FINAL

Accident Prevention Plan

for

Per- and Polyfluoroalkyl Substances (PFAS) Site Inspection (SI)

at

National Aeronautics and Space Administration (NASA)
Jet Propulsion Laboratory (JPL)
Pasadena, California

Contract No. W912PL21D0021
Delivery Order No.: W912PL21F0046

US Army Corps of Engineers,
Los Angeles District
915 Wilshire Boulevard, Suite 930
Los Angeles, California 90017-3401

National Aeronautics and Space Administration
NASA Management Office
Jet Propulsion Laboratory
4800 Oak Grove Drive (Building 180)

October 2022

a. SIGNATURE PAGE

This Accident Prevention Plan (APP) was developed by G2S LLC to provide safety and health guidance during the Per- and Polyfluoroalkyl Substances (PFAS) Site Inspection (SI). The signatures below indicate approval of the plan and agreement to following the procedures described therein.

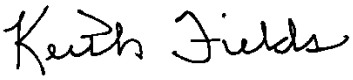
(1) Prepared by:

October 13, 2022

David Conner, PG
Project Geologist, Site Safety Health Officer
G2S LLC
Cell (626) 298-5715

Date

(2) Concurrence by:

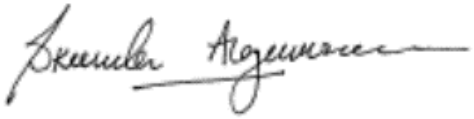


October 13, 2022

Keith Fields, PE, PMP
Project Manager
G2S LLC
Office (614) 792-2896

Date

(3) Approved by:



October 13, 2022

Skanda Abeyesekere, CIH, CSP, CHMM
Safety and Health Manager / Plan Approver
G2S LLC
Cell (443) 983-0362

Date

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ACRONYMS/ABBREVIATIONS:

ACGIH	American Conference of Industrial Hygienists
AED	Automatic External Defibrillator
AHA	Activity Hazard Analysis
ANSI	American National Standards Institute
APP	Accident Prevention Plan
BBP	Bloodborne Pathogens
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CHMM	Certified Hazardous Materials Manager
COC	Chemical of Concern
COR	Contracting Officer Representative
CPR	Cardiopulmonary Resuscitation
CSMP	Cold Stress Monitoring Plan
CSPP	Construction Safety & Phasing Plan
EC	Emergency Coordinator
ESSP	Explosives Safety Site Plan
GFCI	Ground Fault Circuit Interrupter
HAZWOPER	Hazardous Waste Operations
HSMP	Heat Stress Monitoring Plan
IDW	Investigation-derived waste
JPL	Jet Propulsion Laboratory
LDC	Laboratory Data Consultants, Inc.
LHE	Load Handling Equipment
MW	Monitoring Well
NASA	National Aeronautics and Space Administration
OSHA	Occupational Safety and Health Administration
PAR	Preliminary Assessment Report
PFAS	Per- and Polyfluoroalkyl Substances
PM	Project Manager
PPE	Personal Protection Equipment
QC	Quality Control
SDS	Safety Data Sheet
SHM	Safety and Health Manager
SI	Site Inspection
SOH	Safety and Occupational Health
SOW	Scope of Work
SSHP	Site Safety and Health Plan

SSHO	Site Safety and Health Officer
TLV	Threshold Limit Value
USACE	U.S. Army Corps of Engineers
USC	United States Code
UV	Ultraviolet
WBGT	Wet Bulb Globe Temperature

b. BACKGROUND INFORMATION

(1) Contractor

G2S LLC – Prime Contractor

The PFAS site inspection will be conducted by G2S LLC or their designated subcontractors.

(2) Contract Number

US Army Corps of Engineers Los Angeles District Contract No. W912PL-21-D-0021, Delivery Order No. W912-PL-21-F-0046.

(3) Project Name

The project is: Per- and Polyfluoroalkyl Substances (PFAS) Site Inspection (SI) at the National Aeronautics and Space Administration's (NASA's) Jet Propulsion Laboratory (JPL) in Pasadena, California.

(4) Brief Project Description, Description of Work to be performed, and Location

Project Description

G2S LLC has prepared this Accident Prevention Plan (APP) and Site Safety Health Plan (SSHP) for the performance of the PFAS SI at NASA JPL. The objective for the PFAS SI is to implement the environmental investigations specified in the Per-and Polyfluoroalkyl Substances Preliminary Assessment Report (PAR) for the Jet Propulsion Laboratory (NASA, 2021) Appendix F SI Work Plan and prepare a final SI Report. The SI environmental investigations are to be completed in compliance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), 42 United States Code (USC) § 9601 et seq. and State of California environmental regulations dated July 2019.

Project Locations

Work under this contract shall be performed at various sites within NASA JPL located in Pasadena, CA 91109 (Figure 1).

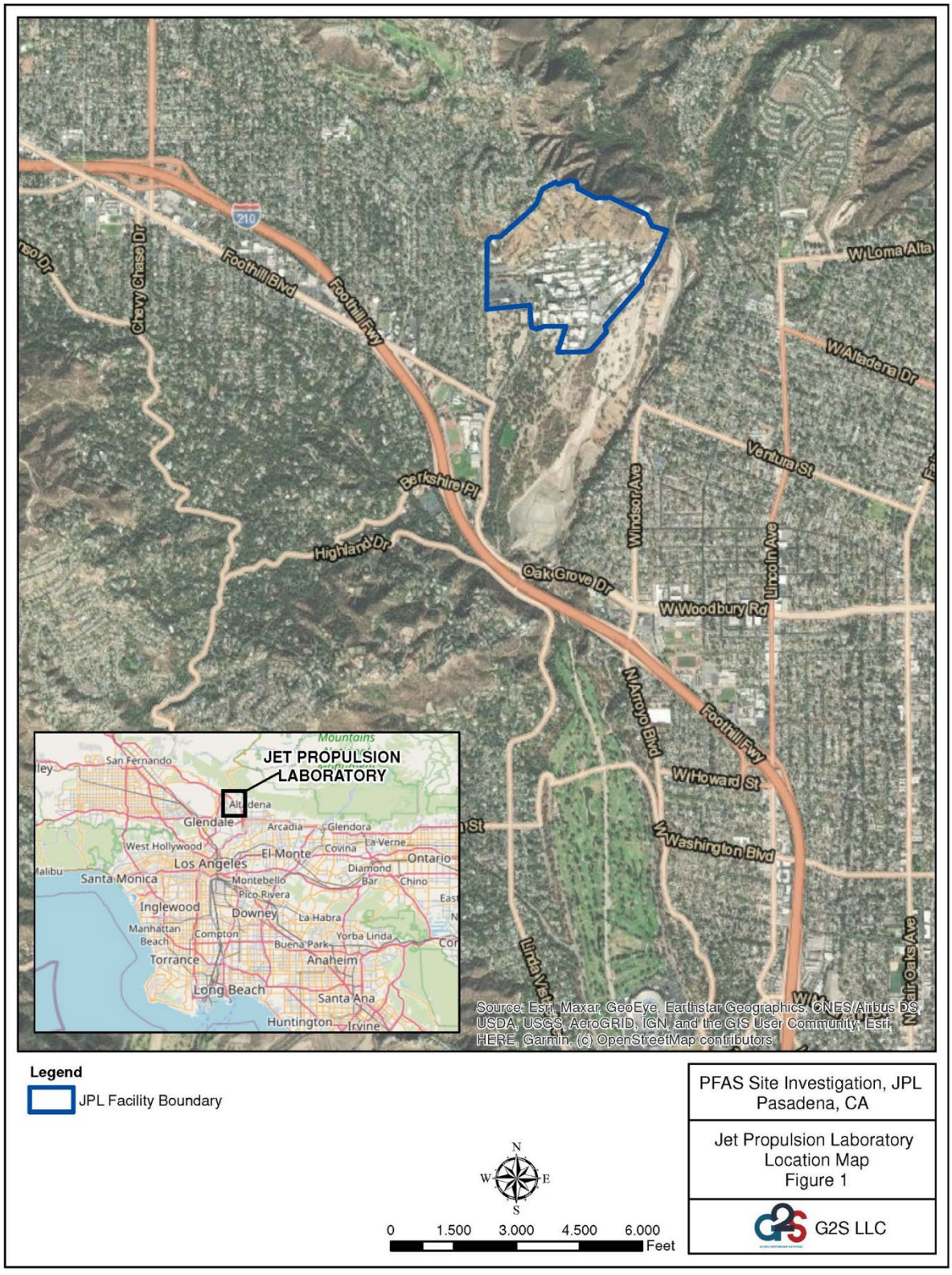
(5) Major phases of work anticipated

The major phases of work anticipated are:

- Mobilization/Demobilization
- Monitoring Well (MW) Gauging
- MW Sampling
- Soil sampling
- Investigation Derived Waste (IDW) Removal and Disposal

(6) Activity Hazard Analysis

The Activity Hazard Analysis (AHA) and control measures associated with the tasks planned are provided in **Appendix A**.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W Woodbury Rd
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Foothill Fwy
W Howard St
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Linda Vista
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JET PROPULSION LABORATORY
San Fernando
Glendale
Arcadia
Glendora
West Hollywood
El Monte
Covina
La Verne
Los Angeles
Ontario
Santa Monica
Montebello
Diamond Bar
Chino
Pico Rivera
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PFAS Site Investigation, JPL Pasadena, CA
Jet Propulsion Laboratory Location Map Figure 1
G2S LLC

Anticipated Physical Hazards

Tools and Equipment: Hazards present while using tools and equipment are associated with improper tool handling and inadequate maintenance. Management of these hazards requires rigorous maintenance of tools and equipment and effective training of employees in the proper use of these tools. Electrically-powered tools have inherent physical hazards. Most equipment will create vibrations during operation. Proper safety procedures will be implemented during their operation.

Large power tools and equipment should be lifted properly to prevent back injuries. Safety glasses with side shields, ear protection, and safety-toed boots will be worn while operating powered tools or equipment.

Heavy equipment usage such as a telehandler and/or forklift shall be used in accordance with the manufacturer's instructions. Personnel will be trained in the usage of a telehandler and/or forklift.

Electrical cords must comply with EM 385-1-1, Section 11 and will be listed by UL or other nationally recognized testing laboratory and shall have unbroken insulation and should not be exposed to water or other liquids. A ground fault circuit interrupter (GFCI) outlet or cord must be used at all times. All electrical equipment must be inspected, and color coded as per the Assured Grounding and Bonding Program (EM 385-1-1: Section 11 and Appendix F) if GFCIs cannot be used as stated above.

Slips, Trips, and Falls: All sites present slip and trip hazards. This Site could have wet areas and uneven terrain that pose slip hazards. Employees should be cognizant of slip hazards and avoid walking over wet surfaces whenever possible. Good housekeeping principles will be applied.

Cold/Heat Stress: Cold/Heat stress (frostbite, hypothermia/heat exhaustion, and heat stroke) may be a hazard depending on the weather conditions encountered at the time of scheduled activities. Workers should dress appropriately and remain aware of changing weather conditions while at the Site. Heat stress will be more of a factor during this project due to the duration and locations of this project.

Exposure to sun, even in the winter, for short or prolonged periods can result in minor to severe sunburn. Chronic exposure to the sun can cause cancer (melanoma lesions). When possible, stay out of direct sunlight by seeking shade. Wear and reapply liberal amounts of sunscreen to protect skin, especially the face, from direct sunlight. Sun/safety glasses that are plain polarized with ultraviolet (UV) light protection should also be used.

Serious and/or threatening chemical and physical hazards frequently overshadow any potential exposure to biological hazards. However, although unlikely for this project, specific biological hazards can cause injury and even death. Therefore, when appropriate, such hazards will be identified and evaluated in conjunction with all other actual or potential hazards associated with an operation, and steps taken to control exposure. Procedures as prescribed in the First

Aid Book will be properly implemented. Paramedics will be summoned for workers exhibiting symptoms of allergic reaction to a biological hazard.

Hazardous or Toxic Agent Inventory

The following chemicals are likely to be present on site during the Site work:

- Gasoline: Gasoline will be used for site vehicles and only filled at offsite filling stations.
- Sample Preservative: Various preservatives will be utilized depending on sample analysis.
- Cleaning agents: Liquids, specifically Liquinox®, will be used as part of the decontamination process for equipment during demolition and groundwater sampling activities.

Hazardous or Toxic Agent Labeling

Proper hazard labeling will be applied to containers containing hazardous substances brought on-site.

Safety Data Sheets (SDSs)

Copies of SDSs (formerly known as Material Safety Data Sheets) for the above listed chemicals will be kept on-site at the point of storage during the field activities. The SDSs will be reviewed during the initial tailgate safety meeting with all site personnel. The SDSs will be followed for each chemical as to the handling and storage listed in each pertinent SDS.

c. STATEMENT OF SAFETY AND HEALTH POLICY

G2S LLC Safety and Health Policy Statement

It is the policy of G2S LLC to provide a healthy and safe environment for all its employees. We do this by fostering a strong safety culture, integrating safety into every aspect of work planning and execution. Incidents resulting in injury, illness, or property damage are preventable and safety takes precedence over short-term gains. G2S LLC has established a health and safety program and management system to prevent accidents and enable managers to provide employees with direction on health and safety issues. Each employee is responsible through personal example to establish a climate in which everyone shares a concern for their own safety and that of their fellow workers.

G2S LLC constantly improves its safety goals by auditing past projects and adding lessons learned to new projects. G2S LLC records all accidents and injuries and near misses to determine areas of improvement on future projects. All recorded incidents and accidents are reviewed by the Safety and Health Manager (SHM) to determine if adjustments need to be made to the company health and safety program.

The primary objective of this project is to remain accident and injury free throughout the duration of the work. All work will be conducted in full compliance with standards of the Occupational Safety and Health Administration (OSHA), the U.S. Army Corps of Engineers (USACE) Safety and Health Requirements Manual EM-385-1-1 where appropriate, and applicable local, state, and federal regulations.

G2S LLC has established procedures that provide direction on health and safety issues for all employees. These procedures are periodically evaluated to ensure that they are kept up to date.

The G2S LLC disciplinary program provides procedures and guidance for addressing problem performance. Disciplinary actions for misconduct or unsatisfactory health and safety performance include verbal and written warnings and suspension without pay. A serious violation of safety or health rules or engaging in conduct that creates a safety or health hazard may be considered a serious offense and may result in immediate termination.

This APP was developed in compliance with USACE EM 385-1-1, 30 Nov 14; APPENDIX A: MINIMUM BASIC OUTLINE FOR ACCIDENT PREVENTION PLAN.

For this project, G2S LLC has adopted Tidewater's written health and safety plans and programs.

d. RESPONSIBILITIES AND LINES OF AUTHORITY

(1) Employer's Ultimate Responsibility for Implementation of the SOH Program

The G2S LLC team bears the ultimate corporate responsibility for the implementation of the Safety and Occupational Health (SOH) Program.

Overall personnel responsibility for G2S LLC team health and safety programs and policies lies with the SHM. Specific responsibilities of the SHM towards health and safety efforts include:

- Ensuring resources are available to implement the program
- Reviewing and approving all policy update(s)
- Develop, implement, and manage the corporate safety and health program
- Provides current safety guidelines and procedures
- Develops checklist and ensures frequent project safety audits
- Oversees medical surveillance, respiratory protection, and Health & Safety training programs for all applicable corporate employees
- Assesses incident reports
- Coordinates and conducts safety training efforts
- Approves all project health and safety plans
- Interacts with OSHA and/or state regulatory officials as required.

The Project Manager has the ultimate responsibility for implementing G2S LLC team's SOH Program at the project level. Specific responsibilities of the Project Manager include:

- Read and review the Construction Safety Standards and become knowledgeable of local, state, and federal regulations
- Is responsible to see that an analysis is made of the plans and specifications and a study made of the site to determine the exposure to accidents which may develop
- Require that subcontractors comply with safety requirements
- Be responsible when visiting the job site to report to the Superintendent all unsafe acts and conditions observed
- Review all accident reports
- See that all site safety record keeping is maintained by field management
- If a temporary office is established at the job site, provide the job site with the necessary safety forms, posters, reports, regulations, and literature
- Conduct a minimum of one safety inspection of the job site and file a written report.

The Site Safety Health Officer (SSHO) is responsible for the implementation of the company SOH Program. Specific responsibilities of the SSHO include:

- Make available all necessary personal protective equipment, job safety materials, fire extinguishers and first aid equipment

- Instruct the site employees that safe practices are to be followed and safe conditions maintained throughout the job
- Provide new employee safety and health orientation for all workers on the project
- Inform the workers they are not to take chances - rather they are to follow proper and safe procedures at all times
- Instruct workers regarding their safety responsibilities and job safety requirements
- Require that all subcontractors adhere to all safety regulations
- Review all accidents with site personnel and ensure that lessons learned are shared and discussed
- Hold weekly safety meetings and require subcontractors to hold daily "Tailgate Safety Meetings"
- Train all members of your crew on hazardous/toxic chemicals which are new to the job before they are exposed to them
- Make sure that appropriate hazard warning labels are present on all containers containing hazardous/toxic chemicals or substances
- Obtain copies of subcontractors' accident reports and perform a proper incident investigation report
- Inspect the job site for health and safety hazards daily during tailgate meeting.
- Identify and assign other competent persons for work activities as needed.

(2) Key Personnel

Position	Name	Phone Number
Project Manager (G2S LLC)	Keith Fields	614-778-2618 cell
Site Safety and Health Officer (SSHO)	David Conner	626-298-5715 cell
Alternate SSHO	Ben Headington	614-348-8939 cell
SHM	Skanda Abeyesekere	443-983-0362 cell

Project Manager (PM): The PM has overall responsibility for completion of the project in accordance with contract and regulatory requirements. The PM is responsible for planning and oversight of the project activities and acts as an interface between the field staff and corporate office. The PM has ultimate responsibility for the implementation of the project tasks and the safety and health of project workers. The PM is responsible for development of work plans, field implementation, and laboratory analyses. The PM is also responsible for the completion of site operations in accordance with the approved plans and field work orders. The PM is responsible for the preparation of submittals, coordination of schedules, cost tracking, and serves as the primary contact with the Client. The G2S LLC team PM is Keith Fields, G2S

LLC, Inc. 3761 Attucks Dr, Powell, OH 43065; 614-792-2896 (office); keith.fields@tideh2o.net.

SSHO: The SSHO has the authority to ensure compliance with the site safety and health requirements, local, state and federal regulations and all aspects of the SOH Program including activity hazard analyses, air monitoring, use of personal protective equipment (PPE), decontamination, site control, standard operating procedures used to minimize hazards, safe use of engineering controls, the emergency response plan, and spill containment program. The SSHO has full authorization to stop work and demand corrective action based on the non-compliance with the level of safety required by the plans. The SSHO is also responsible for preparation and maintenance of records by performing a daily safety and health inspection and documenting the inspection results on the daily log or tailgate meeting form. The G2S LLC team SSHO is David Conner G2S LLC, Inc. 3761 Attucks Dr, Powell, OH 43065; 626-298-5715 (cell); david.conner@tideh2o.net.

SHM: The SHM is responsible for the development, implementation, and oversight of the APP and overall management of the health and safety program for the project. The SHM provides assistance to the SSHO. The SHM coordinates any modification to the APP with the SSHO. The SHM is responsible for the evaluation of air monitoring data and recommending engineering controls, work practices, and PPE. The SHM reviews accident reports and results of daily inspections. The SHM for this scope of work is Skanda Abeyesekere, CIH, Tidewater, 6625 Selnick Drive, Suite A Elkridge, MD 20175, 443-983-0362; skanda.abeyesekere@tideh2o.net.

(3) Competent and/or Qualified Persons Training

The SSHO and Alternate SSHO have the 30-Hour OSHA Safety in Construction certification. Both are also certified in Cardiopulmonary Resuscitation (CPR)/First Aid.

(4) Competent and/or Qualified Persons and Proof of Competency

G2S LLC team has identified the following competent person(s) to serve on the Project Sites:

- David Conner– SSHO Competent Person and Quality Control Inspector
- Ben Headington– Alternate SSHO

The SSHO has the 30-Hour OSHA Safety in Construction certification. The SSHO is also certified in First Aid and CPR. Mr. David Conner's and Mr. Ben Headington's resumes and certifications are in **Appendix B**.

Other CP for specific work activities may be identified and assigned later. Qualifications will be submitted at that time.

(5) G2S LLC's Risk Management Process

G2S LLC team will use approved AHAs as part of a total risk management process.

(6) Pre-Task Safety and Health Analysis

G2S LLC team performs a safety and health analysis prior to the performance of each task. This analysis is documented on the project AHAs, which are included in **Appendix A** of this APP.

G2S LLC team requires the following analysis prior to performing each project task:

- Task description
- Hazard identification
- Risk and likelihood of occurrence
- Engineering controls
- Environmental monitoring for the hazards
- Personal protective equipment
- Training requirements
- Documentation on Activity Hazard Analysis form.

(7) No Work Shall Be Performed Without A Designated Competent Person on Site

It is G2S LLC's policy that no work shall be performed unless the designated competent person is present on the job site. The Competent Person applies to the SSHO and alternate SSHO, and others as identified.

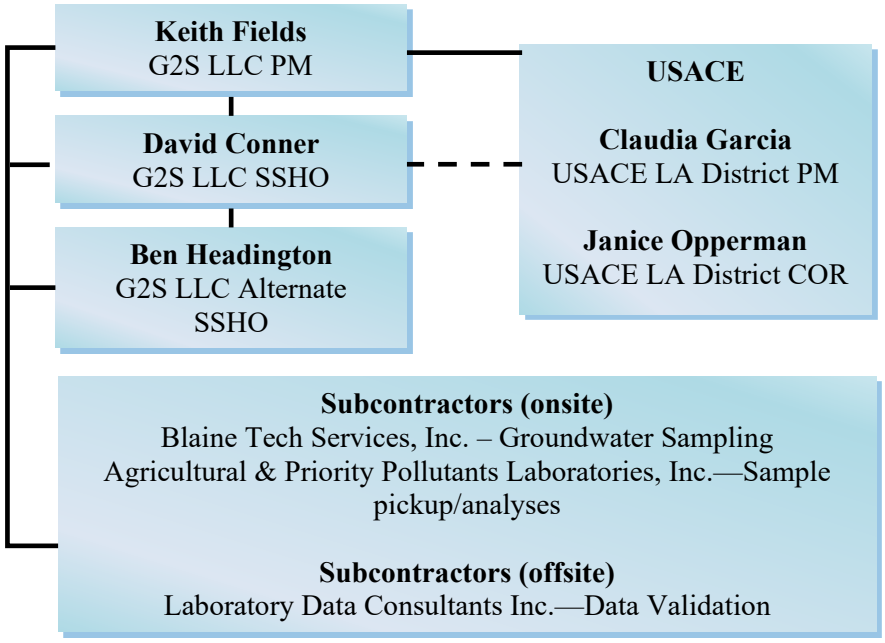
(8) Policies and Procedures Regarding Non-Compliance with Safety Requirements

The Project Manager, SSHO or designated competent person shall stop site work activities for non-compliance with this APP or the site-specific health and safety plan, or if site conditions become unsafe. Site work activities can resume only after the issue has been resolved. In most instances, the resolution occurs at the site level. The ultimate responsibility for resolution of conflicts lies with the Project Manager.

The Project Manager, SSHO or designated competent person shall also suspend participation of an individual project team member from site activities for violation of any provision of this APP.

(9) Lines of Authority

G2S LLC team's organizational approach shown below provides a single point of contact and accountability to USACE providing effective and efficient program management with minimal government oversight. Our PM will be supported at a program-level by quality control (QC), and contracts management, to ensure resources are available and committed to contract and task order requirements.



(10) Procedures for Holding Managers and Supervisors Accountable for Safety

G2S LLC team's policy is that managers and supervisors are ultimately accountable for safety at the job site. They are responsible for ensuring that all personnel adhere to the requirements stipulated in this APP.

Safety performance will be evaluated as part of each manager's and supervisor's annual performance review. Poor safety performance will result in reduced merit compensation for the manager or supervisor.

e. SUBCONTRACTORS AND SUPPLIERS

(1) Identification of Subcontractors and Suppliers

An initial list of subcontractors is provided below. This list will change and be updated periodically.

Subcontractor	Service Provided
Blaine Tech Services, Inc.	Groundwater sample collection
Agriculture & Priority Pollutants Laboratories, Inc.	Analytical services
Laboratory Data Consultants (LDC), Ind.	Data Validation and NIRIS uploads

G2S LLC requires its subcontractors and suppliers to work in a responsible and safe manner. Subcontractors and suppliers are required to adhere to the guidelines and provisions contained in this APP and OSHA 29 Code of Federal Regulations (CFR) 1926 when performing activities at the project sites.

(2) Safety Responsibilities of Subcontractors and Suppliers

All subcontractors are required to provide their own Safety and Health Plan; it will be reviewed by the PM and SSHO. The ssubcontractor's Safety and Health Plan will only be accepted if they are equal to or exceed the requirements of G2S LLC's SOH Program. If a subcontractor submits a Safety and Health Plan and it is approved by the PM and SSHO, it will be attached to the SOH Program as an Appendix with concurrence of the SHM.

Subcontractors First Violation of a Rule or Regulation
A subcontractor employee who is cited for a first-time notice of a Safety/Health Violation Notice shall be immediately removed from the project site and shall not be permitted to return to work for a period of at least 24 hours, missing the next full workday.

Subcontractors Second Violation of a Rule or Regulation
A subcontractor employee responsible for a repeat offense or receiving a second Safety/Health Violation Notice shall be immediately and permanently removed from the project site for the remainder of the contract period.

f. TRAINING

(1) New Hire SOH Orientation Training at the Time of Initial Hire

All employees will receive orientation to the Corporate Health and Safety Program by the Corporate Health and Safety Director or his designate and will be notified of any additions or changes to the program. This includes office safety, office evacuation, and specific safety discussion geared toward that person's specific job description.

In addition to the above, all project personnel must receive training and acknowledge understanding of the contents of this APP prior to performing work at the Project Site. Personnel will attend a site safety orientation prior to starting work on-site. This training shall include a review of the project tasks and responsibilities, hazards expected to be encountered, and means of hazard control. Specifically, the following subjects will be discussed at the site project safety orientation:

- Requirements and responsibilities for accident prevention and the maintenance of safe and healthy work environments
- General safety and health policies and procedures and pertinent provisions of EM 385-1-1
- Employee and supervisor responsibilities for reporting all accidents
- Provisions for medical facilities and emergency response and procedures for obtaining medical treatment or emergency assistance
- Procedures for reporting and correcting unsafe conditions or practices
- Job hazards and the means to control/eliminate those hazards, including applicable AHAs
- Specific training as stipulated in the sections below.

(2) Mandatory Training and Certifications that are Applicable to This Project

40-HR OSHA Hazardous Waste and Emergency Response (HAZWOPER): The SSHO and his alternate must have taken the initial 40-Hour OSHA HAZWOPER and continue to receive the annual 8-HR OSHA HAZWOPER refresher training.

30-HR OSHA Safety in Construction: The SSHO and his alternate must have received training in safety in construction in accordance with 29 CFR 1926 include a 30-Hour Construction Safety class, and an average of at least 8-hours of documented safety training (formal, on-line, self-study) every year.

First Aid and CPR: A minimum of two personnel trained in First Aid and CPR shall be on-site/available at all times.

Personal Protective Equipment (PPE): All personnel shall be trained in the appropriate use of PPE.

(3) Periodic Safety and Health Training for Supervisors and Employees

The SSHO shall conduct daily "tailgate" safety meetings prior to the commencement of field work to review the day's activities, the relevant AHAs, establish safe working procedures for anticipated hazards, and provide pertinent health and safety training and motivation. These meetings shall be documented, including the date, persons in attendance, subjects discussed, and the name of the individual who conducts the meeting. A copy of the safety meeting form is in **Appendix C**.

The SHM or designated person shall conduct supplementary safety and health training for all G2S LLC team personnel, including supervisory personnel, every three months per the corporate health and safety policy.

(4) Requirements for Emergency Response Training

The SSHO is responsible for management of emergency activities that may include responses to medical, fire, or injury occurrences. Prior to commencement of work at the Project Site, during the site safety orientation, the SSHO shall review actions to be taken in the event of an emergency, the location of emergency equipment to include fire extinguishers and first aid kits, and the identity and location (route) to the designated medical facility. The SSHO shall be responsible for ensuring that emergency services are called in the event of an emergency. If the SSHO is unable to perform these duties, his designee will assume these responsibilities.

g. SAFETY AND HEALTH INSPECTIONS

(1) Safety Inspections

General Safety Inspection: The SSHO shall inspect the project location prior to commencing work and at least daily thereafter. Hazards identified or unsafe work practices shall be identified and corrected. Inspection results will be communicated to workers. All inspections shall be documented on the Site Safety Inspections are part of the daily Tailgate Meeting form, **Appendix C**.

Deficiencies: Deficiencies will be recorded on the Site Safety Inspection Checklist and a designated health and safety deficiency log. Specifically, the SSHO shall record the date the deficiency was identified, a brief description of the deficiency, and suggested corrective action. Once the deficiency has been resolved the SSHO shall record the date the deficiency was corrected, what actions were taken, and the personnel responsible for correcting the deficiency.

(2) External Inspections/Certifications

No external inspections/certifications are required for this project.

h. MISHAP REPORTING and INVESTIGATION

Mishap reporting and investigation is essential to preventing incidents and controlling hazards. Thorough investigations, paired with effective remedial actions, can eliminate future injury, property damage, lost time accidents, and mission interruption. Concern for employee and customer safety and well-being drives the accident investigation program. Investigation results are used to enhance the G2S LLC Program through a Lessons Learned program, additional safety training, and modifications to processes and procedures. Mishap reporting and investigations will be conducted in accordance with G2S LLC policy.

(1) Exposure Data

The SSHO will be responsible for collecting and recording the number of man hours worked on the site by skill trade. This data will be compiled and submitted to the Project Manager daily. The PM is responsible for submitting this information to the Client Representative per contract requirements.

(2) Mishap Investigations, Reports, and Documentation

In the event of an injury or illness, work is to be stopped until the cause of the incident has been determined and appropriate action has been taken. Any injury or illness, regardless of severity, is to be reported on accident report forms. The SSHO shall notify the Project Manager, Corporate Safety and Health Manager, and USACE Safety Manager of the accident as soon as possible but not more than twenty-four (24) hours after the incident.

The SSHO shall thoroughly investigate all accidents. The investigation should determine what happened and how it happened, the results, immediate corrective action, and any relevant information. The PM shall submit the findings of the investigation along with corrective actions to the Client as soon as possible but no later than twenty-four (24) hours following the accident. G2S LLC team will implement corrective actions as soon as possible.

G2S LLC team will strive to identify the root cause of each accident, to effectively select corrective actions to prevent mishap recurrence. The identified causes and corresponding corrective actions will be documented. The Safety Office will schedule Safety Concern Meetings to be held for all warranted accidents and incidents at which time a discussion will be conducted with the PM, SSHO, Affected Department Manager and Supervisor, Safety Manager and involved employees. Corrective actions to prevent future accidents or incidents from reoccurring will be discussed and pertinent findings and corrections will be implemented.

The Safety Office will record the “lessons learned” through accident investigation, where appropriate. A Lessons Learned Report will be submitted to the Corporate and Garrison Safety Offices when other organizations and installations could benefit from becoming aware of G2S LLC team experience.

If the lessons learned have internal application only, the Safety Office will use the information to improve hazard awareness, prevent accidents, and better implement the Safety Plan. Lessons learned will be discussed during safety meetings and personnel certification training.

Lessons learned may also stimulate the revision of policies, procedures, and work practices, and will be a standard agenda item for the safety committee meetings.

(3) Mishap Notification

G2S LLC team employees will immediately report each incident, injury, illness, and near miss to the SSHO and their supervisor. The SSHO and/or supervisor will direct actions at the scene of the incident, to assure evidence preservation, thorough investigation, and compliance with applicable company policies, EM 385-1-1, and applicable provisions of 29 CFR. Telephone notification of all mishaps, including reportable property damage, will be made to USACE by the PM.

The following accidents that have, or appear to have, any of the consequences listed below require immediate notification and investigated in depth to identify all causes and to recommend hazard control measure in accordance with EM-385-1-1 Section 1.D.4:

- Fatal injury/illness*;
- Permanent totally disabling injury/illness;
- Permanent partial disabling injury/illness;
- One (1) or more persons hospitalized as inpatients as a result of a single occurrence*;
- $500,000 or greater accidental property damage;
- Three (3) or more individuals become ill or have a medical condition which is suspected to be related to a site condition, or a hazardous or toxic agent on site.

*Requires notifying OSHA in accordance with 29 CFR 1904.39 within 8-hours when their employee(s) is fatally injured as a result of a work-related incident; or within 24-hours when 1 or more persons are hospitalized as inpatients, there is a loss of an eye, or there is an amputation as a result of a work-related incident.

In addition to the above, any mishap occurring in any of the following high hazard areas shall be immediately reported. These mishaps shall be investigated in depth to identify all causes and to recommend hazard control measures.

- Electrical – to include Arc Flash, electrical shock, etc.;
- Uncontrolled Release of Hazardous Energy (includes electrical and non-electrical);
- Load Handling Equipment (LHE) or Rigging;
- Fall-from-Height (any level other than same surface), and
- Underwater Diving.

Also, the following will be reported:

- Property damage (exceeding $5,000 is recordable);
- Days Away Injuries;

- Days Away Illnesses;
- Restricted/Transfer Injuries.

The Accident Investigation and Reporting Form ENG 3394 is included in **Appendix D**.

i. OCCUPATIONAL RISK AND COMPLIANCE PLANS

Below we provide plans to provide Accident Prevention, Activity Hazard Analyses, and Occupational Risk and Compliance for the range of activities required under this contract.

(1) Fatigue Management Plans (01.A.20)

The G2S LLC team does not intend to implement a Fatigue Management Plan as the following criteria for employee work hours would not be applicable:

(1) Exceed 10-hours a day for more than 4 consecutive days;

(2) Exceed 50-hours in a 7-day work week;

(3) Exceed 12-hours a day for more than 3 consecutive days, or

(4) Exceed 58-hours a week for sedentary (to include office) work.

(2) Emergency Response Plans

Plan Procedures (01.E.01)

The purpose of this emergency response plan is to minimize hazards to human health or the environment from fires, explosions, or any unplanned sudden or non-sudden release of hazardous substances to air, soil, or surface water.

The provisions of this emergency response plan must be implemented immediately whenever there is a fire, explosion, or release of hazardous substances that could threaten human health or the environment.

Responsibilities of the Emergency Coordinator (EC)

The SSHO will act as the Emergency Coordinator (EC) at the project site. The EC has the responsibility for coordinating all emergency response measures and initiating materials and equipment purchases. Qualified backup ECs will be designated so an EC will either be located on the site or on call (available to reach the site to respond to an emergency within 60 minutes). The EC has the authority to commit the resources required to implement this emergency response procedure.

The EC is responsible for being thoroughly familiar with:

- The APP and emergency response plan.
- All operations and activities associated with the project.

- The emergency signals and evacuation routes.
- The location of all operation-specific records,
- The physical layout of the facility and location of emergency equipment.

Obtaining Emergency Services

To obtain emergency services, the EC will first investigate the severity of the emergency/injury. If the emergency/injury requires outside emergency services, the EC will immediately contact the appropriate emergency services. The PM and Government Representative will next be notified of the emergency and the impending arrival of emergency services.

Communications

A communication network will be set up to alert site personnel to emergencies and to summon outside emergency assistance. Where voice communication is not feasible, an alarm system (e.g., sirens, horns) will be set up to alert employees to emergencies. Radio communication may also be used to communicate with personnel if necessary. Where phone service is not readily available, radios or portable phones will be used to communicate with outside agencies. Site personnel will be trained in the use of the site emergency communication network. Emergency phone numbers will be posted at the phone or radio used for outside communication. The PM/SSHO/EC is responsible for establishing the communication network during work activities, and for explaining it to all site personnel during the site safety briefing.

Emergency Contacts and Notifications

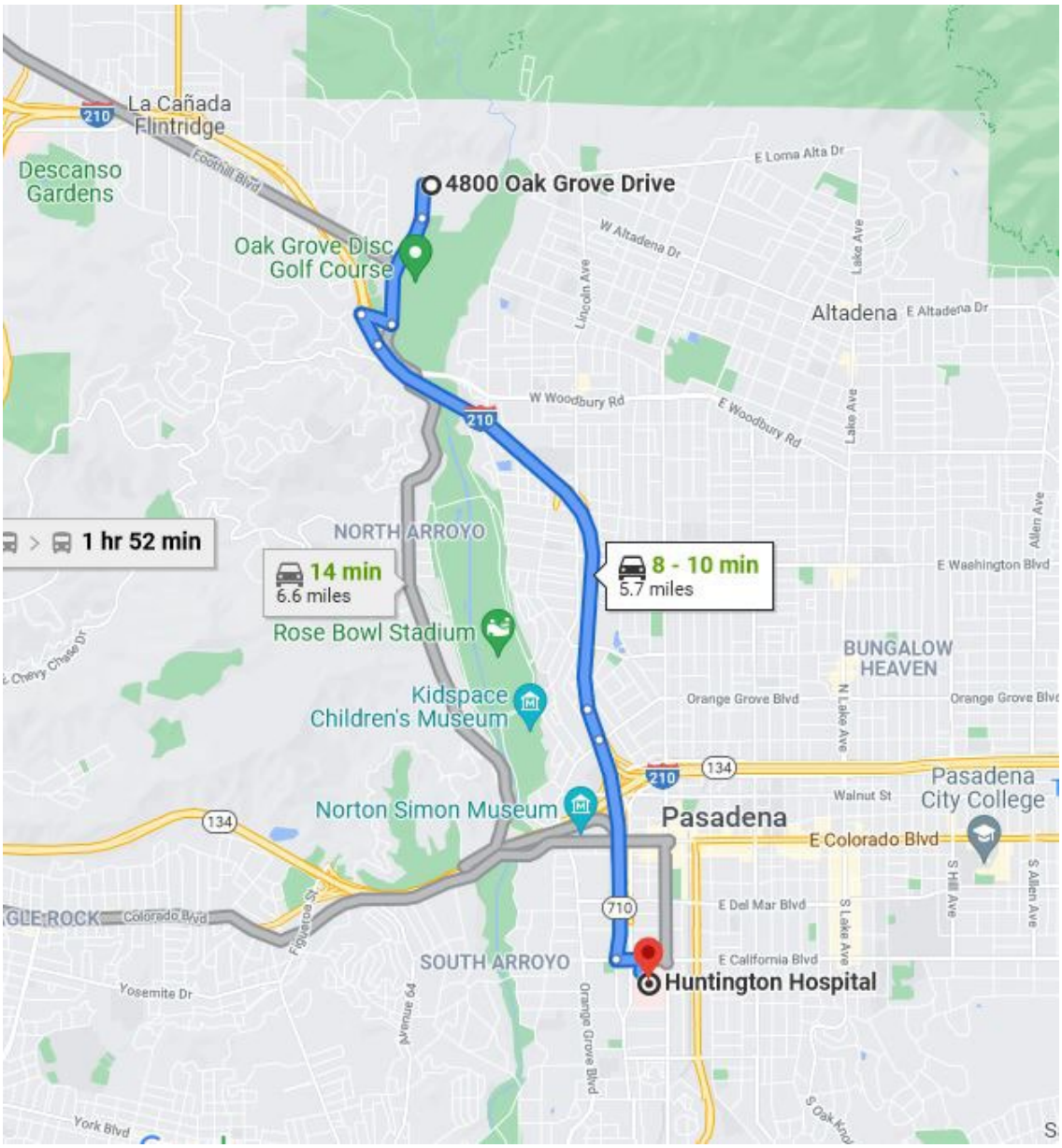
The name, telephone number, and location of police, fire, and other emergency response agencies will be available on site at all times. If emergency personnel are called to the site, efforts should be made to accommodate their operations at the site. Emergency telephone numbers for this project are presented below. In the event of a medical emergency, personnel will notify the appropriate emergency organization and will take direction from the SSHO. In the event of a fire, explosion, or spill at the site, the SSHO will notify base first responders and the appropriate federal, state, and local agencies.

Emergency Telephone Numbers		
Emergency Services		
First Responders		911
NASA JPL Security/Fire/Medical Service		3-3333 (lab phones only)
NASA JPL Fire Dispatch		(818) 354-3530
Huntington Memorial Hospital		(626) 397-5000
USC Verdugo Hills Hospital		(818) 790-7100
Poison Control Center		(800) 523-1222
National Response Center		(800) 424-8802
OSHA Referral		(800) 321-6742
G2S LLC team		
Keith Fields	Project Manager	Cell: (614) 778-2618
David Conner	Site Safety & Health Officer	Cell: (626) 298-5715
Ben Headington	Alt SSHO	Cell: (614) 348-8939
Skanda Abeyesekere	Safety and Health Manager / APP Approver	Cell: (443) 983-0362

Emergency Medical Treatments and First Aid

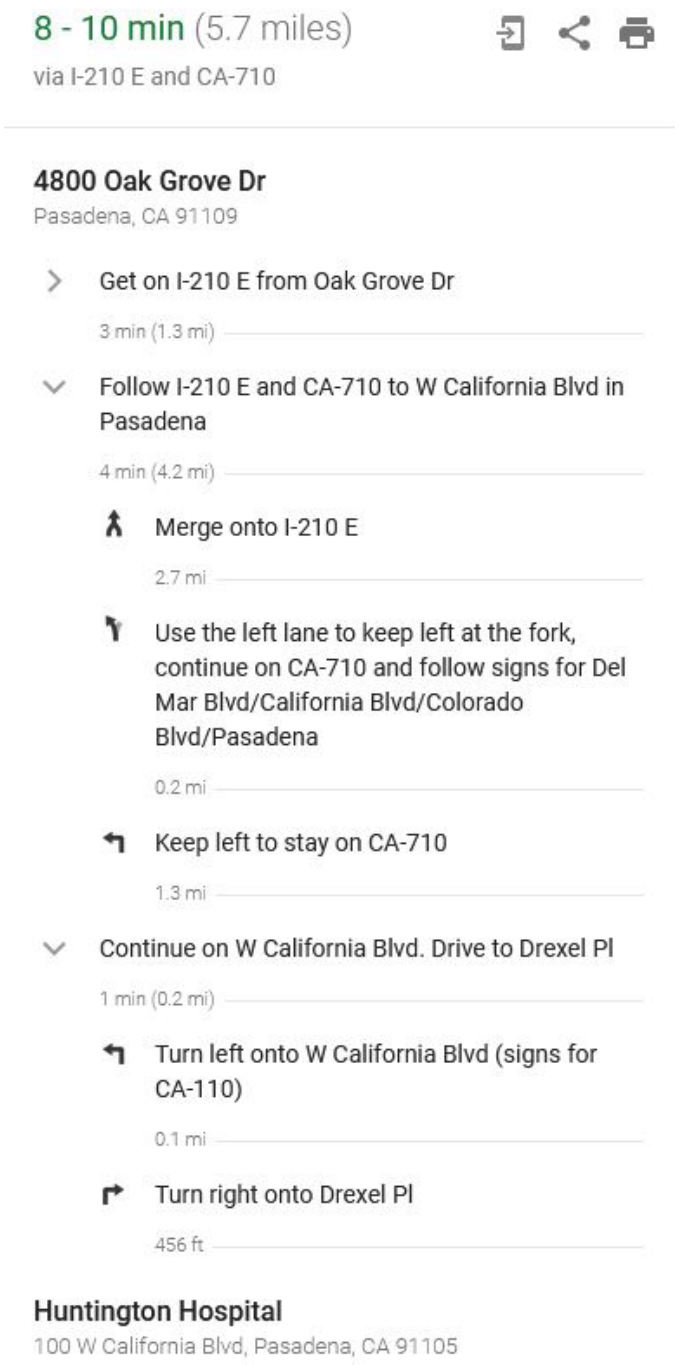
A first aid kit and fire extinguisher will be stored on each site as appropriate. The first aid kit will contain the American Red Cross first aid manual or equivalent. A minimum of two personnel trained and certified in adult first aid, CPR, and blood borne pathogens, in accordance with 29 CFR 1910.1030, will be on-site at all times that work is being performed. If an injured individual requires further attention, the individual will be immediately transported to the nearest hospital. A hospital route map to the closest Emergency Room is presented below for each site. The hospital route maps give directions to the nearest medical facility. If necessary, the worker will be decontaminated prior to transport to the facility; if the injury is serious, decontamination may be delayed pending emergency treatment. As explained earlier, concentrations of the chemical of concern (COC) anticipated to be encountered at these sites are not considered acutely toxic and should not prevent the implementation of emergency medical care.

Hospital Route Map from NASA JPL



Hospital Route Map to Huntington Memorial Hospital (Modified from Google Maps, 2021)

Directions to Huntington Memorial Hospital (5.7 miles; approx. 10 minutes)



8 - 10 min (5.7 miles)

via I-210 E and CA-710

4800 Oak Grove Dr
Pasadena, CA 91109

Get on I-210 E from Oak Grove Dr
3 min (1.3 mi)

Follow I-210 E and CA-710 to W California Blvd in Pasadena
4 min (4.2 mi)

Merge onto I-210 E
2.7 mi

Use the left lane to keep left at the fork, continue on CA-710 and follow signs for Del Mar Blvd/California Blvd/Colorado Blvd/Pasadena
0.2 mi

Keep left to stay on CA-710
1.3 mi

Continue on W California Blvd. Drive to Drexel Pl
1 min (0.2 mi)

Turn left onto W California Blvd (signs for CA-110)
0.1 mi

Turn right onto Drexel Pl
456 ft

Huntington Hospital
100 W California Blvd, Pasadena, CA 91105

Operations Shutdown

Under certain extreme hazardous situations, the SSHO and Project Personnel may temporarily suspend operations while a hazard is corrected or controlled. During operation shutdown, all

personnel will be required to evacuate the work zone and support areas as necessary. The SSHO will have ultimate authority for operations shutdown and restart.

Procedures for Plan Review and Amendment

This emergency response plan will be reviewed and amended as necessary if either one of the following happens:

- The plan fails in an emergency
- The site changes in its design, construction, operation, maintenance, or other circumstances that materially increases the potential for fires, explosions, or releases of hazardous materials or hazardous material constituents, or changes the response necessary in an emergency
- The EC changes
- The plan had to be implemented because of a site emergency and lessons learned can be incorporated.

Changes to this Emergency Response Plan will be made by the EC, SSHO, and/or SHM if any of the above-mentioned occurs. Revised copies of this Emergency Response Plan shall be distributed to applicable personnel.

Spill Plans

Notification of Spills and Discharges

If a spill occurs and humans or the environment are threatened, the SSHO will immediately notify JPL Fire Dispatch. After spill response activities are completed, a Spill Report will be issued to the Contractor Officer Representative (COR). This spill report will identify the cause and extent of the spill, any resulting contamination danger, and the corrective actions taken by G2S LLC team and emergency personnel.

Required Equipment

The following equipment, at a minimum, will be kept at the site at all times to provide for the means to clean up an unexpected spill or discharge:

- 5-gallon bucket
- Spill kit including absorbent pads and booms
- Shovel.

The equipment required may vary depending on the nature and extent of the work performed.

Spill Control

If a spill occurs at the site, the following actions will be immediately taken by the site project personnel, including SSHO:

- Notify the Project Manager and JPL Fire Dispatch
- Control sources of ignition
- Contain the spill
- Do not allow anyone to touch or approach the spilled material without wearing the appropriate PPE
- Keep combustibles away from the spilled material
- Place the spilled material and affected soil in a five-gallon bucket or container for disposal
- Conduct any other actions as needed.

Firefighting Plan (01.E.01)

In the event of a fire or explosion the site will be evacuated, and personnel will gather at the emergency assembly area. The local fire department shall be summoned by the PM/SSHO/EC in the event of a large fire. Personnel shall only attempt to contain or control a fire if: it is in the incipient stage (a small fire); they are properly equipped with a suitable fire extinguisher; and only if it is safe to do so (i.e., no additional hazards exist).

Smoking will not be permitted on-site.

Emergency Services Information (01.E.05)

To obtain emergency services, the EC will first investigate the severity of the emergency/ injury. If the emergency/injury requires outside emergency services, the EC will immediately contact the appropriate emergency services.

The PM and USACE will be notified next of the emergency and the impending arrival of emergency services.

The SSHO shall have full-time access to a cellular telephone while on-site.

Prior to the start of work, the SSHO and project personnel will confirm that the Emergency Phone numbers, and Hospital information remain appropriate. These numbers shall be posted at the worksite immediately adjacent to the site access gate.

(3) Site Sanitation /Housekeeping Plan (02.B)

Housekeeping

Regular cleaning will be conducted in order to maintain safe and sanitary conditions in the workplace. All trash, garbage and waste from the operation will be collected daily, placed in closed containers, and transported to an approved landfill or disposal site as needed.

Aisles and passageways shall be clear of tripping hazards and material shall be stored in such a manner that it does not present a hazard to personnel. Paths of emergency egress shall always be kept unobstructed and clear. Electrical panels, fire alarm stations, and fire extinguishing equipment shall never be blocked.

Any oil, grease, and chemical will be handled in the same manner as above.

Restrooms

Existing building washing and toilet facilities shall be utilized and maintained in good order. Hand soap or similar cleansing agents shall be provided.

Chemical (Portable) Toilets

When applicable and/or directed, G2S LLC team will provide a chemical toilet(s) in the event that existing restrooms are unavailable/ unusable. A chemical toilet(s) will be placed on-site in an easily accessible location, and in a stable position. We anticipate less than 15 personnel at any one time to be impacted, therefore only one chemical toilet will be required. When more personnel are utilized and/or impacted, additional chemical toilets (at the prescribed quantity/# of personnel) will be deployed for use. Sufficient paper supplies and hand sanitizer will be available to allow personnel to sanitize their hands.

When in place, G2S LLC team shall establish provisions for routinely servicing and cleaning chemical toilet(s) and disposing of the sewage before placing back into operation. The method of sewage disposal and the placement location selected shall be in accordance with Federal, state, and local health regulations.

Drinking Water

An adequate supply of potable water will be provided in or near all work areas for both drinking and cleansing. Potable water shall be obtained from sources approved by Federal, State, or local health authorities and shall be dispensed by means which will prevent contamination. The use of a "common" drinking cup is prohibited, and receptacles will be provided for disposal of paper cups. Any portable container used to distribute drinking water shall be clearly marked “DRINKING WATER” and may not be used for other purposes.

All outlets dispensing non-potable water must be conspicuously labeled: "CAUTION -- WATER UNSAFE FOR DRINKING, WASHING, or COOKING".

Waste Disposal

All trash, garbage and waste from the operation will be collected daily, placed in closed containers, and transported to an approved landfill or disposal site as needed.

Any oil, grease, and chemicals will be handled in the same manner as above.

(4) Medical Support (03.A)

On-Site Medical Support

At a typical project, no on-site medical support will be provided beyond first aid and CPR care. In the event medical support is required, emergency services will be summoned. A first aid kit complying with the criteria contained in ANSI/ISEA Z308.1 will be maintained onsite (03.B.03). All employees who work where there is a first aid kit shall receive a tool-box training on the content and use of the kit supplies.

Off-Site Medical Arrangements

Accidents or incidents requiring medical assistance shall be immediately reported to the SSHO.

Prior to the start of work, the SSHO and project personnel will confirm that the Emergency Phone numbers, and Hospital information remain appropriate. These phone numbers will be posted in a conspicuous location at the project site. Copies of this APP Plan will be provided to emergency units, as appropriate, prior to the start of work. The designated medical provider shall also be identified, with a route to the provider's location also noted.

First Aid/CPR

At least two personnel trained in First Aid and CPR shall be on-site at all times to provide initial on-site medical support should it be necessary.

David Conner:	FA/CPR Training Received: 6/30/21
Ben Headington:	FA/CPR Training Received: 9/8/21

(5) Blood-Borne Pathogen (BBP) Program (03.A.05)

At a typical project, no on-site medical support will be provided beyond first aid and CPR care. In the event medical support is required, emergency services will be summoned. However, employees designated as responsible for rendering first aid (e.g., SSHO) are included in G2S LLC team's BBP program in accordance with 29 CFR 1910.1030:

(6) Exposure Control Plan (03.A.05)

Those designated as responsible for providing first aid (e.g., SSHO) are included in G2S LLC team's Exposure Control Plan and are required to read this document as a part of the Blood-Borne Pathogen training.

(7) Automatic External Defibrillator (AED) Program (03.B.04)

An Automatic External Defibrillator (AED) will not be available for this contract; therefore, an AED Program will not be in place.

(8) Site Layout Plan (04.A)

Site Layout Plans are not required since G2S LLC team does not intend to implement construction of temporary structures under this contract.

(9) Access and Haul Road Plan (04.B)

G2S LLC team will only use Access/Haul roads approved by NASA JPL.

(10) Hearing Conservation Program (05.C)

G2S LLC team activities are not expected to exceed American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs). Therefore, a Hearing Conservation Program will not be implemented.

(11) Respiratory Protection Plan (05.G)

G2S LLC reviewed VOC and perchlorate analytical results from groundwater samples collected from NASA JPL monitoring wells MW-4 (Screens 1, 2, 4, and 5), MW-12 (Screens 1 – 5), MW-15, MW-16, MW-17 (Screens 1 – 5), and MW-24 (Screens 1 – 5) from the third quarter 2020 to second quarter 2021 (last five sampling events)(NASA, 2021). In general, carbon tetrachloride, trichloroethylene, tetrachloroethylene, and perchlorate concentrations were detected at low concentrations (i.e., not detected, detected at or below reporting limits, or detected below maximum contaminant levels [MCLs]) with a few exceptions. Carbon tetrachloride was detected in MW-12 (Screen 3) at concentrations ranging from 0.74 µg/L to 1.4 µg/L, which exceeds the state MCL (0.5 µg/L). Carbon tetrachloride was detected in MW-12 (Screen 4) during the second quarter 2021 at a concentration of 1.5 µg/L which exceeded the state MCL. Perchlorate was detected in MW-24 (Screen 1) at concentrations exceeding the state MCL (6.0 µg/L) in three of the five quarters ranging from 14.0 µg/L to 260.0 µg/L. Perchlorate was also detected in MW-24 (Screen 2) at concentrations exceeding the state MCL (6.0 µg/L) in three of the five quarters ranging from 6.2 µg/L to 8.5 µg/L. Therefore, based on the chemical concentrations and limited exposure risk during groundwater sampling, G2S LLC team activities are not expected to require any type of respirator. Therefore, a Respirator Protection Plan will not be implemented.

(12) Health Hazard Control (06.A)

Personal Protective Equipment

Work Clothing: Employees shall wear clothing suitable for the weather, however minimum requirements for work shall be short-sleeve shirt, long pants (excessively long or baggy pants are prohibited) and leather work shoes. If analysis determines that safety-toed (or other protective) footwear is necessary (e.g.,), they shall be worn. Work clothing and footwear materials shall comply with PFAS sampling guidelines where applicable.

Eye and Face Protection: Eye and face protection shall be worn as determined by an analysis of the operations being performed. However, safety glasses with side shields will be worn for all work, as a minimum eye protection.

Hearing Protection: Hearing protection must be worn by all those exposed to high noise activities.

Head Protection: Hard hats shall comply with ANSI Z89.1 and shall be worn by all workers when a head hazard exists.

High Visibility Apparel shall comply with ANSI/ISEA 107, Class 2 requirements at a minimum and shall be worn by all workers exposed to vehicular or equipment traffic. Section 05.F of EM-385 provides specific situational requirements.

Gloves of the proper type shall be worn by persons involved in activities that expose the hands to cuts, abrasions, punctures, burns and chemical irritants.

Machine Guards and safety devices: Forklift/telehandler equipment must have appropriate guards and safety devices in place and in operating condition.

The G2S LLC team personal protective equipment program will comply fully with OSHA requirements published in Subpart I of 29 CFR 1910. The individual supervisors and the SSHO will conduct the workplace hazard assessment, which will be re-assessed at a minimum annually or as necessary due to updates and changes in the environment or equipment.

The workplace hazard assessment (i.e., AHAs) and pertinent OSHA standards will guide the selection of protective equipment and clothing, which will be provided by G2S LLC and its subcontractors to protect their employees. The suitability of the selected PPE will be re-evaluated as needed.

Employees required to use PPE to perform assigned work tasks will receive PPE training. G2S LLC team will maintain the written certification of training conducted, as required by OSHA. The training includes:

- When PPE is necessary
- What PPE is necessary
- How to properly don, doff, adjust, and wear PPE
- The limitations of the PPE (including warning labels)
- The proper care, maintenance, useful life, and disposal of the PPE.

Each affected employee will demonstrate understanding of the training and the ability to effectively use their PPE, before being allowed to perform work requiring the use of PPE. Employees will be retrained as necessitated by changes in the workplace; types of PPE selected, and/or observed inadequacies in employee performance.

PPE Inspection

Employees will perform a visual inspection on their PPE at regular intervals, and before and after each use to assure that the PPE will provide the necessary protection. Defective or damaged PPE will not be used. Supervisory personnel and the SSHO will monitor PPE utilization on an ongoing basis.

G2S LLC team will inspect all its subcontracts on an ongoing basis to ensure compliance for PPE. G2S LLC team requires that its subcontractors provide PPE to its employees and that those employees have been trained in the use of PPE. The SHM or his designated officer (i.e., SSHO) will ensure compliance criteria are met.

PPE Maintenance

PPE will be cleaned and maintained by the user at regular intervals and after use, to assure that it will provide the necessary protection. Defective or damaged PPE will not be used.

(13) Hazard Communication Program (06.B.01)

G2S LLC team shall evaluate jobsite operations, materials, and equipment involving potential exposure to hazardous or toxic agents or environments to formulate a hazard control program.

The hazard evaluation shall identify: the nature of the evaluation (air, biological or radiological samples, etc.); that it serves as certification of hazard evaluation; the workplace and activity evaluated; the name, position and credentials of the person certifying that the evaluation has been performed; and the date of the evaluation.

An AHA shall be used to document the evaluation. The hazard evaluation shall identify all substances, agents, and environments that present a health, explosive or fire hazard to workers or visitors and recommend hazard control measures. Engineering and administrative controls shall be used to control hazards; in cases where engineering or administrative controls are not feasible, PPE may be used.

G2S LLC team shall provide the location of SDSs, records of Contractor employee training, and inventory of hazardous materials (including approximate quantities and a site map, as appropriate) that will be brought onto Government project by the Contractor and any subcontractors.

All chemicals brought onto the site will be subject to the 29 CFR 1910.1200 and may include the following:

- Gasoline: Gasoline will be used for site vehicles and only filled at offsite filling stations.
- Sample Preservative: Various preservatives will be utilized depending on sample analysis.
- Cleaning agents: Liquids, specifically Liquinox, will be used as part of the decontamination process for equipment during demolition and groundwater sampling activities.

Storage prior to transportation of hazardous chemicals, materials, substances, and wastes shall be under the supervision of the SSHO.

Hazardous or Toxic Agent Labeling

Proper hazard labeling will be applied to containers containing hazardous substances brought on-site.

Safety Data Sheets (SDSs)

Copies of SDSs for the above-listed chemicals will be kept on-site during the field activities. The SDSs will be reviewed with all site personnel during the initial site-specific safety orientation. The SDSs will be the primary source of health and safety information for all chemicals.

Employee Information and Training

Employees will be trained in the corporate Hazard Communications program upon employment and then on the specific chemicals they will be dealing with. As the information or types of chemicals changes, employees will be re-trained as necessary.

Personnel working at the Site will be briefed on the chemicals expected to be used or come in contact with, their locations and their identification during the initial tailgate safety meeting. Any changes in chemicals or information will be brought to the attention of all personnel immediately. The SDSs for all chemicals expected to be used or encountered onsite will also be discussed during the tailgate safety meeting along with protective measures available to the personnel.

Personal Protective Equipment

When engineering and work practice controls or substitution are either infeasible or insufficient, appropriate PPE and chemical hygiene facilities shall be provided and used for the transportation, use, and storage of hazardous or toxic agents.

(14) Process Safety Management Program (06.B.04)

A Process Management Safety Program is not required as the work involved does not constitute the following:

- A process that involves a flammable liquid or gas on site in one location in a quantity of 10,000 lb (4,535.9 kg) or more as defined in 29 CFR 1910.119 or 29 CFR 1926.59(c); or
- A process that involves a chemical at or above the threshold quantities listed in Appendix A of the above-cited CFRs.

(15) Lead Compliance and Abatement Plan (06.C.02)

Lead is not a COC on this project; therefore, a Lead Abatement Plan is not applicable for this project.

(16) Asbestos Abatement Plan (06.C.03)

Asbestos is not a COC on this project; therefore, an Asbestos Abatement Plan is not applicable for this project.

(17) Radiation Safety Program (06.F)

G2S LLC team does not anticipate operations involving radiation hazards, and radioactive material or radiation generating devices.

G2S LLC team employees shall not enter areas designated with a radiation hazard without proper training.

(18) Abrasive Blasting Plan (06.I)

Abrasive blasting operations are not part of the scope of work (SOW) at this job site; therefore, an Abrasive Blasting Plan is not applicable.

(19) Heat/Cold Stress Monitoring Plan (06.J)

Heat Stress Monitoring Plan (HSMP) (06.J.01)

If employees are in hot weather (i.e., ambient temperature exceeding 75 degrees F and 55% Humidity), the following procedures should be used to monitor the body's physiological response to heat and to manage the work cycle.

- Measure body temperature: Measure the body temperature orally using a clinical thermometer during initial period of rest. If the oral temperature exceeds 99.4°F (37.4°C), the employee shall not be allowed to continue work until the oral temperature is maintained below the latter threshold.
- Measure heart rate: At temperatures above 85°F employees should have their heart rate measurements taken at 30-minute intervals. They should stop working in PPE when heart rate reaches 120 beats per minute. This schedule is conservative and if one is under a light workload the work periods can be extended. If under a heavy workload or a sunny day the rest periods can be extended.
- Monitor Temperature: The ACGIH Threshold Limit Values work/rest schedule and the Wet Bulb Globe Temperature (WBGT) index is designed for use with permeable ordinary work clothes, and not for impermeable PPE. Therefore, the following modified schedule will be used for employees wearing PPE (e.g., impermeable Tyvek® or Tychem® coveralls) to conduct fuel handling and tank cleaning related tasks. If PPE is not being utilized, 10° F should be added to the temperature schedule below.
  - On a cloudy day, continuous work may be performed below 70°F. Employees should be aware of the potential for heat stress above this temperature and use the buddy system and guidelines below.
  - 75% work / 25% rest each hour at air temperature 70-79°F
  - 50% work / 50% rest each hour at air temperature 79-85°F
  - 25% work / 75% rest each hour at air temperature above 85°F
- Work shall cease at a shaded dry bulb temperature of 98°F.

Cold Stress Monitoring Plan (CSMP) (06.J.04)

To maintain adequate protection against cold exposure, employees shall observe the following work practices and control measures:

- Alternate work and rest periods with rest periods in a warmer area
- Utilize a supplemental heat source, if possible
- Wear an insulating liner or hood under the hard hat
- Dress warmly by layering clothing

- Avoid becoming overheated by removing layers of clothing while working to remain cool enough to not perspire
- Utilize clothing materials that do not lose insulating value when wet or dirty (i.e., use wool or polypropylene; in general, avoid down or cotton). Work clothing and footwear materials shall be in accordance with PFAS sampling guidelines where applicable.
- Keep clothing clean. Laundering procedures shall be in accordance with PFAS sampling guidelines where applicable.

If excessive cold persists in the work area and control measures cannot reduce the cold stress on employees, work will be terminated until the condition subsides. If fieldwork is carried out in the winter, an enclosed heated environment will be made available at the site for employees.

The following procedure shall be followed to monitor ambient environmental conditions during the winter:

- At ambient temperatures above 45°F (7°C) the temperature shall be monitored at a minimum of eight (8) hour intervals
- At ambient temperatures below 45°F (7°C) and above 30°F (-1°C) the temperature shall be monitored at every four (4) hour intervals
- At ambient temperatures below 30°F (-1°C) the temperature and wind speed shall be monitored at every four (4) hour intervals or more frequently if the temperature lowers further.

(20) Indoor Air Quality Management (06.L)

G2S LLC team will be conducting outdoor work only as a part of this contract.

(21) Mold Remediation Plan (06.L.04)

Mold Remediation operations are not part of the SOW at this job site; therefore, a Mold Remediation Plan is not applicable.

(22) Chromium (VI) Exposure Evaluation (06.M)

G2S LLC team does not anticipate activities that could generate chromium (VI) fumes, mist, or dust under this contract.

(23) Crystalline Silica Monitoring Plan (06.N.02)

G2S LLC team does not anticipate operations involving crystalline silica generating activities.

(24) Lighting Plan for Night Operations (07.A.06)

Night operations are not anticipated under this contract. However, if work is to be performed at night, a night operations lighting plan shall be developed to ensure that all activities, areas,

and operations are adequately illuminated to perform work safely in accordance with the lighting levels in Table 7-1 of Section 07.A of the EM385.1.1 (November 2014).

(25) Traffic Control Plan (08.C.05)

G2S LLC team does not anticipate operations involving the maintenance of traffic and access through the contract work area. If a MW is located in a parking area or alongside a roadway, cones will be utilized to delineate the work area and reflective clothing will be worn.

(26) Fire Prevention Plan (09.A.01)

Always keep work and storage areas clean and free of flammable or combustible debris. Ensure that all flammable and combustible materials are stored properly; with all flammable liquids and gases separated from other flammable materials. Dispose of all rags which have oil, grease, paint thinners and cleaning agents that may be combustible in accordance with applicable local, state, and federal regulations. All internal combustion engine powered equipment shall be inspected, and repairs made, if such hazards as igniting of fuel exist.

Fueling Area or Stations

a) "No Smoking, Matches, or Open Flame" signs must be posted and enforced.

b) "Turn Engines Off" signs must be posted and enforced in the same area.

c) Bonding of equipment to be fueled must be accomplished by the use of an internally grounded hose or an external ground cable.

d) Make sure that fuel distributors fuel tank, dispensing hose, and nozzle comply with federal, state, and local regulations.

e) Only approved industrial metal safety cans will be used for the handling and storage of flammable and combustible liquids up to 60 gallons and must be labeled as to the contents.

f) Portable storage tanks with a capacity of 60 gallons or more must be:

- Plainly marked as to contents
- At least 50 feet away from any building
- Kept free from debris, trash, grass, and weeds at all times
- Properly vented, if storing 600 gallons or more.

g) QM must be contacted for additional rules governing fueling depots or storage areas for flammable liquids.

Fire Protection and Control

Provide access roads for emergency vehicles from the start of the project and maintain clear access to the building and storage area at all times. Coordinate access with the local Fire Department to ensure it meets the requirements of the equipment that will respond in case of a

fire. Install and activate building fire standpipes and sprinkler systems as soon as practicable in the construction schedule.

Comply with the following basic rules of fire protection and control:

- Phone numbers of the nearest fire station or department must be posted at job site telephones
- All two ton or larger trucks and cranes must be equipped with not less than a 2B ABC type fire extinguisher (i.e., winch trucks, haul trucks, draglines, and cranes-track, rubber tire or railroad car mounted).
- Fire extinguisher rated not less than 2B shall be furnished for each 3000 square feet (or portion thereof) of the building and located so that the maximum travel distance from any point will not exceed 100 feet
- Fire extinguishers rated not less than 2B shall be located at each floor adjacent to stairways.
- A fire extinguisher rated not less than 10B shall be provided within 50 feet of wherever more than five gallons of flammable or combustible liquids or five pounds of flammable gas are being used on the job site. This requirement does not apply to the integral fuel tanks of motor vehicles.
- Carbon tetrachloride and other toxic vaporizing fire extinguishers are prohibited
- All fire extinguishers must be inspected every month and serviced at least every twelve months with refills and repairs made by a local dealer licensed by the state to service the fire extinguisher or suppression system used
- Familiarize yourself along with the members of the crew with the use and care of these extinguishers. In case of a fire make sure everyone knows where the fire extinguishers are and how to use them. The SSHO must conduct a toolbox safety meeting on this subject at least annually and with new employees/owners.
- Smoke only in designated areas. Make sure to extinguish matches/cigarettes and place them in approved containers.
- Minimize the number of flammable liquids/gases kept at the work area to a single work shift supply
- Close containers of flammable liquids when not in use. Report spills and the location of excessive flammable vapor/gas concentrations immediately.
- Obtain the necessary permits when performing hot work or disabling fire protection systems
- Make sure materials and equipment do not block access to extinguishers and fire protection hoses, hydrants, and standpipes. Also, make sure materials are kept at least 18 inches from sprinkler heads.
- Attempt to extinguish small fires (trash can size) only if trained to do so. If trained to extinguish fires, familiarize yourself with the location of fire extinguishers in the work area.

- At least one portable fire extinguisher of not less than 20 B rating must be located not less than 25 feet or more than 75 feet from a flammable combustible liquid storage area located outside.
- Fire extinguisher location plans must be prepared before construction of a structure begins. Fire extinguishers must be placed according to the plan prior to bringing flammable materials into the area.

(27) Wild Land Fire Management Plan (09.L)

Wild Land Fire Management is not a required activity under the current SOW. If potential exposure to wild land fire exist, G2S LLC team will follow the facility Wild Land Fire Management Plan.

(28) Arc Flash Hazard Analysis (11.B)

Arc Flash Hazards are not a required activity under the current SOW. If potential exposure to arc flash hazards, G2S LLC team will follow the facility Wild Land Fire Management Plan.

(29) Assured Equipment Grounding Control Program (11.D.05, App. E)

Electrical cords must comply with EM 385-1-1, Section 11 and will be listed by UL or other nationally recognized testing laboratory and shall have unbroken insulation and should not be exposed to water or other liquids. A GFCI outlet or cord must be used at all times. All electrical equipment must be inspected, and color coded as per the Assured Grounding and Bonding Program (EM 385-1-1: Section 11 and Appendix F) if GFCIs cannot be used as stated above.

(30) Aircraft/Airfield Safety Plan Compliance Document

This contract does not involve working near Aircraft/Airfield; therefore an Aircraft/Airfield Safety Plan Compliance Document was not prepared.

(31) Hazardous Energy Control Program and Procedures (12.A.01)

This contract does not involve work with Hazardous Energy.

(32) Standard Pre-Lift Plan –Load Handling Equipment (16.A.03)

Lifts are not anticipated as part of the sampling efforts; therefore, a Standard Pre-Lift Plan has not been developed.

(33) Critical Lift Plan – Load Handling Equipment (16.H)

Critical lifts are not anticipated as part of the proposed crane activities; therefore, a Crane Critical Lift Plan has not been developed.

(34) Naval Architectural Analysis –Load Handling Equipment (Floating) (16.L)

G2S LLC team will not employ Floating Cranes/Derricks, Crane Barges, and Auxiliary Shipboard-Mounted Cranes under this contract.

(35) Floating Plant Inspection and Certification (19.A.01)

This contract does not involve Floating Plant and Marine Activities.

(36) Severe Weather Plan for Marine Activities (19.A.03)

This contract does not involve Floating Plant and Marine Activities.

(37) Emergency Plan for Marine Activities (19.A.04)

This contract does not involve Floating Plant and Marine Activities.

(38) Man Overboard/Abandon Ship Procedures (19.A.04)

This contract does not involve Floating Plant and Marine Activities.

(39) Float Plan for Launches, Motorboats, and Skiffs (19.F.04)

G2S LLC team will not employ Launches, Motorboats, and Skiffs under this contract.

(40) Fall Protection & Prevention Plan (21.D)

G2S LLC team will not be exposed to falls requiring protection and planning under this contract.

(41) Demolition/Renovation Plan (23.A)

This contract does not involve Demolition/Renovation Activities.

(42) Safe Practices for Rope Access Work Plan (24.H)

No work on this contract is expected involving a variety of advanced access techniques where roped and specialized equipment are used as the primary method for providing access and support to workers in their jobs at high or hard-to-reach places. Therefore, no work plan was developed.

(43) Excavation/Trenching Plan (25.A.01)

This contract does not involve Excavation or Trenching Activities.

(44) Fire Prevention and Protection Plan for Underground Construction (26.D.01)

Underground construction is not applicable under this contract.

(45) Compressed Air Work Plan for Underground Construction (26.I.01)

Underground construction is not applicable under this contract.

(46) Erection and Removal Plans for Formwork and Shoring (27.C)

Formwork, shoring, and bracing are not applicable under this contract.

(47) Precast Concrete Plan (27.D.01)

Precast Concrete operations are not applicable under this contract.

(48) Lift-Slab Plans (27.E)

Lift-slab operations are not applicable under this contract.

(49) Masonry Bracing Plan (27.F.01)

Masonry Construction is not applicable under this contract.

(50) Steel Erection Plan (28.B)

Structural Steel Assembly is not applicable under this contract.

(51) Explosives Safety Site Plan (ESSP) (29.A)

Explosives-related operations are not applicable under this contract.

(52) Blasting Safety Plan (29.A, 26.J)

G2S LLC team personnel are prohibited from transporting, handling, storing, and using explosives, blasting agents, and blasting equipment.

(53) Dive Operations Plan (30.A.14)

Diving operations are not applicable under this contract.

(54) Safe Practices Manual for Diving Activities (30.A.15)

Diving operations are not applicable under this contract.

(55) Emergency Management Plan for Diving (30.A.18)

Diving operations are not applicable under this contract.

(56) Tree Felling and Maintenance Program (31.A.01)

Tree felling operations are not applicable under this contract.

(57) Aircraft/Airfield Construction Safety & Phasing Plan (CSPP) (32.A.02)

Aircraft/Airfield Construction operations are not applicable under this contract.

(58) Site Safety and Health Plan for HTRW Work (33.B)

Hazardous waste site cleanup operations are applicable under this contract. The risk plans that were determined to be applicable to this contract are incorporated into the SSHP, **Appendix E**.

(59) Confined Space Entry Procedures (34.A.05)

G2S LLC team Employees shall not enter Permit Required Confined Spaces.

(60) Confined Space Program (34.A.06)

G2S LLC team Employees shall not enter Permit Required Confined Spaces.

j. RISK MANAGEMENT PROCESS

Activity Hazard Analyses (AHAs) have been performed for the activities described in this APP and the scope of the contract. This analysis is contained in **Appendix A**. Site specific information will be reviewed during the site safety orientation prior to and during field implementation of the project. Site specific hazard information will also be covered during tailgate safety training. This training will be documented by the SSHO. As additional activities are identified that are not covered by the AHAs, new analyses will be developed and approved by G2S LLC team and USACE and incorporated into the safety program.

APPENDIX A
Activity Hazard Analyses
(AHAs)

Activity Hazard Analysis (AHA)

Activity/Work Task: Mobilization and Demobilization	Overall Risk Assessment Code (RAC) (Use highest code)	**M**
Project Location: NASA's Jet Propulsion Laboratory located in Pasadena, California	**Risk Assessment Code Matrix**	
Contract Number: W912PL21D0021	**Severity** / **Probability**	
Date Prepared: November 3, 2021		
Prepared by (Name/Title): David Conner, SSHO		
Reviewed by (Name/Title): Ben Headington, Alternate SSHO		
Notes: (Field Notes, Review Comments, etc.)		

Severity	Unlikely	Seldom	Occasional	Likely	Frequent
Catastrophic (I)	M	H	H	E	E
Critical (II)	L	M	H	H	E
Marginal (III)	L	L	M	M	H
Negligible (IV)	L	L	L	L	M

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.

RAC Chart

- **E = Extremely High Risk**
- **H = High Risk**
- **M = Moderate Risk**
- **L = Low Risk**

This AHA serves as the PPE hazard assessment certification as required by 29 CFR 1910.132.

Task Steps	Potential Hazards	Critical Safety Procedures and Controls	RAC
In transit to/from site, driving within the site	Driving while fatigued, unfamiliarity with route, surroundings, distractions while driving, erratic, careless behavior of other drivers on the road, not regarding blind spots, not paying attention, Faulty vehicle, Non-compliance to standards and procedure (i.e., use of mobile phone while driving), Minimum space / improper planning	Get plenty of rest the night before. Conduct a proper vehicle inspection prior to leaving the office. Keep maps of the areas with you for reference. Do not use cell phones while operating the vehicle. Always use Defensive Driving techniques. Leave yourself an out. Always wear seat belts while operating the vehicle. Defensive driving training for staff; Apply Life Saving Rule on Driving; Apply Journey management process for planning and executing necessary road transport journeys safely; Keep a safe distance between yourself and other vehicles in accordance with highway safety guidelines; Avoid reversing: try to park facing out so you can later exit your parking space as safely as possible, Avoid sudden braking.	**L**
Work off site on roadways	No clear Red Zone boundaries set at work site, Faulty equipment, Non-compliance with standards and procedures	Appropriate barrier and signage system (Installation of barricades and warning signs and Training in Work Area barricading and Temporary site closure guidelines).	**L**

Task Steps	Potential Hazards	Critical Safety Procedures and Controls	RAC
Weather issues from floods, windstorms, tornadoes, lightning, ice storm, snow and ice build-up, fog, or waterspouts Applicable in any operational environment (facility location) where such weather events occur.	Inadequate preventative measures applied; Lack of awareness	Follow local procedure / equipment to monitor weather service for severe weather warnings. Follow local procedure that defines requirements to address relevant severe weather conditions. Activate shutdown procedure during inclement weather. If needed, execute relevant scenario of the Emergency Response Plan. Consider particular elements of the work that could be affected by the weather e.g. changes in wind during lifting operations and working at height. Suspend work if weather conditions change. Verify that conditions remain the same when returning after a short break in work. Stop work during an electrical storm. Wait 30 minutes from the last sound of thunder before resuming work.	**L**
General Assessment of Work Site	General Construction Hazards, slips, trips, falls, exposed debris. Traversing streams during periods of high flow.	Minimum Personal Protective Equipment Dress: • Long Pants • Shirts with Sleeves • Hardhat (if overhead hazards are present) • Safety Boots/Shoes (Steel or composite Toe) • Safety Glasses / Safety Goggles / Face Shields • Leather Palm Gloves • Hearing Protection (pneumatic tools) • Reflective Safety Vests Coordinate work activities at daily site safety meetings Caution should be used when navigating the site. Be aware of changes in grade, elevation, and any surface contamination when walking. Clear area leading to and around work locations. Place cones or mark-out holes or depressions in the ground to avoid stepping in them. When crossing streams during periods of high flow, use extra caution and “buddy system” to assist one another.	**L**
Identify sampling locations (including GPS locating and returning from the sample location.	Uneven or unstable ground, hazardous flora/fauna, exhaustion/over-exertion, heat and cold stress, UV exposure. Tick exposure	Be aware of changes in grade and elevation when walking. Clear area leading to and around locations. Place cones or mark out holes or depressions in the ground to avoid stepping in them. Check for biological hazards (poison ivy, insects, etc.). Take regular breaks and hydrate if feeling faint or over exerted. Wear appropriate clothing for the current field conditions. Use sun block to avoid sunburn. Avoid prolonged exposure to the sun. **When working in areas infested with ticks:** • Wear long-sleeved shirts, pants, and socks. • Tuck your pant legs into your socks. • Tuck your shirt into your pants.	**M**

Task Steps	Potential Hazards	Critical Safety Procedures and Controls	RAC
		• Use a tick repellent on your clothes. • Do a body check at the end of each work day, paying particular attention to armpits, navel, behind the ears, and the groin area. **Tick Removal**. • The sooner ticks are removed, the better. • Tweezers work best at removing ticks. If fingers are used, shield them with a piece of paper. • Grasp the tick as close to the skin surface as possible and pull outward with a steady, even pressure. DO NOT jerk or twist, as this may cause the head of the tick to break off in the skin. • Take care not to squeeze, crush, or puncture the body of the tick, as this may cause the injection of fluids from the tick to enter the wound. • After removing the tick, disinfect the area with alcohol or soap and water. You may want to keep the tick in a small jar for later identification in case you become sick with Lyme disease or another illness. • Methods of tick removal, such as painting the tick with Vaseline, fingernail polish or alcohol or applying a hot match head, DO NOT WORK.	**M**
Equipment usage on Site	Faulty or inappropriate equipment. Pinch points, abrasion, cuts to the hands. Spills, fire.	Inspect equipment (including hand tools) prior to use. Put faulty equipment out of service. Do not refuel generators, etc. until the equipment has cooled down. Always use a funnel to avoid spillage of fuel.	**L**
Unload/Load Equipment from Vehicle	Back strain, pinch points, abrasion.	Utilize proper lifting procedures (keep your back straight, lift with your legs and knees) when unloading equipment from the vehicle. No individual employee is permitted to lift any object that weighs over 60 pounds. Proper lifting techniques shall be used. Multiple employees or the use of mechanical lifting are for lifting objects over the 60-pound limit. Materials shall be inspected for sharp edges prior to being handled, and avoid pinch point hazards.	**L**

Task Steps	Potential Hazards	Critical Safety Procedures and Controls	RAC
		Utilize material handling devices when possible to move equipment (lift gates, pallet jacks, hand trucks, etc.). If necessary, use a ramp for loading/unloading wheeled devices, ensuring the ramp is properly supported prior to use. Communicate with co-workers who are assisting you to avoid back strain and pinch points. Do not carry heavy equipment over long distances without use of a cart, etc. If workers are above 4 feet elevation from ground surface or lower level, fall protection must be provided/used.	**L**
Movement on Site	Vehicle collisions, pedestrian injuries	Do not exceed the posted speed limit. Be careful when backing up that you do not hit other vehicles, bollard, monitoring well stickups, other objects, and pedestrians. Use a spotter when possible. Always be aware of traffic movements around you. Only park in designated areas, and back into the space when practicable.	**L**

Equipment to be Used	Inspection Requirements	Training Requirements
Equipment for soil and groundwater sampling activities, monitoring well installation, work vehicles, hand tools for work tasks, generator, Traffic cones, Barricades, Work Signage, First Aid/BBP Kit, Portable Fire Extinguisher	All TI-SDC equipment is inspected daily prior to use. Daily walk-arounds are conducted and equipment safety checklists are completed where applicable. Tailgate safety meeting Site-specific orientation	All TI-SDC personnel are 40-hour OSHA HAZWOPER trained, complete yearly 8-hour OSHA refresher training, and are trained in company health and safety procedures and policies. Competency and qualifications are based on years of experience. All TI-SDC personnel receive CPR/First Aid training.
Personal protection equipment: Modified Level D PPE (safety-toed boots, safety glasses, nitrile gloves) Leather gloves for equipment handling First Aid Kit	Prior to use	Training on proper use of PPE; 40-hour HAZWOPER training and 8-hour HAZWOPER Refresher training (if applicable) First Aid/CPR

Activity Hazard Analysis (AHA)

Activity/Work Task: Soil/Sediment; Soil Gas; Surface/Ground Water Sampling	Overall Risk Assessment Code (RAC) (Use highest code) **L**
Project Location: NASA's Jet Propulsion Laboratory located in Pasadena, California	
Prepared by: David Conner, SSHO	
Date Prepared: November 3, 2021	
Reviewed by (Name/Title): Ben Headington, Alternate SSHO	
Contract Number: W912PL21D0021	
Notes: (Field Notes, Review Comments, etc.)	

Risk Assessment Code (RAC) Matrix

Severity	Probability				
	Unlikely	Seldom	Occasional	Likely	Frequent
Catastrophic (I)	M	H	H	E	E
Critical (II)	L	M	H	H	E
Marginal (III)	L	L	M	M	H
Negligible (IV)	L	L	L	L	M

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.

RAC Chart

- **E = Extremely High Risk**
- **H = High Risk**
- **M = Moderate Risk**
- **L = Low Risk**

Task Steps	Potential Hazards	Critical Safety Procedures and Controls	RAC
Locate sampling location	Vehicle could hit someone or something.	Use spotters when positioning vehicle if needed. Ensure that spotters know how to communicate with driver of vehicle. Wear steel-toed, non-skid boots and safety glasses	L
Clear area to be sampled or open well cap	Contact with contaminated material	Wear Modified Level D PPE when working with contaminated areas.	L
Monitor VOCs and combustible gases in the surrounding atmosphere	Exposure to site contaminants or vapors.	Set equipment upwind of site work. Perform air monitoring for VOCs, and combustible gases. If action level is exceeded, evacuate to upwind direction	L
Measure depth to water and insert pump or sampling device	Injury from improper use of hand tools	Only trained personnel will use hand tools.	L
Cut tubing to length	Cut or skin puncture	Review proper cutting procedures; cut away from your body; use a proper cutting tool; use sharp tools.	L
Run electric pumps, generators, or other electrical equipment	Electrical shock from energized equipment	Use GFCI plugs and heavy-duty extension cords	L
Purge Well/Collect groundwater sample, collect soil sample and collect soil vapor sample	Contact with contaminated materials	Wear Modified Level D PPE when working with contaminated soil. Handle samples carefully to avoid spills.	L

Task Steps	Potential Hazards	Critical Safety Procedures and Controls	RAC
Remove sampling equipment from area	Muscle strain due to improper lifting	Rotate the task among workers to share the sample collection duties. Follow proper lifting techniques; no manual lifting of heavy loads. Do not over pack coolers greater than 50 pounds. Use two person lifts for heavy objects.	**L**
Close well cap or clear area sampled	Contact with contaminated material	Wear Modified Level D PPE when working with contaminated areas.	**L**
Decontaminate equipment	Chemical exposure	Use non-toxic detergent for decontaminated equipment (Alconox®). Minimize need for decontamination by using dedicated and/or disposable equipment. Wear appropriate PPE.	**L**

Equipment to be Used	Inspection Requirements	Training Requirements
Hand Tools	Visual prior to use	Tailgate safety meeting
Voltmeter/Multimeter	Instrument Readings	• Site-specific orientation Electrical Safety
Personal protection equipment • Level D PPE (steel-toed boots, safety glasses, hard hat, safety vest, ear plugs) • Modified Level D PPE (safety-toed boots, safety glasses, nitrile gloves)	Current Certification	• 40-hour HAZWOPER training and 8-hour HAZWOPER Refresher training (if applicable) • All TI-SDC personnel receive CPR/First Aid training

IDW Management and Disposal

Date Prepared: November 3, 2021	Overall Risk Assessment Code (RAC) (Use highest code) **M**
Project Location: NASA's Jet Propulsion Laboratory, Pasadena, California	**Risk Assessment Code (RAC) Matrix**
Prepared by: David Conner, SSHO	
Activity/Work Task: IDW Management and Disposal	
Reviewed by (Name/Title): Ben Headington, Alternate SSHA	
Contract Number: W912PL21D0021	

Severity	Unlikely	Seldom	Occasional	Likely	Frequent
Catastrophic (I)	**M**	**H**	**H**	**E**	E
Critical (II)	**L**	**M**	**H**	**H**	**E**
Marginal (III)	**L**	**L**	**M**	**M**	**H**
Negligible (IV)	**L**	**L**	**L**	**L**	**M**

Involved Personnel:
Danielle Forester, CP
David Conner, SSHO
Ben Headington, Alt. SSHO
Keith Fields, PM
Subcontractor Personnel

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.

RAC Chart

E = Extremely High Risk
H = High Risk
M = Moderate Risk
L = Low Risk

Task Steps	Potential Hazards	Critical Safety Procedures and Controls	RAC
1. Place/pour waste into containers (e.g., 55-gallon drum, roll-off bin, etc.).	Lifting of wastes could cause strain to worker.	Use proper lifting techniques such as keeping the back straight, lifting with legs, limiting twisting, and getting help when moving bulky/heavy materials and equipment. Use hand truck if needed. Lifts greater than 50 lbs., especially repeated lifts, need to be evaluated and approved by a qualified person.	L
	Worker could be exposed to chemical contaminants.	Wear required PPE. Visual inspection and ambient air monitoring will determine selection of PPE. Decontaminate exteriors of tools or buckets used to transport wastes to containers. Avoid spills. Ensure spill cleanup supplies are available.	L
2. Load drums onto vehicles	Handling of drums can expose worker to injury (including, but not limited to, strains, lacerations, and pinch points).	Ensure drums are individually properly labeled and that labels are visible when drums are placed on truck. Use truck that has "Tommy Lift" and move drum using drum dolly onto lift. Ensure that drum is secure and will not roll when lift is raised. Wheel drum to appropriate location on truck for transport. Be sure to evenly distribute load weight on bed of truck. Secure drums in place on the truck. If drums are loaded with drum handling device attached to heavy equipment, stand away from truck when drum is placed onto truck. Once drum is placed and "loader" moves away from truck, use drum dolly on truck to position drum. Avoid placing pallets of drums on truck unless pallets can be positioned where they will remain for transport.	L

	Worker could be struck by vehicles.	Wear high-visibility reflective vests at all times in work areas. Make eye contact with operators of vehicles. Post an observer, as needed, when loading drums close to busy streets. Use traffic controls or barricades, if necessary, to keep traffic away from workers.	M
3. Transport drums to temporary storage location	Drums may leak.	Inspect all drums prior to and following transport. Have spill cleanup supplies and equipment readily available. Surface may become slippery. Wear work steel-toed footwear with good traction soles. Avoid exposure to material. Wear appropriate PPE. Clean up all spills immediately. Notify supervisor.	L
	Handling of drums can expose to injury (including, but not limited to, strains, lacerations, and pinch points).	If handling drums, use drum dolly, pallet on forklift, or drum grabber attached to backhoe or excavator to more drums into storage. If handling drums, inspect path that drum must be moved over. Ensure that there are no ruts or other obstacles that can cause drum to tip over or be difficult to handle over surface being traversed. Place drums in approved storage area. When manually handling drums, avoid placing hands between drums and pinching fingers. Wear appropriate PPE. If drums have to be manually positioned, know how to "break and roll" drum. Avoid manually positioning drums if at all possible. Only one person should "break and roll" drum if necessary to manually move drum without mechanical assistance.	L
	Slip, trip, and fall hazards could be present.	Maintain good housekeeping and proper illumination in storage area.	L
4. Store drums in temporary storage location pending characterization	Drums may leak.	Inspect all containers on a regular basis (weekly for non-hazardous materials, daily for hazardous materials). Have spill cleanup supplies and equipment readily available. Surface may become slippery. Wear work steel-toed footwear with good traction soles. Avoid exposure to material. Wear appropriate PPE. Clean up all spills immediately. Notify supervisor.	L
5. Remove cover of containers for sampling	Lifting drum lids may cause injury, particularly to fingers and hands.	Identify and avoid pinch points, such as placing hands between drum lid and drum. Wear leather work gloves when removing and replacing drum lids.	L
	Worker could experience strain from use of tools.	Inspect all tools for damage before use. Do not use damaged tools (mark and tag "out of service"). Select hand tools to minimize following stressors: chronic muscle contraction or steady force, extreme or awkward finger/hand/arm positions; repetitive forceful motions; or excessive gripping, pinching or pressing with hands and fingers.	L
	Containers could contain atmospheric hazards, thus exposing worker to vapors.	Before fully lifting container covers, place probe next to the small opening and measure air using a PID. If reading is less than 10 ppm, open cover and proceed with sampling. If reading is greater than 10 ppm, remove cover slowly and stand back to allow cover to ventilate. Measure air above the drum again after 5 minutes, and if readings are still above 10 ppm, contact that SSHO.	L
6. Collect sample waste	Worker could be exposed to chemical contaminants.	Wear required PPE. Visual inspection and ambient air monitoring will determine selection of PPE and respiratory protection. Decontaminate exteriors of sample containers. Avoid spills. Ensure spill cleanup supplies are available.	L

7. Replace container covers	Replacing drum lids may cause injury, particularly to fingers and hands.	Use care when replacing drum lids. Wear appropriate PPE.	L
	Worker could experience strain from use of tools.	Inspect all tools for damage before use. Do not use damaged tools. Mark and tag "out of service". Select hand tools to minimize the following stressors: chronic muscle contraction or steady force; extreme or awkward finger/hand/arm positions; repetitive forceful motions; or excessive gripping, pinching, or pressing with hands and fingers.	L
8. Pack samples for shipment	Manually moving materials and equipment could cause strains.	Use proper lifting techniques such as keeping the back straight, lifting with legs, limiting twisting, and getting help when moving bulky/heavy materials and equipment. Use hand truck when handling more than one box at a time. Try to pack shipping boxes so that each box does not exceed 60 pounds. Lifts greater than 50 lbs., especially repeated lifts, need to be evaluated and approved by a qualified person.	L
	Contents of sample containers could leak, causing exposure to worker and possibly people handling shipping box.	Ensure that each container top is securely tightened. Pack each container in a manner to prevent damage to container during handling of shipping box and during transportation. Ensure boxes meet required packaging standards based on mode of transportation used for shipping.	L
9. Decontaminate all reusable materials and equipment	Lifting of equipment and materials could cause strain to worker.	Use proper lifting techniques such as keeping back straight, lifting with legs, limiting twisting, and getting help when moving bulky/heavy items. Use hand truck if needed. Lifts greater than 50 lbs, especially repeated lifts, need to be evaluated and approved by a qualified person.	L
	Worker could be exposed to chemical contaminants	Avoid spills. Ensure that spill cleanup supplies are available. Wear required PPE and respiratory protection as specified in the SHSP. Visual inspection and ambient air monitoring will determine selection of PPE. Remove PPE properly and wash hands.	L
	Decontamination area may become slippery.	Visually inspect work areas and mark, barricade, or eliminate slip, trip, and fall hazards as feasible. Maintain proper illumination in all work areas. If decontaminating on plastic sheeting, use caution since plastic sheeting is extremely slippery. Wear steel-toed footwear with good traction.	L
10. Load containers for transport	Handling of containers can expose worker to injury (including, but not limited to, strains, lacerations, and pinch points.)	Ensure drums are individually properly labeled (new labels as appropriate based on analytical results) and that labels are visible when drums are placed on truck. Use truck that has "Tommy Lift" and move drum using drum dolly onto lift. Ensure drum is secure and will not roll when lift is raised. Wheel drum to appropriate location on truck for transport. Be sure to evenly distribute load weight on bed of truck. Secure drums in place on the truck. If drums are loaded with drum handling device attached to heavy equipment, stand way from truck when drum is placed on truck. Once drum is placed and "loader" moves away from truck, use drum dolly on truck to position drum. Avoid placing pallets of drums on truck unless pallets can be positioned where they will remain for transport.	L
	Worker could be struck by vehicles.	Wear high-visibility reflective vests at all times in work areas. Make eye contact with operators of vehicles. Post an observer, as needed, when loading drums close	M

		to busy streets. Use traffic controls or barricades, if necessary, to keep traffic away from workers.	
	Containers may leak.	Inspect all containers prior to transport. Have spill cleanup supplies and equipment readily available. Surface may become slippery. Wear work steel-toed footwear with good traction soles. Avoid exposure to material. Wear appropriate PPE. Clean up all spills immediately. Notify supervisor.	L

Equipment To Be Used	**Inspection Requirements**	**Training Requirements (as applicable) & Competent or Qualified Personnel Name(s)**
Personal protective equipment Hand tools Fire extinguishers, first aid kit Forklift Company Vehicles and Trailers Sampling Equipment/Containers Reach Fork Pallet Jacks Hand Tools PPE	Daily equipment inspections as per manufacturers Requirements Inspect drums/containers weekly Inspection of all emergency equipment (i.e., first aid kits, fire extinguishers)	Drivers must be licensed and insured Proper use of equipment Review AHA with all site personnel All workers must have appropriate OSHA training (minimum 40HR HAZWOPER). Waste drivers must have proper DOT training All workers must be trained in the use of required PPE. Competent / Qualified Personnel (SSHO): • Site Specific Initial Safety Orientation • Hand signal • Task kick-off meeting • Daily Toolbox Safety Meetings • Emergency Response Plan • Proper use of equipment and tools • First Aid/Cardiopulmonary Resuscitation training (at least two individuals onsite)

Activity Hazard Analysis (AHA)

Activity/Work Task: Tasks w/ Potential for Covid-19 Exposures	Overall Risk Assessment Code (RAC) (Use highest code)	**M**
Project Location: NASA's Jet Propulsion Laboratory located in Pasadena, California.	**Risk Assessment Code Matrix**	
Contract Number: W912PL21D0021	**Severity** / **Probability**	
Date Prepared: December 23, 2021		

Severity	Unlikely	Seldom	Occasional	Likely	Frequent
Catastrophic (I)	**M**	**H**	**H**	**E**	E
Critical (II)	**L**	**M**	**H**	**H**	**E**
Marginal (III)	**L**	**L**	**M**	**M**	**H**
Negligible (IV)	**L**	**L**	**L**	**L**	**M**

Prepared by (Name/Title): David Conner, SSHO

Reviewed by (Name/Title): Ben Headington, Alternate SSHO

Notes: (Field Notes, Review Comments, etc.):

Exposure to Coronavirus Disease 2019 (COVID-19) Hazard relevant to all Tasks.

Immediately inform SSHO or PM if sick, having symptoms or tested positive for Covid-19.

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.

RAC Chart

- **E = Extremely High Risk**
- **H = High Risk**
- **M = Moderate Risk**
- **L = Low Risk**

This AHA serves as the PPE hazard assessment certification as required by 29 CFR 1910.132.

Task Steps	Potential Hazards	Critical Safety Procedures and Controls	RAC

All tasks having potential contact with other employees.	Exposure to Coronavirus Disease 2019 (COVID-19)	(For more information, check the resources listed at the end of AHA.)
		
		Pre-Planning
		• Check local and state government health agencies regarding possible travel restrictions.
		• Carry Tidewater letter of essential employee status.
		• Personnel considered to be at higher risk of contracting the virus are not recommended for work. Conditions include:
		  • Older adults (aged 65 years and older)
		  • People who are immune-compromised
			M

		• People with moderate to severe asthma, chronic lung disease, or other respiratory condition. • People who have serious heart conditions. • People of any age with severe obesity (body mass index [BMI] ≥ 40) or certain underlying medical conditions, such as diabetes, renal failure, liver disease. • People who are pregnant should be monitored. • Personnel shall maintain at least 6-foot distance from each other.	
All Tasks listed in this AHA	Exposure to COVID-19 virus.	• Ensure all site workers don't congregate in groups of 10 or more. (Note: Some states have more restrictive policies.) • Personnel shall maintain at least 6-foot distance from each other. • Face cloth coverings (i.e. face masks) shall be worn when 6-foot distancing cannot be maintained, to the extent practicable. • Practice proper disinfecting protocol as outlined in Center for Disease Control (CDC) guidelines. o Frequently wash hands with soap and water for 20 seconds. o Always wash immediately after removing gloves. o Hand sanitizer: If soap and water are not available and hands are not visibly dirty, use an alcohol-based hand sanitizer that contains at least 60% alcohol. However, if hands are visibly dirty, always wash hands with soap and water. o Routinely disinfect surfaces before coming into contact with them. Wear disposable gloves and wash hands after removing. o Use CDC recommended disinfectants: 1. EPA-registered household disinfectant 2. Diluted household bleach solutions may be used if appropriate for the surface 3. Alcohol solutions with at least 70% alcohol • Practice proper personal hygiene habits: o Wash/sanitize hands after blowing one's nose, coughing, or sneezing. o Wash hands after using the restroom. o Wash hands before eating or preparing food. • Where possible, employees are encouraged to pack meals and snacks as needed for the project duration and avoid visiting stores and restaurants. If necessary, modify your schedule to avoid restaurants and public restrooms during peak, i.e., crowded, periods to minimize contact with the public. Use drive-through service for food pick-up if available. <u>Vehicle Use:</u> • Drive separately when possible. Minimize number of people in one vehicle. Avoid renting vehicles if possible. Use personal vehicles or company trucks when possible. If personal vehicles are used, they must be in good condition and fit for purpose. If sharing a vehicle occurs, roll down the windows to let air circulate. For projects of multiple days duration, plan on traveling home rather than staying in a hotel if this can be done in accordance with fatigue protocols.	**M**

		• Wipe down “touch point” surfaces frequently, including the steering wheel, door handles, shift lever, buttons, wiper and turn signal stalks, passenger and driver door armrests, grab handles, keys and seat adjusters. • Use appropriate cleaners for each surface type, particularly touch screens. • Have readily accessible: soap, water, paper towels and/or antibacterial wipes, hand sanitizer, and disposable gloves. • Use disposable gloves at gas stations or sanitize hands prior to re-entering the vehicle <u>Overnight Travel:</u> If overnight travel is unavoidable: • Call hotel in advance regarding any stay restrictions including delivery of shipments. • Wash hands after contact with front desk counters and touch screens, communal service utensils, and coffee machines/ dispensers. • Avoid common areas and fitness facilities. • Wipe down all touch point surfaces in hotel room with disinfectant or alcohol wipes including remote controls, alarm clocks and the landline phone, cabinet and drawer handles, doorknobs and door locks, light switches, desk surfaces and information booklets or brochures. • Wear gloves when handling packages that were sent to hotel. If unavoidable, store packages in designated area of hotel room. Wipe down package surfaces with disinfectant or wipes. Open cardboard packages and dispose of the boxes immediately in the recycling bin, wash hands. • Keep toiletries inside of a toiletry bag instead of unpacking them. • Put a "do not disturb" sign on door handle to prevent hotel staff from entering room to clean during the day. <u>Field Activities</u>: • Personnel shall maintain at least 6-foot distance from each other. Practice social distancing at tailgate meetings, meeting rooms, and job trailers. Limit the number of people in job trailers and other confined areas at any one time so that this distance can be maintained. If possible, hold meetings outside. If indoors, open window(s) for circulation. • Wipe down and disinfect equipment before use with soap or alcohol wipes. When possible, wear disposable gloves when handling tools or equipment.	

Equipment to be Used	Inspection Requirements	Training Requirements
First Aid/BBP Kit, Disinfecting materials to include wipes, sanitizer, soap.	Tailgate safety meeting Site-specific orientation	All Tidewater personnel receive CPR/First Aid training. Bloodborne Pathogens. Hazardous Communication.

Resources/Information on COVID 19	Website
CDC	https://www.cdc.gov/coronavirus/2019-ncov/index.html)
CDC Interim Guidance for Businesses and Employers	https://www.cdc.gov/coronavirus/2019-ncov/community/guidance-business-response.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fspecific-groups%2Fguidance-business-response.html
National Governors Association: Current Information On The Status Of COVID-19 In The United States And Abroad, What Actions States/Territories Have Taken To Address It, And The Latest Efforts By The Federal Government.	https://www.nga.org/coronavirus/
OSHA	https://www.osha.gov/SLTC/covid-19/

SAFETY AND HEALTH GUIDANCE
COVID-19 Infection Prevention in Construction

October 27, 2020

California employers are required to establish and implement an Injury and Illness Prevention Program (IIPP) to protect employees from all worksite hazards, including infectious diseases. This guidance does not impose any new legal obligations. It contains information for construction employers on ways to update their IIPPs to include information on employee training and preventing the spread of coronavirus (SARS-CoV-2), the virus that causes COVID-19, at construction sites. This is mandatory in most California workplaces since COVID-19 is widespread in the community.

Train Employees on COVID-19

Provide training in a form that is readily understandable by all employees on the following topics:

- Information related to COVID-19 from the Centers for Disease Control and Prevention (CDC) — check for updates frequently — including:
  - **What COVID-19 is and how it is spread**.
  - **Preventing the spread of COVID-19 if you are sick**.
  - **Symptoms of COVID-19 and when to seek medical attention**.
  - How an infected person can spread COVID-19 to others even when they don't feel sick.
- California's COVID-19 **Industry Guidance for Construction**.
- The importance of frequent hand-washing with soap and water (or using hand sanitizer as a last resort where employees cannot feasibly get to a sink or hand-washing station), including:
  - Following CDC guidelines to scrub for at least 20 seconds.
  - When employees arrive at work and before they leave work.
  - Before and after eating or using the toilet.
  - After close interaction with other persons.

  - After contacting shared surfaces, equipment or tools.
  - Before and after wearing masks or gloves.
  - After blowing nose or sneezing.

NOTE: Hand sanitizers must have at least 60% ethyl alcohol. They are less effective than hand-washing in preventing the spread of COVID-19 but can be used as an interim measure if a hand-washing station is not immediately available.

- Maintaining more than six feet of separation with others and eliminating close contact with others (see Physical Distancing information on next page).
- Methods to avoid touching eyes, nose and mouth.
- The mandatory use of cloth face coverings, as required by the **California Department of Public Health (CDPH) guidelines**, including:
  - Cloth face coverings are not personal protective equipment (PPE) and do not protect the person wearing the face covering.
  - **CDC has issued guidelines** that everyone should **use cloth face coverings** when around other persons.

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- Cloth face coverings can help protect people near the wearer, but do not replace the need for physical distancing and frequent hand-washing.
- Employees should wash or sanitize hands before and after using or adjusting face coverings.
- Face coverings should be washed after each shift and should be discarded if they no longer cover the nose and mouth, have stretched out or damaged ties or straps, cannot stay on the face, or have holes or tears.
- The employer is responsible for providing and ensuring employees use face covers at work.

- Coughing and sneezing etiquette, including covering a cough or sneeze with a tissue or a sleeve instead of a hand.
- Safely using **cleaners and disinfectants**, which includes:
  - Carefully following label directions.
  - The hazards of the cleaners and disinfectants used at the worksite.
  - Ventilation requirements.
  - Wearing personal protective equipment (such as gloves).
  - Ensuring cleaners and disinfectants are used in a manner that does not endanger employees.
- The importance of not coming to work if they have **symptoms of COVID-19** as described by the CDC, such as a fever or chills, cough, shortness of breath or difficulty breathing, fatigue, muscle or body aches, headache, new loss of taste or smell, sore throat, congestion or runny nose, nausea, vomiting, or diarrhea or if they live with or have had close contact with someone who has been diagnosed with COVID-19.
- To seek medical attention if the symptoms become severe, including persistent pain or pressure in the chest, confusion, or bluish lips or face. Updates and further details are available on **CDC's webpage**.
- Use repeated safety stand-downs or toolbox/tailgates — while maintaining physical distancing — to re-emphasize the training.
- Designate a site-specific COVID-19 officer at every job site to observe and ensure site workers are implementing what they have been trained to do.
- Information on employer or government-sponsored leave benefits the employee may be entitled to receive that would make it financially easier to stay at home. See additional information on **government programs supporting sick leave and workers' compensation for COVID-19**, including employees' sick leave rights under the **Families First Coronavirus Response Act**, and employees' rights to workers' compensation benefits and presumption of the work-relatedness of COVID-19 pursuant to the **Governor's Executive Order N-62-20** while that Order is in effect. Some cities and counties also require employers to provide sick leave benefits to employees.

Increase Cleaning and Disinfection

Establish and implement the following procedures to help prevent the spread of COVID-19:

- Make hand-washing stations more readily available and encourage their use.
- Employers should change productivity expectations to allow extra time for employees to wash their hands thoroughly and frequently.
- Establish procedures to routinely clean and disinfect commonly touched surfaces and objects (e.g., door handles, steering wheels, touch screens, mobile equipment controls, carts, shared power tools) throughout the workday, including:
  - Using disinfectants that are **EPA-approved** for use against the virus that causes COVID- 19.
  - Providing EPA-registered disposable wipes for employees to wipe down commonly used surfaces before and after use.
  - Following the manufacturer's instructions for all cleaning and disinfection products (e.g., safety requirements, protective equipment, proper dilution, contact time).
  - Following safe work practices such as never mixing products together and using adequate ventilation.

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- Cleaning visibly dirty surfaces first before disinfection. Disinfectants are less effective if used on soiled surfaces.
- Ensuring there are adequate supplies to support cleaning and disinfection practices, including cleaning products and tools and chemical resistant gloves. Make sure disinfectants are available to workers throughout the worksite.
- Cleaning and disinfecting vehicles between shifts and between workers.

Increase Physical Distancing

When used with face covers, physical distancing, also referred to as social distancing, is an infection control measure that can stop or slow down the spread of an infectious disease by limiting contact between people. Use the following distancing measures:

- Practice physical distancing at all times, including during work, breaks and in vehicles.
- Plan for office staff to have the ability to work from home.
- Stagger break and lunch times and spread out where employees spend their breaks by providing additional seating and shade areas.
- Limit crew size by staggering or increasing the number of work shifts.
- Maintain separation of six feet or more during work:
  - Limit the number of employees gathered at the start of a shift, in break areas or during trainings and other meetings to allow employees to spread out.
  - Limit the number of personnel riding construction passenger elevators at one time.
  - Ensure employees allow for at least 6 feet of clearance between each other when lining up for the lunch truck and restrooms.
  - Hold meetings electronically rather than in person whenever possible.
  - Perform job interviews and orientations over the phone or using video conferencing.
  - Identify choke points where workers are forced to stand together (e.g. hallways, hoists, buses) and control them.
  - Provide additional seating and shade structures.
- If employees are dispatched from a hiring hall, encourage the hiring hall to implement physical distancing measures, such as using additional locations for dispatch.
- Limit interaction with other contractors.
  - Where possible, limit the number of trades in the same area at the same time.
  - Maintain distance during interactions and deliveries.
- Encourage employees to avoid large gatherings and practice physical distancing during non-work hours.
- Create specific instructions for deliveries to your worksites.
  - Establish a drop-off location and all the procedures to be used at the drop-off point.
  - Create signage to easily identify drop-off points. Include contact information on the signs to assist with questions leading up to delivery and upon arrival.
  - Create procedures to disinfect deliveries, such as wiping down boxes and delivered items.
- Provide alternative methods to reduce the spread of infection when physical distancing is not possible. Engineering controls such as physical barriers between workers and face coverings can help reduce community spread of the virus.
- In addition to physical distancing, provide face coverings or ensure employees use their own face coverings. Ensure they are used in accordance with **CDPH** and **CDC** guidelines.

At this time, health experts do not recommend the use of respirators by the general public for protection against COVID-19.However, employers must provide them to workers in the construction industry when needed to protect against other respiratory hazards.

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Ensure Good Hygiene Practices

Ensure toilets and hand-washing facilities are readily accessible to all employees at all times.

Employers should adjust productivity expectations to allow extra time for employees to thoroughly and frequently wash their hands.

- Restrooms must be clean and sanitary.
- Hand-washing facilities must be located at or near the restrooms.
- Soap or other suitable cleansing agent and single-use towels must be provided.
- Additional hand-washing supplies should be placed as close to work areas and break areas as possible to allow for frequent hand-washing.
- Encourage more frequent hand-washing.
- Encourage more thorough hand-washing. Hands should be washed with soap and water for at least 20 seconds.
- For delivery drivers, normally accessible restrooms on routes (e.g., restaurants, coffee shops) may be closed. Employers should provide employees alternative restroom locations and allow time for employees to use them.
- If employees have limited access to hand-washing or hand sanitizing, employees as a last resort can use disposable gloves to limit hand contact with potentially contaminated surfaces. Employers should encourage employees to change gloves frequently and before touching their face, smoking, eating or using the restroom. In addition, provide an adequate supply of gloves and make them readily available. Employees should wash or sanitize hands as soon as possible after removing gloves.
- Provide hand sanitizer throughout worksites and to delivery drivers for times when access to soap and water may be limited.
- If respirators and other PPE are worn to protect against other hazards at work, hands should be washed before putting on PPE and after taking it off. Reusable PPE should be cleaned and sanitized per manufacturers' instructions.

Implement Safe Work Practices

- Limit the sharing of tools as much as possible. If tools must be shared try to group them to be used by people who reside together or travel to work together. Shared tools must be sanitized between users.
- If fans or other means of ventilation are used on the job, place them to avoid blowing air from one worker or group of workers to another.
- Encourage workers to drive to worksites or parking areas by themselves. They should avoid having passengers or carpooling together unless they are already sheltering in place together. If carpooling cannot be avoided riders should sit as far apart as possible, wear face coverings and wash hands after the trip.
- Discourage shaking hands.
- Discourage the sharing of food and water. Provide single use bottles rather than using shared water stations or dispensers.

What to do with Workers Who Might Be Sick with COVID-19

- Immediately send employees with **COVID-19 symptoms** home or to medical care as needed.
- Actively encourage sick employees to stay home.
- Ensure employees who received a COVID-19 diagnosis return to work only after meeting the criteria in the **CDPH Guidance on Returning to Work or School Following COVID-19 Diagnosis**.
- Ensure employees who return to work following an illness promptly report any recurrence of symptoms.
- Employees who are well but who have a sick family member at home with COVID-19 should notify their supervisor and follow **CDC-recommended precautions**.

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- Encourage sick workers to stay home by implementing work policies that do not penalize workers for missing work because they have been diagnosed with COVID-19. Consider paid sick leave benefits to help prevent the spread among workers who might otherwise work out of economic necessity. Educate eligible employees on other benefits they can access if symptoms, illness or caring for an ill family member prevents them from working.
- The **Families First Coronavirus Response Act** requires certain employers to provide employees with paid sick leave or expanded family and medical leave for specified reasons related to COVID-19. Certain counties and cities also require employers to provide sick leave benefits to workers.
- If someone goes home because they are sick, the area where the person worked and the tools and equipment they used should be disinfected prior to use by others.
- Establish procedures to notify local health officials upon learning that someone has a COVID-19 infection. These officials will help employers determine a course of action.
- Employers can implement health screening programs to ensure that employees showing up to work are healthy. Employers may choose to prohibit employees with a high temperature (100.4 degrees F or higher) from entering the worksite. Train employees on self-screening before they come to work. If conducting workplace screening, provide employees performing screening with appropriate personal protective equipment. In light of personal protective equipment shortages, use gloves, eye protection and a face covering. Have screened employees wear a face covering or cover their nose and mouth with cloth or other material during screening. Use touchless thermometers. Ensure screeners maximize their distance from the employee being screened.

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Additional COVID-19 Resources for Construction

- **California Coronavirus (COVID-19) Response**
- California Coronavirus (COVID-19) Response. **COVID-19 Industry Guidance: Construction**
- California Division of Occupational Safety and Health. **Cal/OSHA Interim Guidelines for General Industry on 2019 Novel Coronavirus Disease (COVID-19)**
  - **Cal/OSHA Injury and Illness Prevention Program**
  - **Log 300 recordkeeping requirements**
  - Reporting Work-Connected Injuries - **Section 342**
- California Department of Public Health. **Asthma-Safer Cleaning and Disinfecting**
- California Department of Public Health. **Guidance for the Use of Face Coverings**
- California Department of Public Health. **Guidance on Returning to Work or School Following COVID-19 Diagnosis**
- California Labor and Workforce Development Agency. **Coronavirus 2019 (COVID-19) Resources for Employers and Workers**
- Centers for Disease Control and Prevention. **Coronavirus Disease (COVID-19)**
  - Centers for Disease Control and Prevention. **What Construction Workers Need to Know about COVID-19**
  - Centers for Disease Control and Prevention. Coronavirus Disease (COVID-19): **How It Spreads**
  - Centers for Disease Control and Prevention. Coronavirus Disease (COVID-19): **Interim Guidance for Businesses and Employers**
  - Centers for Disease Control and Prevention. Coronavirus Disease (COVID-19): **Recommendation Regarding the Use of Cloth Face Coverings**
  - Centers for Disease Control and Prevention. Coronavirus Disease (COVID-19): **Steps to help prevent the spread of COVID-19 if you are sick**
  - Centers for Disease Control and Prevention. Coronavirus Disease (COVID-19): **Symptoms**
  - Centers for Disease Control and Prevention. Coronavirus Disease. **Discontinuation of Isolation for Persons with COVID-19 Not in Healthcare Settings (Interim Guidance)**
  - Centers for Disease Control and Prevention. Coronavirus Disease (COVID-19): **Cleaning and Disinfecting Your Facility**
- Federal OSHA: **COVID-19**
- Federal OSHA: **COVID-19 - Control and Prevention/Construction Work**
- Federal OSHA: **Protecting Workers Who Use Cleaning Chemicals**
- Los Angeles County: **COVID-19: What you need to know about cloth face coverings**
- New York Times: **How to Stop Touching Your Face**
- Ohio Department of Health. COVID-19 Information for Businesses and Employers: **Screening Employees for COVID-19**
- The Center for Construction Research and Training (CPWR): COVID-19 Resources (**English**), (**Spanish**)
- U.S. Environmental Protection Agency: **Disinfectants for Use Against SARS-CoV-2** (the virus that causes COVID-19)
- U.S. Department of Labor. **Families First Coronavirus Response Act: Employee Paid Leave Rights**

Guidance Revision and Updates

- July 20, 2020: Added information on the use of face coverings as reflected in the June 18, **CDPH Face Covering Guidance**. Also added information on the government-sponsored leave benefits and Governor's Executive Order N-62-20.
- October 27, 2020: Updated criteria for when to return to work after a COVID-19 diagnosis, adding reference to **CDPH Guidance on Returning to Work or School Following COVID-19 Diagnosis**.

COVID-19 INDUSTRY GUIDANCE:

Construction

July 29, 2020

covid19.ca.gov

CALIFORNIA ALL
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OVERVIEW

On March 19, 2020, the State Public Health Officer and Director of the California Department of Public Health issued an order requiring most Californians to stay at home to disrupt the spread of COVID-19 among the population.

The impact of COVID-19 on the health of Californians is not yet fully known. Reported illness ranges from very mild (some people have no symptoms) to severe illness that may result in death. Certain groups, including people aged 65 or older and those with serious underlying medical conditions, such as heart or lung disease or diabetes, are at higher risk of hospitalization and serious complications. Transmission is most likely when people are in close contact or in a poorly ventilated area with an infected person, even if that person does not have any symptoms or has not yet developed symptoms.

Precise information about the number and rates of COVID-19 by industry or occupational groups, including among critical infrastructure workers, is not available at this time. There have been multiple outbreaks in a range of workplaces, indicating that workers are at risk of acquiring or transmitting COVID-19 infection. Examples of these workplaces include hospitals, long-term care facilities, prisons, food production, warehouses, meat processing plants, and grocery stores.

As stay-at-home orders are modified, it is essential that all possible steps be taken to ensure the safety of workers and the public.

Key prevention practices include:

- ✓ physical distancing to the maximum extent possible,
- ✓ use of face coverings by workers (where respiratory protection is not required) and customers/clients,
- ✓ frequent handwashing and regular cleaning and disinfection,
- ✓ training workers on these and other elements of the COVID-19 prevention plan.

In addition, it will be critical to have in place appropriate processes to identify new cases of illness in workplaces and, when they are identified, to intervene quickly and work with public health authorities to halt the spread of the virus.

PURPOSE

This document provides guidance for the construction industry to support a safe, clean environment for workers. The guidance is not intended to revoke or repeal any worker rights, either statutory, regulatory or collectively bargained, and is not exhaustive, as it does not include county health orders, nor is it a substitute for any existing safety and health-related regulatory requirements such as those of Cal/OSHA.[1] Stay current on changes to public health guidance and state/local orders, as the COVID-19 situation continues. Cal/OSHA has more safety and health guidance on their Cal/OSHA COVID-19 Infection Prevention for Construction

Employers and Workers webpage. CDC has additional guidance for businesses and employers.

Required Use of Face Coverings

On June 18, CDPH issued Guidance on the Use of Face Coverings, which broadly requires the use of face coverings for both members of the public and workers in all public and workplace settings where there is a high risk of exposure.

People in California must wear face coverings when they are engaged in work, whether at the workplace or performing work off-site, when:

- Interacting in-person with any member of the public;
- Working in any space visited by members of the public, regardless of whether anyone from the public is present at the time;
- Working in any space where food is prepared or packaged for sale or distribution to others;
- Working in or walking through common areas, such as hallways, stairways, elevators, and parking facilities;
- In any room or enclosed area where other people (except for members of the person's own household or residence) are present when unable to physically distance; or,
- Driving or operating any public transportation or paratransit vehicle, taxi, or private car service or ride-sharing vehicle when passengers are present. When no passengers are present, face coverings are strongly recommended.

Complete details, including all requirements and exemptions to these rules, can be found in the guidance. Face coverings are strongly encouraged in other circumstances, and employers can implement additional face covering requirements in fulfilling their obligation to provide workers with a safe and healthful workplace. Employers must provide face coverings to workers or reimburse workers for the reasonable cost of obtaining them.

Employers should develop an accommodation policy for any worker who meets one of the exemptions from wearing a face covering. If a worker who would otherwise be required to wear a face covering because of frequent contact with others cannot wear one due to a medical condition, they should be provided with a non-restrictive alternative, such as a face shield with a drape attached to the bottom edge, if feasible, and if the medical condition permits it.

Businesses that are open to the public should be cognizant of the exemptions to wearing face coverings in the CDPH Face Covering Guidance and may not exclude any member of the public for not wearing a face covering if that person is complying with the guidance. Businesses will need to develop policies for handling these exemptions among customers, clients, visitors, and workers.

Worksite Specific Plan

- Establish a written, worksite-specific COVID-19 prevention plan at every location, perform a comprehensive risk assessment of all work areas and work tasks, and designate a person at each establishment to implement the plan.
- Incorporate the CDPH Face Covering Guidance into the Workplace Specific Plan and include a policy for handling exemptions.
- Identify contact information for the local health department where the operation is located for communicating information about COVID-19 outbreaks among workers or customers.
- Train and communicate with workers and worker representatives on the plan and make the plan available to workers and their representatives.
- Regularly evaluate the establishment for compliance with the plan and document and correct deficiencies identified.
- Investigate any COVID-19 illness and determine if any work-related factors could have contributed to risk of infection. Update the plan as needed to prevent further cases.
- Implement the necessary processes and protocols when a workplace has an outbreak, in accordance with CDPH guidelines.
- Identify close contacts (within six feet for 15 minutes or more) of an infected worker and take steps to isolate COVID-19 positive worker(s) and close contacts.
- Adhere to the guidelines below. Failure to do so could result in workplace illnesses that may cause operations to be temporarily closed or limited.

Topics for Worker Training

- Information on COVID-19, how to prevent it from spreading, and which underlying health conditions may make individuals more susceptible to contracting the virus.
- Self-screening at home, including temperature and/or symptom checks using CDC guidelines.
- The importance of not coming to work:
    - If a worker has symptoms of COVID-19 as described by the CDC, such as a fever or chills, cough, shortness of breath or

difficulty breathing, fatigue, muscle or body aches, headache, new loss of taste or smell, sore throat, congestion or runny nose, nausea, vomiting, or diarrhea, OR

- If a worker was diagnosed with COVID-19 and has not yet been released from isolation, OR
- If, within the past 14 days, a worker has had contact with someone who has been diagnosed with COVID-19 and is considered potentially infectious (i.e. still on isolation).

- To return to work after a worker receives a COVID-19 diagnosis only if 10 days have passed since symptoms first appeared, their symptoms have improved, and the worker has had no fevers (without the use of fever reducing medications) for the last 72 hours. A worker without symptoms who was diagnosed with COVID-19 can return to work only if 10 days have passed since the date of the first positive COVID-19 test.
- To seek medical attention if their symptoms become severe, including persistent pain or pressure in the chest, confusion, or bluish lips or face. Updates and further details are available on CDC's webpage.
- The importance of frequent handwashing with soap and water, including scrubbing with soap for 20 seconds (or using hand sanitizer with at least 60% ethanol (preferred) or 70% isopropanol (if the product is inaccessible to unsupervised children) when workers cannot get to a sink or handwashing station, per CDC guidelines).
- The importance of physical distancing, both at work and off work time (see Physical Distancing section below).
- Proper use of face coverings, including:
  - Face coverings do not protect the wearer and are not personal protective equipment (PPE).
  - Face coverings can help protect people near the wearer, but do not replace the need for physical distancing and frequent handwashing.
  - Face coverings must cover the nose and mouth.
  - Workers should wash or sanitize hands before and after using or adjusting face coverings.
  - Avoid touching the eyes, nose, and mouth.
  - Face coverings must not be shared and should be washed or discarded after each shift.
- Information contained in the CDPH Guidance for the Use of Face

Coverings, which mandates the circumstances in which face coverings must be worn and the exemptions, as well as any policies, work rules, and practices the employer has adopted to ensure the use of face coverings. Training should also include the employer's policies on how people who are exempted from wearing a face covering will be handled.

- Ensure any independent contractors, temporary, or contract workers at the worksite are also properly trained in COVID-19 prevention policies and have necessary supplies and PPE. Discuss these responsibilities ahead of time with organizations supplying temporary and/or contract workers.

- Information on paid leave benefits the worker may be entitled to receive that would make it financially easier to stay at home. See additional information on government programs supporting sick leave and workers' compensation for COVID-19, including workers' sick leave rights under the Families First Coronavirus Response Act and the Governor's Executive Order N-51-20, and workers' rights to workers' compensation benefits and presumption of the work-relatedness of COVID-19 pursuant to the Governor's Executive Order N-62-20 while that Order is in effect.

Individual Control Measures and Screening

- Provide temperature and/or symptom screenings for all workers at the beginning of their shift and any vendors, contractors, or other workers entering the establishment. Make sure the temperature/symptom screener avoids close contact with workers to the extent possible.

- If requiring self-screening at home, which is an appropriate alternative to providing it at the establishment, ensure that screening was performed prior to the worker leaving the home for their shift and follows CDC guidelines, as described in the Topics for Worker Training section above.

- Encourage workers who are sick or exhibiting symptoms of COVID-19 to stay home.

- Employers must provide and ensure workers use all required protective equipment, including eye protection and gloves where necessary.

- Employers should consider where disposable glove use may be helpful to supplement frequent handwashing or use of hand sanitizer; examples are for workers who are screening others for symptoms or handling commonly touched items.

- Non-workers entering the jobsite should be restricted to only those classified as essential by management and they must complete a temperature and/or symptom screening before entering.

Cleaning and Disinfecting Protocols

- Perform thorough cleaning on high traffic areas such as break rooms, lunch areas, and changing areas, and areas of ingress and egress including, stairways and stairwells, handrails, elevators controls and frequently disinfect commonly used surfaces, including, doorknobs, toilets, handwashing facilities, etc.
- Clean touchable surfaces between shifts or between users, whichever is more frequent, including but not limited to working surfaces, tools, handles and latches, and controls on stationary and mobile equipment, including surfaces in the cabs of all vehicles.
- Require workers to wash hands or use sanitizer between the use of shared equipment, such as workstation tools, radios, time clocks, mobilized carts, and other items and allow paid work time to do so.
- Require that employer-owned and controlled equipment, such as hard hats and any face shields, be sanitized at the end of each shift. Clean and disinfect the inside of the equipment, then the outside, then wash hands.
- Encourage workers who own their own hard hats to follow the same cleaning protocol and provide the proper cleaning and sanitation products. Allow paid work time to complete such cleaning.
- Avoid sharing phones, office supplies, other work tools, or handheld mobile communications equipment wherever possible. Individually-assigned peripheral equipment (keyboards, handsets, headsets, chairs, etc.) should be provided wherever possible. If necessary, clean and disinfect them before and after each use. Never share PPE.
- Provide time for workers to implement cleaning practices during their shift. Cleaning assignments should be assigned during working hours as part of the worker's job duties.
- Ensure that sanitary facilities stay operational and stocked at all times and provide additional soap, paper towels, and hand sanitizer when needed.
- Provide additional sanitary facilities (including portable toilets and handwashing stations) if feasible and necessary to maintain physical distancing during scheduled breaks.
- Install hands-free devices, if possible, including motion sensor sinks, soap dispensers, sanitizer dispensers, and paper towel dispensers.
- To minimize the risk of Legionnaires' disease and other diseases

associated with water, take steps to ensure that all water systems and features are safe to use after a prolonged facility shutdown.

- When choosing disinfecting chemicals, employers should use products approved for use against COVID-19 on the Environmental Protection Agency (EPA)-approved list and follow product instructions. Use disinfectants labeled to be effective against emerging viral pathogens, diluted household bleach solutions (5 tablespoons per gallon of water), or alcohol solutions with at least 70% alcohol that are appropriate for the surface. Provide workers training on the chemical hazards, manufacturer's directions, ventilation requirements, and Cal/OSHA requirements for safe use. Workers using cleaners or disinfectants should wear gloves and other protective equipment as required by the product instructions. Follow the asthma-safer cleaning methods recommended by the California Department of Public Health and ensure proper ventilation.
- Consider installing portable high-efficiency air cleaners, upgrading the building or construction trailer's air filters to the highest efficiency possible, and making other modifications to increase the quantity of outside air and ventilation in work and break areas.

Physical Distancing Guidelines

- Implement measures to ensure physical distancing of at least six feet between workers. These can include use of physical partitions or visual cues (e.g., floor markings or signs to indicate to where workers should stand). Reassign personal staging areas to increase distance between workers. Designate separate entrance and exits and post signage to this effect.
- Adjust on-site meetings to ensure physical distance and instead implement smaller individual safety meetings at the jobsite to maintain physical distancing guidelines. Transition other meetings and interviews to phone or digital platforms or hold outside or in a space allowing for at least six feet of physical distance between workers.
- Consider offering workers who request modified duties options that minimize their contact with any customers or other workers (e.g., managing inventory rather or managing administrative needs through telework).
- Utilize work practices, when feasible and necessary, to limit the number of workers on the jobsite at one time. This may include scheduling (e.g. staggering shift start/end times) or rotating crew access to a designated area during a shift. Stage the jobsite to stagger work and limit overlap of work crews. Place additional limitations on the number of workers in enclosed areas, where six feet of separation may not be

sufficient to limit transmission of the virus.

- Stagger worker breaks, within compliance with wage and hour regulations, to maintain physical distancing protocols.
- Close breakrooms, use barriers, or increase distance between tables/chairs to separate workers and discourage congregating during breaks. Where possible, create outdoor break areas with shade covers and seating that ensures physical distancing.
- Workers should consider bringing a lunch made at home or purchase take out or delivery where available as long as they can avoid congested areas.
- Use the following hierarchy to prevent transmission of COVID-19 in production and other work areas: engineering controls, administrative controls, and PPE.
    - Engineering controls include creating physical or spatial barriers between workers such as Plexiglas or other sturdy and impermeable partitions. Where appropriate, install such barriers in offices to create separation between workers.
    - Administrative controls include slowing operations and increasing shifts, within safety requirements, and ensuring adequate time for proper cleaning and disinfection protocols.
    - PPE includes face shields, some types of masks, and impermeable gloves. Note that some disposable equipment, such as respirators, are prioritized for health care workers and workers that handle pathogens and should not otherwise be used. If those are in use, consider changing to reusable elastomeric respirators to conserve supplies for healthcare facilities.

[1]Additional requirements must be considered for vulnerable populations. Employers must comply with all Cal/OSHA standards and be prepared to adhere to its guidance as well as guidance from the Centers for Disease Control and Prevention (CDC) and the California Department of Public Health (CDPH). Additionally, employers must be prepared to alter their operations as those guidelines change.

APPENDIX B
Site Safety Health Officer Qualifications

David Conner, PG – Senior Geologist/Project Manager

Job Title(s): Senior Geologist; Project Manager; Site Safety Health Officer

Education:

- BS, Geology, University of Wisconsin - Milwaukee, 1997

Certifications/Training:

- California Professional Geologist #8868, Florida Professional Geologist #2860, and Texas Professional Geologist #15058
- OSHA 40-Hr HAZWOPER with current 8-Hr refresher
- OSHA 10-Hr Construction and Safety
- OSHA 30-Hr Construction Industry Outreach Training
- OSHA 8-Hr Training for Supervisors
- Confined Space Awareness
- Hearing Conservation Training
- USACE 10-Hr and 40-Hr EM-385-1-1 Training
- USACE CQM Training
- American Red Cross Standard First Aid, Adult CPR with AED

Qualifications:

- Over 20 years of remedial investigation and site assessment experience; remedial system construction, operation, and optimization throughout the US
- 23 years of long-term groundwater monitoring and optimization for private sector, US Navy, NASA, and USACE
- 17 years of groundwater injection well installation, operation, and maintenance
- 18 years of large-scale construction oversight
- 12 years of drinking water treatment system construction, operation, and testing
- Extensive US Navy and NASA environmental restoration experience

Selected Experience:

Project Manager, Jet Propulsion Laboratory (JPL) CERCLA Cleanup Program, NASA, Pasadena, CA (2004-present) – Project manager and lead geologist for this CERCLA NPL site in Pasadena, CA. Supervises project-related activities, including perchlorate and chlorinated solvent remediation; groundwater monitoring (including Westbay® deep multi-port), injection, and extraction well installation, development and testing; long-term groundwater monitoring, reporting, and optimization; construction, operation, and maintenance of a 300 gpm source area treatment system; injection and drinking water production well rehabilitation; construction, startup, testing, and permitting of NASA-funded 7,000 gpm drinking water treatment system operated by City of Pasadena Department of Water and Power (PWP); preparation of project documentation including quarterly groundwater monitoring reports, Work Plans, SSHPs/APPs, SAPs, etc.; development of CERCLA documents including, but not limited to: operation and progress reports, IROD, ROD, FS, Five Year Review, etc.; public meeting participation; interaction with community members; and partnering with multiple regulatory entities.

JPL CERCLA Cleanup, NASA, Task Manager (2009 – 2012)
OU-3 Monk Hill Treatment System (MHTS)
Lead geologist/construction superintendent providing onsite technical leadership, management, and support during the construction, startup and testing, and California Department of Public Health (CDPH) permitting of a 7,000 gpm drinking water treatment system (ion exchange and granular activated carbon). Provided oversight of the rehabilitation of four City of Pasadena drinking water supply wells with flow rates between 1,400 – 2,200 gpm. Responsible for schedules, budgets, deliverables, health and safety, and permit compliance. Actively managed project staff and subcontractors. The project addresses elevated perchlorate and VOC groundwater contamination that is considered by the CDPH to be an "extremely impaired" drinking water source. The system has been serving City of Pasadena customers since 2011.

JPL CERCLA Cleanup, NASA, Task Manager (2007 – Present)
OU-1/OU-3 Long-Term Groundwater Monitoring Program
Lead geologist managing the long-term groundwater monitoring program that consists of 82 sample locations from ten shallow and fifteen deep multi-port (Westbay®) monitoring wells. Responsible for schedules, budgets, subcontracts, quarterly technical memoranda, and groundwater optimization. Actively manage project staff and subcontractors. The project addresses perchlorate and VOC groundwater contamination.

JPL CERCLA Cleanup, NASA, Geologist (2006 – Present)
OU-1 Source Area Treatment System
Lead geologist providing technical support and leadership for the operation of the 300 gpm groundwater bioremediation treatment system (fluidized bed reactor) which includes three extraction and three injection wells. Applied biofouling and well plugging research and rehabilitation techniques to improve injection well performance. Provided oversight of 13 rehabilitation events, and led the design of the newest injection well at the NASA-JPL facility. Successful operation and maintenance of the injection wells has allowed further reduction in source area contamination. The project addresses perchlorate and VOC groundwater contamination.

Onsite Occupational Training

This is to certify that

David J. Conner

has successfully completed Onsite's 40 hour HAZWOPER training and is in compliance with 29 CFR 1910.120(e). This also represents completion of training in Confined Spaces Level A, B, C, D Ensemble.

At

Milwaukee, WI

On

6/4/98

Expiration Date

6/3/99

ONSITE
OCCUPATIONAL TRAINING

921 Elkridge Landing Road, Linthicum, MD 21090

Certificate Number: AMWI060498-004

Greg Stannard
Director, Safety & Security

Certificate of Completion

This certifies that

David Conner

has successfully completed

8 Hour HAZWOPER Refresher Training

Refresher certification does NOT necessarily indicate initial 24 or 40 Hour HAZWOPER certification

In Accordance w/Federal OSHA Regulation 29 CFR 1910.120(e) & (p)

And all State OSHA/EPA Regulations as well including 29 CFR 1926.65 for Construction.

This course (Version 3) is approved for 8 Contact Hours (0.8 CEUs) of continuing education per the California Department of Public Health for Registered Environmental Health Specialist (REHS) (Accreditation # 044).

Safety Unlimited, Inc., Provider #5660170-2, is accredited by the International Association for Continuing Education and Training (IACET) and is accredited to issue the IACET CEU. As an IACET Accredited Provider, Safety Unlimited, Inc. offers CEUs for its programs that qualify under the ANSI/IACET Standard. Safety Unlimited, Inc. is authorized by IACET to offer 0.8 CEUs for this program.

Julius P. Griggs

Julius P. Griggs
Instructor #892

2107225163606

Certificate Number

7/22/2021

Issue Date

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https://www.safetyunlimited.com

Proof of initial certification and subsequent refresher training is NOT required to take refresher training

American Red Cross
Training Services

Certificate of Completion

DavidConner

has successfully completed requirements for

1-year Provisional Certification for Adult First Aid/ CPR/AED. The skills portion must be taken within 1- year of completing the online course to receive a 2-year Red Cross certification.

Date Completed:6/30/2021
Validity Period: 1-Years

Conducted by: American Red Cross

To verify certificate, scan code or visit redcross.org/digitalcertificate and enter ID.

Learn and be inspired at LifesavingAwards.org

00JTJ7I

American Red Cross
Training Services

Certificate of Completion

DavidConner

has successfully completed requirements for

Bloodborne Pathogens Training

Date Completed:10/25/2021
Validity Period: 1-Years

Conducted by: American Red Cross

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00P9UDC

Certificate of Completion

DAVID CONNER

This is to certify that the person named above has successfully completed

NSC Distracted Driving Course

Course Completion Date: 12/9/2016 3:36:39 PM EST.

Office Code: 32B9B3C61D37489586B9D59075567ED2

Professional Development Associates -PDASA- Course Administrator

**** This certificate is solely for the use by the name listed above. Any modification to this certificate is strictly prohibited ****

-- Print --

[Close Window]

U.S. ARMY CORPS OF ENGINEERS

USACE LEARNING CENTER
HUNTSVILLE, ALABAMA

NAVFAC

CERTIFICATE

David J. Conner

SW9-02-20-00041

has completed the Corps of Engineers and Naval Facility Engineering Command Training Course

CONSTRUCTION QUALITY MANAGEMENT FOR CONTRACTORS - #784

San Diego, California	1/30/20 - 1/31/20	SW9 - NAVFAC Southwest	Michael Haliburton PMP , PE
Location	Training Date(s)	Instructional District/ NAVFAC	CQM-C Manager

Kugan Panchadsaram PE	kugan@kugan.com	858-212-2941	
Facilitator/Instructor	Email	Telephone	Facilitator/Instructor Signature

THIS CERTIFICATE EXPIRES FIVE YEARS FROM DATE OF ISSUE
CQM-C Recertification online course: https://www.myuln.net

Chief, USACE Learning Center
Jeffrey D. Dziedzic

Certificate Of Completion

OSHA® TRAINING CENTER | AT CHABOT-LAS POSITAS COMMUNITY COLLEGE DISTRICT

American Safety Council

DAVID CONNER

Has diligently and with merit completed the

40-Hour EM 385-1-1 Hazard Recognition Online on 1/28/2015

CHABOT LAS POSITAS COMMUNITY COLLEGE DISTRICT

Association of
Bay Area Governments

ABAG Training Center
www.hazmatschool.com

CERTIFICATE OF COMPLETION

David Conner

has successfully completed the course titled

OSHA 2-hour Hazard Communication with GHS

Satisfies 29 CFR 1910.1200

on

February 9, 2015

and has earned

0.2 CEUs (Continuing Education Units) (2Course hours) from the program

Certificate No. 117279
(verify at www.hazmatschool.com)

Brian Kirking, Training Director
Michelle McDaniels, Training Coordinator
www.abag.ca.gov; (510) 464-7964

Paul W. Gantt, CSP, CET
Safety Compliance Management, Inc.

360training™
13801 N. Mo-Pac Expwy Ste 100 austin, texas 78727
P: 888-360-TRNG - F: 512.441.1149 - E: info@360training.com

DAVID CONNER
65 WEST DAYTON STREET
PASADENA, CA 91105

Dear David:

Thank you for taking the 30-Hour Construction OSHA course! It was our pleasure to help you further your success.

Enclosed, you will find your Department of Labor (DOL) card.

If you have any questions, please do not hesitate to contact us at 1.888.318.3497 or e-mail us at safety@360training.com.

Kind Regards,

360training Team

Certificate of Completion

OSHAcampus.com™

powered by 360training.com

This Certifies That

David J Conner

is awarded this certificate for

.OSHA - 10 Hour Construction Industry Outreach Training Program

Credit Hours: 10

Completion Date: 08/24/2006 15:01 CST

Certificate Number: 853946

AUTHORIZED IACET PROVIDER

Student Signature

Michael Millsap

Michael Millsap, Trainer C 0034819 and G 0021414

360training.com, Inc. has been approved as an Authorized Provider by the International Association for Continuing Education and Training (IACET), 1760 Old Meadow Road, Suite 500, McLean, VA 22102; (703) 506-3275.

Association of
Bay Area Governments

ABAG Training Center
www.hazmatschool.com

CERTIFICATE OF COMPLETION

David Conner

has successfully completed the course titled

OSHA 8-hr Training for Supervisors

Satisfies 29 CFR 1910.120(e)(4)
on
October 12, 2006

and has earned
IACET authorized 0.8 CEUs (Continuing Education Units) from the program

Certificate No 51626
(verify at www.hazmatschool.com)

Brian Kirking, Training Director
Sharon McCreadie, Training Coordinator
www.abag.ca.gov; (510) 464-7964

Paul W. Gantt, REA
Safety Compliance Management, Inc.

Ben Headington, PMP

Job Title(s):
Site Superintendent/ Site Safety and Health Officer

Education:
- BA, Business Communications, Ohio State University, 2003

Certifications/Training:
- Project Management Professional (PMP) certification
- OSHA 40 hr HAZWOPER
- OSHA 30 hr Construction
- OSHA 10 hr Construction
- OSHA 8 hr Supervisor
- First Aid/CPR/AED

Qualifications:
- Over 15 years of experience with remedial investigation, remedial system design and construction, system operation and optimization
- Over 10 years of experience as a project SSHO during execution of environmental projects, specifically at National Aeronautics and Space Administration (NASA) Jet Propulsion Laboratory (JPL) Pasadena at JPL, supporting NASA
- 15 years of drinking water treatment system construction, operation, and testing experience
- Extensive US Navy environmental restoration experience, specifically MCB Camp Pendleton, NASA-JPL, Former MCAS Tustin, Former Long Beach Naval Shipyard and MCB Twenty Nine Palms

Selected Experience:

Project Manager/Site Superintendent, JPL CERCLA Cleanup, NASA (2006 – 2013) OU-3 Monk Hill Treatment System (MHTS)
Project Manager/Site Superintendent providing onsite technical leadership, management, and support during the construction, startup and testing, and California Department of Public Health (CDPH) permitting of a 7,000 gpm drinking water treatment system (ion exchange and granular activated carbon). Provided oversight of the rehabilitation of four City of Pasadena drinking-water supply wells with flow rates between 1,400 to 2,200 gpm. Responsible for schedules, budgets, safety, permit compliance, and deliverables. Proactively managed staff and subcontractors. The project addresses elevated perchlorate and VOC groundwater contamination within the four MHTS wells which is considered by the CDPH to be an "extremely impaired" drinking water source.

Project Manager, JPL CERCLA Cleanup, NASA (2002 –present) OU-1 Source Area Treatment System
Project Manager providing technical support and leadership for the operation of the 300 gpm groundwater bioremediation treatment system (fluidized bed reactor) which includes three extraction and three injection wells. Provided system design and construction oversight support. Provided support of 12 rehabilitation events, and designed one of the newest injection wells at the NASA-JPL facility. Successful operation and maintenance of the OU-1 treatment facility has resulted in further reduction in source area contamination. The project addresses perchlorate and VOC groundwater contamination.

Project Manager, JPL CERCLA Cleanup, NASA (2006 -2015) Lincoln Avenue Water Company (LAWC) Drinking Water Treatment System
Project Manager supporting Annual CERCLA reporting requirements for the LAWC treatment facility. Supported LAWC staff during the backwash of virgin granular activated carbon (GAC) media used for NASA funded drinking water treatment system (ion exchange and GAC). Included the installation of temporary pipeline, containment tanks, re-configuration of filtration system, field water parameter monitoring during backwash, and the collection of samples for laboratory analyses. Laboratory results used to support water purveyor's application and issuance of National Pollutant Discharge Elimination System (NPDES) permit.

Project Manager/Site Superintendent, JPL CERCLA Cleanup, NASA (2007) OU-1 Source Area Treatment System Expansion (Conveyance Pipeline Installation)
Project Manager/Site Superintendent providing oversight during installation of two new treatment wells and hundreds of feet of conveyance pipelines. Mr. Headington assisted with designing the injection/extraction well and all associated conveyance pipelines. The wells are components of the Phase II expanded treatability study system designed to address source area chemicals of interest (perchlorate and VOCs) in the on-facility groundwater and increase the treatment rate to 300 gpm.

COLUMBUS STATE COMMUNITY COLLEGE

ENVIRONMENTAL TECHNOLOGY

acknowledges the participation of

BENJAMIN J. HEADINGTON

in the

OSHA 40-Hour
Hazardous Waste Site Worker
Health & Safety Training

held in Columbus, OH, January 8 through March 12, 1999

Certificate #: 1024
Date of Certificate: 3/12/99

James Stratton, Chairperson
Construction Sciences Department

COLUMBUS STATE Community College

Jeff Bates, Instructor
Environmental Technology

Certificate of Completion

This certifies that

Ben Headington

has successfully completed

8 Hour HAZWOPER Refresher Training

Refresher certification does NOT necessarily indicate initial 24 or 40 Hour HAZWOPER certification

In Accordance w/Federal OSHA Regulation 29 CFR 1910.120(e) & (p)

And all State OSHA/EPA Regulations as well including 29 CFR 1926.65 for Construction.

This course (Version 3) is approved for 8 Contact Hours (0.8 CEUs) of continuing education per the California Department of Public Health for Registered Environmental Health Specialist (REHS) (Accreditation # 044).

Safety Unlimited, Inc., Provider #5660170-2, is accredited by the International Association for Continuing Education and Training (IACET) and is accredited to issue the IACET CEU. As an IACET Accredited Provider, Safety Unlimited, Inc. offers CEUs for its programs that qualify under the ANSI/IACET Standard. Safety Unlimited, Inc. is authorized by IACET to offer 0.8 CEUs for this program.

Julius P. Griggs

Julius P. Griggs
Instructor #892

2104105161638

Certificate Number

4/10/2021

Issue Date

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Proof of initial certification and subsequent refresher training is NOT required to take refresher training

Hazmat Team Physical Exam Physician's Determination Fitness

Benjamin J. Headington Employee/Applicant:

Date of Evaluation: Last four digits of 8455 SSN:

Physician's Determination:

I certify that I have examined this employee/applicant in accordance with the guidelines set forth by the employer and OSHA regulations, and that I was provided with copies of the employees job descriptions, description of PPE and respiratory protection and related OSHA regulations and appendices for members assigned to hazardous materials response teams.

X I have not detected any medical conditions which would place the employee/applicant at increased risk of material impairment of the employees/applicants health from work in hazardous waste operations or emergency response, or from respirator use.

_____ I have detected evidence of a medical condition which I feel requires the following limitations to the employees assigned work in order to protect the employee/applicant from increased risk of material impairment to the employees/applicants health.
Limitations:

_____ I have detected evidence of a medical condition which I feel would place the employee or applicant at increased risk of material impairment to their health and therefore I recommend that the applicant not be considered for acceptance as a team member.

Follow-Up Evaluations:

X No specific medical follow-up needed. Company policy and/or OSHA standard will determine the time for the next medical evaluation.

_____ Follow-up medical evaluation is needed before clearance can be given. Appointment should be scheduled.

Notification:
I have informed the employee/applicant of these results and of any medical conditions that require further examination or treatment. A copy of this Medical Determination has been provided to the employee/applicant.

Grove City Family Health
6024 Hoover Rd. Ste A
Grove City, OH 43123

Signature - Licensed Health Care Professional Print Name and Title

7/8/24
Date

OSHA Occupational Safety and Health Administration

36-600709859

This card acknowledges that the recipient has successfully completed a 30-hour Occupational Safety and Health Training Course in
Construction Safety and Health

BEN HEADINGTON

Michael Millsap — 7/7/2010

(Trainer name – print or type) — (Course end date)

OSHA recommends Outreach Training Courses as an orientation to occupational safety and health for workers. Participation is voluntary. Workers must receive additional training on specific hazards of their job. This course completion card does not expire.

Use or distribution of this card for fraudulent purposes, including false claims of having received training, may result in prosecution under 18 U.S.C. 1001. Potential penalties include substantial criminal fines, imprisonment up to five years, or both.

For OSHA Outreach Training Program go to "Training" at www.osha.gov

Rev. 12/2009

American Red Cross
Training Services

Certificate of Completion

Ben Headington

has successfully completed requirements for

1 year Provisional Certification for Adult and Pediatric First Aid/CPR/AED. The skills portion must be taken within 1-year of completing the online course to receive a 2-year Red Cross certification.

Date Completed: 9/8/2021
Validity Period: 1 - Years

Conducted by: American Red Cross

To verify certificate, scan code or visit redcross.org/digitalcertificate and enter ID.

Learn and be inspired at LifesavingAwards.org

00OA6EG

The Course

BLOODBORNE PATHOGENS
Session: Bloodbourne Pathogens
Has Been Attended By

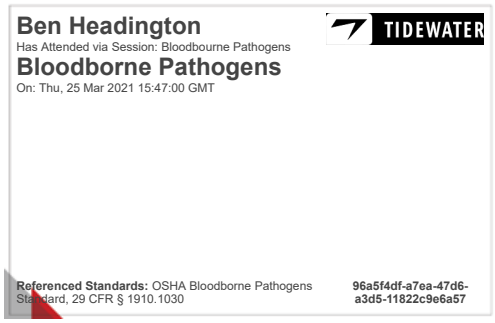
Ben Headington

Thu, 25 Mar 2021 15:47:00 GMT

TIDEWATER

Referenced Standards: OSHA Bloodborne Pathogens Standard, 29 CFR § 1910.1030

96a5f4df-a7ea-47d6-a3d5-11822c9e6a57

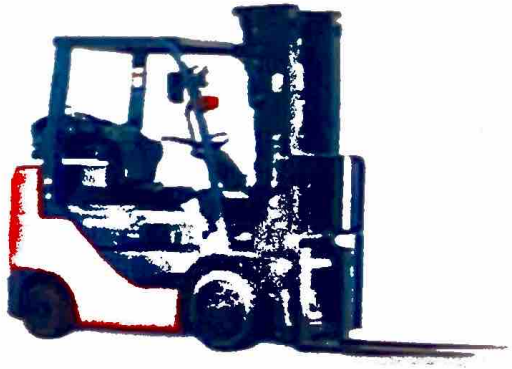


HercRentals™

Forklift Operator

Ben Headington
Class 1, 4, 5, & 7

12/18/19



Herc Instructor

Nicholas Schmidlin

Expires 3 years from Date of Training

APPENDIX C
G2S LLC Safety Meeting Form

TAILGATE SAFETY MEETING FORM

Date: _____ Time: _____ Job Number: _____

Site Location: _____

Scope of Work: _____

SAFETY TOPICS PRESENTED

Protective Clothing/Equipment: _____
Chemical Hazards: _____
Physical Hazards: _____
Equipment Used: _____

Emergency Procedures: _____
Hospital: _____ Phone: _____ EMS Phone: _____
Hospital Address and Route: _____

Noise Impacts and Mitigation: _____

Odor Impacts and Mitigation: _____

Permits Required: _____

ATTENDEES

NAME PRINTED	SIGNATURE

Meeting Conducted By: _____ Signed By: _____
Site Safety Officer: _____ Construction Manager: _____

Daily Issues and Lessons Learned: _____

Daily Site Closure Actions: _____

APPENDIX D
Accident Investigation and Reporting Form ENG 3394

Print Form | Save As | E-mail

U.S. Army Corps of Engineers (USACE)

MISHAP NOTIFICATION AND INVESTIGATION

For use of this form, see instructions in the attachments and USACE ER 385-1-99; the proponent agency is CESO.

Requirement Control Symbol

RCS-CESO-21-0001

DATA REQUIRED BY THE PRIVACY ACT OF 1974

Authority 10 U.S.C. 7013, Secretary of the Army; 5 U.S.C. 7902, Safety Programs; Public Law 91-596, Occupational Safety and Health Act of 1970; DoD Instruction 6055.1, DoD Safety and Occupational Health Program; Army Regulations 385-10, Army Safety Program; DoD Instruction 6055 .07, Mishap Notification, Investigation, Reporting, and Record Keeping; and E.O. 9397 (SSN), as amended.

Principal Purpose Information collected is to provide the USACE leaders, soldiers, families and civilians in injury, illness, and loss data to effectively manage its safety and occupational health program.

Routine Uses In addition to those disclosures generally permitted under 5 U.S.C. 552a(b) of the Privacy Act of 1974, these records or information contained therein may specifically be disclosed outside the DoD as a routine use pursuant to 5 U.S.C. 552a(b) as follows: To the Department of Labor, the Federal Aviation Agency, the National Transportation Safety Board, and to Federal, State, and local agencies and applicable civilian organizations, such as the National Safety Council, for use in a combined effort of accident prevention. In some cases, data must also be disclosed to an employee's representative under the provisions of 29 CFR 196.29. Records will be made available consistent with applicable laws and regulations. Information will be withheld from the public only if authorized by 5 U.S.C. Section 552 (Freedom of Information Act (FOIA), 5 U.S.C. 552a (Privacy Act)), or other statutory or regulatory authority. For additional information for the types of records within this system, visit: http://dpcld.defense.gov/Privacy/SORNsIndex/DOD-wide-SORN-Article-View/Article/570035/a0385-1040-aso.aspx

Disclosure Failure to provide all the required information on the report may result in the rejection of report submission.

1. WHO IS REPORTING MISHAP

a. Name:		b. Phone number:
c. Email address:	d. Signature:	
e. Report type:	☐ 1. Near Miss Report. *(No injury / illness, or property damage. Complete all fields with underlined text.)*	Date:
	☐ 2. Initial Accident Report. (*For accident notification within 24 hrs, Complete all fields with underlined text.*)	Date:
	☐ 3. Final Accident Report. *(For reporting findings from accident investigation, complete full form.)*	Date:

f. Mishap Type. *(Check all that apply)*

☐ Fatality	☐ Injury / Illness	☐ Property Damage	☐ Near Miss

g. Were any of the following items associated with the mishap ? ☐ Yes ☐ No *(If yes, check all that apply)*

☐ Electrical and/or Hazardous Energy	☐ Working at Heights	☐ Diving	☐ Load Handling Equipment or Rigging	☐ Occupational Health Exposure

2. WHO WAS INVOLVED IN THIS MISHAP?

a. Name:		
b. Personnel Classification:	c. Time employee began work:	
d. Gender:	e. Date of birth (for Government personnel only):	f. Age:
g. Date hired:	h. Primary language:	
i. Is individual a supervisor? ☐ Yes ☐ No	j. Duty status at time of mishap:	k. Years experience in job:

l. What was individual doing when mishap occurred? (*Select activity from the drop downs below.*)

1. General activities:	2. Vehicle/Equipment/Vessel:
3. Sports / Recreation:	4. Other not listed:

m. Did individual utilize all OSHA / EM 385-1-1 required Personnel Protective Equipment (PPE) for activity? ☐ Yes ☐ No ☐ N/A

If no, identify missing PPE:

n. Was a Personal Flotation Device used? ☐ Yes ☐ No ☐ N/A	o. Was a seat belt used? ☐ Yes ☐ No ☐ N/A

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p. **Government personnel only:**

1. Job series:	2. Rank:	3. Grade:
4. Center / Division / Lab:	5. District:	

q. **Contractor personnel only:**

1. Employer / Contractor name:		
2. Individual's occupation / trade:	Other not listed:	

r. If mishap occurred on a contractor site, provide the following:

1. Prime Contractor name:		
2. Contract number:	3. Contract type:	4. Funding type:

3. WHAT TYPE OF INJURY / ILLNESS OCCURED?

a. Severity of injury/illness?	b. Type of Injury/Illness:
c. Identify body part(s) affected by injury / illness:	
Primary body part affected:	Secondary body part affected:
d. Identify cause and source of injury / illness:	
Cause of injury / illness:	Source of injury / illness:

e. Was employee treated by a physician or health care professional provider? ☐ Yes ☐ No

If yes, provide name of physician or health care professional provider?

f. Was treatment given away from work site? ☐ Yes ☐ No	g. Was employee treated in an emergency room ? ☐ Yes ☐ No ☐ N/A

h. If treatment was given away from the work-site, where was it given? (For Government Personnel Only)

Treatment facility name:

Address:

City: State: Zip: Country:

i. Was employee hospitalized as an in-patient? ☐ Yes ☐ No	If yes, how many nights?	Was OSHA notified? ☐ Yes ☐ No

Note: OSHA requires reporting all work-related fatalities within 8 hours and in-patient hospitalizations, amputations and loss of an eye within 24 hours to OSHA.

j. Estimated days away from work:	k. Estimated days of restricted / transferred duty:

4. WHAT HAPPENED?

a. What was the primary activity occurring at the time of the mishap?

Other, not listed:

b. What happened? Provide a detailed description of the mishap. (Do not include any personally identifiable information (name, etc.).)

Note: Provide supporting photos, charts, diagrams, etc. with this report.

c. What other organizations or agencies have been notified about this mishap?

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5. WHAT TYPE OF PROPERTY / MATERIAL WAS INVOLVED?

a. List all property / material involved in the mishap. (Include damaged and undamaged property.)

	Item A	*Item B*	*Item C*
i. Type of item:			
Other not listed:			
ii. Name of item(s):			
iii. Event type:			
Other not listed:			
iv. Ownership of item:			
v. Dollar cost of damage:			

6. WHEN DID THE MISHAP OCCUR?

a. Date the mishap occurred:	b. Time mishap occurred:
c. What day did mishap occur on?	d. What period of day did mishap occur?

7. WHERE DID THE MISHAP OCCUR?

a. Did the mishap occur on a military Base/Post? ☐ Yes ☐ No

b. USACE Office / Project name:

c. Select the location type most closely associated with the mishap:

d. Identify exact location where mishap occurred:

Address:

City: State: Zip: Country:

e. Latitude:	f. Longitude:

8. WHY DID THE MISHAP OCCUR? (*Recommend completing this section for Near Misses.*)

A. Performance Causal Factors

1. Did a problem with performance contribute to this mishap occurring? ☐ Yes ☐ No

If yes, select the error that contributed most to the mishap:

2. Describe action(s) taken, anticipated or recommended to eliminate cause(s):

B. Support Causal Factors

1. Did a problem with resources contribute to this mishap occurring? ☐ Yes ☐ No

If yes, select the error that contributed most to the mishap:

2. Describe action(s) taken, anticipated or recommended to eliminate cause(s):

C. Standards / Policy / Planning Causal Factors

1. Did an organizational standard / policy / or plan contribute to this mishap occurring? ☐ Yes ☐ No

If yes, select the error that contributed most to the mishap:

2. Was a written Activity Hazard Analysis (AHA) or equivalent completed and accepted by Government Designated Authority (GDA) for task(s) being performed at time of mishap? (If yes, attach a copy to this report) ☐ Yes ☐ No

If yes, was the AHA available and used by worker? ☐ Yes ☐ No

3. Was a written work plan (critical lift plan, fall protection plan, etc.) required, completed and accepted by the GDA for task(s) being performed at time of mishap? ☐ Yes ☐ No

If yes, was the plan available and used by worker? ☐ Yes ☐ No

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4. Describe action(s) taken, anticipated or recommended to eliminate cause(s):

D. Training Causal Factors

1. Did a problem with training contribute to this mishap occurring? ☐ Yes ☐ No

If yes, select the error that contributed most to the mishap:

2. Was individual trained to perform the activity / task? ☐ Yes ☐ No

If yes, select type of training: ☐ Classroom ☐ Certification/License ☐ On the job

☐ Other, describe:

What was date of most recent training?

3. Describe action(s) taken, anticipated or recommended to eliminate cause(s):

E. Leader / Supervisor Causal Factors

1. Did any leader / supervisory mistake / task error contribute to this mishap occurring? ☐ Yes ☐ No

If yes, select the error that contributed most to the mishap:

2. Did the safety climate/culture contribute to the mishap? ☐ Yes ☐ No

3. Did challenges with teamwork contribute to the mishap? ☐ Yes ☐ No

4. Describe action(s) taken, anticipated or recommended to eliminate cause(s):

F. Individual Causal Factors

1. Did any individual mistakes/task errors contribute to this mishap occurring? ☐ Yes ☐ No

If yes, select the error that contributed most to the mishap:

2. Describe action(s) taken, anticipated or recommended to eliminate cause(s):

G. Physical Environment Causal Factors

1. Did any physical environment contribute to this mishap occurring? ☐ Yes ☐ No

If yes, select the error that contributed most to the mishap:

2. Describe action(s) taken, anticipated or recommended to eliminate cause(s):

H. Material Causal Factors

1. Did any material failure contribute to this mishap occurring? ☐ Yes ☐ No

If yes, select the error that contributed most to the mishap:

2. Which failure is most closely associated with the material failure/malfunction?

3. Describe action(s) taken, anticipated or recommended to eliminate cause(s):

I. Environmental Causal Factors

1. Did any environmental condition contribute to this mishap occurring? ☐ Yes ☐ No

If yes, select the factor that contributed most to the mishap:

2. Describe action(s) taken, anticipated or recommended to eliminate cause(s):

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J. Facility / Building Design

1. Did the design of the facility / building contribute to the mishap? ☐ Yes ☐ No

If yes, describe:

2. Describe action(s) taken, anticipated or recommended to eliminate hazard:

K. Existing Hazard

1. Did a hazard(s) contribute to the mishap? ☐ Yes ☐ No

If yes, describe the hazard(s):

2. Describe action(s) taken, anticipated or recommended to eliminate hazard(s):

9. Corrective Action plan

a. Have all corrective action(s) to prevent mishap recurrence been completed? ☐ Yes ☐ No

b. What person is / was responsible for corrective action plan?

c. What date will / have all corrective action(s) be/been completed by:

d. Additional information:

10. Additional Information

APPENDIX E
Site Safety and Health Plan
(SSHP)

FINAL

Site Safety and Health Plan

for

Per- and Polyfluoroalkyl Substances (PFAS) Site Inspection (SI)

at

National Aeronautics and Space Administration (NASA)
Jet Propulsion Laboratory (JPL)
Pasadena, California

Contract No. W912PL21D0021
Delivery Order No.: W912PL21F0046

US Army Corps of Engineers,
Los Angeles District
915 Wilshire Boulevard, Suite 930
Los Angeles, California 90017-3401

National Aeronautics and Space Administration
NASA Management Office
Jet Propulsion Laboratory
4800 Oak Grove Drive (Building 180)

October 2022

FINAL

Site Safety and Health Plan

for

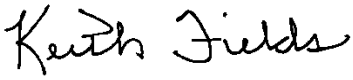
Per- and Polyfluoroalkyl Substances (PFAS) Site Inspection (SI)

Prepared by:

October 13, 2022
Date

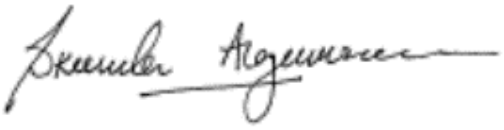
David Conner, PG
Project Geologist, Site Safety Health Officer
G2S LLC
Cell (626) 298-5715

Concurrence by:



October 13, 2022

Keith Fields, PE, PMP
Project Manager
G2S LLC
Office (614) 792-2896



October 13, 2022

Skanda Abeyesekere, CIH, CSP, CHMM
Safety and Health Manager / Plan Approver
G2S LLC
Cell (443) 983-0362

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ACRONYMS AND ABBREVIATIONS

°C	Degrees Celsius
°F	Degrees Fahrenheit
AHA	Activity Hazard Analysis
APP	Accident Prevention Plan
CAS	Chemical Abstracts Service
CIH	Certified Industrial Hygienist
CFR	Code of Federal Regulations
CHMM	Certified Hazardous Materials Manager
COC	Chemical of Concern
CP	Competent Person
CPR	Cardiopulmonary Resuscitation
CRZ	Contaminant Reduction Zone
CSP	Certified Safety Professional
dBA	Decibels Utilizing the A Filter
EAC	Emergency Action Coordinator
EAP	Emergency Action Plan
ERS	Environmental Remediation Services
EZ	Exclusion Zone
HAZWOPER	Hazardous Waste Operations and Emergency Response
IDW	Investigation Derived Waste
kV	Kilovolt
NIOSH	National Institute of Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PE	Professional Engineer
PEL	Permissible Exposure Limit
PID	Photo-Ionization Detector
PM	Project Manager
POC	Point of Contact
PPE	Personal Protective Equipment
ppm	Parts per Million
SDSs	Safety Data Sheets
SHM	Safety and Health Manager
SSHO	Site Safety and Health Officer
SSHP	Site Safety and Health Plan
SOW	Scope of Work
SVOC	Semi-volatile Organic Compound
SZ	Support Zone
TTZ	Target Treatment Zone
TWA	Time weighted average
USEPA	United States Environmental Protection Agency
USACE	United States Army Corps of Engineers
VOC	Volatile Organic Compound
WBGT	Wet Bulb Globe Temperature
WP	Work Plan

1.0 INTRODUCTION

G2S LLC has prepared this Site Safety and Health Plan (SSHP) for implementation of a Per- and Polyfluoroalkyl Substances (PFAS) Site Inspection (SI) at the National Aeronautics and Space Administration's (NASA's) Jet Propulsion Laboratory (JPL) in Pasadena, California. The tasks will be performed under the US Army Corps of Engineers Los Angeles District Contract No. W912PL-21-D-0021, Delivery Order No. W912-PL-21-F-0046.

G2S LLC will implement this SSHP during field activities. G2S LLC will perform the scope of work in accordance with the work plan and sampling and analysis plans, describing the methods and procedures that will be used during field activities to achieve the project objectives for the tasks identified in this SSHP.

1.1 Purpose and Objective

The purpose of this SSHP is to protect human health and the environment from the risks associated with field activities at NASA JPL during the PFAS SI. G2S LLC will perform field activities in accordance with the United States Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities; the National Institute of Occupational Safety and Health (NIOSH) / Occupational Safety and Health Administration (OSHA), October 1985; Title 29, Code of Federal Regulations (CFR), 1926.65, 1910.120, 1910.165, 1910.1030, 1910.1200, 1910.134; the United States Army Corps of Engineers (USACE) Safety and Health Requirements Manual, EM-385-1-1, (2014); and any other relevant Federal, State, and local regulations.

The SSHP objectives are to ensure that all necessary precautions for fieldwork are in place, and that appropriate health and safety procedures are followed at all times to protect personnel. In addition, the SSHP objectives include the necessary protection to prevent damage, injury, or loss of property and equipment, and to respond quickly and effectively to G2S LLC-related activities. The Site Safety and Health Officer (SSHO) will maintain a copy of the signed, final version of this SSHP and the Accident Prevention Plan (APP) on-site at all times when work is being performed.

All G2S LLC employees involved in sampling field work at the site have completed the required 40-hour initial Hazardous Waste Operations and Emergency Response (HAZWOPER) training, maintain qualification through annual refresher training, are under a program of medical monitoring supervised by a physician, and are certified to wear respiratory protection, as specified in 29 CFR Part 1910.134. Field work that does not pose a risk of coming into contact with potential onsite contamination does not require OSHA 40-hour HAZWOPER training, examples of these activities include: delivery driver, surveyor, utility location, etc.

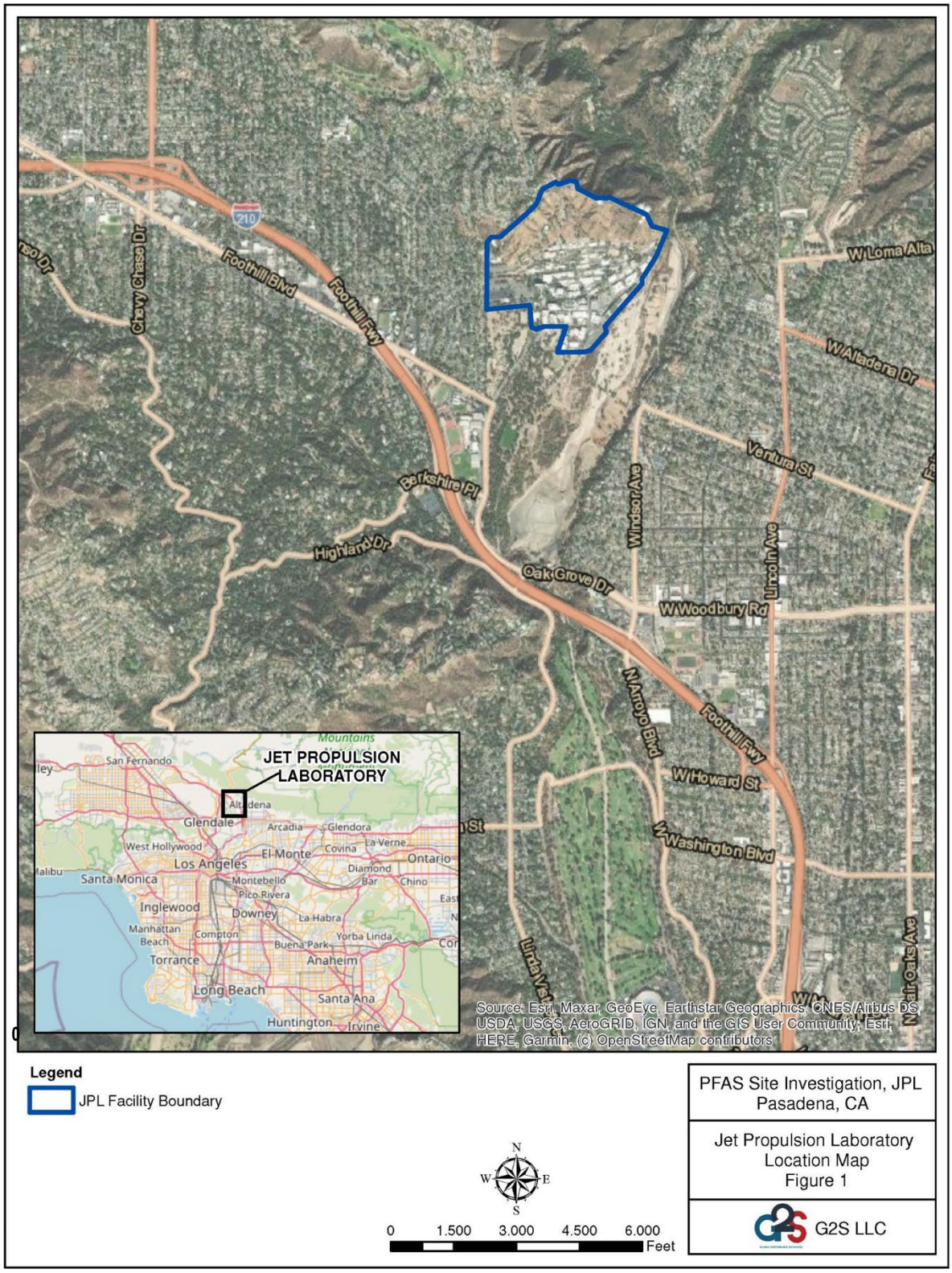
G2S LLC recognizes that conditions at the site may change, or that more information may become available. If, during the operation, it is determined that the conditions are not as described, or the protection specified in the APP/SSHP requires modifications, the SSHO will stop work and contact the Safety and Health Manager (SHM)/Certified Industrial Hygienist (CIH) and the Project Manager (PM) for guidance. Work will not resume until authorized by the PM.

1.2 Site Descriptions

JPL is a federally funded research and development center (FFRDC) in Pasadena, California, currently operated under contract with the California Institute of Technology (Caltech) for NASA. JPL's primary activities include the exploration of the earth and solar system by automated spacecraft and the design and operation of the Global Deep Space Tracking Network. Located in Los Angeles County, the JPL site is situated between the incorporated cities of La Cañada-Flintridge and Pasadena and is bordered on the east by the unincorporated community of Altadena. JPL encompasses approximately 176 acres of land and more than 150 buildings and other structures. Of the JPL facility's 176 acres, approximately 156 acres are federally owned. The remaining land is leased for parking from the City of Pasadena and the Flintridge Riding Club. Development at JPL is primarily located in two regions, an early-developed northeastern area and a later-developed southwestern area. Figure 1 is a location map showing the JPL facility and surrounding areas.

Under the CERCLA program, JPL has been divided into three operable units (OUs). OU1 addresses on-facility groundwater at JPL; OU2 addresses on-facility vadose zone soil at JPL; and OU3 addresses off-facility groundwater adjacent to the JPL property. Cleanup of OU2 is complete, as documented in the Remedial Action Report for Operable Unit 2 (NASA, 2007). A Final Record of Decision (ROD) is currently in place for both OU1 and OU3 (NASA, 2018). The remedies for OU1 and OU3 include three treatment systems: the Source Area Treatment System (OU1) and two systems in OU3, the Monk Hill Treatment System (MHTS) and the Lincoln Avenue Water Company (LAWC) Treatment System. The source area system is made up of three extraction wells, with a combined flow rate of 300 gallons per minute (gpm). This system utilizes liquid-phase granular activated carbon (LGAC) to remove volatile organic compounds (VOCs) and ion exchange (IX) to remove perchlorate. The treated water is reinjected into the aquifer utilizing three injection wells located approximately 350 feet up gradient from the extraction wells.

The PFAS PA recommended four AOPCs (the Site) for further assessment. The description of each AOPC location is provided below. Figure 2 presents a Site map showing the locations of the AOPCs.


Foothill Blvd
Foothill Fwy
Chevy Chase Dr
W Loma Alta
W Altadena Dr
Ventura St
Windsor Ave
Lincoln Ave
Berkshire Pl
Highland Dr
Oak Grove Dr
W Woodbury Rd
N Arroyo Blvd
W Howard St
W Washington Blvd
Mountains
JET PROPULSION LABORATORY
San Fernando
Glendale
Arcadia
Glendora
West Hollywood
El Monte
Covina
La Verne
Los Angeles
Ontario
Santa Monica
Montebello
Diamond Bar
Chino
Pico Rivera
Inglewood
Downey
La Habra
Manhattan Beach
Compton
Buena Park
Yorba Linda
Torrance
Anaheim
Long Beach
Santa Ana
Huntington
Irvine
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community, Esri, HERE, Garmin, (c) OpenStreetMap contributors
Legend
JPL Facility Boundary
N
W
E
S
0
1.500
3.000
4.500
6.000
Feet
PFAS Site Investigation, JPL
Pasadena, CA
Jet Propulsion Laboratory
Location Map
Figure 1
G2S LLC

1.2.1 AOPC 1: Emergency Landing Facility

The Emergency Landing Facility is an approximately 1.25-acre area located in the northern portion of JPL off Mesa Road near Building 243. The facility is located on the mesa north of and at a higher elevation than the main campus of JPL (north of the JPL Thrust Fault) and has a heliport that is used to support Los Angeles County Fire Department (LACoFD) helicopters in the event of a forest fire (Tetra Tech, 2021).

1.2.2 AOPC 2 and 3: Waste Disposal Areas (Seepage Pits and Waste Pits)

40 seepage pits (collectively AOPC 2) and four waste pits (collectively AOPC 3) are being considered as a single potential source. The seepage pits were used from approximately 1945 to 1960 to dispose of a variety of liquid wastes associated with laboratory operations, including sanitary wastes, solvents, paints, wastewater from parts cleaning, and other chemicals. The seepage pits were constructed as open boreholes, often lined with brick, that were designed to have liquids seep directly into the soils. Seepage pits are located primarily in the eastern/northeastern portion the JPL facility.

The waste pit disposal areas were operated by the City of Pasadena and were located along what was the boundary between JPL and the Arroyo Seco at the time, but they currently fall within the JPL boundary. One additional waste disposal area was documented to the south of Former Building 45. Waste pits were used from 1945 – 1960 to dispose of materials such as wood, glass, metal parts and shavings, drums of chemical wastes, and other hazardous and municipal wastes and were designed as open, bermed areas that were later backfilled.

1.2.3 AOPC 4: Building 170 Fabrication Shop

Building 170 houses the Fabrication Shop and is located in the southern portion of JPL between Mariner Road and Forestry Camp Road.

1.3 Scope of Work

The objective for the PFAS SI at NASA JPL is to implement the environmental investigations specified in the Per-and Polyfluoroalkyl Substances Preliminary Assessment (PA) Report for the Jet Propulsion Laboratory (PAR) (Tetra Tech, 2021) Appendix F SI Work Plan and prepare a final SI Report. The SI environmental investigations are to be completed in compliance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), 42 United States Code (USC) § 9601 et seq. and State of California environmental regulations dated July 2019.

The objectives of the PFAS SI environmental investigations at NASA JPL are as follows:

1. Investigate the presence or absence of PFAS at or associated with four Areas of Potential Concern (AOPCs) recommended in the PAR for further assessment.
    - AOPC 1: Emergency Landing Facility

- AOPC 2 and 3: Waste Disposal Areas (Seepage pits [40] and waste pits [4] comprising AOPC 2 and AOPC 3 respectively are considered as a single potential source)
- AOPC 4: Building 170 Fabrication Shop

2. Collect groundwater samples from multiple existing monitoring wells within and downgradient of JPL to assess presence or absence of PFAS in groundwater at or associated with AOPC 1, 2, 3 and 4.
3. Collect soil samples at two intervals (0 to 0.5 feet [ft] and 0.5 ft to 2 ft below ground surface (bgs)) to assess presence or absence of PFAS in soil at or associated with AOPC 1.

1.4 Site Activities Requiring an Activity Hazard Analysis

Work phases that require an activity hazard analysis (AHA) include the following:

1. Mobilization and Demobilization
2. Groundwater Sampling Activities
3. Soil Sampling
4. Investigation Derived Waste (IDW) Removal and Disposal

2.0 KEY PERSONNEL AND RESPONSIBILITIES

Key personnel for this project include the G2S LLC PM, Mr. Keith Fields; the SSHO, Mr. David Conner; and the alternate SSHO, Mr. Ben Headington; the SHM/CIH, Mr. Skanda Abeyesekere H; and subcontractor personnel. An alternate SSHO with the required OSHA Safety Training will be available at all times and will be assigned when the SSHO is not on-site. All project field staff, including subcontractor personnel, have completed comprehensive health and safety training, which meets the requirements of Title 29 Code of Federal Regulations Parts 1926.65, 1910.120. In addition, all workers assigned to this project will comply with the health and safety requirements associated with this project.

Specific project safety responsibilities for these key personnel are provided in detail in Section d of the APP and are briefly outlined below. G2S LLC developed this SSHP for G2S LLC personnel. Subcontractor personnel will, at a minimum, follow this SSHP or a plan approved by USACE and G2S LLC.

2.1 Project Manager Responsibilities

The PM for this project will be Mr. Keith Fields, Professional Engineer (PE), Project Management Professional (PMP), who has completed the 40-hour HAZWOPER class, and completes annual 8-hour HAZWOPER refresher classes. As the PM, Mr. Fields is responsible for generating, organizing, and compiling the SSHP, which describes planned field activities and potential hazards that may be encountered at the site. The PM will be responsible for establishing emergency communications with all potential emergency response organizations and verifying all emergency telephone numbers prior to the start of on-site work. The PM is also responsible for ensuring that adequate training and site safety briefings (including provisions for specific pieces of equipment) are provided to the project field team. The PM will provide a copy of this SSHP to the project field team, and a copy to each subcontractor prior to field activities. A copy of this SSHP shall be on-site at all times. Associated health and safety responsibilities will include:

- Coordinating the activities of all contractors' field personnel, including their signed acknowledgment of the SSHP;
- Selecting a SSHO and field personnel for the contractual site work to be undertaken;
- Ensuring that the tasks assigned to the contractor are completed as planned and are kept on schedule;
- Providing authority and resources to ensure that the SSHO is able to implement and manage safety procedures;
- Preparing reports and recommendations about the project to the client and the concerned contractor's personnel;
- Ensuring that the SSHO is aware of all the provisions of this SSHP and instructing all personnel on site safety practices and emergency procedures defined in this plan;

- Ensuring that the SSHO is monitoring site safety;
- Directing changes in work practices to improve worker health and safety, if necessary;
- Removing individuals from the site if their conduct jeopardizes the health and safety of themselves and/or others;
- Suspending work on any project or operation that jeopardizes the safety of anyone in the area; and
- Suspending work on a project or activity if the health and safety plan and/or protocols used are (or are suspected to be) inappropriate or inadequate.

2.2 Safety and Health Manager / CIH Responsibilities

The SHM / CIH for this project is Mr. Skanda Abeyesekere, Certified Industrial Hygienist (CIH), Certified Safety Professional (CSP), Certified Hazardous Materials Manager (CHMM) who has completed the 40-hour HAZWOPER class and completes annual 8-hour HAZWOPER refresher classes. The SHM is responsible for developing and coordinating the health and safety program. The SHM will also be responsible for reviewing and approving the SSHP for accuracy and incorporating new information or guidelines that aid the PM and SSHO in further definition and control of the potential health and safety hazards associated with this project. Along with the PM and the SSHO, the SHM also can suspend or modify work practices for safety reasons and dismiss individuals whose on-site conduct endangers the health and safety of themselves and/or others.

2.3 Site Safety and Health Officer Responsibilities

The SSHO for this project is Mr. David Conner, PG, and the alternate SSHO is Ben Headington, PMP. The SSHO has a direct line of authority from G2S LLC's SHM to implement specific health and safety requirements for specific site activities, and for ensuring that all team members, including subcontractor(s), comply with the APP/SSHP. It is the SSHO's responsibility to inform the subcontractor(s) and other field personnel of chemical and physical hazards, as they become aware of them. The SSHO and alternate SSHO are the competent personnel overseeing site activities during this field investigation. No project activities will be conducted unless the SSHO/Competent Person is on site supervising. Additional SSHO responsibilities include:

- Ensuring that all project-related personnel have signed the personnel agreement and acknowledgments contained in this SSHP (Refer to Appendix C of the APP);
- Providing a daily site safety briefing (tailgate meeting) for team members;
- Evaluating weather conditions and chemical hazard information to make recommendations to the PM about any modification to work plans or personal protective equipment (PPE) requirements to maintain personnel safety;
- Monitoring the compliance activities and the documentation processes;

- Approving all field personnel working on site while taking into consideration their level of training, physical capacity, and their ability to wear PPE necessary for the assigned tasks;
- Inspecting all PPE prior to use;
- Inspecting all equipment prior to use, which includes observing the testing of all "emergency" stop switches and ensuring that the required number of emergency stop switches are available;
- Assisting the PM in SSHP documentation compliance by completing standard forms (Refer to Appendix C of the APP);
- Monitoring the compliance of field personnel for the routine and proper use of PPE that is required for each task;
- Assisting in, and evaluating the effectiveness of, decontamination procedures for personnel, protective equipment, sampling equipment, heavy equipment and vehicles;
- Enforcing the "buddy system" as appropriate for site activities;
- Reviewing with site personnel the emergency phone numbers, the location and route to the nearest medical facility, the procedures for arranging emergency transportation to the nearest medical facility, and posting the related information (i.e., the telephone numbers of the local hospital, police and fire along with the route to the hospital);
- Stopping operations that threaten the health and safety of the field team or the surrounding population;
- Entering the exclusion area in emergencies after notifying emergency services and taking appropriate precautions;
- Observing field team members for signs of exposure, stress, or other conditions related to pre-existing physical conditions and/or site work activities;
- Serving as the Emergency Action Coordinator (EAC);
- Directing changes in work practices to improve health and safety;
- Removing individuals from operations if their conduct jeopardizes the health and safety of themselves and/or others; and
- Suspending work on a project or activity if the health and safety plan and/or protocols used appear, or are suspected to be, inappropriate or inadequate.

2.4 Project Field Staff

The project field staff is responsible for ensuring that activities are performed in accordance with the APP/SSHP/AHAs, and that deviations from the plan are based upon field conditions encountered, have been approved by the PM and/or SSHO, and that the information is well documented in field notes. Health and safety responsibilities of the field staff include:

- Following the APP/SSHP/AHAs;
- Following the Corporate Health and Safety Program;

- Reporting to the SSHO any unsafe conditions or practices;
- Reporting to the SSHO all facts pertaining to incidents that result in injury or exposure to toxic materials or chemicals of concern (COCs);
- Reporting equipment malfunctions or deficiencies to the SSHO;
- Reviewing the APP/SSHP in the field, as necessary;
- Attending the daily pre-work safety tailgate meetings;
- Attending the scheduled health and safety training classes; and
- Attending all scheduled medical examinations.

It is the responsibility of individual organizations involved in the field activities to ensure understanding of, and compliance with, the SSHP by its on-site employees or representatives working in controlled areas. Failure by any person to adhere to this plan may result in removal from site activities.

2.5 Subcontractor Responsibilities

All subcontractors are responsible for their own health and safety program and the health and safety of their own employees. This requirement is based on OSHA regulations, which recognize the employer-to-employee responsibility for health and safety. Each subcontractor will submit a properly completed AHA to the G2S LLC SSHO for review prior to commencing fieldwork for each task they will perform under this scope of work.

As stated above, subcontractors are responsible for instituting health and safety training for their employees. At a minimum, each must comply with the G2S LLC APP/SSHP. G2S LLC will provide copies to the subcontractor's employees when requested, and they will be required to sign the Site Safety Tailgate Meeting Form as part of the G2S LLC safety protocol prior to working on site.

2.6 Policies and Procedures Regarding Noncompliance with Safety Requirements

Whenever a violation of safety policy occurs and requires correction, the SSHO will document the situation and request the subcontractor's competent person to initiate corrective action. Corrective action will be documented with further explanation given in the daily project notes. If immediate corrective action is not taken by the subcontractor, they will be notified in writing using the Safety/Health Violation Notice. The SSHO and PM will be informed of the action taken within 24 hours of the violation. The involvement of the PM is essential to ensuring that there are no additional violations of safety policies at the work site. G2S LLC reserves the right to immediately remove any personnel from the site for a serious violation of safety requirements.

2.6.1 Subcontractors First Violation of a Rule or Regulation

A subcontractor employee who is cited for a first-time notice of a Safety/Health Violation Notice shall be immediately removed from the site and shall not be permitted to return to work for a period of at least 24 hours, missing the next full workday. For example, if an employee was cited on a Friday afternoon, they would leave the site that day and would not be permitted to return to work until Tuesday morning.

2.6.2 Subcontractors Second Violation of a Rule or Regulation

A subcontractor employee responsible for a repeat offense or receiving a second Safety/Health Violation Notice shall be immediately and permanently removed from the site for the remainder of the contract period. This requirement may only be waived if the subcontractor demonstrates, on behalf of the employee, extenuating or mitigating circumstances, and obtains a waiver from the G2S LLC SSHO and/or PM.

2.7 Safety Accountability for Managers and Supervisors

The following has been adopted into G2S LLC's Policies and Procedures Manuals:

"First line supervisors and management, site managers, department managers, and safety representatives are responsible for enforcing all safety and health policies. G2S LLC will take disciplinary action against employee-owners for failing to enforce such policies." G2S LLC will follow the violation procedures discussed for subcontractors with their own employees.

Also, the following statement was adopted into the policy: "G2S LLC reserves the right to dismiss employee-owners who commit serious or repeat safety or health violations."

3.0 HAZARD/RISK ANALYSIS

This section discusses chemical, physical, and environmental hazards that workers may encounter. Section 3.1 identifies COCs anticipated to be present at the site. Section 3.2 discusses physical hazards identified with this site including those associated with the use of heavy equipment. Environmental hazards discussed in Section 3.3 are associated with the physical location of the site, weather conditions (such as heat stress and noise) and contact with flora and fauna.

Daily "Tailgate" safety meetings will be held at the start of each workday; potential chemical, physical, and environmental hazards and preventative safety measures will be discussed. Subsequent Tailgate safety meetings may be called when the SSHO, SHM, or PM believes that a potential safety issue that was not covered in the morning meeting may exist. An AHA has been developed for each task associated with the general contract activities and is included in the APP. This analysis identifies the sequence of work, specific hazards anticipated, and the control measures to be implemented to minimize or eliminate each hazard. The AHAs will be used to augment daily safety meetings intended to heighten safety and hazard awareness on the job.

3.1 Chemical Hazards

The anticipated COCs for the NASA JPL PFAS SI are volatile organic compounds (VOCs) and perchlorate. The Safety Data Sheets (SDSs) for COCs and other chemicals that may be used during sampling will be presented in Attachment F of the APP. The SDSs will be provided in a combined project site list and made accessible in a centralized location for both G2S LLC and subcontractor personnel to use.

Exposure to a listed COC on site is possible but anticipated to be improbable due to the nature of the work. Site workers will use Level D PPE protection while working on site, including hard hats, coveralls/standard work clothing, safety glasses with protective side shields, safety-toed work boots and chemical-resistant (nitrile) gloves and/or leather work gloves. G2S LLC will acquire, and review with all personnel during daily safety meetings, all SDSs for any additional chemicals brought onto the site.

3.2 Physical Hazards

There are numerous physical hazards associated with this project, which, if not identified and addressed, could cause accidents and personal injury to field personnel, as well as operational problems. Field personnel should maintain awareness of potential safety hazards and should immediately inform the SSHO of any new hazards, so that corrective measures can be taken. In the event of a medical emergency, the nearest medical facilities (with directions) are outlined in Section 8. For specific physical hazards associated with groundwater sampling refer to respective AHAs.

3.2.1 Slips, Trips and Falls

During field activities, work may occur in areas where uneven surfaces or job supplies and other equipment at ground level present possible slip, trip and fall hazards. Wet weather conditions and areas where heavy equipment has traveled over may exacerbate such hazards. Work locations will be kept as tidy as possible and free of ground debris. Personnel will wear appropriate footwear for site conditions and walk carefully.

3.2.2 Head and Back Injuries

If required, hard hats and safety glasses will be donned prior to performing any site activities where hazards exist (drilling or other heavy machinery). This will prevent minor head injuries caused while working around equipment, with hand tools, or process related structures. At the daily safety meeting, personnel will be educated in proper lifting techniques and will not lift heavy items without assistance.

3.2.3 Electrical Hazards

The SSHO will inspect all equipment daily prior to its use to confirm that it is functioning as designed. The SSHO will remove from service any equipment which is found to be malfunctioning. The equipment will be replaced in lieu of on-site repair. If applicable, all equipment will be properly grounded prior to and during all work activities performed on-site.

All electrical wiring on the heavy equipment shall be covered by the appropriately colored wire insulation. Junction boxes and connections will be sealed to protect from potential bad weather issues.

3.2.4 Fire and Explosion Hazards

It is unlikely that explosive atmospheres will be encountered during the proposed sampling activities; however, knowledge of fire/explosion prevention is required.

The following standard safety procedures will be implemented:

- All field vehicles and heavy equipment will be equipped with a type-ABC fire extinguisher. Fire extinguishers will be mounted on the vehicles where field personnel can easily access them. A fire extinguisher check, including inspecting gauges, hoses, and tanks, must be done monthly to ensure proper operation of the equipment.
- When necessary, other fire-fighting equipment should be made available.
- Open fires and burning are prohibited. Smoking will be prohibited in all areas where flammable, combustible, or oxidizing materials are stored or are in use.
- No flammable and combustible liquids (i.e., gasoline or diesel) will be stored on-site. All equipment used during site activities will arrive on-site with a full fuel tank.
- Vehicle engines will be shut off when not in use.

- Smoking is prohibited.

3.3 Environmental Hazards

Environmental hazards associated with the site will be discussed at the orientation meeting prior to the start of field activities. Personnel will be apprised of symptoms of exposure to certain biological hazards and heat stress. If site workers are required to wear semi-permeable or impermeable protective clothing, physiological monitoring for signs of heat stress injury will commence when ambient temperatures reach 75 degrees Fahrenheit (°F). Pursuant to the Cal-OSHA Heat Illness Prevention standard, 8CCR 3395, there shall be at least one quart of water per person per hour and shade available throughout the workday. Employees may stop work whenever they believe it is necessary to prevent heat stress and have water and/or sit in the shade for at least 5 minutes. The SSHO is responsible for monitoring the weather on hot workdays (i.e., over 75°F when disposable suits are being worn) in order to adequately monitor the workforce.

3.3.1 Heat Stress

G2S LLC field workers may spend some part of their day in a hot, humid environment. The amount of heat stresses a worker faces in a hot work area may be affected by four environmental factors: temperature, radiant heat, humidity, and air velocity. Personal characteristics such as age, weight, fitness, medical condition, and acclimatization to heat also affects the level of stress. The human body has defenses to reduce the effects of heat on the body. However, under certain situations, these body functions are not substantial enough to eliminate the problem. When this occurs, the body may be subject to heat stress. Physical reactions to heat stress will range from mild reaction such as fatigue, irritability, anxiety, and decreased concentration, to death.

Heat stress occurs in four stages. These are listed below in order from least to most severe:

1. Heat Rash: Heat rash is caused by continuous exposure to hot, humid air and is aggravated by chafing clothes. This condition decreases the ability to tolerate heat. The symptom is a mild red rash.
2. Heat Cramps: Heat cramps are caused by loss of body fluid through perspiration that is not balanced by adequate fluid intake. Heat cramps typically are the first sign of heat stress and can lead to heat stroke. Symptoms include acute, painful spasms of voluntary muscles, particularly in the abdomen and the extremities. These may also occur during rest.
3. Heat Exhaustion: Heat exhaustion is a weakness caused by loss of fluids. This is the next sign that may lead to heat stroke. Symptoms are pale, moist, clammy skin; perfuse perspiration; and extreme weakness. Body temperature is normal, pulse is weak and rapid, and breathing is shallow. These symptoms may be accompanied by headache, vomiting, and dizziness.

4. Heat Stroke: Heat stroke is the most serious and dangerous reaction to heat stress and is caused by a failure of the body's natural heat regulating mechanisms. Symptoms are red, hot, dry skin, nausea, dizziness, confusion, extremely high body temperature, rapid breathing and pulse rate, and unconsciousness.

To minimize heat stress, employees shall observe the following work practices and control measures in hot work areas:

- Alternate work and rest periods with rest periods in a cooler area;
- Reduce workload under extreme heat conditions;
- Drink large amounts of water;
- Ensure adequate ventilation and air movement around the worksite; and
- If excessive heat persists in the work area and control measures do not adequately reduce the heat stress on the employees, work will be terminated until the condition subsides.

3.3.2 Cold Exposure

During winter months employees may need to work in cold environments. Working outdoors at low temperatures may subject employees to cold stress. Exposure to extreme cold for a short period of time causes severe injury to the surface of the body. Prolonged exposure may result in a generalized cooling of the body and eventually in death.

Two factors influence the development of cold injuries: ambient temperature and wind velocity. Wind chill is used to quantify the chilling effect of wind in combination with the temperature. Moisture, from environmental conditions or perspiration, increases the cooling rate of the body and may decrease the insulating effectiveness of clothing.

Frostbite is the result of exposure of the skin to excessive cold conditions. It is characterized by a grayish or whitish appearance of the skin. Frostbite also causes a deadening of the nerve endings in the exposed areas. For example, a frostbitten hand will no longer feel cold to the victim. As a result, frostbite may go unrecognized for a prolonged period, which can cause more injury. To prevent frostbite, workers should stop work and warm cold skin at the onset of numbness.

Hypothermia is a general cooling of the body caused by freezing or rapidly dropping temperatures.

Symptoms occur in five stages:

1. Shivering
2. Apathy, listlessness, sleepiness, and cooling of the body to less than 95°F
3. Unconsciousness, glassy stare, slow pulse, and slow respiratory rate

4. Freezing of the extremities
5. Death

To maintain adequate protection against cold exposure, employees shall observe the following work practices and control measures:

- Alternate work and rest periods with rest periods in a warmer area;
- Utilize a supplemental heat source, if possible;
- Wear an insulating liner or hood under the hard hat;
- Dress warmly by layering clothing;
- Avoid becoming overheated by removing layers of clothing while working to remain cool enough to not perspire;
- Utilize clothing materials that do not lose insulating value when wet or dirty (i.e., use wool or polypropylene; in general, avoid down or cotton) and is in accordance with PFAS sampling guidance where applicable; and
- Keep clothing clean and utilize laundering procedures in accordance with PFAS sampling guidance where applicable.

If excessive cold persists in the work area and control measures cannot reduce the cold stress on employees, work will be terminated until the condition subsides

3.3.3 Noise

Noise is a potential hazard in areas where heavy equipment, power tools, pumps, compressors, or large generators are being operated. Equipment operation may produce noise levels that reach or exceed 85 decibels utilizing the A filter (dBA). Exposure to elevated noise levels can lead to temporary or permanent hearing loss and can also cause muscle tension and irritability. Exposure levels will comply with the ACGIH, TLV continuous noise exposure limits outlined in Table 5-4 of EM-385.

Noise levels in excess of 85 dB are likely to be generated due to the inherent nature of diesel engines on heavy equipment. Site workers on drilling crews, and anyone working in the immediate vicinity, will don either disposable earplugs or earmuffs. Site workers not directly involved in site activities in these areas will not be allowed in the area.

G2S LLC's SSHO and Alternate SSHO have completed the 30-hour OSHA Construction Safety training. Instruction on the use of and proper fitting of disposable earplugs was included in both classes. The SSHO will visually confirm workers hearing protection is properly fitted into the ear.

3.3.4 Biological Hazards

The San Gabriel Mountains and foothills near NASA JPL are home to many potential biological hazards that include large and small mammals (i.e., black bears, mountain lions, deer, racoons, rodents, etc.), insects (i.e., bees, wasps, including hornets and yellow jackets, fire ants, black and brown widows, mosquitoes, etc.), spiders, scorpions, reptiles, and snakes. In addition to bees, and general insects there are several varieties of fire ants, red wasps, and mosquitos that transmit West Nile Virus and other insects that bite or sting. The Los Angeles Department of Public Health has issued warnings about the emergence of Saint Louis encephalitis which is a mosquito-borne disease caused by the Saint Louis encephalitis virus (SLEV) and spread by the bite of an infected mosquito. SLEV is in the same virus family as West Nile virus. NASA JPL is potentially home to various venomous snakes and spiders.

According to the Los Angeles Department of Public Health, California is home to eight species of rattlesnakes. The most common Southern California rattlesnakes include the Western Diamondback and Southern Pacific Rattlesnakes.

NASA JPL is also home to many spiders. The Los Angeles County Agricultural Commissioner lists the Brown Widow Spider as a pest of medical importance. The University of California Los Angeles (UCLA) Health website states that venom from the black widow spider (commonly seen at NASA JPL) has a toxin that can damage your nervous system. These bites require emergency medical care.

Performance of PFAS activities will potentially expose workers specifically to the rattlesnake or the black widow spiders. G2S LLC employees and their subcontractors will be instructed to maintain awareness for biological hazards in their surroundings, especially when initially entering the work site and opening well vaults. If any such hazards become known during the course of the project, the SSHO and/or the SHM will make the appropriate changes in this SSHP and communicate the dangers/concerns to the workers. Workers will exercise caution when traversing the site or offsite properties to try and avoid heavily vegetated areas where biological hazards likely exist. No significant populations of any of the referenced potential biohazards have been identified at the work site.

The following recommendations shall be considered to protect staff from poisonous snakes and venomous spiders:

Poisonous Snakes

- Do not touch or handle any snake.
- Stay away from tall grass and piles of leaves when possible.
- Avoid climbing on rocks or piles of wood where a snake may be hiding.
- Be aware that snakes tend to be most active at dawn and dusk and in warm weather.

- Wear boots and long pants when working outdoors. Even denim jeans may prevent some, although not all, bites by smaller snakes.
- Wear leather gloves when handling brush and debris.

Venomous Spiders

- Inspect or shake out any clothing, shoes, towels, or equipment before use.
- Wear protective clothing such as a long-sleeved shirt and long pants, hat, gloves, and boots when handling stacked or undisturbed piles of materials.
- Minimize the empty spaces between stacked materials.
- Remove and reduce debris and rubble from around the outdoor work areas.
- Trim or eliminate tall grasses from around outdoor work areas.
- Store apparel and outdoor equipment in tightly closed plastic bags.
- Keep your tetanus boosters up-to-date (every 10 years). Spider bites can become infected with tetanus spores.

The below list of possible symptoms and first aid associated with poisonous snakes and venomous spiders has been provided for reference, staff should monitor for these symptoms if they think they might have been bitten.

Poisonous Snake Symptoms

- Puncture marks at the wound
- Redness, swelling, bruising, bleeding, or blistering around the bite
- Severe pain and tenderness at the site of the bite
- Nausea, vomiting, or diarrhea
- Labored breathing (in extreme cases, breathing may stop altogether)
- Rapid heart rate, weak pulse, low blood pressure
- Disturbed vision
- Metallic, mint, or rubber taste in the mouth
- Increased salivation and sweating
- Numbness or tingling around face and/or limbs
- Muscle twitching

Poisonous Snake First Aid

- Seek medical attention as soon as possible (dial 911 or call local Emergency Medical Services [EMS]).
    - Antivenom is the treatment for serious snake envenomation. The sooner antivenom can be started, the sooner irreversible damage from venom can be stopped.
    - Driving oneself to the hospital is not advised because people with snakebites can become dizzy or pass out.
- Take a photograph of the snake from a safe distance if possible. Identifying the snake can help with treatment of the snakebite.

- Keep calm.
- Inform your supervisor.
- Apply first aid while waiting for EMS staff to get you to the hospital.
    - Lay or sit down with the bite in a neutral position of comfort.
    - Remove rings and watches before swelling starts.
    - Wash the bite with soap and water.
    - Cover the bite with a clean, dry dressing.
    - Mark the leading edge of tenderness/swelling on the skin and write the time alongside it.

Do NOT do any of the following:

- Do not pick up the snake or try to trap it. NEVER handle a venomous snake, not even a dead one or its decapitated head.
- Do not wait for symptoms to appear if bitten, get medical help right away.
- Do not apply a tourniquet.
- Do not slash the wound with a knife or cut it in any way.
- Do not try to suck out the venom.
- Do not apply ice or immerse the wound in water.
- Do not drink alcohol as a painkiller.
- Do not take pain relievers (such as aspirin, ibuprofen, naproxen).
- Do not apply electric shock or folk therapies.

Venomous Spider Symptoms

- Itching or rash
- Pain radiating from the site of the bite
- Muscle pain or cramping
- Reddish to purplish color or blister
- Increased sweating
- Difficulty breathing
- Headache
- Nausea and vomiting
- Fever
- Chills
- Anxiety or restlessness
- High blood pressure

Venomous Spider First Aid

- Stay calm. Identify the type of spider if it is possible to do so safely. Identification will aid in medical treatment.
- Wash the bite area with soap and water.
- Apply a cloth dampened with cold water or filled with ice to the bite area to reduce swelling.
- Elevate bite area if possible.
- Do not attempt to remove venom.
- Notify your supervisor.
- Immediately seek professional medical attention.

Serious and/or threatening chemical and physical hazards frequently overshadow any potential exposure to biological hazards. However, specific biological hazards can cause injury and even death. Therefore, when appropriate, such hazards will be identified and evaluated in conjunction with all other actual or potential hazards associated with an operation, and steps taken to control exposure. Procedures as prescribed in the First Aid Book will be properly implemented. Paramedics will be summoned for workers exhibiting symptoms of allergic reaction to a biological hazard.

CORONAVIRUS DISEASE 2019 (COVID-19)

The purpose of this section is to provide information on preventing the spread of coronavirus (SARS-CoV-2), the virus that causes COVID-19, at construction sites. The COVID-19 AHA, California Department of Public Health (CDPH) and the Division of Occupational Safety and Health (DOSH or Cal/OSHA) COVID-19 Industry Guidance: Construction, and the Safety and Health Guidance for COVID-19 Infection Prevention in Construction are provided in Appendix A of the APP.

According to the Centers for Disease Control and Prevention (CDC), COVID-19 is thought to spread mainly through close contact from person to person, including between people who are physically near each other (within about 6 feet). People who are infected but do not show symptoms can also spread the virus to others. Cases of reinfection with COVID-19 have been

reported but are rare. The CDC is still learning about how the virus spreads and the severity of illness it causes.

The CDC states that the best way to prevent illness is to avoid being exposed to this virus. Steps that can be taken to slow the spread include the following:

- Stay at least 6 feet away from others, whenever possible. This is very important in preventing the spread of COVID-19.
- Cover your mouth and nose with a mask when around others. This helps reduce the risk of spread both by close contact and by airborne transmission.
- Wash your hands often with soap and water. If soap and water are not available, use a hand sanitizer that contains at least 60% alcohol.
- Avoid crowded indoor spaces and ensure indoor spaces are properly ventilated by bringing in outdoor air as much as possible. In general, being outdoors and in spaces with good ventilation reduces the risk of exposure to infectious respiratory droplets.
- Stay home and isolate yourself from others when sick.
- Routinely clean and disinfect frequently touched surfaces and take other steps to stop the spread at home.

Site-specific measures

If fieldwork occurs during the coronavirus pandemic, the following project-specific measures will be implemented:

- G2S staff and its subcontractors (i.e., field staff) will access the jobsite via Fort Irwin, NASA, and Goldstone Roads and will not enter NTC Fort Irwin's Cantonment Area unless there is an emergency that requires entry to the Cantonment Area.
- Field staff will limit in person interactions with Goldstone DSN and NTC Fort Irwin staff to the extent practical.
- Communication between field and facility staff will be via email, phone, or text as applicable.
- If in-person interaction with facility staff is necessary, it will occur outside while maintaining physical distancing, use of face coverings that cover the nose and mouth, followed by handwashing and/or disinfection.
- Field staff will not enter buildings or structures at the Goldstone facility which includes restrooms, offices, hallways, dormitories, or cafeteria.
- Portable toilets and handwashing stations will be provided for field staff use. Additional soap, paper towels, and hand sanitizer will be kept onsite.

3.3.5 Radiological Hazards

Radiological hazards are not expected. Should radiological hazards be encountered during field activities, an amendment to this plan must be prepared.

4.0 SITE CONTROL AND WORK ZONES

Site access control during field activities will be conducted by G2S LLC employees who will be responsible for keeping work areas clear of unauthorized personnel. The G2S LLC SSHO will be responsible for maintaining site access control restrictions and keeping unauthorized and untrained personnel out of restricted access zones.

Visitors will not be permitted within active work areas. All visitors, regardless of affiliations or approvals, will not be permitted unless they provide documentation of the training and medical surveillance requirements specified in this plan, have read, and signed this APP/SSHP, and are escorted. Under no circumstances shall anyone enter the work zone without authorization from the G2S LLC SSHO. This shall include client, utility, and regulatory representatives. A visitor sign in sheet will be maintained by G2S LLC, recording all who enter onto the site into the support zone. A Site Control Log will be used by the SSHO to record all personnel entering the work zone, the times at which they enter and depart, and their company affiliation. All visitors will be advised by the SSHO of the following upon arrival to the site:

- Safe work practices, such as proper site entry and egress, and proper hygiene during meal and rest breaks
- Recognition, in oneself and others, of physical conditions requiring immediate medical attention, especially heat stress, and application of simple first aid measures
- Procedures to be followed in case of emergencies

4.1 Site Work Zones

Work location restrictions will primarily be determined upon the potential physical safety concerns, as the potential for exposures to the COCs are highly unlikely to occur at or above their respective Permissible Exposure Limits (PELs). The site work zones shall include, but not necessarily be limited to, the following zones:

- Exclusion Zone (EZ)
- Contamination Reduction Zone (CRZ)
- Support Zone (SZ)

The EZ and CRZ will consist of any area in the immediate vicinity of the drilling rig and/or sampling activities. All employees will use appropriate PPE when working in those areas. The EZ will be defined as an area where there is a possible respiratory and/or contact health hazard and/or physical safety concern. In most instances, this area will be approximately a 30-foot radius from all intrusive site activities (i.e., drilling rig), to allow for safe movement of the equipment and the personnel in the work zone. Cones, yellow caution tape, or other appropriate means will identify the location of the EZ. The EZ and CRZ will be subject to change based on

the extent of contamination levels and changing site conditions. It is also possible, based upon the extent of contamination (or the lack thereof) that decontamination of site personnel may consist of dry-decon followed by thorough hand and face washing. Air monitoring (if applicable) will be conducted to determine contamination levels. The SSHO will restrict access to this area to site personnel. The personnel decontamination station will be located at the entrance to this area if deemed necessary by the SSHO.

The SZ includes the areas surrounding the EZ and CRZ. The SZ can be any area located outside of the CRZ where activity support may occur. The SZ will be located to prevent employees from being exposed to any particulate levels above regulatory limits, and to allow the safe movement and use of drilling equipment. Eating, drinking, or smoking will be permitted in the support area only after washing face and hands. Smoking will only be allowed in designated areas and will not be permitted if flammables and/or gas cylinders are stored in the area and/or if hot work is being conducted. A Site Operations Center may be established if required.

4.2 Work Limitations

Work limitations include the following:

- No eating, drinking or smoking in the EZ.
- All personnel must wear eye protective equipment when and where appropriate. (Refer to applicable AHA for PPE requirements.)

Facial hair must not interfere with the fit of the respirator or come in contact with the face of the respirator where the respirator touches one's face.

5.0 PERSONAL PROTECTIVE EQUIPMENT

5.1 Levels of Personal Protective Equipment

The harmful effects that chemical substances have on the human body often necessitate the use of respiratory protection and personal protective clothing. Proper selection of PPE depends upon several factors. Protection against different types of chemicals and differing concentrations of those substances can be quite varied. The tasks to be performed and the probability of exposure to the substances must also be considered when specifying protective clothing.

Once the specific hazard has been identified, appropriate PPE can be selected. The protection level assigned must match the hazard confronted. The specific equipment comprising each level of protection will vary slightly but is defined primarily by the type of respiratory protective equipment used, and secondly by skin protection.

The following list briefly describes the various PPE Levels:

Level A: Used when the greatest level of skin, eye, and respiratory protection is needed and consists of a totally encapsulated suit with supplied breathing air

Level B: Used when the highest level of respiratory protection is needed, but a lesser level (than Level A encapsulating suit) of skin protection is required

Level C: Used when criteria for using air-purifying respirators are met, and a lesser level of skin protection is required

Level D: Used in areas without respiratory hazards

5.2 Anticipated Levels of Protection

The PPE Level will be determined by air monitoring discussed in Section 8.0. Based on the hazard analysis for the environmental project at the site, Level D protective clothing is the anticipated primary level of protection to be worn during site activities.

5.2.1 Level D

Level D protection is the minimum level of personal protection allowed on hazardous waste sites. Respiratory protection is not required, as the atmosphere is assumed breathable and uncontaminated.

Level D protection will consist of the "basic work clothing" plus:

- Hard hat (during drilling activities)
- Coveralls/standard work clothing

- Safety glasses with protective side shields
- Safety-toed work boots
- Chemical-resistant (nitrile) gloves and/or leather gloves

Earplugs or earmuffs with noise reduction ratings sufficient to attenuate the sound level will be mandatory during drilling activities due to the inherent nature of diesel engines and the sound generated by drilling. Hard hats, safety glasses (goggles with splash shields or optional full-face shield), and safety shoes must meet American National Standards Institute (ANSI) approval.

5.2.2 Level C

Level C protection is not anticipated during field activities, level C protection is defined by the use of either a full-face or half-face, air-purifying respirator. This level is used when low levels of contaminants of a known nature are present, sufficient oxygen is available, and contaminants are not considered immediately dangerous to life and health. Level C will consist of Level D above plus:

- Half-face (or full face), air-purifying respirator with NIOSH approved filter cartridges, which are selected depending upon the type of exposure
- Chemical-resistant or polyethylene-coated disposable outer coveralls (e.g., Tyvek®)
- Chemical-resistant (e.g., butyl) outer gloves (taped to outer coveralls)
- Chemical-resistant (e.g., nitrile) inner gloves
- Chemical-resistant safety boots (taped to coveralls)

5.2.3 Levels A & B

Levels A and B protection are not anticipated during field activities. If it appears that these levels may be required, the SSHO will immediately shut down and secure the operation and contact the PM, SHM, USACE point of contact (POC) for further guidance. The SSHO will be responsible for determining the appropriate level of personal protection to be used, based on the Action Response Levels established in this document. The SSHO, with the consent of the SHM and PM, shall notify the POC prior to implementing any modifications to the PPE or levels of protection.

5.2.4 Disposable Gloves Utilized in Level D PPE

When working in Level D PPE, site workers will utilize disposable powderless nitrile gloves as their primary hand protection for site COCs. Leather gloves will also be available as another source of hand protection. If the worker is allergic to nitrile gloves, then an alternative non-PFAS containing protective type of glove will be used. Nitrile gloves are made of synthetic rubber, contain no latex proteins, and offer good resistance to wear. They are more puncture resistant than many other types of rubber gloves and offer superior resistance to many types of chemicals, petroleum hydrocarbons included.

6.0 EXPOSURE MONITORING

This section outlines monitoring strategies that will be used to assess employee exposure to chemical hazards. The anticipated chemical hazards present on site are those identified in Section 3.1. G2S LLC will utilize direct reading instruments to monitor for chemical hazards. All direct reading instruments will be calibrated before and after each period of use in accordance with manufacturers' recommendations and standard industrial hygiene practice. Records detailing date, time, span gas, or other standards used and the name of the person performing the calibration will be stored with the instrument. The direct-reading instrument will be calibrated in accordance with the standard operating procedures found in the operator's manual accompanying the instrument. The SSHO will charge the batteries and verify that instruments are fully charged before each use.

6.1 Perimeter/Personnel Air Monitoring Activities

To monitor petroleum hydrocarbon vapors emitted from wellhead during sampling activities, G2S LLC will implement the use of a photo-ionization detector (PID). The PID is a real-time, direct-reading instrument for volatile organic vapors. The breathing zone of workers on-site will be monitored periodically. If the PID reading shows a sustained concentration greater than 10 parts per million (ppm), engineering controls will be implemented (i.e., field personnel will move to an upwind, safe location), and the SSHO will contact the PM, SHM/CIH, and USACE POC for further instructions. PPE will not be upgraded due to consistent organic vapor readings in excess of 100 ppm or other work conditions; however, work will stop until the APP/SSHP has been revised to reflect new working conditions or conditions subside.

6.2 Meteorological Monitoring Activities

On-site, ambient weather conditions (wind speed and direction, temperature, and relative humidity) will be monitored continuously via real-time Internet weather locations, and/or the National Weather Service. If a local station can provide data relevant to the site, its website will be used to obtain forecasts. On-site meteorological conditions will be observed by the SSHO for change in direction, magnitude, incoming storms, or conditions favorable for lightning. More stringent controls will be in place when wind direction is such that residences or populations are downwind from the site.

6.3 Dust Control Activities

G2S LLC will not perform dust control, sampling activities will not create excess dust.

6.4 Noise Monitoring

G2S LLC will not perform noise monitoring, sampling activities will not create excessive noise. However, if staff enter an area where noise levels in excess of 85 dB are likely to be generated,

hearing protection will be required during sampling in those areas. Site workers not involved directly with site activities in this area will not be allowed in the area unless hearing protection is donned.

7.0 DECONTAMINATION

Decontamination involves the physical removal and/or neutralization of harmful contaminants. The extent of decontamination depends on the hazard and the quantities of the contaminant. Contamination can occur from:

- Contacting vapors, gases, mists, or particulates;
- Splashes while sampling or opening containers;
- Handling contaminated instruments, protective clothing, or equipment; and
- Assisting contaminated personnel during project operations, decontamination procedures, and emergencies.

All decontamination will be performed by personnel wearing a level of protective gear that is appropriate for the level of decontamination.

7.1 Decontamination Procedures

Contaminant reduction procedures appropriate for the existing work area will be implemented as explained in Sections 7.2 through 7.5 below.

7.2 Personnel Decontamination

Decontamination procedures are performed on all personnel leaving hazardous waste sites. A procedure appropriate to the degree of contamination recorded will be utilized. Site personnel will use single-use Nitrile gloves during sampling activities to reduce the chance of exposure to potential COCs. Disposable gloves will be disposed of and replaced frequently by site workers to avoid exposure to regulated chemicals.

7.2.1 Level D Personnel Decontamination

When the use of Level D (Section 5.2.1) PPE is required, personnel will perform decontamination in accordance with the following guidelines:

- Place tools, instruments, samples, and trash at an appropriate location. Plastic bags will be available for trash. Waste PPE will not be placed in the same containers as general trash.

- Inspect equipment and samples and, if applicable, tools for signs of residual amounts of contamination. If present, contamination must be completely cleaned off of equipment, samples, and tools prior to removal from the EZ.
- Personnel will visually check themselves for signs of possible contamination. If observed, gross contamination will be completely removed before further decontamination is performed.
- Prior to exiting the work areas, personnel will wash their hands with soap and water in order to minimize the potential for contaminant exposure.

7.3 Equipment Decontamination

Decontamination will be performed on tools and the decontamination equipment itself after all site activities have been completed, or between sampling locations. Before entering the site, all equipment will be cleaned to remove any potential contaminants. General equipment decontamination consists of an Alconox®, Liquinox®, or Citranox® and water wash followed by a triple deionized water rinse. Equipment decontamination will take place in the CRZ according to the following procedures. Wash water will be containerized, characterized, and disposed of according to the procedures described in Section 7.4.

7.3.1 Tools

Generally, tools will be washed with a detergent solution and then a final rinse with deionized water. Wooden tools will not be used, as they cannot be adequately decontaminated due to their porous nature and absorptive properties.

7.3.2 Respirator Decontamination

Respirators, if required, will be discarded or decontaminated daily. Taken from the storage area, the masks will be disassembled; the cartridges either set aside or disposed of, and the respirator placed in a cleansing solution. Personnel will inspect their own masks to ensure proper strap adjustment for correct fit. Certain parts of contaminated respirators, such as the harness assembly or cloth components, are difficult to decontaminate. If grossly contaminated, they will be discarded and replaced.

In addition to decontamination, all respirators, protective clothing, and other personal articles must be sanitized before they can be used again. The insides of masks become soiled from exhalation, body oils, and perspiration. Field personnel shall follow the manufacturer's instructions for respirator mask sanitization.

7.4 Disposal of Decontamination Waste

Decontamination rinsate water will be collected and temporarily stored on site in labeled, 55-gallon drums with bunghole tops pending characterization and disposal. The drums will be

removed by a licensed waste hauler and disposed of or recycled at an approved landfill or recycling facility. The drums will be clearly labeled for content, the operation from which they were filled, and the dates. Waste will not be stored on site for more than 60 days. Drums containing waste materials generated during site activities will be staged in a designated area and cordoned off.

7.5 Decontamination During Emergencies

Often during emergencies, the need to quickly respond to an accident or injury must be weighed against the risk to the injured party from chemical exposure. Time lost or the additional handling of an injured person during the decontamination process may cause greater harm to the individual than the exposure that would be received by undressing that person without "textbook" decontamination. This decision must be made by the SSHO. The SSHO, as the on-site focus for safety matters, must be familiar with the safety criteria and the logic behind them. Each operation is different, and the risks to personnel from exposure versus injury vary.

If personal decontamination must be delayed because immediate transport to the emergency facility is critical, the worker will be wrapped in plastic to prevent cross contamination of the ambulance and to protect emergency responders from being exposed to contaminants from the worker's clothing. A site representative shall accompany the injured person to the medical facility to assist or provide guidance to medical personnel in matters concerning decontamination of the injured worker. A copy of the SDSs will accompany the injured worker to the medical facility. The G2S LLC PM will verify facility acceptance standards as to receiving injured personnel with residual contamination.

7.5.1 Physical Injury

Physical injuries can range from minor to life threatening. Life-saving care should be instituted immediately without considering decontamination. The outside garments can be removed (depending on the weather) if this does not cause delays, interfere with treatment, or aggravate the problem. Considering the SOW, this type of situation is not expected to happen at this site with workers adhering to safe working practices, as provided in the SSHP. For minor medical problems or injuries, the normal decontamination procedure should be followed.

If the outer contaminated garments cannot be safely removed, the individual should be wrapped in plastic or blankets to help prevent contaminating medical personnel and/or the inside of ambulances. Outside garments are then removed at the medical facility. No attempt should be made to wash or rinse the worker unless it is known that he has been contaminated with an extremely toxic or corrosive material that could also cause severe injury or loss of life. For minor medical problems or injuries, the normal decontamination procedure should be followed. The need for additional protective clothing or excessive contamination of Level C or D clothing during site activities associated with the approved SOW is not anticipated.

7.5.2 Heat Stress

Heat-related illness ranges from heat fatigue to heat stroke, the latter being the most serious. Heat stroke requires prompt treatment to prevent irreversible damage to health or death. Protective clothing may have to be cut off. Less serious forms of heat stress require prompt attention, or they may lead to a heat stroke. Unless the worker is obviously contaminated, decontamination should be minimized, and treatment begun immediately.

7.5.3 Chemical Exposure

Chemical exposure can be divided into two categories.

1. Direct contact through touch (e.g., acid burns), inhalation, and/or ingestion
2. Indirect contact through gross contamination of clothing or equipment

Only a qualified physician can treat contaminant inhalation and/or ingestion injuries. If the contaminant is on the skin or in the eyes, immediate measures must be taken to counteract its effect. First-aid treatment will involve flooding the affected area with copious quantities of water. The treatment of acid or alkaline exposure will also be the same.

When protective clothing is grossly contaminated, contaminants may be transferred to the wearer or to treatment personnel and cause injuries. Unless splashing may cause severe medical problems, the protective clothing should be washed off as rapidly as possible and carefully removed. Personnel must be aware of the chemical properties of the site hazards as well as the decontamination rinse solutions used to prevent cross contamination during field activities.

8.0 EMERGENCY PROCEDURES

This section describes emergency action procedures to be implemented at the site in case of an accidental spill or release of regulated substances. This section is consistent with the requirements of 29 CFR 1910.38 / CFR 1910.120(q)(1) and local, state, and federal disaster and emergency management plans. This Emergency Action Plan (EAP) will be implemented to prevent or minimize the impacts of unplanned events that could affect the safety and health of site workers or base personnel. Responses to incidental releases of hazardous substances where the substance can be absorbed, neutralized, or otherwise controlled at the time of release by employees in the immediate release area are not considered to be emergency responses within the scope of this standard.

No regulated chemicals other than fuel in fuel tanks and hydraulic fluid in the drilling equipment will be on-site during project work. SDSs for all chemicals anticipated to be onsite are provided in Attachment 4 of the APP. The potential for an uncontrolled release of large volumes of hazardous materials is remote.

The following sections discuss pre-emergency planning, personnel roles and lines of authority, emergency recognition and prevention, evacuation routes and procedures, emergency contacts and notifications, hospital route directions, emergency medical treatment procedures, protective equipment failure, fire or explosion, weather-related emergencies, spills or leaks, emergency equipment and facilities, and reporting.

The SSHO will conduct (and document) an emergency response/evacuation drill during the first day of work. He or she will also conduct unannounced tests of this EAP and record subsequent site worker responses to the simulated emergency situations. The SSHO and the SHM will review the worker responses and, if necessary, prepare an addendum to the SSHP identifying revisions to the EAP. The results of this review will be discussed with all site workers in subsequent tailgate safety meetings.

8.1 Pre-Emergency Planning

All employees working at the site will be trained in the provisions of this EAP during the initial site safety briefing and be updated on changes and/or reminded of these provisions as necessary during the daily tailgate safety meetings. The SSHO will review this EAP on a regular basis to ensure that the provisions of this plan are adequate and consistent with the current site conditions. The plan will be amended, if necessary, to keep it current with new or changing site conditions or information. This includes changing or moving the evacuation route or meeting area that the workers are directed to meet at following a site evacuation. The location of and access to the spill response equipment will be discussed and any personnel unfamiliar with deployment of sorbent booms onto the ground will be trained in the appropriate manufacturer's

recommended deployment procedure. Proper deployment of sorbent pads and/or sorbent granular material onto the liquid will also be rehearsed.

8.2 Personnel Roles and Lines of Authority

The SSHO will also serve as the EAC for this project. The SSHO/EAC has the primary responsibility for responding to and correcting emergency situations, and for responding appropriately to ensure the safety of site personnel and the public. The SSHO/EAC will have the authority to cease any response activity if the safety of responders, site personnel, or the public is threatened. The SSHO/EAC's duties will include:

- Maintaining emergency preparedness;
- Performing site inspections and informing site workers and subcontractors of work activities and emergency action plans;
- Coordinating with emergency services prior to and during an emergency action scenario;
- Making notifications to appropriate authorities; and
- Preparing follow-up reports.

Site personnel are required to report all injuries, illnesses, spills, fires, and property damage to the SSHO/EAC. The SSHO/EAC must be notified of any on-site emergencies and is responsible for ensuring that the appropriate emergency procedures described in this section are followed.

Subcontractors are required to coordinate with the SSHO/EAC concerning activities associated with their individual scopes of work.

8.3 Emergency Recognition, Prevention, and Response

Table 8-1, Emergency Recognition, Prevention, and Response, of this APP/SSHP identifies potential emergency scenarios and provides emergency recognition, prevention, and response guidance for each scenario. All on-site personnel will be made familiar with this information through pre-work training and tailgate safety meetings. All site personnel and visitors will be made aware of their responsibility for notification and warning of any identified emergency situations.

Table 8-1: Emergency Recognition, Prevention, and Response	
Recognition	**Prevention and Response**
Emergency Scenario - Employee Injury/Illness	
Employees who have been exposed to site contaminants without the use of respiratory protection will report the exposure to their supervisor and the SSHO. Employees who feel they are suffering symptoms of exposure to site contaminants or have suffered an injury will also report to their supervisor and the SSHO. Employees should observe each other for signs and symptoms of exposure to site contaminants and other environmental stress. Signs of exposure include the following: • Skin discoloration • Excessive perspiration • Lack of coordination • Staggered gait • Sleepiness, dizziness, drowsiness • Incorrect responses to questions • Irritability or irrational behavior	**Prevention:** The provisions of the SSHP, including the Activity Hazard Analyses, will be followed to prevent injury and illness. **Response:** If an injury occurs due to an accident or exposure to site contaminants, the SSHO will be notified immediately. The SSHO will be provided with all appropriate information concerning the nature and cause of the injury to allow treatment preparations to be initiated. The PM will be notified and will investigate the cause of the injury and make any necessary changes in work procedures. Personnel Injury in the EZ – Upon notification of an injury in the EZ, work will immediately cease, and an assessment of the injured person will be made. If the injury was the result of a site emergency situation, all personnel will evacuate the site and assemble at the pre-determined safe area. If it is a local problem, personnel in the work area will evacuate to the decontamination reduction area. If the injured party(s) can be evacuated without the risk of further injury, they will be removed from the work zone immediately. If not, stretchers will be obtained to evacuate the injured party(s). The nature of the injury will be evaluated, and the affected personnel will be decontaminated to the highest extent possible prior to movement to the support zone. The appropriate first aid will be administered, and contact will be made for an ambulance with the designated medical facility, if required. No personnel will re-enter the EZ or work area until the cause of the injury or symptoms is determined. If the injury is the result of chemical exposure, an assessment of potential airborne contaminant concentration will be performed using field instrumentation. Rescue will be performed in a level of protection appropriate for the anticipated airborne contaminant concentrations. Emergency decontamination procedures are described in Section 7.5. A copy of the decontamination procedures will be given to the local ambulance and emergency room personnel. Personnel Injury in the SZ – Upon notification of an injury in the SZ, the SSHO will assess the nature of the injury. If the cause of the injury or the loss of the injured person does not affect the performance of the site personnel, operations will continue with appropriate first aid and necessary follow-up as stated above. If the designated emergency signal is sounded, all site personnel will move to the pre-designated safe area

Table 8-1: Emergency Recognition, Prevention, and Response	
Recognition	**Prevention and Response**
	and wait for further instructions. Activities at the site will stop until any added risk is removed or minimized.
Emergency Scenario - Fire/Explosion	
All fires and visible smoke will be immediately reported to the SSHO and the PM.	**Prevention:** The primary goals of fire prevention and protective measures are to control ignition sources and early detection and rapid response. The following preventative measures will be taken at the site: • Smoking will be prohibited at the site except in designated areas • No welding, open flames, or spark-producing activities will be allowed on-site unless evaluated and approved by the SSHO • Only approved containers will be used to store flammable and combustible liquids **Response:** In the event of a fire or explosion, site evacuation procedures will be implemented, and emergency response services will be notified. G2S LLC personnel will only attempt to extinguish small incipient fires (e.g., fires that can be extinguished with available portable fire extinguishers). In the event of larger fires, G2S LLC will notify the proper authorities and evacuate the site in accordance with the Emergency Response Plan.
Emergency Scenario - Environmental Release	

Table 8-1: Emergency Recognition, Prevention, and Response	
Recognition	**Prevention and Response**
Visual observations of leaking containers or puddles of unknown liquids will be reported to the SSHO and the site supervisor immediately. The SSHO will report the incident to the PM. The air monitoring program discussed in Section 6.0 of the SSHP will be the primary recognition tool for air releases.	**Prevention:** All liquids will be stored in approved containers. Additional spill and discharge information is provided in Section 9.2.2 of the APP. Engineering controls such as dust suppression will be used to minimize the release of airborne contaminants. **Response:** Response to an environmental release will involve ceasing site work, notification of the USACE and Facility points of contact and appropriate federal, state, and local agencies, and implementing spill or dust control procedures. In the event of a severe spill or leak, site personnel will follow the procedures listed below: • Evacuate the affected area and relocate personnel to the pre-determined safe area • Inform the SSHO, the site supervisor, and the PM immediately • Locate the source of the spill or leak and stop the flow if it is safe to do so • Begin containment and recovery of spilled or leaked materials • Notify appropriate federal, state and local agencies
Emergency Scenario - Miscellaneous Emergencies (weather, adverse community activity, etc.)	
Any forecasts of severe weather conditions or indications of adverse community activities (e.g., vandalism, threats, pickets, etc.) will be reported immediately to the PM.	**Prevention:** G2S LLC will take reasonable measures to protect the site and site personnel against other potential emergency situations such as severe weather and adverse community activities. Preventative measures will include securing temporary office and storage facilities, grounding of buildings and electrical systems, and implementation of site security and control measures. **Response:** All outdoor work will immediately cease at the first indication of thunder. Work will continue 30 minutes after the last thunder. The safety of work in high winds or other severe weather conditions will be assessed by the SSHO. The SSHO will cease site operations if weather conditions will not allow the safe conduct of work. G2S LLC will not respond to any adverse community situation other than to obtain as much information as possible and to report that information to the USACE and Project POCs, or in the case of an emergency, contact the appropriate authorities.

8.4 Site Security and Control

Work areas will be delineated with traffic cones, barricades, and/or yellow caution tape. Site control zones will be established as described in Section 6.0 of this APP/SSHP to control the spread of contamination and employee exposure to chemical and physical hazards. Access to the exclusion zone will be restricted to authorized personnel only. The perimeter of a delineated EZ will be established in a manner that will provide adequate room for the number of workers involved, their equipment, and be a safe distance and method of travel to the decontamination area. All tools, equipment, and materials will be stored in work vehicles or a secure area for overnight storage. Such overnight storage locations will be identified by the POC for the facility. Temporary storage facilities will be equipped with locks that will be secured at the end of each work shift.

8.5 Evacuation Routes and Procedures

The on-site communication systems that will be used for this project include the use of an air horn, hand signals, and cellular phones among workers. Workers are to use the "buddy system" at all times and be cognizant of the reduction of communication abilities in high noise areas and/or poor air cellular service areas. Hand signals that will be used by site personnel in emergency situations or when verbal communication is difficult are listed in Table 8-2.

Table 8-2: Hand signals to be used in emergency situations

Signal	Definition
Hands clutching throat	Out of Air or cannot breathe
Hands on top of head	Need assistance
Thumbs up	Okay, I am all right, or I understand
Thumbs down	No or negative
Arms waving upright	Send backup support
Gripping partner's wrist	Exit area immediately

In the event of an emergency that necessitates an immediate work stoppage or site evacuation, the air horn shall be used by the SSHO to alert site personnel. One extended blast of the air horn will signal an immediate work stoppage, with all personnel moving into a predetermined meeting/safe area.

Whenever possible, evacuation should be in the direction perpendicular to the wind direction without passing through the plume or smoke cloud, if any. The emergency meeting location and site evacuation route for the site will be communicated to site personnel during the morning tailgate meeting, and the evacuation route map will be reviewed during the daily tailgate safety meeting. Personnel will remain in the emergency meeting area until the SSHO or his/her authorized representative provides further instructions.

8.6 Emergency Contacts and Notifications

The name, telephone number, and location of police, fire, and other emergency response agencies will be available on site at all times. If emergency personnel are called to the site, efforts should be made to accommodate their operations at the site. Emergency telephone numbers for this project are presented in Table 8-3, Emergency Telephone Numbers. In the event of a medical emergency, personnel will notify the appropriate emergency organization and will take directions from the SSHO. In the event of a fire, explosion, or spill at the site, the SSHO will notify first responders and the appropriate federal, state, and local agencies and will follow the procedures discussed in Table 8-1, Emergency Recognition, Prevention, and Response.

Table 8-3: Emergency Telephone Numbers		
Emergency Services		
First Responders		911
NASA JPL Security/Fire/Medical Service		3-3333 (lab telephones only)
NASA JPL Fire Dispatch		(818) 354-3530
Huntington Memorial Hospital		(626) 397-5000
USC Verdugo Hills Hospital		(818) 790-7100
Poison Control Center		(800) 222-1222
National Response Center		(800) 424-8802
OSHA Referral		(800) 321-6742
USACE		
Adrienne Wilson	Engineering Manager	Office: (904) 542-6160
G2S LLC		
Keith Fields	Project Manager	Office: (614) 792-2896 Mobile: (614) 778-2618
David Conner	Site Safety & Health Officer	Mobile: (626) 298-5715
Ben Headington	Alternate Site Safety and Health Officer	Office: (614) 792-2897 Mobile: (614) 348-8939
Skanda Abeyesekere	Safety and Health Manager/ CIH	Mobile: (443) 983-0362

8.7 Emergency Medical Treatments and First Aid

A first aid kit and fire extinguisher will be located in the SZ or as appropriate. The first aid kit will contain the American Red Cross first aid manual or equivalent. A minimum of two personnel trained and certified in adult first aid, cardiopulmonary resuscitation (CPR), and bloodborne pathogens, in accordance with 29 CFR 1910.1030, will be on-site at all times that work is being performed. If an injured individual requires further attention, the individual will be immediately transported to the nearest hospital. A hospital route map for Huntington Memorial Hospital, Emergency Room is presented in Figure 8-1. If necessary, the worker will be decontaminated prior to transport to the facility; if the injury is serious, decontamination may be delayed pending emergency treatment. As explained earlier, concentrations of the COC anticipated to be encountered at these sites are not considered acutely toxic and should not prevent the implementation of emergency medical care.

Hospital Route Map from NASA JPL

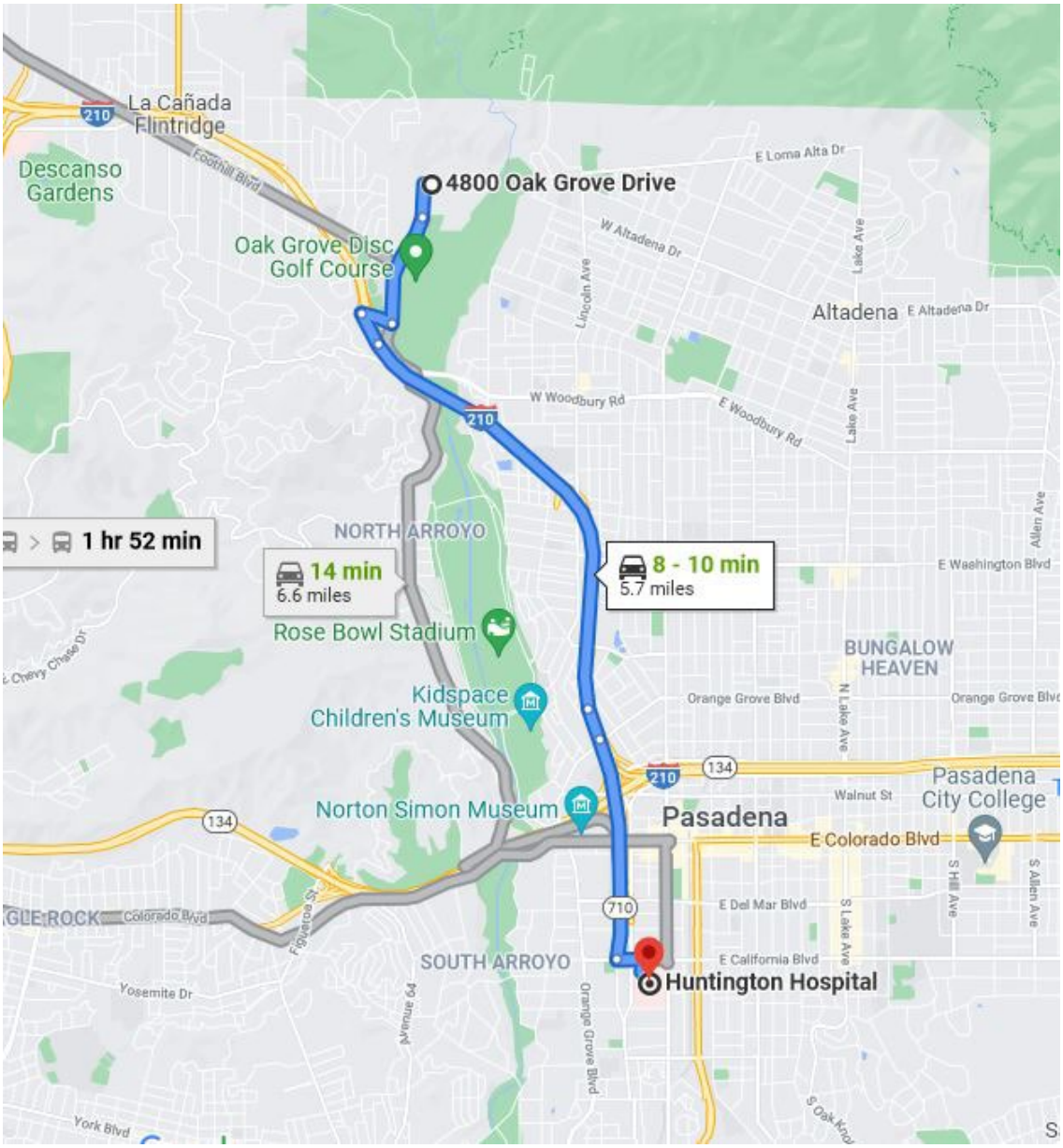


Figure 8-1: Hospital Route Map

Hospital Route Map to Huntington Memorial Hospital (Modified from Google Maps, 2021)

Directions to Huntington Memorial Hospital (5.7 miles; approx. 10 minutes)

8 - 10 min (5.7 miles)

via I-210 E and CA-710

4800 Oak Grove Dr
Pasadena, CA 91109

- Get on I-210 E from Oak Grove Dr
  - 3 min (1.3 mi)
- Follow I-210 E and CA-710 to W California Blvd in Pasadena
  - 4 min (4.2 mi)
  - Merge onto I-210 E
    - 2.7 mi
  - Use the left lane to keep left at the fork, continue on CA-710 and follow signs for Del Mar Blvd/California Blvd/Colorado Blvd/Pasadena
    - 0.2 mi
  - Keep left to stay on CA-710
    - 1.3 mi
- Continue on W California Blvd. Drive to Drexel Pl
  - 1 min (0.2 mi)
  - Turn left onto W California Blvd (signs for CA-110)
    - 0.1 mi
  - Turn right onto Drexel Pl
    - 456 ft

Huntington Hospital
100 W California Blvd, Pasadena, CA 91105

General first aid procedures are outlined below:

- Skin/Eye Contact: Use copious amounts of soap and water. Wash/rinse affected area thoroughly and then provide appropriate medical attention. An eyewash system will be provided on-site at the SZ or as appropriate. Eyes should be rinsed for 15 minutes if there was chemical contact with the eyes. The eyewash station will be ANSI-certified and will meet the Z¬358.1-2004 standard. This eyewash station will be capable of providing flushing fluid to the eyes at 1.5 liters per minute (0 to 4 gallons per minute) for a minimum of 15 minutes.

- Inhalation: Move to fresh air and, if necessary, decontaminate and transport to hospital. Any loss of consciousness or exposure to airborne toxic substances, even if the individual appears to have fully recovered, will require immediate treatment or surveillance by a qualified physician.

- Ingestion: Notify Poison Control Center and emergency medical facility and transport to nearest emergency medical facility immediately.

- Puncture Wound or Laceration: Decontaminate and transport to emergency medical facility. Apply direct compression to stop or slow the flow of blood. Universal precautions to prevent contacting the blood of another shall be implemented.

8.8 Emergency Response Equipment

Based on similar work, the low potential for spills, and the lack of acutely toxic concentrations, it is anticipated that the specified safety equipment worn (U.S. EPA Level D) by the workers will be sufficient for the emergency action events that may occur at this site. The hazard analyses conducted at this site did not identify a risk of a release of potentially flammable or explosive substances.

EPA Level D PPE will include hard hats (as needed), steel-toed boots, work gloves, chemical resistant gloves (as needed), hearing protection (as necessary), and eye protection.

In addition, the following emergency equipment will be available at the site:

- First aid kit
- Eye wash station (portable)
- Fire extinguisher
- Mobile phone
- Sorbent booms and granular material
- Drums
- Spill kits

8.9 Reporting

All emergency situations require follow-up and reporting. Appendix D of the APP includes the Accident Investigation and Reporting Form ENG 3394. This report must be completed and submitted to the PM within twenty-four (24) hours of an emergency situation. The PM will review the report and forward it to the SSHO for review. The report must include proposed actions to prevent similar incidents from occurring. The SSHO must be fully informed of the corrective action process so that he or she may implement applicable elements of the process in the future.

The USACE PM will be notified within four (4) hours of the incident, following administration of necessary first-aid procedures to workers, if applicable. If the accident is serious and the injury(s) results in permanent disfigurement, loss of limb or death, the area will be immediately secured and will not be released until authorized by the USACE PM. OSHA will be notified within eight hours.

9.0 MEDICAL SURVEILLANCE

9.1 Medical Examination Requirements

G2S LLC site personnel (as outlined in G2S LLC's Health and Safety Program) and subcontractor project personnel working on-site will have undergone either a baseline or annual medical monitoring examination within 12 months prior to participation in fieldwork. Medical screening is conducted at the start of employment and annually thereafter and may consist of the following as directed by the medical doctor:

- Medical and occupational history
- Physical examination, with particular attention to the cardiopulmonary system, general physical fitness, skin, blood forming, hepatic, renal, and nervous systems
- Urinalysis
- Blood analysis
- OSHA Noise questionnaire
- Pulmonary function test
- Chest X-ray
- Audiogram
- Electrocardiogram

Based on this examination, the physician will certify in writing whether the individual is capable of full participation in the program, or whether that person must work within certain restrictions. Personnel may be excluded from this project for medical reasons. Any person suffering a lost-time injury or illness must have medical approval prior to returning to work on site.

9.2 Record Keeping

All medical records must be maintained by the employer for a period of at least 30 years after the employee's termination of employment, in accordance with OSHA regulations on confidentiality and record keeping. Prior to the initiation of work, subcontractors will submit copies of their medical fitness certifications to the G2S LLC SSHO for each employee to be assigned to the site. The certifications will state that the employee has received a medical examination within the previous 12 months and has been determined fit to perform on-site work.

10.0 TRAINING

It is recognized that conditions on the site may change or that more information may become available during the operation. If during field activities, it is determined that the conditions are not as described, or the protection specified in the APP and SSHP require modifications, work will cease, and the SSHO will contact the PM for guidance. Work will not resume until authorized by the PM.

In addition to conducting the daily tailgate meetings (which may include supplemental safety training), the SSHO will conduct a Site Supervisors' safety meeting at least once a month. These monthly Supervisor safety meetings will include a discussion on past and present safety issues on site, plans for new or changed activities, reviewing the appropriate AHA (by trade), establishing safe working procedures for anticipated hazards, and providing pertinent health and safety training and reinforcement.

10.1 General Personnel – Training

All G2S LLC personnel are required to attend new employee orientation training. This training includes:

- Hazard Communication/Petroleum Hydrocarbons
- Emergency Action Response Procedures
- Basic Safety Training
- A review and discussion of the Corporate Health & Safety Policy

10.2 Field Personnel – Training

Subcontractors are to provide acceptable certification of training for all personnel on site. At a minimum, all subcontractor personnel will be required to provide 40-hour HAZWOPER Training and applicable 8-hour Refresher Training Certificates prior to the start of fieldwork. These documents will be presented to the SSHO before any field activities take place. Mandatory training (which must be current) required on this project includes:

1. An initial 40-hour HAZWOPER Training Class
   - Workers will have 3-days of on-site, supervised field training
   - Supervisors will have 3-days of on-site supervised field training with at least 8 additional hours of specialized training at the time of job assignment (i.e., on the following programs: Company's Health & Safety policy, employee training, PPE, spill containment and health hazard monitoring and techniques).

2. An annual 8-hour HAZWOPER Refresher Training class and OSHA Construction Safety Training
   - The SSHO and/or Alternative SSHO shall have completed the 30-hour OSHA Construction Safety Training.
   - Potential Topics covered in these classes include the following:
     - Introduction to OSHA
     - Hazard Communication
     - Lead and Asbestos
     - Cranes/Rigging
     - PPE
     - Confined Space Entry
     - Legal Issues
     - Fall Protection
     - Electrical Safety
     - Material Handling
     - Excavations, Trenching, and Shoring
     - Ladders/Stairs
     - Scaffolds
     - Steel
     - Demolition

3. At least two (2) personnel with current Adult First Aid/Adult cardiopulmonary resuscitation (CPR) and Bloodborne Pathogens Training (in accordance with 29 CFR 1910.1030 and 8 CCR 5193) will be on site at all times during site work.

4. Hazard Communication Training

5. PPE Training

6. The SSHO or his/her alternate will be the competent person on site when any fieldwork associated with this project is being conducted. The competent person will have experience in mobilization, site set up, soil sampling, use of protective systems, and requirements of 29 CFR 1926.650-652.

7. All heavy equipment operators will have received proper training and have extensive experience. No certification and/or licensing are required for heavy equipment operators. Drillers will possess a current drilling license.

Records of employee qualifications are kept in the G2S LLC corporate office. As required by OSHA regulations (29 CFR 1926.65), all G2S LLC on-site employees have received 3 days of supervised field training. All site personnel will complete this initial HAZWOPER training

before assignment to this project. The course content of this training will include, but not be limited to, the following:

- Names of personnel and alternates responsible for site safety and health
- Safety, health, and other hazards present on the Site
- Use of protective clothing and equipment
- Work practices by which the employee can minimize risks from hazards
- Safe use of engineering controls and equipment
- Medical surveillance requirements including recognition of symptoms and signs which might indicate overexposure to hazards
- Emergency response procedures
- Refresher training requirements

In addition, the on-site management, supervisors, and SSHO will receive additional management training, which will include, but not be limited to, the following:

- The employer's safety and health program
- Associated employee training program
- PPE program
- Spill containment program
- Health hazard monitoring procedures and techniques
- CPR/First Aid Training

The SSHO will keep copies of the certifications for the completion of such training for all site workers on site in a file. Workers without such certification will not be allowed to work at the site. Prior to commencement of field operations at the project site, personnel will receive site-specific training (briefed in the tailgate safety meeting). This training will include a review of all information contained in this SSHP, with particular emphasis on the following:

- Types and anticipated levels of hazardous substances known to be present on site, their PELs, health effects, and exposure routes
- The need for PPE
- The importance of maintenance and attention to proper fit of PPE
- Prescribed decontamination procedures
- Safe work practices, such as proper site entry and egress, and proper hygiene during meal and rest breaks
- Recognition in oneself and others of physical conditions requiring immediate medical attention, especially heat stress and application of simple first aid measures
- Procedures to be followed in case of emergencies

11.0 ADVERSE WEATHER CONDITIONS

In the event of adverse weather conditions, the SSHO will determine if work can continue without endangering the health and safety of the field workers. The SSHO will monitor the weather news in the morning and afternoon through the radio or internet and will document it in the contractor production report. He or she will also coordinate with a local weather center, if available, to obtain specific information about the current weather conditions. Some of the items to be considered prior to determining if work should continue are:

- Potential for heat stress and heat-related injuries
- Potential for frostbite and cold-related injuries
- Dangerous weather-related working conditions (e.g., high winds, rain, snow, lightning, smog, fog)
- Limited visibility
- The potential for electrical storms (no outdoor activities will be permitted during electrical storms)

12.0 PERSONAL HYGIENE AND SANITATION

G2S LLC will establish and maintain basic sanitation provisions for all employees and subcontractors. G2S LLC will ensure that an adequate supply of drinking water is available at the job site while work is being performed. Access to public toilets or rental of portable toilets with hand-washing capacity will be afforded to site workers when needed. The supervisor will ensure that adequate breaks are given for personnel to use the toilet facilities and water intake. The SSHO will ensure that employees wash their hands and faces thoroughly before breaks, before lunch, and at the end of the workday.

No eating, drinking, smoking, or applying cosmetics will be allowed in the CRZ or EZ. Drinking water will be available in the SZ during working hours. Plastic bags or steel containers will be provided for the collection of refuse and disposable garments and materials. Good housekeeping practices will be enforced at all times.

13.0 REFERENCES

Chemical Information File, USDOL-OSHA, 1985.

County of Los Angeles Public Health Acute Communicable Disease Control: http://publichealth.lacounty.gov/acd/Diseases/SLE.htm (Website accessed November 3, 2021).

County of Los Angeles Public Health Acute Communicable Disease Control: http://publichealth.lacounty.gov/acd/vectorwestnile.htm (Website accessed November 3, 2021).

County of Los Angeles Public Health: http://publichealth.lacounty.gov/wwwfiles/ph/media/media/tph_junejuly08.pdf (Website accessed November 3, 2021).

Los Angeles County Agricultural Commissioner/Weights & Measures, Entomology and Plant Pathology Laboratories: https://acwm.lacounty.gov/entomology-and-plant-pathology-laboratories/ (Website accessed November 3, 2021).

National Institute of Occupational Safety and Health (NIOSH). Pocket Guide to Chemical Hazards, DOHS Pub No. 2005-149.

Occupational Safety and Health Administration (OSHA). Occupational Safety and Health Administration Standards, Title 29 CFR, Parts 1910 and 1926, United States Department of Labor, Occupational Safety and Health Administration.

Occupational Safety and Health Administration Standards, Title 29 CFR, Sections 1910.1001 and 1926.58 (as amended), 1910.134, 1910.20, and 1910.1200.

1989b. Hazardous Waste Operations and Emergency Response, Final Rule. 29 CFR 1910.120.54 FR 9294, March 6.

1985. Guidance Manual for Hazardous Waste Site Activities, NIOSH/OSHA/EPA/ USCG, DHH, Publication No. 85-115.

University of California Los Angeles - Health: https://healthinfo.uclahealth.org/Library/DiseasesConditions/Adult/NonTraumatic/85,P00860 (Website accessed November 3, 2021).

U.S. EPA. See United States Environmental Protection Agency Standards.

United States Army Corps of Engineers, 2014. Safety & Health Requirements Manual, EM 385-1-1, November 30.

United States Department of the Navy, 2006. Environmental Restoration Program Manual, August.

APPENDIX F
Safety Data Sheets (SDSs)

Safety Data Sheet

Effective date: 11 May 2020 **Revision**: 11 May 2020
Trade Name: Alconox®

1 Identification of the substance/mixture and of the supplier

1.1 GHS Product identifier

Trade Name: Alconox®
Product number: 1101, 1103, 1104, 1104-1, 1112, 1112-1, 1125, 1150

1.2 Application of the substance / the mixture: Cleaning material/Detergent

1.2.1 Recommended dilution ratio: 1 – 2% in water

1.3 Details of the supplier of the Safety Data Sheet

Manufacturer:
Alconox Inc.
30 Glenn St
White Plains, NY 10603
(914) 948-4040

Supplier:

Emergency telephone number:
ChemTel Inc
North America: 1-888-255-3924
International: +1 813-248-0573

2 Hazards identification

2.1 Classification of the substance or mixture:

In compliance with EC regulation No. 1272, 29CFR1910/1200 and GHS requirements.

Hazard-determining components of labeling:
Tetrasodium Pyrophosphate
Sodium tripolyphosphate
Sodium Alkylbenzene Sulfonate

2.2 Label elements:

Eye damage, category 1.

Skin irritation, category 2.

Product at recommended dilution:
Eye irritation, category 2B

Hazard pictograms:

Signal word: Danger

Hazard statements:
H315 Causes skin irritation.
H318 Causes serious eye damage.

Precautionary statements:
P264 Wash skin thoroughly after handling.

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P280 Wear protective gloves/protective clothing/eye protection/face protection.
P302+P352 If on skin: Wash with soap and water.
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
P321 Specific treatment (see supplemental first aid instructions on this label).
P332+P313 If skin irritation occurs: Get medical advice/attention.
P362 Take off contaminated clothing and wash before reuse.
P501 Dispose of contents and container as instructed in Section 13.

Hazardous Elements at Use Dilution:

Hazard Pictograms:

Signal Word: Warning
Hazard Statements:
H320 Causes eye irritation

Precautionary statements:
P302+P352 If on skin: Wash with soap and water.
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
P501 Dispose of contents and container as instructed in Section 13

Additional information: None.

Hazard description
Hazards Not Otherwise Classified (HNOC): May cause surfaces to become slippery if wet. Use caution in areas of foot traffic if on floors.

Information concerning particular hazards for humans and environment:
The product has to be labelled due to the calculation procedure of the "General Classification guideline for preparations of the EU" in the latest valid version.

Classification system:
The classification is according to EC regulation No. 1272, 29CFR1910/1200 and GHS Requirements, and extended by company and literature data. The classification is in accordance with the latest editions of international substances lists and is supplemented by information from technical literature and by information provided by the company.

3 Composition/information on ingredients

3.1 Chemical characterization: Not determined or not available.

3.2 Description: None
3.3 Hazardous components (percentages by weight)

Identification	Chemical Name	Classification	Wt. %
CAS number: 7758-29-4	Sodium tripolyphosphate	Skin Irrit. 2; H315 Eye Irrit. 2; H319	12-28
CAS number: 68081-81-2 or 68411-30-3	Sodium Alkylbenzene Sulfonate	Acute Tox. 4; H303 Skin Irrit. 2; H315 Eye Dam. 1; H318	8-22
CAS number: 7722-88-5	Tetrasodium Pyrophosphate	Skin Irrit. 2; H315 Eye Irrit. 2; H319	2-16

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Hazardous components at use dilution (percentages by weight):

Identification	Chemical Name	Classification	Wt. %
CAS number: 7758-29-4	Sodium tripolyphosphate	Eye Irrit. 2; H319	0.12 - 0.28
CAS number: 68081-81-2 or 68411-30-3	Sodium Alkylbenzene Sulfonate	Eye Irrit. 2; H319	0.08 – 0.22
CAS number: 7722-88-5	Tetrasodium Pyrophosphate	Eye Irrit. 2; H319	0.02 – 0.16

3.4 Additional Information: None.

4 First aid measures

4.1 Description of first aid measures

General information: None.

After inhalation:

Maintain an unobstructed airway.
Loosen clothing as necessary and position individual in a comfortable position.

After skin contact:

Wash affected area with soap and water.
Seek medical attention if symptoms develop or persist.

After eye contact:

Rinse/flush exposed eye(s) gently using water for 15-20 minutes.
Remove contact lens(es) if able to do so during rinsing.
Seek medical attention if irritation persists or if concerned.

After swallowing:

Rinse mouth thoroughly.
Seek medical attention if irritation, discomfort, or vomiting persists.

4.2 Most important symptoms and effects, both acute and delayed

None

4.3 Indication of any immediate medical attention and special treatment needed:

No additional information.

First aid measure at recommended dilution:

General information: None.

After inhalation:

Maintain an unobstructed airway.
Loosen clothing as necessary and position individual in a comfortable position.

After skin contact:

Wash affected area with soap and water.

After eye contact:

Rinse/flush exposed eye(s) gently using water for 15-20 minutes.
Remove contact lens(es) if able to do so during rinsing.

After swallowing:

Rinse mouth thoroughly. Seek medical attention if irritation, discomfort, or vomiting develops.

5 Firefighting measures

Safety Data Sheet

5.1 Extinguishing media

Suitable extinguishing agents:

Use appropriate fire suppression agents for adjacent combustible materials or sources of ignition.

For safety reasons unsuitable extinguishing agents: None

5.2 Special hazards arising from the substance or mixture:

Thermal decomposition can lead to release of irritating gases and vapors.

5.3 Advice for firefighters

Protective equipment:

Wear protective eye wear, gloves and clothing.
Refer to Section 8.

5.4 Additional information:

Avoid inhaling gases, fumes, dust, mist, vapor and aerosols.
Avoid contact with skin, eyes and clothing.

6 Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures:

Ensure adequate ventilation.
Ensure air handling systems are operational.

6.2 Environmental precautions:

Should not be released into the environment.
Prevent from reaching drains, sewer or waterway.

6.3 Methods and material for containment and cleaning up:

Wear protective eye wear, gloves and clothing.

6.4 Reference to other sections: None

7 Handling and storage

7.1 Precautions for safe handling:

No expected hazards under normal use condition.

Avoid breathing mist or vapor if aerosolized.
Do not eat, drink, smoke or use personal products when handling chemical substances.

7.2 Conditions for safe storage, including any incompatibilities:

Store in a cool, well-ventilated area.

7.3 Specific end use(s):

No additional information.

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8 Exposure controls/personal protection

8.1 Control parameters:

a) 7722-88-5, Tetrasodium Pyrophosphate, ACGIH TWA 10 mg/m3
b) 7758-29-4, Sodium Tripolyphosphate, ACGIH TWA 10 mg/m3
c) Dusts, non-specific OEL, Irish Code of Practice
   (i) Total inhalable 10 mg/m3 (8hr)
   (ii) Respirable 4 mg/m3 (8hr)
   (iii) Tetrasodium Pyrophosphate, OSHA TWA 5 mg/m3, (8hr)

8.2 Exposure controls

Appropriate engineering controls:

Emergency eye wash fountains and safety showers should be available in the immediate vicinity of use or handling.

Respiratory protection:

Not needed under normal use conditions.

Protection of skin:

Select glove material impermeable and resistant to the substance.

Eye protection:

Safety goggles or glasses, or appropriate eye protection. Recommended to comply with ANSI Z87.1 and/or EN 166.

General hygienic measures:

Wash hands before breaks and at the end of work.
Avoid contact with skin, eyes and clothing.

Exposure Control and Personal Protective Equipment at recommended dilution:

Under normal use and operational conditions, no special personal protective equipment or engineering controls will be necessary. Handle with care.

9 Physical and chemical properties

Appearance (physical state, color):	White and cream colored flakes - powder	**Explosion limit lower**: **Explosion limit upper**:	Not determined or notavailable. Not determined or notavailable.
Odor:	Not determined or not available.	**Vapor pressure at 20°C**:	Not determined or notavailable.
Odor threshold:	Not determined or not available.	**Vapor density**:	Not determined or notavailable.
pH-value:	9.5 (1% aqueous solution)	**Relative density**:	Not determined or notavailable.

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Melting/Freezing point:	Not determined or not available.	**Solubilities**:	Not determined or notavailable.
Boiling point/Boiling range:	Not determined or not available.	**Partition coefficient (n-octanol/water)**:	Not determined or notavailable.
Flash point (closed cup):	Not determined or not available.	**Auto/Self-ignition temperature**:	Not determined or notavailable.
Evaporation rate:	Not determined or not available.	**Decomposition temperature**:	Not determined or notavailable.

Flammability (solid, gaseous):	Not determined or not available.	**Viscosity**:	a. Kinematic: Not determined or not available. b. Dynamic: Not determined or not available.
Density at 20°C:	Not determined or not available.		

10 Stability and reactivity

10.1 Reactivity: Not determined or not available.
10.2 Chemical stability: Not determined or not available.
10.3 Possibility hazardous reactions: Not determined or not available.
10.4 Conditions to avoid: Not determined or not available.
10.5 Incompatible materials: Not determined or not available.
10.6 Hazardous decomposition products: Not determined or not available.

11 Toxicological information

11.1 Information on toxicological effects:

Acute Toxicity:

Oral:

: LD50 > 5000 mg/kg oral rat - Product.

Chronic Toxicity: No additional information.

Skin corrosion/irritation:

Sodium Alkylbenzene Sulfonate: Causes skin irritation.

Serious eye damage/irritation:

Sodium Alkylbenzene Sulfonate: Causes serious eye damage.

Tetrasodium Pyrophosphate: Risk of serious damage to eyes.

Product information at recommended dilution:

Eye irritation may occur upon direct contact with eyes. No specific hazards for skin contact, inhalation, or chronic exposure are expected within normal use parameters.

Respiratory or skin sensitization: No additional information.

Carcinogenicity: No additional information.

IARC (International Agency for Research on Cancer): None of the ingredients are listed.

NTP (National Toxicology Program): None of the ingredients are listed.

Germ cell mutagenicity: No additional information.

Reproductive toxicity: No additional information.

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STOT-single and repeated exposure: No additional information.

Additional toxicological information: No additional information.

12 Ecological information

12.1 Toxicity:

Sodium Alkylbenzene Sulfonate: Fish, LC50 1.67 mg/l, 96 hours.
Sodium Alkylbenzene Sulfonate: Aquatic invertebrates, EC50 Daphnia 2.9 mg/l, 48 hours.
Sodium Alkylbenzene Sulfonate: Aquatic Plants, EC50 Algae 29 mg/l, 96 hours.
Tetrasodium Pyrophosphate: Fish, LC50 - other fish - 1,380 mg/l - 96 h.
Tetrasodium Pyrophosphate: Aquatic invertebrates, EC50 - Daphnia magna (Water flea) - 391 mg/l - 48 h.

12.2 Persistence and degradability: No additional information.

12.3 Bioaccumulative potential: No additional information.

12.4 Mobility in soil: No additional information.

General notes: No additional information.

12.5 Results of PBT and vPvB assessment:

PBT: No additional information.

vPvB: No additional information.

12.6 Other adverse effects: No additional information.

13 Disposal considerations

13.1 Waste treatment methods (consult local, regional and national authorities for proper disposal)

Relevant Information:

It is the responsibility of the waste generator to properly characterize all waste materials according to applicable regulatory entities. (US 40CFR262.11).

14 Transport information

14.1 UN Number: ADR, ADN, DOT, IMDG, IATA	None
14.2 UN Proper shipping name: ADR, ADN, DOT, IMDG, IATA	None
14.3 Transport hazard classes: ADR, ADN, DOT, IMDG, IATA	**Class:** None **Label:** None **LTD. QTY:** None

US DOT

Limited Quantity Exception: None

Bulk:
RQ (if applicable): None
Proper shipping Name: None
Hazard Class: None
Packing Group: None
Marine Pollutant (if applicable): No additional information.

Non Bulk:
RQ (if applicable): None
Proper shipping Name: None
Hazard Class: None
Packing Group: None
Marine Pollutant (if applicable): No additional information.

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	Comments: None	**Comments:** None
14.4	**Packing group:** ADR, ADN, DOT, IMDG, IATA	None
14.5	**Environmental hazards**:	None
14.6	**Special precautions for user:**	None
	Danger code (Kemler):	None
	EMS number:	None
	Segregation groups:	None

14.7 Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code: Not applicable.

14.8 Transport/Additional information:

Transport category:	None
Tunnel restriction code:	None
UN "Model Regulation":	None

15 Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture.

North American

SARA

Section 313 (specific toxic chemical listings): None of the ingredients are listed.
Section 302 (extremely hazardous substances): None of the ingredients are listed.

CERCLA (Comprehensive Environmental Response, Clean up and Liability Act) Reportable

Spill Quantity: None of the ingredients are listed.

TSCA (Toxic Substances Control Act):

Inventory: All ingredients are listed as active.
Rules and Orders: Not applicable.

Proposition 65 (California):

Chemicals known to cause cancer: None of the ingredients are listed.

Chemicals known to cause reproductive toxicity for females: None of the ingredients are listed.

Chemicals known to cause reproductive toxicity for males: None of the ingredients are listed.

Chemicals known to cause developmental toxicity: None of the ingredients are listed.

Canadian

Canadian Domestic Substances List (DSL):
All ingredients are listed.

EU

REACH Article 57 (SVHC): None of the ingredients are listed.

Germany MAK: Not classified.
EC 648/2004 – This is an industrial detergent. Contains >30% phosphate, 15-30% anionic surfactant, <5% EDTA salts
EC 551/2009 – This is not a laundry or dishwasher detergent
EC 907/2006 – Contains no enzymes, optical brighteners, perfumes, allergenic fragrances, or preservative agents

Asia Pacific

Australia

Australian Inventory of Chemical Substances (AICS): All ingredients are listed.

China

Inventory of Existing Chemical Substances in China (IECSC): All ingredients are listed.

Japan

Inventory of Existing and New Chemical Substances (ENCS): All ingredients are listed.

Korea

Existing Chemicals List (ECL): All ingredients are listed.

New Zealand

New Zealand Inventory of Chemicals (NZOIC): All ingredients are listed.

Philippines

Philippine Inventory of Chemicals and Chemical Substances (PICCS): All ingredients are listed.

Taiwan

Taiwan Chemical Substance Inventory (TSCI): All ingredients are listed.

16 Other information

Abbreviations and Acronyms: None

Summary of Phrases

Hazard statements:
H315 Causes skin irritation.
H318 Causes serious eye damage.

NFPA: 1-0-0
HMIS: 1-0-0

At recommended dilution:
NFPA: 1-0-0
HMIS: 1-0-0

Precautionary statements:
P264 Wash skin thoroughly after handling.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P302+P352 If on skin: Wash with soap and water.
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
P321 Specific treatment (see supplemental first aid instructions on this label).
P332+P313 If skin irritation occurs: Get medical advice/attention.
P362 Take off contaminated clothing and wash before reuse.
P501 Dispose of contents and container as instructed in Section 13.

Manufacturer Statement:

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

SAFETY DATA SHEET

Revision Date 20-Feb-2020 **Revision Number** 3

1. Identification

Product Name **Ammonium perchlorate**

Cat No. : **11658**

CAS-No 7790-98-9
Synonyms No information available

Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use.

Details of the supplier of the safety data sheet

Company
Alfa Aesar
Thermo Fisher Scientific Chemicals, Inc.
30 Bond Street
Ward Hill, MA 01835-8099
Tel: 800-343-0660
Fax: 800-322-4757
Email: tech@alfa.com
www.alfa.com

Emergency Telephone Number
During normal business hours (Monday-Friday, 8am-7pm EST), call (800) 343-0660.
After normal business hours, call Carechem 24 at (866) 928-0789.

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Explosives	Division 1.1
Oxidizing solids	Category 1

Label Elements

Signal Word
Danger

Hazard Statements
Explosive; mass explosion hazard
May cause fire or explosion; strong oxidizer

Precautionary Statements
Prevention
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep wetted with water
Ground/bond container and receiving equipment
Do not subject to grinding/shock/friction
Wear protective gloves/protective clothing/eye protection/face protection
Keep/Store away from clothing/ other combustible materials
Take any precaution to avoid mixing with combustibles
Wear fire/flame resistant/retardant clothing
Skin
IF ON CLOTHING: Rinse immediately contaminated clothing and skin with plenty of water before removing clothes
Fire
Explosion risk in case of fire
DO NOT fight fire when fire reaches explosives
In case of major fire and large quantities: Evacuate area. Fight fire remotely due to the risk of explosion
In case of fire: Use CO_2, dry chemical, or foam for extinction
Evacuate area
Storage
Store in accordance with local regulations
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
None identified

3. Composition/Information on Ingredients

Component	CAS-No	Weight %
Ammonium perchlorate	7790-98-9	<=100

4. First-aid measures

General Advice If symptoms persist, call a physician.

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get medical attention.

Skin Contact Wash off immediately with plenty of water for at least 15 minutes. If skin irritation persists, call a physician.

Inhalation Remove to fresh air. If not breathing, give artificial respiration. Get medical attention if symptoms occur.

Ingestion Clean mouth with water and drink afterwards plenty of water. Get medical attention if symptoms occur.

Most important symptoms and effects None reasonably foreseeable.

Notes to Physician Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media Carbon dioxide (CO_2). Powder. Foam. Water may be ineffective.

Unsuitable Extinguishing Media No information available

Flash Point No information available
Method - No information available

Autoignition Temperature No information available
Explosion Limits
Upper No data available
Lower No data available
Oxidizing Properties Oxidizer

Sensitivity to Mechanical Impact No information available
Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical
Oxidizer: Contact with combustible/organic material may cause fire. May ignite combustibles (wood paper, oil, clothing, etc.).

Hazardous Combustion Products
Nitrogen oxides (NOx). Hydrogen chloride.
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
0	0	4	- OX

6. Accidental release measures

Personal Precautions Ensure adequate ventilation. Use personal protective equipment as required. Avoid dust formation.

Environmental Precautions Should not be released into the environment. See Section 12 for additional Ecological Information.

Methods for Containment and Clean Up Sweep up and shovel into suitable containers for disposal. Keep in suitable, closed containers for disposal. Soak up with inert absorbent material. Sweep up and shovel into suitable containers for disposal.

7. Handling and storage

Handling Wear personal protective equipment/face protection. Ensure adequate ventilation. Do not get in eyes, on skin, or on clothing. Avoid ingestion and inhalation. Avoid dust formation. Keep away from clothing and other combustible materials.

Storage Keep containers tightly closed in a dry, cool and well-ventilated place. Do not store near combustible materials.

8. Exposure controls / personal protection

Exposure Guidelines This product does not contain any hazardous materials with occupational exposure limitsestablished by the region specific regulatory bodies.

Engineering Measures Ensure that eyewash stations and safety showers are close to the workstation location.

Ensure adequate ventilation, especially in confined areas.

Personal Protective Equipment

Eye/face Protection Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Solid Crystalline
Appearance	No information available
Odor	Odorless
Odor Threshold	No information available
pH	No information available
Melting Point/Range	No data available
Boiling Point/Range	No information available
Flash Point	No information available
Evaporation Rate	Not applicable
Flammability (solid,gas)	No information available
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	No information available
Vapor Density	Not applicable
Specific Gravity	1.95 g/cm3
Solubility	No information available
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	No information available
Viscosity	Not applicable
Molecular Formula	H4 Cl N O4
Molecular Weight	117.50

10. Stability and reactivity

Reactive Hazard Yes

Stability Oxidizer: Contact with combustible/organic material may cause fire.

Conditions to Avoid Incompatible products. Excess heat. Combustible material.

Incompatible Materials Strong reducing agents, Combustible material, Oxidizing agent

Hazardous Decomposition Products Nitrogen oxides (NOx), Hydrogen chloride

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information
Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Ammonium perchlorate	LD50 = 4200 mg/kg (Rat)	LD50 > 3500 mg/kg (Rat)	Not listed

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation No information available

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Ammonium perchlorate	7790-98-9	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure None known
STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects,both acute and delayed No information available

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

.

Persistence and Degradability No information available

Bioaccumulation/ Accumulation No information available.

Mobility No information available.

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT

UN-No UN1442
Proper Shipping Name AMMONIUM PERCHLORATE
Hazard Class 5.1

Packing Group II

TDG

UN-No UN1442
Proper Shipping Name AMMONIUM PERCHLORATE
Hazard Class 5.1
Packing Group II

IATA

UN-No UN1442
Proper Shipping Name AMMONIUM PERCHLORATE
Hazard Class 5.1
Packing Group II

IMDG/IMO

UN-No UN1442
Proper Shipping Name AMMONIUM PERCHLORATE
Hazard Class 5.1
Packing Group II

15. Regulatory information

United States of America Inventory

Component	CAS-No	TSCA	TSCA Inventory notification - Active/Inactive	TSCA - EPA Regulatory Flags
Ammonium perchlorate	7790-98-9	X	ACTIVE	-

Legend:
TSCA - Toxic Substances Control Act, (40 CFR Part 710)
X - Listed
'-' - Not Listed

TSCA 12(b) - Notices of Export Not applicable

International Inventories
Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Australia (AICS), China (IECSC), Korea (ECL).

Component	CAS-No	DSL	NDSL	EINECS	PICCS	ENCS	AICS	IECSC	KECL
Ammonium perchlorate	7790-98-9	X	-	232-235-1	X	X	X	X	KE-01725

U.S. Federal Regulations

SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Ammonium perchlorate	7790-98-9	<=100	1.0

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act) Not applicable

Clean Air Act Not applicable

OSHA - Occupational Safety and Health Administration Not applicable

Component	Specifically Regulated Chemicals	Highly Hazardous Chemicals
Ammonium perchlorate	-	TQ: 7500 lb

CERCLA Not applicable

California Proposition 65 This product does not contain any Proposition 65 chemicals.

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Ammonium perchlorate	X	X	X	-	X

U.S. Department of Transportation

Reportable Quantity (RQ): N
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security

This product contains the following DHS chemicals:
Legend - STQs = Screening Threshold Quantities, APA = A placarded amount

Component	DHS Chemical Facility Anti-Terrorism Standard
Ammonium perchlorate	Release STQs - 5000lb Theft STQs - 400lb

Other International Regulations

Mexico - Grade No information available

16. Other information

Prepared By

Health, Safety and Environmental Department
Email: tech@alfa.com
www.alfa.com

Revision Date 20-Feb-2020
Print Date 20-Feb-2020
Revision Summary SDS authoring systems update, replaces ChemGes SDS No. 7790-98-9/1.

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS

SAFETY DATA SHEET

Creation Date 24-Nov-2010 **Revision Date** 24-Dec-2021 **Revision Number** 4

1. Identification

Product Name **Carbon tetrachloride**

Cat No. : **AC148170000; AC148170010; AC148170025**

Synonyms Tetrachloromethane

Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use.

Details of the supplier of the safety data sheet

Company
Fisher Scientific Company
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

Emergency Telephone Number For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
CHEMTREC Tel. No.**US:**001-800-424-9300 / **Europe:**001-703-527-3887

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Acute oral toxicity	Category 3
Acute dermal toxicity	Category 3
Acute Inhalation Toxicity - Vapors	Category 3
Carcinogenicity	Category 2
Specific target organ toxicity - (repeated exposure)	Category 1
Target Organs - Liver.	

Label Elements

Signal Word
Danger

Hazard Statements
Toxic if swallowed

Toxic in contact with skin
Toxic if inhaled
May cause cancer
Causes damage to organs through prolonged or repeated exposure

Precautionary Statements
Prevention
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Wash face, hands and any exposed skin thoroughly after handling
Do not eat, drink or smoke when using this product
Use only outdoors or in a well-ventilated area
Do not breathe dust/fume/gas/mist/vapors/spray
Response
IF exposed or concerned: Get medical attention/advice
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Call a POISON CENTER or doctor/physician
Skin
IF ON SKIN: Wash with plenty of soap and water
Call a POISON CENTER or doctor/physician if you feel unwell
Remove/Take off immediately all contaminated clothing
Wash contaminated clothing before reuse
Ingestion
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
Rinse mouth
Storage
Store locked up
Store in a well-ventilated place. Keep container tightly closed
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
Harmful to aquatic life with long lasting effects
Harms public health and the environment by destroying ozone in the upper atmosphere
WARNING. Cancer - https://www.p65warnings.ca.gov/.

3. Composition/Information on Ingredients

Component	CAS No	Weight %
Carbon tetrachloride	56-23-5	>95

4. First-aid measures

Eye Contact Immediate medical attention is required. Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.

Skin Contact Wash off immediately with plenty of water for at least 15 minutes. Immediate medical attention is required.

Inhalation	Remove to fresh air. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Immediate medical attention is required. If not breathing, give artificial respiration.
Ingestion	Do NOT induce vomiting. Call a physician or poison control center immediately.
Most important symptoms and effects	Drowsiness. Dizziness. Difficulty in breathing. Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting
Notes to Physician	Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media	Substance is nonflammable; use agent most appropriate to extinguish surrounding fire.
Unsuitable Extinguishing Media	No information available
Flash Point	No information available
Method -	No information available
Autoignition Temperature	982 °C / 1799.6 °F
Explosion Limits	
Upper	No data available
Lower	No data available
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical
Thermal decomposition can lead to release of irritating gases and vapors. Keep product and empty container away from heat and sources of ignition.

Hazardous Combustion Products
Carbon monoxide (CO). Carbon dioxide (CO_2). Phosgene. Hydrogen chloride gas.
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
3	0	0	N/A

6. Accidental release measures

Personal Precautions	Use personal protective equipment as required. Ensure adequate ventilation. Avoid contact with skin and eyes. Keep people away from and upwind of spill/leak.
Environmental Precautions	Do not flush into surface water or sanitary sewer system.
Methods for Containment and Clean Up	Soak up with inert absorbent material (e.g. sand, silica gel, acid binder, universal binder, sawdust). Keep in suitable, closed containers for disposal. Do not let this chemical enter the environment.

7. Handling and storage

Handling	Ensure adequate ventilation. Wear personal protective equipment/face protection. Do not get in eyes, on skin, or on clothing. Avoid ingestion and inhalation.
Storage.	Keep in a dry, cool and well-ventilated place. Keep container tightly closed. Incompatible Materials. Strong oxidizing agents. Fluorine. Metals.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Carbon tetrachloride	TWA: 5 ppm STEL: 10 ppm Skin	(Vacated) TWA: 2 ppm (Vacated) TWA: 12.6 mg/m^3 Ceiling: 25 ppm TWA: 10 ppm	IDLH: 200 ppm STEL: 2 ppm STEL: 12.6 mg/m^3	TWA: 5 ppm STEL: 10 ppm

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
NIOSH IDLH: NIOSH - National Institute for Occupational Safety and Health

Engineering Measures Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment

Eye/face Protection Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Colorless
Odor	No information available
Odor Threshold	No information available
pH	No information available
Melting Point/Range	-23 °C / -9.4 °F
Boiling Point/Range	76 °C / 168.8 °F
Flash Point	No information available
Evaporation Rate	No information available
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	121 mbar @ 20 °C
Vapor Density	No information available
Specific Gravity	1.594
Solubility	No information available
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	982 °C / 1799.6 °F
Decomposition Temperature	> 100°C
Viscosity	0.97 mPa.s at 20 °C
Molecular Formula	C Cl4
Molecular Weight	153.82

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Incompatible products.

Incompatible Materials Strong oxidizing agents, Fluorine, Metals

Hazardous Decomposition Products Carbon monoxide (CO), Carbon dioxide (CO_2), Phosgene, Hydrogen chloride gas

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Carbon tetrachloride	LD50 = 2350 mg/kg (Rat)	LD50 = 5070 mg/kg (Rat)	LC50 = 8000 ppm (Rat) 4 h

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation No information available

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen. Limited evidence of a carcinogenic effect.

Component	CAS No	IARC	NTP	ACGIH	OSHA	Mexico
Carbon tetrachloride	56-23-5	Group 2B	Reasonably Anticipated	A2	X	A2

Mutagenic Effects Not mutagenic in AMES Test

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure None known

STOT - repeated exposure Liver

Aspiration hazard No information available

Symptoms / effects,both acute and delayed Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

The product contains following substances which are hazardous for the environment. Toxic to aquatic organisms, may cause

long-term adverse effects in the aquatic environment.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Carbon tetrachloride	Not listed	LC50: 36.3 - 47.3 mg/L, 96h flow-through (Pimephales promelas) LC50: 9.68 - 11.3 mg/L, 96h static (Pimephales promelas) LC50: 23 - 33 mg/L, 96h static (Lepomis macrochirus)	EC50 = 34 mg/L 10 min EC50 = 5.6 mg/L 5 min	EC50: = 29 mg/L, 48h (Daphnia magna)

Persistence and Degradability Persistence is unlikely based on information available.

Bioaccumulation/ Accumulation No information available.

Mobility Will likely be mobile in the environment due to its volatility.

Component	log Pow
Carbon tetrachloride	2.75

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

Component	RCRA - U Series Wastes	RCRA - P Series Wastes
Carbon tetrachloride - 56-23-5	U211	-

14. Transport information

DOT

UN-No UN1846
Proper Shipping Name CARBON TETRACHLORIDE
Hazard Class 6.1
Packing Group II

TDG

UN-No UN1846
Proper Shipping Name CARBON TETRACHLORIDE
Hazard Class 6.1
Packing Group II

IATA

UN-No UN1846
Proper Shipping Name CARBON TETRACHLORIDE
Hazard Class 6.1
Packing Group II

IMDG/IMO

UN-No UN1846
Proper Shipping Name CARBON TETRACHLORIDE
Hazard Class 6.1
Packing Group II

15. Regulatory information

United States of America Inventory

Component	CAS No	TSCA	TSCA Inventory notification - Active-Inactive	TSCA - EPA Regulatory Flags
Carbon tetrachloride	56-23-5	X	ACTIVE	-

Legend:
TSCA US EPA (TSCA) - Toxic Substances Control Act, (40 CFR Part 710)

X - Listed
'-' - Not Listed

TSCA 12(b) - Notices of Export Not applicable

International Inventories
Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Japan (ISHL), Australia (AICS), China (IECSC), Korea (KECL).

Component	CAS No	DSL	NDSL	EINECS	PICCS	ENCS	ISHL	AICS	IECSC	KECL
Carbon tetrachloride	56-23-5	X	-	200-262-8	X	X	X	X	X	KE-04756

KECL - NIER number or KE number (http://ncis.nier.go.kr/en/main.do)

U.S. Federal Regulations

SARA 313

Component	CAS No	Weight %	SARA 313 - Threshold Values %
Carbon tetrachloride	56-23-5	>95	0.1

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Carbon tetrachloride	X	10 lb	X	X

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Carbon tetrachloride	X	X	-

OSHA - Occupational Safety and Health Administration Not applicable

CERCLA This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
Carbon tetrachloride	10 lb 1 lb	-

California Proposition 65 This product contains the following Proposition 65 chemicals.

Component	CAS No	California Prop. 65	Prop 65 NSRL	Category
Carbon tetrachloride	56-23-5	Carcinogen	5 µg/day	Carcinogen

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Carbon tetrachloride	X	X	X	X	X

U.S. Department of Transportation
Reportable Quantity (RQ): Y
DOT Marine Pollutant Y
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

Authorisation/Restrictions according to EU REACH

Component	REACH (1907/2006) - Annex XIV - Substances Subject to Authorization	REACH (1907/2006) - Annex XVII - Restrictions on Certain Dangerous Substances	REACH Regulation (EC 1907/2006) article 59 - Candidate List of Substances of Very High Concern (SVHC)
Carbon tetrachloride	-	Use restricted. See item 75. (see link for restriction details)	-

https://echa.europa.eu/substances-restricted-under-reach

Safety, health and environmental regulations/legislation specific for the substance or mixture

Component	CAS No	OECD HPV	Persistent Organic Pollutant	Ozone Depletion Potential	Restriction of Hazardous Substances (RoHS)
Carbon tetrachloride	56-23-5	Listed	Not applicable	Annex I (Group IV substance) : ODP = 1.1 Annex B - Group II : ODP = 1.1	Not applicable

Component	CAS No	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Major Accident Notification	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Safety Report Requirements	Rotterdam Convention (PIC)	Basel Convention (Hazardous Waste)
Carbon tetrachloride	56-23-5	Not applicable	Not applicable	Not applicable	Annex I - Y45

16. Other information

Prepared By Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date 24-Nov-2010
Revision Date 24-Dec-2021
Print Date 24-Dec-2021
Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

Disclaimer

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End of SDS

SAFETY DATA SHEET

CITGO Gasolines, All Grades Unleaded

Section 1. Identification

GHS product identifier : CITGO Gasolines, All Grades Unleaded

Synonyms : Unleaded Gasolines; Conventional Unleaded Gasoline with Ethanol; Unleaded Gasoline with Ethanol; Reformulated Unleaded Gasoline with Ethanol; Motor Gasolines; Petrol; Automobile Motor Fuels; Finished Gasolines; Gasoline, Regular Unleaded; Gasoline, Mid-grade Unleaded; Gasoline, Premium Unleaded; Reformulated Gasolines (RFG); Reformulated Motor Fuels; Oxygenated Motor Spirits; Gasoline, Regular Reformulated; Gasoline, Mid-grade Reformulated; Gasoline, Premium Reformulated; RBOB; GTAB; Arizona Clean Burning Gasoline (CBG); CARB Gasoline with Ethanol.

Material uses : Fuel.

Code : Various

MSDS # : UNLEAD

Supplier's details : CITGO Petroleum Corporation
P.O. Box 4689
Houston, TX 77210
sdsvend@citgo.com

Emergency telephone number (with hours of operation) : Technical Contact: (800) 248-4684
Medical Emergency: (832) 486-4700
CHEMTREC Emergency: (800) 424-9300
(United States Only)

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : FLAMMABLE LIQUIDS - Category 2
SKIN IRRITATION - Category 2
EYE IRRITATION - Category 2B
GERM CELL MUTAGENICITY - Category 1
CARCINOGENICITY - Category 1B
TOXIC TO REPRODUCTION (Fertility) - Category 2
TOXIC TO REPRODUCTION (Unborn child) - Category 2
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (central nervous system (CNS)) - Category 2
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Narcotic effects) - Category 3
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) (blood system, central nervous system (CNS), hearing organs) - Category 1
ASPIRATION HAZARD - Category 1
AQUATIC HAZARD (ACUTE) - Category 1
AQUATIC HAZARD (LONG-TERM) - Category 1

GHS label elements

Hazard pictograms :

Signal word : Danger

Section 2. Hazards identification

Hazard statements : Highly flammable liquid and vapor.
Causes skin and eye irritation.
May cause genetic defects.
May cause cancer.
Suspected of damaging fertility or the unborn child.
May be fatal if swallowed and enters airways.
May cause damage to organs. (central nervous system (CNS))
May cause respiratory irritation.
May cause drowsiness or dizziness.
Causes damage to organs through prolonged or repeated exposure. (blood system, central nervous system (CNS), hearing organs)
Very toxic to aquatic life with long lasting effects.

Precautionary statements

General : Do not syphon by mouth.

Prevention : Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wear protective gloves. Wear eye or face protection. Wear protective clothing. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Use explosion-proof electrical, ventilating, lighting and all material-handling equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Keep container tightly closed. Use only outdoors or in a well-ventilated area. Avoid release to the environment. Do not breathe vapor. Do not eat, drink or smoke when using this product. Wash hands thoroughly after handling.

Response : Collect spillage. Get medical attention if you feel unwell. IF exposed or concerned: Call a POISON CENTER or physician. IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER or physician if you feel unwell. IF SWALLOWED: Immediately call a POISON CENTER or physician. Do NOT induce vomiting. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. IF ON SKIN: Wash with plenty of soap and water. Take off contaminated clothing and wash it before reuse. If skin irritation occurs: Get medical attention. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical attention.

Storage : Store locked up. Store in a well-ventilated place. Keep cool.

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Supplemental label elements : Eliminate sources of ignition. Avoid spark promoters. Ground/bond container and receiving equipment. These alone may be insufficient to remove static electricity. Avoid contact with skin and clothing. Wash thoroughly after handling.

Hazards not otherwise classified : Static accumulating flammable liquid can become electrostatically charged even in bonded and grounded equipment. Sparks may ignite liquid and vapor may cause flash fire or explosion. Prolonged or repeated contact may dry skin and cause irritation. Repeated or prolonged overexposure to certain chemicals in this product may exacerbate the hearing loss effects associated with noise exposure.

Section 3. Composition/information on ingredients

Substance/mixture : Substance

Other means of identification : Unleaded Gasolines; Conventional Unleaded Gasoline with Ethanol; Unleaded Gasoline with Ethanol; Reformulated Unleaded Gasoline with Ethanol; Motor Gasolines; Petrol; Automobile Motor Fuels; Finished Gasolines; Gasoline, Regular Unleaded; Gasoline, Mid-grade Unleaded; Gasoline, Premium Unleaded; Reformulated Gasolines (RFG); Reformulated Motor Fuels; Oxygenated Motor Spirits; Gasoline, Regular Reformulated; Gasoline, Mid-grade Reformulated; Gasoline, Premium Reformulated; RBOB; GTAB; Arizona Clean Burning Gasoline (CBG); CARB Gasoline with Ethanol.

CAS number/other identifiers

Section 3. Composition/information on ingredients

Ingredient name	%	CAS number
Pentanes	<20	109-66-0
Toluene	<20	108-88-3
Xylene	<20	1330-20-7
Hexanes, mixture of isomers	<15	*
Heptane	<15	142-82-5
Ethanol	0 - 10	64-17-5
Butane	0 - 10	106-97-8
benzene	<4.9	71-43-2
Ethylbenzene	<4	100-41-4
Cumene	<4	98-82-8
n-hexane	<3	110-54-3
Cyclohexane	<3	110-82-7
1,2,4-trimethylbenzene	<2	95-63-6
Naphthalene	<2	91-20-3

* = Various ** = Mixture *** = Proprietary

Any concentration shown as a range is to protect confidentiality or is due to process variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention. If necessary, call a poison center or physician.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention. If necessary, call a poison center or physician. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Skin contact : Wash skin thoroughly with soap and water or use recognized skin cleanser. Remove contaminated clothing and shoes. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. Continue to rinse for at least 10 minutes. Get medical attention. If necessary, call a poison center or physician. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : Get medical attention immediately. Call a poison center or physician. Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. Aspiration hazard if swallowed. Can enter lungs and cause damage. Do not induce vomiting. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : Causes eye irritation.

Inhalation : Can cause central nervous system (CNS) depression. May cause drowsiness or dizziness. May cause respiratory irritation. Breathing high concentrations can cause irregular heartbeats which can be fatal.

Skin contact : Causes skin irritation. Defatting to the skin.

Section 4. First aid measures

Ingestion : Can cause central nervous system (CNS) depression. May be fatal if swallowed and enters airways.

Over-exposure signs/symptoms

Eye contact : Adverse symptoms may include the following:
pain or irritation
watering
redness

Inhalation : Breathing high concentrations can cause irregular heartbeats which may be fatal. Repeated or prolonged overexposure to solvents can cause brain or other nervous system damage. The symptoms can include the loss of memory, the loss of intellectual capacity and the loss of coordination.
Repeated or prolonged overexposure to certain chemicals in this product may exacerbate the hearing loss effects associated with noise exposure.
Adverse symptoms may include the following:
respiratory tract irritation
coughing
nausea or vomiting
headache
drowsiness/fatigue
dizziness/vertigo
unconsciousness
reduced fetal weight
increase in fetal deaths
skeletal malformations

Skin contact : Adverse symptoms may include the following:
irritation
redness
dryness
cracking

Ingestion : Adverse symptoms may include the following:
nausea or vomiting

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : This material (or a component) may sensitize the heart to the effects of sympathomimetic amines. Epinephrine and other sympathomimetic drugs may initiate cardiac arrthymias in individuals exposed to this material. If ingested, this material presents a significant aspiration and chemical pneumonitis hazard. Induction of emesis is not recommended. Consider activated charcoal and/or gastric lavage. If patient is obtunded, protect the airway by cuffed endotracheal intubation or by placement of the body in a Trendelenburg and left lateral decubitus position.

Specific treatments : Treat symptomatically and supportively.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that gas or vapor is still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use caution when applying carbon dioxide in confined spaces.
SMALL FIRE: Steam, CO_2, dry chemical or inert gas (e.g., nitrogen). LARGE FIRE: Use foam, water fog or water spray. Water fog and spray are effective in cooling containers and adjacent structures. However, water can cause frothing and/or may not extinguish the fire. Water can be used to cool the external walls of vessels to prevent excessive pressure, ignition or explosion.

Unsuitable extinguishing media : Do not use water jet.

Section 5. Fire-fighting measures

Specific hazards arising from the chemical : Highly flammable liquid and vapor. Runoff to sewer may create fire or explosion hazard. This product is a poor conductor of electricity and can become electrostatically charged. If sufficient charge is accumulated, ignition of flammable mixtures can occur. To reduce potential for static discharge, use proper bonding and grounding procedures. This liquid may accumulate static electricity when filling properly grounded containers. Static accumulation may be significantly increased by the presence of small quantities of water or other contaminants. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. The vapor/gas is heavier than air and will spread along the ground. Vapors may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back. This material is very toxic to aquatic life with long lasting effects. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). Water polluting material. May be harmful to the environment if released in large quantities. Collect spillage.

Methods and materials for containment and cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Use only as a motor fuel. Do not syphon by mouth. Put on appropriate personal protective equipment (see Section 8). Avoid exposure - obtain special instructions before use. Avoid exposure during pregnancy. Do not handle until all safety precautions have been read and understood. Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Do not swallow. Avoid release to the environment. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use only non-sparking tools. Take precautionary measures against electrostatic discharges. Empty containers retain product residue and can be hazardous. Do not reuse container. Non equilibrium conditions may increase the fire hazard associated with this product. Always bond receiving containers to the fill pipe before and during loading. Always confirm that receiving container is properly grounded. Bonding and grounding alone may be inadequate to eliminate fire and explosion hazards. Carefully review operations that may increase the risks such as tank and container filling, tank cleaning, sampling, gauging, loading, filtering, mixing, agitation, etc. In addition to bonding and grounding, efforts to mitigate the hazards may include, but are not limited to, ventilation, inerting and/or reduction of transfer velocities.
Always keep nozzle in contact with the container throughout the loading process. Do NOT fill any portable container in or on a vehicle.

Special precautions, such as reduced loading rates and increased monitoring, must be observed during "switch loading" operations (i.e., loading this material in tanks or shipping compartments that previously contained a dissimilar product).

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Store locked up. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination. See Section 10 for incompatible materials before handling or use.

Bulk Storage Conditions: Maintain all storage tanks in accordance with applicable regulations. Use necessary controls to monitor tank inventories. Inspect all storage tanks on a periodic basis. Test tanks and associated piping for tightness. Maintain the automatic leak detection devices to assure proper working condition.

Head spaces in tanks and other containers may contain a mixture of air and vapor in the flammable range. Vapor may be ignited by static discharge. Storage area must meet OSHA requirements and applicable fire codes. Additional information regarding the design and control of hazards associated with the handling and storage of flammable and combustible liquids may be found in professional and industrial documents including, but not limited to, the National Fire Protection Association (NFPA) publications NFPA 30 ("Flammable and Combustible Liquid Code"), NFPA 77 ("Recommended Practice on Static Electricity") and the American Petroleum Institute (API) Recommended Practice 2003, (“Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents").

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Pentanes	**NIOSH REL (United States, 10/2013).** TWA: 120 ppm 10 hours. TWA: 350 mg/m³ 10 hours. CEIL: 610 ppm 15 minutes. CEIL: 1800 mg/m³ 15 minutes. **ACGIH TLV (United States, 3/2016).** TWA: 1000 ppm 8 hours. **OSHA PEL (United States, 6/2016).** TWA: 1000 ppm 8 hours. TWA: 2950 mg/m³ 8 hours.
Toluene	**OSHA PEL Z2 (United States, 2/2013).** TWA: 200 ppm 8 hours. CEIL: 300 ppm AMP: 500 ppm 10 minutes. **NIOSH REL (United States, 10/2013).** TWA: 100 ppm 10 hours. TWA: 375 mg/m³ 10 hours. STEL: 150 ppm 15 minutes. STEL: 560 mg/m³ 15 minutes. **ACGIH TLV (United States, 3/2016).** TWA: 20 ppm 8 hours.
Xylene	**ACGIH TLV (United States, 3/2016).** TWA: 100 ppm 8 hours. TWA: 434 mg/m³ 8 hours. STEL: 150 ppm 15 minutes. STEL: 651 mg/m³ 15 minutes. **OSHA PEL (United States, 6/2016).** TWA: 100 ppm 8 hours. TWA: 435 mg/m³ 8 hours.
Hexanes, other isomers	**ACGIH TLV (United States).** TWA: 500 ppm 8 hours. STEL: 1000 ppm 15 minutes.
Heptane	**ACGIH TLV (United States, 3/2016).** TWA: 400 ppm 8 hours. TWA: 1640 mg/m³ 8 hours. STEL: 500 ppm 15 minutes. STEL: 2050 mg/m³ 15 minutes. **NIOSH REL (United States, 10/2013).** TWA: 85 ppm 10 hours. TWA: 350 mg/m³ 10 hours. CEIL: 440 ppm 15 minutes. CEIL: 1800 mg/m³ 15 minutes. **OSHA PEL (United States, 6/2016).** TWA: 500 ppm 8 hours. TWA: 2000 mg/m³ 8 hours.
Ethanol	**ACGIH TLV (United States).** TWA: 1000 ppm 8 hours. **ACGIH TLV (United States, 3/2016).** STEL: 1000 ppm 15 minutes. **NIOSH REL (United States, 10/2013).** TWA: 1000 ppm 10 hours. TWA: 1900 mg/m³ 10 hours. **OSHA PEL (United States, 6/2016).** TWA: 1000 ppm 8 hours. TWA: 1900 mg/m³ 8 hours.
Butane	**ACGIH TLV (United States).** TWA: 800 ppm 8 hours. **NIOSH REL (United States, 10/2013).**

Section 8. Exposure controls/personal protection

	TWA: 800 ppm 10 hours. TWA: 1900 mg/m³ 10 hours. **ACGIH TLV (United States, 3/2015).** STEL: 1000 ppm 15 minutes.
Benzene	**ACGIH TLV (United States, 3/2016).** **Absorbed through skin.** TWA: 0.5 ppm 8 hours. TWA: 1.6 mg/m³ 8 hours. STEL: 2.5 ppm 15 minutes. STEL: 8 mg/m³ 15 minutes. **NIOSH REL (United States, 10/2013).** TWA: 0.1 ppm 10 hours. STEL: 1 ppm 15 minutes. **OSHA PEL (United States, 6/2016).** TWA: 1 ppm 8 hours. STEL: 5 ppm 15 minutes. **OSHA PEL Z2 (United States, 2/2013).** TWA: 10 ppm 8 hours. CEIL: 25 ppm AMP: 50 ppm 10 minutes.
Ethylbenzene	**ACGIH TLV (United States, 3/2016).** TWA: 20 ppm 8 hours. **NIOSH REL (United States, 10/2013).** TWA: 100 ppm 10 hours. TWA: 435 mg/m³ 10 hours. STEL: 125 ppm 15 minutes. STEL: 545 mg/m³ 15 minutes. **OSHA PEL (United States, 6/2016).** TWA: 100 ppm 8 hours. TWA: 435 mg/m³ 8 hours.
Cumene	**NIOSH REL (United States, 10/2013).** **Absorbed through skin.** TWA: 50 ppm 10 hours. TWA: 245 mg/m³ 10 hours. **ACGIH TLV (United States, 3/2016).** TWA: 50 ppm 8 hours. **OSHA PEL (United States, 6/2016).** **Absorbed through skin.** TWA: 50 ppm 8 hours. TWA: 245 mg/m³ 8 hours.
n-Hexane	**NIOSH REL (United States, 10/2013).** TWA: 50 ppm 10 hours. TWA: 180 mg/m³ 10 hours. **ACGIH TLV (United States, 3/2016).** **Absorbed through skin.** TWA: 50 ppm 8 hours. **OSHA PEL (United States, 6/2016).** TWA: 500 ppm 8 hours. TWA: 1800 mg/m³ 8 hours.
Cyclohexane	**ACGIH TLV (United States, 3/2016).** TWA: 100 ppm 8 hours. **NIOSH REL (United States, 10/2013).** TWA: 300 ppm 10 hours. TWA: 1050 mg/m³ 10 hours. **OSHA PEL (United States, 6/2016).** TWA: 300 ppm 8 hours. TWA: 1050 mg/m³ 8 hours.
1,2,4-trimethylbenzene	**ACGIH TLV (United States, 3/2016).** TWA: 25 ppm 8 hours. TWA: 123 mg/m³ 8 hours. **NIOSH REL (United States, 10/2013).**

Section 8. Exposure controls/personal protection

	TWA: 25 ppm 10 hours. TWA: 125 mg/m³ 10 hours.
Naphthalene	**ACGIH TLV (United States). Absorbed through skin.** STEL: 15 ppm 15 minutes. **ACGIH TLV (United States, 3/2016). Absorbed through skin.** TWA: 10 ppm 8 hours. TWA: 52 mg/m³ 8 hours. **NIOSH REL (United States, 10/2013).** TWA: 10 ppm 10 hours. TWA: 50 mg/m³ 10 hours. STEL: 15 ppm 15 minutes. STEL: 75 mg/m³ 15 minutes. **OSHA PEL (United States, 6/2016).** TWA: 10 ppm 8 hours. TWA: 50 mg/m³ 8 hours.

Appropriate engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, vapor controls, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety glasses equipped with side shields are recommended as minimum protection in industrial settings. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles. Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If inhalation hazards exist, a full-face respirator may be required instead.

Skin protection

Hand protection : Avoid skin contact with liquid. Chemical-resistant gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Recommended: Heavy duty, industrial grade chemically resistant gloves constructed of nitrile, neoprene, polyethylene, fluoroelastomer rubber or polyvinyl chloride as approved by glove manufacturer. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. Leather gloves are not protective for liquid contact.

Body protection : Avoid skin contact with liquid. Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Other skin protection : Avoid skin contact with liquid. Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. Leather boots are not protective for liquid contact.

Section 8. Exposure controls/personal protection

Respiratory protection : Avoid inhalation of gases, vapors, mists or dusts. Use a properly fitted, air-purifying or supplied-air respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. If an air purifying respirator is appropriate, use one equipped with cartridges rated for organic vapors.

Section 9. Physical and chemical properties

Appearance

Physical state : Liquid.

Color : Transparent, clear to amber or red.

Odor : Pungent, characteristic gasoline.

pH : Not applicable

Boiling point : 38 to 204°C (100.4 to 399.2°F)

Flash point : Closed cup: -43°C (-45.4°F) [Tagliabue [ASTM D-56]]

Evaporation rate : 7.5 (n-butyl acetate. = 1)

Lower and upper explosive (flammable) limits : Lower: 1.4%
Upper: 7.6%

Vapor pressure : 29.3 to 100 kPa (220 to 750 mm Hg) [room temperature]

Vapor density : 3 to 4 [Air = 1]

Relative density : 0.72 to 0.77

Density lbs/gal : Estimated 6.21 lbs/gal

Density gm/cm^3 : Not available.

Solubility : Very slightly soluble in the following materials: cold water.

Auto-ignition temperature : 280°C (536°F)

Flow time (ISO 2431) : Not available.

Viscosity : Kinematic (room temperature): <0.01 cm^2/s (<1 cSt)

Conductivity : <50 picosiemens/meter (unadditized)

Section 10. Stability and reactivity

Reactivity : Not expected to be Explosive, Self-Reactive, Self-Heating, or an Organic Peroxide under US GHS Definition(s).

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Do not allow vapor to accumulate in low or confined areas. Do not store with strong oxidizing agents.

Incompatible materials : Reactive or incompatible with the following materials:
oxidizing materials

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Toluene	LC50 Inhalation Vapor	Rat	>20 mg/l	4 hours
	LD50 Dermal	Rabbit	12267 mg/kg	-
	LD50 Oral	Rat - Male	5580 mg/kg	-
	TDLo Oral	Rat	0.65 g/kg	-
	TDLo Oral	Rat	1000 mg/kg	-
Xylene	LC50 Inhalation Vapor	Rat	5000 ppm	4 hours
	LC50 Inhalation Vapor	Rat	6700 ppm	4 hours
	LD50 Oral	Mouse	2119 mg/kg	-
	LD50 Oral	Rat	4300 mg/kg	-
	LD50 Oral	Rat	4300 mg/kg	-
Hexanes, other isomers	LC50 Inhalation Vapor	Rat	48000 ppm	4 hours
Heptane	LD50 Dermal	Rabbit	>2000 mg/kg	-
	LD50 Oral	Rat	>5000 mg/kg	-
Ethanol	LC50 Inhalation Vapor	Mouse	>40000 ppm	10 minutes
	LC50 Inhalation Vapor	Rat	124700 mg/m³	4 hours
	LD50 Oral	Guinea pig	5560 mg/kg	-
	LD50 Oral	Rabbit	6300 mg/kg	-
	LD50 Oral	Rat	7060 mg/kg	-
Butane	LC50 Inhalation Vapor	Mouse	680000 mg/m³	2 hours
	LC50 Inhalation Vapor	Rat	658000 mg/m³	4 hours
Benzene	LC50 Inhalation Vapor	Rat	10000 ppm	7 hours
	LD50 Oral	Mammal - species unspecified	5700 mg/kg	-
	LD50 Oral	Mouse	4700 mg/kg	-
	LD50 Oral	Rat	6400 mg/kg	-
Ethylbenzene	LD50 Dermal	Rabbit	>5000 mg/kg	-
	LD50 Oral	Rat	3500 mg/kg	-
Cumene	LC50 Inhalation Vapor	Mouse	10 g/m³	7 hours
	LD50 Dermal	Rabbit	12300 uL/kg	-
	LD50 Oral	Rat	2.9 g/kg	-
	LD50 Oral	Rat	4000 mg/kg	-
n-Hexane	LC50 Inhalation Vapor	Rat	48000 ppm	4 hours
	LD50 Oral	Rat	15840 mg/kg	-
Cyclohexane	LC50 Inhalation Vapor	Mouse	70000 mg/m³	2 hours
	LD50 Oral	Rat	6240 mg/kg	-
	LD50 Oral	Rat	12705 mg/kg	-
	LD50 Oral	Rat	>5000 mg/kg	-
	LDLo Oral	Rabbit	5500 mg/kg	-
1,2,4-trimethylbenzene	LC50 Inhalation Vapor	Rat	18000 mg/m³	4 hours
	LD50 Oral	Mouse	6900 mg/kg	-
	LD50 Oral	Rat	5 g/kg	-
Naphthalene	LD50 Oral	Rat	490 mg/kg	-

Conclusion/Summary : **pentane**: Studies of pentane isomers in laboratory animals indicate exposure to extremely high levels (roughly 10 vol.%) may induce cardiac arrhythmias (irregular heartbeats) which may be serious or fatal.
toluene: Deliberate inhalation of toluene at high concentrations (e.g., glue sniffing and solvent abuse) can cause CNS depression, cardiac arrhythmias and death.
xylene: Overexposure to xylene may cause upper respiratory tract irritation, headache, cyanosis, blood serum changes, CNS damage and narcosis. Effects may be increased by the use of alcoholic beverages. Evidence of liver and kidney impairment were reported in workers recovering from a gross over-exposure.
heptane: Heptane is a CNS depressant and narcosis at elevated concentrations.
ethanol: Inhalation exposure to ethanol vapor at concentrations above applicable workplace exposure levels is expected to produce eye and mucus membrane irritation. Human exposure at concentrations from 1000 to 5000 ppm produced symptoms of narcosis, stupor and unconsciousness. Subjects exposed to ethanol vapor in concentrations between 500 and 10,000 ppm experienced coughing and smarting of the

Section 11. Toxicological information

eyes and nose. At 15,000 ppm there was continuous lacrimation and coughing. While extensive acute and chronic effects can be expected with ethanol consumption, ingestion is not expected to be a significant route of exposure to this product.
Butane: Studies in laboratory animals indicate exposure to extremely high levels of butanes (1-10 or higher vol.% in air) may cause cardiac arrhythmias (irregular heartbeats) which may be serious or fatal.
cumene: Overexposure to cumene may cause upper respiratory tract irritation and CNS depression.
n-hexane: n-Hexane is a CNS depressant and narcosis at elevated concentrations.
cyclohexane: Cyclohexane is a CNS depressant and narcosis at elevated concentrations.

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
Toluene	Eyes - Mild irritant	Rabbit	-	0.5 minutes 100 milligrams	-
	Eyes - Mild irritant	Rabbit	-	870 Micrograms	-
	Skin - Mild irritant	Pig	-	24 hours 250 microliters	-
	Skin - Mild irritant	Rabbit	-	435 milligrams	-
	Skin - Moderate irritant	Rabbit	-	500 milligrams	-
Xylene	Skin - Mild irritant	Rat	-	8 hours 60 microliters	-
	Skin - Moderate irritant	Rabbit	-	24 hours 500 milligrams	-
	Skin - Moderate irritant	Rabbit	-	100 Percent	-
Ethanol	Eyes - Mild irritant	Rabbit	-	24 hours 500 milligrams	-
	Eyes - Moderate irritant	Rabbit	-	0.066666667 minutes 100 milligrams	-
	Eyes - Moderate irritant	Rabbit	-	100 microliters	-
	Skin - Mild irritant	Rabbit	-	400 milligrams	-
	Skin - Moderate irritant	Rabbit	-	24 hours 20 milligrams	-
Benzene	Eyes - Moderate irritant	Rabbit	-	88 milligrams	-
	Skin - Mild irritant	Rat	-	8 hours 60 microliters	-
	Skin - Mild irritant	Rabbit	-	24 hours 15 milligrams	-
Ethylbenzene	Skin - Mild irritant	Rabbit	-	24 hours 15 milligrams	-
Cumene	Eyes - Mild irritant	Rabbit	-	86 milligrams	-
	Skin - Mild irritant	Rabbit	-	24 hours 10 milligrams	-
n-Hexane	Eyes - Mild irritant	Rabbit	-	10 milligrams	-
1,2,4-trimethylbenzene	Skin - Edema	Rabbit	3	-	-
Naphthalene	Skin - Mild irritant	Rabbit	-	495 milligrams	-

Skin : **xylene**: May cause skin irritation.
cyclohexane: Cyclohexane can cause eye, skin and mucous membrane irritation.

Eyes : **xylene**: May cause eye irritation.

Respiratory : **xylene**: May cause respiratory irritation.

Sensitization

Section 11. Toxicological information

Not available.

Skin : **toluene**: Non-sensitizer to skin.

Respiratory : **toluene**: Non-sensitizer to lungs.

Mutagenicity

Not available.

Conclusion/Summary : **heptane**: n-heptane was not mutagenic in the Salmonella/microsome (Ames) assay.
benzene: Some studies of workers exposed to benzene have shown an association with increased rates of chromosome aberrations in circulating lymphocytes.
naphthalene: Findings from a large number of bacterial and mammalian cell mutation assays have been negative. A few studies have shown chromosomal effects (elevated levels of Sister Chromatid Exchange or chromosomal aberrations) *in vitro.*

Carcinogenicity

Product/ingredient name	Result	Species	Dose	Exposure
Benzene	Positive - Inhalation - TD	Rat - Female	-	-

Conclusion/Summary : IARC has determined that gasoline and gasoline exhaust are possibly carcinogenic to humans. Exposure to wholly vaporized unleaded gasoline was associated with kidney cancers in male rats and liver tumors in female mice. The male rat kidney tumors are specific to that species and are not relevant to human health. The significance of the tumors identified in female mice is unclear.

ethanol: IARC Monograph 96 (2010) identified Ethanol in alcoholic beverages as a Group 1 carcinogen.
benzene: Studies of workers exposed to benzene show clear evidence that over-exposure can cause cancer of the blood forming organs (acute myelogenous leukemia) and aplastic anemia. Also, studies indicate repeated over-exposure to benzene may be associated with other types of leukemia and other blood disorders, including myelodysplastic syndromes. Studies in laboratory animals indicate that prolonged, repeated exposure to high levels of benzene vapor can cause bone marrow suppression and cancer in multiple organ systems.
ethylbenzene: Findings from a 2-year inhalation study in rodents conducted by NTP were as follows: Effects were observed only at the highest exposure level (750 ppm). At this level the incidence of renal tumors was elevated in male rats (tubular carcinomas) and female rats (tubular adenomas). Also, the incidence of tumors was elevated in male mice (alveolar and bronchiolar carcinomas) and female mice (hepatocellular carcinomas). IARC has classified ethyl benzene as “possibly carcinogenic to humans” (Group 2B).
cumene: Cumene exhibited hyperplasia of the epithelial tissues of the nose in NTP animal studies. Exposed male and female mice experienced metaplasia and hyperplasia of the lung. Also, male mice exhibited nonneoplastic lesions in the forestomach and liver. Adenomas of the respiratory epithelium of the nose were observed in male and female rats. Male rats exposed to cumene exhibited increased incidences of renal tubule adenoma or carcinoma (combined) as well as interstitial cell adenoma of the testis. Adenomas and carcinomas of the lung were increased in male and female mice exposed to cumene. The relevance of these findings to humans is not clear at this time. IARC has classified cumene as “possibly carcinogenic to humans” (Group 2B). In addition, NTP has determined cumene is reasonably anticipated to be a human carcinogen based on sufficient evidence of carcinogenicity from studies in experimental animals.
naphthalene: Laboratory rodents exposed to naphthalene vapor for 2 years (lifetime studies) developed non-neoplastic and neoplastic tumors and inflammatory lesions of the nasal and respiratory tract.

Classification

Section 11. Toxicological information

Product/ingredient name	OSHA	IARC	NTP
Toluene	-	3	-
Xylene	-	3	-
Ethanol	-	1	-
Benzene	+	1	Known to be a human carcinogen.
Ethylbenzene	-	2B	-
Cumene	-	2B	Reasonably anticipated to be a human carcinogen.
Naphthalene	-	2B	Reasonably anticipated to be a human carcinogen.

Reproductive toxicity

Not available.

Conclusion/Summary : **toluene**: Case studies of persons abusing toluene suggest isolated incidences of adverse effects on the fetus including birth defects. Several studies of workers suggest long-term exposure may be related to small increases in spontaneous abortions and changes in some gonadotropic hormones. However, the weight of evidence does not indicate toluene is a reproductive hazard to humans. Studies in laboratory animals indicate some changes in reproductive organs following high levels of exposure, but no significant effects on mating performance or reproduction were observed. Case studies of persons abusing toluene suggest isolated incidences of adverse effects on the fetus including birth defects. Findings in laboratory animals were largely negative. Positive findings include small increases in minor skeletal and visceral malformations and developmental delays following very high levels of maternal exposure.
benzene: One study of women workers exposed to benzene suggested a weak association with irregular menstruation. However, other studies of workers exposed to benzene have not demonstrated clear evidence of an effect on fertility or reproductive outcome in humans. Benzene can cross the placenta and affect the developing fetus. Cases of aplastic anemia have been reported in the offspring of persons severely over-exposed to benzene. Studies in laboratory animals show evidence of adverse effects on male reproductive organs following high levels of exposure but no significant effects on reproduction have been observed. Embryotoxicity has been reported in studies of laboratory animals but effects were limited to reduced fetal weight and skeletal variations.
ethylbenzene: Studies in laboratory animals indicate limited evidence of renal malformations, resorptions, and developmental delays following high levels of maternal exposure. The relevance of these findings to humans is not clear at this time.
n-hexane: In laboratory studies, prolonged exposure to elevated concentrations of n-hexane was associated with decreased sperm count and degenerative changes in the testicles of rats.

Teratogenicity

Product/ingredient name	Result	Species	Dose	Exposure
Benzene	Negative - Inhalation	Rat	-	-

Conclusion/Summary : No additional information.

Specific target organ toxicity (single exposure)

Name	Category	Route of exposure	Target organs
Toluene	Category 3	Not applicable.	Narcotic effects
Pentanes	Category 3	Not applicable.	Narcotic effects
Hexanes, mixture of isomers	Category 3	Not applicable.	Narcotic effects
Heptane	Category 3	Not applicable.	Narcotic effects
Ethanol	Category 3	Not applicable.	Respiratory tract irritation
Butane	Category 2	Not determined	central nervous system (CNS)
Cumene	Category 3	Not applicable.	Respiratory tract irritation
Ethylbenzene	Category 3	Not applicable.	Respiratory tract irritation

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n-hexane	Category 3	Not applicable.	Narcotic effects
Cyclohexane	Category 3	Not applicable.	Narcotic effects
1,2,4-trimethylbenzene	Category 3	Not applicable.	Respiratory tract irritation

Specific target organ toxicity (repeated exposure)

Name	Category	Route of exposure	Target organs
Toluene	Category 2	Inhalation	kidneys
benzene	Category 1	Inhalation	blood system
n-hexane	Category 2	Inhalation	peripheral nervous system

Aspiration hazard

Name	Result
Pentanes	ASPIRATION HAZARD - Category 1
Toluene	ASPIRATION HAZARD - Category 1
Hexanes, other isomers	ASPIRATION HAZARD - Category 1
Heptane	ASPIRATION HAZARD - Category 1
Benzene	ASPIRATION HAZARD - Category 1
Ethylbenzene	ASPIRATION HAZARD - Category 1
Cumene	ASPIRATION HAZARD - Category 1
n-Hexane	ASPIRATION HAZARD - Category 1
Cyclohexane	ASPIRATION HAZARD - Category 1

Information on the likely routes of exposure : Routes of entry anticipated: Oral, Dermal, Inhalation.

Potential acute health effects

Eye contact : Causes eye irritation.

Inhalation : Can cause central nervous system (CNS) depression. May cause drowsiness or dizziness. May cause respiratory irritation. Breathing high concentrations can cause irregular heartbeats which can be fatal.

Skin contact : Causes skin irritation. Defatting to the skin.

Ingestion : Can cause central nervous system (CNS) depression. May be fatal if swallowed and enters airways.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : Adverse symptoms may include the following:
pain or irritation
watering
redness

Inhalation : Breathing high concentrations can cause irregular heartbeats which may be fatal.
Repeated or prolonged overexposure to solvents can cause brain or other nervous system damage. The symptoms can include the loss of memory, the loss of intellectual capacity and the loss of coordination.
Repeated or prolonged overexposure to certain chemicals in this product may exacerbate the hearing loss effects associated with noise exposure.
Adverse symptoms may include the following:
respiratory tract irritation
coughing
nausea or vomiting
headache
drowsiness/fatigue
dizziness/vertigo
unconsciousness
reduced fetal weight
increase in fetal deaths
skeletal malformations

Section 11. Toxicological information

Skin contact : Adverse symptoms may include the following:
irritation
redness
dryness
cracking

Ingestion : Adverse symptoms may include the following:
nausea or vomiting

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Not available.

General : Causes damage to organs through prolonged or repeated exposure. Prolonged or repeated contact can defat the skin and lead to irritation, cracking and/or dermatitis.

Carcinogenicity : May cause cancer. Risk of cancer depends on duration and level of exposure.

Mutagenicity : May cause genetic defects.

Teratogenicity : Suspected of damaging the unborn child.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : Suspected of damaging fertility.

Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
Toluene	Acute EC50 12500 µg/l Fresh water	Algae - Pseudokirchneriella subcapitata	72 hours
	Acute EC50 11600 µg/l Fresh water	Crustaceans - Gammarus pseudolimnaeus - Adult	48 hours
	Acute EC50 6000 µg/l Fresh water	Daphnia - Daphnia magna - Juvenile (Fledgling, Hatchling, Weanling)	48 hours
	Acute LC50 5500 µg/l Fresh water	Fish - Oncorhynchus kisutch - Fry	96 hours
	Chronic NOEC 1000 µg/l Fresh water	Daphnia - Daphnia magna	21 days
Xylene	Acute EC50 90 mg/l Fresh water	Crustaceans - Cypris subglobosa	48 hours
	Acute LC50 8.5 ppm Marine water	Crustaceans - Palaemonetes pugio - Adult	48 hours
	Acute LC50 8500 µg/l Marine water	Crustaceans - Palaemonetes pugio	48 hours
	Acute LC50 15700 µg/l Fresh water	Fish - Lepomis macrochirus - Juvenile (Fledgling, Hatchling, Weanling)	96 hours
	Acute LC50 19000 µg/l Fresh water	Fish - Lepomis macrochirus	96 hours
	Acute LC50 13400 µg/l Fresh water	Fish - Pimephales promelas	96 hours
	Acute LC50 16940 µg/l Fresh water	Fish - Carassius auratus	96 hours
Heptane	Acute EC50 1.5 mg/l	Daphnia - Daphnia magna	48 hours
	Acute LC50 4 mg/l	Fish - Carassius auratus	24 hours

Section 12. Ecological information

	Acute LC50 375000 µg/l Fresh water	Fish - Oreochromis mossambicus	96 hours
	Acute LC50 4924 ppm Fresh water	Fish - Gambusia affinis - Adult	96 hours
Ethanol	Acute EC50 17.921 mg/l Marine water	Algae - Ulva pertusa	96 hours
	Acute EC50 2000 µg/l Fresh water	Daphnia - Daphnia magna	48 hours
	Acute LC50 25500 µg/l Marine water	Crustaceans - Artemia franciscana - Larvae	48 hours
	Acute LC50 42000 µg/l Fresh water	Fish - Oncorhynchus mykiss	4 days
	Chronic NOEC 4.995 mg/l Marine water	Algae - Ulva pertusa	96 hours
	Chronic NOEC 100 ul/L Fresh water	Daphnia - Daphnia magna - Neonate	21 days
	Chronic NOEC 0.375 ul/L Fresh water	Fish - Gambusia holbrooki - Larvae	12 weeks
Benzene	Acute EC50 29000 µg/l Fresh water	Algae - Pseudokirchneriella subcapitata	72 hours
	Acute EC50 1600000 µg/l Fresh water	Algae - Selenastrum sp.	96 hours
	Acute EC50 9230 µg/l Fresh water	Daphnia - Daphnia magna - Neonate	48 hours
	Acute LC50 21 mg/l Marine water	Crustaceans - Artemia salina	48 hours
	Acute LC50 5.28 ul/L Fresh water	Fish - Oncorhynchus gorbuscha - Fry	96 hours
	Chronic NOEC 98 mg/l Fresh water	Daphnia - Daphnia magna	21 days
	Chronic NOEC 1.5 to 5.4 ul/L Marine water	Fish - Morone saxatilis - Juvenile (Fledgling, Hatchling, Weanling)	4 weeks
Ethylbenzene	Acute EC50 4600 µg/l Fresh water	Algae - Pseudokirchneriella subcapitata	72 hours
	Acute EC50 3600 µg/l Fresh water	Algae - Pseudokirchneriella subcapitata	96 hours
	Acute EC50 6530 µg/l Fresh water	Crustaceans - Artemia sp. - Nauplii	48 hours
	Acute EC50 2930 µg/l Fresh water	Daphnia - Daphnia magna - Neonate	48 hours
	Acute LC50 4200 µg/l Fresh water	Fish - Oncorhynchus mykiss	96 hours
Cumene	Acute EC50 2600 µg/l Fresh water	Algae - Pseudokirchneriella subcapitata	72 hours
	Acute EC50 7400 µg/l Fresh water	Crustaceans - Artemia sp. - Nauplii	48 hours
	Acute EC50 10600 µg/l Fresh water	Daphnia - Daphnia magna - Neonate	48 hours
	Acute LC50 2700 µg/l Fresh water	Fish - Oncorhynchus mykiss	96 hours
n-Hexane	Acute LC50 2500 µg/l Fresh water	Fish - Pimephales promelas	96 hours
Cyclohexane	Acute LC50 4530 µg/l Fresh water	Fish - Pimephales promelas	96 hours
1,2,4-trimethylbenzene	Acute LC50 17000 µg/l Marine water	Crustaceans - Cancer magister - Zoea	48 hours
	Acute LC50 4910 µg/l Marine water	Crustaceans - Elasmopus pectenicrus - Adult	48 hours
	Acute LC50 7720 µg/l Fresh water	Fish - Pimephales promelas	96 hours
	Acute LC50 22.4 mg/l Fresh water	Fish - Tilapia zillii	96 hours
Naphthalene	Acute EC50 1.6 ppm Fresh water	Daphnia - Daphnia magna	48 hours
	Acute LC50 2350 µg/l Marine water	Crustaceans - Palaemonetes pugio	48 hours
	Acute LC50 213 µg/l Fresh water	Fish - Melanotaenia fluviatilis - Larvae	96 hours
	Chronic NOEC 0.5 mg/l Marine water	Crustaceans - Uca pugnax - Adult	3 weeks
	Chronic NOEC 1.5 mg/l Fresh water	Fish - Oreochromis mossambicus	60 days

Conclusion/Summary : Not available.

Persistence and degradability

Conclusion/Summary : **toluene**: Rapidly biodegradable in aerobic conditions.

Product/ingredient name	Aquatic half-life	Photolysis	Biodegradability
Toluene	-	-	Readily
Benzene	-	-	Readily

Section 12. Ecological information

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
Pentanes	3.45	171	low
Toluene	2.73	90	low
Xylene	3.12	8.1 to 25.9	low
Heptane	4.66	552	high
Ethanol	-0.35	-	low
Butane	2.89	-	low
Benzene	2.13	11	low
Ethylbenzene	3.6	-	low
Cumene	3.55	35.48	low
n-Hexane	4	501.187	high
Cyclohexane	3.44	167	low
1,2,4-trimethylbenzene	3.63	243	low
Naphthalene	3.4	36.5 to 168	low

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Vapor from product residues may create a highly flammable or explosive atmosphere inside the container. Do not cut, weld or grind used containers unless they have been cleaned thoroughly internally. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

RCRA classification : D001, D018

United States - RCRA Toxic hazardous waste "U" List

Ingredient	CAS #	Status	Reference number
Xylene	1330-20-7	Listed	U239
Toluene; Benzene, methyl-	108-88-3	Listed	U220
Benzene (I,T)	71-43-2	Listed	U019
Cumene (I); Benzene, (1-methylethyl)- (I)	98-82-8	Listed	U055
Cyclohexane (I); Benzene, hexahydro- (I)	110-82-7	Listed	U056
Naphthalene	91-20-3	Listed	U165

Section 14. Transport information

Section 14. Transport information

	DOT Classification	IMDG	IATA
UN number	UN1203	UN 1203	UN1203
UN proper shipping name	UN 1203, Gasoline, 3 PG II.	UN 1203, Gasoline, 3 PG II.	UN 1203, Gasoline, 3 PG II.
Transport hazard class(es)	3 	3 	3 
Packing group	II	II	II
Environmental hazards	Yes.	Yes.	Yes.

Additional information

DOT Classification : **Packaging instruction**
Passenger aircraft
Quantity limitation: 5 L

Cargo aircraft
Quantity limitation: 60 L

TDG Classification : Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.18-2.19 (Class 3), 2.7 (Marine pollutant mark).
The marine pollutant mark is not required when transported by road or rail.

ADR/RID : The environmentally hazardous substance mark is not required when transported in sizes of ≤5 L or ≤5 kg.

IMDG : The marine pollutant mark is not required when transported in sizes of ≤5 L or ≤5 kg.

IATA : The environmentally hazardous substance mark may appear if required by other transportation regulations.
Quantity limitation Cargo Aircraft Only: 60 L. Limited Quantities - Passenger Aircraft: 5 L.

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to Annex II of MARPOL and the IBC Code : Not available.

Section 15. Regulatory information

U.S. Federal regulations :

United States inventory (TSCA 8b): All components are listed or exempted.

Clean Water Act (CWA) 307: toluene; benzene; ethylbenzene; naphthalene

Clean Water Act (CWA) 311: xylene; toluene; benzene; ethylbenzene; cyclohexane; naphthalene

This material is classified as an oil under Section 311 of the Clean Water Act (CWA) and the Oil Pollution Act of 1990 (OPA). Discharges or spills which produce a visible sheen on waters of the United States, their adjoining shorelines, or into conduits leading to surface waters must be reported to the EPA's National Response Center at (800) 424-8802.

Clean Air Act (CAA) 112 regulated flammable substances: pentane; Butane

SARA 302/304

Composition/information on ingredients

Section 15. Regulatory information

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : FLAMMABLE LIQUIDS - Category 2
SKIN IRRITATION - Category 2
EYE IRRITATION - Category 2B
GERM CELL MUTAGENICITY - Category 1
CARCINOGENICITY - Category 1B
TOXIC TO REPRODUCTION (Fertility) - Category 2
TOXIC TO REPRODUCTION (Unborn child) - Category 2
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (central nervous system (CNS)) - Category 2
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Narcotic effects) - Category 3
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) (blood system, central nervous system (CNS), hearing organs) - Category 1
ASPIRATION HAZARD - Category 1
HNOC - Defatting irritant
HNOC - Static-accumulating flammable liquid

Composition/information on ingredients

Name	%	Classification
Gasoline	Proprietary	FLAMMABLE LIQUIDS - Category 2 SKIN IRRITATION - Category 2 EYE IRRITATION - Category 2B GERM CELL MUTAGENICITY - Category 1 CARCINOGENICITY - Category 1B TOXIC TO REPRODUCTION (Fertility) - Category 2 TOXIC TO REPRODUCTION (Unborn child) - Category 2 SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (central nervous system (CNS)) - Category 2 SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3 SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Narcotic effects) - Category 3 SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) (blood system, central nervous system (CNS), hearing organs) - Category 1 ASPIRATION HAZARD - Category 1 HNOC - Defatting irritant HNOC - Static-accumulating flammable liquid
Pentanes	10 - 30	FLAMMABLE LIQUIDS - Category 2 SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Narcotic effects) - Category 3 ASPIRATION HAZARD - Category 1
Toluene	10 - 30	FLAMMABLE LIQUIDS - Category 2 SKIN IRRITATION - Category 2 EYE IRRITATION - Category 2A TOXIC TO REPRODUCTION (Unborn child) - Category 2 SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3 SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Narcotic effects) - Category 3 SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) - Category 2 SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) (central nervous system (CNS)) (inhalation) - Category 2 ASPIRATION HAZARD - Category 1
Xylene	10 - 30	FLAMMABLE LIQUIDS - Category 3 ACUTE TOXICITY (inhalation) - Category 4

Section 15. Regulatory information

		SKIN IRRITATION - Category 2 EYE IRRITATION - Category 2A SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) (hearing organs) - Category 2
Hexanes, other isomers	10 - 30	FLAMMABLE LIQUIDS - Category 2 SKIN IRRITATION - Category 2 TOXIC TO REPRODUCTION (Fertility) (inhalation) - Category 2 SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Narcotic effects) - Category 3 ASPIRATION HAZARD - Category 1
Heptane	10 - 30	FLAMMABLE LIQUIDS - Category 2 SKIN IRRITATION - Category 2 SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Narcotic effects) - Category 3 ASPIRATION HAZARD - Category 1
Ethanol	3 - 7	FLAMMABLE LIQUIDS - Category 2 SKIN IRRITATION - Category 2 EYE IRRITATION - Category 2A CARCINOGENICITY - Category 1A SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3
Butane	3 - 7	FLAMMABLE GASES - Category 1 GASES UNDER PRESSURE - Liquefied gas SIMPLE ASPHYXIANTS SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (central nervous system (CNS)) - Category 2
Benzene	3 - 7	FLAMMABLE LIQUIDS - Category 2 SKIN IRRITATION - Category 2 EYE IRRITATION - Category 2A GERM CELL MUTAGENICITY - Category 1B CARCINOGENICITY - Category 1A SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) - Category 1 SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) (blood system) (inhalation) - Category 1 ASPIRATION HAZARD - Category 1
Ethylbenzene	1 - 5	FLAMMABLE LIQUIDS - Category 2 SKIN IRRITATION - Category 2 EYE IRRITATION - Category 2A CARCINOGENICITY (inhalation) - Category 2 SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3 ASPIRATION HAZARD - Category 1
Cumene	1 - 5	FLAMMABLE LIQUIDS - Category 3 EYE IRRITATION - Category 2A CARCINOGENICITY (inhalation) - Category 2 SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3 ASPIRATION HAZARD - Category 1
n-Hexane	1 - 5	FLAMMABLE LIQUIDS - Category 2 SKIN IRRITATION - Category 2 EYE IRRITATION - Category 2A SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Narcotic effects) - Category 3 SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) - Category 2 SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) (peripheral nervous system) (inhalation) - Category 2 ASPIRATION HAZARD - Category 1
Cyclohexane	1 - 5	FLAMMABLE LIQUIDS - Category 2 SKIN IRRITATION - Category 2 SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE)

Section 15. Regulatory information

1,2,4-trimethylbenzene	1 - 5	(Narcotic effects) - Category 3 ASPIRATION HAZARD - Category 1 FLAMMABLE LIQUIDS - Category 3 ACUTE TOXICITY (inhalation) - Category 4 SKIN IRRITATION - Category 2 EYE IRRITATION - Category 2A SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3
Naphthalene	1 - 5	FLAMMABLE SOLIDS - Category 2 ACUTE TOXICITY (oral) - Category 4 CARCINOGENICITY - Category 2

SARA 313

	Product name	CAS number	%
Form R - Reporting requirements	Toluene Xylenes, mixed isomers Benzene Ethylbenzene Cumene n-Hexane Cyclohexane 1,2,4-Trimethylbenzene Naphthalene	108-88-3 1330-20-7 71-43-2 100-41-4 98-82-8 110-54-3 110-82-7 95-63-6 91-20-3	<20 <20 <5 <4 <4 <3 <3 <2 <2
Supplier notification	Toluene Xylenes, mixed isomers Benzene Ethylbenzene Cumene n-Hexane Cyclohexane 1,2,4-Trimethylbenzene Naphthalene	108-88-3 1330-20-7 71-43-2 100-41-4 98-82-8 110-54-3 110-82-7 95-63-6 91-20-3	<20 <20 <5 <4 <4 <3 <3 <2 <2

SARA 313 notifications must not be detached from the SDS and any copying and redistribution of the SDS shall include copying and redistribution of the notice attached to copies of the SDS subsequently redistributed.

State regulations

Massachusetts : The following components are listed: HEPTANE; N-HEPTANE; xylene; toluene; Octanes, all isomers; PENTANE; ETHYL ALCOHOL; DENATURED ALCOHOL; BENZENE; Butane; cumene; ethylbenzene; trimethylbenzene; methylcyclohexane; n-hexane; ethyltoluene; cyclohexane; 2,2,4-trimethylpentane; PSEUDOCUMENE; Cyclopentane; NAPHTHALENE

New York : The following components are listed: Xylene mixed; Toluene; Benzene; Cumene; Benzene, 1-methylethyl-; Ethylbenzene; Hexane; Cyclohexane; Benzene, hexahydro-; 2, 2,4-Trimethylpentane; Naphthalene

New Jersey : The following components are listed: Gasoline

Pennsylvania : The following components are listed: Gasoline

California Prop. 65 Clear and Reasonable Warnings (2018)

⚠ **WARNING**: This product can expose you to chemicals including Ethanol, Benzene, which are known to the State of California to cause cancer and birth defects or other reproductive harm. This product can expose you to chemicals including Ethylbenzene, Cumene, Naphthalene, which are known to the State of California to cause cancer, and Toluene, which is known to the State of California to cause birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

Section 15. Regulatory information

Ingredient name	%	Cancer	Reproductive	No significant risk level	Maximum acceptable dosage level
Gasoline engine exhaust (condensates / extracts)	100	Yes.	No.	No.	No.
Toluene	<20	No.	Yes.	No.	7000 µg/day (ingestion)
Ethanol	<10	Yes.	Yes.	No.	No.
Benzene	<5	Yes.	Yes.	6.4 µg/day (ingestion) 13 µg/day (inhalation)	24 µg/day (ingestion) 49 µg/day (inhalation)
Ethylbenzene	<5	Yes.	No.	41 µg/day (ingestion) 54 µg/day (inhalation)	No.
Cumene	<5	Yes.	No.	No.	No.
Naphthalene	<2	Yes.	No.	Yes.	No.

International regulations

WHMIS (Canada) : Class B-2: Flammable liquid
Class D-2A: Material causing other toxic effects (Very toxic).
Class D-2B: Material causing other toxic effects (Toxic).

Inventory list

United States : All components are listed or exempted.
Australia : All components are listed or exempted.
Canada : All components are listed or exempted.
China : All components are listed or exempted.
Europe : All components are listed or exempted.
Japan : **Japan inventory (ENCS)**: All components are listed or exempted.
Japan inventory (ISHL): Not determined.
Malaysia : All components are listed or exempted.
New Zealand : All components are listed or exempted.
Philippines : All components are listed or exempted.
Republic of Korea : All components are listed or exempted.
Taiwan : All components are listed or exempted.
Thailand : Not determined.
Turkey : Not determined.
Viet Nam : Not determined.

Section 16. Other information

National Fire Protection Association (U.S.A.)

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Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

Section 16. Other information

Procedure used to derive the classification

Classification	Justification
FLAMMABLE LIQUIDS - Category 2	On basis of test data
SKIN IRRITATION - Category 2	Calculation method
EYE IRRITATION - Category 2B	Expert judgment
GERM CELL MUTAGENICITY - Category 1	Calculation method
CARCINOGENICITY - Category 1B	Expert judgment
TOXIC TO REPRODUCTION (Fertility) - Category 2	Expert judgment
TOXIC TO REPRODUCTION (Unborn child) - Category 2	Expert judgment
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (central nervous system (CNS)) - Category 2	Calculation method
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3	Calculation method
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Narcotic effects) - Category 3	Expert judgment
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) (blood system, central nervous system (CNS), hearing organs) - Category 1	Calculation method
ASPIRATION HAZARD - Category 1	Expert judgment
AQUATIC HAZARD (ACUTE) - Category 1	Calculation method
AQUATIC HAZARD (LONG-TERM) - Category 1	Calculation method

History

Date of printing : 3/19/2018

Date of issue/Date of revision : 3/19/2018

Date of previous issue : No previous validation

Version : 1

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

References : Not available.

Indicates information that has changed from previously issued version.

Notice to reader

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SAFETY DATA SHEET

CITGO No. 2 Diesel Fuel, All Grades, Low Sulfur

Section 1. Identification

GHS product identifier : CITGO No. 2 Diesel Fuel, All Grades, Low Sulfur

Chemical name : Fuels, diesel, No 2

Synonyms : No. 2-D Grade Diesel Fuel Oil (defined by ASTM D-975); Treated or Refined Diesel Fuel No. 2; Grade 2 Distillate Fuel; Hydrodesulfurized Middle Distillate; C9-C16 Petroleum Hydrocarbons

Material uses : Fuel.

Code : Various

Supplier's details : CITGO Petroleum Corporation
P.O. Box 4689
Houston, TX 77210
sdsvend@citgo.com

Emergency telephone number (with hours of operation) : Technical Contact: (800) 248-4684
Medical Emergency: (832) 486-4700
CHEMTREC Emergency: (800) 424-9300
(United States Only)

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : FLAMMABLE LIQUIDS - Category 3
ACUTE TOXICITY (inhalation) - Category 4
SKIN IRRITATION - Category 2
EYE IRRITATION - Category 2B
CARCINOGENICITY - Category 2
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) (central nervous system (CNS)) - Category 2
ASPIRATION HAZARD - Category 1
AQUATIC HAZARD (LONG-TERM) - Category 2

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : Flammable liquid and vapor.
Harmful if inhaled.
Causes skin and eye irritation.
Suspected of causing cancer.
May be fatal if swallowed and enters airways.
May cause damage to organs through prolonged or repeated exposure. (central nervous system (CNS))
Toxic to aquatic life with long lasting effects.

Precautionary statements

General : Diesel engine exhaust can cause upper respiratory tract irritation and reversible pulmonary effects. Long-term exposure to diesel engine exhaust may cause cancer.
Do not syphon by mouth.

Section 2. Hazards identification

Prevention : Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wear protective gloves. Wear eye or face protection. Wear protective clothing. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Use explosion-proof electrical, ventilating, lighting and all material-handling equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Keep container tightly closed. Use only outdoors or in a well-ventilated area. Avoid release to the environment. Do not breathe vapor. Wash hands thoroughly after handling.

Response : Collect spillage. Get medical attention if you feel unwell. IF exposed or concerned: Get medical attention. IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER or physician if you feel unwell. IF SWALLOWED: Immediately call a POISON CENTER or physician. Do NOT induce vomiting. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. IF ON SKIN: Wash with plenty of soap and water. Take off contaminated clothing and wash it before reuse. If skin irritation occurs: Get medical attention. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical attention.

Storage : Store locked up. Store in a well-ventilated place. Keep cool.

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Supplemental label elements : Eliminate sources of ignition. Avoid spark promoters. Ground/bond container and receiving equipment. These alone may be insufficient to remove static electricity. Do not taste or swallow. Wash thoroughly after handling.

Hazards not otherwise classified : Static accumulating flammable liquid can become electrostatically charged even in bonded and grounded equipment. Sparks may ignite liquid and vapor may cause flash fire or explosion. Causes digestive tract burns. Prolonged or repeated contact may dry skin and cause irritation.

Section 3. Composition/information on ingredients

Substance/mixture : Substance

Chemical name : Fuels, diesel, No 2

Other means of identification : No. 2-D Grade Diesel Fuel Oil (defined by ASTM D-975); Treated or Refined Diesel Fuel No. 2; Grade 2 Distillate Fuel; Hydrodesulfurized Middle Distillate; C9-C16 Petroleum Hydrocarbons

CAS number/other identifiers

CAS number : 68476-34-6

Ingredient name	%	CAS number
Benzene, trimethyl-	1 - 5	25551-13-7
Naphthalene	0.5 - 1.5	91-20-3
biphenyl	0.5 - 1.5	92-52-4
Cumene	0.5 - 1.5	98-82-8
Xylene	0.5 - 1.5	1330-20-7
Ethylbenzene	0.5 - 1.5	100-41-4

* = Various ** = Mixture *** = Proprietary

Any concentration shown as a range is to protect confidentiality or is due to process variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention. If necessary, call a poison center or physician. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Skin contact : Wash skin thoroughly with soap and water or use recognized skin cleanser. Remove contaminated clothing and shoes. Continue to rinse for at least 10 minutes. Get medical attention. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : Get medical attention immediately. Call a poison center or physician. Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. Aspiration hazard if swallowed. Can enter lungs and cause damage. Do not induce vomiting. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : Causes eye irritation.

Inhalation : Harmful if inhaled.

Skin contact : Causes skin irritation. Defatting to the skin.

Ingestion : Corrosive to the digestive tract. Causes burns. May be fatal if swallowed and enters airways.

Over-exposure signs/symptoms

Eye contact : Adverse symptoms may include the following:
pain or irritation
watering
redness

Inhalation : Repeated or prolonged overexposure to solvents can cause brain or other nervous system damage. The symptoms can include the loss of memory, the loss of intellectual capacity and the loss of coordination.

Skin contact : Adverse symptoms may include the following:
irritation
redness
dryness
cracking

Ingestion : Adverse symptoms may include the following:
stomach pains
nausea or vomiting

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : If ingested, this material presents a significant aspiration and chemical pneumonitis hazard. Induction of emesis is not recommended. Consider activated charcoal and/or gastric lavage. If patient is obtunded, protect the airway by cuffed endotracheal intubation or by placement of the body in a Trendelenburg and left lateral decubitus position.

Specific treatments : Treat symptomatically and supportively.

Section 4. First aid measures

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that gas or vapor is still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use caution when applying carbon dioxide in confined spaces. SMALL FIRE: Steam, CO_2, dry chemical or inert gas (e.g., nitrogen). LARGE FIRE: Use foam, water fog or water spray. Water fog and spray are effective in cooling containers and adjacent structures. However, water can cause frothing and/or may not extinguish the fire. Water can be used to cool the external walls of vessels to prevent excessive pressure, ignition or explosion.

Unsuitable extinguishing media : Do not use water jet.

Specific hazards arising from the chemical : Flammable liquid and vapor. Runoff to sewer may create fire or explosion hazard. This product is a poor conductor of electricity and can become electrostatically charged. If sufficient charge is accumulated, ignition of flammable mixtures can occur. To reduce potential for static discharge, use proper bonding and grounding procedures. This liquid may accumulate static electricity when filling properly grounded containers. Static accumulation may be significantly increased by the presence of small quantities of water or other contaminants. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. The vapor/gas is heavier than air and will spread along the ground. Vapors may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back. This material is toxic to aquatic life with long lasting effects. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
Diesel engine exhaust

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Section 6. Accidental release measures

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). Water polluting material. May be harmful to the environment if released in large quantities. Collect spillage.

Methods and materials for containment and cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Avoid exposure - obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Do not swallow. Avoid release to the environment. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use only non-sparking tools. Take precautionary measures against electrostatic discharges. Empty containers retain product residue and can be hazardous. Do not reuse container. Handling operations that can promote accumulation of static charges include but are not limited to: mixing, filtering, pumping at high flow rates, splash filling, creating mists or sprays, tank and container filling, tank cleaning, sampling, gauging, switch loading, vacuum truck operations. Restrict flow velocity according to API 2003 (2008), NFPA 77 (2007), and Laurence Britton, “Avoiding Static Ignition Hazards in Chemical Operations”. To reduce potential for static discharge, ensure that all equipment is properly grounded and bonded and meets appropriate electrical classification requirements. Non equilibrium conditions may increase the fire hazard associated with this product. Always bond receiving containers to the fill pipe before and during loading. Always confirm that receiving container is properly grounded. Bonding and grounding alone may be inadequate to eliminate fire and explosion hazards. Carefully review operations that may increase the risks such as tank and container filling, tank cleaning, sampling, gauging, loading, filtering, mixing, agitation, etc. In addition to bonding and grounding, efforts to mitigate the hazards may include, but are not limited to, ventilation, inerting and/or reduction of transfer velocities. Always keep nozzle in contact with the container throughout the loading process. Do NOT fill any portable container in or on a vehicle.

Special precautions, such as reduced loading rates and increased monitoring, must be observed during "switch loading" operations (i.e., loading this material in tanks or shipping compartments that previously contained a dissimilar product).

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Section 7. Handling and storage

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Store locked up. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination. See Section 10 for incompatible materials before handling or use.

Bulk Storage Conditions: Maintain all storage tanks in accordance with applicable regulations. Use necessary controls to monitor tank inventories. Inspect all storage tanks on a periodic basis. Test tanks and associated piping for tightness. Maintain the automatic leak detection devices to assure proper working condition.

Head spaces in tanks and other containers may contain a mixture of air and vapor in the flammable range. Vapor may be ignited by static discharge. Storage area must meet OSHA requirements and applicable fire codes. Additional information regarding the design and control of hazards associated with the handling and storage of flammable and combustible liquids may be found in professional and industrial documents including, but not limited to, the National Fire Protection Association (NFPA) publications NFPA 30 ("Flammable and Combustible Liquid Code"), NFPA 77 ("Recommended Practice on Static Electricity") and the American Petroleum Institute (API) Recommended Practice 2003, (“Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents").

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Fuels, diesel, No 2	**ACGIH TLV (United States, 2/2010). Absorbed through skin.** TWA: 100 mg/m³, (measured as total hydrocarbons) 8 hours. Form: Total hydrocarbons
Benzene, trimethyl-	**ACGIH TLV (United States, 3/2017).** TWA: 25 ppm 8 hours. TWA: 123 mg/m³ 8 hours.
Naphthalene	**ACGIH TLV (United States). Absorbed through skin.** STEL: 15 ppm 15 minutes. **ACGIH TLV (United States, 3/2017). Absorbed through skin.** TWA: 10 ppm 8 hours. TWA: 52 mg/m³ 8 hours. **NIOSH REL (United States, 10/2016).** TWA: 10 ppm 10 hours. TWA: 50 mg/m³ 10 hours. STEL: 15 ppm 15 minutes. STEL: 75 mg/m³ 15 minutes. **OSHA PEL (United States, 6/2016).** TWA: 10 ppm 8 hours. TWA: 50 mg/m³ 8 hours.
biphenyl	**OSHA PEL Z2 (United States).** TWA: 0.2 ppm 8 hours. **ACGIH TLV (United States, 3/2017).** TWA: 0.2 ppm 8 hours. TWA: 1.3 mg/m³ 8 hours. **NIOSH REL (United States, 10/2016).** TWA: 1 mg/m³ 10 hours. TWA: 0.2 ppm 10 hours. **OSHA PEL (United States, 6/2016).** TWA: 0.2 ppm 8 hours. TWA: 1 mg/m³ 8 hours.

Section 8. Exposure controls/personal protection

Cumene	**NIOSH REL (United States, 10/2016).** **Absorbed through skin.** TWA: 50 ppm 10 hours. TWA: 245 mg/m³ 10 hours. **ACGIH TLV (United States, 3/2017).** TWA: 50 ppm 8 hours. **OSHA PEL (United States, 6/2016).** **Absorbed through skin.** TWA: 50 ppm 8 hours. TWA: 245 mg/m³ 8 hours.
Xylene	**ACGIH TLV (United States, 3/2017).** TWA: 100 ppm 8 hours. TWA: 434 mg/m³ 8 hours. STEL: 150 ppm 15 minutes. STEL: 651 mg/m³ 15 minutes. **OSHA PEL (United States, 6/2016).** TWA: 100 ppm 8 hours. TWA: 435 mg/m³ 8 hours.
Ethylbenzene	**ACGIH TLV (United States, 3/2017).** TWA: 20 ppm 8 hours. **NIOSH REL (United States, 10/2016).** TWA: 100 ppm 10 hours. TWA: 435 mg/m³ 10 hours. STEL: 125 ppm 15 minutes. STEL: 545 mg/m³ 15 minutes. **OSHA PEL (United States, 6/2016).** TWA: 100 ppm 8 hours. TWA: 435 mg/m³ 8 hours.

Appropriate engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, vapor controls, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety glasses equipped with side shields are recommended as minimum protection in industrial settings. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles. Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If inhalation hazards exist, a full-face respirator may be required instead.

Skin protection

Section 8. Exposure controls/personal protection

Hand protection : Avoid skin contact with liquid. Chemical-resistant gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Recommended: Heavy duty, industrial grade chemically resistant gloves constructed of nitrile, neoprene, polyethylene, fluoroelastomer rubber or polyvinyl chloride as approved by glove manufacturer. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. Leather gloves are not protective for liquid contact.

Body protection : Avoid skin contact with liquid. Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Other skin protection : Avoid skin contact with liquid. Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. Leather boots are not protective for liquid contact.

Respiratory protection : Avoid inhalation of gases, vapors, mists or dusts. Use a properly fitted, air-purifying or supplied-air respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. If an air purifying respirator is appropriate, use one equipped with cartridges rated for organic vapors.

Section 9. Physical and chemical properties

Appearance

Physical state : Liquid.

Color : Not available.

Odor : Characteristic.

pH : Not available.

Melting point : -30 to -18°C (-22 to -0.4°F)

Boiling point : 282 to 338°C (539.6 to 640.4°F)

Flash point : Closed cup: ≥52°C (≥125.6°F) [Pensky-Martens.]

Evaporation rate : <1 (butyl acetate = 1)

Lower and upper explosive (flammable) limits : Lower: 0.6%
Upper: 6.5%

Vapor pressure : 0.27 kPa (2 mm Hg) [room temperature]

Vapor density : 5 [Air = 1]

Relative density : 0.84

Density lbs/gal : Estimated 7 lbs/gal

Density gm/cm³ : 0.87 to 0.95 g/cm³

Gravity, °API : Estimated 37 @ 60 F

Solubility : Very slightly soluble in the following materials: cold water.

Solubility in water : 0.005 g/l

Partition coefficient: n-octanol/water : >3.3

Auto-ignition temperature : 254 to 285°C (489.2 to 545°F)

Flow time (ISO 2431) : Not available.

Viscosity : Kinematic (room temperature): 0.03 cm^2/s (3 cSt)

Conductivity : <50 picosiemens/meter (unadditized)

Section 10. Stability and reactivity

Reactivity : Not expected to be Explosive, Self-Reactive, Self-Heating, or an Organic Peroxide under US GHS Definition(s).

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Do not allow vapor to accumulate in low or confined areas. Do not store with strong oxidizing agents.

Incompatible materials : Reactive or incompatible with the following materials:
oxidizing materials

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Benzene, trimethyl-	LD50 Oral	Rat	8970 mg/kg	-
Naphthalene	LD50 Oral	Rat	490 mg/kg	-
biphenyl	LD50 Dermal	Rabbit	>5010 mg/kg	-
	LD50 Oral	Rat	2140 mg/kg	-
Cumene	LC50 Inhalation Vapor	Mouse	10 g/m³	7 hours
	LD50 Dermal	Rabbit	12300 uL/kg	-
	LD50 Oral	Rat	2.9 g/kg	-
	LD50 Oral	Rat	4000 mg/kg	-
Xylene	LC50 Inhalation Vapor	Rat	5000 ppm	4 hours
	LC50 Inhalation Vapor	Rat	6700 ppm	4 hours
	LD50 Oral	Mouse	2119 mg/kg	-
	LD50 Oral	Rat	4300 mg/kg	-
	LD50 Oral	Rat	4300 mg/kg	-
Ethylbenzene	LD50 Dermal	Rabbit	>5000 mg/kg	-
	LD50 Oral	Rat	3500 mg/kg	-

Conclusion/Summary : No additional information.

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
Benzene, trimethyl-	Eyes - Mild irritant	Rabbit	-	24 hours 500 milligrams	-
	Skin - Moderate irritant	Rabbit	-	24 hours 500 milligrams	-
Naphthalene	Skin - Mild irritant	Rabbit	-	495 milligrams	-
biphenyl	Eyes - Mild irritant	Rabbit	-	100 milligrams	-
	Skin - Severe irritant	Rabbit	-	24 hours 500 microliters	-
Cumene	Eyes - Mild irritant	Rabbit	-	86 milligrams	-
	Skin - Mild irritant	Rabbit	-	24 hours 10 milligrams	-
Xylene	Skin - Mild irritant	Rat	-	8 hours 60 microliters	-

Section 11. Toxicological information

	Skin - Moderate irritant	Rabbit	-	24 hours 500 milligrams	-
	Skin - Moderate irritant	Rabbit	-	100 Percent	-
Ethylbenzene	Skin - Mild irritant	Rabbit	-	24 hours 15 milligrams	-

Skin : No additional information.

Eyes : No additional information.

Respiratory : No additional information.

Sensitization

Not available.

Skin : No additional information.

Respiratory : No additional information.

Mutagenicity

Not available.

Conclusion/Summary : No additional information.

Carcinogenicity

Not available.

Conclusion/Summary : **Diesel exhaust particulate**: Lung tumor and lymphomas were identified in rats and mice exposed to unflitered diesel fuel exhaust in chronic inhalation studies. Further, epidemiological studies have identified increase incidences of lung cancer in US railroad workers and bladder cancer in bus and truck drivers possibly associated with exposure to diesel engine exhaust. NTP has determined that exposure to diesel exhaust particulates, a complex mixture of combustion products of diesel fuel, is reasonably anticipated to be a human carcinogen. In addition, NIOSH has identified complete diesel exhaust as a potential carcinogen.

Classification

Product/ingredient name	OSHA	IARC	NTP
Fuels, diesel, No 2	-	3	-
Diesel exhaust particulate	-	1	Reasonably anticipated to be a human carcinogen.
Naphthalene	-	2B	Reasonably anticipated to be a human carcinogen.
Cumene	-	2B	Reasonably anticipated to be a human carcinogen.
Xylene	-	3	-
Ethylbenzene	-	2B	-

Reproductive toxicity

Not available.

Conclusion/Summary : No additional information.

Teratogenicity

Not available.

Conclusion/Summary : No additional information.

Specific target organ toxicity (single exposure)

Name	Category	Route of exposure	Target organs
Benzene, trimethyl-	Category 3	Not applicable.	Respiratory tract irritation and Narcotic effects
biphenyl	Category 3	Not applicable.	Respiratory tract irritation
Cumene	Category 3	Not applicable.	Respiratory tract irritation
Ethylbenzene	Category 3	Not applicable.	Respiratory tract irritation

Section 11. Toxicological information

Specific target organ toxicity (repeated exposure)

Name	Category	Route of exposure	Target organs
Benzene, trimethyl-	Category 2	Not determined	central nervous system (CNS)
Xylene	Category 2	Not determined	hearing organs

Aspiration hazard

Name	Result
Benzene, trimethyl-	ASPIRATION HAZARD - Category 1
Cumene	ASPIRATION HAZARD - Category 1
Ethylbenzene	ASPIRATION HAZARD - Category 1

Information on the likely routes of exposure : Routes of entry anticipated: Dermal, Inhalation.

Potential acute health effects

Eye contact : Causes eye irritation.

Inhalation : Harmful if inhaled.

Skin contact : Causes skin irritation. Defatting to the skin.

Ingestion : Corrosive to the digestive tract. Causes burns. May be fatal if swallowed and enters airways.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : Adverse symptoms may include the following:
pain or irritation
watering
redness

Inhalation : Repeated or prolonged overexposure to solvents can cause brain or other nervous system damage. The symptoms can include the loss of memory, the loss of intellectual capacity and the loss of coordination.

Skin contact : Adverse symptoms may include the following:
irritation
redness
dryness
cracking

Ingestion : Adverse symptoms may include the following:
stomach pains
nausea or vomiting

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Not available.

General : May cause damage to organs through prolonged or repeated exposure.

Carcinogenicity : Suspected of causing cancer. Risk of cancer depends on duration and level of exposure.

Mutagenicity : No known significant effects or critical hazards.

Section 11. Toxicological information

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
Benzene, trimethyl-	Acute LC50 5600 µg/l Marine water	Crustaceans - Palaemonetes pugio	48 hours
Naphthalene	Acute EC50 1.6 ppm Fresh water	Daphnia - Daphnia magna	48 hours
	Acute LC50 2350 µg/l Marine water	Crustaceans - Palaemonetes pugio	48 hours
	Acute LC50 213 µg/l Fresh water	Fish - Melanotaenia fluviatilis - Larvae	96 hours
	Chronic NOEC 0.5 mg/l Marine water	Crustaceans - Uca pugnax - Adult	3 weeks
	Chronic NOEC 1.5 mg/l Fresh water	Fish - Oreochromis mossambicus	60 days
biphenyl	Acute LC50 360 µg/l Fresh water	Daphnia - Daphnia magna - Neonate	48 hours
	Acute LC50 1450 µg/l Fresh water	Fish - Pimephales promelas	96 hours
	Chronic NOEC 0.17 mg/l Fresh water	Daphnia - Daphnia magna - Neonate	21 days
	Chronic NOEC 0.229 mg/l Fresh water	Fish - Oncorhynchus mykiss	87 days
Cumene	Acute EC50 2600 µg/l Fresh water	Algae - Pseudokirchneriella subcapitata	72 hours
	Acute EC50 7400 µg/l Fresh water	Crustaceans - Artemia sp. - Nauplii	48 hours
	Acute EC50 10600 µg/l Fresh water	Daphnia - Daphnia magna - Neonate	48 hours
	Acute LC50 2700 µg/l Fresh water	Fish - Oncorhynchus mykiss	96 hours
Xylene	Acute EC50 90 mg/l Fresh water	Crustaceans - Cypris subglobosa	48 hours
	Acute LC50 8.5 ppm Marine water	Crustaceans - Palaemonetes pugio - Adult	48 hours
	Acute LC50 8500 µg/l Marine water	Crustaceans - Palaemonetes pugio	48 hours
	Acute LC50 15700 µg/l Fresh water	Fish - Lepomis macrochirus - Juvenile (Fledgling, Hatchling, Weanling)	96 hours
	Acute LC50 19000 µg/l Fresh water	Fish - Lepomis macrochirus	96 hours
	Acute LC50 13400 µg/l Fresh water	Fish - Pimephales promelas	96 hours
	Acute LC50 16940 µg/l Fresh water	Fish - Carassius auratus	96 hours
Ethylbenzene	Acute EC50 4600 µg/l Fresh water	Algae - Pseudokirchneriella subcapitata	72 hours
	Acute EC50 3600 µg/l Fresh water	Algae - Pseudokirchneriella subcapitata	96 hours
	Acute EC50 6530 µg/l Fresh water	Crustaceans - Artemia sp. - Nauplii	48 hours
	Acute EC50 2930 µg/l Fresh water	Daphnia - Daphnia magna - Neonate	48 hours
	Acute LC50 4200 µg/l Fresh water	Fish - Oncorhynchus mykiss	96 hours

Conclusion/Summary : Not available.

Persistence and degradability

Not available.

Conclusion/Summary : Not available.

Section 12. Ecological information

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
Fuels, diesel, No 2	>3.3	-	low
Benzene, trimethyl-	3.4 to 3.8	-	low
Naphthalene	3.4	36.5 to 168	low
biphenyl	4.008	1900	high
Cumene	3.55	35.48	low
Xylene	3.12	8.1 to 25.9	low
Ethylbenzene	3.6	-	low

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Vapor from product residues may create a highly flammable or explosive atmosphere inside the container. Do not cut, weld or grind used containers unless they have been cleaned thoroughly internally. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

RCRA classification : D001, D018

Section 14. Transport information

	DOT Classification	IMDG	IATA
UN number	NA1993	UN1202	UN1202
UN proper shipping name	Diesel Fuel	DIESEL FUEL	Diesel Fuel
Transport hazard class(es)	3 	3 	3 
Packing group	III	III	III
Environmental hazards	No.	No.	No.

Additional information

Section 14. Transport information

DOT Classification : This product may be re-classified as "Combustible Liquid," unless transported by vessel or aircraft. Non-bulk packages (less than or equal to 119 gal) of combustible liquids are not regulated as hazardous materials in package sizes less than the product reportable quantity.
Reportable quantity 11223.3 lbs / 5095.4 kg [1479.2 gal / 5599.3 L]. Package sizes shipped in quantities less than the product reportable quantity are not subject to the RQ (reportable quantity) transportation requirements.
Limited quantity Yes.
Packaging instruction Exceptions: 150. Non-bulk: 203. Bulk: 242.
Quantity limitation Passenger aircraft/rail: 60 L. Cargo aircraft: 220 L.
Special provisions 144, B1, IB3, T4, TP1, TP29
Remarks 49 CFR 173.150 (f)(1) states that a flammable liquid with a flash point at or above 38ºC (100ºF) that does not meet the definition of any other hazard class may be reclassed as a combustible liquid. This provision does not apply to transportation by vessel or aircraft except where other means of transportaion is impracticable.

TDG Classification : Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.18-2.19 (Class 3).

IMDG : **Emergency schedules** F-E, S-E
Special provisions 363

IATA : **Quantity limitation** Passenger and Cargo Aircraft: 60 L. Packaging instructions: 355. Cargo Aircraft Only: 220 L. Packaging instructions: 366. Limited Quantities - Passenger Aircraft: 10 L. Packaging instructions: Y344.
Special provisions A3

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to Annex II of MARPOL and the IBC Code : Not available.

Section 15. Regulatory information

U.S. Federal regulations :

United States inventory (TSCA 8b): All components are listed or exempted.

Clean Water Act (CWA) 307: naphthalene; ethylbenzene; toluene; benzene

Clean Water Act (CWA) 311: naphthalene; xylene; ethylbenzene; toluene; benzene

This material is classified as an oil under Section 311 of the Clean Water Act (CWA) and the Oil Pollution Act of 1990 (OPA). Discharges or spills which produce a visible sheen on waters of the United States, their adjoining shorelines, or into conduits leading to surface waters must be reported to the EPA's National Response Center at (800) 424-8802.

SARA 302/304

Composition/information on ingredients

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : FLAMMABLE LIQUIDS - Category 3
ACUTE TOXICITY (inhalation) - Category 4
SKIN IRRITATION - Category 2
EYE IRRITATION - Category 2B
CARCINOGENICITY - Category 2
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) (central nervous system (CNS)) - Category 2
ASPIRATION HAZARD - Category 1
HNOC - Corrosive to digestive tract
HNOC - Static-accumulating flammable liquid

Composition/information on ingredients

Section 15. Regulatory information

Name	%	Classification
Fuels, diesel, No 2	>99	FLAMMABLE LIQUIDS - Category 3 ACUTE TOXICITY (inhalation) - Category 4 SKIN IRRITATION - Category 2 EYE IRRITATION - Category 2B CARCINOGENICITY - Category 2 SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) (central nervous system (CNS)) - Category 2 ASPIRATION HAZARD - Category 1 HNOC - Corrosive to digestive tract HNOC - Static-accumulating flammable liquid
Diesel exhaust particulate	1 - 5	CARCINOGENICITY (inhalation) - Category 2
Benzene, trimethyl-	1 - 5	FLAMMABLE LIQUIDS - Category 3 ACUTE TOXICITY (inhalation) - Category 4 SKIN IRRITATION - Category 2 EYE IRRITATION - Category 2A SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3 SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Narcotic effects) - Category 3 SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) (central nervous system (CNS)) - Category 2 ASPIRATION HAZARD - Category 1
Naphthalene	0.5 - 1.5	FLAMMABLE SOLIDS - Category 2 ACUTE TOXICITY (oral) - Category 4 CARCINOGENICITY - Category 2
biphenyl	0.5 - 1.5	SKIN IRRITATION - Category 2 EYE IRRITATION - Category 2A SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3
Cumene	0.5 - 1.5	FLAMMABLE LIQUIDS - Category 3 EYE IRRITATION - Category 2A CARCINOGENICITY (inhalation) - Category 2 SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3 ASPIRATION HAZARD - Category 1
Xylene	0.5 - 1.5	FLAMMABLE LIQUIDS - Category 3 ACUTE TOXICITY (inhalation) - Category 4 SKIN IRRITATION - Category 2 EYE IRRITATION - Category 2A SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) (hearing organs) - Category 2
Ethylbenzene	0.5 - 1.5	FLAMMABLE LIQUIDS - Category 2 SKIN IRRITATION - Category 2 EYE IRRITATION - Category 2A CARCINOGENICITY (inhalation) - Category 2 SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3 ASPIRATION HAZARD - Category 1

SARA 313

	Product name	CAS number	%
Form R - Reporting requirements	naphthalene ethylbenzene	91-20-3 100-41-4	<1 <1
Supplier notification	naphthalene ethylbenzene	91-20-3 100-41-4	<1 <1

SARA 313 notifications must not be detached from the SDS and any copying and redistribution of the SDS shall include copying and redistribution of the notice attached to copies of the SDS subsequently redistributed.

State regulations

Massachusetts : The following components are listed: ethyltoluene; trimethylbenzene

Section 15. Regulatory information

New York : The following components are listed: Naphthalene; Cumene; Benzene, 1-methylethyl-; Ethylbenzene

New Jersey : The following components are listed: ETHYLTOLUENES; BENZENE, ETHYLMETHYL-; TRIMETHYL BENZENE (mixed isomers); BENZENE, TRIMETHYL-; NAPHTHALENE; MOTH FLAKES; cumene; ethylbenzene

Pennsylvania : The following components are listed: ethyltoluene; trimethylbenzene; NAPHTHALENE; cumene; ethylbenzene

California Prop. 65 Clear and Reasonable Warnings (2018)

⚠ **WARNING**: This product can expose you to Benzene, which is known to the State of California to cause cancer and birth defects or other reproductive harm. This product can expose you to chemicals including Diesel exhaust particulate, Naphthalene, Cumene, Ethylbenzene, which are known to the State of California to cause cancer, and Toluene, which is known to the State of California to cause birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

Ingredient name	%	Cancer	Reproductive	No significant risk level	Maximum acceptable dosage level
Diesel exhaust particulate	<3	Yes.	No.	-	-
naphthalene	<1	Yes.	No.	Yes.	-
cumene	<1	Yes.	No.	-	-
ethylbenzene	<1	Yes.	No.	Yes.	-
toluene	<0.1	No.	Yes.	-	Yes.
benzene	<0.1	Yes.	Yes.	Yes.	Yes.

International regulations

Inventory list

United States : All components are listed or exempted.

Australia : All components are listed or exempted.

Canada : All components are listed or exempted.

China : All components are listed or exempted.

Europe : All components are listed or exempted.

Japan : **Japan inventory (ENCS)**: All components are listed or exempted.
Japan inventory (ISHL): Not determined.

Malaysia : Not determined.

New Zealand : All components are listed or exempted.

Philippines : All components are listed or exempted.

Republic of Korea : All components are listed or exempted.

Taiwan : Not determined.

Thailand : Not determined.

Turkey : Not determined.

Viet Nam : Not determined.

Section 16. Other information

National Fire Protection Association (U.S.A.)

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Section 16. Other information

Procedure used to derive the classification

Classification	Justification
FLAMMABLE LIQUIDS - Category 3	Expert judgment
ACUTE TOXICITY (inhalation) - Category 4	Expert judgment
SKIN IRRITATION - Category 2	Expert judgment
EYE IRRITATION - Category 2B	Expert judgment
CARCINOGENICITY - Category 2	Expert judgment
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) (central nervous system (CNS)) - Category 2	Calculation method
ASPIRATION HAZARD - Category 1	Expert judgment
AQUATIC HAZARD (LONG-TERM) - Category 2	Expert judgment

History

Date of printing : 7/31/2018

Date of issue/Date of revision : 7/31/2018

Date of previous issue : 4/16/2018

Version : 4

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

References : Not available.

Indicates information that has changed from previously issued version.

Notice to reader

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THE CONDITIONS OR METHODS OF HANDLING, STORAGE, USE, AND/OR DISPOSAL OF THE PRODUCT ARE BEYOND OUR CONTROL AND MAY BE BEYOND OUR KNOWLEDGE. FOR THIS AND OTHER REASONS, WE DO NOT ASSUME RESPONSIBILITY AND EXPRESSLY DISCLAIM LIABILITY FOR ANY LOSS, DAMAGE OR EXPENSE ARISING OUT OF OR IN ANY WAY CONNECTED WITH HANDLING, STORAGE, USE OR DISPOSAL OF THE PRODUCT.

Safety Data Sheet

Effective date: 11 May 2020 **Revision** : 11 May 2020

Trade Name: Liquinox®

1 Identification of the substance/mixture and of the supplier

1.1 GHS Product identifier

Trade Name: Liquinox®
Product number: 1201, 1201-1, 1205, 1215, 1230, 1232, 1232-1, 1255

1.2 Application of the substance / the mixture: Cleaning material/Detergent

1.2.1 Recommended dilution ratio: 1 - 2% in water

1.3 Details of the supplier of the Safety Data Sheet

Manufacturer:

Alconox Inc.
30 Glenn St
White Plains, NY 10603
(914) 948-4040

Supplier:

Emergency telephone number:
ChemTel Inc
North America: 1-888-255-3924
International: +1 813-248-0573

2 Hazards identification

2.1 Classification of the substance or mixture:

In compliance with EC regulation No. 1272, 29CFR1910/1200 and GHS requirements.

Hazard-determining components of labeling:
Alcohol ethoxylate
Sodium alkylbenzene sulfonate
Sodium xylenesulphonate
Lauramine oxide

2.2 Label elements:

Eye damage, category 1.
Skin irritation, category 2.

Product at recommended dilution:

Eye irritation, category 2B

Hazard pictograms:

Signal word: Danger

Hazard statements:
H315 Causes skin irritation.
H318 Causes serious eye damage.

Precautionary statements:
P264 Wash skin thoroughly after handling.
P280 Wear protective gloves/protective clothing/eye protection/face protection.

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P302+P352 If on skin: Wash with soap and water.
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
P332+P313 If skin irritation occurs: Get medical advice/attention.
P501 Dispose of contents and container as instructed in Section 13.

Hazardous Elements at Use Dilution:

Hazard pictograms:

Signal word: Warning

Hazard statements:

H320 Causes eye irritation

Precautionary statements:

P302+P352 If on skin: Wash with soap and water.
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
P501 Dispose of contents and container as instructed in Section 13

Additional information: None.

Hazard description

Hazards Not Otherwise Classified (HNOC): May cause surfaces to become slippery. Use caution in areas of foot traffic if on floors.

Information concerning particular hazards for humans and environment:

The product has to be labelled due to the calculation procedure of the "General Classification guideline for preparations of the EU" in the latest valid version.

Classification system:

The classification is according to EC regulation No. 1272, 29CFR1910/1200 and GHS, and extended by company and literature data. The classification is in accordance with the latest editions of international substances lists and is supplemented by information from technical literature and by information provided by the company.

3 Composition/information on ingredients

3.1 Chemical characterization: None

3.2 Description: None

3.3 Hazardous components (percentages by weight)

Identification	Chemical Name	Classification	Wt. %
CAS number: 68081-81-2 or 68411-30-3	Sodium Alkylbenzene Sulfonate	Acute Tox. 4; H303 Skin Irrit. 2 ; H315 Eye Dam. 1; H318	10-25
CAS number: 1300-72-7	Sodium Xylenesulphonate	Eye Irrit. 2;H319	2.5-10
CAS number: 84133-50-6	Alcohol Ethoxylate	Skin Irrit. 2 ; H315 Eye Dam. 1; H318	2.5-10
CAS number: 1643-20-5	Lauramine oxide	Skin Irrit. 2 ; H315 Eye Dam. 1; H318	1-2

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Trade Name: Liquinox®

At use dilution:

CAS number: 68081-81-2 or 68411-30-3	Sodium Alkylbenzene Sulfonate	Eye Irr. 2B; H319	0.1-0.25

3.4 Additional Information: None.

4 First aid measures

4.1 Description of first aid measures

General information: None.

After inhalation:
Maintain an unobstructed airway.
Loosen clothing as necessary and position individual in a comfortable position.

After skin contact:
Wash affected area with soap and water.
Seek medical attention if symptoms develop or persist.

After eye contact:
Rinse/flush exposed eye(s) gently using water for 15-20 minutes.
Remove contact lens(es) if able to do so during rinsing.
Seek medical attention if irritation persists or if concerned.

After swallowing:
Rinse mouth thoroughly.
Seek medical attention if irritation, discomfort, or vomiting persists.

4.2 Most important symptoms and effects, both acute and delayed

None

4.3 Indication of any immediate medical attention and special treatment needed:

No additional information.

First aid measure at recommended dilution:

General information: None.

After inhalation:
Maintain an unobstructed airway.
Loosen clothing as necessary and position individual in a comfortable position.

After skin contact:
Wash affected area with soap and water.

After eye contact:
Rinse/flush exposed eye(s) gently using water for 15-20 minutes.
Remove contact lens(es) if able to do so during rinsing.

After swallowing:
Rinse mouth thoroughly. Seek medical attention if irritation, discomfort, or vomiting develops.

Safety Data Sheet

Effective date: 11 May 2020 **Revision** : 11 May 2020

Trade Name: Liquinox®

5 Firefighting measures

5.1 Extinguishing media

Suitable extinguishing agents:

Use appropriate fire suppression agents for adjacent combustible materials or sources of ignition.

For safety reasons unsuitable extinguishing agents: None

5.2 Special hazards arising from the substance or mixture:

Thermal decomposition can lead to release of irritating gases and vapors.

5.3 Advice for firefighters

Protective equipment:

Wear protective eye wear, gloves and clothing.
Refer to Section 8.

5.4 Additional information:

Avoid inhaling gases, fumes, dust, mist, vapor and aerosols.
Avoid contact with skin, eyes and clothing.

6 Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Ensure adequate ventilation.
Ensure air handling systems are operational.

6.2 Environmental precautions:

Should not be released into the environment.
Prevent from reaching drains, sewer or waterway.

6.3 Methods and material for containment and cleaning up:

Wear protective eye wear, gloves and clothing.

6.4 Reference to other sections: None

7 Handling and storage

7.1 Precautions for safe handling:

Avoid breathing mist or vapor.
Do not eat, drink, smoke or use personal products when handling chemical substances.

7.2 Conditions for safe storage, including any incompatibilities

Store in a cool, well-ventilated area.

7.3 Specific end use(s):

No additional information.

8 Exposure controls/personal protection

8.1 Control parameters :

25322-68-3, Poly(ethylene oxide), AIHA TWA 10 mg/m3 (<0.15% present in concentrate)

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Trade Name: Liquinox®

8.2 Exposure controls

Appropriate engineering controls:
Emergency eye wash fountains and safety showers should be available in the immediate vicinity of use or handling.

Respiratory protection:
Not needed under normal conditions.

Protection of skin:
Select glove material impermeable and resistant to the substance.

Eye protection:
Safety goggles or glasses, or appropriate eye protection.

General hygienic measures:
Wash hands before breaks and at the end of work.
Avoid contact with skin, eyes and clothing.

Exposure Control and Personal Protective Equipment at recommended dilution:

Under normal use and operational conditions, no special personal protective equipment or engineering controls will be necessary. Handle with care.

9 Physical and chemical properties

Appearance (physical state, color):	Pale yellow liquid	**Explosion limit lower**: **Explosion limit upper**:	Not determined or not available. Not determined or not available.
Odor:	Not determined or not available.	**Vapor pressure at 20°C**:	Not determined or not available.
Odor threshold:	Not determined or not available.	**Vapor density**:	Not determined or not available.
pH-value:	8.5 (as is)	**Relative density**:	Not determined or not available.
Melting/Freezing point:	Not determined or not available.	**Solubilities**:	Not determined or not available.
Boiling point/Boiling range:	Not determined or not available.	**Partition coefficient (n-octanol/water)**:	Not determined or not available.
Flash point (closed cup):	Not determined or not available.	**Auto/Self-ignition temperature**:	Not determined or not available.
Evaporation rate:	Not determined or not available.	**Decomposition temperature**:	Not determined or not available.
Flammability (solid, gaseous):	Not flammable	**Viscosity**:	a. Kinematic: Not determined or not available. b. Dynamic: Not determined or not available.
Density at 20°C:	1.08 g/mL		

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Trade Name: Liquinox®

10 Stability and reactivity

10.1 Reactivity: Not determined or not available.
10.2 Chemical stability: Not determined or not available.
10.3 Possibility hazardous reactions: Not determined or not available.
10.4 Conditions to avoid: Not determined or not available.
10.5 Incompatible materials: Not determined or not available.
10.6 Hazardous decomposition products: Not determined or not available.

11 Toxicological information

11.1 Information on toxicological effects:

Acute Toxicity:

Oral:

: LD50 >5000 mg per kg (Rat, Oral) - product.

Chronic Toxicity: No additional information.

Skin corrosion/irritation (raw materials):

Alcohol Ethoxylate: May cause mild to moderate skin irritation.

Sodium Alkylbenzene Sulfonate: Causes skin irritation.

Lauramine oxide: Causes skin irritation.

Serious eye damage/irritation (raw materials):

Sodium Alkylbenzene Sulfonate: Causes serious eye damage.

Alcohol Ethoxylate: Causes moderate to severe eye irritation and conjunctivitis.

Sodium xylenesulphonate: irritating to eyes.

Lauramine oxide: Causes serious eye damage.

Product information at recommended dilution:

Eye irritation may occur upon direct contact with eyes. No specific hazards for skin contact, inhalation, or chronic exposure are expected within normal use parameters.

Respiratory or skin sensitization: No additional information.

Carcinogenicity: No additional information.

IARC (International Agency for Research on Cancer): None of the ingredients are listed.

NTP (National Toxicology Program): None of the ingredients are listed.

Germ cell mutagenicity: No additional information.

Reproductive toxicity: No additional information.

STOT-single and repeated exposure: No additional information.

Additional toxicological information: No additional information.

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Trade Name: Liquinox®

12 Ecological information

12.1 Toxicity:

Sodium Alkylbenzene Sulfonate: Fish, LC50 1.67 mg/l, 96 hours.
Sodium Alkylbenzene Sulfonate: Aquatic invertebrates, EC50 Daphnia 2.9 mg/l, 48 hours. Sodium Alkylbenzene Sulfonate: Aquatic Plants, EC50 Algae 29 mg/l, 96 hours.
Lauramine oxide: Fish, LC50 24.3 mg/l, 96h [Killifish (Cyprinodontidae)]
Lauramine oxide: Aquatic invertebrates, (LC50): 3.6 mg/l 96 hours [Daphnia (Daphnia)].
Lauramine oxide: Aquatic plants, EC50 Algae 0.31 mg/l 72 hours [Algae]
Alcohol Ethoxylate: Aquatic invertebrates, (LC50): 4.01 mg/l 48 hours [Daphnia (daphnia)].

12.2 Persistence and degradability: No additional information.

12.3 Bioaccumulative potential: No additional information.

12.4 Mobility in soil: No additional information.

General notes: No additional information.

12.5 Results of PBT and vPvB assessment:

PBT: No additional information.

vPvB: No additional information.

12.6 Other adverse effects: No additional information.

13 Disposal considerations

13.1 Waste treatment methods (consult local, regional and national authorities for proper disposal)

Relevant Information:

It is the responsibility of the waste generator to properly characterize all waste materials according to applicable regulatory entities. (US 40CFR262.11).

14 Transport information

14.1 UN Number: None
ADR, ADN, DOT, IMDG, IATA

14.2 UN Proper shipping name: None
ADR, ADN, DOT, IMDG, IATA

14.3 Transport hazard classes:
ADR, ADN, DOT, IMDG, IATA

Class: None
Label: None
LTD. QTY: None

US DOT
Limited Quantity Exception: None

Safety Data Sheet

Effective date: 11 May 2020 **Revision** : 11 May 2020

Trade Name: Liquinox®

Bulk: **RQ (if applicable):** None **Proper shipping Name:** None **Hazard Class:** None **Packing Group:** None **Marine Pollutant (if applicable):** No additional information. **Comments:** None	**Non Bulk:** **RQ (if applicable):** None **Proper shipping Name:** None **Hazard Class:** None **Packing Group:** None **Marine Pollutant (if applicable):** No additional information. **Comments:** None
14.4 Packing group: ADR, ADN, DOT, IMDG, IATA	None
14.5 Environmental hazards:	None
14.6 Special precautions foruser:	None
Danger code (Kemler):	None
EMS number:	None
Segregation groups:	None
14.7 Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code: Not applicable.	
14.8 Transport/Additional information:	
Transport category:	None
Tunnel restriction code:	None
UN "Model Regulation":	None

15 Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture.

North American

SARA

Section 313 (specific toxic chemical listings): None of the ingredients are listed.
Section 302 (extremely hazardous substances): None of the ingredients are listed.

CERCLA (Comprehensive Environmental Response, Clean up and Liability Act)

Reportable Spill Quantity: None of the ingredients are listed.

TSCA (Toxic Substances Control Act):

Inventory: All ingredients are listed as active.
Rules and Orders: Not applicable.

Proposition 65 (California):

Chemicals known to cause cancer: None of the ingredients are listed.

Chemicals known to cause reproductive toxicity for females: None of the ingredients are listed.

Chemicals known to cause reproductive toxicity for males: None of the ingredients are listed.

Chemicals known to cause developmental toxicity: None of the ingredients are listed.

Canadian

Canadian Domestic Substances List (DSL):
All ingredients are listed.

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Trade Name: Liquinox®

Asia Pacific

Australia

Australian Inventory of Chemical Substances (AICS): All ingredients are listed.

China

Inventory of Existing Chemical Substances in China (IECSC): All ingredients are listed.

Japan

Inventory of Existing and New Chemical Substances (ENCS): All ingredients are listed.

Korea

Existing Chemicals List (ECL): All ingredients are listed.

New Zealand

New Zealand Inventory of Chemicals (NZOIC): All ingredients are listed.

Philippines

Philippine Inventory of Chemicals and Chemical Substances (PICCS): All ingredients are listed.

Taiwan

Taiwan Chemical Substance Inventory (TSCI): All ingredients are listed.

EU

REACH Article 57 (SVHC): None of the ingredients are listed.

Germany MAK: Not classified.

16 Other information

Abbreviations and Acronyms: None

Summary of Phrases

Hazard statements:

H315 Causes skin irritation.
H318 Causes serious eye damage.

Precautionary statements:

P264 Wash skin thoroughly after handling.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P302+P352 If on skin: Wash with soap and water.
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
P332+P313 If skin irritation occurs: Get medical advice/attention.
P501 Dispose of contents and container as instructed in Section 13.

Manufacturer Statement:

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

NFPA: 1-0-0
HMIS: 1-0-0

At recommended dilution:

NFPA: 1-0-0
HMIS: 1-0-0

SAFETY DATA SHEET

Creation Date 10-Dec-2009 **Revision Date** 28-Dec-2021 **Revision Number** 6

1. Identification

Product Name **Tetrachloroethylene**

Cat No. : **AC445690000; ACR445690010; AC445690025; AC445691000**

CAS No 127-18-4
Synonyms Perchloroethylene

Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use.

Details of the supplier of the safety data sheet

Company

Fisher Scientific Company
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

Emergency Telephone Number For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
CHEMTREC Tel. No.**US:**001-800-424-9300 / **Europe:**001-703-527-3887

2. Hazard(s) identification

Classification

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Skin Corrosion/Irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 2
Skin Sensitization	Category 1
Carcinogenicity	Category 1B
Specific target organ toxicity (single exposure) Target Organs - Central nervous system (CNS).	Category 3
Specific target organ toxicity - (repeated exposure) Target Organs - Kidney, Liver, Blood.	Category 2

Label Elements

Signal Word
Danger

Hazard Statements
Causes skin irritation
Causes serious eye irritation
May cause an allergic skin reaction
May cause drowsiness or dizziness
May cause cancer
May cause damage to organs through prolonged or repeated exposure

Precautionary Statements
Prevention
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Wash face, hands and any exposed skin thoroughly after handling
Contaminated work clothing should not be allowed out of the workplace
Do not breathe dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Wear protective gloves/protective clothing/eye protection/face protection
Response
IF exposed or concerned: Get medical attention/advice
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Skin
IF ON SKIN: Wash with plenty of soap and water
Take off contaminated clothing and wash before reuse
If skin irritation or rash occurs: Get medical advice/attention
Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention
Storage
Store locked up
Store in a well-ventilated place. Keep container tightly closed
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
Toxic to aquatic life with long lasting effects
WARNING. Cancer - https://www.p65warnings.ca.gov/.

3. Composition/Information on Ingredients

Component	CAS No	Weight %
Tetrachloroethylene	127-18-4	>95

4. First-aid measures

General Advice If symptoms persist, call a physician.

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get medical attention.

Skin Contact	Wash off immediately with plenty of water for at least 15 minutes. If skin irritation persists, call a physician.
Inhalation	Remove to fresh air. If not breathing, give artificial respiration. Get medical attention if symptoms occur.
Ingestion	Clean mouth with water and drink afterwards plenty of water.
Most important symptoms and effects	None reasonably foreseeable. May cause allergic skin reaction. Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting: Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest pain, muscle pain or flushing
Notes to Physician	Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media	Water spray, carbon dioxide (CO2), dry chemical, alcohol-resistant foam.
Unsuitable Extinguishing Media	No information available
Flash Point	No information available
Method -	No information available
Autoignition Temperature	No information available
Explosion Limits	
Upper	No data available
Lower	No data available
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical
Thermal decomposition can lead to release of irritating gases and vapors. Containers may explode when heated.

Hazardous Combustion Products
Chlorine. Phosgene. Hydrogen chloride gas.
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
2	0	0	N/A

6. Accidental release measures

Personal Precautions	Use personal protective equipment as required. Ensure adequate ventilation.
Environmental Precautions	Do not flush into surface water or sanitary sewer system.
Methods for Containment and Clean Up	Soak up with inert absorbent material. Keep in suitable, closed containers for disposal.

7. Handling and storage

Handling	Wear personal protective equipment/face protection. Do not get in eyes, on skin, or on clothing. Ensure adequate ventilation. Avoid ingestion and inhalation.
Storage.	Keep containers tightly closed in a dry, cool and well-ventilated place. Protect from sunlight. Incompatible Materials. Strong acids. Strong oxidizing agents. Strong bases. Metals. Zinc.

Amines. Aluminium.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Tetrachloroethylene	TWA: 25 ppm STEL: 100 ppm	(Vacated) TWA: 25 ppm (Vacated) TWA: 170 mg/m³ Ceiling: 200 ppm TWA: 100 ppm	IDLH: 150 ppm	TWA: 25 ppm STEL: 100 ppm

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
NIOSH IDLH: NIOSH - National Institute for Occupational Safety and Health

Engineering Measures Use only under a chemical fume hood. Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment

Eye/face Protection Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Colorless
Odor	Characteristic, sweet
Odor Threshold	No information available
pH	No information available
Melting Point/Range	-22 °C / -7.6 °F
Boiling Point/Range	120 - 122 °C / 248 - 251.6 °F @ 760 mmHg
Flash Point	No information available
Evaporation Rate	6.0 (Ether = 1.0)
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	18 mbar @ 20 °C
Vapor Density	No information available
Density	1.619
Specific Gravity	1.625
Solubility	0.15 g/L water (20°C)
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	> 150°C
Viscosity	0.89 mPa s at 20 °C
Molecular Formula	C2 Cl4

Molecular Weight 165.83

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Incompatible products. Excess heat. Exposure to moist air or water.

Incompatible Materials Strong acids, Strong oxidizing agents, Strong bases, Metals, Zinc, Amines, Aluminium

Hazardous Decomposition Products Chlorine, Phosgene, Hydrogen chloride gas

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Tetrachloroethylene	LD50 = 2629 mg/kg (Rat)	LD50 > 10000 mg/kg (Rat)	LC50 = 27.8 mg/L (Rat) 4 h

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation Irritating to eyes and skin

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS No	IARC	NTP	ACGIH	OSHA	Mexico
Tetrachloroethylene	127-18-4	Group 2A	Reasonably Anticipated	A3	X	A3

IARC (International Agency for Research on Cancer)

IARC (International Agency for Research on Cancer)
Group 1 - Carcinogenic to Humans
Group 2A - Probably Carcinogenic to Humans
Group 2B - Possibly Carcinogenic to Humans

NTP: (National Toxicity Program)

NTP: (National Toxicity Program)
Known - Known Carcinogen
Reasonably Anticipated - Reasonably Anticipated to be a Human Carcinogen

ACGIH: (American Conference of Governmental Industrial Hygienists)

A1 - Known Human Carcinogen
A2 - Suspected Human Carcinogen
A3 - Animal Carcinogen
ACGIH: (American Conference of Governmental Industrial Hygienists)

Mexico - Occupational Exposure Limits - Carcinogens

Mexico - Occupational Exposure Limits - Carcinogens
A1 - Confirmed Human Carcinogen
A2 - Suspected Human Carcinogen
A3 - Confirmed Animal Carcinogen
A4 - Not Classifiable as a Human Carcinogen
A5 - Not Suspected as a Human Carcinogen

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Central nervous system (CNS)
STOT - repeated exposure Kidney Liver Blood

Aspiration hazard No information available

Symptoms / effects,both acute and delayed Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting: Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest pain, muscle pain or flushing

Endocrine Disruptor Information

Component	EU - Endocrine Disrupters Candidate List	EU - Endocrine Disruptors - Evaluated Substances	Japan - Endocrine Disruptor Information
Tetrachloroethylene	Group II Chemical	Not applicable	Not applicable

Other Adverse Effects Tumorigenic effects have been reported in experimental animals.

12. Ecological information

Ecotoxicity

Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. The product contains following substances which are hazardous for the environment.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Tetrachloroethylene	EC50: > 500 mg/L, 96h (Pseudokirchneriella subcapitata)	LC50: 12.4 - 14.4 mg/L, 96h flow-through (Pimephales promelas) LC50: 8.6 - 13.5 mg/L, 96h static (Pimephales promelas) LC50: 11.0 - 15.0 mg/L, 96h static (Lepomis macrochirus) LC50: 4.73 - 5.27 mg/L, 96h flow-through (Oncorhynchus mykiss)	EC50 = 100 mg/L 24 h EC50 = 112 mg/L 24 h EC50 = 120.0 mg/L 30 min	EC50: 6.1 - 9.0 mg/L, 48h Static (Daphnia magna)

Persistence and Degradability Insoluble in water Persistence is unlikely based on information available.

Bioaccumulation/ Accumulation No information available.

Mobility . Is not likely mobile in the environment due its low water solubility. Will likely be mobile in the environment due to its volatility.

Component	log Pow
Tetrachloroethylene	2.88

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

Component	RCRA - U Series Wastes	RCRA - P Series Wastes
Tetrachloroethylene - 127-18-4	U210	-

14. Transport information

DOT

UN-No UN1897
Proper Shipping Name TETRACHLOROETHYLENE

Hazard Class 6.1
Packing Group III

TDG
UN-No UN1897
Proper Shipping Name TETRACHLOROETHYLENE
Hazard Class 6.1
Packing Group III

IATA
UN-No UN1897
Proper Shipping Name TETRACHLOROETHYLENE
Hazard Class 6.1
Packing Group III

IMDG/IMO
UN-No UN1897
Proper Shipping Name TETRACHLOROETHYLENE
Hazard Class 6.1
Packing Group III

15. Regulatory information

United States of America Inventory

Component	CAS No	TSCA	TSCA Inventory notification - Active-Inactive	TSCA - EPA Regulatory Flags
Tetrachloroethylene	127-18-4	X	ACTIVE	-

Legend:
TSCA US EPA (TSCA) - Toxic Substances Control Act, (40 CFR Part 710)
X - Listed
'-' - Not Listed

TSCA 12(b) - Notices of Export Not applicable

International Inventories
Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Japan (ISHL), Australia (AICS), China (IECSC), Korea (KECL).

Component	CAS No	DSL	NDSL	EINECS	PICCS	ENCS	ISHL	AICS	IECSC	KECL
Tetrachloroethylene	127-18-4	X	-	204-825-9	X	X	X	X	X	KE-33294

KECL - NIER number or KE number (http://ncis.nier.go.kr/en/main.do)

U.S. Federal Regulations

SARA 313

Component	CAS No	Weight %	SARA 313 - Threshold Values %
Tetrachloroethylene	127-18-4	>95	0.1

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Tetrachloroethylene	-	-	X	X

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Tetrachloroethylene	X		-

OSHA - Occupational Safety and Health Administration: Not applicable

CERCLA: This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
Tetrachloroethylene	100 lb 1 lb	-

California Proposition 65: This product contains the following Proposition 65 chemicals.

Component	CAS No	California Prop. 65	Prop 65 NSRL	Category
Tetrachloroethylene	127-18-4	Carcinogen	14 µg/day	Carcinogen

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Tetrachloroethylene	X	X	X	X	X

U.S. Department of Transportation

Reportable Quantity (RQ): Y
DOT Marine Pollutant Y
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security: This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade: No information available

Authorisation/Restrictions according to EU REACH

Component	REACH (1907/2006) - Annex XIV - Substances Subject to Authorization	REACH (1907/2006) - Annex XVII - Restrictions on Certain Dangerous Substances	REACH Regulation (EC 1907/2006) article 59 - Candidate List of Substances of Very High Concern (SVHC)
Tetrachloroethylene	-	Use restricted. See item 75. (see link for restriction details)	-

https://echa.europa.eu/substances-restricted-under-reach

Safety, health and environmental regulations/legislation specific for the substance or mixture

Component	CAS No	OECD HPV	Persistent Organic Pollutant	Ozone Depletion Potential	Restriction of Hazardous Substances (RoHS)
Tetrachloroethylene	127-18-4	Listed	Not applicable	Not applicable	Not applicable

Component	CAS No	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Major Accident Notification	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Safety Report Requirements	Rotterdam Convention (PIC)	Basel Convention (Hazardous Waste)
Tetrachloroethylene	127-18-4	Not applicable	Not applicable	Not applicable	Annex I - Y45

16. Other information

Prepared By: Regulatory Affairs
Thermo Fisher Scientific

Email: EMSDS.RA@thermofisher.com

Creation Date	10-Dec-2009
Revision Date	28-Dec-2021
Print Date	28-Dec-2021
Revision Summary	This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS

APPENDIX G
OSHA 300A Form

CORPORATE

OSHA's Form 300A (Rev. 01/2004)
Summary of Work-Related Injuries and Illnesses

Year 2020

U.S. Department of Labor
Occupational Safety and Health Administration

Form approved OMB no. 1218-0176

All establishments covered by Part 1904 must complete this Summary page, even if no injuries or illnesses occurred during the year. Remember to review the Log to verify that the entries are complete.

Using the Log, count the individual entries you made for each category. Then write the totals below, making sure you've added the entries from every page of the log. If you had no cases write "0."

Employees, former employees, and their representatives have the right to review the OSHA Form 300 in its entirety. They also have limited access to the OSHA Form 301 or its equivalent. See 29 CFR 1904.35, in OSHA's Recordkeeping rule, for further details on the access provisions for these forms.

Number of Cases

Total number of deaths	Total number of cases with days away from work	Total number of cases with job transfer or restriction	Total number of other recordable cases
0	1	0	0
(G)	(H)	(I)	(J)

Number of Days

Total number of days away from work	Total number of days of job transfer or restriction
6	0
(K)	(L)

Injury and Illness Types

Total number of... (M)			
(1) Injury	1	(4) Poisoning	0
(2) Skin Disorder	0	(5) Hearing Loss	0
(3) Respiratory Condition	0	(6) All Other Illnesses	0

Post this Summary page from February 1 to April 30 of the year following the year covered by the form

Establishment information

Your establishment name: Tidewater, Inc. (Corporate)

Street: 6625 Selnick Drive, Suite A

City: Elkridge State: MD Zip: 21075

Industry description (e.g., Manufacture of motor truck trailers)
Environmental Remediation Services

Standard Industrial Classification (SIC), if known (e.g., SIC 3715)
____ ____ ____ ____

OR North American Industrial Classification (NAICS), if known (e.g., 336212)
5 6 2 9 1 0

Employment information

Annual average number of employees: 132

Total hours worked by all employees last year: 218,940

Sign here

Knowingly falsifying this document may result in a fine.

I certify that I have examined this document and that to the best of my knowledge the entries are true, accurate, and complete.

David S McCall

David S McCall

Corporate HSE Manager

740-504-9714
Phone

15-Jan-21
Date