

Site Specific Health and Safety Plan

Revision 16

Project Name: RW-21 OU2/OU3 Onsite/Offsite Investigation & Groundwater Monitoring,
Northrop Grumman Systems Corporation
Bethpage, New York

Project Number:	NYNG2019.TS14
Client Name:	Northrop Grumman Systems Corporation
Date:	6/3/2019
HASP Expires	6/2/2020
Revision:	3

Approvals:

HASP Developer: _____ Thomas Darmon

Project Manager: _____ Carlo San Giovanni

HASP Reviewer: _____ John Kirby, CIH, CSP

Arcadis Culture of Caring

Arcadis is committed to a Culture of Caring that ensures each Arcadis employee, part time as needed employee (PTAN), temporary agency employee under Arcadis day to day control, Inexperienced Workers and contractor (cumulatively referred to here as "field staff") goes home at the end of the day free from injury or illness. I certify that the following has been performed with all Arcadis field staff on this project either in person or by Skype:

- Reviewed the HASP including a discussion of hazard identification and controls.
- If conducting activities deemed by Arcadis to be "High Risk", frontline management has reviewed applicable H&S standards (Job Safety Analysis [JSA] when authorized by H&S) for these activities with field staff.
- If permit to work is required, frontline management has reviewed the permit(s) with field staff.
- Reviewed proactive H&S engagement expectations/injury prevention actions.
- Reviewed Stop Work Authority.
- Reviewed the incident reporting process and expectations including when WorkCare should be contacted by staff (WorkCare incident intervention for all minor, non-emergency injuries) and that the WorkCare phone number is programmed into field team cell phone.
- For Inexperienced Workers, a mentor has been assigned for the new task being performed.

For short service employees (SSEs), PTANS* and temporary agency employees* :

- Provided coaching and mentoring on Arcadis H&S expectations during project work. Reviewed in detail specific hazards and controls and provided a resource who can be contacted if individual has questions regarding planned or unplanned work tasks.

Mentor/Resource # Xuan Xu 631-391-5235
Name Phone Number

Signed:

Carlo San Giovanni Project Manager

* Upon hiring/contracting for the first time.

Emergency Information

Site Address:

925 South Oyster Bay Road
Bethpage, NY 11714

Note: Work locations throughout Bethpage.

Emergency Phone Numbers:

Emergency (fire, police, ambulance)		911
Emergency (facility specific, if applicable):		
Northrop Grumman Emergency (serious, external)		516-575-3333
Northrop Grumman Security (onsite)		516-575-3895
Northrop Grumman EHSM (spills, unsafe conditions)		516-575-6789
Northrop Grumman Facilities (facility upsets)		516-346-6632
Emergency Other (specify):		
Primary Client Contact:	Ed Hannon	516-575-2333
WorkCare (non-life-threatening injury/illness):		1-888-449-7787
Project H&S:	Art Zahradnik	631-391-5208
Task Manager:	Soma Das	631-391-5247
	Xuan Xu	631-391-5235
Project Manager:	Carlo San Giovanni	631-391-5259
	Art Zahradnik	631-391-5208
Corporate H&S Specialist:	Julie Santaniello	978-551-0033
Corporate H&S Director:	Denis Balcer	614-778-9171

Hospital Name and Address:

St. Joseph Hospital
4295 Hemstead Turnpike, Bethpage, NY 11714
OR
Plainview Hospital
888 Old Country Road, Plainview, NY 11803

Hospital Phone Number:	St. Joseph Hospital	516-579-6000
	Plainview Hospital	516-719-3000

Supplemental Client Contact Information:

Other Important Phone Numbers:

Poison Control Center	1-800-222-1222
Nat. Response Ctr. (spills in reportable quantities)	1-800-424-8802
U.S. Coast Guard (spills to water)	1-800-424-8802

Incident Reporting Protocol Within Arcadis

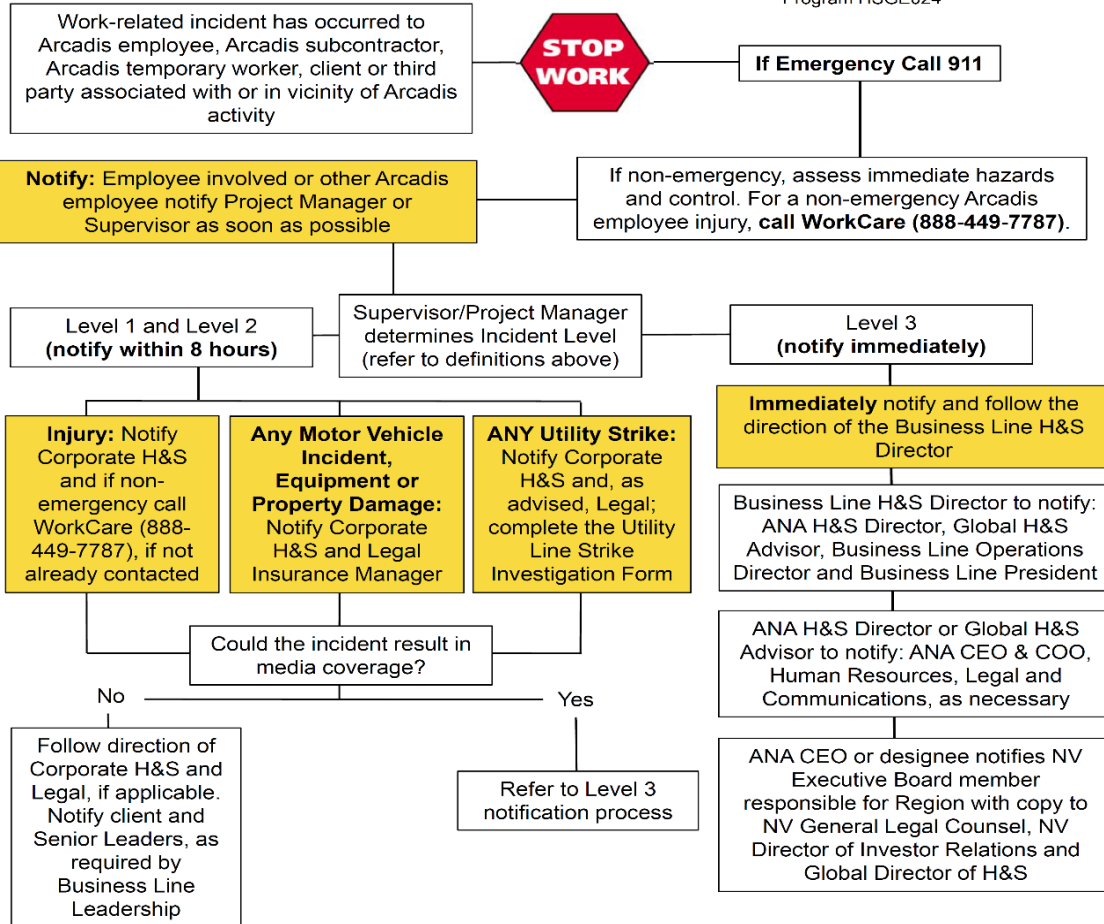
Incident Levels

Level 1: First aid/self-treated, work-related injury (contact WorkCare as soon as possible); minor property or equipment damage (less than or equal to \$100); vehicle loss event* (no injuries, no third-party involvement or other vehicle involvement).

Level 2: Professional Medical Treatment (if non-emergency injury or illness, employee must contact WorkCare as soon as possible); moderate property or equipment damage (greater than \$100 but less than or equal to \$5,000); ANY utility strike incident, any motor vehicle accident* (including injury or third-party involvement).

Level 3: Immediately report fatality, severe or catastrophic injury and/or overnight hospitalization required; significant property or equipment damage (greater than \$5,000); missing person or incident that generates media coverage.

* Refer to Motor Vehicle Safety Program HSGE024

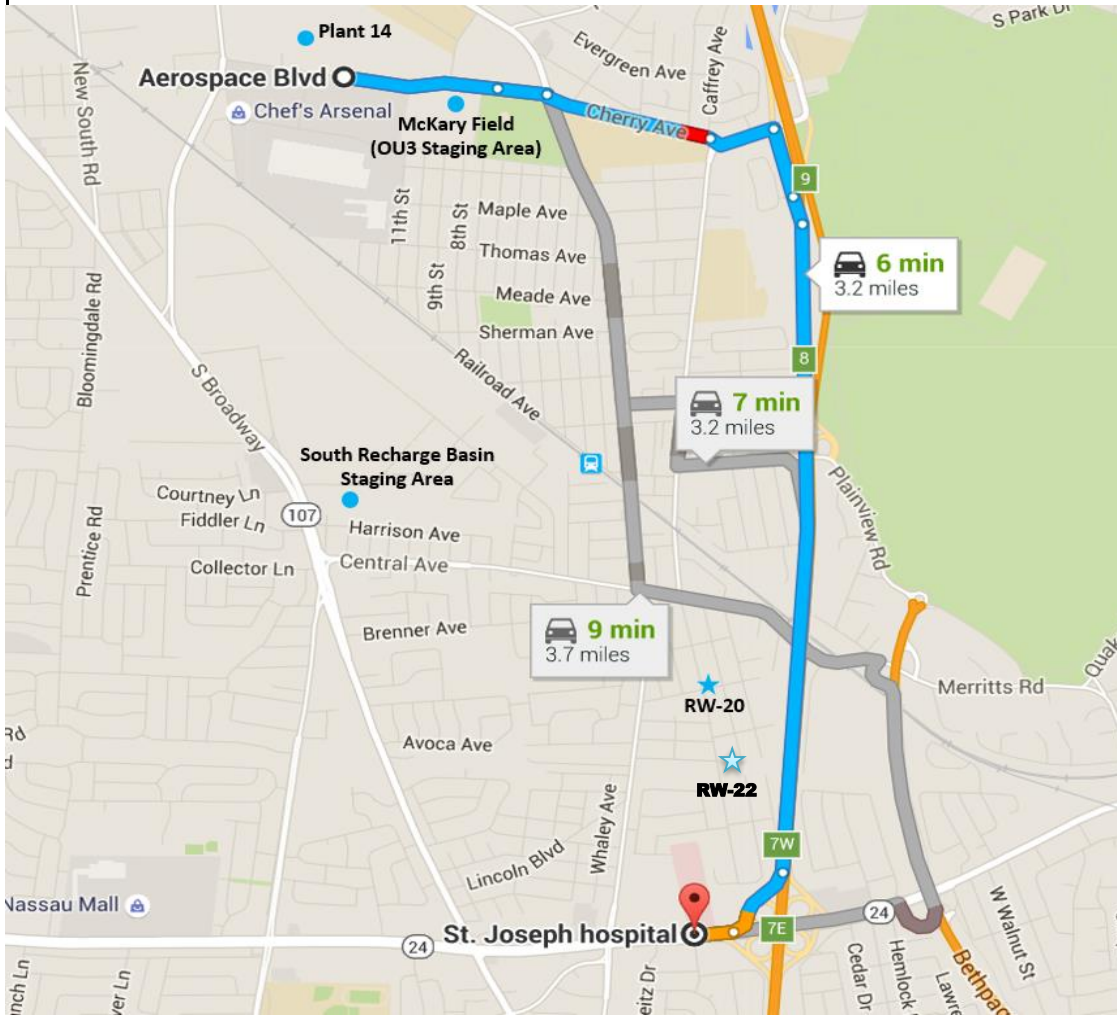


Client Incident Reporting Protocol

Arcadis Project Team shall communicate to Ed Hannon in case of incident (516-575-2333).

Route to the Hospital

Directions to
St. Joseph Hospital
4295 Hempstead Turnpike, Bethpage, NY 11714



Route to the Hospital







Aerospace Blvd, Bethpage, NY 11714 to St. Joseph hospital

Drive 3.2 miles, 6 min




Aerospace Blvd

Bethpage, NY 11714



Take Aerospace Blvd to Cherry Ave

-  1. Head east on Aerospace Blvd toward Evergreen Ave
 Partial restricted usage road
1 min (0.5 mi)
-  2. Continue onto Lent Dr
0.4 mi
-  0.1 mi

Continue on Cherry Ave to Plainview Rd

-  3. Continue onto Cherry Ave
2 min (0.6 mi)
-  0.4 mi
-  4. Use the right lane to turn slightly left onto Broadway
0.2 mi

Get on NY-135 S

-  5. Turn right onto Plainview Rd
28 s (0.2 mi)
-  0.2 mi
-  6. Take the ramp onto NY-135 S
387 ft

Continue on NY-135 S. Drive to Hempstead Turnpike in Plainedge

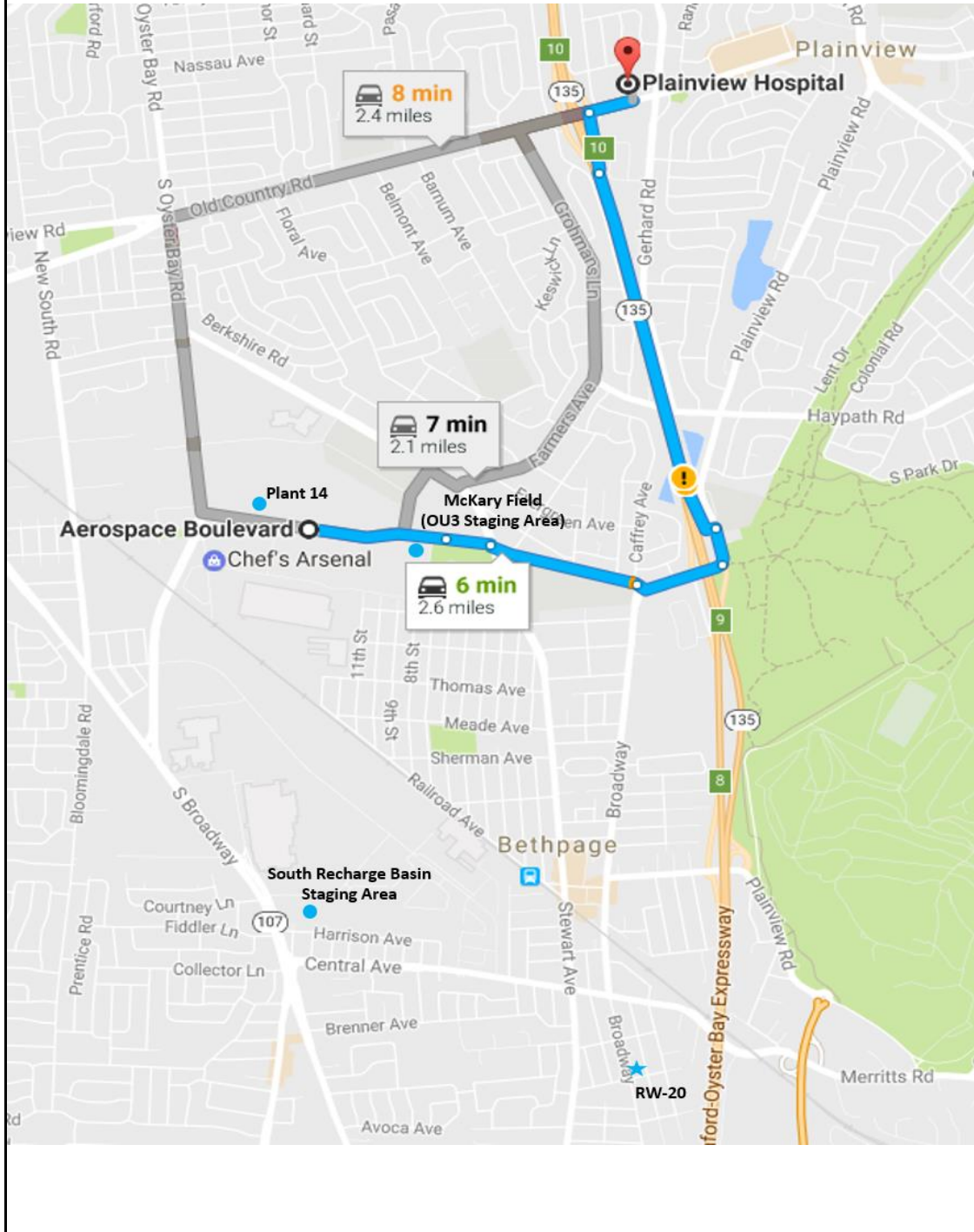
-  7. Merge onto NY-135 S (signs for New York 135 S)
2 min (1.9 mi)
-  1.6 mi
-  8. Take exit 7W for New York 24 W toward Hempstead
0.2 mi
-  9. Merge onto Hempstead Turnpike
 Destination will be on the right
469 ft

St. Joseph hospital

4295 Hempstead Turnpike, Bethpage, NY 11714

Route to the Hospital

**Directions to
Plainview Hospital
888 Old Country Road, Plainview, NY 11803**



Route to the Hospital



Aerospace Blvd, Bethpage, NY 11714 to 888 Old Country Rd, Plainview, NY 11803 Drive 2.4 miles, 8 min

Aerospace Blvd

Bethpage, NY 11714

1. Head west on Aerospace Blvd toward Evergreen Ave
▲ Restricted usage road
0.3 mi
2. Turn right onto S Oyster Bay Rd
0.8 mi
3. Turn right onto Old Country Rd
1.2 mi
4. Turn left
262 ft

888 Old Country Rd

Plainview, NY 11803

Site Type

The project site is an active facility with the following attributes:

Commercial	Recharge Basins
Industrial	
Parking Lot/Private Drive (NON ROW)	
Roadway (public, including ROW)	
Residential	

Work in parking lots will require preparation of a Non-ROW Traffic Safety Plan. Work on roadways or in the right of way will require a ROW Traffic Safety Plan.

Surrounding Land Use and Topography

The majority of the Northrop Grumman and former Naval Weapons Industrial Reserve Plant (NWIRP) sites (as well as the adjacent former OCC/RUCO Site) has been developed as commercial/industrial, with numerous residences bordering the sites. At the sites, the land surface is relatively flat and is approximately 120 feet above mean sea level; land surface elevation decreases at a rate of approximately 20 ft per mile to the south. The site area is devoid of significant natural features. Man-made recharge basins receive storm water runoff and are located sporadically on- and off-site. The Bethpage Community Park, which is 18 acres in size, is located east of the former NWIRP site, and consists of paved and unpaved areas, a swimming pool, recharge basin and an indoor ice rink. Soils underlying the sites consist of sands with interbedded lenses of silt and clay. Groundwater is encountered at approximately 50 ft bls. The prevailing regional horizontal groundwater flow direction is to the south-southeast.

Simultaneous Operations (SimOps)

Planned Arcadis site work will not be in proximity to SimOps work activities performed by non Arcadis employees or subcontractors. Arcadis will initiate stop work and evaluate the work activities through the JSA process if during the course of work a SimOps activity is identified that could reasonably affect health and safety of Arcadis employees and subcontractors.

Site Background

The former Grumman Aerospace Corporation, Bethpage New York facility (Grumman), which is identified as New York State Superfund Site No. 1-30-003A; Class 2; is now referred to as the Northrop Grumman Systems Corporation (Northrop Grumman), Bethpage, New York facility site. The original Grumman facility had been situated on 550 acres in east-central Nassau County, in the Hamlet of Bethpage, Town of Oyster Bay, New York. The former Grumman site had been bounded by Stewart Avenue to the north, Central Avenue to the south, Route 107 to the southwest, South Oyster Bay Road to the west, and various residential and commercial areas to the east. The former Naval Weapons Industrial Reserve Plant site (NWIRP)(a Government-Owned, Contractor Operated [GOCO] facility) (NYSDEC Site# 1-30-003B), situated on 105 acres, is located in the north-central portion of the former Grumman Site. Ownership of the majority of the NWIRP property was transferred by the U.S. Navy to Nassau County. Former Grumman Plant 2 (now owned by Steel Los Corporation) (NYSDEC Site #1-30-003C) is located in the southwest portion of the former Grumman Site. Operable Units (OU) included at the facility are OU1 and OU2 and consist of a soil vapor extraction system and a groundwater remediation system, respectively. The groundwater remediation system is located within the facility, but monitoring wells and outpost wells used to monitor the system are located to the south and to the east of the facility in areas that are a mix of commercial, industrial, and residentially zoned properties.

Operable Unit 3 consists of the Bethpage Community Park (the Park) that is located east of the former NWIRP site. The former Occidental Chemical Corporation/Hooker RUCO Polymer Site (currently owned and operated by Bayer Corporation), a federal Superfund Site, and is located west of the former Grumman/NWIRP Sites. Currently, there are interim remedial measures in place at the Park to remediate soil vapor and groundwater. Contaminants of concern are also located in the soils located in the ballfield section of the Park as well as the Former Plant 24 Access Road. Monitoring wells used to monitor the groundwater associated with OU3 are located to the south of the Park in areas that are a mix of commercial, industrial, and residentially zoned properties. The site location is shown on Figure 1 of this HASP.

Operational Description of Operable Units:

Operable Unit 1 (soil/soil vapor): Former Grumman Site – Commercial/Industrial

Operable Unit 2 (groundwater): Former Grumman Site , Former NWIRP Site, and Off-Site – Commercial/Industrial/Residential

Operable Unit 3 (soil, soil vapor and groundwater): Bethpage Community Park and Off-Site - Parkland/Residential/Commercial/Light Industrial

Project Tasks

The following tasks are identified for this project:

1	Driving - Motor vehicles
2	Mobilization - Site set up and take down
3	Mobilization - Loading and unloading vehicles
4	Drilling - Contractor oversight
5	Sampling - Soil sampling using manual methods
6	Sampling - Soil sampling using split spoons or continuous sampling tool
7	Monitor well - Well installation, development, or purging contractor oversight
	Monitor well - Well sounding, water level or product measurements using probes, tapes or downhole water
8	parameter measurements
9	Monitoring - Air monitoring using hand held or stationary equipment - non-radiation
10	Survey - Land surveying
11	Survey - Geophysical and Video Log
12	Sampling Maintenance - Well sampling and maintenance using pumps requiring pump installation and removal
13	Decontamination - Arcadis oversight of contractors performing decontamination
14	Decontamination - Set up and demobilization of personnel decontamination stations
15	Decontamination - Small or hand-held objects using manual methods
16	Utilities - Clearance
17	Waste - Containment of IDW in large containment devices greater than 119 gallons capacity
18	Waste - Containment of IDW in small containment devices greater than 10 gallons but less than or equal to 119 gallons capacity
19	Waste - Solid waste sampling using manual methods
20	Waste - Liquid waste sampling using manual methods

Supplemental requirements associated with the above task(s):
Client H&S information is attached.

The Arcadis Utility Clearance Checklist must be used for utility clearance activities.

A Journey Management Plan is required and is attached.

Site access agreements and/or a discussion of proper procedures for accessing off-site non-client owned RCS plan shall be provided by the Subcontractor and implemented by Arcadis as necessary. Arcadis shall furnish a RCS plan for tasks being performed by Arcadis.

<input checked="" type="checkbox"/>	Required Checklists/Work Forms
	<i>Tailgate Safety Briefing Form</i>
	<i>Vehicle Inspection Checklist</i>
	<i>Confined Space Evaluation Form</i>
	<i>Utility and Structures Checklist</i>
	<i>Lockout/Tagout Exchange of Information Form</i>
	<i>Lockout/Tagout Periodic Inspection</i>
	<i>LOTO Specific Equipment Procedure Template</i>

<input checked="" type="checkbox"/>	Required Permits
	<i>Lockout Tagout Permit to Work</i>
	<i>Permit Required Confined Space Entry Permit</i>
<input type="checkbox"/>	Required H&S Standards
	<i>Not applicable</i>

Short Service Employees (SSEs)

SSEs (employees who are employed with Arcadis for less than 1 year or are Inexperienced Workers) have the potential to work on this project. If SSEs are utilized, the project team working in conjunction with the SSE's administrative supervisor will ensure requirements of ARC HSGE019 "Short Service Employees" are completed. SSE's will be identified on the project Tailgate Safety Meeting Form.

Roles and Responsibilities

Name	Role	Short Service Employee
1 Carlo San Giovanni	Project Manager (PM)	No
2 Art Zahradnik	Associate Project Manager (APM) (OU2)	No
3 Soma Das	Task Manager (OU2)	No
4 David Stern	Associate Project Manager (APM) (OU3)	No
5 Xuan Xu	Task Manager (OU3)	No
6 Xuan XU and Soma Das	Site Safety Officer	No
- Review all applicable H&S Procedures, and ensure that project activities conform to all requirements. - Obtain client-specific H&S information & communicate with the client on H&S issues. - Site Safety Officers to communicate to Project Managers on H&S issues.		
7 Julie Santaniello	Corporate H&S Specialist	No
8 Art Zahradnik	Project H&S	No
- Assist the SSO in issues as they arise. - Perform site audits & assessments. - Assist with near-miss/incident investigations and follow-up - Serve as the liaison with Corporate during H&S issues as they may arise. - Assisting project team with H&S guidance and procedures, and HASP updates.		
9 Field Staff (To Be Determined)	Site Workers	Yes
	Site Workers (Electrical, Confined Space Trained, RCS Dust Awareness/Competent Person)	
10 Field Staff (To Be Determined)		No

Training

All Arcadis employees are required to have the following training to be on site:

H&S Program Orientation (non-certificate)
HAZCOM GHS/EAP (non-certificate)
Defensive Driving - Smith On-Line
Hazwoper 40-Hour
Hazwoper 8-Hour Annual Refresher
None
None
None
None
None
None
None
None
None
Client specific:
Other:

Selected Arcadis employees are required to have the following additional training:

	Names or Numbers from above
BBP (Bloodborne Pathogens)	9,10
Benzene - General Awareness	9,10
Construction Safety - 10 Hour	9,10
DOT HazMat #1	9,10
Hazwoper 8-Hour Supervisor	9,10
Electrical General Awareness	10
Electrical NFPA 70E - includes Arc Flash	10
Fire Extinguisher (non-certificate)	9,10
First Aid/CPR	9,10
Lockout/Tagout - Affected	10
Lockout/Tagout - Authorized	10
Confined Space Awareness	10
Fall Protection General Awareness	10
Hearing Conservation/Protection	9,10
Heat Stress	9,10
Other:	
RCS Dust Awareness	9,10

STOP WORK AUTHORITY

All Arcadis employees, subcontractors, client, or Town of Oyster Bay have the authority to STOP WORK if a condition exists that is deemed unsafe. STOP WORK will continue until the condition has been corrected.

The Arcadis Fundamental H&S Principles

Staff working on any of the task(s) listed above must utilize the six Arcadis Fundamental H&S Principles to ensure work is conducted safely. These principles include: 1) Use of TRACK, 2) H&S Planning, 3) Stop Work Authority, 4) "If Not Me Then Who", 5) Stewardship, and 6) Incident Reporting. Every project team member plays an important role in project health and safety. This is more than just having a HASP, training, or PPE. Proactive staff engagement with these principles is critical to a safe work environment.



General Task Hazard Assessment and Risk Control (HARC)

General: Hazards Applicable to All Project Tasks

The 12 hazard category HARC ratings are not available in this General THA. The mitigated and unmitigated ratings for the hazards presented are based on the Risk Assessment Matrix below. Modify hazards and ratings as necessary to meet project needs.

Risk Assessment Matrix		Likelihood Ratings			
Consequences Ratings		A	B	C	D
People	Property	0 Almost Impossible	1 Possible but Unlikely	2 Likely to Happen	3 Almost Certain to Happen
1-Slight or No Health Effect	Slight or No Damage	0-Low	1-Low	2-Low	3-Low
2-Minor Health Effect	Minor Damage	0-Low	2-Low	4-Medium	6-Medium
3-Major Health Effect	Local Damage	0-Low	3-Low	6-Medium	9-High
4-Fatalities	Major Damage	0-Low	4-Medium	8-High	12-High

Hazard #1

Driving - On road - Injury or vehicle damage from motor vehicle accident or incident

Suggested FSHSB Ref: III V, W, U, AO To mitigate this hazard, use TRACK and the following:
 Overall Unmitigated Risk: **HIGH** Smith System (on line)
 Mitigated Risk: **MEDIUM** JSAs
 Comments: Use Smith System "5-Keys" when driving. See Driving JSA for details.

Hazard #2

Driving - Driver - Injury, death or property damage due to driver distraction, fatigue, etc.

Suggested FSHSB Ref: III V, AO To mitigate this hazard, use TRACK and the following:
 Overall Unmitigated Risk: **HIGH** Smith System (on line)
 Mitigated Risk: **LOW** Driver awareness and use of stop work authority
 Comments: Use route planning. Keep eyes moving while driving. See Driving JSA.

Hazard #3

Biological - skin/eye irritation or damage from poisonous plants

Suggested FSHSB Ref: III N, AE To mitigate this hazard, use TRACK and the following:
 Overall Unmitigated Risk: **LOW** Job Briefing/Site Awareness
 Mitigated Risk: **LOW** PPE (see HASP "PPE" section)
 Comments: Use skin pre-treatment lotions when available.

Hazard #4

Biological - bites or stings from exposure to insects or arachnids

Suggested FSHSB Ref: III N To mitigate this hazard, use TRACK and the following:
 Overall Unmitigated Risk: **LOW** Job Briefing/Site Awareness
 Mitigated Risk: **LOW** PPE (see HASP "PPE" section)
 Comments: Do body check daily.

Hazard #5

Biological - cuts, scrapes, skin/eye puncture from exposure to physically damaging plants

Suggested FSHSB Ref: III N, AE To mitigate this hazard, use TRACK and the following:
 Overall Unmitigated Risk: **MEDIUM** Job Briefing/Site Awareness
 Mitigated Risk: **LOW** PPE (see HASP "PPE" section)
 Comments:

General Task HARC (continued)

Hazard #6		
Environmental - Thermal stress - Injury or illness from heat or cold		
Suggested FSHSB Ref:	III M	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	Field H&S Handbook (see ref. above)
Mitigated Risk:	LOW	JSAs
Comments:	Use job rotation or rest breaks. Stay hydrated and eat regularly.	
Hazard #7		
Environmental - Inclement weather -Injury or equipment damage from inclement weather		
Suggested FSHSB Ref:	III I	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	Weather Monitoring
Mitigated Risk:	LOW	Cont./Emerg. Planning
Comments:	Use 30/30 rule for lightning. See FSHSB for details.	
Hazard #8		
Motion - Musculoskeletal - Injury from lifting, twisting , stooping, or awkward body positions		
Suggested FSHSB Ref:	III AF	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	Engineering Controls (specify in comments)
Mitigated Risk:	LOW	Admin. Controls (specify in comments)
Comments:	Use proper lifting techniques. Use job rotation when applicable. See FSHSB for details.	
Hazard #9		
Motion - Musculoskeletal - Injury from repeated work activity or body motion		
Suggested FSHSB Ref:	III AF	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	Engineering Controls (specify in comments)
Mitigated Risk:	LOW	Admin. Controls (specify in comments)
Comments:	Use proper lifting techniques. Use job rotation when applicable. See FSHSB for details.	
Hazard #10		
Sound - Noise - Injury or illness due to noise exposure		
Suggested FSHSB Ref:	III L	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	Engineering Controls (specify in comments)
Mitigated Risk:	LOW	PPE (see HASP "PPE" section)
Comments:	Increase distance from source if possible. Maintain equipment.	
Hazard #11		
Gravity - Falls - Injury due to slips and trips		
Suggested FSHSB Ref:	III F	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	Site Awareness
Mitigated Risk:	LOW	Housekeeping
Comments:	Use footwear appropriate for site conditions, plan routes and do not hurry while walking.	
Hazard #12		
Environmental - Wind -Skin injury from sun or wind exposure		
Suggested FSHSB Ref:	III M	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	JSAs
Mitigated Risk:	LOW	PPE (see HASP "PPE" section)
Comments:		

Task Specific HARC

Task 1:		Driving - Motor vehicles			
HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low):		FHSB Ref:		III V	
Biological	L	Chemical	-	Driving	H
Environmental	L	Gravity	-	Mechanical	M
Personal Safety	L	Pressure	-	Radiation	-
				Electrical	-
				Motion	M
				Sound	-
Hazard #1					
Mechanical - Pinch point - Injury by pinching of body part in mechanical process					
Suggested FHSB Ref:	III S IV, E, F, G, O		To mitigate this hazard, use TRACK and the following:		
Overall Unmitigated Risk:	MEDIUM		Inspections		
Mitigated Risk:	LOW		PPE (see HASP "PPE" section)		
Comments:	Don't perform mechanical repairs in the field. Call roadside assistance for vehicle issues				
Hazard #2					
Motion - Struck by - Bodily injury from impact with moving object					
Suggested FHSB Ref:	III S		To mitigate this hazard, use TRACK and the following:		
Overall Unmitigated Risk:	LOW		Site Awareness		
Mitigated Risk:	LOW		JSAs		
Comments:	Wear PPE when checking fluid levels on vehicle				

Task Specific HARC (continued)

Task 2:		Mobilization - Site set up and take down					
HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low):						FHSHB Ref:	III F
Biological	L	Chemical	M	Driving	-	Electrical	-
Environmental	L	Gravity	M	Mechanical	-	Motion	M
Personal Safety	L	Pressure	-	Radiation	L	Sound	-
Hazard #1							
Chemical - liquid, solid, or gas - Equipment damage due to corrosion or spill							
Suggested FHSHB Ref:	III F			To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:	MEDIUM			JSAs			
Mitigated Risk:	LOW			Site Awareness			
Comments:	Make sure all equipment is properly stored						
Hazard #2							
Pressure - Compressed gas - Injury or illness from damaged cylinder/ valve due improper use or handling							
Suggested FHSHB Ref:	III AI			To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:	MEDIUM			JSAs			
Mitigated Risk:	LOW			Hazcom Training			
Comments:	Ensure all compressed gases are properly stowed away securely.						
Hazard #3							
Gravity - Struck by - Injury from falling object							
Suggested FHSHB Ref:	III AC, IV A			To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:	MEDIUM			PPE (see HASP "PPE" section)			
Mitigated Risk:	LOW			Job Briefing/Site Awareness			
Comments:	TRACK when starting work or ending work. Get help as needed						
Hazard #4							
Motion - Struck by - Bodily injury from impact with moving object							
Suggested FHSHB Ref:	III S			To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:	MEDIUM			JSAs			
Mitigated Risk:	LOW			Site Awareness			
Comments:	Be aware of surroundings, set up Traffic Safety Plan prior to starting work						

Task Specific HARC (continued)

Task 3:		Mobilization - Loading and unloading vehicles					
HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low):		FHSB Ref:				III F	
Biological	L	Chemical	L	Driving	-	Electrical	-
Environmental	L	Gravity	M	Mechanical	M	Motion	M
Personal Safety	L	Pressure	-	Radiation	L	Sound	L
Hazard #1							
Motion - Struck by - Bodily injury from impact with moving object							
Suggested FHSB Ref:		III S		To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:		MEDIUM		JSAs			
Mitigated Risk:		LOW		PPE (see HASP "PPE" section)			
Comments:		Be sure all Traffic control measures are in place before loading and unloading to avoid risk of getting struck by others.					
Hazard #2							
Mechanical - Pinch point - Injury by pinching of body part in mechanical process							
Suggested FHSB Ref:		III S IV, E, F, G, O		To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:		MEDIUM		Site Awareness			
Mitigated Risk:		LOW		PPE (see HASP "PPE" section)			
Comments:		Watch for pinch points when unloading vehicle.					
Hazard #3							
Personal Safety - Fatigue - Injury or illness caused while working when fatigued							
Suggested FHSB Ref:		III R		To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:		LOW		Job Rotation			
Mitigated Risk:		LOW		Job Briefing/Site Awareness			
Comments:		Take breaks/rotate when unloading vehicles. Some equipment can be heavy. Use team lift for heavy lifting.					
Hazard #4							
Chemical - liquid, solid, or gas - Equipment damage due to corrosion or spill							
Suggested FHSB Ref:		III F		To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:		LOW		JSAs			
Mitigated Risk:		LOW		PPE (see HASP "PPE" section)			
Comments:		Ensure all equipment is properly stored when transporting and unloading. Secure equipment using devices to avoid movement during transport.					

Task Specific HARC (continued)

Task 4:		Drilling - Contractor oversight					
HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low):		FHSB Ref:				II M	
Biological	L	Chemical	M	Driving	-	Electrical	-
Environmental	H	Gravity	M	Mechanical	M	Motion	M
Personal Safety	L	Pressure	M	Radiation	-	Sound	M
Hazard #1							
Environmental - Utilities - Injury or property damage from utility strike/damage							
Suggested FHSB Ref:		III AN		To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:		HIGH		H&S Standards			
Mitigated Risk:		MEDIUM		Specialized Checklist/Forms			
Comments:		Perform Utility Clearance prior to drilling and obtain permits. STOP WORK if utility is					
Hazard #2							
Mechanical - Pinch point - Injury by pinching of body part in mechanical process							
Suggested FHSB Ref:		III S IV, E, F, G, O		To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:		MEDIUM		Inspections			
Mitigated Risk:		LOW		Site Awareness			
Comments:		Review JSA and inspect equipment each day. Discuss potential pinch points associated with drill rig.					
Hazard #3							
Pressure - Hydraulic - Injury from hydraulic process or device failure							
Suggested FHSB Ref:		IV E		To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:		MEDIUM		H&S Standards			
Mitigated Risk:		LOW		Specialized Training per Standard			
Comments:		Review JSA and have driller who is qualified to perform daily inspections. Test emergency stop and make sure absorbent pads are available.					
Hazard #4							
Chemical- liquids - injury or illness from skin absorption							
Suggested FHSB Ref:		III C, F, G, K, S, AG		To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:		MEDIUM		HASP			
Mitigated Risk:		LOW		JSAs			
Comments:		Use proper PPE when providing oversight of drilling operations.					
Hazard #5							
Chemical - solids/particulates, injury or illness from inhalation							
Suggested FHSB Ref:		III C, F, G, K, S, AG		To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:		MEDIUM		HASP			
Mitigated Risk:		LOW		PPE (see HASP "PPE" section)			
Comments:		Use proper PPE when providing oversight of drilling operations. Ensure proper RCS Plan is in place					
Hazard #6							
Motion - Struck by - Bodily injury from impact with moving object							
Suggested FHSB Ref:		III S		To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:		MEDIUM		Site Awareness			
Mitigated Risk:		LOW		JSAs			
Comments:		Be aware of scope of work and Contractor work location.					

Task Specific HARC (continued)

Task 5:		Sampling - Soil sampling using manual methods					
HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low):		FHSB Ref:			III F		
Biological	L	Chemical	M	Driving	-	Electrical	-
Environmental	M	Gravity	M	Mechanical	-	Motion	M
Personal Safety	L	Pressure	-	Radiation	-	Sound	L
Hazard #1							
Chemical- solids/particulates - injury or illness from skin absorption							
Suggested FHSB Ref:		III C, F, G, K, S, AG			To mitigate this hazard, use TRACK and the following:		
Overall Unmitigated Risk:		MEDIUM			JSAs		
Mitigated Risk:		LOW			PPE (see HASP "PPE" section)		
Comments:		Review COCs and see appropriate monitoring requirements. Perform safety briefings and treat soil as potentially contaminated.					
Hazard #2							
Chemical - solids/particulates, skin or eye irritation/damage/allergy							
Suggested FHSB Ref:		III C, F, G, K, S, AG			To mitigate this hazard, use TRACK and the following:		
Overall Unmitigated Risk:		MEDIUM			JSAs		
Mitigated Risk:		LOW			PPE (see HASP "PPE" section)		
Comments:		Wear appropriate PPE to prevent solid contact with self (i.e. nitrile gloves for skin, or eye protection to prevent soil from getting into eyes.)					
Hazard #3							
Chemical - solids/particulates, injury or illness from inhalation							
Suggested FHSB Ref:		III C, F, G, K, S, AG			To mitigate this hazard, use TRACK and the following:		
Overall Unmitigated Risk:		MEDIUM			JSAs		
Mitigated Risk:		LOW			PPE (see HASP "PPE" section)		
Comments:		Make sure proper RCS plan is in place from driller					
Hazard #4							
Mechanical - Pinch point - Injury by pinching of body part in mechanical process							
Suggested FHSB Ref:		III S IV, E, F, G, O			To mitigate this hazard, use TRACK and the following:		
Overall Unmitigated Risk:		MEDIUM			Machine Guarding		
Mitigated Risk:		LOW			Inspections		
Comments:		Review equipment for pinch points (i.e. hand auger connections). Inspect equipment each day prior to use.					
Hazard #5							
Environmental - Utilities - Injury or property damage from utility strike/damage							
Suggested FHSB Ref:		III AN			To mitigate this hazard, use TRACK and the following:		
Overall Unmitigated Risk:		HIGH			Inspections		
Mitigated Risk:		MEDIUM			Specialized Checklist/Forms		
Comments:		Perform Utility checklist, DO NOT FORCE manual equipment down or use excessive digging due to potential utilities in the area. Off-set and re-evaluate locations if necessary.					
Hazard #6							
Personal Safety - Fatigue - Injury or illness caused while working when fatigued							
Suggested FHSB Ref:		III R			To mitigate this hazard, use TRACK and the following:		
Overall Unmitigated Risk:		MEDIUM			Job Rotation		
Mitigated Risk:		LOW			Job Briefing/Site Awareness		
Comments:		TRACK, use job rotation or breaks for manual soil sampling. Discuss in safety meeting.					

Task Specific HARC (continued)

Task 6:	Sampling - Soil sampling using split spoons or continuous sampling tool						
HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low):				FHSHB Ref:	III F		
Biological	L	Chemical	M	Driving	-	Electrical	-
Environmental	L	Gravity	M	Mechanical	M	Motion	M
Personal Safety	L	Pressure	L	Radiation	-	Sound	M
Hazard #1							
Chemical- solids/particulates - injury or illness from skin absorption							
Suggested FHSHB Ref:	III C, F, G, K, S, AG			To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:	MEDIUM			JSAs			
Mitigated Risk:	LOW			PPE (see HASP "PPE" section)			
Comments:	Review JSAs and COCs and see appropriate equipment. Treat soil as potentially contaminated.						
Hazard #2							
Chemical - solids/particulates, skin or eye irritation/damage/allergy							
Suggested FHSHB Ref:	III C, F, G, K, S, AG			To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:	MEDIUM			JSAs			
Mitigated Risk:	LOW			HASP			
Comments:	Review JSAs and have PPE available (face shield, nitrile gloves). Additionally, have SDS available for any drilling fluids used (i.e. betonite mixture).						
Hazard #3							
Mechanical - Pinch point - Injury by pinching of body part in mechanical process							
Suggested FHSHB Ref:	III S IV, E, F, G, O			To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:	MEDIUM			Inspections			
Mitigated Risk:	LOW			Site Awareness			
Comments:	Don't use cheaters to open split spoons. Use leather gloves to prevent pinch points while threading/unthreading parts of the spoon.						
Hazard #4							
Chemical - solids/particulates, injury or illness from inhalation							
Suggested FHSHB Ref:	III C, F, G, K, S, AG			To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:	MEDIUM			JSAs			
Mitigated Risk:	LOW			See HASP "Monitoring" section			
Comments:	When drilling, there is a risk of exposure to COCs. Perform air monitoring as required.						

Task Specific HARC (continued)

Task 7:		Monitor well - Well installation, development, or purging contractor oversight					
HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low):		FHSB Ref:				III F	
Biological	L	Chemical	L	Driving	-	Electrical	-
Environmental	L	Gravity	M	Mechanical	M	Motion	M
Personal Safety	L	Pressure	L	Radiation	-	Sound	M
Hazard #1							
Mechanical - Pinch point - Injury by pinching of body part in mechanical process							
Suggested FHSB Ref:		III S IV, E, F, G, O		To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:		MEDIUM		Site Awareness			
Mitigated Risk:		LOW		Inspections			
Comments:		During well installation, be sure there is a certified well driller. Do not enter work zones. STOP WORK if you see a task that is being done in an unsafe manner. Mark pinch point hazards as necessary.					
Hazard #2							
Motion - Struck by - Bodily injury from impact with moving object							
Suggested FHSB Ref:		III S		To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:		MEDIUM		Site Awareness			
Mitigated Risk:		LOW		JSAs			
Comments:		Be aware of surroundings at all times.					

Task Specific HARC (continued)

Task 8:		Monitor well - Well sounding, water level or product measurements using probes, tapes or downhole water parameter measurements					
HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low):		FHSB Ref:				III F	
Biological	L	Chemical	L	Driving	-	Electrical	-
Environmental	L	Gravity	M	Mechanical	-	Motion	M
Personal Safety	L	Pressure	L	Radiation	-	Sound	L
Hazard #1							
Motion - Struck by - Bodily injury from impact with moving object							
Suggested FHSB Ref:		III S		To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:		MEDIUM		JSAs			
Mitigated Risk:		LOW		Site Awareness			
Comments:		Mark work zones prior to start of work based on Traffic Safety Plan					

Task Specific HARC (continued)

Task 9:		Monitoring - Air monitoring using hand held or stationary equipment - non-radiation					
HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low):		FHSB Ref:				V I	
Biological	L	Chemical	L	Driving	-	Electrical	-
Environmental	-	Gravity	L	Mechanical	-	Motion	L
Personal Safety	-	Pressure	L	Radiation	-	Sound	-

Task Specific HARC (continued)

Task 10:	Survey - Land surveying						
HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low):				FHSHB Ref:	III F		
Biological	M	Chemical	-	Driving	-	Electrical	L
Environmental	L	Gravity	M	Mechanical	-	Motion	M
Personal Safety	L	Pressure	-	Radiation	-	Sound	L
Hazard #1							
Motion - Struck by - Bodily injury from impact with moving object							
Suggested FHSHB Ref:	III S			To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:	MEDIUM			JSAs			
Mitigated Risk:	LOW			Site Awareness			
Comments:	Be aware of all surroundings. Set-up traffic control as necessary						
Hazard #2							
Electrical - Housekeeping - Injury or property damage due to frayed wiring, improperly mounted wiring, missing							
Suggested FHSHB Ref:	III AB, AG			To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:	LOW			JSAs			
Mitigated Risk:	LOW			Housekeeping			
Comments:	Keep electrical components of geophysical equipment protected from damage by performing necessary inspections and repairs.						

Task Specific HARC (continued)

Task 11:		Survey - Geophysical and Video Log					
HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low):		FHSBH Ref:			III F		
Biological	M	Chemical	-	Driving	-	Electrical	M
Environmental	L	Gravity	L	Mechanical	-	Motion	M
Personal Safety	L	Pressure	-	Radiation	-	Sound	L
Hazard #1							
Electrical - Housekeeping - Injury or property damage due to frayed wiring, improperly mounted wiring, missing							
Suggested FHSBH Ref:		III AB, AG		To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:		MEDIUM		JSAs			
Mitigated Risk:		LOW		Housekeeping			
Keep electrical components of geophysical equipment protected from damage, perform necessary inspection and repairs. If connection to a power source is required, then staff should have electrical NFPA 70E training.							
Comments:							
Hazard #2							
Motion - Struck by - Bodily injury from impact with moving object							
Suggested FHSBH Ref:		III S		To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:		MEDIUM		Site Awareness			
Mitigated Risk:		LOW		JSAs			
Comments: Be aware of surroundings, put up Traffic control/work zone control							

Task Specific HARC (continued)

Task 12:		Sampling Maintenance - Well sampling and maintenance using pumps requiring pump					
HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low):		FHSBH Ref:			III F		
Biological	L	Chemical	M	Driving	-	Electrical	M
Environmental	M	Gravity	M	Mechanical	L	Motion	M
Personal Safety	L	Pressure	L	Radiation	-	Sound	L
Hazard #1							
Chemical- liquids - injury or illness from skin absorption							
Suggested FHSBH Ref:		III C, F, G, K, S, AG			To mitigate this hazard, use TRACK and the following:		
Overall Unmitigated Risk:	MEDIUM		JSAs				
Mitigated Risk:	LOW		PPE (see HASP "PPE" section)				
Comments:		Review COCs and appropriate monitoring requirements, use nitrile gloves to avoid skin contact with chemicals and contaminated water during sampling.					
Hazard #2							
Chemical - liquids, skin or eye irritation/damage/allergy							
Suggested FHSBH Ref:		III C, F, G, K, S, AG			To mitigate this hazard, use TRACK and the following:		
Overall Unmitigated Risk:	MEDIUM		JSAs				
Mitigated Risk:	LOW		PPE (see HASP "PPE" section)				
Comments:		Review COCs and utilize appropriate PPE to avoid skin contact or water contact to eye					
Hazard #3							
Chemical - liquids - injury or illness from vapor inhalation							
Suggested FHSBH Ref:		III C, F, G, K, S, AG			To mitigate this hazard, use TRACK and the following:		
Overall Unmitigated Risk:	MEDIUM		JSAs				
Mitigated Risk:	LOW		HASP				
Comments:		Monitor breathing zone when opening wellheads for VOCs and review any required respiratory protection.					
Hazard #4							
Motion - Struck by - Bodily injury from impact with moving object							
Suggested FHSBH Ref:		III S			To mitigate this hazard, use TRACK and the following:		
Overall Unmitigated Risk:	MEDIUM		JSAs				
Mitigated Risk:	LOW		Site Awareness				
Comments:		Implement proper Traffic control plan. Do NOT open well without barrier protection					
Hazard #5							
Electrical - Housekeeping - Injury or property damage due to frayed wiring, improperly mounted wiring, missing							
Suggested FHSBH Ref:		III AB, AG			To mitigate this hazard, use TRACK and the following:		
Overall Unmitigated Risk:	MEDIUM		Inspections				
Mitigated Risk:	LOW		PPE (see HASP "PPE" section)				
Comments:		Review equipment for issues with connection to potable generators					

Task Specific HARC (continued)

Task 13:		Decontamination - Arcadis oversight of contractors performing decontamination					
HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low):		FHSB Ref:		II M			
Biological	L	Chemical	L	Driving	-	Electrical	-
Environmental	L	Gravity	L	Mechanical	L	Motion	M
Personal Safety	L	Pressure	L	Radiation	-	Sound	L
Hazard #1							
Motion - Cuts and scrapes - Injury from moving object impacting skin or eye							
Suggested FHSB Ref:		III S		To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:		MEDIUM		JSAs			
Mitigated Risk:		LOW		Site Awareness			
Comments:		Be aware of surroundings, mark work zones, wear appropriate PPE					

Task Specific HARC (continued)

Task 14:		Decontamination - Set up and demobilization of personnel decontamination stations					
HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low):		FHSB Ref:		III G			
Biological	L	Chemical	L	Driving	-	Electrical	-
Environmental	L	Gravity	M	Mechanical	L	Motion	M
Personal Safety	L	Pressure	L	Radiation	-	Sound	L
Hazard #1							
Motion - Struck by - Bodily injury from impact with moving object							
Suggested FHSB Ref:		III S		To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:		MEDIUM		JSAs			
Mitigated Risk:		LOW		Site Awareness			
Comments:		Be aware of surroundings. Construction station in a secure location that is not subject to traffic. If necessary, set-up a secure work zone to mitigate impact from moving objects.					

Task Specific HARC (continued)

Task 15:		Decontamination - Small or hand-held objects using manual methods					
HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low):		FHSB Ref:		III G			
Biological	L	Chemical	L	Driving	-	Electrical	-
Environmental	L	Gravity	L	Mechanical	L	Motion	M
Personal Safety	L	Pressure	L	Radiation	-	Sound	L
Hazard #1							
Motion - Struck by - Bodily injury from impact with moving object							
Suggested FHSB Ref:		III S		To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:		MEDIUM		Site Awareness			
Mitigated Risk:		LOW		JSAs			
Comments:		Be aware of surroundings, mark work zones.					
Hazard #2							
Motion - Cuts and scrapes - Injury from moving object impacting skin or eye							
Suggested FHSB Ref:		III S		To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:		MEDIUM		JSAs			
Mitigated Risk:		LOW		Site Awareness			
Comments:		Be aware of surroundings, mark work zones, wear appropriate PPE					

Task Specific HARC (continued)

Task 16:		Utilities - Clearance					
HARC Unmitigated	Hazard Types (H-High, M-Medium, L-Low):					FHSHB Ref:	III AN
Biological	L	Chemical	L	Driving	-	Electrical	H
Environmental	H	Gravity	L	Mechanical	L	Motion	M
Personal Safety	L	Pressure	L	Radiation	-	Sound	L
Hazard #1							
Environmental - Utilities - Injury or property damage from utility strike/damage							
Suggested FHSHB Ref:	III AN			To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:	High			H&S Standards			
Mitigated Risk:	MEDIUM			Specialized Checklist/Forms			
Comments:	Follow most recent Utility Clearance Form and H&S standard. Prior to performing utility clearance, the geology and utilities should be reviewed by staff and 3 reliable lines of evidence must be used prior to starting intrusive work. Note that GPR by a subcontractor may not be reliable if the soils are not appropriate.						
Hazard #2							
Motion - Struck by - Bodily injury from impact with moving object							
Suggested FHSHB Ref:	III S			To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:	MEDIUM			Site Awareness			
Mitigated Risk:	LOW			JSAs			
Comments:	Set-up Traffic safety plan per location while performing utility locate. Adjust as needed.						
Hazard #3							
Electrical - Electrocutation or arc flash - Injury or death from electrocution or arc flash from electrical							
Suggested FHSHB Ref:	III AA, AB			To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:	HIGH			JSAs			
Mitigated Risk:	MEDIUM			HASP			
Comments:	Have proper utility clearance, watch soft dig methods						

Task Specific HARC (continued)

Task 17:		Waste - Containment of IDW in large containment devices greater than 119 gallons capacity							
HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low):		FHSB Ref:				III AG			
Biological	L	Chemical	M	Driving	-	Electrical	-		
Environmental	M	Gravity	H	Mechanical	M	Motion	M		
Personal Safety	L	Pressure	L	Radiation	-	Sound	L		
Hazard #1									
Chemical- liquids - injury or illness from skin absorption									
Suggested FHSB Ref:		III C, F, G, K, S, AG		To mitigate this hazard, use TRACK and the following:					
Overall Unmitigated Risk:		MEDIUM		HASP					
Mitigated Risk:		LOW		JSAs					
Comments:		Review COCs and wear appropriate PPE during containment of IDW							
Hazard #2									
Chemical- solids/particulates - injury or illness from skin absorption									
Suggested FHSB Ref:		III C, F, G, K, S, AG		To mitigate this hazard, use TRACK and the following:					
Overall Unmitigated Risk:		MEDIUM		HASP					
Mitigated Risk:		LOW		JSAs					
Comments:		Review COCs and wear appropriate PPE during containment of IDW							
Hazard #3									
Environmental - Utilities - Injury or property damage from utility strike/damage									
Suggested FHSB Ref:		III AN		To mitigate this hazard, use TRACK and the following:					
Overall Unmitigated Risk:		MEDIUM		Inspections					
Mitigated Risk:		LOW		PPE (see HASP "PPE" section)					
Comments:		Review storage areas for large containers. Avoid placing near overhead utilities							
Hazard #4									
Motion - Struck by - Bodily injury from impact with moving object									
Suggested FHSB Ref:		III S		To mitigate this hazard, use TRACK and the following:					
Overall Unmitigated Risk:		MEDIUM		JSAs					
Mitigated Risk:		LOW		Site Awareness					
Comments:		Use caution entering IDW area and be aware of movement of large IDW containers. Do NOT stand near the container during loading or unloading.							
Hazard #5									
Mechanical - Pinch point - Injury by pinching of body part in mechanical process									
Suggested FHSB Ref:		III S IV, E, F, G, O		To mitigate this hazard, use TRACK and the following:					
Overall Unmitigated Risk:		MEDIUM		Inspections					
Mitigated Risk:		LOW		Site Awareness					
Comments:		When closing IDW, watch for pinch point locations. Ensure you are out of the line of closure when sealing IDW (i.e. lids, tarps).							
Hazard #6									
Chemical - liquids - injury or illness from vapor inhalation									
Suggested FHSB Ref:		III C, F, G, K, S, AG		To mitigate this hazard, use TRACK and the following:					
Overall Unmitigated Risk:		MEDIUM		JSAs					
Mitigated Risk:		LOW		PPE (see HASP "PPE" section)					
Comments:		Review COCs, perform air monitoring during handling or re-opening IDW containments as necessary. Review if a confined space entry is required for cleaning of larger IDW (i.e. Frac Tanks). Should this be required, then follow the confined space entry requirements							

Task Specific HARC (continued)

Task 18:	Waste - Containment of IDW in small containment devices greater than 10 gallons b						
HARC Unmitigated	Hazard Types (H-High, M-Medium, L-Low):				FHSBH Ref:		III AG
Biological	L	Chemical	M	Driving	-	Electrical	-
Environmental	L	Gravity	M	Mechanical	L	Motion	L
Personal Safety	L	Pressure	L	Radiation	-	Sound	L
Hazard #1							
Chemical- liquids - injury or illness from skin absorption							
Suggested FHSBH Ref:	III C, F, G, K, S, AG			To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:	MEDIUM			HASP			
Mitigated Risk:	LOW			JSAs			
Comments:	Review COCs and wear appropriate PPE during containment of IDW						
Hazard #2							
Chemical- solids/particulates - injury or illness from skin absorption							
Suggested FHSBH Ref:	III C, F, G, K, S, AG			To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:	MEDIUM			HASP			
Mitigated Risk:	LOW			JSAs			
Comments:	Review COCs and wear appropriate PPE during containment of IDW						
Hazard #3							
Chemical - storage of liquids or solids - injury or property damage due to chemical incompatibility							
Suggested FHSBH Ref:	III AG			To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:	LOW			Engineering Controls (specify in comments)			
Mitigated Risk:	LOW			Admin. Controls (specify in comments)			
Comments:	should be placed on a priority pick-up. Inspections should occur regularly.						
Hazard #4							
Motion - Struck by - Bodily injury from impact with moving object							
Suggested FHSBH Ref:	III S			To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:	MEDIUM			JSAs			
Mitigated Risk:	LOW			Site Awareness			
Comments:	Use caution entering IDW area and be aware of movement of large IDW containers. Do						
Hazard #5							
Chemical - liquids - injury or illness from vapor inhalation							
Suggested FHSBH Ref:	III C, F, G, K, S, AG			To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:	MEDIUM			JSAs			
Mitigated Risk:	LOW			PPE (see HASP "PPE" section)			
Comments:	Review COCs, perform air monitoring during handling or re-opening IDW containments						

Task Specific HARC (continued)

Task 19:		Waste - Solid waste sampling using manual methods					
HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low):		FHSBH Ref:			III AG		
Biological	L	Chemical	M	Driving	-	Electrical	-
Environmental	L	Gravity	M	Mechanical	-	Motion	M
Personal Safety	L	Pressure	-	Radiation	-	Sound	L
Hazard #1							
Chemical- solids/particulates - injury or illness from skin absorption							
Suggested FHSBH Ref:		III C, F, G, K, S, AG		To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:		MEDIUM		JSAs			
Mitigated Risk:		LOW		HASP			
Comments:		Review COCs and appropriate monitoring requirements. Use nitrile gloves for sampling					
Hazard #2							
Chemical - solids/particulates, injury or illness from inhalation							
Suggested FHSBH Ref:		III C, F, G, K, S, AG		To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:		MEDIUM		JSAs			
Mitigated Risk:		LOW		HASP			
Comments:		Air monitor as necessary and avoid being right over large containers or drums when opening.					
Hazard #3							
Gravity - Falls - Injury due to falls from height							
Suggested FHSBH Ref:		III AC, AK IV A, L		To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:		MEDIUM		H&S Standards			
Mitigated Risk:		LOW		Fall Protection Awareness Training			
Comments:		Be aware of sampling procedure. If required to stand on a ladder, remember to maintain 3 points of contact at all times. Review sampling procedure and identify location to safely sample. Have appropriate fall protection if necessary.					
Hazard #4							
Motion - Cuts and scrapes - Injury from moving object impacting skin or eye							
Suggested FHSBH Ref:		III S		To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:		MEDIUM		JSAs			
Mitigated Risk:		LOW		Site Awareness			
Comments:		Review how to sample. Avoid putting too much stress on sampling equipment that can cause breakage (i.e. breaking a shovel).					

Task Specific HARC (continued)

Task 20:		Waste - Liquid waste sampling using manual methods					
HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low):				FHSBH Ref: III AG			
Biological	L	Chemical	M	Driving	-	Electrical	-
Environmental	L	Gravity	M	Mechanical	-	Motion	M
Personal Safety	L	Pressure	-	Radiation	-	Sound	L
Hazard #1							
Chemical- liquids - injury or illness from skin absorption							
Suggested FHSBH Ref:		III C, F, G, K, S, AG		To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:		MEDIUM		HASP			
Mitigated Risk:		LOW		JSAs			
Comments:		Use PPE as per JSA for sampling to avoid contact with liquids.					
Hazard #2							
Chemical - liquids - injury or illness from vapor inhalation							
Suggested FHSBH Ref:		III C, F, G, K, S, AG		To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:		MEDIUM		JSAs			
Mitigated Risk:		LOW		HASP			
Comments:		Air monitor when sampling. Do NOT stand above IDW opening, allowing yourself room for fresh air. If necessary, STOP WORK if air monitoring shows COCs in breathing zone.					
Hazard #3							
Gravity - Falls - Injury due to falls from height							
Suggested FHSBH Ref:		III AC, AK IV A, L		To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:		HIGH		H&S Standards			
Mitigated Risk:		LOW		Fall Protection Awareness Training			
Comments:		maintain 3 points of contact at all times. Review sampling procedure and identify					
Hazard #4							
Motion - Cuts and scrapes - Injury from moving object impacting skin or eye							
Suggested FHSBH Ref:		III S		To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:		MEDIUM		JSAs			
Mitigated Risk:		LOW		Site Awareness			
Comments:		Review how to sample. Avoid putting too much stress on sampling equipment that can cause breakage (i.e. breaking a shovel).					

Hazard Communication (HAZCOM)/Global Harmonization System (GHS)

HAZCOM/GHS for this project is managed by the client or general contractor

List the chemicals anticipated to be used by Arcadis on this project per HAZCOM/GHS requirements.
(Modify quantities as needed)

Preservatives		Qty	Decontamination		Qty	Calibration		Qty.
<input type="checkbox"/>	Not applicable		<input type="checkbox"/>	Not applicable		<input type="checkbox"/>	Not applicable	
<input checked="" type="checkbox"/>	Hydrochloric acid	<500 ml	<input type="checkbox"/>	Alconox	≤ 5 lbs	<input checked="" type="checkbox"/>	Isobutylene/air	1 cyl
<input checked="" type="checkbox"/>	Nitric acid	<500 ml	<input type="checkbox"/>	Liquinox	≤ 1 gal	<input type="checkbox"/>	Methane/air	1 cyl
<input checked="" type="checkbox"/>	Sulfuric acid	<500 ml	<input type="checkbox"/>	Acetone	≤ 1 gal	<input type="checkbox"/>	Pentane/air	1 cyl
<input type="checkbox"/>	Sodium hydroxide	<500 ml	<input type="checkbox"/>	Methanol	≤ 1 gal	<input type="checkbox"/>	Hydrogen/air	1 cyl
<input type="checkbox"/>	Zinc acetate	<500 ml	<input type="checkbox"/>	Hexane	≤ 1 gal	<input type="checkbox"/>	Propane/air	1 cyl
<input type="checkbox"/>	Ascorbic acid	<500 ml	<input type="checkbox"/>	Isopropyl alcohol	≤ 4 gal	<input type="checkbox"/>	Hydrogen sulfide/air	1 cyl
<input type="checkbox"/>	Acetic acid	<500 ml	<input type="checkbox"/>	Nitric acid	≤ 1 L	<input type="checkbox"/>	Carbon monoxide/air	1 cyl
<input type="checkbox"/>	Isopropyl alcohol	< 4 gal.	<input checked="" type="checkbox"/>	Other:		<input checked="" type="checkbox"/>	pH standards (4,7,10)	≤ 1 gal
<input type="checkbox"/>	Formalin (<10%)	< 4 gal.		Micro 90	< 1 gal	<input checked="" type="checkbox"/>	Conductivity standards	≤ 1 gal
<input checked="" type="checkbox"/>	Methanol	<500 ml				<input checked="" type="checkbox"/>	Other:	
<input checked="" type="checkbox"/>	Sodium bisulfate	<500 ml					ORP, Turbidity	
Fuels			Kits					
<input type="checkbox"/>	Not applicable	Qty.	<input type="checkbox"/>	Not applicable				Qty.
<input checked="" type="checkbox"/>	Gasoline	≤ 5 gal	<input type="checkbox"/>	Hach (specify):				1 kit
<input checked="" type="checkbox"/>	Diesel	≤ 5 gal	<input type="checkbox"/>	DTECH (specify):				1 kit
<input type="checkbox"/>	Kerosene	≤ 5 gal	<input checked="" type="checkbox"/>	Other:				1 kit
<input checked="" type="checkbox"/>	Propane	1 cyl		Dexsil Corporation			Clor-N-Soil Kit	50 kit
<input checked="" type="checkbox"/>	Other:							
	Engine Oil; 2 cycle oil	< 2 qts						
Remediation			Other:		Qty.	DOT(1):		Qty.
<input checked="" type="checkbox"/>	Not applicable		<input type="checkbox"/>	Not applicable		<input checked="" type="checkbox"/>	MOT eligible soils	TBD
<input type="checkbox"/>			<input checked="" type="checkbox"/>	Spray paint	≤ 6 cans	<input checked="" type="checkbox"/>	MOT eligible water	TBD
<input type="checkbox"/>			<input checked="" type="checkbox"/>	WD-40	≤ 1 can	<input checked="" type="checkbox"/>	MOT eligible solids	TBD
<input type="checkbox"/>			<input checked="" type="checkbox"/>	Pipe cement	≤ 1 can	<input checked="" type="checkbox"/>	MOT eligible liquids	TBD
<input type="checkbox"/>			<input checked="" type="checkbox"/>	Pipe primer	≤ 1 can			
<input type="checkbox"/>				Mineral spirits	≤ 1 gal			
<input type="checkbox"/>			<input checked="" type="checkbox"/>	Nitrogen Gas	80CG			

(1) Attach applicable Materials of Trade (MOT) generic shipping determination. SDS not generally applicable to this category.

SDSs for this project will be available in printed form in the company vehicle. All project workers will be notified of the SDS location in their initial safety briefing.

Contractor SDSs will be submitted to Arcadis in advance of work and will be filed with Arcadis SDSs as indicated above.

This project will not be utilizing materials subject to the HAZCOM Standard in bulk storage. In this HASP, bulk storage means any material stored on the project site in a bulk packaging >119 gallons (> 450 L) liquid capacity or a palletized quantity of a material in packagings ≤119 gallons (≤450 L) liquid capacity.

Air Monitoring

Task or Area of Concern: Drilling, Groundwater Sampling, IDW Management

Constituents of Interest:

Time Weighted Averages (TWAs) are ACGIH 8 Hr Threshold Limit Values (TLVs) unless noted.

Antimony	Anticipated Breathing Zone Concentration <=	0	mg/m3
TWA 0.5 mg/m3	LEL/UEL (%):	NA/NA	
STEL NA	VD (Air = 1):	NA	
IDLH 50 mg/m3	VP (mmHg):	NA	
Aluminum	Anticipated Breathing Zone Concentration <=	0	mg/m3
TWA 1 mg/m3, respirable	LEL/UEL (%):	NA/NA	
STEL NA	VD (Air = 1):	NA	
IDLH NA	VP (mmHg):	NA	
Vinyl chloride			
TWA 1 ppm, OSHA Reg. See Notes	LEL/UEL (%):	3.6/33.0	
STEL 5 ppm, ceiling, OSHA	VD (Air = 1):	2.21	
IDLH NA	VP (mmHg):	2508	
Trichloroethene			
TWA 10 ppm	LEL/UEL (%):	8/10.5	
STEL 25 ppm	VD (Air = 1):	NA	
IDLH 1000 ppm, NIOSH	VP (mmHg):	58	
cis 1,2-Dichloroethene			
TWA 200 ppm	LEL/UEL (%):	5.6/12.8	
STEL NA	VD (Air = 1):	NA	
IDLH 1000 ppm, NIOSH	VP (mmHg):	180-265	
Chromium metal	Anticipated Breathing Zone Concentration <=	0	mg/m3
TWA 0.5 mg/m3	LEL/UEL (%):	NA/NA	
STEL NA	RGD (Air = 1):	NA	
IDLH 250 mg/m3, NIOSH	VP (mmHg):	NA	
Barium	Anticipated Breathing Zone Concentration <=	0	mg/m3
TWA 0.5 mg/m3	LEL/UEL (%):	NA/NA	
STEL NA	RGD (Air = 1):	NA	
IDLH NA	VP (mmHg):	NA	
Lead	Anticipated Breathing Zone Concentration <=	0	mg/m3
TWA 0.05 mg/m3, OSHA Reg. See Notes	LEL/UEL (%):	NA/NA	
STEL NA	RGD (Air = 1):	NA	
IDLH 100 mg/m3	VP (mmHg):	NA	

Cadmium	Anticipated Breathing Zone Concentration <=	0	mg/m3
TWA 0.005 mg/m3, OSHA, OSHA Reg. See Notes	LEL/UEL (%):	NA/NA	
STEL NA	RGD (Air = 1):	NA	
IDLH 9 mg/m3, NIOSH	VP (mmHg):	NA	
Toluene			
TWA 20 ppm	LEL/UEL (%):	1.1/7.1	
STEL 150 ppm, NIOSH	RGD (Air = 1):	NA	
IDLH 500 ppm, NIOSH	VP (mmHg):	21	
Silica	Anticipated Breathing Zone Concentration <=	3	mg/m3
TWA 0.025 mg/m3, respirable, OSHA Reg. See Notes	LEL/UEL (%):	NA/NA	
STEL NA	RGD (Air = 1):	NA	
IDLH 25 mg/m3, NIOSH	VP (mmHg):	NA	
Naphthalene			
TWA 10 ppm, skin	LEL/UEL (%):	0.9/5.9	
STEL NA	RGD (Air = 1):	NA	
IDLH 250 ppm, NIOSH	VP (mmHg):	0.08	
Ethylbenzene			
TWA 20 ppm	LEL/UEL (%):	0.8/6.7	
STEL 125 ppm	RGD (Air = 1):	NA	
IDLH 800 ppm, NIOSH	VP (mmHg):	7	
Arsenic	Anticipated Breathing Zone Concentration <=	0	mg/m3
TWA 0.01 mg/m3, OSHA Reg. See Notes	LEL/UEL (%):	NA/NA	
STEL NA	RGD (Air = 1):	NA	
IDLH 5 mg/m3	VP (mmHg):	NA	
PCBs	Anticipated Breathing Zone Concentration <=	0	mg/m3
TWA 0.5 mg/m3, skin	LEL/UEL (%):	NA/NA	
STEL NA	RGD (Air = 1):	NA	
IDLH 5 mg/m3, NIOSH	VP (mmHg):	0.001	
1,2,4-Trimethylbenzene			
TWA 25 ppm, LAMP NOTICE See Notes	LEL/UEL (%):	NA/NA	
STEL NA	RGD (Air = 1):	NA	
IDLH NA	VP (mmHg):	NA	

TWA - Time Weighted Average (ACGIH TLV unless noted) LEL/UEL - Lower/Upper Explosive Limit
STEL - Short Term Exposure Limit RGD - Relative Gas Density
IDLH - Immediately Dangerous to Life and Health VP - Vapor Pressure

Notes:

One or more constituents above is listed with a skin notation. Avoid conditions where dusts, mists, or aerosols are created. Avoid skin contact with impacted media.

One or more constituents listed above is a particulate hazard. Use wetting as the primary control to eliminate dust hazards.

As noted, one or more of the above constituents is an OSHA regulated substance. If exposure is expected to be above the TWA, contact a CIH or CSP for assistance unless otherwise permitted by a substance specific plan template identified in this section.

A Silica Exposure Control Plan is required and contains additional information regarding air monitoring.

The lamp selected does not have a correction factor for one or more constituents listed above. Action levels may require manual adjustment or, if required, select PID with different eV rating.

Required Monitoring Instruments, Action Levels and Monitoring Frequency

Gray fields below are not automated. Make necessary selections from drop down menus.

Photoionization Detector Select Lamp: 10.6 eV

The lamp selected does not have a correction factor for one or more constituents listed above. Action levels may require manual adjustment or, if required, select PID with different eV rating.

Action levels are in PID units (1):	X	Computed action levels have been manually adjusted.
<	5.0	Continue working
	5.0 - 10.0	Levels sustained > 5 minutes, monitor continuously and review engineering controls and PPE. Proceed with caution.
>	10.0	Stop work and contact SSO

(1) Computed action levels are for PIDs which have not been programmed to correct TLVs for specific constituents or mixtures.

Particulate/Aerosol monitoring is required.

Utilize TSI Dust Trak II or equivalent monitor

Action levels are in mg/m3		Computed action levels have been manually adjusted.
<	0.013	Continue working
	0.0125 - 0.025	Levels sustained > 5 minutes, monitor continuously and review engineering controls and PPE. Proceed with caution.
>	0.025	Stop work and contact SSO

Breathing zone air monitoring using the above instruments will be performed at the following frequency:
Continuously

The monitoring instrument(s) used must be capable of data logging if continuous monitoring is required. Staff using these instruments must be trained in data logging procedures for the actual instrument(s) used. Data logging results must be backed up daily.

LEL/O2 monitoring plus monitoring for checked gases below with multigas meter is required

LEL/O2 Meter	0-5% LEL	Continue work
	>5-10% LEL	Continually monitor, review engineering controls, proceed with caution
	>10% LEL	Stop work, evacuate, contact SSO
Monitoring Required	19.5%-23.5% O2	Normal, continue work
	<19.5% O2	O2 deficient, stop work, evacuate, contact SSO
	>23.5% O2	O2 enriched, stop work, evacuate, contact SSO

Check Gases/Vapors to be Monitored:

	1/2 TLV	Stop Work Action Level	Comments
<input type="checkbox"/> Ammonia	12.5 ppm	25 ppm	Use a multigas meter equipped with a sensor(s) capable of detecting checked gases identified to the right. Review engineering controls and perform continuous monitoring with data logging at concentrations >1/2 TLV. Stop work action levels are based on Level D protection.
<input type="checkbox"/> Carbon dioxide	2500 ppm	5000 ppm	
<input checked="" type="checkbox"/> Carbon monoxide	12.5 ppm	25 ppm	
<input type="checkbox"/> Chlorine	0.05 ppm	0.1 ppm	
<input type="checkbox"/> Hydrogen cyanide	2.35 ppm (skin)	4.7 ppm* (skin)	
<input type="checkbox"/> Hydrogen sulfide	0.5 ppm	1 ppm	
<input type="checkbox"/> Nitrogen dioxide	0.1 ppm	0.2 ppm	
<input type="checkbox"/> Phosphine	0.025 ppm	0.05 ppm	
<input type="checkbox"/> Sulfur dioxide	0.125 ppm	0.25 ppm	
<input type="checkbox"/> Mercury vapor	0.0125 mg/m3	0.025 mg/m3	

* Ceiling or STEL value

All air-monitoring instruments must be calibration checked daily, if used, per manufacturer's instructions. Calibration checks, including calibration gases used, must be documented.

Compound specific monitoring using indicator tubes or chips is not required.

Indicator:		≤TWA	Continue work
<input checked="" type="checkbox"/> Tube	<input type="checkbox"/> Chip	>TWA	Stop work, review engineering controls and PPE, contact SSO
Compound(s): Vinyl Chloride			

Indicator tube/chip monitoring frequency: 30 Minute intervals

Personal Protective Equipment (PPE)

See JSA or Permit for the task being performed for required PPE. If work is not conducted under a JSA or Permit, refer to the governing document for PPE requirements. At a minimum, the following checked PPE is required for all tasks during field work (outside of field office trailers and vehicles) not covered by a JSA or Permit on this project:

Minimum PPE required to be worn by all staff on project:			Specify Type:
<input checked="" type="checkbox"/>	Hard hat	<input type="checkbox"/>	Coveralls:
<input checked="" type="checkbox"/>	Safety glasses	<input type="checkbox"/>	Apron:
<input type="checkbox"/>	Safety goggles	<input type="checkbox"/>	Chem. resistant gloves: Nitrile as needed
<input type="checkbox"/>	Face shield	<input type="checkbox"/>	Gloves other: Ansi Level II as needed
<input type="checkbox"/>	Hearing protection	<input checked="" type="checkbox"/>	Chemical boot:
<input type="checkbox"/>	Rain suit	<input type="checkbox"/>	Boot other:
<input checked="" type="checkbox"/>	Other:	<input checked="" type="checkbox"/>	Traffic vest, shirt or coat: Class II
	Absorbent Pads	<input type="checkbox"/>	Life vest:

Task specific PPE: Rain suit is required when raining; Hearing protection is required when decibels exceed 85 dba; nitrile gloves are required when handling contaminated soil or

Medical Surveillance

All Arcadis employees and subcontractors performing field work will be required to be current in HAZWOPER medical surveillance.

Client and DOT mandated drug and alcohol testing is not required for this project and will not be performed.

Hazardous Materials Shipping and Transportation

A shipping determination package has been prepared, reviewed and provided to Arcadis field staff for this project.

Traffic Safety and Traffic Safety Plans (TSPs)

All or portions of the project work will be conducted in both a public right of way (ROW) and parking lot/private roadway and a TSP addressing ROW and Non-ROW traffic safety controls is attached to this HASP.

Arcadis Commercial Motor Vehicles (CMVs)

CMVs operated by Arcadis employees on public roadways will not be utilized on this project. Arcadis defines a CMV as any single vehicle with a gross vehicle weight rating (GVWR) ≥10,001 pounds or a truck and trailer combination with a combined GVWR ≥10,001 pounds (GVWR of truck + GVWR of trailer = ≥10,001 pounds).

Site Control

Site control requirements are integrated into the TSP for this project. Work areas will be delineated, as specified in the TSP, with cones and caution tape to prevent public from entering. Work zones will also be monitored by onsite personnel for unauthorized entry.

Decontamination

Decontamination protocols are addressed in the applicable task JSA(s) for this project. The applicable JSAs are attached to this HASP.

Sanitation

The project scope is a mobile work operation. The project field team will have reasonable access to restroom facilities within 10 minutes of the work area where the mobile work activity is actively taking place. Potable water will be carried by the field team in the vehicle used for the project. Unless alternate requirements are stipulated in a plan supplement (i.e. Heat Injury and Illness Prevention Plan), permit or JSA, bottled or water coolers with potable water will be provided to project workers at 1 gallon/worker/day.

Safety Briefings

Arcadis will lead all safety briefings on this project and will document the safety briefing on a Tailgate Safety Briefing form or logbook. Safety briefings will be conducted once at the beginning of each work day unless the Site Safety Officer deems more frequent safety briefings will be required based on work being conducted. All project workers, including Arcadis subcontractors, will be required to attend the safety briefing. Site visitors and project workers not on duty during the morning safety briefing will receive the safety briefing upon their arrival onto the project site for the day.

Behavior Based Safety (BBS) Program

The CPM or APM is responsible for reviewing and establishing BBS goals for the project. These goals are summarized below.

TIP required at the following frequency on this project:

1 per task

Near Miss reporting goals for this project:

1 NM per event

Other (specify):

Safety Equipment and Supplies

Safety equipment/supply requirements are addressed in the JSA or Permit for the task being performed. If work is not performed under a JSA or Permit, the following safety equipment is required to be present on site in good condition (Check all that apply):

<input checked="" type="checkbox"/>	First aid kit	<input checked="" type="checkbox"/>	Insect repellent: <u>Deet 25%</u>
<input type="checkbox"/>	Bloodborne pathogens kit	<input checked="" type="checkbox"/>	Sunscreen
<input checked="" type="checkbox"/>	Fire extinguisher	<input type="checkbox"/>	Air horn
<input type="checkbox"/>	Eyewash (ANSI compliant)	<input checked="" type="checkbox"/>	Traffic cones
<input checked="" type="checkbox"/>	Eyewash (bottle)	<input type="checkbox"/>	2-way radios
<input checked="" type="checkbox"/>	Drinking water	<input type="checkbox"/>	Heat stress monitor
<input type="checkbox"/>	Other: _____	<input checked="" type="checkbox"/>	Poisonous plant pre/post exposure lotion/soap _____

Control of Ticks and Poisonous Plants

Work on this project has a low tick exposure hazard. Use of insect repellent (DEET and/or permethrin) is recommended. Wear light colored clothing to help identify presence of ticks on staff. Keep shirt tails inside pants.

Work on this project has a low poisonous plant exposure hazard. First aid kits should be equipped with post exposure soap as a precaution. Inspect work area for presence of hazard prior to initiating work at the location. Wear disposable gloves during work and while removing outer footwear.

International Travel

International travel is not required for this project.

Spill Control and Containment

Spill control and containment protocols, including required equipment and supplies, are located in the project work plan governing work on this project.

Signatures

I have read, understand and agree to abide by the requirements presented in this health and safety plan.
I understand that I have the absolute right to stop work if I recognize an unsafe condition affecting my work until corrected.

Printed Name	Signature	Date
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
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_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Add additional sheets if necessary

You have an absolute right to STOP WORK if unsafe conditions exist!

Attachments

APPENDIX A

Arcadis H&S Standards



Arcadis U.S. Health & Safety Standards

Document Number	Standard Name	Revision Number	Revision Date
NA	Field Health & Safety Handbook	NA	2014
ARC HSMS000	Arcadis U.S. Health & Safety Management System	5	1-Jul-14
ARC HSMS002	Hazard Identification, Risk Assessment and Risk Control	4	14-Sep-15
ARC HSMS008	Emergency Response and Fire Safety	3	7-Aug-18
ARC HSMS009	H&S Conformance Assessments	0	21-Oct-14
ARC HSMS010	Incident Reporting and Investigation	7	26-Apr-16
ARC HSMS011	Root Cause Analysis and Solutions Development	2	2-Dec-13
ARC HSMS012	OSHA Recordkeeping and Reporting	5	21-Apr-17
General H&S Procedures (GE)			
ARC HSGE001	Daily Tailgate Meeting	6	21-Sep-15
ARC HSGE004	First Aid/CPR/AED	9	16-Apr-18
ARC HSGE005	Bloodborne Pathogens	6	28-Feb-14
ARC HSGE007	Hazard Communication	5	27-May-16
ARC HSGE008	Illness and Injury Prevention Program	3	25-Jun-14
ARC HSGE009	Stop Work Authority	4	22-Oct-15
ARC HSGE010	Medical Surveillance	7	30-Jun-16
ARC HSGE011	Workstation Set-Up	7	13-Apr-18
ARC HSGE013	OSHA and Other Regulatory Agency Inspections	5	15-May-14
ARC HSGE015	Personal Protective Equipment	6	23-Jun-14
ARC HSGE017	Respiratory Protection	11	14-Oct-15
ARC HSGE019	Short Service Employee Program	2	30-Oct-17
ARC HSGE022	International Travel	3	24-Oct-17
ARC HSGE024	Motor Vehicle Safety Program	20	4-Oct-18
ARC HSGE025	Weapons in the Workplace	2	28-Apr-17
Industrial Hygiene (IH)			
ARC HSIH002	Asbestos	4	19-May-15
ARC HSIH003	Benzene	8	4-Sep-14
ARC HSIH004	Radiation Safety Program - Requirements for Conducting Work at Radiological Sites	0	22-Jan-15
ARC HSIH006	Cadmium	5	4-Aug-16
ARC HSIH007	Hydrogen Sulfide	4	13-Apr-12
ARC HSIH008	Hearing Conservation	8	20-Apr-17
ARC HSIH009	Industrial Hygiene Health & Safety	4	4-Apr-16
ARC HSIH010	Lead	7	18-May-15
ARC HSIH011	Radiation - Sealed Source Instrument	5	5-Oct-14

Arcadis U.S. Health & Safety Standards

Document Number	Standard Name	Revision Number	Revision Date
ARC HSIH012	Respirable Crystalline Silica	2	13-Nov-17
ARC HSIH013	Heat Stress	7	15-Mar-17
ARC HSIH014	Cold Stress	2	3-Feb-15
Field Safety (FS)			
ARC HSFS001	Specialty Vehicle Safety (All-Terrain Vehicles, Utility Task Vehicles and Snowmobiles)	1	21-Nov-16
ARC HSFS002	Water Safety and Boating Operations	2	5-Jan-18
ARC HSFS003	Confined Space	15	7-May-18
ARC HSFS004	Control of Hazardous Energy (Lockout/Tagout)	13	29-Sep-16
ARC HSFS006	Electrical Safety	15	16-Jul-18
ARC HSFS007	Elevated Work and Fall Protection	4	16-Feb-18
ARC HSFS010	Health & Safety Plans	9	16-Aug-18
ARC HSFS012	Hazardous Waste Operations and Emergency Response	4	15-Aug-13
ARC HSFS014	Process Safety Management	2	24-Aug-17
ARC HSFS015	Scaffolds	5	16-Feb-18
ARC HSFS016	Ladders	3	5-Oct-14
ARC HSFS017	Aerial Work Platforms	3	21-Jan-15
ARC HSFS019	Utility Location Procedures	16	17-Mar-17
Construction Safety (CS)			
ARC HSCS003	Hoisting, Rigging and Other Lifting (Cranes, Derricks, Hoists, Elevators and Conveyors)	3	26-Jul-16
ARC HSCS005	Excavation and Trenching	9	23-Feb-15
ARC HSCS006	Heavy and Mechanized Equipment	4	2-Mar-18
ARC HSCS013	Hot Work (Including Welding and Cutting)	4	26-Sep-13
Special Work Areas (SP)			
ARC HSSP002	Railroad Workplace	7	12-Jul-16
ARC HSSP006	Powered Industrial Trucks (Forklifts)	2	26-Mar-14

APPENDIX B

Northrop Grumman

H&S Standards




Appendix B

Current Northrop Grumman

H&S Protocols

- K0-0602.04 Aerospace
System Sector Work
Instruction for Contractor
EHS Management
- K212 Corporate Procedure
– Contractor EHS Program
- K0-F042 Contractor EHS
Rules Acknowledgement
- K0-F043 Contractor Project
Specific Hazard Review
- K20F006 Contractor's EHS
Qualification Questionnaire


	PA NO.	DOCUMENT NO.
	10.01.02	K0-0602.04
	Aerospace Systems Sector Work Instruction	
SUBJECT:	CONTRACTOR ENVIRONMENTAL, SAFETY AND HEALTH MANAGEMENT	
	PAGE	1 of 6
	DATE	31 August 2015

Process Architecture	10.01.02 Provide Safety and Health Programs
Supersedes	K0-0602.04 dated 08/29/12
Document Owner	Manager – Environmental, Safety, Health & Medical (ESH&M) – Bethpage
Applies To	Bethpage Site
Scope	<p>This work instruction is also applicable to personnel working on Northrop Grumman property who are not Northrop Grumman employees. Throughout this document, references are made to “contractors,” however, the requirements stated herein also apply to other non-company persons who reside at the site and whose activities are not under the direct supervision of Northrop Grumman.</p>
Purpose	<p>This work instruction sets forth requirements and responsibilities for a contractor environmental, health, and safety (EHS) program as described in Northrop Grumman Corporate Procedure (CO) K212, Contractor Environmental, Health, and Safety Program. This work instruction also ensures that any contractor whose work is on-site is competent to perform such work on the basis of appropriate education, training or experience. Finally, this work instruction ensures that the Environmental, Safety and Health Policy (K0-101) has been communicated to all employees of on-site contractors and their subcontractors working for or on behalf of Northrop Grumman.</p>

General Information

Acronyms	APA	Advance Procurement Authorization
	BOA	Basic Order of Agreement
	ESH&M	Environmental, Safety, Health & Medical
	RFP	Request for Proposal
	RFQ	Request for Quote
	SDS	Safety Data Sheet
	SOW	Statement of Work

Three year review. No changes necessary.

	PA NO. 10.01.02	DOCUMENT NO. K0-0602.04
	PAGE 2 of 6	DATE 31 August 2015

General Information (Continued)

Definitions

On-Site Contractor or Subcontractor: Any firm or person other than a Northrop Grumman employee or contract laborer (job shop personnel) who performs facility construction or maintenance services or other activity on-site with the potential to affect safety and/or health or the potential to cause a significant environmental impact(s).

Project Manager: The Northrop Grumman employee on-site responsible for coordinating tasks and overseeing completion of a project or process.

Overview

The Northrop Grumman Bethpage site operates a comprehensive contractor management program in order to help ensure work performed by contractors is performed in accordance with our occupational safety and environmental management systems.

The program consists of the following elements:


- Approved On-Site Contractors List
- Pre-Bid Meetings
- Requirements for Contractor Personnel
- Environmental, Safety and Health Rules and Policy
- Auditing by the ESH&M department

The program is administered by the ESH&M department with the assistance of Facilities, Procurement, Security, and Project Managers.

Approved On-Site Contractors List

Bids for the performance of work covered by this work instruction are typically only accepted from companies on the Approved On-Site Contractors List. This list is maintained by ESH&M and used by the Procurement department. It is the responsibility of each company desiring to work on this site to complete the steps necessary to be recognized, and to maintain recognition, on the Approved On-Site Contractors List. It is also the responsibility of each company to ensure that any subcontractors included in their proposals for work covered under this work instruction are recognized on the Approved On-Site Contractors List.

Companies wishing to be recognized on the Approved On-Site Contractors List must complete and submit Form [K2-F006](#), Contractor's Environmental, Safety & Health Qualification Questionnaire, with all attachments.

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General Information (Continued)

Approved On-Site Contractors List (Continued)

The questionnaire is evaluated by the ESH&M department, and includes analysis of the following contractor data:

- Workers' Compensation Experience Modification Rate (EMR)
- Total Case Incident Rate (TCIR)
- Days Away, Restricted and Transferred Case Rate (DART)

A contractor is approved or rejected based on the review by the ESH&M department. Approved companies are placed on the Approved On-Site Contractors List. Rejected companies are eligible to reapply in 12 months.

Any company not responding to the annual update is removed from the Responsible Bidders List. Each response is reviewed by the ESH&M department for continued inclusion on the Approved On-Site Contractors List.

Pre-Bid Meetings

Procurement invites selected companies from the Approved On-Site Contractors List to a pre-bid meeting. (New bidders are informed of this procedure in order to qualify for the Approved On-Site Contractors List.) Attendance at the pre-bid meeting is mandatory and is attended by all potential contractors, Security, Facilities, Procurement, ESH&M and the Project Manager. Various aspects of the proposed scope of work are discussed at the pre-bid meeting, including but not limited to, site security requirements, transportation issues, insurance requirements, environmental requirements relative to Bethpage's ISO 14001 Environmental Management System, and project-specific Safety and Health issues. ESH&M identifies all environmental, safety and health procedures, programs, records, and documents that must accompany each bidder's proposal. Failure to submit the requested information may result in disqualification of the bid package.


Responsibilities

Procurement

Provides the on-site contractor (as defined above) with appropriate documentation for completion.

Alerts the on-site contractor that failure to comply with contractual safety, health, and environmental management system requirements could result in termination of work, removal of their firm and/or sub-contractors from the premises and possible preclusion from bidding on future work.

Invites a representative of the ESH&M department to a Pre-Bid, Pre-Award Technical Review and/or Pre-Construction Meeting.

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Responsibilities (Continued)

Procurement (Continued)

When applicable to requisition, Basic Order of Agreement (BOA) or Purchase Request, forwards on-site contractor's completed Form [K2-F006](#), and Form [K0-F043](#), Contractor Project Specific Hazard Review, to ESH&M for review and comment.

Obtains ESH&M concurrence prior to awarding the contract and later scope of work changes.

Project Manager/ Requester

Serves as the single point of contact between ESH&M and Procurement for any facility construction/maintenance activity issues that need consideration or resolution.

Ensures that an ESH&M, Procurement, and Security representative are invited to all pre-construction meetings.

Periodically monitors on-site contractor's compliance with [K0-F042](#), Contractor Environmental, Safety and Health Rules Acknowledgement, and reports non-compliance.

Environmental, Safety, Health & Medical (ESH&M)

Reviews the potential safety and health impact of planned construction activities on the job site and adjacent areas. Specifies preventive or mitigative measures, as applicable.

Reviews Form [K0-F043](#), Contractor Project Specific Hazard Review, to ensure that it addresses all requirements.

Reviews Form [K2-F006](#), Contractor's Environmental, Safety & Health Qualification Questionnaire.

Ensures that the on-site contractor has satisfactory safety and health performance records.


Reviews the on-site contractor employee training/certification records.

Reviews and pre-approves the on-site contractor's Safety Data Sheets (SDSs).

Maintains the Approved On-Site Contractors List.

Periodically monitors on-site contractor's safety and health and environmental performance and reports any problems to the Facilities Engineering/Maintenance or Project Manager.

Holds periodic meetings to discuss and resolve safety, health or environmental issues, as required.


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Procedure

Contractor Environmental, Safety, and Health Management

NOTE: This process incorporates ESH&M requirements into Advanced Procurement Authorizations (APAs), Purchase Orders, Change Orders, Basic Order of Agreements (BOAs) and other Procurement methods

Responsible Party	Step	Action
Project Manager/ Requester	1	Coordinate and provide a Statement of Work (SOW) to Environmental, Safety, Health & Medical (ESH&M) prior to requesting the service when the proposed requirements have the potential to impact employee health and safety and/or create significant environmental impacts.
Environmental, Safety, Health & Medical	2	Review requisitions and any accompanying SOW and applicable data.
Procurement	3	As part of the Request for Quote (RFQ) or Request for Proposal (RFP) package, provide the contractor the following for their completion: <ul style="list-style-type: none"> Form K2-F006, Contractor's Environmental, Safety & Health Qualification Questionnaire. Form K0-F042, Contractor Environmental, Safety and Health Rules Acknowledgement.
	4	Schedule a Pre-bid/Walk-thru meeting as necessary.
	5	Return copies of the completed forms to Environmental, Safety, Health & Medical (ESH&M) for review and approval.
ESH&M	6	Review Form K2-F006 in accordance with this procedure. 6.1 Review Form K0-F042 .
	7	Note appropriate status and sign Form K2-F006 .
Procurement	8	Inform on-site contractor of decision and requirements as necessary. 8.1 Send Form K0-F043 to chosen contractor for their completion; schedule a pre-award meeting and issue the contract.


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Contractor Environmental, Safety and Health Management (Continued)

Responsible Party	Step	Action
Project Manager / Requester	9	Schedule a pre-construction meeting inviting Procurement, Facilities, ESH&M and Security.
	10	Conduct periodic inspection of contractor operations on-site.
ESH&M	11	At the Pre-Construction meeting, review with the contractor the Contractor Environmental, Safety and Health Rules.
	12	Review the completed Form K0-F043 and associated submissions (SDS, training records, etc.).
	13	Conduct periodic inspection of contractor operations on-site.

References

Corporate	CO K212	Contractor Environmental, Health, and Safety Program
Sector	K0-101	Environmental, Safety & Health (ESH)
Other	ISO 14001	Environmental Management System
Forms	K0-F042	Contractor Environmental, Safety & Health Rules Acknowledgement
	K0-F043	Contractor Project Specific Hazard Review
	K2-F006	Contractor's Environmental, Safety & Health Qualification Questionnaire

	CO NO.	K212
	PAGE	1 of 6
<p align="center">CORPORATE PROCEDURE</p> <p>Subject: CONTRACTOR ENVIRONMENTAL, HEALTH, AND SAFETY PROGRAM</p> <p align="center">AUTHORIZED DOCUMENTS ARE PUBLISHED ONLINE ONLY. VERIFY ANY COPY AGAINST THE ONLINE SYSTEM BEFORE USE.</p>	DATE	25 May 2012
	SUPERSEDES	See below
	REVISION	New

Supersedes CTM No. K100, Section 2-11, Contractor Environmental, Health, and Safety Program, dated 26 August 2011

Process Owner Primary Responsibility – Director of Environmental, Health, and Safety

Functional Responsibility – Director of Environmental, Health, and Safety

Authorization of Currency and Accuracy This procedure is authorized by the Process Owner on **25 May 2012** for a period of three years from this date. At the end of this period, this procedure must be reauthorized by the Process Owner in accordance with [CO No. A101](#), Northrop Grumman Command Media System. Revisions published in the interim may not necessarily satisfy this requirement.

Purpose This document sets forth the requirements and responsibilities for a contractor environmental, health, and safety (EHS) safety program.

Definitions This section defines acronyms and/or terminology used in this procedure.

Acronym or Term	Definition
Contractor	<p>Any company or individual worker that provides services to Northrop Grumman but is not under the direct supervision of a Northrop Grumman manager, supervisor, or lead. Examples include the following:</p> <ul style="list-style-type: none"> • Major and minor renovation and construction • Computer and copier service • Food vendor • Delivery company • Job shoppers • Minor facility or vehicle maintenance • Security protection • Fire fighting and emergency response <p>See CO No. H113, Contract Labor, for more information.</p>

Continued on next page

Definitions (continued)

Acronym or Term	Definition
EHS	Environmental, Health, and Safety
MSDS	Material Safety Data Sheet

General

Northrop Grumman requires all contractors to comply with all federal, state, and local EHS laws and regulations applicable to work on Northrop Grumman-owned and -leased properties through the imposition and enforcement of appropriate contract terms and provisions.

Contractors working on Northrop Grumman-owned or -leased facilities have an obligation to comply with all federal, state, and local laws and regulations applicable to the work being performed.

Contractors must also be apprised of site-specific health and safety requirements for the mutual protection of contractors, employees, and property.

Northrop Grumman retains the right to notify the contractor of any potential failure to comply with a health or safety requirement. Note: This function is normally performed through the Contracts Administrator.

**Contractor
Responsibilities**

Cognizant Northrop Grumman personnel are required to apprise all contractors of their responsibilities, including, but not limited to the following. Contractors must:

- Make available plans; specifications; work schedules; and environmental, health and safety programs relevant to the project when requested by a Northrop Grumman EHS representative. Note: Northrop Grumman reserves the right to retain copies of such documents for reference during the contracting period.
- Provide an accurate record of all accidents resulting in death, traumatic injury, occupational disease, or damage to property to the Northrop Grumman Contracts Administrator.

Continued on next page

**Contractor
Responsibilities
(continued)**

- Immediately inform the Northrop Grumman Contracts Administrator upon receipt of any notice of violation, notice to comply, citation, or other enforcement document received from any regulatory agency related to their work at Northrop Grumman.
- Ensure all material delivered by the contractor; its subcontractors; or the servants, agents, or employees for use in the performance of any or all work on Northrop Grumman premises complies with the applicable requirements of the federal and/or state Occupational Safety and Health standards.
- Provide MSDSs to Northrop Grumman for chemicals intended for use on Northrop Grumman premises that are not already approved by the site.
- Take immediate action upon identification of any health or safety issue that affects Northrop Grumman personnel or property or could result in an injury or illness to any worker. Note: In the event that the contractor fails to do so, the Northrop Grumman Contracts Administrator must issue an order stopping the work until the issue is corrected.
- Maintain a file with copies of all EHS-related documents, records, notices, etc. generated prior to and during the project and provide a copy of this file to Northrop Grumman upon completion of the project, if requested.
- Ensure that contracted employees:
 - Show accurate and current documentation of completion of all applicable federal and/or state EHS training required for the job, i.e., hazardous material training, respirator training, confined space training, etc., prior to work being performed on Northrop Grumman property.
 - Complete site-specific EHS orientation training for the work to be performed on Northrop Grumman property prior to the commencement of any work. Note: The orientation is to apprise workers of Northrop Grumman policies and procedures including emergency procedures. The orientation may be accomplished by use of a locally developed contractor EHS video or brochure.

Continued on next page

**Sector and
Sector Business
Area/Site
Contracts
Administrator
Responsibilities**

Incorporate contractor EHS responsibilities and requirements into applicable contract documents requiring the contractor to:

- Provide all necessary equipment, tools, personnel, etc., to meet contractual obligations, including equipment needed to comply with federal, state, or local EHS regulations.
- Perform the work in strict accordance with all applicable municipal, state, or other government codes governing the particular trade and in accordance with applicable safe practices outlined in the current edition of the National Electric Code and other building and fire codes.
- Be responsible for compliance to all EHS requirements by subcontractors employed by the contractor.
- Notify the site EHS representative of all awarded contracts and orientation training requirements.

**Corporate EHS
Office
Responsibilities**

Periodically review the company's contractor EHS program and make modifications as warranted, e.g., due to changes in laws or regulations.

**Sector and
Sector Business
Area/Site
Responsibilities**

Develop and implement a written contractor EHS program and/or procedure that identifies relevant requirements and responsibilities pertaining to contractor EHS management, and ensure that individuals responsible for implementing the requirements are cognizant of their responsibilities.

When notified and/or requested by the site Contracts manager concerning contract awards and prior to the commencement of work onsite, perform the following, as applicable to the work being performed:

- Provide site EHS awareness training to the contractor, including review of site requirements and contractor EHS information.
- Inform the contractor of relevant site EHS requirements, which may include, but is not limited to, the following:
 - construction or work-site layout
 - housekeeping during the course of the project and/or work assignment
 - fire safety, especially where and how to obtain “hot work” permits when required

**Sector and
Sector Business
Area/Site
Responsibilities
(continued)**

- personal protective equipment required to be worn on the site
 - barricades that are needed or to be used with the proposed location
 - compressed gas cylinder handling, storage, filling, and disposal
 - radiation and unusual hazards
 - rigging and hoisting equipment
 - electrical safety to include lockout/tagout requirements
 - confined space entry requirements and special equipment
 - inspection programs
 - additional protection for Northrop Grumman personnel and property, and protection of properties adjoining Northrop Grumman
 - first-aid facilities in the local area
 - sanitation while performing work and at the work site
 - contractor requirements under the chemical approval process
-
- Obtain and review information, as appropriate, concerning the contractor's EHS programs applicable to the planned work on site that could potentially affect Northrop Grumman employees, including MSDSs.

Conduct periodic onsite inspections of contractors' operations including temporary offices, storage areas, and work areas to ensure that contractors adhere to applicable EHS regulations and Northrop Grumman EHS procedures.

Monitor the EHS performance of approved Northrop Grumman contractors, including a review of applicable accident/injury records, federal Occupational Safety and Health Administration 300 logs, and other relevant information. Note: This may be accomplished by periodically selecting contractors for such reviews on a random or other basis, for example.

Immediately inform the corporate EHS office of any Notices of Violation or other regulatory citations received by contractors while on Northrop Grumman owned or leased properties, and of any company or contractor fatalities or hospitalization resulting from contractor work. See [CO No. K204](#), Regulatory Agency Actions Related to EHS Noncompliance, for more information.

Continued on next page

References

Policies

None

Procedures

[CO No. A101](#), Northrop Grumman Command Media System

[CO No. H113](#), Contract Labor

[CO No. K204](#), Regulatory Agency Actions Related to EHS Noncompliance

Topical Manuals

None

Work Instructions

None

Forms/Checklists

None

Other

[CC No. 17](#), Environmental, Health, and Safety Leadership Council

Feedback

Have feedback or suggested change regarding this procedure or a form?

[Click here.](#)

Issued by: Corporate Command Media

OVERVIEW

Applicability

The Environmental, Safety, and Health (ESH) requirements stated in this document apply to personnel working for Northrop Grumman Aerospace Systems (NGAS).

Purpose

This document is in compliance with our Corporate EHS Management Procedure, CO K212, Contractor Environmental, Health and Safety Program, and provides the means to partner with our customers, suppliers and contractors in achieving our commitments to our Environmental, Safety, and Health Policy.

The management and personnel of this site are committed to protecting the environment and the health and safety of our employees, customers, contractors, visitors, and the public. Meeting this commitment is a primary management objective and the individual and collective responsibility of all site employees. Our Environmental, Safety and Health Policy Statement is as follows:

Northrop Grumman, Aerospace Systems is committed to:

- ***Full compliance with environmental, safety & health laws and regulations***
- ***Providing a safe and healthful workplace***
- ***Pollution prevention***
- ***Continual improvement***
- ***Satisfaction of customer and community requirements.***

The NGAS Bethpage site is a demonstration of these values as we are certified to the international standard, ISO 14001, for Environmental Management Systems.

Your role in our ESH program is to perform your work in a safe and environmentally acceptable manner and comply with all applicable legal requirements. These include regulations and national consensus standards established by the Occupational Safety and Health Administration (OSHA), the Environmental Protection Agency (EPA), National Electrical Code (NEC), National Fire Prevention Association (NFPA) standards, local codes, rules and regulations listed in this document. Failure to comply with all applicable requirements may lead to expulsion from the facility and termination of existing and future contracts with NGAS.

APPROACH

Contractor Safety Program

NGAS expects our contractors to have an effective and comprehensive safety program that protects their personnel as well as NGAS employees and others within our facilities. To ensure this protection, safety considerations are taken into account prior to selecting contractors and to their performance while on-site.

The Bethpage site is currently registered to the ISO 14001 environmental management standard. To ensure that this certification is obtained and maintained, on-site contractors working on the behalf of NGAS are required to support us fully. To that end, the following is required:

1. Certification by the Owner of the Company (or his/her representative) that all company employees working at the Bethpage facility who have the potential to cause a significant environmental impact(s) have received communication of the Environmental, Safety and Health Policy.
2. Certification by the Owner of the Company (or their representative) that all employees working on-site at the Bethpage facility who have the potential to cause a significant environmental impact(s) have been advised of the following:
 - The importance of adherence to the site's environmental, safety and health policy and these ESH site requirements,
 - The significant environmental aspects and related actual or potential impacts associated with their work and the environmental benefits of improved personal performance.
 - The potential consequences of departure from specified procedures.

CONTRACTOR ENVIRONMENTAL, SAFETY AND HEALTH RULES ACKNOWLEDGEMENT

3. Certification by the Owner of the Company (or his/her representative) that all employees working at the Bethpage facility who have the potential to cause a significant environmental impact(s) are sufficiently competent to avoid them based on appropriate education, training or experience.

Certification signature will be required on Form K2-F006, Contractor's Environmental, Safety & Health Qualification Questionnaire.

Contractor Acknowledgement

All contractor representatives and their employees will receive a copy of these rules prior to working onsite and will acknowledge receipt and understanding of its rules by signing and returning Form K0-F042, Contractor Environmental, Safety and Health Rules Acknowledgement.

GENERAL RULES

Smoke-Free

All NGAS facilities are smoke-free and smoking is prohibited inside any building and outside wherever no smoking signs are posted or within 20 feet outside of the entrance doors. Designated smoking areas are provided to employees and visitors in marked locations.

Company EHS Inspections

The ESHM organization, Project Manager or Security may inspect the contractor's job site to ensure compliance with these rules or other ESH rules and regulations.

NGAS will stop work in situations that may pose imminent harm to the health or safety of any person or the loss of or damage to property.

Contractor EHS Inspections

Contractors are responsible for conducting inspections of their work areas during and at the end of each workday to ensure compliance with ESH requirements. When infractions are found they should be corrected immediately. Infractions of a serious nature that can impact NGAS employees or operations must be immediately brought to the Project Manager's attention.

EHS Training

Prior to working on NGAS property, Contractor's employees must receive the applicable federal and or state ESH training required for the tasks being performed. This includes hazard communication, confined space entry, and respirator use training. Training records must be made available to the Project Manager and/or ESHM if requested.

Tools & Equipment

On-site contractors, subcontractors and representatives are required to furnish their employees with tools and equipment that are in good condition and meet applicable safety standards. Northrop Grumman tools and equipment (including ladders) are not to be used by on-site contractors, subcontractors or representatives.

On-site contractors, subcontractors, and representatives must:

- Use electric tools that are double insulated or grounded with three-wire plugs.
- Use GFCIs with any electrically operated tools or equipment in wet and/or conductive locations.
- Comply with the latest National Electrical Code and OSHA requirements for use of tools on site.

Housekeeping & Movement of Materials

During daily work activities, contractors must:

- Maintain a clear, fire-safe area.
- Supply dumpsters, gondolas, or any other container required to collect and remove waste from the site.

CONTRACTOR ENVIRONMENTAL, SAFETY AND HEALTH RULES ACKNOWLEDGEMENT

- Place trash in containers and empty containers.
- Place rubbish in designated trash containers
- Separate regular trash from hazardous wastes (See “Construction Waste” below).
- At the end of the workday, leave work areas clean and remove all materials, tools, equipment, or other obstructions from aisles, exits, or roadways.
- Do not bring construction materials in through lobbies. Make arrangements with the Project Manager for the delivery of materials to one of the docks or other location.

Construction Waste

Prior to acceptance of project completion, contractors must:

- Repair all damaged property.
- Remove all waste and rubbish caused or generated by the construction at the Bethpage location, unless the Project Manager has made other arrangements.
- The disposal of hazardous waste generated by the contractors must be coordinated through the Project Manager and ESHM.
- Never discard chemical wastes, such as solvents or chemicals, into sinks, drains, dumpsters, or on the ground.
- Remove chemical waste from the site in accordance with all federal, state and local regulations.
- Scrap Metals (aluminum, steel, copper, brass and wire) are reclaimed. Contractors will coordinate with the Project Manager to dispose of large scrap metal items in recycling bins located at the Building 14 facility, provided these items are devoid of hazardous contaminants. Scrap metal having little reclaimable value, or which requires extensive clean up, are disposed with normal trash.

SECURITY

Building Access

NGAS is a secure facility that limits access to buildings using a badge system. Prior to entry, contractors must declare their citizenship, and provide valid photo identification (driver license).

Restricted Items

The following items are prohibited on NGAS property:

- Drugs, alcohol and weapons.
- Cameras, recording devices, radios and computers, unless the Project Manager has received approval from Security.

In addition, all types of transmitting or recording devices, such as camera phones are restricted and their transmitting or recording functions cannot be activated within certain areas of the facility.

The company retains the right to inspect all materials entering and leaving the facility.

Roof Access

General roof access is restricted; you must contact the Project Manager prior to performing any work on the roof.

Important Note: Because of testing being conducted on the rooftop over Building 14, access to this area is controlled. Access requires notification to Facilities (516-346-6632).

Notify the Project Manager immediately if any roofing system is damaged either preexisting to your work or occurring during the course of your work.

Traffic and Parking

Site traffic and parking are carefully controlled; the Project Manager will provide direction to acceptable parking areas. Contractors must adhere to the following:

- Do not park in reserved, visitor, or restricted areas.
- Do not park in places that block the passage of emergency vehicles or block access to fire hydrants and other emergency equipment.
- Observe speed limits and traffic signs.
- Secure loads to prevent accidents.

EMERGENCIES

Public Address System

Our site can utilize the public address system to provide emergency information to employees and visitors. During an emergency, contractors and visitors need to follow the information provided over the public address system.

Emergency Systems

Contractors are prohibited from working on or disconnecting any of the following emergency systems without prior approval of the Project Manager:

- Paging system wiring or components,
- Telephone system wiring or components,
- Alarm system wiring or components,
- High Voltage disconnect systems or components,
- Fire protection systems or components.

External Assistance for Serious Emergencies

Contractors are required to report emergencies that may impact the safety of themselves and others. For serious emergencies, dial 5-3333 from any phone within our facilities for the police, paramedics, and/or fire department.

Internal Assistance for Less Serious Emergencies

For less serious emergencies, you may report the emergency to your Northrop Grumman contact.

Other NG organizations that can be directly called for assistance are:

- **346-6632** – Facilities/Maintenance for facility upsets involving plumbing, electrical, heating, ventilation and air conditioning, etc.
- **575-6789** – ESHM for chemical spills and other unsafe conditions.

Note: The 5-3333 emergency number is posted on every site phone.

Reporting Accidents & Injuries

Contractors are required to report all accidents and injuries occurring on NGAS property to ESHM, extension 5-6789.

First Aid

For serious injuries, Security (x5-3333) will assist contractors to gain appropriate medical assistance from paramedics.

FIRE PREVENTION

Fire Prevention Practices

The contractor will follow basic fire prevention to ensure the safety of personnel. All chemicals and flammable liquids must be stored in containers that clearly label the contents and potential hazards.

If a water supply is needed, do not use fire hydrants. Arrange for the use of domestic water taps with the Project Manager.

Fire Extinguishers

NGAS provides fire extinguishers throughout its facilities for the voluntary use by employees and visitors.

Do not use a fire extinguisher if you are not familiar with its operation or trained in its use. This may place you in greater danger.

Roofing

Roofing contractors using tar pots must:

- Attend to these pots while they are in use.
- Keep tar pots as far away from buildings as possible.
- Keep a carbon dioxide or dry-chemical fire extinguisher readily available.

Hot Work

On-site contractors shall obtain a Hot Work Permit from the Northrop Grumman Security department (575-3895) before performing any welding, cutting, brazing or soldering work or any work that may produce sparks.

The permit is valid for only one day and for use only in the area specified in the permit. The permit must be renewed daily unless conditions change, in which case the work should cease, and the permit should be reissued. A Security department representative will accompany the contractor to the job site and assess hot work-related site hazards.

The Hot Work Permit requires the on-site contractor, subcontractor or representative to maintain a fire watch for the duration of the hot work tasks and for 30 minutes after the work is completed. The person performing the fire watch must be equipped with a fire extinguisher rated for the type of hazard at the work site, trained in its proper operation and be aware of the location of the nearest fire alarm. If a fire does start, the fire watch must immediately notify Security by calling **575-3333** and leave the area. **DO NOT CALL 911**. On-site contractor, subcontractor or representative employees may attempt to extinguish the fire with the appropriate fire extinguisher, provided there is no risk of injury, and they are trained and capable of operating the extinguisher safely and effectively.

Welding

In addition to the above hot work rules, welding requires the following additional precautions:

- Wear proper eye protection and protective clothing (welders and helpers).
- Keep gas cylinders securely chained in an upright position.
- Shield employees from arc rays and sparks.
- Do not cut or weld in areas where vapors are present from flammable liquids and gases, or vapor degreasers.
- Do not cut or weld metals coated with or containing zinc, lead, beryllium, magnesium, or cadmium without special ventilation and the prior approval of the Project Manager and ESHM.
- Use flame retardant welding tarps to cover machinery and furnishings in the welding area so that sparks and hot metal do not fall on them.

SAFETY

Compressed Gas Cylinders

Compressed gas bottles are to be secured in an upright position at all times. Bottles shall be secured at approximately two thirds their height. Gas bottles shall have either the original cap in place or shall be fitted with a regulator. Compressed gas bottles must be labeled as to their contents.

Personal Protective Equipment (PPE)

Contractors are responsible for complying with all PPE requirements, providing their employees with the appropriate PPE, and making sure that the PPE is in good condition and used properly. Appropriate protective clothing and devices, such as hard hats and those for hearing, eye, face, hand, body, foot, and respiratory protection are to be worn when the job requires them or when required by signs posted in the work area.

Fall protection systems must be used when working at heights greater than 6 feet, where guardrails or other passive restraints are not available. Ladders are exempt from this requirement.

The contractor will follow basic equipment safety rules, including the following:

- Read and obey all signs, labels, danger notices, and other warning devices
- Never remove warnings without proper authorization.
- Do not activate equipment with STOP, UNSAFE, DANGER or LOCKOUT/TAGOUT tags or other warnings. These tags indicate that the equipment is unsafe or under repair and must not be used.
- Do not make unauthorized repairs to NGAS equipment.
- Do not remove or tamper with machine guards, interlocks or other safety devices. If they are not functioning properly, notify the Project Manager immediately.

Chemical and Material Approval Requirements

All chemicals (e.g., fuels, paints, primers, sealants, solvents, refrigerants, welding rods, etc.) that the on-site contractor will be using on the facility must be reviewed and approved by the Bethpage site ESHM department before they are brought on the site. Two weeks prior to beginning work, Material Safety Data Sheets (MSDS) for all chemicals and hazardous materials required for performance of the contract must be submitted to ESHM. Only those chemicals allowed on site by ESHM can be used by the on-site contractor for the performance of the work. This requirement is mandatory.

No polychlorinated biphenyl (PCB), asbestos or chlorofluorocarbon (CFC) materials will be allowed on site.

Flammable chemicals must be stored in "Safety Cans." Open, unattended containers of chemicals are prohibited. At the end of each working day, all chemicals must be tightly sealed and placed into a safe storage area.

Lockout/Tagout

Contractors are required to have their own lockout/tagout procedure that complies with the OSHA standard and is comparable to our site process. Variation between procedures must be reconciled with ESHM before lockout/tagout is used.

Contractors must ensure that their employees are trained in the proper lockout/tagout procedures, including the prohibition against tampering with energy isolation devices. ESHM may require a copy of the contractor's procedure and proof of training.

The contractor is required to provide the Project Manager with all lockout/ tagout information for all new or relocated equipment installed. This information should be presented in a legible format within 24 hours of final hook-up.

Barricades and Warnings

The contractor will provide and maintain barricades and warning signs where needed to protect personnel, unless pre-arrangements have been made with the Project Manager, and must abide by the following:

- Post construction area warning signs at all construction sites.
- Use warning signs and barricades for the temporary storage of materials or for all work done in the hallways.
- Coordinate all work in hallways to minimize disruption and maintain adequate exit ways.
- Use barricades for any work that might expose personnel to unsafe conditions, including open electrical boxes or live conductors.

Notify the Project Manager when the proposed work might:

- Disrupt the productivity of others.
- Present an ESH concern to other personnel.
- Require employees to be relocated.

These conditions may require the contracted work be rescheduled to off hours.

Rigging and Hoisting Equipment

All mobile crane operations on the Bethpage site must comply with the New York State Department of Labor Code Rule 23, Section 8 regulations.

Crane monthly inspection records must be provided for review by the Bethpage site ESH&M department prior to using the crane.

All mobile cranes having a manufacturer's maximum rate capacity exceeding five tons or a boom exceeding forty feet in length must provide a copy of the crane operator's New York State Department of Labor, Certificate of Competence for review by the ESH&M department prior to using the crane.

All hoisting equipment, to include suspended scaffolds and support rigging, must have a minimum 4:1 Safety Factor. The hoist/scaffold and all slings, cables, shackles, etc. shall be annually load tested to a minimum 2.0 times the maximum total load to be hoisted.

The hoisting area must be roped off or adequately barricaded and signs installed to keep personnel and equipment out of the hazardous area. Spreader bars will be used wherever necessary to prevent hoisting cables from contacting equipment.

Hard-hats are required within a 20 foot radius of an operating crane or suspended load.

Working under suspended loads is prohibited.

No lifting is permitted if a thunder storm or lightening is within 20 miles.

Electrical Safety

The contractor will not work on live electrical circuits except for the following:

- The contractor has received prior approval from the Project Manager,
- Operations require energized equipment,
- Shutting off the power will introduce additional hazards,
- Qualified contractor personnel who have been trained to use "energized work safe practices" are performing the work on live circuits.

Painting Activities

All personnel using paints and associated products shall be familiar with the product's Material Safety Data Sheets (MSDS). The on-site contractor must provide documentation showing that their personnel have received Hazard Communication training in accordance with OSHA 29 CFR 1910.1200.

The on-site contractor shall provide respiratory protection equipment to their personnel for paint products requiring such protection. The on-site contractor's respiratory protection program shall meet the requirements of OSHA 29 CFR 1910.134.

All paints shall be used in accordance with the manufacturer's directions. Personnel applying paints shall observe the safety instructions printed on the product's label.

Use of flammable products, such as thinners and paints, within buildings is prohibited unless prior concurrence is obtained from ESHM.

Paints shall be applied in areas of sufficient ventilation. Doors, windows and other sources of outside ventilation shall be used if possible. Spray application of paint and paint products requires the prior approval of the Bethpage site ESH&M department (575-6789).

Consideration to performing painting activities during off-shift should be considered in order to prevent the creation of vapors within building interiors. Securing of nearby building air inlets should be considered for outdoor applications.

FACILITY HAZARDS

General

The major hazards associated with our facilities are listed below. Be aware that our facilities are undergoing continual changes; therefore, NGAS cannot guarantee that all hazards are identified below. Please ask questions and use caution when working in any area.

Process Chemicals and Equipment

A variety of chemicals are used throughout our facilities. Contractors should verify with the Project Manager what chemicals they may encounter in their expected work areas. This includes any process equipment and their exhaust systems.

Process Piping

Be cautious when disturbing any process piping running throughout our facilities. Various process piping that may be encountered include:

- Compressed air.
- Inert gasses that could cause suffocation (argon, carbon dioxide, nitrogen, helium).
- Flammable/explosive hydrogen or natural gas.
- City and de-ionized water.

Contact the Project Manager before disturbing or working on any process piping.

Asbestos Containing Material (ACM)

Some buildings at the Bethpage site contain asbestos. Contractors performing asbestos abatement activities shall comply with all federal regulations and New York State Code Rule 56.

Contractors that are not remediating asbestos, but who are working in areas containing asbestos, shall be advised of its presence at the Facilities / ESHM pre-construction meeting.

It is expected that asbestos-containing materials will be identified prior to the start of the project. However, as a precaution, the on-site contractor should be alert to materials that could contain asbestos. Some examples of more common asbestos-containing materials are thermal insulation on piping, ducts and equipment; floor tile; roofing; gasket material; electrical wire insulation; and Spackle for sheet rock and/or other surfacing materials.

CONTRACTOR ENVIRONMENTAL, SAFETY AND HEALTH RULES ACKNOWLEDGEMENT

If a suspect material has not been positively identified, and the material will be or may be disturbed during the course of construction, the on-site contractor, subcontractor or representative must cease work immediately and notify the Northrop Grumman Project Manager.

Lead Paint

Some buildings at the Bethpage site have lead paint. On-site contractors which are performing lead paint abatement activities shall comply with all federal and New York State regulations.

On-site contractors not performing a lead abatement, but working in areas containing lead paint, shall be informed and briefed at the pre-construction meeting.

It is expected that the lead painted area will be identified prior to the start of the project. However, as a precaution, the on-site contractor should be alert to areas that could be painted with lead paint.

If a suspect area has not been positively identified, and the material will be or may be disturbed during the course of construction, the on-site contractor, subcontractor or representative must cease work immediately and notify the Northrop Grumman Project Manager.

Radiation Safety

Areas marked with radiation hazard signs are controlled to ensure protection of persons and may only be entered by authorized personnel. Health and safety rules posted for such areas shall be strictly followed. If you have any questions regarding these safety rules any other precautions or the degree of hazard, ask the Project Manager, who will contact ESHM.

Polychlorinated biphenyls (PCBs)

PCBs are not present in any major electrical transformer or capacitor; however, NGAS cannot guarantee the presence of PCBs in some small capacitors within old fluorescent lighting. Therefore, report all oil spills, even from small lighting capacitors, to the Project Manager.

Confined Space

Confined Space Work done in confined spaces requires an NGAS Confined Space Entry Permit before the work begins. For Confined Space Entry the contractor must provide for:

- Employee training
- PPE
- Testing of the air
- Personnel monitoring
- Rescue procedures.

Contact the Project Manger to obtain a confined space permit and authorization from ESHM before starting confined space activities.

Rooftop Hazards

On-site contractors performing work that requires fall protection per OSHA requirements shall use a safety harness system or other OSHA-approved fall protection. Safety belts are not permitted.

Working Above Ceilings

Use extra caution when working above ceilings as these areas can present dangers from electrical lines, pipes containing flammable gases or cold/hot fluids. Fall hazards are always present, of course.

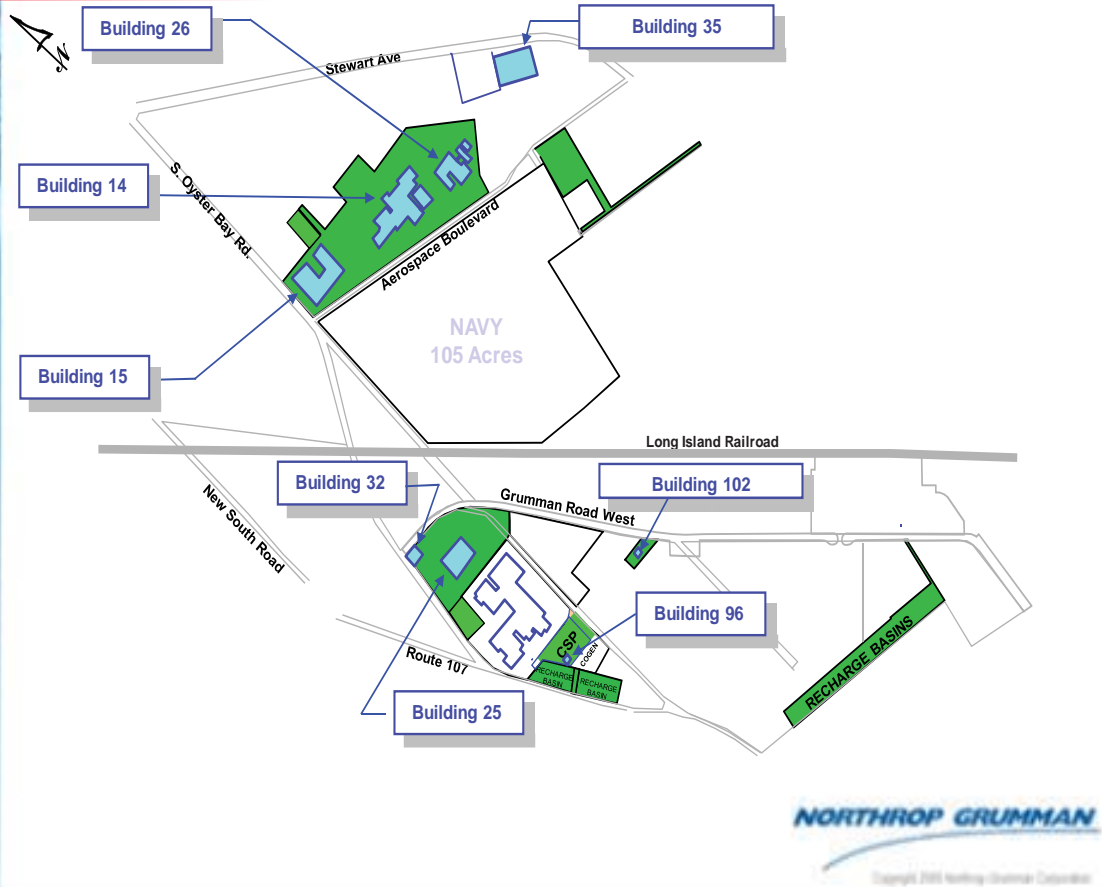
When removing ceiling tiles in hallways or other occupied areas protect yourself and personnel below as follow:

- Don appropriate PPE before removing tiles.
- Install safety cones in the affected area before using a ladder or other climbing equipment.

CONTRACTOR ENVIRONMENTAL, SAFETY AND HEALTH RULES ACKNOWLEDGEMENT

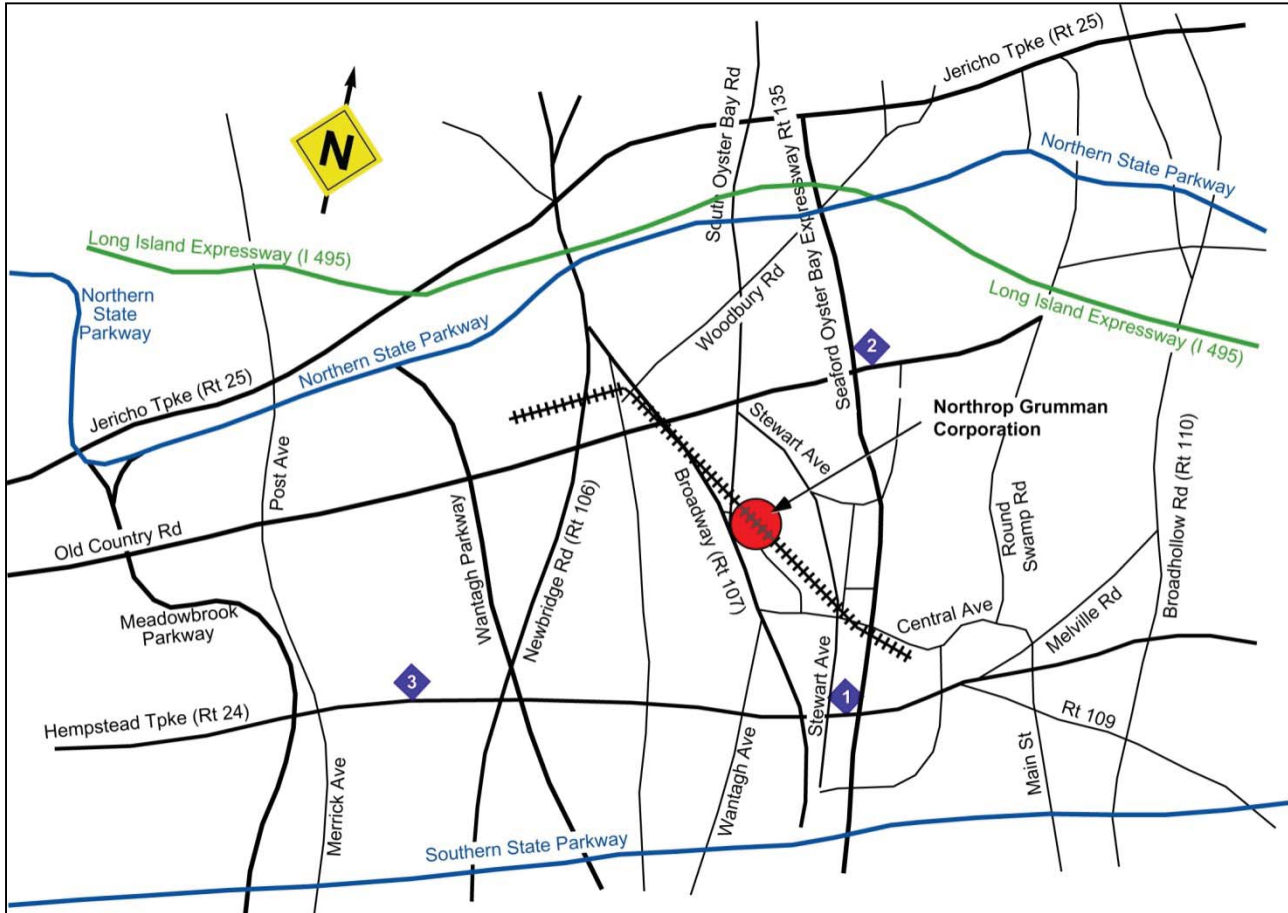
- Remove tile(s) and check area above for debris, equipment or other loose items that may fall and injure personnel in the vicinity of the work area.
- Inspect the ceiling and notify the Project Manager that the area is safe before starting construction. At this time the Project Manager may verify ceiling conditions him/herself.
- Barricade all areas in the construction zone. If the open ceiling area is less than 100 square feet, you may use safety cones to warn the building occupants. If the open ceiling is over 100 square feet, you shall use additional approved safety barriers as needed
- Never cut or disconnect telephone, paging system or security alarm wiring without written permission from the Project Manager.
- Do not open ceilings without approval of the Project Manager. Some ceilings are alarmed. Do not work over occupied areas. Request employees to temporarily move while working above them. If necessary contact the Project Manager to make arrangements for moving employees well ahead of your work.
- Carefully avoid bump obstacles in the above ceiling area. These include protruding ducts, pipes, and conduits.
- Do not; walk on top of walls, duct works or step on false ceilings.
- Remove all trash and excess material from the ceiling area before leaving.
- Replace all ceiling tiles at the end of each work day. In the event that tiles cannot be replaced, then notify the Project Manager.
- Inform the Project Manager if ceiling tiles were unintentionally broken and before breaching any building systems such as piping, ducting, conduits, etc., that were not part of the project's scope of work.

Bethpage Site



BETHPAGE SITE MAP

CONTRACTOR ENVIRONMENTAL, SAFETY AND HEALTH RULES ACKNOWLEDGEMENT



Local Hospital Map

- 1) **St. Joseph Hospital**
4295 Hempstead Turnpike
Bethpage, NY
516-579-6000

- 2) **North Shore University Hospital – Plainview**
888 Old Country Road
Plainview, NY
516-719-3000

- 3) **Nassau University Medical Center**
2201 Hempstead Turnpike
East Meadow, NY
516-572-0123

**CONTRACTOR ENVIRONMENTAL, SAFETY AND
HEALTH RULES ACKNOWLEDGEMENT**



EMPLOYEE NAME (PLEASE PRINT)	COMPANY	DATE	SIGNATURE*
ex: John Doe	Bob's Construction	01/01/2012	<i>John Doe</i>

* I have reviewed the Contractor Environmental, Safety and Health (ESH) Rules presented to me by Northrop Grumman. I understand that it is my responsibility to comply with the requirements in this document. I further understand that failure to comply with company safety requirements may result in being prohibited from working on the Northrop Grumman site.

CONTRACTOR PROJECT SPECIFIC HAZARD REVIEW

Please fill out all parts of this form and sign the form at the end of this document. The completed form is required before any work begins and prior to materials are brought on-site.

CONTRACTOR GENERAL INFORMATION

NAME OF CONTRACTOR Arcadis of New York, Inc.	
STREET ADDRESS Two Huntington Quadrangle, Suite 1S10	CITY AND ZIP CODE Melville, NY 11747
ON-SITE SUPERVISOR Ahren Tatro	PHONE NO. 516-743-5240
EMERGENCY CONTACT Paul Martorano	PHONE NO. 631-626-0844
ON-SITE SAFETY REP Carlo San Giovanni	PHONE NO. 631-391-5259
ANTICIPATED START DATE 10/1/2016	ANTICIPATED COMPLETION DATE 9/30/2017
Provide a general description of the work or services you will be performing under this contract. Include locations, equipment and methods to be used. See attached Statements of Work for OU3 Subtasks.	

Documentation to Provide Upon NGAS–Bethpage Request

You may be asked to provide any of the following:

- Company's Occupational Safety Manual.
- Training records for classes required prior to performing specific duties (i.e., Fall Protection, Lock and Tag, Respirator usage, forklift operator, etc.).
- Copies of Federal or State required certifications.
- Copies of training materials when requested.
- Equipment specifications and inspections.

SECTION 1: HAZARDOUS TASK CHECKLIST

Some of the following operations will require coordination through the NGAS–BETHPAGE ESHM Office. Check each box on the checklist that is applicable to the operations you or your subcontractors will be conducting. Fill in the location in which you will be working and the scope of work on the Work Plan. Attach additional sheets if necessary.

NO.	DESCRIPTION ON WORK PLAN	ATTACHMENT	YES	NO	NOT APPLICABLE	QUESTIONS
1	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Will workers be bringing hazardous materials (including glue, cleaners, paints, oils, etc.) to the work area? If yes, contractor must have a MSDS for each material at the location of work and furnish a copy to ESHM prior to beginning work for review and approval.
2	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Will workers be using open flames or other sources of fire ignition (brazing, welding, torch cutting)? Will workers be using a power-actuated tool? Or could workers' activity produce sparks? If any statement above was answered, "YES," then the contractor must contact Security (575-3895) and obtain a "Hot Work" permit before working.
3	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Will workers be entering a Confined Space (tank, trench, air handler, manholes, or vaults)? If yes, task plan must meet the requirements of OSHA 29 CFR 1910:146 "Confined Space Entry." All workers must have appropriate training. Attach applicable documents.
4	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Will workers perform decontamination activities or remove equipment or materials that may be contaminated?
5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Could task possibly interrupt fire or gas life safety systems (i.e., testing flow-switches, altering sprinkler systems, moving leak detection, tapping to exhaust ducts, etc.)? If yes contractor must contact Facilities prior to starting work.
6	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Will task involve rigging or other materials handling equipment (i.e., crane lift, forklift, pallet jack, helicopter, etc.) to lift and install heavy equipment? Provide equipment operation certifications as required.
7	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Will task produce vibration or high noise levels? Including but not limited to abrasive blasting, power sanding, grinding, etc.?
8	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Will task produce high dust levels? (Including abrasive blasting or indoor power sanding, grinding, etc.?)
9	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Will task require excavation of soil? If so notification to ESHM must occur prior to any disturbance of soil.
10	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Does task involve installing, removing or modifying gas or liquid lines and/or needing access to gas or systems?
11	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Will workers be cutting, removing, or disturbing floor tile and mastic, pipe insulation, roofing material, boiler insulation, dry wall joint compound, excavations near insulated lines or other asbestos containing material (ACM) or lead?
12	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Do all workers have appropriate safety training for the tasks they will perform (i.e., forklift, asbestos/lead worker, decontamination, confined space, crane operator, LOTO, ladders, hazardous materials, etc.)?
13	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Work on pressurized pipes and vessels?
14	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Will there be work on systems with hazardous Energy (actual or potential); chemical, thermal, hydrostatic, pneumatic, electrical (high voltage lines, etc.) mechanical kinetic, gravity, etc.? If yes, workers must practice proper hazardous energy control (i.e., Lock-Out Tag Out, double block and bleed, Block out etc.)
15	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Could this task produce strong odors? If yes, address odor control in the task plan.

CONTRACTOR PROJECT SPECIFIC HAZARD REVIEW

NO.	DESCRIPTION ON WORK PLAN	ATTACHMENT	YES	NO	NOT APPLICABLE	QUESTIONS
16	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Will workers be removing or disturbing fiberglass material? If yes, specify PPE and particle containment as applicable.
17	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Will task require removing raised floor tiles? If yes appropriate barricading methods and work practices must be employed. (e.g., open floor tiles must not be left unattended).
18	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Will workers encounter or use hazardous materials in the work area? If yes specify below. <input type="checkbox"/> Corrosives <input checked="" type="checkbox"/> Oxidizers <input type="checkbox"/> Poisons <input type="checkbox"/> Radiation <input type="checkbox"/> Other (describe) _____ <input type="checkbox"/> Flammable/combustibles <input type="checkbox"/> Inert or Nonflammable Gases <input type="checkbox"/> Cryogenics <input type="checkbox"/> Explosives
19	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Will tasks require Personnel Protective Equipment (PPE)? If yes, specify below. NOTE: The contractor/vendor must supply appropriate PPE. <input checked="" type="checkbox"/> Safety glasses/goggles <input type="checkbox"/> Faces shield <input checked="" type="checkbox"/> Nitric gloves <input type="checkbox"/> Acid gloves <input checked="" type="checkbox"/> Neoprene gloves <input checked="" type="checkbox"/> Work gloves <input type="checkbox"/> Electrical PPE <input checked="" type="checkbox"/> Hearing protection <input type="checkbox"/> Other (describe) _____ <input checked="" type="checkbox"/> Steel toe safety shoes <input type="checkbox"/> Chemical boots <input type="checkbox"/> Sturdy work boots <input checked="" type="checkbox"/> Hard hat <input type="checkbox"/> Welding Helmet <input type="checkbox"/> Fall protection PPE <input type="checkbox"/> Chemical-resistant suit <input type="checkbox"/> Respiratory Protection
20	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Could task being performed result in hazards to those above, below or around the work area? If yes appropriate barricading methods to keep non-essential personnel away from your work zone must be employed.
21	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Will work be conducted at elevated locations (i.e., using a ladder, scaffold, scissor lift) or will workers be working on a roof?
22	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Are all workers aware that no material (including water) may be released to the storm drain/sewers or left where it may impact the storm drain/sewer at a later time?
23	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Could this task result in leaks or spills of liquids (fire water, oils, DI water, chemicals, etc.)? If yes, provide appropriate and adequate spill containment.
24	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Could work result in Hazardous Waste being generated? Coordinate waste removal and transportation with ESHM.
25	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Will your task impact the operation, or effectiveness of a pollution prevention system (scrubber, waste H2O treatment system, etc.)? If yes, indicate system(s) on the Task Plan.
26	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Will trash or debris be generated? If yes, describe how it will be collected, transported, labeled, and stored on the task plan.
27	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Are you aware of others who may be working in or need access to the same work area and may be affected by your work.
29	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Will soil or ground water be disposed of during excavation? Notify ESHM for further instructions and requirements.
30	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Have all workers on site been briefed on the evacuation routes and procedures for the worksite?
31	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Were workers briefed on the location of phones, eyewash/showers, and fire extinguishers?

SECTION 2: SITE SPECIFIC WORK PLAN

NO.	STEPS TO TAKE TO COMPLETE WORK	HAZARDS	REQUIRED ACTIONS TO ELIMINATE OR CONTROL THE HAZARD
1	<i>Task plan checklist and work plan reviewed by crew working on project.</i>	<i>ESHM or Facilities stopping by job site and not being able to find a completed task plan.</i>	<i>Review with workers and post at job site.</i>
2	SEE ATTACHED SITE-SPECIFIC SOPS		
3	SEE ATTACHED JSAS		
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26	<i>Final step: work inspected, floor tiles in place, barricading taken down, trash removed, etc.</i>		

I, contractor foreman (*sign*), _____ have reviewed the work plan checklist with the crew performing the tasks on (*date*) _____ prior to starting work. Information covered included but was not limited to daily work plan, hazards in the area and their controls, required PPE to perform tasks, and other relevant information specific to this project.

Note: The review and approval from facilities (maintenance) and ESHM is only for the purpose of ascertaining that all work plan elements have been completed by the contractor and does not constitute a substantive plan review. The review process is not intended to relieve the contractor of responsibility for the contents of the work plan and its implementation. Contractors are responsible for full compliance with the work plan and with all applicable NGAS–Bethpage policies and with all applicable laws and regulations.

SECTION 3: SUBCONTRACTOR DISCLOSURE REQUIREMENT

The contractor has the responsibility to ensure all subcontractors are aware of and comply with the terms and conditions specified in the NGAS–Bethpage "Contractor Environmental, Safety and Health Rules Acknowledgement." The contractor must provide a list of all subcontractor companies who are hired to work on-site. This practice is necessary to help the NGAS–Bethpage ESHM office track on-site construction activities involving hazardous operations or requiring safety permits.

SUBCONTRACTOR INFORMATION (NAME, ADDRESS, TELEPHONE NUMBER, CONTACT PERSON)	SCOPE OF WORK
Donna Bensin, President / Christopher Okon Delta Well & Pump Company 97 Union Ave, Ronkonkoma, NY 11779 (631) 981-2255; chriso@deltawell.com	Well and boring drilling and sampling; well maintenance
Nicholas Thies, General Manager Uni-Tech Drilling Co., Inc. 61 Grays Ferry Rd (P.O.Box 407) Franklinville, NJ 08322 (856) 694-4200; nthies@unitechdrilling.com	Well and boring drilling and sampling; well maintenance
Steven Catania, Vice President Subsurface Technologies, Inc. 40 Stone Castle Rd, Rock Tavern, NY 12575 (845) 567-0695; scatania@subsurfacetech.com	Well redevelopment and maintenance
Donald G. DeKenipp Jr., P.L.S. Professional Land Surveyor 222 Greene Avenue, Sayville, N.Y. 11782 631-589-5350; dgdpls@verizon.net	Land survey services
Heather Funk Enviroprobe Service, Inc. 81 Marter Ave, Mt. Laurel, NJ 08054 (856) 858-8584 x105; hfunk@enviroprobe.com	Surface geophysics for utility markout
John Wade, Operations Manager AB Environmental Service 1599 Ocean Ave, Bohemia, NY 11716 (631) 567-6545; jwade@abenviro.com	Investigation-derived waste disposal (non-hazardous waste)
Corrinne-Haddad-Meullen, District Sales Manager Clean Harbors Environmental Services 761 Middle Street, Bristol, CT 06010 (860) 516-8745	Investigation-derived waste disposal (hazardous waste)
Jeff Barber Tetrasolv Filtration 1424 Abraham Drive - Anderson, Indiana 46013 (765) 643-3941; tetrasolv@yahoo.com	Media change out and disposal

CONTRACTOR PROJECT SPECIFIC HAZARD REVIEW

SECTION 4: SAFETY COMPLIANCE CHECKLIST

By checking each box and signing this document, you are stating that you are in compliance with each statement.

<input checked="" type="checkbox"/>	NGAS–Bethpage will be provided a list, and MSDS of hazardous materials that the Contractor will use onsite before the project begins. Should the Contractor bring additional chemicals onsite, the ESHM Department shall be notified.
<input checked="" type="checkbox"/>	The Contractor will maintain MSDSs for all chemicals used onsite including if the Contractor brings additional chemical onsite. They will be made available for any NGAS–Bethpage employee to review upon request.
<input checked="" type="checkbox"/>	Circumventing this approval process may result in the ESHM Department shutting down the project and the Contractor may be removed from the site as well as removal from the Approved Contractor list.
<input checked="" type="checkbox"/>	My employees have completed all applicable safety training as required by OSHA or State programs and meet all qualifications and requirements to complete the assigned work. I agree to provide these training records to NGAS–Bethpage when requested.
<input checked="" type="checkbox"/>	My employee will be required to review the Northrop Grumman Contractor Environmental, Safety and Health (ESH) Rules before they begin work at the site.
<input checked="" type="checkbox"/>	My employees are aware of their responsibilities and the safety requirements set forth in the document, “Contractor Environmental, Safety and Health (EHS) Rules” provided by NGAS–Bethpage.
<input checked="" type="checkbox"/>	I have a written Injury and Illness Prevention Program or equivalent method and have discussed components of this program with my employees. I will provide a copy upon request.
<input checked="" type="checkbox"/>	I will provide my employees with all necessary personal protective equipment and ensure that they have been properly trained to use the equipment. I will ensure no NGAS–Bethpage tools or equipment are used by my employees.
<input checked="" type="checkbox"/>	I will hold meetings with my employees and subcontractors for the duration of the contract and will dedicate a portion of this time to discuss safety issues that may arise. These meetings will be held at a minimum of once a week and will address all necessary topics related to environmental, safety and health issues applying to the scope of work to be performed. Special emphasis will be placed on coordination and communication between contractors, sub-contractors and affected NGAS–Bethpage personnel. Written minutes summarizing these discussions shall be provided to the EH&S office upon request when safety issues are discussed or addressed.

Contractor Agreement

I certify that information provided in this agreement are true to the best of my knowledge and I agree to comply with all terms, conditions and procedures outlined in "Contractor Notification – Environmental, Safety and Health Requirements" provided by NGAS–Bethpage. Further, I agree to comply with all local, state and federal safety and environmental regulations that apply to work performed under this contract. I will ensure that all subcontractors I use under this contract are aware of and comply with the same terms and conditions described herein.

If my employees, or I, cannot safely perform a job while on-site, I will immediately cease the unsafe work activity and notify the NGAS–Bethpage ESHM Department and other appropriate NGAS–Bethpage personnel.

PRINT NAME CARLO SAN GIOVANNI	SIGN NAME	DATE 11/1/2016
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**CONTRACTOR'S ENVIRONMENTAL, SAFETY & HEALTH
QUALIFICATION QUESTIONNAIRE**

CONTRACTOR'S NAME Arcadis of New York, Inc.		DATE 11/1/2016		
ADDRESS Two Huntington Quadrangle, Suite 1S10, Melville, NY 11747		STANDARD INDUSTRIAL CLASSIFICATION (SIC) CODE 541620, 541330, 541310, 541360		
		YES	NO	N/A
1. Has your company had a change in ownership in the past three years?		<input type="checkbox"/>	<input checked="" type="checkbox"/>	
2. Has your company ever performed work for Northrop Grumman Aerospace Systems?		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
If yes, When? Ongoing		Where? <input checked="" type="checkbox"/> BETHPAGE, NY <input type="checkbox"/> HOLLYWOOD, MD		
TYPE OF WORK Environmental consulting services				
		YES	NO	N/A
3. Has a qualification questionnaire been submitted within the past three years?		<input type="checkbox"/>	<input checked="" type="checkbox"/>	
4. Does your company have a written substance abuse policy?		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
5. Does your company have a written safety and environmental program?		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
If No, would you be willing to develop one?		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
If Yes, what are the program's key elements? <i>(Check applicable elements below)</i>				
<input checked="" type="checkbox"/> Management Commitment		<input checked="" type="checkbox"/> Emergency Preparation & Planning		
<input checked="" type="checkbox"/> Assigned Responsibility		<input checked="" type="checkbox"/> Competent Persons		
<input checked="" type="checkbox"/> Employee Involvement		<input checked="" type="checkbox"/> Disciplinary Program		
<input checked="" type="checkbox"/> Supervisors/Employee held accountable		<input checked="" type="checkbox"/> Safe Work Procedures		
<input checked="" type="checkbox"/> Hazard Identification & Reporting		<input checked="" type="checkbox"/> Safety/Health Information & Training		
<input checked="" type="checkbox"/> Hazard Assessment		<input checked="" type="checkbox"/> Special programs (i.e Respiratory Protection)		
<input checked="" type="checkbox"/> Hazard Prevention & Control		<input checked="" type="checkbox"/> Recordkeeping		
<input checked="" type="checkbox"/> Injury/illness analysis		<input checked="" type="checkbox"/> Communication of Environmental & Safety Policies		
<input checked="" type="checkbox"/> Inspection/audit program		<input type="checkbox"/> Other: _____		
6. What is your company's safety organization structure?				
NAME	TITLE AND PHONE NO.	RESPONSIBILITIES		
See attached org chart				
7. Describe the type of safety, health, and environmental training your employees receive: <i>(Check training received or place on a separate sheet of paper if necessary.)</i>				
TITLE OF EMPLOYEE	TYPE OF TRAINING			
TRAINING PROVIDED TO ARCADIS EMPLOYEES BY ARCADIS HR OR TRAINING TEAM OR EXTERNAL TRAINER AS APPROPRIATE	<input type="checkbox"/> Confined Space Entry	<input checked="" type="checkbox"/> Personal Protective Equipment		
	<input type="checkbox"/> Electrical Safety	<input type="checkbox"/> Powered Platforms, Manlifts,		
	<input type="checkbox"/> Environmental	<input type="checkbox"/> Powered Industrial Trucks		
	<input type="checkbox"/> Explosives	<input checked="" type="checkbox"/> Respiratory Protection		
	<input checked="" type="checkbox"/> Fall Protection	<input type="checkbox"/> Scaffolding		
	<input checked="" type="checkbox"/> Fire Suppression/Detection	<input type="checkbox"/> Welding/Cutting/Brazing		
	<input checked="" type="checkbox"/> First Aid	<input checked="" type="checkbox"/> Hazardous Waste Management		
	<input checked="" type="checkbox"/> Hazard Communication	<input checked="" type="checkbox"/> Environmental Awareness		
	<input type="checkbox"/> Machine Guarding	<input type="checkbox"/> Other: _____		
	8. How is personal protective and other safety equipment purchased and distributed? ARCADIS maintains stock of disposable PPE & rents air monitoring/other H&S instrumentation as project needs require.			

**CONTRACTOR'S ENVIRONMENTAL, SAFETY & HEALTH
QUALIFICATION QUESTIONNAIRE**

		YES	NO	N/A
9. Are "tool box" or other safety meetings conducted with employees?		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
10. Is there a safety committee?		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
11. Are safety inspections of the work area conducted?		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
How often are safety audits or inspections performed? <input type="checkbox"/> Weekly <input type="checkbox"/> Quarterly <input checked="" type="checkbox"/> Other				
Who participates in the inspections? All staff levels have H&S inspection goals. Management ensures they're met.				
12. Does your company have a formal hazard reporting procedure?		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
If yes, describe your company's reporting method for the following type of incident:				
TYPE OF ACCIDENT REPORT	REPORT DESCRIPTION	DISTRIBUTION LIST		
Injury/Illness	See attached Arcadis HS Standard	See attached Arcadis HS Standard		
Damage	See attached Arcadis HS Standard	See attached Arcadis HS Standard		
Chemical Spill/Releases	See attached Arcadis HS Standard	See attached Arcadis HS Standard		
Near Misses	See attached Arcadis HS Standard	See attached Arcadis HS Standard		
13. Does your company have OSHA 300 Logs?		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
If yes, provide them for the past for the past three (3) years.				
14. Does your company have an Experienced Modification Rate (EMR)?		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
If No, please explain:				
If yes, please enter data for the past three (3) years: Year: 2014 - 0.65 Year: 2015 - 0.61 Year: 2016 - 0.67				
15. Has your company had any fatalities and/or OSHA/EPA citations in the last three (3) years?		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
If yes, please explain:				
16. Questions or comments regarding request for information or other information you wish to supply.				
<p>I certify that I have communicated the Northrop Grumman Aerospace Systems (NGAS), Environmental, Safety & Health (ESH) Policy (below) to all my employees who will be performing work at the site.</p> <p>In addition, I certify that all employees, under my supervision, that have the potential to cause a significant environmental impact(s) are competent on the basis of appropriate education, training or experience.</p> <p>I also certify that employees working on the behalf of NGAS have been advised as to the importance of conformity with NGAS's ESH policy and ESH site requirements; the significance of the environmental aspects related to actual or potential impacts associated with their work; and the environmental benefits of improved personal performance; their roles and responsibilities in achieving conformity with the ESH site requirements, and potential consequences of departure from these requirements.</p>				
CONTRACT OWNER OR REP CERTIFICATION SIGNATURE			DATE 11/1/2016	
<p>Northrop Grumman Aerospace Systems, Environmental, Safety, and Health Policy:</p> <ul style="list-style-type: none"> • Full compliance with environmental safety & health laws and regulations • Providing a safe and healthful workplace • Pollution prevention • Continual improvement • Satisfaction of customer and community requirements 				
FORM COMPLETED BY (PRINTED NAME) Carlo San Giovanni	COMPANY AND TITLE Arcadis of New York, Inc.; Project Manager	DATE 11/1/2016		
FOR NGAS USE ONLY				
REVIEWED BY (NAME)	TITLE	DATE		
OUTCOME: <input type="checkbox"/> APPROVED <input type="checkbox"/> SEND BACK FOR COMPLETION <input type="checkbox"/> REJECTED				
COMMENTS				
REVIEWER SIGNATURE				

APPENDIX C

Journey Management and
Traffic Safety Plans



Arcadis Journey Management Plan

Project Name: RW-21 OU2/OU3 Onsite/Offsite Investigation & Groundwater Monitoring, Northrop Grur
 Project Number: NYNG2019.TS14
 Date: 6/5/2019
 Revision: 2

Route Identification

Planning and evaluation of route(s) on this project will utilize (*select all that apply*):

- On-line mapping software with traffic reporting
- On-line mapping software without traffic reporting
- GPS navigation with traffic reporting (portable unit or integrated into the vehicle)
- Standard GPS navigation device (portable unit or integrated into the vehicle)
- App with mapping and traffic reporting
- App without traffic reporting
- Government website with traffic and construction zone reporting
- Standard maps or atlases
- Other -Specify: _____

Identified Hazards

List any identified hazards or route concerns identified in the route identification above:

Railroad near Central Avenue which can cause delays and backups. Caution is to be used. Traffic Cameras are used on Central Avenue. Be vigilant and obey traffic laws. Do not attempt to run a yellow light.

List any portions of this route that have recommended driving restrictions due to time of day, weather, or security

Driving in the dark is discouraged at the Site. Heavy traffic, especially foot traffic, can be expected during the morning and evening rush hours (7-9 AM, 3-6 PM). Use caution when driving at this time.

- Driving JSA attached or provided in the project specific HASP
- Vehicle Pre-Trip Inspections required: Daily Weekly
- Commercial Motor Vehicle (CMV) requirements apply to this project.

Tolls

- All or portions of this route includes toll roads.
Specify how the tolls are paid (select all that apply):
- Transponder Request transponder for vehicle when renting
- License Plate Review rental agreement concerning rental agency participation in license plate toll payment systems.
- Cash only
- Other:

Documentation

When using on-line mapping software to prepare routes, it is recommended to print an overview map with route, and turn by turn maps of route when available. When using GPS navigation devices, it is also recommended that on-line mapping software routes and maps be printed to augment the GPS navigation device routing. Standard maps or atlases should only be considered if navigation assistance from a passenger in the vehicle.

Printing of maps from on-line mapping software should be considered, especially if little is known about potential traffic or construction hazards from primary route planning.

All hard copy maps and driving directions are attached.

Signatures

JMP Prepared by: Thomas Darmon Date: 6/5/2019

Driver Review: _____ Date: _____

_____ Date: _____

_____ Date: _____

_____ Date: _____

FIELD GUIDE FOR ROADWAY WORK ZONE SAFETY

September, 2016





Important Note:

This document is to be used in conjunction with Arcadis Traffic Control Plans (TCPs) and Site Traffic Awareness and Response (STAR) Plans. This document, or its relevant parts, must be readily available in the field for employee use, if incorporated by reference into the TCP or STAR Plan. This document is NOT a substitute for TCP or STAR Plan development and approval in accordance with ARC DOT-301 and ARC DOT-302, respectively.

This document is not designed to address complex traffic control situations nor a substitute for Engineering Judgment, when required.

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ACRONYMS AND ABBREVIATIONS

ADAAG	Americans with Disability Act Accessibility Guidelines
EJE	Engineering Judgement Employee
HASP	Health and Safety Plan
JSA	Job Safety Analysis
MUTCD	Manual of Uniform Traffic Control Devices
RWZ	Roadway Work Zone
STAR	Site Traffic Awareness and Response
TCP	Traffic Control Plan
TTC	Temporary Traffic Control

1 GENERAL

1.1 Requirement to have a Traffic Control Plan or Site Traffic Awareness and Response Plan

If project work will be conducted in the public right-of-way, a traffic control plan (TCP) is required. The TCP may be prepared using an Arcadis TCP template or an alternate format as approved by an Engineering Judgment Employee (EJE). The only requirements for TCPs are:

- Must be written (text, pictures, drawings, pictograms either alone or in combination);
- Must be provided to the field staff expected to implement and/or work in the Roadway Work Zone (RWZ); and
- Be approved by an EJE when required by this Field Guide for Roadway Work Zone Safety (Field Guide) DOT Fact drawing “M1” note or by the TCP/STAR Plan Template.

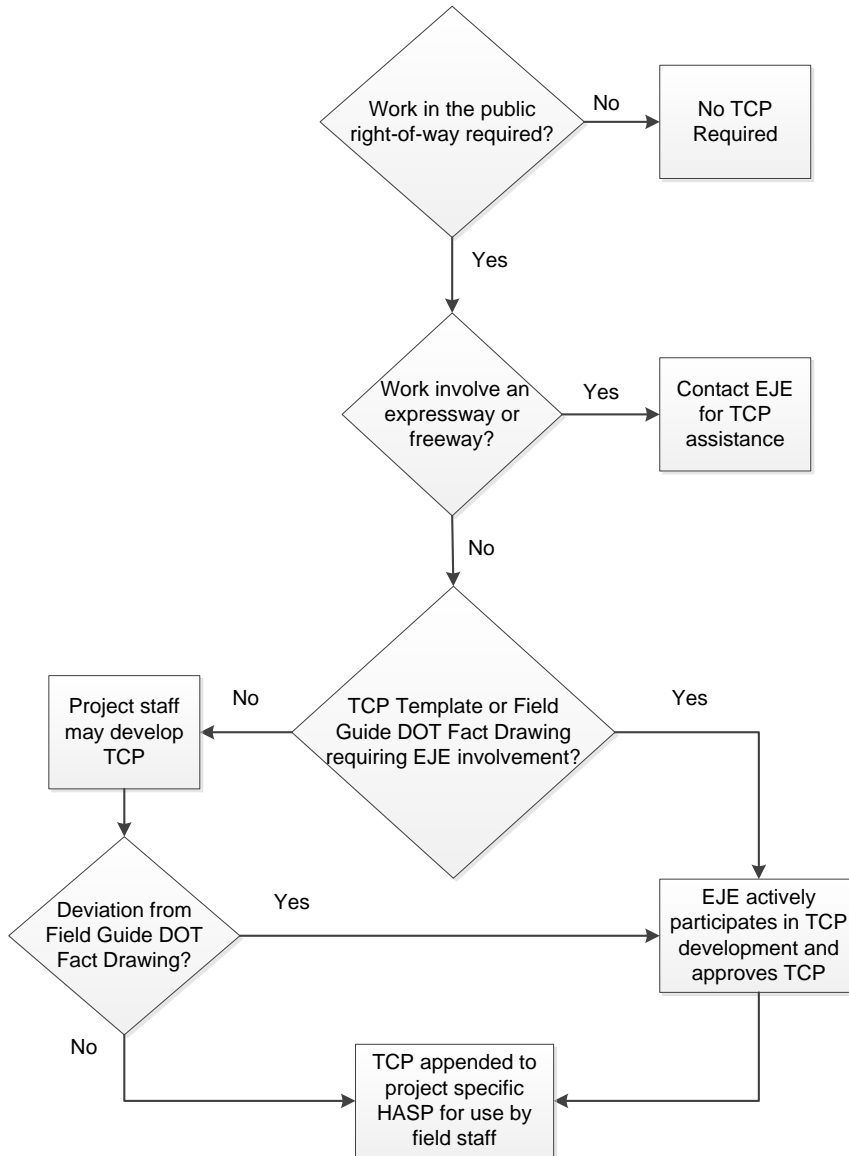
For work involving on-site (not in the public right-of-way) traffic and/or pedestrian controls, a Site Traffic Awareness and Response Plan (STAR Plan) is required. Preparation of a STAR Plan is similar to TCP preparation. However, a STAR Plan may be approved by a HASP Reviewer instead of an EJE.

If the project has both on-site and public right-of-way work activities, prepare a TCP and incorporate any STAR Plan controls within the TCP. Arcadis TCP templates are designed to accommodate both TCP and STAR Plan elements.

1.2 Overview of the TCP Preparation Process

The following is the general process that should be used to prepare TCPs within Arcadis. Any STAR Plan components would be incorporated into the TCP. The EJE may approve STAR Plan elements or defer to a HASP Reviewer to approve the STAR Plan elements.

Figure 1. The TCP Preparation Process

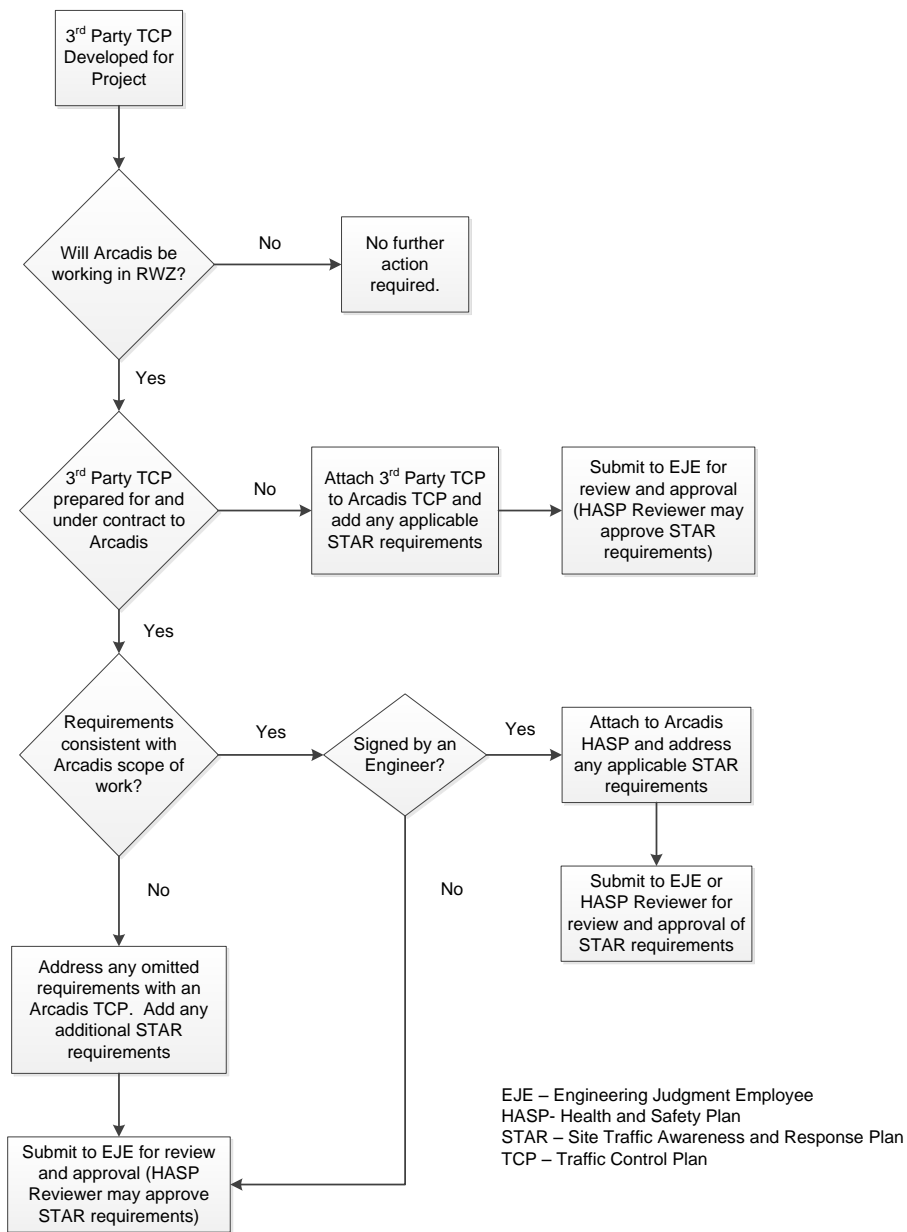


Notes:
 EJE – Engineering Judgment Employee. for a list of EJEs, refer to the TCP/STAR Template in the Excel Standard HASP Template .
 TCPs developed using client or governmental agency templates/drawings/permits are acceptable and preparation of an Arcadis TCP is not required as long as EJE approves of the alternate format plan content and the content is understood by field staff in the RWZ.

1.3 Overview of Third Party TCP Evaluation Process

Arcadis may contract and/or work under a TCP prepared by a third party (specialty contractor or government agency specified plan/drawing). To ensure the TCP meets Arcadis project safety expectations, the following evaluation process should be conducted prior to implementation of work in the RWZ.

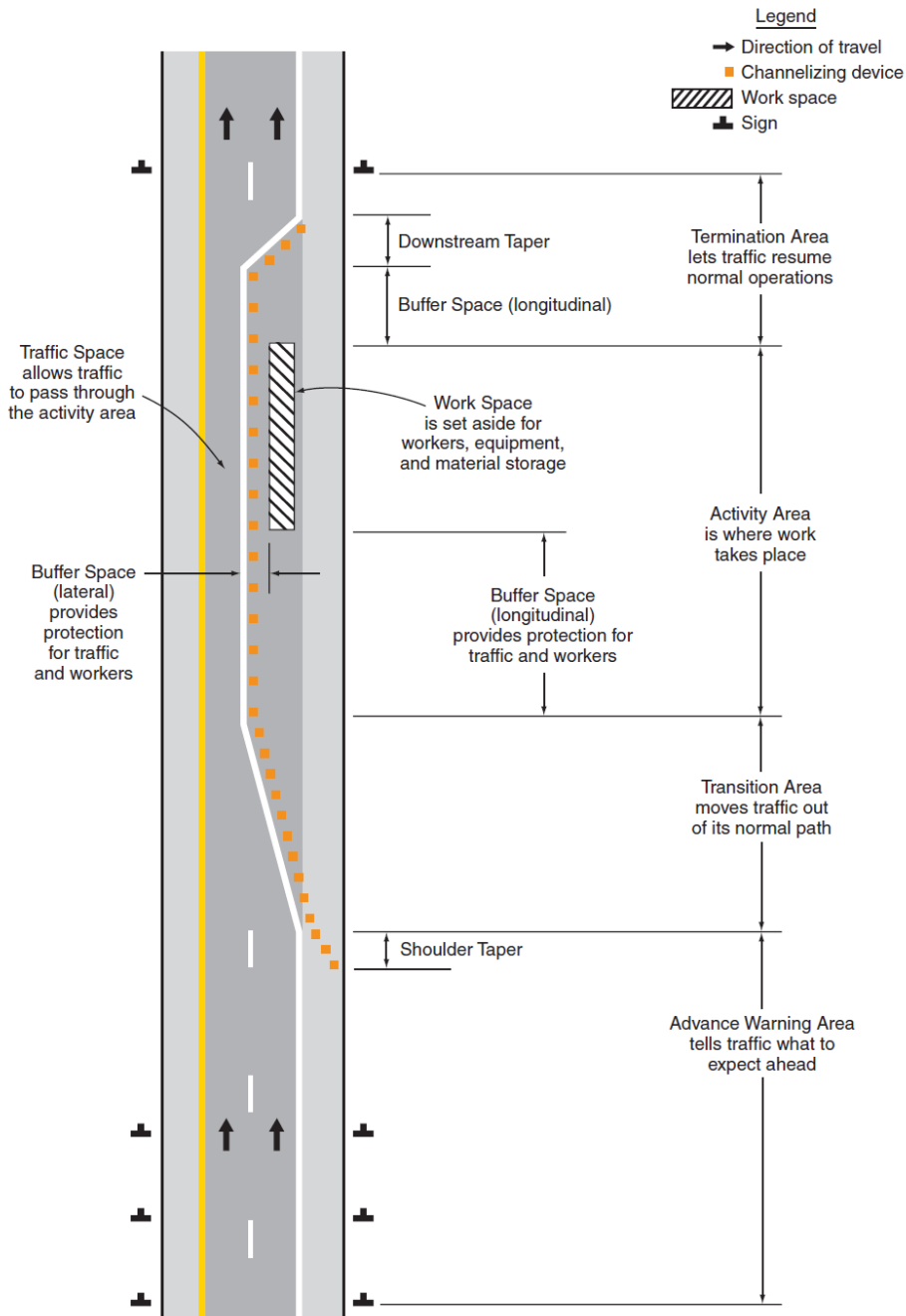
Figure 2. Overview of the Third Party TCP Evaluation Process



1.4 Component Parts of a Roadway Work Zone

Figure 3 presents a general overview of the different RWZ components.

Figure 3. Overview of RWZ Components

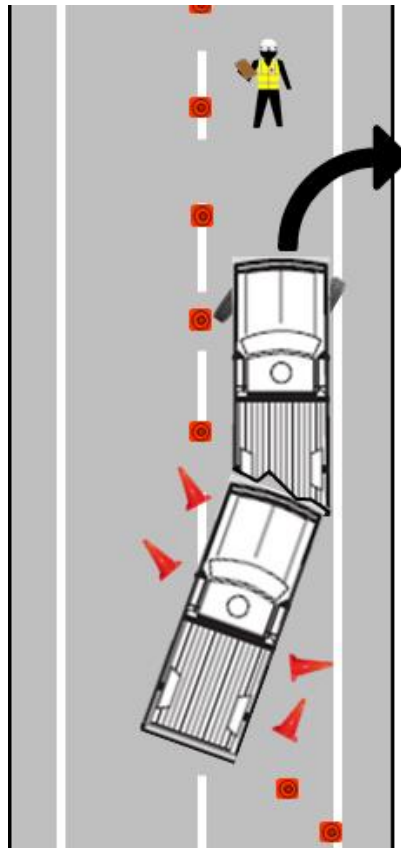


1.5 Parking Vehicles in a Roadway Work Zone

When parking vehicles in a RWZ, especially shadow vehicles, turn the front wheels to the right (Figure 4). If the vehicle is struck from behind, having the front wheels turned to the right should force the vehicle into the barrier or guardrail, if present, or increase probability that the vehicle will be pushed off of the shoulder and away from workers. This action will also significantly reduce the potential for causing the vehicle to be pushed into the travel lane when parked on or near the shoulder. Always use TRACK to stage the shadow vehicle, when used, in a location that protects the work crew and factor positioning of the front wheels.

Always keep vehicle doors closed when parked in a RWZ.

Figure 4. Front Wheel Positioning while Parked in a RWZ



2 SIGNS

2.1 General Sign Requirements

The following sign requirements are applicable to typical Arcadis work activities:

- Warning signs in typical Arcadis RWZs shall have a black legend and border on an orange background (where the color orange is required, fluorescent red-orange or fluorescent yellow-orange colors may also be used).
- Arcadis will not rely on signs placed by other contractors unless coordination with the contractor has been performed.
- Standard orange flags or flashing warning lights may be used in conjunction with signs if they do not block the sign face.
- RWZ sign size shall be as shown in Table 6F-1 of the Manual on Uniform Traffic Control Devices (MUTCD). The dimensions of signs shown in Table 6F-1 may be increased wherever necessary for greater legibility or emphasis, such as on freeways and expressways. Deviations from standard sizes as prescribed herein shall be in 150 mm (6 in) increments.
- All signs used at night shall be either retro-reflective with a material that has a smooth, sealed outer surface or illuminated to show the same shape and similar color both day and night. The requirement for sign illumination shall not be considered to be satisfied by street, highway, or strobe lighting. Sign illumination may be either internal or external.
- Signs may be made of rigid or flexible material. To reduce physical hazards associated with moving and placing rigid signs and to facilitate storage in project vehicles, flexible material signs are recommended.

2.2 Sign Placement

The following are general rules for sign placement:

- Signs should be located on the right side of the roadway unless otherwise specified in section 6.0 or as permitted in the MUTCD or state equivalent guidance document.

- Where special emphasis is needed, signs may be placed on both the left and right sides of the roadway.
- Signs mounted on portable supports may be placed within the roadway itself. Signs may also be mounted on or above barricades.
- Guidelines for height and lateral clearance of temporary ground-mounted signs are shown in Figure 5.
 - Ground-mounted signs installed at the side of the road in rural areas shall be mounted at a height at least 1.5 m (5 ft), measured from the bottom of the sign to the near edge of the pavement. In business, commercial, and residential districts where parking and/or bicycle or pedestrian movement is likely to occur, or where there are other obstructions to view, the distance between the bottom of the sign and the top of the near edge of the traveled way shall be at least 2.1 m (7 ft).
 - A 2.1 m (7 ft) mounting height may be used in rural areas for increased visibility.
 - The height to the bottom of a secondary sign mounted below another sign may be 0.3 m (1 ft) less than the appropriate height specified above
- Sign supports shall be crashworthy. Large signs having an area exceeding 5 square meters (50 square feet) that are installed on multiple breakaway posts shall be mounted a minimum of 2.1 m (7 ft) above the ground.
- Unshielded sign posts placed in the clear zone should yield or breakaway upon impact to minimize obstructions to road users.
- Where it has been determined that the accommodation of pedestrians with disabilities is necessary, signs shall be mounted and placed in accordance with Section 4.4 of the [“Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities \(ADAAG\)”](#).
- Neither portable nor permanent sign supports should be located on sidewalks, bicycle facilities, or areas designated for pedestrian or bicycle traffic. Signs mounted lower than 2.1 m (7 ft) should not project more than 100 mm (4 in) into pedestrian facilities.

- Portable signs will be periodically checked to ensure proper placement. Portable signs will be adequately weighted to prevent being blown over by weather or passing traffic.
- Signs mounted on barricades and barricade/sign combinations shall be crashworthy.
- Signs mounted on barricades, or other portable supports, shall be no less than 0.3 m (1 ft) above the traveled way (Figure 6).
- For mobile operations, a sign may be mounted on a work vehicle, a shadow vehicle, or a trailer stationed in advance of the RWZ or moving along with it. The work vehicle, the shadow vehicle, or the trailer may or may not have an impact attenuator (Figure 6).

Figure 5. Height and Clearance Criteria for Temporary RWZ Signs

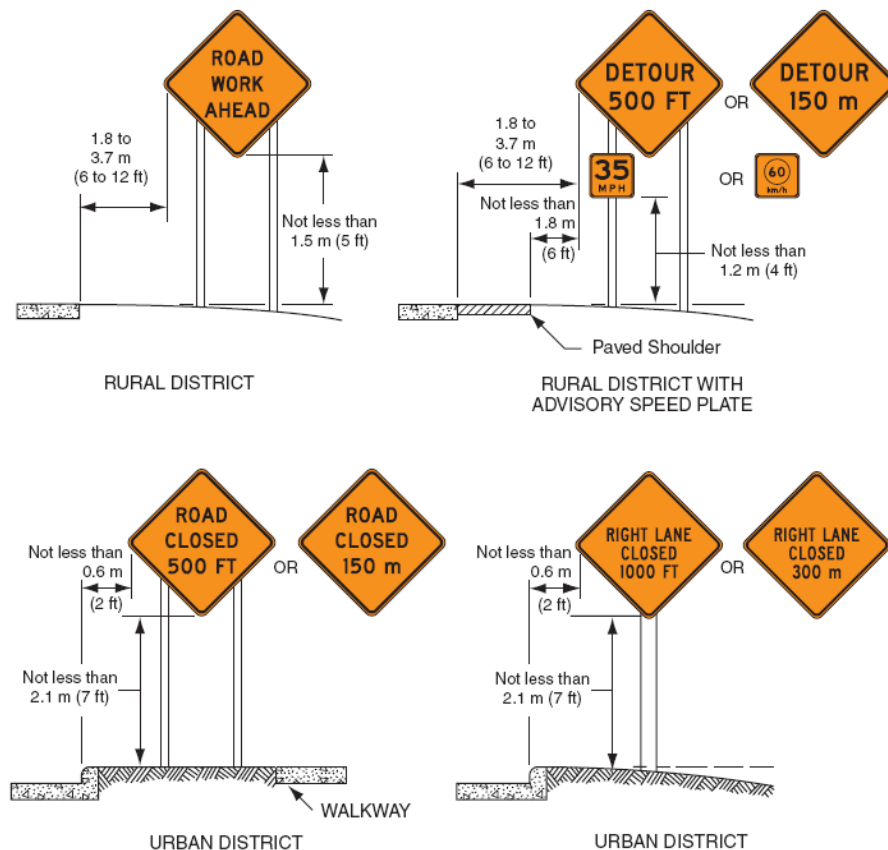
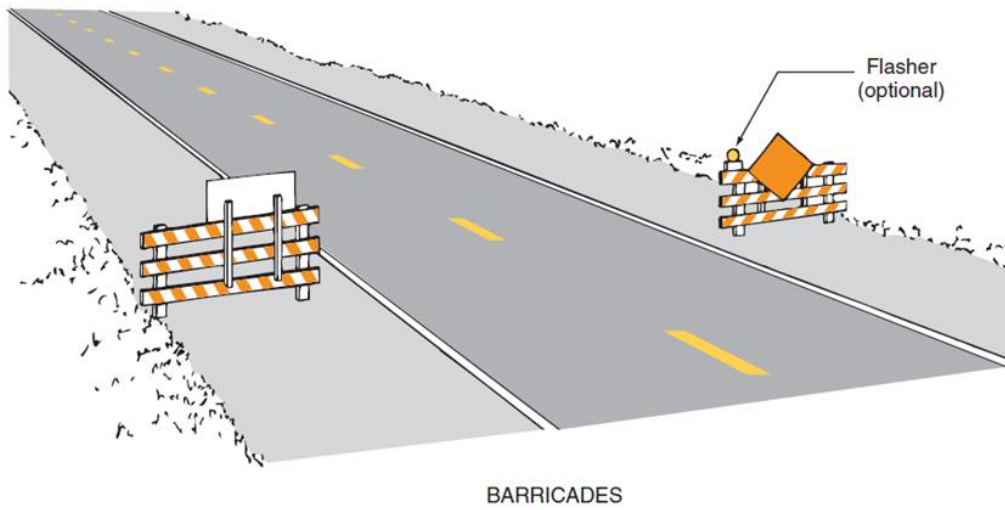
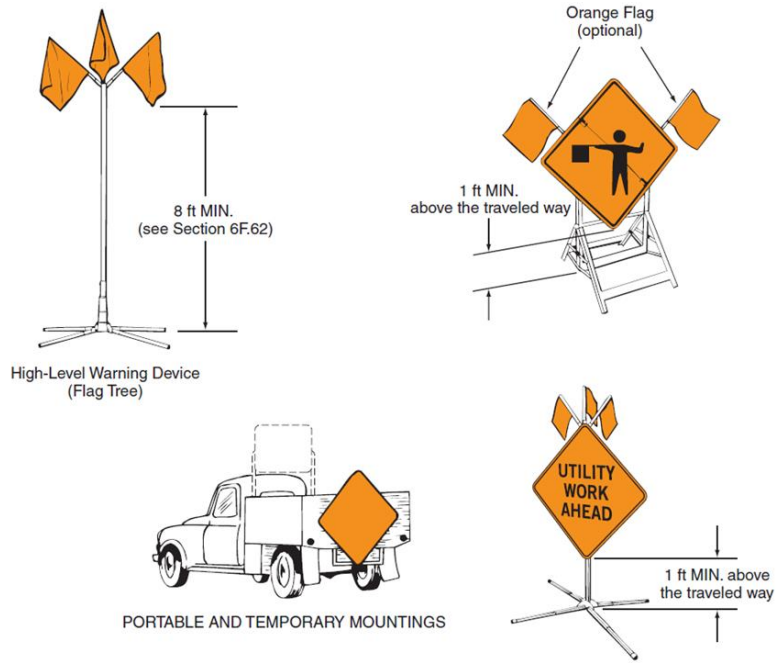


Figure 6. Criteria for Signs Mounted on Portable Supports, Barricades and Vehicles



2.3 Sign Spacing

Spacing requirements for advance warning signs placement in section 5.0 examples are listed in Table 1.

Table 1. Spacing Requirements for “A”, “B” and “C” in Field Guide DOT Fact Drawings

Road Type	“A” (m/ft)	“B” (m/ft)	“C” (m/ft)
Urban (Low Speed)	30/100	30/100	30/100
Urban (High Speed) ¹	100/350	100/350	100/350
Rural	150/500	150/500	150/500
Freeway/Expressway	300/1000	450/1500	800/2640

1) This category is not applicable to freeway or expressway scenarios.

Guidance: This information is programmed into the Arcadis TCP/STAR Plan Template and will automatically populate when preparing the TCP.

2.4 Sign Maintenance

Signs will be properly maintained for cleanliness, visibility and correct positioning. Signs which have lost significant legibility shall be promptly replaced (Figure 7)

Figure 7. Acceptable, Marginal and Unacceptable Sign Conditions



Acceptable



Marginal







Unacceptable




2.5 Typical Sign Wording for Arcadis Work



Table 2 Illustrates wording that is acceptable for signs typically used during Arcadis work.

Table 2. Acceptable Sign Wording

Sign Example	Acceptability for Use
	<p>A Workers symbol sign may be used to alert road users of workers in or near the roadway. In the absence of other warning devices, a Workers symbol sign should be used.</p> <p>The WORKERS word message sign may be used as an alternate to the Workers symbol sign.</p>

	<p>The Flagger symbol sign should be used in advance of any point where a flagger is stationed to control road users.</p>
	<p>The ROAD (STREET) WORK sign, which serves as a general warning of obstructions or restrictions, should be located in advance of the work space or any detour, on the road where the work is taking place. Where traffic can enter a RWZ from a crossroad or a major (high-volume) driveway, an advance warning sign should be used on the crossroad or major driveway.</p> <p>Acceptable variations: ROAD (STREET) WORK, XX m (FT), ROAD (STREET) WORK XX km (MILES), or ROAD (STREET) WORK AHEAD.</p>
	<p>Shoulder Work signs warn of maintenance, reconstruction, or utility operations on the highway shoulder where the roadway is unobstructed.</p> <p>Acceptable variations: SHOULDER WORK, RIGHT (LEFT) SHOULDER CLOSED, RIGHT (LEFT) SHOULDER CLOSED XXX m (FT), or SHOULDER WORK AHEAD.</p> <p>The Shoulder Work sign may be used in advance of the point on a non-limited access highway where there is shoulder work. It may be used singly or in combination with a ROAD WORK NEXT X km (MILES) or ROAD WORK AHEAD sign.</p> <p>On freeways and expressways, the RIGHT (LEFT) SHOULDER CLOSED XXX m (FT) or AHEAD sign followed</p>

	<p>by RIGHT (LEFT) SHOULDER CLOSED sign should be used in advance of the point where the shoulder work occurs and should be preceded by a ROAD WORK AHEAD sign.</p>
	<p>The SURVEY CREW sign should be used to warn of surveying crews working in or adjacent to the roadway.</p>
	<p>The Lane(s) Closed sign shall be used in advance of that point where one or more through lanes of a multi-lane roadway are closed.</p> <p>Acceptable variations for single lane closure: RIGHT (LEFT) LANE CLOSED, XX m (FT), RIGHT (LEFT) LANE CLOSED XX km (MILES), or RIGHT (LEFT) LANE CLOSED AHEAD.</p> <p>Acceptable variations where two adjacent lanes are closed: RIGHT (LEFT) TWO LANES CLOSED, XX m (FT), RIGHT (LEFT) TWO LANES CLOSED XX km (MILES), or RIGHT (LEFT) TWO LANES CLOSED AHEAD.</p>
	<p>The ONE LANE ROAD sign shall be used only in advance of that point where motor vehicle traffic in both directions must use a common single lane.</p> <p>Acceptable Variations: ONE LANE ROAD, XX m (FT), ONE LANE ROAD XX km (MILES), or ONE LANE ROAD AHEAD.</p>

	<p>The ROAD (STREET) CLOSED sign should be used when the roadway is closed to all road users except contractors' equipment or officially authorized vehicles. The sign should be accompanied by appropriate warning and detour signing.</p> <p>The ROAD (STREET) CLOSED sign should be installed at or near the center of the roadway on or above a Type III barricade that closes the roadway (see DOT Facts-301e)</p> <p>The ROAD (STREET) CLOSED sign shall not be used where road user flow is maintained or where the actual closure is some distance beyond the sign.</p>
	<p>When used, the END ROAD WORK sign should be placed near the end of the termination area, as determined by the employee with Engineering Judgment.</p> <p>The END ROAD WORK sign may be installed on the back of a warning sign facing the opposite direction of road users or on the back of a Type III barricade.</p>
<p>Atypical Signs</p>	<p>DOT MUTCD Chapter 6F: http://mutcd.fhwa.dot.gov/pdfs/2009r1r2/pdf_index.htm DOT Standard Highway Signs (Warning Signs): http://mutcd.fhwa.dot.gov/ser-shs_millennium.htm</p>

3 CHANNELIZING DEVICES

3.1 The Function of Channelizing Devices

The function of channelizing devices is to warn road users of conditions created by work activities in or near roadway and to guide road users. Channelizing devices include cones, tubular markers, vertical panels, drums, barricades, and temporary raised islands.

Channelizing devices provide for smooth and gradual vehicular traffic flow from one lane to another, onto a bypass or detour, or into a narrower traveled way. They are also used to separate vehicular traffic from the work space, pavement drop-offs, pedestrian or shared-use paths, or opposing directions of vehicular traffic.

3.2 General Requirements

Channelizing devices should be constructed and ballasted to perform in a predictable manner when inadvertently struck by a vehicle. Channelizing devices should be crashworthy. Fragments or other debris from the device or the ballast should not pose a significant hazard to road users or workers.

The name and telephone number of the highway agency, contractor, or supplier may be shown on the non-retroreflective surface of all types of channelizing devices. The letters and numbers of the name and telephone number shall be non-retroreflective and not over 50 mm (2 in) in height.

3.3 General Pedestrian Requirements

If drums, cones, or tubular markers are used to channelize pedestrians, they shall be located such that there are no gaps between the bases of the devices, in order to create a continuous bottom, and the height of each individual drum, cone, or tubular marker shall be no less than 900 mm (36 in) to be detectable to users of long canes.

3.4 Specific Requirements

3.4.1 Cones

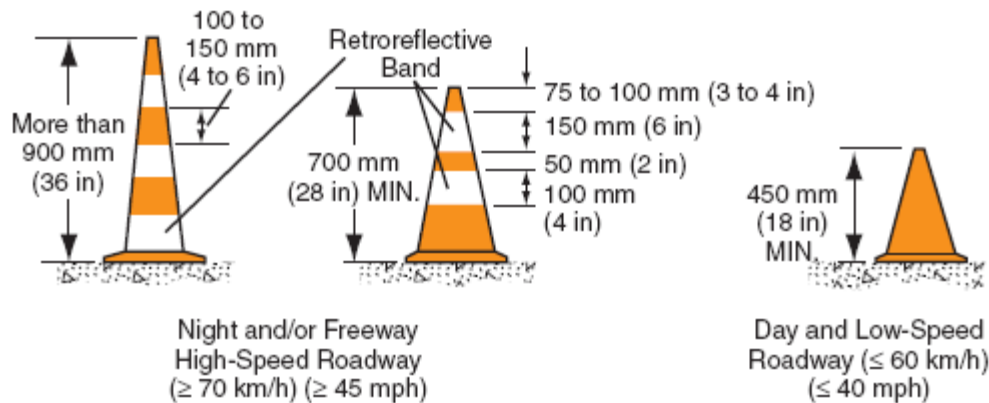
Cones shall be predominantly orange and shall be made of a material that can be struck without causing damage to the impacting vehicle. For daytime and low-speed roadways, cones shall be not less than 450 mm (18 in) in height. When cones are used on freeways and other high-speed highways or at night on all highways, or when more conspicuous guidance is needed, cones shall be a minimum of 700 mm (28 in) in height.

For nighttime use, cones shall be retroreflectorized or equipped with lighting devices for maximum visibility. Retroreflectorization of cones that are 700 to 900 mm (28 to 36 in) in height shall be provided by a 150 mm (6 in) wide white band located 75 to 100 mm (3 to 4 in) from the top of the cone and an additional 100 mm (4 in) wide white band located approximately 50 mm (2 in) below the 150 mm (6 in) band.

Retroreflectorization of cones that are more than 900 mm (36 in) in height shall be provided by horizontal, circumferential, alternating orange and white retroreflective stripes that are 100 to 150 mm (4 to 6 in) wide. Each cone shall have a minimum of two orange and two white stripes with the top stripe being orange. Any nonretroreflective

spaces between the orange and white stripes shall not exceed 75 mm (3 in) in width (Figure 8).

Figure 8. Example Cones



Additional cone requirements:

- Traffic cones may be used to channelize road users, divide opposing vehicular traffic lanes, divide lanes when two or more lanes are kept open in the same direction, and delineate short duration maintenance and utility work.
- Steps should be taken to minimize the possibility of cones being blown over or displaced by wind or moving vehicular traffic.
- Cones should not be used for pedestrian channelization or as pedestrian barriers in RWZ on or along sidewalks unless they are continuous between individual devices and detectable to users of long canes.
- Cones may be doubled up to increase their weight.
- Some cones are constructed with bases that can be filled with ballast. Others have specially weighted bases, or weight such as sandbag rings that can be dropped over the cones and onto the base to provide added stability. Ballast should be kept to the minimum amount needed.

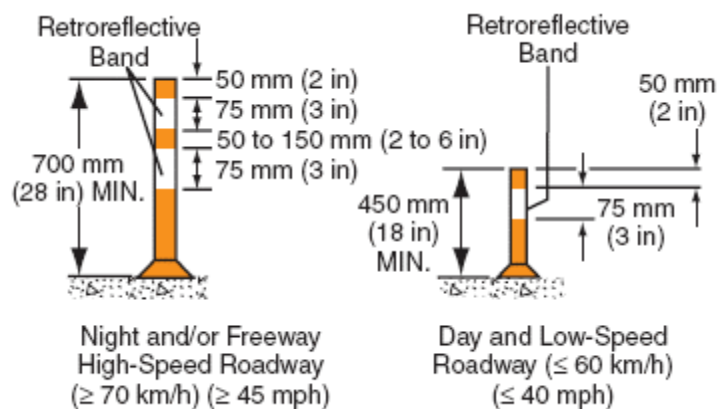
3.4.2 Tubular Markers

Tubular markers shall be predominantly orange and shall be not less than 450 mm (18 in) high and 50 mm (2 in) wide facing road users. They shall be made of a material that can be struck without causing damage to the impacting vehicle. Tubular markers shall be a minimum of 700 mm (28 in) in height when they are used on freeways and other

high-speed highways, on all highways during nighttime, or whenever more conspicuous guidance is needed.

For nighttime use, tubular markers shall be retroreflective. Retroreflective tubular markers shall be provided by two 75 mm (3 in) wide white bands placed a maximum of 50 mm (2 in) from the top with a maximum of 150 mm (6 in) between the bands (Figure 9).

Figure 9. Example Tubular Markers



Additional tubular marker requirements:

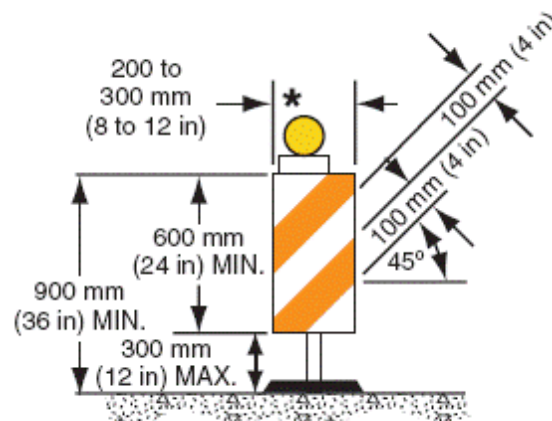
- Tubular markers should not be used for pedestrian channelization or as pedestrian barriers in RWZ zones on or along sidewalks unless they are continuous between individual devices and detectable to users of long canes.
- Tubular markers have less visible area than other devices and should be used only where space restrictions do not allow for the use of other more visible devices.
- Tubular markers should be stabilized by affixing them to the pavement, by using weighted bases, or weights such as sandbag rings that can be dropped over the tubular markers and onto the base to provide added stability. Ballast should be kept to the minimum amount needed.
- Tubular markers may be used effectively to divide opposing lanes of road users, divide vehicular traffic lanes when two or more lanes of moving motor vehicle traffic are kept open in the same direction, and to delineate the edge of a pavement drop off where space limitations do not allow the use of larger devices.

- When a non-cylindrical tubular marker is used, it shall be attached to the pavement in a manner such that the width facing road users meets the minimum requirements.
- A tubular marker shall be attached to the pavement to display the minimum 50 mm (2 in) width to the approaching road users.

3.4.3 Vertical Panels

Vertical panels shall be 200 to 300 mm (8 to 12 in) in width and at least 600 mm (24 in) in height. They shall have orange and white diagonal stripes and be retroreflectorized. Vertical panels shall be mounted with the top a minimum of 900 mm (36 in) above the roadway. Where the height of the vertical panel itself is 900 mm (36 in) or greater, a panel stripe width of 150 (6 in) shall be used (Figure 10).

Figure 10. Example Vertical Panel



* Warning lights (optional)

Additional vertical panel requirements:

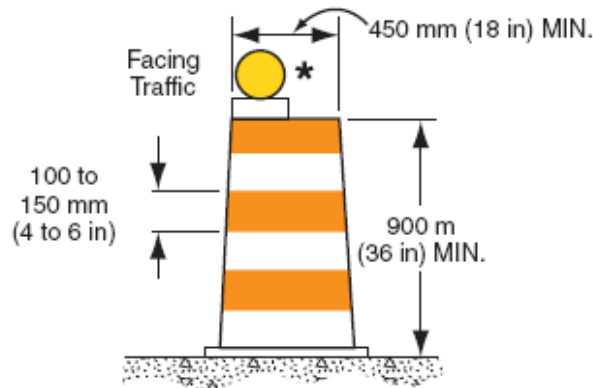
- Where the height of the vertical panel itself is less than 900 mm (36 in), a panel stripe width of 100 mm (4 in) may be used.
- Markings for vertical panels shall be alternating orange and white retroreflective stripes, sloping downward at an angle of 45 degrees in the direction vehicular traffic are to pass. Vertical panels used on freeways, expressways, and other high-speed roadways shall have a minimum of 169,000 mm² (270 in²) retroreflective area facing vehicular traffic.

- Where space is limited, vertical panels may be used to channelize vehicular traffic, divide opposing lanes, or replace barricades.

3.4.4 Drums

Drums used for road user warning or channelization shall be constructed of lightweight, deformable materials. They shall be a minimum of 900 mm (36 in) in height and have at least a 450 mm (18 in) minimum width regardless of orientation. Metal drums shall not be used. The markings on drums shall be horizontal, circumferential, alternating orange and white retroreflective stripes 100 to 150 mm (4 to 6 in) wide. Each drum shall have a minimum of two orange and two white stripes with the top stripe being orange. Any non-retroreflectORIZED spaces between the horizontal orange and white stripes shall not exceed 75 mm (3 in) wide. Drums shall have closed tops that will not allow collection of construction debris or other debris (Figure 11).

Figure 11. Example Drum



* Warning lights (optional)

Additional drum requirements:

- Although drums are most commonly used to channelize or delineate road user flow, they may also be used alone or in groups to mark specific locations.
- Drums should not be used for pedestrian channelization or as pedestrian barriers in the RWZ on or along sidewalks unless they are continuous between individual devices and detectable to users of long canes.
- Drums should not be weighted with sand, water, or any material to the extent that would make them hazardous to road users or workers when struck. Drums used

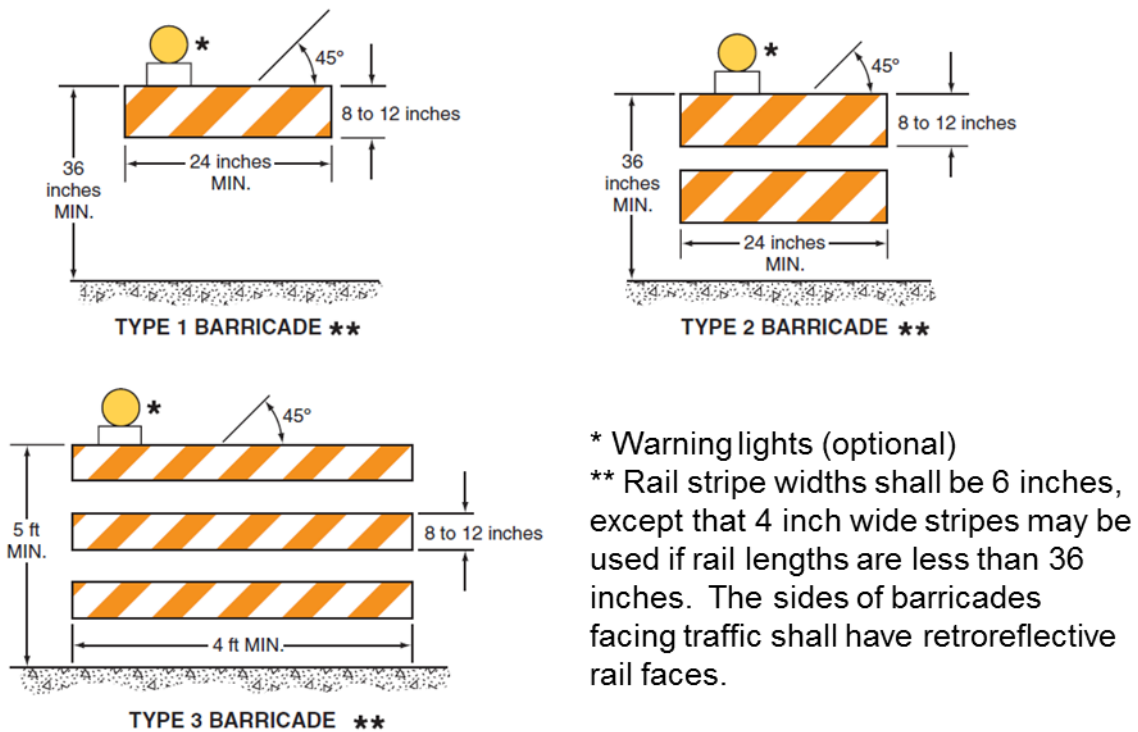
in regions susceptible to freezing should have drain holes in the bottom so that water will not accumulate and freeze causing a hazard if struck by a road user.

- Ballast shall not be placed on the top of a drum.

3.4.5 Type I, II or III Barricades

A barricade is a portable or fixed device having from one to three rails with appropriate markings and is used to control road users by closing, restricting, or delineating all or a portion of the right-of-way. As illustrated in Figure 12, barricades are classified as Type I, Type II, or Type III.

Figure 12. Example Barricade Types



Stripes on barricade rails shall be alternating orange and white retroreflective stripes sloping downward at an angle of 45 degrees in the direction road users are to pass. The stripes shall be 150 mm (6 in) wide (when rail lengths are less than 900 mm (36 in), 100 mm (4 in) wide stripes may be used).

The minimum length for Type I and Type II Barricades shall be 600 mm (24 in), and the minimum length for Type III Barricades shall be 1200 mm (48 in). Each barricade rail shall be 200 to 300 mm (8 to 12 in) wide. Barricades used on freeways, expressways, and other high-speed roadways shall have a minimum of 169,000 mm² (270 in²) of retroreflective area facing road users.

Additional barricade requirements:

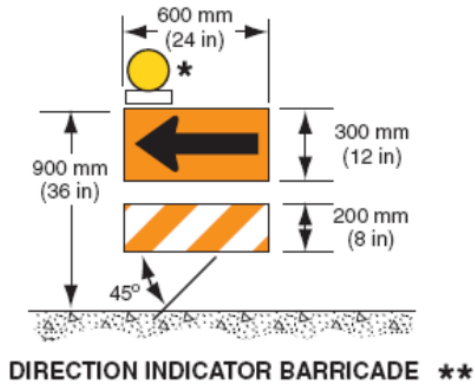
- Where barricades extend entirely across a roadway, the stripes should slope downward in the direction toward which road users must turn.
- Where both right and left turns are provided, the barricade stripes should slope downward in both directions from the center of the barricade or barricades.
- Where no turns are intended, the stripes should be positioned to slope downward toward the center of the barricade or barricades.
- Barricade rails should be supported in a manner that will allow them to be seen by the road user, and in a manner that provides a stable support that is not easily blown over or displaced.
- The width of the existing pedestrian facility should be provided for the temporary facility, if practical. Traffic control devices and other construction materials and features should not intrude into the usable width of the sidewalk, temporary pathway, or other pedestrian facility. When it is not possible to maintain a minimum width of 1500 mm (60 in) throughout the entire length of the pedestrian pathway, a 1500 x 1500 mm (60 x 60 in) passing space should be provided at least every 60 m (200 ft) to allow individuals in wheelchairs to pass.
- Barricade rail supports should not project into pedestrian circulation routes more than 100 mm (4 in) from the support between 675 mm (27 in) and 2000 mm (80 in) from the surface as described in Section 4.4.1 of the [“Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities \(ADAAG\)”](#).
- For Type I Barricades, the support may include other unstriped horizontal panels necessary to provide stability.
- Barricades should be crashworthy as they are located adjacent to vehicular traffic flow and are subject to impact by errant vehicles.
- On high-speed expressways or in other situations where barricades may be susceptible to overturning in the wind, ballasting should be used.
- Sandbags may be placed on the lower parts of the frame or the stays of barricades to provide the required ballast.

- Ballast shall not be placed on top of any striped rail. Barricades shall not be ballasted by
- Nondeformable objects such as rocks or chunks of concrete. Ballast shall not extend into the accessible passage width of 1500 mm (60 in).
- Type I or Type II Barricades are intended for use in situations where road user flow is maintained through the RWZ.
- Barricades may be used alone or in groups to mark a specific condition or they may be used in a series for channelizing road users.
- Type I Barricades may be used on conventional roads or urban streets.
- Type II or Type III Barricades should be used on freeways and expressways or other high-speed roadways.
- Type III Barricades should be used to close or partially close a road. Type III Barricades used at a road closure may be placed completely across a roadway or from curb to curb. Where provision is made for access of authorized equipment and vehicles, the responsibility for Type III Barricades should be assigned to a person who will provide proper closure at the end of each work day.

3.4.6 Direction Indicator Barricades

The Direction Indicator Barricade shall consist of a One-Direction Large Arrow Sign mounted above a diagonal striped, horizontally aligned, retroreflective rail. The One-Direction Large Arrow Sign shall be black on an orange background. The stripes on the bottom rail shall be alternating orange and white retroreflective stripes sloping downward at an angle of 45 degrees in the direction road users are to pass. The stripes shall be 100 mm (4 in) wide. The One-Direction Large Arrow sign shall be 600 x 300 mm (24 x 12 in). The bottom rail shall have a length of 600 mm (24 in) and a height of 200 mm (8 in) (Figure 13).

Figure 13. Example Direction Indicator Barricade



* Warning lights (optional)
** Rail stripe widths shall be 6 inches, except that 4 inch wide stripes may be used if rail lengths are less than 36 inches. The sides of barricades facing traffic shall have retroreflective rail faces.

Additional Direction Indicator Barricade requirements:

- The Direction Indicator Barricade, including any associated ballast or lights, should be crashworthy.
- The Direction Indicator Barricade may be used in tapers, transitions, and other areas where specific directional guidance to drivers is necessary.
- If used, Direction Indicator Barricades should be used in series to direct the driver through the transition and into the intended travel lane.

3.4.7 Channelizing Device Spacing

The spacing of channelizing devices should not exceed a distance in meters (feet) equal to 0.2 times the speed limit in km/h (1.0 times the speed limit in mph) when used for taper channelization, and a distance in meters (feet) equal to 0.4 times the speed limit in km/h (2.0 times the speed limit in mph) when used for tangent channelization.

When channelizing devices have the potential of leading vehicular traffic out of the intended vehicular traffic space, the channelizing devices should be extended a distance in meters (feet) of 0.4 times the speed limit in km/h (2.0 times the speed limit in mph) beyond the end of the transition area.

3.4.8 Use of Lights with Channelizing Devices

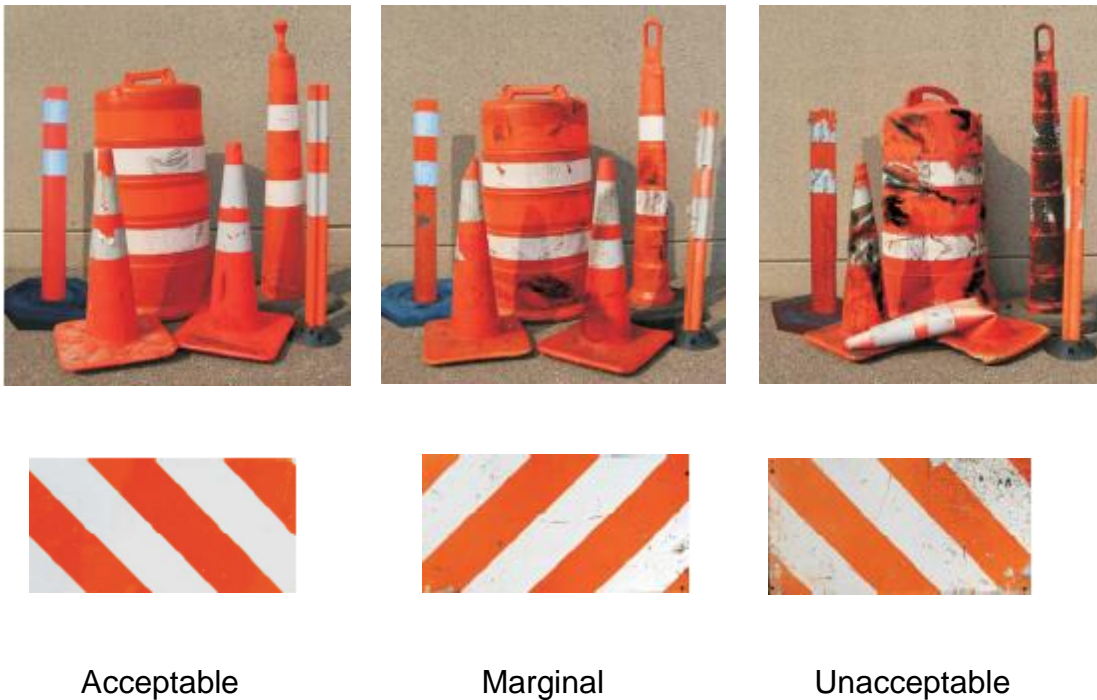
Warning lights may be added to channelizing devices in areas with frequent fog, snow, or severe roadway curvature, or where visual distractions are present. Warning lights shall flash when placed on channelizing devices used alone or in a cluster to warn of a condition. Warning lights placed on channelizing devices used in a series to channelize

road users shall be steady-burn. The retroreflective material used on channelizing devices shall have a smooth, sealed outer surface that will display a similar color day or night.

3.4.9 Channelizing Device Maintenance

Particular attention should be given to maintaining the channelizing devices to keep them clean, visible, and properly positioned at all times. Devices that are damaged or have lost a significant amount of their retroreflectivity and effectiveness shall be replaced (Figure 14).

Figure 14. Acceptable, Marginal and Unacceptable Channelizing Device Conditions



4 USING FLAGGERS FOR TRAFFIC CONTROL

4.1 General

Because flaggers are responsible for public safety and make the greatest number of contacts with the public of all highway workers, they should be trained in safe traffic control practices and public contact techniques (contact the Arcadis Learning Center for information about flagger training). Flaggers should be able to satisfactorily demonstrate the following abilities:

- Ability to receive and communicate specific instructions clearly, firmly, and courteously;
- Ability to move and maneuver quickly in order to avoid danger from errant vehicles;
- Ability to control signaling devices (such as paddles and flags) in order to provide clear and positive guidance to drivers approaching a RWZ in frequently changing situations;
- Ability to understand and apply safe traffic control practices, sometimes in stressful or emergency situations; and
- Ability to recognize dangerous traffic situations and warn workers in sufficient time to avoid injury.

Hand-signaling devices, such as STOP/SLOW paddles, lights, and red flags, are used to control road users through the RWZ. The STOP/SLOW paddle should be the primary and preferred hand-signaling device because the STOP/SLOW paddle gives road users more positive guidance than red flags. Use of flags should be limited to emergency situations.

4.2 STOP/SLOW Paddle Requirements

The STOP/SLOW paddle shall have an octagonal shape on a rigid handle. STOP/SLOW paddles shall be at least 450 mm (18 in) wide with letters at least 150 mm (6 in) high and should be fabricated from light semirigid material. The background of the STOP face shall be red with white letters and border. The background of the SLOW face shall be orange with black letters and border. When used at night, the STOP/SLOW paddle shall be retroreflectorized.

Additional STOP/SLOW paddle requirements:

- The STOP/SLOW paddle may be modified to improve conspicuity by incorporating either white or red flashing lights on the STOP face, or either white or yellow flashing lights on the SLOW face.
- If flashing lights are used on the STOP face of the paddle, their colors shall be all white or all red.
- If flashing lights are used on the SLOW face of the paddle, their colors shall be all white or all yellow.
- If more than eight flashing lights are used, the lights shall be arranged such that they clearly convey the octagonal shape of the STOP face of the paddle and/or the diamond shape of the SLOW face of the paddle.
- If flashing lights are used on the STOP/SLOW paddle, the flash rate shall be at least 50, but not more than 60, flashes per minute.
- The flashing lights may be arranged in any of the following patterns:
 - Two white or red lights, one centered vertically above and one centered vertically below the STOP legend; and/or two white or yellow lights, one centered vertically above and one centered vertically below the SLOW legend; or
 - Two white or red lights, one centered horizontally on each side of the STOP legend; and/or two white or yellow lights, one centered horizontally on each side of the SLOW legend; or
 - One white or red light centered below the STOP legend; and/or one white or yellow light centered below the SLOW legend; or
 - A series of eight or more small white or red lights no larger than 6 mm (0.25 in) in diameter along the outer edge of the paddle, arranged in an octagonal pattern at the eight corners of the border of the STOP face; and/or a series of eight or more small white or yellow lights no larger than 6 mm (0.25 in) in diameter along the outer edge of the paddle, arranged in a diamond pattern along the border of the SLOW face.

- A series of white lights forming the shapes of the letters in the legend.

4.3 Flag Requirements

Flags, when used, shall be a minimum of 600 mm (24 in) square, made of a good grade of red material, and securely fastened to a staff that is approximately 900 mm (36 in) in length. The free edge of a flag should be weighted so the flag will hang vertically, even in heavy winds. When used at nighttime, flags shall be retroreflectorized red.

4.4 Flagger Procedures

The following methods of signaling with paddles shall be used (Figure 15):

- To stop road users, the flagger shall face road users and aim the STOP paddle face toward road users in a stationary position with the arm extended horizontally away from the body.
- The free arm shall be held with the palm of the hand above shoulder level toward approaching traffic.
- To direct stopped road users to proceed, the flagger shall face road users with the SLOW paddle face aimed toward road users in a stationary position with the arm extended horizontally away from the body. The flagger shall motion with the free hand for road users to proceed.
- To alert or slow traffic, the flagger shall face road users with the SLOW paddle face aimed toward road users in a stationary position with the arm extended horizontally away from the body.

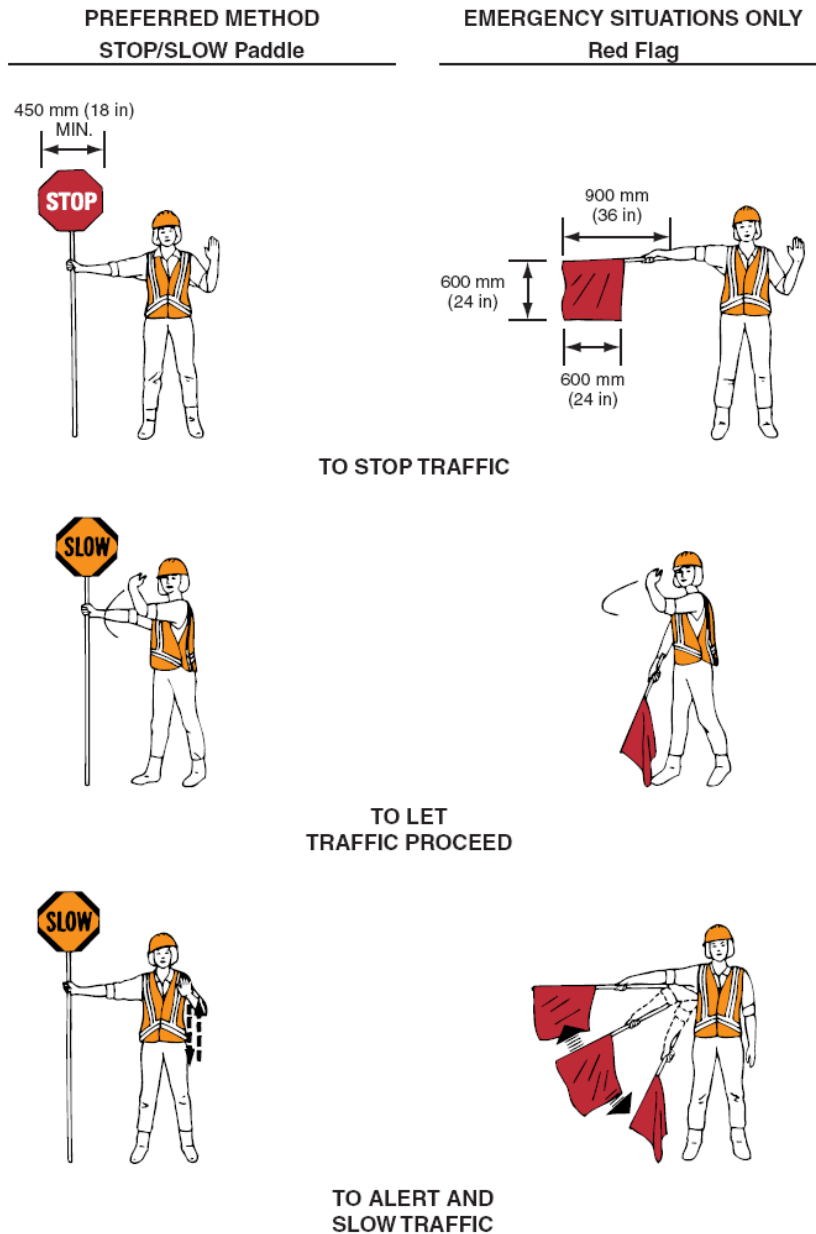
To further alert or slow traffic, the flagger holding the SLOW paddle face toward road users may motion up and down with the free hand, palm down.

The following methods of signaling with a flag shall be used (Figure 15):

- To stop road users, the flagger shall face road users and extend the flag staff horizontally across the road users' lane in a stationary position so that the full area of the flag is visibly hanging below the staff. The free arm shall be held with the palm of the hand above the shoulder level toward approaching traffic.
- To direct stopped road users to proceed, the flagger shall stand parallel to the road user movement and with flag and arm lowered from the view of the road users, and shall motion with the free hand for road users to proceed. Flags shall not be used to signal road users to proceed.

- To alert or slow traffic, the flagger shall face road users and slowly wave the flag in a sweeping motion of the extended arm from shoulder level to straight down without raising the arm above a horizontal position. The flagger shall keep the free hand down.

Figure 15. STOP/SLOW Paddle and Flag Signaling Methods



4.5 Flagger Stations

Flagger stations shall be located such that approaching road users will have sufficient distance to stop at an intended stopping point. The distances shown in Table 3 provides information regarding the stopping sight distance as a function of speed, may be used for the location of a flagger station. These distances may be increased for downgrades and other conditions that affect stopping distance. Flagger stations should be located such that an errant vehicle has additional space to stop without entering the work space.

Table 3. Site Distance for Oncoming Traffic for Flagger Station Location

Speed* (km/h)	Distance (m)	Speed* (mph)	Distance (ft)
30	35	20	115
40	50	25	155
50	65	30	200
60	85	35	250
70	105	40	305
80	130	45	360
90	160	50	425
100	185	55	495
110	220	60	570
120	250	65	645
		70	730
		75	820

* Posted speed, off-peak 85th-percentile speed prior to work starting, or the anticipated operating speed

Guidance: The above information is programmed into the TCP/STAR Plan Template and will automatically populate the site distance (in mph) when selecting a traffic control configuration utilizing a flagger.

Except in emergency situations, flagger stations shall be preceded by an advance warning sign or signs. Except in emergency situations, flagger stations shall be illuminated at night.

The flagger should stand either on the shoulder adjacent to the road user being controlled or in the closed lane prior to stopping road users. A flagger should only stand in the lane being used by moving road users after road users have stopped. The flagger should be clearly visible to the first approaching road user at all times. The flagger also should be visible to other road users. The flagger should be stationed sufficiently in advance of the workers to warn them (for example, with audible warning devices such as horns or whistles) of approaching danger by out-of-control vehicles. The flagger should stand alone, never permitting a group of workers to congregate around the flagger station.

At a spot constriction, the flagger may have to take a position on the shoulder opposite the closed section in order to operate effectively. At spot lane closures where adequate sight distance is available for the reasonably safe handling of traffic, the use of one flagger may be sufficient.

5 COMPUTING TAPER LENGTHS

5.1 General

RWZs requiring a transition area to move traffic out of its normal path require a taper. DOT has specific requirements for the length of the taper which must be computed using the formulas in Table 4:

Table 4. Formulas used to Compute Taper Length

Speed Limit (S)	Taper Length (L) Meters	Speed Limit (S)	Taper Length (L) Feet
60 km/h or less	$L = \frac{WS^2}{155}$	40 mph or less	$L = \frac{WS^2}{60}$
70 km/h or more	$L = \frac{WS}{1.6}$	45 mph or more	$L = WS$

Where: L = taper length in meters (feet)

W = width of offset in meters (feet)

S = posted speed limit, or off-peak 85th-percentile speed prior to work starting, or the anticipated operating speed in km/h (mph)

Guidance: The formulas above are programmed into the TCP/STAR Plan Template and will automatically select the required taper and compute length and number of cones required based on the traffic control scenario selected in section 6.0 or will notify the plan preparer to seek EJE guidance to determine taper characteristics.

Tapers may be used in both the transition and termination areas. Whenever tapers are to be used in close proximity to an interchange ramp, crossroads, curves, or other influencing factors, the length of the tapers may be adjusted.

Longer tapers are not necessarily better than shorter tapers (particularly in urban areas with characteristics such as short block lengths or driveways) because extended tapers tend to encourage sluggish operation and to encourage drivers to delay lane changes unnecessarily. Determining adequacy of taper length involves observation of driver performance after traffic control plans (TCPs) are put into effect.

The maximum distance in meters (feet) between devices in a taper should not exceed 0.2 times the speed limit in km/h (1.0 times the speed limit in mph).

5.2 Shoulder Tapers

A shoulder taper may be beneficial on a high-speed roadway where shoulders are part of the activity area and are closed, or when improved shoulders might be mistaken as a driving lane. In these instances, the same type, but abbreviated, closure procedures used on a normal portion of the roadway can be used.

If used, shoulder tapers should have a length of approximately 0.33 L. If a shoulder is used as a travel lane, either through practice or during a RWZ activity, a normal merging or shifting taper should be used.

5.3 Merging Tapers

A merging taper requires the longest distance because drivers are required to merge into common road space. A merging taper should be long enough to enable merging drivers to have adequate advance warning and sufficient length to adjust their speeds and merge into a single lane before the end of the transition.

5.4 Shifting Tapers

A shifting taper is used when a lateral shift is needed. When more space is available, a longer than minimum taper distance can be beneficial. Changes in alignment can also be accomplished by using horizontal curves designed for normal highway speeds. A shifting taper should have a length of approximately 0.5 L.

Guidance: The cone calculation functions of the TCP/STAR Plan Template do not address shifting tapers.

5.5 Downstream Tapers

A downstream taper may be useful in termination areas to provide a visual cue to the driver that access is available back into the original lane or path that was closed. When used, a downstream taper should have a length of approximately 30 m (100 ft) per lane with devices placed at a spacing of approximately 6.1 m (20 ft).

5.6 One-Lane, Two-Way Tapers

The one-lane, two-way taper is used in advance of an activity area that occupies part of a two-way roadway in such a way that a portion of the road is used alternately by traffic in each direction.

Traffic should be controlled by a flagger or temporary traffic control signal (if sight distance is limited), or a STOP or YIELD sign. A short taper having a maximum length of 30 m (100 ft) with channelizing devices spaced at approximately 6.1 m (20 ft) should be used to guide traffic into the one-way section.

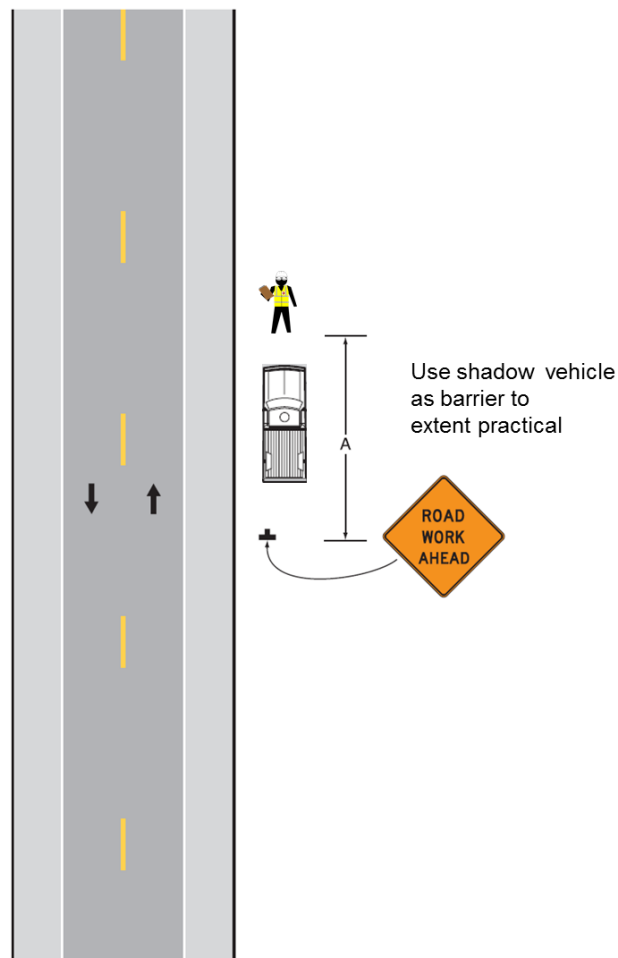
Guidance: The cone calculation functions of the TCP/STAR Plan Template do not address one-way, two lane tapers.

6 TEMPORARY TRAFFIC CONTROL EXAMPLES

6.1 Work beyond the Shoulder (DOT Facts-301i)

Figure 16 may be used for temporary traffic control (TTC) conducted beyond the shoulder of the roadway.

Figure 16. TTC for Work Beyond the Shoulder



Note: The TCP/STAR Plan Template will automatically calculate sign spacing distance "A". See section 2.3 if using an alternate TCP format.

6.1.1 Mandatory Requirements for TTC Work Beyond the Shoulder

M1. Deviation from Figure 16 (except as permitted in section 6.1.2) requires EJE review and approval.

M2. Work on the shoulder of an expressway, freeway, high speed (>45 mph) rural highway and/or configurations that deviate from the figure above (except as described in Guidance below) requires EJE review and approval.

M2. Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights.

6.1.2 Guidance for TTC Work Beyond the Shoulder

G1. If the work space is in the median of a divided highway, an advance warning sign should also be placed on the left side of the directional roadway.

G2. The ROAD WORK AHEAD sign may be replaced with other appropriate signs such as the SHOULDER WORK sign. The SHOULDER WORK sign may be used for work adjacent to the shoulder.

G3. The ROAD WORK AHEAD sign may be omitted where the work space is behind a barrier, more than 600 mm (24 in) behind the curb, or 4.6 m (15 ft) or more from the edge of any roadway.

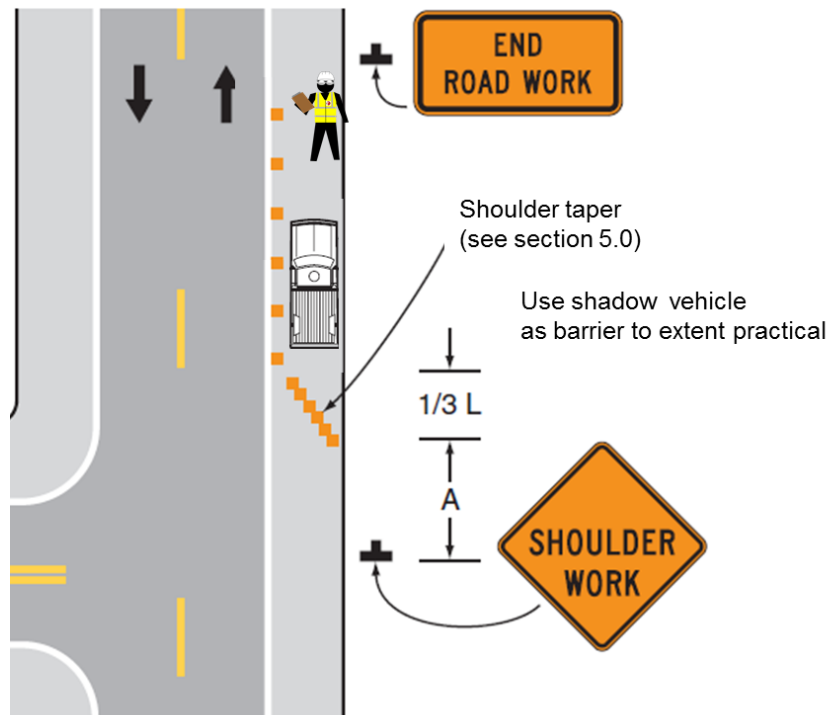
G4. For short-term, short-duration or mobile operation, all signs and channelizing devices may be eliminated if a vehicle with activated high-intensity rotating, flashing, oscillating, or strobe lights is used.

G5. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

6.2 Work on the Shoulder (DOT Facts-301j)

Figure 17 may be used for TTC work conducted on the shoulder of the roadway.

Figure 17. TTC for Work Conducted on the Shoulder



Note: The TCP/STAR Plan Template will automatically calculate sign spacing distance "A" and "1/3 L" (shoulder taper). See section 2.3 for "A" and section 5.1 for "L" if using an alternate TCP format.

6.2.1 Mandatory Requirements for TTC Work on the Shoulder

M1. Work on the shoulder of an expressway, freeway, high speed (>45 mph) rural highway and/or configurations that deviate from Figure 17 (except as permitted in section 6.2.2) requires EJE review and approval.

M2. Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights.

M3. When paved shoulders having a width of 2.4 m (8 ft) or more are closed, at least one advance warning sign shall be used. In addition, channelizing devices shall be used to close the shoulder in advance to delineate the beginning of the work space and direct vehicular traffic to remain within the traveled way.

6.2.2 Guidance for TCC Work Conducted on the Shoulder

G1. A SHOULDER WORK sign should be placed on the left side of the roadway for a divided or one-way street only if the left shoulder is affected.

G2. The Workers symbol signs may be used instead of SHOULDER WORK signs.

G3. The SHOULDER WORK AHEAD sign on an intersecting roadway may be omitted where drivers emerging from that roadway will encounter another advance warning sign prior to this activity area.

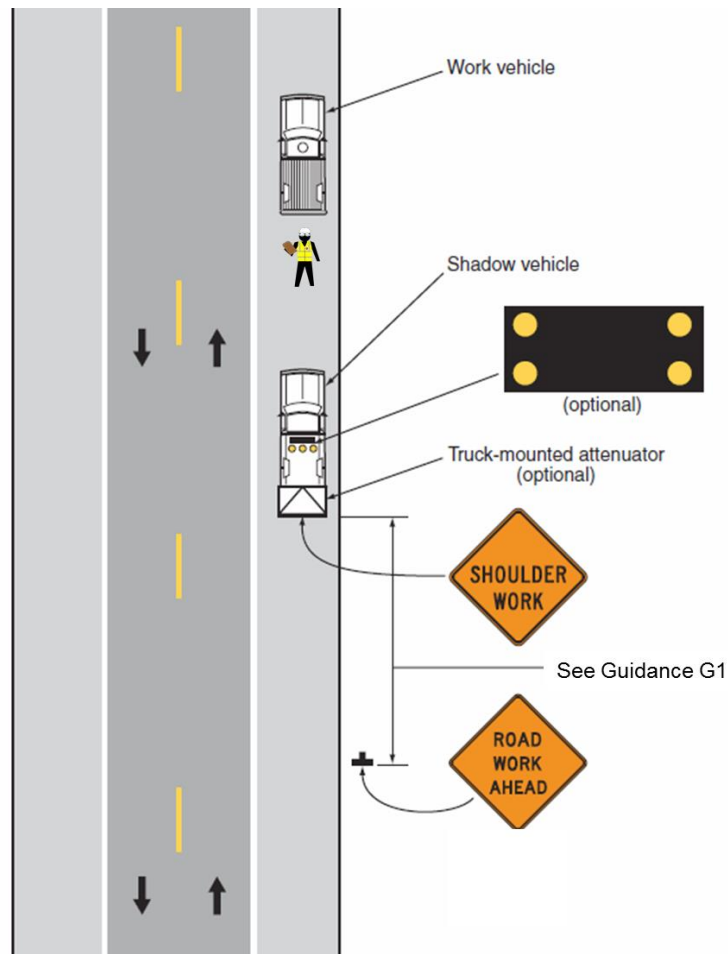
G4. For short-duration operations of 60 minutes or less, all signs and channelizing devices may be eliminated if a vehicle with activated high-intensity rotating, flashing, oscillating, or strobe lights is used.

G5. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

6.3 Short Duration or Mobile Operation on the Shoulder (DOT Facts-301k)

Figure 18 may be used for short duration or mobile TTC work on the shoulder of the roadway.

Figure 18. Short Duration or Mobile Operation TTC Work Conducted on the Roadway Shoulder



6.3.1 Mandatory Requirements for Short Duration or Mobile Operations of the Shoulder of the Roadway

M1. Work on the shoulder of an expressway, freeway, high speed (>45 mph) rural highway and/or configurations that deviate from Figure 18 (except as permitted in section 6.3.2) requires EJE review and approval.

M2. Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights.

M2. If an arrow panel is used for an operation on the shoulder, the caution mode shall be used.

6.3.2 Guidance for Short Duration or Mobile Operations of the Shoulder of the Roadway

G1. In situations where multiple work locations within a limited distance make it practical to place stationary signs, the distance between the advance warning sign and the work should not exceed 8 km (5 mi).

G2. In situations where the distance between the advance signs and the work is 3.2 km (2 mi) to 8 km (5 mi), a Supplemental Distance Plaque should be used with the ROAD WORK AHEAD sign (Figure 18a).

G3. The ROAD WORK NEXT XX km (MILES) sign may be used instead of the ROAD WORK AHEAD sign if the work locations occur over a distance of more than 3.2 km (2 mi).

G4. Warning signs may be omitted when the work vehicle displays high-intensity rotating, flashing, oscillating, or strobe lights if the distance between work locations is 1.6 km (1 mile) or more, and if the work vehicle travels at vehicular traffic speeds between locations.

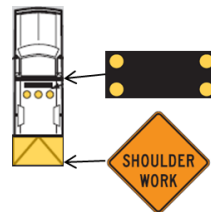
G5. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

G6. Truck mounted attenuator and/or arrow panel should be considered for vehicles involved in long term work involving this activity (Figure 18b).

Figure 18a. Example Supplemental Distance Plaques



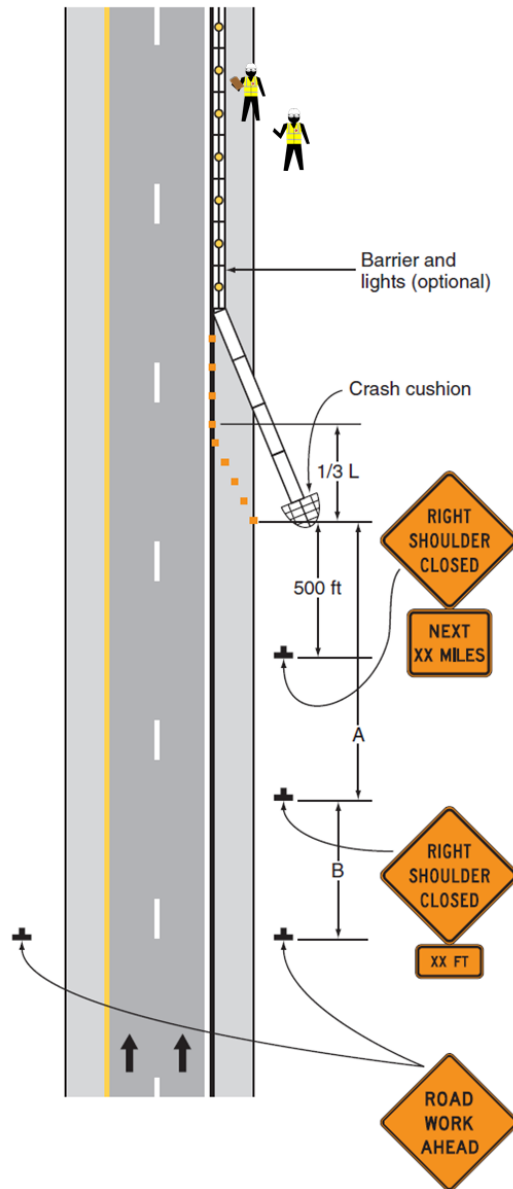
Figure 18b. Example of a Truck Mounted Attenuator with Arrow Panel



6.4 Shoulder Closure on the Freeway (DOT Facts-301I)

Figure 19 may be used for shoulder work (long term) on the freeway.

Figure 19. Example TTC Shoulder Closure on the Freeway



Note: The TCP/STAR Plan Template will automatically calculate sign spacing distance "A" and "B". See section 2.3 for "A" if using an alternate TCP format.

6.4.1 Mandatory Requirements for TTC Shoulder Closure on the Freeway

M1. Work on the shoulder of an expressway or freeway requires EJE review and approval.

M2. Where temporary traffic barriers are installed, the ends of the barrier shall be treated in accordance with Section 6F.81.5 of the Manual on Uniform Traffic Control Devices. The barrier shown is an example of one method that may be used to close a shoulder of a long-term project. The warning lights shown on the barrier may be used.

6.4.2 Guidance for TTC Shoulder Closure on the Freeway

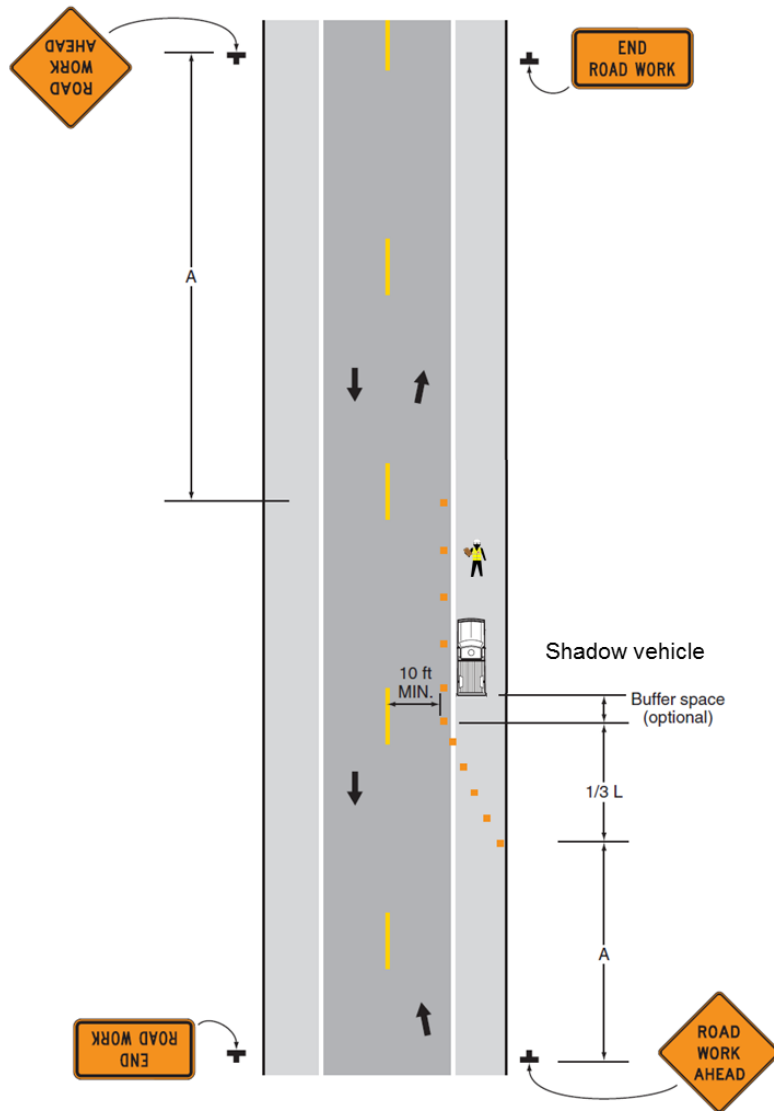
G1. SHOULDER CLOSED signs should be used on limited-access highways where there is no opportunity for disabled vehicles to pull off the roadway.

G2. If drivers cannot see a pull-off area beyond the closed shoulder, information regarding the length of the shoulder closure should be provided in meters or kilometers (feet or miles), as appropriate.

6.5 Shoulder Work with Minor Encroachment (DOT Facts-301m)

Figure 20 may be used for shoulder work with minor encroachment.

Figure 20. Example TTC for Work Conducted on the Shoulder with Minor Lane Encroachment



Note: The TCP/STAR Plan Template will automatically calculate sign spacing distance "A" and "1/3 L" (shoulder taper). See section 2.3 for "A" and section 5.1 for "L" if using an alternate TCP format.

6.5.1 Mandatory Requirements for TTC Work Conducted on the Shoulder with Minor Lane Encroachment

M1. Work on the shoulder of an expressway, freeway, high speed (>45 mph) rural highway and/or configurations that deviate from Figure 20 (except as permitted in section 6.5.2) requires EJE review and approval.

M2. Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights.

6.5.2 Guidance for TTC Work Conducted on the Shoulder with Minor Lane Encroachment

G1. All lanes should be a minimum of 3 m (10 ft) in width as measured to the near face of the channelizing devices.

G2. The treatment shown should be used on a minor road having low speeds. For higher-speed traffic conditions, a lane closure should be used.

G3. For short-term use on low-volume, low-speed roadways with vehicular traffic that does not include longer and wider heavy commercial vehicles, a minimum lane width of 2.7 m (9 ft) may be used.

G4. Where the opposite shoulder is suitable for carrying vehicular traffic and of adequate width, lanes may be shifted by use of closely spaced channelizing devices, provided that the minimum lane width of 3 m (10 ft) is maintained.

G5. Additional advance warning may be appropriate, such as a ROAD NARROWS sign.

G6. Temporary traffic barriers may be used along the work space.

G7. The shadow vehicle may be omitted if taper and channelizing devices are used.

G8. A truck-mounted attenuator may be used on the shadow vehicle.

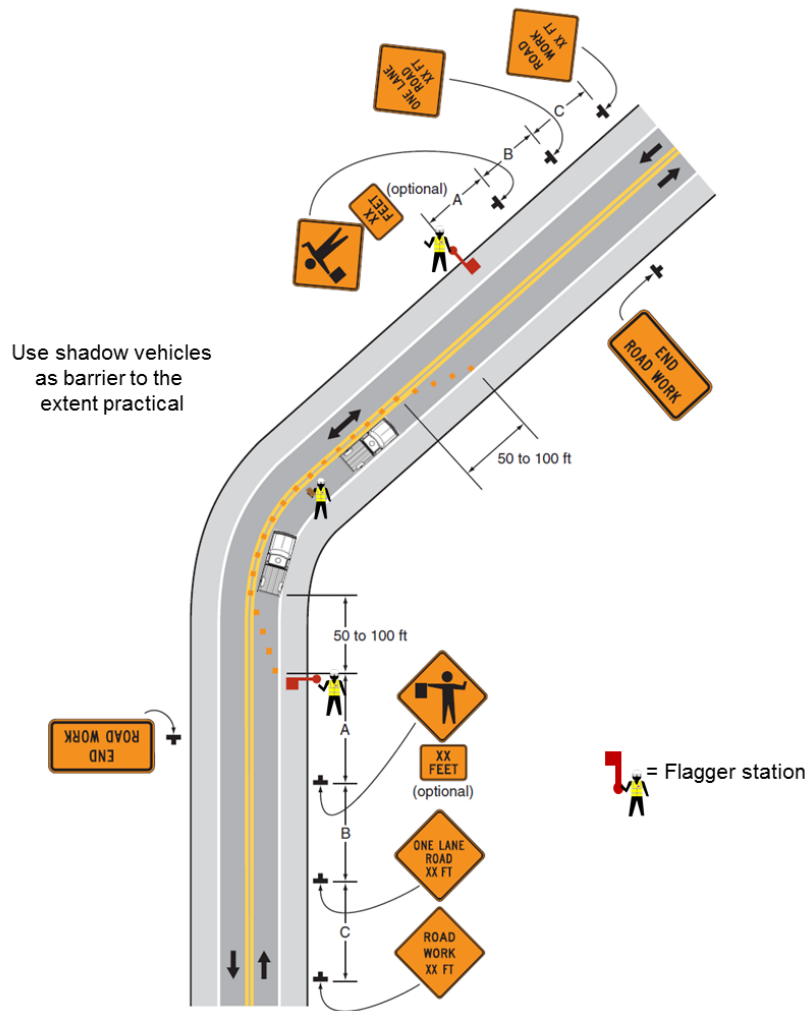
G9. For short-duration work, the taper and channelizing devices may be omitted if a shadow vehicle with activated high-intensity rotating, flashing, oscillating, or strobe lights is used.

G10. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

6.6 Lane Closure on Two-Lane Road Using Flaggers (DOT Facts-301n)

Figure 21 may be used for lane closure on two-lane roads using flaggers.

Figure 21. Example TTC for Lane Closure on Two-Lane Roads Using Flaggers



Note: The TCP/STAR Plan Template will automatically calculate sign spacing distances for “A”, “B” and “C”. The template will also compute oncoming site distance for flagger station placement. See section 2.3 for sign distance information and section 4.5 for site distance information for flagger stations if using an alternate TCP format.

6.6.1 Mandatory Requirements for Lane Closure on Two-Lane Roads Using Flaggers

M1. Work on a high speed (>45 mph) rural highway and/or configurations that deviate from figure 21 (except as permitted in section 6.6.2) requires EJE review and approval.

M2. At night, flagger stations shall be illuminated, except in emergencies.

6.6.2 Guidance for Lane Closure on Two-Lane Roads Using Flaggers

G1. For low-volume situations with short work zones on straight roadways where the flagger is visible to road users approaching from both directions, a single flagger, positioned to be visible to road users approaching from both directions, may be used.

G2. The ROAD WORK AHEAD and the END ROAD WORK signs may be omitted for short-duration operations.

G3. Flashing warning lights and/or flags may be used to call attention to the advance warning signs. A BE PREPARED TO STOP sign may be added to the sign series.

G4. The buffer space should be extended so that the two-way traffic taper is placed before a horizontal (or crest vertical) curve to provide adequate sight distance for the flagger and a queue of stopped vehicles.

G5. When used, the BE PREPARED TO STOP sign should be located between the Flagger sign and the ONE LANE ROAD sign.

G6. When a highway-rail grade crossing exists within or upstream of the transition area and it is anticipated that queues resulting from the lane closure might extend through the highway-rail grade crossing, the RWZ should be extended so that the transition area precedes the highway-rail grade crossing.

G7. When a highway-rail grade crossing equipped with active warning devices exists within the activity area, provisions should be made for keeping flaggers informed as to the activation status of these warning devices.

G8. When a highway-rail grade crossing exists within the activity area, drivers operating on the left side of the normal centerline should be provided with comparable warning devices as for drivers operating on the right side of the normal centerline.

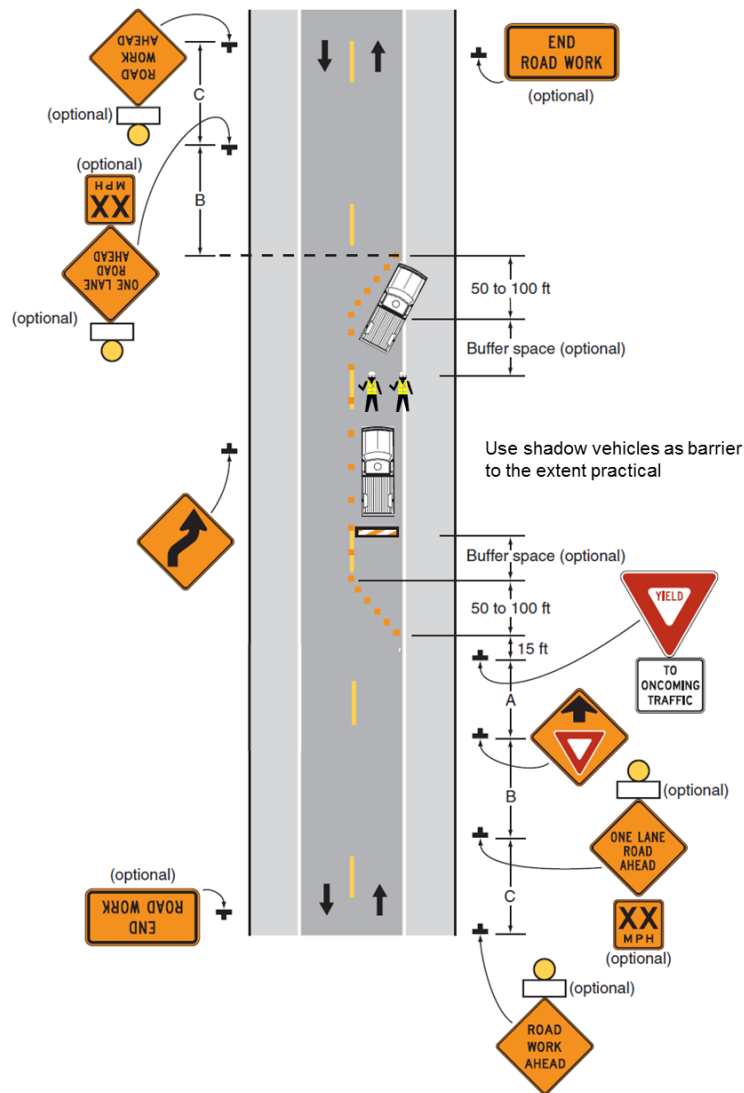
G9. Early coordination with the railroad company should occur before work starts.

G10. A flagger or a uniformed law enforcement officer may be used at the highway-rail grade crossing to minimize the probability that vehicles are stopped within 4.6 m (15 ft) of the highway-rail grade crossing, measured from both sides of the outside rails.

6.7 Lane Closure on Two-Lane Road with Low Traffic Volumes (DOT Facts-301o)

Figure 22 may be used for lane closure on two-lane roads with low traffic volumes.

Figure 22. Example TTC for Lane Closure on Two-Lane Roads with Low Traffic Volumes



Note: The TCP/STAR Plan Template will automatically calculate sign spacing distances for “A”, “B” and “C”. See section 2.3 for sign distance if using an alternate TCP format.

6.7.1 Mandatory Requirements for Lane Closures on Two-Lane Roads with Low Traffic Volumes

M1. Lane closures on two lane roadways require EJE review and approval.

6.7.2 Guidance for Lane Closures on Two-Lane Roads with Low Traffic Volumes

G1. This RWZ application may be used as an alternate to the RWZ application shown in DOT Facts-301n (using flaggers) when the following conditions exist:

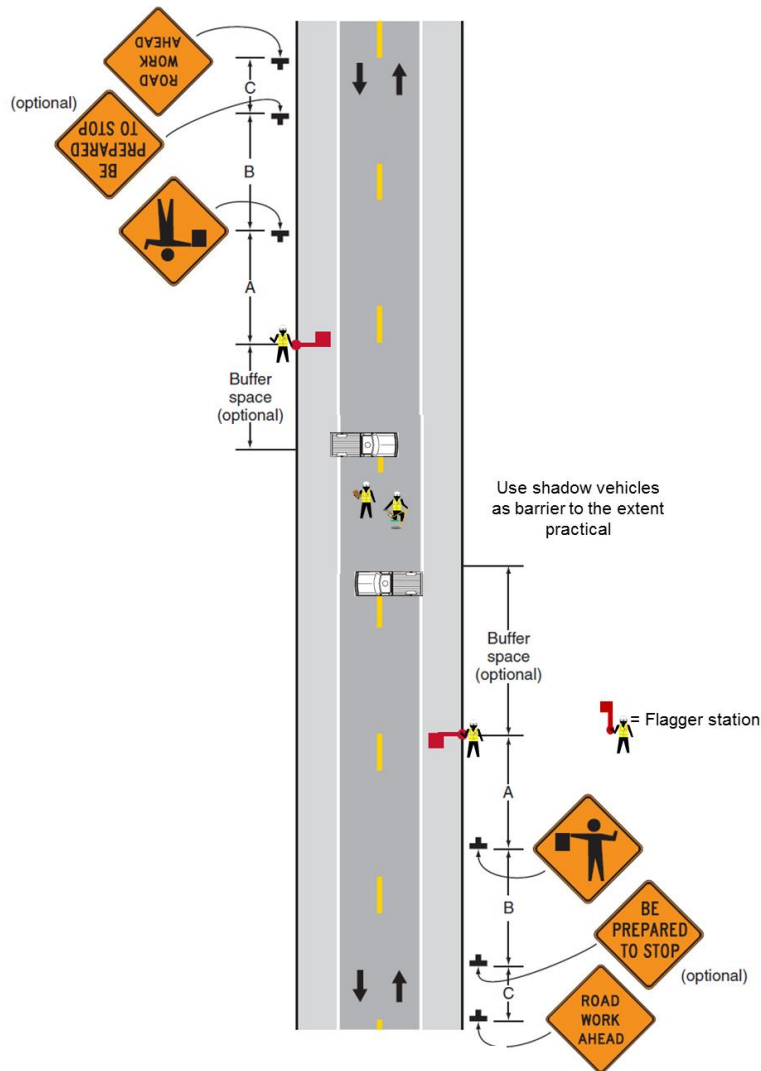
- a. Vehicular traffic volume is such that sufficient gaps exist for vehicular traffic that must yield.
- b. Road users from both directions are able to see approaching vehicular traffic through and beyond the work site and have sufficient visibility of approaching vehicles.

G2. The Type B flashing warning lights may be placed on the ROAD WORK AHEAD and the ONE LANE ROAD AHEAD signs whenever a night lane closure is necessary.

6.8 Temporary Road Closure (DOT Facts-301p)

Figure 23 may be used for a temporary road closure.

Figure 23. Example TTC for a Temporary Road Closure



Note: The TCP/STAR Plan Template will automatically calculate sign spacing distances for “A”, “B” and “C”. The template will also compute oncoming site distance for flagger station placement. See section 2.3 for sign distance information and section 4.5 for site distance information for flagger stations if using an alternate TCP format.

6.8.1 Mandatory Requirements for TTC Involving a Temporary Road Closure

M1. Road closures require EJE review and approval.

M2. A flagger or uniformed law enforcement officer shall be used for this application. The flagger, if used for this application, shall follow the procedures noted in Section 4.0.

6.8.2 Guidance for TTC Involving a Temporary Road Closure

G1. Conditions represented are a planned closure not exceeding 20 minutes during the daytime.

G2. The uniformed law enforcement officer, if used for this application, should follow the procedures noted in Sections 6E.04 and 6E.05 of the Manual on Uniform Traffic Control Devices (refer also to Section 4.0).

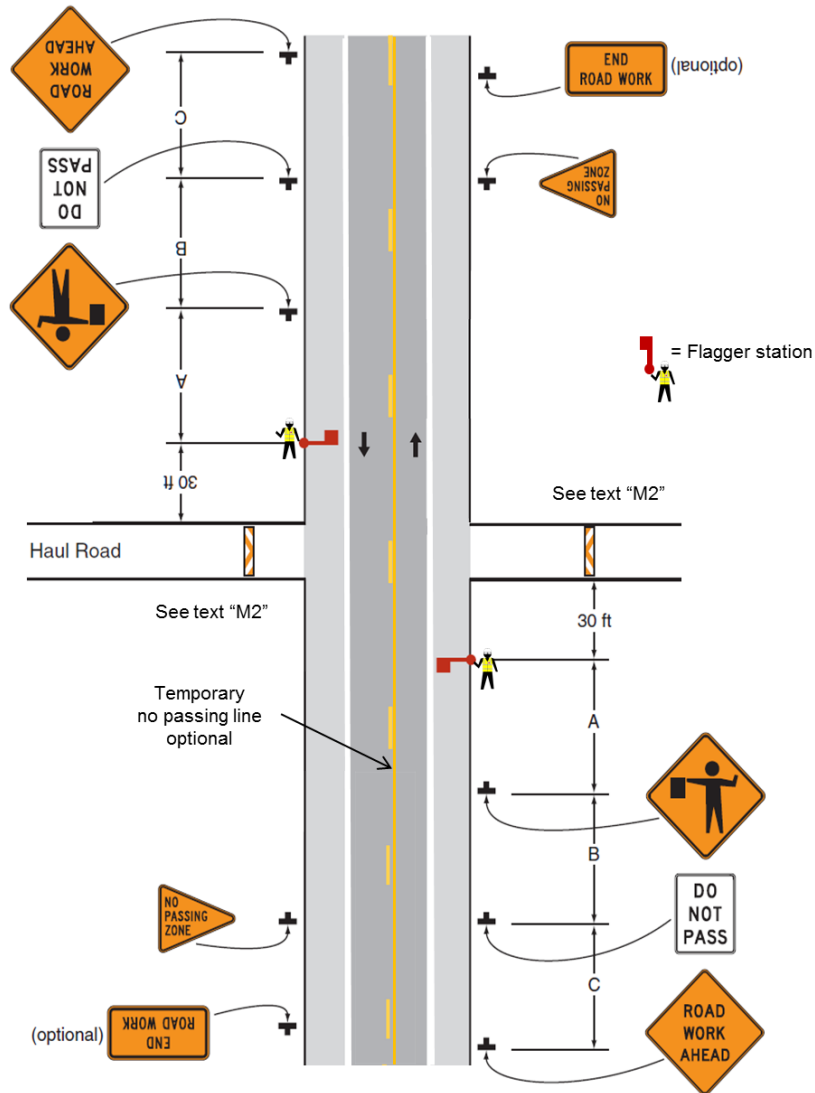
G3. A BE PREPARED TO STOP sign may be added to the sign series.

G4. When used, the BE PREPARED TO STOP sign should be located before the Flagger symbol sign.

6.9 Haul Road Crossing (DOT Facts-301q)

Figure 24 may be used for standard haul road crossings.

Figure 24. Example TTC for a Standard Haul Road Crossing



Note: The TCP/STAR Plan Template will automatically calculate sign spacing distances for "A", "B" and "C". The template will also compute oncoming site distance for flagger

station placement. See section 2.3 for sign distance information and section 4.5 for site distance information for flagger stations if using an alternate TCP format.

6.9.1 Mandatory Requirements for TTC Involving a Haul Road Crossing

M1. Work on a high speed (>45 mph) rural highway and/or configurations that deviate from Figure 24 (except as permitted in section 6.9.2) requires EJE review and approval.

M2. The traffic control method shall be used in both directions.

M3. When a road used exclusively as a haul road is not in use, the haul road shall be closed with Type III barricades (see section 3.4.5) and the Flagger symbol signs covered.

M4. The flagger shall follow the procedures noted in Section 4.0.

M5. At night, flagger stations shall be illuminated, except in emergencies.

6.9.2 Guidance for TTC Involving a Haul Road Crossing

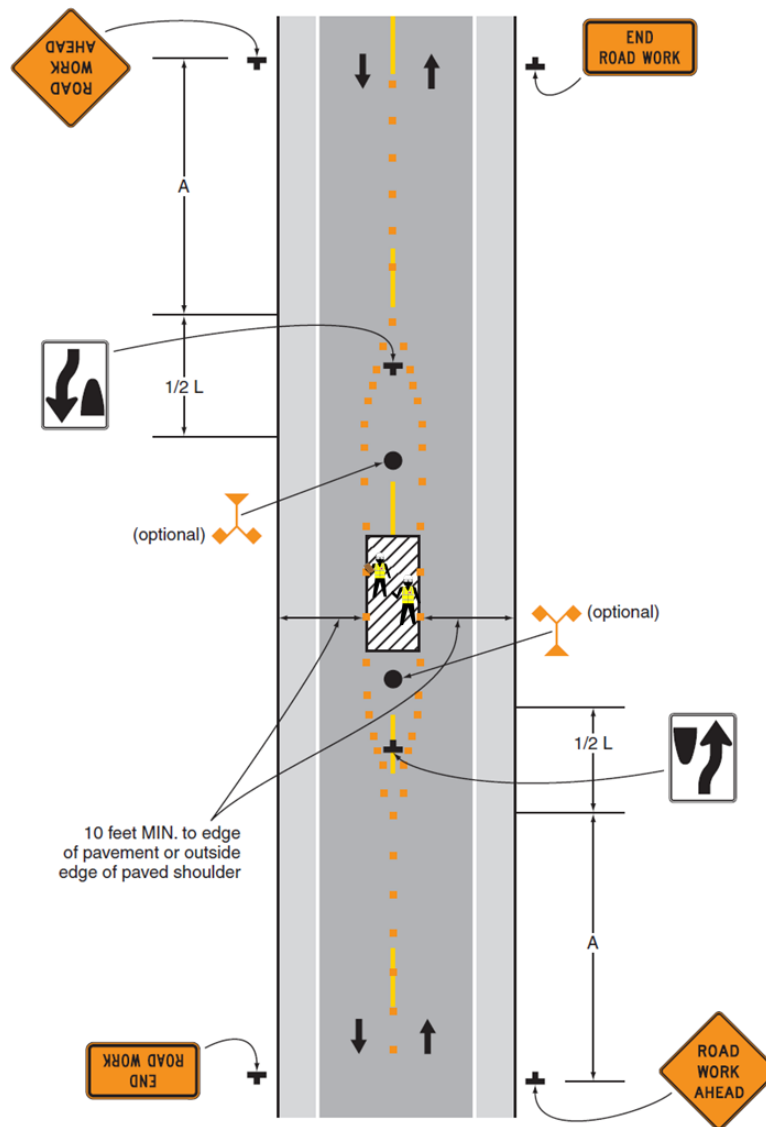
G1. Floodlights should be used to illuminate haul road crossings where existing light is inadequate.

G2. Where no passing lines are absent, a temporary no passing line should be added.

6.10 Work in Center of Road with Low Traffic Volumes (DOT Facts-301r)

Figure 25 may be used for work in the center of the road with low traffic volumes.

Figure 25. Example TTC for Work in the Center of the Road with Low Traffic Volumes



Note: The TCP/STAR Plan Template will automatically calculate sign spacing distance “A” but cannot compute “1/2 L”. See section 2.3 for “A” if using an alternate TCP format and section 5.1 for “L” computation information.

6.10.1 Mandatory Requirements for Center of the Road TTC on Roads with Low Traffic Volume

M1. Center of the road work requires EJE review and approval.

M2. Vehicle hazard warning signals shall not be used instead of the vehicle’s high-intensity rotating, flashing, oscillating, or strobe lights.

6.10.2 Guidance for Center of the Road TTC on Roads with Low Traffic Volume

G1. The lanes on either side of the center work space should have a minimum width of 3 m (10 ft) as measured from the near edge of the channelizing devices to the edge of pavement or the outside edge of paved shoulder.

G2. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.

G3. If the closure continues overnight, warning lights may be used on the channelizing devices.

G4. A lane width of 2.7 m (9 ft) may be used for short-term stationary work on low-volume, low-speed roadways when motor vehicle traffic does not include longer and wider heavy commercial vehicles.

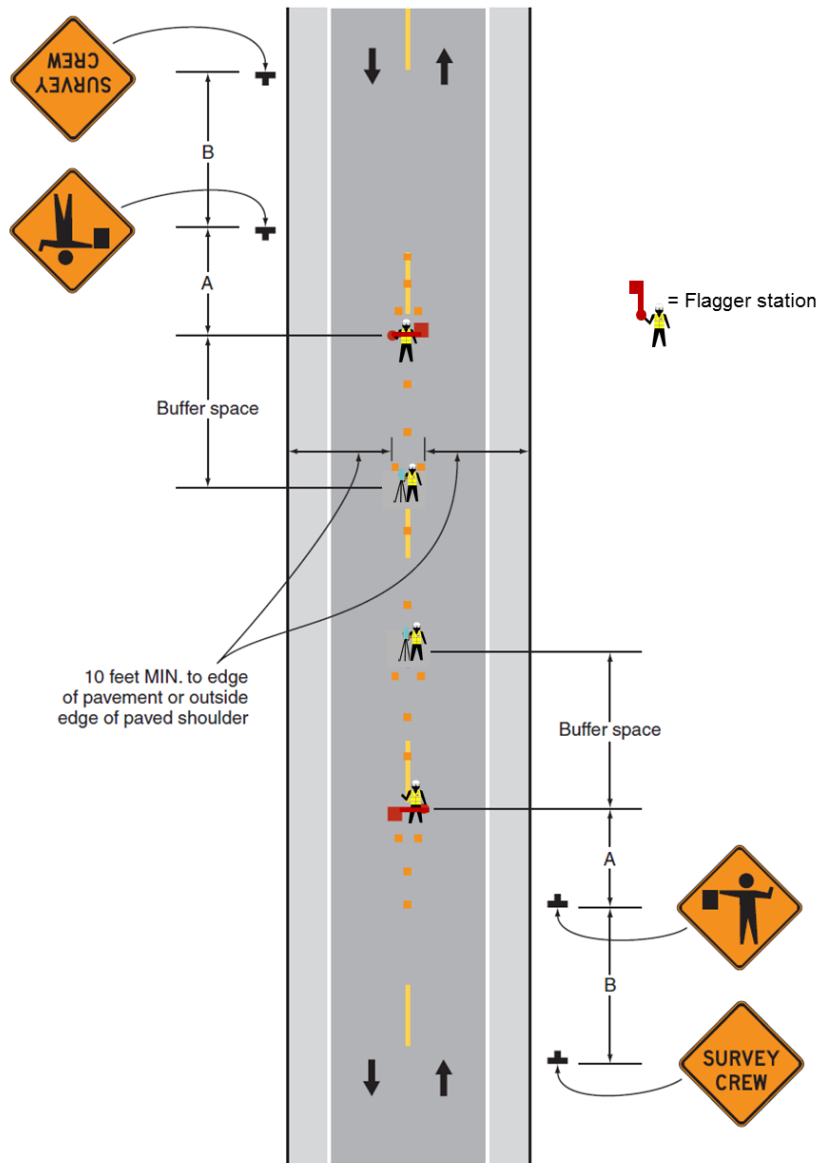
G5. A work vehicle displaying high-intensity rotating, flashing, oscillating, or strobe lights may be used instead of the channelizing devices forming the tapers or the high-level warning devices.

G6. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

6.11 Surveying along Centerline of Road with Low Traffic Volumes (DOT Facts-301s)

Figure 26 may be used for surveying along centerline of the road with low traffic volumes.

Figure 26. Example TTC for Surveying along the Centerline of Roads with Low Traffic Volumes



Note: Note: The TCP/STAR Plan Template will automatically calculate sign spacing distances for “A” and “B”. The template will also compute oncoming site distance for flagger station placement. See section 2.3 for sign distance information and section 4.5 for site distance information for flagger stations if using an alternate TCP format.

6.11.1 Mandatory Requirements for Surveying in the Center of the Road TTC on Roads with Low Traffic Volume

M1. Surveying and similar activities in the centerline of the road requires EJE review and approval.

M2. For surveying on the centerline of a high-volume road, one lane shall be closed using the information in DOT Facts-301n.

6.11.2 Guidance for Surveying in the Center of the Road TTC on Roads with Low Traffic Volume

G1. Cones should be placed 150 mm (6 in) to 300 mm (12 in) on either side of the centerline.

G2. The lanes on either side of the center work space should have a minimum width of 10 feet as measured from the near edge of the channeling device to the edge of the pavement or the outside edge of the paved shoulder.

G3. A flagger should be used to warn workers who cannot watch road users.

G4. A high-level warning device may be used to protect a surveying device, such as a target on a tripod.

G5. Cones may be omitted for a cross-section survey.

G6. ROAD WORK AHEAD signs may be used in place of the SURVEY CREW AHEAD signs.

G7. Flags may be used to call attention to the advance warning signs.

G8. If the work is along the shoulder, the flagger may be omitted.

G9. For a survey along the edge of the road or along the shoulder, cones may be placed along the edge line.

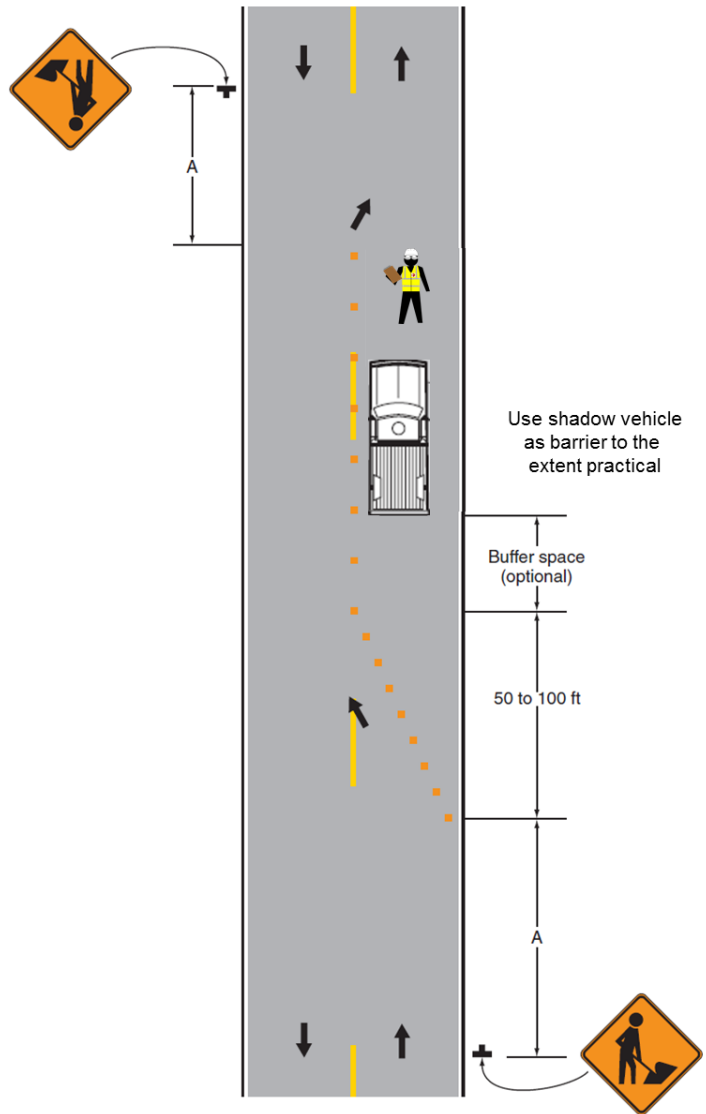
G10. A BE PREPARED TO STOP sign may be added to the sign series.

G11. When used, the BE PREPARED TO STOP sign should be located before the Flagger symbol sign.

6.12 Lane Closure on Minor Street (DOT Facts-301t)

Figure 27 may be used for lane closure on minor urban streets.

Figure 27. Example TTC for Lane Closure on Minor Urban Street



Note: Note: The TCP/STAR Plan Template will automatically calculate sign spacing distances for “A”. The template will also compute oncoming site distance for flagger station placement if complying with M2 below. See section 2.3 for sign distance information and section 4.5 for site distance information for flagger stations (if used) when using an alternate TCP format.

The lane closure in this configuration includes a one lane, two-way taper. The TCP/STAR template cannot compute specific length or number of cones required for this type of taper.

6.12.1 Mandatory Requirements for TTC Lane Closure on a Minor Urban Street

M1. Work on a high speed (>45 mph) minor urban streets and/or configurations that deviate from Figure 27 (except as permitted in section 6.12.2) requires EJE review and approval.

M2. This RWZ configuration shall be used only for low-speed roadways having low traffic volumes.

M3. Where vehicular traffic cannot effectively self-regulate, one or two flaggers shall be used as illustrated in DOT Facts-301n.

6.12.2 Guidance for TTC Lane Closure on a Minor Urban Street

G1. Where the work space is short, where road users can see the roadway beyond, and where volume is low, vehicular traffic may be self-regulating.

G2. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.

G3. A truck-mounted attenuator may be used on the work vehicle and the shadow vehicle.

6.13 Atypical Traffic Control (DOT Facts-301u)

Sections 6.1 through 6.12 address typical Arcadis traffic control scenarios. RWZs located in heavily congested urban areas, areas subject to vehicles with oversized loads on a routine basis or areas requiring pedestrian or bicycle control must have a detailed TCP addressing these issues.

Sources of information acceptable in aiding in the design of traffic control for a particular situation include:

- [US DOT Manual on Uniform Traffic Control Devices](#) (MUTCD); and/or
- State MUTCD equivalent guidance document.

Other sources of information may be used if issued by a state or local government agency having jurisdiction over roadway work where the work will be performed.

The applicable traffic control configuration illustration from the guidance document used will be printed and attached to the project specific TCP. Referencing of the document in the TCP in lieu of printing and attaching the illustration is not permitted.

Traffic control used in complex traffic environments may be designed by an employee with Engineering Judgment (see ARC DOT-301 for more information). A legible drawing (handwritten or computer generated) will be generated detailing the traffic control configuration and attached to the TCP.

7 RECOMMENDED BEST PRACTICES FOR TRAFFIC CONTROL IN PARKING AREAS

7.1 Selection of Traffic Control Devices for Parking Areas

Care should be taken to obtain the right traffic control device(s) for the application where it will be used. This section will provide an overview of best practices for the selection and use of traffic control devices used in traffic control in retail parking areas.

7.1.1 General Guidelines

- Traffic control devices selected must have a design and construction meeting the requirements of the DOT Manual on Uniform Traffic Control Devices (MUTCD).
- Barricades and channelizer cones used for night work must have retroreflective tape and warning lighting meeting MUTCD requirements.
- Channelizer cones must have a minimal height of 42 inches.

7.1.2 Device Descriptions and Applications

7.1.2.1 Cones

Cones may be used to augment traffic control devices recommended by the Arcadis Transportation Safety Program for Work Zone Safety (Figure 28). However, cones alone are not enough to provide the necessary protection to employees working near the ground. For parking area use, cones are typically utilized as part of the Arcadis Cone and Spotter Program (refer to the Motor Vehicle Safety Program Standard [ARC HSGE-024] for more information).

Figure 28. Example Cone Types Permitted to be used for STAR Plan Implementation



7.1.2.2 Channelizing Cones

Due to their increased height and design, channelizing cones are the preferred device for providing critical driver awareness of Arcadis work zones within parking areas (Figure 29).

Figure 29. Example Channelizing Cones Permitted for Use in STAR Plan Implementation



Example channelizing cones
Height: 42 inches

When selecting channelizing cones, the following factors should be considered:

- Ability to remove the base from the cone to facilitate storage in company vehicles
- Stackability of the cones (examples on the right and left may be stacked)
- Base weight:
 - Light weight bases (10-pound weight as illustrated in the left and center examples above) should be considered for short and intermediate duration work described in section 7.2 and 7.3.
 - Heavier bases (30 pound weight as illustrated in the example on the right above) should be considered for long duration work described in section 7.4.
- Accessories such as warning lights for night work
- Ability to affix caution tape and/or safety fencing to the cone.

Sections 7.2 through 7.4 recommend placing flags on channelizing cones to increase height awareness for drivers of larger vehicles in parking areas. Flags acceptable for

use include standard bicycle safety flag (6 ft height) affixed to the channelizing cone (see example above).

7.1.2.3 Barricades

The Arcadis Transportation Safety Program for Work Zone Safety recommends using barricades to close of entrances to parking areas when required for project work (figure 30). Of the examples above, the Type II barricade is preferred (light not required if only using during daylight hours) but all three may be used. Use of barricades may require additional weighting in windy environments. Weights if used shall not be placed on the top of the barricade. Weights selected should not create a hazard to the driver of an errant vehicle striking the barricade. The preferred weight is sand bags placed on the lower portions of the barricade.

Figure 30. Example Barricades Permitted for Use in STAR Plan Implementation



Type I Barricade



Type II Barricade



Type III Barricade

7.1.2.4 Caution Tape

Caution tape is acceptable for demarcating and increasing awareness of work zones within parking areas for intermediate duration work activities (1-8 hours in duration, daylight hours only) (Figure 31). Caution tape must be securely affixed to the channelizing cone or barricade and taught. Increase number of channelizing cones or use cones with 30 pound weighted bases in windy environments. Since caution tape is easily damaged, frequent inspection and maintenance is required. Create an access point to enter and leave the work area instead of crossing over or under the caution tape.

Figure 31. Example Channelizing Cones Equipped with Caution Tape



7.1.2.5 Plastic Safety Fencing

Standard orange plastic safety fencing is the preferred material for demarcating and increasing awareness of work zones in parking areas for long duration work activities (>8 hours duration) and night work (Figure 32). The fencing must be securely affixed to the channelizing cone and the cones used should be equipped with 30 pound weighted bases. Sufficient number of channelizing cones should be used to ensure fencing remains taught for the duration of work. Create an access point to enter and leave the work area without having to cross over the fencing. Do not affix the fencing to vehicles inside the work zone and leave sufficient walking space around all vehicles.

Figure 32. Example Channelizing Cones with Plastic Safety Fencing

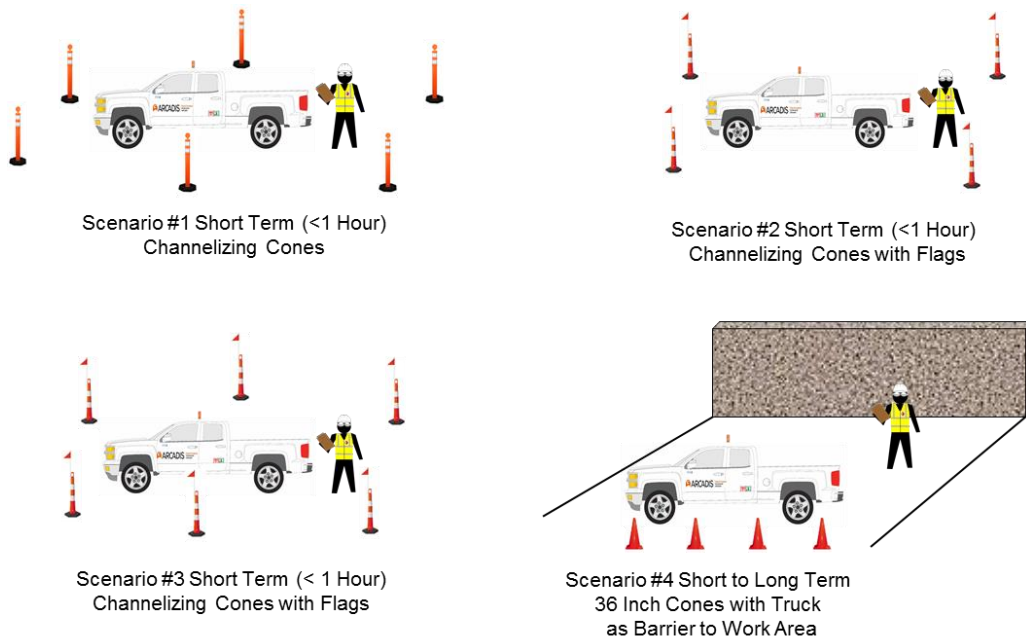


7.2 Short Duration Work in Parking Areas (<1 Hour) (DOT Facts-302a)

7.2.1 Short Duration Work with Vehicle

The configurations illustrated in Figure 33 should be considered for traffic protection in retail parking areas for work durations less than 1 hour.

Figure 33. Example Short Term (<1 Hour) Traffic Control Configurations for Use in STAR Plan Implementation



In all cases, use the vehicle as a shield when possible. All above scenarios utilize concepts of the Arcadis Cone and Spotter Program (see the Motor Vehicle Safety Program Standard (ARC HSGE-024) for more information.

7.2.1.1 General Guidelines for Safety with Vehicle

The following guidelines should be considered as part of STAR Plan implementation:

- Always work facing the area with greatest traffic movement and least protection
- Always assume vehicle will move in either direction (frontwards or backwards)
- Always use TRACK to predict traffic movement and stage vehicle in manner that offers protection without impairing site entrance or blocking access to fuel islands, when possible.

- If there is a perceived drivable space, you must assume that someone will attempt to access or drive to/through the location. Plan, deploy and work accordingly.
- Class II high visibility vest (minimum) to be worn at all times.
- Discuss with site operator or manager times of lower traffic volume and attempt to schedule work activity during traffic lulls.

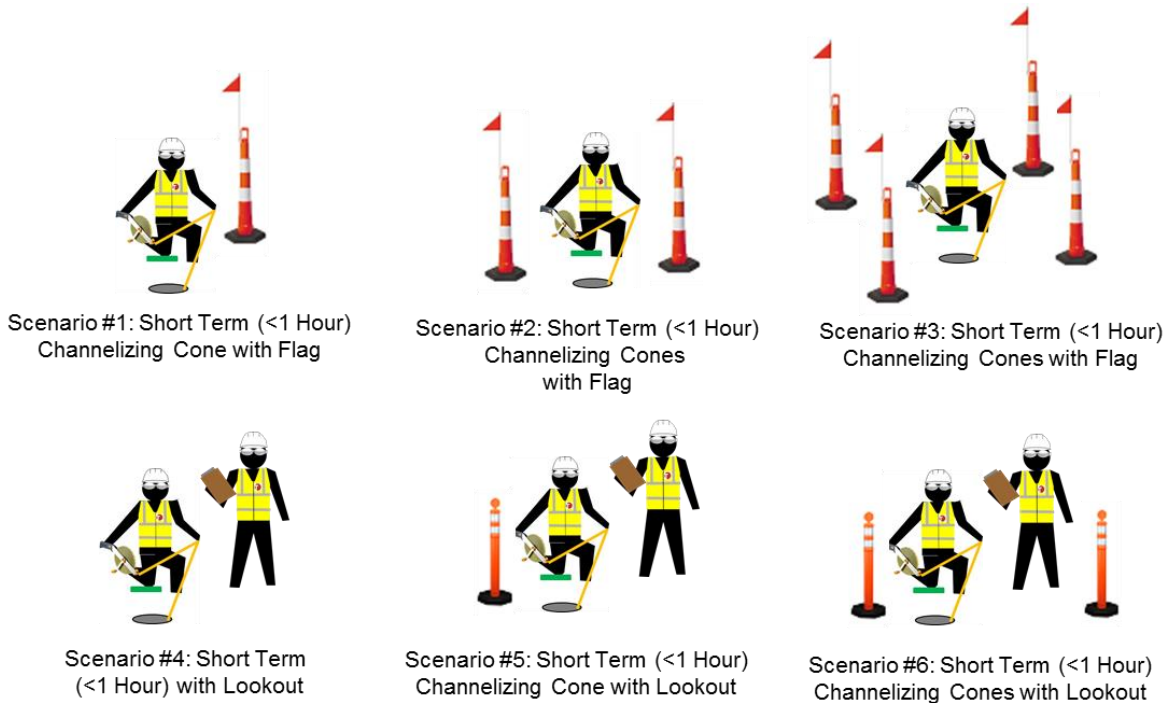
7.2.1.2 Scenario Descriptions with Vehicle

- 1) Use of 6 channelizing cones around the work area may be appropriate for parking lots with a low traffic volume such as parking lots of closed retail facilities with access to the public (the lot is not closed and gated). Six cones is a minimum and more cones may be required for large work areas within the parking lot.
- 2) Use of 4 channelizing cones with flags may be appropriate for parking lots with a low traffic volume such as parking lots of closed retail facilities with access to the public (the lot is not closed and gated) and work activities will be near to the ground. This scenario should also be considered if vehicles will be backing in the vicinity of the work area.
- 3) For parking lot with constant traffic, more channelizing cones should be considered and they should be equipped with flags to increase visibility to drivers of backing vehicles.
- 4) Where parking areas are to the side of the building with little or no traffic, it may be beneficial to block the entire area with the vehicle. For this scenario, if the work duration is intermediate or long term, deployment of 36 inch cones is suggested to let drivers in the parking lot know the area is planned to be closed off for a considerable period of time.

7.2.2 Short Duration Work without Vehicle

On some sites, it may be impractical to move the vehicle from one location to another for short term work. In these situations, use a Spotter to watch for traffic and/or utilize one of the scenarios illustrated in Figure 34.

Figure 34. Example Short Term (< 1 Hour) Traffic Control Scenarios without Use of Vehicle During STAR Plan Implementation



7.2.2.1 General Guidelines for Safety

- All guidelines in section 7.2.1.1 apply to these scenarios.
- Always position yourself near large stationary objects when practical

7.2.2.2 Scenario Descriptions

- 1) Use of the single channelizing cone is acceptable if in a closed parking lot where public access is not available. This scenario may apply when contractor or Arcadis vehicles or are operating the closed parking lot. If working near the ground, a flag should be considered to increase visibility. If heavy equipment is on the site with poor rear or side visibility, additional cones should be considered.
- 2) Work along the edges of parking lots with minimal vehicular traffic should consider use of 2 channelizing cones, at a minimum. If work is conducted near the ground, flags should be considered.
- 3) Work in parking lots with constant vehicular traffic should consider using 4 channelizing cones equipped with flags for maximum visibility. If possible, use

the truck as a shield, on the side of the work ware with maximum traffic exposure.

- 4) If a lookout is available, short duration work activities may be performed in parking lots with minimal vehicular traffic without use of channelizing cones or flags. Lookout should be dedicated to spotting activities.
- 5) Use of a channelizing cone is acceptable when working along the edge of parking lots using a spotter with moderate or heavy traffic flow. The channelizing cone should be on the side of the work area with the most exposure to site traffic. Lookout should be dedicated to spotting activities.
- 6) Use of two channelizing cones should be considered for areas of parking lots with traffic exposure and a spotter is available. The channelizing cones should be positioned in locations with the most traffic exposure (i.e. in the parking lane of a parking lot).

7.3 Intermediate Duration Work in Parking Areas (1 to 8 Hours) (DOT Facts-302b)

The configurations illustrated in Figure 35 should be considered for STAR Plan traffic protection in retail parking areas for work durations of 1 to 8 hours.

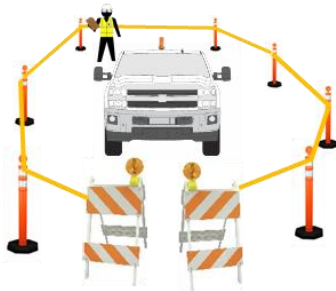
Figure 35. Example Intermediate Duration (1-8 Hours) Traffic Control Configurations for Use in STAR Plan Implementation



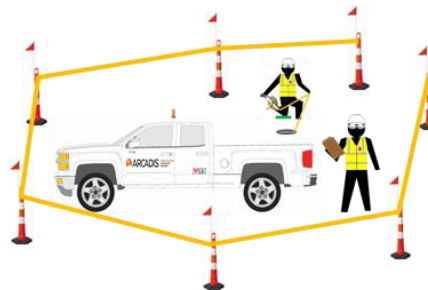
Scenario #1: Intermediate Term 1-8 Hours)
Channelizing Cones with
Flag and Caution Tape



Scenario #2: Intermediate Term (1-8 Hours)
Channelizing Cones with
Caution Tape and Lookout



Scenario #3: Intermediate Term (1-8 Hours)
Channelizing Cones, Caution Tape and
Type II Barricades



Scenario #4: Intermediate Term (1-8 Hours)
Channelizing Cones with Flags and
Caution Tape

7.3.1 General Guidelines for Safety

- Use the vehicle as a shield when possible. Orient the rear of the Arcadis vehicle away from site entrances and areas of increased backing or movement of other vehicles, when practical.
- Always work facing the area with greatest traffic movement and least protection
- Always assume vehicles will move in either direction (forwards or backwards)
- Always use TRACK to predict traffic movement and stage vehicle and Control Zones in manner that offers protection without impairing site entrance or blocking access to fuel islands when possible. STAR Plan requirements should be reviewed against HASP exclusion zone requirements for consistency.
- If there is a perceived drivable space, you must assume that someone will attempt to access or drive to/through the location. Plan, deploy and work accordingly.
- Class II high visibility vest (minimum) to be worn at all times (refer to HASP or JSA for additional requirements, if any).
- Discuss with site operator or manager times of lower traffic volume and attempt to schedule work activity during traffic lulls. For retail gas station, always find out when the fuel deliveries arrive and avoid areas of the site during planned delivery times. For other facilities with dumpsters, inquire about dumpster emptying days and times.

7.3.2 Scenario Descriptions

- 1) Use a minimum of 4 channelizing cones with flags and caution tape when working near the edges of parking lots accessible to the public for intermediate work durations regardless of traffic volume. Flags will be particularly important if work is conducted near the ground, a lookout is not available and/or a vehicle is not available to act as a barrier. This scenario may also be beneficial as part of HASP site control or if general pedestrian control is required for the work area in the parking lot.
- 2) Similar to Scenario #1, the flags in this scenario may be omitted if a lookout is used. Intricate work near the ground may warrant using a lookout if the parking lot has constant traffic flow.
- 3) Use of a combination of channelizing cones with barricades (Type II illustrated) should be considered if a parking lot entrance requires closure. The barricades should be placed at the entrance. The striping on the barricades should be presented as shown (see section 3.4.5 for more information on stripe orientation). This scenario may also be used if closing a parking lane of a

parking lot with high traffic flow (place barricades on each end of the work area in the parking lane).

- 4) Use channelizing cones with flags and caution tape for open areas of the parking lot regardless of traffic volume. The number of cones used should be sufficient to adequately encompass the work area while keeping the caution tape taught. If working alone near to the ground, use the truck as shield to extent possible or increase the number of cones and flags to promote visibility.

7.4 Long Duration Work in Parking Areas (>8 Hours) (DOT Facts-302c)

The configurations illustrated in Figure 36 should be considered for traffic protection in retail parking areas for work durations greater than 8 hours or during night work.

Figure 36. Example Long Term (> 8 Hours) Traffic Control Configurations for Use in STAR Plan Implementation



Scenario #1: Long Term (>8 Hours)
Channelizing Cones with Safety Fencing



Scenario #2: Long Term (>8 Hours)
Channelizing Cones with Flags and Safety Fencing

7.4.1 General Guidelines for Safety

- Use the vehicle as a shield when possible. Orient the rear of the Arcadis vehicle away from site entrances and areas of increased backing or movement of other vehicles, when practical.
- Always work facing the area with greatest traffic movement and least protection
- Always assume vehicles will move in either direction (frontwards or backwards)
- Always use TRACK to predict traffic movement and stage vehicle in manner that offers protection without impairing site entrance, blocking access to fuel islands at gas stations, or drive up windows of retail facilities, when possible. STAR Plan

requirements should be reviewed against HASP exclusion zone requirements for consistency.

- If there is a perceived drivable space, you must assume that someone will attempt to access or drive to/through the location. Plan, deploy and work accordingly.
- Class II high visibility vest (minimum) to be worn at all times (refer to HASP or JSA for additional requirements, if any).
- Discuss with site operator or manager times of lower traffic volume and attempt to schedule work activity during traffic lulls. For retail gas station, always find out when the fuel deliveries arrive and avoid areas of the site during planned delivery times. For other facilities with dumpsters, inquire about dumpster emptying days and times.
- Warning lights shall be used for night work on both the channelizer drums and barricades, if used.

7.4.2 Scenario Descriptions

- 1) In long-term work applications in parking lots, plastic safety fencing with channelizing cones should be used. The number of cones used should be sufficient to keep the safety fencing taught and cones with 30 pound bases should be considered. This scenario should be considered for all long-term work applications regardless of traffic flow.
- 2) Similar to Scenario #1 above, this scenario utilizes flags to increase visibility and should be considered if vehicles are frequently backing in the vicinity of the work area or near parking lot entrances. Barricades should be used at closed entrances similar to section 7.3.2 Scenario #3 in conjunction with safety fencing and channelizing cones for long-term entrance closures.

8 PEDESTRIAN TRAFFIC CONTROL

8.1 Pedestrian Safety Considerations in Temporary Traffic Control Zones

A wide range of pedestrians might be affected by TTC zones, including the young, elderly, and people with disabilities such as hearing, visual, or mobility. These pedestrians need a clearly delineated and usable travel path. This section provides consideration guidance in the preparation of TTC zones affecting pedestrian traffic (sidewalks, crosswalks, etc.).

8.1.1 Mandatory Requirements for TTC Affecting Pedestrians

M1. The various TTC provisions for pedestrian and worker safety required by the Arcadis RWZ Program shall be applied by knowledgeable persons after appropriate evaluation and engineering judgment. Refer to the list of Arcadis EJE's in the current Excel HASP template or [Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities \(ADAAG\)](#) on the Arcadis Transportation Safety Team Site for assistance in preparation of TCPs with pedestrian issues.

M2. Advance notification of sidewalk closures shall be provided by the maintaining agency.

M3. If the TTC zone affects the movement of pedestrians, adequate pedestrian access and walkways shall be provided. If the TTC zone affects an accessible and detectable pedestrian facility, the accessibility and detectability shall be maintained along the alternate pedestrian route.

M4. Short intermittent segments of temporary traffic barrier shall not be used because they nullify the containment and re-directive capabilities of the temporary traffic barrier, increase the potential for serious injury both to vehicle occupants and pedestrians, and encourage the presence of blunt, leading ends. All upstream leading ends that are present shall be appropriately flared or protected with properly installed and maintained crashworthy cushions. Adjacent temporary traffic barrier segments shall be properly connected in order to provide the overall strength required for the temporary traffic barrier to perform properly.

M5. Normal vertical curbing shall not be used as a substitute for temporary traffic barriers when temporary traffic barriers are needed.

M6. When existing pedestrian facilities are disrupted, closed, or relocated in a TTC zone, the temporary facilities shall be detectable and include accessibility features consistent with the features present in the existing pedestrian facility. Where pedestrians with visual disabilities normally use the closed sidewalk, a barrier that is detectable by a person with a visual disability traveling with the aid of a long cane shall be placed across the full width of the closed sidewalk.

8.1.2 Guidance for TTC Affecting Pedestrians

G1. If establishing or maintaining an alternate pedestrian route is not feasible during the project, an alternate means of providing for pedestrians may be used, such as adding free bus service around the project or assigning someone the responsibility to assist pedestrians with disabilities through the project limits (It must be recognized that pedestrians are reluctant to retrace their steps to a prior intersection for a crossing or to add distance or out-of-the-way travel to a destination).

G2. The following three items should be considered when planning for pedestrians in TTC zones:

- A. Pedestrians should not be led into conflicts with vehicles, equipment, and operations.
- B. Pedestrians should not be led into conflicts with vehicles moving through or around the worksite.
- C. Pedestrians should be provided with a convenient and accessible path that replicates as nearly as practical the most desirable characteristics of the existing sidewalk(s) or footpath(s).

G3. A pedestrian route should not be severed and/or moved for non-construction activities such as parking for vehicles and equipment.

G4. Consideration should be made to separate pedestrian movements from both worksite activity and vehicular traffic. Unless an acceptable route that does not involve crossing the roadway can be provided, pedestrians should be appropriately directed with advance signing that encourages them to cross to the opposite side of the roadway. In urban and suburban areas with high vehicular traffic volumes, these signs should be placed at intersections (rather than midblock locations) so that pedestrians are not confronted with midblock worksites that will induce them to attempt skirting the worksite or making a midblock crossing.

G5. Sections 8.2 and 8.3 below show typical TTC device usage and techniques for pedestrian movement through work zones.

G6. To accommodate the needs of pedestrians, including those with disabilities, the following considerations should be addressed when temporary pedestrian pathways in TTC zones are designed or modified:

- A. Provisions for continuity of accessible paths for pedestrians should be incorporated into the TTC plan.

- B. Access to transit stops should be maintained.
- C. A smooth, continuous hard surface should be provided throughout the entire length of the temporary pedestrian facility. There should be no curbs or abrupt changes in grade or terrain that could cause tripping or be a barrier to wheelchair use. The geometry and alignment of the facility should meet the applicable requirements of the “Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)”.
- D. The width of the existing pedestrian facility should be provided for the temporary facility if practical. Traffic control devices and other construction materials and features should not intrude into the usable width of the sidewalk, temporary pathway, or other pedestrian facility. When it is not possible to maintain a minimum width of 60 inches throughout the entire length of the pedestrian pathway, a 60 x 60-inch passing space should be provided at least every 200 feet to allow individuals in wheelchairs to pass.
- E. Blocked routes, alternate crossings, and sign and signal information should be communicated to pedestrians with visual disabilities by providing devices such as audible information devices, accessible pedestrian signals, or barriers and channelizing devices that are detectable to the pedestrians traveling with the aid of a long cane or who have low vision. Where pedestrian traffic is detoured to a TTC signal, engineering judgment should be used to determine if pedestrian signals or accessible pedestrian signals should be considered for crossings along an alternate route.
- F. Signs and other devices mounted lower than 7 feet above the temporary pedestrian pathway should not project more than 4 inches into accessible pedestrian facilities.
- G. When channelization is used to delineate a pedestrian pathway, a continuous detectable edging should be provided throughout the length of the facility such that pedestrians using a long cane can follow it.

Individual channelizing devices, tape or rope used to connect individual devices, other discontinuous barriers and devices, and pavement markings are not detectable by persons with visual disabilities and are incapable of providing detectable path guidance on temporary or realigned sidewalks or other pedestrian facilities.

When it is determined that a facility should be accessible to and detectable by pedestrians with visual disabilities, a continuously detectable edging should be provided throughout the length of the facility such that it can be followed by pedestrians using long canes for guidance. This edging should protrude at least 6 inches above the surface of the sidewalk or pathway, with the bottom of the edging a maximum of 2.5 inches above the surface. This edging should be continuous throughout the length of the facility except for gaps at locations where pedestrians or vehicles will be turning or crossing. This edging should consist of a prefabricated or formed in place curbing or other continuous device that is placed along the edge of the sidewalk or walkway. This edging should be firmly

attached to the ground or to other devices. Adjacent sections of this edging should be interconnected such that the edging is not displaced by pedestrian or vehicular traffic or work operations, and such that it does not constitute a hazard to pedestrians, workers, or other road users.

Examples of detectable edging for pedestrians include:

1. Prefabricated lightweight sections of plastic, metal, or other suitable materials that are interconnected and fixed in place to form a continuous edge.
2. Prefabricated lightweight sections of plastic, metal, or other suitable materials that are interconnected, fixed in place, and placed at ground level to provide a continuous connection between channelizing devices located at intervals along the edge of the sidewalk or walkway.
3. Sections of lumber interconnected and fixed in place to form a continuous edge.
4. Formed-in-place asphalt or concrete curb.
5. Prefabricated concrete curb sections that are interconnected and fixed in place to form a continuous edge.
6. Continuous temporary traffic barrier or longitudinal channelizing barricades placed along the edge of the sidewalk or walkway that provides a pedestrian edging at ground level.
7. Chain link or other fencing equipped with a continuous bottom rail.

Detectable pedestrian edging should be orange, white, or yellow and should match the color of the adjacent channelizing devices or traffic control devices, if any are present.

G7. Whenever it is feasible, closing off the worksite from pedestrian intrusion may be preferable to channelizing pedestrian traffic along the site with TTC devices.

G8. Fencing should not create sight distance restrictions for road users. Fences should not be constructed of materials that would be hazardous if impacted by vehicles. Wooden railing, fencing, and similar systems placed immediately adjacent to motor vehicle traffic should not be used as substitutes for crashworthy temporary traffic barriers.

G9. Ballast for TTC devices should be kept to the minimum amount needed and should be mounted low to prevent penetration of the vehicle windshield.

G10. Movement by work vehicles and equipment across designated pedestrian paths should be minimized and, when necessary, should be controlled by flaggers or TTC. Staging or stopping of work vehicles or equipment along the side of pedestrian paths should be avoided, since it encourages movement of workers, equipment, and materials across the pedestrian path.

G11. Access to the work space by workers and equipment across pedestrian walkways should be minimized because the access often creates unacceptable changes in grade, and rough or muddy terrain, and pedestrians will tend to avoid these areas by attempting non-intersection crossings where no curb ramps are available.

G12. A canopied walkway may be used to protect pedestrians from falling debris, and to provide a covered passage for pedestrians.

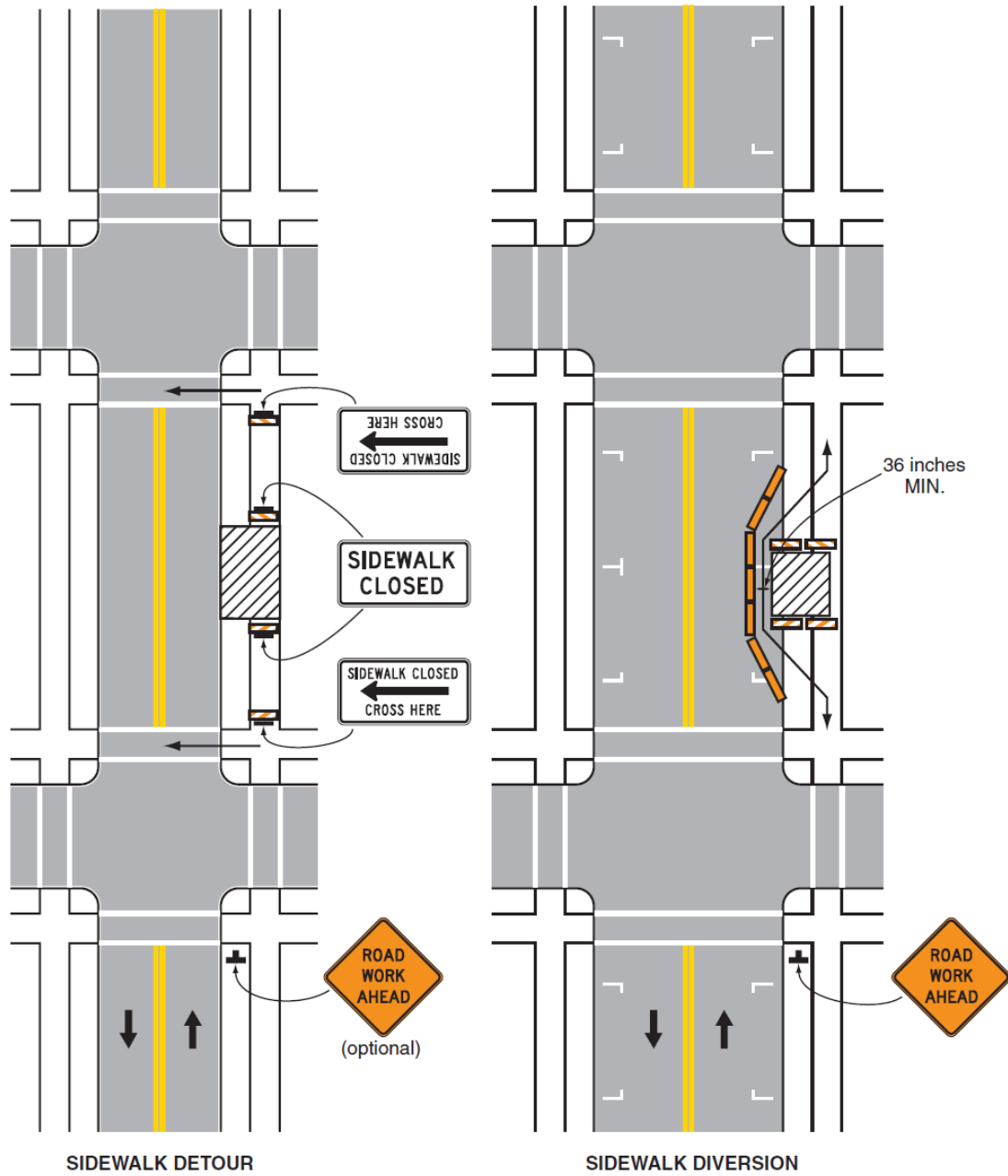
- A. Covered walkways should be sturdily constructed and adequately lighted for nighttime use.
- B. When pedestrian and vehicle paths are rerouted to a closer proximity to each other, consideration should be given to separating them by a temporary traffic barrier.
- C. If a temporary traffic barrier is used to shield pedestrians, it should be designed to accommodate site conditions.

G13. Depending on the possible vehicular speed and angle of impact, temporary traffic barriers might deflect upon impact by an errant vehicle. Guidance for locating and designing temporary traffic barriers can be found in Chapter 9 of AASHTO's "Roadside Design Guide".

8.2 Sidewalk Detour or Diversion (DOT Facts-301x)

The configurations illustrated in Figure 37 may be used for sidewalk detour or diversion.

Figure 37 Example TTC for Sidewalk Detours and Diversions



8.2.1 Mandatory Requirements for TTC Sidewalk Detours and Diversions

M1. Sidewalk detours and diversions require EJE review and approval.

M2. When crosswalks or other pedestrian facilities are closed or relocated, temporary facilities shall be detectable and shall include accessibility features consistent with the features present in the existing pedestrian facility.

8.2.2 Guidance for TTC Sidewalk Detours and Diversions

G1. Only the TTC devices related to pedestrians are shown. Other devices, such as lane closure signing or ROAD NARROWS signs, may be used to control vehicular traffic.

G2. Where high speeds are anticipated, a temporary traffic barrier and, if necessary, a crash cushion should be used to separate the temporary sidewalks from vehicular traffic.

G3. For long term closures, audible information devices should be considered where midblock closings and changed crosswalk areas cause inadequate communication to be provided to pedestrians who have visual disabilities.

G4. Street lighting may be considered.

G5. For nighttime closures, Type A Flashing warning lights may be used on barricades that support signs and close sidewalks.

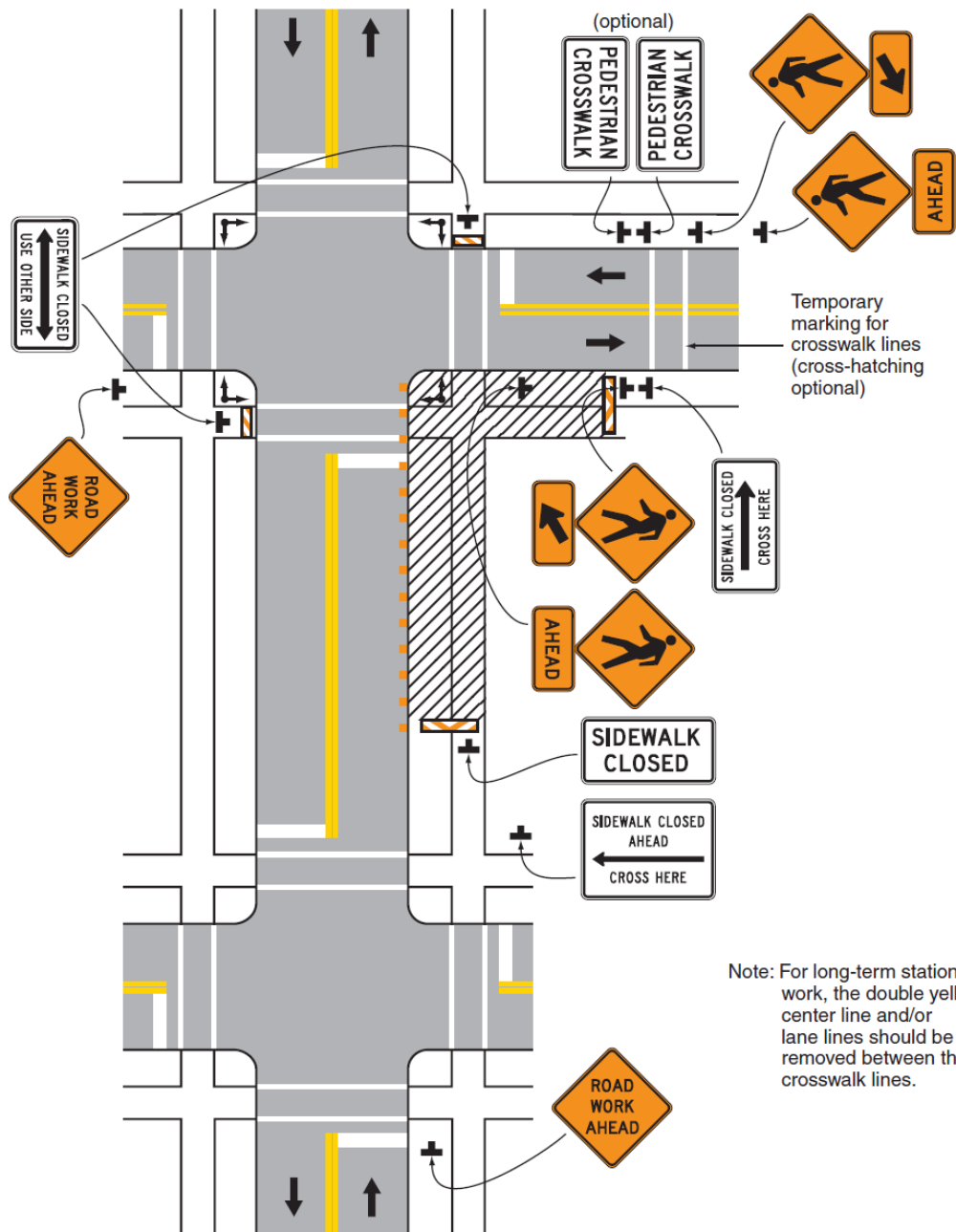
G6. Type C Steady-Burn or Type D 360-degree Steady-Burn warning lights may be used on channelizing devices separating the temporary sidewalks from vehicular traffic flow.

G7. Signs, such as KEEP RIGHT (LEFT), may be placed along a temporary sidewalk to guide or direct pedestrians.

8.3 Sidewalk Closures and Pedestrian Detours (DOT Facts-301y)

The configurations in Figure 38 may be used for sidewalk closures and pedestrian detours.

Figure 38. Example TTC for Sidewalk Closures and Pedestrian Detours



8.3.1 Mandatory Requirements for Sidewalk Closure and Pedestrian Detours

M1. Sidewalk closures and pedestrian detours require EJE review and approval.

M2. When crosswalks or other pedestrian facilities are closed or relocated, temporary facilities shall be detectable and shall include accessibility features consistent with the features present in the existing pedestrian facility.

M3. Curb parking shall be prohibited for at least 50 feet in advance of the midblock crosswalk.

8.3.2 Guidance for sidewalk Closures and Pedestrian Detours

G1. Only the TTC devices related to pedestrians are shown. Other devices, such as lane closure signing or ROAD NARROWS signs, may be used to control vehicular traffic.

G2. Pedestrian traffic signal displays controlling closed crosswalks should be covered or deactivated.

G3. Audible information devices should be considered where midblock closings and changed crosswalk areas cause inadequate communication to be provided to pedestrians who have visual disabilities.

G4. Street lighting may be considered.

G5. For nighttime closures, Type A Flashing warning lights may be used on barricades that support signs and close sidewalks.

G6. Type C Steady-Burn or Type D 360-degree Steady-Burn warning lights may be used on channelizing devices separating the work space from vehicular traffic.

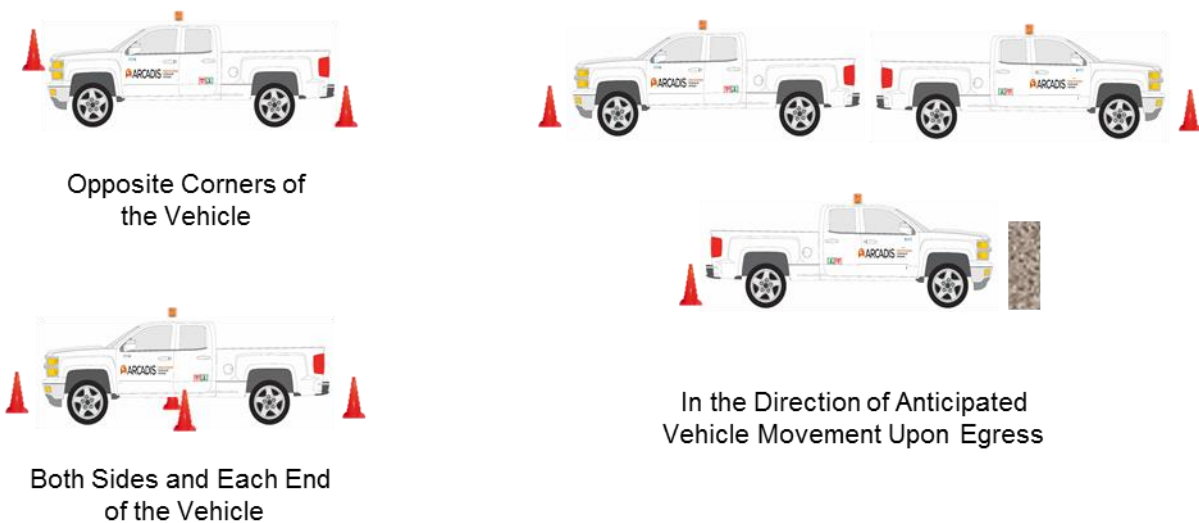
G7. In order to maintain the systematic use of the fluorescent yellow-green background for pedestrian, bicycle, and school warning signs in a jurisdiction, the fluorescent yellow-green background for pedestrian, bicycle, and school warning signs may be used in TTC zones.

9 MOTOR VEHICLE SAFETY PROGRAM (MVSP) (ARC HSGE024)

9.1 Cone Placement Best Practices

To aid in identifying objects in the vicinity of the vehicle that may present a hazard during parking space egress, Arcadis recommends using the cone program to aid in spotting these hazards. Figure 39 illustrated different cone placement scenarios that may be utilized.

Figure 39. Recommended Cone Placement Around Parked Vehicles

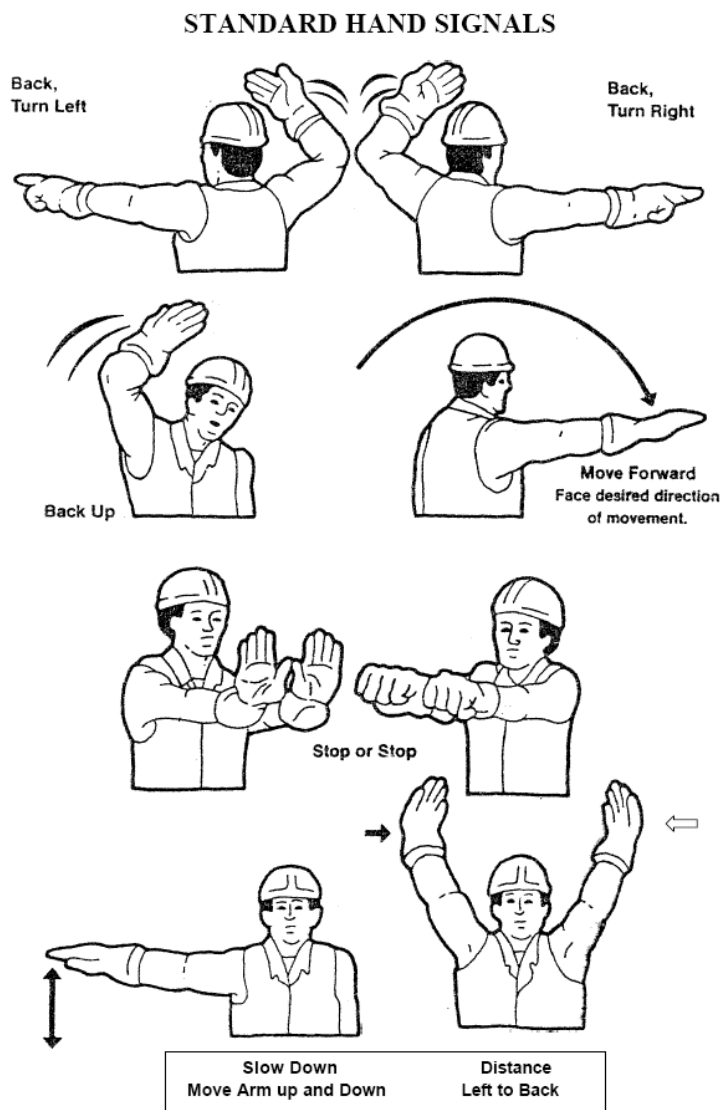


- Use TRACK for cone placement
- Follow the TCP or STAR Plan for specific requirements because those requirements take precedence over MVSP.
- Cones must be at least 18 inches tall
- Use Smith System “5-Keys”® to drive, park and back your vehicle:
 - ✓ Aim High in Steering®
 - ✓ Get the Big Picture®
 - ✓ Keep your Eyes Moving®
 - ✓ Leave Yourself an Out®
 - ✓ Make Sure They See You®

9.2 Spotter Hand Signals

When two or more employees are in the vehicle, Arcadis recommends one of the occupants get out of the vehicle and act as a spotter when parking. Figure 40 illustrated standard hand signals that may be utilized when acting as a spotter.

Figure 40. Example Hand Signals for Spotting Vehicles During Parking Activities



CITY AND COUNTY OF HONOLULU
DEPARTMENT OF HUMAN RESOURCES
Division of Industrial Safety and Workers' Compensation

BACK UP SAFELY!

Avoid backing up whenever possible, but when it's unavoidable:

- 👉 Check the backing area first
- 👉 Look front, sides, and rear as you back
- 👉 Back slowly and carefully
- 👉 Remain aware of the blind areas
- 👉 Back no further than you must
- 👉 Get out and look - don't rely just on mirrors.
- 👉 Watch for changing circumstances - people or objects moving behind you.
- 👉 Avoid all risks and remember to use a spotter. When placing cones around vehicle, inspect area thoroughly as cones are collected.



A Real Commitment, A Daily Issue: Safety



T R A C K TO 0

Safety Share

Drowsy Driving

June 16, 2016

Reviewed by H&S

Drowsy driving is a very real and very dangerous. It is responsible for 1.2 million crashes annually, involving up to 500,000 injuries and 8,000 lives lost.

The effects of driving while drowsy can be similar to driving under the influence of alcohol or drugs. Sleepiness slows reaction time, decreases awareness and impairs judgement.

The National Sleep Foundation's poll shows 60% of Americans have driven while feeling sleepy and many admit to actually having fallen asleep at the wheel in the past year. More than half of Americans are putting themselves and their families at risk by driving drowsy.

Did you know Alaska and New Jersey have laws against drowsy driving? In Alaska, "fatigued driving" is classified as an offense under negligent homicide, and in New Jersey, a driver who hasn't slept for 24 hours is considered to be driving recklessly, in the same class as an intoxicated driver.

Recognize the dangers of drowsy driving, and encourage your friends and family do the same.

Resource Sites:

- [Centers for Disease Control and Prevention](#)
- [Drowsy Driving – National Sleep Foundation](#)
- [National Highway Traffic Safety Administration](#)

Key Points:

- Reaction time is one of the first things to go when you're sleep deprived.
- Develop good sleeping habits and try to get at least 6-7 hours of sleep a day.
- Check medication labels and prescription summaries from the pharmacist, which indicate whether you can operate machinery.

The Effects of Drowsy Driving



Warning Signs

- ✓ Yawning
- ✓ Frequent blinking
- ✓ Difficulty remembering the past few miles driven
- ✓ Missing your exit
- ✓ Drifting from your lane
- ✓ Hitting a rumble strip

Contributed By: ANA, Corporate, IT, Debbie Ondeck

A Real Commitment, A Daily Issue: Safety

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A decorative graphic consisting of three thin orange lines: one horizontal line extending across the width of the page, and two parallel diagonal lines extending from the bottom left towards the top right.

Arcadis Journey Management Plan

Project Name: OU2/OU3 Onsite/Offsite Investigation &
Groundwater Monitoring,
Northrop Grumman Systems Corporation
Bethpage, New York

Project Number: NY001496

Date: 5/18/2018

Revision: 1

Route Identification

Planning and evaluation of route(s) on this project will utilize (*select all that apply*):

- On-line mapping software with traffic reporting
- On-line mapping software without traffic reporting
- GPS navigation with traffic reporting (portable unit or integrated into the vehicle)
- Standard GPS navigation device (portable unit or integrated into the vehicle)
- App with mapping and traffic reporting
- App without traffic reporting
- Government website with traffic and construction zone reporting
- Standard maps or atlases
- Other -Specify: _____

Identified Hazards

List any identified hazards or route concerns identified in the route identification above:

Railroad near Central Avenue which can cause minor delays and backups. Caution is to be used.

Traffic Cameras are used on Central Avenue, be vigilant and obey traffic laws. Do not attempt to run a yellow light.

List any portions of this route that have recommended driving restrictions due to time of day, weather, or security

Diving in the dark is discouraged at the Site.

Heavy traffic, especially foot traffic, can be expected during the morning and evening rush hours (7-9 AM, 3-6 PM). Use caution when driving during this time.

- Driving JSA attached or provided in the project specific HASP
- Vehicle Pre-Trip Inspections required: Daily Weekly
- Commercial Motor Vehicle (CMV) requirements apply to this project.

Tolls

All or portions of this route includes toll roads.

Specify how the tolls are paid (select all that apply):

- Transponder
- License Plate
- Request transponder for vehicle when renting

- Cash only
- Other:

- Review rental agreement concerning rental agency participation in license plate toll

Documentation

When using on-line mapping software to prepare routes, it is recommended to print an overview map with route, and turn by turn maps of route when available. When using GPS navigation devices, it is also recommended that on-line mapping software routes and maps be printed to augment the GPS navigation device routing. Standard maps or atlases should only be considered if navigation assistance from a passenger in the vehicle.

Printing of maps from on-line mapping software should be considered, especially if little is known about potential traffic or construction hazards from primary route planning.

All hard copy maps and driving directions are attached.

Signatures

JMP Prepared by: Thomas Darmon Date: 5/18/2018

Driver Review: _____ Date: _____
_____ Date: _____
_____ Date: _____
_____ Date: _____



Traffic Control Plan/Site Traffic Awareness and Response Plan

Revision 8, 10/15/2015

1.0 General

Plan type	TCP
Project Name:	Northrop Grumman System Corporation
Project Number:	NY001496.1416
Developer Name:	Xuan Xu
Duration of Project (in hours or days):	8 hours per location
Time Restrictions (Y/N, if Y describe below):	Y
Roadway Work Zone Start Point	See Work Description
Roadway Work Zone End Point	See Work Description
Posted Speed Limit (roadway)	30 mph
Number of Lanes (each direction)	1

Comments:

General work hours are from 8:00 am to 5:00 pm. The work day may be extended beyond 5:00 pm as necessary to complete activities but will be limited to the extent reasonable possible.

2.0 Work Description

Provide a brief description of scope of work:

Depth to water measurements and groundwater sampling activities will be performed from select monitoring wells that are installed along right-of-ways on minor urban roads as well as within large grass medians on major roadways located at various locations in Bethpage, New York that are sampled as part of sampling programs associated with the Northrop Grumman Systems Corporation site.

The above-mentioned activities require removal of manhole covers installed at each well location, installation of sampling equipment or measuring tape, purging of monitoring well, removal of the sampling equipment or measuring device, and reinstallation of the manhole cover. The work associated with the monitoring activities will take place between 8:00 am and 5:00 pm and the necessary sampling equipment will not be left at the location passed 5:00 pm. Note that these procedures must be followed when performing any work associated with monitoring well sampling associated with the NGC site that will last for a duration of one hour or more per location, or requires the work to be completed by one, individual field technician.

The number of lanes varies from one to two lanes because of where the wells are located. If the well is within a grassed median there are streets with two lanes in each direction. This condition under the MUTCD uses DOT Facts-301i. For wells that require a lane closer on an urban minor street DOT Facts-301t will be used.

3.0 Type and Duration

Work locations on this project will be: Intermediate work (1-8 hours per location)

Roadway work will be performed: Off shoulder, bicycle lane and sidewalk

Special traffic conditions may include (select most prevalent): Not applicable

4.0 Traffic Control Layout, Number of Devices Required and Phasing

The following traffic control configuration in the Field Guide to RWZ Safety applies:

Section 6.1 Work Beyond the Shoulder (DOT Facts-301i)
 Section 6.5 Shoulder Work with Minor Encroachment (DOT Facts-301m)

Section 6.12 Lane Closure on Minor Street (DOT Facts-301t)

The following pedestrian requirements in the Field Guide to RWZ Safety applies:

All ARCADIS vehicles in a RWZ will, at a minimum, have a functioning high intensity strobe or rotating orange light. All ARCADIS employees in the RWZ will wear, at a minimum, a retroreflective high visibility vest meeting Class II or III requirements and other PPE required by JSA or HASP. Don't leave vehicle doors open.

Select the traffic control devices to be used and enter number each required:

Check all that apply:	Wording or Pictogram	Number:	TCP Phasing:
<input checked="" type="checkbox"/> Warning signs	<u>Road Work Ahead</u>	<u>2</u>	1) Deploy warning signs at first approach, if required 2) Deploy subsequent approach warning signs, if required 3) Deploy channeling devices, if required, starting with first approach 4) Deploy "End Road Work" signs, if required 5) Position vehicle as shield to the extent practical 6) Commence work, SSO or designated contractor to maintain devices 7) Remove devices in reverse order
<input checked="" type="checkbox"/> Warning signs	<u>Shoulder Work</u>	<u>2</u>	
<input checked="" type="checkbox"/> Warning signs	<u>End of Road Work</u>	<u>2</u>	
<input type="checkbox"/> Stop/Slow paddle			
<input type="checkbox"/> Red flag			
<input type="checkbox"/> Drums			
<input type="checkbox"/> Channelizer cone (42 inch height, 10 lb base)			
<input type="checkbox"/> Channelizer cone (42 inch height, 30 lb base)			
<input checked="" type="checkbox"/> Traffic cones (≥ 18 inches tall)		<u>7</u>	
<input type="checkbox"/> Barricade <input type="checkbox"/> Type I <input type="checkbox"/> Type II			
<input type="checkbox"/> Flags for cones			
<input type="checkbox"/> Lights (for night work)			
<input type="checkbox"/> Plastic fencing (rolls)			
<input type="checkbox"/> Caution tape (rolls)			
<input type="checkbox"/> Other (specify):			

5.0 Approvals

Plan Developer: Xuan Xu

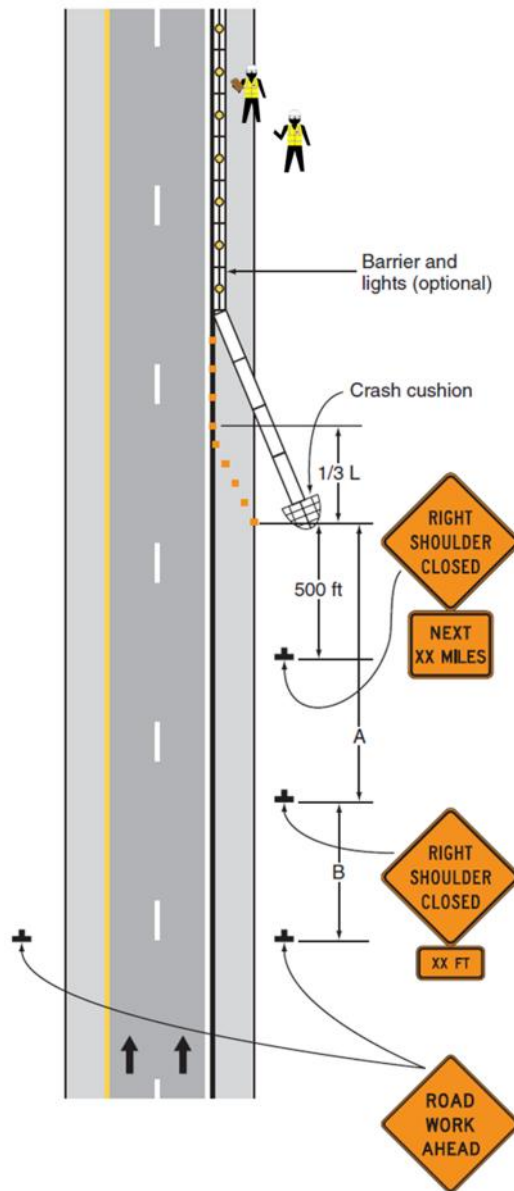
HASP Reviewer Carlo San Giovanni

Engineering Judgment Review By: Justin Maderia

6.4 Shoulder Closure on the Freeway (DOT Facts-301I)

Figure 19 may be used for shoulder work (long term) on the freeway.

Figure 19. Example TTC Shoulder Closure on the Freeway



Note: The TSP Template will automatically calculate sign spacing distance "A" and "B". See section 2.3 for "A" if using an alternate TSP format.

6.4.1 Mandatory Requirements for TTC Shoulder Closure on the Freeway

M1. Work on the shoulder of an expressway or freeway requires EJE review and approval.

M2. Where temporary traffic barriers are installed, the ends of the barrier shall be treated in accordance with Section 6F.81.5 of the Manual on Uniform Traffic Control Devices. The barrier shown is an example of one method that may be used to close a shoulder of a long-term project. The warning lights shown on the barrier may be used.

6.4.2 Guidance for TTC Shoulder Closure on the Freeway

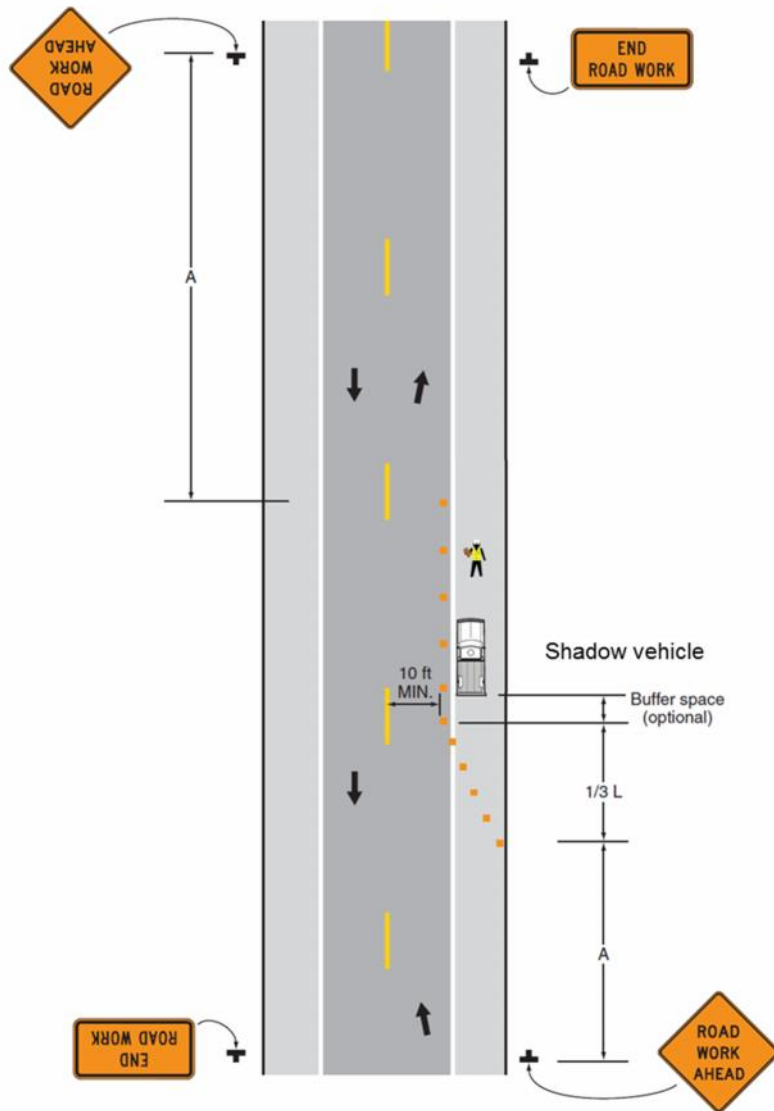
G1. SHOULDER CLOSED signs should be used on limited-access highways where there is no opportunity for disabled vehicles to pull off the roadway.

G2. If drivers cannot see a pull-off area beyond the closed shoulder, information regarding the length of the shoulder closure should be provided in meters or kilometers (feet or miles), as appropriate.

6.5 Shoulder Work with Minor Encroachment (DOT Facts-301m)

Figure 20 may be used for shoulder work with minor encroachment.

Figure 20. Example TTC for Work Conducted on the Shoulder with Minor Lane Encroachment



Note: The TSP Template will automatically calculate sign spacing distance "A" and "1/3 L" (shoulder taper). See section 2.3 for "A" and section 5.1 for "L" if using an alternate TSP format.

6.5.1 Mandatory Requirements for TTC Work Conducted on the Shoulder with Minor Lane Encroachment

M1. Work on the shoulder of an expressway, freeway, high speed (>45 mph) rural highway and/or configurations that deviate from Figure 20 (except as permitted in section 6.5.2) requires EJE review and approval.

M2. Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights.

6.5.2 Guidance for TTC Work Conducted on the Shoulder with Minor Lane Encroachment

G1. All lanes should be a minimum of 3 m (10 ft) in width as measured to the near face of the channelizing devices.

G2. The treatment shown should be used on a minor road having low speeds. For higher-speed traffic conditions, a lane closure should be used.

G3. For short-term use on low-volume, low-speed roadways with vehicular traffic that does not include longer and wider heavy commercial vehicles, a minimum lane width of 2.7 m (9 ft) may be used.

G4. Where the opposite shoulder is suitable for carrying vehicular traffic and of adequate width, lanes may be shifted by use of closely spaced channelizing devices, provided that the minimum lane width of 3 m (10 ft) is maintained.

G5. Additional warning may be appropriate, such as a ROAD NARROWS sign.

G6. Temporary traffic barriers may be used along the work space.

G7. The shadow vehicle may be omitted if taper and channelizing devices are used.

G8. A truck-mounted attenuator may be used on the shadow vehicle.

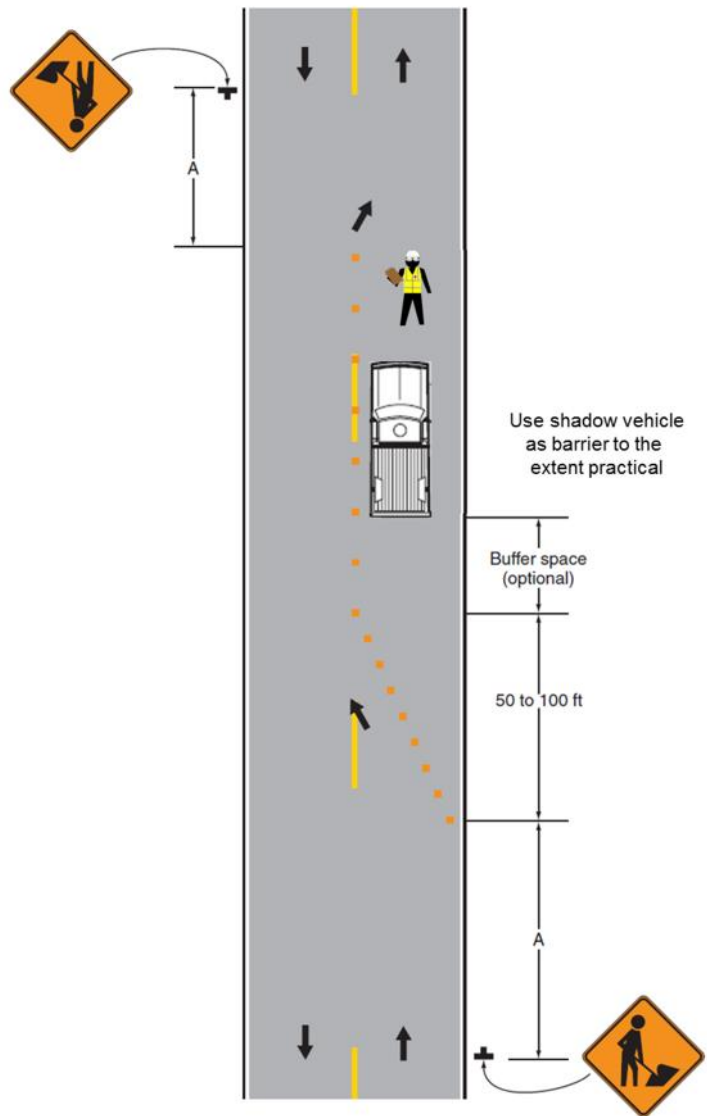
G9. For short-duration work, the taper and channelizing devices may be omitted if a shadow vehicle with activated high-intensity rotating, flashing, oscillating, or strobe lights is used.

G10. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

6.12 Lane Closure on Minor Street (DOT Facts-301t)

Figure 27 may be used for lane closure on minor urban streets.

Figure 27. Example TTC for Lane Closure on Minor Urban Street



Note: Note: The TSP Template will automatically calculate sign spacing distances for “A”. The template will also compute oncoming site distance for flagger station placement if complying with M2 below. See section 2.3 for sign distance information and section 4.5 for site distance information for flagger stations (if used) when using an alternate TSP format.

The lane closure in this configuration includes a one lane, two-way taper. The TSP Template cannot compute specific length or number of cones required for this type of taper.

6.12.1 Mandatory Requirements for TTC Lane Closure on a Minor Urban Street

M1. Work on a high speed (>45 mph) minor urban streets and/or configurations that deviate from Figure 27 (except as permitted in section 6.12.2) requires EJE review and approval.

M2. This RWZ configuration shall be used only for low-speed roadways having low traffic volumes.

M3. Where vehicular traffic cannot effectively self-regulate, one or two flaggers shall be used as illustrated in section 6.6 (DOT Facts-301n).

6.12.2 Guidance for TTC Lane Closure on a Minor Urban Street

G1. Where the work space is short, where road users can see the roadway beyond, and where volume is low, vehicular traffic may be self-regulating.

G2. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.

G3. A truck-mounted attenuator may be used on the work vehicle and the shadow vehicle.



Traffic Control Plan/Site Traffic Awareness and Response Plan

Revision 8, 10/15/2015

1.0 General

Plan type	STAR
Project Name:	Northrop Grumman System Corporation
Project Number:	NY001496.1416
Developer Name:	Xuan Xu
Duration of Project (in hours or days):	up to 8 hours per location
Time Restrictions (Y/N, if Y describe below):	Y
Not Applicable	
Not Applicable	
Not Applicable	
Not Applicable	

Comments:

General work hours are from 8:00 am to 5:00 pm. The work day may be extended beyond 5:00 pm as necessary to complete activities but will be limited to the extent reasonable possible.

2.0 Work Description

Provide a brief description of scope of work:

Depth to water measurements and groundwater sampling activities will be performed from select monitoring wells that are installed along private roadways and parking lots within property owned by Northrop Grumman Systems Corporation (NGC) in Bethpage, New York. The roads are owned by NGC but are encumbered with easements allowing through traffic to other property owners.

The above-mentioned activities require removal of manhole covers installed at each well location, installation of sampling equipment or measuring tape, purging of monitoring well, removal of the sampling equipment or measuring device, and reinstallation of the manhole cover. The work associated with the monitoring activities will take place between 8:00 am and 5:00 pm and the necessary sampling equipment will not be left at the location passed 5:00 pm. Note that these STAR procedures must be followed when performing any work associated with monitoring well sampling along NGC private roads or parking lots that will last for a duration of one hour or more per location, or requires the work to be completed by one, individual field technician.

3.0 Type and Duration

Work locations on this project will be: Intermediate work (1-8 hours per location)

Non-roadway work will be performed in: Active parking lot

Special traffic conditions may include (select most prevalent): Not applicable

4.0 Traffic Control Layout, Number of Devices Required and Phasing

The following STAR requirements in the Field Guide to RWZ Safety applies:

Section 7.2 Short Duration Work in Parking Areas (<1 Hour) (DOT Facts-302a)

Section 7.3 Intermediate Duration Work in Parking Areas (1 to 8 Hours) (DOT Facts-302b)

STAR configuration:

An example STAR traffic control configuration for this project is illustrated below. The actual type and number of devices required are specified below. Don't leave vehicle doors open. Don't establish controls within 25 ft of the front or rear of parked large vehicles/rolling equipment without coordinating with the vehicle/equipment operator.



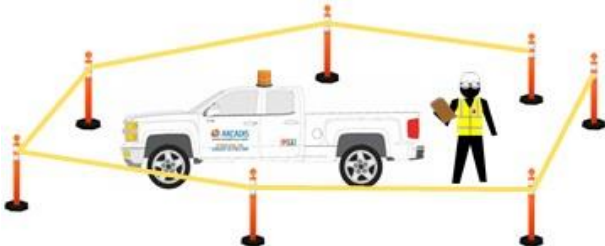
Short Term (<1 Hour)
Channelizing Cones
with Flag



Short Term (<1 Hour)
Channelizing Cone
with Lookout



Short Term (<1 Hour)
Channelizing Cones



Intermediate Term (1-8 Hours)
Channelizing Cones with Caution Tape

Select the traffic control devices to be used and enter number each required:

Check all that apply:	Wording or Pictogram	Number:	STAR Phasing:
<input type="checkbox"/> Warning signs	_____	_____	1) Position truck as shield, if practical 2) Deploy traffic control devices 3) Affix flags, caution tape or fencing 4) Unload project equipment 5) Commence work 6) SSO to maintain controls 7) Remove controls in reverse order
<input type="checkbox"/> Warning signs	_____	_____	
<input type="checkbox"/> Warning signs	_____	_____	
<input type="checkbox"/> Stop/Slow paddle	_____	_____	
<input type="checkbox"/> Red flag	_____	_____	
<input type="checkbox"/> Drums	_____	_____	
<input type="checkbox"/> Channelizer cone (42 inch height, 10 lb base)	_____	_____	
<input type="checkbox"/> Channelizer cone (42 inch height, 30 lb base)	_____	_____	
<input checked="" type="checkbox"/> Traffic cones (≥ 18 inches tall)	_____	10	
<input type="checkbox"/> Barricade <input type="checkbox"/> Type I <input type="checkbox"/> Type II	_____	_____	
<input type="checkbox"/> Flags for cones	_____	_____	
<input type="checkbox"/> Lights (for night work)	_____	_____	
<input type="checkbox"/> Plastic fencing (rolls)	_____	_____	
<input checked="" type="checkbox"/> Caution tape (rolls)	_____	1	
<input type="checkbox"/> Other (specify):	_____	_____	
	_____	_____	
	_____	_____	
	_____	_____	
	_____	_____	
	_____	_____	
	_____	_____	

5.0 Approvals

Plan Developer: _____ Xuan Xu

HASP Reviewer _____ Carlo San Giovanni



Traffic Safety Plan (TSP)

Notes: ROW - Right of Way (Public) formerly known as "TCP"

Non-ROW - Not in the ROW (parking lots, etc.) formerly known as "STAR"

1.0 General

Plan type	Right of Way (ROW)
Project Name:	Northrop Grumman RW-21
Project Number:	NYNG2019.22LS PM0QC
Developer Name:	Justin Maderia
Duration of Project (in hours or days):	10 Hours
Time Restrictions (Y/N, if Y describe below):	Yes - 7a to 5p
Roadway Work Zone Start Point	125' Before Work Area
Roadway Work Zone End Point	Cul-De-Sac (as Pictured)
Posted Speed Limit (roadway in mph)	35
Number of Lanes (each direction)	3 (1 in Each Direction with TWLTL)
Road Category Type (select)	Urban (≤40 mph)
<input type="checkbox"/> Working on multiple roads?	

Comments: **This TSP covers work on Grumman Road**

2.0 Work Description

Provide a brief description of scope of work:

Work performed in accordance with this traffic control plan is associated with the soil borings installed along Grumman Road in the ROW.

The site specific DOT Facts sheets attached shall be followed when setting up the work zone. Site figures from Master Locators have been approved for use by Arcadis.

3.0 Type and Duration

Work locations on this project will be: **Intermediate work (1-8 hours per location)**

Roadway work will be performed: **Travel lane**

Special traffic conditions may include (select most prevalent): **Not applicable**

4.0 Traffic Control Layout, Number of Devices Required, and Phasing

Review by an EJE employee is mandatory

The following traffic control configuration in the Traffic Safety Handbook applies:

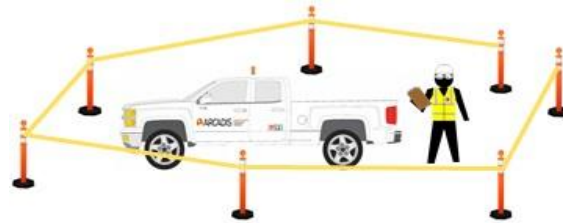
Section 6.13 Freeway Ramp or Lane Closure/Atypical Traffic Control (DOT Facts-301u)

The menu below will be blank and is not applicable.

The menu below will be blank and is not applicable.

Review by an EJE employee is mandatory

All Arcadis vehicles in a ROW will, at a minimum, have a functioning high intensity strobe or rotating orange light. All Arcadis employees in the ROW will wear, at a minimum, a retroreflective high visibility outer clothing meeting ANSI Class II or III requirements and other PPE required by JSA or HASP. Don't leave vehicle doors open. Park vehicles in ROW with front wheels turned to the right. Avoid work configurations requiring standing to rear of vehicles. Stage equipment in vehicles where it can be accessed from the right side of the vehicle to the extent practical.



Intermediate Term (1-8 Hours)
Channelizing Cones with Caution Tape

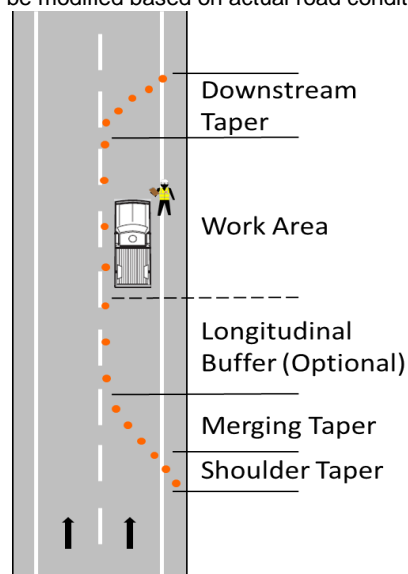
<p>ROW minimum sign spacing distances for "A", "B" and "C" (as applicable) in referenced DOT Facts.</p> <table> <tr> <td>A</td> <td>100 ft.</td> </tr> <tr> <td>B</td> <td>100 ft.</td> </tr> <tr> <td>C</td> <td>100 ft.</td> </tr> </table>	A	100 ft.	B	100 ft.	C	100 ft.	<p>ROW oncoming traffic minimum site distance required to see Flagger and properly decelerate and stop.</p>
A	100 ft.						
B	100 ft.						
C	100 ft.						

ROW Cone Calculation (Values are default. Light grey fields may be modified based on actual road conditions)

Active work area length (feet)	3000
<input type="checkbox"/> Apply Optional Longitudinal Buffer (ft)?	0
Lane width of offset (feet)	12
Shoulder width of offset (feet)	10
Posted speed limit	35

Contact EJE for assistance

<input type="checkbox"/> Shoulder Taper		
Taper Length (feet)	NA	
Cones Required	0	
Cones Spacing (max., ft)	NA	
<input checked="" type="checkbox"/> Shifting/Merging Taper		
Taper Length (feet)	125	
Cones Required	7	
Cones Spacing (max., ft)	35	



Work Area

Cone Spacing (max., ft) 35
 Cones Required 113

Note: Review taper configuration and cone spacing after ROW implementation to ensure traffic is moving efficiently without motorist confusion in the RWZ.

Downstream Taper

Taper Length (feet) NA
 Cones Required 0
 Cone Spacing (max., ft) NA

Cones Required (minimum) 120

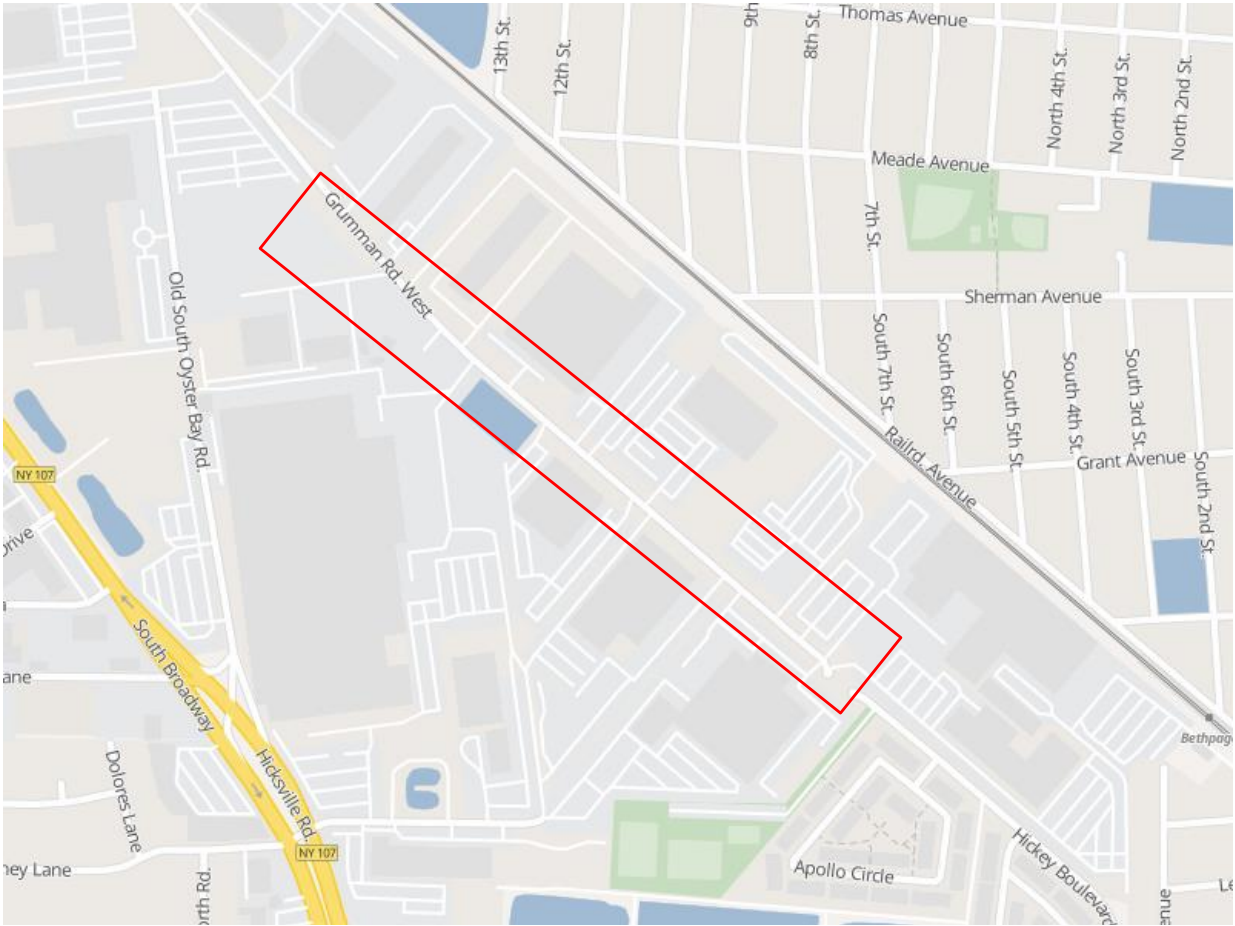
Select the traffic control devices to be used and enter number each required:			ROW Phasing:	
<i>Check all that apply:</i>	<i>Wording or Pictogram</i>	<i>Number:</i>		
<input checked="" type="checkbox"/>	Warning signs	Road Work Ahead	2	1) Deploy warning signs at first approach, if required 2) Deploy subsequent approach warning signs, if required 3) Deploy channeling devices, if required, starting with first approach 4) Deploy "End Road Work" signs, if required 5) Position vehicle as shield to the extent practical 6) Commence work, SSO or designated contractor to maintain devices 7) Remove devices in reverse order
<input checked="" type="checkbox"/>	Warning signs	Lane Shift Arrow	1	
<input checked="" type="checkbox"/>	Warning signs	Center Lane Closed	1	
<input checked="" type="checkbox"/>	Stop/Slow paddle		2	
<input type="checkbox"/>	Red flag			
<input type="checkbox"/>	Drums			
<input type="checkbox"/>	Channelizer cone (42 inch height, 10 lb base)			
<input type="checkbox"/>	Channelizer cone (42 inch height, 30 lb base)			
<input checked="" type="checkbox"/>	Traffic cones (≥ 18 inches tall)		120	
<input type="checkbox"/>	Barricade:			
<input type="checkbox"/>	Flags for cones			
<input type="checkbox"/>	Lights (for night work)			
<input type="checkbox"/>	Plastic fencing (rolls)			
<input type="checkbox"/>	Caution tape (rolls)			
<input checked="" type="checkbox"/>	Other (specify):			
	Keep Right		1	
	Flagger		2	


Reviewed By: Justin Maderia

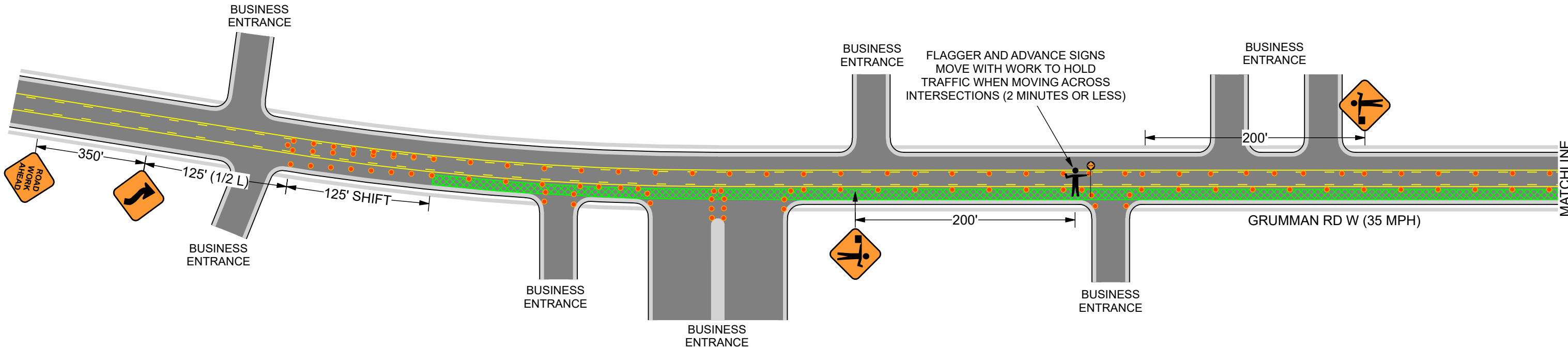
HASP Reviewer: John Kirby

Engineering Judgment Review By: Justin Maderia

SECTION 1 - GRUMMAN RD W - PHASE 1 - PAGE 1 OF 2

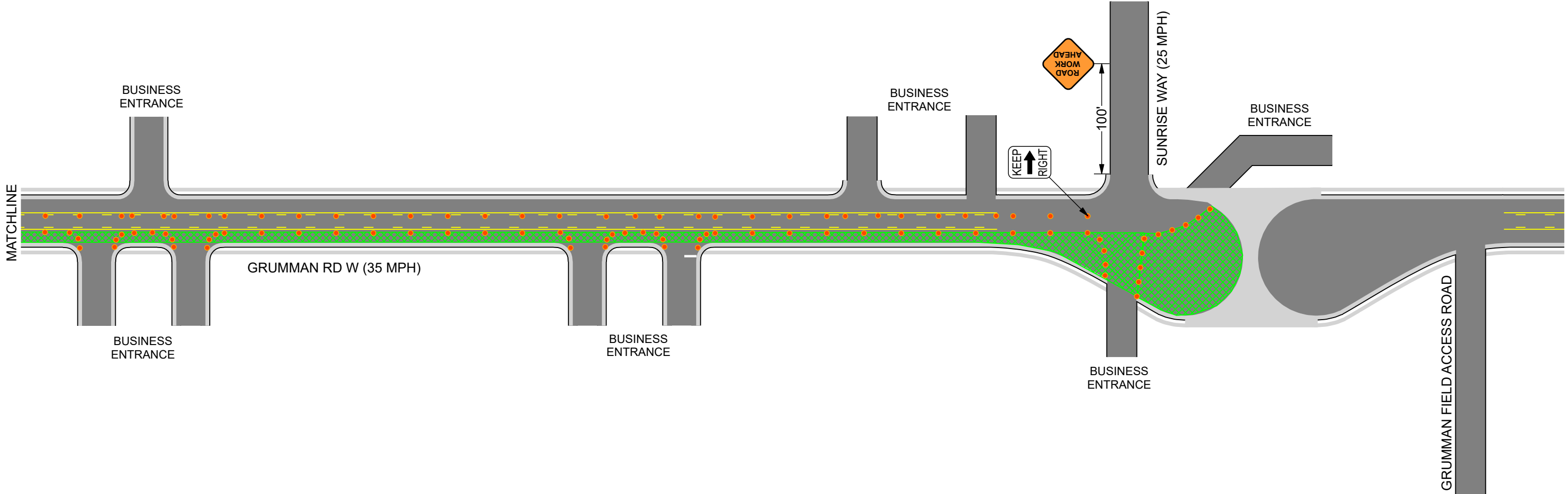


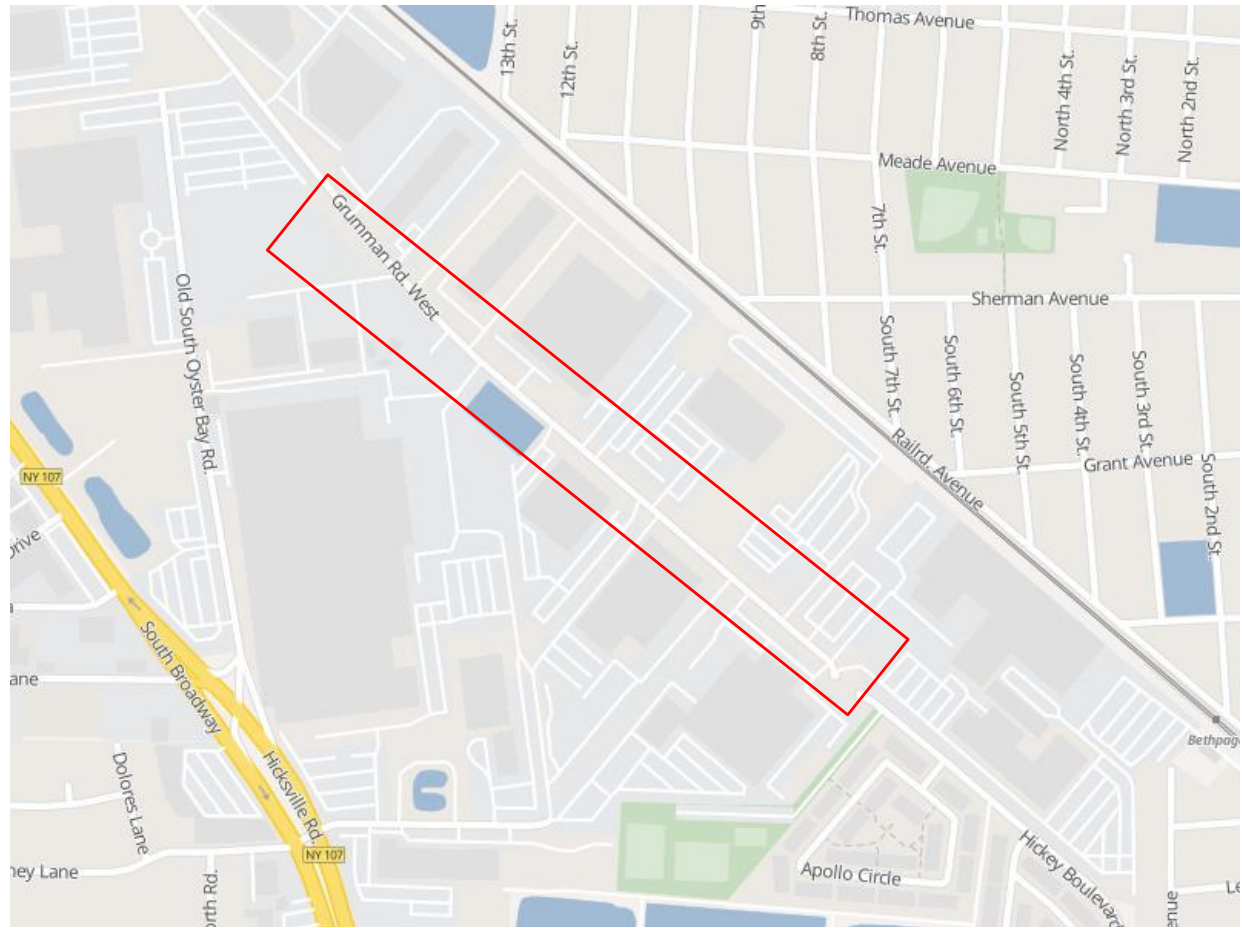
	Date: 5/3/2019 Author: Master Locators, Inc. Project: Grumman Rd W - Line Locating
	Comments: NOT TO SCALE
	All Plan Details According to New York MUTCD
	Cones for All Tapers and Tangents ○ ○ ○
	Flagger Moves With Work and Holds Intersections As Needed (2 Minutes of Less)



SECTION 1 - GRUMMAN RD W - PHASE 1 - PAGE 2 OF 2

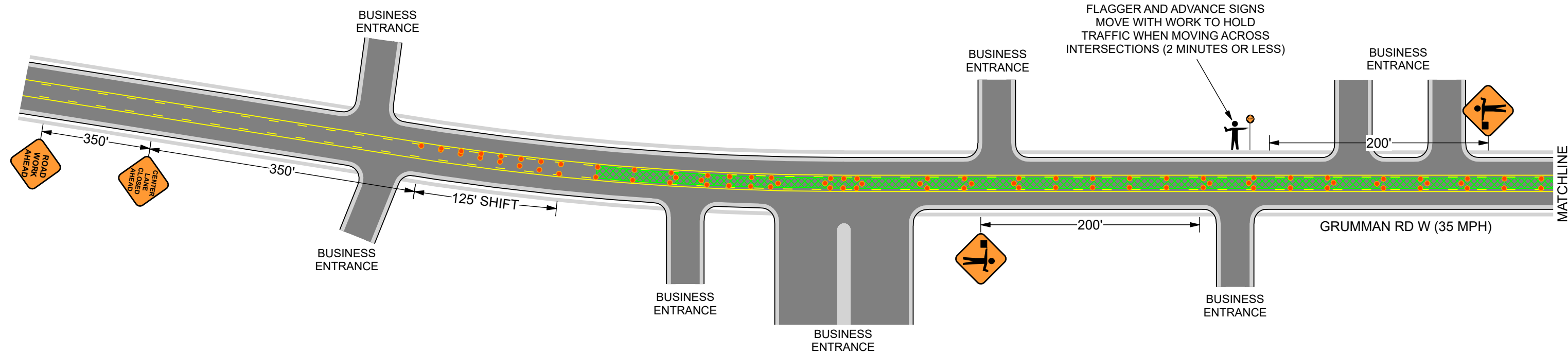
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	All Plan Details According to New York MUTCD
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SECTION 1 - GRUMMAN RD W - PHASE 2 - PAGE 1 OF 2

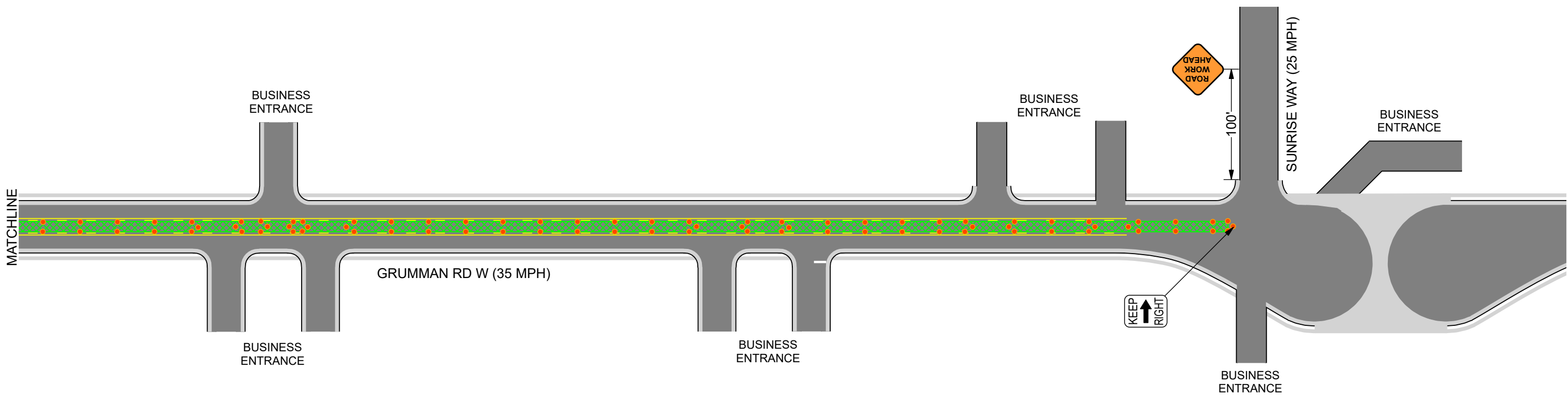
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	<p>Comments: NOT TO SCALE</p>
	<p>All Plan Details According to New York MUTCD</p>
	<p>Cones for All Tapers and Tangents ● ● ●</p> <p>Flagger Moves With Work and Holds Intersections As Needed (2 Minutes or Less)</p>



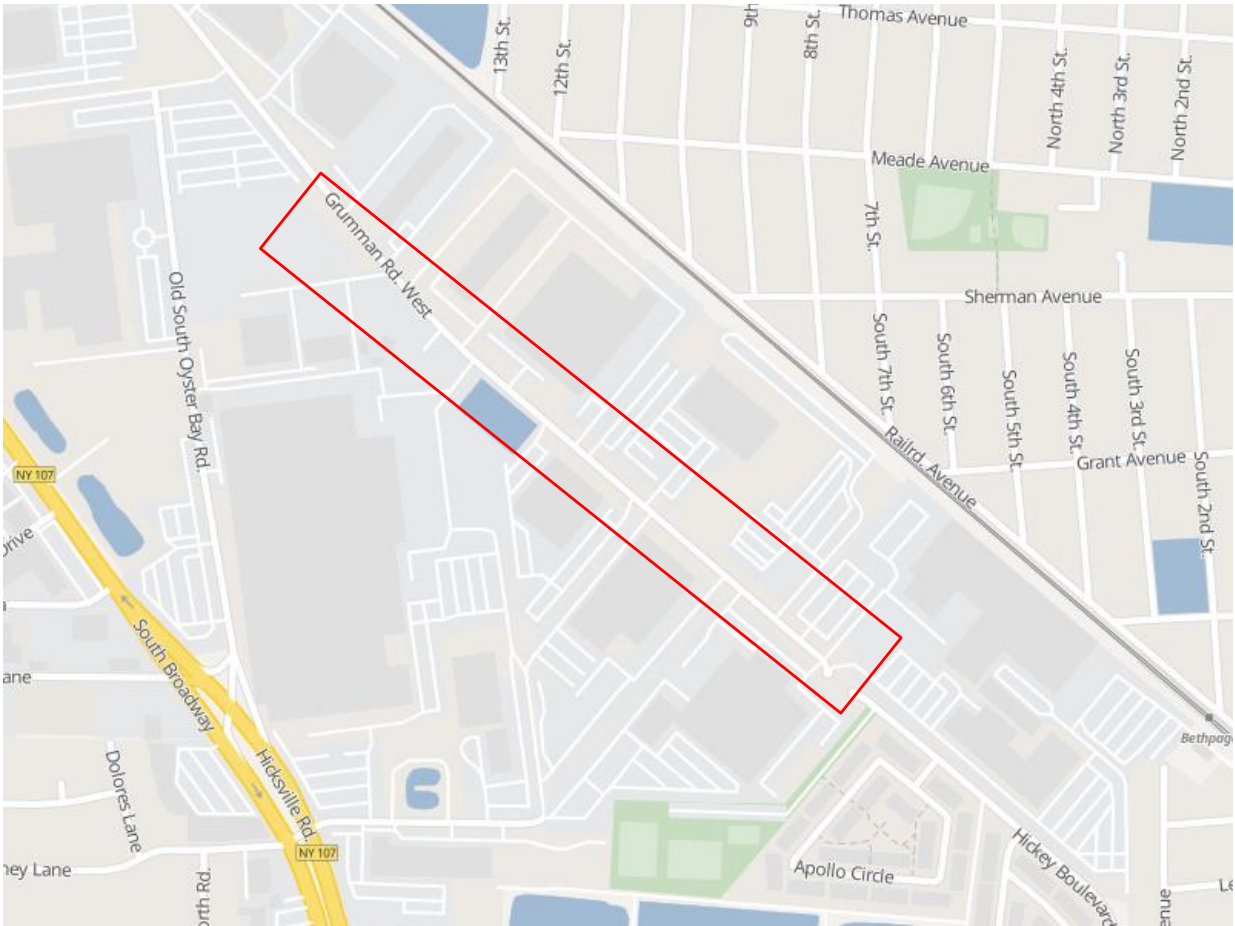
SECTION 1 - GRUMMAN RD W - PHASE 2 - PAGE 2 OF 2

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	Comments: NOT TO SCALE
	All Plan Details According to New York MUTCD
	Cones for All Tapers and Tangents ● ● ●

Flagger Moves With Work and Holds Intersections As Needed (2 Minutes of Less)

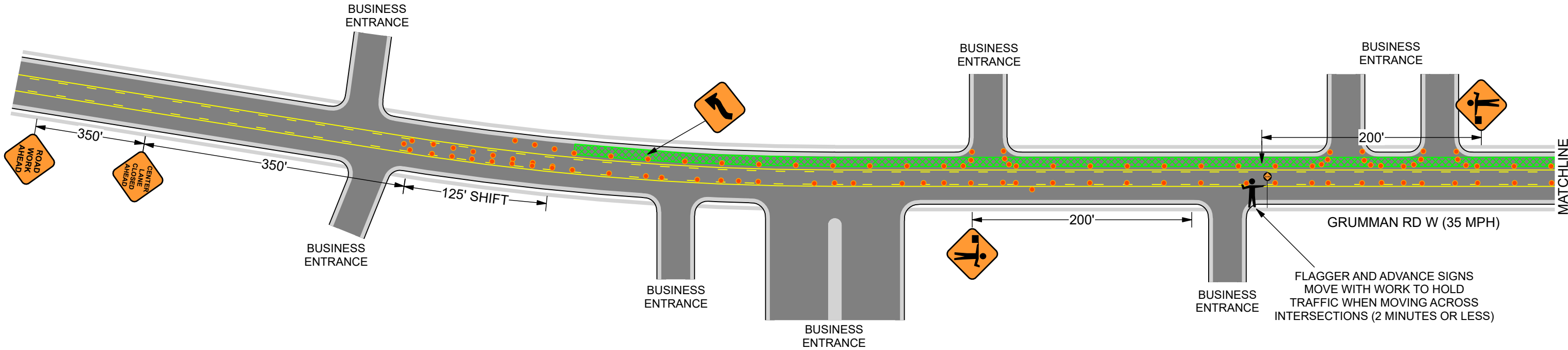


SECTION 1 - GRUMMAN RD W - PHASE 3 - PAGE 1 OF 2




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	Comments: NOT TO SCALE
	All Plan Details According to New York MUTCD
	Cones for All Tapers and Tangents ● ● ●

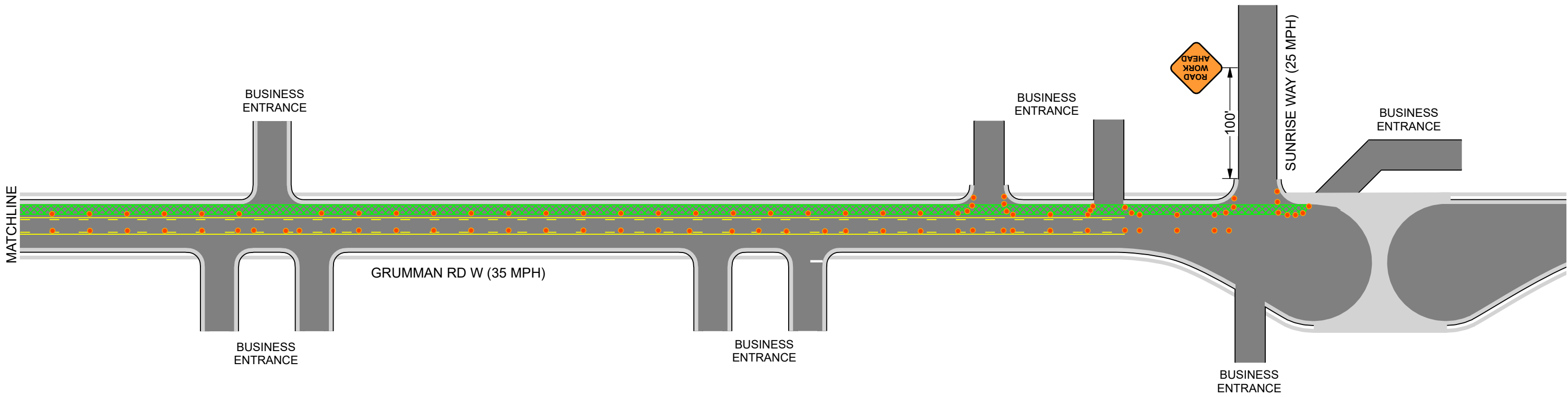
Flagger Moves With Work and Holds Intersections As Needed (2 Minutes or Less)



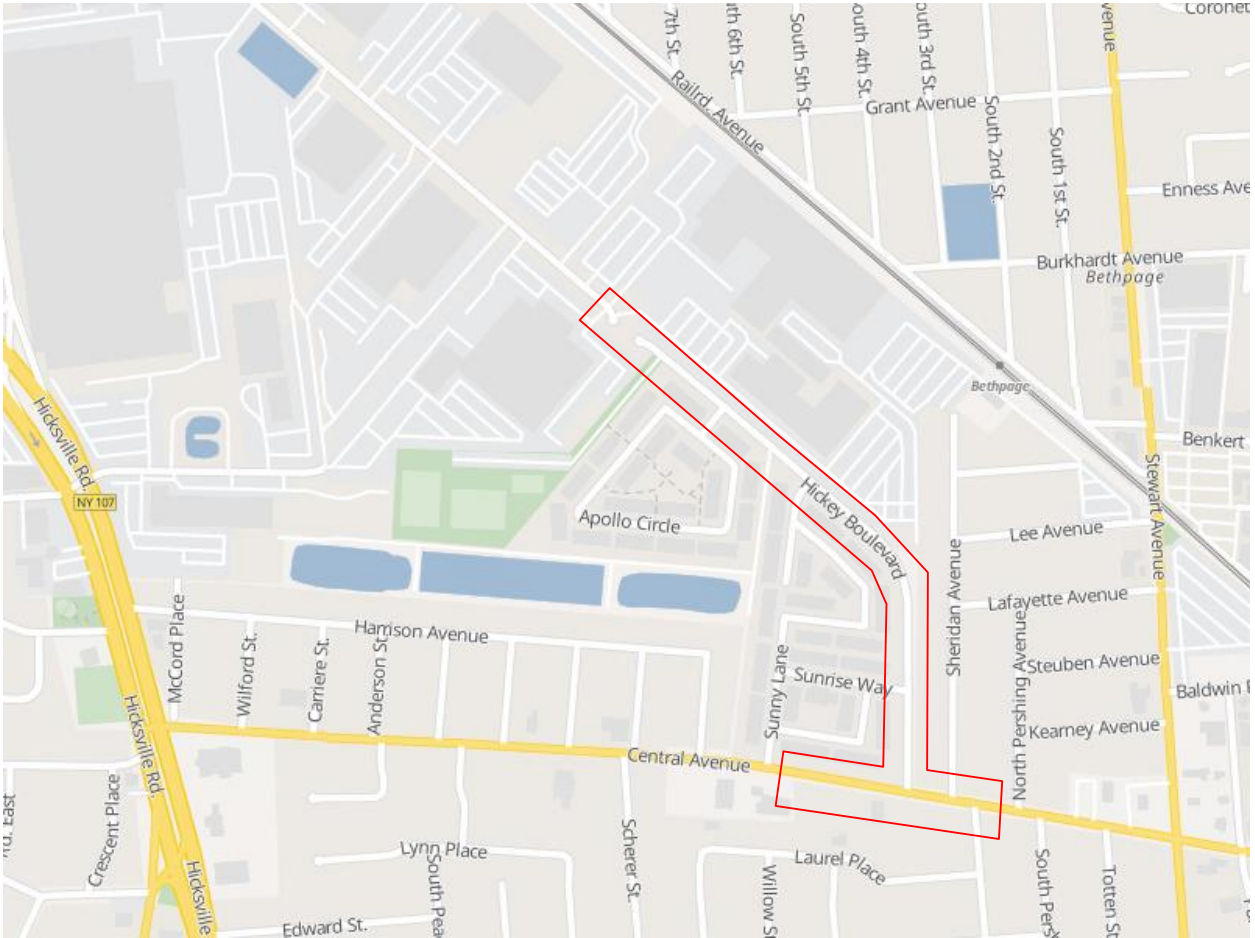
SECTION 1 - GRUMMAN RD W - PHASE 3 - PAGE 2 OF 2

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	Comments: NOT TO SCALE
	All Plan Details According to New York MUTCD
	Cones for All Tapers and Tangents ● ● ●

Flagger Moves With Work and Holds Intersections As Needed (2 Minutes of Less)



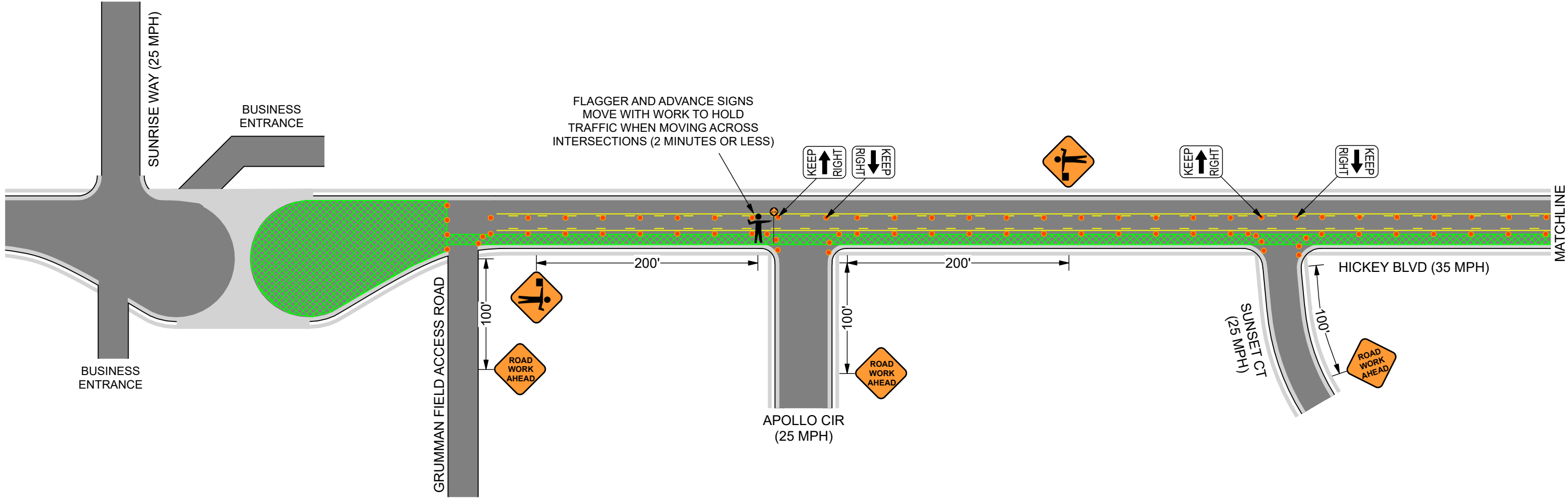
SECTION 2 - HICKEY BLVD - PHASE 1 - PAGE 1 OF 2




 master locators	Date: 5/3/2019 Author: Master Locators, Inc. Project: Hickey Blvd - Line Locating
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	All Plan Details According to New York MUTCD
	Cones for All Tapers and Tangents ● ● ●

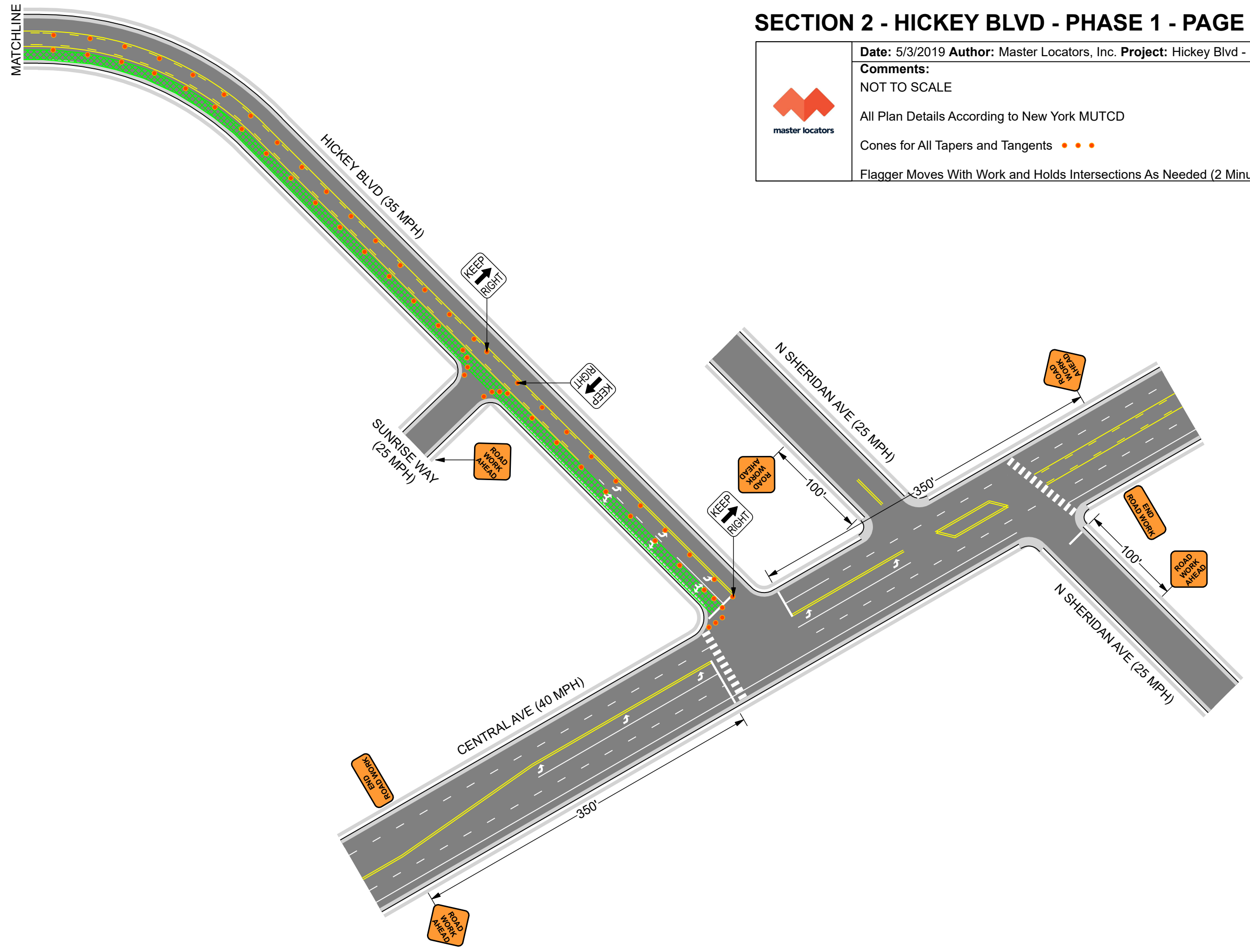
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Flagger Moves With Work and Holds Intersections As Needed (2 Minutes or Less)



SECTION 2 - HICKEY BLVD - PHASE 1 - PAGE 2 OF 2

 master locators	Date: 5/3/2019 Author: Master Locators, Inc. Project: Hickey Blvd - Line Locating
	Comments: NOT TO SCALE
	All Plan Details According to New York MUTCD
	Cones for All Tapers and Tangents ● ● ● Flagger Moves With Work and Holds Intersections As Needed (2 Minutes of Less)



SECTION 2 - HICKEY BLVD - PHASE 2 - PAGE 1 OF 2



Date: 5/3/2019 **Author:** Master Locators, Inc. **Project:** Hickey Blvd - Line Locating

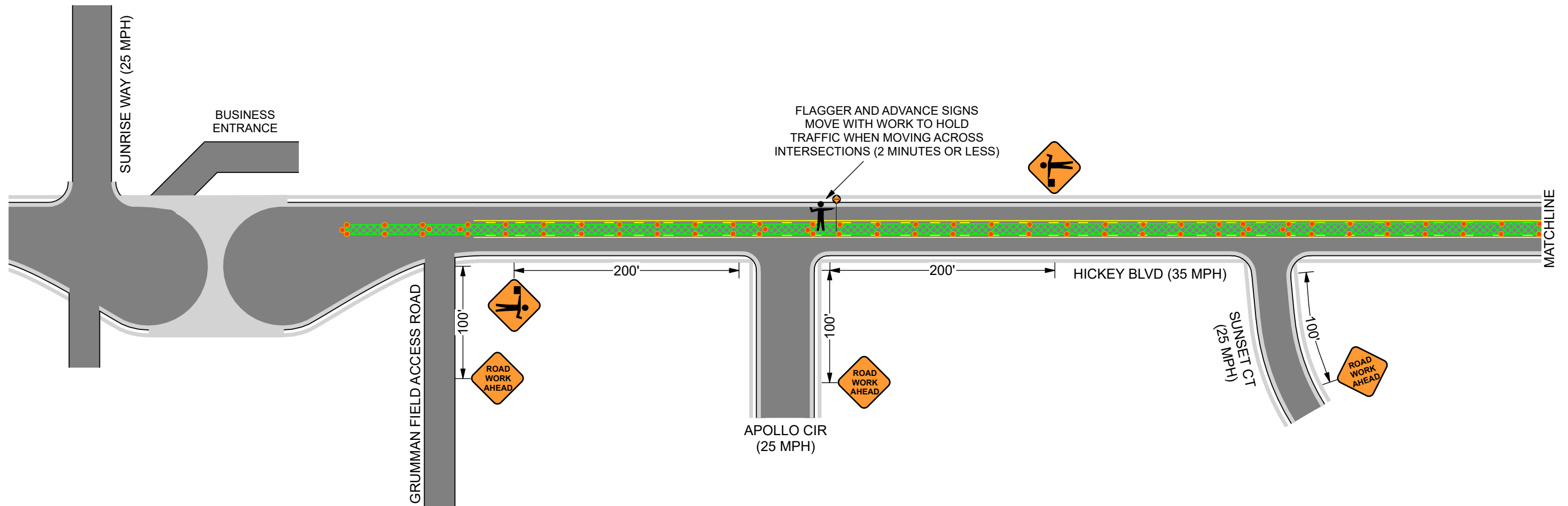
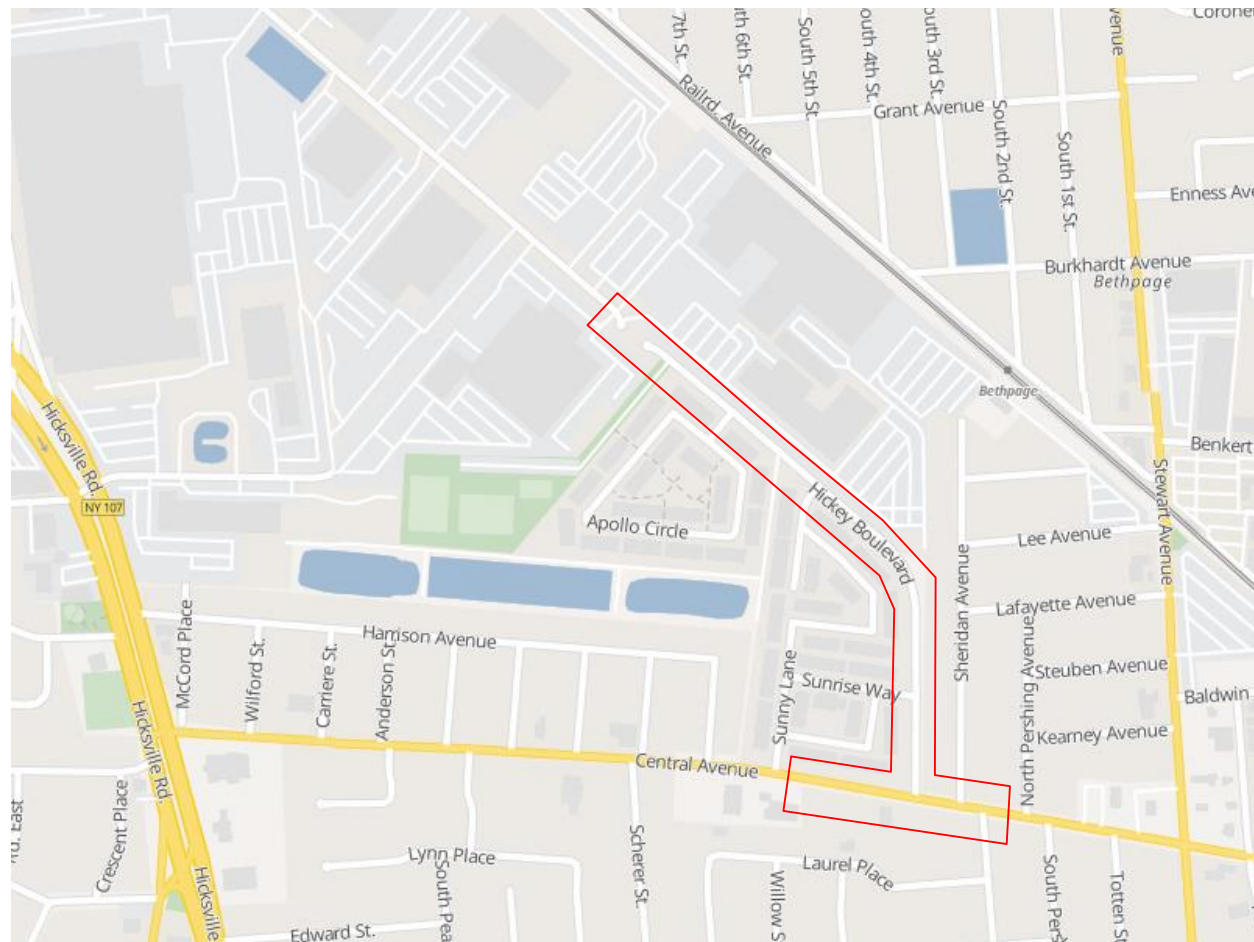
Comments:

NOT TO SCALE

All Plan Details According to New York MUTCD

Cones for All Tapers and Tangents ●●●

Flagger Moves With Work and Holds Intersections As Needed (2 Minutes or Less)



SECTION 2 - HICKEY BLVD - PHASE 2 - PAGE 2 OF 2



Date: 5/3/2019 Author: Master Locators, Inc. Project: Hickey Blvd - Line Locating

Comments:

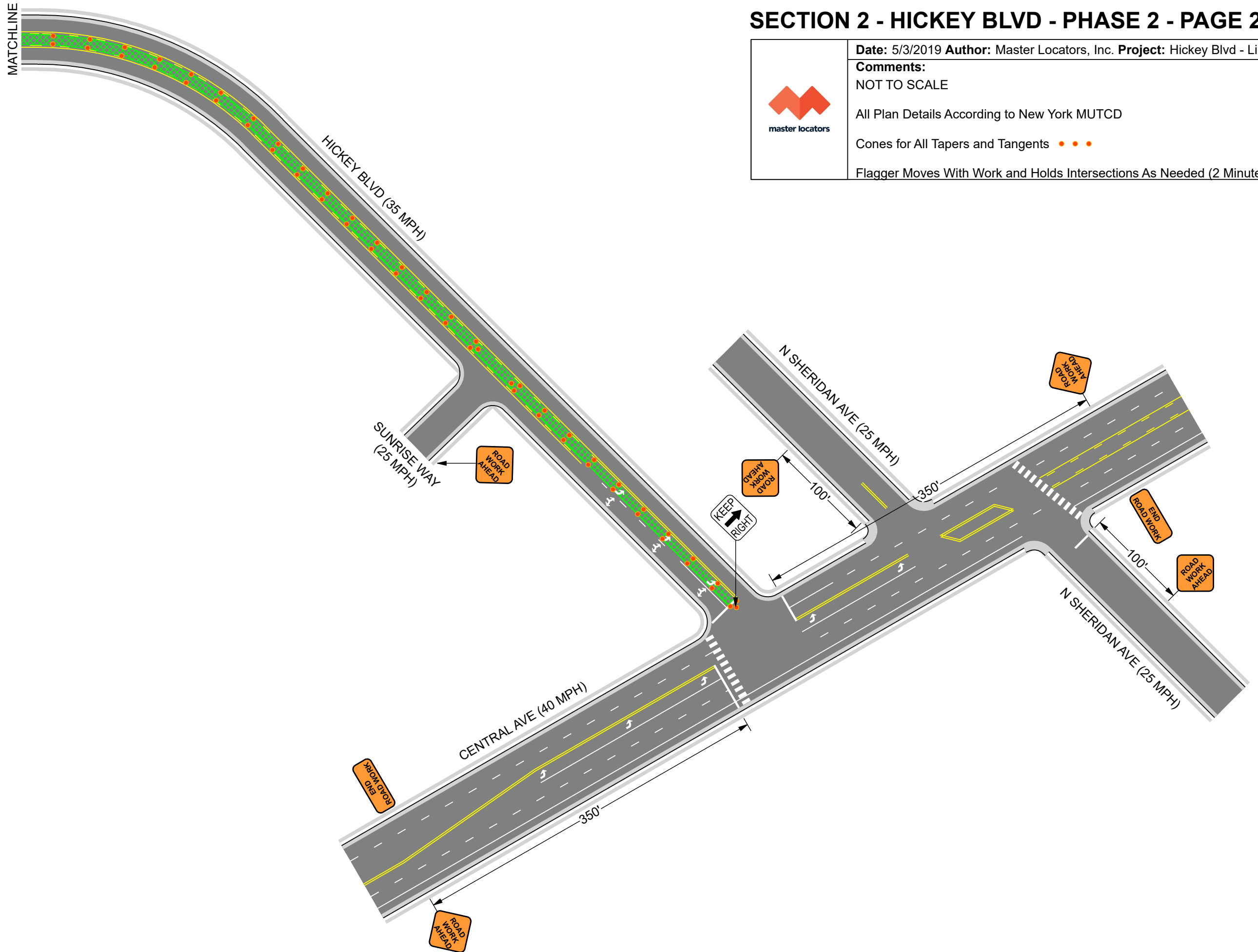
NOT TO SCALE

All Plan Details According to New York MUTCD

Cones for All Tapers and Tangents ● ● ●

Flagger Moves With Work and Holds Intersections As Needed (2 Minutes of Less)

MATCHLINE

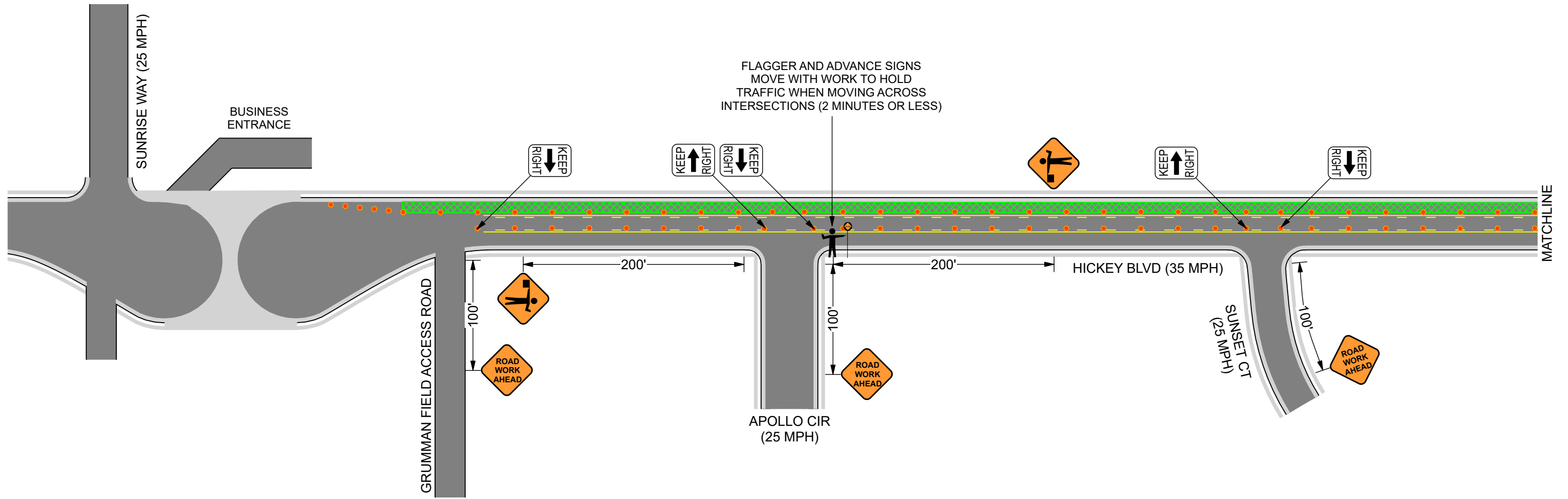
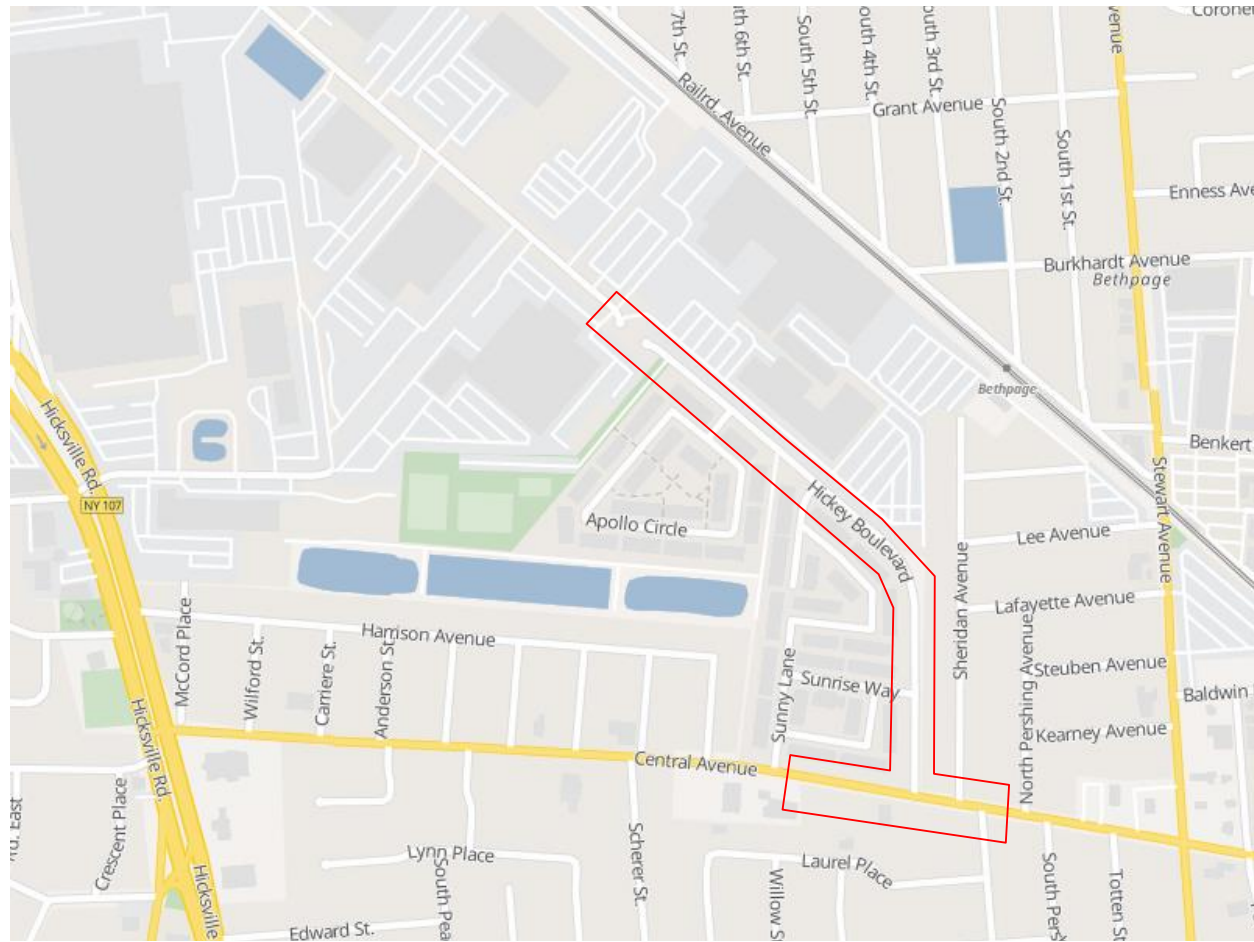


SECTION 2 - HICKEY BLVD - PHASE 3 - PAGE 1 OF 2




Date: 5/3/2019 **Author:** Master Locators, Inc. **Project:** Hickey Blvd - Line Locating

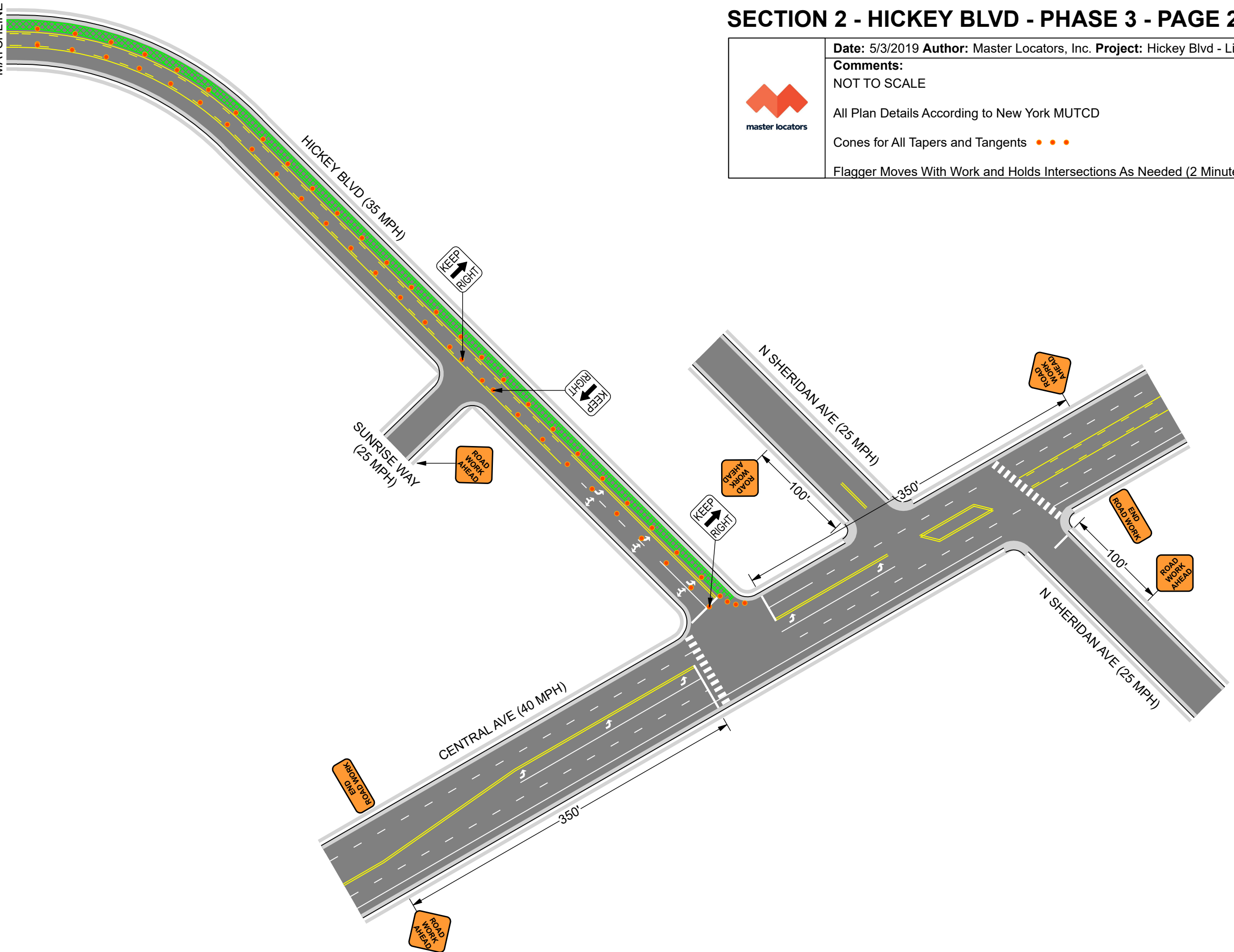
Comments:
 NOT TO SCALE
 All Plan Details According to New York MUTCD
 Cones for All Tapers and Tangents ● ● ●
 Flagger Moves With Work and Holds Intersections As Needed (2 Minutes or Less)



SECTION 2 - HICKEY BLVD - PHASE 3 - PAGE 2 OF 2

 master locators	Date: 5/3/2019 Author: Master Locators, Inc. Project: Hickey Blvd - Line Locating
	Comments: NOT TO SCALE
	All Plan Details According to New York MUTCD
	Cones for All Tapers and Tangents ● ● ● Flagger Moves With Work and Holds Intersections As Needed (2 Minutes or Less)

MATCHLINE



APPENDIX D

JSA's



JSA Table of Contents

JSA ID	Job Name
9410	Environment-Other, Groundwater Sampling for Radium
9767	Environment-Other, Well Development
11177	Environment-Geophysical Survey- Downhole Geophysical Logging
12841	Environment-Drilling, Soil Sampling, Well Installation – Split Spoon Sampling and Mud Rotary
12991	Environment-Drilling Soil Sampling, Well Installation – Collection of Soil and Water Waste
13266	Environment-Other, Pneumatic Testing
14825	General Industry-Driving Passenger Vehicles
14826	Environment-Geophysical Survey
14828	Environment- Groundwater Sampling and Free Product Recovery
14845	Environment-Drilling, Soil Sampling, Well Installation
14847	Environment-Other, Monitoring Well Repair
14956	General Industry-Fence Installation
14959	General Industry-Site Clearing (tree/brush/vegetation removal)
16904	Environment-Air knife/hydro knife
10240	Environment - Remediation System O&M - Recovery Well Pump Removal
7375	Environment - Remediation System O&M - Well Pump Pull/Replacement, Video Log

Job Safety Analysis

General

JSA ID	9410	Status	(3) Completed
Job Name	Environment-Other	Created Date	5/29/2013
Task Description	Groundwater Sampling for Radium,	Completed Date	06/18/2013
Template	FALSE	Auto Closed	FALSE

Client / Project

Client	NORTHROP GRUMMAN
Project Number	NY0014962116
Project Name	OU3 RW-21 Project Area
PIC	JOHNSTON, DAVID KENT
Project Manager	SANGIOVANNI, CARLO

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Xu, Xuan	6/20/2013	6/6/2013	Zahradnik, Arthur J	<input checked="" type="checkbox"/>
HASP Reviewer	Sangiovanni, Carlo	6/20/2013	6/18/2013	Glazewski, Robert J	<input checked="" type="checkbox"/>
Quality Reviewer	Haney, Bryan J.	6/30/2013	6/30/2013	Guillette, Brian	<input type="checkbox"/>
Reviewer	Stern, David	6/20/2013	6/9/2013	Feldman, Steven	<input checked="" type="checkbox"/>

Job Steps

Job Step No.	Job Step Description	Potential Hazard	Critical Action	H&S Reference
1	Sampling groundwater for Radium, Uranium and Gross Alpha / Gross Beta.	1 The known concentration of radiological parameters in the study area is below EPA drinking water standard. The potential ways of exposure to Radium, Uranium and decay products are through ingestion or inhalation as part of dust in the air.	Wear gloves and safety glasses. Do not drink the purge water. Follow JSA for groundwater sampling.	
2	Stage at pre-determined sampling location and set up work zone and sampling equipment	1 Personnel could be hit by vehicular traffic	Follow traffic control plan. Set up cones and establish work area. Position vehicle so that field crew is protected from site traffic. Unload as close to work area as safely possible.	Site Specific HASP, Northrop Grumman System Corporation, 5/2/2013
		2 Sampling equipment, tools and monitoring well covers can cause tripping hazard	Keep equipment picked up and use TRACK to assess changes.	
3	Open wells to equilibrate and gauge wells	1 When squatting, personnel can be difficult to see by vehicular traffic.	Wear class II traffic vest if wells are located proximal to vehicular traffic. Use tall cones and the buddy system if practicable.	
		2 Pinchpoints on well vault can pinch or lacerate fingers	Use correct tools to open well vault/cap. Wear leather gloves when removing well vault lids, and chemical protective gloves while gauging. Wear proper PPE including safety boots, knee pads and safety glasses.	
		3 Lifting sampling equipment can cause muscle strain	Unload as close to work area as safely possible; use proper lifting and reaching techniques and body positioning; don't carry more than you can handle, and get help moving heavy or awkward objects.	

		4	Pressure can build up inside well causing cap to release under pressure	Keep head away from well cap when removing. If pressure relief valves are on well use prior to opening well	
4	Begin Purging Well and Collecting Parameter Measurements	1	Electrical shock can occur when connecting/disconnecting pump from the generator.	Make sure equipment is turned off when connecting/disconnecting. Wear leather gloves. Use GFCIs when using powered tools and pumps. Do not use in the rain or run electrical cords through wet areas.	
		2	Purge water can spill or leak from equipment	Stop purging activities immediately, stop leakage and block any drainage grate with absorbent pads. Call PM to notify them of any reportable spill.	
		3	Water spilling on the ground can cause muddy/slippery conditions	Be careful walking in work area. Keep work area free of trip hazards. During winter, if water is pooling and walking area is getting icy, use salt or sand to de-ice work area and use TRACK to access and control potential hazard.	
		4	Lacerations can occur when cutting materials such as plastic tubing	When cutting tubing, use tubing cutter. No open fixed blades should ever be used. When possible wear work gloves, leather type.	
		5	Purge water can splash into eyes	Adjust pumping rate to control forces coming out of the outlet. Pour water slowly into buckets/drums to minimize splashing. Wear safety glasses.	
5	Collect Groundwater Sample	1	Sample containers could break or leak preservative	Discard any broken sampleware or glass properly. Do not overtighten sample containers. Wear chemical protective gloves.	
		2	Groundwater could splash onto person's face, hands and arms.	Wear gloves and safety glasses. Adjust pumping rate to control forces at the outlet.	
6	Staging of Well Purge water	1	Muscle strains can occur when moving purge water or drums	If using buckets, do not fill buckets up to the top. Always keep lid on buckets when traveling or moving them to another location. Only half fill buckets so when dumping the buckets weigh less. See drum handling JSA for movement of drums.	Drum handling JSA

PPE Personal Protective Equipment			
Type	Personal Protective Equipment	Description	Required
Dermal Protection	long sleeve shirt/pants		Recommended
Eye Protection	safety glasses		Required
Foot Protection	steel-toe boots		Required
Hand Protection	chemical resistant gloves (specify type)	Nitrile	Required
	work gloves (specify type)	leather	Required
Head Protection	hard hat		Required
Hearing Protection	ear plugs		Recommended
Miscellaneous PPE	other	Knee pads	Required

Supplies

Type	Supply	Description	Required
Communication Devices	mobile phone		Required
Decontamination	Decon supplies (specify type)	alconox, DI water, spray bottle	Required
Miscellaneous	fire extinguisher		Required
	first aid kit		Required
	flashlight		Required
Personal	eye wash (specify type)	bottle	Required
	insect repellent		Recommended
	sunscreen		Recommended
Traffic Control	barricades		Recommended
	traffic cones		Required

Review Comments

Reviewer	Comments
Employee: Sangiovanni, Carlo Role HASP Reviewer Review Type Revise Completed Date 6/5/2013	Job Step 1: Change the word "digestion" to "ingestion".
Employee: Sangiovanni, Carlo Role HASP Reviewer Review Type Approve Completed Date 6/18/2013	Good job on this.
Employee: Stern, David Role Reviewer Review Type Approve Completed Date 6/9/2013	Well done
Employee: Haney, Bryan J. Role Quality Reviewer Review Type NA Completed Date 6/30/2013	I disagree with the use of leather gloves during sampling. Since the gloves are thick, you lose sensitivity and ability to move hands and fingers freely. Use gloves for moving drums. Appears very complete

Job Safety Analysis

General

JSA ID	9767	Status	(3) Completed
Job Name	Environment-Other	Created Date	8/1/2013
Task Description	Well Development	Completed Date	08/26/2013
Template	FALSE	Auto Closed	FALSE

Client / Project

Client	NORTHROP GRUMMAN
Project Number	NY0014962116
Project Name	OU3 RW-21 Project Area
PIC	JOHNSTON, DAVID KENT
Project Manager	SANGIOVANNI, CARLO

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Miranda, Karla M	8/22/2013	8/1/2013	Wright, Justin M	<input checked="" type="checkbox"/>
HASP Reviewer	Sangiovanni, Carlo	8/15/2013	8/23/2013	Glazewski, Robert J	<input checked="" type="checkbox"/>
Quality Reviewer	Gomes, David C	8/28/2013	8/28/2013	Lutrick, Janis K.	<input checked="" type="checkbox"/>
Reviewer	Xu, Xuan	8/15/2013	8/26/2013	Zahradnik, Arthur J	<input checked="" type="checkbox"/>

Job Steps

Job Step No.	Job Step Description	Potential Hazard	Critical Action	H&S Reference
1	Establish Workzone Controls.	1 Slip, trips, and falls. Cuts and abrasions.	Survey the site upon arrival. Note any uneven ground surfaces and/or site obstructions. Generate clear work zone and staging area sufficient to prep, install and remove pump and any associated support tubing/wiring and equipment.	JSA 7002
2	Don Appropriate PPE.	1 Contaminant Contact and Splash Hazard.	In order to prevent dermal contact, always follow proper PPE Protocol (hard hat, long sleeve shirt, high visibility vest, steel-toe boots, and safety glasses with side shields) when working and performing set up tasks. Use chemical resistant gloves when installing/removing pump, attaching tubing to equipment, calibrating equipment and sampling. Use leather gloves over chemical resistant gloves when assembling/disassembling equipment, removing pump and handling drums and/or tooling.	
		2 Injured by vehicular traffic.	Wear Class II high visibility vest due to decreased visibility when squatting or bending over wells in high traffic area, i.e. parking lot. If applicable, use tall cones and a buddy system.	

3	Opening Wells.	1	Pinch Points.	Don appropriate PPE, including leather gloves when opening stick up/manhole covers and unlocking/loosening fasteners.	
		2	Injury due to improper technique and tooling, i.e. scrapes, cuts.	Use correct tools to open well vault/cover and cap.	
		3	Stinging insects/spiders in stick up casing or flush mount manhole.	After opening stick up/manhole cover, visually inspect the inside of well vault and perimeter of casing for spiders, stinging insects and nest. If insects are present, use appropriate spray to kill/clear any insects present.	
		4	Pressure build up in well.	Do not stand directly over the well. Depressurize the well by loosening the well plug gasket (i.e. turning the well plug wing nut). Once pressure has been relieved, remove well plug.	
4	Well Development Using Submersible Pump.	1	Contamination of Ground Surface and Soil.	Place protective plastic sheeting at/near the well to provide sufficient staging area for pump assembly and all associated tubing/wiring.	
		2	Trip/Fall Hazards due to uncoiled and/or unsecured tubing/wiring.	When loading and unloading, keep tubing/wiring secured to coil. Stop and pick up dangling tubing and wires that could be a trip hazard when carrying. Use cones when necessary.	
		3	Cuts and Abrasions while lowering the pump in and out of well.	Prior to installation, evaluate pump and piping for sharp edges, pinch points, etc. Wear durable, slip-resistant gloves to ensure a secure grip on pump and piping. Avoid lacerations if and when cutting ties, loosening/tightening clamps, etc.	
		4	Losing pump down the well.	Ensure that tubing/wiring is securely attached to pump. Use fail safe tethers (i.e. string) to tie off pump before lowering to minimize potential risk.	
		5	Back strain while lowering pump in and out well.	Implement proper lifting techniques (i.e. bending knees, keeping back straight and lifting with legs) and avoid awkward movements.	
		6	Electric shock due to incorrect connection/disconnection to pump power source (i.e. battery).	Ensure that positive and negative connections are clearly labeled on both the pump and battery. Clear any tarnish or chemical build from battery terminals. Make sure equipment is turned off when connecting/disconnecting. Minimize exposure of electric wiring to rain and wet surface areas. Wear leather gloves.	

		7	Strike Hazard.	Keep a safe distance from the tubing as it is moving up and down out of the well. Secure tubing if necessary.	
5	Collecting Water Quality Measurements/Readings.	1	Dermal Contact with Skin. Splash/Spill Hazard.	Appropriately position collection device and sample port to minimize spill and splash potential. Don appropriate PPE and use caution when collecting and/or disposing sample to avoid contact with skin.	
6	Deconing equipment and pump assembly.	1	Slips, trips and falls as a result of slippery surfaces and equipment laid out for cleaning.	Be aware of surroundings when cleaning equipment. Maintain good footing and walk slowly on wet/slippery surfaces.	
7	Containerizing and Disposing of Purge Water.	1	Spill and/or Leaking of Purge Water.	Verify purge water container has sufficient volume to hold all purge water before pumping begins. Inspect tubing and fitting connections to ensure there are no compromises. If spill or leak occurs, stop purging immediately and correct the issue.	
		2	Splashing or spilling of purge water.	Ensure that the end of the tubing stays securely in the purge water container. Use clamp if necessary.	
		3	Unknown drum contents.	Ensure that drums are labeled with proper information and that labels are secure.	
		4	Pinch points and injury due to drum handling.	Use proper equipment and PPE when moving drums.	

PPE Personal Protective Equipment			
Type	Personal Protective Equipment	Description	Required
Dermal Protection	chemical protective suit (specify type)	Long sleeve shirt	Recommended
	long sleeve shirt/pants		Recommended
Eye Protection	faceshield		Required
	safety glasses	Clear glasses when working inside	Required
	safety goggles		Required
Foot Protection	boots		Required
	steel-toe boots		Required
Hand Protection	chemical resistant gloves (specify type)	Nitrile	Required
	work gloves (specify type)	Leather or cut resistant material; Slip	Required
Head Protection	hard hat		Required
Miscellaneous PPE	other		Required
	traffic vest--Class II or III		Required

Supplies			
Type	Supply	Description	Required
Communication Devices	mobile phone		Required
Decontamination	Decon supplies (specify type)	Micro 90 and Distilled Water	Required
Miscellaneous	auxiliary lighting		Recommended
	fire extinguisher		Required
	first aid kit		Required
Personal	eye wash (specify type)	Bottle	Required
Traffic Control	barricades		Required
	traffic cones		Required

Review Comments		
Reviewer	Comments	
Employee: Role Review Type Completed Date	Sangiovanni, Carlo HASP Reviewer Approve 8/23/2013	Good job on this. If we are using a portable generator for job Step 4.6, then use of a GFCI is recommended to reduce risk of electrical shock.
Employee: Role Review Type Completed Date	Xu, Xuan Reviewer Approve 8/26/2013	
Employee: Role Review Type Completed Date	Gomes, David C Quality Reviewer NA 8/28/2013	Good analysis of safety considerations.

Job Safety Analysis

General

JSA ID	11177	Status	(3) Completed
Job Name	Environment-Geophysical survey	Created Date	6/5/2014
Task Description	Downhole geophysical logging	Completed Date	08/14/2014
Template	FALSE	Auto Closed	TRUE

Client / Project

Client	NORTHROP GRUMMAN
Project Number	NY0014962116
Project Name	OU3 RW-21 Project Area
PIC	JOHNSTON, DAVID KENT
Project Manager	JOHNSTON, DAVID KENT

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Xu, Xuan	7/4/2014	7/17/2014	Zahradnik, Arthur J	<input checked="" type="checkbox"/>
Developer	Zahradnik, Arthur J	7/4/2014	7/17/2014	Glazewski, Robert J	<input checked="" type="checkbox"/>
HASP Reviewer	Sangiovanni, Carlo	7/31/2014		Glazewski, Robert J	<input checked="" type="checkbox"/>
Quality Reviewer	Calderon, Efrain	9/7/2014	9/7/2014	Alonso, John C	<input checked="" type="checkbox"/>
Reviewer	Wolfert, Michael	7/31/2014	7/18/2014	Feldman, Steven	<input checked="" type="checkbox"/>

Job Steps

Job Step No.	Job Step Description	Potential Hazard	Critical Action	H&S Reference
1	General site and weather related hazards	1 Biological hazards	Use insect repellent; tuck pants into sock and boots; wear light color clothes if possible; check yourself occasionally and after work for ticks and other insects; avoid high grass area.	
		2 Severe weather	Plan ahead and watch local forecast; use TRACK and STOP work authority when severe weather approaches; know adjacent areas and identify where can be used as temporary shelter.	
		3 Work area is close to recharge basin; uneven ground	Wear boots with ankle support; be mindful of where you walk; stay at a safe distance away from the bank of recharge basin.	
		4 Exposure to contaminants of concern	Perform air monitoring at well head; wear gloves when perform decontamination and contact with probes and cables; stay upwind.	
2	Driving to and back from site	1 Hazards related to operating a vehicle; refer to JSA001461 for details	Review JSA001461; plan the route; use Smith Driving System.	JSA001461, Smith Driving System

3	Mobilization/demobilization of equipment to/from survey area	1	Lifting hazards (heavy or bulky equipment)	Use TRACK to plan lifts and routes to work location. Use proper lifting techniques.	
		2	Awkward body positions and twisting	Plan activity to avoid twisting of body or awkward body positions. Use buddy system or job rotation to reduce exposure to conditions that cannot be avoided.	
		3	Trip and fall hazards from uneven ground or restricted view when carrying equipment	Break loads down to manageable size that does not obstruct view of ground. Plan route and use TRACK, wear footwear with good tread and ankle support. Use buddy system for large or bulky items when carrying.	
4	Equipment setup and breakdown; decontamination	1	Lifting hazards (heavy or bulky equipment)	Use TRACK to plan lifts and routes to work location. Use proper lifting techniques.	
		2	Crush hazard or contact stress to hands/fingers; pinch point.	Wear work gloves; use TRACK to avoid awkward position	
		3	Contact with contaminants of concern during decontamination.	Wear nitrile gloves; use TRACK to control potential splash and wear safety glasses if splash is a concern and can not be controlled;	
5	Performing geophysical logging	1	Electrical hazards	Use GFCI; inspect equipments for loose wires, loose connection and worn parts, replace if necessary.	
		2	Scrapes or cuts to hands, arms or legs from moving cable line; struck by flying cable when probe gets stuck and breaks away.	Wear suitable gloves when performing survey; identify work zone i.e. from the back of the truck where cable is running out to the well head, and minimize activities and personnels within the work zone; wear long pants and long sleeve shirt if arm hazard exists; inspect	
		3	Contact with contaminants of concern	Wear gloves and wipe down the cable while retrieving probe from the well.	

PPE Personal Protective Equipment			
Type	Personal Protective Equipment	Description	Required
Eye Protection	safety glasses		Recommended
Foot Protection	boots	supportive with good tread	Required
Hand Protection	chemical resistant gloves (specify type)	Nitril	Required
	work gloves (specify type)	leather	Required
Head Protection	hard hat		Required

Supplies			
Type	Supply	Description	Required
Communication Devices	mobile phone		Required
Miscellaneous	first aid kit		Required

Review Comments

Reviewer		Comments
Employee: Role Review Type Completed Date	Sangiovanni, Carlo HASP Reviewer Revise 6/9/2014	Sunny, Please add driving (on-site) and backing as a hazard. You don't need to add a lot of detail; sufficient to reference our existing smith driving jsa for details.
Employee: Role Review Type Completed Date	Wolfert, Michael Reviewer Revise 6/20/2014	JSA looks thorough and complete. One change, make Carlo San Giovanni the project manager.
Employee: Role Review Type Completed Date	Wolfert, Michael Reviewer Approve 7/18/2014	Apparently the project manager cannot be changed as it appears fixed based on the project number selected so I approve this JSA.
Employee: Role Review Type Completed Date	Calderon, Efrain Quality Reviewer NA 9/7/2014	complete JSA

Job Safety Analysis

General

JSA ID	12841	Status	(3) Completed
Job Name	Environment-Drilling, soil sampling, well	Created Date	6/4/2015
Task Description	Mud Rotary Drilling, Split Spoon Soil and	Completed Date	07/27/2015
Template	FALSE	Auto Closed	TRUE

Client / Project

Client	NORTHROP GRUMMAN
Project Number	NY0014962116
Project Name	OU3 RW-21 Project Area
PIC	JOHNSTON, DAVID KENT
Project Manager	SANGIOVANNI, CARLO

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Maza, David A.	6/26/2015	6/29/2015	Conger, Marc A	<input checked="" type="checkbox"/>
HASP Reviewer	Sangiovanni, Carlo	7/13/2015		Glazewski, Robert J	<input checked="" type="checkbox"/>
Reviewer	Xu, Xuan	7/13/2015		Zahradnik, Arthur J	<input checked="" type="checkbox"/>

Job Steps

Job Step No.	Job Step Description	Potential Hazard	Critical Action	H&S Reference
1	Driving To/From Drilling Location	1 Motor Vehicle Collision with pedestrians, other motor vehicles or stationary objects. Contact between larger vehicles (e.g. drill rig, water truck, support vehicles) and overhead electric or telecommunication lines can result in electrocution or damage to utilities.	See Driving JSA. Use Smith System. Ensure you are mentally fit to drive. Conduct vehicle walk-around prior to driving and perform periodic vehicle inspections. Prioritize pull-through parking. Use a spotter when backing. Plan route in advance and re-evaluate periodically and as conditions change. Consider alternate routes to avoid high vehicle or pedestrian volume areas in which children may be in proximity to the public right-of-way.	
		2 Equipment and other items in vehicle can become projectiles.	Secure cargo. Place heavy items down low in vehicle or in trunk.	
2	Work Zone Setup	1 Struck by vehicle traffic when working in or near a public right-of-way	Establish Traffic Control in accordance with the Traffic Control Plan. Ensure cones/barricades are visible to oncoming traffic and adequately spaced.	ARCHSFS019
		2 Back/Muscle strain from unloading, lifting, moving equipment.	Use proper lifting/pushing/pulling techniques. Avoid awkward twisting when carrying heavy loads. Share efforts. Make multiple trips between support vehicle and work zone as needed. Position support vehicle near work zone to minimize carrying distances.	
		3 Electrocution from contact or proximity to overhead electric lines when raising drill rig derrick.	Always look up before raising derrick. Refer to ARCADIS utility clearance standard for minimum clearance distances from overhead electric lines based on voltage. Maintain required clearance distance.	

		4	Crushed/Struck by Mud Tub	Ensure mud tub is properly secured when lifting. Clear area of non-essential personnel when unloading and setting mud tub. Use a tag line to guide mud tub into position.	
3	Mud Rotary Drilling	1	Striking subsurface utilities	Refer to ARCADIS Utility Clearance Standards. Call underground utility locating service to mark out public utilities. Complete the ARCADIS Utility Clearance Checklist. Visually examine the work area for evidence of subsurface utilities. Perform soft dig using a hand auger, air knife or equivalent prior to drilling. Ensure that there are at a minimum three reliable lines of evidence that drilling location is clear of utilities.	ARC HSIH014, ARC HSIH013, ARC HSIH008, ARCHSFS019
		2	Pinch/Crush points on moving or rotating parts.	Wear appropriate hand protection. Keep hands clear of moving parts. Maintain exclusion zone and clear of non-essential personnel. Ensure moving parts are properly guarded where appropriate. Test kill switches prior to beginning drilling operations. Maintain a safe work pace.	
		3	Damage to hearing and obstruction of communication from noise generated by drilling.	Wear hearing protection. Establish hand signals to communicate emergency.	
		4	Slips/Trips and Falls over tooling, hoses, slick or uneven surfaces.	Maintain clear walking paths in and around work zone. Take the safest route. Maintain 3 points of contact when boarding and unboarding vehicles and drilling platform. Avoid stepping on rim of mud tub. Rinse down work area if it becomes excessively muddy and apply rock salt to melt ice in the work zone as needed.	
		5	Injury from pressure release due to failing of pressurized hoses, valves, fittings and pumps.	Inspect equipment and connections prior to beginning work and periodically. Stand clear of potential discharge points.	
		6	Exposure to contaminants via dermal absorption or inhalation (volatiles)	Wear impermeable work gloves at all times when handling drilling tooling. Avoid contact with face and eyes. Conduct air monitoring in accordance with the HASP and evacuate work zone if action levels are exceeded.	
		7	Back/Muscle strain from adding or removing drill rods to tools string.	Position drill rods to minimize awkward lifting and maintain clear walking path between drill rods and the drill rig. Ensure drill rods are properly secured before lifting. Lift gradually.	
		8	Cold Stress/Heat Stress	When working in cold conditions, take warm-up breaks as needed, wear appropriate clothing and layers. Keep a change of dry clothing available. In warm weather conditions, take breaks to rest and hydrate as needed. Apply sunscreen as needed.	

4	Transfer drill cuttings to rolloff container using a backhoe.	1	Personnel in work zone struck by backhoe.	All site personnel should clear backhoe swing radius. Inspect backhoe periodically and ensure the backup alarm is operational. Operators seat should be rotated to face the direction of motion.	ARCHSFS019
		2	Spilling contaminated drilling mud and soil cuttings.	Avoid overfilling backhoe bucket. Maintain low speeds when transferring cuttings. Use a spotter when transferring cuttings to ensure bucket is positioned directly over rolloff container when dumping. Verify integrity of rolloff and ensure rolloff is properly lined.	
		3	Striking of overhead utilities, vehicles or stationary objects when operating backhoe.	Ensure backhoe bucket maintains adequate clearance from overhead utilities. Scan area for pedestrians before mobilizing. Maintain adequate cushion between backhoe and stationary objects to minimize the risk of collision.	
5	Collect Split Spoon Soil Samples and Hydropunch Groundwater Samples.	1	Slip/Trip Fall on hoses, tooling, slick/uneven surface when carrying split spoon/hydropunch sampler away from drill rig.	Maintain clear walking paths. Take the safest route. Apply rock salt to work zone to melt ice as needed. Rinse down work zone if it becomes excessively muddy.	
		2	Back/Muscle strain from breaking split spoon/hydropunch sampler assembly.	Avoid over-tightening split spoon/hydropunch sampler assembly. Use appropriate sized pipe wrenches to break split spoon/hydropunch sampler. Share efforts and use proper body positioning. Use a mallet to gently strike split spoon/hydropunch sampler assembly as needed to loosen threads.	
		3	Exposure to contaminants when handling split spoon/hydropunch sampler assembly and soil and when collecting groundwater sample.	Wear nitrile gloves when handling split spoon/hydropunch sampler and soil and when collecting groundwater sample.	
		4	Laceration from broken glass	Avoid over tightening glass sample containers.	
		5	Contact with or inhalation of sample preservatives may cause chemical burns or dermal/respiratory irritation.	Wear nitrile gloves when handling sample containers. When collecting samples, open sample containers away from face and allow to ventilate.	
6	Monitoring Well Construction	1	Back/Muscle Strain from unloading lifting/moving well materials, bags of sand, bentonite or cement	Stage well materials and supplies near borehole to minimize carrying distances. Use winch or sand line to lift bags of sand to avoid manual handling. Share efforts. Use proper lifting techniques.	

		2	Slip/Trip and Fall over wells materials and supplies and discarded bas of sand/bentonite/cement in work area.	Maintain clear walking path between well materials and borehole. Perform periodic housekeeping to minimize clutter and obstructions.	
		3	Pressure release from pumps, valves, fittings or hoses while pumping in sand or grout into borehole annulus through tremie pipes or mixing cement.	Inspect equipment and connections periodically. Monitor pressure gauges for increases in pressure caused by clogging tremie pipes. Stand clear of potential discharge points.	
		4	Exposure to contaminants in water displaced during well construction via dermal absorption or inhalation (volatiles).	Wear impermeable work gloves and avoid contact with face and eyes. Conduct air monitoring in accordance with the HASP and evacuate work zone if action levels are exceeded.	
7	Clean Site/Demobilize	1	Back/Muscle strain from lifting/loading equipment and supplies.	Position support vehicle to minimize carrying distances. Use proper lifting techniques. Make multiple trips to avoid carrying excessively heavy loads. Share efforts.	
		2	Slip/Trip and Fall on tooling, hoses, equipment or slick/uneven surfaces.	Take the safest route between work zone and support vehicle. Maintain clear walking paths.	
		3	Vehicle Traffic	Continue to wear high visibility safety vet or equivalent during demobilization. Ensure you are visible to oncoming traffic	
		4	Pinch points on/between equipment when loading and on vehicle storage compartments.	Wear work gloves while loading equipment and supplies.	

PPE Personal Protective Equipment			
Type	Personal Protective Equipment	Description	Required
Dermal Protection	long sleeve shirt/pants		Required
Eye Protection	safety glasses		Required
Foot Protection	outer boot covers		Recommended
	steel-toe boots		Required
Hand Protection	work gloves (specify type)		Required
Head Protection	hard hat		Required
Hearing Protection	ear plugs		Required
Miscellaneous PPE	traffic vest--Class II or III		Required

Supplies			
Type	Supply	Description	Required
Communication Devices	mobile phone		Required
Decontamination	Decon supplies (specify type)	Micro-90 and distilled water	Required
Miscellaneous	fire extinguisher		Required
	first aid kit		Required
Personal	insect repellent		Recommended
	sunscreen		Recommended

Review Comments		
Reviewer	Comments	
Employee: Role Review Type Completed Date	Xu, Xuan Reviewer Revise 6/12/2015	Good thorough JSA. Suggest in the driving section, add route planning to consider road conditions, e.g. rush hour, school bus dropping off kids, overhead clearance etc. Also, in Hydropunch sampling section, please add contact with sample preservatives as one of hazards.

Job Safety Analysis

General

JSA ID	12991	Status	(3) Completed
Job Name	Environment-Drilling, soil sampling, well	Created Date	7/20/2015
Task Description	Collection of Soil and Water Waste	Completed Date	08/17/2015
Template	FALSE	Auto Closed	TRUE

Client / Project

Client	NORTHROP GRUMMAN
Project Number	NY001496.2116
Project Name	OU3 RW-21 Project Area
PIC	JOHNSTON, DAVID KENT
Project Manager	SANGIOVANNI, CARLO

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Maza, David A.	8/10/2015	7/20/2015	Conger, Marc A	<input checked="" type="checkbox"/>
HASP Reviewer	Sangiovanni, Carlo	8/3/2015	7/29/2015	Glazewski, Robert J	<input checked="" type="checkbox"/>
Quality Reviewer	Nicolay, Philip J	9/9/2015	9/9/2015	Cope, Lisa M.	<input checked="" type="checkbox"/>
Reviewer	Xu, Xuan	8/3/2015		Zahradnik, Arthur J	<input checked="" type="checkbox"/>

Job Steps

Job Step No.	Job Step Description	Potential Hazard	Critical Action	H&S Reference
1	Collect Soil Waste Characterization Sample from Rolloff Container	1 Struck by Vehicle Traffic in the Right-of-Way or Subcontractor/Maintenance Vehicles at Waste Staging Area	Plan to collect waste characterization samples during periods of low traffic volume. Establish traffic control using traffic cones/barricades/candles spaced a maximum of 4 feet apart. Set up work station to minimize exposure to oncoming traffic. When walking around rolloff container, look both ways for oncoming traffic when entering the roadway.	
		2 Injury from being struck by whipping bungee cord when uncovering rolloff container.	Relieve tension on bungee cord by pulling cord toward the ground with one hand before releasing the hook with the other hand. Keep face clear of the direction of tensile stress when releasing bungee cord. Wear Safety glasses.	
		3 Back/muscle strain from rolling back and replacing rolloff cover	Use wrench and roll bar to roll back and replace rolloff cover. Use proper body positioning, avoid awkward twisting and share efforts. Remove accumulated rainwater from tarp cover prior to rolling back.	
		4 Exposure to contaminants (e.g. inhalation of organic vapors, dermal absorption) when collecting and compositing waste characterization soil samples	Allow rolloff container to ventilate prior to sample collection. Obtain PID readings from the headspace in and area around rolloff container prior to sample collection. Refer to HASP for air monitoring action levels and stop work if action levels are exceeded. Wear nitrile gloves when collecting and compositing soil waste samples.	

		5	Laceration from broken soil jars.	Wear cut-resistant work gloves under nitrile gloves when handling soil jars. Avoid over-tightening soil jars.	
2	Collect Water Waste Characterization Samples from Frac Tank	1	Struck by traffic	Establish traffic control around the frac tank using high visibility traffic cones/candles/barricades spaced a maximum of 4 feet apart. If possible, set up work station away from traffic areas.	
		2	Slip and fall from fixed ladder or from atop frac tank	Inspect frac tank ladder integrity and dry off rungs if wet or slippery prior to climbing. Maintain 3 points of contact at all times when climbing up or down ladder. Inspect integrity of guardrail and ensure the area around hatchway on top of frac tank is dry prior to collecting sample. Place sample containers in pocket and pass field sampling equipment below before descending ladder.	
		3	Injury from getting caught between hatch door and rim of frac tank when opening/closing hatchway.	Wear work gloves underneath nitrile gloves. Verify that hatch door is stable in the open position before releasing. Keep hands clear of the rim of the hatchway when closing hatch door.	
		4	Exposure to contaminants (e.g. inhalation of vapors, dermal absorption)	Allow frac tank to ventilate after opening prior to collecting sample. Wear nitrile gloves when collecting sample and handling sample containers. Decontaminate field instruments per the HASP.	
		5	Laceration from broken sample containers.	Wear cut resistant gloves underneath nitrile gloves when handling sample containers. Avoid over-tightening	

PPE Personal Protective Equipment			
Type	Personal Protective Equipment	Description	Required
Dermal Protection	long sleeve shirt/pants		Required

Eye Protection	safety glasses		Required
Foot Protection	steel-toe boots		Required
Hand Protection	chemical resistant gloves (specify type)	nitrile	Required
	work gloves (specify type)	cut-resistant	Required
Head Protection	hard hat		Required
Miscellaneous PPE	traffic vest--Class II or III		Required

Supplies

Type	Supply	Description	Required
Communication Devices	mobile phone		Required
Decontamination	Decon supplies (specify type)	Deionized water and Micro-90	Required
Miscellaneous	first aid kit		Required
Personal	eye wash (specify type)		Recommended
	water/fluid replacement		Required
Traffic Control	traffic cones		Required

Review Comments

Reviewer	Comments	
Employee: Sangiovanni, Carlo Role HASP Reviewer Review Type Approve Completed Date 7/29/2015		
Employee: Nicolay, Philip J Role Quality Reviewer Review Type NA Completed Date 9/9/2015		Good JSA.

Job Safety Analysis

General

JSA ID	13266	Status	(3) Completed
Job Name	Environment-Other	Created Date	10/7/2015
Task Description	Pneumatic Slug Testing (4" Monitoring	Completed Date	11/02/2015
Template	FALSE	Auto Closed	FALSE

Client / Project

Client	NORTHROP GRUMMAN
Project Number	NY0014962116
Project Name	OU3 RW-21 Project Area
PIC	JOHNSTON, DAVID KENT
Project Manager	SANGIOVANNI, CARLO

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Miranda, Karla M	10/22/2015	10/8/2015	Wright, Justin M	<input checked="" type="checkbox"/>
HASP Reviewer	Sangiovanni, Carlo	10/22/2015	11/2/2015	Glazewski, Robert J	<input checked="" type="checkbox"/>
Quality Reviewer	Good, Megan C	11/18/2015	11/18/2015	Crone, Thomas E.	<input checked="" type="checkbox"/>
Reviewer	Xu, Xuan	10/22/2015	10/8/2015	Zahradnik, Arthur J	<input checked="" type="checkbox"/>

Job Steps

Job Step No.	Job Step Description	Potential Hazard	Critical Action	H&S Reference
1	Setup Work Zone, including traffic controls and obstacle-free work area. Inspect all tools and equipment to verify that all are in working order; that the proper tools and equipment have been selected for the tests.	1 Potential Traffic (residential vehicles, municipal parking lot, field vehicles, some commercial traffic).	Isolate work zone using site-specific traffic control plan generated for each well.	
		2 Slip, Trip and Fall	Inspect work area for uneven areas, setting up work table and zone on flat, stable ground that has an even foot path to/from well. Use clamps and chord-ties to bundle, assemble and secure the various (and many) tubes and chords associated with the test kit apparatus. Keep work zone and foot path to/from the well organized and free of unnecessary equipment, tools and chords. Utilize storage under work table to properly stage equipment, tools and supplies that are not actively used.	
		3 Muscle Strain Transporting pneumatic slug test kit in and out of field vehicle (40 pounds).	Minimize the distance the kit needs to be carried by staging the field vehicle close to the work zone. Utilize proper lifting techniques when transporting the kit/case outside of the field vehicle. If necessary, use a dolly.	
2	Set up and Assembly of the (Hi K) Pneumatic Test Kit.	1 Pinch-Points, Cuts and/or Abrasions (on pneumatic slug test equipment)	The slug test apparatus contains multiple valves, fittings and attachment pieces (4" adapter) that could be pinch-points and/or surfaces which have sharp edges. Use proper PPE (gloves) and caution when opening/closing valves and/or assembling pieces of equipment (threaded fittings, etc.)	

3	Connect Slug Test Manifold to (4") Monitoring Well Head.	1	Pinch-Points, Cuts and/or Abrasions (on pneumatic test equipment)	Don appropriate PPE and work gloves when fashioning manifold onto 4" well head. Use proper tooling to tighten/loosen fittings and attachments (4" adapter).	
		2	Dermal Contact with potentially contaminated groundwater (when introducing unit, tubing and transducer chords down well)	Wear proper PPE (safety glasses, gloves) and secure manifold carefully, to avoid movements which potentiate splashing.	
4	Connect Nitrogen (or other compressed gas source) to manifold/airline.	1	Strike or blast during transport and operation of compressed gas source (nitrogen or other).	Follow Melville standard for carrying and transporting nitrogen tank to and from site (carrier, straps, locked clasps, etc). Follow guidelines and instructions outlined in Melville Office Standard "Control of Potential Hazardous Energy" for proper handling and operation of (nitrogen) gas. Inspect condition of all hoses, fittings, regulators and quick connects prior to assembly and use.	
		2	Lifting/Muscle Strain associated with transport of compressed gas tank (nitrogen or other) and Potential Contusions if dropped.	Use proper lifting techniques associated with transporting gas cylinder tanks, rolling the tank along its outer bottom edge in upright position to and from well. Best methods include employing a 2-man lifting system or rolling cart, if available. Don appropriate work gloves when handling tank.	
		3	Pinchpoints on slug test apparatus can pinch or lacerate fingers.	Wear proper PPE including heavy work gloves, safety boots and safety glasses.	
		4	Muscle strains and general fatigue and discomfort from frequent bending over to operate test.	Setup the laptop and associated equipment at a small table or truck tailgate rather than on the ground.	
		5	Dermal Contact with potentially contaminated groundwater(when introducing unit, tubing and transducer chords down well)	Wear proper PPE (safety glasses, gloves)	
5	Conduct iterative tests at various pressures between 0.5-1.5 psi, first pressurizing the airline/well with 0.5-1.5 psi and then, de-pressurizing the well by opening the quick-release valve. Subsequent tests will be performed at increasing pressures (1.0-1.5 psi).	1	Strike or Blast due to over-pressurization of the tubing.	Pay close attention to pressure applied to the tubing, stopping well before maximum pressure rating of the tubing (45 psi).	
		2	Pinching or (finger) lacerations caused by pinchpoints on slug test apparatus.	Wear proper PPE including heavy work gloves, safety boots and safety glasses. Follow directions when assembling and/or using slug test apparatus.	
		3	Muscle strains and general fatigue and discomfort from frequent bending over to operate test.	Utilize benefits of an ergonomic work zone such that all pertinent equipment (laptop, field documentation, tools, etc.) are organized on a work table and accessible for frequent and repetitive use, rather than at ground level.	

PPE Personal Protective Equipment			
Type	Personal Protective Equipment	Description	Required
Dermal Protection	chemical protective suit (specify type)		Required
	long sleeve shirt/pants	Long sleeve pants	Required
Eye Protection	faceshield		Required
	safety glasses		Required
Foot Protection	boots		Required
	steel-toe boots		Required
Hand Protection	chemical resistant gloves (specify type)	Nitrile (when conducting test)	Required
	work gloves (specify type)	Heavy duty leather/canvas	Required
Head Protection	hard hat		Required
	hard hat		Required
Miscellaneous PPE	other		Required
	other		Required
	traffic vest--Class II or III	Type II (ANSI Rated)	Required
	traffic vest--Class II or III	Type II (ANSI Rated)	Required

Supplies			
Type	Supply	Description	Required
Communication Devices	mobile phone		Required
Decontamination	Decon supplies (specify type)	Clean water, 2 buckets, soap, brush,	Required
Miscellaneous	auxiliary lighting		Required
	fire extinguisher		Required
	first aid kit		Required
	flashlight		Recommended
	Other	Small work table for laptop and	Recommended
Personal	eye wash (specify type)		Recommended
	sunscreen	>SPF 30	Recommended

Review Comments		
Reviewer	Comments	
Employee: Sangiovanni, Carlo Role HASP Reviewer Review Type Approve Completed Date 11/2/2015	Approved; good job on this JSA	
Employee: Xu, Xuan Role Reviewer Review Type Approve Completed Date 10/8/2015	Approved considering immediate need for performing field work. Suggest field person to dirty up this JSA during field work. In step 5, suggest to include potential hazards when releasing pressure, i.e. onsite personnel should stay clear from "line of fire" and the release valve on the well head assembly should point away from personnel and equipment.	
Employee: Good, Megan C Role Quality Reviewer Review Type NA Completed Date 11/18/2015	Overall, great level of detail and PPE specifications. Both preventative mitigation steps and PPE outlined (proactive and reactive measures) which is excellent. For jobs that require more dexterity, it may also make sense to recommend cut resistant or abrasion resistant (specify rating that's applicable) rather than leather/canvas work gloves.	

Job Safety Analysis

General

JSA ID	14825	Status	(3) Completed
Job Name	General Industry-Driving - passenger vehicles	Created Date	3/10/2017
Task Description	Driving a car, van, or truck	Completed Date	04/07/2017
Template	False	Auto Closed	True

Client / Project

Client	NORTHROP GRUMMAN
Project Number	NY0014962116
Project Name	OU3 RW-21 Project Area
PIC	JOHNSTON, DAVID KENT
Project Manager	SANGIOVANNI, CARLO

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Darmon, Thomas W	3/31/2017	3/10/2017	Golli, Andrea N.	<input checked="" type="checkbox"/>
HASP Reviewer	Sangiovanni, Carlo	3/24/2017		Glazewski, Robert J	<input checked="" type="checkbox"/>
Reviewer	Xu, Xuan	3/24/2017	3/20/2017	Zahradnik, Arthur J	<input checked="" type="checkbox"/>

Job Steps

Job Step No.	Job Step Description	Potential Hazard	Critical Action	H&S Reference
1	Pre-Trip Inspection Checklist	1 Vehicle Overheating, Mechanical failure, accident or injury	Perform vehicle inspections daily. Check tire conditions, vehicle lights, wipers, seatbelts for proper operating condition. Properly adjust seat and mirrors prior to vehicle operation. Use or review vehicle inspection checklist as required under the MVSP. Review vehicle maintenance history , and schedule for maintenance per vehicle manufacturer operation and maintenance manual. STOP WORK if fluid levels are depreciated or other vehicle safety issues identified and schedule for repair as needed.	ARC HSGE024 Motor Vehicle Safety Standard (MVSP)
		2 Scrapes, cuts, burns to hand if inspecting engine fluids and/or tires. Eye splash hazard if inspecting engine fluids. Pinch or crush hazards when opening or closing hood, trunk or tailgate.	Wear protective gloves and safety glasses as described below when checking under hood or tires. Use TRACK and keep hands clear when opening/closing hood, trunk, or tailgate to avoid crush or pinch hazard.	
		3 Improperly secured cargo may dislodge creating injury, property damage or road hazard.	Ensure all cargo is properly secured to prevent movement while the vehicle is in operation. This includes cargo in the cab of the vehicle. Check for loose items under seats and perform vehicle cleaning pre-/post-operation	
		4 Stalling, impaired vision, obstacles, accident, injury, or death due to weather/surface conditions	Review weather and surface conditions prior to use. Notify someone of departure time/route/ and ETA if going to remote area. Analyze and plan route to reduce risk of hazards of stalling or potential of getting stuck. Have appropriate roadside assistance number available for use in emergency.	
2	Driving a motor vehicle on public streets and job sites	1 Failing to observe traffic flow ahead increases risk of hard braking resulting in potential impact of vehicle ahead, being struck by another vehicle from behind and decreases decision making time.	Use Smith System Key #1, "Aim High in Steering". Look ahead (15 seconds if possible) to observe traffic flow and traffic signals. Adjust speed accordingly to keep vehicle moving and avoid frequent braking. Select lane of least traffic and adjust speed based on observed signal timing when possible. Avoid following directly behind large vehicles that obscure view ahead.	Smith System "5-Keys" is a registered trademark of Smith System Driver Improvement Institute, Inc.

2	Driving a motor vehicle on public streets and job sites	2	Failing to observe vehicles, pedestrians, bicyclists and other relevant objects in vicinity of your vehicle increases risk of side swipes, rear ending, and third party injury.	Use Smith System Key #2, "Get the Big Picture". Maintain 360 degrees of awareness around vehicle. Check a mirror every 6-8 seconds, maintain space around the vehicle, choose a lane that avoids being boxed in. Look for pedestrian activity ahead in crosswalks or sidewalks. Watch for construction zone approach signs and act early by executing lane changes and reducing speed.	
		3	Failing to keep your eyes moving increases risk of not seeing relevant vehicles, pedestrians and objects in your vicinity that may impair your ability to make timely and appropriate driving decisions and also increases risk of accident.	Use Smith System Key #3, "Keep Your Eyes Moving". Move your eyes every 2 seconds and avoid staring while evaluating relevant objects. Scan major and minor intersections prior to entering them. Check mirrors.	
		4	Failing to maintain space around and in front of your vehicle increases risk of striking another vehicle or being struck by another vehicle. Insufficient space shortens time for effective driving decision making resulting in increased accident risk.	Use Smith System #4, "Leave Yourself an Out". Use 4 second rule when following a vehicle. Avoid driving in vehicle clusters by adjusting speed and using lanes that permit maximum space and visibility. When stopped, keep one car length space in front of vehicle ahead or white line.	
		5	Failing to communicate with other drivers and pedestrians increases risk of striking vehicles, pedestrians, or being struck by other vehicles, especially from the rear.	Use Smith System Key #5, "Make Sure They See You". Brake early and gradually when stopping to reduce potential of being rear ended. Keep foot on brake while stopped. Use turn signals and horn effectively. Establish eye contact with other drivers and pedestrians to extent practical. Use vehicle positioning that promotes being seen.	
		6	Distractions within the vehicle takes focus off driving, increases risk of accident decreases time for making effective driving decisions.	Cell phone use (any type or configuration) is prohibited while the vehicle is in use. Familiarize yourself with vehicle layout and controls (radio, temperature controls, etc.) prior to operating unfamiliar vehicles. Set controls prior to operating vehicle. Use GPS in unfamiliar areas to avoid use of paper maps/directions while driving. Set GPS prior to vehicle operation. Pull over and stop to modify GPS functions. Do not consume food or drink while driving.	
		3	Parking	1	Risk of collision, injury or death to occupants or other parties.
4	Post-Trip - Vehicle maintenance	1	Mechanical failure, accident, or injury.	Report vehicle problems immediately to company representative. Remove vehicle from operation until mechanical problems are repaired if identified or occurred during use.	
		2	Theft and vehicle damage	Remove all valuable items and rental equipment from vehicle after use. Park vehicle in a secure area that is well lite as possible.	
		3	Stalling or inability to start vehicle	Maintain fluid levels (gas, oil, etc.) post use to reduce risk of stalling on next use. Make sure all lights are off to prevent battery draining from occurring. Replace vehicle battery every 5 years or less as needed to ensure proper ability to start	

PPE Personal Protective Equipment			
Type	Personal Protective Equipment	Description	Required
Eye Protection	safety glasses	While checking engine or tires	Required
Foot Protection	boots	Loading/Unloading equipment	Required
Hand Protection	chemical resistant gloves (specify type)	nitrile gloves when checking fluids.	Required
	work gloves (specify type)	Leather or equivalent checking engine or tires	Required
Miscellaneous PPE	traffic vest--Class II or III	Parking and Pre-Trip inspection	Recommended

Supplies			
Type	Supply	Description	Required
Communication Devices	mobile phone		Required
	other	Vehicle Emergency Kit (applies to company trucks)	Required
Miscellaneous	auxiliary lighting	Applies to company trucks	Required
	fire extinguisher	Applies to company trucks	Required
	first aid kit	Applies to company trucks	Required
	flashlight	Flashlight for vehicle checks during dark	Recommended
Personal	eye wash (specify type)	Eye wash required for potential hazards	Required
	water/fluid replacement	Water in emergency	Recommended
Traffic Control	traffic cones	Spotter Cones for Parking	Required

Review Comments		
Reviewer	Comments	
Employee: Xu, Xuan Role Reviewer Review Type Approve Completed Date 3/20/2017	Good thorough JSA.	

Job Safety Analysis

General

JSA ID	14826	Status	(2) Review
Job Name	Environment-Geophysical survey	Created Date	3/10/2017
Task Description	Geophysical Survey	Completed Date	
Template	False	Auto Closed	False

Client / Project

Client	NORTHROP GRUMMAN
Project Number	NY0014962116
Project Name	OU3 RW-21 Project Area
PIC	JOHNSTON, DAVID KENT
Project Manager	SANGIOVANNI, CARLO

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Darmon, Thomas W	4/4/2017	3/21/2017	Golli, Andrea N.	<input checked="" type="checkbox"/>
HASP Reviewer	Sangiovanni, Carlo	4/4/2017		Glazewski, Robert J	<input checked="" type="checkbox"/>
Reviewer	Xu, Xuan	4/4/2017	4/13/2017	Zahradnik, Arthur J	<input checked="" type="checkbox"/>

Job Steps

Job Step No.	Job Step Description	Potential Hazard	Critical Action	H&S Reference
1	Mobilization of equipment to survey area	1 Lifting hazards (heavy or bulky equipment)	Use TRACK to plan lifts and routes to work location. Use proper lifting techniques.	
		2 Delay or improper/unsafe performance of work due to improper equipment	Review HASP for required traffic control and air monitoring equipment. Review work plan and equipment prior to mobilization.	
		3 Awkward body positions and twisting	Plan activity to avoid twisting of body or awkward body positions. Use buddy system or job rotation to reduce exposure to conditions that cannot be avoided.	
		4 Trip and fall hazards from uneven ground or restricted view when carrying equipment	Break loads down to manageable size that does not obstruct view of ground. Plan route and use TRACK, wear footwear with good tread and ankle support. Use buddy system for large or bulky items when carrying.	
2	Set up survey grid and control	1 Slip trip and fall hazards from wet, uneven ground or over vegetation.	Break loads down to manageable size that does not obstruct view of ground. Plan route and use TRACK, wear footwear with good tread and ankle support. Use buddy system for large or bulky items when carrying.	
		2 Crush hazard or contact stress to hands/fingers from inserting pins or stakes.	Wear leather gloves when inserting pins, flagging, or stakes into the ground. Do not hurry task if hammering.	
		3 Struck by hazards by vehicles if working in traffic area.	Establish traffic control and wear a Class II traffic vest if in traffic area. Use vehicles to block work area when practical.	
		4 Repetitive stress from repeated bending or squatting during grid construction	Use job rotation when hazard exists, stretch before performing work activity. Use paint device that allows employee to stand up while spraying.	
		5 Chemical exposure from using spray paint	Stand up wind of paint spraying activities	
3	Performing survey	1 Slips trips and falls on wet, uneven or steep sloped surfaces	Break loads down to manageable size that does not obstruct view of ground. Plan route and use TRACK, wear footwear with good tread and ankle support. Use buddy system for large or bulky items when carrying.	
		2 Pinch or injury to hand when opening/closing manhole cover.	Use proper tools to open and utilize help if available with good verbal communication. Wear work gloves	
		3 Scrapes or cuts to hands, arms or legs from equipment or vegetation in area.	Wear leather or other suitable gloves when performing survey, wear long pants, wear heavy long sleeve shirt if arm hazard exists.	

3	Performing survey	4	Noise hazards from survey equipment using percussion devices	Wear hearing protection, keep unnecessary workers away from devices when activated.	
		5	Theft of personal items or survey equipment	Use TRACK. If necessary, secure equipment if not close by and use second person to watch if the equipment must be left out.	
		6	Ergonomic injury from improper or prolonged use of carried devices that are long or bulky.	Use job rotation to reduce potential for injury.	
		7	Data loss and/or anomalies	Review data in secure area (field office/trailer), download and store on secure media and backup data.	
4	Demobilization and clean up	1	Muscle strain from removing pins or stakes	Use devices that maintain neutral body positions to remove pins when practical. Do not bend at waist when removing.	
		2	Pinch hazards to fingers from equipment cases	Identify hazard and avoid, pack equipment properly so that no wires or cables protrude from case requiring fingers to push into case when closing.	
		3	Lifting hazards from demobilizing equipment from work area	Use proper lifting techniques and use buddy system when necessary to assist in awkward size or heavy equipment.	
		4	Slip, trip and falls carrying equipment that obstructs view or on wet or uneven surfaces.	Break loads down to manageable size that does not obstruct view of ground. Plan route and use TRACK, wear footwear with good tread and ankle support. Use buddy system for large or bulky items when carrying.	
5	Preparation and return shipment of equipment	1	Cuts to hands and forearms from cutting strapping tape	Do not hurry during package preparation, Use TRACK, Use the right cutting tool for the task activity, use cutting tools with self-retracting blades.	
		2	Pinch hazards to fingers from equipment cases and placement of equipment in boxes	Identify hazard and avoid, pack equipment properly so that no wires or cables protrude from case requiring fingers to push into case when closing.	
		3	Lifting hazards from completed shipping packages	Break loads down to manageable size that does not obstruct view of ground. Plan route and use TRACK, wear footwear with good tread and ankle support. Use buddy system for large or bulky items when carrying.	
		4	Fire hazard from improperly packed spare batteries	Cover battery terminals or keep in original packaging when shipping, protect batteries from other metal objects in packages, perform shipping determination for number of spare batteries permitted to be shipped in package or consignment.	

PPE Personal Protective Equipment			
Type	Personal Protective Equipment	Description	Required
Eye Protection	safety glasses		Required
Foot Protection	boots	supportive with good tread	Required
Hand Protection	work gloves (specify type)	leather	Required
Head Protection	hard hat		Recommended
Miscellaneous PPE	other	Additional PPE as required by the HASP	Required

Supplies			
Type	Supply	Description	Required
Communication Devices	mobile phone		Required
Miscellaneous	fire extinguisher		Required
	first aid kit		Required
Personal	insect repellent		Required
	sunscreen		Required
	water/fluid replacement		Required
Traffic Control	traffic cones	Cone off work zone as necessary	Recommended

Review Comments

Reviewer		Comments
Employee: Role Review Type Completed Date	Xu, Xuan Reviewer Revise 3/20/2017	One typo in Job step 5, #4. Job Step 3, potential hazard #2, please add pinch/injury to hand when open/close manhole cover. Control will be use proper tool to open, use help if available with good verbal communication, wear work gloves. Also job step 3, add stolen survey equipment (least likely to happen, but personally observed at Brooklyn). Control will be use TRACK. If necessary, secure equipment if not close by and use second person to watch eif the equipment has to be left out.
Employee: Role Review Type Completed Date	Xu, Xuan Reviewer Approve 4/13/2017	

Job Safety Analysis

General

JSA ID	14828	Status	(3) Completed
Job Name	Environment-Groundwater Sampling and free product recovery	Created Date	3/10/2017
Task Description	Groundwater Monitoring/Sampling	Completed Date	04/07/2017
Template	False	Auto Closed	True

Client / Project

Client	NORTHROP GRUMMAN
Project Number	NY0014962116
Project Name	OU3 RW-21 Project Area
PIC	JOHNSTON, DAVID KENT
Project Manager	SANGIOVANNI, CARLO

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Darmon, Thomas W	3/24/2017	3/10/2017	Golli, Andrea N.	<input checked="" type="checkbox"/>
HASP Reviewer	Sangiovanni, Carlo	3/24/2017		Glazewski, Robert J	<input checked="" type="checkbox"/>
Reviewer	Xu, Xuan	3/24/2017		Zahradnik, Arthur J	<input checked="" type="checkbox"/>

Job Steps

Job Step No.	Job Step Description	Potential Hazard	Critical Action	H&S Reference
1	Load and Transport required equipment and supplies	1 Lifting hazards and back strain	Use proper lifting techniques, Use buddy system when lifting heavy or awkward equipment. Refer to HASP for emergency procedures and contact numbers.	JSA 14825
		2 Crush hazard from falling cylinder, compressed gas hazard from sudden release of pressure	<ol style="list-style-type: none"> 1. Store cylinders in a vertical position with strap to fixed part of vehicle at point one third of distance from top of cylinder. 2. Inspect all hoses, connections, and regulators for fitness for use prior to connections. 3. Use correct pressure regulator for dispensing gas to well packers. 4. Keep cap on compressed gas until ready for use. 	
		3 Slip, trip, and fall hazards	Create clear walking path for loading/unloading equipment. Use transport dolly or wagon to prevent dropping equipment.	
		4 Equipment damage or leaks	Cover equipment when in vehicle to prevent heat or cold build-up while in transport. Remove equipment from vehicle when not in use.	
		5 Vehicle Traffic, collision, or injury	Follow Driving and Motor Vehicle JSA for Northrop Grumman Bethpage, NY project.	
2	Stage at pre-determined sampling location and set up work zone and sampling equipment	1 Personnel could be hit by vehicular traffic	Set up cones and establish work area. Position vehicle so that field crew is protected from site traffic. Unload as close to work area as safely possible.	
		2 Sampling equipment, tools and monitoring well covers can cause tripping hazard	Keep equipment picked up and use TRACK to assess changes.	
3	Connect Nitrogen (or other compressed gas source to manifold/airline)	1 Strike or blast during transport and operation of compressed gas source (nitrogen or other)	Follow Arcadis Melville standard for carrying and transporting nitrogen tank to and from site (carrier, straps, locked clasps, etc.). Follow guidelines and instructions outlined in Melville Office Standard "Control of Potential Hazardous Energy" for proper handling and operation of (nitrogen) gas. Inspect condition of all hoses, fittings, regulators and quick connects prior to assembly.	

3	Connect Nitrogen (or other compressed gas source to manifold/airline)	2	Lifting/Muscle Strain associated with transport of compressed gas tank (nitrogen or other) and Potential Contusion if dropped.	Use proper lifting techniques associated with transporting gas cylinder tanks, rolling the tank along its outer bottom edge in upright position to and from well. Best methods include employing a 2-man lifting system or rolling car, if available. Don appropriate work gloves when handling tank.	
4	Open wells to equilibrate and gauge wells	1	When squatting, personnel can be difficult to see by vehicular traffic.	Wear class II traffic vest if wells are located proximal to vehicular traffic. Use tall cones and the buddy system if practicable.	
		2	Pinchpoints on well vault can pinch or lacerate fingers	Use correct tools to open well vault/cap. Wear leather gloves when removing well vault lids, and chemical protective gloves while gauging. Wear proper PPE including safety boots, knee pads and safety glasses.	
		3	Lifting sampling equipment can cause muscle strain	Unload as close to work area as safely possible; use proper lifting and reaching techniques and body positioning; don't carry more than you can handle, and get help moving heavy or awkward objects.	
		4	Pressure can build up inside well causing cap to release under pressure	Keep head away from well cap when removing. If pressure relief valves are on well use prior to opening well	
		5	Volatile vapors escaping from well	Monitor the vapor with PID. Ventilate the area before commencing the work. Follow HASP air monitoring procedures.	
		6	Dermal reaction to contaminated groundwater, insects, or poison ivy	Wear PPE, including safety glasses and nitrile gloves, decontaminated equipment in between wells. Use work gloves when accessing wells.	
5	Begin Purging Well and Collecting Parameter Measurements	1	Electrical shock can occur when connecting/disconnecting pump from the battery.	Make sure equipment is turned off when connecting/disconnecting. Wear leather gloves. Use GFCIs when using powered tools and pumps. Do not use in the rain or run electrical cords through wet areas.	
		2	Injury from compressed gas or improper connections	Wear safety glasses, maintain N2 gas canister securely in upright position at all times within vehicle. Use only properly fitted connections. Cover N2 or other gas canisters outdoors.	
		3	Purge water can spill or leak from equipment	Stop purging activities immediately, stop leakage and block any drainage grate with absorbent pads. Call PM to notify them of any reportable spill.	
		4	Water spilling on the ground can cause muddy/slippery conditions	Be careful walking in work area when using plastic around well to protect from spillage	
		5	Lacerations can occur when cutting materials such as plastic tubing	When cutting tubing, use tubing cutter. No open fixed blades should ever be used. When possible wear work gloves, leather type.	
		6	Purge water can splash into eyes	Pour water slowly into buckets/drums to minimize splashing. Wear safety glasses.	
		7	Slip, Trip, Fall hazards	Maintain clear working area to avoid trip and slip hazards.	
6	Collect groundwater samples	1	Exposure to chemical hazards	Use proper PPE, wear protective gloves and goggles to avoid splashing groundwater and sample bottle chemicals.	
		2	Sample containers could break or leak preservative	Discard any broken sampleware or glass properly. Do not overtighten sample containers. Wear chemical protective gloves.	
		3	Improper labelling or storage can disqualify samples	Label samples in accordance with sampling plan. Keep containers out of direct sunlight and away from hot surfaces. Keep samples stored at proper temperature and away from work areas. Handle bottles with caution.	
		4	Lifting hazards and back strain	Use proper lifting techniques when handling sample coolers. Avoid bending while taking a sample. Use knee pads as appropriate.	

6	Collect groundwater samples	5	Contaminated groundwater spills or preservative spills can cause environmental/public concern	Collect samples in an containment area. Have spill kits available to use to contain any spills that occur and notify project team immediately if occurs.	
7	Staging of Well Purge water - Store, transport and empty DOT drums, 5-gal carboys of purge water. Transfer water to sanitary sewer intake or frac tank.	1	Muscle strains can occur when moving purge water or drums	If using buckets, do not fill buckets up to the top. Always keep lid on buckets when traveling or moving them to another location. Only half fill buckets so when dumping the buckets weigh less. See drum handling JSA for movement of drums.	Drum handling JSA
		2	Exposure to chemical hazards/contaminated media.	Use proper PPE and equipment when transporting. Label storage containers and locate in isolated area away from traffic and other site functions. All containers should be sealed tightly on containers.	
		3	Damage to storage containers/vehicle during transport	Secure all storage containers with straps to prevent movement during transport. Know vehicle weight limits to avoid over loading vehicle for transport.	

PPE Personal Protective Equipment			
Type	Personal Protective Equipment	Description	Required
Dermal Protection	long sleeve shirt/pants	Pants are required, long sleeve are as needed	Recommended
Eye Protection	safety glasses		Required
Foot Protection	steel-toe boots		Required
Hand Protection	chemical resistant gloves (specify type)	Nitrile	Required
	insulated gloves	Recommended during winter sampling	Recommended
	work gloves (specify type)	leather	Required
Head Protection	hard hat		Required
Hearing Protection	ear plugs		Recommended
Miscellaneous PPE	other	Knee pads	Required
	traffic vest--Class II or III		Required

Supplies			
Type	Supply	Description	Required
Communication Devices	mobile phone		Required
Decontamination	Decon supplies (specify type)	Micro 90, DI water, spray bottle	Required
Miscellaneous	auxiliary lighting		Required
	fire extinguisher		Required
	first aid kit		Required
	flashlight		Required
	Other	sample containers	Required
	Other	ice	Required
	Other	Standard rental equipment	Required
Personal	eye wash (specify type)	bottle	Required
	insect repellent		Recommended
	sunscreen		Recommended
	water/fluid replacement		Required
Traffic Control	barricades		Recommended
	Other	Permits	Required
	traffic cones		Required

Job Safety Analysis

General

JSA ID	14845	Status	(3) Completed
Job Name	Environment-Drilling, soil sampling, well installation	Created Date	3/15/2017
Task Description	Drilling, soil sampling, and well installation	Completed Date	04/12/2017
Template	False	Auto Closed	True

Client / Project

Client	NORTHROP GRUMMAN
Project Number	NY0014962116
Project Name	OU3 RW-21 Project Area
PIC	JOHNSTON, DAVID KENT
Project Manager	SANGIOVANNI, CARLO

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Darmon, Thomas W	4/5/2017	3/15/2017	Golli, Andrea N.	<input checked="" type="checkbox"/>
HASP Reviewer	Sangiovanni, Carlo	3/29/2017		Glazewski, Robert J	<input checked="" type="checkbox"/>
Reviewer	Xu, Xuan	3/29/2017		Zahradnik, Arthur J	<input checked="" type="checkbox"/>

Job Steps

Job Step No.	Job Step Description	Potential Hazard	Critical Action	H&S Reference
1	Set up necessary traffic and public access controls	1 Struck by vehicle due to improper traffic controls	Use a buddy system for placing site control cones and/or signage. Position vehicle so that you are protected from moving traffic. Wear Class II traffic vest	
2	Utility Clearance	1 Potential to encounter underground or above ground utilities while drilling.	Complete utility clearance in accordance with the ARCADIS Utility Clearance H&S Standard.	ARCADIS H&S Standard ARCHSFS019, 2012 NG Health and Safety Protocols
3	General drill rig operation	1 Excessive noise is generated by rig operation.	When the engine is used at high RPMs or soil samples are being collected, use hearing protection.	
2		During drill rig operation, surfaces will become hot and cause burns if touched, and COCs in the soils more readily vaporize generating airborne contaminates.	Due to friction and lack of a drilling fluid, heat will be produced during this method. Mainly drill augers. Be careful handling split spoons. Wear proper work gloves. When soils and parts become heated, the COC could volatilize. Air monitoring should always be performed in accordance with the HASP.	
3		Moving parts of the drilling rig can pull you in causing injury. Pinch points on the rig and auger connections can cause pinching or crushing of body parts.	Stay at least 5 feet away from moving parts of the drill rig. Know where the kill switch is, and have the drillers test it to verify that it is working. Do not wear loose clothing, and tie long hair back. Avoid wearing jewelry while drilling. Cone off the work area to keep general public away from the drilling rig.	
4		Dust and debris can cause eye injury and soil cuttings and/or water could contain COCs.	Wear safety glasses and stay as far away from actual drilling operation as practicable. Wear appropriate gloves to protect from COCs.	
5		Drilling equipment laying on the ground (i.e. augers, split spoons, decon equipment, coolers, etc), create a tripping hazard. Water from decon buckets generate mud and cause a slipping hazard.	Keep equipment and trash picked up, and store away from the primary work area.	
6		The raised derrick can strike overhead utilities, tree limbs or other elevated items	Never move the rig with the derrick up. Ensure there is proper clearance to raise the derrick, and that you are far enough away from overhead power lines. See the Utility Clearance H&S Standard for guidance.	

4	Mudd rotary drilling	1	The raised derrick can strike overhead utilities, tree limbs or other elevated items.	Never move the rig with the derrick up. Ensure there is proper clearance to raise the derrick, and that you are far enough away from overhead power lines. See the Utility Location H&S policy and procedure for guidance.	
		2	This technology uses fluid, which collects with sediments in large basin. Fluid can splash out and cause slipping/mud hazard. Liquid mixture can splash into your eyes.	Wear rubber boots if needed, and keep clear of muddy/wet area as much as practicable. If area becomes excessively muddy, consider mud spikes or covering the area with a material that improves traction. Wear safety glasses.	
5	Reverse rotary drilling	1	This method will use fresh water to pump out drill cuttings through the center of the casing. Water/sediment mixture is generated and could cause contact with impacted soils or groundwater.	Ensure the pit construction can hold the amount of cuttings that are anticipated. Air monitoring should also be used of pit area.	
		2	Fire hydrants are often used for water source. Hydrants deliver water at high pressure. Pressurized water can cause flying parts/debris and excessive slipping hazards.	Water usage from fire hydrants should be cleared with local municipalities prior to use. Only persons that know how to use the hydrant should be performing this task. Ensure all connections are tight, and hose line is not run over to cut by traffic. Any leaks from the hydrant should be reported immediately.	
		3	Settling pit construction can cause tripping hazard from excavated soils, and plastic sheeting can cause slipping.	Cone off the area to keep the general public/visitors away from the settling pit. Ensure proper sloping of excavation.	
		4	The raised derrick can strike overhead utilities, tree limbs or other elevated items.	Never move the rig with the derrick up. Ensure there is proper clearance to raise the derrick, and that you are far enough away from overhead power lines. See the Utility Location H&S policy and procedure for guidance.	
6	Direct push drilling	1	The drill rods will be handled by workers most of the time rather than the rig doing it, therefore pinch points can cause lacerations and crushing of fingers/body parts.	Keep a minimum of 5 feet away from drill rig operation and moving parts.	
		2	The direct push rigs are usually meant to fit in spaces where larger rig can't. Tight spaces can pin workers.	Do not put yourself between the rig and a fixed object. Use Spotters or a tape measure to ensure clearances in tight areas. Pre-plan equipment movement from one location to the next.	
		3	Some direct push equipment is controlled by wireless devices. These controls can fail and equipment can strike workers or cause damage to property.	The drill rig should be used in a large open area to test wireless controls prior to moving to boring locations. The operator of the rig will test the kill switch with wireless remote prior to use. Operator will stay in range of rig while moving so that wireless signal will not be too weak and cause errors to the controls.	
		4	Sampling sleeves must be cut to obtain access to soil. Cutting can cause lacerations.	It's preferable to let the driller cut the sleeves open. Many drillers have holders for the sleeve to allow for stability when cutting. If you cut the sleeves, use a hook blade, change blade regularly, and cut away from the body.	
		5	Soil cores may contain contaminated media.	Wear nitrile gloves and safety glasses for protection from contaminated media when logging soil borings.	
7	Sample collection and processing	1	Injuries can result from pinch points on sampling equipment, and from breakage of sample containers.	Care should be taken when opening sampling equipment. Look at empty containers before picking them up, and do not over-tighten container caps. Use dividers to store containers in the cooler so they do not break.	Sample Cooler Handling JSA

7	Sample collection and processing	2	Lifting heavy coolers can cause back injuries.	Use two people to move heavy coolers. Use proper lifting techniques.	
8	Monitoring well installation	1	Same hazards as in Step 3 with general drill rig operation	See step 3	
		2	Monitoring well construction materials can clutter the work area causing tripping hazards.	Well construction materials should be picked up during the well installation process.	
		3	Heavy lifting can cause muscle strains, and cutting open bags can cause lacerations.	Well construction materials are usually 50 lbs or greater. Team lift or use drill rig to hoist bags. Always use work gloves while cutting open bags.	
		4	Well pack material (i.e. sand, grout, bentonite) can become airborne and get in your eyes.	Wear safety glasses for protection from airborne sand and dust.	
		5	Cutting the top of the well to size can cause jagged/sharp edges on the top of the well casing.	Wear gloves when working with the top of the well casing, and file any sharp jagged edges that resulted from cutting to size.	
9	Decontamination Procedures	1	Splash hazards from COCs in waste stream	Maintain Safe distance, use decontaminant pad, use face shield over safety glasses. Remove material as much as possible prior to using pressure washers.	
		2	Electric shock	Use GFCI and power cords rated for outdoor use. Keep power cords away from water to the maximum extent possible. Do not stand in water.	
		3	Slip, Trip, Falls	Maintain work area - free of objects on ground. Mark hose pathways to avoid. Do not walk within containment pad to avoid slip hazards caused by water	
		4	Spills	Containerize decon water in containment pad. Inspect containment pad for holes and possible leaks. Do not overfill containment pad and have drums available to containerize excess water.	
10	Soil cutting and purge water management	1	Moving full drums can cause back injury, or pinching/crushing injury.	Preferably have the drilling contractor move full drums with their equipment. If this is not practicable, use lift assist devices such as drum dollies, lift gates, etc. Employ proper lifting techniques, and perform TRACK to identify pinch/crush points. Wear leather work gloves, and clear all walking and work areas of debris prior to moving a drum.	Drum Handling JSA
		2	Mislabeled containers	Ensure all manifests and daily forms completed. Ensure drums labeled with contents as soon as contents enter drum.	
		3	Exposure to COCs and Spills	Use proper PPE when handling drums. Ensure drums are not completely full to allow for expansion of material in freeze/thaw conditions. Make sure drums are properly containerized and closed prior to moving. Have spill kits on hand.	

PPE Personal Protective Equipment			
Type	Personal Protective Equipment	Description	Required
Eye Protection	faceshield	Required during Decon procedures	Required
	safety glasses		Required
Foot Protection	steel-toe boots		Required
Hand Protection	chemical resistant gloves (specify type)	Nitrile	Required
	work gloves (specify type)	leather	Required
Head Protection	hard hat		Required
Hearing Protection	ear plugs		Required
Miscellaneous PPE	traffic vest--Class II or III		Required
Respiratory Protection	dust mask		Recommended

Supplies

Type	Supply	Description	Required
Communication Devices	mobile phone		Required
Decontamination	Decon supplies (specify type)	Driller to provide decon pad, use Micro 90	Recommended
Miscellaneous	fire extinguisher		Required
	first aid kit		Required
	flashlight		Recommended
Personal	eye wash (specify type)	bottle	Required
	sunscreen		Required
	water/fluid replacement		Recommended
Traffic Control	traffic cones		Required

Job Safety Analysis

General

JSA ID	14847	Status	(3) Completed
Job Name	Environment-Other	Created Date	3/15/2017
Task Description	Monitoring Well Repair	Completed Date	04/12/2017
Template	False	Auto Closed	True

Client / Project

Client	NORTHROP GRUMMAN
Project Number	NY0014962116
Project Name	OU3 RW-21 Project Area
PIC	JOHNSTON, DAVID KENT
Project Manager	SANGIOVANNI, CARLO

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Darmon, Thomas W	4/5/2017	3/15/2017	Golli, Andrea N.	<input checked="" type="checkbox"/>
HASP Reviewer	Sangiovanni, Carlo	3/29/2017		Glazewski, Robert J	<input checked="" type="checkbox"/>
Reviewer	Xu, Xuan	3/29/2017		Zahradnik, Arthur J	<input checked="" type="checkbox"/>

Job Steps

Job Step No.	Job Step Description	Potential Hazard	Critical Action	H&S Reference
1	Drive to Site and setup necessary traffic and public access controls	1 Collisions, driving hazards	Reference Driving JSA, Use TRACK throughout day and as conditions change. Use Smith 5-Key System while driving and set-up of work area	Motor Vehicle Safety Program (ARC HSGE024)
		2 Struck by vehicle	Wear ANSI Class II Vests; use road cones to mark off work area.	
2	Remove former protective casing/manhole to expose well head by digging or jackhammering	1 Utility Strike - causing injury or death	Perform Utility locate procedures, even on locations previously altered when performing any type of digging or concrete removal operation. Potential risk of utilities that were covered up and never discussed can occur. Follow the Arcadis procedure for utility locating.	ARC HSFS019 (Utility Location Procedures), ARC HSFS006 (Electrical Safety)
		2 Slips, Trips, Falls, and Ergonomic injury	Use proper lifting techniques and use assistance when possible for heavy lifting. Clear work area of slip/trip/fall hazards and be aware of uneven ground. Use proper footing.	
		3 Inhalation of dust can cause breathing issues	Use water during jackhammering operation to mitigate dust.	
		4 Electrical shock or electrocution can cause injury/death	Use GFCI with equipment requiring electricity. Avoid water near electrical outlets	
		5 Heat/cold stress	Take breaks, stay hydrated even during cold weather. Have 2 people on site for task for safety consideration and consider using lightweight equipment and supplies.	
3	Install new protective casing/manhole	1 Slips, Trips, Falls, and Ergonomic hazards can cause minor to sever injury.	Use proper lifting techniques, clear work area of slip/trip/fall hazards. Cone and cover open holes of former protective casing area	
		2 Cuts, scrapes, bruises	Use leather gloves when handling equipment. Consider cut resistant nitrile gloves if handling potentially contaminated material while re-installing new protective casing.	
4	Mix and Install new concrete pad	1 Slips, Trips, Falls, and Ergonomic hazards can cause injury to body	Clear work area prior of hazards that can cause slips/trips/falls. Use buddy system when handling heavy bags of concrete mix. Cone off work area until concrete has set, to prevent outside sources (people, animals, etc.) from walking and destroying pad and potentially getting stuck.	
		2 Inhalation hazard can cause breathing difficulty and injury	Use dust masks when mixing concrete, stand up-wind during the process.	

4	Mix and Install new concrete pad	3	Heat/Cold Stress related injuries	Take breaks as appropriate, drinking plenty of fluids. Avoid replacing concrete in cold weather when possible due to equipment limitations. Have a warm or cool area, such as a vehicle or tent available for breaks.	
		4	Chemical Burns	Use Nitrile gloves when mixing concrete. Consider using steel toe- rubber boots if mixing larger area to prevent contact with concrete. Wash all clothing prior of concrete prior to departure	

PPE Personal Protective Equipment			
Type	Personal Protective Equipment	Description	Required
Eye Protection	safety glasses		Required
Foot Protection	steel-toe boots		Required
Hand Protection	chemical resistant gloves (specify type)	nitrile	Required
	work gloves (specify type)	leather	Required
Head Protection	hard hat		Required
Hearing Protection	ear plugs		Required
Miscellaneous PPE	traffic vest--Class II or III		Required
Respiratory Protection	dust mask		Recommended

Supplies			
Type	Supply	Description	Required
Communication Devices	mobile phone		Required
Decontamination	Decon supplies (specify type)	Micro 90	Required
Miscellaneous	fire extinguisher		Required
	first aid kit		Required
	flashlight		Recommended
Personal	eye wash (specify type)	bottle	Required
	insect repellent		Recommended
	sunscreen		Required
	water/fluid replacement		Required
Traffic Control	traffic cones		Required

Job Safety Analysis

General

JSA ID	14956	Status	(2) Review
Job Name	General Industry-Fence installation	Created Date	4/12/2017
Task Description	Oversight of Fence and Sound Barrier Installation	Completed Date	
Template	False	Auto Closed	False

Client / Project

Client	NORTHROP GRUMMAN
Project Number	NY0014962515
Project Name	OU3 RW-21 Area Remedy
PIC	JOHNSTON, DAVID KENT
Project Manager	SANGIOVANNI, CARLO

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Spradlin, Jeff Dale	5/3/2017	4/12/2017	Rutledge, Jon	<input checked="" type="checkbox"/>
HASP Reviewer	Sangiovanni, Carlo	4/26/2017		Glazewski, Robert J	<input checked="" type="checkbox"/>
Reviewer	Xu, Xuan	4/26/2017	4/13/2017	Zahradnik, Arthur J	<input checked="" type="checkbox"/>

Job Steps

Job Step No.	Job Step Description	Potential Hazard	Critical Action	H&S Reference
1	Visual Survey of Area for Proposed Installation of Fencing and Posts	1 Tripping can occur from uneven walking/working surfaces	Identify and control any trip hazards. Setup work area with least interference to public and surrounding activities.	Employee Field H&S Handbook; Utility Location (ARCHSFS019); H&S Procedure ARCHSFS017
		2 Underground utilities can be hit when doing intrusive work	Follow utility locate H&S Policy	
		3 Staff can be hit by vehicular traffic, and pedestrians can enter work area	Wear Class II traffic vest when working proximal to vehicular traffic. Use traffic cones to keep pedestrians away.	
2	Fence Post Installation and Handling/Disposal of Cuttings	1 Injury can occur when using power auger	Always inspect hand tools prior to starting task. Wear leather work gloves. Use GFCIs for any power tools. Do not use in wet work areas.	Employee Field H&S Handbook
		2 Rotating parts on powered augers can cause bodily injury, and this equipment can be unstable to operate.	Make sure machine is stabilized when in use. Keep all unnecessary staff clear of augering - stand to the side where the operator can see you and where you can see the post being installed. Stay in communication with the operator. Do not wear loose clothing or jewelry.	
		3 Dermal/Inhalation hazards from Site COC's in posthole cuttings/Incorrect reading of potentially hazardous vapors due to incorrectly calibrated PID	Ensure that PID is charged and calibrated before each workday. Make sure continuous PID readings are taken of breathing area and check instrument frequently, Wear proper PPE while inspecting cuttings. Refer to HASP for action levels for PID.	
		4 Fuel spills can occur with refueling equipment	Use approved gas cans for all refueling of equipment. Allow ample time for motor to cool before refueling.	
		5 Sharp edges can cause cuts, and equipment has pinch point hazards	Always secure the equipment when transporting them in vehicles with ratchet straps. Use heavy work gloves while handling and team lift when moving equipment.	
3	Fence and Sound Barrier Installation	1 Handling fence materials can cause lacerations from sharp edges, or injury from pinch points and puncture hazards	Wear leather work gloves	Employee Field H&S Handbook
		2 Muscle strain can occur from heavy lifting	Team lift sections of fence or sound barrier or use powered equipment to move them.	

3	Fence and Sound Barrier Installation	3	Injury can occur when using hand and power tools	Always inspect hand tools prior to starting task. Wear leather work gloves. Use GFCIs for any power tools. Do not use in wet work areas.	
		4	Staff can trip over equipment or uneven working surfaces.	Do not lay out piping for post on ground where it can create a trip hazard for workers and pedestrians. Keep site in order, and do not wear loose clothing. Keep shoe laces tied tightly.	
		5	Lifting bags of cement/Mixing and pouring concrete can generate dust	Follow proper lifting techniques/utilize team lifts for objects over 50 lbs. Wear safety glasses or goggles and a dust mask. Use a dust meter to measure particulates in the air, refer to HASP for action levels associated with the dust meter. Wet down area to suppress dust.	
		6	Attaching sound barrier to fence can result in pinch points and lacerations.	Wear leather gloves, utilize TRACK when attaching materials to fence.	
4	Demobilization of sound barrier and fence	1	Removal of sound barrier from fence and uncoupling fence can result in pinch points and lacerations.	Wear leather work gloves and follow proper lifting techniques.	Employee Field H&S Handbook
		2	Staff can trip over equipment or uneven working surfaces.	Do not lay out piping for post or sound barrier materials on ground where it can create a trip hazard for workers and pedestrians. Keep site in order, and do not wear loose clothing. Keep shoe laces tied tightly.	

PPE Personal Protective Equipment			
Type	Personal Protective Equipment	Description	Required
Eye Protection	safety glasses		Required
Foot Protection	boots	Steel Toe	Required
Hand Protection	chemical resistant gloves (specify type)	Nitrile	Required
	work gloves (specify type)	Leather	Required
Head Protection	hard hat		Required
Hearing Protection	ear plugs		Required
Miscellaneous PPE	traffic vest--Class II or III		Required
Respiratory Protection	dust mask	As necessary with dust	Required

Supplies			
Type	Supply	Description	Required
Communication Devices	mobile phone		Recommended
Miscellaneous	fire extinguisher		Required
	first aid kit		Required
	flashlight		Required
	Other	Dust mask	Recommended
Personal	eye wash (specify type)		Required
	sunscreen		Recommended
Traffic Control	traffic cones		Required

Review Comments	
Reviewer	Comments
Employee: Xu, Xuan Role: Reviewer Review Type: Approve Completed Date: 4/13/2017	

Job Safety Analysis

General

JSA ID	14959	Status	(2) Review
Job Name	General Industry-Site clearing (tree/brush/vegetation) removal	Created Date	4/12/2017
Task Description	Oversight of Tree Removal and Wrapping	Completed Date	
Template	False	Auto Closed	False

Client / Project

Client	NORTHROP GRUMMAN
Project Number	NY0014962515
Project Name	OU3 RW-21 Area Remedy
PIC	JOHNSTON, DAVID KENT
Project Manager	SANGIOVANNI, CARLO

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Spradlin, Jeff Dale	5/3/2017	4/12/2017	Rutledge, Jon	<input checked="" type="checkbox"/>
HASP Reviewer	Sangiovanni, Carlo	4/26/2017		Glazewski, Robert J	<input checked="" type="checkbox"/>
Reviewer	Xu, Xuan	4/26/2017	4/13/2017	Zahradnik, Arthur J	<input checked="" type="checkbox"/>

Job Steps

Job Step No.	Job Step Description	Potential Hazard	Critical Action	H&S Reference	
1	Prepping equipment for clearing activities	1	Improperly maintained tools and equipment increase risk for injury to workers using tools/equipment	Maintain tools and equipment according to manufacturer recommendations, including proper oiling and inspection of tool/equipment. Ensure cutting blades are sharp.	
		2	Cuts to hands, fingers, forearms from sharpening tool/equipment blades	Wear protective gloves suitable for the tool/device being sharpened, use proper sharpening techniques and do not hurry through the sharpening process.	
		3	Falls from accessing or egressing from large equipment like tractors or bulldozers	Always use 3 points of contact when access/egressing large heavy equipment. Never attempt to access/egress from moving equipment, wear footwear with good anti-slip tread and ankle support, keep mud off of stepping surfaces. Promptly affix seatbelt when sitting in seat.	
		4	Exposure to fuel during refueling activities	Wear protective gloves during refueling activities, avoid breathing fuel vapors by standing up wind when practical, promptly wash exposed skin or clothing.	
		5	Overhead electrical lines	Ensure proper distance is maintained from all nearby overhead electrical lines	
2	Removing trees with heavy equipment and/or hand tools	1	Struck by vegetation under tension during clearing	Stand at least 100 ft from clearing activity. Keep unnecessary workers away from clearing activity in all directions.	
		2	Trip fall hazards on uneven ground surfaces	Plan route and avoid walking over down trees and into vegetation where ground surface cannot be seen. Wear footwear with good tread and ankle support, don't carry tools in a manner that can obstruct vision of ground.	
		3	Slip or trip on muddy or sloped surfaces	Plan route, wear footwear as above, keep hands out of pockets to balance and brace falls.	
		4	Contact with poisonous or biting insects	Watch for and avoid hazardous insects, keep cab doors closed, if equipped, to reduce exposure potential.	
		5	Struck by falling trees or large brush	Keep clear of planned fall direction, assume tree can fall in any direction and keep clear in all fall directions	
		6	Open holes left by removal of trees can cause trip/fall hazards	Ensure that all holes generated by removing trees are immediately filled in and leveled to remove hazards	

3	Wrapping of trees to remove their limbs from work area	1	Slips and falls from ladder	Ensure proper footing, utilize a ladder spotter, do not overreach from ladder while installing wrap on vegetation	
		2	Pinch points from tree wrap can cause a fall from the ladder or a trip point on the ground surface.	Do not lay tree wrap out on ground surface where coworkers might accidentally trip over it. Do not wear loose fitting clothing or jewelry while handling the tree wrap.	

PPE Personal Protective Equipment

Type	Personal Protective Equipment	Description	Required
Dermal Protection	long sleeve shirt/pants		Required
Eye Protection	safety glasses		Required
Foot Protection	steel-toe boots	or equivalent	Required
Hand Protection	work gloves (specify type)	leather	Required
Head Protection	hard hat		Required
Hearing Protection	ear plugs		Required
Miscellaneous PPE	other	chainsaw chaps if using chainsaw	Required
	traffic vest--Class II or III		Required

Supplies

Type	Supply	Description	Required
Communication Devices	mobile phone		Required
Miscellaneous	fire extinguisher		Required
	first aid kit		Required
Personal	insect repellent		Recommended
	sunscreen		Recommended
Traffic Control	traffic cones		Required

Review Comments

Reviewer	Comments	
Employee: Xu, Xuan Role Reviewer Review Type Approve Completed Date 4/13/2017		

Job Safety Analysis

General

JSA ID	16904	Status	(3) Completed
Job Name	Environment-Air knife/hydro knife	Created Date	5/1/2019
Task Description	Air Knife for Utility Clearance	Completed Date	05/31/2019
Template	False	Auto Closed	True

Client / Project

Client	Northrop Grumman Corporation
Project Number	NYNG2019TS14
Project Name	OU3 RW-21 Project Area
PIC	ALEXANDER, PHILIP
Project Manager	STERN, DAVID

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Darmon, Thomas W	5/16/2019	5/3/2019	Schell, Christopher S	<input checked="" type="checkbox"/>
HASP Reviewer	Held, Daniel K.	5/17/2019		Kaufman, Brian	<input checked="" type="checkbox"/>
Reviewer	Xu, Xuan	5/17/2019		Zahradnik, Arthur J	<input checked="" type="checkbox"/>

Job Steps

Job Step No.	Job Step Description	Potential Hazard	Critical Action	H&S Reference
1	Check and clear proposed hydro-knife locations for the presence of underground and overhead utilities	1 Staff can be hit by vehicular traffic	Wear reflective traffic vest. Establish work zone with cones.	Utility Clearance H&S Standard: ARCHSFS019
		2 Underground utilities can be encountered	Follow ARCADIS policy on utility location	
2	Clear hole using the hydro-knife	1 Subsurface could have material that may contain rocks/sharp objects. Flying debris could cause injury to eyes, face, arms and legs; Water spray could contain mud, sharp debris or chemicals of concern;	Stay back a minimum of five feet from the hydro-knife while in operation by the contractor. Wear safety glasses, leather gloves, hardhat.	
		2 Operation of the hydro-knife generates excessive noise.	Hearing protection is required when the equipment is in operation	
		3 Vacuum unit has a large amount of suction.	Do not put any part of your body near the end of the hose.	
		4 Leak from Air Knife from compressor can cause whipping	Inspect and ensure all whip checks are in place and in good working condition; replace worn parts.	
		5 Hearing loss due to vacuum and air compressor run time	Wear hearing protection when working with Air knife to prevent hearing loss	
		6 Exposure to dust can cause irritation to eyes and breathing.	Use Filter to control and position exhaust away from the work zone.	
3	Barricade open holes	1 Holes can be difficult to see depending on their size, and site workers could twist their ankle or fall if they step on an open hole.	Holes can be as large as 6-8 inches in diameter and as deep as 7 feet. Heavy cones, orange barrels or cones with caution tape should be used to protect the holes.	
		2 Lifting hazards from carrying heavy cones or orange barrels.	Minimize number of cones lifted at one time. Use team lift approach when possible.	

PPE Personal Protective Equipment			
Type	Personal Protective Equipment	Description	Required
Dermal Protection	chemical protective suit (specify type)	Tyvek	Recommended
	long sleeve shirt/pants		Required
Eye Protection	faceshield		Required
	safety glasses		Required
Foot Protection	boots		Required
	steel-toe boots		Required
Hand Protection	chemical resistant gloves (specify type)	Nitrile	Required
	work gloves (specify type)	leather	Required
Head Protection	hard hat		Required
Hearing Protection	ear plugs		Required
Miscellaneous PPE	traffic vest--Class II or III		Required
Respiratory Protection	dust mask		Recommended

Supplies			
Type	Supply	Description	Required
Communication Devices	mobile phone		Required
Decontamination	Decon supplies (specify type)		Required
Miscellaneous	fire extinguisher		Required
	first aid kit		Required
	flashlight		Recommended
Personal	eye wash (specify type)		Required
Traffic Control	traffic cones		Required

Review Comments		
Reviewer	Comments	
Employee: Xu, Xuan Role Reviewer Review Type Revise Completed Date 5/2/2019	Revise per comments in email.	

Job Safety Analysis

General

JSA ID	7375	Status	(3) Completed
Job Name	Environment-Remediation system O&M	Created Date	4/23/2012
Task Description	Well Pump Pull/Replacement, Video Log	Completed Date	05/21/2012
Template	False	Auto Closed	True

Client / Project

Client	Northrop Grumman
Project Number	
Project Name	
PIC	JOHNSTON, DAVID KENT
Project Manager	SANGIOVANNI, CARLO

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Frattali, John M	10/22/2012	4/23/2012	Rosen, Peter	<input type="checkbox"/>
HASP Reviewer	Merrifield, Christopher	5/7/2012		Burgess, Thomas G.	<input type="checkbox"/>
Quality Reviewer	Goldberg Day, Amy	6/12/2012	6/12/2012	Demetrios, Ginna E	<input checked="" type="checkbox"/>

Job Steps

Job Step No.	Job Step Description	Potential Hazard	Critical Action	H&S Reference
1	Mobilize to work area and set up equipment and materials needed for pump motor replacement. Cover the work area with plastic prior to setting up, or as directed by PGE onsite personnel.	1 <ul style="list-style-type: none"> - Slips, trips and falls - Pinch points - Body strains - Heat/cold stress 	<ul style="list-style-type: none"> - Conduct visual assessment of site prior to entering to identify any potential hazards. - Inspect for tortoises and tortoise burrows. - Closely watch footing if ground is uneven - Unload as close to work area as safely possible. - Set up exclusion zone using traffic cones. - Use proper lifting techniques and body positioning; don't carry more than you can handle, and get help moving heavy or awkward objects. - Stay clear of pinch point hazards on development rig and support equipment - Wear proper PPE including foot, eye, head, ear and hand protection - Workers should hydrate throughout the day and understand what heat stress is, how it affects their health and safety, and how it can be prevented. Take breaks if needed. - Dress in layers, use insulating clothing, and allow for breaks to warm up during cold temperature conditions. 	
2	Disconnect well head piping and electrical supply.	1 <ul style="list-style-type: none"> - Pinch-points on well vault - Slips/Trips/Falls - Back strain - Electrical shock - Chemical - Slippery conditions - Spills 	<ul style="list-style-type: none"> - Use correct tools to open well cap. -Wear leather and nitrile gloves when removing pipe. - Unload as close to work area as safely possible; use proper lifting and reaching techniques and body positioning; don't carry more than you can handle, use the buddy system when moving heavy or awkward objects. - Make sure equipment is turned off and LOTO'd when connecting/disconnecting. Follow site-specific LOTO procedures. - Containerize all water in drums. Be careful when walking on the plastic in the work area. - Complete non-permitted confined space entry, as required. 	
3	Remove pump/motor from well. - Pull drop pipe and pump. - Disconnect drop pipe. - Lay down drop pipe	1 <ul style="list-style-type: none"> - Moving parts on rig and support equipment - Entanglement - Slips, trips and falls 	<ul style="list-style-type: none"> - Use correct tools to disassemble drop pipe (absolutely no cheater bars per client direction). - Moving parts of the development rig can 	

	adjacent to well. - Manage lead wire during removal.		<ul style="list-style-type: none"> - Excessive noise generated by rig operation - Pinch points - Chemical - Pressurized equipment - Spills 	<ul style="list-style-type: none"> pull you in causing injury. - Stay at least 5 feet away from moving parts of the drill rig and winch. Know where the kill switch is on the rig. - Ensure all verbal and non-verbal communication has been addressed prior to development rig operation. - Wear a hardhat when equipment is operating and watch for loose equipment. - Wear hearing protection when rig or other noise generating equipment is in use. - Water removed from the well may be impacted by site contaminants. Wear proper PPE including nitrile gloves and eye protection to minimize contact with groundwater. 	
4	Connect new motor and pump. - Remove existing pump/motor from the drop pipe. - Attach new motor and pump to drop pipe.- Attach new motor to lead wires.	1	<ul style="list-style-type: none"> - Slips/Trips/Falls - Back strain -Slippery conditions -Pinch points -Thermal burns 	<ul style="list-style-type: none"> - Assemble close to work area as safely possible; use proper lifting and reaching techniques and body positioning. - Make sure equipment is turned off when connecting/disconnecting. - Water spilled on plastic during pump pull can cause slippery conditions Be careful when walking on plastic in the work area. - Heat gun used for shrink wrap on motor leads can cause burns. Wear proper hand protection. 	
5	Video log the well.	1	<ul style="list-style-type: none"> - Slips/Trips/Falls - Back strain -Slippery conditions - Electrical shock 	<ul style="list-style-type: none"> - Water spilled on plastic during pump pull can cause slippery conditions Be careful walking on plastic in the work area. - Use proper lifting and reaching techniques and body positioning. - Keep non-waterproof video equipment away from spills/splashing 	
6	Remove sediment with a bailer, as required.-Confirm total depth below top of casing before and after sediment removal	1	<ul style="list-style-type: none"> - Moving parts on rig and support equipment - Entanglement - Slips, trips and falls - Excessive noise generated by rig operation - Pinch points - Chemical - Spills 	<ul style="list-style-type: none"> - Moving parts of the development rig can pull you in causing injury. - Stay at least 5 feet away from moving parts of the drill rig and winch. Know where the kill switch is on the rig. - Ensure all verbal and non-verbal communication has been addressed prior to development rig operation. - Wear a hardhat when equipment is operating and watch for loose equipment. - Wear hearing protection when rig or other noise generating equipment is in use. - Transferring water from the bailer into a storage drum can cause splashes. 	
7	Install new pump and motor in well. - Install drop pipe and pump. - Manage lead wire during installation.	1	<ul style="list-style-type: none"> - Moving parts on rig and support equipment - Entanglement - Slips, trips and falls - Excessive noise generated by rig operation - Pinch points - Chemical -Pressurized equipment 	<ul style="list-style-type: none"> - Moving parts of the development rig can pull you in causing injury. - Stay at least 5 feet away from moving parts of the drill rig and winch. Know where the kill switch is on the rig. - Ensure all verbal and non-verbal communication has been addressed prior to development rig operation. - Wear a hardhat when equipment is operating and watch for loose equipment. - Wear hearing protection when rig or other noise generating equipment is in use. 	
8	Connect well head piping and electrical supply. - Connect piping. - Connect wiring. - Remove LOTO. - Bump test motor to verify rotation.- Test well for proper flow/leaks	1	<ul style="list-style-type: none"> - Pinch-points on well vault - Slips/Trips/Falls - Back strain - Electrical shock -Chemical -Slippery conditions 	<ul style="list-style-type: none"> - Use correct tools to open well cap. -Wear leather and nitrile gloves when removing drop pipe. - Use proper lifting and reaching techniques and body positioning; don't carry more than you can handle, use the buddy system when moving heavy or awkward objects. - Make sure equipment is turned off and LOTO'd when connecting/disconnecting. Follow site-specific LOTO procedures. - Communicate with all affected employees before removing LOTO and energizing well. -Reinstall all well head insulation and protective devices that were removed. 	

9	Demobilization. -Drain the bailer water on the Ranch LTU or as directed by PGE onsite personnel.	1	- Slips/Trips/Falls - Chemical - Leaks - Pinch points	- Be aware of pinch points when moving drum. Wear leather gloves. - Avoid spilling water while transporting to the Ranch LTU.	
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PPE Personal Protective Equipment			
Type	Personal Protective Equipment	Description	Required
Eye Protection	safety glasses		Required
Foot Protection	steel-toe boots		Required
Hand Protection	chemical resistant gloves (specify type)	nitrile	Required
	work gloves (specify type)	leather	Required
Head Protection	hard hat		Required
Miscellaneous PPE	traffic vest--Class II or III		Required

Supplies			
Type	Supply	Description	Required
Communication Devices	mobile phone		Required
Miscellaneous	fire extinguisher		Required
	first aid kit		Required
Personal	eye wash (specify type)		Required
	insect repellent		Required

Review Comments		
Reviewer	Comments	
Employee: Goldberg Day, Amy Role Quality Reviewer Review Type NA Completed Date 6/12/2012	The JSA was well written and contains pertinent information. I recommend that it is reviewed prior to repeating this type of work.	

Job Safety Analysis

General

JSA ID	10240	Status	(3) Completed
Job Name	Environmental-Remediation system O&M	Created Date	11/13/2013
Task Description	Removal and Reinstallation Recovery Well Pump-Well 3R Tie-In	Completed Date	12/02/2013
Template	False	Auto Closed	False

Client / Project

Client	NORTHROP GRUMMAN
Project Number	NY0014960512
Project Name	OU2 CONSTRUCTION
PIC	JOHNSTON, DAVID KENT
Project Manager	SANGIOVANNI, CARLO

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Martorano, Paul	12/5/2013	11/21/2013	Tuohy, Christina	<input checked="" type="checkbox"/>
Developer	Miranda, Karla	12/5/2013	11/21/2013	Smolensky, Douglas	<input checked="" type="checkbox"/>
Developer	Xu, Xuan	12/5/2013	11/21/2013	Smolensky, Douglas	<input checked="" type="checkbox"/>
HASP Reviewer	San Giovanni, Carlo	12/5/2013	11/22/2013	Smolensky, Douglas	<input checked="" type="checkbox"/>
Quality Reviewer	Novotny, John	12/2/2013	12/2/2013	Cameron, Gary	<input checked="" type="checkbox"/>
Reviewer	Engler, Christopher	12/5/2013	12/2/2013	Rankin, Erin	<input checked="" type="checkbox"/>

Job Steps

Job Step No.	Job Step Description	Potential Hazard	Critical Action	H&S Reference
1	Proper Preparation and Understanding of Task/Task Roles and Responsibilities	1 Hazardous Onsite Conditions as a result of not understanding Task Specific Roles and Responsibilities	ARCADIS project personnel should review task specific SOW document and attend Kickoff Meeting with project mangement team (TM, APM and/or PM) to discuss SOW and ARCADIS role. This meeting should be used to ask questions prior to work commencement.	
2	Driving to and around site	1 Traffic Accident (To and From Site). Backing/Equipment Accident (On site).	Follow SMITH System for defensive driving and Arcadis Motor Vehicle Safety Program. Use a spotter when backing and/or driving/moving equipment.	Motor Vehicle Safety Program, ARC HSGE024
3	Health and Safety Tailgate Meeting Don Appropriate PPE	1 Serious Personal Injury as a result of: -Not physically and mentally alert during tailgate meetings and subsequent work. -Not following correct procedures and/or site protocols. -Failing to don required personal protective equipment (PPE).	-Arrive on site mentally and physically alert. Be prepared to discuss potential health and safety hazards with all personnel working on the site. -Don required PPE as discussed in the tailgate meeting, alerting site supervisor if any required PPE is missing .	Tailgate Meeting, ARC HSGE001, ARC HSGE009
4	Power off pump to be removed from recovery well. Disconnect pump wires from breaker control box in Pump House.	1 Electrical Hazard (Electrocution) and Personal Injury due to: Release of hazardous (electrical) energy when disconnecting pump wire from breaker box at well head.	-Power down pump by disconnecting electrical supply from power source. Always consider every circuit to be energized until proven powered off. -Ensure personnel performing work is trained in lockout/tagout procedures; that the LO/TO is performed by the same worker conducting the work. -Lockout/tagout (LO/TO) circuit breaker in control box. Make sure to test the effectiveness of the lockout. Keep key on personnel performing work at all times. -Ensure work area at breaker box is dry and free of standing water.	ARC HSFS004 (Control of Hazardous Energy:Lockout/Tagout), ARC HSFS006 (Electrical Safety Policy)

				-Don task-appropriate gloves when conducting electrical work.	
5	Closing Backflow Valve after powering off pump.	1	Pinches/Scrapes from turning valve handle with wrench.	-Wear work gloves and use appropriate tools to open and close valve. -Use tool properly to avoid pinchpoints and/or scrapes.	
		2	Hazardous Pressure Buildup and Pump Damage if pump is not shut off prior to closing valve.	Confirm pump is off and disconnected before shutting off backflow valve along well pipe assembly.	
6	Working from Pump House Roof (Coring Access Port through Concrete Ceiling for Hoisting Pump): a) Elevated Work: -Use of Aerial Platforms -Use of Ladders	1	Personal Injury as a result of skipping pre-operational inspection	-Perform daily pre-operational inspection prior to use and operation of platform/ladder. -Place inspection sheet on lift in weather-proof box. -Ensure that all employees operating and working on aerial lifts are fully trained on proper operation and use prior to work. -Inspect for drop-offs, holes, uneven surfaces and/or other conditions that would cause the platform to tip and/or cause the lift to fail. Mitigate hazards with controls, i.e. repair, replacement, leveling, etc.).	ARC HSFS007, ARC HSFS021, JSA 9376, JSA 9297
		2	Fall Hazard (Personal Injury, Head Injury, Broken Limbs/body Parts, Cuts/Scrapes/Contusions)	-Ensure employee has been trained in the proper use of aerial platforms and/or ladders. -Follow H&S Protocols required by Arcadis' Elevated Work and Fall Protection Standard (ARC HSFS007) and Ladder Standard (ARC HSFS021). Ensure whether or not elevated work permit needs to be furnished before beginning work. -Operation of aerial work platform shall follow manufacturer's specifications and recommendations. -If necessary, don appropriate fall protection when working from aerial platform and/or roof of pump house. -Tie off to the appropriate tie off point attached to the aerial work platform. ***Note: Handrails are not an appropriate tie-off point. -Do not stand on and/or use the mid-rail of aerial platform to conduct work. -Always make sure to maintain 3 points of contact when working on ladder and/or using handrails. -Erect temporary fencing atop Pump House Roof to designate safe work area for coring/drilling through concrete.	
7	Working from Pump House Roof (Coring Access Port through Concrete Ceiling for Hoisting Pump): -Elevated Work: -Use of Fall Protection	1	Pre-Use Inspection Failure: -Fall Hazard -Personal Injury	-Workers must be fully trained in proper use, inspection and limitations of personal fall arrests systems (PFAS). -If PFAS does not pass inspection, remove for service and/or ensure inspected back-up's are ready for worker deployment. -Use field audits to ensure workers are employing PFAS' correctly. -Review and instruct all workers on rescue procedures associated with Site-Specific Fall Protection Plan. Follow Site-Specific HASP and Standard Guidance as reference resource.	ARC HSFS007, JSA 9376, JSA 9297
8	Working from Pump House Roof (Coring Access Port through Concrete Ceiling for Hoisting Pump): -Use of Power/Drill/Coring Tools	1	Electrical Hazard (Electrocution)	-All equipment and power tools should be inspected prior to use, ensuring that equipment and cords are in good working condition. -Portable electrical equipment, extension cords and power tools should be grounded and connected via Ground Fault Circuit Interrupters (GFCI's) to control electrical hazard potential. -Avoid operating tools in wet area conditions	JSA 9376, JSA 9297, JSA 7128

				<p>or inclement weather. -Keep fire extinguisher in close proximity to work area.</p>	
		2	Noise Hazard	<p>Use of electrical equipment and generator can create excessive noise. Employ hearing protection if noise hazard exceeds 85 dBA standard.</p>	
		3	<p>Personal Injury: -Flying Parts, Tools, Debris -Cuts/Lacerations -Slips, Trips, Falls</p>	<p>-Keep tools free of grease and oil. -Always use right equipment/power tools for right job-task. -Keep work area on roof/work platform free and clear of tools, debris, unused materials. Only keep tools and equipment relevant to job-task on work platform, storing unused tools/equipment in work truck and/or staged at grade. -Don appropriate PPE (Hard Hat, protective eyewear, long sleeve work shirt) to protect against flying material and/or debris when coring through concrete ceiling. -Eliminate work within pump house during coring activities to avoid falling/flying debris.</p>	
9	Disassembling Well Head and T-Assembly	1	<p>Personal Injury: -Pinchpoints -Cuts/Lacerations -Crush Hazard -Slip, Trip, Fall</p>	<p>-Use proper tooling to disconnect bolts, flanges and T-assemblies from well head. -Keep work area free and clear of unnecessary tooling, equipment and material to control tripping hazards. -Don necessary PPE (Leather, Cut Resistant Work Gloves) to avoid crushing, cutting or pinching hands and digits when disassembling well pipe.</p>	
10	Pulling Wire Assembly for Pump	1	Muscle/Back Strains, Pulls	<p>-Utilize lifting equipment to pull associated wire when possible. If not, use 2 person team to pull and spool wire extracted from well for material in excess of 50 pounds. -Use good body position and proper lifting techniques when pulling wire from well (straight back, bent knees, proper footing). -Avoid twisting or jerking movements. Avoid awkward footing and stance when pulling wire assembly from well.</p>	JSA 9297
		2	<p>-Hand Injuries (Rubs, Burns, Cuts) -Dermal Exposure to Potential Impacted Groundwater</p>	<p>-Don cut resistant and/or chemical resistant work gloves in order to eliminate dermal contact with groundwater and burns that can develop from constant rubbing during pulling electrical wiring and wire cords. -Use 2 person team when pulling wire assembly to avoid pinching fingers and skin when holding/pulling wire. -Set up winch or rig system in order to offset weight of wire assembly down well.</p>	
		3	Slips, Trips, Falls	<p>-Use rig or winch system and designated spools to roll wire coming out of well. This avoids laying and bunching wire at well head, which blocks clear footing with which to continue pulling.</p>	
11	Rigging Well Pipe Equipment, T-Assembly and Pump	1	<p>-Crush Hazard/Impale (Suspended Load) -Personal Injury (pinching)</p>	<p>-Inspect lifting straps for damage and load rating before use. -Verify crane/winch rig is properly set up, leveled and stabilized before use. -Operator and spotter should have clear view of one another, using designated hand signals and visual contact to keep in constant communication. Use walkie-talkie communication if necessary and/or visual contact is limited because of pump house walls. -Use proper placement of hands and fingers when connecting pump assembly to crane hook and lifting straps. -Ensure pump assembly is properly connected to crane hook and lifting straps</p>	

				before lifting with crane/rig. -Ensure equipment is lifted slowly, carefully and straight, with all unnecessary personnel kept at safe distance outside of pump house work area.	
12	Decon Pump and Wire Assembly	1	Splash Hazard/Dermal Contact with Potentially Impacted Groundwater Environmental/Spill Hazard	-Don appropriate PPE when deconing pump, pump assembly and associated wiring (protective eyewear, long sleeve work shirts/pants, chemical resistant gloves). -Use safe distance if using steam cleaning/power washing equipment to minimize splashing. Use caution not to damage pump and wiring with force of spray. -Utilize secondary containment when deconing pump and assembly, ensuring that decon water is properly contained and disposed. Do not dump or dispose decon water on ground surface.	
13	Reinstallation of Pump and Wire Assembly	1	Overhead Strike/Crush Hazards Personal Injury (Head, Body, Hand)	-Inspect lifting straps for damage and load rating before use. -Verify crane/winch rig is properly set up, leveled and stabilized before use. -Ensure Operator and Spotter has clear view of one another, using designated hand signals and visual contact to keep in constant communication. Use walkie-talkie communication if necessary. -Use proper placement of hands and fingers when connecting pump assembly to crane hook and lifting straps. -Verify that pump assembly is properly connected to crane hook and lifting straps before lifting with crane/rig. Make sure equipment is centered and lifted and descended slowly into Well 3R. Keep all unnecessary personnel kept at safe distance outside of pump house work area. -Wear hard hat and work gloves at all time when lowering pump and wire assembly into Recovery Well 3R.	JSA 2243
14	Reconnection of electric wiring from submersible pump to control breaker box	1	Electrical Hazard/Discharge (Electrocution): -Improper LO/TO -Live Wires	-Before accessing electrical boxes and reconnecting wires, ensure that LO/TO locks and tags are in place and have not been removed or tampered with. -Ensure that the same worker who performed LO/TO system, removes LO/TO system. -Use caution when removing LO/TO system, avoiding standing areas of water and/or wearing wet gloves or clothing. -After LO/TO has been removed, wear proper work gloves and use correct tools to reconnect electrical capacity of pump to control panel. Communicate with all personnel to ensure that no other parts of system have been previously powered on. -Use caution when powering on pump system, keeping all unnecessary personnel out of electrical work area. Make sure other workers are aware of powering on to avoid personal injury/electrocution associated with live electricity.	ARC HSFS004, ARC HSFS006, JSA 2243
15	Secure well head assembly and breaker control box. Open backflow valve.	1	Pinches, Scrapes	Wear proper work gloves and use correct tools.	

PPE Personal Protective Equipment			
Type	Personal Protective Equipment	Description	Required
Dermal Protection	chemical protective suit (specify type)		Required
	long sleeve shirt/pants		Required

Eye Protection	faceshield		Required
	safety glasses		Required
Foot Protection	boots		Required
	steel-toe boots		Required
Hand Protection	chemical resistant gloves (specify type)	Butyl, Nitrile	Required
	work gloves (specify type)	Leather, Type II Cut Resistant	Required

Supplies			
Type	Supply	Description	Required
Communication Devices	mobile phone		Required
	walkie talkie	If necessary for communication with Crane Operator	Recommended
Decontamination	Decon supplies (specify type)	Alconox	Required
Miscellaneous	auxiliary lighting	If Night Work	Required
	fall protection (specify type)	PFAS	Recommended
	fire extinguisher		Required
	first aid kit		Required
	flashlight		Required
	Other	Hard Hat (ANSI Rated)	Required
	Other	Class II High Visibility Vest	Required
Personal	eye wash (specify type)	16 oz. Saline Eyewash	Required

Review Comments		
Reviewer	Comments	
Employee: San Giovanni, Carlo Role HASP Reviewer Review Type Revise Completed Date 11/19/2013	Since this JSA covers both work to be conducted by ARCADIS and work to be conducted by Subcontractor, please add to Job Step 1 that ARCADIS project personnel should review task specific SOW document and attend Kickoff Meeting with project mangement team (TM, APM and/or PM) to discuss SOW and ARCADIS role. Employee should use this meeting to aks questions.	
Employee: San Giovanni, Carlo Role HASP Reviewer Review Type Approve Completed Date 11/22/2013		
Employee: Engler, Christopher Role Reviewer Review Type Approve Completed Date 12/2/2013	Great Job with this.	
Employee: Novotny, John Role Quality Reviewer Review Type NA Completed Date 12/2/2013	Consider the following: 1. Development of a simple HASP - from the ARCADIS template. 2. Suggest making reference to LOTO and LOTO requirements.	

APPENDIX E

Safety Data Sheets



SAFETY DATA SHEET

Lucas Semi-Synthetic 2-Cycle Oil



Section 1. Identification

GHS product identifier : Lucas Semi-Synthetic 2-Cycle Oil
Other means of identification : Not available.
Product number : 10058, 10059, 10110, 10115, 10120, 10125

Identified uses

Fuel/Lubricating Oil

Supplier's details : Lucas Oil Products, Inc
 302 North Sheridan Street
 Corona, California 92880-2067
 Toll Free: (800) 342-2512
 Tel: (951) 270-0154
 Fax: (951) 270-1902
 Website: www.LucasOil.com

Emergency telephone number (with hours of operation) : (951) 493-1149
 (951) 847-5949
 Markn@lucasoil.com

7:00A.M. to 5:00P.M. Monday thru Friday

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 4
 ASPIRATION HAZARD - Category 1

GHS label elements

Hazard pictograms :



Signal word : Danger
Hazard statements : Combustible liquid.
 May be fatal if swallowed and enters airways.

Precautionary statements

General : Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand.
Prevention : Wear protective gloves. Wear eye or face protection. Keep away from flames and hot surfaces. - No smoking.
Response : IF SWALLOWED: Immediately call a POISON CENTER or physician. Do NOT induce vomiting.





Section 2. Hazards identification

- 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.
- Hazards not otherwise classified** : None known.

Section 3. Composition/information on ingredients

- Substance/mixture** : Mixture
- Other means of identification** : Not available.

CAS number/other identifiers

- CAS number** : Not applicable.
- Product code** : 10058, 10059, 10110, 10115, 10120, 10125

Ingredient name	%	CAS number
Solvent naphtha (petroleum), medium aliph.	10 - 30	64742-88-7

Any concentration shown as a range is to protect confidentiality or is due to batch 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 20 minutes. Get medical attention if irritation occurs.
- Inhalation** : Remove victim to fresh air and keep at rest in a position comfortable for breathing. 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 adverse health effects persist or are severe. 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** : Flush contaminated skin with plenty of water. Get medical attention if symptoms occur. 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. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. 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





Section 4. First aid measures

- Eye contact** : No known significant effects or critical hazards.
Inhalation : No known significant effects or critical hazards.
Skin contact : No known significant effects or critical hazards.
Ingestion : May be fatal if swallowed and enters airways.

Over-exposure signs/symptoms

- Eye contact** : No known significant effects or critical hazards.
Inhalation : No known significant effects or critical hazards.
Skin contact : No known significant effects or critical hazards.
Ingestion : Adverse symptoms may include the following:
nausea or vomiting

Indication of immediate medical attention and special treatment needed, if necessary

- Notes to physician** : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.
Specific treatments : No specific treatment.
Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. 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 dry chemical, CO₂, water spray (fog) or foam.
Unsuitable extinguishing media : Straight streams of water.

Specific hazards arising from the chemical : Combustible liquid. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. Runoff to sewer may create fire or explosion hazard.

Hazardous thermal decomposition products : carbon monoxide, carbon dioxide and oxides of manganese.

Special protective actions for fire-fighters : 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.





Section 6. Accidental release measures

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).

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). Do not swallow. Avoid contact with eyes, skin and clothing. Avoid breathing vapor or mist. 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. Empty containers retain product residue and can be hazardous. Do not reuse container.

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. 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.





Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
Solvent naphtha (petroleum), medium aliph.	OSHA PEL (United States, 2/2013). TWA: 100 ppm 8 hours. TWA: 400 mg/m ³ 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.

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.

Eyeface protection : 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 contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields.

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. 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. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : 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 : 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.

Respiratory protection : 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.



Section 9. Physical and chemical properties

Appearance

Physical state	: Liquid. [Clear.]
Color	: Blue-Green.
Odor	: Petroleum solvent
Odor threshold	: Not available.
pH	: Not available.
Melting point	: Not available.
Boiling point	: 191.11 to 211.11°C (376 to 412°F)
Flash point	: Closed cup: 83.33°C (182°F)
Evaporation rate	: Not available.
Flammability (solid, gas)	: Not available.
Lower and upper explosive (flammable) limits	: Not available.
Vapor pressure	: Not available.
Vapor density	: Not available.
Relative density	: 0.866
Solubility	: Negligible at 25°C
Partition coefficient: n-octanol/water	: Not available.
Auto-ignition temperature	: Not available.
Decomposition temperature	: Not available.
Viscosity	: Kinematic (100°C (212°F)): 0.075 cm ² /s (7.5 cSt)

Section 10. Stability and reactivity

Reactivity	: No specific test data related to reactivity available for this product or its ingredients.
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	: Excessive heat, flames and sparks.
Incompatible materials	: Reactive or incompatible with the following materials: Strong oxidizers, exposure to light.
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

There is no data available.

Irritation/Corrosion

There is no data available.





Section 11. Toxicological information

Sensitization

There is no data available.

Carcinogenicity

There is no data available.

Specific target organ toxicity (single exposure)

There is no data available.

Specific target organ toxicity (repeated exposure)

There is no data available.

Aspiration hazard

Name	Result
Solvent naphtha (petroleum), medium aliph.	ASPIRATION HAZARD - Category 1

Information on the likely routes of exposure : Dermal contact. Eye contact. Inhalation. Ingestion.

Potential acute health effects

Eye contact : No known significant effects or critical hazards.
Inhalation : No known significant effects or critical hazards.
Skin contact : No known significant effects or critical hazards.
Ingestion : May be fatal if swallowed and enters airways.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : No known significant effects or critical hazards.
Inhalation : No known significant effects or critical hazards.
Skin contact : No known significant effects or critical hazards.
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 : No known significant effects or critical hazards.
Potential delayed effects : No known significant effects or critical hazards.

Long term exposure

Potential immediate effects : No known significant effects or critical hazards.
Potential delayed effects : No known significant effects or critical hazards.

Potential chronic health effects

General : No known significant effects or critical hazards.
Carcinogenicity : No known significant effects or critical hazards.
Mutagenicity : No known significant effects or critical hazards.
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 11. Toxicological information

Numerical measures of toxicity

Acute toxicity estimates

There is no data available.

Section 12. Ecological information

Toxicity

There is no data available.

Persistence and degradability

There is no data available.

Bioaccumulative potential

There is no data available.

Mobility in soil

Soil/water partition coefficient (K_{oc}) : There is no data 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 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 empty 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.

Section 14. Transport information

	DOT Classification	IMDG	IATA
UN number	NA1993	Not regulated.	Not regulated.
UN proper shipping name	COMBUSTIBLE LIQUID, N.O.S. (Solvent naphtha (petroleum), medium aliph.)	-	-
Transport hazard class(es)	Combustible liquid.	-	-



**Section 14. Transport information**

Packing group	III	-	-
Environmental hazards	No.	No.	No.
Additional information	Non-bulk packages (less than or equal to 119 gal) of combustible liquids are not regulated as hazardous materials.	-	-

AERG : 128

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 73/78 and the IBC Code : Not available.

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 8(a) CDR Exempt/Partial exemption:** All components are listed or exempted.
United States inventory (TSCA 8b): All components are listed or exempted.

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Not listed

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304**Composition/information on ingredients**

No products were found.

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : Fire hazard

Composition/information on ingredients**State regulations**

Massachusetts : None of the components are listed.

New York : None of the components are listed.

New Jersey : The following components are listed: Distillates (petroleum), hydrotreated heavy paraffinic; Residual oils (petroleum), solvent-dewaxed; Residual oils (petroleum), hydrotreated; Distillates (petroleum), solvent-dewaxed heavy paraffinic

Pennsylvania : None of the components are listed.

California Prop. 65



Section 15. Regulatory information

No products were found.

Section 16. Other information

Hazardous Material Information System (U.S.A.)

Health : 1 * **Flammability :** 2 **Physical hazards :** 0

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings are not required on SDSs under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.)

Health : 1 **Flammability :** 2 **Instability :** 0

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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.

History

Date of issue mm/dd/yyyy : 05/15/2014

Version : 1

Revised Section(s) : Not applicable.

Prepared by : KMK Regulatory Services Inc.

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 73/78 = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.

Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.



Ace Safety Data Sheet

Issue Date 01-Jun-2010

Revision Date: 02-Oct-2013

1. IDENTIFICATION

Product Identifier

Product Name PVC- PVC Cement

Other means of identification

SDS # PVC

UN/ID No UN1133
Product Code PVC-8, PVC-16

Recommended use of the chemical and restrictions on use

Recommended Use Low-VOC solvent cement for PVC plastic pipe

Details of the supplier of the safety data sheet

Distributed By:

Atlantic Chemical & Equipment Co.
3471 Atlanta Industrial Pkwy – Ste 200
Atlanta, GA 30331 USA

Emergency Telephone Number

Company Phone Number 1-800-929-2436
Emergency Telephone (24 hr) INFOTRAC 1-800-535-5053

2. HAZARDS IDENTIFICATION

Appearance Liquid of various colors

Physical State Liquid

Odor Ether-like

Classification

Acute toxicity - Oral	Category 4
Acute toxicity - Inhalation (Dusts/Mists)	Category 4
Serious eye damage/eye irritation	Category 2
Specific target organ toxicity (single exposure)	Category 3
Flammable Liquids	Category 2

Hazards Not Otherwise Classified (HNOC)

May be harmful in contact with skin

Signal Word

Danger

Hazard Statements

Harmful if swallowed
Harmful if inhaled
Causes serious eye irritation
May cause respiratory irritation. May cause drowsiness or dizziness

Highly flammable liquid and vapor

**Precautionary Statements - Prevention**

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
Avoid breathing dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Keep away from heat/sparks/open flames/hot surfaces. — No smoking
Keep container tightly closed
Ground/bond container and receiving equipment
Use explosion-proof equipment
Use only non-sparking tools
Take precautionary measures against static discharge
Wear protective gloves/protective clothing/eye protection/face protection
Keep cool

Precautionary Statements - Response

If exposed or concerned: Get medical advice/attention
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
Immediately call a POISON CENTER or doctor/physician
IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
Rinse mouth
IN CASE OF FIRE: Use CO₂, dry chemical, or foam for extinction

Precautionary Statements - Storage

Store in a well-ventilated place. Keep container tightly closed
Store locked up
Keep cool

Precautionary Statements - Disposal

Dispose of contents/container to an approved waste disposal plant

WHMIS Classification

Class B-Division 2 Class D-Division 2A Class D-Division 2B

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS No	Weight-%
Tetrahydrofuran	109-99-9	Proprietary
Methyl ethyl ketone	78-93-3	Proprietary
Cyclohexanone	108-94-1	Proprietary
Acetone	67-64-1	Proprietary
PVC Resin	9002-86-2	Proprietary

* The exact percentage (concentration) of composition has been withheld as a trade secret

4. FIRST-AID MEASURES

First Aid Measures

General Advice	If exposed or concerned: Get medical advice/attention.
Eye Contact	In case of irritation from airborne exposure, move to fresh air. Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Seek immediate medical attention/advice.
Skin Contact	Take off contaminated clothing. Wash with soap and water. If symptoms persist, call a physician. Wash contaminated clothing before reuse.
Inhalation	Remove to fresh air. If symptoms persist, call a physician. If breathing is difficult, give oxygen. Seek immediate medical attention/advice.
Ingestion	Rinse mouth. Seek medical attention. If drowsy or unconscious, do not give anything by mouth; place individual on the left side with head down. Do not induce vomiting.

Most important symptoms and effects

Symptoms	Exposed individuals may experience eye tearing, redness and discomfort. Prolonged or repeated skin contact may result in dermatitis (red, dry skin). May cause nose and throat irritation, with possible central nervous system effects. Fatigue and weakness. May cause drowsiness or dizziness. Long term overexposure may cause liver and kidney damage.
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Indication of any immediate medical attention and special treatment needed

Notes to Physician	Treat symptomatically. Individuals with chronic respiratory, skin, kidney, or liver disorders may be at increased risk from exposure.
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5. FIRE-FIGHTING MEASURES

Suitable Extinguishing Media

Foam. Carbon dioxide (CO₂). Dry chemical.

Unsuitable Extinguishing Media Not determined.

Specific Hazards Arising from the Chemical

Class IB Flammable Liquid. Vapors may travel to source of ignition and flash back.

Hazardous Combustion Products Carbon oxides. Various hydrocarbon vapors and toxic gases.

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.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

- Personal Precautions** Use personal protective equipment as required. ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Persons not wearing proper personal protective equipment should be excluded from area of spill.
- Environmental Precautions** Do not allow into any sewer, on the ground or into any body of water.

Methods and material for containment and cleaning up

- Methods for Containment** Prevent further leakage or spillage if safe to do so.
- Methods for Clean-Up** Pump or vacuum transfer spilled product to clean containers for recovery. Absorb unrecoverable product. Transfer contaminated absorbent, soil and other materials to containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling

- Advice on Safe Handling** Wash thoroughly after handling. Use personal protection recommended in Section 8. Do not eat, drink or smoke when using this product. Avoid breathing vapors or mists. Use only in well-ventilated areas. Ground/bond container and receiving equipment. Keep away from heat/sparks/open flames/hot surfaces. — No smoking. Use spark-proof tools and explosion-proof equipment. Take precautionary measures against static discharges. Containers of this material may be hazardous when emptied. Since emptied containers retain product residues (vapor, liquid, solid) all hazard precautions given in the data sheet must be observed. Avoid prolonged contact with eyes, skin, and clothing. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood.

Conditions for safe storage, including any incompatibilities

- Storage Conditions** Keep containers tightly closed in a dry, cool and well-ventilated place. Store containers upright. Store away from heat, sparks, flame.
- Incompatible Materials** Oxidizers. Acids. Bases.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure Guidelines

Chemical Name	ACGIH TLV	OSHA PEL	NIOSH IDLH
Tetrahydrofuran 109-99-9	STEL: 100 ppm TWA: 50 ppm S*	TWA: 200 ppm TWA: 590 mg/m ³ (vacated) TWA: 200 ppm (vacated) TWA: 590 mg/m ³ (vacated) STEL: 250 ppm (vacated) STEL: 735 mg/m ³	IDLH: 2000 ppm TWA: 200 ppm TWA: 590 mg/m ³ STEL: 250 ppm STEL: 735 mg/m ³
Acetone 67-64-1	STEL: 750 ppm TWA: 500 ppm	TWA: 1000 ppm TWA: 2400 mg/m ³ (vacated) TWA: 750 ppm (vacated) TWA: 1800 mg/m ³ (vacated) STEL: 2400 mg/m ³ The acetone STEL does not apply to the cellulose acetate fiber industry. It is in effect for all other sectors (vacated) STEL: 1000 ppm	IDLH: 2500 ppm TWA: 250 ppm TWA: 590 mg/m ³

Methyl ethyl ketone 78-93-3	STEL: 300 ppm TWA: 200 ppm	TWA: 200 ppm TWA: 590 mg/m ³ (vacated) TWA: 200 ppm (vacated) TWA: 590 mg/m ³ (vacated) STEL: 300 ppm (vacated) STEL: 885 mg/m ³	IDLH: 3000 ppm TWA: 200 ppm TWA: 590 mg/m ³ STEL: 300 ppm STEL: 885 mg/m ³
Cyclohexanone 108-94-1	STEL: 50 ppm TWA: 20 ppm S*	TWA: 50 ppm TWA: 200 mg/m ³ (vacated) TWA: 25 ppm (vacated) TWA: 100 mg/m ³ (vacated) S*	IDLH: 700 ppm TWA: 25 ppm TWA: 100 mg/m ³
PVC Resin 9002-86-2	TWA: 1 mg/m ³ respirable fraction	-	-

Appropriate engineering controls

Engineering Controls

Apply technical measures to comply with the occupational exposure limits. Ventilation systems. Eyewash stations. Showers. Mechanical exhaust (explosion proof) may be required.

Individual protection measures, such as personal protective equipment

Eye/Face Protection

Splash goggles or safety glasses.

Skin and Body Protection

Rubber gloves. Use body protection appropriate for task.

Respiratory Protection

Not required under normal conditions. If recommended levels are exceeded, respiratory protection must be selected to assure compliance with OSHA Standard 29CFR 1910.134.

General Hygiene Considerations

Handle in accordance with good industrial hygiene and safety practice.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical State	Liquid	Odor	Ether-like
Appearance	Liquid	Odor Threshold	0.88 ppm
Color	Clear		
Property	Values	Remarks • Method	
pH	Not available		
Melting Point/Freezing Point	-108 °C / -163 °F		
Boiling Point/Boiling Range	56 °C / 133 °F		
Flash Point	-20 °C / -4 °F		
Evaporation Rate	> 1.0	(butyl acetate = 1)	
Flammability (Solid, Gas)	n/a-liquid		
Upper Flammability Limits	12.8%		
Lower Flammability Limit	1.8%		
Vapour Pressure	190 mm Hg	@ 20°C (68°F)	
Vapor Density	2.5	(Air=1)	
Specific Gravity	0.890		
Water Solubility	Negligible		
Solubility in other solvents	Not determined		
Partition Coefficient	Not determined		
Auto-ignition Temperature	321 °C / 610 °F	Not determined	
Decomposition Temperature	Not determined		
Kinematic Viscosity	Not determined		
Dynamic Viscosity	Not determined		
Explosive Properties	Not determined		
Oxidizing Properties	Not determined		
VOC Content	Maximum VOC emissions when applied and tested per SCAQMD Rule 1168, Test Method 316A is <= 510 g/L		

10. STABILITY AND REACTIVITY

Reactivity

Not reactive under normal conditions.

Chemical Stability

Stable under recommended storage conditions.

Possibility of Hazardous Reactions

None under normal processing.

Hazardous Polymerization Hazardous polymerization does not occur.

Conditions to Avoid

Avoid heat, sparks, open flames and other ignition sources.

Incompatible Materials

Oxidizers. Acids. Bases.

Hazardous Decomposition Products

Carbon oxides. Hydrogen chloride. Other various hydrocarbons.

11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

Product Information

Eye Contact Causes serious eye irritation.

Skin Contact May be harmful in contact with skin.

Inhalation Harmful if inhaled.

Ingestion Harmful if swallowed.

Component Information

Chemical Name	Oral LD50	Dermal LD50	Inhalation LC50
Tetrahydrofuran 109-99-9	= 1650 mg/kg (Rat)	-	= 53.9 mg/L (Rat) 4 h = 180 mg/L (Rat) 1 h
Acetone 67-64-1	= 5800 mg/kg (Rat)	-	-
Methyl ethyl ketone 78-93-3	= 2737 mg/kg (Rat)	= 6480 mg/kg (Rabbit)	-
Cyclohexanone 108-94-1	= 800 mg/kg (Rat)	= 948 mg/kg (Rabbit)	= 10.7 mg/L (Rat) 4 h = 8000 ppm (Rat) 4 h

Information on physical, chemical and toxicological effects

Symptoms Please see section 4 of this SDS for symptoms.

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen. However, the product as a whole has not been tested.

Chemical Name	ACGIH	IARC	NTP	OSHA
Tetrahydrofuran 109-99-9	A3			
Cyclohexanone 108-94-1	A3	Group 3		
PVC Resin 9002-86-2		Group 3		

Legend

ACGIH (American Conference of Governmental Industrial Hygienists)

A3 - Animal Carcinogen

IARC (International Agency for Research on Cancer)

Group 3 IARC components are "not classifiable as human carcinogens"

STOT - single exposure

May cause respiratory irritation. May cause drowsiness or dizziness.

Numerical measures of toxicity

Not determined

12. ECOLOGICAL INFORMATION

Ecotoxicity

Category IV

Chemical Name	Algae/aquatic plants	Fish	Toxicity to microorganisms	Crustacea
Tetrahydrofuran 109-99-9		1970 - 2360: 96 h Pimephales promelas mg/L LC50 flow-through 2700 - 3600: 96 h Pimephales promelas mg/L LC50 static		5930: 24 h Daphnia magna mg/L EC50
Acetone 67-64-1		4.74 - 6.33: 96 h Oncorhynchus mykiss mL/L LC50 6210 - 8120: 96 h Pimephales promelas mg/L LC50 static 8300: 96 h Lepomis macrochirus mg/L LC50	EC50 = 14500 mg/L 15 min	10294 - 17704: 48 h Daphnia magna mg/L EC50 Static 12600 - 12700: 48 h Daphnia magna mg/L EC50
Methyl ethyl ketone 78-93-3		3130 - 3320: 96 h Pimephales promelas mg/L LC50 flow-through	EC50 = 3403 mg/L 30 min EC50 = 3426 mg/L 5 min	520: 48 h Daphnia magna mg/L EC50 5091: 48 h Daphnia magna mg/L EC50 4025 - 6440: 48 h Daphnia magna mg/L EC50 Static
Cyclohexanone 108-94-1	20: 96 h Chlorella vulgaris mg/L EC50	481 - 578: 96 h Pimephales promelas mg/L LC50 flow- through 8.9: 96 h Pimephales promelas mg/L LC50	EC50 = 18.5 mg/L 5 min EC50 = 21.3 mg/L 10 min EC50 = 25 mg/L 5 min	800: 24 h Daphnia magna mg/L EC50

Persistence/Degradability

Not determined.

Bioaccumulation

Not determined.

Mobility

Chemical Name	Partition Coefficient
Tetrahydrofuran 109-99-9	0.45
Methyl ethyl ketone 78-93-3	0.29
Cyclohexanone 108-94-1	0.86

Acetone 67-64-1	-0.24
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Other Adverse Effects

Not determined

13. DISPOSAL CONSIDERATIONS

Waste Treatment Methods

Disposal of Wastes Disposal should be in accordance with applicable regional, national and local laws and regulations.

Contaminated Packaging Disposal should be in accordance with applicable regional, national and local laws and regulations.

US EPA Waste Number

Chemical Name	RCRA	RCRA - Basis for Listing	RCRA - D Series Wastes	RCRA - U Series Wastes
Tetrahydrofuran 109-99-9				U213
Acetone 67-64-1		Included in waste stream: F039		U002
Methyl ethyl ketone 78-93-3	U159	Included in waste streams: F005, F039	200.0 mg/L regulatory level	U159
Cyclohexanone 108-94-1		Included in waste stream: F039		U057

California Hazardous Waste Status

Chemical Name	California Hazardous Waste Status
Tetrahydrofuran 109-99-9	Toxic Ignitable
Methyl ethyl ketone 78-93-3	Toxic Ignitable
Acetone 67-64-1	Ignitable

14. TRANSPORT INFORMATION

Note

Please see current shipping paper for most up to date shipping information, including exemptions and special circumstances. Shipments of containers holding 5 Liters or less per inner packaging may qualify for a "Limited Quantity" exception. Refer to 49 CFR 173.150 for additional information.

DOT

UN/ID No UN1133
Proper Shipping Name Adhesives
Hazard Class 3
Packing Group II

IATA

UN/ID No UN1133
Proper Shipping Name Adhesives
Hazard Class 3
Packing Group II

IMDG

UN/ID No	UN1133
Proper Shipping Name	Adhesives
Hazard Class	3
Packing Group	II
Marine Pollutant	No

15. REGULATORY INFORMATION

International Inventories

TSCA Listed

Legend:

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory

DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List

EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances

ENCS - Japan Existing and New Chemical Substances

IECSC - China Inventory of Existing Chemical Substances

KECL - Korean Existing and Evaluated Chemical Substances

PICCS - Philippines Inventory of Chemicals and Chemical Substances

US Federal Regulations**CERCLA**

Chemical Name	Hazardous Substances RQs	CERCLA/SARA RQ	Reportable Quantity (RQ)
Tetrahydrofuran 109-99-9	1000 lb		RQ 1000 lb final RQ RQ 454 kg final RQ
Methyl ethyl ketone 78-93-3	5000 lb		RQ 5000 lb final RQ RQ 2270 kg final RQ
Cyclohexanone 108-94-1	5000 lb		RQ 5000 lb final RQ RQ 2270 kg final RQ
Acetone 67-64-1	5000 lb		RQ 5000 lb final RQ RQ 2270 kg final RQ

SARA 313

Not determined

US State Regulations**California Proposition 65**

This product may contain trace levels of chemicals known to the State of California to cause cancer. Exposure to these chemicals above the State of California 'No Significant Risk Level' is unlikely under normal use conditions.

U.S. State Right-to-Know Regulations

Chemical Name	New Jersey	Massachusetts	Pennsylvania
Tetrahydrofuran 109-99-9	X	X	X
Acetone 67-64-1	X	X	X
Methyl ethyl ketone 78-93-3	X	X	X
Cyclohexanone 108-94-1	X	X	X

PVC Resin 9002-86-2	X		
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16. OTHER INFORMATION

<u>NFPA</u>	Health Hazards	Flammability	Instability	Special Hazards
	2	3	1	None
<u>HMIS</u>	Health Hazards	Flammability	Physical Hazards	Personal Protection
	2	3	1	G

Issue Date	01-Jun-2010
Revision Date:	02-Oct-2013
Revision Note	New format

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 Safety Data Sheet



SAFETY DATA SHEET

1. Identification

Product identifier	AMCO CLEAR® TURBIDITY STANDARD, 10 NTU		
Other means of identification			
Product code	8014		
Recommended use	Reagent for determination of turbidity of liquids.		
Recommended restrictions	None known.		
Manufacturer/Importer/Supplier/Distributor information			
Manufacturer			
Company name	GFS Chemicals, Inc.		
Address	P.O. Box 245 Powell, OH 43065 United States		
Telephone	Phone	740-881-5501	
	Toll Free	800-858-9682	
	Fax	740-881-5989	
Website	www.gfschemicals.com		
E-mail	service@gfschemicals.com		
Emergency phone number	Emergency Assistance	Chemtrec 800-424-9300	

2. Hazard(s) identification

Physical hazards	Not classified.
Health hazards	Not classified.
Environmental hazards	Not classified.
OSHA defined hazards	Not classified.
No hazards resulting from the material as supplied.	

Label elements

Hazard symbol	None.
Signal word	None.
Hazard statement	Not available.
Precautionary statement	
Prevention	Not available.
Response	Not available.
Storage	Not available.
Disposal	Not available.
Hazard(s) not otherwise classified (HNOC)	None known.
Supplemental information	None.

3. Composition/information on ingredients

Mixtures

Chemical name	Common name and synonyms	CAS number	%
WATER		7732-18-5	90 - 100
STYRENE DIVINYLBENZENE COPOLYMER BEADS		9003-70-7	<0.1
Other components below reportable levels			< 0.1

*Designates that a specific chemical identity and/or percentage of composition has been withheld as a trade secret.

4. First-aid measures

Inhalation	Move to fresh air. Call a physician if symptoms develop or persist.
Skin contact	Dry skin with paper towel or similar.
Eye contact	Rinse with water. Get medical attention if irritation develops and persists.

Material name: AMCO CLEAR® TURBIDITY STANDARD, 10 NTU

8014

Version #: 01

Revision date: Issue date: December-17-2014

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Ingestion	Get medical attention if symptoms occur.
Most important symptoms/effects, acute and delayed	Not available.
Indication of immediate medical attention and special treatment needed	Treat symptomatically.

5. Fire-fighting measures

Suitable extinguishing media	Use extinguishing agent suitable for type of surrounding fire. Water fog. Foam. Dry chemical powder. Carbon dioxide (CO2).
Unsuitable extinguishing media	Not available.
Specific hazards arising from the chemical	Not applicable.
Special protective equipment and precautions for firefighters	Wear suitable protective equipment.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	No special precautions.
Methods and materials for containment and cleaning up	Containment of this material should not be necessary. This product is miscible in water. Flush with water. Never return spills in original containers for re-use. For waste disposal, see section 13 of the SDS.
Environmental precautions	No special environmental precautions required.

7. Handling and storage

Precautions for safe handling	No special precautions required.
Conditions for safe storage, including any incompatibilities	Do not allow material to freeze.

8. Exposure controls/personal protection

Occupational exposure limits	No exposure limits noted for ingredient(s).
Biological limit values	No biological exposure limits noted for the ingredient(s).
Appropriate engineering controls	Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level.
Individual protection measures, such as personal protective equipment	
Eye/face protection	Not normally needed.
Skin protection	
Hand protection	Not normally needed.
Other	Normal work clothing (long sleeved shirts and long pants) is recommended.
Respiratory protection	No personal respiratory protective equipment normally required.
Thermal hazards	Not available.
General hygiene considerations	Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Appearance	Cloudy.
Physical state	Liquid.
Form	Aqueous solution.
Color	Colorless to white.
Odor	Odorless.
Odor threshold	Not available.
pH	6.7
Melting point/freezing point	32 °F (0 °C) estimated

Initial boiling point and boiling range	212 °F (100 °C) estimated
Flash point	Not available.
Evaporation rate	Not available.
Flammability (solid, gas)	Not available.
Upper/lower flammability or explosive limits	
Flammability limit - lower (%)	Not available.
Flammability limit - upper (%)	Not available.
Explosive limit - lower (%)	Not available.
Explosive limit - upper (%)	Not available.
Vapor pressure	0.00001 hPa estimated
Vapor density	Not available.
Relative density	Not available.
Solubility(ies)	
Solubility (water)	Completely Miscible
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.
Viscosity	Not available.
Other information	
Density	1.00 g/cm3 estimated
Percent volatile	> 99.9 %
Specific gravity	1.00 estimated

10. Stability and reactivity

Reactivity	Not available.
Chemical stability	Material is stable under normal conditions.
Possibility of hazardous reactions	Hazardous polymerization does not occur.
Conditions to avoid	Do not freeze.
Incompatible materials	None known.
Hazardous decomposition products	No hazardous decomposition products are known.

11. Toxicological information

Information on likely routes of exposure

Inhalation	Due to lack of data the classification is not possible.
Skin contact	Due to lack of data the classification is not possible.
Eye contact	Due to lack of data the classification is not possible.
Ingestion	Based on available data, the classification criteria are not met.

Symptoms related to the physical, chemical and toxicological characteristics Not available.

Information on toxicological effects

Acute toxicity

Product	Species	Test Results
AMCO CLEAR® TURBIDITY STANDARD, 10 NTU (CAS Mixture)		
Acute		
<i>Dermal</i>		
LD50	Rabbit	99999 mg/kg

Product	Species	Test Results
<i>Oral</i>		
LD50	Bird	99999 mg/kg
	Mouse	99999 mg/kg
	Rat	99999 mg/kg
TD	Rat	99999 mg/kg
TDL0	Rat	99999 mg/kg

* Estimates for product may be based on additional component data not shown.

Skin corrosion/irritation Due to lack of data the classification is not possible.

Serious eye damage/eye irritation Due to lack of data the classification is not possible.

Respiratory or skin sensitization

Respiratory sensitization Due to lack of data the classification is not possible.

Skin sensitization Due to lack of data the classification is not possible.

Germ cell mutagenicity Due to lack of data the classification is not possible.

Carcinogenicity This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.

Reproductive toxicity Due to lack of data the classification is not possible.

Specific target organ toxicity - single exposure Due to lack of data the classification is not possible.

Specific target organ toxicity - repeated exposure Due to lack of data the classification is not possible.

Aspiration hazard Due to lack of data the classification is not possible.

Chronic effects Prolonged inhalation may be harmful.

Further information This product has no known adverse effect on human health.

12. Ecological information

Ecotoxicity Contains a substance which causes risk of hazardous effects to the environment. Not applicable.

Product	Species	Test Results
AMCO CLEAR® TURBIDITY STANDARD, 10 NTU (CAS Mixture)		
Aquatic		
Crustacea	EC50	Daphnia
		37000 mg/l, 48 hours estimated
Fish	LC50	Fish
		22840.0156 mg/l, 96 hours estimated

* Estimates for product may be based on additional component data not shown.

Persistence and degradability No data is available on the degradability of this product.

Bioaccumulative potential Not available.

Mobility in soil Not available.

Other adverse effects Not available.

13. Disposal considerations

Disposal instructions Wash to drains with lots of water. Dispose in accordance with all applicable regulations.

Hazardous waste code Not regulated.

Waste from residues / unused products Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).

Contaminated packaging Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. Transport information

DOT

Not regulated as dangerous goods.

IATA

Not regulated as dangerous goods.

IMDG

Not regulated as dangerous goods.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code This substance/mixture is not intended to be transported in bulk.

15. Regulatory information

US federal regulations All components are on the U.S. EPA TSCA Inventory List.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

CERCLA Hazardous Substance List (40 CFR 302.4)

Not listed.

SARA 304 Emergency release notification

Not regulated.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories Immediate Hazard - No
Delayed Hazard - No
Fire Hazard - No
Pressure Hazard - No
Reactivity Hazard - No

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical No

SARA 313 (TRI reporting)
Not regulated.

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Safe Drinking Water Act (SDWA) Not regulated.

US state regulations

California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65): This material is not known to contain any chemicals currently listed as carcinogens or reproductive toxins.

US. California Controlled Substances. CA Department of Justice (California Health and Safety Code Section 11100)

Not listed.

US. Massachusetts RTK - Substance List

Not regulated.

US. New Jersey Worker and Community Right-to-Know Act

Not listed.

US. Pennsylvania Worker and Community Right-to-Know Law

Not listed.

US. Rhode Island RTK

Not regulated.

US. California Proposition 65

Not Listed.

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	No
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes

Country(s) or region	Inventory name	On inventory (yes/no)*
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

Issue date	December-17-2014
Version #	01
Disclaimer	The information in the sheet was written based on the best knowledge and experience currently available. 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.
Revision Information	Product and Company Identification: Product Codes

SAFETY DATA SHEET

according to Regulation (EC) No. 453/2010

BAROID® GRANULAR 30 MESH BENTONITE

Revision Date: 20-Dec-2012

Revision Number: 11

1. IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

Product Identifier

Product Name BAROID® GRANULAR 30 MESH BENTONITE

Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Weight Additive
Uses Advised Against No information available

Details of the supplier of the safety data sheet

Halliburton Energy Services
Halliburton House, Howemoss Place
Kirkhill Industrial Estate
Dyce
Aberdeen, AB21 0GN
United Kingdom

Emergency Phone Number: +44 1224 795277 or +1 281 575 5000

www.halliburton.com

For further information, please contact

E-Mail address: fdunexchem@halliburton.com

Emergency telephone number

+44 1224 795277 or +1 281 575 5000

Emergency telephone §45 - (EC)1272/2008	
Europe	112
Denmark	Poison Control Hotline (DK): +45 82 12 12 12
France	ORFILA (FR): + 01 45 42 59 59
Germany	Poison Center Berlin (DE): +49 030 30686 790
Italy	Poison Center, Milan (IT): +39 02 6610 1029
Netherlands	National Poisons Information Center (NL): +31 30 274 88 88 (NB: this service is only available to health professionals)
Norway	Poisons Information (NO):+ 47 22 591300
Poland	Poison Control and Information Centre, Warsaw (PL): +48 22 619 66 54; +48 22 619 08 97
Spain	Poison Information Service (ES): +34 91 562 04 20
United Kingdom	NHS Direct (UK): +44 0845 46 47

2. HAZARDS IDENTIFICATION

Classification of the substance or mixture

REGULATION (EC) No 1272/2008

Carcinogenicity	Category 1A - (H350)
Specific Target Organ Toxicity - (Repeated Exposure)	Category 1 - (H372)

Classification according to EU Directives 67/548/EEC or 1999/45/EC

For the full text of the R-phrases mentioned in this Section, see Section 16

2. HAZARDS IDENTIFICATION

Classification Crystalline silica is not classified as a carcinogen in EU Council Directives 67/548/EEC and 88/379/EEC.

Risk Phrases None

Label Elements

Hazard Pictograms



Signal Word Danger

Hazard Statements

H350i - May cause cancer by inhalation

H372 - Causes damage to organs through prolonged or repeated exposure

Contains

Substances	CAS Number
Crystalline silica, cristobalite	14464-46-1
Crystalline silica, tridymite	15468-32-3
Bentonite	1302-78-9
Crystalline silica, quartz	14808-60-7

Precautionary Statements - EU (§28, 1272/2008)

P201 - Obtain special instructions before use

P308 + P313 - IF exposed or concerned: Get medical advice/attention

Other Hazards

None known

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substances	EINECS	CAS Number	PERCENT	EEC Classification	EU - CLP Substance Classification	REACH No.
Crystalline silica, cristobalite	238-455-4	14464-46-1	0 - 1%	Not applicable	Carc. 1A (H350i) STOT RE 1 (H372)	No data available
Crystalline silica, tridymite	239-487-1	15468-32-3	0 - 1%	Not applicable	Carc. 1A (H350i) STOT RE 1 (H372)	No data available
Bentonite	215-108-5	1302-78-9	60 - 100%	Not applicable	Not applicable	No data available
Crystalline silica, quartz	238-878-4	14808-60-7	< 3	Not applicable	Carc. 1A (H350i) STOT RE 1 (H372)	No data available

For the full text of the R-phrases mentioned in this Section, see Section 16

4. FIRST AID MEASURES

Description of first aid measures

4. FIRST AID MEASURES

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Eyes	In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.
Skin	Wash with soap and water. Get medical attention if irritation persists.
Ingestion	Under normal conditions, first aid procedures are not required.

Most Important symptoms and effects, both acute and delayed

May cause eye irritation.

Indication of any immediate medical attention and special treatment needed

Notes to Physician Treat symptomatically

5. FIREFIGHTING MEASURES

Extinguishing media

Suitable Extinguishing Media

All standard fire fighting media

Extinguishing media which must not be used for safety reasons

None known.

Special hazards arising from the substance of mixture

Special Exposure Hazards

Not applicable.

Advice for firefighters

Special Protective Equipment for Fire-Fighters

Not applicable.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment. Avoid creating and breathing dust.

See Section 12 for additional information

Environmental precautions

None known.

Methods and material for containment and cleaning up

Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

Reference to other sections

See Section 12 for additional information.

7. HANDLING AND STORAGE

Precautions for Safe Handling

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice

Conditions for safe storage, including any incompatibilities

Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Do not reuse empty container.

Specific End Use(s)

Exposure Scenario

No information available

Other Guidelines

No information available

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Substances	EU	UK OEL	Netherlands	France OEL	Germany MAK/TRK
Crystalline silica, cristobalite	Not applicable	0.1 mg/m ³	0,075 mg/m ³	0.05 mg/m ³	0,15 mg/m ³
Crystalline silica, tridymite	Not applicable	0.1 mg/m ³	0,075 mg/m ³	0.05 mg/m ³	Not applicable
Bentonite	Not applicable	10 mg/m ³	Not applicable	Not applicable	Not applicable
Crystalline silica, quartz	Not applicable	0.1 mg/m ³	0,075 mg/m ³	0.1 mg/m ³	0,15 mg/m ³

Substances	Italy	Poland	Hungary	Czech Republic	Denmark
Crystalline silica, cristobalite	Not applicable	2 mg/m ³	0.15 mg/m ³	0.1 mg/m ³	Not applicable
Crystalline silica, tridymite	Not applicable	2 mg/m ³	0.15 mg/m ³	0.1 mg/m ³	Not applicable
Bentonite	Not applicable	Not applicable	Not applicable	6.0 mg/m ³	Not applicable
Crystalline silica, quartz	Not applicable	2 mg/m ³	0.15 mg/m ³	Not applicable	Not applicable

Derived No Effect Level (DNEL) No information available.

Predicted No Effect Concentration (PNEC) No information available.

Exposure controls

Engineering Controls

Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits listed in Section 2.

Personal protective equipment

Respiratory Protection

Not normally needed. But if significant exposures are possible then the following respirator is recommended:

Dust/mist respirator. (N95, P2/P3)

Hand Protection

Normal work gloves.

Skin Protection

Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing.

Eye Protection

Wear safety glasses or goggles to protect against exposure.

Other Precautions

None known.

Environmental Exposure Controls No information available

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical State: Solid

Color: Various

Odor: Odorless

Odor Threshold: No information available

Property

Values

Remarks/ Method

pH:

9.9

Melting Point/Range

No data available

Freezing Point/Range (C):

No data available

Boiling Point/Range

No data available

Flash Point

No data available

Evaporation rate

No data available

Vapor Pressure

No data available

Vapor Density

No data available

Specific Gravity

2.65

Water Solubility

Insoluble in water

Solubility in other solvents

No data available

Partition coefficient: n-octanol/water

No data available

Autoignition Temperature

No data available

Decomposition Temperature

No data available

Viscosity

No data available

Explosive Properties

No information available

Oxidizing Properties

No information available

Other information

9. PHYSICAL AND CHEMICAL PROPERTIES

VOC Content (%)

No data available

10. STABILITY AND REACTIVITY

Reactivity

Not applicable

Chemical Stability

Stable

Possibility of Hazardous Reactions

Will Not Occur

Conditions to Avoid

None anticipated

Incompatible Materials

Hydrofluoric acid.

Hazardous Decomposition Products

Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C).

11. TOXICOLOGICAL INFORMATION

Information on Toxicological Effects**Acute Toxicity****Inhalation**

Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A).

Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).

Eye Contact
Skin Contact
Ingestion

May cause eye irritation.
 May cause mechanical skin irritation.
 None known

Chronic Effects/Carcinogenicity

Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.

Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to IARC Monograph 68, *Silica, Some Silicates and Organic Fibres* (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2).

There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.

11. TOXICOLOGICAL INFORMATION

Substances	LD50 Oral	LD50 Dermal	LC50 Inhalation
Crystalline silica, cristobalite	No data available	No data available	No data available
Crystalline silica, tridymite	No data available	No data available	No data available
Bentonite	No data available	No data available	No data available
Crystalline silica, quartz	No data available	No data available	No data available

12. ECOLOGICAL INFORMATION

Toxicity Ecotoxicity Effects

Substances	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Daphnia Magna (Water Flea)
Crystalline silica, cristobalite	No information available	No information available	No information available	No information available
Crystalline silica, tridymite	No information available	No information available	No information available	No information available
Bentonite	No information available	TLM96: 10000 ppm (Oncorhynchus mykiss)	No information available	No information available
Crystalline silica, quartz	No information available	No information available	No information available	No information available

Persistence and degradability

The methods for determining biodegradability are not applicable to inorganic substances.

Bioaccumulative potential

No information available

Mobility in soil

No information available

Results of PBT and vPvB assessment

No information available.

Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. DISPOSAL CONSIDERATIONS

Waste treatment methods

Disposal Method

Bury in a licensed landfill according to federal, state, and local regulations.

Contaminated Packaging

Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

IMDG/IMO

UN Number: Not restricted.
UN Proper Shipping Name: Not restricted
Transport Hazard Class(es): Not applicable

RID

UN Number: Not restricted.
UN Proper Shipping Name: Not restricted
Transport Hazard Class(es): Not applicable

14. TRANSPORT INFORMATION**ADR**

UN Number: Not restricted.
UN Proper Shipping Name: Not restricted
Transport Hazard Class(es): Not applicable

IATA/ICAO

UN Number: Not restricted.
UN Proper Shipping Name: Not restricted
Transport Hazard Class(es): Not applicable

Special Precautions for User None
Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code Not applicable

15. REGULATORY INFORMATION**Safety, health and environmental regulations/legislation specific for the substance or mixture****International Inventories**

EINECS Inventory This product, and all its components, complies with EINECS
US TSCA Inventory All components listed on inventory or are exempt.
Canadian DSL Inventory All components listed on inventory or are exempt.

Legend

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
EINECS/ELINCS - European Inventory of Existing Commercial Chemical Substances/EU List of Notified Chemical Substances
DSL/NDL - Canadian Domestic Substances List/Non-Domestic Substances List

Germany, Water Endangering Classes (WGK) WGK 0: Generally not water endangering.

Chemical Safety Assessment

No information available

16. OTHER INFORMATION**Full text of R-phrases referred to under Sections 2 and 3**

None

Key literature references and sources for data

www.ChemADVISOR.com/

Revision Date: 20-Dec-2012
Revision Note Not applicable

This safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

End of Safety Data Sheet



LEHIGH CEMENT COMPANY
EVANSVILLE PLANT

CEMENT TEST REPORT

Date : May 20, 2008
Cement : Type 2
Trailer:

Plant : Evansville, Pa
Silo : 34

CHEMICAL REQUIREMENTS ASTM C 114	TEST RESULT	SPECIFICATION LIMITS	
		Type 2	
		ASTM C150	AASHTO M85
Silicon Dioxide (SiO ₂)	19.49		> 20.0
Aluminum Oxide (Al ₂ O ₃)	4.99		
Ferric Oxide (Fe ₂ O ₃)	3.53		
Calcium Oxide (CaO)	62.38		
Magnesium Oxide (MgO)	3.01		
Sulphur Trioxide (SO ₃)	3.41	3.5 max	3.5 max
Ignition Loss	1.34	3.0 max	3.0 max
Insoluble Residue	0.10	0.75 max	0.75 max
Carbon Dioxide - CO ₂ %	0.19		
Limestone %	0.46	5 % max.	5 % max.
CaCO ₃ % in Limestone	94.5	70 % min	70 % min
Tricalcium Silicate (C ₃ S)	56.6		
Tricalcium Aluminate (C ₃ A)	7.2	< 8	< 8
C ₃ S + 4.75C ₃ A	90.8	100 max	100 max
Equivalent Alkalies(Na ₂ O+.658K ₂ O)	0.88		
Chloride (Cl)	0.03		
PHYSICAL REQUIREMENTS			
(ASTM C 187) Normal Consistency, %	27.2		
(ASTM C 204) Blaine Fineness, m ² /kg	409	260 min / 430 max	260 min / 430 max
Average Blaine Fineness, m ² /kg- Ave last 5	408	280 min / 420 max	280 min / 420 max
(ASTM C 430) - 325 Mesh, % Retained	8.4		
(ASTM C 151) Autoclave Expansion, %	0.10	0.80 max	0.80 max
(ASTM C 191) Time of Setting - Initial (Vicat)	98	45 min / 375 max	45 min / 375 max
(ASTM C 185) Air Content, %	7.0	12 max	12 max
Heat of Hydration (7 days) cal / gr.	-	80 max	80 max
(ASTM C 109) Compressive Strength, psi			
1 Day	2891		
3 Day	4003	1740 min	1740 min
7 Day	4584	2760 min	2760 min
Previous Month-28 Days	5797		
(ASTM C 1038) Expansion @ 14 days,%	0.011	0.020 max	0.020 max
Color Index	31		

Test data shown above is representative of the silo which the cement was taken from. We hereby certify that the cement shipped in the above carrier conforms to present ASTM C-150 standard specifications for Type II Cement. Since Lehigh Cement has no control on the final use of our cements we do not guarantee the finished product.

Ronald Huard
Ronald Huard
Plant Chemist



CEMENT MILL TEST RESULTS

This form is for use by a cement/blended cement mill in reporting test results to the Bureau of Construction and Materials, Materials and Testing Division, P.O. Box 2926, Harrisburg, PA, 17105-2926. **Complete fillable fields, print and sign before submitting.**

Mill <u>Evansville Plant</u>	Mill Location <u>Fleetwood, PA, USA</u>
Silo/Lot Number <u>08-34-C</u>	Date(s) Produced (Ground) <u>5/20/2008</u>
Cement Type <u>Type II</u>	Other _____
Quantity and Unit <u>3000 Tons</u>	Mill Test Date <u>5/20/2008</u>

List below only those properties required by the Specification for the type of cement indicated

<u>CHEMICAL RESULTS</u>	<u>PHYSICAL RESULTS</u>
Silica (SiO ₂) <u>20.00</u> %	Air Content (AASHTO T 137) <u>6.5</u> %
Lime (CaO) <u>62.05</u> %	Finene: (Turbidimeter) <u>-</u> m ² /kg
Alumina (Al ₂ O ₃) <u>5.20</u> %	Finen ess (Blaine) <u>408</u> m ² /kg
Iron Oxide (Fe ₂ O ₃) <u>3.46</u> %	Finene: (Average of 5) <u>402</u> m ² /kg
Magnesia (MgO) <u>2.95</u> %	Soundness-Autoclave Expansion <u>0.10</u> %
Sulfur Trioxide (SO ₃) <u>3.32</u> %	Compressive Strength:
Loss on Ignition <u>1.27</u> %	1 Day <u>2946 (20.3)</u> psi (MPa)
Insoluble Residue <u>0.25</u> %	3 Day <u>4005 (27.6)</u> psi (MPa)
Alkalies (Na ₂ O + 0.658 K ₂ O) <u>0.85</u> %	7 Day <u>4832 (33.3)</u> psi (MPa)
Tricalcium Aluminate (C ₃ A) <u>7.90</u> %	Normal Consistency (AASHTO T 129) <u>26.8</u> %
Tricalcium Silicate (C ₃ S) <u>50.70</u> %	Time of Setting by Vicat
C ₃ S + 4.75 C ₃ A <u>88.30</u> %	Initial Set <u>90</u> min.
Carbon Dioxide (CO ₂) <u>0.17</u> %	Final Set <u>189</u> min.
Limestone <u>0.40</u> %	False Set <u>-</u> %
CaCO ₃ in Limestone <u>94.50</u> %	ASTM C 1038 Mortar Bars <u>0.014</u> %
	ASTM C 186
	Heat of Hydration (7 day) <u>-</u> cal/g (kJ/kg)
	Date Performed <u>5/1/2008</u>

We certify that the above-described cement, at the time of shipment, meets the chemical and physical requirements of AASHTO M 85 (latest version)

Authorized Signature Ronald Howard Title Quality Manager Date 1-May

Citra Solv

MSDS Number: S100C

Revision Date: 4/1/2015

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1 PRODUCT AND COMPANY IDENTIFICATION

Manufacturer

Wechem, Inc
5734 Susitna Dr
Harahan, LA 70123

Contact: Ligia M. Hernandez
Phone: 504-733-1152
Fax: 504-733-2218
Web: www.wechem.com

Product Name: Citra Solv
Revision Date: 4/1/2015
MSDS Number: S100C
Product Code: S100
Product Use: Heavy Duty Cleaning Solvent

Emergency Telephone Number:
INFOTRAC
1-800-535-5053

2 HAZARDS IDENTIFICATION

Route of Entry: Ingestion, eye, inhalation, skin
Target Organs: N/A
Inhalation: May cause irritation of nose, throat and central nervous system. May be Harmful if swallowed and enters airways.
Skin Contact: Causes skin Irritation.
Eye Contact: Causes Eye Irritation.
Ingestion: Irritation of digestive tract and central nervous system effects. May be Harmful if swallowed and enters airways.

PERSONAL PROTECTION INDEX													
A													
B													
C													
D													
E													
F													
G													
H													
I													
J													
K													
X	Consult your supervisor or S.O.P. for "SPECIAL" handling directions												
A		n		o		p		q		r		s	
t		u		w		y		z		Additional Information			

Citra Solv

MSDS Number: S100C

Revision Date: 4/1/2015

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GHS Signal Word:
WARNING

GHS Hazard Pictograms:



GHS Classifications:

- Physical, Flammable Liquids, 4
- Health, Aspiration hazard, 2
- Health, Skin corrosion/irritation, 2
- Health, Serious Eye Damage/Eye Irritation, 2 B
- Health, Specific target organ toxicity - Single exposure, 3

GHS Phrases:

- H227 - Combustible liquid
- H305 - May be harmful if swallowed and enters airways
- H315 - Causes skin irritation
- H320 - Causes eye irritation
- H335 - May cause respiratory irritation

GHS Precautionary Statements:

- P210 - Keep away from heat/sparks/open flames/hot surfaces. No smoking
- P211 - Do not spray on an open flame or other ignition source.
- P261 - Avoid breathing dust/fume/gas/mist/vapors/spray.
- P262 - Do not get in eyes, on skin, or on clothing.
- P264 - Wash thoroughly after handling.
- P271 - Use only outdoors or in a well-ventilated area.
- P280 - Wear protective gloves/protective clothing/eye protection/face protection.
- P301+330+331 - IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
- P301+310 - IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.
- P302+352 - IF ON SKIN: Wash with soap and water.
- P303+361+353 - IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
- P333+313 - If skin irritation or a rash occurs: Get medical advice/attention.
- P304+340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
- P309+311 - IF exposed or you feel unwell: Call a POISON CENTER or doctor/physician.
- P305+351+338 - IF IN EYES: Rinse continuously with water for several minutes. Remove contact lenses if present and easy to do.

Continue rinsing.

- P337 - If eye irritation persists: Get medical advice/attention.
- P403+233 - Store in a well ventilated place. Keep container tightly closed.
- P501 - Dispose of contents/container in accordance with local/regional/national/international regulations.

Citra Solv

MSDS Number: S100C

Revision Date: 4/1/2015

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3 COMPOSITION/INFORMATION ON INGREDIENTS

Ingredients:

Cas #	Perc.	Chemical Name	OSHA (ppm)	PEL	ACGIH TLV (PPM)	Carcin. Ref.
NA	>90	solvent Mixture	100		100	D

This product is proprietary blend and chemical identity is withheld as trade secret as per 29 CFR 1910.1200.

4 FIRST AID MEASURES

Inhalation:	Move victim to fresh air. Get medical attention if symptoms develop or persist.
Skin Contact:	Wash off with soap and water. Remove and isolate contaminated clothing and shoes. Get medical attention if irritation develops and persists.
Eye Contact:	In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. If easy to do, remove contact lenses, if worn. Get immediate medical advice/attention.
Ingestion:	If swallowed, do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get immediate medical advice/attention.

5 FIRE FIGHTING MEASURES

Flammability:	Combustible
Flash Point:	156 Deg F
Flash Point Method:	PMCC

Extinguishing media: Foam, dry chemical, carbon dioxide

Special Fire fighting procedures: Self contained breathing apparatus and protective clothing. Cool fire-exposed containers to prevent rupturing.

Unusual Fire & Explosion Hazards: None

6 ACCIDENTAL RELEASE MEASURES

Use personal protection recommended in Section 8. Isolate the hazard area and deny entry to unnecessary and unprotected personnel. Avoid any contact with the skin and eyes.

Contain and/or absorb spill with inert material (e.g. sand, vermiculite), then place in a suitable container. Do not flush to sewer or allow to enter waterways. Use appropriate Personal Protective Equipment (PPE).

Scoop up material and place in a disposal container. Provide ventilation.

Citra Solv

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7 HANDLING AND STORAGE

Handling Precautions: Combustible liquid. Keep away from sources of ignition-No smoking. Do not breathe gas/fumes/vapor/spray. Use in well-ventilated areas. Do not get in eyes, on skin, or on clothing. Do not swallow. Handle and open container with care. When using do not eat, drink or smoke. Handle in accordance with good industrial hygiene and safety practice.

Storage Requirements: Launder contaminated clothing before reuse. Wash hands before eating, drinking, or smoking. Combustible liquid. Keep out of reach of children. Keep container tightly closed and in a well-ventilated place. Do not store at temperatures above 49 C/120 F. Store in a cool dry, climate controlled area, away from incompatibles, sparks and open flame.

8 EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls: Ventilation Requirement: Local exhaust/mechanical

Personal Protective Equip: HMIS PP, B | Goggles, Gloves
 Respiratory Protection: Use a NIOSH-approved respirator in poorly ventilated areas or when permissible exposure limits may be exceeded..
 Protective gloves: Rubber/Neoprene
 Eye protection: Safety glasses/Chemical goggles

Hygienic work practices: Wash with soap and water before handling food. Do not eat, smoke, or drink where material is handled, processed or stored. Wash hands carefully before eating or smoking.

9 PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Clear, colorless to yellowish liquid	Odor:	Characteristic
Physical State:	Liquid	Solubility:	Insoluble
Spec Grav./Density:	(H2O=1): 0.80 +/- 0.1	Percent Volatile:	~100%
Viscosity:	Not available	Vapor Density:	(Air=1): Not determined
Boiling Point:	> 200 Deg F	VOC:	~100%
Flammability:	Combustible Liquid		
pH:	Not available		

10 STABILITY AND REACTIVITY

Stability: Stable and non-reactive under normal conditions of use, storage and transport.

Conditions to Avoid: Avoid heat, sparks, open flames and other ignition sources. Avoid temperatures exceeding the flash point. Contact with incompatible materials.

Materials to Avoid: Strong oxidizers

Hazardous Decomposition: Carbon dioxide, carbon monoxide

Hazardous Polymerization: Will not occur

Citra Solv

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TOXICOLOGICAL INFORMATION

Data summary for the components are as follows:

Solvent #1 (CAS N/A)

Acute Toxicity

Oral LD50 >15000 mg/kg

Dermal LD50 >3160 mg/kg

Solvent #2 (CAS N/A)

Acute Effects:

Oral LD50 >5 g/kg (Rabbits)

Dermal LD 50 > 5 g/kg (Rabbits)

Inhalation RD50 > 1 g/kg (Mice)

Prolonged contact can cause irritation, drying and cracking.

Repeated contact can cause irritation and reddening.

May cause irritation of nose, throat and central nervous system. May be Harmful or Fatal if swallowed and enters airways.

Irritation of digestive tract and central nervous system effects. May be Harmful or Fatal if swallowed and enters airways.

Small amounts of liquid aspirated into the lungs during ingestion from vomiting may cause chemical peumonitis or pulmonary edema.

12

ECOLOGICAL INFORMATION

Ecotoxicity: There is no information available at this time for this product.

13

DISPOSAL CONSIDERATIONS

This material must be disposed of in accordance with all local, state, provincial, and federal regulations.

14

TRANSPORT INFORMATION

Proper Shipping Name: Not Regulated

Citra Solv

MSDS Number: S100C

Revision Date: 4/1/2015

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REGULATORY INFORMATION

NA

*Solvent Blend (NA >90%) TSCA

REGULATORY KEY DESCRIPTIONS

TSCA = Toxic Substances Control Act

16

OTHER INFORMATION

We believe the statements, technical information and recommendations contained herein are reliable, but they are given without warranty or guarantee of any kind. ** Chemical listed as carcinogen or potential carcinogen. [a] NTP [b] IARC Monograph [c] OSHA [d] Not listed [e] Animal Data only
N/A = Not available N/D = Not determined



Safety Data Sheet

Material Name: Diesel Fuel, All Types

SDS No. 9909
US GHS

Synonyms: Ultra Low Sulfur Diesel; Low Sulfur Diesel; No. 2 Diesel; Motor Vehicle Diesel Fuel; Non-Road Diesel Fuel; Locomotive/Marine Diesel Fuel

*** Section 1 - Product and Company Identification ***

Manufacturer Information

Hess Corporation
1 Hess Plaza
Woodbridge, NJ 07095-0961

Phone: 732-750-6000 Corporate EHS
Emergency # 800-424-9300 CHEMTREC
www.hess.com (Environment, Health, Safety Internet Website)

*** Section 2 - Hazards Identification ***

GHS Classification:

Flammable Liquids - Category 3
Skin Corrosion/Irritation – Category 2
Germ Cell Mutagenicity – Category 2
Carcinogenicity - Category 2
Specific Target Organ Toxicity (Single Exposure) - Category 3 (respiratory irritation, narcosis)
Aspiration Hazard – Category 1
Hazardous to the Aquatic Environment, Acute Hazard – Category 3

GHS LABEL ELEMENTS

Symbol(s)



Signal Word

DANGER

Hazard Statements

Flammable liquid and vapor.
Causes skin irritation.
Suspected of causing genetic defects.
Suspected of causing cancer.
May cause respiratory irritation.
May cause drowsiness or dizziness.
May be fatal if swallowed and enters airways.
Harmful to aquatic life.

Precautionary Statements

Prevention

Keep away from heat/sparks/open flames/hot surfaces. No smoking
Keep container tightly closed.
Ground/bond container and receiving equipment.

Safety Data Sheet

Material Name: Diesel Fuel, All Types

SDS No. 9909

Use explosion-proof electrical/ventilating/lighting/equipment.
Use only non-sparking tools.
Take precautionary measures against static discharge.
Wear protective gloves/protective clothing/eye protection/face protection.
Wash hands and forearms thoroughly after handling.
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Avoid breathing fume/mist/vapours/spray.

Response

In case of fire: Use water spray, fog or foam to extinguish.
IF ON SKIN (or hair): Wash with plenty of soap and water. Remove/Take off immediately all contaminated clothing and wash it before reuse. If skin irritation occurs: Get medical advice/attention.
IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a poison center/doctor if you feel unwell.
If swallowed: Immediately call a poison center or doctor. Do NOT induce vomiting.
IF exposed or concerned: Get medical advice/attention.

Storage

Store in a well-ventilated place. Keep cool.
Keep container tightly closed.
Store locked up.

Disposal

Dispose of contents/container in accordance with local/regional/national/international regulations.

* * * Section 3 - Composition / Information on Ingredients * * *

CAS #	Component	Percent
68476-34-6	Fuels, diesel, no. 2	100
91-20-3	Naphthalene	<0.1

A complex mixture of hydrocarbons with carbon numbers in the range C9 and higher.

* * * Section 4 - First Aid Measures * * *

First Aid: Eyes

In case of contact with eyes, immediately flush with clean, low-pressure water for at least 15 min. Hold eyelids open to ensure adequate flushing. Seek medical attention.

First Aid: Skin

Remove contaminated clothing. Wash contaminated areas thoroughly with soap and water or with waterless hand cleanser. Obtain medical attention if irritation or redness develops. Thermal burns require immediate medical attention depending on the severity and the area of the body burned.

First Aid: Ingestion

DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration. Monitor for breathing difficulties. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

Safety Data Sheet

Material Name: Diesel Fuel, All Types

SDS No. 9909

First Aid: Inhalation

Remove person to fresh air. If person is not breathing, provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

* * * Section 5 - Fire Fighting Measures * * *

General Fire Hazards

See Section 9 for Flammability Properties.

Vapors may be ignited rapidly when exposed to heat, spark, open flame or other source of ignition. When mixed with air and exposed to an ignition source, flammable vapors can burn in the open or explode in confined spaces. Being heavier than air, vapors may travel long distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

Hazardous Combustion Products

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

Extinguishing Media

SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO₂, water spray, fire fighting foam, and other gaseous agents.

LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

Unsuitable Extinguishing Media

None

Fire Fighting Equipment/Instructions

Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other fire fighting equipment. Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing. Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

* * * Section 6 - Accidental Release Measures * * *

Recovery and Neutralization

Carefully contain and stop the source of the spill, if safe to do so.

Materials and Methods for Clean-Up

Take up with sand or other oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal. Caution, flammable vapors may accumulate in closed containers.

Emergency Measures

Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to confirm spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

Safety Data Sheet

Material Name: Diesel Fuel, All Types

SDS No. 9909

Personal Precautions and Protective Equipment

Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

Environmental Precautions

Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

Prevention of Secondary Hazards

None

* * * Section 7 - Handling and Storage * * *

Handling Procedures

Handle as a combustible liquid. Keep away from heat, sparks, excessive temperatures and open flame! No smoking or open flame in storage, use or handling areas. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.

Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil) is loaded into tanks previously containing low flash point products (such as this product) - see API Publication 2003, "Protection Against Ignitions Arising Out Of Static, Lightning and Stray Currents."

Storage Procedures

Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks."

Incompatibilities

Keep away from strong oxidizers.

* * * Section 8 - Exposure Controls / Personal Protection * * *

Component Exposure Limits

Fuels, diesel, no. 2 (68476-34-6)

ACGIH: 100 mg/m³ TWA (inhalable fraction and vapor, as total hydrocarbons, listed under Diesel fuel)
Skin - potential significant contribution to overall exposure by the cutaneous route (listed under Diesel fuel)

Safety Data Sheet

Material Name: Diesel Fuel, All Types

SDS No. 9909

Naphthalene (91-20-3)

ACGIH: 10 ppm TWA
15 ppm STEL
Skin - potential significant contribution to overall exposure by the cutaneous route
OSHA: 10 ppm TWA; 50 mg/m³ TWA
NIOSH: 10 ppm TWA; 50 mg/m³ TWA
15 ppm STEL; 75 mg/m³ STEL

Engineering Measures

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

Personal Protective Equipment: Respiratory

A NIOSH/MSHA-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited.

Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

Personal Protective Equipment: Hands

Gloves constructed of nitrile, neoprene, or PVC are recommended.

Personal Protective Equipment: Eyes

Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

Personal Protective Equipment: Skin and Body

Chemical protective clothing such as of E.I. DuPont TyChem®, Saranex® or equivalent recommended based on degree of exposure. Note: The resistance of specific material may vary from product to product as well as with degree of exposure. Consult manufacturer specifications for further information.

* * * Section 9 - Physical & Chemical Properties * * *

Appearance:	Clear, straw-yellow.	Odor:	Mild, petroleum distillate odor
Physical State:	Liquid	pH:	ND
Vapor Pressure:	0.009 psia @ 70 °F (21 °C)	Vapor Density:	>1.0
Boiling Point:	320 to 690 °F (160 to 366 °C)	Melting Point:	ND
Solubility (H₂O):	Negligible	Specific Gravity:	0.83-0.876 @ 60°F (16°C)
Evaporation Rate:	Slow; varies with conditions	VOC:	ND
Percent Volatile:	100%	Octanol/H₂O Coeff.:	ND
Flash Point:	>125 °F (>52 °C) minimum	Flash Point Method:	PMCC
Upper Flammability Limit (UFL):	7.5	Lower Flammability Limit (LFL):	0.6
Burning Rate:	ND	Auto Ignition:	494°F (257°C)

* * * Section 10 - Chemical Stability & Reactivity Information * * *

Chemical Stability

This is a stable material.

Hazardous Reaction Potential

Will not occur.

Safety Data Sheet

Material Name: Diesel Fuel, All Types

SDS No. 9909

Conditions to Avoid

Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources.

Incompatible Products

Keep away from strong oxidizers.

Hazardous Decomposition Products

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

* * * Section 11 - Toxicological Information * * *

Acute Toxicity

A: General Product Information

Harmful if swallowed.

B: Component Analysis - LD50/LC50

Naphthalene (91-20-3)

Inhalation LC50 Rat >340 mg/m³ 1 h; Oral LD50 Rat 490 mg/kg; Dermal LD50 Rat >2500 mg/kg; Dermal LD50 Rabbit >20 g/kg

Potential Health Effects: Skin Corrosion Property/Stimulativeness

Practically non-toxic if absorbed following acute (single) exposure. May cause skin irritation with prolonged or repeated contact. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are repeatedly exposed.

Potential Health Effects: Eye Critical Damage/ Stimulativeness

Contact with eyes may cause mild irritation.

Potential Health Effects: Ingestion

Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death may occur.

Potential Health Effects: Inhalation

Excessive exposure may cause irritations to the nose, throat, lungs and respiratory tract. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death.

WARNING: the burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death.

Respiratory Organs Sensitization/Skin Sensitization

This product is not reported to have any skin sensitization effects.

Generative Cell Mutagenicity

This material has been positive in a mutagenicity study.

Carcinogenicity

A: General Product Information

Suspected of causing cancer.

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Material Name: Diesel Fuel, All Types

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Studies have shown that similar products produce skin tumors in laboratory animals following repeated applications without washing or removal. The significance of this finding to human exposure has not been determined. Other studies with active skin carcinogens have shown that washing the animal's skin with soap and water between applications reduced tumor formation.

B: Component Carcinogenicity

Fuels, diesel, no. 2 (68476-34-6)

ACGIH: A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans (listed under Diesel fuel)

Naphthalene (91-20-3)

ACGIH: A4 - Not Classifiable as a Human Carcinogen

NTP: Reasonably Anticipated To Be A Human Carcinogen (Possible Select Carcinogen)

IARC: Monograph 82 [2002] (Group 2B (possibly carcinogenic to humans))

Reproductive Toxicity

This product is not reported to have any reproductive toxicity effects.

Specified Target Organ General Toxicity: Single Exposure

This product is not reported to have any specific target organ general toxicity single exposure effects.

Specified Target Organ General Toxicity: Repeated Exposure

This product is not reported to have any specific target organ general toxicity repeat exposure effects.

Aspiration Respiratory Organs Hazard

The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

* * * Section 12 - Ecological Information * * *

Ecotoxicity

A: General Product Information

Keep out of sewers, drainage areas and waterways. Report spills and releases, as applicable, under Federal and State regulations.

B: Component Analysis - Ecotoxicity - Aquatic Toxicity

Fuels, diesel, no. 2 (68476-34-6)

Test & Species

96 Hr LC50 Pimephales promelas	35 mg/L [flow-through]
--------------------------------	------------------------

Conditions

Naphthalene (91-20-3)

Test & Species

96 Hr LC50 Pimephales promelas	5.74-6.44 mg/L [flow-through]
96 Hr LC50 Oncorhynchus mykiss	1.6 mg/L [flow-through]
96 Hr LC50 Oncorhynchus mykiss	0.91-2.82 mg/L [static]
96 Hr LC50 Pimephales promelas	1.99 mg/L [static]

Conditions

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Material Name: Diesel Fuel, All Types

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96 Hr LC50 Lepomis macrochirus	31.0265 mg/L [static]
72 Hr EC50 Skeletonema costatum	0.4 mg/L
48 Hr LC50 Daphnia magna	2.16 mg/L
48 Hr EC50 Daphnia magna	1.96 mg/L [Flow through]
48 Hr EC50 Daphnia magna	1.09 - 3.4 mg/L [Static]

Persistence/Degradability

No information available.

Bioaccumulation

No information available.

Mobility in Soil

No information available.

*** Section 13 - Disposal Considerations ***

Waste Disposal Instructions

See Section 7 for Handling Procedures. See Section 8 for Personal Protective Equipment recommendations.

Disposal of Contaminated Containers or Packaging

Dispose of contents/container in accordance with local/regional/national/international regulations.

*** Section 14 - Transportation Information ***

DOT Information

Shipping Name: Diesel Fuel

NA #: 1993 Hazard Class: 3 Packing Group: III

Placard:



*** Section 15 - Regulatory Information ***

Regulatory Information

Component Analysis

This material contains one or more of the following chemicals required to be identified under SARA Section 302 (40 CFR 355 Appendix A), SARA Section 313 (40 CFR 372.65) and/or CERCLA (40 CFR 302.4).

Naphthalene (91-20-3)

CERCLA: 100 lb final RQ; 45.4 kg final RQ

SARA Section 311/312 – Hazard Classes

<u>Acute Health</u>	<u>Chronic Health</u>	<u>Fire</u>	<u>Sudden Release of Pressure</u>	<u>Reactive</u>
X	X	X	--	--

Safety Data Sheet

Material Name: Diesel Fuel, All Types

SDS No. 9909

SARA SECTION 313 - SUPPLIER NOTIFICATION

This product may contain listed chemicals below the de minimis levels which therefore are not subject to the supplier notification requirements of Section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and of 40 CFR 372. If you may be required to report releases of chemicals listed in 40 CFR 372.28, you may contact Hess Corporate Safety if you require additional information regarding this product.

State Regulations

Component Analysis - State

The following components appear on one or more of the following state hazardous substances lists:

Component	CAS	CA	MA	MN	NJ	PA	RI
Fuels, diesel, no. 2	68476-34-6	No	No	No	Yes	No	No
Naphthalene	91-20-3	Yes	Yes	Yes	Yes	Yes	No

The following statement(s) are provided under the California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65):

WARNING! This product contains a chemical known to the state of California to cause cancer.

Component Analysis - WHMIS IDL

No components are listed in the WHMIS IDL.

Additional Regulatory Information

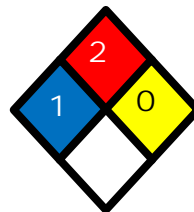
Component Analysis - Inventory

Component	CAS #	TSCA	CAN	EEC
Fuels, diesel, no. 2	68476-34-6	Yes	DSL	EINECS
Naphthalene	91-20-3	Yes	DSL	EINECS

*** Section 16 - Other Information ***

NFPA® Hazard Rating

Health	1
Fire	2
Reactivity	0



HMIS® Hazard Rating

Health	1*	Slight
Fire	2	Moderate
Physical	0	Minimal

*Chronic

Safety Data Sheet

Material Name: Diesel Fuel, All Types

SDS No. 9909

Key/Legend

ACGIH = American Conference of Governmental Industrial Hygienists; ADG = Australian Code for the Transport of Dangerous Goods by Road and Rail; ADR/RID = European Agreement of Dangerous Goods by Road/Rail; AS = Standards Australia; DFG = Deutsche Forschungsgemeinschaft; DOT = Department of Transportation; DSL = Domestic Substances List; EEC = European Economic Community; EINECS = European Inventory of Existing Commercial Chemical Substances; ELINCS = European List of Notified Chemical Substances; EU = European Union; HMIS = Hazardous Materials Identification System; IARC = International Agency for Research on Cancer; IMO = International Maritime Organization; IATA = International Air Transport Association; MAK = Maximum Concentration Value in the Workplace; NDSL = Non-Domestic Substances List; NFPA = National Fire Protection Association; NOHSC = National Occupational Health & Safety Commission; NTP = National Toxicology Program; STEL = Short-term Exposure Limit; TDG = Transportation of Dangerous Goods; TLV = Threshold Limit Value; TSCA = Toxic Substances Control Act; TWA = Time Weighted Average

Literature References

None

Other Information

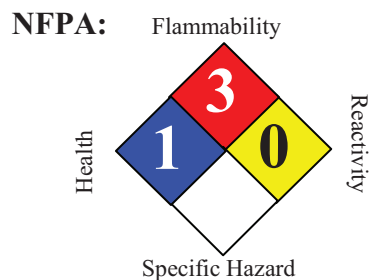
Information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgment.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

End of Sheet

Safety Data Sheet

Gasoline, Unleaded



SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Gasoline, Unleaded			
Synonyms	:	Blend of Highly Flammable Petroleum Distillates, Regular, Mid-Grade, Premium, 888100008809			
SDS Number	:	888100008809	Version	:	1.1
Product Use Description	:	Fuel			
Company	:	For: Tesoro Refining & Marketing Co. 19100 Ridgewood Parkway, San Antonio, TX 78259			
Tesoro Call Center	:	(877) 783-7676	Chemtrec (Emergency Contact)	:	(800) 424-9300

SECTION 2. HAZARDS IDENTIFICATION

Classifications :

- Flammable Liquid – Category 1 or 2 depending on formulation.
- Aspiration Hazard – Category 1
- Carcinogenicity – Category 2
- Specific Target Organ Toxicity (Repeated Exposure) – Category 2
- Specific Target Organ Toxicity (Single Exposure) – Category 3
- Skin Irritation – Category 2
- Eye Irritation – Category 2B
- Chronic Aquatic Toxicity – Category 2

Pictograms :

Signal Word : **Danger**

Hazard Statements

- Extremely flammable liquid and vapor.
- May be fatal if swallowed and enters airways – do not siphon gasoline by mouth.
- Suspected of causing blood cancer if repeated over-exposure by inhalation and/or skin contact occurs.
- May cause damage to liver, kidneys and nervous system by repeated and prolonged inhalation or skin contact. Causes eye irritation. Can be absorbed through skin.
- May cause drowsiness or dizziness. Extreme exposure such as intentional inhalation may cause unconsciousness, asphyxiation and death.
- Repeated or prolonged skin contact can cause irritation and dermatitis.

Harmful to aquatic life.

Precautionary statements

Prevention

- : Obtain special instructions before use.
- Do not handle until all safety precautions have been read and understood.
- Keep away from heat, sparks, open flames, welding and hot surfaces.
- No smoking.
- Keep container tightly closed.
- Ground and/or bond container and receiving equipment.
- Use explosion-proof electrical equipment.
- Use only non-sparking tools (if tools are used in flammable atmosphere).
- Take precautionary measures against static discharge.
- Wear gloves, eye protection and face protection (as needed to prevent skin and eye contact with liquid).
- Wash hands or liquid-contacted skin thoroughly after handling.
- Do not eat, drink or smoke when using this product.
- Do not breathe vapors.
- Use only outdoors or in a well-ventilated area.

Response

- : In case of fire: Use dry chemical, CO₂, water spray or fire fighting foam to extinguish.
- If swallowed: Immediately call a poison center, doctor, hospital emergency room, medical clinic or 911. Do NOT induce vomiting. Rinse mouth.
- If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
- If in eye: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
- If skin or eye irritation persists, get medical attention.
- If inhaled: Remove person to fresh air and keep comfortable for breathing. Get medical attention if you feel unwell.

Storage

- : Store in a well ventilated place. Keep cool. Store locked up. Keep container tightly closed. Use only approved containers. Some containers not approved for gasoline may dissolve and release flammable gasoline liquid and vapors.

Disposal

- : Dispose of contents/containers to approved disposal site in accordance with local, regional, national, and/or international regulations.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No.	Weight %
Gasoline, natural; Low boiling point naphtha	8006-61-9	10 - 30%
Toluene	108-88-3	10 - 30%
Xylene	1330-20-7	10 - 30%
Ethanol; ethyl alcohol	64-17-5	0-8.2%
Trimethylbenzene	25551-13-7	1 - 5%
Isopentane; 2-methylbutane	78-78-4	1 - 5%

Naphthalene	91-20-3	1 - 5%
Benzene	71-43-2	Less than 1.3%
Pentane	109-66-0	1 - 5%
Cyclohexane	110-82-7	1 - 5%
Ethylbenzene	100-41-4	1 - 5%
Butane	106-97-8	1 - 20%
Heptane [and isomers]	142-82-5	0.5 - 0.75%
N-hexane	110-54-3	0.5 - 0.75%

SECTION 4. FIRST AID MEASURES

Inhalation	: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Seek medical attention immediately.
Skin contact	: In case of contact, immediately flush skin with plenty of water. Take off contaminated clothing and shoes immediately. Wash contaminated clothing before re-use. Contaminated leather, particularly footwear, must be discarded. Note that contaminated clothing may be a fire hazard. Seek medical advice if symptoms persist or develop.
Eye contact	: Remove contact lenses. Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Seek medical advice if symptoms persist or develop.
Ingestion	: Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Obtain medical attention.
Notes to physician	: Symptoms: Dizziness, Discomfort, Headache, Nausea, Kidney disorders, Liver disorders. Aspiration may cause pulmonary edema and pneumonitis. Swallowing gasoline is more likely to be fatal for small children than adults, even if aspiration does not occur.

SECTION 5. FIRE-FIGHTING MEASURES

Suitable extinguishing media	: SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO ₂ , water spray or fire fighting foam. LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers. Keep containers and surroundings cool with water spray.
Specific hazards during fire fighting	: Extremely flammable liquid and vapor. This material is combustible/flammable and is sensitive to fire, heat, and static discharge.
Special protective equipment for fire-fighters	: Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing.

Further information : Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam. Exposure to decomposition products may be a hazard to health. Use extinguishing measures that are appropriate to local circumstances and the surrounding environment. Use water spray to cool unopened containers. Fire residues and contaminated fire extinguishing water must be disposed of in accordance with local regulations.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions : Evacuate personnel to safe areas. Ventilate the area. Remove all sources of ignition. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

Environmental precautions : Discharge into the environment must be avoided. If the product contaminates rivers and lakes or drains inform respective authorities.

Methods for cleaning up : Contain and collect spillage with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations.

SECTION 7. HANDLING AND STORAGE

Precautions for safe handling : Keep away from fire, sparks and heated surfaces. No smoking near areas where material is stored or handled. The product should only be stored and handled in areas with intrinsically safe electrical classification.

Hydrocarbon liquids including this product can act as a non-conductive flammable liquid (or static accumulators), and may form ignitable vapor-air mixtures in storage tanks or other containers. Precautions to prevent static-initated fire or explosion during transfer, storage or handling, include but are not limited to these examples:

- (1) Ground and bond containers during product transfers. Grounding and bonding may not be adequate protection to prevent ignition or explosion of hydrocarbon liquids and vapors that are static accumulators.
- (2) Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil or diesel) is loaded into tanks previously containing low flash point products (such as gasoline or naphtha).
- (3) Storage tank level floats must be effectively bonded.

For more information on precautions to prevent static-initated fire or explosion, see NFPA 77, Recommended Practice on Static Electricity (2007), and API Recommended Practice 2003, Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents (2008).

Conditions for safe storage, including incompatibilities : Keep away from flame, sparks, excessive temperatures and open flame. Use approved containers. Keep containers closed and clearly labeled. Empty or partially full product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose containers to sources of ignition. Store in a well-ventilated area. The storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

Reports suggest that government-mandated ethanol, if present, may not be compatible with fiberglass gasoline tanks. Ethanol may dissolve fiberglass resin, causing engine damage and possibly allow leakage of explosive gasoline.

Keep away from food, drink and animal feed. Incompatible with oxidizing agents. Incompatible with acids.

No decomposition if stored and applied as directed. Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Store only in containers approved and labeled for gasoline.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines

List	Components	CAS-No.	Type:	Value
OSHA	Benzene	71-43-2	TWA	1 ppm
		71-43-2	STEL	5 ppm
		71-43-2	OSHA_ACT	0.5 ppm
OSHA Z1	Xylene	1330-20-7	PEL	100 ppm 435 mg/m3
	Ethanol; Ethyl alcohol	64-17-5	PEL	1,000 ppm 1,900 mg/m3
	Naphthalene	91-20-3	PEL	10 ppm 50 mg/m3
	Cyclohexane	110-82-7	PEL	300 ppm 1,050 mg/m3
	Ethylbenzene	100-41-4	PEL	100 ppm 435 mg/m3
	Heptane [and isomers]	142-82-5	PEL	500 ppm 2,000 mg/m3
	N-hexane	110-54-3	PEL	500 ppm 1,800 mg/m3
ACGIH	Toluene	108-88-3	TWA	50 ppm
	Xylene	1330-20-7	TWA	100 ppm
		1330-20-7	STEL	150 ppm
	Ethanol; Ethyl alcohol	64-17-5	TWA	1,000 ppm
	Trimethylbenzene	25551-13-7	TWA	25 ppm
	Isopentane; 2-Methylbutane	78-78-4	TWA	600 ppm
	Naphthalene	91-20-3	TWA	10 ppm
		91-20-3	STEL	15 ppm
	Benzene	71-43-2	TWA	0.5 ppm
		71-43-2	STEL	2.5 ppm
	Pentane	109-66-0	TWA	600 ppm
	Cyclohexane	110-82-7	TWA	100 ppm
	Ethylbenzene	100-41-4	TWA	100 ppm
100-41-4		STEL	125 ppm	
Heptane [and isomers]	142-82-5	TWA	400 ppm	
	142-82-5	STEL	500 ppm	

	N-hexane	110-54-3	TWA	50 ppm
Engineering measures	: Use adequate ventilation to keep gas and vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces. Use only intrinsically safe electrical equipment approved for use in classified areas.			
Eye protection	: Safety glasses or goggles are recommended where there is a possibility of splashing or spraying. Ensure that eyewash stations and safety showers are close to the workstation location.			
Hand protection	: Gloves constructed of nitrile or neoprene are recommended. Consult manufacturer specifications for further information.			
Skin and body protection	: If needed to prevent skin contact, chemical protective clothing such as of DuPont TyChem®, Saranex or equivalent recommended based on degree of exposure. Flame resistant clothing such as Nomex ® is recommended in areas where material is stored or handled.			
Respiratory protection	: A NIOSH/ MSHA-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited. Refer to OSHA 29 CFR 1910.134, ANSI Z88.2-1992, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection. Use a NIOSH/ MSHA-approved positive-pressure supplied-air respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.			
Work / Hygiene practices	: Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.			

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	: Clear to straw colored liquid
Odor	: Characteristic hydrocarbon-like
Odor threshold	0.5 - 1.1 ppm
pH	: Not applicable
Melting point/freezing point	About -101°C (-150°F)
Initial boiling point & range	Boiling point varies: 30 – 200°C (85 – 392°F)
Flash point	< -21°C (-5.8°F)
Evaporation rate	: Higher initially and declining as lighter components evaporate
Flammability (solid, gas)	: Flammable vapor released by liquid

Upper explosive limit	7.6 %(V)
Lower explosive limit	1.3 %(V)
Vapor pressure	345 - 1,034 hPa at 37.8 °C (100.0 °F)
Vapor density (air = 1)	Approximately 3 to 4
Relative density (water = 1)	0.8 g/mL
Solubility (in water)	Negligible
Partition coefficient (n-octanol/water)	2 – 7 as log Pow
Auto-ignition temperature	Approximately 250°C (480°F)
Decomposition temperature	Will evaporate or boil and possibly ignite before decomposition occurs.
Kinematic viscosity	0.64 to 0.88 mm ² /s range reported for gasoline
Conductivity (conductivity can be reduced by environmental factors such as a decrease in temperature)	: Hydrocarbon liquids without static dissipater additive may have conductivity below 1 picoSiemens per meter (pS/m). The highest electro-static ignition risks are associated with "ultra-low conductivities" below 5 pS/m. See Section 7 for sources of information on defining safe loading and handling procedures for low conductivity products.

SECTION 10. STABILITY AND REACTIVITY

Reactivity	: Vapors may form explosive mixture with air. Hazardous polymerization does not occur.
Chemical stability	: Stable under normal conditions.
Possibility of hazardous reactions	Can react with strong oxidizing agents, peroxides, alkaline products and strong acids. Contact with nitric and sulfuric acids will form nitroresols that can decompose violently.
Conditions to avoid	: Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources. Avoid static charge accumulation and discharge (see Section 7).
Hazardous decomposition products	: Ignition and burning can release carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

SECTION 11. TOXICOLOGICAL INFORMATION

Skin contact	: Irritating to skin. Can be partially absorbed through skin.
Eye contact	: Irritating to eyes.
Ingestion	: Aspiration hazard if liquid is inhaled into lungs, particularly from vomiting after ingestion. Aspiration may result in chemical pneumonia, severe lung damage, respiratory failure and even death. Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest and death may occur.

Inhalation and further information

Acute toxicity of benzene results primarily from depression of the central nervous system (CNS). Inhalation of concentrations over 50 ppm can produce headache, lassitude, weariness, dizziness, drowsiness, over excitation. Exposure to very high levels can result in unconsciousness and death.

Repeated over-exposure may cause liver and kidney injuries. Components of the product may affect the nervous system.

IARC has determined that gasoline and gasoline exhaust are possibly carcinogenic in humans. Inhalation exposure to completely vaporized unleaded gasoline caused kidney cancers in male rats and liver tumors in female mice. The U.S. EPA has determined that the male kidney tumors are species-specific and are irrelevant for human health risk assessment. The significance of the tumors seen in female mice is not known. Exposure to light hydrocarbons in the same boiling range as this product has been associated in animal studies with effects to the central and peripheral nervous systems, liver, and kidneys. The significance of these animal models to predict similar human response to gasoline is uncertain.

This product contains benzene. Human health studies indicate that prolonged and/or repeated overexposure to benzene may cause damage to the blood-forming system (particularly bone marrow), and serious blood disorders such as aplastic anemia and leukemia. Benzene is listed as a human carcinogen by the NTP, IARC, OSHA and ACGIH.

Component:

Gasoline, natural; Low boiling point naphtha	8006-61-9	<p><u>Acute oral toxicity:</u> LD50 rat Dose: 18.8 mg/kg</p> <p><u>Acute inhalation toxicity:</u> LC50 rat Dose: 20.7 mg/l Exposure time: 4 h</p> <p><u>Skin irritation:</u> Classification: Irritating to skin. Result: Mild skin irritation</p> <p><u>Eye irritation:</u> Classification: Irritating to eyes. Result: Moderate eye irritation</p>
Toluene	108-88-3	<p><u>Acute oral toxicity:</u> LD50 rat Dose: 636 mg/kg</p> <p><u>Acute dermal toxicity:</u> LD50 rabbit Dose: 12,124 mg/kg</p> <p><u>Acute inhalation toxicity:</u> LC50 rat Dose: 49 mg/l Exposure time: 4 h</p> <p><u>Skin irritation:</u> Classification: Irritating to skin. Result: Mild skin irritation Prolonged skin contact may defat the skin and produce dermatitis.</p> <p><u>Eye irritation:</u> Classification: Irritating to eyes. Result: Mild eye irritation</p>
Xylene	1330-20-7	<p><u>Acute oral toxicity:</u> LD50 rat Dose: 2,840 mg/kg</p> <p><u>Acute dermal toxicity:</u> LD50 rabbit Dose: ca. 4,500 mg/kg</p> <p><u>Acute inhalation toxicity:</u> LC50 rat Dose: 6,350 mg/l Exposure time: 4 h</p> <p><u>Skin irritation:</u> Classification: Irritating to skin. Result: Mild skin irritation</p>

Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product.

Eye irritation: Classification: Irritating to eyes.

Result: Mild eye irritation

Ethanol; Ethyl alcohol

64-17-5

Acute oral toxicity: LD50 rat

Dose: 6,200 mg/kg

Acute dermal toxicity: LD50 rabbit

Dose: 19,999 mg/kg

Acute inhalation toxicity: LC50 rat

Dose: 8,001 mg/l

Exposure time: 4 h

Skin irritation: Classification: Irritating to skin.

Result: Mild skin irritation

Prolonged skin contact may cause skin irritation and/or dermatitis.

Eye irritation: Classification: Irritating to eyes.

Result: Mild eye irritation

Mild eye irritation

Naphthalene

91-20-3

Acute oral toxicity: LD50 rat

Dose: 2,001 mg/kg

Acute dermal toxicity: LD50 rat

Dose: 2,501 mg/kg

Acute inhalation toxicity: LC50 rat

Dose: 101 mg/l

Exposure time: 4 h

Skin irritation: Classification: Irritating to skin.

Result: Mild skin irritation

Eye irritation: Classification: Irritating to eyes.

Result: Mild eye irritation

Carcinogenicity: N11.00422130

Benzene

71-43-2

Acute oral toxicity: LD50 rat

Dose: 930 mg/kg

Acute inhalation toxicity: LC50 rat

Dose: 44 mg/l

Exposure time: 4 h

Skin irritation: Classification: Irritating to skin.

Result: Mild skin irritation

Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product.

Eye irritation: Classification: Irritating to eyes.

Result: Risk of serious damage to eyes.

Pentane

109-66-0

Acute oral toxicity: LD50 rat

Dose: 2,001 mg/kg

Acute inhalation toxicity: LC50 rat

Dose: 364 mg/l

Exposure time: 4 h

Skin irritation: Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product.

Eye irritation: Classification: Irritating to eyes.

Result: Mild eye irritation

Cyclohexane

110-82-7

Acute dermal toxicity: LD50 rabbit

Dose: 2,001 mg/kg

Acute inhalation toxicity: LC50 rat

Dose: 14 mg/l

Exposure time: 4 h

		<p><u>Skin irritation:</u> Classification: Irritating to skin. Result: Skin irritation</p> <p><u>Eye irritation:</u> Classification: Irritating to eyes. Result: Mild eye irritation</p>
Ethylbenzene	100-41-4	<p><u>Acute oral toxicity:</u> LD50 rat Dose: 3,500 mg/kg</p> <p><u>Acute dermal toxicity:</u> LD50 rabbit Dose: 15,500 mg/kg</p> <p><u>Acute inhalation toxicity:</u> LC50 rat Dose: 18 mg/l Exposure time: 4 h</p> <p><u>Skin irritation:</u> Classification: Irritating to skin. Result: Mild skin irritation</p> <p><u>Eye irritation:</u> Classification: Irritating to eyes. Result: Risk of serious damage to eyes.</p>
Heptane [and isomers]	142-82-5	<p><u>Acute oral toxicity:</u> LD50 rat Dose: 15,001 mg/kg</p> <p><u>Acute inhalation toxicity:</u> LC50 rat Dose: 103 g/m³ Exposure time: 4 h</p> <p><u>Skin irritation:</u> Classification: Irritating to skin. Result: Skin irritation Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product.</p> <p><u>Eye irritation:</u> Classification: Irritating to eyes. Result: Mild eye irritation</p>
N-hexane	110-54-3	<p><u>Acute oral toxicity:</u> LD50 rat Dose: 25,000 mg/kg</p> <p><u>Acute dermal toxicity:</u> LD50 rabbit Dose: 2,001 mg/kg</p> <p><u>Acute inhalation toxicity:</u> LC50 rat Dose: 171.6 mg/l Exposure time: 4 h</p> <p><u>Skin irritation:</u> Classification: Irritating to skin. Result: Skin irritation</p> <p><u>Eye irritation:</u> Classification: Irritating to eyes. Result: Mild eye irritation</p> <p><u>Teratogenicity:</u> N11.00418960</p>

Carcinogenicity

NTP	:	Naphthalene (CAS-No.: 91-20-3) Benzene (CAS-No.: 71-43-2)
IARC	:	Gasoline, natural; Low boiling point naphtha (CAS-No.: 8006-61-9) Naphthalene (CAS-No.: 91-20-3) Benzene (CAS-No.: 71-43-2) Ethylbenzene (CAS-No.: 100-41-4)
OSHA	:	Benzene (CAS-No.: 71-43-2)
CA Prop 65	:	WARNING! This product contains a chemical known to the State of California to cause birth defects or other reproductive harm. Toluene (CAS-No.: 108-88-3)

Benzene (CAS-No.: 71-43-2)

SECTION 12. ECOLOGICAL INFORMATION

Additional ecological information : Keep out of sewers, drainage areas, and waterways. Report spills and releases, as applicable, under Federal and State regulations.

Component:

Toluene	108-88-3	<p><u>Toxicity to fish:</u> LC50 Species: Carassius auratus (goldfish) Dose: 13 mg/l Exposure time: 96 h</p> <p><u>Acute and prolonged toxicity for aquatic invertebrates:</u> EC50 Species: Daphnia magna (Water flea) Dose: 11.5 mg/l Exposure time: 48 h</p> <p><u>Toxicity to algae:</u> IC50 Species: Selenastrum capricornutum (green algae) Dose: 12 mg/l Exposure time: 72 h</p>
Ethanol; Ethyl alcohol	64-17-5	<p><u>Toxicity to fish:</u> LC50 Species: Leuciscus idus (Golden orfe) Dose: 8,140 mg/l Exposure time: 48 h</p> <p><u>Acute and prolonged toxicity for aquatic invertebrates:</u> EC50 Species: Daphnia magna (Water flea) Dose: 9,268 - 14,221 mg/l Exposure time: 48 h</p>
Isopentane; 2-Methylbutane	78-78-4	<p><u>Toxicity to fish:</u> LC50 Species: Oncorhynchus mykiss (rainbow trout) Dose: 3.1 mg/l Exposure time: 96 h</p> <p><u>Acute and prolonged toxicity for aquatic invertebrates:</u> EC50 Species: Daphnia magna (Water flea) Dose: 2.3 mg/l Exposure time: 96 h</p>
Naphthalene	91-20-3	<p><u>Toxicity to algae:</u> EC50 Species: Dose: 33 mg/l Exposure time: 24 h</p>
Pentane	109-66-0	<p><u>Acute and prolonged toxicity for aquatic invertebrates:</u> EC50 Species: Daphnia magna (Water flea) Dose: 9.74 mg/l Exposure time: 48 h</p>
Cyclohexane	110-82-7	<p><u>Acute and prolonged toxicity for aquatic invertebrates:</u> EC50 Species: Daphnia magna (Water flea) Dose: 3.78 mg/l Exposure time: 48 h</p>

Heptane [and isomers]	142-82-5	<u>Toxicity to fish:</u> LC50 Species: Carassius auratus (goldfish) Dose: 4 mg/l Exposure time: 24 h <u>Acute and prolonged toxicity for aquatic invertebrates:</u> EC50 Species: Daphnia magna (Water flea) Dose: 1.5 mg/l Exposure time: 48 h
N-hexane	110-54-3	<u>Toxicity to fish:</u> LC50 Species: Pimephales promelas (fathead minnow) Dose: 2.5 mg/l Exposure time: 96 h <u>Acute and prolonged toxicity for aquatic invertebrates:</u> EC50 Species: Daphnia magna (Water flea) Dose: 2.1 mg/l Exposure time: 48 h

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal : Dispose of container and unused contents in accordance with federal, state and local requirements.

SECTION 14. TRANSPORT INFORMATION

CFR

Proper shipping name : Petrol
 UN-No. : 1203
 Class : 3
 Packing group : II

TDG

Proper shipping name : Gasoline
 UN-No. : UN1203
 Class : 3
 Packing group : II

IATA Cargo Transport

UN UN-No. : UN1203
 Description of the goods : Gasoline
 Class : 3
 Packaging group : II
 ICAO-Labels : 3
 Packing instruction (cargo aircraft) : 364
 Packing instruction (cargo aircraft) : Y341

IATA Passenger Transport

UN UN-No. : UN1203
 Description of the goods : Gasoline
 Class : 3

Packaging group : II
 ICAO-Labels : 3
 Packing instruction (passenger aircraft) : 353
 Packing instruction (passenger aircraft) : Y341

IMDG-Code

UN-No. : UN 1203
 Description of the goods : Gasoline
 Class : 3
 Packaging group : II
 IMDG-Labels : 3
 EmS Number : F-E S-E
 Marine pollutant : No

SECTION 15. REGULATORY INFORMATION

OSHA Hazards : Flammable liquid
 Highly toxic by ingestion
 Moderate skin irritant
 Severe eye irritant
 Carcinogen

TSCA Status : On TSCA Inventory

DSL Status : . All components are on the Canadian DSL list.

SARA 311/312 Hazards : Fire Hazard
 Acute Health Hazard
 Chronic Health Hazard

CERCLA SECTION 103 and SARA SECTION 304 (RELEASE TO THE ENVIROMENT)

The CERCLA definition of hazardous substances contains a "petroleum exclusion" clause which exempts crude oil. Fractions of crude oil, and products (both finished and intermediate) from the crude oil refining process and any indigenous components of such from the CERCLA Section 103 reporting requirements. However, other federal reporting requirements, including SARA Section 304, as well as the Clean Water Act may still apply.

California Prop. 65 : WARNING! This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.

Toluene 108-88-3
 Benzene 71-43-2

SECTION 16. OTHER INFORMATIONFurther information

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.

Revision Date : 08/09/2012

6, 8, 10, 12, 14, 16, 64, 68, 91, 112, 306, 1092, 1106, 1500, 1570, 1571, 1651, 1652, 1654, 1700, 1701, 1702, 1710, 1711, 1714, 1726, 1729, 1730, 1732, 1733, 1826, 1848, 1880, 1950


SAFETY DATA SHEET

Nonflammable Gas Mixture: Carbon Monoxide / Hydrogen Sulfide / Methane / Nitrogen / Oxygen

Section 1. Identification

GHS product identifier	: Nonflammable Gas Mixture: Carbon Monoxide / Hydrogen Sulfide / Methane / Nitrogen / Oxygen
Other means of identification	: Not available.
Product type	: Gas.
Product use	: Synthetic/Analytical chemistry.
SDS #	: 012738
Supplier's details	: Airgas USA, LLC and its affiliates 259 North Radnor-Chester Road Suite 100 Radnor, PA 19087-5283 1-610-687-5253
24-hour telephone	: 1-866-734-3438

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	: GASES UNDER PRESSURE - Compressed gas
GHS label elements	
Hazard pictograms	: 
Signal word	: Warning
Hazard statements	: Contains gas under pressure; may explode if heated. May displace oxygen and cause rapid suffocation.
Precautionary statements	
General	: Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. Do not depend on odor to detect presence of gas.
Prevention	: Not applicable.
Response	: Not applicable.
Storage	: Protect from sunlight. Store in a well-ventilated place.
Disposal	: Not applicable.
Hazards not otherwise classified	: In addition to any other important health or physical hazards, this product may displace oxygen and cause rapid suffocation.

Section 3. Composition/information on ingredients

Substance/mixture	: Mixture
Other means of identification	: Not available.
Product code	: 012738

Ingredient name	%	CAS number
Nitrogen	77.159 - 99	7727-37-9
oxygen	1 - 19.5	7782-44-7
methane	0.0001 - 3	74-82-8
hydrogen sulfide	0.0001 - 0.2499	7783-06-4
carbon monoxide	0.0001 - 0.0999	630-08-0

Any concentration shown as a range is to protect confidentiality or is due to batch 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 irritation occurs.
Inhalation	: Remove victim to fresh air and keep at rest in a position comfortable for breathing. 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 adverse health effects persist or are severe. 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. In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.
Skin contact	: Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse.
Ingestion	: As this product is a gas, refer to the inhalation section.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact	: Contact with rapidly expanding gas may cause burns or frostbite.
Inhalation	: No known significant effects or critical hazards.
Skin contact	: Contact with rapidly expanding gas may cause burns or frostbite.
Frostbite	: Try to warm up the frozen tissues and seek medical attention.
Ingestion	: As this product is a gas, refer to the inhalation section.

Over-exposure signs/symptoms

Eye contact	: No specific data.
Inhalation	: No specific data.
Skin contact	: No specific data.
Ingestion	: No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician	: In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.
Specific treatments	: No specific treatment.

Section 4. First aid measures

- Protection of first-aiders** : No action shall be taken involving any personal risk or without suitable training. 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 an extinguishing agent suitable for the surrounding fire.
- Unsuitable extinguishing media** : None known.

Specific hazards arising from the chemical : Contains gas under pressure. In a fire or if heated, a pressure increase will occur and the container may burst or explode.

- Hazardous thermal decomposition products** : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
nitrogen oxides

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. Contact supplier immediately for specialist advice. 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. Avoid breathing gas. 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 : Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

- Small spill** : Immediately contact emergency personnel. Stop leak if without risk.
- Large spill** : Immediately contact emergency personnel. Stop leak if without risk. 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). Contains gas under pressure. Avoid breathing gas. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.
Avoid contact with eyes, skin and clothing. Empty containers retain product residue and can be hazardous.

Section 7. Handling and storage

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 away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F). Keep container tightly closed and sealed until ready for use. See Section 10 for incompatible materials before handling or use.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
Nitrogen oxygen methane hydrogen sulfide	<p>ACGIH TLV (United States, 3/2017). Oxygen Depletion [Asphyxiant]. None. None.</p> <p>ACGIH TLV (United States, 3/2017). STEL: 5 ppm 15 minutes. TWA: 1 ppm 8 hours.</p> <p>NIOSH REL (United States, 10/2016). CEIL: 15 mg/m³ 10 minutes. CEIL: 10 ppm 10 minutes.</p> <p>OSHA PEL 1989 (United States, 3/1989). STEL: 21 mg/m³ 15 minutes. STEL: 15 ppm 15 minutes. TWA: 14 mg/m³ 8 hours. TWA: 10 ppm 8 hours.</p> <p>OSHA PEL Z2 (United States, 2/2013). AMP: 50 ppm 10 minutes. CEIL: 20 ppm</p>
carbon monoxide	<p>California PEL for Chemical Contaminants (Table AC-1) (United States). PEL: 25 ppm 8 hours. CEIL: 200 ppm</p> <p>ACGIH TLV (United States, 3/2017). TWA: 25 ppm 8 hours. TWA: 29 mg/m³ 8 hours.</p> <p>OSHA PEL 1989 (United States, 3/1989). TWA: 35 ppm 8 hours. TWA: 40 mg/m³ 8 hours. CEIL: 200 ppm CEIL: 229 mg/m³</p> <p>NIOSH REL (United States, 10/2016). TWA: 35 ppm 10 hours. TWA: 40 mg/m³ 10 hours. CEIL: 200 ppm CEIL: 229 mg/m³</p> <p>OSHA PEL (United States, 6/2016). TWA: 50 ppm 8 hours. TWA: 55 mg/m³ 8 hours.</p>

Section 8. Exposure controls/personal protection

- Appropriate engineering controls** : Good general ventilation should be sufficient to control worker exposure to airborne contaminants.
- 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, fume scrubbers, 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 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 contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields.
- Skin protection**
- Hand protection** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. 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. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.
- Body protection** : 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** : 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.
- Respiratory protection** : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use. 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.

Section 9. Physical and chemical properties

Appearance

- Physical state** : Gas.
- Color** : Not available.
- Odor** : Not available.
- Odor threshold** : Not available.
- pH** : Not available.
- Melting point** : -187.6°C (-305.7°F) This is based on data for the following ingredient: methane. Weighted average: -210.8°C (-347.4°F)
- Boiling point** : Not available.
- Critical temperature** : Lowest known value: -146.95°C (-232.5°F) (nitrogen).
- Flash point** : Not available.
- Evaporation rate** : Not available.
- Flammability (solid, gas)** : Not available.
- Lower and upper explosive (flammable) limits** : Not available.
- Vapor pressure** : Not available.
- Vapor density** :

Section 9. Physical and chemical properties

	Highest known value: 1.1 (Air = 1) (oxygen). Weighted average: 0.98 (Air = 1)
Gas Density (lb/ft³)	: Weighted average: 0.08
Relative density	: Not applicable.
Solubility	: Not available.
Solubility in water	: Not available.
Partition coefficient: n-octanol/water	: Not available.
Auto-ignition temperature	: Not available.
Decomposition temperature	: Not available.
Viscosity	: Not applicable.
Flow time (ISO 2431)	: Not available.

Section 10. Stability and reactivity

Reactivity	: No specific test data related to reactivity available for this product or its ingredients.
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	: No specific data.
Incompatible materials	: No specific data.
Hazardous decomposition products	: Under normal conditions of storage and use, hazardous decomposition products should not be produced.
Hazardous polymerization	: Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
hydrogen sulfide	LC50 Inhalation Gas.	Rat	712 ppm	1 hours
carbon monoxide	LC50 Inhalation Gas.	Rat	3760 ppm	1 hours

Irritation/Corrosion

Not available.

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Reproductive toxicity

Not available.

Teratogenicity

Section 11. Toxicological information

Not available.

Specific target organ toxicity (single exposure)

Name	Category	Route of exposure	Target organs
hydrogen sulfide	Category 3	Not applicable.	Respiratory tract irritation

Specific target organ toxicity (repeated exposure)

Name	Category	Route of exposure	Target organs
carbon monoxide	Category 1	Not determined	Not determined

Aspiration hazard

Not available.

Information on the likely routes of exposure : Not available.

Potential acute health effects

- Eye contact** : Contact with rapidly expanding gas may cause burns or frostbite.
Inhalation : No known significant effects or critical hazards.
Skin contact : Contact with rapidly expanding gas may cause burns or frostbite.
Ingestion : As this product is a gas, refer to the inhalation section.

Symptoms related to the physical, chemical and toxicological characteristics

- Eye contact** : No specific data.
Inhalation : No specific data.
Skin contact : No specific data.
Ingestion : No specific data.

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** : No known significant effects or critical hazards.
Carcinogenicity : No known significant effects or critical hazards.
Mutagenicity : No known significant effects or critical hazards.
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.

Numerical measures of toxicity**Acute toxicity estimates**

Not available.

Section 11. Toxicological information

Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
hydrogen sulfide	Acute EC50 62 µg/l Fresh water	Crustaceans - Gammarus pseudolimnaeus	2 days
	Acute LC50 2 µg/l Fresh water	Fish - Coregonus clupeaformis - Yolk-sac fry	96 hours

Persistence and degradability

Not available.

Bioaccumulative potential

Product/ingredient name	LogP _{ow}	BCF	Potential
Nitrogen	0.67	-	low
oxygen	0.65	-	low
methane	1.09	-	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. Empty Airgas-owned pressure vessels should be returned to Airgas. 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. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1956	UN1956	UN1956	UN1956	UN1956
UN proper shipping name	COMPRESSED GAS, N.O.S. (nitrogen, oxygen)	COMPRESSED GAS, N.O.S. (nitrogen, oxygen)	COMPRESSED GAS, N.O.S. (nitrogen, oxygen)	COMPRESSED GAS, N.O.S. (nitrogen, oxygen)	COMPRESSED GAS, N.O.S. (nitrogen, oxygen)
Transport hazard class(es)	2.2 	2.2 	2.2 	2.2 	2.2 
Packing group	-	-	-	-	-

Section 14. Transport information

Environmental hazards	No.	No.	No.	No.	No.
------------------------------	-----	-----	-----	-----	-----

“Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product.”

Additional information

TDG Classification : Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.13-2.17 (Class 2).
Explosive Limit and Limited Quantity Index 0.125
Passenger Carrying Road or Rail Index 75

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 : **TSCA 8(a) CDR Exempt/Partial exemption:** Not determined
Clean Water Act (CWA) 311: hydrogen sulphide
Clean Air Act (CAA) 112 regulated flammable substances: methane

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Listed

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304

Composition/information on ingredients

Name	%	EHS	SARA 302 TPQ		SARA 304 RQ	
			(lbs)	(gallons)	(lbs)	(gallons)
hydrogen sulfide	0.0001 - 0.2499	Yes.	500	-	100	-

SARA 304 RQ : 40016 lbs / 18167.3 kg

SARA 311/312

Classification : Refer to Section 2: Hazards Identification of this SDS for classification of substance.

State regulations

Massachusetts : The following components are listed: NITROGEN; NITROGEN (LIQUIFIED); OXYGEN (LIQUID); METHANE; MARSH GAS

New York : None of the components are listed.

New Jersey : The following components are listed: NITROGEN; OXYGEN; METHANE

Pennsylvania : The following components are listed: NITROGEN; OXYGEN; METHANE

California Prop. 65

Section 15. Regulatory information

⚠ WARNING: This product can expose you to Carbon monoxide, 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	No significant risk level	Maximum acceptable dosage level
Carbon monoxide	-	-

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol (Annexes A, B, C, E)

Not listed.

Stockholm Convention on Persistent Organic Pollutants

Not listed.

Rotterdam Convention on Prior Informed Consent (PIC)

Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

Inventory list

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): Not determined. 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	: All components are listed or exempted.
Thailand	: Not determined.
Turkey	: Not determined.
United States	: All components are listed or exempted.
Viet Nam	: Not determined.

Section 16. Other information

Hazardous Material Information System (U.S.A.)

Health	/	1
Flammability		0
Physical hazards		3

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings and the associated label are not required on SDSs or products leaving a facility under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered trademark and service mark of the American Coatings Association, Inc.

The customer is responsible for determining the PPE code for this material. For more information on HMIS® Personal Protective Equipment (PPE) codes, consult the HMIS® Implementation Manual.

Section 16. Other information

[National Fire Protection Association \(U.S.A.\)](#)



Reprinted with permission from NFPA 704-2001, Identification of the Hazards of Materials for Emergency Response Copyright ©1997, National Fire Protection Association, Quincy, MA 02269. This reprinted material is not the complete and official position of the National Fire Protection Association, on the referenced subject which is represented only by the standard in its entirety.

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.

[Procedure used to derive the classification](#)

Classification	Justification
GASES UNDER PRESSURE - Compressed gas	On basis of test data

[History](#)

Date of printing : 2/8/2018

Date of issue/Date of revision : 2/8/2018

Date of previous issue : 10/27/2017

Version : 2.01

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](#)

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.

Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.



Safety Data Sheet

According to Regulation (EC) No. 1907/2006
OSHA Regulation 29 CFR 1910.1200
Canadian Regulation SOR/88-66

Revision Date: 2013-06-14
Reason for Revision: Regulation (EC) No. 1272/2008 Compliance

SECTION 1: IDENTIFICATION OF THE PRODUCT AND COMPANY

Product Name: HI 7021 ORP Solution

Additional Product Codes: HI 7021L

Application: ORP Solution for Platinum and Gold Electrodes.
240 mV @ 25°C/77°F

HI 7021M
HI 7021/G

Company Information (USA):

Hanna Instruments, Inc.
584 Park East Dr, Woonsocket, Rhode Island, USA 02895

Technical Service Contact Information:

1-800-426-6287 (8:30AM - 5:00PM ET)
+1-401-766-4260 (8:30AM - 5:00PM ET)

USA Emergency Contact Information:

1-800-424-9300 (Chemtrec 24Hr. Emergency)

International Emergency Contact Information:

+1-703-527-3887 (Chemtrec 24Hr. Emergency)

E-mail Address:

tech@hannainst.com

SECTION 2: HAZARD IDENTIFICATION

Non-hazardous product as specified in Directives 67/548/EEC and 1999/45/EC.
Non-hazardous product as specified in OSHA Regulation 29 CFR 1910.1200.
Non-hazardous product as specified in Canadian Regulation SOR/88-66.
Non-hazardous product as specified in Regulation (EC) 1272/2008.

SECTION 3: COMPOSITION AND COMPONENT INFORMATION

Aqueous Solution

SECTION 4: FIRST AID MEASURES

After Inhalation: Remove to fresh air.

After Skin Contact: Wash affected area with plenty of water.

After Eye Contact: Rinse out with water.

After Swallowing: Wash out mouth thoroughly with water and give plenty of water to drink. In severe cases obtain medical attention.

General Information: Remove contaminated, soaked clothing immediately and dispose of safely.

SECTION 5: FIRE-FIGHTING MEASURES

Suitable Extinguishing Media:

Water spray, Carbon Dioxide, Dry Chemical Powder, Appropriate Foam.

Special Risks:

Non-combustible.

Special Protective Equipment:

Do not stay in dangerous zone without suitable chemical protection clothing and self-contained breathing apparatus.

Additional Information:

NA

Safety Data Sheet

According to Regulation (EC) No. 1907/2006
OSHA Regulation 29 CFR 1910.1200
Canadian Regulation SOR/88-66

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions:

Avoid formation of dusts. Do not inhale dusts. Avoid substance contact.

Environmental Precautions:

Do not discharge into the drains/surface waters/groundwater.

Additional Notes:

Take up with liquid-absorbent material. Clean up affected area and dispose according to local regulation. Avoid generation of dusts.

SECTION 7: HANDLING AND STORAGE

Handling:

Cannot be stored indefinitely.

Storage:

Tightly closed. Store at room temperature (+15 to +25 °C recommended). Protect from light.

SECTION 8: EXPOSURE CONTROL/PERSONAL PROTECTION

Engineering:

Maintain general industrial hygiene practice.

Personal Protective Equipment:

Protective clothing should be selected specifically for the working place, depending on concentration and quantity of the hazardous substances handled.

Respiratory Protection:

Required when vapors/aerosols are generated. Work under hood.

Protective Gloves:

Rubber or plastic

Eye Protection:

Goggles or face mask

Industrial Hygiene:

Change contaminated clothing. Wash hands after working with substance.

SECTION 9: PHYSICAL/CHEMICAL PROPERTIES

Appearance: Yellow liquid

Odor: Odorless

Density at 20°C: ~ 1 g/cm³

Melting Point: NA

Boiling Point: ND

Solubility: Soluble

pH at 20°C: ~ 7

Explosion Limit: NA

Flash Point: NA

Thermal Decomp.: NA

SECTION 10: STABILITY AND REACTIVITY

Conditions to be Avoided:

Strong Heating

Hazardous Polymerization:

Will not occur.

Further Information:

Not available

Hazardous Decomposition Products:

None

Substances to be Avoided:

The generally known reaction partners of water

Safety Data Sheet

According to Regulation (EC) No. 1907/2006
OSHA Regulation 29 CFR 1910.1200
Canadian Regulation SOR/88-66

SECTION 11: TOXICOLOGICAL INFORMATION

Product Toxicity

No toxic effects are to be expected when the product is handled appropriately.

Component Toxicity

Acute Toxicity:

Not Available

Chronic Toxicity:

Not Available

Additional Data:

Not Available

SECTION 12: ECOLOGICAL INFORMATION

No environmental hazard.

Further Data: Can be safely disposed off as ordinary refuse.

SECTION 13: DISPOSAL CONSIDERATIONS

Waste Disposal:

SECTION 14: TRANSPORTATION INFORMATION

Land:

Not subject to transport regulations

Sea:

Not subject to transport regulations

Air:

Not subject to transport regulations

SECTION 15: REGULATORY INFORMATION

Complies with European Regulations (EC) No. 1907/2006 and No. 1272/2008.
Complies with European Council Directives 67/548/EEC and 1999/45/EC.
Complies with OSHA Regulation 29 CFR 1910.1200.
Complies with Canadian Regulation SOR/88-66

SECTION 16: OTHER INFORMATION

Text of phrases under Section 3

NA

Revision Information

Revision Date: 2013-06-14

Supersedes edition of: 2012-06-01

Reason for revision: Regulation (EC) No. 1272/2008
Compliance

Legend NA: Not Applicable
ND: Not Determined

**THE INFORMATION CONTAINED HEREIN IS BASED ON THE PRESENT STATE OF OUR
KNOWLEDGE. IT CHARACTERIZES THE PRODUCT WITH REGARD TO THE
APPROPRIATE SAFETY PRECAUTIONS. IT DOES NOT REPRESENT A GUARANTEE OF
THE PROPERTIES OF THE PRODUCT.**



Safety Data Sheet

According to Regulation (EC) No. 1907/2006
OSHA Regulation 29 CFR 1910.1200
Canadian Regulation SOR/88-66

Revision Date: 2013-06-14
Reason for Revision: Regulation (EC) No. 1272/2008 Compliance

SECTION 1: IDENTIFICATION OF THE PRODUCT AND COMPANY

Product Name: HI 7031 Conductivity Calibration Solution
Application: For calibrating electrodes. 1413 $\mu\text{S}/\text{cm}$ @ 25°C/77°F

Additional Product Codes: HI 7031/1G HI 7031L HI 7031L/C
HI 7031M HI 7031/120ML

Company Information (USA): Hanna Instruments, Inc.
584 Park East Dr, Woonsocket, Rhode Island, USA 02895

Technical Service Contact Information: 1-800-426-6287 (8:30AM - 5:00PM ET)
+1-401-766-4260 (8:30AM - 5:00PM ET)

USA Emergency Contact Information: 1-800-424-9300 (Chemtrec 24Hr. Emergency)

International Emergency Contact Information: +1-703-527-3887 (Chemtrec 24Hr. Emergency)

E-mail Address: tech@hannainst.com

SECTION 2: HAZARD IDENTIFICATION

Non-hazardous product as specified in Directives 67/548/EEC and 1999/45/EC.
Non-hazardous product as specified in OSHA Regulation 29 CFR 1910.1200.
Non-hazardous product as specified in Canadian Regulation SOR/88-66.
Non-hazardous product as specified in Regulation (EC) 1272/2008.

SECTION 3: COMPOSITION AND COMPONENT INFORMATION

Aqueous Solution

SECTION 4: FIRST AID MEASURES

After Inhalation: Remove to fresh air. Call a physician if breathing becomes difficult.
After Skin Contact: Wash affected area with water and soap.
After Eye Contact: Rinse out with plenty of water for at least 15 minutes. If pain persists, summon medical advice.
After Swallowing: Wash out mouth with plenty of water, provided person is conscious. Obtain medical attention if feeling unwell.
General Information: Not available

SECTION 5: FIRE-FIGHTING MEASURES

Suitable Extinguishing Media: Water Spray, Foam, Dry Powder, Carbon Dioxide
Special Risks: Non-combustible.
Special Protective Equipment: Do not stay in dangerous zone without suitable chemical protection clothing and self-contained breathing apparatus.
Additional Information: Contain escaping vapors with water.

Safety Data Sheet

According to Regulation (EC) No. 1907/2006
 OSHA Regulation 29 CFR 1910.1200
 Canadian Regulation SOR/88-66

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions:

None

Environmental Precautions:

None

Additional Notes:

None

SECTION 7: HANDLING AND STORAGE

Handling:

No restrictions

Storage:

Keep container closed and protected from direct sunlight. Store at room temperature (+15°C to +25°C).

SECTION 8: EXPOSURE CONTROL/PERSONAL PROTECTION

Engineering:

Maintain general industrial hygiene practice.

Personal Protective Equipment:

As appropriate to quantity handled.

Respiratory Protection:

Required when vapors/aerosols are generated.

Protective Gloves:

Rubber or plastic

Eye Protection:

Goggles or face mask

Industrial Hygiene:

Change contaminated clothing. Wash hands after working with substance.

SECTION 9: PHYSICAL/CHEMICAL PROPERTIES

Appearance:	Colorless liquid	Odor:	Odorless	Density at 20°C:	~ 1 g/cm ³
Melting Point:	NA	Boiling Point:	~ 100°C	Solubility:	Soluble
pH at 20°C:	~ 7	Explosion Limit:	NA	Flash Point:	NA
Thermal Decomp.:	NA				

SECTION 10: STABILITY AND REACTIVITY

Conditions to be Avoided:

Strong Heating (above boiling point). Stable in the recommended storage conditions.

Hazardous Polymerization:

Will not occur.

Further Information:

Not available

Hazardous Decomposition Products:

In the event of fire: See section 5.

Substances to be Avoided:

The generally known reaction partners of water

Safety Data Sheet

According to Regulation (EC) No. 1907/2006
 OSHA Regulation 29 CFR 1910.1200
 Canadian Regulation SOR/88-66

SECTION 11: TOXICOLOGICAL INFORMATION

Product Toxicity

Quantitative data on the toxicity of this product is not available.

Potential Health Effects:

Further Data: Hazardous properties cannot be excluded, but are relatively unlikely because of the low concentration of the dissolved substances, when the product is handled appropriately. The product should be handled with the usual care when dealing with chemicals.

Component Toxicity

Acute Toxicity:

Not Available

Chronic Toxicity:

Not Available

Additional Data:

Not Available

SECTION 12: ECOLOGICAL INFORMATION

Quantitative data on the ecological effect of this product is not available.

Further Data: No ecological problems are to be expected when the product is handled and used with due care and attention.

SECTION 13: DISPOSAL CONSIDERATIONS

Waste Disposal: Can be safely disposed of as ordinary refuse.

SECTION 14: TRANSPORTATION INFORMATION

Land:

Not subject to transport regulations

Sea:

Not subject to transport regulations

Air:

Not subject to transport regulations

SECTION 15: REGULATORY INFORMATION

Complies with European Regulations (EC) No. 1907/2006 and No. 1272/2008.
 Complies with European Council Directives 67/548/EEC and 1999/45/EC.
 Complies with OSHA Regulation 29 CFR 1910.1200.
 Complies with Canadian Regulation SOR/88-66

SECTION 16: OTHER INFORMATION

Text of phrases under Section 3

NA

Revision Information

Revision Date: 2013-06-14

Supersedes edition of: 2012-06-01

Reason for revision: Regulation (EC) No. 1272/2008 Compliance

Legend NA: Not Applicable
 ND: Not Determined

THE INFORMATION CONTAINED HEREIN IS BASED ON THE PRESENT STATE OF OUR KNOWLEDGE. IT CHARACTERIZES THE PRODUCT WITH REGARD TO THE APPROPRIATE SAFETY PRECAUTIONS. IT DOES NOT REPRESENT A GUARANTEE OF THE PROPERTIES OF THE PRODUCT.



HI 7004
Buffer Solution pH 4.01
Safety Data Sheet

According to Regulation (EC) No. 1907/2006
OSHA Regulation 29 CFR 1910.1200
Canadian Regulation SOR/88-66

Revision Date: 2016-02-17
Reason for Revision: Section 3, 15 updated

SECTION 1: IDENTIFICATION OF THE PRODUCT AND COMPANY

Product Name: HI 7004 Buffer Solution pH 4.01
Application: pH Buffer Solution, ± 0.01 @ 25°C/77°F

Additional Product Codes: HI 7004/1G HI 7004/1L HI 7004L
HI 7004L/C HI 7004M HI 7004P/5
HI 7004M/S HI 7004/120ML
HI 7004/1LB HI 7004C HI 7004LB
HI 7004M-0 HI 7004W

Company Information (USA): Hanna Instruments, Inc.
584 Park East Dr, Woonsocket, Rhode Island, USA 02895

Technical Service Contact Information: 1-800-426-6287 (8:30AM - 5:00PM ET)
+1-401-766-4260 (8:30AM - 5:00PM ET)

USA Emergency Contact Information: 1-800-424-9300 (Chemtrec 24Hr. Emergency)

International Emergency Contact Information: +1-703-527-3887 (Chemtrec 24Hr. Emergency)

E-mail Address: tech@hannainst.com

SECTION 2: HAZARD IDENTIFICATION

Non-hazardous product as specified in OSHA Regulation 29 CFR 1910.1200.
Non-hazardous product as specified in Canadian Regulation SOR/88-66.
Non-hazardous product as specified in Regulation (EC) 1272/2008.

SECTION 3: COMPOSITION AND COMPONENT INFORMATION

Component:	EC No:	CAS No:	Hazard Class:	Phrases:	Concentration:
Water	231-791-2	7732-18-5	-	-	> 95%
Other components, disclosure not required according to Regulation (EC) No. 1907/2006	-	-	-	-	< 5%

SECTION 4: FIRST AID MEASURES

After Inhalation: Remove to fresh air. Call a physician if breathing becomes difficult.
After Skin Contact: Wash affected area with water and soap.
After Eye Contact: Rinse out with plenty of water for at least 15 minutes. If pain persists, summon medical advice.
After Swallowing: Wash out mouth with plenty of water, provided person is conscious. Obtain medical attention if feeling unwell.
General Information: Not available

SECTION 5: FIRE-FIGHTING MEASURES

Suitable Extinguishing Media:
Water Spray, Foam, Dry Powder, Carbon Dioxide

Special Risks:
Non-combustible. Development of hazardous combustion gases or vapors possible in the event of fire.

Special Protective Equipment:
Do not stay in dangerous zone without suitable chemical protection clothing and self-contained breathing apparatus.

Additional Information:
Contain escaping vapors with water.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions:

None

Environmental Precautions:

None

Additional Notes:

None

SECTION 7: HANDLING AND STORAGE

Handling:

No restrictions

Storage:

Keep container closed and protected from direct sunlight. Store at room temperature (+15°C to +25°C).

SECTION 8: EXPOSURE CONTROL/PERSONAL PROTECTION

Engineering:

Maintain general industrial hygiene practice.

Personal Protective Equipment:

As appropriate to quantity handled.

Respiratory Protection:

Required when vapors/aerosols are generated.

Protective Gloves:

Rubber or plastic

Eye Protection:

Goggles or face mask

Industrial Hygiene:

Change contaminated clothing. Wash hands after working with substance.

SECTION 9: PHYSICAL/CHEMICAL PROPERTIES

Appearance:	Colorless or red liquid	Odor:	Odorless	Density at 20°C:	1.0 g/cm ³
Melting Point:	NA	Boiling Point:	~ 100°C	Solubility:	Soluble
pH at 20°C:	4.01 at 25°C	Explosion Limit:	NA	Flash Point:	NA
Thermal Decomp.:	NA				

SECTION 10: STABILITY AND REACTIVITY

Conditions to be Avoided:

Heating

Hazardous Polymerization:

Will not occur.

Further Information:

Not available

Hazardous Decomposition Products:

In the event of fire: See section 5.

Substances to be Avoided:

The generally known reaction partners of water

SECTION 11: TOXICOLOGICAL INFORMATION

Product Toxicity

Quantitative data on the toxicity of this product is not available.

Potential Health Effects:

Further Data: Hazardous properties cannot be excluded, but are relatively unlikely because of the low concentration of the dissolved substances, when the product is handled appropriately. The product should be handled with the usual care when dealing with chemicals.

Component Toxicity

Acute Toxicity:

Not Available

Chronic Toxicity:

Not Available

Additional Data:

Not Available

SECTION 12: ECOLOGICAL INFORMATION

Quantitative data on the ecological effect of this product is not available.

Further Data: No ecological problems are to be expected when the product is handled and used with due care and attention.

SECTION 13: DISPOSAL CONSIDERATIONS

Waste Disposal: Can be safely disposed of as ordinary refuse.

SECTION 14: TRANSPORTATION INFORMATION

Land:

Not subject to transport regulations

Sea:

Not subject to transport regulations

Air:

Not subject to transport regulations

SECTION 15: REGULATORY INFORMATION

Complies with European Regulations (EC) No. 1907/2006 and No. 1272/2008.
 Complies with OSHA Regulation 29 CFR 1910.1200.
 Complies with Canadian Regulation SOR/88-66.
 All chemical substances in this product are listed on the TSCA Inventory.

SECTION 16: OTHER INFORMATION

Text of phrases under Section 3

NA

Revision Information

Revision Date: 2016-02-17

Supersedes edition of: 2013-04-01

Reason for revision: Section 3, 15 updated

Legend
 NA: Not Applicable
 ND: Not Determined

THE INFORMATION CONTAINED HEREIN IS BASED ON THE PRESENT STATE OF OUR KNOWLEDGE. IT CHARACTERIZES THE PRODUCT WITH REGARD TO THE APPROPRIATE SAFETY PRECAUTIONS. IT DOES NOT REPRESENT A GUARANTEE OF THE PROPERTIES OF THE PRODUCT.



HI 7007
Buffer Solution pH 7.01
Safety Data Sheet

According to Regulation (EC) No. 1907/2006
OSHA Regulation 29 CFR 1910.1200
Canadian Regulation SOR/88-66

Revision Date: 2016-02-17
Reason for Revision: Section 3, 15 updated

SECTION 1: IDENTIFICATION OF THE PRODUCT AND COMPANY

Product Name: HI 7007 Buffer Solution pH 7.01
Application: pH Buffer Solution. ± 0.01 @ 25°C/77°F

Additional Product Codes: HI 7007/1G HI 7007/1L HI 7007L
HI 7007L/C HI 7007M HI 7007P/5
HI 7007/120ML HI 7007AN
HI 7007C HI 7007LB HI 7007M/S
HI 7007QC

Company Information (USA): Hanna Instruments, Inc.
584 Park East Dr, Woonsocket, Rhode Island, USA 02895

Technical Service Contact Information: 1-800-426-6287 (8:30AM - 5:00PM ET)
+1-401-766-4260 (8:30AM - 5:00PM ET)

USA Emergency Contact Information: 1-800-424-9300 (Chemtrec 24Hr. Emergency)

International Emergency Contact Information: +1-703-527-3887 (Chemtrec 24Hr. Emergency)

E-mail Address: tech@hannainst.com

SECTION 2: HAZARD IDENTIFICATION

Non-hazardous product as specified in OSHA Regulation 29 CFR 1910.1200.
Non-hazardous product as specified in Canadian Regulation SOR/88-66.
Non-hazardous product as specified in Regulation (EC) 1272/2008.

SECTION 3: COMPOSITION AND COMPONENT INFORMATION

Component:	EC No:	CAS No:	Hazard Class:	Phrases:	Concentration:
Water	231-791-2	7732-18-5	-	-	> 95%
Other components, disclosure not required according to Regulation (EC) No. 1907/2006	-	-	-	-	< 5%

SECTION 4: FIRST AID MEASURES

After Inhalation: Remove to fresh air. Call a physician if breathing becomes difficult.

After Skin Contact: Wash affected area with water and soap.

After Eye Contact: Rinse out with plenty of water for at least 15 minutes. If pain persists, summon medical advice.

After Swallowing: Wash out mouth with plenty of water, provided person is conscious. Obtain medical attention if feeling unwell.

General Information: Not available

SECTION 5: FIRE-FIGHTING MEASURES

Suitable Extinguishing Media:
Water Spray, Foam, Dry Powder, Carbon Dioxide

Special Risks:
Non-combustible. Development of hazardous combustion gases or vapors possible in the event of fire.

Special Protective Equipment:
Do not stay in dangerous zone without suitable chemical protection clothing and self-contained breathing apparatus.

Additional Information:
Contain escaping vapors with water.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions:

None

Environmental Precautions:

None

Additional Notes:

None

SECTION 7: HANDLING AND STORAGE

Handling:

No restrictions

Storage:

Keep container closed and protected from direct sunlight. Store at room temperature (+15°C to +25°C).

SECTION 8: EXPOSURE CONTROL/PERSONAL PROTECTION

Engineering:

Maintain general industrial hygiene practice.

Personal Protective Equipment:

As appropriate to quantity handled.

Respiratory Protection:

Required when vapors/aerosols are generated.

Protective Gloves:

Rubber or plastic

Eye Protection:

Goggles or face mask

Industrial Hygiene:

Change contaminated clothing. Wash hands after working with substance.

SECTION 9: PHYSICAL/CHEMICAL PROPERTIES

Appearance:	Colorless or green liquid	Odor:	Odorless	Density at 20°C:	1.0 g/cm ³
Melting Point:	NA	Boiling Point:	~ 100°C	Solubility:	Soluble
pH at 20°C:	7.01 at 25°C	Explosion Limit:	NA	Flash Point:	NA
Thermal Decomp.:	NA				

SECTION 10: STABILITY AND REACTIVITY

Conditions to be Avoided:

Heating

Hazardous Polymerization:

Will not occur.

Further Information:

Not available

Hazardous Decomposition Products:

In the event of fire: See section 5.

Substances to be Avoided:

The generally known reaction partners of water

SECTION 11: TOXICOLOGICAL INFORMATION

Product Toxicity

Quantitative data on the toxicity of this product is not available.

Potential Health Effects:

Further Data: Hazardous properties cannot be excluded, but are relatively unlikely because of the low concentration of the dissolved substances, when the product is handled appropriately. The product should be handled with the usual care when dealing with chemicals.

Component Toxicity

Acute Toxicity:

Not Available

Chronic Toxicity:

Not Available

Additional Data:

Not Available

SECTION 12: ECOLOGICAL INFORMATION

Quantitative data on the ecological effect of this product is not available.

Further Data: No ecological problems are to be expected when the product is handled and used with due care and attention.

SECTION 13: DISPOSAL CONSIDERATIONS

Waste Disposal: Can be safely disposed of as ordinary refuse.

SECTION 14: TRANSPORTATION INFORMATION

Land:

Not subject to transport regulations

Sea:

Not subject to transport regulations

Air:

Not subject to transport regulations

SECTION 15: REGULATORY INFORMATION

Complies with European Regulations (EC) No. 1907/2006 and No. 1272/2008.
 Complies with OSHA Regulation 29 CFR 1910.1200.
 Complies with Canadian Regulation SOR/88-66.
 All chemical substances in this product are listed on the TSCA Inventory.

SECTION 16: OTHER INFORMATION

Text of phrases under Section 3

NA

Revision Information

Revision Date: 2016-02-17

Supersedes edition of: 2013-04-01

Reason for revision: Section 3, 15 updated

Legend
 NA: Not Applicable
 ND: Not Determined

THE INFORMATION CONTAINED HEREIN IS BASED ON THE PRESENT STATE OF OUR KNOWLEDGE. IT CHARACTERIZES THE PRODUCT WITH REGARD TO THE APPROPRIATE SAFETY PRECAUTIONS. IT DOES NOT REPRESENT A GUARANTEE OF THE PROPERTIES OF THE PRODUCT.



HI 7010
Buffer Solution pH 10.01
Safety Data Sheet

According to Regulation (EC) No. 1907/2006
OSHA Regulation 29 CFR 1910.1200
Canadian Regulation SOR/88-66

Revision Date: 2016-02-17
Reason for Revision: Section 3, 15 updated

SECTION 1: IDENTIFICATION OF THE PRODUCT AND COMPANY

Product Name: HI 7010 Buffer Solution pH 10.01
Application: pH Buffer Solution. ± 0.01 @ 25°C/77°F
Company Information (USA): Hanna Instruments, Inc.
584 Park East Dr, Woonsocket, Rhode Island, USA 02895
Technical Service Contact Information: 1-800-426-6287 (8:30AM - 5:00PM ET)
+1-401-766-4260 (8:30AM - 5:00PM ET)
USA Emergency Contact Information: 1-800-424-9300 (Chemtrec 24Hr. Emergency)
International Emergency Contact Information: +1-703-527-3887 (Chemtrec 24Hr. Emergency)
E-mail Address: tech@hannainst.com

Additional Product Codes: HI 7010/1G HI 7010/1L HI 7010L
HI 7010L/C HI 7010M HI 7010/1LB
HI 7010C HI 7010LB HI 7010M-0
HI 7010W HI 7010QC

SECTION 2: HAZARD IDENTIFICATION

Non-hazardous product as specified in OSHA Regulation 29 CFR 1910.1200.
Non-hazardous product as specified in Canadian Regulation SOR/88-66.
Non-hazardous product as specified in Regulation (EC) 1272/2008.

SECTION 3: COMPOSITION AND COMPONENT INFORMATION

Component:	EC No:	CAS No:	Hazard Class:	Phrases:	Concentration:
Water	231-791-2	7732-18-5	-	-	> 95%
Other components, disclosure not required according to Regulation (EC) No. 1907/2006	-	-	-	-	< 5%

SECTION 4: FIRST AID MEASURES

After Inhalation: Remove to fresh air. Call a physician if breathing becomes difficult.
After Skin Contact: Wash affected area with water and soap.
After Eye Contact: Rinse out with plenty of water for at least 15 minutes. If pain persists, summon medical advice.
After Swallowing: Wash out mouth with plenty of water, provided person is conscious. Obtain medical attention if feeling unwell.
General Information: Not available

SECTION 5: FIRE-FIGHTING MEASURES

Suitable Extinguishing Media:
Water Spray, Foam, Dry Powder, Carbon Dioxide
Special Risks:
Non-combustible. Development of hazardous combustion gases or vapors possible in the event of fire.
Special Protective Equipment:
Do not stay in dangerous zone without suitable chemical protection clothing and self-contained breathing apparatus.
Additional Information:
Contain escaping vapors with water.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions:

None

Environmental Precautions:

None

Additional Notes:

None

SECTION 7: HANDLING AND STORAGE

Handling:

No restrictions

Storage:

Keep container closed and protected from direct sunlight. Store at room temperature (+15°C to +25°C).

SECTION 8: EXPOSURE CONTROL/PERSONAL PROTECTION

Engineering:

Maintain general industrial hygiene practice.

Personal Protective Equipment:

As appropriate to quantity handled.

Respiratory Protection:

Required when vapors/aerosols are generated.

Protective Gloves:

Rubber or plastic

Eye Protection:

Goggles or face mask

Industrial Hygiene:

Change contaminated clothing. Wash hands after working with substance.

SECTION 9: PHYSICAL/CHEMICAL PROPERTIES

Appearance:	Colorless or violet liquid	Odor:	Odorless	Density at 20°C:	1.0 g/cm ³
Melting Point:	NA	Boiling Point:	~ 100°C	Solubility:	Soluble
pH at 20°C:	10.01 at 25°C	Explosion Limit:	NA	Flash Point:	NA
Thermal Decomp.:	NA				

SECTION 10: STABILITY AND REACTIVITY

Conditions to be Avoided:

Heating

Hazardous Polymerization:

Will not occur.

Further Information:

Not available

Hazardous Decomposition Products:

In the event of fire: See section 5.

Substances to be Avoided:

The generally known reaction partners of water

SECTION 11: TOXICOLOGICAL INFORMATION

Product Toxicity

Quantitative data on the toxicity of this product is not available.

Potential Health Effects:

Further Data: Hazardous properties cannot be excluded, but are relatively unlikely because of the low concentration of the dissolved substances, when the product is handled appropriately. The product should be handled with the usual care when dealing with chemicals.

Component Toxicity

Acute Toxicity:

Not Available

Chronic Toxicity:

Not Available

Additional Data:

Not Available

SECTION 12: ECOLOGICAL INFORMATION

Quantitative data on the ecological effect of this product is not available.

Further Data: No ecological problems are to be expected when the product is handled and used with due care and attention.

SECTION 13: DISPOSAL CONSIDERATIONS

Waste Disposal: Can be safely disposed of as ordinary refuse.

SECTION 14: TRANSPORTATION INFORMATION

Land:

Not subject to transport regulations

Sea:

Not subject to transport regulations

Air:

Not subject to transport regulations

SECTION 15: REGULATORY INFORMATION

Complies with European Regulations (EC) No. 1907/2006 and No. 1272/2008.

Complies with OSHA Regulation 29 CFR 1910.1200.

Complies with Canadian Regulation SOR/88-66.

All chemical substances in this product are listed on the TSCA Inventory.

SECTION 16: OTHER INFORMATION

Text of phrases under Section 3

NA

Revision Information

Revision Date: 2016-02-17

Supersedes edition of: 2013-04-01

Reason for revision: Section 3, 15 updated

Legend
NA: Not Applicable
ND: Not Determined

THE INFORMATION CONTAINED HEREIN IS BASED ON THE PRESENT STATE OF OUR KNOWLEDGE. IT CHARACTERIZES THE PRODUCT WITH REGARD TO THE APPROPRIATE SAFETY PRECAUTIONS. IT DOES NOT REPRESENT A GUARANTEE OF THE PROPERTIES OF THE PRODUCT.

SAFETY DATA SHEET

Isobutylene

Section 1. Identification

GHS product identifier	: Isobutylene
Chemical name	: 2-methylpropene
Other means of identification	: 1-Propene, 2-methyl-; Isobutene; Isobutylene; 1-Propene, 2-methyl- (isobutene)
Product use	: Synthetic/Analytical chemistry.
Synonym	: 1-Propene, 2-methyl-; Isobutene; Isobutylene; 1-Propene, 2-methyl- (isobutene)
SDS #	: 001031
Supplier's details	: Airgas USA, LLC and its affiliates 259 North Radnor-Chester Road Suite 100 Radnor, PA 19087-5283 1-610-687-5253
24-hour telephone	: 1-866-734-3438

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 GASES - Category 1 GASES UNDER PRESSURE - Liquefied gas

GHS label elements

Hazard pictograms



Signal word

: Danger

Hazard statements

: Extremely flammable gas.
May form explosive mixtures with air.
Contains gas under pressure; may explode if heated.
May cause frostbite.
May displace oxygen and cause rapid suffocation.

Precautionary statements

General

: Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. Always keep container in upright position. Approach suspected leak area with caution.

Prevention

: Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

Response

: Leaking gas fire: Do not extinguish, unless leak can be stopped safely. Eliminate all ignition sources if safe to do so.

Storage

: Protect from sunlight when ambient temperature exceeds 52°C/125°F. Store in a well-ventilated place.

Disposal

: Not applicable.

Hazards not otherwise classified

: In addition to any other important health or physical hazards, this product may displace oxygen and cause rapid suffocation.

Section 3. Composition/information on ingredients

Substance/mixture	: Substance
Chemical name	: 2-methylpropene
Other means of identification	: 1-Propene, 2-methyl-; Isobutene; Isobutylene; 1-Propene, 2-methyl- (isobutene)

CAS number/other identifiers

CAS number	: 115-11-7
Product code	: 001031

Ingredient name	%	CAS number
Isobutylene	100	115-11-7

Any concentration shown as a range is to protect confidentiality or is due to batch 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 irritation occurs.
Inhalation	: Remove victim to fresh air and keep at rest in a position comfortable for breathing. 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 adverse health effects persist or are severe. 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	: Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse.
Ingestion	: As this product is a gas, refer to the inhalation section.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact	: No known significant effects or critical hazards.
Inhalation	: No known significant effects or critical hazards.
Skin contact	: No known significant effects or critical hazards.
Frostbite	: Try to warm up the frozen tissues and seek medical attention.
Ingestion	: As this product is a gas, refer to the inhalation section.

Over-exposure signs/symptoms

Eye contact	: No specific data.
Inhalation	: No specific data.
Skin contact	: No specific data.
Ingestion	: No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician	: Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.
Specific treatments	: No specific treatment.

Section 4. First aid measures

- Protection of first-aiders** : No action shall be taken involving any personal risk or without suitable training. 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 an extinguishing agent suitable for the surrounding fire.
- Unsuitable extinguishing media** : None known.

- Specific hazards arising from the chemical** : Contains gas under pressure. Extremely flammable gas. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion.

- 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. Contact supplier immediately for specialist advice. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool. If involved in fire, shut off flow immediately if it can be done without risk. If this is impossible, withdraw from area and allow fire to burn. Fight fire from protected location or maximum possible distance. Eliminate all ignition sources if safe to do so.

- 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** : Accidental releases pose a serious fire or explosion hazard. No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

- For emergency responders** : If specialised 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** : Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

- Small spill** : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment.
- Large spill** : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. 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). Contains gas under pressure. Avoid contact with eyes, skin and clothing. Avoid breathing gas. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. 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. Empty containers retain product residue and can be hazardous. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

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 away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Eliminate all ignition sources. Keep container tightly closed and sealed until ready for use. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
Isobutylene	ACGIH TLV (United States, 3/2015). TWA: 250 ppm 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, fume scrubbers, 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 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 contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields.

Skin protection

Section 8. Exposure controls/personal protection

- Hand protection** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. 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. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.
- Body protection** : 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. When there is a risk of ignition from static electricity, wear anti-static protective clothing. For the greatest protection from static discharges, clothing should include anti-static overalls, boots and gloves.
- Other skin protection** : 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.
- Respiratory protection** : Use a properly fitted, air-purifying or air-fed 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.

Section 9. Physical and chemical properties

Appearance

- Physical state** : Gas. [Liquefied compressed gas.]
- Color** : Colorless.
- Molecular weight** : 56.12 g/mole
- Molecular formula** : C₄H₈
- Boiling/condensation point** : -6.9°C (19.6°F)
- Melting/freezing point** : -140.7°C (-221.3°F)
- Critical temperature** : 144.75°C (292.6°F)
- Odor** : Characteristic.
- Odor threshold** : Not available.
- pH** : Not available.
- Flash point** : Closed cup: -76.1°C (-105°F)
- Burning time** : Not applicable.
- Burning rate** : Not applicable.
- Evaporation rate** : Not available.
- Flammability (solid, gas)** : Extremely flammable in the presence of the following materials or conditions: open flames, sparks and static discharge and oxidizing materials.
- Lower and upper explosive (flammable) limits** : Lower: 1.8%
Upper: 9.6%
- Vapor pressure** : 24.3 (psig)
- Vapor density** : 1.94 (Air = 1)
- Specific Volume (ft³/lb)** : 6.6845
- Gas Density (lb/ft³)** : 0.1496 (25°C / 77 to °F)
- Relative density** : Not applicable.
- Solubility** : Not available.
- Solubility in water** : 0.263 g/l
- Partition coefficient: n-octanol/water** : 2.34
- Auto-ignition temperature** : 465°C (869°F)
- Decomposition temperature** : Not available.
- SADT** : Not available.

Section 9. Physical and chemical properties

Viscosity : Not applicable.

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

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.

Incompatible materials : Oxidizers

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Isobutylene	LC50 Inhalation Vapor	Rat	550000 mg/m ³	4 hours

Irritation/Corrosion

Not available.

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Section 11. Toxicological information

Information on the likely routes of exposure : Not available.

Potential acute health effects

- Eye contact** : No known significant effects or critical hazards.
Inhalation : No known significant effects or critical hazards.
Skin contact : No known significant effects or critical hazards.
Ingestion : As this product is a gas, refer to the inhalation section.

Symptoms related to the physical, chemical and toxicological characteristics

- Eye contact** : No specific data.
Inhalation : No specific data.
Skin contact : No specific data.
Ingestion : No specific data.

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** : No known significant effects or critical hazards.
Carcinogenicity : No known significant effects or critical hazards.
Mutagenicity : No known significant effects or critical hazards.
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.

Numerical measures of toxicity

Acute toxicity estimates

Not available.

Section 12. Ecological information

Toxicity

Not available.

Persistence and degradability

Not available.

Bioaccumulative potential

Product/ingredient name	LogP _{ow}	BCF	Potential
Isobutylene	2.34	-	low

Section 12. Ecological information

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. Empty Airgas-owned pressure vessels should be returned to Airgas. 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. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1055	UN1055	UN1055	UN1055	UN1055
UN proper shipping name	ISOBUTYLENE	ISOBUTYLENE	ISOBUTYLENE	ISOBUTYLENE	ISOBUTYLENE
Transport hazard class(es)	2.1 	2.1 	2.1 	2.1 	2.1 
Packing group	-	-	-	-	-
Environment	No.	No.	No.	No.	No.
Additional information	<p>Limited quantity Yes.</p> <p>Packaging instruction Passenger aircraft Quantity limitation: Forbidden.</p> <p>Cargo aircraft Quantity limitation: 150 kg</p> <p>Special provisions 19, T50</p>	<p>Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.13-2.17 (Class 2).</p> <p>Explosive Limit and Limited Quantity Index 0.125</p> <p>ERAP Index 3000</p> <p>Passenger Carrying Ship Index Forbidden</p> <p>Passenger Carrying Road or Rail Index Forbidden</p> <p>Special provisions 29</p>	-	-	<p>Passenger and Cargo Aircraft Quantity limitation: 0 Forbidden Cargo Aircraft Only Quantity limitation: 150 kg</p>

“Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product.”

Section 14. Transport information

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 73/78 and the IBC Code : Not available.

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 8(a) CDR Exempt/Partial exemption:** Not determined
United States inventory (TSCA 8b): This material is listed or exempted.
Clean Air Act (CAA) 112 regulated flammable substances: isobutylene

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Not listed

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304

Composition/information on ingredients

No products were found.

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : Fire hazard
Sudden release of pressure

Composition/information on ingredients

Name	%	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
Isobutylene	100	Yes.	Yes.	No.	No.	No.

State regulations

Massachusetts : This material is listed.

New York : This material is not listed.

New Jersey : This material is listed.

Pennsylvania : This material is listed.

International regulations

International lists

National inventory

Australia : This material is listed or exempted.

Canada : This material is listed or exempted.

China : This material is listed or exempted.

Europe : This material is listed or exempted.

Japan : This material is listed or exempted.

Malaysia : Not determined.

Section 15. Regulatory information

- New Zealand** : This material is listed or exempted.
Philippines : This material is listed or exempted.
Republic of Korea : This material is listed or exempted.
Taiwan : This material is listed or exempted.

Canada

- WHMIS (Canada)** : Class A: Compressed gas.
 Class B-1: Flammable gas.
CEPA Toxic substances: This material is not listed.
Canadian ARET: This material is not listed.
Canadian NPRI: This material is listed.
Alberta Designated Substances: This material is not listed.
Ontario Designated Substances: This material is not listed.
Quebec Designated Substances: This material is not listed.

Section 16. Other information

- Canada Label requirements** : Class A: Compressed gas.
 Class B-1: Flammable gas.

Hazardous Material Information System (U.S.A.)

Health	1
Flammability	4
Physical hazards	2

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings are not required on SDSs under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

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.

Procedure used to derive the classification

Classification	Justification
Flam. Gas 1, H220 Press. Gas Liq. Gas, H280	Expert judgment Expert judgment

History

- Date of printing** : 7/11/2016
Date of issue/Date of revision : 7/11/2016
Date of previous issue : No previous validation

Section 16. Other information

Version : 0.01

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 73/78 = 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

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.

Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product form : Substance
 Substance name : Methanol
 CAS No : 67-56-1
 Product code : VT430
 Formula : CH4O
 Synonyms : acetone alcohol / alcohol C1 / alcohol, methyl / carbinol / colonial spirits / columbian spirits / green wood spirits / manhattan spirits / methyl alcohol / methyl hydrate / methyl hydroxide / methylen / methylol / monohydroxymethane / pyroligneous spirit / pyroxylic spirit / wood alcohol / wood naphtha

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture : Solvent

1.3. Details of the supplier of the safety data sheet

Val Tech Diagnostics, A Division of LabChem Inc
 Jackson's Pointe Commerce Park Building 1000
 1010 Jackson's Pointe Court
 Zelienople, PA 16063
 T 412-826-5230
 F 724-473-0647

1.4. Emergency telephone number

Emergency number : CHEMTREC: 1-800-424-9300 or 011-703-527-3887

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

GHS-US classification

Flam. Liq. 2 H225
 Acute Tox. 3 (Oral) H301
 Acute Tox. 3 (Dermal) H311
 Acute Tox. 3 (Inhalation) H331
 STOT SE 1 H370

2.2. Label elements

GHS-US labelling

Hazard pictograms (GHS-US) :



Signal word (GHS-US) :

Danger

Hazard statements (GHS-US) :

H225 - Highly flammable liquid and vapour
 H301+H311+H331 - Toxic if swallowed, in contact with skin or if inhaled
 H370 - Causes damage to organs (liver, kidneys, central nervous system, optic nerve) (Dermal, oral)

Precautionary statements (GHS-US) :

P210 - Keep away from heat, sparks, open flames, hot surfaces. - No smoking
 P233 - Keep container tightly closed
 P240 - Ground/bond container and receiving equipment
 P241 - Use explosion-proof electrical, ventilating, lighting equipment
 P242 - Use only non-sparking tools
 P243 - Take precautionary measures against static discharge
 P260 - Do not breathe mist, vapours, spray
 P264 - Wash exposed skin thoroughly after handling
 P270 - Do not eat, drink or smoke when using this product
 P271 - Use only outdoors or in a well-ventilated area
 P280 - Wear protective gloves, protective clothing, eye protection, face protection

Methanol

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

P301 + P310 - IF SWALLOWED: immediately call a POISON CENTER or doctor/physician
P303 + P361 + P353 - IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower
P304 + P340 - IF INHALED: remove victim to fresh air and keep at rest in a position comfortable for breathing
P330 - If swallowed, rinse mouth
P363 - Wash contaminated clothing before reuse
P370 + P378 - In case of fire: Use carbon dioxide (CO₂), powder, alcohol-resistant foam for extinction
P403 + P233 - Store in a well-ventilated place. Keep container tightly closed
P235 - Keep cool
P405 - Store locked up
P501 - Dispose of contents/container to comply with local, state and federal regulations

2.3. Other hazards

Other hazards not contributing to the classification : None.

2.4. Unknown acute toxicity (GHS-US)

No data available

SECTION 3: Composition/information on ingredients

3.1. Substance

Substance type : Mono-constituent
Name : Methanol
CAS No : 67-56-1
EC no : 200-659-6
EC index no : 603-001-00-X

Name	Product identifier	%	GHS-US classification
Methanol (Main constituent)	(CAS No) 67-56-1	100	Flam. Liq. 2, H225 Acute Tox. 3 (Oral), H301 Acute Tox. 3 (Dermal), H311 Acute Tox. 3 (Inhalation), H331 STOT SE 1, H370

Full text of H-phrases: see section 16

3.2. Mixture

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures general : Check the vital functions. Unconscious: maintain adequate airway and respiration. Respiratory arrest: artificial respiration or oxygen. Cardiac arrest: perform resuscitation. Victim conscious with laboured breathing: half-seated. Victim in shock: on his back with legs slightly raised. Vomiting: prevent asphyxia/aspiration pneumonia. Prevent cooling by covering the victim (no warming up). Keep watching the victim. Give psychological aid. Keep the victim calm, avoid physical strain. Never give alcohol to drink.

First-aid measures after inhalation : Remove the victim into fresh air. Immediately consult a doctor/medical service.

First-aid measures after skin contact : Wash immediately with lots of water. Soap may be used. Do not apply (chemical) neutralizing agents. Remove clothing before washing. Consult a doctor/medical service.

First-aid measures after eye contact : Rinse with water. Take victim to an ophthalmologist if irritation persists.

First-aid measures after ingestion : Rinse mouth with water. Give nothing to drink. Do not induce vomiting. Immediately consult a doctor/medical service. Call Poison Information Centre (www.big.be/antigif.htm). Ingestion of large quantities: immediately to hospital. Take the container/vomit to the doctor/hospital. Doctor: administration of chemical antidote. Doctor: gastric lavage.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms/injuries after inhalation : Slight irritation. EXPOSURE TO HIGH CONCENTRATIONS: Coughing. Symptoms similar to those listed under ingestion.

Symptoms/injuries after skin contact : Symptoms similar to those listed under ingestion. Slight irritation.

Symptoms/injuries after eye contact : Redness of the eye tissue. Lacrimation.

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Symptoms/injuries after ingestion	: Nausea. Vomiting. AFTER ABSORPTION OF HIGH QUANTITIES: FOLLOWING SYMPTOMS MAY APPEAR LATER: Change in the haemogramme/blood composition. Headache. Feeling of weakness. Abdominal pain. Muscular pain. Central nervous system depression. Dizziness. Mental confusion. Drunkenness. Coordination disorders. Disturbed motor response. Disturbances of consciousness. Visual disturbances. Blindness. Respiratory difficulties. Cramps/uncontrolled muscular contractions.
Chronic symptoms	: ON CONTINUOUS/REPEATED EXPOSURE/CONTACT: Red skin. Dry skin. Skin rash/inflammation. Headache. Disturbed tactile sensibility. Visual disturbances. Sleeplessness. Gastrointestinal complaints. Cardiac and blood circulation effects.

4.3. Indication of any immediate medical attention and special treatment needed

Hospitalize at once. Until victim can be cared for by specialized staff:

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media	: Preferably: alcohol resistant foam. Water spray. BC powder. Carbon dioxide.
Unsuitable extinguishing media	: Solid water jet ineffective as extinguishing medium.

5.2. Special hazards arising from the substance or mixture

Fire hazard	: DIRECT FIRE HAZARD. Highly flammable. Gas/vapour flammable with air within explosion limits. INDIRECT FIRE HAZARD. May be ignited by sparks.
Explosion hazard	: DIRECT EXPLOSION HAZARD. Gas/vapour explosive with air within explosion limits. INDIRECT EXPLOSION HAZARD. may be ignited by sparks. Reactions with explosion hazards: see "Reactivity Hazard".
Reactivity	: On heating: release of toxic/corrosive/combustible gases/vapours (formaldehyde). Upon combustion: CO and CO ₂ are formed. Violent to explosive reaction with (some) metal powders and with (strong) oxidizers. Violent exothermic reaction with (some) acids and with (some) halogens compounds.

5.3. Advice for firefighters

Firefighting instructions	: Cool tanks/drums with water spray/remove them into safety. Do not move the load if exposed to heat. Take account of toxic fire-fighting water. Use water moderately and if possible collect or contain it.
Protection during firefighting	: Do not enter fire area without proper protective equipment, including respiratory protection.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel

Protective equipment	: Gas-tight suit.
Emergency procedures	: Keep upwind. Mark the danger area. Consider evacuation. Close doors and windows of adjacent premises. Stop engines and no smoking. No naked flames or sparks. Spark- and explosionproof appliances and lighting equipment. Keep containers closed. Wash contaminated clothes.

6.1.2. For emergency responders

Protective equipment	: Equip cleanup crew with proper protection.
Emergency procedures	: Stop leak if safe to do so. Ventilate area.

6.2. Environmental precautions

Prevent soil and water pollution. Prevent spreading in sewers.

6.3. Methods and material for containment and cleaning up

For containment	: Contain released substance, pump into suitable containers. Consult "Material-handling" to select material of containers. Plug the leak, cut off the supply. Dam up the liquid spill. Try to reduce evaporation. Measure the concentration of the explosive gas-air mixture. Dilute combustible/toxic gases/vapours with water spray. Take account of toxic/corrosive precipitation water. Provide equipment/receptacles with earthing. Do not use compressed air for pumping over spills.
Methods for cleaning up	: Take up liquid spill into a non combustible material e.g.: sand, earth, vermiculite slaked lime or soda ash. Scoop absorbed substance into closing containers. See "Material-handling" for suitable container materials. Carefully collect the spill/leftovers. Damaged/cooled tanks must be emptied. Do not use compressed air for pumping over spills. Clean contaminated surfaces with an excess of water. Take collected spill to manufacturer/competent authority. Wash clothing and equipment after handling.

6.4. Reference to other sections

No additional information available

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SECTION 7: Handling and storage

7.1. Precautions for safe handling

- Precautions for safe handling : Comply with the legal requirements. Remove contaminated clothing immediately. Clean contaminated clothing. Handle uncleaned empty containers as full ones. Thoroughly clean/dry the installation before use. Do not discharge the waste into the drain. Do not use compressed air for pumping over. Use spark-/explosionproof appliances and lighting system. Take precautions against electrostatic charges. Keep away from naked flames/heat. Keep away from ignition sources/sparks. Observe strict hygiene. Keep container tightly closed. Measure the concentration in the air regularly. Work under local exhaust/ventilation.
- Hygiene measures : Do not eat, drink or smoke when using this product. Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Wash contaminated clothing before reuse.

7.2. Conditions for safe storage, including any incompatibilities

- Incompatible products : Strong oxidizers. Strong bases. Strong acids. Acid anhydrides. Acid chlorides.
- Incompatible materials : Direct sunlight. Heat sources. Sources of ignition.
- Heat and ignition sources : KEEP SUBSTANCE AWAY FROM: heat sources. ignition sources.
- Prohibitions on mixed storage : KEEP SUBSTANCE AWAY FROM: combustible materials. oxidizing agents. (strong) acids. (strong) bases. halogens. amines. water/moisture.
- Storage area : Store at room temperature. Keep out of direct sunlight. Store in a dry area. Keep container in a well-ventilated place. Fireproof storeroom. Keep locked up. Provide for a tub to collect spills. Provide the tank with earthing. Unauthorized persons are not admitted. Aboveground. Meet the legal requirements.
- Special rules on packaging : SPECIAL REQUIREMENTS: closing. dry. clean. correctly labelled. meet the legal requirements. Secure fragile packagings in solid containers.
- Packaging materials : SUITABLE MATERIAL: steel. stainless steel. iron. glass. MATERIAL TO AVOID: lead. aluminium. zinc. polyethylene. PVC.

7.3. Specific end use(s)

No additional information available

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Methanol (67-56-1)		
USA ACGIH	ACGIH TWA (ppm)	200 ppm
USA ACGIH	ACGIH STEL (ppm)	200 ppm
USA OSHA	OSHA PEL (TWA) (mg/m ³)	260 mg/m ³
USA OSHA	OSHA PEL (TWA) (ppm)	200 ppm

8.2. Exposure controls

- Appropriate engineering controls : Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure. Keep concentrations well below lower explosion limits.
- Personal protective equipment : Safety glasses. Protective clothing. Gloves. Full protective flameproof clothing. Face shield.



- Materials for protective clothing : GIVE EXCELLENT RESISTANCE: No data available. GIVE GOOD RESISTANCE: polyethylene/ethylenevinylalcohol. styrene-butadiene rubber. viton. GIVE LESS RESISTANCE: chloroprene rubber. chlorinated polyethylene. natural rubber. nitrile rubber/PVC. GIVE POOR RESISTANCE: leather. neoprene. nitrile rubber. polyethylene. PVA. PVC. polyurethane.
- Hand protection : Gloves.
- Eye protection : Combined eye and respiratory protection. Safety glasses.
- Skin and body protection : Head/neck protection. Protective clothing.
- Respiratory protection : Gas mask with filter type AX at conc. in air > exposure limit. Wear gas mask with filter type A if conc. in air > exposure limit. High vapour/gas concentration: self-contained respirator.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

- Physical state : Liquid

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Appearance	: Liquid.
Molecular mass	: 32.04 g/mol
Colour	: Colourless.
Odour	: Characteristic odour. Mild odour. Pleasant odour. Alcohol odour. Commercial/unpurified substance: Irritating/pungent odour.
Odour threshold	: 2000 - 8800 ppm 2620 - 11528 mg/m ³
pH	: No data available
Relative evaporation rate (butylacetate=1)	: 4.1
Relative evaporation rate (ether=1)	: 6.3
Melting point	: -98 °C
Freezing point	: No data available
Boiling point	: 65 °C
Flash point	: 11 °C
Critical temperature	: 240 °C
Self ignition temperature	: 455 °C
Decomposition temperature	: No data available
Flammability (solid, gas)	: No data available
Vapour pressure	: 128 hPa
Vapour pressure at 50 °C	: 552 hPa
Critical pressure	: 79547 hPa
Relative vapour density at 20 °C	: 1.1
Relative density	: 0.79
Relative density of saturated gas/air mixture	: 1.0
Density	: 792 kg/m ³
Solubility	: Soluble in water. Soluble in ethanol. Soluble in ether. Soluble in acetone. Soluble in chloroform. Water: Complete Ethanol: Complete Ether: Complete Acetone: Complete
Log Pow	: -0.77 (Experimental value; Other, Experimental value; Other)
Log Kow	: No data available
Viscosity, kinematic	: No data available
Viscosity, dynamic	: 0.6 mPa.s (20 °C)
Explosive properties	: No data available
Oxidising properties	: No data available
Explosive limits	: 5.5 - 36.5 vol %

9.2. Other information

Minimum ignition energy	: 0.14 mJ
Saturation concentration	: 166 g/m ³
VOC content	: 100 %
Other properties	: Clear. Hygroscopic. Volatile. Substance has neutral reaction.

SECTION 10: Stability and reactivity

10.1. Reactivity

On heating: release of toxic/corrosive/combustible gases/vapours (formaldehyde). Upon combustion: CO and CO₂ are formed. Violent to explosive reaction with (some) metal powders and with (strong) oxidizers. Violent exothermic reaction with (some) acids and with (some) halogens compounds.

10.2. Chemical stability

Hygroscopic.

10.3. Possibility of hazardous reactions

No additional information available

10.4. Conditions to avoid

Direct sunlight. High temperature. Incompatible materials. Open flame. Sparks. Overheating.

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10.5. Incompatible materials

Strong oxidizers. Strong bases. Strong acids. Peroxides. Acid anhydrides. Acid chlorides.

10.6. Hazardous decomposition products

Carbon dioxide. Carbon monoxide.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity : Toxic if swallowed. Toxic in contact with skin. Toxic if inhaled.

Methanol (V)67-56-1	
LD50 oral rat	> 5000 mg/kg (1187-2769 mg/kg bodyweight; Rat; Rat)
LD50 dermal rabbit	15800 mg/kg (Rabbit)
LC50 inhalation rat (mg/l)	85 mg/l/4h (Rat)
LC50 inhalation rat (ppm)	64000 ppm/4h (Rat)
Skin corrosion/irritation	: Not classified
Serious eye damage/irritation	: Not classified
Respiratory or skin sensitisation	: Not classified
Germ cell mutagenicity	: Not classified
Carcinogenicity	: Not classified
Reproductive toxicity	: Not classified
Specific target organ toxicity (single exposure)	: Causes damage to organs (liver, kidneys, central nervous system, optic nerve) (Dermal, oral).
Specific target organ toxicity (repeated exposure)	: Not classified
Aspiration hazard	: Not classified
Symptoms/injuries after inhalation	: Slight irritation. EXPOSURE TO HIGH CONCENTRATIONS: Coughing. Symptoms similar to those listed under ingestion.
Symptoms/injuries after skin contact	: Symptoms similar to those listed under ingestion. Slight irritation.
Symptoms/injuries after eye contact	: Redness of the eye tissue. Lacrimation.
Symptoms/injuries after ingestion	: Nausea. Vomiting. AFTER ABSORPTION OF HIGH QUANTITIES: FOLLOWING SYMPTOMS MAY APPEAR LATER: Change in the haemogramme/blood composition. Headache. Feeling of weakness. Abdominal pain. Muscular pain. Central nervous system depression. Dizziness. Mental confusion. Drunkenness. Coordination disorders. Disturbed motor response. Disturbances of consciousness. Visual disturbances. Blindness. Respiratory difficulties. Cramps/uncontrolled muscular contractions.
Chronic symptoms	: ON CONTINUOUS/REPEATED EXPOSURE/CONTACT: Red skin. Dry skin. Skin rash/inflammation. Headache. Disturbed tactile sensibility. Visual disturbances. Sleeplessness. Gastrointestinal complaints. Cardiac and blood circulation effects.

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general	: Classification concerning the environment: not applicable.
Ecology - air	: TA-Luft Klasse 5.2.5/l.
Ecology - water	: Not harmful to fishes (LC50(96h) >1000 mg/l). Not harmful to invertebrates (Daphnia) (EC50 (48h) > 1000 mg/l). Not harmful to algae (EC50 (72h) >1000 mg/l). Slightly harmful to bacteria (EC50: 100 - 1000 mg/l). Inhibition of activated sludge.

Methanol (67-56-1)	
LC50 fishes 1	15400 mg/l (96 h; Lepomis macrochirus; Lethal)
EC50 Daphnia 1	> 10000 mg/l (48 h; Daphnia magna; Lethal)
LC50 fish 2	10800 mg/l 96 h; Salmo gairdneri (Oncorhynchus mykiss)
EC50 Daphnia 2	24500 mg/l (48 h; Daphnia magna)
Threshold limit other aquatic organisms 1	6600 mg/l (16 h; Pseudomonas putida)
Threshold limit algae 1	530 mg/l (192 h; Microcystis aeruginosa)
Threshold limit algae 2	8000 mg/l (168 h; Scenedesmus quadricauda)

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12.2. Persistence and degradability

Methanol (67-56-1)	
Persistence and degradability	Readily biodegradable in water. Biodegradable in the soil.
Biochemical oxygen demand (BOD)	0.6 - 1.12 g O ₂ /g substance
Chemical oxygen demand (COD)	1.42 g O ₂ /g substance
ThOD	1.5 g O ₂ /g substance
BOD (% of ThOD)	0.8 % ThOD

12.3. Bioaccumulative potential

Methanol (67-56-1)	
BCF fish 1	< 10 (Leuciscus idus)
Log Pow	-0.77 (Experimental value; Other, Experimental value; Other)
Bioaccumulative potential	Low potential for bioaccumulation (BCF < 500).

12.4. Mobility in soil

Methanol (67-56-1)	
Surface tension	0.023 N/m (20 °C)

12.5. Other adverse effects

No additional information available

SECTION 13: Disposal considerations

13.1. Waste treatment methods

- Waste disposal recommendations : Remove waste in accordance with local and/or national regulations. Hazardous waste shall not be mixed together with other waste. Different types of hazardous waste shall not be mixed together if this may entail a risk of pollution or create problems for the further management of the waste. Hazardous waste shall be managed responsibly. All entities that store, transport or handle hazardous waste shall take the necessary measures to prevent risks of pollution or damage to people or animals. Recycle by distillation. Incinerate under surveillance with energy recovery. Do not discharge into drains or the environment. Obtain the consent of pollution control authorities before discharging to wastewater treatment plants.
- Additional information : LWCA (the Netherlands): KGA category 06. Hazardous waste according to Directive 2008/98/EC.

SECTION 14: Transport information

- In accordance with DOT
- Transport document description : UN1230 Methanol, 3, II
- UN-No.(DOT) : 1230
- DOT NA no. : UN1230
- DOT Proper Shipping Name : Methanol
- Department of Transportation (DOT) Hazard Classes : 3 - Class 3 - Flammable and combustible liquid 49 CFR 173.120
- Hazard labels (DOT) : 3 - Flammable liquid



- DOT Symbols : D - Proper shipping name for domestic use only, or to and from Canada
- Packing group (DOT) : II - Medium Danger

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DOT Special Provisions (49 CFR 172.102)	: IB2 - Authorized IBCs: Metal (31A, 31B and 31N); Rigid plastics (31H1 and 31H2); Composite (31HZ1). Additional Requirement: Only liquids with a vapor pressure less than or equal to 110 kPa at 50 C (1.1 bar at 122 F), or 130 kPa at 55 C (1.3 bar at 131 F) are authorized. T7 - 4 178.274(d)(2) Normal..... 178.275(d)(3) TP2 - a. The maximum degree of filling must not exceed the degree of filling determined by the following: (image) Where: tr is the maximum mean bulk temperature during transport, tf is the temperature in degrees celsius of the liquid during filling, and a is the mean coefficient of cubical expansion of the liquid between the mean temperature of the liquid during filling (tf) and the maximum mean bulk temperature during transportation (tr) both in degrees celsius. b. For liquids transported under ambient conditions may be calculated using the formula: (image) Where: d15 and d50 are the densities (in units of mass per unit volume) of the liquid at 15 C (59 F) and 50 C (122 F), respectively.
DOT Packaging Exceptions (49 CFR 173.xxx)	: 150
DOT Packaging Non Bulk (49 CFR 173.xxx)	: 202
DOT Packaging Bulk (49 CFR 173.xxx)	: 242
DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27)	: 1 L
DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75)	: 60 L
DOT Vessel Stowage Location	: B - (i) The material may be stowed "on deck" or "under deck" on a cargo vessel and on a passenger vessel carrying a number of passengers limited to not more than the larger of 25 passengers, or one passenger per each 3 m of overall vessel length; and (ii) "On deck only" on passenger vessels in which the number of passengers specified in paragraph (k)(2)(i) of this section is exceeded.
DOT Vessel Stowage Other	: 40 - Stow "clear of living quarters"

Additional information

Other information	: No supplementary information available.
State during transport (ADR-RID)	: as liquid.

ADR

Transport document description	: UN 1230 Methanol, 3 (6.1), II, (D/E)
Packing group (ADR)	: II
Class (ADR)	: 3 - Flammable liquid
Hazard identification number (Kemler No.)	: 336
Classification code (ADR)	: FT1
Danger labels (ADR)	: 3 - Flammable liquids 6.1 - Toxic substances



Orange plates	:
---------------	---

Tunnel restriction code	: D/E
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Transport by sea

UN-No. (IMDG)	: 1230
Class (IMDG)	: 3 - Flammable liquids
Subsidiary risk (IMDG)	: 6.1
EmS-No. (1)	: F-E
MFAG-No	: 19
EmS-No. (2)	: S-D

Air transport

UN-No.(IATA)	: 1230
Class (IATA)	: 3 - Flammable Liquids

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Packing group (IATA) : II - Medium Danger

Subsidiary risk (IATA) : 6.1

SECTION 15: Regulatory information

15.1. US Federal regulations

Methanol (67-56-1)

Listed on the United States TSCA (Toxic Substances Control Act) inventory
Listed on SARA Section 313 (Specific toxic chemical listings)

RQ (Reportable quantity, section 304 of EPA's List of Lists) : 5000 lb

SARA Section 311/312 Hazard Classes : Immediate (acute) health hazard
Fire hazard

15.2. International regulations

CANADA

Methanol (67-56-1)

Listed on the Canadian DSL (Domestic Substances List) inventory.

WHMIS Classification : Class B Division 2 - Flammable Liquid
Class D Division 2 Subdivision A - Very toxic material causing other toxic effects
Class D Division 2 Subdivision B - Toxic material causing other toxic effects

EU-Regulations

No additional information available

Classification according to Regulation (EC) No. 1272/2008 [CLP]

Flam. Liq. 2 : H225
Acute Tox. 3 (Inhalation) : H331
Acute Tox. 3 (Dermal) : H311
Acute Tox. 3 (Oral) : H301
STOT SE 1 : H370
STOT SE 1 : H370
STOT SE 1 : H370

Full text of H-phrases: see section 16

Classification according to Directive 67/548/EEC or 1999/45/EC

F; R11
T; R23/24/25
T; R39/23/24/25

Full text of R-phrases: see section 16

15.2.2. National regulations

Methanol (67-56-1)

Listed on the Canadian Ingredient Disclosure List

15.3. US State regulations

Methanol(67-56-1)

U.S. - California - Proposition 65 - Developmental Toxicity : Yes

No significance risk level (NSRL) : 23000 µg/day

SECTION 16: Other information

Full text of H-phrases: see section 16:

Acute Tox. 3 (Dermal)	Acute toxicity (dermal), Category 3
Acute Tox. 3 (Inhalation)	Acute toxicity (inhal.), Category 3

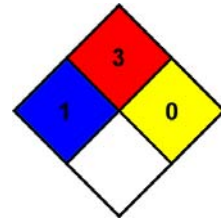
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Acute Tox. 3 (Oral)	Acute toxicity (oral), Category 3
Flam. Liq. 2	Flammable liquids, Category 2
STOT SE 1	Specific target organ toxicity — single exposure, Category 1
H225	Highly flammable liquid and vapour
H301	Toxic if swallowed
H311	Toxic in contact with skin
H331	Toxic if inhaled
H370	Causes damage to organs

- NFPA health hazard : 1 - Exposure could cause irritation but only minor residual injury even if no treatment is given.
- NFPA fire hazard : 3 - Liquids and solids that can be ignited under almost all ambient conditions.
- NFPA reactivity : 0 - Normally stable, even under fire exposure conditions, and are not reactive with water.



HMIS III Rating

- Health : 2 Moderate Hazard - Temporary or minor injury may occur
- Flammability : 3 Serious Hazard
- Physical : 0 Minimal Hazard
- Personal Protection : H

SDS US ValTech

Information in this SDS is from available published sources and is believed to be accurate. No warranty, express or implied, is made and LabChem Inc assumes no liability resulting from the use of this SDS. The user must determine suitability of this information for his application.



Concentrated Cleaning Solution

1. IDENTIFICATION

Product Identifier: MICRO-90[®] Concentrated Cleaning Solution
CAS Number: Not applicable to mixtures
EC Number: Not applicable to mixtures
REACH Registration Number: Not applicable to mixtures
Chemical Formula: Not applicable to mixtures
Relevant Identified Uses: A water-based cleaning concentrate used on glass, ceramic, metals, filter membranes, and other surfaces
Manufacturer / Supplier:
 International Products Corporation
 201 Connecticut Drive
 Burlington, NJ 08016, USA
 Tel: (609) 386-8770 / Fax: (609) 386-8438
 E-mail: mkt@ipcol.com / Website: www.ipcol.com
EU Distributor:
 International Products Corp.
 Unit 5, Green Lane Business Park
 238 Green Lane London, SE9 3TL, United Kingdom
 Tel: 020-8857-5678 Fax: 020-8857-1313
 E-mail: saleseurope@ipcol.com
Emergency Phone Number: 24-Hour CHEMTREC Telephone
 (800) 424-9300 (USA and Canada)
 (703) 527-3887 (Calls from outside the USA)

2. HAZARD(S) IDENTIFICATION

The following information is provided for concentrated levels of this chemical mixture.
Classification of the Substance or Mixture:
 Mild Eye Irritant Category 2B.
Label Elements:
Trade Name: MICRO-90[®] Concentrated Cleaning Solution
Signal Word: Warning
Hazard Statements:
 H320: Causes eye irritation.
Precautionary Statements:
 P305 + P351 + P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
 Gloves and safety glasses are recommended.
Other Hazards: No data available

3. COMPOSITION / INFORMATION ON INGREDIENTS

Synonyms: None
Molecular Weight: Not applicable to mixtures

Ingredient	CAS No.	EC No.	Index No.	Range
Surfactants	Mixture	Mixture	Mixture	10 – 25%
EDTA Na4	64-02-8	200-573-9	607-428-00-2	10 – 25%

4. FIRST AID MEASURES

Inhalation: If exposed to excessive fumes, remove to fresh air. Get medical attention if cough or other symptoms develop.
Ingestion: Call physician if pain or discomfort develops. Treat symptomatically.
Skin Contact: Remove contaminated clothing. Gently wash skin with soap and water. Get medical attention if irritation develops or persists.
Eye Contact: Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. FIRE-FIGHTING MEASURES

Fire: Not considered to be a fire hazard.
Explosion: Not considered to be an explosion hazard.
Fire Extinguishing Media: Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.
Special Information: Hazardous decomposition products may be formed under fire conditions. Nature of decomposition products not known.
Advice for Firefighters: Wear self-contained breathing apparatus for fire-fighting if necessary.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures: Wear appropriate personal protective equipment as specified in Section 8.
Environmental Precautions and Methods and Materials for Containment and Cleaning Up: Spills will present a slip hazard. Clean up spills with absorbent material or mop. Do not discharge to surface waterways. Dried MICRO-90[®] residue can be removed with warm water.

7. HANDLING AND STORAGE

Precautions for Safe Handling and Conditions for Safe Storage, Including Any Incompatibilities: MICRO-90[®] should be stored in a cool place in its original container. Recommended storage temperature is 2–43°C (36–109°F). The shelf life of MICRO-90[®] is five years from the date of manufacture when stored in the original sealed container at the recommended storage temperature.
Advice on General Occupational Hygiene: Do not eat, drink and / or smoke in work areas; wash hands after use.
Specific End Uses: A 1% to 2% MICRO-90[®] solution is routinely used in ultrasonic tanks, immersion, CIP, and hand-washing applications to clean a variety of surfaces, including manufacturing tanks and equipment, precision parts, medical devices, filter membranes, glass, ceramic, and electronic components. Optimum cleaning can be achieved using distilled water as the diluent and heating the solution. Cleaning should be followed by a thorough rinse.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Limits: Contains no substances with occupational exposure limit values.

Ventilation System: Not necessary.

Personal Respirators: Not necessary.

Skin Protection: Rubber, nitrile, or latex gloves are recommended. No additional protection is required. Common sense chemical hygiene practices should be followed.

Eye Protection: Safety glasses with side-shields are recommended.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Clear, colorless to pale yellow solution

Odor: Ammonia

Odor Threshold: No information found

pH: 9.7

% Volatiles by volume @ 21 °C (70 °F): < 1% (ASTM D2369-01)

Melting Point: ca.-8 °C (18 °F)

Boiling Point / Boiling Range: ca.100 °C (212 °F)

Flash Point: Not applicable

Evaporation Rate (BuAc=1): Similar to water

Flammability: Not applicable

Upper / Lower Flammability or Explosive Limits: Not applicable

Vapor Pressure (mm Hg): Similar to water

Vapor Density (Air=1): Similar to water

Relative Density: 1.135 g/mL

Solubility: Soluble

Partition Coefficient: n-octanol / water: Not determined

Auto-ignition Temperature: No information found

Decomposition Temperature: No information found

Viscosity: 10 cps

Explosive Properties: Not considered to be an explosion hazard

Oxidizing Properties: No information found

10. STABILITY AND REACTIVITY

Reactivity and / or Chemical Stability: Stable under recommended storage conditions.

Possibility of Hazardous Reactions and Conditions to Avoid: Chlorine-based products.

Incompatible Materials: Sodium Hypochlorite; Heated contact may etch Zinc, Aluminum, Copper and Nickel; MICRO-90® residue may craze polycarbonate and polymethyl methacrylate. Do not mix with other cleaners.

Hazardous Decomposition Products: Hazardous decomposition products may be formed under fire conditions. Nature of decomposition products not known.

11. TOXICOLOGICAL INFORMATION

Acute Toxicity: Non-toxic

Inhalation: No data available

Skin Contact: Not an irritant

Eye Contact: Mildly irritating

Chronic Exposure: No data available

Aggravation of Pre-existing Conditions: No data available

Specific Target Organ Toxicity - Single Exposure (Globally

Harmonized System): No data available

Specific Target Organ Toxicity - Repeated Exposure (Globally

Harmonized System): No data available

Numerical Measures of Toxicity:

NTP Carcinogen Database:

Ingredient	CAS No.	Known	Anticipated	IARC Category
EDTA Na4	64-02-8	No	No	None
Surfactants	Mixture	No	No	None

12. ECOLOGICAL INFORMATION

Ecotoxicity: No data available

Persistence and Degradability:

EDTA and its salts are not biodegradable

Bioaccumulative Potential: No data available

Mobility in Soil: No data available

Other adverse effects: No data available

Results of PBT and vPvB Assessment: According to the substances' SDSs, none are PBTs or a vPvBs.

13. DISPOSAL CONSIDERATIONS

MICRO-90® contains an EDTA salt, which enhances the transport of pollutant metals through wastewater treatment plants. Offer surplus and non-recyclable solutions to a licensed disposal company.

14. TRANSPORT INFORMATION

Land Transport ADR/RID and GGVS/GGVE

(Cross Border / Domestic):

Not regulated

Maritime Transport IMDG/GGVSea:

Not regulated

Air Transport ICAO-TI and IATA-DGR:

Not regulated

15. REGULATORY INFORMATION

European Inventory of Existing Commercial Chemical Substances (EINECS)

The components of this product are on the EINECS inventory or are exempt from inventory.

USA

TSCA STATUS All ingredients are listed on the TSCA inventory

SARA TITLE III,302/303 EHS None

SARA TITLE III,304,HS None

SARA 311/312 None

SARA TITLE III,313 None

CANADA

DSL / NDSL

All ingredients are listed

WHMIS Classification

D.2.B.

JAPAN

Pollution Release and Transfer Register :

6.5% n-alkylbenzenesulfonic acid and its salts

(alkyl C = 10 – 14)

Chemical Safety Assessment: A Chemical Safety Assessment of EDTA and its salts has been prepared by its manufacturers.

16. OTHER INFORMATION

Training Advice: Wearing cotton gloves is not recommended because they allow for a sustained, occluded chemical contact with the skin. Manual and ultrasonic cleaning methods are ideally suited for MICRO-90®. Most applications work using 1% to 2% MICRO-90®. Heat will improve the detergency of the MICRO-90® solution. Chelant and metal recovery methods are available from the manufacturer.

Additional Information: The above information is believed to be accurate but International Products Corporation (IPC) does not claim it to be all inclusive. It should only be used as a guide. It is provided for the purpose of hazard communication. It does not represent any guarantee of the properties of the product.

150408

SAFETY DATA SHEET

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

PRODUCT

Product Name: MOBIL 1 5W-20
Product Description: Synthetic Base Stocks and Additives
Product Code: 201510101035, 484279-00, 97Z108
Intended Use: Engine oil

COMPANY IDENTIFICATION

Supplier: EXXON MOBIL CORPORATION
22777 Springwoods Village Parkway
Spring, TX. 77389 USA

24 Hour Health Emergency 609-737-4411
Transportation Emergency Phone 800-424-9300 or 703-527-3887 CHEMTREC
Product Technical Information 800-662-4525
MSDS Internet Address <http://www.exxon.com>, <http://www.mobil.com>

SECTION 2 HAZARDS IDENTIFICATION

This material is not hazardous according to regulatory guidelines (see (M)SDS Section 15).

Other hazard information:

HAZARD NOT OTHERWISE CLASSIFIED (HNOC): None as defined under 29 CFR 1910.1200.

PHYSICAL / CHEMICAL HAZARDS

No significant hazards.

HEALTH HAZARDS

High-pressure injection under skin may cause serious damage. Excessive exposure may result in eye, skin, or respiratory irritation.

ENVIRONMENTAL HAZARDS

No significant hazards.

NFPA Hazard ID:	Health: 0	Flammability: 1	Reactivity: 0
HMIS Hazard ID:	Health: 0	Flammability: 1	Reactivity: 0

NOTE: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

This material is defined as a mixture.

Hazardous Substance(s) or Complex Substance(s) required for disclosure

Name	CAS#	Concentration*	GHS Hazard Codes
1-DECENE, HOMOPOLYMER HYDROGENATED	68037-01-4	20 - < 30%	H304

* All concentrations are percent by weight unless material is a gas. Gas concentrations are in percent by volume.

As per paragraph (i) of 29 CFR 1910.1200, formulation is considered a trade secret and specific chemical identity and exact percentage (concentration) of composition may have been withheld. Specific chemical identity and exact percentage composition will be provided to health professionals, employees, or designated representatives in accordance with applicable provisions of paragraph (i).

SECTION 4 FIRST AID MEASURES

INHALATION

Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use mouth-to-mouth resuscitation.

SKIN CONTACT

Wash contact areas with soap and water. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

EYE CONTACT

Flush thoroughly with water. If irritation occurs, get medical assistance.

INGESTION

First aid is normally not required. Seek medical attention if discomfort occurs.

SECTION 5 FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

Appropriate Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO₂) to extinguish flames.

Inappropriate Extinguishing Media: Straight Streams of Water

FIRE FIGHTING

Fire Fighting Instructions: Evacuate area. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply. Firefighters should use standard protective equipment and in enclosed

Product Name: MOBIL 1 5W-20

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spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

Hazardous Combustion Products: Sulfur oxides, Smoke, Fume, Incomplete combustion products, Aldehydes, Oxides of carbon

FLAMMABILITY PROPERTIES

Flash Point [Method]: >200°C (392°F) [ASTM D-92]

Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0

Autoignition Temperature: N/D

SECTION 6	ACCIDENTAL RELEASE MEASURES
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NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations. US regulations require reporting releases of this material to the environment which exceed the applicable reportable quantity or oil spills which could reach any waterway including intermittent dry creeks. The National Response Center can be reached at (800)424-8802.

PROTECTIVE MEASURES

Avoid contact with spilled material. See Section 5 for fire fighting information. See the Hazard Identification Section for Significant Hazards. See Section 4 for First Aid Advice. See Section 8 for advice on the minimum requirements for personal protective equipment. Additional protective measures may be necessary, depending on the specific circumstances and/or the expert judgment of the emergency responders.

For emergency responders: Respiratory protection: respiratory protection will be necessary only in special cases, e.g., formation of mists. Half-face or full-face respirator with filter(s) for dust/organic vapor or Self Contained Breathing Apparatus (SCBA) can be used depending on the size of spill and potential level of exposure. If the exposure cannot be completely characterized or an oxygen deficient atmosphere is possible or anticipated, SCBA is recommended. Work gloves that are resistant to hydrocarbons are recommended. Gloves made of polyvinyl acetate (PVA) are not water-resistant and are not suitable for emergency use. Chemical goggles are recommended if splashes or contact with eyes is possible. Small spills: normal antistatic work clothes are usually adequate. Large spills: full body suit of chemical resistant, antistatic material is recommended.

SPILL MANAGEMENT

Land Spill: Stop leak if you can do it without risk. Recover by pumping or with suitable absorbent.

Water Spill: Stop leak if you can do it without risk. Confine the spill immediately with booms. Warn other shipping. Remove from the surface by skimming or with suitable absorbents. Seek the advice of a specialist before using dispersants.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

ENVIRONMENTAL PRECAUTIONS

Large Spills: Dike far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

SECTION 7	HANDLING AND STORAGE
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HANDLING

Avoid contact with used product. Prevent small spills and leakage to avoid slip hazard. Material can accumulate static charges which may cause an electrical spark (ignition source). When the material is handled in bulk, an electrical spark could ignite any flammable vapors from liquids or residues that may be present (e.g., during switch-loading operations). Use proper bonding and/or ground procedures. However, bonding and grounds may not eliminate the hazard from static accumulation. Consult local applicable standards for guidance. Additional references include American Petroleum Institute 2003 (Protection Against Ignitions Arising out of Static, Lightning and Stray Currents) or National Fire Protection Agency 77 (Recommended Practice on Static Electricity) or CENELEC CLC/TR 50404 (Electrostatics - Code of practice for the avoidance of hazards due to static electricity).

Static Accumulator: This material is a static accumulator.

STORAGE

The container choice, for example storage vessel, may effect static accumulation and dissipation. Do not store in open or unlabelled containers. Keep away from incompatible materials.

SECTION 8	EXPOSURE CONTROLS / PERSONAL PROTECTION
------------------	--

EXPOSURE LIMIT VALUES

Exposure limits/standards (Note: Exposure limits are not additive)

Substance Name	Form	Limit / Standard		NOTE	Source
1-DECENE, HOMOPOLYMER HYDROGENATED	Aerosols (thoracic fraction)	TWA	5 mg/m ³	N/A	ExxonMobil

Exposure limits/standards for materials that can be formed when handling this product: When mists/aerosols can occur the following are recommended: 5 mg/m³ - ACGIH TLV (inhalable fraction), 5 mg/m³ - OSHA PEL.

NOTE: Limits/standards shown for guidance only. Follow applicable regulations.

No biological limits allocated.

ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:

No special requirements under ordinary conditions of use and with adequate ventilation.

PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection: If engineering controls do not maintain airborne contaminant concentrations at a

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level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:

No special requirements under ordinary conditions of use and with adequate ventilation.

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapor warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

Hand Protection: Any specific glove information provided is based on published literature and glove manufacturer data. Glove suitability and breakthrough time will differ depending on the specific use conditions. Contact the glove manufacturer for specific advice on glove selection and breakthrough times for your use conditions. Inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:

No protection is ordinarily required under normal conditions of use.

Eye Protection: If contact is likely, safety glasses with side shields are recommended.

Skin and Body Protection: Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:

No skin protection is ordinarily required under normal conditions of use. In accordance with good industrial hygiene practices, precautions should be taken to avoid skin contact.

Specific Hygiene Measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping.

ENVIRONMENTAL CONTROLS

Comply with applicable environmental regulations limiting discharge to air, water and soil. Protect the environment by applying appropriate control measures to prevent or limit emissions.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Note: Physical and chemical properties are provided for safety, health and environmental considerations only and may not fully represent product specifications. Contact the Supplier for additional information.

GENERAL INFORMATION

Physical State: Liquid

Color: Amber

Odor: Characteristic

Odor Threshold: N/D

IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION

Relative Density (at 15 °C): 0.86

Flammability (Solid, Gas): N/A

Flash Point [Method]: >200°C (392°F) [ASTM D-92]

Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0

Autoignition Temperature: N/D

Boiling Point / Range: N/D

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Decomposition Temperature: N/D
Vapor Density (Air = 1): > 2 at 101 kPa [Estimated]
Vapor Pressure: < 0.013 kPa (0.1 mm Hg) at 20 °C [Estimated]
Evaporation Rate (n-butyl acetate = 1): N/D
pH: N/A
Log Pow (n-Octanol/Water Partition Coefficient): N/D
Solubility in Water: Negligible
Viscosity: 48.5 cSt (48.5 mm²/sec) at 40 °C | 8.8 cSt (8.8 mm²/sec) at 100°C
Oxidizing Properties: See Hazards Identification Section.

OTHER INFORMATION

Freezing Point: N/D
Melting Point: N/A
Pour Point: -42°C (-44°F)

SECTION 10	STABILITY AND REACTIVITY
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REACTIVITY: See sub-sections below.

STABILITY: Material is stable under normal conditions.

CONDITIONS TO AVOID: Excessive heat. High energy sources of ignition.

MATERIALS TO AVOID: Strong oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS: Material does not decompose at ambient temperatures.

POSSIBILITY OF HAZARDOUS REACTIONS: Hazardous polymerization will not occur.

SECTION 11	TOXICOLOGICAL INFORMATION
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INFORMATION ON TOXICOLOGICAL EFFECTS

<u>Hazard Class</u>	<u>Conclusion / Remarks</u>
Inhalation	
Acute Toxicity: No end point data for material.	Minimally Toxic. Based on assessment of the components.
Irritation: No end point data for material.	Negligible hazard at ambient/normal handling temperatures.
Ingestion	
Acute Toxicity: No end point data for material.	Minimally Toxic. Based on assessment of the components.
Skin	
Acute Toxicity: No end point data for material.	Minimally Toxic. Based on assessment of the components.
Skin Corrosion/Irritation: No end point data for material.	Negligible irritation to skin at ambient temperatures. Based on assessment of the components.
Eye	
Serious Eye Damage/Irritation: No end point data for material.	May cause mild, short-lasting discomfort to eyes. Based on assessment of the components.
Sensitization	
Respiratory Sensitization: No end point data for material.	Not expected to be a respiratory sensitizer.

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Skin Sensitization: No end point data for material.	Not expected to be a skin sensitizer. Based on assessment of the components.
Aspiration: Data available.	Not expected to be an aspiration hazard. Based on physico-chemical properties of the material.
Germ Cell Mutagenicity: No end point data for material.	Not expected to be a germ cell mutagen. Based on assessment of the components.
Carcinogenicity: No end point data for material.	Not expected to cause cancer. Based on assessment of the components.
Reproductive Toxicity: No end point data for material.	Not expected to be a reproductive toxicant. Based on assessment of the components.
Lactation: No end point data for material.	Not expected to cause harm to breast-fed children.
Specific Target Organ Toxicity (STOT)	
Single Exposure: No end point data for material.	Not expected to cause organ damage from a single exposure.
Repeated Exposure: No end point data for material.	Not expected to cause organ damage from prolonged or repeated exposure. Based on assessment of the components.

OTHER INFORMATION

For the product itself:

Diesel engine oils: Not carcinogenic in animals tests. Used and unused diesel engine oils did not produce any carcinogenic effects in chronic mouse skin painting studies.

Oils that are used in gasoline engines may become hazardous and display the following properties: Carcinogenic in animal tests. Caused mutations in vitro. Possible allergen and photoallergen. Contains polycyclic aromatic compounds (PAC) from combustion products of gasoline and/or thermal degradation products.

Contains:

Synthetic base oils: Not expected to cause significant health effects under conditions of normal use, based on laboratory studies with the same or similar materials. Not mutagenic or genotoxic. Not sensitizing in test animals and humans.

The following ingredients are cited on the lists below: None.

--REGULATORY LISTS SEARCHED--

1 = NTP CARC

2 = NTP SUS

3 = IARC 1

4 = IARC 2A

5 = IARC 2B

6 = OSHA CARC

SECTION 12

ECOLOGICAL INFORMATION

The information given is based on data available for the material, the components of the material, and similar materials.

ECOTOXICITY

Material -- Not expected to be harmful to aquatic organisms.

MOBILITY

Base oil component -- Low solubility and floats and is expected to migrate from water to the land.

Expected to partition to sediment and wastewater solids.

SECTION 13	DISPOSAL CONSIDERATIONS
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Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

DISPOSAL RECOMMENDATIONS

Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products. Protect the environment. Dispose of used oil at designated sites. Minimize skin contact. Do not mix used oils with solvents, brake fluids or coolants.

REGULATORY DISPOSAL INFORMATION

RCRA Information: The unused product, in our opinion, is not specifically listed by the EPA as a hazardous waste (40 CFR, Part 261D), nor is it formulated to contain materials which are listed as hazardous wastes. It does not exhibit the hazardous characteristics of ignitability, corrosivity or reactivity and is not formulated with contaminants as determined by the Toxicity Characteristic Leaching Procedure (TCLP). However, used product may be regulated.

Empty Container Warning Empty Container Warning (where applicable): Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. **DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.**

SECTION 14	TRANSPORT INFORMATION
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LAND (DOT): Not Regulated for Land Transport

LAND (TDG): Not Regulated for Land Transport

SEA (IMDG): Not Regulated for Sea Transport according to IMDG-Code

Marine Pollutant: No

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AIR (IATA): Not Regulated for Air Transport

SECTION 15	REGULATORY INFORMATION
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OSHA HAZARD COMMUNICATION STANDARD: This material is not considered hazardous in accordance with OSHA HazCom 2012, 29 CFR 1910.1200.

Listed or exempt from listing/notification on the following chemical inventories: AICS, DSL, IECSC, KECI, PICCS, TSCA

Special Cases:

Inventory	Status
ENCS	Restrictions Apply

EPCRA SECTION 302: This material contains no extremely hazardous substances.

SARA (311/312) REPORTABLE HAZARD CATEGORIES: None.

SARA (313) TOXIC RELEASE INVENTORY: This material contains no chemicals subject to the supplier notification requirements of the SARA 313 Toxic Release Program.

The following ingredients are cited on the lists below:

Chemical Name	CAS Number	List Citations
PHENOL, 4,4-METHYLENEBIS(2,6-BIS(1,1-DIMETHYLETHYL)-	118-82-1	5
ZINC ALKYL DITHIOPHOSPHATE	68649-42-3	15, 19
ZINC DITHIOPHOSPHATE	68649-42-3	15, 19

--REGULATORY LISTS SEARCHED--

- | | | | |
|---------------|------------------|-------------------|-------------|
| 1 = ACGIH ALL | 6 = TSCA 5a2 | 11 = CA P65 REPRO | 16 = MN RTK |
| 2 = ACGIH A1 | 7 = TSCA 5e | 12 = CA RTK | 17 = NJ RTK |
| 3 = ACGIH A2 | 8 = TSCA 6 | 13 = IL RTK | 18 = PA RTK |
| 4 = OSHA Z | 9 = TSCA 12b | 14 = LA RTK | 19 = RI RTK |
| 5 = TSCA 4 | 10 = CA P65 CARC | 15 = MI 293 | |

Code key: CARC=Carcinogen; REPRO=Reproductive

SECTION 16	OTHER INFORMATION
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N/D = Not determined, N/A = Not applicable

KEY TO THE H-CODES CONTAINED IN SECTION 3 OF THIS DOCUMENT (for information only):

H304: May be fatal if swallowed and enters airways; Aspiration, Cat 1

Product Name: MOBIL 1 5W-20

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THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:

Updates made in accordance with implementation of GHS requirements.

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Internal Use Only

MHC: 0B, 0B, 0, 0, 0, 0

PPEC: A

DGN: 7009417XUS (1008034)

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SAFETY DATA SHEET

Creation Date 12-Mar-2009

Revision Date 11-Apr-2018

Revision Number 8

1. Identification

Product Name Nitric acid (65 - 70%)

Cat No. : A198C-212, A200-212, A200-212LC, A200-500, A200-500LC, A200-612GAL, A200C-212, A200S-212, A200S-212LC, A200S-500, A200SI-212, A467-1, A467-2, A467-250, A467-500, A483-212; S719721

CAS-No 7697-37-2
Synonyms Azotic acid; Engraver's acid; Aqua fortis

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
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Emergency Telephone Number

CHEMTREC®, Inside the USA: 800-424-9300
CHEMTREC®, Outside the USA: 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)

Oxidizing liquids	Category 3
Corrosive to metals	Category 1
Skin Corrosion/irritation	Category 1 A
Serious Eye Damage/Eye Irritation	Category 1

Label Elements

Signal Word

Danger

Hazard Statements

May intensify fire; oxidizer
May be corrosive to metals
Causes severe skin burns and eye damage

**Precautionary Statements****Prevention**

Do not breathe dust/fume/gas/mist/vapors/spray
 Wash face, hands and any exposed skin thoroughly after handling
 Wear protective gloves/protective clothing/eye protection/face protection
 Use only outdoors or in a well-ventilated area
 Keep away from heat/sparks/open flames/hot surfaces. - No smoking
 Keep/Store away from clothing/ other combustible materials
 Take any precaution to avoid mixing with combustibles
 Keep only in original container
 Wear respiratory protection

Response

Immediately call a POISON CENTER or doctor/physician

Inhalation

IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
 Immediately call a POISON CENTER or doctor/physician

Skin

IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
 Wash contaminated clothing before reuse

Eyes

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing

Ingestion

IF SWALLOWED: Rinse mouth. DO NOT induce vomiting

Fire

In case of fire: Use CO₂, dry chemical, or foam for extinction

Spills

Absorb spillage to prevent material damage

Storage

Store locked up
 Store in a well-ventilated place. Keep container tightly closed
 Store in corrosive resistant polypropylene container with a resistant inliner
 Store in a dry place

Disposal

Dispose of contents/container to an approved waste disposal plant

Hazards not otherwise classified (HNOC)

Corrosive to the respiratory tract

3. Composition/Information on Ingredients

Component	CAS-No	Weight %
Nitric acid	7697-37-2	65 - 70
Water	7732-18-5	30 - 35

4. First-aid measures

General Advice

Immediate medical attention is required. Show this safety data sheet to the doctor in attendance.

Eye Contact

Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.

	Immediate medical attention is required.
Skin Contact	Wash off immediately with plenty of water for at least 15 minutes. Remove and wash contaminated clothing before re-use. Call a physician immediately.
Inhalation	If breathing is difficult, give oxygen. 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. Remove from exposure, lie down. Call a physician immediately.
Ingestion	Do not induce vomiting. Never give anything by mouth to an unconscious person. Clean mouth with water. Call a physician immediately.
Most important symptoms and effects	Causes burns by all exposure routes. Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation: Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated
Notes to Physician	Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media	CO ₂ , dry chemical, dry sand, alcohol-resistant foam.
Unsuitable Extinguishing Media	No information available
Flash Point	Not applicable
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

Thermal decomposition can lead to release of irritating gases and vapors. The product causes burns of eyes, skin and mucous membranes. Oxidizer: Contact with combustible/organic material may cause fire. May ignite combustibles (wood paper, oil, clothing, etc.).

Hazardous Combustion Products

Nitrogen oxides (NO_x) Thermal decomposition can lead to release of irritating gases and vapors

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. Thermal decomposition can lead to release of irritating gases and vapors.

NFPA

Health	Flammability	Instability	Physical hazards
4	0	0	OX

6. Accidental release measures

Personal Precautions	Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak. Ensure adequate ventilation. Use personal protective equipment.
Environmental Precautions	Should not be released into the environment. Do not flush into surface water or sanitary sewer system. See Section 12 for additional ecological information.
Methods for Containment and Clean Up	Soak up with inert absorbent material. Keep in suitable, closed containers for disposal. Sweep up and shovel into suitable containers for disposal.

7. Handling and storage

Handling	Use only under a chemical fume hood. Wear personal protective equipment. Do not get in eyes, on skin, or on clothing. Do not ingest. Do not breathe vapors or spray mist. Keep away from clothing and other combustible materials.
Storage	Keep containers tightly closed in a cool, well-ventilated place. Do not store near combustible materials.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Nitric acid	TWA: 2 ppm STEL: 4 ppm	(Vacated) TWA: 2 ppm (Vacated) TWA: 5 mg/m ³ (Vacated) STEL: 4 ppm (Vacated) STEL: 10 mg/m ³ TWA: 2 ppm TWA: 5 mg/m ³	IDLH: 25 ppm TWA: 2 ppm TWA: 5 mg/m ³ STEL: 4 ppm STEL: 10 mg/m ³	TWA: 2 ppm TWA: 5 mg/m ³ STEL: 4 ppm STEL: 10 mg/m ³

Legend

ACGIH - American Conference of Governmental Industrial Hygienists

OSHA - Occupational Safety and Health Administration

NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health

Engineering Measures	Use only under a chemical fume hood. Ensure that eyewash stations and safety showers are close to the workstation location. Ensure adequate ventilation, especially in confined areas.
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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. Tightly fitting safety goggles. Face-shield.
Skin and body protection	Long sleeved clothing.
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	Keep away from food, drink and animal feeding stuffs. When using, do not eat, drink or smoke. Contaminated work clothing should not be allowed out of the workplace. Provide regular cleaning of equipment, work area and clothing. Avoid contact with skin, eyes and clothing. For environmental protection remove and wash all contaminated protective equipment before re-use. Wear suitable gloves and eye/face protection.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Clear Colorless, Light yellow
Odor	Strong Acrid
Odor Threshold	No information available
pH	< 1.0 (0.1M)
Melting Point/Range	-41 °C / -41.8 °F
Boiling Point/Range	Not applicable
Flash Point	Not applicable
Evaporation Rate	No information available
Flammability (solid,gas)	Not applicable

Flammability or explosive limits

Upper	No data available
Lower	No data available
Vapor Pressure	0.94 kPa (20°C)
Vapor Density	No information available
Specific Gravity	1.40
Solubility	miscible
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	No information available
Viscosity	No information available
Molecular Formula	HNO ₃
Molecular Weight	63.01

10. Stability and reactivity

Reactive Hazard	Yes
Stability	Oxidizer: Contact with combustible/organic material may cause fire.
Conditions to Avoid	Incompatible products. Combustible material. Excess heat. Exposure to air or moisture over prolonged periods.
Incompatible Materials	Combustible material, Strong bases, Reducing agents, Metals, Powdered metals, Organic materials, Aldehydes, Alcohols, Cyanides, Ammonia, Strong reducing agents
Hazardous Decomposition Products	Nitrogen oxides (NO _x), Thermal decomposition can lead to release of irritating gases and vapors
Hazardous Polymerization	Hazardous polymerization does not occur.
Hazardous Reactions	None under normal processing.

11. Toxicological information

Acute Toxicity**Product Information**

Oral LD50 Based on ATE data, the classification criteria are not met. ATE > 2000 mg/kg.

Dermal LD50 Based on ATE data, the classification criteria are not met. ATE > 2000 mg/kg.

Vapor LC50 Based on ATE data, the classification criteria are not met. ATE > 20 mg/l.

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Nitric acid	Not listed	Not listed	LC50 = 2500 ppm. (Rat) 1h
Water	-	Not listed	Not listed

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation Causes severe burns by all exposure routes

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
Nitric acid	7697-37-2	Not listed	Not listed	Not listed	Not listed	Not listed
Water	7732-18-5	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	Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation: Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated
Endocrine Disruptor Information	No information available
Other Adverse Effects	The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

Do not empty into drains. Large amounts will affect pH and harm aquatic organisms.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Nitric acid	Not listed	LC50: = 72 mg/L, 96h (Gambusia affinis)	Not listed	Not listed

Persistence and Degradability Miscible with water Persistence is unlikely based on information available.

Bioaccumulation/ Accumulation No information available.

Mobility Will likely be mobile in the environment due to its water solubility.

Component	log Pow
Nitric acid	-2.3

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	UN2031
Proper Shipping Name	NITRIC ACID
Hazard Class	8
Subsidiary Hazard Class	5.1
Packing Group	II

TDG

UN-No	UN2031
Proper Shipping Name	NITRIC ACID
Hazard Class	8
Subsidiary Hazard Class	5.1
Packing Group	II

IATA

UN-No	UN2031
Proper Shipping Name	NITRIC ACID
Hazard Class	8
Subsidiary Hazard Class	5.1
Packing Group	II

IMDG/IMO

UN-No	UN2031
Proper Shipping Name	NITRIC ACID
Hazard Class	8
Subsidiary Hazard Class	5.1
Packing Group	II

15. Regulatory information

All of the components in the product are on the following Inventory lists: X = listed

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Nitric acid	X	X	-	231-714-2	-		X	X	X	X	X
Water	X	X	-	231-791-2	-		X	-	X	X	X

Legend:

X - Listed

E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.

F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.

N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.

P - Indicates a commenced PMN substance

R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.

S - Indicates a substance that is identified in a proposed or final Significant New Use Rule

T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.

XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B)).

Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.

Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable

SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Nitric acid	7697-37-2	65 - 70	1.0

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
Nitric acid	X	1000 lb	-	-

Clean Air Act Not applicable

OSHA Occupational Safety and Health Administration

Component	Specifically Regulated Chemicals	Highly Hazardous Chemicals
Nitric acid	-	TQ: 500 lb

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
Nitric acid	1000 lb	1000 lb

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
Nitric acid	X	X	X	X	X
Water	-	-	X	-	-

U.S. Department of Transportation

Reportable Quantity (RQ): Y
 DOT Marine Pollutant N
 DOT Severe Marine Pollutant N

U.S. Department of Homeland Security

This product contains the following DHS chemicals:

Component	DHS Chemical Facility Anti-Terrorism Standard
Nitric acid	2000 lb STQ

Other International Regulations

Mexico - Grade No information available

16. Other information

Prepared By Regulatory Affairs
 Thermo Fisher Scientific
 Email: EMSDS.RA@thermofisher.com

Creation Date 12-Mar-2009

Revision Date 11-Apr-2018

Print Date 11-Apr-2018

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

Nitrogen, compressed

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SECTION 1: Product and company identification

1.1. Product identifier

Product form : Substance
Name : Nitrogen, compressed
CAS No : 7727-37-9
Formula : N2
Other means of identification : Dinitrogen, Refrigerant R728, Nitrogen, Medipure Nitrogen, Extendapak Nitrogen, Nitrogen - Diving Grade

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture : Industrial use
Medical applications.
Food applications.
Diving Gas (Underwater Breathing)

1.3. Details of the supplier of the safety data sheet

Praxair, Inc.
39 Old Ridgebury Road
Danbury, CT 06810-5113 - USA
T 1-800-772-9247 (1-800-PRAXAIR) - F 1-716-879-2146
www.praxair.com

1.4. Emergency telephone number

Emergency number : Onsite Emergency: 1-800-645-4633

CHEMTREC, 24hr/day 7days/week — Within USA: 1-800-424-9300, Outside USA: 001-703-527-3887 (collect calls accepted, Contract 17729)

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification (GHS-US)

Compressed gas H280

2.2. Label elements

GHS-US labeling

Hazard pictograms (GHS-US) :



GHS04

Signal word (GHS-US) :

WARNING

Hazard statements (GHS-US) :

H280 - CONTAINS GAS UNDER PRESSURE; MAY EXPLODE IF HEATED
OSHA-H01 - MAY DISPLACE OXYGEN AND CAUSE RAPID SUFFOCATION.

Precautionary statements (GHS-US) :

P202 - Do not handle until all safety precautions have been read and understood
P271+P403 - Use and store only outdoors or in a well-ventilated place.
CGA-PG05 - Use a back flow preventive device in the piping.
CGA-PG10 - Use only with equipment rated for cylinder pressure.
CGA-PG06 - Close valve after each use and when empty.
CGA-PG02 - Protect from sunlight when ambient temperature exceeds 52°C (125°F).

2.3. Other hazards

No additional information available

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2.4. Unknown acute toxicity (GHS-US)

No data available

SECTION 3: Composition/information on ingredients

3.1. Substance

Name : Nitrogen, compressed
CAS No : 7727-37-9

Name	Product identifier	%
Nitrogen	(CAS No) 7727-37-9	99.5 - 100

3.2. Mixture

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures after inhalation : Immediately remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, qualified personnel may give oxygen. Call a physician.

First-aid measures after skin contact : Adverse effects not expected from this product.

First-aid measures after eye contact : Adverse effects not expected from this product. In case of eye irritation: Rinse immediately with plenty of water. Consult an ophthalmologist if irritation persists.

First-aid measures after ingestion : Ingestion is not considered a potential route of exposure.

4.2. Most important symptoms and effects, both acute and delayed

No additional information available

4.3. Indication of any immediate medical attention and special treatment needed

None.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : Use extinguishing media appropriate for surrounding fire.

5.2. Special hazards arising from the substance or mixture

Reactivity : Under certain conditions, nitrogen can react violently with lithium, neodymium, titanium (above 1472°F/800°C), and magnesium to form nitrides. At high temperature, it can also combine with oxygen and hydrogen.

5.3. Advice for firefighters

Firefighting instructions : Evacuate all personnel from the danger area. Use self-contained breathing apparatus (SCBA) and protective clothing. Immediately cool containers with water from maximum distance. Stop flow of gas if safe to do so, while continuing cooling water spray. Remove ignition sources if safe to do so. Remove containers from area of fire if safe to do so. On-site fire brigades must comply with OSHA 29 CFR 1910.156 and applicable standards under 29 CFR 1910 Subpart L—Fire Protection.

Protection during firefighting : Compressed gas: asphyxiant. Suffocation hazard by lack of oxygen.

Special protective equipment for fire fighters : Standard protective clothing and equipment (Self Contained Breathing Apparatus) for fire fighters.

Specific methods : Use fire control measures appropriate for the surrounding fire. Exposure to fire and heat radiation may cause gas containers to rupture. Cool endangered containers with water spray jet from a protected position. Prevent water used in emergency cases from entering sewers and drainage systems.

Stop flow of product if safe to do so.

Use water spray or fog to knock down fire fumes if possible.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

General measures : Evacuate area. Ensure adequate air ventilation. Wear self-contained breathing apparatus when entering area unless atmosphere is proven to be safe. Stop leak if safe to do so.

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6.1.1. For non-emergency personnel

No additional information available

6.1.2. For emergency responders

No additional information available

6.2. Environmental precautions

No additional information available

6.3. Methods and material for containment and cleaning up

No additional information available

6.4. Reference to other sections

See also sections 8 and 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling

: Wear leather safety gloves and safety shoes when handling cylinders. Protect cylinders from physical damage; do not drag, roll, slide or drop. While moving cylinder, always keep in place removable valve cover. Never attempt to lift a cylinder by its cap; the cap is intended solely to protect the valve. When moving cylinders, even for short distances, use a cart (trolley, hand truck, etc.) designed to transport cylinders. Never insert an object (e.g., wrench, screwdriver, pry bar) into cap openings; doing so may damage the valve and cause a leak. Use an adjustable strap wrench to remove over-tight or rusted caps. Slowly open the valve. If the valve is hard to open, discontinue use and contact your supplier. Close the container valve after each use; keep closed even when empty. Never apply flame or localized heat directly to any part of the container. High temperatures may damage the container and could cause the pressure relief device to fail prematurely, venting the container contents. For other precautions in using this product, see section 16.

Safe use of the product

: **The suitability of this product as a component in underwater breathing gas mixtures** is to be determined by or under the supervision of personnel experienced in the use of underwater breathing gas mixtures and familiar with the physiological effects, methods employed, frequency and duration of use, hazards, side effects, and precautions to be taken.

7.2. Conditions for safe storage, including any incompatibilities

Storage conditions

: Store in a cool, well-ventilated place. Store and use with adequate ventilation. Store only where temperature will not exceed 125°F (52°C). Firmly secure containers upright to keep them from falling or being knocked over. Install valve protection cap, if provided, firmly in place by hand. Store full and empty containers separately. Use a first-in, first-out inventory system to prevent storing full containers for long periods.

OTHER PRECAUTIONS FOR HANDLING, STORAGE, AND USE: When handling product under pressure, use piping and equipment adequately designed to withstand the pressures to be encountered. Never work on a pressurized system. Use a back flow preventive device in the piping. Gases can cause rapid suffocation because of oxygen deficiency; store and use with adequate ventilation. If a leak occurs, close the container valve and blow down the system in a safe and environmentally correct manner in compliance with all international, federal/national, state/provincial, and local laws; then repair the leak. Never place a container where it may become part of an electrical circuit.

7.3. Specific end use(s)

None.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Nitrogen, compressed (7727-37-9)	
ACGIH	Not established
USA OSHA	Not established
Nitrogen (7727-37-9)	
ACGIH	Not established
USA OSHA	Not established

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8.2. Exposure controls

Appropriate engineering controls	: Use a local exhaust system with sufficient flow velocity to maintain an adequate supply of air in the worker's breathing zone. Mechanical (general): General exhaust ventilation may be acceptable if it can maintain an adequate supply of air.
Eye protection	: Wear safety glasses with side shields.
Skin and body protection	: Wear metatarsal shoes and work gloves for cylinder handling, and protective clothing where needed. Wear appropriate chemical gloves during cylinder changeout or wherever contact with product is possible. Select per OSHA 29 CFR 1910.132, 1910.136, and 1910.138.
Respiratory protection	: When workplace conditions warrant respirator use, follow a respiratory protection program that meets OSHA 29 CFR 1910.134, ANSI Z88.2, or MSHA 30 CFR 72.710 (where applicable). Use an air-supplied or air-purifying cartridge if the action level is exceeded. Ensure that the respirator has the appropriate protection factor for the exposure level. If cartridge type respirators are used, the cartridge must be appropriate for the chemical exposure (e.g., an organic vapor cartridge). For emergencies or instances with unknown exposure levels, use a self-contained breathing apparatus (SCBA).

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	: Gas
Appearance	: Colorless gas.
Molecular mass	: 28 g/mol
Color	: Colorless.
Odor	: No odor warning properties.
Odor threshold	: No data available
pH	: Not applicable.
Relative evaporation rate (butyl acetate=1)	: No data available
Relative evaporation rate (ether=1)	: Not applicable.
Melting point	: -210 °C
Freezing point	: No data available
Boiling point	: -195.8 °C
Flash point	: No data available
Critical temperature	: -149.9 °C
Auto-ignition temperature	: Not applicable.
Decomposition temperature	: No data available
Flammability (solid, gas)	: No data available
Vapor pressure	: Not applicable.
Critical pressure	: 3390 kPa
Relative vapor density at 20 °C	: No data available
Relative density	: No data available
Density	: 1.16 kg/m ³
Relative gas density	: 0.97
Solubility	: Water: 20 mg/l
Log Pow	: Not applicable.
Log Kow	: Not applicable.
Viscosity, kinematic	: Not applicable.
Viscosity, dynamic	: Not applicable.
Explosive properties	: Not applicable.
Oxidizing properties	: None.
Explosion limits	: No data available

9.2. Other information

Gas group	: Compressed gas
Additional information	: None.

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SECTION 10: Stability and reactivity

10.1. Reactivity

Under certain conditions, nitrogen can react violently with lithium, neodymium, titanium (above 1472°F/800°C), and magnesium to form nitrides. At high temperature, it can also combine with oxygen and hydrogen.

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

May occur.

10.4. Conditions to avoid

None under recommended storage and handling conditions (see section 7).

10.5. Incompatible materials

None.

10.6. Hazardous decomposition products

None.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity	: Not classified
Skin corrosion/irritation	: Not classified pH: Not applicable.
Serious eye damage/irritation	: Not classified pH: Not applicable.
Respiratory or skin sensitization	: Not classified
Germ cell mutagenicity	: Not classified
Carcinogenicity	: Not classified
Reproductive toxicity	: Not classified
Specific target organ toxicity (single exposure)	: Not classified
Specific target organ toxicity (repeated exposure)	: Not classified
Aspiration hazard	: Not classified

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general : No ecological damage caused by this product.

12.2. Persistence and degradability

Nitrogen, compressed (7727-37-9)	
Persistence and degradability	No ecological damage caused by this product.
Nitrogen (7727-37-9)	
Persistence and degradability	No ecological damage caused by this product.

12.3. Bioaccumulative potential

Nitrogen, compressed (7727-37-9)	
Log Pow	Not applicable.
Log Kow	Not applicable.
Bioaccumulative potential	No ecological damage caused by this product.

Nitrogen, compressed

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Nitrogen (7727-37-9)	
Log Pow	Not applicable for inorganic gases.
Log Kow	Not applicable.
Bioaccumulative potential	No ecological damage caused by this product.

12.4. Mobility in soil

Nitrogen, compressed (7727-37-9)	
Mobility in soil	No data available.
Ecology - soil	No ecological damage caused by this product.

Nitrogen (7727-37-9)	
Mobility in soil	No data available.
Ecology - soil	No ecological damage caused by this product.

12.5. Other adverse effects

Effect on ozone layer : None.
 Effect on the global warming : None.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste disposal recommendations : Dispose of contents/container in accordance with local/regional/national/international regulations. Contact supplier for any special requirements.

SECTION 14: Transport information

In accordance with DOT
 Transport document description : UN1066 Nitrogen, compressed, 2.2
 UN-No.(DOT) : UN1066
 Proper Shipping Name (DOT) : Nitrogen, compressed
 Transport hazard class(es) (DOT) : 2.2 - Class 2.2 - Non-flammable compressed gas 49 CFR 173.115
 Hazard labels (DOT) : 2.2 - Non-flammable gas



Additional information

Emergency Response Guide (ERG) Number : 121 (UN1066);120 (UN1977)
 Other information : No supplementary information available.
 Special transport precautions : Avoid transport on vehicles where the load space is not separated from the driver's compartment. Ensure vehicle driver is aware of the potential hazards of the load and knows what to do in the event of an accident or an emergency. Before transporting product containers:
 - Ensure there is adequate ventilation. - Ensure that containers are firmly secured. - Ensure cylinder valve is closed and not leaking. - Ensure valve outlet cap nut or plug (where provided) is correctly fitted. - Ensure valve protection device (where provided) is correctly fitted.

Transport by sea

UN-No. (IMDG) : 1066
 Proper Shipping Name (IMDG) : NITROGEN, COMPRESSED
 Class (IMDG) : 2 - Gases
 MFAG-No : 121

Air transport

UN-No.(IATA) : 1066
 Proper Shipping Name (IATA) : Nitrogen, compressed

Nitrogen, compressed

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Class (IATA) : 2
Civil Aeronautics Law : Gases under pressure/Gases nonflammable nontoxic under pressure

SECTION 15: Regulatory information

15.1. US Federal regulations

Nitrogen, compressed (7727-37-9)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

SARA Section 311/312 Hazard Classes	Sudden release of pressure hazard
-------------------------------------	-----------------------------------

15.2. International regulations

CANADA

Nitrogen, compressed (7727-37-9)

Listed on the Canadian DSL (Domestic Substances List)

Nitrogen (7727-37-9)

Listed on the Canadian DSL (Domestic Substances List)

EU-Regulations

Nitrogen, compressed (7727-37-9)

Listed on the EEC inventory EINECS (European Inventory of Existing Commercial Chemical Substances)

15.2.2. National regulations

Nitrogen, compressed (7727-37-9)

Listed on the AICS (Australian Inventory of Chemical Substances)

Listed on IECSC (Inventory of Existing Chemical Substances Produced or Imported in China)

Listed on the Korean ECL (Existing Chemicals List)

Listed on NZIoC (New Zealand Inventory of Chemicals)

Listed on PICCS (Philippines Inventory of Chemicals and Chemical Substances)

15.3. US State regulations

Nitrogen, compressed(7727-37-9)

U.S. - California - Proposition 65 - Carcinogens List	No
U.S. - California - Proposition 65 - Developmental Toxicity	No
U.S. - California - Proposition 65 - Reproductive Toxicity - Female	No
U.S. - California - Proposition 65 - Reproductive Toxicity - Male	No
State or local regulations	U.S. - Massachusetts - Right To Know List U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) List

Nitrogen (7727-37-9)

U.S. - California - Proposition 65 - Carcinogens List	U.S. - California - Proposition 65 - Developmental Toxicity	U.S. - California - Proposition 65 - Reproductive Toxicity - Female	U.S. - California - Proposition 65 - Reproductive Toxicity - Male	No significance risk level (NSRL)
No	No	No	No	

Nitrogen (7727-37-9)

U.S. - Massachusetts - Right To Know List

U.S. - New Jersey - Right to Know Hazardous Substance List

U.S. - Pennsylvania - RTK (Right to Know) List

Nitrogen, compressed

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SECTION 16: Other information

- Revision date : 6/24/2015 12:00:00 AM
- Other information : When you mix two or more chemicals, you can create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an industrial hygienist or other trained person when you evaluate the end product. Before using any plastics, confirm their compatibility with this product.

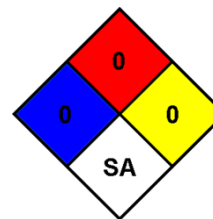
Praxair asks users of this product to study this SDS and become aware of the product hazards and safety information. To promote safe use of this product, a user should (1) notify employees, agents, and contractors of the information in this SDS and of any other known product hazards and safety information, (2) furnish this information to each purchaser of the product, and (3) ask each purchaser to notify its employees and customers of the product hazards and safety information.

The opinions expressed herein are those of qualified experts within Praxair, Inc. We believe that the information contained herein is current as of the date of this Safety Data Sheet. Since the use of this information and the conditions of use are not within the control of Praxair, Inc., it is the user's obligation to determine the conditions of safe use of the product.

Praxair SDSs are furnished on sale or delivery by Praxair or the independent distributors and suppliers who package and sell our products. To obtain current SDSs for these products, contact your Praxair sales representative, local distributor, or supplier, or download from www.praxair.com. If you have questions regarding Praxair SDSs, would like the document number and date of the latest SDS, or would like the names of the Praxair suppliers in your area, phone or write the Praxair Call Center (Phone: 1-800-PRAXAIR/1-800-772-9247; Address: Praxair Call Center, Praxair, Inc., P.O. Box 44, Tonawanda, NY 14151-0044).

PRAXAIR and the Flowing Airstream design are trademarks or registered trademarks of Praxair Technology, Inc. in the United States and/or other countries.

- NFPA health hazard : 0 - Exposure under fire conditions would offer no hazard beyond that of ordinary combustible materials.
- NFPA fire hazard : 0 - Materials that will not burn.
- NFPA reactivity : 0 - Normally stable, even under fire exposure conditions, and are not reactive with water.
- NFPA specific hazard : SA - This denotes gases which are simple asphyxiants.



HMIS III Rating

- Health : 0 Minimal Hazard - No significant risk to health
- Flammability : 0 Minimal Hazard
- Physical : 3 Serious Hazard

SDS US (GHS HazCom 2012) - Praxair

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.

SAFETY DATA SHEET

Nonflammable Gas Mixture: Carbon Dioxide / Nitrogen / Oxygen

Section 1. Identification

GHS product identifier	: Nonflammable Gas Mixture: Carbon Dioxide / Nitrogen / Oxygen
Other means of identification	: Not available.
Product type	: Gas.
Product use	: Synthetic/Analytical chemistry.
SDS #	: 002061
Supplier's details	: Airgas USA, LLC and its affiliates 259 North Radnor-Chester Road Suite 100 Radnor, PA 19087-5283 1-610-687-5253
24-hour telephone	: 1-866-734-3438

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	: GASES UNDER PRESSURE - Compressed gas

GHS label elements

Hazard pictograms

:



Signal word

: Warning

Hazard statements

: Contains gas under pressure; may explode if heated.
May displace oxygen and cause rapid suffocation.
May increase respiration and heart rate.

Precautionary statements

General

: Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction.

Prevention

: Not applicable.

Response

: Not applicable.

Storage

: Protect from sunlight. Store in a well-ventilated place.

Disposal

: Not applicable.

Hazards not otherwise classified

: In addition to any other important health or physical hazards, this product may displace oxygen and cause rapid suffocation.

Section 3. Composition/information on ingredients

Substance/mixture	: Mixture
Other means of identification	: Not available.
Product code	: 002061

Ingredient name	%	CAS number
Carbon Dioxide	2 - 99	124-38-9
Nitrogen	0.0001 - 98	7727-37-9
oxygen	0.0001 - 19.5	7782-44-7

Any concentration shown as a range is to protect confidentiality or is due to batch 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 irritation occurs.
Inhalation	: Remove victim to fresh air and keep at rest in a position comfortable for breathing. 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 adverse health effects persist or are severe. 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. In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.
Skin contact	: Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse.
Ingestion	: As this product is a gas, refer to the inhalation section.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact	: Contact with rapidly expanding gas may cause burns or frostbite.
Inhalation	: No known significant effects or critical hazards.
Skin contact	: Contact with rapidly expanding gas may cause burns or frostbite.
Frostbite	: Try to warm up the frozen tissues and seek medical attention.
Ingestion	: As this product is a gas, refer to the inhalation section.

Over-exposure signs/symptoms

Eye contact	: No specific data.
Inhalation	: No specific data.
Skin contact	: No specific data.
Ingestion	: No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician	: In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.
Specific treatments	: No specific treatment.

Section 4. First aid measures

- Protection of first-aiders** : No action shall be taken involving any personal risk or without suitable training. 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 an extinguishing agent suitable for the surrounding fire.
- Unsuitable extinguishing media** : None known.

Specific hazards arising from the chemical : Contains gas under pressure. In a fire or if heated, a pressure increase will occur and the container may burst or explode.

- Hazardous thermal decomposition products** : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
nitrogen oxides

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. Contact supplier immediately for specialist advice. 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. Avoid breathing gas. 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 : Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

- Small spill** : Immediately contact emergency personnel. Stop leak if without risk.
- Large spill** : Immediately contact emergency personnel. Stop leak if without risk. 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). Contains gas under pressure. Avoid breathing gas. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.
Avoid contact with eyes, skin and clothing. Empty containers retain product residue and can be hazardous.

Section 7. Handling and storage

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 away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F). Keep container tightly closed and sealed until ready for use. See Section 10 for incompatible materials before handling or use.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
Carbon Dioxide	<p>ACGIH TLV (United States, 3/2017). Oxygen Depletion [Asphyxiant]. STEL: 54000 mg/m³ 15 minutes. STEL: 30000 ppm 15 minutes. TWA: 9000 mg/m³ 8 hours. TWA: 5000 ppm 8 hours.</p> <p>NIOSH REL (United States, 10/2016). STEL: 54000 mg/m³ 15 minutes. STEL: 30000 ppm 15 minutes. TWA: 9000 mg/m³ 10 hours. TWA: 5000 ppm 10 hours.</p> <p>OSHA PEL (United States, 6/2016). TWA: 9000 mg/m³ 8 hours. TWA: 5000 ppm 8 hours.</p> <p>OSHA PEL 1989 (United States, 3/1989). STEL: 54000 mg/m³ 15 minutes. STEL: 30000 ppm 15 minutes. TWA: 18000 mg/m³ 8 hours. TWA: 10000 ppm 8 hours.</p>
Nitrogen	<p>ACGIH TLV (United States, 3/2017). Oxygen Depletion [Asphyxiant]. None.</p>
oxygen	

Appropriate engineering controls : Good general ventilation should be sufficient to control worker exposure to airborne contaminants.

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, fume scrubbers, 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.

Section 8. Exposure controls/personal protection

- Eye/face protection** : 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 contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields.
- Skin protection**
- Hand protection** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. 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. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.
- Body protection** : 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** : 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.
- Respiratory protection** : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use. 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.

Section 9. Physical and chemical properties

Appearance

- Physical state** : Gas.
- Color** : Not available.
- Odor** : Not available.
- Odor threshold** : Not available.
- pH** : Not available.
- Melting point** : -210.01°C (-346°F) This is based on data for the following ingredient: nitrogen. Weighted average: -211.4°C (-348.5°F)
- Boiling point** : Not available.
- Critical temperature** : Lowest known value: -146.95°C (-232.5°F) (nitrogen).
- Flash point** : Not available.
- Evaporation rate** : Not available.
- Flammability (solid, gas)** : Not available.
- Lower and upper explosive (flammable) limits** : Not available.
- Vapor pressure** : Not available.
- Vapor density** : Highest known value: 1.5 (Air = 1) (Carbon Dioxide). Weighted average: 1.22 (Air = 1)
- Gas Density (lb/ft³)** : Weighted average: 0.09
- Relative density** : Not applicable.
- Solubility** : Not available.
- Solubility in water** : Not available.
- Partition coefficient: n-octanol/water** : Not available.
- Auto-ignition temperature** : Not available.
- Decomposition temperature** : Not available.
- Viscosity** : Not applicable.
- Flow time (ISO 2431)** : Not available.

Section 10. Stability and reactivity

- Reactivity** : No specific test data related to reactivity available for this product or its ingredients.
- 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** : No specific data.
- Incompatible materials** : No specific data.
- Hazardous decomposition products** : Under normal conditions of storage and use, hazardous decomposition products should not be produced.
- Hazardous polymerization** : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Not available.

Irritation/Corrosion

Not available.

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Information on the likely routes of exposure : Not available.

Potential acute health effects

- Eye contact** : Contact with rapidly expanding gas may cause burns or frostbite.
- Inhalation** : No known significant effects or critical hazards.
- Skin contact** : Contact with rapidly expanding gas may cause burns or frostbite.

Section 11. Toxicological information

Ingestion : As this product is a gas, refer to the inhalation section.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

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 : No known significant effects or critical hazards.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

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.

Numerical measures of toxicity

Acute toxicity estimates

Not available.

Section 12. Ecological information

Toxicity

Not available.

Persistence and degradability

Not available.

Bioaccumulative potential

Product/ingredient name	LogP _{ow}	BCF	Potential
Carbon Dioxide	0.83	-	low
Nitrogen	0.67	-	low
oxygen	0.65	-	low

Mobility in soil

Soil/water partition coefficient (K_{oc}) : Not available.






Section 12. Ecological information

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. Empty Airgas-owned pressure vessels should be returned to Airgas. 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. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1956	UN1956	UN1956	UN1956	UN1956
UN proper shipping name	COMPRESSED GAS, N.O.S. (nitrogen, oxygen)	COMPRESSED GAS, N.O.S. (nitrogen, oxygen)	COMPRESSED GAS, N.O.S. (nitrogen, oxygen)	COMPRESSED GAS, N.O.S. (nitrogen, oxygen)	COMPRESSED GAS, N.O.S. (nitrogen, oxygen)
Transport hazard class(es)	2.2 	2.2 	2.2 	2.2 	2.2 
Packing group	-	-	-	-	-
Environmental hazards	No.	No.	No.	No.	No.

“Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product.”

Additional information

TDG Classification : Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.13-2.17 (Class 2).
Explosive Limit and Limited Quantity Index 0.125
Passenger Carrying Road or Rail Index 75

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 : **TSCA 8(a) CDR Exempt/Partial exemption:** All components are listed or exempted.

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Not listed

Section 15. Regulatory information

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304

Composition/information on ingredients

No products were found.

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : Refer to Section 2: Hazards Identification of this SDS for classification of substance.

State regulations

Massachusetts : The following components are listed: CARBON DIOXIDE; NITROGEN; NITROGEN (LIQUIFIED); OXYGEN (LIQUID)

New York : None of the components are listed.

New Jersey : The following components are listed: CARBON DIOXIDE; CARBONIC ACID GAS; NITROGEN; OXYGEN

Pennsylvania : The following components are listed: CARBON DIOXIDE; NITROGEN; OXYGEN

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol (Annexes A, B, C, E)

Not listed.

Stockholm Convention on Persistent Organic Pollutants

Not listed.

Rotterdam Convention on Prior Informed Consent (PIC)

Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

Inventory list

- 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)**: Not determined.
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 : All components are listed or exempted.
Thailand : Not determined.
Turkey : Not determined.
United States : All components are listed or exempted.

Section 15. Regulatory information

Viet Nam : Not determined.

Section 16. Other information

Hazardous Material Information System (U.S.A.)

Health	/	1
Flammability		0
Physical hazards		3

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings and the associated label are not required on SDSs or products leaving a facility under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered trademark and service mark of the American Coatings Association, Inc.

The customer is responsible for determining the PPE code for this material. For more information on HMIS® Personal Protective Equipment (PPE) codes, consult the HMIS® Implementation Manual.

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.

Procedure used to derive the classification

Classification	Justification
GASES UNDER PRESSURE - Compressed gas	On basis of test data

History

Date of printing : 1/22/2018

Date of issue/Date of revision : 1/22/2018

Date of previous issue : 10/24/2016

Version : 2

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

Section 16. Other information

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.

Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Section 1 Product Description

Product Name	ORP Calibration Solution
Recommended Use	Equipment Calibration
Synonyms	Zobell's Solution
Distributor	Atlas Scientific 43-15 11th Street, Long Island City, NY 11101 718-387-2075
Chemical Information	800-227-1150 (8am-5pm M-F)
Chemtrec	800-424-9300 (Transportation Spill Response 24 hours)

Section 2 Hazard Identification

Classification of the chemical in accordance with paragraph (d) of §1910.1200

Not a dangerous substance according to GHS classification criteria. No known OSHA hazards.

GHS Classification

Section 3 Composition / Information on Ingredients

Chemical Name	CAS #	%
Water	7732-18-5	97
Potassium Ferrocyanide	13746-66-2	1
Potassium Ferricyanide	14459-95-1	1
Potassium Chloride	7440-09-7	1

Section 4 First Aid Measures

Emergency and First Aid Procedures

Inhalation	In case of accident by inhalation: remove casualty to fresh air and keep at rest.
Eyes	In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
Skin Contact	After contact with skin, wash immediately with plenty of water.
Ingestion	If swallowed, do not induce vomiting: seek medical advice immediately and show this container or label.

Section 5 Firefighting Procedures

Extinguishing Media	Use media suitable to extinguish surrounding fire.
Fire Fighting Methods and Protection	Firefighters should wear full protective equipment and NIOSH approved self-contained breathing apparatus.
Fire and/or Explosion Hazards	Fire or excessive heat may produce hazardous decomposition products.
Hazardous Combustion Products	Phosphorus compounds, Potassium Oxide, Sodium Oxides

Section 6 Spill or Leak Procedures

Steps to Take in Case Material are Released or Spilled	No health affects expected from the clean-up of this material if contact can be avoided. Follow personal protective equipment recommendations found in Section 8 of this (M)SDS
Environmental Precautions	Avoid breathing material. Avoid contact with skin and eyes. Prevent the spread of any spill to minimize harm to human health and the environment if safe to do so. Wear complete and proper personal protective equipment following the recommendation of Section 8 at a minimum. Dike with suitable absorbent material like granulated clay. Gather and store in a sealed container pending a waste disposal evaluation.

Section 7 Handling and Storage

Handling	Avoid contact with skin and eyes.
-----------------	-----------------------------------

**Storage
Storage Code**

Keep container tightly closed in a cool, well-ventilated place.
Green - general chemical storage

Section 8 Protection Information

Chemical Name	ACGIH		OSHA PEL	
	(TWA)	(STEL)	(TWA)	(STEL)
Potassium Ferrocyanide	N/A	N/A	N/A	N/A
Potassium Ferricyanide	N/A	N/A	N/A	N/A
Potassium Chloride	N/A	N/A	2 mg/m ³ TWA	N/A

**Control Parameters
Engineering Measures**

Local exhaust ventilation or other engineering controls are normally required when handling or using this product to avoid overexposure.

**Personal Protective
Equipment (PPE)
Respiratory Protection
Respirator Type(s)**

Lab coat, apron, eye wash, safety shower.
No respiratory protection required under normal conditions of use.
None required where adequate ventilation is provided. If airborne concentrations are above the applicable exposure limits, use NIOSH/MSHA approved respiratory protection.
Eye Protection Wear chemical splash goggles when handling this product. Have an eye wash station available.

Skin Protection

Avoid skin contact by wearing chemically resistant gloves, an apron and other protective equipment depending upon conditions of use. Inspect gloves for chemical break-through and replace at regular intervals. Clean protective equipment regularly. Wash hands and other exposed areas with mild soap and water before eating, drinking, and when leaving work.

Gloves

No information available

Section 9 Physical Data

Formula See Section 3
Molecular Weight No data available
Appearance Colorless Yellow Depends upon product selection.
The color additives do not affect product hazards. Liquid
Odor None
Odor Threshold No data available
ORP Calibration Solution
Melting Point Estimated 0°C
Boiling Point 100°C
Flash Point No data available
Flammable Limits in Air No data available

Vapor Pressure No data available
Evaporation Rate (BuAc=1) No data available
Vapor Density (Air=1) No data available
Specific Gravity Approx. 1
Solubility in Water Soluble
Log Pow (calculated) No data available
Autoignition Temperature No data available
Decomposition Temperature No data available
Viscosity No data available
Percent Volatile by Volume No data available

Section 10 Reactivity Data

Reactivity
Chemical Stability
Conditions to Avoid
Incompatible Materials
**Hazardous Decomposition
Products**
Hazardous Polymerization

Not generally reactive under normal conditions.
Stable under normal conditions.
None known.
Water-reactive materials

Sodium Oxides, Potassium Oxide, Phosphorus compounds
Will not occur



Section 11 Toxicity Data

Routes of Entry Ingestion, skin and eye contact.
Symptoms (Acute) No data available
Delayed Effects No data available

Acute Toxicity	CAS Number	Oral LD50	Dermal LD50	Inhalation LC50
Chemical Name Water	7732-18-5	Oral LD50 Rat 90000 mg/kg		

Carcinogenicity	CAS Number	IARC	NTP	OSHA
Chemical Name Potassium Ferrocyanide	13746-66-2	Not listed	Not listed	Not listed
Potassium Ferricyanide	14459-95-1	Not listed	Not listed	Not listed
Potassium Chloride	7440-09-7	Not listed	Not listed	Not listed

Chronic Effects
Mutagenicity No evidence of a mutagenic effect.
Teratogenicity No evidence of a teratogenic effect (birth defect).
Sensitization No evidence of a sensitization effect.
Reproductive No evidence of negative reproductive effects.
Target Organ Effects
Acute Respiratory system, Cardiovascular system, Musculoskeletal system
Chronic No information available

Section 12 Ecological Data

Overview: This material is not expected to be harmful to the ecology.
Mobility: This material is expected to have high mobility in soil. It absorbs weakly to most soil types.
Persistence: Dissolved into water
Bioaccumulation: Bioconcentration is not expected to occur.
Degradability: No data
Other Adverse Effects: No data

Chemical Name	CAS Number	Eco Toxicity
Water	7732-18-5	No data available
Potassium Ferrocyanide	13746-66-2	
Potassium Ferricyanide	14459-95-1	
Potassium Chloride	7440-09-7	

Section 13 Disposal Information

Disposal Methods Dispose in accordance with all applicable Federal, State and Local regulations. Always contact a permitted waste disposer (TSD) to assure compliance.
Waste Disposal Code(s) Not Determined

Section 14 Transport Information

Ground - DOT Proper Shipping Name Not regulated for transport by US DOT.
Air - IATA Proper Shipping Name Not regulated for air transport by IATA.

Section 15 Regulatory Information

TSCA Status

All components in this product are on the TSCA Inventory.

Chemical Name	CAS Name	§ 313 Name	§ 304 RQ	CERCLA RQ	§ 302 TPQ	CAA 112(2) TQ
Potassium Ferrocyanide	13746-66-2	No	No	No	No	No
Potassium Ferricyanide	14459-95-1	No	No	No	No	No
Potassium Chloride	7440-09-7	No	No	No	No	No

Section 16 Additional Information

Revised 09/16/2015

Replaces 09/16/2015

Printed 09/16/2015

The information provided in this (Material) Safety Data Sheet represents a compilation of data drawn directly from various sources available to us. Atlas Scientific makes no representation or guarantee as to the suitability of this information to a particular application of the substance covered in the (Material) Safety Data Sheet.

Glossary

ACGIH	American Conference of Governmental Industrial Hygienists
CAS	Chemical Abstract Service Number
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DOT	U.S. Department of Transportation
IARC	International Agency for Research on Cancer
N/A	Not Available
NTP	National Toxicology Program
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Limit
ppm	Parts per million
RCRA	Resource Conservation and Recovery Act
SARA	Superfund Amendments and Reauthorization Act
TLV	Threshold Limit Value
TSCA	Toxic Substances Control Act
IDLH	Immediately dangerous to life and health


SAFETY DATA SHEET

Oxygen

Section 1. Identification

GHS product identifier	: Oxygen
Chemical name	: oxygen
Other means of identification	: Molecular oxygen; Oxygen molecule; Pure oxygen; O ₂ ; UN 1072; Dioxygen; Oxygen USP, Aviator's Breathing Oxygen (ABO)
Product type	: Gas.
Product use	: Synthetic/Analytical chemistry.
Synonym	: Molecular oxygen; Oxygen molecule; Pure oxygen; O ₂ ; UN 1072; Dioxygen; Oxygen USP, Aviator's Breathing Oxygen (ABO)
SDS #	: 001043
Supplier's details	: Airgas USA, LLC and its affiliates 259 North Radnor-Chester Road Suite 100 Radnor, PA 19087-5283 1-610-687-5253
24-hour telephone	: 1-866-734-3438

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	: OXIDIZING GASES - Category 1 GASES UNDER PRESSURE - Compressed gas
GHS label elements	
Hazard pictograms	: 
Signal word	: Danger
Hazard statements	: May cause or intensify fire; oxidizer. Contains gas under pressure; may explode if heated.
Precautionary statements	
General	: Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. Open valve slowly. Use only with equipment cleaned for Oxygen service.
Prevention	: Keep away from clothing, incompatible materials and combustible materials. Keep reduction valves, valves and fittings free from oil and grease.
Response	: In case of fire: Stop leak if safe to do so.
Storage	: Protect from sunlight. Store in a well-ventilated place.
Disposal	: Not applicable.
Hazards not otherwise classified	: None known.

Section 3. Composition/information on ingredients

Substance/mixture	: Substance
Chemical name	: oxygen
Other means of identification	: Molecular oxygen; Oxygen molecule; Pure oxygen; O ₂ ; UN 1072; Dioxygen; Oxygen USP, Aviator's Breathing Oxygen (ABO)
Product code	: 001043

CAS number/other identifiers

CAS number : 7782-44-7

Ingredient name	%	CAS number
oxygen	100	7782-44-7

Any concentration shown as a range is to protect confidentiality or is due to batch 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 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 adverse health effects persist or are severe. 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** : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse.
- Ingestion** : As this product is a gas, refer to the inhalation section.

Most important symptoms/effects, acute and delayed

Potential acute health effects

- Eye contact** : Contact with rapidly expanding gas may cause burns or frostbite.
- Inhalation** : No known significant effects or critical hazards.
- Skin contact** : Contact with rapidly expanding gas may cause burns or frostbite.
- Frostbite** : Try to warm up the frozen tissues and seek medical attention.
- Ingestion** : As this product is a gas, refer to the inhalation section.

Over-exposure signs/symptoms

- Eye contact** : No specific data.
- Inhalation** : No specific data.
- Skin contact** : No specific data.
- Ingestion** : No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

- Notes to physician** : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.
- Specific treatments** : No specific treatment.

Section 4. First aid measures

- Protection of first-aiders** : No action shall be taken involving any personal risk or without suitable training. 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 an extinguishing agent suitable for the surrounding fire.
- Unsuitable extinguishing media** : None known.

- Specific hazards arising from the chemical** : Contains gas under pressure. Oxidizing material. This material increases the risk of fire and may aid combustion. Contact with combustible material may cause fire. In a fire or if heated, a pressure increase will occur and the container may burst or explode.

- Hazardous thermal decomposition products** : No specific data.

- 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. Contact supplier immediately for specialist advice. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool. If involved in fire, shut off flow immediately if it can be done without risk.

- 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. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing gas. 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** : Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

- Small spill** : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment.
- Large spill** : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Section 7. Handling and storage

- Protective measures** : Put on appropriate personal protective equipment (see Section 8). Contains gas under pressure. Avoid breathing gas. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.
Avoid contact with eyes, skin and clothing. Empty containers retain product residue and can be hazardous. Keep away from clothing, incompatible materials and combustible materials. Keep reduction valves free from grease and oil.
- 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 away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F). Separate from reducing agents and combustible materials. Store away from grease and oil. Keep container tightly closed and sealed until ready for use. See Section 10 for incompatible materials before handling or use.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
oxygen	None.

- Appropriate engineering controls** : Good general ventilation should be sufficient to control worker exposure to airborne contaminants.
- 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, fume scrubbers, 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 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 contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields.
- Skin protection**
- Hand protection** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. 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. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Section 8. Exposure controls/personal protection

- Body protection** : 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** : 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.
- Respiratory protection** : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use. 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.

Section 9. Physical and chemical properties

Appearance

- Physical state** : Gas. [Compressed gas.]
- Color** : Colorless. Blue.
- Odor** : Odorless.
- Odor threshold** : Not available.
- pH** : Not available.
- Melting point** : -218.4°C (-361.1°F)
- Boiling point** : -183°C (-297.4°F)
- Critical temperature** : -118.15°C (-180.7°F)
- Flash point** : [Product does not sustain combustion.]
- Evaporation rate** : Not available.
- Flammability (solid, gas)** : Extremely flammable in the presence of the following materials or conditions: reducing materials, combustible materials and organic materials.
- Lower and upper explosive (flammable) limits** : Not available.
- Vapor pressure** : Not available.
- Vapor density** : 1.1 (Air = 1)
- Specific Volume (ft³/lb)** : 12.0482
- Gas Density (lb/ft³)** : 0.083
- Relative density** : Not applicable.
- Solubility** : Not available.
- Solubility in water** : Not available.
- Partition coefficient: n-octanol/water** : 0.65
- Auto-ignition temperature** : Not available.
- Decomposition temperature** : Not available.
- Viscosity** : Not applicable.
- Flow time (ISO 2431)** : Not available.
- Molecular weight** : 32 g/mole

Section 10. Stability and reactivity

- Reactivity** : No specific test data related to reactivity available for this product or its ingredients.
- Chemical stability** : The product is stable.
- Possibility of hazardous reactions** : Hazardous reactions or instability may occur under certain conditions of storage or use. Conditions may include the following:
contact with combustible materials
Reactions may include the following:
risk of causing fire

Section 10. Stability and reactivity

- Conditions to avoid** : No specific data.
- Incompatible materials** : Highly reactive or incompatible with the following materials:
combustible materials
reducing materials
grease
oil
- Hazardous decomposition products** : Under normal conditions of storage and use, hazardous decomposition products should not be produced.
- Hazardous polymerization** : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Not available.

Irritation/Corrosion

Not available.

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Information on the likely routes of exposure : Not available.

Potential acute health effects

- Eye contact** : Contact with rapidly expanding gas may cause burns or frostbite.
- Inhalation** : No known significant effects or critical hazards.
- Skin contact** : Contact with rapidly expanding gas may cause burns or frostbite.
- Ingestion** : As this product is a gas, refer to the inhalation section.

Symptoms related to the physical, chemical and toxicological characteristics

Section 11. Toxicological information

- Eye contact** : No specific data.
- Inhalation** : No specific data.
- Skin contact** : No specific data.
- Ingestion** : No specific data.

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** : No known significant effects or critical hazards.
- Carcinogenicity** : No known significant effects or critical hazards.
- Mutagenicity** : No known significant effects or critical hazards.
- 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.

Numerical measures of toxicity

Acute toxicity estimates

Not available.

Section 12. Ecological information

Toxicity

Not available.

Persistence and degradability

Not available.

Bioaccumulative potential

Product/ingredient name	LogP _{ow}	BCF	Potential
oxygen	0.65	-	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. Empty Airgas-owned pressure vessels should be returned to Airgas. 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. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1072	UN1072	UN1072	UN1072	UN1072
UN proper shipping name	OXYGEN, COMPRESSED	OXYGEN, COMPRESSED	OXYGEN, COMPRESSED	OXYGEN, COMPRESSED	OXYGEN, COMPRESSED
Transport hazard class(es)	2.2 (5.1)  	2.2 	2.2 (5.1)  	2.2 (5.1)  	2.2 (5.1)  
Packing group	-	-	-	-	-
Environmental hazards	No.	No.	No.	No.	No.

“Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product.”

Additional information

- DOT Classification** : **Limited quantity** Yes.
Quantity limitation Passenger aircraft/rail: 75 kg. Cargo aircraft: 150 kg.
Special provisions A52
- TDG Classification** : Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.13-2.17 (Class 2), 2.23-2.25 (Class 5).
Explosive Limit and Limited Quantity Index 0.125
ERAP Index 3000
Passenger Carrying Ship Index 50
Passenger Carrying Road or Rail Index 75
Special provisions 42
- IATA** : **Quantity limitation** Passenger and Cargo Aircraft: 75 kg. Cargo Aircraft Only: 150 kg.

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 : TSCA 8(a) CDR Exempt/Partial exemption: This material is listed or exempted.

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Not listed

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304

Composition/information on ingredients

No products were found.

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : Refer to Section 2: Hazards Identification of this SDS for classification of substance.

State regulations

Massachusetts : This material is listed.

New York : This material is not listed.

New Jersey : This material is listed.

Pennsylvania : This material is listed.

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol (Annexes A, B, C, E)

Not listed.

Stockholm Convention on Persistent Organic Pollutants

Not listed.

Rotterdam Convention on Prior Informed Consent (PIC)

Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

Inventory list

Australia : This material is listed or exempted.

Canada : This material is listed or exempted.

China : This material is listed or exempted.

Europe : This material is listed or exempted.

Japan : **Japan inventory (ENCS)**: Not determined.
Japan inventory (ISHL): Not determined.

Malaysia : Not determined.

New Zealand : This material is listed or exempted.

Philippines : This material is listed or exempted.

Republic of Korea : This material is listed or exempted.

Section 15. Regulatory information

Taiwan	: This material is listed or exempted.
Thailand	: Not determined.
Turkey	: Not determined.
United States	: This material is listed or exempted.
Viet Nam	: Not determined.

Section 16. Other information

Hazardous Material Information System (U.S.A.)

Health	/	0
Flammability		0
Physical hazards		3

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings and the associated label are not required on SDSs or products leaving a facility under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered trademark and service mark of the American Coatings Association, Inc.

The customer is responsible for determining the PPE code for this material. For more information on HMIS® Personal Protective Equipment (PPE) codes, consult the HMIS® Implementation Manual.

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.

Procedure used to derive the classification

Classification	Justification
OXIDIZING GASES - Category 1 GASES UNDER PRESSURE - Compressed gas	Expert judgment According to package

History

Date of printing	: 2/3/2018
Date of issue/Date of revision	: 2/3/2018
Date of previous issue	: 1/27/2017
Version	: 0.03

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

Section 16. Other information

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

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.

Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.



SAFETY DATA SHEET

1. Identification

Product identifier Oatey Purple Primer- NSF Listed for PVC and CPVC

Other means of identification

Product code 1402E

Synonyms Part Numbers: 30755(TV), 30756(TV), 30757(TV), 30758, 30759, 30927

Recommended use Joining PVC Pipes

Recommended restrictions None known.

Manufacturer/Importer/Supplier/Distributor information

Company Name Oatey Co.

Address 4700 West 160th St.
Cleveland, OH 44135

Telephone 216-267-7100

E-mail info@oatey.com

Transport Emergency Chemtrec 1-800-424-9300 (Outside the US 1-703-527-3887)

Emergency First Aid 1-877-740-5015

Contact person MSDS Coordinator

2. Hazard(s) identification

Physical hazards Flammable liquids Category 2

Health hazards

Acute toxicity, oral Category 4

Skin corrosion/irritation Category 2

Serious eye damage/eye irritation Category 2A

Specific target organ toxicity, single exposure Category 3 respiratory tract irritation

Specific target organ toxicity, single exposure Category 3 narcotic effects

Aspiration hazard Category 1

OSHA defined hazards Not classified.

Label elements



Signal word Danger

Hazard statement Highly flammable liquid and vapor. Harmful if swallowed. May be fatal if swallowed and enters airways. Causes skin irritation. Causes serious eye irritation. May cause respiratory irritation. May cause drowsiness or dizziness.

Precautionary statement

Prevention Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Keep container tightly closed. Ground/bond container and receiving equipment. Use explosion-proof electrical/ventilating/lighting equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Avoid breathing mist or vapor. Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Use only outdoors or in a well-ventilated area. Wear protective gloves/protective clothing/eye protection/face protection.

Response If swallowed: Immediately call a poison center/doctor. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. If inhaled: Remove person to fresh air and keep comfortable for breathing. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Call a poison center/doctor if you feel unwell. Rinse mouth. Do NOT induce vomiting. If skin irritation occurs: Get medical advice/attention. If eye irritation persists: Get medical advice/attention. Take off contaminated clothing and wash before reuse. In case of fire: Use appropriate media to extinguish.

Storage	Store in a well-ventilated place. Keep container tightly closed. Keep cool. Store locked up.
Disposal	Dispose of contents/container in accordance with local/regional/national/international regulations.
Hazard(s) not otherwise classified (HNOC)	Frequent or prolonged contact may defat and dry the skin, leading to discomfort and dermatitis. May form explosive peroxides. Contains a chemical classified by the US EPA as a suspected possible carcinogen.

Supplemental information

Not applicable.

3. Composition/information on ingredients

Mixtures

Chemical name	CAS number	%
Acetone	67-64-1	25-40
Cyclohexanone	108-94-1	25-40
Furan, Tetrahydro-	109-99-9	15-30
Methyl ethyl ketone	78-93-3	15-30

*Designates that a specific chemical identity and/or percentage of composition has been withheld as a trade secret.

4. First-aid measures

Inhalation	Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTER or doctor/physician if you feel unwell.
Skin contact	Take off immediately all contaminated clothing. Wash with plenty of soap and water. If skin irritation occurs: Get medical advice/attention.
Eye contact	Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.
Ingestion	Call a physician or poison control center immediately. Do not induce vomiting. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs. Aspiration may cause pulmonary edema and pneumonitis.
Most important symptoms/effects, acute and delayed	Irritation of nose and throat. Aspiration may cause pulmonary edema and pneumonitis. Severe eye irritation. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. May cause respiratory irritation. Vapors have a narcotic effect and may cause headache, fatigue, dizziness and nausea. Skin irritation. May cause redness and pain.
Indication of immediate medical attention and special treatment needed	Provide general supportive measures and treat symptomatically. Thermal burns: Flush with water immediately. While flushing, remove clothes which do not adhere to affected area. Call an ambulance. Continue flushing during transport to hospital. In case of shortness of breath, give oxygen. Keep victim warm. Keep victim under observation. Symptoms may be delayed.
General information	Take off all contaminated clothing immediately. Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Wash contaminated clothing before reuse.

5. Fire-fighting measures

Suitable extinguishing media	Alcohol resistant foam. Water fog. Dry chemical powder. Carbon dioxide (CO2).
Unsuitable extinguishing media	Do not use water jet as an extinguisher, as this will spread the fire.
Specific hazards arising from the chemical	Vapors may form explosive mixtures with air. Vapors may travel considerable distance to a source of ignition and flash back. During fire, gases hazardous to health may be formed.
Special protective equipment and precautions for firefighters	Self-contained breathing apparatus and full protective clothing must be worn in case of fire.
Fire fighting equipment/instructions	In case of fire and/or explosion do not breathe fumes. Move containers from fire area if you can do so without risk.
Specific methods	Use standard firefighting procedures and consider the hazards of other involved materials.
General fire hazards	Highly flammable liquid and vapor. This product contains tetrahydrofuran that may form explosive organic peroxide when exposed to air or light or with age.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Keep out of low areas. Eliminate all ignition sources (no smoking, flares, sparks, or flames in immediate area). Wear appropriate protective equipment and clothing during clean-up. Avoid breathing mist or vapor. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ventilate closed spaces before entering them. Local authorities should be advised if significant spillages cannot be contained. For personal protection, see section 8 of the SDS.

Methods and materials for containment and cleaning up

Eliminate all ignition sources (no smoking, flares, sparks, or flames in immediate area). Take precautionary measures against static discharge. Use only non-sparking tools. Keep combustibles (wood, paper, oil, etc.) away from spilled material. This product is miscible in water.

Large Spills: Stop the flow of material, if this is without risk. Use water spray to reduce vapors or divert vapor cloud drift. Dike the spilled material, where this is possible. Cover with plastic sheet to prevent spreading. Use a non-combustible material like vermiculite, sand or earth to soak up the product and place into a container for later disposal. Prevent entry into waterways, sewer, basements or confined areas. Following product recovery, flush area with water.

Small Spills: Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination.

Never return spills to original containers for re-use. For waste disposal, see section 13 of the SDS. Avoid discharge into drains, water courses or onto the ground.

Environmental precautions

7. Handling and storage

Precautions for safe handling

Vapors may form explosive mixtures with air. Do not handle, store or open near an open flame, sources of heat or sources of ignition. Protect material from direct sunlight. Explosion-proof general and local exhaust ventilation. Take precautionary measures against static discharges. All equipment used when handling the product must be grounded. Use non-sparking tools and explosion-proof equipment. Avoid breathing mist or vapor. Avoid contact with eyes, skin, and clothing. Avoid prolonged exposure. Do not taste or swallow. When using, do not eat, drink or smoke. Wear appropriate personal protective equipment. Wash hands thoroughly after handling. Observe good industrial hygiene practices.

Conditions for safe storage, including any incompatibilities

Store locked up. Keep away from heat, sparks and open flame. Prevent electrostatic charge build-up by using common bonding and grounding techniques. Store in a cool, dry place out of direct sunlight. Store in original tightly closed container. Store in a well-ventilated place. Store away from incompatible materials (see Section 10 of the SDS).

8. Exposure controls/personal protection

Occupational exposure limits

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Components	Type	Value
Acetone (CAS 67-64-1)	PEL	2400 mg/m3 1000 ppm
Cyclohexanone (CAS 108-94-1)	PEL	200 mg/m3 50 ppm
Furan, Tetrahydro- (CAS 109-99-9)	PEL	590 mg/m3 200 ppm
Methyl ethyl ketone (CAS 78-93-3)	PEL	590 mg/m3 200 ppm

US. ACGIH Threshold Limit Values

Components	Type	Value
Acetone (CAS 67-64-1)	STEL	750 ppm
	TWA	500 ppm
Cyclohexanone (CAS 108-94-1)	STEL	50 ppm
	TWA	20 ppm
Furan, Tetrahydro- (CAS 109-99-9)	STEL	100 ppm

US. ACGIH Threshold Limit Values

Components	Type	Value
Methyl ethyl ketone (CAS 78-93-3)	TWA	50 ppm
	STEL	300 ppm
	TWA	200 ppm

US. NIOSH: Pocket Guide to Chemical Hazards

Components	Type	Value
Acetone (CAS 67-64-1)	TWA	590 mg/m3
		250 ppm
Cyclohexanone (CAS 108-94-1)	TWA	100 mg/m3
		25 ppm
Furan, Tetrahydro- (CAS 109-99-9)	STEL	735 mg/m3
		250 ppm
Methyl ethyl ketone (CAS 78-93-3)	TWA	590 mg/m3
		200 ppm
	STEL	885 mg/m3
	TWA	300 ppm
		590 mg/m3
		200 ppm

Biological limit values**ACGIH Biological Exposure Indices**

Components	Value	Determinant	Specimen	Sampling Time
Acetone (CAS 67-64-1)	50 mg/l	Acetone	Urine	*
Cyclohexanone (CAS 108-94-1)	80 mg/l	1,2-Cyclohexanediol, with hydrolysis	Urine	*
		Cyclohexanol, with hydrolysis	Urine	*
Furan, Tetrahydro- (CAS 109-99-9)	2 mg/l	Tetrahydrofuran	Urine	*
Methyl ethyl ketone (CAS 78-93-3)	2 mg/l	MEK	Urine	*

* - For sampling details, please see the source document.

Exposure guidelines**US - California OELs: Skin designation**

Cyclohexanone (CAS 108-94-1)

Can be absorbed through the skin.

US - Minnesota Haz Subs: Skin designation applies

Cyclohexanone (CAS 108-94-1)

Skin designation applies.

US - Tennessee OELs: Skin designation

Cyclohexanone (CAS 108-94-1)

Can be absorbed through the skin.

US ACGIH Threshold Limit Values: Skin designation

Cyclohexanone (CAS 108-94-1)

Can be absorbed through the skin.

Furan, Tetrahydro- (CAS 109-99-9)

Can be absorbed through the skin.

US. NIOSH: Pocket Guide to Chemical Hazards

Cyclohexanone (CAS 108-94-1)

Can be absorbed through the skin.

Appropriate engineering controls

Explosion-proof general and local exhaust ventilation. Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Eye wash facilities and emergency shower must be available when handling this product.

Individual protection measures, such as personal protective equipment**Eye/face protection**

Face shield is recommended. Wear safety glasses with side shields (or goggles).

Skin protection	
Hand protection	Wear appropriate chemical resistant gloves.
Other	Wear appropriate chemical resistant clothing.
Respiratory protection	If engineering controls do not maintain airborne concentrations below recommended exposure limits (where applicable) or to an acceptable level (in countries where exposure limits have not been established), an approved respirator must be worn.
Thermal hazards	Wear appropriate thermal protective clothing, when necessary.
General hygiene considerations	When using, do not eat, drink or smoke. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties

Appearance

Physical state	Liquid.
Form	Translucent liquid.
Color	Purple
Odor	Solvent.
Odor threshold	Not available.
pH	Not available.
Melting point/freezing point	Not available.
Initial boiling point and boiling range	151 °F (66.11 °C)
Flash point	14.0 - 23.0 °F (-10.0 - -5.0 °C)
Evaporation rate	5.5 - 8
Flammability (solid, gas)	Not available.
Upper/lower flammability or explosive limits	
Flammability limit - lower (%)	1.8
Flammability limit - upper (%)	11.8
Explosive limit - lower (%)	Not available.
Explosive limit - upper (%)	Not available.
Vapor pressure	145 mm Hg @ 20 C
Vapor density	2.5
Relative density	0.84 +/- 0.02 @20°C
Solubility(ies)	
Solubility (water)	Negligible
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.
Viscosity	Not available.
Other information	
Bulk density	7 lb/gal
VOC (Weight %)	505 g/l SQACMD Method 24

10. Stability and reactivity

Reactivity	The product is stable and non-reactive under normal conditions of use, storage and transport.
Chemical stability	Material is stable under normal conditions.
Possibility of hazardous reactions	No dangerous reaction known under conditions of normal use.
Conditions to avoid	Avoid heat, sparks, open flames and other ignition sources. Avoid temperatures exceeding the flash point. Contact with incompatible materials.
Incompatible materials	Acids. Strong oxidizing agents. Ammonia. Amines. Isocyanates. Caustics.

Hazardous decomposition products No hazardous decomposition products are known.

11. Toxicological information

Information on likely routes of exposure

Inhalation May be fatal if swallowed and enters airways. Headache. Nausea, vomiting. May cause irritation to the respiratory system. Vapors have a narcotic effect and may cause headache, fatigue, dizziness and nausea. Prolonged inhalation may be harmful.

Skin contact Causes skin irritation.

Eye contact Causes serious eye irritation.

Ingestion May be fatal if swallowed and enters airways. Harmful if swallowed. Harmful if swallowed. Droplets of the product aspirated into the lungs through ingestion or vomiting may cause a serious chemical pneumonia.

Symptoms related to the physical, chemical and toxicological characteristics

Irritation of nose and throat. Aspiration may cause pulmonary edema and pneumonitis. Severe eye irritation. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. May cause respiratory irritation. Skin irritation. May cause redness and pain. Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting.

Information on toxicological effects

Acute toxicity May be fatal if swallowed and enters airways. Narcotic effects. May cause respiratory irritation.

Components	Species	Test Results
Acetone (CAS 67-64-1)		
Acute		
<i>Dermal</i>		
LD50	Rabbit	20 ml/kg
<i>Inhalation</i>		
LC50	Rat	50 mg/l, 8 Hours
<i>Oral</i>		
LD50	Rat	5800 mg/kg
Cyclohexanone (CAS 108-94-1)		
Acute		
<i>Dermal</i>		
LD50	Rabbit	948 mg/kg
<i>Inhalation</i>		
LC50	Rat	8000 ppm, 4 hours
<i>Oral</i>		
LD50	Rat	1540 mg/kg

* Estimates for product may be based on additional component data not shown.

Skin corrosion/irritation Causes skin irritation.

Serious eye damage/eye irritation Causes serious eye irritation.

Respiratory or skin sensitization

Respiratory sensitization Not available.

Skin sensitization This product is not expected to cause skin sensitization.

Germ cell mutagenicity No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.

Carcinogenicity In 2012 USEPA Integrated Risk Information System (IRIS) reviewed a two species inhalation lifetime study on THF conducted by NTP (1998). Male rats developed renal tumors and female mice developed liver tumors while neither the female rats nor the male mice showed similar results. Because the carcinogenic mechanisms could not be identified clearly in either species for either tumor, the EPA determined that the male rat and female mouse findings are relevant to the assessment of carcinogenic potential in humans. Therefore, the IRIS review concludes that these data in aggregate indicate that there is "suggestive evidence of carcinogenic potential" following exposure to THF by all routes of exposure.

IARC Monographs. Overall Evaluation of Carcinogenicity

Cyclohexanone (CAS 108-94-1) 3 Not classifiable as to carcinogenicity to humans.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

Reproductive toxicity	This product is not expected to cause reproductive or developmental effects.
Specific target organ toxicity - single exposure	Narcotic effects. May cause drowsiness and dizziness. Respiratory tract irritation.
Specific target organ toxicity - repeated exposure	Not classified.
Aspiration hazard	May be fatal if swallowed and enters airways.
Chronic effects	Prolonged inhalation may be harmful.

12. Ecological information

Ecotoxicity The product is not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Components	Species	Test Results
Acetone (CAS 67-64-1)		
Aquatic		
Fish	LC50	Fathead minnow (Pimephales promelas) > 100 mg/l, 96 hours
Cyclohexanone (CAS 108-94-1)		
Aquatic		
Fish	LC50	Fathead minnow (Pimephales promelas) 481 - 578 mg/l, 96 hours

* Estimates for product may be based on additional component data not shown.

Persistence and degradability No data is available on the degradability of this product.

Bioaccumulative potential No data available.

Partition coefficient n-octanol / water (log Kow)

Acetone (CAS 67-64-1)	-0.24
Cyclohexanone (CAS 108-94-1)	0.81
Furan, Tetrahydro- (CAS 109-99-9)	0.46
Methyl ethyl ketone (CAS 78-93-3)	0.29

Mobility in soil No data available.

Other adverse effects No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component.

13. Disposal considerations

Disposal instructions Collect and reclaim or dispose in sealed containers at licensed waste disposal site. This material and its container must be disposed of as hazardous waste. Do not allow this material to drain into sewers/water supplies. Do not contaminate ponds, waterways or ditches with chemical or used container. Dispose of contents/container in accordance with local/regional/national/international regulations.

Local disposal regulations Dispose in accordance with all applicable regulations.

Hazardous waste code The waste code should be assigned in discussion between the user, the producer and the waste disposal company.

Waste from residues / unused products Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).

Contaminated packaging Empty containers should be taken to an approved waste handling site for recycling or disposal. Since emptied containers may retain product residue, follow label warnings even after container is emptied.

14. Transport information

DOT

UN number	UN1993
UN proper shipping name	Flammable liquids, n.o.s. (Methyl ethyl ketone RQ = 26274 LBS, Acetone RQ = 13130 LBS)
Transport hazard class(es)	
Class	3
Subsidiary risk	-
Label(s)	3
Packing group	II

Special precautions for user Read safety instructions, SDS and emergency procedures before handling.
Special provisions IB2, T7, TP1, TP8, TP28
Packaging exceptions 150
Packaging non bulk 202
Packaging bulk 242

IATA

UN number UN1993
UN proper shipping name Flammable liquid, n.o.s. (Methyl ethyl ketone, Acetone)
Transport hazard class(es)
Class 3
Subsidiary risk -
Packing group II
Environmental hazards No.
ERG Code 3H
Special precautions for user Read safety instructions, SDS and emergency procedures before handling.

IMDG

UN number UN1993
UN proper shipping name FLAMMABLE LIQUID, N.O.S. (Methyl ethyl ketone, Acetone)
Transport hazard class(es)
Class 3
Subsidiary risk -
Packing group II
Environmental hazards
Marine pollutant No.
EmS F-E, S-E
Special precautions for user Read safety instructions, SDS and emergency procedures before handling.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code Not available.

15. Regulatory information

US federal regulations This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.
All components are on the U.S. EPA TSCA Inventory List.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

CERCLA Hazardous Substance List (40 CFR 302.4)

Acetone (CAS 67-64-1)	LISTED
Cyclohexanone (CAS 108-94-1)	LISTED
Furan, Tetrahydro- (CAS 109-99-9)	LISTED
Methyl ethyl ketone (CAS 78-93-3)	LISTED

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories Immediate Hazard - Yes
Delayed Hazard - No
Fire Hazard - Yes
Pressure Hazard - No
Reactivity Hazard - No

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical No

SARA 313 (TRI reporting)
Not regulated.

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Safe Drinking Water Act (SDWA) Not regulated.

Drug Enforcement Administration (DEA). List 2, Essential Chemicals (21 CFR 1310.02(b) and 1310.04(f)(2) and Chemical Code Number

Acetone (CAS 67-64-1) 6532

Methyl ethyl ketone (CAS 78-93-3) 6714

Drug Enforcement Administration (DEA). List 1 & 2 Exempt Chemical Mixtures (21 CFR 1310.12(c))

Acetone (CAS 67-64-1) 35 %WV

Methyl ethyl ketone (CAS 78-93-3) 35 %WV

DEA Exempt Chemical Mixtures Code Number

Acetone (CAS 67-64-1) 6532

Methyl ethyl ketone (CAS 78-93-3) 6714

US state regulations

US. Massachusetts RTK - Substance List

Acetone (CAS 67-64-1)

Cyclohexanone (CAS 108-94-1)

Furan, Tetrahydro- (CAS 109-99-9)

Methyl ethyl ketone (CAS 78-93-3)

US. New Jersey Worker and Community Right-to-Know Act

Acetone (CAS 67-64-1)

Cyclohexanone (CAS 108-94-1)

Furan, Tetrahydro- (CAS 109-99-9)

Methyl ethyl ketone (CAS 78-93-3)

US. Pennsylvania Worker and Community Right-to-Know Law

Acetone (CAS 67-64-1)

Cyclohexanone (CAS 108-94-1)

Furan, Tetrahydro- (CAS 109-99-9)

Methyl ethyl ketone (CAS 78-93-3)

US. Rhode Island RTK

Acetone (CAS 67-64-1)

Cyclohexanone (CAS 108-94-1)

Furan, Tetrahydro- (CAS 109-99-9)

Methyl ethyl ketone (CAS 78-93-3)

US. California Proposition 65

California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65): This material is not known to contain any chemicals currently listed as carcinogens or reproductive toxins.

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Canada	Domestic Substances List (DSL)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates this product complies with the inventory requirements administered by the governing country(s).

A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

Issue date	27-May-2015
Revision date	-
Version #	01
HMIS® ratings	Health: 2 Flammability: 3 Physical hazard: 0

NFPA ratings



Disclaimer

The information in the sheet was written based on the best knowledge and experience currently available. Oatey Co. cannot anticipate all conditions under which this information and its product, or the products of other manufacturers in combination with its product, may be used. It is the user's responsibility to ensure safe conditions for handling, storage and disposal of the product, and to assume liability for loss, injury, damage or expense due to improper use.

SECTION 1: Product and company identification

1.1. Product identifier

Product form : Substance
 Name : Propane
 CAS No : 74-98-6
 Formula : C3H8
 Other means of identification : Propane, Liquefied Petroleum Gas, n-propane, dimethylmethane, propyl hydride, refrigerant gas R290

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture : Industrial use. Use as directed.

1.3. Details of the supplier of the safety data sheet

Praxair, Inc.
 10 Riverview Drive
 Danbury, CT 06810-6268 - USA
 T 1-800-772-9247 (1-800-PRAXAIR) - F 1-716-879-2146
www.praxair.com

1.4. Emergency telephone number

Emergency number : Onsite Emergency: 1-800-645-4633

CHEMTREC, 24hr/day 7days/week
 — Within USA: 1-800-424-9300, Outside USA: 001-703-527-3887
 (collect calls accepted, Contract 17729)

SECTION 2: Hazard identification

2.1. Classification of the substance or mixture

GHS-US classification

Flam. Gas 1 H220
 Liquefied gas H280

2.2. Label elements

GHS-US labeling

Hazard pictograms (GHS-US) :



GHS02

GHS04

Signal word (GHS-US) :

DANGER

Hazard statements (GHS-US) :

H220 - **EXTREMELY FLAMMABLE GAS**
 H280 - CONTAINS GAS UNDER PRESSURE; MAY EXPLODE IF HEATED
 OSHA-H01 - MAY DISPLACE OXYGEN AND CAUSE RAPID SUFFOCATION
 CGA-HG04 - MAY FORM EXPLOSIVE MIXTURES WITH AIR
 CGA-HG01 - MAY CAUSE FROSTBITE

Precautionary statements (GHS-US) :

P202 - Do not handle until all safety precautions have been read and understood
 P210 - Keep away from Heat, Open flames, Sparks, Hot surfaces. - No smoking
 P271+P403 - Use and store only outdoors or in a well-ventilated place
 P377 - Leaking gas fire: Do not extinguish, unless leak can be stopped safely
 P381 - Eliminate all ignition sources if safe to do so
 CGA-PG05 - Use a back flow preventive device in the piping
 CGA-PG12 - Do not open valve until connected to equipment prepared for use
 CGA-PG06 - Close valve after each use and when empty
 CGA-PG11 - Never put cylinders into unventilated areas of passenger vehicles

CGA-PG02 - Protect from sunlight when ambient temperature exceeds 52°C (125°F)

2.3. Other hazards

Other hazards not contributing to the classification : Contact with liquid may cause cold burns/frostbite.

2.4. Unknown acute toxicity (GHS US)

No data available

SECTION 3: Composition/Information on ingredients

3.1. Substance

Name	Product identifier	%
Propane (Main constituent)	(CAS No) 74-98-6	100

3.2. Mixture

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

- First-aid measures after inhalation : Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.
- First-aid measures after skin contact : The liquid may cause frostbite. For exposure to liquid, immediately warm frostbite area with warm water not to exceed 105°F (41°C). Water temperature should be tolerable to normal skin. Maintain skin warming for at least 15 minutes or until normal coloring and sensation have returned to the affected area. In case of massive exposure, remove clothing while showering with warm water. Seek medical evaluation and treatment as soon as possible.
- First-aid measures after eye contact : Immediately flush eyes thoroughly with water for at least 15 minutes. Hold the eyelids open and away from the eyeballs to ensure that all surfaces are flushed thoroughly. Contact an ophthalmologist immediately.. Get immediate medical attention.
- First-aid measures after ingestion : Ingestion is not considered a potential route of exposure.

4.2. Most important symptoms and effects, both acute and delayed

No additional information available

4.3. Indication of any immediate medical attention and special treatment needed

None.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : Carbon dioxide, dry chemical powder, water spray, fog.

5.2. Special hazards arising from the substance or mixture

- Fire hazard : **EXTREMELY FLAMMABLE GAS.** If venting or leaking gas catches fire, do not extinguish flames. Flammable vapors may spread from leak, creating an explosive reignition hazard. Vapors can be ignited by pilot lights, other flames, smoking, sparks, heaters, electrical equipment, static discharge, or other ignition sources at locations distant from product handling point. Explosive atmospheres may linger. Before entering an area, especially a confined area, check the atmosphere with an appropriate device.
- Explosion hazard : **EXTREMELY FLAMMABLE GAS.** Forms explosive mixtures with air and oxidizing agents.
- Reactivity : No reactivity hazard other than the effects described in sub-sections below.

5.3. Advice for firefighters

- Firefighting instructions : Evacuate all personnel from the danger area. Use self-contained breathing apparatus (SCBA) and protective clothing. Immediately cool containers with water from maximum distance. Stop flow of gas if safe to do so, while continuing cooling water spray. Remove ignition sources if safe to do so. Remove containers from area of fire if safe to do so. On-site fire brigades must comply with OSHA 29 CFR 1910.156 and applicable standards under 29 CFR 1910 Subpart L—Fire Protection.
- Protection during firefighting : Compressed gas: asphyxiant. Suffocation hazard by lack of oxygen.

Special protective equipment for fire fighters	: Standard protective clothing and equipment (Self Contained Breathing Apparatus) for fire fighters.
Specific methods	: Use fire control measures appropriate for the surrounding fire. Exposure to fire and heat radiation may cause gas containers to rupture. Cool endangered containers with water spray jet from a protected position. Prevent water used in emergency cases from entering sewers and drainage systems Stop flow of product if safe to do so Use water spray or fog to knock down fire fumes if possible.
Other information	: Containers are equipped with a pressure relief device. (Exceptions may exist where authorized by DOT.).

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

General measures : Wear self-contained breathing apparatus when entering area unless atmosphere is proven to be safe. Evacuate area. Ensure adequate air ventilation. Stop leak if safe to do so.

6.1.1. For non-emergency personnel

No additional information available

6.1.2. For emergency responders

No additional information available

6.2. Environmental precautions

Try to stop release.

6.3. Methods and material for containment and cleaning up

No additional information available

6.4. Reference to other sections

See also sections 8 and 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling : Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Use only non-sparking tools. Use only explosion-proof equipment

Wear leather safety gloves and safety shoes when handling cylinders. Protect cylinders from physical damage; do not drag, roll, slide or drop. While moving cylinder, always keep in place removable valve cover. Never attempt to lift a cylinder by its cap; the cap is intended solely to protect the valve. When moving cylinders, even for short distances, use a cart (trolley, hand truck, etc.) designed to transport cylinders. Never insert an object (e.g, wrench, screwdriver, pry bar) into cap openings; doing so may damage the valve and cause a leak. Use an adjustable strap wrench to remove over-tight or rusted caps. Slowly open the valve. If the valve is hard to open, discontinue use and contact your supplier. Close the container valve after each use; keep closed even when empty. Never apply flame or localized heat directly to any part of the container. High temperatures may damage the container and could cause the pressure relief device to fail prematurely, venting the container contents. For other precautions in using this product, see section 16.

7.2. Conditions for safe storage, including any incompatibilities

Storage conditions : Store only where temperature will not exceed 125°F (52°C). Post “No Smoking/No Open Flames” signs in storage and use areas. There must be no sources of ignition. Separate packages and protect against potential fire and/or explosion damage following appropriate codes and requirements (e.g, NFPA 30, NFPA 55, NFPA 70, and/or NFPA 221 in the U.S.) or according to requirements determined by the Authority Having Jurisdiction (AHJ). Always secure containers upright to keep them from falling or being knocked over. Install valve protection cap, if provided, firmly in place by hand when the container is not in use. Store full and empty containers separately. Use a first-in, first-out inventory system to prevent storing full containers for long periods. For other precautions in using this product, see section 16

OTHER PRECAUTIONS FOR HANDLING, STORAGE, AND USE: When handling product under pressure, use piping and equipment adequately designed to withstand the pressures to be encountered. Never work on a pressurized system. Use a back flow preventive device in the piping. Gases can cause rapid suffocation because of oxygen deficiency; store and use with adequate ventilation. If a leak occurs, close the container valve and blow down the system in a safe and environmentally correct manner in compliance with all international, federal/national, state/provincial, and local laws; then repair the leak. Never place a container where it may become part of an electrical circuit.

7.3. Specific end use(s)

None.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Propane (74-98-6)		
USA OSHA	OSHA PEL (TWA) (mg/m ³)	1800 mg/m ³
USA OSHA	OSHA PEL (TWA) (ppm)	1000 ppm
USA IDLH	US IDLH (mg/m ³)	< mg/m ³
USA IDLH	US IDLH (ppm)	2100 ppm (10% LEL)
ACGIH	Not established	

8.2. Exposure controls

Appropriate engineering controls : An explosion-proof local exhaust system or a mechanical system is acceptable if it can prevent oxygen deficiency and keep hazardous fumes and gases below all applicable exposure limits in the worker's breathing area. During welding, ensure that there is adequate ventilation to keep worker exposure below applicable limits for fumes, gases, and other by-products of welding. Do not breathe fumes or gases. Short-term overexposure to fumes may cause dizziness, nausea, and dryness or irritation of the nose, throat, and eyes, or may cause other similar discomfort.

Eye protection : Wear safety glasses with side shields.

Skin and body protection : As needed for welding, wear hand, head, and body protection to help prevent injury from radiation and sparks. (See ANSI Z49.1.) At a minimum, this includes welder's gloves and protective goggles, and may include arm protectors, aprons, hats, and shoulder protection as well as substantial clothing.

Respiratory protection : When workplace conditions warrant respirator use, follow a respiratory protection program that meets OSHA 29 CFR 1910.134, ANSI Z88.2, or MSHA 30 CFR 72.710 (where applicable). Use an air-supplied or air-purifying cartridge if the action level is exceeded. Ensure that the respirator has the appropriate protection factor for the exposure level. If cartridge type respirators are used, the cartridge must be appropriate for the chemical exposure. For emergencies or instances with unknown exposure levels, use a self-contained breathing apparatus (SCBA).

Thermal hazard protection : Wear cold insulating gloves when transfilling or breaking transfer connections.

Environmental exposure controls : Refer to local regulations for restriction of emissions to the atmosphere. See section 13 for specific methods for waste gas treatment.

Other information : Consider the use of flame resistant anti-static safety clothing. Wear safety shoes while handling containers.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	: Gas
Appearance	: Colorless gas.
Molecular mass	: 44 g/mol
Color	: Colorless.
Odor	: Poor warning properties at low concentrations. Stenchant often added. Sweetish.
Odor threshold	: No data available
pH	: Not applicable.
Relative evaporation rate (butyl acetate=1)	: No data available
Relative evaporation rate (ether=1)	: Not applicable.
Melting point	: No data available
Freezing point	: -187.69 °C (-305.8°F)
Boiling point	: -42.1 °C (-44.32°F)
Flash point	: -104.4 °C (-155.2°F) TCC
Critical temperature	: 96.8 °C (206°F)
Auto-ignition temperature	: 450 °C (842°F)
Decomposition temperature	: No data available
Flammability (solid, gas)	: 2.1 - 9.5 vol %
Vapor pressure	: 8.58 bar (109.73 psig)
Relative vapor density at 20 °C	: No data available
Relative density	: 0.58
Density	: 0.506 - 0.583 g/cm ³ (at 15 °C)
Relative gas density	: 1.5
Solubility	: Water: 75 mg/l
Log Pow	: 2.36
Log Kow	: Not applicable.
Viscosity, kinematic	: Not applicable.
Viscosity, dynamic	: Not applicable.
Explosive properties	: Not applicable.
Oxidizing properties	: None.
Explosion limits	: No data available

9.2. Other information

Gas group	: Liquefied gas
Additional information	: Gas/vapor heavier than air. May accumulate in confined spaces, particularly at or below ground level

SECTION 10: Stability and reactivity

10.1. Reactivity

No reactivity hazard other than the effects described in sub-sections below.

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

Can form explosive mixture with air. May react violently with oxidants.

10.4. Conditions to avoid

Keep away from heat/sparks/open flames/hot surfaces. – No smoking.

10.5. Incompatible materials

Air, Oxidizer. Chlorine dioxide.

10.6. Hazardous decomposition products

Thermal decomposition or burning may produce carbon monoxide, carbon dioxide, and hydrogen. The welding and cutting process may form reaction products such as carbon monoxide and carbon dioxide. Other decomposition products of normal operation originate from the volatilization, reaction, or oxidation of the material being worked.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity : Not classified

Propane (74-98-6	
LC50 inhalation rat (mg/l)	658 mg/l/4h
ATE US (vapors)	658.000 mg/l/4h
ATE US (dust, mist)	658.000 mg/l/4h

Skin corrosion/irritation : Not classified
pH: Not applicable.

Serious eye damage/irritation : Not classified
pH: Not applicable.

Respiratory or skin sensitization : Not classified

Germ cell mutagenicity : Not classified

Carcinogenicity : Not classified

Reproductive toxicity : Not classified

Specific target organ toxicity (single exposure) : Not classified

Specific target organ toxicity (repeated exposure) : Not classified

Aspiration hazard : Not classified

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general : No ecological damage caused by this product.

12.2. Persistence and degradability

Propane (74-98-6)	
Persistence and degradability	The substance is biodegradable. Unlikely to persist.

12.3. Bioaccumulative potential

Propane (74-98-6)	
Log Pow	2.36
Log Kow	Not applicable.
Bioaccumulative potential	Not expected to bioaccumulate due to the low log Kow (log Kow < 4). Refer to section 9.

12.4. Mobility in soil

Propane (74-98-6)	
Mobility in soil	No data available.
Ecology - soil	Because of its high volatility, the product is unlikely to cause ground or water pollution.

12.5. Other adverse effects

Effect on ozone layer : None

Effect on the global warming : No known effects from this product

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste disposal recommendations : Dispose of contents/container in accordance with local/regional/national/international regulations. Contact supplier for any special requirements.

SECTION 14: Transport information

In accordance with DOT

Transport document description : UN1978 Propane (see also Petroleum gases, liquefied [UN1075]), 2.1

UN-No.(DOT) : UN1978

Proper Shipping Name (DOT) : Propane
 see also Petroleum gases, liquefied [UN1075]

Class (DOT) : 2.1 - Class 2.1 - Flammable gas 49 CFR 173.115

Hazard labels (DOT) : 2.1 - Flammable gas



DOT Special Provisions (49 CFR 172.102) : 19 - For domestic transportation only, the identification number UN1075 may be used in place of the identification number specified in column (4) of the 172.101 table. The identification number used must be consistent on package markings, shipping papers and emergency response information
 T50 - When portable tank instruction T50 is referenced in Column (7) of the 172.101 Table, the applicable liquefied compressed gases are authorized to be transported in portable tanks in accordance with the requirements of 173.313 of this subchapter

Additional information

Emergency Response Guide (ERG) Number : 115 (UN1075)

Other information : No supplementary information available.

Special transport precautions : Avoid transport on vehicles where the load space is not separated from the driver's compartment. Ensure vehicle driver is aware of the potential hazards of the load and knows what to do in the event of an accident or an emergency. Before transporting product containers:
 - Ensure there is adequate ventilation. - Ensure that containers are firmly secured. - Ensure cylinder valve is closed and not leaking. - Ensure valve outlet cap nut or plug (where provided) is correctly fitted. - Ensure valve protection device (where provided) is correctly fitted.

Transport by sea

UN-No. (IMDG) : 1978

Proper Shipping Name (IMDG) : PROPANE

Class (IMDG) : 2 - Gases

MFAG-No : 115

Air transport

UN-No. (IATA) : 1978

Proper Shipping Name (IATA) : PROPANE

Class (IATA) : 2

Civil Aeronautics Law : Gases under pressure/Gases flammable under pressure

SECTION 15: Regulatory information

15.1. US Federal regulations

Propane (74-98-6)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

SARA Section 311/312 Hazard Classes	Immediate (acute) health hazard Sudden release of pressure hazard Fire hazard
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Propane

Safety Data Sheet P-4646

This SDS conforms to U.S. Code of Federal Regulations 29 CFR 1910.1200, Hazard Communication.

Date of issue: 01/01/1984 Revision date: 10/24/2016 Supersedes: 01/21/2016

Propane (74-98-6)

All components of this product are listed on the Toxic Substances Control Act (TSCA) inventory.

This product or mixture does not contain a toxic chemical or chemicals in excess of the applicable de minimis concentration as specified in 40 CFR §372.38(a) subject to the reporting requirements of section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

15.2. International regulations

CANADA

Propane (74-98-6)

Listed on the Canadian DSL (Domestic Substances List)

EU-Regulations

Propane (74-98-6)

Listed on the EEC inventory EINECS (European Inventory of Existing Commercial Chemical Substances)

15.2.2. National regulations

Propane (74-98-6)

Listed on the AICS (Australian Inventory of Chemical Substances)
 Listed on IECSC (Inventory of Existing Chemical Substances Produced or Imported in China)
 Listed on the Japanese ENCS (Existing & New Chemical Substances) inventory
 Listed on the Korean ECL (Existing Chemicals List)
 Listed on NZIoC (New Zealand Inventory of Chemicals)
 Listed on PICCS (Philippines Inventory of Chemicals and Chemical Substances)
 Listed on INSQ (Mexican National Inventory of Chemical Substances)
 Listed on CICR (Turkish Inventory and Control of Chemicals)

15.3. US State regulations

Propane(74-98-6)

U.S. - California - Proposition 65 - Carcinogens List	No
U.S. - California - Proposition 65 - Developmental Toxicity	No
U.S. - California - Proposition 65 - Reproductive Toxicity - Female	No
U.S. - California - Proposition 65 - Reproductive Toxicity - Male	No
State or local regulations	U.S. - Massachusetts - Right To Know List U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) List

California Proposition 65 - This product does not contain any substances known to the state of California to cause cancer, developmental and/or reproductive harm

SECTION 16: Other information

Other information

: When using this product in welding and cutting, read and understand the manufacturer's instructions and the precautionary label on the product. Ask your welding products supplier for a copy of Praxair's free safety booklet, P-2035, Precautions and Safe Practices for Gas Welding, Cutting, and Heating, and for other manufacturers' safety publications. For a detailed treatment, get ANSI Z49.1, Safety in Welding, Cutting, and Allied Processes, published by the American Welding Society (AWS), www.aws.org. Order AWS documents from Global Engineering Documents, global.ihc.com. Arcs and sparks can ignite combustible materials. Prevent fires. Refer to NFPA 51B, Standard for Fire Prevention During Welding, Cutting, and Other Hotwork. Do not strike an arc on the container. The defect produced by an arc burn may lead to container rupture

Fumes and gases produced during welding and cutting processes can be dangerous to your health and may cause serious lung disease. **KEEP YOUR HEAD OUT OF FUMES. DO NOT BREATHE FUMES AND GASES.** Use enough ventilation, local exhaust, or both to keep fumes and gases from your breathing zone and the general area. Short-term overexposure to fumes may cause dizziness, nausea, and dryness or irritation of the nose, throat, and eyes; or may cause other similar discomfort. Contaminants in the air may add to the hazard of fumes and gases

When you mix two or more chemicals, you can create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an industrial hygienist or other trained person when you evaluate the end product. Before using any plastics, confirm their compatibility with this product

Praxair asks users of this product to study this SDS and become aware of the product hazards and safety information. To promote safe use of this product, a user should (1) notify employees, agents, and contractors of the information in this SDS and of any other known product hazards and safety information, (2) furnish this information to each purchaser of the product, and (3) ask each purchaser to notify its employees and customers of the product hazards and safety information

The opinions expressed herein are those of qualified experts within Praxair, Inc. We believe that the information contained herein is current as of the date of this Safety Data Sheet. Since the use of this information and the conditions of use are not within the control of Praxair, Inc, it is the user's obligation to determine the conditions of safe use of the product

Praxair SDSs are furnished on sale or delivery by Praxair or the independent distributors and suppliers who package and sell our products. To obtain current SDSs for these products, contact your Praxair sales representative, local distributor, or supplier, or download from www.praxair.com. If you have questions regarding Praxair SDSs, would like the document number and date of the latest SDS, or would like the names of the Praxair suppliers in your area, phone or write the Praxair Call Center (Phone: 1-800-PRAXAIR/1-800-772-9247; Address: Praxair Call Center, Praxair, Inc, P.O. Box 44, Tonawanda, NY 14151-0044)

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NFPA health hazard

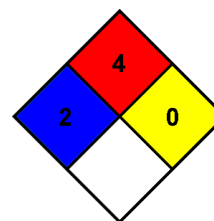
: 2 - Intense or continued exposure could cause temporary incapacitation or possible residual injury unless prompt medical attention is given.

NFPA fire hazard

: 4 - Will rapidly or completely vaporize at normal pressure and temperature, or is readily dispersed in air and will burn readily.

NFPA reactivity

: 0 - Normally stable, even under fire exposure conditions, and are not reactive with water.





Propane

Safety Data Sheet P-4646

This SDS conforms to U.S. Code of Federal Regulations 29 CFR 1910.1200, Hazard Communication.

Date of issue: 01/01/1984 Revision date: 10/24/2016 Supersedes: 01/21/2016

HMIS III Rating

Health : 1 Slight Hazard - Irritation or minor reversible injury possible
Flammability : 4 Severe Hazard
Physical : 2 Moderate Hazard

SDS US (GHS HazCom 2012) - Praxair

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.

SAFETY DATA SHEET

1. Identification

Product identifier: HYDROCHLORIC ACID

Other means of identification

Synonyms: Muriatic Acid, Hydrogen Chloride, Aqueous
CAS No.: 7647-01-0

Recommended use and restriction on use

Recommended use: Not available.
Restrictions on use: Not known.

Manufacturer/Importer/Supplier/Distributor Information

Manufacturer

Company Name: Quality Environmental Containers, Inc.
Address: 607 Industrial Park Road • PO Box 1160
Beaver, WV 25813
Telephone: Customer Service: 800-255-3950
e-mail: info@qecusa.com

Emergency telephone number:
Chemtrec: 800-424-9300

2. Hazard(s) identification

Hazard Classification

Physical Hazards

Corrosive to metals Category 1

Health Hazards

Acute toxicity (Oral) Category 4
Skin Corrosion/Irritation Category 1
Serious Eye Damage/Eye Irritation Category 1
Specific Target Organ Toxicity -
Single Exposure (Inhalation - vapor) Category 3

Label Elements

Hazard Symbol:



Signal Word: Danger

Hazard Statement:	May be corrosive to metals. Harmful if swallowed. Causes severe skin burns and eye damage. May cause respiratory irritation.
Precautionary Statement	
Prevention:	Keep only in original container. Wash thoroughly after handling. 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. Do not eat, drink or smoke when using this product.
Response:	Absorb spillage to prevent material damage. IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. IF ON SKIN (or hair): Remove/take off immediately all contaminated clothing. Rinse skin with water/shower. Wash contaminated clothing before reuse. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or doctor/physician.
Storage:	Store locked up. Store in a well-ventilated place. Keep container tightly closed. Store in corrosive resistant container with a resistant inner liner.
Disposal:	Dispose of contents/container to an appropriate treatment and disposal facility in accordance with applicable laws and regulations, and product characteristics at time of disposal.
Other hazards which do not result in GHS classification:	None.

3. Composition/information on ingredients
--

Mixtures

Chemical Identity	Common name and synonyms	CAS number	Content in percent (%)*
HYDROCHLORIC ACID		7647-01-0	20 - 40%

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4. First-aid measures

General information:	Get medical advice/attention if you feel unwell. Show this safety data sheet to the doctor in attendance.
Ingestion:	Call a physician or poison control center immediately. Do not induce vomiting without advice from poison control center. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs.
Inhalation:	Move to fresh air. Call a physician or poison control center immediately. Apply artificial respiration if victim is not breathing. If breathing is difficult, give oxygen.
Skin Contact:	Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician or poison control center immediately. Wash contaminated clothing before reuse. Destroy or thoroughly clean contaminated shoes.

Eye contact: Immediately flush with plenty of water for at least 15 minutes. If easy to do, remove contact lenses. Call a physician or poison control center immediately. In case of irritation from airborne exposure, move to fresh air. Get medical attention immediately.

Most important symptoms/effects, acute and delayed

Symptoms: Causes severe skin and eye burns. Harmful if swallowed.

Indication of immediate medical attention and special treatment needed

Treatment: Treat symptomatically. Symptoms may be delayed.

5. Fire-fighting measures

General Fire Hazards: No data available.

Suitable (and unsuitable) extinguishing media

Suitable extinguishing media: The product is non-combustible. Use fire-extinguishing media appropriate for surrounding materials.

Unsuitable extinguishing media: None known.

Specific hazards arising from the chemical: Fire or excessive heat may produce hazardous decomposition products.

Special protective equipment and precautions for firefighters

Special fire fighting procedures: Move containers from fire area if you can do so without risk. Use water spray to keep fire-exposed containers cool.

Special protective equipment for fire-fighters: Firefighters must use standard protective equipment including flame retardant coat, helmet with face shield, gloves, rubber boots, and in enclosed spaces, SCBA.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures: Ventilate closed spaces before entering them. Keep unauthorized personnel away. Evacuate area. Keep upwind. See Section 8 of the SDS for Personal Protective Equipment. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.

Methods and material for containment and cleaning up: Neutralize with lime or soda ash. Absorb spill with vermiculite or other inert material, then place in a container for chemical waste. Dike far ahead of larger spill for later recovery and disposal.

Notification Procedures: Inform authorities if large amounts are involved.

Environmental Precautions: Do not contaminate water sources or sewer. Prevent further leakage or spillage if safe to do so.

7. Handling and storage

Precautions for safe handling: Do not eat, drink or smoke when using the product. Do not get in eyes, on skin, on clothing. Wash hands thoroughly after handling. Do not breathe dust/fume/gas/mist/vapors/spray. Use caution when adding this material to water.

Conditions for safe storage, including any incompatibilities:

Keep container tightly closed. Store in a well-ventilated place. Unsuitable containers: metals.

8. Exposure controls/personal protection

Control Parameters

Occupational Exposure Limits

Chemical Identity	Type	Exposure Limit Values	Source
HYDROCHLORIC ACID	Ceiling	2 ppm	US. ACGIH Threshold Limit Values (2011)
	Ceil_Time	5 ppm 7 mg/m3	US. NIOSH: Pocket Guide to Chemical Hazards (2010)
	Ceiling	5 ppm 7 mg/m3	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
	Ceiling	5 ppm 7 mg/m3	US. OSHA Table Z-1-A (29 CFR 1910.1000) (1989)

Appropriate Engineering Controls

No data available.

Individual protection measures, such as personal protective equipment

General information: Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. An eye wash and safety shower must be available in the immediate work area.

Eye/face protection: Wear safety glasses with side shields (or goggles) and a face shield.

Skin Protection

Hand Protection: Chemical resistant gloves

Other: Wear suitable protective clothing and gloves.

Respiratory Protection: If engineering controls do not maintain airborne concentrations below recommended exposure limits (where applicable) or to an acceptable level (in countries where exposure limits have not been established), an approved respirator must be worn. Air-purifying respirator with an appropriate, government approved (where applicable), air-purifying filter, cartridge or canister. Contact health and safety professional or manufacturer for specific information.

Hygiene measures: Provide eyewash station and safety shower. Observe good industrial hygiene practices. Wash hands before breaks and immediately after handling the product. Do not get in eyes. Wash contaminated clothing before reuse. Do not get this material in contact with skin.

9. Physical and chemical properties

Appearance

Physical state: Liquid

Form: Liquid

Color: Colorless

Odor: Pungent

Odor threshold: No data available.

pH: 0.1 (1 N aqueous solution)

Melting point/freezing point: -35 °C

Initial boiling point and boiling range:	48 °C
Flash Point:	Not applicable
Evaporation rate:	No data available.
Flammability (solid, gas):	No data available.
Upper/lower limit on flammability or explosive limits	
Flammability limit - upper (%):	No data available.
Flammability limit - lower (%):	No data available.
Explosive limit - upper (%):	No data available.
Explosive limit - lower (%):	No data available.
Vapor pressure:	14.1 kPa
Vapor density:	No data available.
Relative density:	1.18 (20 °C)
Solubility(ies)	
Solubility in water:	Soluble
Solubility (other):	No data available.
Partition coefficient (n-octanol/water):	No data available.
Auto-ignition temperature:	No data available.
Decomposition temperature:	No data available.
Viscosity:	No data available.

10. Stability and reactivity

Reactivity:	Reacts violently with strong alkaline substances.
Chemical Stability:	Material is stable under normal conditions.
Possibility of Hazardous Reactions:	Hazardous polymerization does not occur.
Conditions to Avoid:	Avoid contact with strong reducing agents. Strong oxidizing agents. Contact with alkalis.
Incompatible Materials:	Acids. Amines. Alkalies. Metals. Reducing agents. Oxidizing agents.
Hazardous Decomposition Products:	Chlorine. hydrogen chloride By heating and fire, corrosive vapors/gases may be formed.

11. Toxicological information

Information on likely routes of exposure

Ingestion:	Harmful if swallowed.
Inhalation:	Causes severe burns.
Skin Contact:	Causes severe skin burns.
Eye contact:	Causes serious eye damage.

Information on toxicological effects

Acute toxicity (list all possible routes of exposure)

Oral	
Product:	ATEmix (Rat): 581 mg/kg
Dermal	
Product:	No data available.
Specified substance(s):	

HYDROCHLORIC ACID LD 50 (Mouse): 1,449 mg/kg

Inhalation

Product: No data available.

Specified substance(s):

HYDROCHLORIC ACID LC 50 (Mouse, 1 h): 1108 ppm
LC 50 (Rat, 1 h): 3124 ppm

Repeated Dose Toxicity

Product: No data available.

Skin Corrosion/Irritation

Product: Causes severe skin burns.

Serious Eye Damage/Eye Irritation

Product: Causes serious eye damage.

Respiratory or Skin Sensitization

Product: Not a skin sensitizer.

Carcinogenicity

Product: This substance has no evidence of carcinogenic properties.

IARC Monographs on the Evaluation of Carcinogenic Risks to Humans:

No carcinogenic components identified

US. National Toxicology Program (NTP) Report on Carcinogens:

No carcinogenic components identified

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050):

No carcinogenic components identified

Germ Cell Mutagenicity

In vitro

Product: No mutagenic components identified

In vivo

Product: No mutagenic components identified

Reproductive Toxicity

Product: No components toxic to reproduction

Specific Target Organ Toxicity - Single Exposure

Product: Respiratory tract irritation.

Specific Target Organ Toxicity - Repeated Exposure

Product: None known.

Aspiration Hazard

Product: Not classified

Other Effects: None known.

12. Ecological information

Ecotoxicity:

Acute hazards to the aquatic environment:

Fish

Product: No data available.

Specified substance(s):

HYDROCHLORIC ACID LC 50 (Western mosquitofish (*Gambusia affinis*), 96 h): 282 mg/l Mortality

Aquatic Invertebrates

Product: No data available.

Specified substance(s):

HYDROCHLORIC ACID LC 50 (Green or European shore crab (*Carcinus maenas*), 48 h): 240 mg/l Mortality
LC 50 (Common shrimp, sand shrimp (*Crangon crangon*), 48 h): 260 mg/l Mortality

Chronic hazards to the aquatic environment:

Fish

Product: No data available.

Aquatic Invertebrates

Product: No data available.

Toxicity to Aquatic Plants

Product: No data available.

Persistence and Degradability

Biodegradation

Product: Expected to be readily biodegradable.

BOD/COD Ratio

Product: No data available.

Bioaccumulative Potential

Bioconcentration Factor (BCF)

Product: No data available on bioaccumulation.

Partition Coefficient n-octanol / water (log Kow)

Product: No data available.

Mobility in Soil:

The product is water soluble and may spread in water systems.

Other Adverse Effects:

Large amounts of the product may affect the acidity (pH-factor) in water with possible risk of harmful effects to aquatic organisms.

13. Disposal considerations

Disposal instructions:

Discharge, treatment, or disposal may be subject to national, state, or local laws. Since emptied containers retain product residue, follow label warnings even after container is emptied.

Contaminated Packaging:

No data available.

14. Transport information

DOT

UN Number: UN 1789
 UN Proper Shipping Name: Hydrochloric acid
 Transport Hazard Class(es)
 Class(es): 8
 Label(s): 8
 Packing Group: II
 Marine Pollutant: No

IMDG

UN Number: UN 1789
 UN Proper Shipping Name: HYDROCHLORIC ACID
 Transport Hazard Class(es)
 Class(es): 8
 Label(s): 8
 EmS No.: F-A, S-B
 Packing Group: II
 Marine Pollutant: No

IATA

UN Number: UN 1789
 Proper Shipping Name: Hydrochloric acid
 Transport Hazard Class(es):
 Class(es): 8
 Label(s): 8
 Marine Pollutant: No
 Packing Group: II

15. Regulatory information

US Federal Regulations

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)
US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)
 None present or none present in regulated quantities.

CERCLA Hazardous Substance List (40 CFR 302.4):
 HYDROCHLORIC ACID Reportable quantity: 5000 lbs.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories

Acute (Immediate) Chronic (Delayed) Fire Reactive Pressure Generating

SARA 302 Extremely Hazardous Substance

Chemical Identity	RQ	Threshold Planning Quantity
HYDROCHLORIC ACID	5000 lbs.	500 lbs.

SARA 304 Emergency Release Notification

Chemical Identity	RQ
HYDROCHLORIC ACID	5000 lbs.

SARA 311/312 Hazardous Chemical

Chemical Identity	Threshold Planning Quantity
HYDROCHLORIC ACID	500lbs

SARA 313 (TRI Reporting)

Chemical Identity	Reporting threshold for other users	Reporting threshold for manufacturing and processing
HYDROCHLORIC ACID	10000 lbs	25000 lbs.

Clean Water Act Section 311 Hazardous Substances (40 CFR 117.3)

HYDROCHLORIC ACID Reportable quantity: 5000 lbs.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130):

HYDROCHLORIC ACID Threshold quantity: 15000 lbs

HYDROCHLORIC ACID Threshold quantity: 5000 lbs

US State Regulations

US. California Proposition 65

No ingredient regulated by CA Prop 65 present.

US. New Jersey Worker and Community Right-to-Know Act

HYDROCHLORIC ACID Listed

US. Massachusetts RTK - Substance List

HYDROCHLORIC ACID Listed

US. Pennsylvania RTK - Hazardous Substances

HYDROCHLORIC ACID Listed

US. Rhode Island RTK

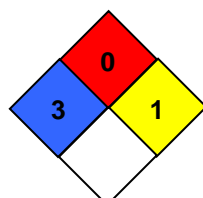
HYDROCHLORIC ACID Listed





Inventory Status:

Australia AICS:	On or in compliance with the inventory
Canada DSL Inventory List:	On or in compliance with the inventory
EU EINECS List:	On or in compliance with the inventory
EU ELINCS List:	Not in compliance with the inventory.
Japan (ENCS) List:	On or in compliance with the inventory
EU No Longer Polymers List:	Not in compliance with the inventory.
China Inv. Existing Chemical Substances:	On or in compliance with the inventory
Korea Existing Chemicals Inv. (KECI):	On or in compliance with the inventory
Canada NDSL Inventory:	Not in compliance with the inventory.
Philippines PICCS:	On or in compliance with the inventory
US TSCA Inventory:	On or in compliance with the inventory
New Zealand Inventory of Chemicals:	On or in compliance with the inventory
Switzerland Consolidated Inventory:	Not in compliance with the inventory.
Japan ISHL Listing:	Not in compliance with the inventory.
Japan Pharmacopoeia Listing:	Not in compliance with the inventory.

16. Other information, including date of preparation or last revision

NFPA Hazard ID



	Flammability
	Health
	Reactivity
	Special hazard.

Hazard rating: 0 - Minimal; 1 - Slight; 2 - Moderate; 3 - Serious; 4 - Severe

Issue Date: 02-02-2015

Revision Date: No data available.

Version #: 4.0

Further Information: No data available.

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Safety Data Sheet



1. Identification

Product Name:	PRO LSPR 6PK 2X MRKNG FLUORSCNT RED ORNG	Revision Date:	1/29/2015
Product Identifier:	266590	Supersedes Date:	New SDS
Product Use/Class:	Marking Paint/Aerosols		
Supplier:	Rust-Oleum Corporation 11 Hawthorn Parkway Vernon Hills, IL 60061 USA	Manufacturer:	Rust-Oleum Corporation 11 Hawthorn Parkway Vernon Hills, IL 60061 USA
Preparer:	Regulatory Department		
Emergency Telephone:	24 Hour Hotline: 847-367-7700		

2. Hazard Identification

EMERGENCY OVERVIEW: Harmful if swallowed. Extremely flammable liquid and vapor. Vapors may cause flash fire or explosion. Contents Under Pressure. Harmful if inhaled. May affect the brain or nervous system causing dizziness, headache or nausea. May cause eye, skin, or respiratory tract irritation. KEEP OUT OF REACH OF CHILDREN. Harmful if inhaled. Causes eye irritation. Use ventilation necessary to keep exposures below recommended exposure limits, if any. Vapor Harmful. Causes Eye, Skin, Nose, and Throat Irritation.

Classification

Symbol(s) of Product



Signal Word

Danger

GHS HAZARD STATEMENTS

Flammable Aerosol, category 1	H222	Extremely flammable aerosol.
Flammable Liquid, category 1	H224	Extremely flammable liquid and vapour.
Acute Toxicity, Oral, category 5	H303	May be harmful if swallowed.
Acute Toxicity, Dermal, category 5	H313	May be harmful in contact with skin.
Skin Irritation, category 2	H315	Causes skin irritation.
Eye Irritation, category 2	H319	Causes serious eye irritation.
Acute Toxicity, Inhalation, category 4	H332	Harmful if inhaled.
STOT, single exposure, category 3, RTI	H335	May cause respiratory irritation.
STOT, single exposure, category 3, NE	H336	May cause drowsiness or dizziness.
Aspiration Hazard, category 2	H305	May be harmful if swallowed and enters airways.
Eye Irritation, category 2B	H320	Causes eye irritation.
Flammable Aerosol, category 1	H280	Contains gas under pressure; may explode if heated

Germ Cell Mutagenicity, category 1B	H340	May cause genetic defects. Classified as mutagenic Category 1 if one ingredient is present at or above 0.1%. Applies to liquids, solids (w/w units) and gases (v/v). The substance may also have its own exposure limit. Routes of exposure are dependent on ingredient form.
Carcinogenicity, category 1A	H350	May cause cancer. Classified as carcinogenic Category 1 on the basis of epidemiological and/or animal data. Mixtures are classified as carcinogenic when at least 1 ingredient has been classified as carcinogenic and is present at 0.1% or above. Routes of exposure are dependant on ingredient form. May cause cancer <state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard>.
STOT, repeated exposure, category 2	H373	May cause damage to organs <or state all organs affected, if known> through prolonged or repeated exposure <state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard>.

GHS PRECAUTIONARY STATEMENTS

P211	Do not spray on an open flame or other ignition source.
P220	Keep/Store away from clothing/.../combustible materials.
P235	Keep cool.
P251	Pressurized container: Do not pierce or burn, even after use.
P375	Fight fire remotely due to the risk of explosion.
P102	Keep out of reach of children.
P103	Read label before use.
P202	Do not handle until all safety precautions have been read and understood.
P234	Keep only in original container.
P260	Do not breathe dust/fume/gas/mist/vapours/spray.
P261	Avoid breathing dust/fume/gas/mist/vapours/spray.
P262	Do not get in eyes, on skin, or on clothing.
P264	Wash ... thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/protective clothing/eye protection/face protection.
P281	Use personal protective equipment as required.
P285	In case of inadequate ventilation wear respiratory protection.
P312	Call a POISON CENTER or doctor/physician if you feel unwell.
P351	Rinse cautiously with water for several minutes.
P374	Fight fire with normal precautions from a reasonable distance.
P402	Store in a dry place.
P210	Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
P410+P412	Protect from sunlight. Do no expose to temperatures exceeding 50°C/ 122°F.
P240	Ground/bond container and receiving equipment.
P241	Use explosion-proof electrical/ventilating/lighting/.../ equipment.
P242	Use only non-sparking tools.
P243	Take precautionary measures against static discharge.
P303+P361+P353	IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
P370+P378	In case of fire: Use ... for extinction.
P403+P235	Store in a well-ventilated place. Keep cool.
P501	Dispose of contents/container to ...
P321	Specific treatment (see ... on this label).
P352	Wash with plenty of soap and water.
P362	Take off contaminated clothing and wash before reuse.
P332+P313	If skin irritation occurs: Get medical advice/attention.
P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P337+P313	If eye irritation persists: Get medical advice/attention.
P304+P340	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P405	Store locked up.
P403+P233	Store in a well-ventilated place. Keep container tightly closed.
P201	Obtain special instructions before use.
P308+P313	IF exposed or concerned: Get medical advice/attention.

P314
P302+P350Get medical advice/attention if you feel unwell.
IF ON SKIN: Gently wash with plenty of soap and water.

3. Composition/Information On Ingredients

HAZARDOUS SUBSTANCES

<u>Chemical Name</u>	<u>CAS-No.</u>	<u>Wt.% Range</u>	<u>GHS Symbols</u>	<u>GHS Statements</u>
Liquefied Petroleum Gas	68476-86-8	10-25	GHS08	H340-350
Xylene (mixed isomers)	1330-20-7	2.5-10	GHS02-GHS07	H226-312-332-315
Limestone	1317-65-3	2.5-10		
Aliphatic Hydrocarbon	64742-89-8	2.5-10	GHS08	H340-350
Barium Sulfate	7727-43-7	2.5-10		
Hydrotreated Light Distillate	64742-47-8	2.5-10	GHS06	H331
Mineral Spirits	64742-88-7	1.0-2.5	GHS06-GHS08	H331-372
Ethylbenzene	100-41-4	1.0-2.5	GHS02-GHS07	H225-332

The text for GHS Hazard Statements shown above (if any) is given in the "16. Other Information" section.

4. First-aid Measures

FIRST AID - EYE CONTACT: Immediately flush eyes with plenty of water for at least 15 minutes holding eyelids open. Get medical attention. Do NOT allow rubbing of eyes or keeping eyes closed.

FIRST AID - SKIN CONTACT: Wash skin with soap and water. Remove contaminated clothing. Get medical attention if irritation develops or persists.

FIRST AID - INHALATION: If you experience difficulty in breathing, leave the area to obtain fresh air. If continued difficulty is experienced, get medical assistance immediately. Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get immediate medical attention. Do NOT use mouth-to-mouth resuscitation.

FIRST AID - INGESTION: Aspiration hazard: Do not induce vomiting or give anything by mouth because this material can enter the lungs and cause severe lung damage. Get immediate medical attention. If swallowed, get medical attention.

5. Fire-fighting Measures

EXTINGUISHING MEDIA: Alcohol Film Forming Foam, Carbon Dioxide, Dry Chemical, Dry Sand, Water Fog

UNUSUAL FIRE AND EXPLOSION HAZARDS: FLASH POINT IS LESS THAN 20°F. EXTREMELY FLAMMABLE LIQUID AND VAPOR! Water spray may be ineffective. Closed containers may explode when exposed to extreme heat. Vapors may form explosive mixtures with air. Vapors can travel to a source of ignition and flash back. Keep containers tightly closed. Isolate from heat, electrical equipment, sparks and open flame. Perforation of the pressurized container may cause bursting of the can. Closed containers may explode when exposed to extreme heat due to buildup of steam. No unusual fire or explosion hazards noted.

SPECIAL FIREFIGHTING PROCEDURES: Evacuate area and fight fire from a safe distance. Full protective equipment including self-contained breathing apparatus should be used. Water may be used to cool closed containers to prevent pressure buildup and possible autoignition or explosion. Use water spray to keep fire-exposed containers cool. Containers may explode when heated.

6. Accidental Release Measures

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED: Contain spilled liquid with sand or earth. DO NOT use combustible materials such as sawdust. Remove all sources of ignition, ventilate area and remove with inert absorbent and non-sparking tools. Dispose of according to local, state (provincial) and federal regulations. Do not incinerate closed containers. Isolate the hazard area and deny entry to unnecessary and unprotected personnel. Ventilate area, isolate spilled material, and remove with inert absorbent. Dispose of contaminated absorbent, container, and unused contents in accordance with local, state, and federal regulations.

7. Handling and Storage

HANDLING: Wash thoroughly after handling. Wash hands before eating. Use only in a well-ventilated area. Follow all MSDS/label precautions even after container is emptied because it may retain product residues. Avoid breathing fumes, vapors, or mist. Remove contaminated clothing and launder before reuse. Use only with adequate ventilation. Avoid contact with eyes, skin and clothing.

STORAGE: Keep containers tightly closed. Isolate from heat, electrical equipment, sparks and open flame. Contents under pressure. Do not store above 120 ° F. Store large quantities in buildings designed and protected for storage of NFPA Class I flammable liquids. Contents under pressure. Do not expose to heat or store above 120 ° F. Product should be stored in tightly sealed containers and protected from heat, moisture, and foreign materials. Store in a dry, well ventilated place. Keep container tightly closed when not in use. Keep away from heat, sparks, flame and sources of ignition. Avoid excess heat.

8. Exposure Controls/Personal Protection

Chemical Name	CAS-No.	Weight % Less Than	ACGIH TLV- TWA	ACGIH TLV- STEL	OSHA PEL-TWA	OSHA PEL- CEILING
Liquefied Petroleum Gas	68476-86-8	25.0	N.E.	N.E.	N.E.	N.E.
Xylene (mixed isomers)	1330-20-7	10.0	100 ppm	150 ppm	100 ppm	N.E.
Limestone	1317-65-3	10.0	15 mg/m3 (Total Dust, OSHA)	N.E.	5 mg/m3 (Respirable Dust)	N.E.
Aliphatic Hydrocarbon	64742-89-8	10.0	350 ppm	N.E.	500 ppm	N.E.
Barium Sulfate	7727-43-7	5.0	5 mg/m3 (Inhalable fraction w/o asbestos and <1% cryst.silica)	N.E.	15 mg/m3 [Total Dust]	N.E.
Hydrotreated Light Distillate	64742-47-8	5.0	100 ppm	N.E.	500 ppm	N.E.
Mineral Spirits	64742-88-7	5.0	100 ppm	N.E.	100 ppm	N.E.
Ethylbenzene	100-41-4	5.0	20 ppm	125 ppm	100 ppm	N.E.

PERSONAL PROTECTION

ENGINEERING CONTROLS: Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits. Use explosion-proof ventilation equipment. Prevent build-up of vapors by opening all doors and windows to achieve cross-ventilation. Provide general dilution of local exhaust ventilation in volume and pattern to keep TLV of hazardous ingredients below acceptable limits.

RESPIRATORY PROTECTION: A respiratory protection program that meets OSHA 1910.134 and ANSI Z88.2 requirements must be followed whenever workplace conditions warrant a respirator's use. A NIOSH/MSHA approved air purifying respirator with organic vapor cartridge or canister may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits.

SKIN PROTECTION: Use impervious gloves to prevent skin contact and absorption of this material through the skin. Nitrile or Neoprene gloves may afford adequate skin protection. Use gloves to prevent prolonged skin contact.

EYE PROTECTION: Use safety eyewear designed to protect against splash of liquids.

OTHER PROTECTIVE EQUIPMENT: Refer to safety supervisor or industrial hygienist for further information regarding personal protective equipment and its application. Refer to safety supervisor or industrial hygienist for further guidance regarding types of personal protective equipment and their applications.

HYGIENIC PRACTICES: Wash thoroughly with soap and water before eating, drinking or smoking. Remove contaminated clothing immediately and launder before reuse.

9. Physical and Chemical Properties

Appearance:	Aerosolized Mist	Physical State:	Liquid
Odor:	Solvent Like	Odor Threshold:	N.E.
Relative Density:	0.859	pH:	N.A.
Freeze Point, °C:	N.D.	Viscosity:	N.D.
Solubility in Water:	Slight	Partition Coefficient, n-octanol/ water:	No Information
Decomposition Temp., °C:	No Information	Explosive Limits, vol%:	0.9 - 12.6
Boiling Range, °C:	-34 - 415	Flash Point, °C:	-105
Flammability:	Does not Support Combustion	Auto-ignition Temp., °C:	No Information
Evaporation Rate:	Faster than Ether	Vapor Pressure:	N.D.
Vapor Density:	Heavier than Air		

(See "Other information" Section for abbreviation legend)

10. Stability and Reactivity

CONDITIONS TO AVOID: Avoid temperatures above 120 ° F. Avoid all possible sources of ignition. Avoid contact with strong acid and strong bases.

INCOMPATIBILITY: Incompatible with strong oxidizing agents, strong acids and strong alkalis.

HAZARDOUS DECOMPOSITION: By open flame, carbon monoxide and carbon dioxide. When heated to decomposition, it emits acrid smoke and irritating fumes. Contains solvents which may form carbon monoxide, carbon dioxide, and formaldehyde.

HAZARDOUS POLYMERIZATION: Will not occur under normal conditions.

STABILITY: This product is stable under normal storage conditions.

11. Toxicological information

EFFECTS OF OVEREXPOSURE - EYE CONTACT: Causes Serious Eye Irritation

EFFECTS OF OVEREXPOSURE - SKIN CONTACT: Substance may cause slight skin irritation. Prolonged or repeated contact may cause skin irritation. May cause skin irritation. Allergic reactions are possible.

EFFECTS OF OVEREXPOSURE - INHALATION: Harmful if inhaled. High gas, vapor, mist or dust concentrations may be harmful if inhaled. Avoid breathing fumes, spray, vapors, or mist. High vapor concentrations are irritating to the eyes, nose, throat and lungs. Prolonged or excessive inhalation may cause respiratory tract irritation.

EFFECTS OF OVEREXPOSURE - INGESTION: Aspiration hazard if swallowed; can enter lungs and cause damage. Harmful if swallowed.

EFFECTS OF OVEREXPOSURE - CHRONIC HAZARDS: IARC lists Ethylbenzene as a possible human carcinogen (group 2B). Overexposure to xylene in laboratory animals has been associated with liver abnormalities, kidney, lung, spleen, eye and blood damage as well as reproductive disorders. Effects in humans, due to chronic overexposure, have included liver, cardiac abnormalities and nervous system damage. May cause central nervous system disorder (e.g., narcosis involving a loss of coordination, weakness, fatigue, mental confusion, and blurred vision) and/or damage. Reports have associated repeated and prolonged occupational overexposure to solvents with permanent brain and nervous system damage. High concentrations may lead to central nervous system effects (drowsiness, dizziness, nausea, headaches, paralysis, and blurred vision) and/or damage.

PRIMARY ROUTE(S) OF ENTRY: Eye Contact, Ingestion, Inhalation, Skin Absorption, Skin Contact

ACUTE TOXICITY VALUES

The acute effects of this product have not been tested. Data on individual components are tabulated below:

<u>CAS-No.</u>	<u>Chemical Name</u>	<u>Oral LD50</u>	<u>Dermal LD50</u>	<u>Vapor LC50</u>
1330-20-7	Xylene (mixed isomers)	4300 mg/kg Rat	N.I.	47635 mg/L Rat
64742-89-8	Aliphatic Hydrocarbon	N.I.	3000 mg/kg Rabbit	N.I.
64742-47-8	Hydrotreated Light Distillate	>5000 mg/kg Rat	>2000 mg/kg Rabbit	>5.2 mg/L Rat
64742-88-7	Mineral Spirits	>5000 mg/kg Rat	3000 mg/kg Rabbit	>5.28 mg/L Rat
100-41-4	Ethylbenzene	3500 mg/kg Rat	15354 mg/kg Rabbit	17.2 mg/L Rat

N.I. - No Information

12. Ecological Information

ECOLOGICAL INFORMATION: Product is a mixture of listed components. Product is a mixture of listed components.

13. Disposal Information

DISPOSAL INFORMATION: Dispose of material in accordance to local, state, and federal regulations and ordinances. Do not allow to enter waterways, wastewater, soil, storm drains or sewer systems.

14. Transport Information

	<u>Domestic (USDOT)</u>	<u>International (IMDG)</u>	<u>Air (IATA)</u>	<u>TDG (Canada)</u>
UN Number:	N.A.	1950	1950	N.A.
Proper Shipping Name:	Paint Products in Limited Quantities	Aerosols	Aerosols	Paint Products in Limited Quantities
Hazard Class:	N.A.	2.1	2.1	N.A.
Packing Group:	N.A.	N.A.	N.A.	N.A.
Limited Quantity:	Yes	Yes	Yes	Yes

15. Regulatory Information

U.S. Federal Regulations:**CERCLA - SARA Hazard Category**

This product has been reviewed according to the EPA 'Hazard Categories' promulgated under Sections 311 and 312 of the Superfund Amendment and Reauthorization Act of 1986 (SARA Title III) and is considered, under applicable definitions, to meet the following categories:

Fire Hazard, Pressure Hazard, Acute Health Hazard, Chronic Health Hazard

Sara Section 313:

This product contains the following substances subject to the reporting requirements of Section 313 of Title III of the Superfund Amendment and Reauthorization Act of 1986 and 40 CFR part 372:

<u>Chemical Name</u>	<u>CAS-No.</u>
Xylene (mixed isomers)	1330-20-7
Ethylbenzene	100-41-4

Toxic Substances Control Act:

This product contains the following chemical substances subject to the reporting requirements of TSCA 12(b) if exported from the United States:

<u>Chemical Name</u>	<u>CAS-No.</u>
Acetaldehyde	75-07-0

CALIFORNIA PROPOSITION 65:

WARNING: This product contains a substance known to the State of California to cause cancer.

<u>Chemical Name</u>	<u>CAS-No.</u>
Ethylbenzene	100-41-4
Pigment Orange 13	3520-72-7
Crystalline Silica / Quartz	14808-60-7
Formaldehyde	50-00-0
Benzene	71-43-2
Lead Compounds	7439-92-1
Cadmium Compounds	7440-43-9
1,4-Dioxane	123-91-1
Acetaldehyde	75-07-0
Ethylene Oxide	75-21-8

CALIFORNIA PROPOSITION 65 REPRODUCTIVE TOXINS

WARNING: This product contains a substance known to the State of California to cause birth defects or other reproductive harm.

<u>Chemical Name</u>	<u>CAS-No.</u>
Toluene	108-88-3
Benzene	71-43-2
Cadmium Compounds	7440-43-9
Lead Compounds	7439-92-1
Ethylene Oxide	75-21-8

International Regulations:**CANADIAN WHMIS:**

This SDS has been prepared in compliance with Controlled Product Regulations except for the use of the 16 headings.

16. Other Information

HMIS RATINGS

Health: 2* Flammability: 4 Physical Hazard: 0 Personal Protection: X

CANADIAN WHMIS CLASS: AB5 D2A

NFPA RATINGS

Health: 2 Flammability: 4 Instability: 0

VOLATILE ORGANIC COMPOUNDS, g/L: 559

MSDS REVISION DATE: 1/29/2015

REASON FOR REVISION: No Information

Legend: N.A. - Not Applicable, N.E. - Not Established, N.D. - Not Determined

Text for GHS Hazard Statements shown in Section 3 describing each ingredient:

H225	Highly flammable liquid and vapor.
H226	Flammable liquid and vapor.
H312	Harmful in contact with skin.
H315	Causes skin irritation.
H331	Toxic if inhaled.
H332	Harmful if inhaled.
H340	May cause genetic defects <state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard>.
H350	May cause cancer <state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard>.
H372	Causes damage to organs <or state all organs affected, if known> through prolonged or repeated exposure <state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard>.

Icons for GHS Pictograms shown in Section 3 describing each ingredient:

GHS02



GHS06



GHS07



GHS08



Rust-Oleum Corporation believes, to the best of its knowledge, information and belief, the information contained herein to be accurate and reliable as of the date of this safety data sheet. However, because the conditions of handling, use, and storage of these materials are beyond our control, we assume no responsibility or liability for personal injury or property damage incurred by the use of these materials. Rust-Oleum Corporation makes no warranty, expressed or implied, regarding the accuracy or reliability of the data or results obtained from their use. All materials may present unknown hazards and should be used with caution. The information and recommendations in this material safety data sheet are offered for the users' consideration and examination. It is the responsibility of the user to determine the final suitability of this information and to comply with all applicable international, federal, state, and local laws and regulations.



SAFETY DATA SHEET

1. Identification

Product identifier AMCO CLEAR® TURBIDITY STANDARD, 1.0 NTU for LAMOTTE 2020e and TC3000e

Other means of identification

Product code 8335

Recommended use Reagent for determination of turbidity of liquids.

Recommended restrictions None known.

Manufacturer/Importer/Supplier/Distributor information

Manufacturer

Company name GFS Chemicals, Inc.
Address P.O. Box 245
Powell, OH 43065
United States
Telephone Phone 740-881-5501
Toll Free 800-858-9682
Fax 740-881-5989
Website www.gfschemicals.com
E-mail service@gfschemicals.com
Emergency phone number Emergency Assistance Chemtrec 800-424-9300

2. Hazard(s) identification

Physical hazards Not classified.

Health hazards Not classified.

Environmental hazards Not classified.

OSHA defined hazards Not classified.

Label elements

Hazard symbol None.

Signal word None.

Hazard statement The mixture does not meet the criteria for classification.

Precautionary statement

Prevention Observe good industrial hygiene practices.

Response Wash hands after handling.

Storage Store away from incompatible materials.

Disposal Dispose of waste and residues in accordance with local authority requirements.

Hazard(s) not otherwise classified (HNOC) None known.

Supplemental information None.

3. Composition/information on ingredients

Mixtures

Chemical name	Common name and synonyms	CAS number	%
WATER		7732-18-5	90 - 100
STYRENE DIVINYLBENZENE COPOLYMER BEADS		9003-70-7	<0.1
Other components below reportable levels			< 0.1

*Designates that a specific chemical identity and/or percentage of composition has been withheld as a trade secret.

4. First-aid measures

Inhalation Move to fresh air. Call a physician if symptoms develop or persist.

Skin contact Dry skin with paper towel or similar.

Eye contact Rinse with water. Get medical attention if irritation develops and persists.

Ingestion Rinse mouth. Get medical attention if symptoms occur.

Material name: AMCO CLEAR® TURBIDITY STANDARD, 1.0 NTU for LAMOTTE 2020e and TC3000e

Most important symptoms/effects, acute and delayed	Direct contact with eyes may cause temporary irritation.
Indication of immediate medical attention and special treatment needed	Treat symptomatically.
General information	Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

5. Fire-fighting measures

Suitable extinguishing media	Use extinguishing agent suitable for type of surrounding fire. Water fog. Foam. Dry chemical powder. Carbon dioxide (CO ₂).
Unsuitable extinguishing media	Do not use water jet as an extinguisher, as this will spread the fire.
Specific hazards arising from the chemical	During fire, gases hazardous to health may be formed.
Special protective equipment and precautions for firefighters	Self-contained breathing apparatus and full protective clothing must be worn in case of fire.
Fire fighting equipment/instructions	Move containers from fire area if you can do so without risk.
Specific methods	Use standard firefighting procedures and consider the hazards of other involved materials.
General fire hazards	No unusual fire or explosion hazards noted.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	No special precautions.
Methods and materials for containment and cleaning up	This product is miscible in water. Containment of this material should not be necessary. Flush with water.
Environmental precautions	Never return spills to original containers for re-use. For waste disposal, see section 13 of the SDS. No special environmental precautions required.

7. Handling and storage

Precautions for safe handling	Avoid prolonged exposure. No special precautions required.
Conditions for safe storage, including any incompatibilities	Store in original tightly closed container. Do not allow material to freeze. Store away from incompatible materials (see Section 10 of the SDS).

8. Exposure controls/personal protection

Occupational exposure limits	No exposure limits noted for ingredient(s).
Biological limit values	No biological exposure limits noted for the ingredient(s).
Appropriate engineering controls	Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level.
Individual protection measures, such as personal protective equipment	
Eye/face protection	Wear safety glasses with side shields (or goggles).
Skin protection	
Hand protection	Not normally needed.
Other	Wear suitable protective clothing.
Respiratory protection	No personal respiratory protective equipment normally required.
Thermal hazards	Wear appropriate thermal protective clothing, when necessary.
General hygiene considerations	Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties

Appearance	Cloudy.
Physical state	Liquid.
Form	Aqueous solution.

Material name: AMCO CLEAR® TURBIDITY STANDARD, 1.0 NTU for LAMOTTE 2020e and TC3000e

8335

Version #: 01

Revision date: Issue date: October-29-2015

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Color	Colorless to white.
Odor	Odorless.
Odor threshold	Not available.
pH	6.7
Melting point/freezing point	32 °F (0 °C) estimated
Initial boiling point and boiling range	212 °F (100 °C) estimated
Flash point	Not available.
Evaporation rate	Not available.
Flammability (solid, gas)	Not available.
Upper/lower flammability or explosive limits	
Flammability limit - lower (%)	Not available.
Flammability limit - upper (%)	Not available.
Explosive limit - lower (%)	Not available.
Explosive limit - upper (%)	Not available.
Vapor pressure	Not available.
Vapor density	Not available.
Relative density	Not available.
Solubility(ies)	
Solubility (water)	Completely Miscible
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.
Viscosity	Not available.
Other information	
Density	1.00 g/cm ³ estimated
Percent volatile	> 99.9 %
Specific gravity	1.00 estimated

10. Stability and reactivity

Reactivity	The product is stable and non-reactive under normal conditions of use, storage and transport.
Chemical stability	Material is stable under normal conditions.
Possibility of hazardous reactions	Hazardous polymerization does not occur.
Conditions to avoid	Contact with incompatible materials. Do not freeze.
Incompatible materials	Strong oxidizing agents.
Hazardous decomposition products	No hazardous decomposition products are known.

11. Toxicological information

Information on likely routes of exposure

Inhalation	Prolonged inhalation may be harmful.
Skin contact	No adverse effects due to skin contact are expected.
Eye contact	Direct contact with eyes may cause temporary irritation.
Ingestion	Expected to be a low ingestion hazard.

Symptoms related to the physical, chemical and toxicological characteristics Direct contact with eyes may cause temporary irritation.

Information on toxicological effects

Acute toxicity

Product	Species	Test Results
AMCO CLEAR® TURBIDITY STANDARD, 1.0 NTU for LAMOTTE 2020e and TC3000e (CAS Mixture)		
Acute		
<i>Dermal</i>		
LD50	Rabbit	99999 mg/kg
<i>Oral</i>		
LD50	Bird	99999 mg/kg
	Mouse	99999 mg/kg
	Rat	99999 mg/kg
TD	Rat	99999 mg/kg
TDL0	Rat	99999 mg/kg

* Estimates for product may be based on additional component data not shown.

Skin corrosion/irritation Prolonged skin contact may cause temporary irritation.

Serious eye damage/eye irritation Direct contact with eyes may cause temporary irritation.

Respiratory or skin sensitization

Respiratory sensitization Not available.

Skin sensitization This product is not expected to cause skin sensitization.

Germ cell mutagenicity No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.

Carcinogenicity This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.

IARC Monographs. Overall Evaluation of Carcinogenicity

Not available.

US. National Toxicology Program (NTP) Report on Carcinogens

Not available.

Reproductive toxicity This product is not expected to cause reproductive or developmental effects.

Specific target organ toxicity - single exposure Not classified.

Specific target organ toxicity - repeated exposure Not classified.

Aspiration hazard Not available.

Chronic effects Prolonged inhalation may be harmful.

12. Ecological information

Ecotoxicity Not applicable.

Product	Species	Test Results	
AMCO CLEAR® TURBIDITY STANDARD, 1.0 NTU for LAMOTTE 2020e and TC3000e (CAS Mixture)			
Aquatic			
Crustacea	EC50	Daphnia	37000 mg/l, 48 hours estimated
Fish	LC50	Fish	22840.0156 mg/l, 96 hours estimated

* Estimates for product may be based on additional component data not shown.

Persistence and degradability No data is available on the degradability of this product.

Bioaccumulative potential No data available.

Mobility in soil No data available.

Other adverse effects No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component.

13. Disposal considerations

Disposal instructions Wash to drains with lots of water. Dispose in accordance with all applicable regulations.

Local disposal regulations Dispose in accordance with all applicable regulations.

Hazardous waste code The waste code should be assigned in discussion between the user, the producer and the waste disposal company.

Waste from residues / unused products	Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).
Contaminated packaging	Empty containers should be taken to an approved waste handling site for recycling or disposal. Since emptied containers may retain product residue, follow label warnings even after container is emptied.

14. Transport information

DOT

Not regulated as dangerous goods.

IATA

Not regulated as dangerous goods.

IMDG

Not regulated as dangerous goods.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code Not established.

15. Regulatory information

US federal regulations All components are on the U.S. EPA TSCA Inventory List. This product is not known to be a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

CERCLA Hazardous Substance List (40 CFR 302.4)

Not listed.

SARA 304 Emergency release notification

Not regulated.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories Immediate Hazard - No
Delayed Hazard - No
Fire Hazard - No
Pressure Hazard - No
Reactivity Hazard - No

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical No

SARA 313 (TRI reporting)

Not regulated.

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Safe Drinking Water Act (SDWA) Not regulated.

US state regulations

US. California Controlled Substances. CA Department of Justice (California Health and Safety Code Section 11100)
Not listed.

US. Massachusetts RTK - Substance List
Not regulated.

US. New Jersey Worker and Community Right-to-Know Act
Not listed.

US. Pennsylvania Worker and Community Right-to-Know Law
Not listed.

US. Rhode Island RTK
Not regulated.

US. California Proposition 65

California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65): This material is not known to contain any chemicals currently listed as carcinogens or reproductive toxins.

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	No
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

Issue date October-29-2015

Version # 01

Disclaimer GFS Chemicals cannot anticipate all conditions under which this information and its product, or the products of other manufacturers in combination with its product, may be used. It is the user's responsibility to ensure safe conditions for handling, storage and disposal of the product, and to assume liability for loss, injury, damage or expense due to improper use. The information in the sheet was written based on the best knowledge and experience currently available.

Revision Information Product and Company Identification: Product Codes

SAFETY DATA SHEET

1. Identification

Product identifier AMCO CLEAR® TURBIDITY STANDARD, 0.0 NTU

Other means of identification

Product code YSI 608000, (6080)

Recommended use Reagent for determination of turbidity of liquids.

Recommended restrictions None known.

Manufacturer/Importer/Supplier/Distributor information

Company name GFS Chemicals, Inc.
Address P.O. Box 245

Powell

OH

43065

US

Telephone

Phone

Toll Free

Fax

Website

E-mail

Emergency phone number

www.gfschemicals.com

service@gfschemicals.com

Emergency Assistance

DISTRIBUTOR:

ADDRESS

YSI, INC

1700/1725 BRANNUM LANE

YELLOW SPRINGS, OHIO

45387

(937) 767-7241

TELEPHONE

E-MAIL

MSDSINFO@XYLEMINC.COM

740-881-5501

800-858-9682

740-881-5989

Chemtrec 800-424-9300

2. Hazard(s) identification

Physical hazards Not classified.

Health hazards Not classified.

OSHA hazard(s) Not classified.

No hazards resulting from the material as supplied.

Label elements

Hazard symbol No symbol.

Signal word Not available.

Hazard statement Not available.

Precautionary statement

Prevention Not available.

Response Not available.

Storage Not available.

Disposal Not available.

Hazard(s) not otherwise classified (HNOC) Not classified.

3. Composition/information on ingredients

Mixtures

Non-hazardous components

Chemical name	CAS number	%
WATER	7732-18-5	>99.9
Other components below reportable levels		0.01082

*Designates that a specific chemical identity and/or percentage of composition has been withheld as a trade secret.

4. First-aid measures

Inhalation Move to fresh air. Call a physician if symptoms develop or persist.

Skin contact Dry skin with paper towel or similar.

Eye contact Rinse with water. Get medical attention if irritation develops and persists.

Ingestion Get medical attention if symptoms occur.

Most important symptoms/effects, acute and delayed	Not available.
Indication of immediate medical attention and special treatment needed	Treat symptomatically.

5. Fire-fighting measures

Suitable extinguishing media	Use extinguishing agent suitable for type of surrounding fire. Water fog. Foam. Dry chemical powder. Carbon dioxide (CO2).
Unsuitable extinguishing media	Not available.
Specific hazards arising from the chemical	Not applicable.
Special protective equipment and precautions for firefighters	Wear suitable protective equipment.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	No special precautions.
Methods and materials for containment and cleaning up	Containment of this material should not be necessary. This product is miscible in water. Flush with water. Never return spills in original containers for re-use. For waste disposal, see section 13 of the MSDS.
Environmental precautions	No special environmental precautions required.

7. Handling and storage

Precautions for safe handling	No special precautions required.
Conditions for safe storage, including any incompatibilities	Do not allow material to freeze.

8. Exposure controls/personal protection

Occupational exposure limits	No exposure limits noted for ingredient(s).
Biological limit values	No biological exposure limits noted for the ingredient(s).
Appropriate engineering controls	Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level.
Individual protection measures, such as personal protective equipment	
Eye/face protection	Not normally needed.
Skin protection	
Hand protection	Not normally needed.
Other	Normal work clothing (long sleeved shirts and long pants) is recommended.
Respiratory protection	No personal respiratory protective equipment normally required.
Thermal hazards	Not available.
General hygiene considerations	Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Appearance	Clear.
Physical state	Liquid.
Form	Liquid.
Color	Colorless.
Odor	Odorless.
Odor threshold	Not available.
pH	6.7
Melting point/freezing point	32 °F (0 °C) estimated

Material name: AMCO CLEAR® TURBIDITY STANDARD, 0.0 NTU

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SDS US

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Initial boiling point and boiling range	212 °F (100 °C) Approximately
Flash point	Not available.
Evaporation rate	Not available.
Flammability (solid, gas)	Not applicable.
Upper/lower flammability or explosive limits	
Flammability limit - lower (%)	Not available.
Flammability limit - upper (%)	Not available.
Explosive limit - lower (%)	Not available.
Explosive limit - upper (%)	Not available.
Vapor pressure	0.000011 hPa estimated
Vapor density	Not available.
Relative density	Not available.
Solubility(ies)	Completely miscible.
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.
Viscosity	Not available.
Other information	
Density	1.00 g/cm3 estimated
Percent volatile	100 %
Specific gravity	1.00 estimated

10. Stability and reactivity

Reactivity	Not available.
Chemical stability	Material is stable under normal conditions.
Possibility of hazardous reactions	Hazardous polymerization does not occur.
Conditions to avoid	Do not freeze.
Incompatible materials	None known.
Hazardous decomposition products	No hazardous decomposition products are known.

11. Toxicological information

Information on likely routes of exposure

Ingestion	Based on available data, the classification criteria are not met.
Inhalation	Due to lack of data the classification is not possible.
Skin contact	Due to lack of data the classification is not possible.
Eye contact	Due to lack of data the classification is not possible.

Symptoms related to the physical, chemical and toxicological characteristics Not available.

Information on toxicological effects

Acute toxicity

Product	Species	Test Results
AMCO CLEAR® TURBIDITY STANDARD, 0.0 NTU (CAS Mixture)		
Acute		
<i>Dermal</i>		
LD50	Rabbit	99999 mg/kg
<i>Oral</i>		
LD50	Bird	99999 mg/kg

Product	Species	Test Results
	Mouse	99999 mg/kg
	Rat	99999 mg/kg
TD	Rat	99999 mg/kg
TDLO	Rat	99999 mg/kg

* Estimates for product may be based on additional component data not shown.

Skin corrosion/irritation	Due to lack of data the classification is not possible.
Serious eye damage/eye irritation	Due to lack of data the classification is not possible.
Respiratory sensitization	Due to lack of data the classification is not possible.
Skin sensitization	Due to lack of data the classification is not possible.
Germ cell mutagenicity	Due to lack of data the classification is not possible.
Carcinogenicity	This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.
Reproductive toxicity	Due to lack of data the classification is not possible.
Specific target organ toxicity - single exposure	Due to lack of data the classification is not possible.
Specific target organ toxicity - repeated exposure	Due to lack of data the classification is not possible.
Aspiration hazard	Due to lack of data the classification is not possible.
Chronic effects	Prolonged inhalation may be harmful.
Further information	This product has no known adverse effect on human health.

12. Ecological information

Ecotoxicity Contains a substance which causes risk of hazardous effects to the environment. Not applicable.

Product	Species	Test Results
AMCO CLEAR® TURBIDITY STANDARD, 0.0 NTU (CAS Mixture)		
Crustacea	EC50	Daphnia
		34905.6602 mg/l, 48 hours, estimated
Fish	LC50	Fish
		21604.9727 mg/l, 96 hours, estimated

* Estimates for product may be based on additional component data not shown.

Persistence and degradability	No data is available on the degradability of this product.
Bioaccumulative potential	Not available.
Mobility in soil	Not available.
Other adverse effects	Not available.

13. Disposal considerations

Disposal instructions	Wash to drains with lots of water. Dispose in accordance with all applicable regulations.
Local disposal regulations	Not available.
Hazardous waste code	Not regulated.
Waste from residues / unused products	Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).
Contaminated packaging	Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. Transport information

DOT

Not regulated as a hazardous material by DOT.

IATA

Not regulated as a dangerous good.

IMDG

Not regulated as a dangerous good.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code No information available.

15. Regulatory information

US federal regulations All components are on the U.S. EPA TSCA Inventory List.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not on regulatory list.

CERCLA Hazardous Substance List (40 CFR 302.4)

Not listed.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories
Immediate Hazard - No
Delayed Hazard - No
Fire Hazard - No
Pressure Hazard - No
Reactivity Hazard - No

SARA 302 Extremely hazardous substance No

SARA 311/312 Hazardous chemical No

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Safe Drinking Water Act (SDWA) Not regulated.

Drug Enforcement Administration (DEA). List 2, Essential Chemicals (21 CFR 1310.02(b) and 1310.04(f)(2) and Chemical Code Number

Not listed.

Drug Enforcement Administration (DEA). List 1 & 2 Exempt Chemical Mixtures (21 CFR 1310.12(c))

Not regulated.

DEA Exempt Chemical Mixtures Code Number

Not regulated.

Food and Drug Administration (FDA) Not regulated.

US state regulations

California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65): This material is not known to contain any chemicals currently listed as carcinogens or reproductive toxins.

US. Massachusetts RTK - Substance List

Not regulated.

US. New Jersey Worker and Community Right-to-Know Act

Not regulated.

US. Pennsylvania RTK - Hazardous Substances

Not regulated.

US. Rhode Island RTK

Not regulated.

US. California Proposition 65

US - California Proposition 65 - Carcinogens & Reproductive Toxicity (CRT): Listed substance

Not listed.

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	No
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes

Country(s) or region	Inventory name	On inventory (yes/no)*
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates this product complies with the inventory requirements administered by the governing country(s)

16. Other information, including date of preparation or last revision

Issue date	August-12-2013
Version #	01
Further information	Not available.
Disclaimer	The information in the sheet was written based on the best knowledge and experience currently available. 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.
Revision Information	Product and Company Identification: Synonyms Composition / Information on Ingredients: Ingredients Physical & Chemical Properties: Multiple Properties

SECTION 1: Identification

1.1. Identification

Product form	: Mixtures
Product name	: Sodium Hydroxide, 50% w/w
CAS-No.	: 1310-73-2
Product code	: LC24150
Formula	: NaOH
Synonyms	: caustic soda 50% W/W / soda lye, 50%, aqueous solution / white caustic, 50%, aqueous solution

1.2. Recommended use and restrictions on use

Use of the substance/mixture	: Industrial use
Recommended use	: Laboratory chemicals
Restrictions on use	: Not for food, drug or household use

1.3. Supplier

LabChem Inc
Jackson's Pointe Commerce Park Building 1000, 1010 Jackson's Pointe Court
Zellienople, PA 16063 - USA
T 412-826-5230 - F 724-473-0647
info@labchem.com - www.labchem.com

1.4. Emergency telephone number

Emergency number : CHEMTREC: 1-800-424-9300 or 011-703-527-3887

SECTION 2: Hazard(s) identification

2.1. Classification of the substance or mixture

GHS-US classification

Skin corrosion/irritation Category 1B	H314	Causes severe skin burns and eye damage
Serious eye damage/eye irritation Category 1	H318	Causes serious eye damage
Hazardous to the aquatic environment - Acute Hazard Category 3	H402	Harmful to aquatic life

Full text of H statements : see section 16

2.2. GHS Label elements, including precautionary statements

GHS-US labeling

Hazard pictograms (GHS-US) :



GHS05

Signal word (GHS-US) :

: Danger

Hazard statements (GHS-US) :

: H314 - Causes severe skin burns and eye damage
H402 - Harmful to aquatic life

Precautionary statements (GHS-US) :

: P260 - Do not breathe mist, vapors, spray.
P264 - Wash exposed skin thoroughly after handling.
P273 - Avoid release to the environment.
P280 - Wear protective gloves, protective clothing, eye protection, face protection.
P301+P330+P331 - IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303+P361+P353 - IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P310 - Immediately call a poison center or doctor/physician.
P363 - Wash contaminated clothing before reuse.
P405 - Store locked up.

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P501 - Dispose of contents/container to comply with local, state and federal regulations
If inhaled: Remove person to fresh air and keep comfortable for breathing

2.3. Other hazards which do not result in classification

No additional information available

2.4. Unknown acute toxicity (GHS US)

Not applicable

SECTION 3: Composition/Information on ingredients

3.1. Substances

Not applicable

3.2. Mixtures

Name	Product identifier	%	GHS-US classification
Sodium Hydroxide	(CAS-No.) 1310-73-2	50	Acute Tox. 4 (Dermal), H312 Skin Corr. 1A, H314 Eye Dam. 1, H318 Aquatic Acute 3, H402
Water	(CAS-No.) 7732-18-5	50	Not classified

Full text of hazard classes and H-statements : see section 16

SECTION 4: First-aid measures

4.1. Description of first aid measures

- First-aid measures general : Check the vital functions. Unconscious: maintain adequate airway and respiration. Respiratory arrest: artificial respiration or oxygen. Cardiac arrest: perform resuscitation. Victim conscious with labored breathing: half-seated. Victim in shock: on his back with legs slightly raised. Vomiting: prevent asphyxia/aspiration pneumonia. Prevent cooling by covering the victim (no warming up). Keep watching the victim. Give psychological aid. Keep the victim calm, avoid physical strain. Depending on the victim's condition: doctor/hospital. Never give anything by mouth to an unconscious person. If you feel unwell, seek medical advice (show the label where possible).
- First-aid measures after inhalation : Remove the victim into fresh air. Respiratory problems: consult a doctor/medical service. Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a poison center or doctor/physician.
- First-aid measures after skin contact : Wash immediately with lots of water (15 minutes)/shower. Do not apply (chemical) neutralizing agents. Remove clothing while washing. Do not remove clothing if it sticks to the skin. Cover wounds with sterile bandage. Consult a doctor/medical service. If burned surface > 10%: take victim to hospital. Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower. Immediately call a poison center or doctor/physician.
- First-aid measures after eye contact : Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a poison center or doctor/physician.
- First-aid measures after ingestion : Rinse mouth with water. Immediately after ingestion: give lots of water to drink. Do not induce vomiting. Do not give activated charcoal. Do not give chemical antidote. Immediately consult a doctor/medical service. Call Poison Information Centre (www.big.be/antigif.htm). Take the container/vomit to the doctor/hospital. Ingestion of large quantities: immediately to hospital. Rinse mouth. Do NOT induce vomiting. Immediately call a poison center or doctor/physician.

4.2. Most important symptoms and effects (acute and delayed)

- Symptoms/effects : Causes severe skin burns and eye damage.
- Symptoms/effects after inhalation : EXPOSURE TO HIGH CONCENTRATIONS: Dry/sore throat. Coughing. Irritation of the respiratory tract. Irritation of the nasal mucous membranes. FOLLOWING SYMPTOMS MAY APPEAR LATER: Possible laryngeal spasm/oedema. Risk of lung edema. Respiratory difficulties.
- Symptoms/effects after skin contact : Caustic burns/corrosion of the skin. Slow-healing wounds.
- Symptoms/effects after eye contact : Corrosion of the eye tissue. Permanent eye damage. Causes serious eye damage.
- Symptoms/effects after ingestion : Vomiting. Diarrhoea. Burns to the gastric/intestinal mucosa. Possible esophageal perforation. Bleeding of the gastrointestinal tract. Shock. AFTER ABSORPTION OF LARGE QUANTITIES: Disturbances of consciousness.
- Chronic symptoms : ON CONTINUOUS/REPEATED EXPOSURE/CONTACT: Dry skin. Skin rash/inflammation. Possible inflammation of the respiratory tract.

4.3. Immediate medical attention and special treatment, if necessary

No additional information available

Sodium Hydroxide, 50% w/w

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SECTION 5: Fire-fighting measures

5.1. Suitable (and unsuitable) extinguishing media

- Suitable extinguishing media : EXTINGUISHING MEDIA FOR SURROUNDING FIRES: Adapt extinguishing media to the environment. Foam. Dry powder. Carbon dioxide. Water spray. Sand.
- Unsuitable extinguishing media : Solid water jet ineffective as extinguishing medium.

5.2. Specific hazards arising from the chemical

- Fire hazard : DIRECT FIRE HAZARD. Non combustible. INDIRECT FIRE HAZARD. Reactions involving a fire hazard: see "Reactivity Hazard".
- Explosion hazard : INDIRECT EXPLOSION HAZARD. Reactions with explosion hazards: see "Reactivity Hazard".
- Reactivity : Violent exothermic reaction with water (moisture): (increased) risk of fire. On heating: release of corrosive gases/vapours. Absorbs the atmospheric CO₂. Violent exothermic reaction with (some) acids. May be corrosive to metals. Reacts with (some) metals: release of highly flammable gases/vapours (hydrogen).

5.3. Special protective equipment and precautions for fire-fighters

- Precautionary measures fire : Exposure to fire/heat: keep upwind. Exposure to fire/heat: consider evacuation. Exposure to fire/heat: have neighbourhood close doors and windows.
- Firefighting instructions : Cool tanks/drums with water spray/remove them into safety. Dilute toxic gases with water spray. Take account of toxic fire-fighting water. Use water moderately and if possible collect or contain it.
- Protection during firefighting : Heat/fire exposure: compressed air/oxygen apparatus.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel

- Protective equipment : Gloves. Face-shield. Corrosion-proof suit. Large spills/in enclosed spaces: compressed air apparatus. Large spills/in enclosed spaces: gas-tight suit. See "Material-Handling" to select protective clothing.
- Emergency procedures : Mark the danger area. No naked flames. Wash contaminated clothes. Large spills/in confined spaces: consider evacuation. In case of hazardous reactions: keep upwind. In case of reactivity hazard: consider evacuation.

6.1.2. For emergency responders

- Protective equipment : Equip cleanup crew with proper protection.
- Emergency procedures : Ventilate area.

6.2. Environmental precautions

Prevent soil and water pollution. Prevent spreading in sewers. Prevent entry to sewers and public waters. Notify authorities if liquid enters sewers or public waters. Avoid release to the environment.

6.3. Methods and material for containment and cleaning up

- For containment : Contain released substance, pump into suitable containers. Consult "Material-handling" to select material of containers. Plug the leak, cut off the supply. Dam up the liquid spill. Hazardous reaction: measure explosive gas-air mixture. Reaction: dilute combustible gas/vapour with water curtain. Heat exposure: dilute toxic gas/vapour with water spray. Take account of toxic/corrosive precipitation water.
- Methods for cleaning up : Take up liquid spill into absorbent material, e.g.: sand, saw dust, kieselguhr. Scoop absorbed substance into closing containers. See "Material-handling" for suitable container materials. Carefully collect the spill/leftovers. Small quantities of liquid spill: neutralize with acid solution. Wash away neutralized product with plentiful water. Damaged/cooled tanks must be emptied. Clean contaminated surfaces with an excess of water. Take collected spill to manufacturer/competent authority. Wash clothing and equipment after handling.

6.4. Reference to other sections

See Heading 8. Exposure controls and personal protection.

Sodium Hydroxide, 50% w/w

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SECTION 7: Handling and storage

7.1. Precautions for safe handling

- Precautions for safe handling : Comply with the legal requirements. Remove contaminated clothing immediately. Clean contaminated clothing. Handle and open the container with care. Thoroughly clean/dry the installation before use. Do not discharge the waste into the drain. Keep away from naked flames/heat. Observe very strict hygiene - avoid contact. Keep container tightly closed. Measure the concentration in the air regularly. Carry operations in the open/under local exhaust/ventilation or with respiratory protection.
- Hygiene measures : Wash exposed skin thoroughly after handling.

7.2. Conditions for safe storage, including any incompatibilities

- Technical measures : Comply with applicable regulations.
- Storage conditions : Keep only in the original container in a cool, well ventilated place away from : incompatible materials. Keep container closed when not in use.
- Incompatible products : Strong bases. Strong acids.
- Incompatible materials : Sources of ignition. Direct sunlight.
- Storage temperature : > 15 °C
- Heat-ignition : KEEP SUBSTANCE AWAY FROM: heat sources.
- Prohibitions on mixed storage : KEEP SUBSTANCE AWAY FROM: combustible materials. strong acids. metals.
- Storage area : Store in a dry area. Keep container in a well-ventilated place. Keep locked up. Protect against frost. Provide for a tub to collect spills. Unauthorized persons are not admitted. Meet the legal requirements.
- Special rules on packaging : SPECIAL REQUIREMENTS: hermetical. dry. clean. correctly labelled. meet the legal requirements. Secure fragile packagings in solid containers.
- Packaging materials : SUITABLE MATERIAL: stainless steel. nickel. polyethylene. polypropylene. glass. stoneware/porcelain. MATERIAL TO AVOID: lead. aluminium. copper. tin. zinc. bronze.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Sodium Hydroxide, 50% w/w (1310-73-2)		
OSHA	OSHA PEL (TWA) (mg/m ³)	2 mg/m ³
IDLH	US IDLH (mg/m ³)	10 mg/m ³
NIOSH	NIOSH REL (ceiling) (mg/m ³)	2 mg/m ³
Sodium Hydroxide (1310-73-2)		
ACGIH	ACGIH Ceiling (mg/m ³)	2 mg/m ³ (Sodium hydroxide; USA; Momentary value; TLV - Adopted Value)
OSHA	OSHA PEL (TWA) (mg/m ³)	2 mg/m ³
IDLH	US IDLH (mg/m ³)	10 mg/m ³
NIOSH	NIOSH REL (ceiling) (mg/m ³)	2 mg/m ³
Water (7732-18-5)		
Not applicable		

8.2. Appropriate engineering controls

- Appropriate engineering controls : Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure. Provide adequate general and local exhaust ventilation.

8.3. Individual protection measures/Personal protective equipment

Personal protective equipment:

Protective goggles. Gloves. Protective clothing. Face shield.



Sodium Hydroxide, 50% w/w

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according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Materials for protective clothing:

GIVE EXCELLENT RESISTANCE: nitrile rubber. GIVE GOOD RESISTANCE: No data available. GIVE LESS RESISTANCE: chlorinated polyethylene. styrene-butadiene rubber. nitrile rubber/PVC. GIVE POOR RESISTANCE: PVA. natural fibres

Hand protection:

Wear protective gloves.

Eye protection:

Chemical goggles or face shield. Face shield

Skin and body protection:

Corrosion-proof clothing

Respiratory protection:

Wear gas mask with filter type B if conc. in air > exposure limit

Other information:

Do not eat, drink or smoke during use.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	: Liquid
Appearance	: Liquid.
Color	: Colorless
Odor	: Odorless
Odor threshold	: No data available
pH	: 14 (8 %)
pH solution	: 8 %
Melting point	: 12 °C
Freezing point	: No data available
Boiling point	: 143 °C
Flash point	: Not applicable
Relative evaporation rate (butyl acetate=1)	: No data available
Flammability (solid, gas)	: Non flammable.
Vapor pressure	: 1.2 hPa (20 °C)
Relative vapor density at 20 °C	: No data available
Relative density	: 1.5
Specific gravity / density	: 1525 kg/m ³
Molecular mass	: 40 g/mol
Solubility	: Exothermically soluble in water. Soluble in ethanol. Soluble in methanol. Soluble in glycerol. Water: Complete
Log Pow	: No data available
Auto-ignition temperature	: Not applicable
Decomposition temperature	: No data available
Viscosity, kinematic	: No data available
Viscosity, dynamic	: 79 mPa.s (20 °C)
Explosion limits	: No data available
Explosive properties	: Not applicable.
Oxidizing properties	: None.

9.2. Other information

Minimum ignition energy	: Not applicable
VOC content	: Not applicable (inorganic)
Other properties	: Clear. Hygroscopic. Slightly volatile. Substance has basic reaction.

Sodium Hydroxide, 50% w/w

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

SECTION 10: Stability and reactivity

10.1. Reactivity

Violent exothermic reaction with water (moisture): (increased) risk of fire. On heating: release of corrosive gases/vapours. Absorbs the atmospheric CO₂. Violent exothermic reaction with (some) acids. May be corrosive to metals. Reacts with (some) metals: release of highly flammable gases/vapours (hydrogen).

10.2. Chemical stability

Stable under normal conditions. Absorbs atmospheric CO₂. Hygroscopic. Not established.

10.3. Possibility of hazardous reactions

Not established.

10.4. Conditions to avoid

Direct sunlight. Extremely high or low temperatures.

10.5. Incompatible materials

Strong acids. metals.

10.6. Hazardous decomposition products

Sodium oxide. Thermal decomposition generates : Corrosive vapors.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Likely routes of exposure : Skin and eye contact

Acute toxicity : Not classified

Sodium Hydroxide (1310-73-2)	
ATE US (dermal)	1350 mg/kg body weight
Water (7732-18-5)	
LD50 oral rat	≥ 90000 mg/kg
ATE US (oral)	90000 mg/kg body weight

Skin corrosion/irritation : Causes severe skin burns and eye damage.
pH: 14 (8 %)

Serious eye damage/irritation : Causes serious eye damage.
pH: 14 (8 %)

Respiratory or skin sensitization : Not classified

Germ cell mutagenicity : Not classified

Based on available data, the classification criteria are not met

Carcinogenicity : Not classified

Reproductive toxicity : Not classified

Based on available data, the classification criteria are not met

Specific target organ toxicity – single exposure : Not classified

Specific target organ toxicity – repeated exposure : Not classified

Aspiration hazard : Not classified

Potential Adverse human health effects and symptoms : Based on available data, the classification criteria are not met.

Symptoms/effects after inhalation : EXPOSURE TO HIGH CONCENTRATIONS: Dry/sore throat. Coughing. Irritation of the respiratory tract. Irritation of the nasal mucous membranes. FOLLOWING SYMPTOMS MAY APPEAR LATER: Possible laryngeal spasm/oedema. Risk of lung edema. Respiratory difficulties.

Symptoms/effects after skin contact : Caustic burns/corrosion of the skin. Slow-healing wounds.

Symptoms/effects after eye contact : Corrosion of the eye tissue. Permanent eye damage. Causes serious eye damage.

Symptoms/effects after ingestion : Vomiting. Diarrhoea. Burns to the gastric/intestinal mucosa. Possible esophageal perforation. Bleeding of the gastrointestinal tract. Shock. AFTER ABSORPTION OF LARGE QUANTITIES: Disturbances of consciousness.

Sodium Hydroxide, 50% w/w

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Chronic symptoms : ON CONTINUOUS/REPEATED EXPOSURE/CONTACT: Dry skin. Skin rash/inflammation. Possible inflammation of the respiratory tract.

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general : Not classified as dangerous for the environment according to the criteria of Regulation (EC) No 1272/2008.

Ecology - air : Not classified as dangerous for the ozone layer (Regulation (EC) No 1005/2009). None of the known components is included in the list of fluorinated greenhouse gases (Regulation (EC) No 842/2006).

Ecology - water : Ground water pollutant. Maximum concentration in drinking water: 200 mg/l (sodium) (Directive 98/83/EC). Harmful to fishes. Harmful to invertebrates (Daphnia). pH shift.

Sodium Hydroxide (1310-73-2)

LC50 fish 1	45.4 mg/l (LC50; Other; 96 h; Salmo gairdneri; Static system; Fresh water; Experimental value)
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12.2. Persistence and degradability

Sodium Hydroxide, 50% w/w (1310-73-2)

Persistence and degradability	Biodegradability: not applicable. No test data on mobility of the components available.
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Sodium Hydroxide (1310-73-2)

Persistence and degradability	Biodegradability: not applicable. No test data on mobility of the substance available.
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Biochemical oxygen demand (BOD)	Not applicable
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Chemical oxygen demand (COD)	Not applicable
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ThOD	Not applicable
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Water (7732-18-5)

Persistence and degradability	Not established.
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12.3. Bioaccumulative potential

Sodium Hydroxide, 50% w/w (1310-73-2)

Bioaccumulative potential	Does not contain bioaccumulative component(s).
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Sodium Hydroxide (1310-73-2)

Bioaccumulative potential	No bioaccumulation data available.
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Water (7732-18-5)

Bioaccumulative potential	Not established.
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12.4. Mobility in soil

No additional information available

12.5. Other adverse effects

Other information : Avoid release to the environment.

SECTION 13: Disposal considerations

13.1. Disposal methods

Waste disposal recommendations : Remove waste in accordance with local and/or national regulations. Hazardous waste shall not be mixed together with other waste. Different types of hazardous waste shall not be mixed together if this may entail a risk of pollution or create problems for the further management of the waste. Hazardous waste shall be managed responsibly. All entities that store, transport or handle hazardous waste shall take the necessary measures to prevent risks of pollution or damage to people or animals. Recycle/reuse. Remove for physico-chemical/biological treatment. Do not discharge into drains or the environment.

Additional information : LWCA (the Netherlands): KGA category 05. Hazardous waste according to Directive 2008/98/EC.

Ecology - waste materials : Avoid release to the environment.

Sodium Hydroxide, 50% w/w

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

SECTION 14: Transport information

Department of Transportation (DOT)

In accordance with DOT

Transport document description : UN1824 Sodium hydroxide solution, 8, II

UN-No.(DOT) : UN1824

Proper Shipping Name (DOT) : Sodium hydroxide solution

Transport hazard class(es) (DOT) : 8 - Class 8 - Corrosive material 49 CFR 173.136

Packing group (DOT) : II - Medium Danger

Hazard labels (DOT) : 8 - Corrosive



DOT Packaging Non Bulk (49 CFR 173.xxx) : 202

DOT Packaging Bulk (49 CFR 173.xxx) : 242

DOT Special Provisions (49 CFR 172.102) : B2 - MC 300, MC 301, MC 302, MC 303, MC 305, and MC 306 and DOT 406 cargo tanks are not authorized.
IB2 - Authorized IBCs: Metal (31A, 31B and 31N); Rigid plastics (31H1 and 31H2); Composite (31HZ1). Additional Requirement: Only liquids with a vapor pressure less than or equal to 110 kPa at 50 C (1.1 bar at 122 F), or 130 kPa at 55 C (1.3 bar at 131 F) are authorized.
N34 - Aluminum construction materials are not authorized for any part of a packaging which is normally in contact with the hazardous material.
T7 - 4 178.274(d)(2) Normal..... 178.275(d)(3)
TP2 - a. The maximum degree of filling must not exceed the degree of filling determined by the following: (image) Where: tr is the maximum mean bulk temperature during transport, tf is the temperature in degrees celsius of the liquid during filling, and a is the mean coefficient of cubical expansion of the liquid between the mean temperature of the liquid during filling (tf) and the maximum mean bulk temperature during transportation (tr) both in degrees celsius. b. For liquids transported under ambient conditions may be calculated using the formula: (image) Where: d15 and d50 are the densities (in units of mass per unit volume) of the liquid at 15 C (59 F) and 50 C (122 F), respectively.

DOT Packaging Exceptions (49 CFR 173.xxx) : 154

DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27) : 1 L

DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75) : 30 L

DOT Vessel Stowage Location : A - The material may be stowed "on deck" or "under deck" on a cargo vessel and on a passenger vessel.

DOT Vessel Stowage Other : 52 - Stow "separated from" acids

Other information : No supplementary information available.

SECTION 15: Regulatory information

15.1. US Federal regulations

Sodium Hydroxide, 50% w/w (1310-73-2)

Listed on the United States TSCA (Toxic Substances Control Act) inventory
Not subject to reporting requirements of the United States SARA Section 313

RQ (Reportable quantity, section 304 of EPA's List of Lists)	1000 lb
SARA Section 311/312 Hazard Classes	Health hazard - Skin corrosion or Irritation Health hazard - Serious eye damage or eye irritation

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory

Sodium Hydroxide (1310-73-2)

RQ (Reportable quantity, section 304 of EPA's List of Lists)	1000 lb
SARA Section 311/312 Hazard Classes	Immediate (acute) health hazard

Sodium Hydroxide, 50% w/w

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

15.2. International regulations

CANADA

Sodium Hydroxide (1310-73-2)

Listed on the Canadian DSL (Domestic Substances List)

EU-Regulations

No additional information available

National regulations

No additional information available

15.3. US State regulations

California Proposition 65 - This product does not contain any substances known to the state of California to cause cancer, developmental and/or reproductive harm

SECTION 16: Other information

Revision date : 02/07/2017

Other information : None.

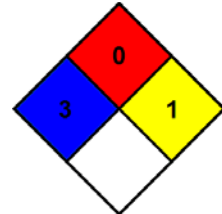
Full text of H-phrases: see section 16:

H312	Harmful in contact with skin
H314	Causes severe skin burns and eye damage
H318	Causes serious eye damage
H402	Harmful to aquatic life

NFPA health hazard : 3 - Materials that, under emergency conditions, can cause serious or permanent injury.

NFPA fire hazard : 0 - Materials that will not burn under typical dire conditions, including intrinsically noncombustible materials such as concrete, stone, and sand.

NFPA reactivity : 1 - Materials that in themselves are normally stable but can become unstable at elevated temperatures and pressures.



Hazard Rating

Health : 3 Serious Hazard - Major injury likely unless prompt action is taken and medical treatment is given

Flammability : 0 Minimal Hazard - Materials that will not burn

Physical : 1 Slight Hazard - Materials that are normally stable but can become unstable (self-react) at high temperatures and pressures. Materials may react non-violently with water or undergo hazardous polymerization in the absence of inhibitors.

Personal protection : H
H - Splash goggles, Gloves, Synthetic apron, Vapor respirator

SDS US LabChem

Information in this SDS is from available published sources and is believed to be accurate. No warranty, express or implied, is made and LabChem Inc assumes no liability resulting from the use of this SDS. The user must determine suitability of this information for his application.

SAFETY DATA SHEET

Creation Date 12-Nov-2010

Revision Date 18-Jan-2018

Revision Number 6

1. Identification

Product Name Sulfuric Acid (Certified ACS Plus)

Cat No. : A300-212; A300-225LB; A300-500; A300-612GAL; A300-700LB;
A300C212; A300C212EA; A300P500; A300S212; A300S212EA;
A300S500; A300SI212

Synonyms Hydrogen sulfate; Vitriol brown oil; Oil of vitriol

Recommended Use Laboratory chemicals.

Uses advised against Not for food, drug, pesticide or biocidal product use

Details of the supplier of the safety data sheet

Company

Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Emergency Telephone Number

CHEMTREC®, Inside the USA: 800-424-9300
CHEMTREC®, Outside the USA: 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)

Corrosive to metals	Category 1
Skin Corrosion/Irritation	Category 1 A
Serious Eye Damage/Eye Irritation	Category 1
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system.	

Label Elements

Signal Word

Danger

Hazard Statements

May be corrosive to metals
Causes severe skin burns and eye damage
May cause respiratory irritation

**Precautionary Statements****Prevention**

Do not breathe dust/fume/gas/mist/vapors/spray
 Wear protective gloves/protective clothing/eye protection/face protection
 Wash face, hands and any exposed skin thoroughly after handling
 Use only outdoors or in a well-ventilated area
 Keep only in original container

Response

Immediately call a POISON CENTER or doctor/physician

Inhalation

IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing

Skin

IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
 Wash contaminated clothing before reuse

Eyes

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing

Ingestion

IF SWALLOWED: Rinse mouth. DO NOT induce vomiting

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)

None identified

WARNING. Cancer - <https://www.p65warnings.ca.gov/>.

3. Composition/Information on Ingredients

Component	CAS-No	Weight %
Sulfuric acid	7664-93-9	90 - 98
Water	7732-18-5	2 - 10

4. First-aid measures

General Advice

Show this safety data sheet to the doctor in attendance. Immediate medical attention is required.

Eye Contact

Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Immediate medical attention is required.

Skin Contact

Wash off immediately with plenty of water for at least 15 minutes. Remove and wash contaminated clothing before re-use. Call a physician immediately.

Inhalation

If not breathing, give artificial respiration. Remove from exposure, lie down. 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. Call a physician immediately.

Ingestion

Do not induce vomiting. Clean mouth with water. Never give anything by mouth to an

unconscious person. Call a physician immediately.

Most important symptoms and effects

Causes burns by all exposure routes. Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated: Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation

Notes to Physician

Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media CO₂, dry chemical, dry sand, alcohol-resistant foam.

Unsuitable Extinguishing Media DO NOT USE WATER

Flash Point Not applicable
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. The product causes burns of eyes, skin and mucous membranes.

Hazardous Combustion Products

Sulfur oxides Hydrogen

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. Thermal decomposition can lead to release of irritating gases and vapors.

NFPA

Health
3

Flammability
0

Instability
2

Physical hazards
W

6. Accidental release measures

Personal Precautions Ensure adequate ventilation. Use personal protective equipment. Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak.

Environmental Precautions Should not be released into the environment.

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. Do not get in eyes, on skin, or on clothing. Use only under a chemical fume hood. Do not breathe vapors or spray mist. Do not ingest.

Storage Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from water. Corrosives area.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Sulfuric acid	TWA: 0.2 mg/m ³	(Vacated) TWA: 1 mg/m ³ TWA: 1 mg/m ³	IDLH: 15 mg/m ³ TWA: 1 mg/m ³	TWA: 1 mg/m ³

Legend

ACGIH - American Conference of Governmental Industrial Hygienists

OSHA - Occupational Safety and Health Administration

NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or 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	Clear, Colorless to brown
Odor	Odorless
Odor Threshold	No information available
pH	0.3 (1N)
Melting Point/Range	10 °C / 50 °F
Boiling Point/Range	290 - 338 °C / 554 - 640.4 °F
Flash Point	Not applicable
Evaporation Rate	Slower than ether
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	< 0.001 mmHg @ 20 °C
Vapor Density	3.38 (Air = 1.0)
Specific Gravity	1.84
Solubility	Soluble in water
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	340°C
Viscosity	No information available
Molecular Formula	H ₂ SO ₄
Molecular Weight	98.08

10. Stability and reactivity

Reactive Hazard Yes

Stability Reacts violently with water. Hygroscopic.

Conditions to Avoid	Incompatible products. Excess heat. Exposure to moist air or water.
Incompatible Materials	Water, Organic materials, Strong acids, Strong bases, Metals, Alcohols, Cyanides, Sulfides
Hazardous Decomposition Products	Sulfur oxides, Hydrogen
Hazardous Polymerization	Hazardous polymerization does not occur.
Hazardous Reactions	None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Oral LD50

Based on ATE data, the classification criteria are not met. ATE > 2000 mg/kg.

Dermal LD50

Based on ATE data, the classification criteria are not met. ATE > 2000 mg/kg.

Vapor LC50

Based on ATE data, the classification criteria are not met. ATE > 20 mg/l.

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Sulfuric acid	2140 mg/kg (Rat)	Not listed	LC50 = 510 mg/m ³ (Rat) 2 h
Water	-	Not listed	Not listed

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation Causes severe burns by all exposure routes

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen. Exposure to strong inorganic mists containing sulfuric acid may cause cancer by inhalation.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Sulfuric acid	7664-93-9	Group 1	Known	A2	X	A2
Water	7732-18-5	Not listed	Not listed	Not listed	Not listed	Not listed

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	Respiratory system
STOT - repeated exposure	None known
Aspiration hazard	No information available
Symptoms / effects, both acute and delayed	Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated: Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation
Endocrine Disruptor Information	No information available
Other Adverse Effects	The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

This product contains the following substance(s) which are hazardous for the environment. .

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Sulfuric acid	-	LC50: > 500 mg/L, 96h static (Brachydanio rerio)	-	EC50: 29 mg/L/24h

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	UN1830
Proper Shipping Name	Sulfuric acid
Hazard Class	8
Packing Group	II

TDG

UN-No	UN1830
Proper Shipping Name	SULFURIC ACID
Hazard Class	8
Packing Group	II

IATA

UN-No	UN1830
Proper Shipping Name	SULFURIC ACID
Hazard Class	8
Packing Group	II

IMDG/IMO

UN-No	UN1830
Proper Shipping Name	SULFURIC ACID
Hazard Class	8
Packing Group	II

15. Regulatory information

All of the components in the product are on the following Inventory lists: X = listed

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Sulfuric acid	X	X	-	231-639-5	-		X	X	X	X	X
Water	X	X	-	231-791-2	-		X	-	X	X	X

Legend:

X - Listed

E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.

F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.

N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.

P - Indicates a commenced PMN substance

R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.

S - Indicates a substance that is identified in a proposed or final Significant New Use Rule

T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.

XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B)).

Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.

Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable

SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Sulfuric acid	7664-93-9	90 - 98	1.0

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
Sulfuric acid	X	1000 lb	-	-

Clean Air Act Not applicable

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
Sulfuric acid	1000 lb	1000 lb

California Proposition 65 This product contains the following proposition 65 chemicals

Component	CAS-No	California Prop. 65	Prop 65 NSRL	Category
Sulfuric acid	7664-93-9	Carcinogen	-	Carcinogen

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Sulfuric acid	X	X	X	X	X
Water	-	-	X	-	-

U.S. Department of Transportation

Reportable Quantity (RQ): Y
 DOT Marine Pollutant N
 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

16. Other information

Prepared By Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date 12-Nov-2010
Revision Date 18-Jan-2018
Print Date 18-Jan-2018
Revision Summary SDS sections updated. 2.

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

Product Name: **Tecnu® Original Outdoor Skin Cleanser**
Tec Laboratories, Inc.

Page 1 of 6
Issue Date: 5/14/2015
Revision No: 00

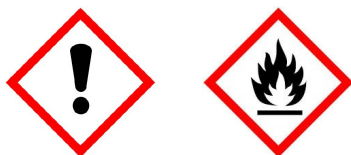
1. IDENTIFICATION

Product name: **Tecnu® Original Outdoor Skin Cleanser**
CAS number: Not available for this mixture
Chemical family: Detergent
Recommended use: Cleanser for removal of poison plant oils.
Manufacturer: Tec Laboratories, Inc.
7100 Tec Labs Way SW
Albany, OR 97321
Emergency telephone number: (541) 926-4577
24 Hour Emergency Assistance: 1-800-535-5053
Email: info@teclabsinc.com

2. HAZARD(S) IDENTIFICATION

Classification: Flammable liquid, Category 3
Skin corrosion/irritation, Category 2
Eye damage/eye irritation, Category 2B

Symbol:



Signal word: Warning

Hazard statements: Flammable liquid and vapor
Causes skin irritation
Causes eye irritation

Precautionary statements:

Prevention (Flammability)
Keep away from heat, sparks, open flames, and hot surfaces - No smoking. Keep container tightly closed. Use explosion-proof electrical, ventilating, and lighting equipment and non-sparking tools. Take precautionary measures against static discharge. Wear protective gloves/eye protection/face protection when handling in bulk and during prolonged use.
Prevention (Skin corrosion/irritation)
Wash sensitive skin thoroughly after handling. Wear protective gloves with handling in bulk.
Prevention (Eye damage/irritation)
Wash hands thoroughly after handling.

SAFETY DATA SHEET

Product Name: **Tecnu® Original Outdoor Skin Cleanser**
Tec Laboratories, Inc.

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3. COMPOSITION/INFORMATION ON INGREDIENTS

- Product name: Tecnu® Original Outdoor Skin Cleanser
- Hazardous ingredients: No hazardous ingredients
- Other ingredients: Deodorized mineral spirits, water, propylene glycol, octylphenoxy-polyethoxyethanol, mixed fatty acid soap, fragrance
- Composition: The specific chemical identity and/or exact percentage (concentration) of composition is withheld as a proprietary.

4. FIRST AID MEASURES

- Skin: If on skin: Take off contaminated clothing and rinse skin with water/shower for at least 15 minutes. Wash clothes before reuse. If skin irritation 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.
- Inhalation: Not likely to occur. If inhaled: Remove to fresh air. Seek medical attention if respiratory irritation or distress continues.
- Ingestion: If ingested: Seek medical advice/attention immediately. Will cause nausea if swallowed. Stomach cramps may also occur. **DO NOT INDUCE VOMITING.** Treat as for petroleum jelly ingestion.

NOTE TO PHYSICIAN: There is no specific antidote. Treatment of over-exposure should be directed at the control of symptoms and the clinical solution.

5. FIRE FIGHTING MEASURES

- Extinguishing media: Foam for large fires; carbon dioxide or dry chemical for small fires.
- Exposure hazards: Smoke may be generated when burning.
- Fire fighting procedures: Keep away from heat or hot surfaces above 150°F, treat vapors as you would odorless spirits. Treat as oil fire.
- Combustion products: No data available.

6. ACCIDENTAL RELEASE MEASURES

- Personal precautions: Refer to section 8 of SDS for personal protection details. Material is not considered toxic.
- Environmental precautions: This product contains no hazardous waste. Waste materials should be dumped or buried in an approved industrial waste landfill. Large quantities may be disposed of by incineration.
- Clean-up procedures: Absorb with dry sand or oil absorbents. All materials are biodegradable. Clean spill area with detergent solution and flush down sewer with water.

SAFETY DATA SHEET

Product Name: **Tecnu® Original Outdoor Skin Cleanser**
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Issue Date: 5/14/2015
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7. HANDLING AND STORAGE

Handling requirements: Keep away from heat, sparks, and flame. Avoid contact with eyes.

Storage conditions: Store between 59 - 86°F (15 - 30 °C) in original closed container. Store in an area that is dry and well-ventilated.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Hazardous ingredients: No hazardous ingredients.

Respiratory protection: None required for normal use.

Hand protection: None required for normal use.

Eye protection: Avoid applying product in and around eyes.

Skin protection: None required for normal use.

When handling in bulk: Wear OSHA approved safety glasses. Wear rubber gloves. To avoid excessive exposure, wear impervious boots and clothing. Respiratory protection not necessary.

9. PHYSICAL AND CHEMICAL PROPERTIES

State: Liquid

Color: White

Odor: Lavender

Odor threshold: Not available

pH: 7.05 - 7.80

Melting point: Not applicable

Freezing point: Not available

Boiling point: Not available

Flash point (closed cup): 113°F (45.5°C)

Evaporation rate: Not available

Solubility(ies): 100% (% by weight in water)

Flammability (solid, gas): Not available

Flammability limits: Not available

Explosion limits: Not available

SAFETY DATA SHEET

Product Name: **Tecnu® Original Outdoor Skin Cleanser**
Tec Laboratories, Inc.

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Issue Date: 5/14/2015
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Vapor pressure: Not available
Vapor density: Not available
Partition coefficient: Not available
Specific Gravity: 0.916 @ 25°C
Viscosity: about 1100 cps
Auto-ignition temperature: Unknown
Density: 7.65 lb/gallon
Decomposition temperature: Not available

10. STABILITY AND REACTIVITY

Stability: Stable, no decomposition if used according to directions.
Reactivity: Not available.
Possibility of haz. reactions: None are known.
Conditions to avoid: Heat, sparks, flame.
Materials to avoid: Strong oxidizing agents.
Haz. decomp. products: Waxy mixed alkanes at high temperatures.
Haz. polymerization: Will not occur.

11. TOXICOLOGICAL INFORMATION

Primary routes of entry: Skin, eyes
Acute oral toxicity: LD₅₀ >5g/kg, non-toxic
Acute dermal toxicity: LD₅₀ >2g/kg, non-toxic
Skin corrosion/irritation: Primary Dermal Irritation Index score (PDII): 4.375; moderate
Serious eye damage/irritation: Average Draize score range 2.5 - 25.0; minimal to mild
Respiratory/skin sensitization: Buehler Technique - Grade: 1, Rank: Weak; weak sensitizer
Germ cell mutagenicity: No data available.
Carcinogenicity: Not listed as a cancer causing agent by NTP, IARC or OSHA.
Reproductive toxicity: No data available.

SAFETY DATA SHEET

Product Name: **Tecnu® Original Outdoor Skin Cleanser**
Tec Laboratories, Inc.

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STOT - single exposure: No data available.

STOT - repeated exposure: No data available.

Aspiration hazard: Not applicable.

Potential health effects: Skin: may cause irritation on sensitive skin.
Eyes: may cause mild irritation.

Signs and Symptoms of Exposure: May cause minimal to mild irritation of the eyes. Extended use may cause drying of the skin. Prolonged contact may cause dermatitis or chemical burns on sensitive skin. Nausea and/or stomach cramps may occur if swallowed.

Occupation Exposure Limit: Not established

12. ECOLOGICAL INFORMATION

Toxicity: Material is not considered toxic.

Persistence and biogradability: All materials are biodegradable.

Mobility: Readily absorbed into soil.

Other adverse effects: Negligible ecotoxicity.

13. DISPOSAL CONSIDERATIONS

Disposal methods: Absorbed material should be landfilled in closed containers according to Federal, State, and local regulations.

14. TRANSPORT INFORMATION

US DOT (ground): Reclassed as combustible liquid, not regulated on ground. Excepted from Hazmat (49CFR 173.150 (F)) in non-bulk packaging.

IMDG (sea): Flammable liquid, n.o.s. (contains deodorized mineral spirits), UN1993, Class 3, PGIII, Limited Quantity

IATA (air): Flammable liquid, n.o.s. (contains deodorized mineral spirits), UN1993, Class 3, PGIII, Limited Quantity

Note: The shipper / supplier may apply one of the following exceptions: Combustible Liquid, Consumer Commodity, Limited Quantity, or others, as allowed under 49 CFR Hazmat Regulations. Please consult 49 CFR Subchapter C to ensure that subsequent shipments comply with these exceptions.

15. REGULATORY INFORMATION

This SDS was prepared in accordance with 29 CFR 1910.1200 OSHA Hazard Communication.

SAFETY DATA SHEET

Product Name: **Tecnu® Original Outdoor Skin Cleanser**
Tec Laboratories, Inc.

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Issue Date: 5/14/2015
Revision No: 00

16. OTHER INFORMATION

Revision date: 5/14/2015
Revision indicator: New Safety Data Sheet

Disclaimer: The information contained herein is accurate to the best of our knowledge. Tec Laboratories, Inc. makes no warranty of any kind, express or implied, concerning the safe personal use of this material or in combination with other substances. Please refer to the product label for complete directions for use and additional warning information.



Safety Data Sheet

1 - Identification

Product Name: WD-40 Multi-Use Product Aerosol <i>NOT FOR SALE IN CALIFORNIA</i> Product Use: Lubricant, Penetrant, Drives Out Moisture, Removes and Protects Surfaces From Corrosion Restrictions on Use: None identified SDS Date Of Preparation: 07/20/2014	Manufacturer: WD-40 Company Address: 1061 Cudahy Place (92110) P.O. Box 80607 San Diego, California, USA 92138 -0607 Telephone: Emergency only: 1-888-324-7596 (PROSAR) Information: 1-888-324-7596 Chemical Spills: 1-800-424-9300 (Chemtrec) 1-703-527-3887 (International Calls)
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2 – Hazards Identification

Hazcom 2012/GHS Classification:

Flammable Aerosol Category 1
 Gas Under Pressure: Compressed Gas
 Aspiration Toxicity Category 1

Note: This product is a consumer product and is labeled in accordance with the US Consumer Product Safety Commission regulations which take precedence over OSHA Hazard Communication labeling. The actual container label will not include the label elements below. The labeling below applies to industrial/professional products.

Label Elements:



DANGER!

Extremely Flammable Aerosol.
 Contains gas under pressure; may explode if heated.
 May be fatal if swallowed and enters airways.

Prevention

Keep away from heat, sparks, open flames, hot surfaces – No smoking.
 Do not spray on an open flame or other ignition source.
 Pressurized container: Do not pierce or burn, even after use.

Response

IF SWALLOWED: Immediately call a POISON CENTER or physician. Do NOT induce vomiting.

Storage

Store locked up.
 Protect from sunlight. Do not expose to temperatures exceeding 50°C/122°F. Store in a well-ventilated place.

Disposal

Dispose of contents and container in accordance with local and national regulations.

3 - Composition/Information on Ingredients

Ingredient	CAS #	Weight Percent	US Hazcom 2012/ GHS Classification
Aliphatic Hydrocarbon	64742-47-8	45-50	Flammable Liquid Category 3

			Aspiration Toxicity Category 1
Petroleum Base Oil	64742-56-9 64742-65-0 64742-53-6 64742-54-7 64742-71-8	<25	Not Hazardous
LVP Aliphatic Hydrocarbon	64742-47-8	12-18	Aspiration Toxicity Category 1
Carbon Dioxide	124-38-9	2-3	Simple Asphyxiant Gas Under Pressure, Compressed Gas
Non-Hazardous Ingredients	Mixture	<10	Not Hazardous

Note: The exact percentages are a trade secret.

4 – First Aid Measures

Ingestion (Swallowed): Aspiration Hazard. DO NOT induce vomiting. Call physician, poison control center or the WD-40 Safety Hotline at 1-888-324-7596 immediately.

Eye Contact: Flush thoroughly with water. Remove contact lenses if present after the first 5 minutes and continue flushing for several more minutes. Get medical attention if irritation persists.

Skin Contact: Wash with soap and water. If irritation develops and persists, get medical attention.

Inhalation (Breathing): If irritation is experienced, move to fresh air. Get medical attention if irritation or other symptoms develop and persist.

Signs and Symptoms of Exposure: May cause eye and respiratory irritation. Inhalation may cause coughing, headache and dizziness. Skin contact may cause drying of the skin.

Indication of Immediate Medical Attention/Special Treatment Needed: Immediate medical attention is needed for ingestion.

5 – Fire Fighting Measures

Suitable (and unsuitable) Extinguishing Media: Use water fog, dry chemical, carbon dioxide or foam. Do not use water jet or flooding amounts of water. Burning product will float on the surface and spread fire.

Specific Hazards Arising from the Chemical: Contents under pressure. Keep away from ignition sources and open flames. Exposure of containers to extreme heat and flames can cause them to rupture often with violent force. Vapors are heavier than air and may travel along surfaces to remote ignition sources and flash back. Combustion will produce oxides of carbon and hydrocarbons.

Special Protective Equipment and Precautions for Fire-Fighters: Firefighters should always wear positive pressure self-contained breathing apparatus and full protective clothing. Cool fire-exposed containers with water. Use shielding to protect against bursting containers.

6 – Accidental Release Measures

Personal Precautions, Protective Equipment and Emergency Procedures: Wear appropriate protective clothing (see Section 8). Eliminate all sources of ignition and ventilate area.

Methods and Materials for Containment/Cleanup: Leaking cans should be placed in a plastic bag or open pail until the pressure has dissipated. Contain and collect liquid with an inert absorbent and place in a container for disposal. Clean spill area thoroughly. Report spills to authorities as required.

7 – Handling and Storage

Precautions for Safe Handling: Avoid contact with eyes. Avoid prolonged contact with skin. Avoid breathing vapors or aerosols. Use only with adequate ventilation. Keep away from heat, sparks, pilot lights, hot surfaces and open flames. Unplug electrical tools, motors and appliances before spraying or bringing the can near any source of electricity. Electricity can burn a hole in the can and cause contents to burst into flames. To avoid serious burn injury, do not let the can touch battery terminals, electrical connections on motors or appliances or any other source of electricity. Wash thoroughly with soap and water after handling. Keep containers closed when not in use. Keep out of the reach of children. Do not puncture, crush or incinerate containers, even when empty.

Conditions for Safe Storage: Store in a cool, well-ventilated area, away from incompatible materials Do not store above 120°F or in direct sunlight. U.F.C (NFPA 30B) Level 3 Aerosol. Store away from oxidizers.

8 – Exposure Controls/Personal Protection

Chemical	Occupational Exposure Limits
Aliphatic Hydrocarbon	1200 mg/m ³ TWA (manufacturer recommended)
Petroleum Base Oil	5 mg/m ³ TWA, 10 mg/m ³ STEL ACGIH TLV 5 mg/m ³ TWA OSHA PEL
LVP Aliphatic Hydrocarbon	1200 mg/m ³ TWA (manufacturer recommended)
Carbon Dioxide	5000 ppm TWA (OSHA/ACGIH), 30,000 ppm STEL (ACGIH)
Non-Hazardous Ingredients	None Established

The Following Controls are Recommended for Normal Consumer Use of this Product

Appropriate Engineering Controls: Use in a well-ventilated area.

Personal Protection:

Eye Protection: Avoid eye contact. Always spray away from your face.

Skin Protection: Avoid prolonged skin contact. Chemical resistant gloves recommended for operations where skin contact is likely.

Respiratory Protection: None needed for normal use with adequate ventilation.

For Bulk Processing or Workplace Use the Following Controls are Recommended

Appropriate Engineering Controls: Use adequate general and local exhaust ventilation to maintain exposure levels below that occupational exposure limits.

Personal Protection:

Eye Protection: Safety goggles recommended where eye contact is possible.

Skin Protection: Wear chemical resistant gloves.

Respiratory Protection: None required if ventilation is adequate. If the occupational exposure limits are exceeded, wear a NIOSH approved respirator. Respirator selection and use should be based on contaminant type, form and concentration. Follow OSHA 1910.134, ANSI Z88.2 and good Industrial Hygiene practice.

Work/Hygiene Practices: Wash with soap and water after handling.

9 – Physical and Chemical Properties

Appearance:	Light amber liquid	Flammable Limits: (Solvent Portion)	LEL: 0.6% UEL: 8%
Odor:	Mild petroleum odor	Vapor Pressure:	95-115 PSI @ 70°F
Odor Threshold:	Not established	Vapor Density:	Greater than 1 (air=1)
pH:	Not Applicable	Relative Density:	0.8 – 0.82 @ 60°F
Melting/Freezing Point	Not established	Solubilities:	Insoluble in water
Boiling Point/Range:	361 - 369°F (183 - 187°C)	Partition Coefficient; n-octanol/water:	Not established
Flash Point:	122°F (49°C) Tag Closed Cup (concentrate)	Autoignition Temperature:	Not established
Evaporation Rate:	Not established	Decomposition Temperature:	Not established
Flammability (solid, gas)	Flammable Aerosol	Viscosity:	2.79-2.96 cSt @ 100°F
VOC:	412 grams/liter (49.5%)	Pour Point:	-63°C (-81.4°F) ASTM D-97

10 – Stability and Reactivity

Reactivity: Not reactive under normal conditions

Chemical Stability: Stable

Possibility of Hazardous Reactions: May react with strong oxidizers generating heat.
Conditions to Avoid: Avoid heat, sparks, flames and other sources of ignition. Do not puncture or incinerate containers.
Incompatible Materials: Strong oxidizing agents.
Hazardous Decomposition Products: Carbon monoxide and carbon dioxide.

11 – Toxicological Information

Symptoms of Overexposure:

Inhalation: High concentrations may cause nasal and respiratory irritation and central nervous system effects such as headache, dizziness and nausea. Intentional abuse may be harmful or fatal.

Skin Contact: Prolonged and/or repeated contact may produce mild irritation and defatting with possible dermatitis.

Eye Contact: Contact may be irritating to eyes. May cause redness and tearing.

Ingestion: This product has low oral toxicity. Swallowing may cause gastrointestinal irritation, nausea, vomiting and diarrhea. This product is an aspiration hazard. If swallowed, can enter the lungs and may cause chemical pneumonitis, severe lung damage and death.

Chronic Effects: None expected.

Carcinogen Status: None of the components are listed as a carcinogen or suspect carcinogen by IARC, NTP, ACGIH or OSHA.

Reproductive Toxicity: None of the components is considered a reproductive hazard.

Numerical Measures of Toxicity:

The oral toxicity of this product is estimated to be greater than 5,000 mg/kg and the dermal toxicity greater than 2,000 mg/kg based on an assessment of the ingredients. This product is not classified as toxic by established criteria. It is an aspiration hazard.

12 – Ecological Information

Ecotoxicity: No specific aquatic toxicity data is currently available, however components of this product are not expected to be harmful to aquatic organisms

Persistence and Degradability: Component are readily biodegradable.

Bioaccumulative Potential: Bioaccumulation is not expected based on an assessment of the ingredients.

Mobility in Soil: No data available

Other Adverse Effects: None known

13 - Disposal Considerations

If this product becomes a waste, it would be expected to meet the criteria of a RCRA ignitable hazardous waste (D001). However, it is the responsibility of the generator to determine at the time of disposal the proper classification and method of disposal. Do not puncture or incinerate containers, even empty. Dispose in accordance with federal, state, and local regulations.

14 – Transportation Information

DOT Surface Shipping Description:

UN1950, Aerosols, 2.1 Ltd. Qty (Note: Shipping Papers are not required for Limited Quantities unless transported by air or vessel – each package must be marked with the Limited Quantity Mark)

IMDG Shipping Description: Un1950, Aerosols, 2.1, LTD QTY

ICAO Shipping Description: UN1950, Aerosols, flammable, 2.1 NOTE: WD-40 does not test aerosol cans to assure that they meet the pressure and other requirements for transport by air. We do not recommend that our aerosol products be transported by air.

15 – Regulatory Information

U.S. Federal Regulations:

CERCLA 103 Reportable Quantity: This product is not subject to CERCLA reporting requirements, however, oil spills are reportable to the National Response Center under the Clean Water Act and many

states have more stringent release reporting requirements. Report spills required under federal, state and local regulations.

SARA TITLE III:

Hazard Category For Section 311/312: Acute Health, Fire Hazard, Sudden Release of Pressure

Section 313 Toxic Chemicals: This product contains the following chemicals subject to SARA Title III

Section 313 Reporting requirements: None

Section 302 Extremely Hazardous Substances (TPQ): None

EPA Toxic Substances Control Act (TSCA) Status: All of the components of this product are listed on the TSCA inventory.

VOC Regulations: This product complies with the consumer product VOC limits of the US EPA and states adopting the OTC VOC rules but does not comply with CARB.

California Safe Drinking Water and Toxic Enforcement Act (Proposition 65): This product does not contain chemicals regulated under California Proposition 65.

Canadian Environmental Protection Act: One of the components is listed on the NDSL. All of the other ingredients are listed on the Canadian Domestic Substances List or exempt from notification.

Canadian WHMIS Classification: Class A (Compressed gas), Class B-5 (Flammable Aerosol)

This MSDS has been prepared according to the criteria of the Controlled Products Regulation (CPR) and the MSDS contains all of the information required by the CPR.

16 – Other Information:

HMIS Hazard Rating:

Health – 1 (slight hazard), Fire Hazard – 4 (severe hazard), Reactivity – 0 (minimal hazard)

Revision Date: July 20, 2014

Supersedes: May 23, 2014

Revision Summary: Convert to Hazcom 2012. Changes in all sections.

Prepared by: Industrial Health & Safety Consultants, Inc. Shelton, CT, USA

APPROVED By: I. Kowalski

Regulatory Affairs Dept.

APPENDIX F

Community Air Monitoring Plan (CAMP)



ARCADIS

Appendix F

Attachment A-2

Community Air Monitoring Plan

Former Grumman Settling Ponds

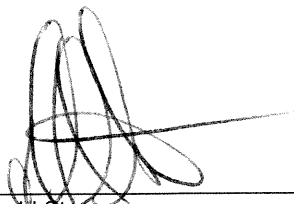
(Operable Unit 3 – Bethpage Community Park),

Bethpage, New York.

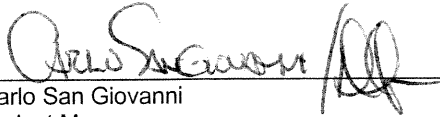
NYSDEC Site # 1-30-003A

Revised: March 8, 2006

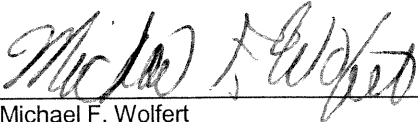
ARCADIS



David Stern
Task Manager



Carlo San Giovanni
Project Manager



Michael F. Wolfert
Project Director

**Appendix A
Attachment A-2
Community Air Monitoring
Plan**

Northrop Grumman Systems
Corporation
Bethpage, New York.
NYSDEC Site # 1-30-003A
Revised: March 8, 2006

Prepared for:
Northrop Grumman Systems Corporation

Prepared by:
ARCADIS G&M, Inc.
88 Duryea Road
Melville
New York 11747
Tel 631 249 7600
Fax 631 249 7610

Our Ref.:
NY001348.0706.00002

Date:
8 March 2006

1. Introduction	A2-1
2. Monitoring Instrumentation	A2-1
3. Monitoring Frequency	A2-2
3.1 VOC Monitoring Stations Locations, Response Levels, and Action	A2-4
3.2 Particulate Monitoring Stations Locations, Response Levels, and Actions	A2-5

Former Grumman Settling
Ponds (Operable Unit 3 –
Bethpage Community Park),
Bethpage, NY

NYSDEC Site #1-30-003A
Revised March 8, 2006
Former Grumman Settling
Ponds (Operable Unit 3 –
Bethpage Community Park),
Bethpage, NY

NYSDEC Site #1-30-003A
Revised March 8, 2006

1. Introduction

In accordance with New York State Department of Health (NYSDOH) requirements, this Community Air Monitoring Plan (CAMP) has been prepared for use during certain investigative and remedial field activities associated with the Northrop Grumman Corporation (NGC), Bethpage Facility (Site). This CAMP serves to present the methods and procedures to conduct real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at each designated work area when certain activities are in progress. This CAMP is not intended for use in establishing action levels for worker respiratory protection; action levels are described in the Northrop Grumman Corporation Health and Safety Plan (HASP) (ARCADIS G&M, Inc. 2004). The intent of this CAMP is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers that are not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities that are related to the Site. The response levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, this CAMP helps to confirm that work activities do not spread contamination off-site through the air.

Depending upon the nature of the site-related contaminants of concern, chemical-specific monitoring, with appropriately-sensitive methods, may be required during field work (please refer to the HASP for details).

Reliance on this CAMP does not preclude simple, common-sense measures to keep potential VOCs, dust, and odor emissions at a minimum around work areas.

The following sections of this CAMP present the monitoring instrumentation required to comply with NYSDOH policy, the frequency of monitoring, response levels, and response actions.

2. Monitoring Instrumentation

Based on the currently available analytical data and the contaminants of concern for the NGC Site, real-time air monitoring for VOCs and particulates at the perimeter areas of the work area (i.e., the exclusion zone – see HASP for definition) will be necessary for field activities associated with investigation and remediation of the NGC Site.

Former Grumman Settling
Ponds (Operable Unit 3 –
Bethpage Community Park),
Bethpage, NY

NYSDEC Site #1-30-003A
Revised March 8, 2006

VOC monitoring will be performed using real-time monitoring instrumentation that is appropriate to measure the types of VOCs known or suspected to be present at the work location (please refer to the HASP for details). The equipment will be calibrated on the frequency and using the methods described in the HASP. It is preferable to use instrumentation that is capable of calculating 15-minute running average concentrations or provide a written record of readings taken during monitoring events. If neither capability is available, then the reading obtained every 15 minutes will be used for decision making.

The particulate monitoring will be performed using real-time monitoring instrumentation that is capable of measuring particulates less than 10 micrometers in size (PM-10). It is preferable to use instrumentation that is capable of calculating 15-minute running average concentrations or provide a written record of readings taken during monitoring events. If neither capability is available, then the reading obtained every 15 minutes will be used for decision making. The particulate monitoring equipment will be equipped with an audible alarm to indicate exceedence of the response level.

3. Monitoring Frequency

This section defines the typical activities that will occur in relation to the NGC Site and relates these activities to the frequency of monitoring required.

Continuous Monitoring for VOCs and Particulates Will be Carried out for Intrusive Activities. Additionally, upwind VOC and particulate concentrations will be measured at the **start** of each work day and **periodically** (see below) thereafter to establish the background concentration. Ground intrusive activities typically include the following:

1. Soil excavation and handling.
2. Test pitting or trenching.
3. Drilling and installation of vertical profile borings, soil borings, and/or wells.
4. During the demolition of contaminated or potentially contaminated structures.
5. Construction activities involving earthwork or disturbance of earthen surfaces.

Former Grumman Settling Ponds (Operable Unit 3 – Bethpage Community Park), Bethpage, NY

NYSDEC Site #1-30-003A
Revised March 8, 2006

6. Other activities specified in this CAMP.

Periodic monitoring for VOCs will be carried out during non-intrusive activities.

For non-intrusive activities, the upwind concentrations will be measured at the **start and finish** of the work effort to establish the background concentration. Non-intrusive activities typically include the following:

1. Site Mobilization/Demobilization of equipment and machinery.
2. Drum or container sampling.
3. Soil sampling (to the extent not coinciding with intrusive work).
4. Groundwater sampling.
5. Water-level measurements.
6. Surveying (geophysical, coordinate/elevation).
7. Well development.
8. Waste transportation.
9. Site preparation and restoration that does not involve re-grading or other disturbances to surface materials.

“**Periodic**” monitoring should be performed, at a minimum as follows:

1. Upon arrival at a work location to determine the ambient, or background concentrations.
2. During each phase of work that potentially may generate VOC emissions to the air.
3. Prior to leaving the work location.

As an example, “Periodic” monitoring for VOCs during sample collection activities shall include monitoring as above and during the following times:

1. When accessing wells, opening drums or containers, or overturning soil.

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2. During well bailing/purging.
3. During collection of samples (soil/sediment/water).

For non-intrusive activities, particulate monitoring will not be performed.

Continuous monitoring for VOCs will be carried out during activities that occur on the Bethpage Community Park property.

3.1 VOC Monitoring Stations Locations, Response Levels, and Action

During each workday, the VOC monitoring station will be positioned at the downwind perimeter of the work area (i.e., the exclusion zone – see HASP for definition). As stated above, monitoring frequency (periodic or continuous) will be determined based on whether the activity is considered intrusive or non-intrusive (or whether the activity is occurring on Bethpage Community Park property). The direction of wind (if any) will be periodically recorded during each work day and re-positioning of upwind/downwind monitoring stations will be performed accordingly.

The VOC monitoring instrumentation output documenting 15-minute running average concentrations (or printed output of readings taken or the reading taken every 15 minutes, as available), will be compared to the following response levels:

- If the ambient air concentration of total organic vapors at the downwind perimeter of the work area exceeds 5 parts per million (ppm) **above background** for the 15-minute average, work activities will be temporarily halted and monitoring continued.

If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities will resume with continued monitoring.

- If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm **above background** but less than 25 ppm, work activities will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities will resume provided that the total organic vapor level 200 feet downwind of the work area or half the distance to the nearest potential

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receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15- minute average.

- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities will be shutdown.

All readings will be recorded on the appropriate air monitoring log (please refer to the HASP for details) or the electronic log will be printed out. Air monitoring results will be appended to the appropriate report.

3.2 Particulate Monitoring Stations Locations, Response Levels, and Actions

For intrusive activities, the particulate (i.e., dust) monitoring station will be positioned at the downwind perimeter of the work zone (i.e., exclusion zone – see HASP for definition). In addition, fugitive dust migration will be visually assessed during all work activities. The direction of wind (if any) will be periodically recorded during each work day and re-positioning of the downwind monitoring station will be performed accordingly. The response levels and actions for fugitive dust are as follows:

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m³) greater **than background** (upwind perimeter) for the 15-minute period or if airborne dust is visually observed leaving the work area, then dust suppression techniques will be employed. Work will continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m³ above the upwind level and provided that no visible dust is observed leaving the work area.
- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m³ above the **background** concentration, then work will be stopped and a re-evaluation of activities initiated. Work will resume provided that dust suppression measures and/or other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m³ of the upwind level and in preventing visible dust from leaving the work area.

All readings will be recorded on the appropriate air monitoring log (please refer to the HASP for details) or the electronic log will be printed out. Air monitoring results will be appended to the appropriate report.

APPENDIX G

HASP FORMS



Control Number: TSM- NYNG2019.TS14



TSM + project number plus date as follows: xxxxxxxx.xxxx.xxxx - dd/mm/year

TAILGATE HEALTH & SAFETY MEETING FORM

Project Name: _____ **Project Location:** _____

Date: _____ **Time:** _____ **Conducted by:** _____ **Signature/Title:** _____

Issues or concerns from previous day's activities:

Task anticipated to be performed today:
 Additional permits/checklists attached

USE TRACK! Evaluate the hazards (h) for the tasks being performed today and rank as Low (L), Medium (M) or High (H). Use relevant JSAs, FSHB, permit or other work standard to communicate controls (c) to be used to eliminate or mitigate identified hazards.

Gravity (i.e., ladder, trips) (L M H) Motion (i.e., traffic, machinery) (L M H) Mechanical (i.e., augers, motors) (L M H)
 h: _____ h: _____ h: _____
 c: _____ c: _____ c: _____

Electrical (i.e., utilities) (L M H) Pressure (i.e., gas cyl., wells) (L M H) Environment (i.e., heat, cold) (L M H)
 h: _____ h: _____ h: _____
 c: _____ c: _____ c: _____

Chemical (i.e., fuel, acid, paint) (L M H) Biological (i.e., ticks, poison ivy) (L M H) Radiation (i.e., alpha, sun, laser) (L M H)
 h: _____ h: _____ h: _____
 c: _____ c: _____ c: _____

Sound (i.e., machinery) (L M H) Personal (i.e. alone, night) (L M H) Driving (i.e. car, ATV, boat) (L M H)
 h: _____ h: _____ h: _____
 c: _____ c: _____ c: _____

Refer to the attached Hazard Analysis Sheet(s) or JSA

Comments:

Signature and Certification: I have read and understand the project specific HASP for this project.

SSE Employee*	Non-Life Threatening Injury or Illness Call WorkCare 1-888-449-7787		
	Printed Name/Signature/Company	Sign In Time	Sign Out Time

I will STOP the job any time anyone is concerned or uncertain about health & safety or if anyone identifies a hazard or additional mitigation not recorded in the site, project, job or task hazard assessment.

I will be alert to any changes in personnel, conditions at the work site or hazards not covered by the original hazard assessments.

If it is necessary to **STOP THE JOB**, I will perform **TRACK**; and then amend the hazard assessments or the HASP as needed.

I will not assist a subcontractor or other party with their work unless it is absolutely necessary and then only after I have done TRACK and I have thoroughly controlled the hazard.

All site staff should arrive fit for work. If not, they should report to the supervisor any restrictions or concerns.

In the event of an injury, employees will call **WorkCare at 1.888.449-7787** and then notify the field supervisor.

Utility strike, motor vehicle accident or 3rd party property damage - field supervisor will immediately notify the Project or Task Manager

*Short Service Employee (SSE) working for Arcadis <1 year.

What You Need to Know

Emergency Phone: 911

WorkCare Phone: 1-888-449-7787

Your nearest hospital: St. Joseph Hospital, 4295 Hemstead Turnpike, Bethpage, NY 11714 , OR, Plainville

H&S Specialist for this project:

Julie Santaniello

Cell Phone: 978-551-0033

Project Site Safety Officer:

David Stern

Nearest assembly area(s):

Nearest storm shelter(s):

Confirm the following PPE is on site: hard hat, safety glasses, boots with protective toe and shank, traffic vest Class II, 0, Nitrile as needed gloves, Ansi Level II as needed gloves, 0, . . Applicability of PPE to a particular work task is specified in the JSA or permit.

Confirm the following supplies and equipment are on site: first aid kit, fire extinguisher, eyewash (bottle), drinking water, sunscreen, traffic cones. Applicability of supplies and equipment to a specific task is specified in the JSA or permit and must be reviewed in the safety briefing.

Review applicable JSA or permit for the task being performed in the safety briefing.

Confirm traffic controls in place are consistent with the project NON-ROW TSP for the parking lot or other non-right-of-way location.

Confirm traffic controls in place are consistent with the project ROW TSP. Deviations of approved controls will require a stop work until Arcadis Engineering Judgement review is performed.

If the planned task for the day involves exposure to silica, you must review the project Silica Exposure Control Plan prior to start of work.

One or more shipping determinations apply this project. Review of the shipping determination(s) is required during initial safety briefing for project.

Prior to intrusive work on this project, review of the Utilities and Structures Checklist and site walkover for utility identification is required.

During the initial safety briefing on this project, review Journey Management Plan for effectiveness and accuracy.

SDSs for this project will be available in printed form in the company vehicle. All project workers will be notified of the SDS location in their initial safety briefing.

Contractor SDSs will be submitted to Arcadis in advance of work and will be filed with Arcadis SDSs as indicated above.

This project will not be utilizing materials subject to the HAZCOM Standard in bulk storage. In this HASP, bulk storage means any material stored on the project site in a bulk packaging >119 gallons (> 450 L) liquid capacity or a palletized quantity of a material in packaging <119 gallons (<450 L) liquid capacity

THIS FORM MUST BE COMPLETED IN ENTIRETY PRIOR TO BEGINNING ANY INTRUSIVE WORK

Project: RW-21 OU2/OU3 Onsite/Offsite Investigation & Groundwater
 Project Number: NYNG2019.TS14
 Form Completion Date: _____ Form Expiration Date: _____
 (15 business days post form completion date)

Pre-Field Work

Required: One Call or "811" notified 48-72 hours in advance of work? #: _____
 Ticket Expiration Date _____ (Review State Requirements)
 Utility companies notified during the One Call process See attached ticket

List any other utilities requiring notification:
 None _____

Private Locator Contacted Yes No
 Plan private utility clearance subcontractor assignments, areas, required clearance equipment, depth of clearance needed, types of utilities. When possible re-clear 811 markings to confirm utility locations.

Client provided utility maps or "as built" drawings showing utilities? Yes No

Field Work - This must be completed on site, by staff who have a minimum of one year of field experience in identifying utilities. Review check list with PM or designee prior to beginning intrusive work.

List Soil Boring / Well IDs or Excavation Locations applicable to this clearance checklist:

3 Reliable Lines of Evidence Required Prior to Starting any Subsurface Intrusive Work

One Call/"811" (Reliable as a line of evidence when working in public right of way or easement)
 Utility Markings Present: Paint Pin flags/stakes Other None
 Client Provided Maps/Drawings **OR** Maps/Drawings requested but not provided
 Client Clearance Name(s)/Affiliation(s) _____
 Interview(s): Name(s)/Affiliation(s) _____

Did person(s) interviewed indicate depths of any utilities in the subsurface?
 Yes, depths provided: _____ Did not know or refused to answer
 Additional Comments: _____

<input type="checkbox"/> Site Inspection (Complete Page 2 & Photo Document Marked Utilities & Utility Structures) <input type="checkbox"/> Public Records / Maps / Asbuilts <input type="checkbox"/> Private Locator: (Name and Company) _____ <input type="checkbox"/> Ground Penetrating Radar (GPR) <input type="checkbox"/> Radiofrequency (RFloc) <input type="checkbox"/> Electromagnetic (EM) <input type="checkbox"/> Metal Detector Soft Dig Methods <input type="checkbox"/> Termination Depth _____ ft. bgs <input type="checkbox"/> Potholing / Vacuum Extraction <input type="checkbox"/> Air-Knife or Hydro-Knife <input type="checkbox"/> Probing <input type="checkbox"/> Hand Auguring <input type="checkbox"/> Other: _____ <input type="checkbox"/> Marine Locator: (Name and Company) _____	<p>Tips for Successful Utility Location:</p> <ol style="list-style-type: none"> 1. Don't forget to look up 2. Be on site with Private Utility Locators 3. Ask Private Locators to "confirm" other's markings 4. Select alternate/backup locations during clearance process 5. Mark out all known utilities. Leave nothing to question 6. No hammering - no pickaxes - no digging bars - no shortcutting 7. No excessive turning or downward force of hand augers/shovels 8. Utilities may run in or directly under asphalt/concrete
---	--

During the site inspection look for the following: ("YES" requires additional investigation and the utility must be marked properly prior to beginning subsurface intrusive work):

Site Inspection	Utility Color Codes	Present	
a) Natural gas line present (evidence of a gas meter)?	Yellow	<input type="checkbox"/> Yes	<input type="checkbox"/> No
i) Feeder Lines to buildings or homes?		<input type="checkbox"/> Yes	<input type="checkbox"/> No
b) Evidence of electric lines:	Red		
i) Conduits to ground from electric meter or along wall?		<input type="checkbox"/> Yes	<input type="checkbox"/> No
iii) Conduits from power poles running into ground?		<input type="checkbox"/> Yes	<input type="checkbox"/> No
ii) Light poles, electric devices with no overhead lines?		<input type="checkbox"/> Yes	<input type="checkbox"/> No
iii) Overhead electric lines present? (See Section I)		<input type="checkbox"/> Yes	<input type="checkbox"/> No
c) Evidence of sewer drains:	Green		
i) Restrooms or kitchen on site?		<input type="checkbox"/> Yes	<input type="checkbox"/> No
ii) Sewer cleanouts present?		<input type="checkbox"/> Yes	<input type="checkbox"/> No
iii) Combined sewer/storm lines or multiple sewer lines?		<input type="checkbox"/> Yes	<input type="checkbox"/> No
d) Evidence of water lines:	Blue		
i) Water meter on site or multiple water lines?		<input type="checkbox"/> Yes	<input type="checkbox"/> No
ii) Fire hydrants in vicinity of work?		<input type="checkbox"/> Yes	<input type="checkbox"/> No
iii) Irrigation systems? (Sprinkler heads, valve boxes, controls in building)		<input type="checkbox"/> Yes	<input type="checkbox"/> No
e) Evidence of storm drains:	Green		
i) Open curbside or slotted grate storm drains		<input type="checkbox"/> Yes	<input type="checkbox"/> No
ii) Gutter down spouts going into ground		<input type="checkbox"/> Yes	<input type="checkbox"/> No
f) Evidence of telecommunication lines:	Orange		
i) Fiber optic warning signs in areas?		<input type="checkbox"/> Yes	<input type="checkbox"/> No
iv) Aboveground cable boxes or housings or wires in work area?		<input type="checkbox"/> Yes	<input type="checkbox"/> No
g) Underground storage tanks:			
i) Tank pit present, tank vent present?		<input type="checkbox"/> Yes	<input type="checkbox"/> No
ii) Product lines running to dispensers/buildings?		<input type="checkbox"/> Yes	<input type="checkbox"/> No
h) Do utilities enter or exit existing structures/buildings?			
If Yes, confirm the utility markings outside of structure/building match up.		<input type="checkbox"/> Yes	<input type="checkbox"/> No
i) Proposed excavation marked in white?	White	<input type="checkbox"/> Yes	<input type="checkbox"/> No
j) Unclassed utilities / anomalies marked in pink?	Pink	<input type="checkbox"/> Yes	<input type="checkbox"/> No
k) Overhead Utilities/Communication Lines - Look Up:			
i) Overhead electrical conduit, pipe chases, cable trays, product lines?		<input type="checkbox"/> Yes	<input type="checkbox"/> No
ii) Overhead fire sprinkler system?		<input type="checkbox"/> Yes	<input type="checkbox"/> No
l) Overhead Power lines in or near the work area:			
i) < 50 kV within 10 ft. of work area?		<input type="checkbox"/> Yes	<input type="checkbox"/> No
ii) >50 - 200 kV within 15 ft. of work area?		<input type="checkbox"/> Yes	<input type="checkbox"/> No
iii) >200-350 kV within 20 ft. of work area?		<input type="checkbox"/> Yes	<input type="checkbox"/> No
iv) >350-500 kV within 25 ft. of work area?		<input type="checkbox"/> Yes	<input type="checkbox"/> No
v) >500-750 kV within 35 ft. or work area?		<input type="checkbox"/> Yes	<input type="checkbox"/> No
vi) >750-1000 kV within 45 ft. of work area?		<input type="checkbox"/> Yes	<input type="checkbox"/> No
m) Other:			
i) Evidence of linear asphalt or concrete repair?		<input type="checkbox"/> Yes	<input type="checkbox"/> No
ii) Evidence of linear ground subsidence or change in vegetation?		<input type="checkbox"/> Yes	<input type="checkbox"/> No
iii) Unmarked manholes or valve covers in work area?		<input type="checkbox"/> Yes	<input type="checkbox"/> No
iv) Warning signs ("Call Before you Dig", etc.) on or adjacent to site?		<input type="checkbox"/> Yes	<input type="checkbox"/> No
v) Utility color markings not illustrated in this checklist?	Purple	<input type="checkbox"/> Yes	<input type="checkbox"/> No
n) Has the Utilities & Structures Checklist been reviewed by the PM or Designee		<input type="checkbox"/> Yes	<input type="checkbox"/> No
PM or Designee Name: _____			

Name and Signature of person completing the checklist: _____

Date: _____

Do not perform **mechanized** intrusive work within 30 inches of a utility marking without receiving pre-approval by Corporate H&S .

Task Improvement Process

General

Observed Company: _____

Observation Type: _____

TIP Form: H&S Field Multi-Task (General)

Task Observed: _____

Observee Name: _____

Observer Name: _____

Observation Date: _____

Project Number: NYNG2019.TS14

RW-21 OU2/OU3 Onsite/Offsite Investigation & Groundwater Monitoring,
Northrop Grumman Systems Corporation

Project Name: Bethpage, New York

Supervisor: _____

Equipment On Site: _____

Pertinent Information: _____

Observation

Task	Correct	Questionable	Comments
General			
PPE worn according to HASP/JLA specifications and inspected before use?			
STOP work authority used where appropriate?			
Body Use/Positioning			
Proper lifting/pushing/pulling techniques used (no awkward positions/posture; no twisting or excessive reaching; no straining; no excessive weight; load under control/stable; etc.)?			
Body parts away from pinch points (clear or protected from being caught between objects/equipment or from contacting sharp objects/edges, etc.)?			
Body parts not in the Line of Fire (protected from being struck by traffic, equipment, falling/flying objects, etc.)?			
Work Procedures/Environment			
Correct type and number of barricades/warning devices/cones?			

Communication with others when necessary (hand signals, flags, etc.)?			
Right tools and equipment selected for the job and inspected before use?			
Tools and equipment used properly?			
Housekeeping performed (work areas and pathways clear of hazards, uneven surfaces addressed, etc.)?			
Slip/trip/fall hazards addressed (path selected and cleared, eyes on path, speed footing, etc.)?			
Proper energy control (electrical systems grounded, lock out/tag out performed, isolated, cords/fixtures in good condition, GFCI inspected and utilized when appropriate and used properly, etc.)?			
Protected from overhead/underground utilities (proper clearance, properly marked, spotters as necessary, etc.)?			
Safe work on/near water (appropriate flotation device, appropriate boat for body of water and operation of boat, etc.)?			
Chemical/Radiation protection (decontamination zones set up properly, air monitoring, completed, and logged, etc.)?			
Fall from elevated height prevention (maintains 3-points of contact, appropriate ladder, mounting/dismounting vehicle/equipment, fall arrest system, etc.)?			
Any additional safety issues identified:			

Tip Summary Enter details of the TIP and follow up discussion provide details on how any questionable items were resolved.

Discussion following the TIP led by: _____

Date of follow-up discussion: _____

Positive Comments:

Discussion Summary Completed:

- Supervisor Led
- Peer to Peer
- Arcadis Employee to Subcontractor

Summary of Questionable Items

Action Items (Optional) Assign appropriate action items based on the observations made. You can add more than one action item if needed.

Item #	Action Item	Responsible Person	Due Date	Comp. Date
1				
2				
3				

Standard Review

Reviews to be performed after entry of this TIP into 4-Sight.

Quality Review

Quality Reviews to be performed after entry of this TIP into 4-Sight.

Field Validation and Verification

Use the 4-Sight generated copy of this TIP to perform field V&V activities.

Arcadis Weekly Vehicle Inspection Form

Vehicle # / License Plate #

Lease Plan # / Last 6 of Vin #

Inspection Date																									
Odometer reading																									
Driver / Inspector Name																									
Check the appropriate box and enter repair date for identified repairs:												OK	Needs Repair	Repair Date	OK	Needs Repair	Repair Date	OK	Needs Repair	Repair Date	OK	Needs Repair	Repair Date		
Interior	Horn operational																								
	Door Locks operational																								
	Seat Belts in good repair																								
	Seats and Seating Controls																								
	Steering Wheel - No Excessive Play																								
	Interior Lights and Light Controls																								
	Instrument Panel/Gauges																								
	Wiper Controls operational																								
	Heat/Defrost/Air Conditioning working																								
	Rear View Mirror present																								
Backup Camera/Sensors working																									
Jack and Lug Wrench present																									
Exterior¹	Lights and Signals operational																								
	Tires properly inflated/good tread depth																								
	Spare Tire properly inflated																								
	Doors operational																								
	Windows Not Cracked/Damaged																								
	Side View Mirrors																								
Body Panels and Bumpers																									
Engine & Brakes	Engine Start & Running Smoothly																								
	Fluid Levels, No Noticeable Leaks																								
	Belts tight, no cracks																								
	Brakes operational, no squeaking																								
Emergency Equipment²	First Aid Kit, inspected weekly																								
	Fire Extinguisher properly secured																								
	Fire Extinguisher inspected weekly																								
	Orange/Yellow emergency warning light																								
	Roadside Assistance Information																								
Recommend spotter cones available																									
Cargo	Cargo Secure and Properly Distributed																								
	Securing Devices in Good Condition																								
Registration	License Plate /Tags																								
	Registration and Insurance																								
	City/State Inspection Decal																								
	Lease Plan information/Fuel Card																								

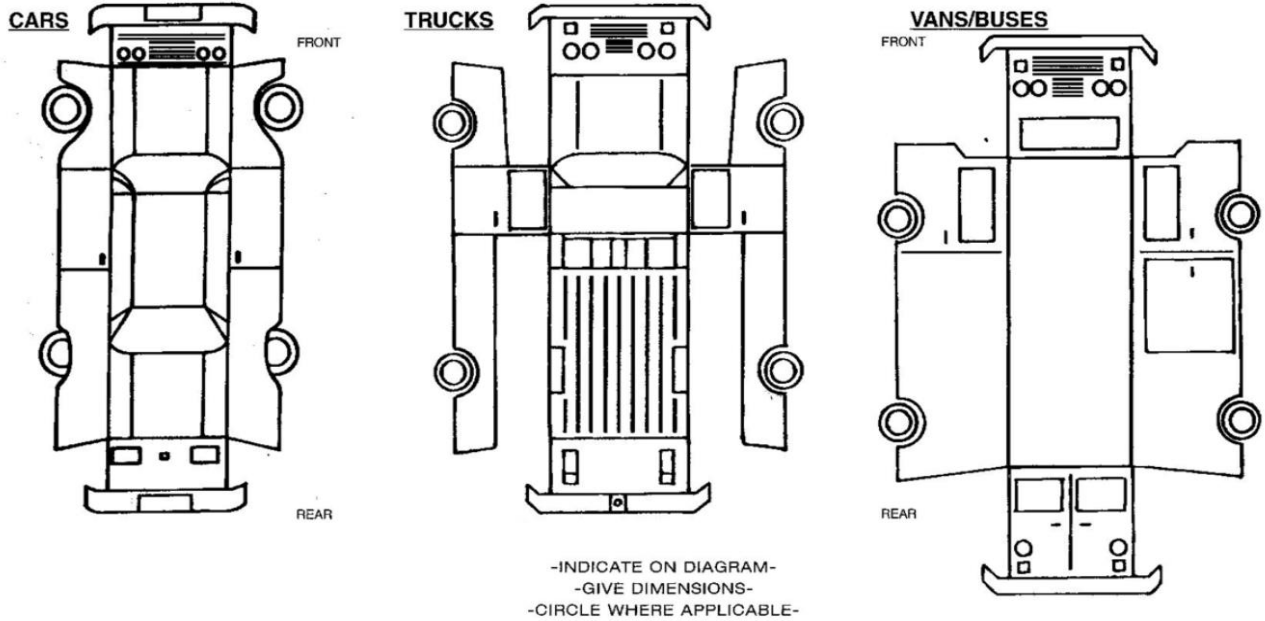
¹ Note all damages to the vehicle on the back of this page

² Emergency Equipment required per Motor Vehicle Standard ARC HSGE024

Note All Vehicle Damage Below

All Vehicle Damage must be reported to Sue Berndt (Corporate Legal), Andrew McDonald (Corporate H&S), and Roger Elliot (Corporate Fleet Manger)

- CODES:**
- B-BENT
 - BR-BROKEN
 - BU-BULGE
 - C-CHAFED
 - CH-CHIPPED
 - CPM-COVERED WITH PROTECTIVE MATERIAL-UNABLE TO DETERMINE DEFECTS IF ANY
 - CSA-CHAFED AND SCRATCHED ALL OVER
 - CR-CRACKED
 - D-DENTED
 - DMC-DUST AND MUD COVERED UNABLE TO DETERMINE OTHER DEFECTS IF ANY
 - G-GOUGED OR CUT
 - GC-GLASS CRACKED
 - HS-HAIRLINE SCRATCH
 - M-MISSING
 - P-PUNCTURED
 - R-RUSTY
 - S-SCRATCHED
 - SC-SCRAPED
 - SM-SMASHED
 - ST-STAINED AND/OR SOILED
 - T-TORN



Notes:

Tread guide: If a tread gauge is not available coins may be used to determine remaining tread. 2/32" is the minimum by law in most states (top of Lincoln's head on penny), 4/32" is minimum recommended for wet surfaces (top of Washington's head on quarter), 6/32" is minimum recommended for snowy surfaces (top of Lincoln Memorial on penny). Vehicle tires should be replaced if the tread depth is less than 6/32".



Reference JSA 10907 For Weekly Vehicle Inspection

Air Monitoring Documentation Form



PID Model: _____

Monitor Frequency: _____

LEL/O₂ Model: _____

CIT Model: _____

Dust Mon. Model: _____

Air Monitoring Results

Date	Time	PID (units)	O ₂ (%)	LEL (% LEL)	CIT (ppm)	Dusts (mg/m ³)	Location
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____
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_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____

CIT = Colorimetric Indicator Tube
LEL = Lower Explosive Limit
mg/m³ = Milligram per cubic meter
O₂ = Oxygen

ppm = Part per million
% = Percent
PID = Photoionization Detector

Confined Space Evaluation Form <small>Must be attached to Completed Non PRCS & Alternative Procedures Checklist or PRCS Entry Permit</small>						
Project Name:			Date / Time:			
Project Number:			Project Location:			
Evaluation Completed By:			Project Manager:			
1. Description of Confined Space						
Location of the Space:						
Owner/Host Employer of Space:			Description of the Space:			
Dimensions of the Space Entrance:			Dimensions of the Space:			
Volume of the Space (Formulas in Instruction Guide):						
2. Definition of the Confined Space						
					YES	NO
The space is large enough and so configured that an employee can bodily enter and perform assigned work? Note: In order to meet this criteria, an employee must physically be able to enter and work in the space					<input type="checkbox"/>	<input type="checkbox"/>
The space has limited or restricted means of entry or exit?					<input type="checkbox"/>	<input type="checkbox"/>
The space is not designed for continuous occupancy?					<input type="checkbox"/>	<input type="checkbox"/>
1) If any of the above questions are marked <u>NO</u>, this is not a confined space. Stop here and go to Section 5. 2) If all of the above questions are marked <u>YES</u>, go to Section 3.						
3. Identification of Confined Space Hazards						
Documentation of Pre-Entry Air Monitoring						
Monitoring For	Monitoring Equipment	Calibration Info:		Pre-Entry Reading	Defined Acceptable Range for Entry ^[1]	
		Date / Time	By			
% Oxygen					19.5 – 23.5%	
% of LEL					<10% LEL	
Hydrogen Sulfide-H ₂ S					<1 ppm TLV-TWA	
					<5 ppm TLV-STEL	
Carbon Monoxide-CO					<25 ppm	
Combustible Dust (LFL)					< LFL (Dust that doesn't obscure vision at a distance of 5ft)	
Other:						
^[1] Refer to the Confined Space Standard for details on acceptable ranges based on entry classification. TLV-STEL - Short-term exposure limit: Employee can work in the area up to 15 minutes TLV-TWA - 8 hr. Time Weighted Avg (PEL/TLV): Employee can work in area 8 hrs (longer with appropriate respiratory protection)						
Pre-Entry Atmospheric Testing Conducted By						
Print Name:					Date:	
Signature:					Time:	

Does the confined space contain, or have the potential to contain, a Hazardous Atmosphere? <i>Note:</i> See Alternate Procedures Confined Space Entry	YES	NO
Oxygen deficient <19.5% or enriched >23	<input type="checkbox"/>	<input type="checkbox"/>
Combustible gases, vapors above 10% of Lower Explosive Limit (LEL)	<input type="checkbox"/>	<input type="checkbox"/>
Hydrogen Sulfide >1 ppm	<input type="checkbox"/>	<input type="checkbox"/>
Carbon Monoxide >25 ppm	<input type="checkbox"/>	<input type="checkbox"/>
An airborne combustible dust at a concentration that meets or exceeds its Lower Flammable Limit (LFL). This concentration may be approximated as a condition in which the dust obscures vision at a distance of 5 feet (1.52 m) or less.	<input type="checkbox"/>	<input type="checkbox"/>
Other toxic gas or vapors exceeding the OSHA PEL or ACGIH TLV, whichever is more stringent.	<input type="checkbox"/>	<input type="checkbox"/>
Any other atmospheric condition that is immediately dangerous to life or health. Describe:	<input type="checkbox"/>	<input type="checkbox"/>
Does the confined space contain a material with the potential for engulfment of an entrant? (e.g., grain, sand or water). Describe:	<input type="checkbox"/>	<input type="checkbox"/>
Does the confined space have an internal shape such that a worker could be trapped or suffocated by inwardly converging walls, floor or ceiling? Describe:	<input type="checkbox"/>	<input type="checkbox"/>
Does the confined space contain any other recognized serious safety or health hazards? <i>Note:</i> A serious safety or health hazard is described as the substantial probability that death or serious physical harm could result from a condition that exists, or from one or more practices, means, methods, operations or processes that have been adopted or are in use.	YES	NO
Mechanical - (agitators, blenders, stirrers, conveyors, unguarded moving parts)	<input type="checkbox"/>	<input type="checkbox"/>
Electrical - (power line contact hazard, exposed energized equipment or terminals)	<input type="checkbox"/>	<input type="checkbox"/>
Chemical - (acids, alkali, coal tar products, skin irritants, solvents)	<input type="checkbox"/>	<input type="checkbox"/>
Environment - (heat stress; cold stress; lighting; flooding)	<input type="checkbox"/>	<input type="checkbox"/>
Biological - (sewage, waste water, blood or other bodily fluids, live or dead animals)	<input type="checkbox"/>	<input type="checkbox"/>
Pressure - (compressed gas cylinders, pneumatic or hydraulic lines/equipment, tanks, heated vessels)	<input type="checkbox"/>	<input type="checkbox"/>
Radiation - (Radioactive sources, lasers, Infrared or UV sources, microwaves, RF, welding flash)	<input type="checkbox"/>	<input type="checkbox"/>
Hot Work - Welding, cutting, torch work or other (note that a hot work permit is required)	<input type="checkbox"/>	<input type="checkbox"/>
Any other recognized serious safety or health hazards. Describe:	<input type="checkbox"/>	<input type="checkbox"/>
1) If <u>ALL</u> of the above hazards are marked <u>NO</u>, stop here, classify as a Confined Space Only and go to <u>Section 5</u>. 2) If any of the above hazards are marked <u>YES</u>, complete <u>Section 4</u> and continue to classify your space. If the nature of the work creates any of the above hazards, this may become a Permit Required Confined Space. Go to <u>Section 4</u>.		
4. Definition of Hazards and Description of Controls		
(List all of the hazards marked <u>YES</u> in Section 3 and complete the information in the table below)		
Hazard	Description	Controls
1) If the permit space <u>poses no actual or potential atmospheric hazards</u> and if all <u>non-atmospheric hazards</u> within the space are <u>eliminated without entry into the space</u>, the permit space may be reclassified as a <u>NON PERMIT REQUIRED CONFINED SPACE</u> for as long as the non-atmospheric hazards remain eliminated, stop here and go to <u>Section 5</u>. 2) If all <u>non-atmospheric hazards within the space are eliminated</u> without entry into the space and actual or potential <u>atmospheric hazards are isolated or eliminated through forced air ventilation</u> use <u>Alternate Procedures Confined Space Entry</u> below. 3) If <u>Hazards listed are not isolated or eliminated</u> the space must be classify this space a <u>PERMIT REQUIRED CONFINED SPACE</u>, stop here and go to <u>Section 5</u>.		

4.a Alternate Procedures Confined Space Entry For Controlling Atmospheric Hazards

If Arcadis can demonstrate that physical hazards within the space are eliminated or isolated using engineering controls and the only hazard was a potential or actual atmospheric hazard, without entry into the space to assess, and we can demonstrate that continuous forced air ventilation is sufficient to maintain the permit space safe for entry (e.g. defined as, <5% LEL; toxic substance levels 50% or less of the ACGIH TLV or OSHA PEL, whichever is more stringent), then Arcadis may use the Alternate Procedures outlined in (c)(5)(ii) of the OSHA General Industry Permit-Required Confined Space Standard (29 CFR 1910.146) or 29 CFR 1926.1203(e)(2) for Construction Work.

If an initial entry of the permit space necessary to obtain monitoring and inspection data, STOP WORK – This must be performed as a Permit Required Confined Space Entry.

What is the capacity and configuration of the ventilation equipment to be used?
Describe:

Identify atmospheric hazards and potential hazards created by work in the space.
Describe:

In the event the ventilation system stops working, define what atmospheric monitoring procedures will be set-up to detect an increase in atmospheric hazard levels in sufficient time for the entrants to safely exit the space:
Describe:

Alternate Procedures Confined Space Entry Readings

Detail below final sampling results from routine testing of the space from the time ventilating began through final determination of acceptable entry conditions (LEL and toxic substance values must be 50% or less of TLV or PEL): (Use table below and the Confined Space Evaluation Air Monitoring Documentation Form)

Monitoring For	Monitoring Equipment	Calibration Info:		Pre-Entry Reading	Defined Acceptable Range for Entry ^[1]
		Date / Time	By		
% Oxygen					19.5 – 23.5%
% of LEL					<5% LEL
Hydrogen Sulfide-H ₂ S					<0.5 ppm TLV-TWA
					<2.5 ppm TLV-STEL
Carbon Monoxide-CO					<12.5 ppm
Combustible Dust (LFL)					< 50% of LFL
Other:					<50% of TLV or PEL (whichever is more stringent)

^[1] Refer to the Confined Space Standard for details on acceptable ranges based on entry classification.
TLV-STEL - Short-term exposure limit: Employee can work in the area up to 15 minutes
TLV-TWA - 8 hr. Time Weighted Avg (PEL/TLV): Employee can work in area 8 hrs (longer with appropriate respiratory protection)

Pre-Entry Atmospheric Testing Conducted By

Print Name:	Date:
Signature:	Time:

**1) For Permit Required Confined Space Qualifying for Alternate Procedures Confined Space Entry Procedures - Go to Section 5.
 2) If the permit space has actual or potential atmospheric hazards that can not be controlled with ventilation OR the Non-Atmospheric hazards listed above have no controls, or if the controls are not achievable for the hazards listed above, this area will be considered a: Permit Required Confined Space. Go to Section 5.**

5. Confined Space Classification		
Select how the space was classified and associated Checklist or Permit	YES	NO
Is the Space classified as a Confined Space? Note: If NO proceed to Section 6. If YES answer the questions below.	<input type="checkbox"/>	<input type="checkbox"/>
Is the Space classified as Non Permit Required Confined Space? Note: If YES this evaluation must be attached to the <u>Completed Non Permit Required Confined Space Entry Checklist</u> .	<input type="checkbox"/>	<input type="checkbox"/>
Is the space a Permit Required Confined Space Qualifying for Alternate Procedures Confined Space Entry Procedures? Note: If YES this evaluation must be attached to the <u>Completed Alternate Procedures Confined Space Entry Checklist</u> .	<input type="checkbox"/>	<input type="checkbox"/>
Is the space classified as Permit Required Confined Space? Note: If YES this evaluation must be attached to the <u>Completed Permit-Required Confined Space Entry Permit</u> .	<input type="checkbox"/>	<input type="checkbox"/>
1) Evaluation Complete. Go to Step 6		
6. Competent Person Completing Confined Space Evaluation Form		
<p>Please note that the minimal credentials for the person authorized to evaluate confined spaces and to certify the space safe for entry, when it relates to Alternate Procedures or Non-Permit Required Confined Space entry, is a competent person (e.g., one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has the authorization to take prompt corrective measures to eliminate them). A copy of this evaluation form must be attached to the Entry Permit, Alternate Procedures entry checklist and/or Non-Permit Required Confined Space entry checklist</p>		
Name (Print):	Date:	
Signature:	Time:	

Confined Space Evaluation Form Instruction Guide

The Confined Space Evaluation Form must be completed to properly classify a space as a confined space and must be completed prior to entering a confined space. The evaluation form must be attached to the completed Non Permit Required Confined Space Checklists, Alternative Procedures Checklist or the Permit Required Confined Space Entry Permit.

Section 1. Description of Confined Space

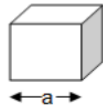
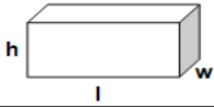
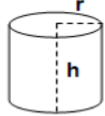
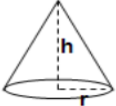
Location: Fill in building pertinent information as indicated on the form. Locations can be uniquely identifiable such as Manhole #, Chemical Building, or Tank C.

Description of the space: Give a short but detailed description of the space to be entered.

Dimension of entrance: Fill in the dimensions of the opening into the space.

Dimension of space: Fill in the approximate depth and width of the space in feet.

Volume of space: Fill in the approximate volume of the space.

Figure	Formula	Variables
<p>Cube</p> 	a^3	a = length of edge
<p>Rectangular prism</p> 	$l \times w \times h$	l = length w = width h = height
<p>Cylinder</p> 	$\pi \times r^2 \times h$	r = radius of circular face h = height
<p>Cone</p> 	$1/3 \times \pi \times r^2 \times h$	r = radius of circular base h = height from tip to base

Section 2. Definition of the Confined Space

Check **Yes** or **No** to the three questions, then follow instructions on the form. If Yes is marked for all 3 questions, the space will be classified as a confined space.

3. Identification of Confined Space Hazards

Mark the appropriate **Yes** or **No** box for each Question. For the Other recognized serious safety or health hazards question, check those categories that apply. For example, if there is an exposed electrical hazard that poses an electrical shock/arc flash hazard located in the confined space, the box labeled Electrical would be checked on the form. The box labeled "Other" may be used for other undefined serious safety or health hazards.

If no hazards can be identified, please indicate "None" in Section 4 and proceed to Section 5.

Note: A serious safety or health hazard is described as the substantial probability that death or serious physical harm could result from a condition that exists, or from one or more practices, means, methods, operations or processes that have been adopted or are in use.

Section 4. Definition of Hazards and Description of Controls

Describe the hazards present at the time of entry. This rating is irrelevant of what activity is going to occur. (Follow the instructions of the form). Examples of these types of hazards include:

(HA) Hazardous Atmosphere Oxygen level < 19.5 or > 23.5 percent. Flammable range (LFL or LEL) of > than 10%. Toxic air > than TLV or PEL, whichever is more stringent (e.g. CO, H2S).

(M) Mechanical hazards such as sharp objects, augers, paddles, moving gears or parts, rotating, equipment, etc.

(E) Electrical Hazards - electrical sources significant enough to cause personal injury.

(CC) Chemical Contact, typically skin and eye hazard. Corrosive materials that could cause burns, sensitization.

(EN) Environment - heat stress; cold stress; lighting; flooding)

(B) Biological Hazards - sewage, waste water, blood or other bodily fluids, live or dead animals

(P) Pressure - compressed gas cylinders, pneumatic or hydraulic lines/equipment, tanks, well heads, heated vessels

(R) Radiation - Radioactive sources, lasers, Infrared or UV sources, microwaves, RF, welding flash

(W) Welding, cutting, torch work or other hot work (note that a hot work permit is required)

(O) Other recognized serious safety or health hazards

Note: Corrosive chemicals on the wall which pose a skin hazard rather than a respiratory hazard should be listed under "Chemical Contact" hazards.

Section 4 must be extremely well documented, especially the hazard column if you are using this section to confirm whether a space is considered a non permit required confined space. A space classified by the employer as a permit required confined space may be reclassified as a non permit confined if the permit space poses no actual or potential atmospheric hazards and if all hazards within the space are eliminated without entry into the space. For example: if an auger is in a confined space, a Lock out/Tag out of the auger may still require the space to be a permit required confined space, but the LO/TO or hazard removal of the auger could reclassify the space as a non permit required confined space.

Arcadis recommends confined spaces that had contained materials with a NFPA/HMIS rating of 2 or more to be classified as a permit required confined space. Furthermore, Site sewers should also be treated as a permit required confined space. Good candidates for non permit required confined spaces are: tanks which do not/did not contain a hazardous material and storm water sewers.

Hazard	Description	Controls
(HA)	Specific chemical creating a toxic or flammable hazard	State the location of the valve to shut off the chemical. If ventilation is used to control the atmospheric hazard, include flow rates, number of air changes needed, etc.
(M)	Pneumatic press, hydraulic lift, auger, propellers, agitators	State what action needs to be taken to eliminate the hazard. For example: Hydraulic - lockout hydraulic source and place pin in the lift, or block it so it can not fall. <i>For an auger or paddle - remove the auger or lock it/tag it</i>
(E)	State the voltage/amperage and the source. For example: 208v/40amp/vacuum pump	State what needs to be done to lock out the electrical supply and bleed off the vacuum. For example: Lock out and tag out the knife switch located next to the vacuum pump. Open valve on vacuum line to bring to atmospheric pressure.
(CC)	List what chemical hazards might be present. Examples include chemical contact that is a corrosive, or chemical gases, etc.	State the actions to be taken to minimize/eliminate the chemical hazard. For chemical contact, list the PPE or method to decontaminate the tank.
(O)	List all other hazard that might be present. An example may be water that might present a drowning hazard, or dirt that may fall in on you.	State the actions to be taken to minimize/eliminate the hazard. Drain any water that may present a drowning hazard or use a harness device that prevents a person from being submerged.

Note:

Hazard - This space is a listing of the hazards identified in Section 3.

Description and Controls - In these two columns, provide a DESCRIPTION of the hazard associated with the confined space and the CONTROL used to minimize or eliminate the hazard.

5. Confined Space Classification

List the classification of the space. Check **YES** or **NO** or questions. Follow directions at the bottom of the section. If the space is not classified as a confined space keep evaluation with project records. The evaluation form must be attached to the completed Non Permit Required Confined Space Checklists, Alternative Procedures Checklist or the Permit Required Confined Space Entry Permit.

6. Competent Person Completing Confined Space Evaluation Form

The Competent Person signs this form prior to entry into the confined space.

Note: the minimal credentials for the person authorized to evaluate confined spaces and to certify the space safe for entry, when it relates to Alternate Procedures or Non-Permit Required Confined Space entry, is a competent person (e.g., one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has the authorization to take prompt corrective measures to eliminate them).

PRCS entries must be reviewed and approved by an Entry Supervisor.

Periodic inspections of energy control procedure(s) are required at least annually to ensure that the requirements of the established energy control procedure and the LO/TO standard are being followed. This form must be attached to the Periodic Inspection Log. The Arcadis LO/TO TIP may be used in place of this checklist.

All **No** responses require an update to the written LO/TO procedure.

		Yes/No	Details
1	Is all machinery or equipment capable of movement, required to be de-energized or disengaged and locked-out during cleaning, servicing, adjusting or setting up operations, whenever required?		
2	Where the power disconnecting means for equipment does not also disconnect the electrical control circuit:	--	--
2a	Are the appropriate electrical enclosures identified?		
2b	Is means provided to assure the control circuit can also be disconnected and locked-out?		
2c	Is the locking-out of control circuits in lieu of locking-out main power disconnects prohibited?		
3	Are all equipment control valve handles provided with a means for locking-out?		
4	Does the lock-out procedure require that stored energy (mechanical, hydraulic, air, etc.) be released or blocked before equipment is locked-out for repairs?		
5	Are appropriate employees provided with individually keyed personal safety locks?		
6	Are employees required to keep personal control of their key(s) while they have safety locks in use?		
7	Is it required that only the employee exposed to the hazard, place or remove the safety lock?		
8	Is it required that employees check the safety of the lock-out by attempting a startup after making sure no one is exposed?		
9	Are employees instructed to always push the control circuit stop button immediately after checking the safety of the lock-out?		
10	Is there a means provided to identify any or all employees who are working on locked-out equipment by their locks or accompanying tags?		
11	Are a sufficient number of accident preventive signs or tags and safety padlocks provided for any reasonably foreseeable repair emergency?		
12	When machine operations, configuration or size requires the operator to leave his or her control station to install tools or perform other operations, and that part of the machine could move if accidentally activated, is such element required to be separately locked or blocked out?		
13	In the event that equipment or lines cannot be shut down, locked-out and tagged, is a safe job procedure established and rigidly followed?		

Lockout Tagout (LO/TO) Periodic Inspection Log

Machine ID# or Equipment ID# _____

Written LOTO Procedure ID# _____

Date of Inspection	Authorized Person Conducting Inspection	Additional Staff Included in Inspection	LO/TO Procedure Adequate? (Yes/No)	List changes to the LOTO Procedure

All No responses require an update to the written LO/TO procedure.

Lockout Tagout (LO/TO) Periodic Inspection Log

Machine ID# or Equipment ID# _____

Written LOTO Procedure ID# _____

Date of Inspection	Authorized Person Conducting Inspection	Additional Staff Included in Inspection	LO/TO Procedure Adequate? (Yes/No)	List changes to the LOTO Procedure

All **No** responses require an update to the written LO/TO procedure.

Equipment Lockout / Tagout (LO/TO) Permit to Work

Equipment:		Project Number:	
Project Name:		Project Location:	
Name of Authorized Person in Control of LO/TO Process:		Name of Authorized Person applying Equip Isolation Device:	
Name of Authorized Person that verified Hazardous Energy Source is controlled:		Name of NFPA 70e Authorized Person (If Required):	
Start Date for LO/TO Procedure:		Estimated Date of Completion for LO/TO Procedure:	
Estimated Start Time for LO/TO Procedure:		Estimated Completion Time for LO/TO Procedure:	

TRACKing the LO/TO Work Permit

THINK THROUGH THE TASK

Job Task: (Brief summary of what hazardous energy control work is proposed)

WORKFORCE INVOLVED/AFFECTED BY LO/TO WORK

Check all that apply

Name	Company	Phone Number	Revised LO/TO Procedure	LO/TO Authorized Person	NFPA 70e Authorized Person	Affected Employee	Affected Employee Trained
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Comments/Additional Details:

RECOGNIZE THE HAZARDOUS ENERGY SOURCE (check all that apply) and ASSESS THE RISK (Low-Moderate-High)

YES	NO	Type of Hazardous Energy	SELECT ↓	YES	NO	Type of Hazardous Energy	SELECT ↓
<input type="checkbox"/>	<input type="checkbox"/>	Electrical		<input type="checkbox"/>	<input type="checkbox"/>	Thermal	
<input type="checkbox"/>	<input type="checkbox"/>	Mechanical		<input type="checkbox"/>	<input type="checkbox"/>	Gravitational (Stored)	
<input type="checkbox"/>	<input type="checkbox"/>	Hydraulic		<input type="checkbox"/>	<input type="checkbox"/>	Pressure (Stored)	
<input type="checkbox"/>	<input type="checkbox"/>	Pneumatic		<input type="checkbox"/>	<input type="checkbox"/>	Hazardous Material	
<input type="checkbox"/>	<input type="checkbox"/>	Chemical		<input type="checkbox"/>	<input type="checkbox"/>	Other Hazard	

CONTROL THE WORKING ENVIRONMENT					
Written LO/TO Procedure	YES	NO	Written LO/TO Procedure <u>E</u> ception	YES	NO
Developed an Equipment LO/TO Procedure	<input type="checkbox"/>	<input type="checkbox"/>	Written LO/TO Procedure Eception	<input type="checkbox"/>	<input type="checkbox"/>
Identified all hazardous energy sources	<input type="checkbox"/>	<input type="checkbox"/>	Equipment has been removed from service	<input type="checkbox"/>	<input type="checkbox"/>
Equipment LO/TO Procedure Reviwed with the past 12 months	<input type="checkbox"/>	<input type="checkbox"/>	Locking devices and Tags in use	<input type="checkbox"/>	<input type="checkbox"/>
Identified all hazardous energy sources	<input type="checkbox"/>	<input type="checkbox"/>	Equipment reduced to zero energy state	<input type="checkbox"/>	<input type="checkbox"/>
Notified affected employees	<input type="checkbox"/>	<input type="checkbox"/>	Equipment has been isolated	<input type="checkbox"/>	<input type="checkbox"/>
Locking devices and Tags in use	<input type="checkbox"/>	<input type="checkbox"/>	Equipment isolation tested/verified	<input type="checkbox"/>	<input type="checkbox"/>

All No responses; Use Stop Work Authority- Explain Control Work Environment:

LO/TO POINTS ISOLATED BY AUTHORIZED PERSON(S)
Refrence Written LO/TO Procedure

Hazard	Action Required	Lock ID / #	Authorized Person Name	Date LOTO Applied	Date LO/TO Removed

EMERGENCY CONTACT LIST

Emergency Contact:	Phone 1:	Phone 2:	Location:
Emergency (FIRE/EMS):			
Emegerncy (Facility):			
Work Care:	888.449.7787	-----	
Project Manager:			
Site Safety Officer:			
Client Contact:			
Other:			

***Include any Task Specific JSA's with this permit to work.**

KEEP H&S FIRST IN ALL THINGS

I understand the nature of the work for this permit, and certify that this permit meets the requirements specified in the Arcadis LO/TO Standard.

Completed Permit to Work Must Be Retained in Project File for 12 Months

APPROVAL OF LO/TO WORK PERMIT- By ARCADIS LO/TO Authorized Person:

Name: _____	Office Location: _____
Title: _____	Date: _____

Project Name:		Project Location:	
Project Number:		Project Manager:	
Developed By:		Reviewed By:	
Origin Date:	Revision #:	Revision Date:	Revised By:
Equipment #:		Equipment Manufacture:	
Equipment Description:		Equipment Location:	

Warning: Only Authorized Employees who have been Trained and Authorized can perform the LOTO procedures below

Equipment Diagram

Insert photos of equipment or schematic showing location of equipment to be locked out

Adjacent & Associated Equipment

Adjacent & Associated Equipment	Location of Adjacent & Associated Equipment and Action to be Taken

Lockout Tagout (LOTO) Procedure

Energy Source	Lockout Device	Isolation Location	Lockout Method	Zero Energy Check, Verification & Testing

Non Permit-Required Confined Space Entry Checklist

Project Name:	Date / Time:
Project Number:	Project Location:
Checklist Completed By:	Project Manager:
Location and Description of Confined Space:	
Entry Objectives:	
Equipment / Materials Required for Entry:	
Time of Entry:	Expiration of Entry:

Pre-Entry Air Monitoring

(enter pre-entry readings below to confirm that space poses no actual atmospheric hazard)

Monitoring For	Monitoring Equipment	Calibration Info:		Pre-Entry Reading	Defined Acceptable Range for Entry ^[1]
		Date / Time	By		
% Oxygen					19.5 – 23.5%
% of LEL					<10% LEL
Hydrogen Sulfide-H ₂ S					<1 ppm TLV-TWA
					<5 ppm TLV-STEL
Carbon Monoxide-CO					<25 ppm
Combustible Dust (LFL)					< LFL (Dust that doesn't obscure vision at a distance of 5ft)
Other:					

^[1] Refer to the Confined Space Standard for details on acceptable ranges based on entry classification.

TLV-STEL - Short-term exposure limit: Employee can work in the area up to 15 minutes

TLV-TWA - 8 hr. Time Weighted Avg (PEL/TLV): Employee can work in area 8 hrs (longer with appropriate respiratory protection)

Pre-Entry Atmospheric Testing Conducted By

Print Name:	Date:
Signature:	Time:

Pre-Entry Checklist

Checklist	YES	NO	N/A	Comment
Competent Person completed confined space evaluation?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Attach copy of signed confined space evaluation to this entry checklist and make available to all entrants
Confirmed that permit space poses no actual or potential atmospheric hazards?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
All hazards within the space are eliminated or isolated?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Cross-reference against the confined space evaluation form

Pre-Entry Checklist				
Checklist	YES	NO	N/A	Comment
Hazards have been eliminated or isolated without entry into the space (unless we can demonstrate that doing so without entry is infeasible)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
If it is necessary to enter the permit space to eliminate or isolate hazards, STOP WORK - such entry must be performed as PRCS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	If testing and inspection during that entry demonstrate that the non-atmospheric hazards within the permit space have been eliminated or isolated, the permit space may be reclassified as a non-permit confined space for as long as the non-atmospheric hazards remain eliminated or isolated
Has there been changes in the use or configuration of a non-permit confined space that might increase the hazards to entrants, or some indication that the initial evaluation of the space may not have been adequate?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	If YES, STOP WORK and/or exit the confined space immediately. Each entry employer must have a competent person reevaluate that space and, if necessary, reclassify it as a permit-required confined space.
Adequate emergency supplies on hand?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Fire extinguisher, first aid/CPR supplies, etc.
<i>A permit-required confined space may be reclassified as a non-permit confined space for as long as the non-atmospheric hazards remain eliminated or isolated. If hazards arise within a permit space that has been reclassified as a non-permit space, each employee in the space must exit the space</i>				
Arcadis Non-Permit Required Confined Space Entrant(s)				
Total Number of Entrants (Arcadis + Other Authorized Entrants):				
I have been properly instructed with regards to safe entry into this Non-Permit Required Confined Space and understand my duties and STOP WORK Authority:				
Names of Entrant(s)		Signature of Entrants		
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

Other Authorized Entrants (Contractor, Client, Regulator) Entering Non-Permit Required Confined Space	
Multi-employer work site activities coordinated?	Yes / No / NA
Confirmed that workers working outside confined space won't introduce hazards into the Non- Permit Required Confined Space?	Yes / No / NA
I have been properly instructed with regards to safe entry into this Non-Permit Required Confined Space and understand my duties and my STOP WORK Authority	
Name of Authorized Entrant:	Company
Signature of Authorized Entrant:	Date
Name of Authorized Entrant:	Company
Signature of Authorized Entrant:	Date
Name of Authorized Entrant:	Company
Signature of Authorized Entrant:	Date
Name of Authorized Entrant:	Company
Signature of Authorized Entrant:	Date
Name of Authorized Entrant:	Company
Signature of Authorized Entrant:	Date
Individual Authorizing Non-Permit Required Confined Space Entry	
The following signatory has reviewed this pre-entry checklist, the information contained here-in and has reviewed the confined space evaluation form. Written instructions and safety procedures have been received and are understood. Entry cannot be approved if any questions are answered with a "<u>NO</u>".	
Name (Print):	Date:
Signature:	Time:
Documenting Problems Encountered during Non-Permit Required Confined Space	
If problems are encountered during entry, submit a copy of this checklist to corporate H&S so necessary program/standard revisions can be developed and that a record of documented problems/incidents during Non-PRCS is maintained. A copy of the Non-PRCS Entry Checklist will be forwarded to 4-sight-support@arcadis-us.com	
Describe problem/incident:	
Detail confined space program / standard revisions required:	
Date Copy of Non-Permit Required Confined Space Entry Checklist provided to Corporate H&S:	
Copy of Non-Permit Required Confined Space Entry Checklist must be provided to Corporate H&S via 4-Sight-Support@arcadis-us.com .	

Permit-Required Confined Space Entry Permit

Permit No. _____
 (e.g., PRCS - Project Number - Date - #{sequential for day})

Project Name:	Date / Time:
Project Number:	Project Location:
Permit Prepared By:	Project Manager:

Location and Description of Confined Space:

Rescue Contact and Phone Number:

Note: If relying on local emergency services for emergency rescue, detail how we have coordinated advance notice if local emergency service will be unable to respond for a period of time (because they are responding to another emergency, attending department-wide training, etc.):

Entry Objectives:

Equipment / Materials Required for Entry:

Time of Entry: _____ Expiration of Entry: _____

Respirator Required for Entry: (Explain)

Required Protective Clothing for Entry:

Air Monitoring Interval: Continuous Every 15min* Every 30min* Every Hour*
 (Circle Selection)

* If continuous monitoring isn't feasible detail reasoning for air monitoring interval selected:

Pre-Entry Air Monitoring

(enter pre-entry readings below, subsequent readings record in attachment or log published in the project HASP)

Monitoring For	Monitoring Equipment	Calibration Info:		Pre-Entry Reading	Values outside defined Acceptable Range = Hazardous Atmosphere ^[1]
		Date / Time	By		
% Oxygen					19.5 – 23.5%
% of LEL					<10% LEL
Hydrogen Sulfide-H ₂ S					<1 ppm TLV-TWA <5 ppm TLV-STEL
Carbon Monoxide-CO					<25 ppm
Combustible Dust (LFL)					< LFL (Dust that doesn't obscure vision at a distance of 5ft)
Other:					

^[1] Refer to the Confined Space Standard for details on acceptable ranges based on entry classification.
TLV-STEL - Short-term exposure limit: Employee can work in the area up to 15 minutes
TLV-TWA - 8 hr. Time Weighted Avg (PEL/TLV): Employee can work in area 8 hrs (longer with appropriate respiratory protection)

Pre-Entry Atmospheric Testing Conducted By

Print Name:	Date:
Signature:	Time:

Pre-Entry Checklist				
Checklist	YES	NO	N/A	Comment
Competent Person completed confined space evaluation?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Are all lines to and from confined space blanked, capped, or isolated?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Are lines purged, flused and vented?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Electrical service locked out (entrant with key)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Are mechanical devices / systems restrained and locked out?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
If mechanical ventilation is needed, is it in place and functioning?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
If relying upon natural ventilation only, is air monitoring in place?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Is explosion-proof electrical equipment in use?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
If required, are we using non-sparking tools?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Are ladders secured at top?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Are the permanent ladder rungs in safe condition?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Is the ground fault circuit interrupter checked and functioning?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Are all ignition sources identified and isolated?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Are warning signs posted?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Is required PPE being used?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Are respirators and air supply equipment in proper condition?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Are safety harnesses and lifelines in proper condition?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Is a full-body harness with back "D" ring being used ?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Is the retrieval system (hoist, etc.) functioning properly?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Is emergency equipment ready for use?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Fire extinguisher, first aid/CPR supplies, etc.
Are rescue provisions in place?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Has rescue plan (entry or non-entry) been practiced in last 12 months?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Communication device for entrance and attendants?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Explain here:

Pre-Entry Checklist				
Checklist	YES	NO	N/A	Comment
Is air monitoring equipment calibrated and functioning properly?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Calibrated according to manufacturer requirements and daily verification with certified calibration gas
Is pre-entry atmospheric testing completed and within range?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Is a trained attendant on standby?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
If high hazard work is conducted, are other permits (welding, etc.) in place?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Explain here:
If entry rescue is planned, are SCBAs on site and ready as needed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Is the area secured to eliminate unauthorized entry?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Are entry personnel trained for confined space entry?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Is this confined space entry permit completed, signed and posted?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Confined Space Rescue (Non-Entry or Entry Rescue Assistance)				
PRCS Rescue Type: (Circle Selection)	Non-Entry Rescue or Entry Rescue	If Entry Rescue is selected, identify names, qualifications and verification of rescue capabilities for type of confined space entry planned by contracted service (Arcadis staff are not permitted to perform entry rescue)		
Entry Rescuer Name:	Qualifications:			
Has Selected Rescue Type & Capabilities been Confirmed and Practiced? (<12months)				Yes / No
Provide details on Non-Entry Rescue or Entry Rescue Assistance here:				
Permit Required Confined Space Entrants and Attendants				
Total Number of Entrants: (Arcadis + Other Authorized Entrants)		Total Number of Attendants: (Arcadis + Other Authorized Attendants)		
Arcadis Entrant Signature(s)				
I have been properly instructed on safe entry into this Permit Required Confined Space and understand my duties including STOP WORK Authority and the Emergency Evacuation Procedures				
Entrant 1 - Print Name:		Date:	Time:	
Entrant 1 Signature:				
Entrant 2 - Print Name:		Date:	Time:	
Entrant 2 Signature:				
Entrant 3 - Print Name:		Date:	Time:	
Entrant 3 Signature:				

Arcadis Entrant Signature(s)		
I have been properly instructed on safe entry into this Permit Required Confined Space and understand my duties including STOP WORK Authority and the Emergency Evacuation Procedures		
Entrant 4 - Print Name:	Date:	Time:
Entrant 4 Signature:		
Entrant 5 - Print Name:	Date:	Time:
Entrant 5 Signature:		
Entrant 6- Print Name:	Date:	Time:
Entrant 6 Signature:		
Attendant Signature		
I have reviewed the Arcadis Confined Space Standard, the completed confined space evaluation form and this entry permit and I understand my responsibilities as an Attendant		
Print Name:	Date:	
Signature:	Time:	
Print Name:	Date:	
Signature:	Time:	
Other Authorized Entrants (Contractor, Client, Regulator) Entering Permit Required Confined Space		
Multi-employer work site activities coordinated?	Yes / No / NA	
Confirmed that workers working outside confined space won't introduce hazards into Permit Required Confined Space?	Yes / No / NA	
I have been properly instructed on safe entry into this Permit Required Confined Space and understand my duties including STOP WORK Authority and the Emergency Evacuation Procedures		
Name of Authorized Entrant:	Company	
Signature of Authorized Entrant:	Date	
Name of Authorized Entrant:	Company	
Signature of Authorized Entrant:	Date	
Name of Authorized Entrant:	Company	
Signature of Authorized Entrant:	Date	
Name of Authorized Entrant:	Company	
Signature of Authorized Entrant:	Date	
Name of Authorized Entrant:	Company	
Signature of Authorized Entrant:	Date	
Name of Authorized Entrant:	Company	
Signature of Authorized Entrant:	Date	

Entry Supervisor Authorizing Confined Space Entry Permit	
Entry Supervisor has reviewed the work authorized by this permit, the information contained here-in and has reviewed the confined space evaluation form. Written instructions and safety procedures have been received and are understood. Entry cannot be approved if any questions are answered with a "No". This permit is not valid unless all appropriate items are completed	
Entry Supervisor Name (Print):	Date:
Entry Supervisor Signature:	Time:
Construction Work ONLY Entry Supervisor Suspending Permit Required Confined Space Entry Permit	
Detail the situation that warranted the temporary suspension of the Construction Work Permit Required Confined Space Entry Permit:	
OSHA Construction Confined Space standard allows for the suspension of a permit, instead of cancellation, in the event of changes from the entry conditions listed on the permit or an unexpected event requiring evacuation of the space. The space must be returned to the entry conditions listed on the permit before re-entry.	
Entry Supervisor Name (Print):	Date Permit Suspended
Entry Supervisor Signature:	Time Permit Suspended
Detail how the space was returned to entry conditions listed on this permit before re-entry is allowed:	
Entry Supervisor Name (Print):	Date Permit Reinstated
Entry Supervisor Signature:	Time Permit Reinstated
Entry Supervisor Canceling Confined Space Entry Permit	
Entry Supervisor Name (Print):	Date:
Entry Supervisor Signature:	Time:
Submit a copy of the Completed / Cancelled Confined Space Entry Permit to Corporate H&S @ 4-Sight-Support@arcadis-us.com. Additionally this Completed / Cancelled Confined Space Entry Permit is to be retained in project files.	
Documenting Problems Encountered During Permit Required Confined Space Entry	
Describe problem/incident:	
Detail corrective actions implemented:	
Detail confined space program / standard revisions required:	
Submit a copy of the Completed / Cancelled Confined Space Entry Permit to Corporate H&S @ 4-Sight-Support@arcadis-us.com. Additionally this Completed / Cancelled Confined Space Entry Permit is to be retained in project files.	

Lockout/Tagout Exchange of Information Documentation

The LO/TO standard requires that Arcadis exchange energy control procedures with outside employers who service and/or maintain equipment/machines owned by Arcadis that require LO/TO. Arcadis staff will use this form to notify all parties that they must comply with any identified restrictions and prohibitions, as outlined below. This form should be completed by an Arcadis Qualified LO/TO staff person in conjunction with the outside employer's LO/TO Authorized representative. This exchange of information must occur before service/maintenance activities begin on Arcadis-owned equipment. If Arcadis staff will also be working on this equipment or in surrounding areas, then attach this documentation form to the Equipment Specific LO/TO Procedure and the LO/TO Permit to Work.

1. Identification of Outside Employer(s):

Company: _____

Name: _____

Address: _____

Telephone #: _____

2. Identify Location of Equipment: _____

Identify Equipment/Machine to be serviced: _____

Hazardous energy control procedures for the equipment/machine have been exchanged? _____
(No response would trigger Stop Work Authority)

3. After comparing the Arcadis and Outside Employer LO/TO programs/procedures, identify any specific restrictions/prohibitions or procedural steps below:

4. Affected Persons (listed below) shall review, understand and comply with the above-identified specific restrictions/prohibitions or procedural steps.

(Printed Name)

(Signature)

5. Acknowledged acceptance of the provisions of this exchange of information form:

Outside Employer Representative: _____
 (LO/TO Qualified) (Signature) (Date)

Arcadis Authorized LO/TO Staff: _____
 (Signature) (Date)

APPENDIX H

Heat Related Illness Prevention Plan and
Bloodborne Pathogens Exposure Control
Plan



HEAT ILLNESS PREVENTION PLAN



Purpose and Scope

Date Completed

The purpose of this document is to serve as a planning tool and implementation guide to assist the project team, onsite personnel, and the Site Safety Officer (SSO) or other designated responsible party to comply with the requirements set forth by **Cal/OSHA Title 8 CCR 3395 Heat Illness Prevention Standard** and the **Washington State Outdoor Heat Exposure Regulations 296-62-09510 thru 09560**.

NOTE: This HASP Supplement is required to be used in California and Washington states. The Arcadis Health and Safety Standards ARC HSIH013 Heat Stress Prevention, and ARC HSGE008 Injury and Illness Prevention Program (IIPP) must accompany this HASP Supplement. To completely address the regulatory requirements for work in CA and WA states these standards are required to be used in association with the project-specific HASP and this supplement.

The scope of this HIPP applies to Arcadis projects which include, but are not limited to: outdoor operations such as contractor oversight, construction, refining, oil and gas extraction, asbestos removal, and hazardous waste site activities and interior work particularly tasks which require employees to wear PPE which can increase the risk for heat stress for the wearer. This HIPP provides guidance to prevent or reduce the risk of work-related heat illness. This HASP Supplement provides site specific instructions for actions to be completed at the project site.

Project sites in other states and provinces are expected to use this HASP Supplement as a Best Management Practice to prevent heat related illness injuries.

Project Site Name

RW-21 OU2/OU3 Onsite/Offsite Investigation & Groundwater Monitoring,
Northrop Grumman Systems Corporation
Bethpage, New York

Authority and Implementation

The following designated individuals have authority and responsibility for implementing the provisions of this program at the project work site indicated above.

Project Manager

Carlo San Giovanni

Site Safety Officer (SSO)

Xuan Xu

SSO Designated Alternate

Acclimatization of Personnel for Heat Stress Prevention

The degree to which personnel have been able to physiologically adjust or acclimatize to working under hot conditions affects ability to safely do work. Acclimatized individuals generally have lower heart rates and body temperatures than unacclimated individuals, and sweat sooner and more profusely. This enables them to maintain lower skin and body temperatures at a given level of environmental heat and work loads than unacclimated workers. Acclimatization can occur after a few days of exposure to the hot work environment. OSHA/NIOSH suggests an acclimatization period of 2-3 days for fit personnel. One the 1st day personnel should spend 50% of the day exposed to / working in the hot environment and increasing the amount of work 10-20% based on personnel response to the hot environment and work load.

Procedures for Provisions for Potable Water

The SSO or designee will be responsible for implementing the following when conditions at the site are anticipated to exceed 80 degrees (°) Fahrenheit (F) / 26.6° Celsius (C)

1. Proper hydration is critical to preventing heat related illness and injury. Project sites will maintain an adequate supply of suitably cool, fresh and pure potable water on site/readily accessible to allow each employee to consume 1 quart (1 L) of water per hour, ideally at a rate of four 8-oz (250 mL) cups per hour.

NOTE: Fresh and pure water is defined as being "odor free and suitably cool". Where suitably cool means water being cooler than the ambient temperature but not so cold as to cause discomfort or prevent drinking.

NOTE: Electrolyte replacement drinks or "Sports Drinks" should be used to replace essential minerals lost during sweating. Sports drinks should supplement water intake e.g. one "sport drink" to every three bottles of water (3 waters : 1 sport drink)

2. During the Tailgate Safety Meeting and site briefings identify and communicate the type and location of the water source. The water source must provide suitably cool, fresh, and pure water in sufficient quantity for all employees at the site. Water shall be provided free of charge or expenses will be reimbursed for employees. If the source is potable plumbed water do not complete Item 6 of this Section.

3. Communicate to staff whether all water for the day will be provided at the start of the shift (e.g., 2 gallons / 8 L per employee for an 8-hour shift), or how and when water will be replenished.

NOTE: A sufficient quantity of water must always be present and readily accessible to allow every employee to consume at least 1 quart (1L) of water per hour. It is suggested to have a minimum of three hours supply of water per employee on hand.

4. Water supplies must be positioned as close as reasonable possible to site workers. Placing water only in shaded areas or by toilet facilities is not sufficient, particularly at large work sites or at multi-story construction sites. Drinking water sources need to be close enough to workers to allow for routine consumption per the rate noted above.

5. Inspect the coolers / water dispensers for cleanliness and replenishment of water and cooling ice routinely based on temperatures and staff size. Cooling ice will be stored in clean coolers if added directly to water dispensers.

NOTE: If the site temperature exceeds 90° F / 32° C the frequency of the cooler inspection will increase to verify water remains cool and the water supply is maintained.

6. Oversee the daily inspection and maintenance of coolers to ensure they are kept clean and in good condition.

Potable Water Source & Location

<input type="checkbox"/>	Potable plumbed source	Location:	
<input checked="" type="checkbox"/>	Bottled water in chilled cooler	Location:	Field Support Strucks
<input type="checkbox"/>	Drinking water dispenser & cups	Location:	

Procedures for Provisions for Potable Water Continued

Check which applies. Must check at least one box, or provide additional detail.

<input checked="" type="checkbox"/>	Ice will be purchased at the start of each day.
<input checked="" type="checkbox"/>	Ice will be provided by an onsite source or vendor service. Ice to be potable
<input type="checkbox"/>	Alternative potable ice source: _____
<input checked="" type="checkbox"/>	Food safe cleaning product for water cooler.
<input checked="" type="checkbox"/>	Sufficient amount of drinking water cups for each employee per dispenser.
<input type="checkbox"/>	Other items needed: _____

Access to Shade

The SSO or designee is responsible for implementing the following for how shade will be coordinated and provided **when temperatures exceed 80° F / 26° C.**

1. Access to shade must be allowed at all times. Before the start of work, the location of the shade areas, the importance of taking shade breaks, recognizing the signs and symptoms of heat illness, the schedule of shade breaks, and the location of shade break locations (if not portable) will be addressed during each Tailgate Safety Meeting and site briefing.

NOTE: Where required by regulation, shade breaks will be taken at a minimum rate of 10 minutes of shade for every two hour work period. As temperature increases shade breaks will increase in frequency. See the Heat Index table below for Heat Index specific Action Levels defining shade break frequency and duration.

2. The amount of shaded area must be able to accommodate all employees taking a recovery or rest break including employees on meal breaks. The shaded area(s) don't need to provide shade to accommodate **all employees** on a site or working a shift at the same time. An example includes rotating routine breaks among employees. Also, additional portable shade structures can be erected on an "as-needed" basis.

Employees must have enough shaded space so they can sit in a normal posture fully in the shade with enough space to allow for sitting without being in physical contact with each other. Employees who desire access to shade must not be deprived of it due to lack of space.

3. Employees who take a preventative cool-down rest;

(1) shall be monitored and asked if they are experiencing symptoms of heat related illness. (2) shall be encouraged to remain in the shade. (3) shall not be ordered back to work until signs or symptoms of heat illness have abated, but in no event less than 5 minutes in addition to the time needed to access the shade.

If an employee exhibits signs or symptoms of heat illness while taking a preventative cool-down rest the SSO will provide appropriate support (e.g. additional hydration and/or call to WorkCare) or emergency response support as needed based on symptoms.

4. Shade structures will be relocated to follow the crew for moving tasks. Shade structures will be placed within 50 feet of the work area, if practical. Shade structures must be no further than a short walk away (e.g. 2-3 minutes) from the work area. This consideration becomes more critical as the temperature rises above 80° F (26 C).

Access to Shade Continued

5. In situations where it is not safe or feasible to provide shade, the SSO will document in the HASP Supplement the unsafe or unfeasible conditions, and include the steps taken to provide alternative cooling measures equivalent to shade.

Unsafe/unfeasible conditions: _____

Alternative Cooling Measures Implemented:

<input checked="" type="checkbox"/>	Provide vehicles with working air conditioner to all employees for rest breaks / recovery breaks / meal breaks.
<input type="checkbox"/>	Provide temporary or mobile shade structure(s) that are either ventilated or open to air movement (Secure against wind.)
<input type="checkbox"/>	Provide a building / permanent structure(s) in close proximity to the work area with a cooling environment via mechanical ventilation or open to air movement which will be used for shade. (Job trailer, pavilion, manufacturing building, etc.)
<input type="checkbox"/>	Other: _____

Monitoring of Weather and Heat Index Table

1. The SSO or designee must check the extended weather forecast in advance of the upcoming work on a weekly basis. Work schedules will be adjusted in advance, taking into consideration whether high temperatures or a heat wave is expected.

Accepted weather forecasting resources include webpages "NOAA.gov" or "weather.com" or see the NIOSH Heat Tool (formerly the OSHA Heat Tool app)

<https://www.cdc.gov/niosh/topics/heatstress/heatapp.html>

2. Before work starts for the day or shift, the SSO will review the forecasted temperature and humidity for the (exterior) work site and compare conditions against the National Weather Service Heat Index (below) to evaluate the risk level for heat illness. Determination will be made of whether or not workers will be exposed to a combination of temperature and humidity characterized as "Caution", "Extreme Caution", "Danger" or "Extreme Danger" for heat illnesses.

NOTE: It is important to know the temperature at which these warnings occur. When working outdoors see the Heat Index Table in this supplement for Action Level specific instructions for hazard controls.


3. Where state regulations indicate a thermometer or similar on-site monitoring device will be used at the job site to monitor for sudden increases in temperature. The SSO will be responsible for obtaining a thermometer/weather station prior to the start of work and make it readily visible / accessible where it can easily be monitored throughout the course of the day.

NOTE: If the temperature is **> 80° F (26 C)** shade structures will be opened and made available to workers. If temperature is **≥ 95° F (35 C)** additional preventive measures will be implemented.

Monitoring of Weather and Heat Index Table

		Relative Humidity (%)																			
		5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
Temperature (°F)	80	77	78	78	79	79	79	80	80	80	81	81	82	82	83	84	84	85	86	86	87
	81	78	79	79	79	80	80	81	81	82	82	83	84	85	86	86	87	88	90	91	93
	82	79	79	80	80	80	81	81	82	83	84	85	86	88	89	90	91	93	95	97	99
	83	79	80	80	81	81	81	82	82	83	84	85	86	87	88	90	91	93	95	97	99
	84	80	81	81	81	82	82	83	83	84	85	86	88	89	90	92	94	96	98	100	103
	85	81	81	82	82	82	83	84	84	85	86	88	89	91	93	95	97	99	102	104	107
	86	81	82	83	83	83	84	85	85	87	88	89	91	93	95	97	100	102	105	108	112
	87	82	83	83	84	84	85	86	87	88	89	91	93	95	98	100	103	106	109	113	116
	88	83	84	84	85	85	86	87	88	89	91	93	95	98	100	103	106	110	113	117	121
	89	84	84	85	85	86	87	88	89	91	93	95	97	100	103	106	110	113	117	122	
	90	84	85	86	86	87	88	89	91	92	95	97	100	103	106	109	113	117	122	127	
	91	85	86	87	87	88	89	90	92	94	97	99	102	105	109	113	117	122	126	132	
	92	86	87	88	88	89	90	92	94	96	99	101	105	108	112	116	121	126	131		
	93	87	88	89	89	90	92	93	95	98	101	104	107	111	116	120	125	130	136		
	94	87	89	90	90	91	93	95	97	100	103	106	110	114	119	124	129	135	141		
	95	88	89	91	91	93	94	96	99	102	105	109	113	118	123	128	134	140			
	96	89	90	92	93	94	96	98	101	104	108	112	116	121	126	132	138	145			
	97	90	91	93	94	95	97	100	103	106	110	114	119	125	130	136	143	150			
	98	91	92	94	95	97	99	102	105	109	113	117	123	128	134	141	148				
	99	92	93	95	96	98	101	104	107	111	115	120	126	132	138	145	153				
	100	93	94	96	97	100	102	106	109	114	118	124	129	136	143	150	158				
	101	93	95	97	99	101	104	108	112	116	121	127	133	140	147	155					
	102	94	96	98	100	103	106	110	114	119	124	130	137	144	152	160					
	103	95	97	99	101	104	108	112	116	122	127	134	141	148	157	165					
	104	96	98	100	103	106	110	114	119	124	131	137	145	153	161						
105	97	99	102	104	108	112	116	121	127	134	141	149	157	166							
106	98	100	103	106	109	114	119	124	130	137	145	153	162	172							
107	99	101	104	107	111	116	121	127	134	141	149	157	167								
108	100	102	105	109	113	118	123	130	137	144	153	162	172								
109	100	103	107	110	115	120	126	133	140	148	157	167	177								
110	101	104	108	112	117	122	129	136	143	152	161	171									
111	102	106	109	114	119	125	131	139	147	156	166	176									
112	104	107	111	115	121	127	134	142	150	160	170	181									
113	104	108	112	117	123	129	137	145	154	164	175										
114	105	109	113	119	125	132	140	148	158	168	179										
115	106	110	115	121	127	134	143	152	162	173	184										
116	107	111	116	122	129	137	146	155	166	177											
117	108	112	118	124	132	140	149	159	170	181											
118	108	113	119	126	134	142	152	162	174	186											
119	109	114	121	128	136	145	155	166	178												
120	110	116	122	130	138	148	158	170	182												
121	111	117	124	132	141	151	162	174	187												
122	111	118	125	134	143	154	165	178													
123	112	119	127	136	146	157	169	182													
124	113	120	129	138	148	160	172														
125	114	121	130	140	151	163	176														

Heat Index



Extreme Danger	Heat stroke likely.
Danger	Sunstroke, muscle cramps, and/or heat exhaustion likely. Heatstroke possible with prolonged exposure and/or physical activity.
Extreme Caution	Sunstroke, muscle cramps, and/or heat exhaustion possible with prolonged exposure and/or physical activity.
Caution	Fatigue possible with prolonged exposure and/or physical activity.

Note: The Heat Index table was developed with an expectation of partial shade & light wind conditions present. Work conducted in direct / full sunlight (e.g. no partial shade) and no wind adds up to 15° F (8° C) to the Heat Index evaluation.

Monitoring of Weather and Heat Index Table Continued

Heat Index Action Levels. Below are recommended additional controls. Each level of additional controls is additive as the temperature increases.

	<p>CAUTION 80° - 89° F (26° - 32° C). Implement one or more of the following measures: Provide and direct hydration, schedule breaks, ensure lightweight clothing is worn, provide break areas with shade / ventilation / air conditioning.</p>
	<p>EXTREME CAUTION 90° - 97° F (32° - 39° C). Implement all the previous and add one or more of the following: Provide light duty PPE, cooled break areas, shaded work areas. NOTE: "Light Duty PPE" includes hard hat sun shades, sun hats, dry or wet evaporative cooling vests, microfiber cooling towels / scarves / headbands / hard hat suspension inserts or sweatbands, hard hat neck shades.</p>
	<p>DANGER 98° - 107° F (39° - 43° C). Implement all the previous and add one or more of the following: cooled work areas, modified work schedule, heavy duty PPE, and personnel physiological monitoring. NOTE: "Heavy Duty PPE" phase-change cooling vests, gel pack or ice pack equipped cooling vests. Consider engineering controls such as forced ventilation.</p>
	<p>EXTREME DANGER $\geq 108^\circ$ F ($\geq 44^\circ$ C). If working at this temperature or greater Stop Work until conditions change or hazards are effectively controlled via the items listed above. At this range of temperatures it is critical to implement personnel vital sign monitoring for determining the appropriate frequency and duration of Work / Rest cycles.</p>

Work / Rest Cycle Duration and Frequency Process

Because the incidence for heat stress depends on a variety of factors, all workers regardless if they are wearing permeable or semi-permeable clothing, should be monitored. If semi-permeable clothing is worn (e.g. **not** standard cotton or synthetic work clothing) begin monitoring those workers when temps exceed 70° F in the work area. This becomes of particular importance when work is conducted indoors, includes strenuous tasks, and additional PPE is worn such as Level C respiratory protection or chemical protective clothing (CPC) is worn.

NOTE: Warning signs include when a persons sustained heart rate exceeds 180 beats per minute minus their age (e.g., 180 - age = X) for individuals with normal cardiac performance per their physician; or a body core temperature exceeding 101.3° F / 38.5° C for acclimatized workers or 100° F / 38° C for unacclimated workers.

Suggested Frequency and Duration of Work / Rest Cycles Applying Physiological Monitoring of Acclimatized Personnel

Adjusted Temp. (1)	Permeable PPE (2)	Impermeable PPE
≥ 90° F / 32° C	After ea. 45 mins. of work	After ea. 15 mins. working
87.5-90° F / 30.8-32.2° C	After ea. 60 mins. of work	After ea. 30 mins. Working
82.5-87.5° F / 28.1-30.8° C	After ea. 90 mins. of work	After ea. 60 mins. Working
77.5-82.5° F / 25.3-28.1° C	After ea.120 mins. of work	After ea. 90 mins. Working
72.5-77.5° F / 22.5-25.3° C	After ea.150 mins. of work	After ea. 120 mins. Working

NOTES:

(1) Adjusted air temp (ta adj) calculation: $ta\ adj\ F = ta\ F + (13 \times \% \text{ sunshine})$. Measure the air temperature (ta) with a thermometer (shielded from radiant heat). Estimate the percent sunshine by judging what percent time the sun is not covered by clouds that are thick enough to produce a shadow. (100 percent sunshine = no cloud cover and a sharp, distinct shadow; 0 percent sunshine = no shadows.)

(2) Permeable PPE consists of cotton clothing with long sleeves and pants or breathable coveralls.

Heart Rate Monitoring

Count the radial pulse (located on the inside of the wrist below the thumb) during a 30 second interval before the start of work to establish a baseline heart rate. During rest cycles count the heart rate as early as possible at the beginning of the rest cycle.

- If the heart rate exceeds 110 beats per minute at the beginning of the rest period, shorten the next work cycle by one-third and keep the rest period the same.
- If the heart rate still exceeds 110 beats per minute at the next rest period, shorten the following work cycle by one-third.

Body Temperature Monitoring

Oral temperature. Use a clinical thermometer (3 minutes under the tongue) or a forehead infrared type device to measure the body temperature at the end of the work period (If using an oral thermometer record temperature before drinking liquids).

- If oral temperature exceeds 99.6°F (37.6°C), shorten the next work cycle by one-third without changing the rest period.
- If oral temperature still exceeds 99.6°F (37.6°C) at the beginning of the next rest period, shorten the following work cycle by one-third.
- Do not permit a worker to wear a semi-permeable or impermeable garment when his/her oral temperature exceeds 100.6 °F (38.1 °C).

Procedures for High Heat Conditions and Heat Waves

These procedures are additional preventative measures to be implemented when the temperature is > 95° F (35° C). The SSO or designee is responsible for ensuring effective observation and monitoring of employees during periods of high heat by implementing one or more of the following procedures:

1. SSO or designee will supervise 20 or fewer employees.
2. The “Buddy System” is mandatory. Conduct routine checks for early signs of Heat Illness. Set and verify routine consumption of water & sports drinks in a 3:1 ratio.
3. Maintain regular communication between Project Manager or SSO / designee and field staff (e.g. via mobile phone, radio or another effective means) for observation of early signs of heat illness.
4. Designate one or more employees as authorized to contact emergency medical services and communicating that if no designate is identified and the SSO is unavailable that any employee can call for emergency medical assistance.
5. Modify work schedule to avoid hottest parts of the day (e.g. start work earlier in the AM, stop work for the hottest hours of the day, conduct work during the evening).

Additionally, tailgate Safety Meetings will include a review the high heat procedures, encourage employees to drink plenty of water, and remind employees of the importance to take a preventative or recovery cool-down rest when necessary.

Employees will be observed for alertness and signs and symptoms of heat illness at regular intervals to be documented in the field book or field log.

The “Buddy System” must be implemented. Particular attention needs to be paid to new employees or employees who have yet to acclimate to high heat conditions. Additionally, frequent communication will be maintained with employees working by themselves (via cell phone or two-way radio), to evaluate early warning signs and symptoms of heat illness.

When the SSO is not available, an alternate responsible person must be assigned to look for signs and symptoms of heat illness. Such a designated observer will be trained and know what steps to take if heat illness occurs.

"Heat Wave" Procedures

A "heat wave" as defined by NOAA, is a period of abnormally and uncomfortably hot and unusually humid weather." Typically, a heat wave lasts 2 or more days. A "Heat Wave" as defined for the purposes of this Standard is when temperatures are sustained above 80° F (26° C). During a heat wave or if site conditions indicate the potential for "Extreme Caution", "Danger" or "Extreme Danger" per the NOAA Heat Index Table the following steps will be taken:

Work schedules will be modified to protect workers from heat illnesses. The SSO or designee in coordination with the project team, will use their Stop Work Authority and evaluate the following actions and document the action in the daily field log

1. Modify work hours to exclude the hottest parts of the day.
2. Reschedule work or specific tasks that require strenuous exertion or Stop Work.

If schedule modifications are not possible, the Heat Illness Prevention Plan will be reviewed before work resumes. At a minimum, procedures for heat illness prevention, the provisions of the high heat procedures, the weather forecast and emergency response protocols will be reviewed.

Employees will be provided with additional water and rest breaks and will be observed more frequently. During work activities and rest breaks, employees will be observed for signs and symptoms of heat illness.

All employees will maintain frequent communication with the SSO or designee, who will be monitoring workers for possible symptoms of heat illness. In the event of large project sites where the SSO may be unable to be near the workers (to directly observe or communicate with them), then communication via a cell phone or radio may be used for this purpose provided reception in the area is reliable.

Procedure for Emergency Response

Emergency procedures include recognizing the symptoms of heat related illness. A critical step also involves ensuring that effective communication is established either through voice, direct observation or electronic means such as via mobile phones or 2-way radios. In an emergency situation it is critical that employees understand the process and contact information for requesting emergency medical support. The reception coverage for the site must be evaluated and understood to ensure adequate communication is in place across the project site. During a heat wave or hot temperatures, workers will be reminded and encouraged to immediately report to the SSO any signs or symptoms of the onset of heat stress they are experiencing.

Procedure for Emergency Response Continued

The SSO or designee is responsible for implementing the following procedures for emergency response. These procedures include, but are not limited to, the following:

- 1.** Prior to assigning staff to a particular work site, during the Tailgate H&S Safety Meeting all site workers will review the HASP along with the identified Hospital precise directions (such as streets or road names, distinguishing features, and distances to major roads), to avoid a delay of emergency medical services.
- 2.** Prior to work, efforts will be made to ensure that a qualified, appropriately trained and equipped personnel are consistently available to render first aid.
- 3.** Prior to the morning Tailgate Safety Meeting, an evaluation of whether or not a language barrier is present at the site for understanding the necessary preventative measures and emergency notifications procedures can be completed. Necessary steps will be taken (such as assigning the responsibility to call emergency medical services to the SSO or an English speaking worker) to ensure that emergency medical services can be immediately called in the event of an emergency.
- 4.** All SSOs and supervisors will carry cell phones or other means of communication to ensure that emergency medical services can be called. Routine checks will be made to ensure the devices are allowed on site, have adequate reception across the site, and are functional prior to each shift.
- 5.** When an employee reports symptoms, or displaying symptoms of possible heat illness, steps will be taken immediately to keep the affected employee cool and comfortable. Evaluate whether 1st aid is to be administered or emergency services are to be contacted or the employee is to be taken to an emergency facility for care.

Procedure for Handling a Sick Employee

Signs of Heat Stress: Excessive fatigue, heavy sweating, headaches, abdominal and/or upper thigh cramps, mild dizziness, elevated pulse.

Signs of Heat Exhaustion: Cool, moist, pale or flushed skin, nausea or vomiting, disorientation or confusion.

Signs of Heat Stroke: Hot, red skin which can feel dry to the touch, or moist from overexertion, changes in consciousness, rapid or weak pulse, shallow rapid breathing.

The SSO or designee is responsible for implementing the following procedures for evaluating and providing care for a sick employee:

- 1.** When an employee displays signs or symptoms consistent with the heat related illness, the SSO or designee will check the sick employee and determine whether resting in the shade and drinking cool water will suffice or if emergency service providers will need to be called.

If determined to be a **non-emergency (e.g. heat cramps or heat stress)** the SSO will contact WorkCare Injury Assistance Hotline 1-888-449-7787 for non-emergency 1st aid level medical assistance. In the event of the injury being an **emergency**, or potentially (**e.g. Heat Exhaustion or Heat Stroke**) contact emergency support services.

BLOODBORNE PATHOGEN EXPOSURE CONTROL PLAN

(HASP Template 5-30-18)

ARCADIS OFFICE/PROJECT: Melville, NY - Northrop Grumman RW-21 Project Area	
WRITTEN BY: Thomas Darmon	DATE WRITTEN: 5/1/2019
REVISED BY:	DATE REVISED:

Purpose:

Each Arcadis field office or project site that designates employees to render first aid as part of their job duties, are required to develop a written Bloodborne Pathogen Exposure Control Plan (“ECP”). The plan may be used in this format or incorporated in another way into the project HASP.

The purpose of the ECP is to eliminate or minimize employee exposure to bloodborne pathogens. It will be accessible to all employees and reviewed at least once per year. The ECP does not apply to employees who have not been designated to render first aid.

Definitions:

Bloodborne Pathogens (“BBP”) are microorganisms present in human blood including, but not limited to, HBV (Hepatitis B virus) and HIV (human immunodeficiency virus).

BBP Exposure is a specific eye, mouth, mucous membrane, or non-intact skin (e.g., bites, cuts, abrasions) contact with another person’s blood or other body fluid contaminated with blood.

Employees, for purposes of this ECP, are employees who have been designated to render first aid as part of their job duties.

First Aid, for purposes of Arcadis employees, includes rendering basic first aid and adult CPR, but does not include injections, intravenous interventions or any other invasive procedure, technique or treatment.

Victim is the person who is being given first aid.

Exposure Determination

The following employees have the potential for occupational exposure to BBPs because they have been designated to render first aid as part of their job responsibilities:

EMPLOYEE NAME & JOB TITLE (To be Filled out by Project Team as project evolves)

1. _____
2. _____
3. _____
4. _____
5. _____

Methods of Compliance

To help prevent exposure, we will follow "Universal Precautions". That is, the victim's blood and other bodily fluids will be treated as if known to be infectious for BBPs.

Materials and equipment detailed below may be kept in a first aid kit if that kit will be available to the employee at sites where he/she is expected to render first aid.

Engineering and work practice controls will be used to minimize the risk of employee exposure, and they are:

- o Employees will wash their hands and other potentially contaminated skin with antiseptic soap and water as soon as possible after removal of PPE.
- o Employees will flush mucous membranes with water as soon as possible after contact with potentially infectious materials.
- o If hand washing facilities are or may not be available, employees will be given an antiseptic hand cleanser to use immediately, and will wash their hands and other potentially contaminated skin with antiseptic soap and water as
- o Employees will try and minimize splashing, spraying, or spattering of blood or body fluids.

Personal protective equipment will be provided and employees are expected to have this equipment with them on any job site at which they are expected to render first aid. If an employee refuses to wear PPE, the manager will investigate and document the circumstances and any action taken.

Employees will be given and instructed on the proper use, maintenance and disposal of the following PPE:

- o Disposable gloves (non-latex gloves are preferred)
- o Eye protection (goggles with adjustable straps or face shields)
- o Mouth guard for mouth-to-mouth resuscitation
- o Disposable mask

If required to clean a surface that has been potentially contaminated with BBPs, the employee will wear gloves and will clean the area with disinfectant. Gloves and cleaning items will be discarded as noted below.

Any sharp object that has been contaminated (e.g., broken glass, piece of metal) will be picked up with a brush/dust pan rather than the hands and discarded as noted below.

Items contaminated with a victims blood or other body fluids will be placed in a closable and puncture/leak resistant biohazard trash bag labeled with the below red/red-orange symbol:



o The bag will be disposed of at or by [check with local resources on how to dispose of these bags – a local clinic, hospital or your trash local clinic, hospital or your trash pick-up company should be able to advise you – and note it here]:

If contaminated sharps (e.g., needles, metal or glass) or other contaminated material is an expected/potential hazard at a project site, the HASP will include instruction for its removal by a professional company/service. If such items are unexpectedly found at a site, Stop Work, isolate the area in question, contact the client and discuss with the client options for contracting with a professional company service for cleanup and removal.

Hepatitis B Vaccination Series

Employees who are designated to render first aid as part of their job duties will be offered the Hepatitis B vaccination series after they've received the required BBP training. The vaccination series is offered without cost to the employee and consists of three injections.

[Employees who decline the injection will be asked to sign a Hepatitis B Declination form \(Appendix 1- from the Arcadis Bloodborne Pathogens Exposure Control Plan Template\)](#)

which will be placed in the employee's Corporate Health and Safety file. If an employee later decides to have the vaccination and is still designated to provide first aid, the vaccination will be made available at no cost to the employee.

Post Exposure Evaluation and Follow-Up

If an employee feels that he/she has had an exposure to a BBP, the employee will be sent for a medical evaluation if the employee so chooses. The employee's supervisor or a manager will complete the medical provider information form (Attachment 1) and send it with the employee to the evaluation.

The employee will receive a detailed report from the medical provider, and Arcadis will receive notification that the employee has been informed of the results of the evaluation and any recommended treatment.

The incident will also be reported to Corporate Health and Safety.

Training

All employees who are designated to render first aid will be given BBP training upon initial designation and annually thereafter. The training will be provided before the employee is offered the Hepatitis B vaccination.

Record Keeping

Medical records regarding an exposure to a BBP and Hepatitis B vaccination information will be maintained by the healthcare provider. Records provided to Arcadis will be maintained by Corporate Health and Safety permanently, and will be kept confidential and not disclosed without an employee's written consent except as required by law.

BBP exposure training records will be maintained in the Arcadis training database.

Attachment 1

INFORMATION TO THE MEDICAL PROVIDER FOLLOWING THE REPORT OF A BBP EXPOSURE

(To be completed by the employee's supervisor or manager or the project manager and sent with the employee to the medical evaluation)

Job Duties as They Relate To The Exposure Incident: The Employee is a designated first aid responder.

Route of Exposure: _____
(e.g., absorption through the skin, splashed in eyes, mouth or nose, etc.)

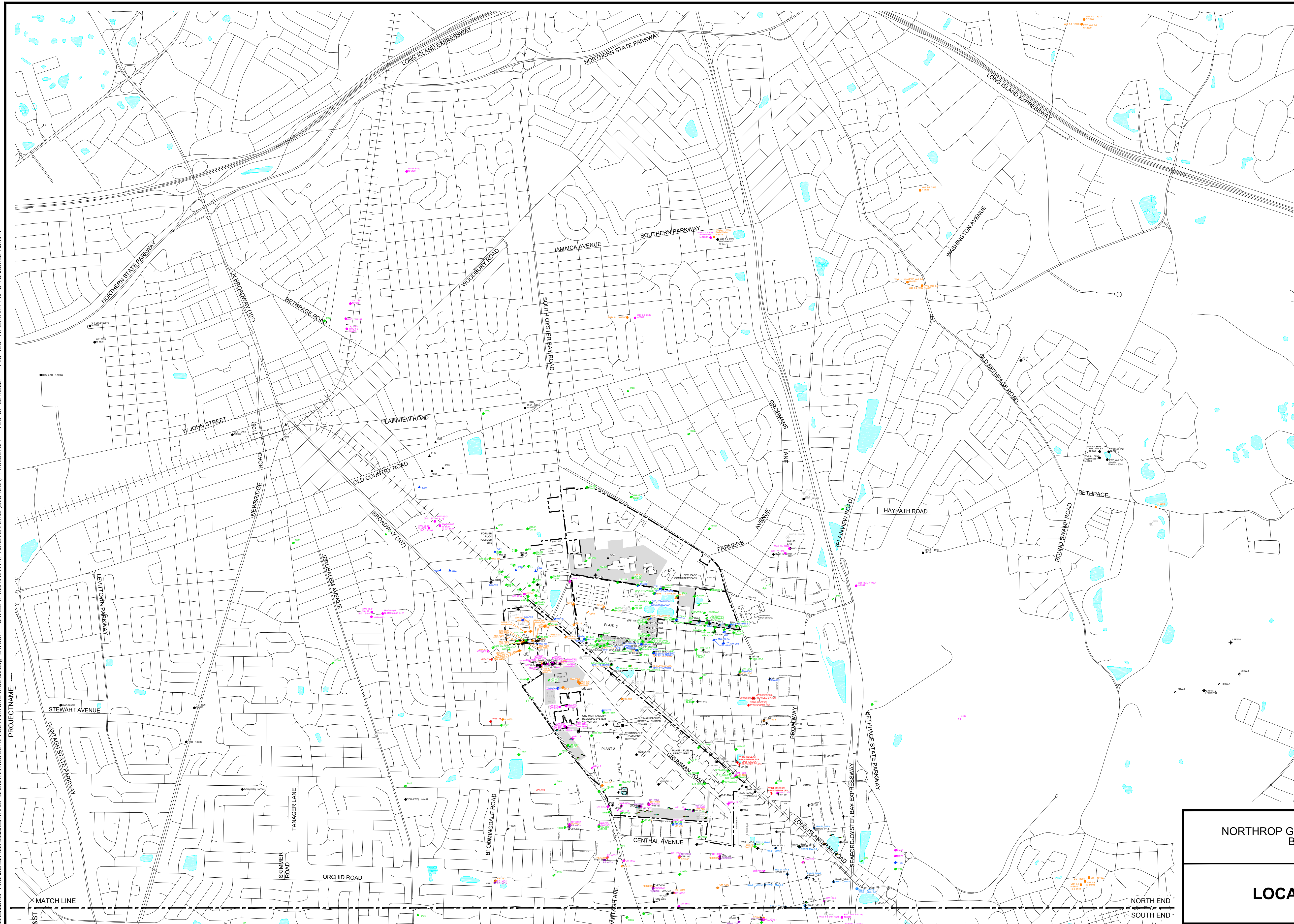
Circumstances Under Which Exposure Occurred: _____
(explain why the employee thinks he/she was exposed/came in contact with another person's blood or other bodily fluids)

Results of Source Individual's/Victim's Blood Test: _____
(if unavailable, if the blood hasn't been tested, if the source refused testing or the source is not known, note this)

The employee's medical records, including Hepatitis B vaccination status, should be sent with the employee if not already available to the medical provider.

A copy of the OSHA Bloodborne Pathogen Regulation will also be submitted to the medical provider if not already available to the provider.

CITY OF BETHPAGE, NY DIVISION OF ENVIRONMENTAL SERVICES, DP&A, SANCHEZ, LD&LS, PC(C)(1), PM(C)(1), TM(C)(1), LVR(C)(1), OFF-REF-
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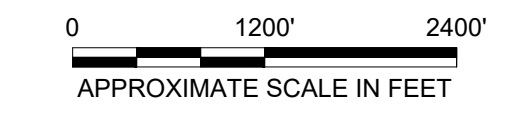
REVISED ON: January 17, 2019

NORTHROP GRUMMAN SYSTEMS CORPORATION
 BETHPAGE, NEW YORK

LOCATION MAP - NORTH

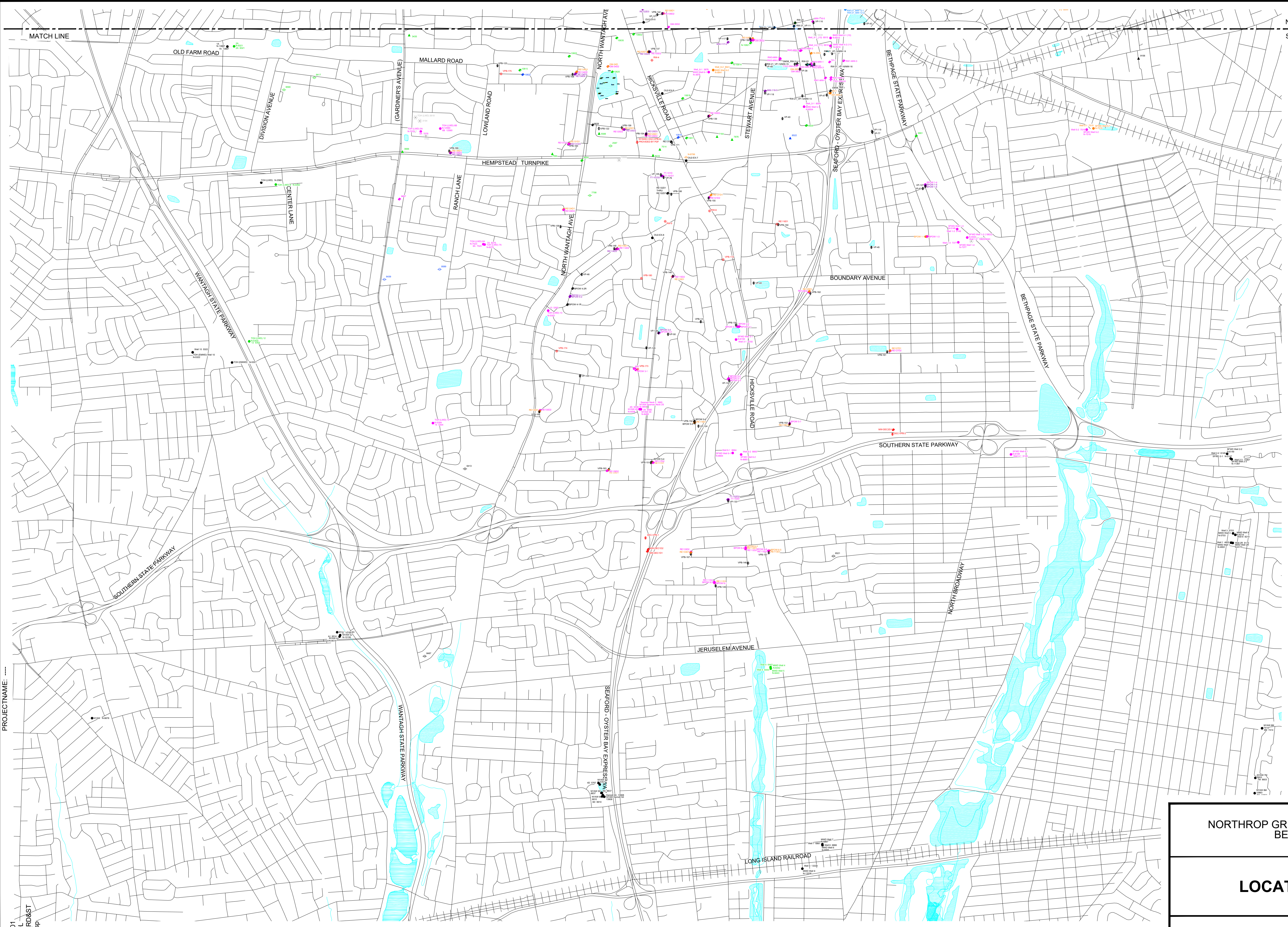
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FIGURE
1

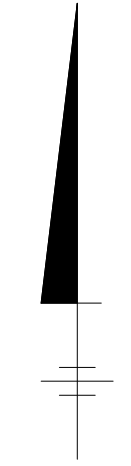


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NORTH END
SOUTH END



LEGEND:

- ABANDONED LOCATION
- MONITORING WELL
- PUBLIC SUPPLY WELL
- INDUSTRIAL WELL
- IRRIGATION WELL
- INJECTION WELL
- PRODUCTION/REMEDIAL WELL
- RECOVERY WELL
- VERTICAL PROFILE BORING
- NAVY VERTICAL PROFILE BORING
- NAVY VERTICAL PROFILE BORING TO BE INSTALLED
- GROUNDWATER HOT SPOT
- GROUNDWATER HOT SPOT REMEDIAL WELL
- SOIL BORING
- SOIL VAPOR EXTRACTION
- SHALLOW WELL
- INTERMEDIATE WELL
- DEEP WELL
- DEEP 2 WELL
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BETHPAGE, NEW YORK

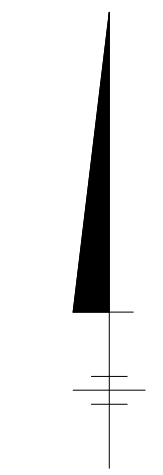
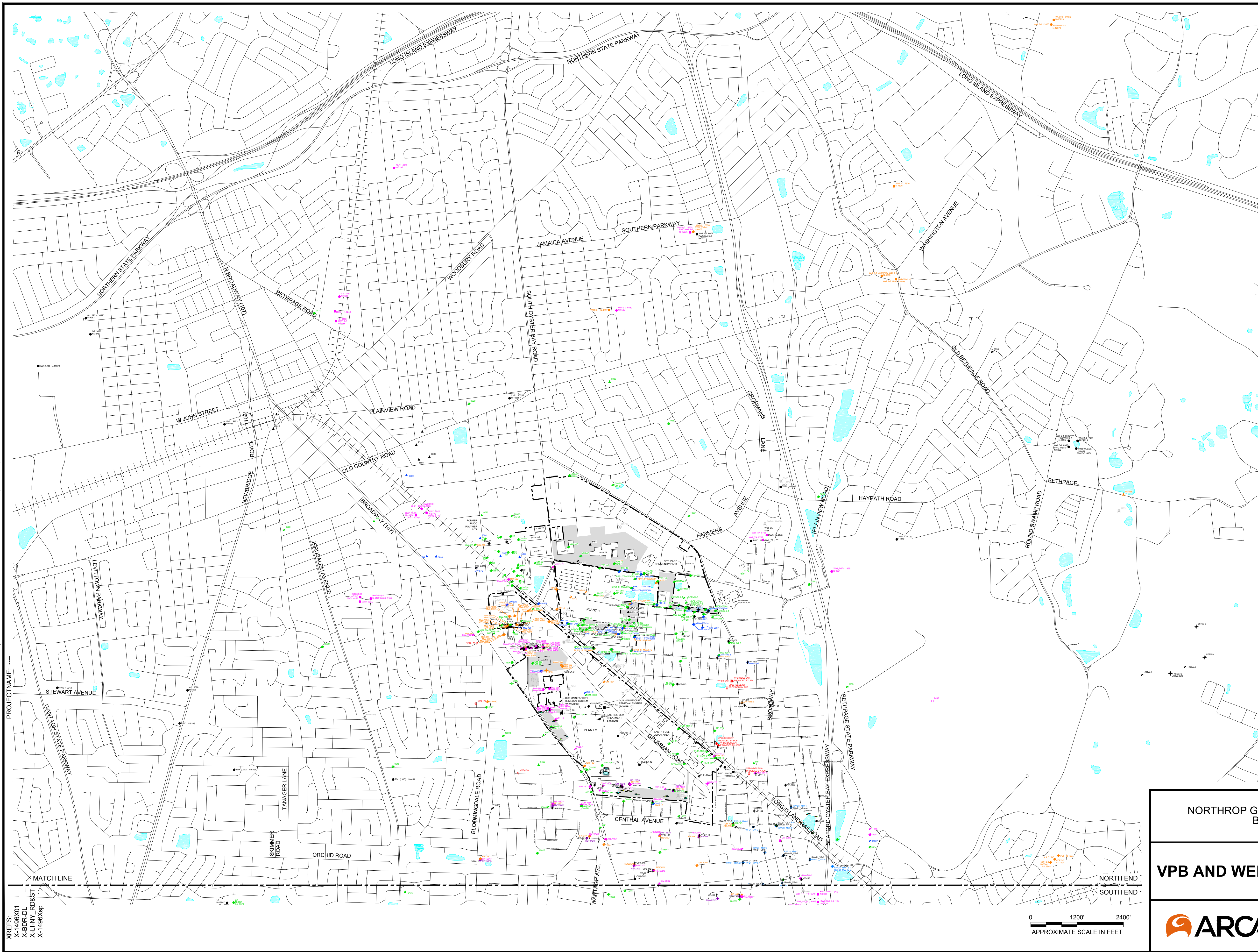
LOCATION MAP - SOUTH



FIGURE
2

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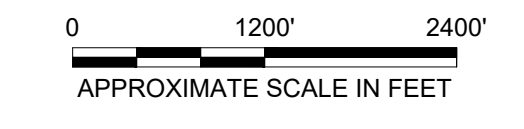
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VPB AND WELL LOCATION MAP - NORTH

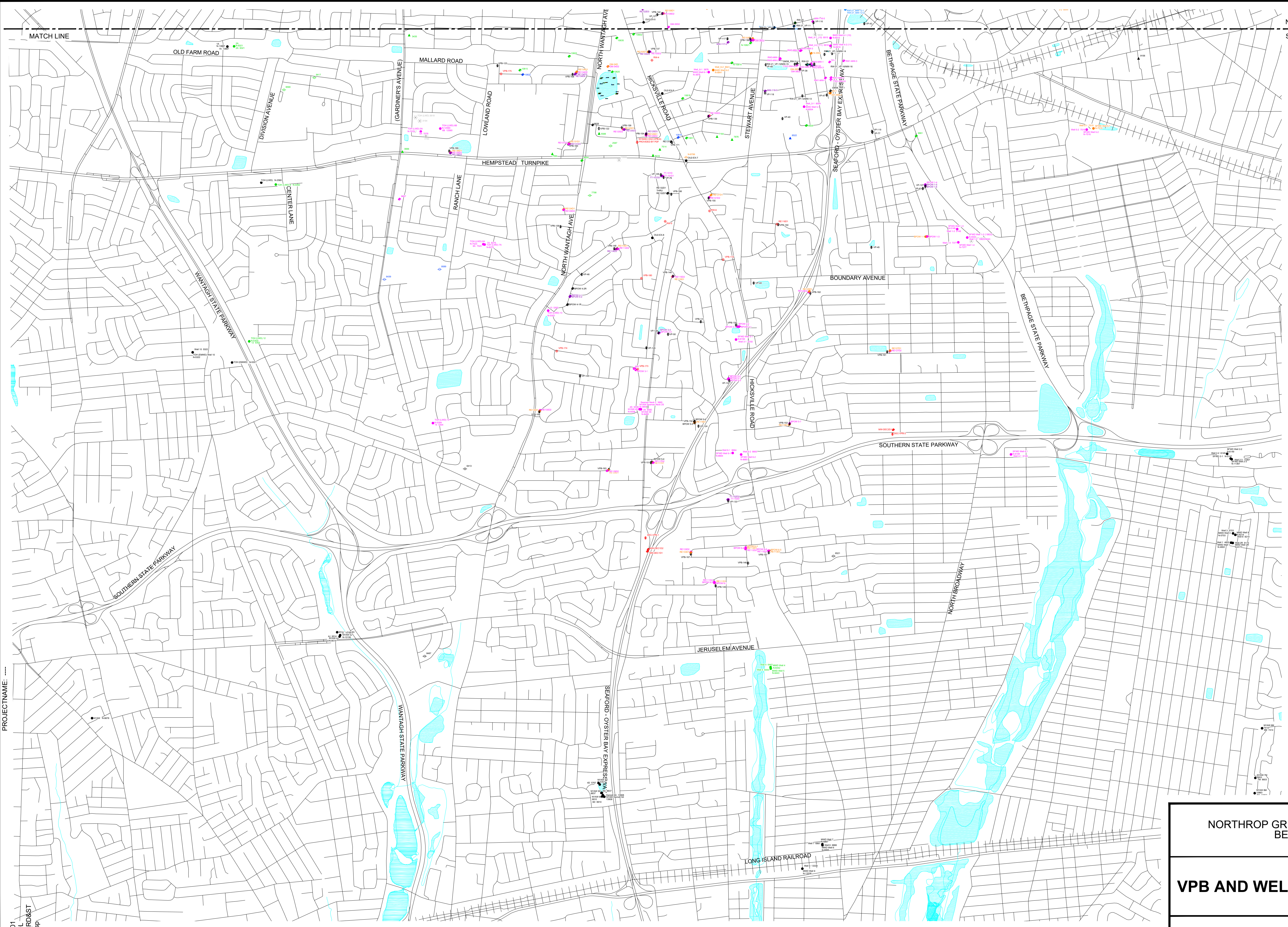
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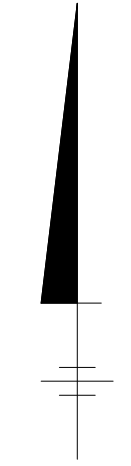


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NORTH END
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BETHPAGE, NEW YORK

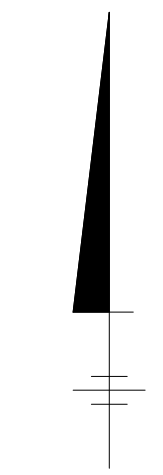
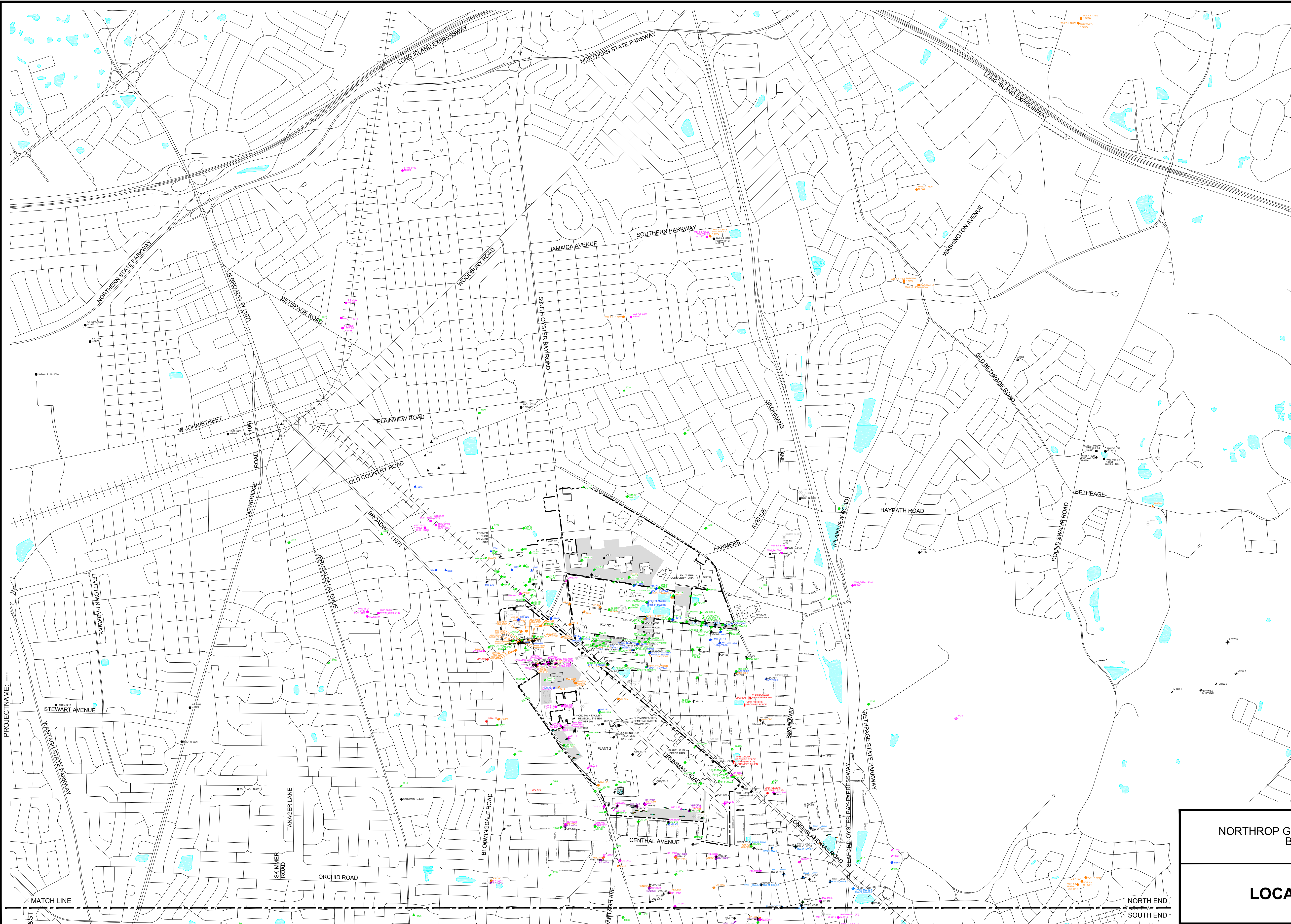
VPB AND WELL LOCATION MAP - SOUTH

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FIGURE
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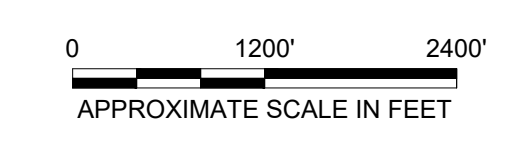
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NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

LOCATION MAP - NORTH



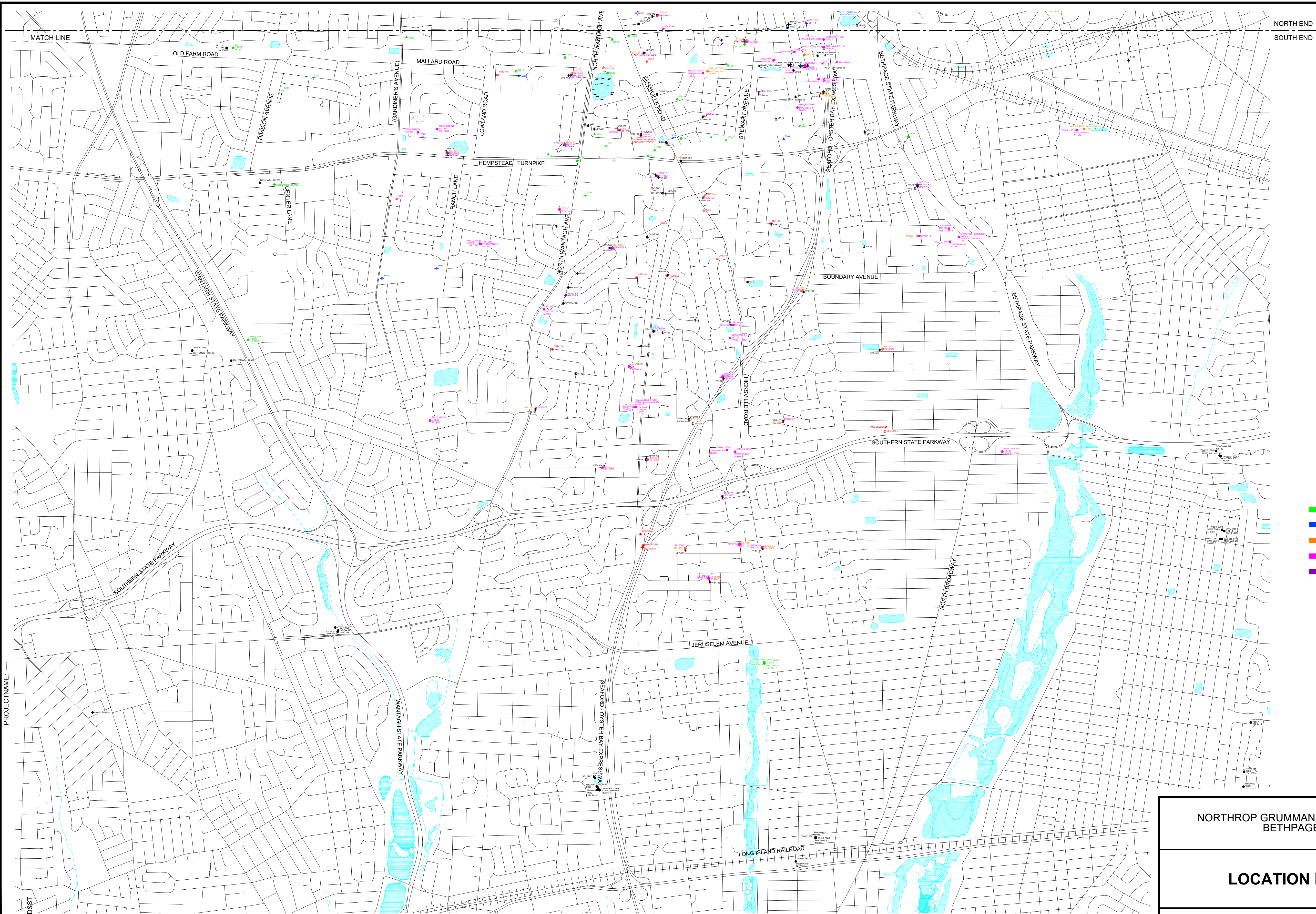
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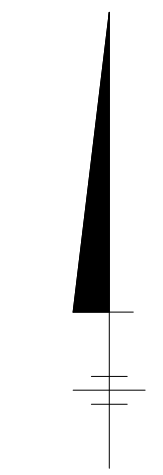
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NORTH END
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- VERTICAL PROFILE BORING
- GROUNDWATER HOT SPOT VERTICAL PROFILE BORING
- GROUNDWATER HOT SPOT REMEDIAL WELL
- SOIL BORING
- SOIL VAPOR EXTRACTION

- SHALLOW WELL
- INTERMEDIATE WELL
- DEEP WELL
- DEEP 2 WELL
- DEEP 3 WELL

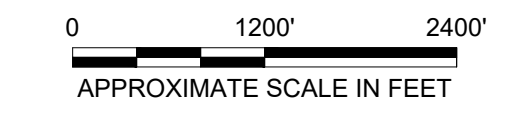
REVISED ON: January 17, 2019

NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

LOCATION MAP - SOUTH

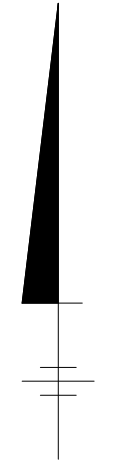
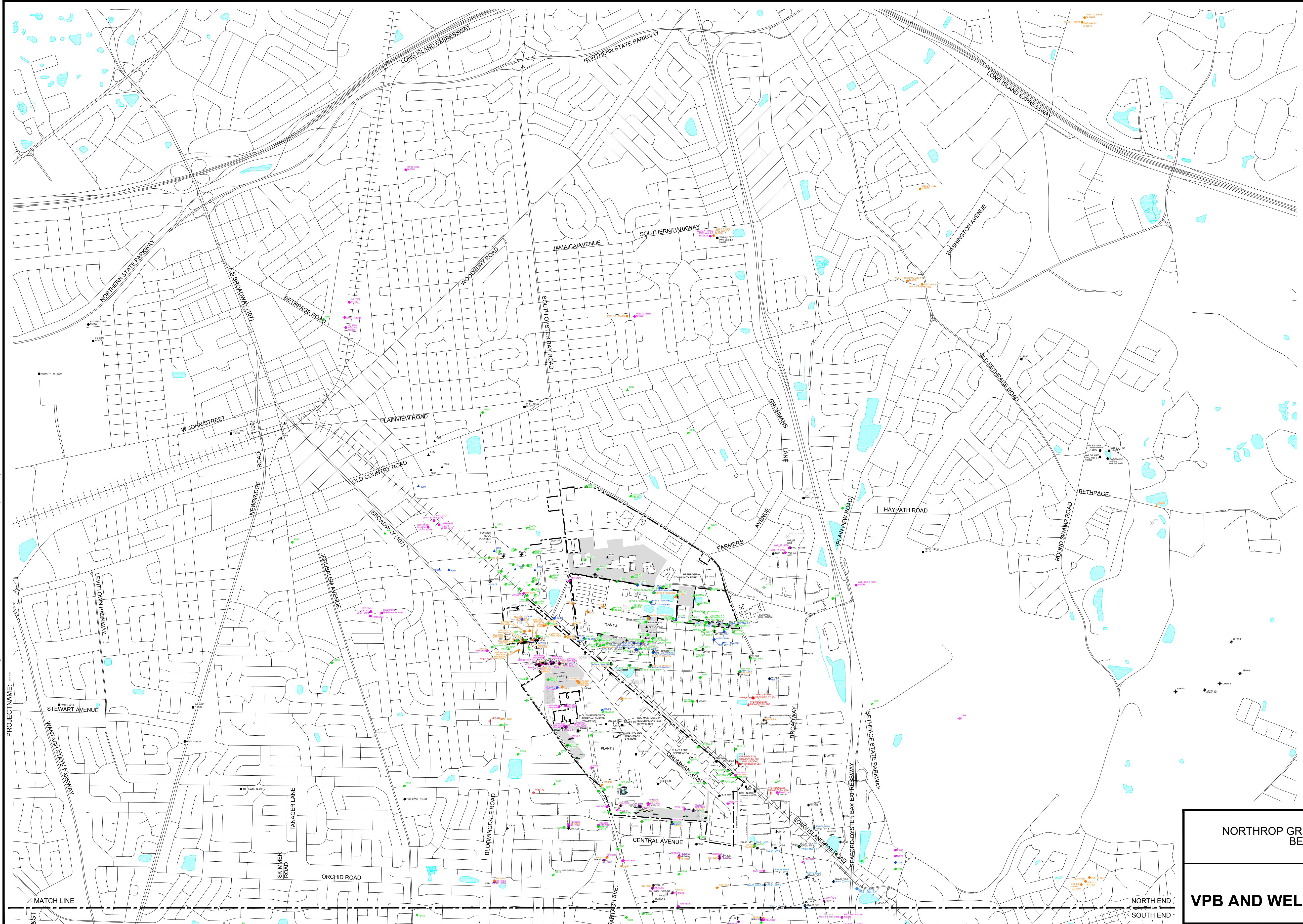
ARCADIS Design & Consultancy
for natural and built assets

FIGURE
2g



CITY OF BETHPAGE, NY DIVISION OF ENVIRONMENTAL SERVICES 1000 WOODBURY ROAD BETHPAGE, NY 11709
PROJECT NAME: NORTHROP GRUMMAN SYSTEMS CORPORATION BETHPAGE, NY
DATE: 1/17/2019 3:47 PM
PLOT STYLE TABLE: ...
PAGESETUP: ...
ACADVER: 2.1.0.8 (LMS TECH) PAGES: 1 OF 2
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PROJECT NAME: ...
MATCH LINE

XREFS:
X-1496X01
X-BDR-DL
X-LINT_RD8S1
X-1496XSP



LEGEND:

- ABANDONED LOCATION
 - MONITORING WELL
 - PUBLIC SUPPLY WELL
 - INDUSTRIAL WELL
 - IRRIGATION WELL
 - INJECTION WELL
 - PRODUCTION/REMEDIAL WELL
 - VERTICAL PROFILE BORING
 - NAVY VERTICAL PROFILE BORING
 - NAVY VERTICAL PROFILE BORING TO BE INSTALLED
 - GROUNDWATER HOT SPOT VERTICAL PROFILE BORING
 - SOIL BORING
 - SOIL VAPOR EXTRACTION
-
- SHALLOW WELL
 - INTERMEDIATE WELL
 - DEEP WELL
 - DEEP 2 WELL
 - DEEP 3 WELL

REVISED ON: January 17, 2019

NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

**NAVY
VPB AND WELL LOCATION MAP - NORTH**

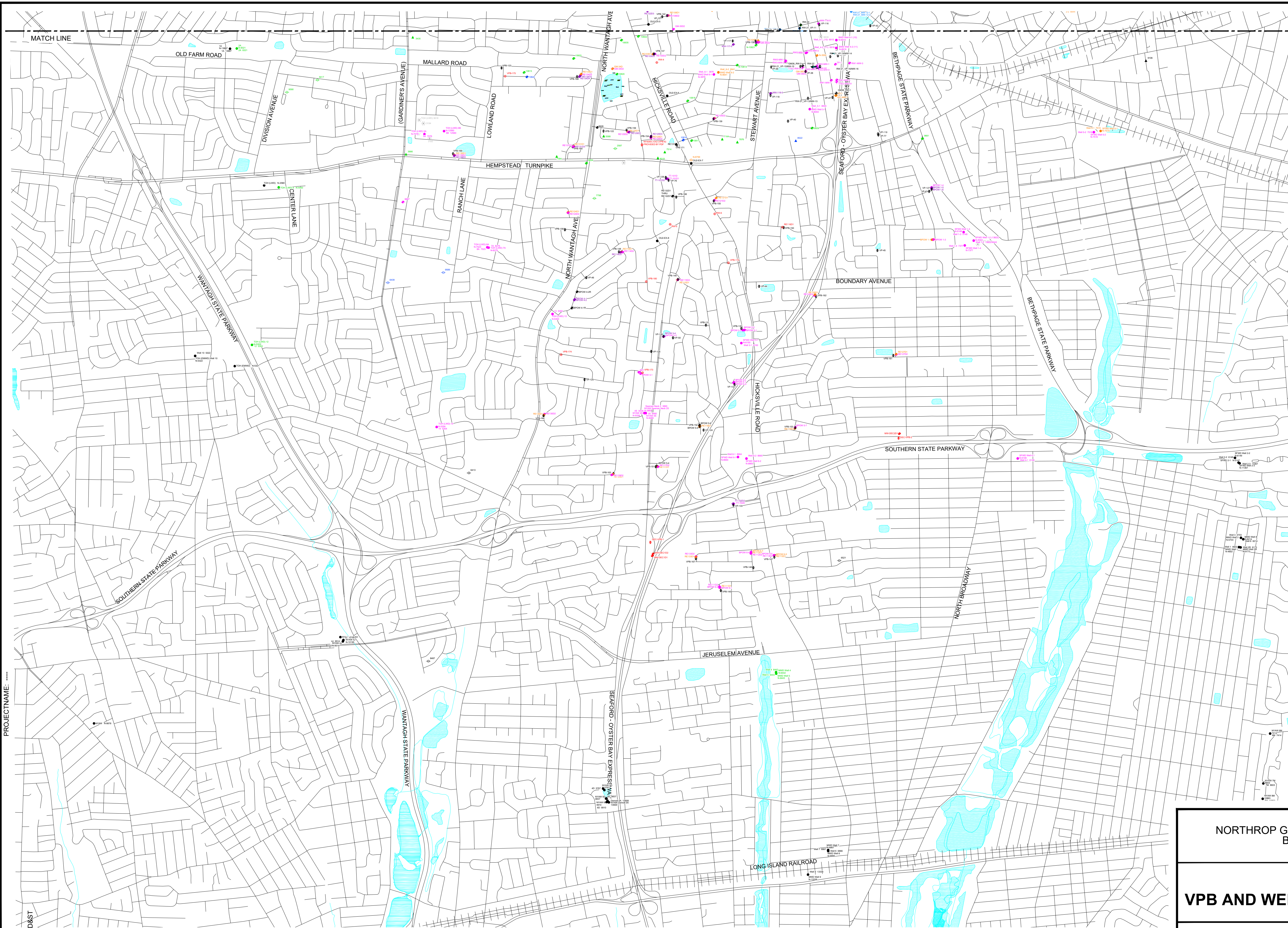


ARCADIS Design & Consultancy
for natural and built assets

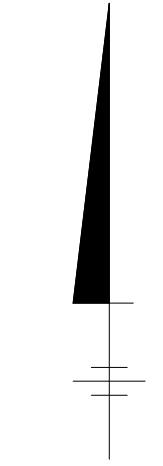
FIGURE
1n

CITY OF SYRACUSE, NY DIVISION OF ENVIRONMENTAL SERVICES, DR. A. SANCHEZ, LDALS, PLS (C/PL) PM (R/S/PL) TM (C/PL) LVL (C/PL) OFF-REF-
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PROJECT NAME: ...
XREFS:
X-1496X01
X-BDR-DL
X-LIN-L_RDBST
X-1496VSP



NORTH END
SOUTH END



LEGEND:

- ABANDONED LOCATION
- MONITORING WELL
- PUBLIC SUPPLY WELL
- INDUSTRIAL WELL
- IRRIGATION WELL
- INJECTION WELL
- PRODUCTION/REMEDIAL WELL
- VERTICAL PROFILE BORING
- NAVY VERTICAL PROFILE BORING
- NAVY VERTICAL PROFILE BORING TO BE INSTALLED
- GROUNDWATER HOT SPOT VERTICAL PROFILE BORING
- SOIL BORING
- SOIL VAPOR EXTRACTION
- SHALLOW WELL
- INTERMEDIATE WELL
- DEEP WELL
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- DEEP 3 WELL

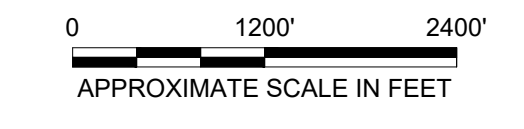
REVISED ON: January 17, 2019

NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

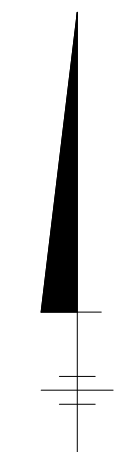
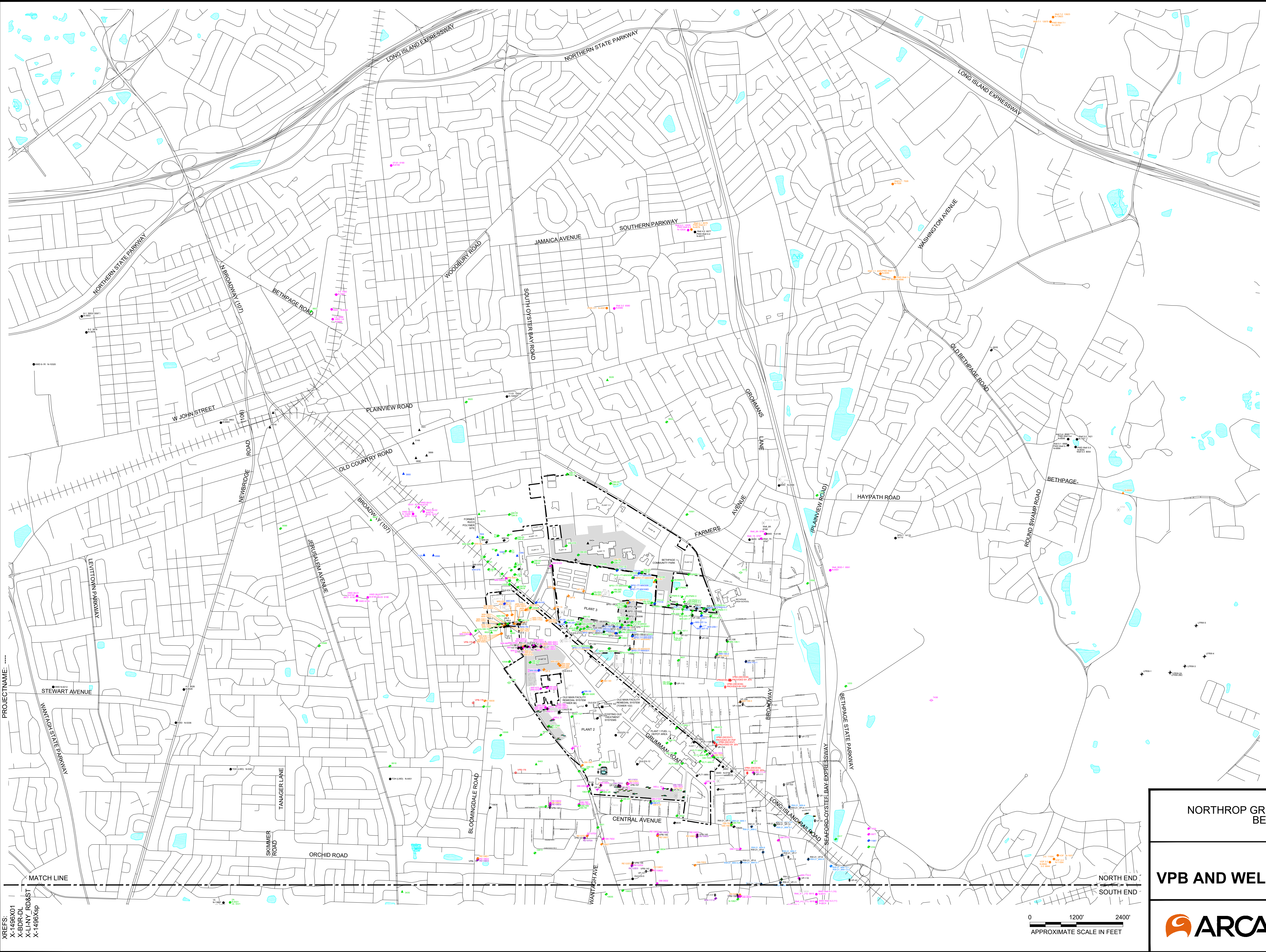
**NAVY
VPB AND WELL LOCATION MAP - SOUTH**

ARCADIS Design & Consultancy
for natural and built assets

FIGURE
2n



CITY: SYRACUSE, NY DIV: GROUNDWATER DBA: SANCHEZ, LDALS: PC(C)(H) PM(C)(H) TM(C)(H) LVL(C)(H)/O/C/F=REF- PLOTSTYLETABLE: PLOTTED: 1/17/2019 3:48 PM BY: SANCHEZ, ADRIAN
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X-BDR-DL
X-LINL_RD&ST
X-1496Xsp



- LEGEND:**
- MONITORING WELL
 - INJECTION WELL
 - VERTICAL PROFILE BORING
 - NAVY VERTICAL PROFILE BORING
 - NAVY VERTICAL PROFILE BORING TO BE INSTALLED
 - GROUNDWATER HOT SPOT VERTICAL PROFILE BORING
 - SHALLOW WELL
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 - DEEP 3 WELL

REVISED ON: January 17, 2019

NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

**OXY
VPB AND WELL LOCATION MAP - NORTH**

