = ERPG-2)
  Note: Threat zone was not drawn because effects of near-field patchiness
     make dispersion predictions less reliable for short distances.
  Orange: less than 10 meters(10.9 yards) --- (34 ppm)
  Note: Threat zone was not drawn because effects of near-field patchiness
     make dispersion predictions less reliable for short distances.
```

```
SITE DATA:
  Location: VALLEY CENTER, CALIFORNIA
  Building Air Exchanges Per Hour: 0.38 (unsheltered single storied)
  Time: June 8, 2020  0000 hours PDT (user specified)

CHEMICAL DATA:
  Warning: HYDROGEN FLUORIDE can react with water and/or water vapor.  This
  can affect the evaporation rate and downwind dispersion.  ALOHA cannot
  accurately predict the air hazard if this substance comes in contact with
  water.
  Chemical Name: HYDROGEN FLUORIDE
  CAS Number: 7664-39-3                   Molecular Weight: 20.01 g/mol
  AEGL-1 (60 min): 1 ppm   AEGL-2 (60 min): 24 ppm   AEGL-3 (60 min): 44 ppm
  IDLH: 30 ppm
  Ambient Boiling Point: 64.8° F
  Vapor Pressure at Ambient Temperature: greater than 1 atm
  Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
  Wind: 1.5 meters/second from W at 3 meters
  Ground Roughness: open country          Cloud Cover: 5 tenths
  Air Temperature: 77° F                  Stability Class: F
  No Inversion Height                     Relative Humidity: 50%

SOURCE STRENGTH:
  Direct Source: 7.83e-6 kilograms/sec
  Source Height: 0
  Release Duration: 30 minutes
  Release Rate: 0.00104 pounds/min
  Total Amount Released: 0.031 pounds
  Note: This chemical may flash boil and/or result in two phase flow.
     Use both dispersion modules to investigate its potential behavior.

THREAT ZONE:
  Model Run: Gaussian
  Red   : 14 yards --- (20 ppm = ERPG-2)
  Note: Threat zone was not drawn because effects of near-field patchiness
     make dispersion predictions less reliable for short distances.
  Orange: less than 10 meters(10.9 yards) --- (34 ppm)
  Note: Threat zone was not drawn because effects of near-field patchiness
     make dispersion predictions less reliable for short distances.
```

```
SITE DATA:
  Location: VALLEY CENTER, CALIFORNIA
  Building Air Exchanges Per Hour: 0.85 (unsheltered single storied)
  Time: March 27, 2020  1212 hours PDT (user specified)

CHEMICAL DATA:
  Chemical Name: HYDROGEN CYANIDE
  CAS Number: 74-90-8                   Molecular Weight: 27.03 g/mol
  AEGL-1 (60 min): 2 ppm   AEGL-2 (60 min): 7.1 ppm   AEGL-3 (60 min): 15 ppm
  IDLH: 50 ppm       LEL: 56000 ppm      UEL: 400000 ppm
  Ambient Boiling Point: 75.8° F
  Vapor Pressure at Ambient Temperature: greater than 1 atm
  Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
  Wind: 3.9 meters/second from W at 3 meters
  Ground Roughness: open country        Cloud Cover: 5 tenths
  Air Temperature: 77° F                Stability Class: C
  No Inversion Height                   Relative Humidity: 50%

SOURCE STRENGTH:
  Direct Source: 7.83e-6 kilograms/sec
  Source Height: 0
  Release Duration: 30 minutes
  Release Rate: 0.00104 pounds/min
  Total Amount Released: 0.031 pounds

THREAT ZONE:
  Model Run: Gaussian
  Red   : less than 10 meters(10.9 yards) --- (10 ppm = ERPG-2)
  Note: Threat zone was not drawn because effects of near-field patchiness
     make dispersion predictions less reliable for short distances.
  Orange: less than 10 meters(10.9 yards) --- (10 ppm)
  Note: Threat zone was not drawn because effects of near-field patchiness
     make dispersion predictions less reliable for short distances.
```

```
SITE DATA:
  Location: VALLEY CENTER, CALIFORNIA
  Building Air Exchanges Per Hour: 0.38 (unsheltered single storied)
  Time: June 8, 2020  0000 hours PDT (user specified)

CHEMICAL DATA:
  Chemical Name: HYDROGEN CYANIDE
  CAS Number: 74-90-8                   Molecular Weight: 27.03 g/mol
  AEGL-1 (60 min): 2 ppm   AEGL-2 (60 min): 7.1 ppm   AEGL-3 (60 min): 15 ppm
  IDLH: 50 ppm       LEL: 56000 ppm      UEL: 400000 ppm
  Ambient Boiling Point: 75.8° F
  Vapor Pressure at Ambient Temperature: greater than 1 atm
  Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
  Wind: 1.5 meters/second from W at 3 meters
  Ground Roughness: open country         Cloud Cover: 5 tenths
  Air Temperature: 77° F                 Stability Class: F
  No Inversion Height                    Relative Humidity: 50%

SOURCE STRENGTH:
  Direct Source: 7.83e-6 kilograms/sec
  Source Height: 0
  Release Duration: 30 minutes
  Release Rate: 0.00104 pounds/min
  Total Amount Released: 0.031 pounds

THREAT ZONE:
  Model Run: Gaussian
  Red   : 17 yards --- (10 ppm = ERPG-2)
  Note: Threat zone was not drawn because effects of near-field patchiness
     make dispersion predictions less reliable for short distances.
  Orange: 17 yards --- (10 ppm)
  Note: Threat zone was not drawn because effects of near-field patchiness
     make dispersion predictions less reliable for short distances.
```

```
SITE DATA:
  Location: VALLEY CENTER, CALIFORNIA
  Building Air Exchanges Per Hour: 3.77 (unsheltered single storied)
  Time: June 8, 2020  1200 hours PDT (user specified)

CHEMICAL DATA:
  Chemical Name: HYDROGEN CYANIDE
  CAS Number: 74-90-8                    Molecular Weight: 27.03 g/mol
  AEGL-1 (60 min): 2 ppm   AEGL-2 (60 min): 7.1 ppm   AEGL-3 (60 min): 15 ppm
  IDLH: 50 ppm       LEL: 56000 ppm      UEL: 400000 ppm
  Ambient Boiling Point: 75.8° F
  Vapor Pressure at Ambient Temperature: greater than 1 atm
  Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
  Wind: 18 meters/second from E at 3 meters
  Ground Roughness: open country         Cloud Cover: 0 tenths
  Air Temperature: 77° F                 Stability Class: C
  No Inversion Height                    Relative Humidity: 5%

SOURCE STRENGTH:
  Direct Source: 7.83e-6 kilograms/sec
  Source Height: 0
  Release Duration: 30 minutes
  Release Rate: 0.00104 pounds/min
  Total Amount Released: 0.031 pounds

THREAT ZONE:
  Model Run: Gaussian
  Red   : less than 10 meters(10.9 yards) --- (10 ppm = ERPG-2)
  Note: Threat zone was not drawn because effects of near-field patchiness
     make dispersion predictions less reliable for short distances.
  Orange: less than 10 meters(10.9 yards) --- (10 ppm)
  Note: Threat zone was not drawn because effects of near-field patchiness
     make dispersion predictions less reliable for short distances.
```

Text Summary ALOHA® 5.4.7

SITE DATA:
Location: VALLEY CENTER, CALIFORNIA
Building Air Exchanges Per Hour: 0.85 (unsheltered single storied)
Time: March 27, 2020 1212 hours PDT (user specified)

CHEMICAL DATA:
Chemical Name: CARBON MONOXIDE
CAS Number: 630-8-0 Molecular Weight: 28.01 g/mol
AEGL-1 (60 min): N/A AEGL-2 (60 min): 83 ppm AEGL-3 (60 min): 330 ppm
IDLH: 1200 ppm LEL: 125000 ppm UEL: 742000 ppm
Ambient Boiling Point: -313.5° F
Vapor Pressure at Ambient Temperature: greater than 1 atm
Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
Wind: 3.9 meters/second from W at 3 meters
Ground Roughness: open country Cloud Cover: 5 tenths
Air Temperature: 77° F Stability Class: C
No Inversion Height Relative Humidity: 50%

SOURCE STRENGTH:
Direct Source: 9e-6 kilograms/sec Source Height: 0
Release Duration: 30 minutes
Release Rate: 0.00119 pounds/min
Total Amount Released: 0.036 pounds
Note: This chemical may flash boil and/or result in two phase flow.
Use both dispersion modules to investigate its potential behavior.

THREAT ZONE:
Model Run: Gaussian
Red : less than 10 meters(10.9 yards) --- (350 ppm = ERPG-2)
Note: Threat zone was not drawn because effects of near-field patchiness
make dispersion predictions less reliable for short distances.
Orange: less than 10 meters(10.9 yards) --- (150 ppm)
Note: Threat zone was not drawn because effects of near-field patchiness
make dispersion predictions less reliable for short distances.

```
SITE DATA:
  Location: VALLEY CENTER, CALIFORNIA
  Building Air Exchanges Per Hour: 0.38 (unsheltered single storied)
  Time: June 8, 2020  0000 hours PDT (user specified)

CHEMICAL DATA:
  Chemical Name: CARBON MONOXIDE
  CAS Number: 630-8-0                    Molecular Weight: 28.01 g/mol
  AEGL-1 (60 min): N/A   AEGL-2 (60 min): 83 ppm   AEGL-3 (60 min): 330 ppm
  IDLH: 1200 ppm     LEL: 125000 ppm     UEL: 742000 ppm
  Ambient Boiling Point: -313.5° F
  Vapor Pressure at Ambient Temperature: greater than 1 atm
  Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
  Wind: 1.5 meters/second from W at 3 meters
  Ground Roughness: open country         Cloud Cover: 5 tenths
  Air Temperature: 77° F                 Stability Class: F
  No Inversion Height                    Relative Humidity: 50%

SOURCE STRENGTH:
  Direct Source: 9e-6 kilograms/sec      Source Height: 0
  Release Duration: 30 minutes
  Release Rate: 0.00119 pounds/min
  Total Amount Released: 0.036 pounds
  Note: This chemical may flash boil and/or result in two phase flow.
     Use both dispersion modules to investigate its potential behavior.

THREAT ZONE:
  Model Run: Gaussian
  Red   : less than 10 meters(10.9 yards) --- (350 ppm = ERPG-2)
  Note: Threat zone was not drawn because effects of near-field patchiness
     make dispersion predictions less reliable for short distances.
  Orange: less than 10 meters(10.9 yards) --- (150 ppm)
  Note: Threat zone was not drawn because effects of near-field patchiness
     make dispersion predictions less reliable for short distances.
```

APPENDIX B

Peer Review

Stantec

Memo

To:	Robert Kallin 3 Bedford Farms Ave Bedford, New Hampshire 03110	From:	Eric Clark, P.E. 727 East Riverpark Lane, Suite 150 Boise, Idaho 83706
File:	185804813	Date:	June 18, 2020

Reference: Stantec Review of Hazard Consequences Analysis Valley Center Storage Project

Mr. Kallin:

Haley & Aldrich requested that Stantec provide peer review on the methods and findings of the Hazard Consequences Analysis for the Valley Center Storage Project. Stantec reviewed a draft of the report dated 18 June 2020 and provided comments. My comments have been satisfactorily addressed in the final report dated 19 June 2020.

Stantec Consulting Services Inc.

Eric E. Clark

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Project Engineer
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