CONTRACTOR DRAWINGS & INFORMATION SUBMITTAL
EFANENAVFACENGCOM 4335/3 (Rev. 6/80)

Prepare in quintuplicate (original and 4 copies)
CONTROL NO. 13

CONTRACT NO.	CONTRACT TASK ORDER NO.	ACTIVITY LOCATION
N62472-99-D-0032	**0096**	**Naval Weapons Industrial Reserve Plant – Bethpage, NY**

PROJECT TITLE:
Development of Implementation Plan for Construction of a Pump & Treat System Located at the GM-38 Off-Site Area

FROM:	DATE
Tetra Tech EC, Inc.: Program QC Manager George Sze	May 8, 2006
TO:	DATE
J. Colter (3 CD-Copies)	May 8, 2006

1. THE CONTRACTOR SUBMITTALS LISTED BELOW ARE FORWARDED FOR YOUR REVIEW AND RECOMMENDATIONS.
(a) APPLY APPROPRIATE STAMP IMPRINT TO EACH SUBMITTAL AND INDICATE REVIEW COMMENTS, AS REQUIRED.
(b) RETAIN ONE (1) COPY OF THIS TRANSMITTAL FORM AND RETURN REMAINING COPIES WITH REVIEWED SUBMITTALS TO ROICC.
2. THESE SUBMITTALS SHOULD BE RETURNED TO THIS OFFICE BY _____

CD-COPY TO:	**EFANE:**	R. Boucher (1 CD)
	MIDLANT	S. Clarke (1 CD)
	NEHC:	D. Coons (1 CD)
	NYSDEC:	S. Scharf (5 CDs), W. Fonda (1 CD)
	NCDPW:	T. Kelly (1 CD)
	TOOB:	R. Pfaender (1 CD), M. Russo (3 CDs),
	LIRR:	K. Rydzewski (1 CD)
	ARCADIS:	C. SanGiovanni (1 CD)
	TtNUS:	D. Brayack (1 CD)
	ECOR:	A. Toarmina (2 CDs)
	BETHPAGE:	Public Library (1 CD)
	NWIRP:	Bethpage (1 CD)
HARD COPY TO:	**NYSDEC:**	S. Scharf (1 Copy)
LETTER NOTIFICATION TO:	**NAVAIR:**	J. Kaminski
	USEPA:	C. Stein, C. Struble, S. Quadri
	NYSDEC:	W. Parish, H. Wilkie
	NYSDOH:	T. Wescott
	NC:	T. Maher
	NCDOH:	J. Lovejoy
	TOH:	D. Lopez
	TOOB:	J. Venditto
	H2MG:	R. Humann, G. Loesch
	DB:	R. Burns
	NG:	J. Cofman, L. Leskovjan
	HWD:	A. Palleschi
	BWD:	A. Musgrave
	MWD:	F. Flood
	NYWS:	M. Snyder
	SFWD:	E. Licci
	RAB:	C. Bevilacqua, M. Grello, E. Mangano, J. McBride, E. Resch, R. Styne, R. Tringali

☐ ROICC ☐ RPM ☐ CSO

MAY 8, 2006
SIGNATURE AND DATE

FROM: DESIGNER	DATE
TO: ROICC	DATE

1. THE SUBMITTALS LISTED BELOW HAVE BEEN REVIEWED AND ARE RETURNED, WITH ACTION TAKEN AS INDICATED.

COPY TO:
☐ ROICC ☐ DESIGNER

SIGNATURE AND DATE

FROM: ROICC	DATE
TO: CONTRACTOR	DATE

1. THE SUBMITTALS LISTED BELOW HAVE BEEN REVIEWED AND ARE APPROVED/DISAPPROVED AS SHOWN BELOW AND ON EACH STAMP IMPRINT.

COPY TO:
☐ ROICC ☐ OTHER

FOR COMMANDING OFFICER, ENGINEERING FIELD ACTIVITY NORTHEAST - NAVAL FACILITIES ENGINEERING COMMAND — DATE

ITEM NO.	SUBMITTAL DESCRIPTION	PREPARED/ SUBMITTED BY	APPROVED	DISAPPROVED	REMARKS
1	SD-08, Statements; Waste Management Plan for Construction Tasks GM-38 Area Groundwater Remediation	Helene Ropars			
2	SD-08, Statements; Construction Quality Control Plan for Construction Tasks GM-38 Area Groundwater Remediation	Helene Ropars			
3	SD-08, Statements; Site-Specific Health and Safety Plan for Construction Tasks GM-38 Area Groundwater Remediation	Helene Ropars			
4	SD-08, Statements; Soil Erosion and Sediment Control Plan for Construction Tasks GM-38 Area Groundwater Remediation	Helene Ropars			
5	SD-08, Statements; Traffic Control Plan for Construction Tasks GM-38 Area Groundwater Remediation	Helene Ropars			

DEPARTMENT OF THE NAVY
ENGINEERING FIELD ACTIVITY, NORTHEAST
NAVAL FACILITIES ENGINEERING COMMAND
10 INDUSTRIAL HIGHWAY
MAIL STOP, #82
LESTER, PA 19113-2090

IN REPLY REFER TO
5090
Code EV21/JLC

8 MAY 2006

Mr. Steve Scharf, P.E.
Project Engineer
New York State Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway
Albany, NY 12233-7015

Dear Mr. Scharf:

Subj: Final Design for Construction of a Groundwater Extraction, Treatment, and Re-injection System at the GM-38 Area; NWIRP Bethpage, NY and Northrop Grumman Corporation, NY; NYS Registry #1-30-003 A & B

Enclosed, please find a copy of the Final Design for the construction of the GM-38 Area Groundwater Treatment System. This final document was developed by Tetra Tech EC, Inc. in accordance with the Records of Decision for Groundwater approved by the New York State Department of Environmental Conservation (NYSDEC) and United States Department of Navy (Navy).

On November 11, 2005, the Navy forwarded a 90% Draft Final Design which was reviewed by NYSDEC and other parties during a 45-day public comment period which ended on December 30, 2005. The Navy received comments regarding the 90% draft final design from the NYSDEC and a Responsiveness Summary Document was prepared and issued to NYSDEC on March 23, 2006 for consideration. In a letter dated April 10, 2006, NYSDEC stated that the Navy's responses to comments had been reviewed and further directed the Navy to incorporate the responses to comments and finalize the GM-38 Area Remedial Design.

Tetra Tech EC will begin to forward solicitations for work associated with implementation of the final design. Construction mobilization will occur shortly thereafter pending receipt of property access. Letters requesting access were forwarded from the Navy to the Town of Oyster Bay, Long Island Railroad, and New York State Department of Transportation on April 6, 2006 and have gone unanswered to date.

If you have any questions regarding the enclosed final design, please contact me at (610) 595-0567, ext 163 or by email at james.colter@navy.mil.

Sincerely,

JAMES L. COLTER, P.E.
Remedial Project Manager
By direction of the
Commanding Officer

Enclosure: (1) Final Remedial Design for GM-38 Area Groundwater Remediation System (1 copy of Drawings & Construction Plans & 5 CD-ROMs)

Distribution: (Drawings & CD-ROM)
Tim Kelly - Nassau County DPW
Matt Russo - Town of Oyster Bay
Eugene Smith - New York State Department of Transportation
Ken Rydzewski - Long Island Railroad
Carlo San Giovanni - ARCADIS
Al Taormina - ECOR Solutions
Information Repository - Bethpage Public Library

Distribution: (CD Only)
Susan Clarke - NAVFAC Mid-Atlantic
Dave Brayack - Tetra Tech NUS
Bill Fonda - NYSDEC (Stony Brook)
Rich Pfaender - Town of Oyster Bay

Distribution: (w/o enclosures)
Tom Maher - Nassau County
John Lovejoy - Nassau County DOH
Larry Leskovjan - Northrop Grumman
John Cofman - Northrop Grumman
Carol Stein - USEPA Region II
Carla Struble - USEPA Region II
Syed Quadri - USEPA Region II
Trevor Wescott - NYSDOH
Carl Hoffman - NYSDEC (Albany)
Henry Wilkie - NYSDEC (Albany)
Hon. John Venditto-Town of Oyster Bay
Darrol Lopez - Town of Hempstead
Arnold Palleschi-Hempstead Water Dist
Andy Musgrave - Bethpage Water Dist
Frank Flood - Massapequa Water Dist
Matt Snyder - New York Water Service
Edoardo Licci - South Farmingdale Water District
Rich Humann - H2M Group
Gary Loesch - H2M Group
Rob Burns - Dvirka & Bartilucci
Joe Kaminski - NAVAIR
Jim McBride - RAB Community Co-Chair
Mike Grello - RAB Member
Hon. Ed Mangano - RAB Member
Ed Resch - RAB Member
Charles Bevilacqua - RAB Member
Roy Tringali - RAB Member
Rosemary Styne - RAB Member

FINAL TRAFFIC CONTROL PLAN
FOR
CONSTRUCTION TASKS
GM-38 AREA GROUNDWATER REMEDIATION
AT
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BETHPAGE, NEW YORK

Issued:

May 8, 2006

Prepared for:

Engineering Field Activity, Northeast
Naval Facilities Engineering Command
10 Industrial Highway, Mail Stop #82
Lester, Pennsylvania 19113-2090

Remedial Action Contract No. N62472-99-D-0032
Contract Task Order No. 96

Prepared by:

Tetra Tech EC, Inc.
Bucks Town Corporate Campus
820 Town Center Drive, Suite 100
Langhorne, PA 19047-1748

Revision	Date	Prepared By	Approved By	Pages Affected
0	5/8/06	Joseph Gray	Stavros Patselas	All

TABLE OF CONTENTS

1.0 INTRODUCTION 1
1.1 Basic Maintenance and Protection of Traffic 1
2.0 BACKGROUND 2
3.0 CONSTRUCTION ACTIVITIES 4
3.1 Location 4
3.2 Schedule and Hours of Operation 4
3.3 Permits 4
4.0 CONSTRUCTION IMPACTS 6
4.1 Pedestrian Safety 6
4.2 Traffic Control and Signal Devices 6
4.3 Traffic Flow Interference 6
5.0 CONSTRUCTION ENGINEERING CONTROLS 7
5.1 Speed Limits 7
5.2 Traffic and Construction Signage 7
5.3 Flagger 7
5.4 Repairs 7
5.5 Drainage 7
5.6 Dust Control and Spillage 7

LIST OF FIGURES

Figure 1 Site Location Map 3
Figure 2 Traffic Control Routes 5

LIST OF APPENDICES

Appendix A Project Schedule
Appendix B New York State Department of Transportation Standard Specifications Section 619

LIST OF ACRONYMS AND ABBREVIATIONS

bgs	below ground surface
CTO	Contract Task Order
GOCO	Government Owned Contractor-Operated
mph	miles per hour
NGC	Northrop Grumman Corporation
NWIRP	Naval Weapons Industrial Reserve Plant
NYSDOT	New York State Department of Transportation
NYSMUTCD	New York State Manual of Uniform Traffic Control Devices
RAC	Remedial Action Contract
TtEC	Tetra Tech EC, Inc.
µg/L	micrograms per liter
VOCs	Volatile Organic Compounds

1.0 INTRODUCTION

Tetra Tech EC, Inc. (TtEC) has prepared this Traffic Control Plan in accordance with the Remedial Action Contract (RAC) Number N62472-99-D-0032, Contract Task Order (CTO) Number 0096.

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this plan refers to the Navy's representative or agent, TtEC. All subcontractors and vendors contracted by TtEC will be required to comply with this Traffic Control Plan.

This document presents the Traffic Control Plan for the GM-38 Area Groundwater Remediation project at the Naval Weapons Industrial Reserve Plant (NWIRP), Bethpage, NY. This Traffic Control Plan will be considered one of the contract documents for this project. This Traffic Control Plan covers the control and orderly movement of vehicles and equipment at the NWIRP Bethpage, NY during construction activities.

1.1 Basic Maintenance and Protection of Traffic

Traffic will be maintained over a reasonably smooth traveled way which will be so marked by signs, delineators, guiding devices and other methods that a person who has no knowledge of conditions may safely and with minimum of discomfort and inconvenience ride, drive or walk, day or night, over all or any portion of the highway and/or structure under construction where traffic is to be maintained. All work will conform to the requirements of the New York State Manual of Uniform Traffic Control Devices (NYSMUTCD).

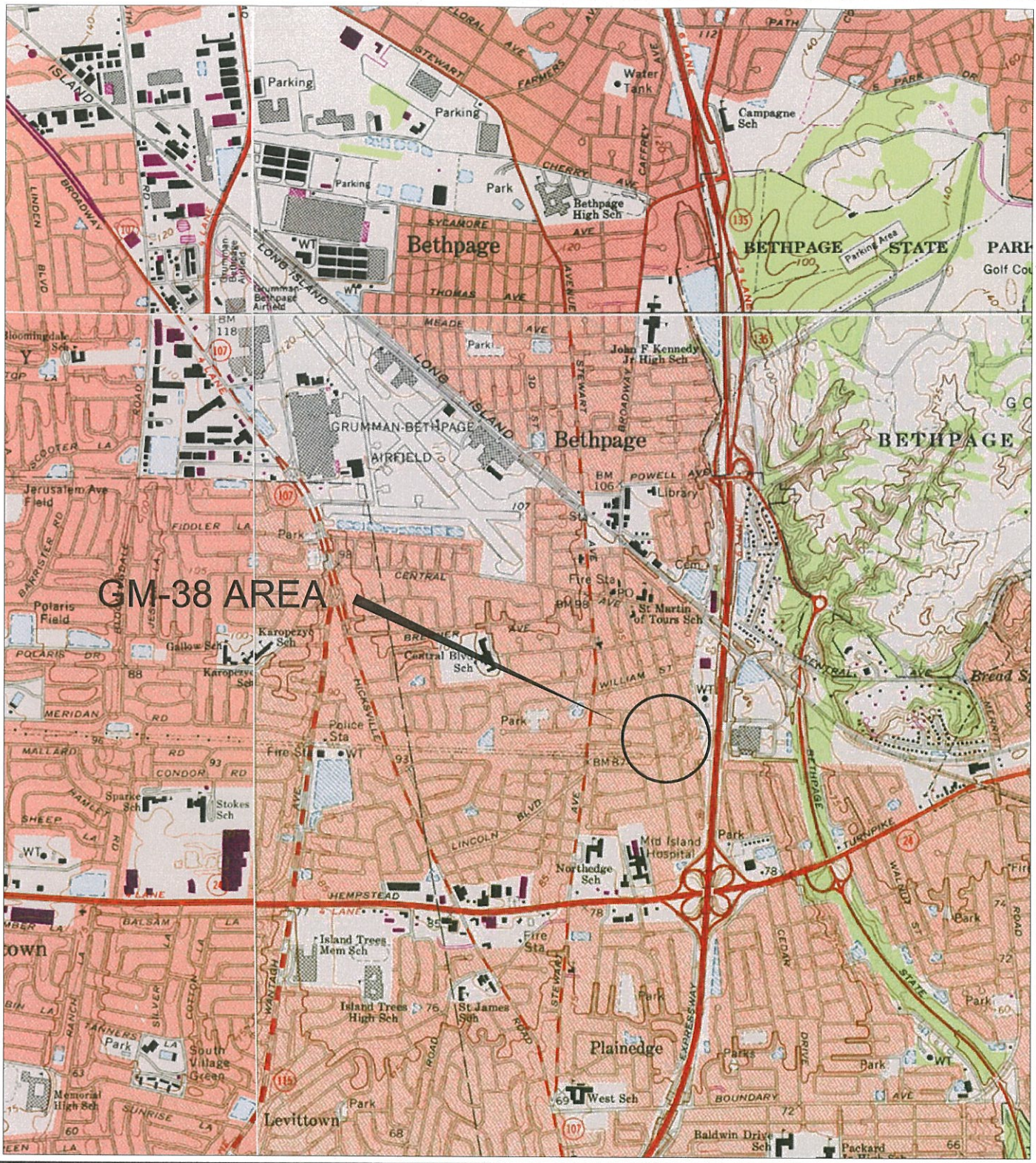
2.0 BACKGROUND

NWIRP Bethpage is located in east central Nassau County, Long Island, New York, approximately 30 miles east of New York City (Figure 1 Site Location Map). The Navy's property totaled approximately 109.5 acres and was formerly a Government Owned Contractor-Operated (GOCO) facility that was operated by the Northrop Grumman Corporation (NGC) until September 1998. NWIRP Bethpage is bordered on the north, west, and south by property owned, or formerly owned, by NGC that covered approximately 605 acres, and, on the east, by a residential neighborhood.

The GM-38 Area is approximately 8,500 feet south-southeast and hydraulically down gradient of NWIRP Bethpage. Specifically, the center of the project area is a utility easement that is located east of Broadway Avenue, west of the Seaford – Oyster Bay Expressway, and between the north and south dead ends of Windhorst and Herman Streets.

The GM-38 Area refers to a cluster of monitoring wells that were installed in the 1990s by NGC and that first identified an isolated groundwater contaminant plume in this area. Chlorinated volatile organic compounds (VOCs) were identified in moderately deep groundwater (220 to 470 feet below ground surface (bgs) at concentrations greater than 500 micrograms per liter (μg/L). The contaminated groundwater in the area represents a relatively large mass of chlorinated VOCs that would remain for extended periods and could adversely affect public water supplies in the area, as well as other down gradient water supplies. Two public water supply systems are present in the general area and extract groundwater at depths ranging from 540 to 740 feet bgs.

The Navy’s selected remedy in the vicinity of the GM-38 Area is construction of a groundwater extraction and treatment system near the GM-38 monitoring well cluster to facilitate the removal of contaminants in the groundwater.



Source: U.S.G.S. Topographic Maps (7.5 Minute)
Amityville, Freeport, Hicksville, Huntington, NY Quadrangles

U.S. Navy RAC
Engineering Field Activity, Northeast

GM-38 Area (Offsite)
NWIRP Bethpage
Bethpage, NY

Figure 1
Site Location Map

TETRA TECH EC, INC.

P:\Bethpage\CAD - GIS\Site Location Map.dwg, 04/28/2004 03:22:20 PM

3.0 CONSTRUCTION ACTIVITIES

3.1 Location

The area of construction will be in the GM-38 Area as described in Section 2.0. The majority of construction activities will be located within the utility easement in the GM-38 Area and will not impact any public right-of-way.

Access to the GM-38 Area will be required to allow for deliveries of construction equipment and materials. Access will be through an entrance/exit located on the east side of Broadway Avenue approximately 100 feet south of the intersection of Broadway Avenue and Arthur Avenue. A temporary curb cut will be completed to establish the construction entrance/exit on Broadway Avenue. The curb will be restored to original conditions upon completion of the project.

Vehicles traveling to and from the site will be restricted to either a primary or a secondary route when traveling in the local vicinity of the GM-38 Area (Figure 2 Traffic Control Routes). All vehicles except tractor-trailers will follow the primary route listed below. Tractor-trailers may have difficulty negotiating the turn from Arthur Avenue to Broadway Avenue and are directed to use the secondary route.

- Primary Route (for all vehicles except tractor trailer units): Approach the site from Stewart Avenue. At the intersection of Stewart Avenue and Arthur Avenue turn east onto Arthur Avenue. At the end of Arthur Avenue make a right turn onto Broadway Avenue. Travel south on Broadway Avenue for approximately 100 feet and make a left turn into the construction entrance for the site.

- Secondary Route (tractor trailers only): Approach the site from Central Avenue. At the intersection of Central Avenue and Broadway Avenue turn south onto Broadway Avenue. Follow Broadway Avenue south and make a left turn into the construction entrance for the site.

3.2 Schedule and Hours of Operation

The project schedule is provided in Appendix A and outlines the anticipated timeline associated with construction activities. It is estimated that the total duration of the project will be approximately 12 months. Construction activities will be conducted between the hours of 0700 and 1700 hours 5 days/week, Monday through Friday.

3.3 Permits

TtEC will obtain the necessary permits as required from the local authorities having jurisdiction. Additionally TtEC will notify New York City and Long Island One-Call to obtain mark-outs of existing underground utilities. Having received confirmation of the underground utility mark-out and 5 days prior to construction activities, TtEC will notify the local Police and Fire Departments and other Municipal offices as may be required.

NOTES:

1. SANITARY SEWER MANHOLE LOCATIONS AND RIM ELEVATIONS ARE AS PER L.K. McLEAN ASSOCIATES FIELD DATA EXCEPT WHERE OTHERWISE NOTED. ALL SEWER PIPE INVERTS (WHERE SHOWN) ARE AS PER NASSAU COUNTY SANITARY SEWER RECORD PLANS.
2. THE LOCATION OF OVERHEAD AND UNDERGROUND ELECTRIC LINES SHOWN ON THIS MAP ARE AS PER UTILITY MAPS PROVIDED BY LIPA UNLESS OTHERWISE NOTED.
3. THE LOCATION OF GAS MAINS SHOWN ON THIS MAP ARE AS PER UTILITY MAPS PROVIDED BY KEYSPAN.
4. THE LOCATION OF WATER MAINS SHOWN ON THIS MAP ARE AS PER UTILITY MAPS PROVIDED BY THE BETHPAGE WATER DISTRICT.
5. STORM SEWER DRAINAGE MANHOLE LOCATIONS, CATCH BASIN LOCATIONS AND RIM ELEVATIONS ARE AS PER L.K. McLEAN ASSOCIATES FIELD DATA EXCEPT WHERE OTHERWISE NOTED.
6. THE LOCATION OF THE DRAINAGE (STORM SEWER) PIPES ON SOPHIA STREET HAVE NOT BEEN ESTABLISHED. THERE IS NO DATA ON RECORD AT THE TOWN OF OYSTER BAY DEPARTMENT OF PUBLIC WORKS.
7. MEASUREMENTS ARE IN ACCORDANCE WITH U.S. STANDARDS.
8. COORDINATES AND BEARINGS SHOWN ARE IN LONG ISLAND ZONE OF THE NEW YORK STATE PLANE COORDINATE SYSTEM NAD 1983. ELEVATIONS REFER TO NAVD 1929.
9. UNAUTHORIZED ALTERATION OR ADDITION TO A SURVEY MAP BEARING A LICENSED LAND SURVEYOR'S SEAL IS A VIOLATION OF SECTION 7209, SUBDIVISION 2, OF NEW YORK STATE EDUCATION LAW.
10. ONLY COPIES FROM THE ORIGINAL OF THIS SURVEY MARKED WITH AN ORIGINAL OF THE LAND SURVEYOR'S "EMBOSSED" SEAL OR "INKED" SEAL SHALL BE CONSIDERED TO BE VALID TRUE COPIES.
11. CERTIFICATIONS INDICATED HEREON SIGNIFY THAT THIS SURVEY WAS PREPARED IN ACCORDANCE WITH THE EXISTING CODE OF PRACTICE FOR LAND SURVEYORS ADOPTED BY THE NEW YORK STATE ASSOCIATION OF PROFESSIONAL LAND SURVEYORS. SAID CERTIFICATIONS SHALL RUN ONLY TO THE PERSON FOR WHOM THE SURVEY IS PREPARED, AND ON HIS BEHALF TO THE TITLE COMPANY, GOVERNMENTAL AGENCY AND LENDING INSTITUTION LISTED HEREON, AND TO THE ASSIGNEES OF THE LENDING INSTITUTION. CERTIFICATIONS ARE NOT TRANSFERABLE TO ADDITIONAL INSTITUTIONS OR SUBSEQUENT OWNERS.
12. RIGHTS–OF–WAY NOT SHOWN ARE NOT CERTIFIED.
13. FOUR INJECTION WELLS POSITIONED 80 FEET APART ARE EACH PREDICTED TO HANDLE SUSTAINABLE INJECTION FLOW RATES OF 275 GALLONS PER MINUTE (GPM) FOR A CUMULATIVE FLOW OF 1,100 GPM. NUMBER OF INJECTION WELLS AND SPACING IS BASED UPON REGIONAL GROUNDWATER MODEL RESULTS PRESENTED BY TETRA TECH NUS, INC. IN THE "GROUNDWATER REMEDY ANALYSIS REPORT" DATED FEBRUARY 2003.
14. LINES IDENTIFIED ON THIS DRAWING AS PART OF GWTP PROJECT ILLUSTRATE APPROXIMATE AND DO NOT REPRESENT ACTUAL PIPE/WIRE SIZES OR TRENCH WIDTHS.
15. TEMPORARY ACCESS ROAD ENTRANCE FROM BROADWAY AVE. SHALL INCLUDE 20 FT. CURB CUT FOR INSTALLATION OF CONCRETE DRIVEWAY APRON.
16. SANITARY LINE SHALL MAINTAIN 1–2% SLOPE FROM BUILDING TO THE DESIGNATED MANHOLE. CONNECTION INTO MANHOLE SHALL BE A MINIMUM OF 48" BELOW MANHOLE RIM ELEVATION. SEWER CONNECTION PERMIT SHALL BE OBTAINED FROM THE COUNTY OF NASSAU, DEPT. OF PUBLIC WORKS PRIOR TO WORK INITIATION.
17. ELECTRICAL AND TELEPHONE TIE–IN CONNECTIONS ARE AT POLE L.I.L. #18.
18. POTABLE WATER LINE TIE–IN LOCATION SHALL BE ON THE EASTERN SIDE OF THE FUTURE PERMANENT ACCESS ROAD TO THE TREATMENT BUILDING. WATER METER PIT SHALL BE LOCATED ADJACENT TO THE ACCESS ROAD ENTRANCE AT SOPHIA STREET. A REDUCED PRESSURE ZONE DEVICE SHALL BE LOCATED DOWNSTREAM OF METER PIT IN AN ABOVEGRADE VAULT. PLANS AND APPLICATIONS MUST BE APPROVED BY THE BETHPAGE WATER DISTRICT AND NASSAU COUNTY DEPT. OF HEALTH PRIOR TO INSTALL.
19. THE RW–2 EFFLUENT PIPING TRENCH SHALL ALSO CONTAIN 12 IN X 8 IN. HDPE PIPE FOR POTENTIAL FUTURE WELL CONNECTION AND A 12 IN. HDPE PIPE FOR POTENTIAL FUTURE ALTERNATE DISCHARGE POINT. BOTH PIPES FOR POTENTIAL FUTURE USE SHALL BE BLIND FLANGED AND INSIDE A TERMINATION VAULT.

REFERENCE:

L. K. McLEAN ASSOCIATES, P.C.
437 SO. COUNTRY ROAD, BROOKHAVEN, NY
TOPOGRAPHIC SURVEY, NAVAL WEAPONS INDUSTRIAL RESERVE PLANT,
GM–38 AREA, FILE # 04033.000
AUGUST 2, 2004

LEGEND:

	=	TAX LOT LINE
OH OH OH	=	OVERHEAD ELECTRIC WIRES
E E E	=	UNDERGROUND ELECTRIC WIRES
NE NE NE	=	NEW UNDERGROUND ELECTRIC WIRES
NW NW NW	=	NEW WATER LINE
W W W	=	WATER MAIN
G G G	=	GAS MAIN
D	=	DRAINAGE LINES (STORM SEWER)
S S S	=	SANITARY SEWER MAIN
NS NS NS	=	NEW SANITARY SEWER MAIN
	=	HDPE PIPE AND ELECTRICAL CONDUIT
242	=	TAX LOT NUMBER
	=	WATER VALVE
GV	=	GAS VALVE
590	=	LOT NUMBER
IW–1	=	INJECTION WELL
RW1–MW–1	=	MONITORING WELL
RW–1	=	RECOVERY WELL
PB	=	PULL BOX
	=	PRIMARY ROUTE
	=	SECONDARY ROUTE

GRAPHIC SCALE

80 0 40 80 160 320

SCALE: 1 INCH = 80 FEET

THIS DRAWING PRODUCED ON AUTOCAD DO NOT REVISE MANUALLY

"THIS DOCUMENT IS THE PROPERTY OF NAVAL FACILITIES ENGINEERING COMMAND, PREPARED BY TETRA TECH EC, INC., AND IS PROVIDED UPON THE CONDITION THAT IT WILL NOT BE REPRODUCED, COPIED, OR ISSUED TO A THIRD PARTY, AND WILL BE USED SOLEY FOR THE ORIGINAL INTENDED PURPOSE AND SOLEY FOR THE EXECUTION OR REVIEW OF THE ENGINEERING CONSTRUCTION OF THE PROJECT".

IT IS A VIOLATION OF THE NEW YORK STATE EDUCATION LAW, ARTICLE 145, FOR ANY PERSON, UNLESS UNDER THE DIRECTION OF A NEW YORK STATE LICENSED PROFESSIONAL ENGINEER, TO ALTER AN ITEM ON THIS DOCUMENT IN ANY WAY.

REV	DESCRIPTION	PREP BY	DATE	APPRVD	
					TETRA TECH EC, INC.
					DES: CHK:
					SURV: CH ENG:
					SUBMITTED BY: (TRM NUMBER) (TITLE) (DATE)
					NORTHSW HD:
					DM: RE:
					PIC: DR:
					OFFICER IN CHARGE DATE
					APPROVED

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
ENGINEERING FIELD ACTIVITY – NORTHEAST
LESTER PENNSYLVANIA
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE, NEW YORK

GM–38 AREA
GROUNDWATER TREATMENT PLANT
TRAFFIC CONTROL ROUTES

APPROVED DATE EFANE FOR COMMANDER, NAVFAC

SEAL AREA

SAT TO	DATE
CODE I.D. NO.	80091
SCALE : AS SHOWN	
SPEC. NO.	
CONSTRN. CONTR. NO.	N62472–99–D–0032
NAVFAC DRAWING NO.	
SHEET	OF
SIZE: D	DIS. SH. NO. Fig. 2

P:\VB-Projects\AD - GEN\Traffic Control Plan.dwg, 1:1

4.0 CONSTRUCTION IMPACTS

4.1 Pedestrian Safety

There are no designated pedestrian crossways, sidewalks, bicycle routes or lanes in the area where the temporary construction entrance will be constructed on Broadway Avenue.

4.2 Traffic Control and Signal Devices

There are no traffic controller assemblies, signal heads, detectors or signal devices in the vicinity of the proposed temporary construction entrance on Broadway Avenue.

4.3 Traffic Flow Interference

There may be minimal traffic interference that occurs during the construction of the temporary construction entrance or by trucks entering and exiting the GM-38 Area. TtEC will provide proper traffic notification by several methods including flaggers and caution signs to inform the traffic flow of a construction entrance and work ahead. The signs will be New York State Department of Transportation (NYSDOT) approved and placed as per the sign detail locations illustrated on Figure 2 Traffic Control Routes.

All work will be performed in compliance with the applicable articles of Maintenance and Protection of Traffic, (NYSDOT) Standard Specifications Section 619 (Appendix B).

5.0 CONSTRUCTION ENGINEERING CONTROLS

5.1 Speed Limits

Truck traffic will adhere to a speed limit of 25 miles per hour (mph) on the local public roads in the vicinity of the GM-38 Area. Within the GM-38 Area truck traffic will adhere to a speed limit of 10 mph.

5.2 Traffic and Construction Signage

NYSDOT approved signs will be erected near the temporary construction entrance, which is indicated on Figure 2 Traffic Control Routes. The intent of the signs will be to provide sufficient notice of the construction entrance and warn traffic that trucks may be entering the roadway. Signs will also be erected within GM-38 denoting the 10 mph speed limit. Speed limit signs will be placed at the entrance, at the access road mid-point, and approximately 50' feet prior to the treatment plant work area. The speed limit signs will be double sided so that they can be visible when exiting the site.

5.3 Flagger

During installation of the temporary construction entrance the necessary traffic control equipment and flaggers will be provided to maintain adequate traffic control.

5.4 Repairs

Any damage to the existing pavement and curb as a result of the installation of the temporary construction entrance will be repaired to provide a reasonably smooth roadway where vehicle traffic is maintained. Within the GM-38 Area the gravel access road will be repaired and maintained as necessary so that the surface condition is consistent with the posted speed limit.

5.5 Drainage

Any existing drainage facilities near the temporary construction entrance will be maintained to provide adequate drainage of the roadway. The gravel access road will be graded to facilitate adequate drainage and prevent accumulation of standing water.

5.6 Dust Control and Spillage

The gravel access road within the GM-38 Area will be maintained at all times to minimize and control dust. Any material spilled or tracked onto the public roadway will be removed at the end of each work day.

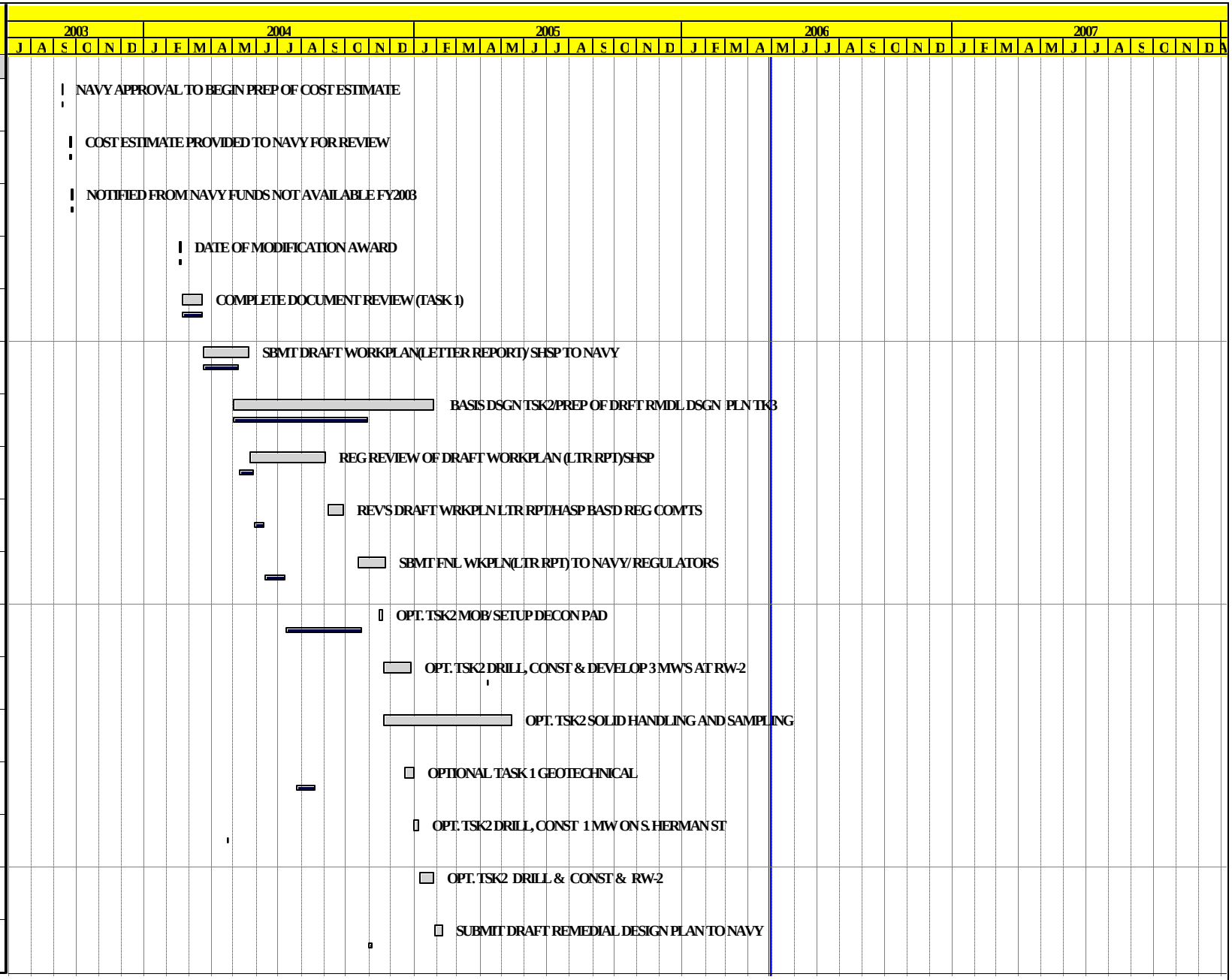
All work areas will be maintained within the limits of work, staging area and along haul routes, in order to prevent dust generation due to this operation that would contribute to air pollution. Dust control will be accomplished by the sprinkling of water or a dilute solution (less then

0.05%) of water plus bio-degradable surfactant. Sprinkling, where used, must be repeated at such intervals as to keep all parts of the disturbed area at least damp at all times. Dust control will be performed as the work proceeds and whenever a dust nuisance or hazard occurs. Light bituminous treatment of the soil or work area is not an acceptable method of dust control.

Appendix A

Project Schedule

Early Start	Early Finish	% Comp	
Phase 1 Groundwater Remediation			
12SEP03A	12SEP03A	100	NAVY APPROVAL TO BEGIN PREP OF COST ESTIMATE
23SEP03A	23SEP03A	100	COST ESTIMATE PROVIDED TO NAVY FOR REVIEW
25SEP03A	25SEP03A	100	NOTIFIED FROM NAVY FUNDS NOT AVAILABLE FY2003
19FEB04A	19FEB04A	100	DATE OF MODIFICATION AWARD
23FEB04A	19MAR04A	100	COMPLETE DOCUMENT REVIEW (TASK 1)
22MAR04A	21MAY04A	100	SBMT DRAFT WORKPLAN(LETTER REPORT)/ SHSP TO NAVY
03MAY04A	28JAN05A	100	BASIS DSGN TSK2/PREP OF DRFT RMDL DSGN PLN TK3
24MAY04A	03SEP04A	100	REG REVIEW OF DRAFT WORKPLAN (LTR RPT)/SHSP
07SEP04A	28SEP04A	100	REV'S DRAFT WRKPLN LTR RPT/HASP BAS'D REG COMTS
18OCT04A	24NOV04A	100	SBMT FNL WKPLN(LTR RPT) TO NAVY/ REGULATORS
17NOV04A	19NOV04A	100	OPT. TSK2 MOB/ SETUP DECON PAD
22NOV04A	28DEC04A	100	OPT. TSK2 DRILL, CONST & DEVELOP 3 MW'S AT RW-2
22NOV04A	13MAY05A	100	OPT. TSK2 SOLID HANDLING AND SAMPLING
20DEC04A	31DEC04A	100	OPTIONAL TASK 1 GEOTECHNICAL
03JAN05A	07JAN05A	100	OPT. TSK2 DRILL, CONST 1 MW ON S. HERMAN ST
10JAN05A	28JAN05A	100	OPT. TSK2 DRILL & CONST & RW-2
31JAN05A	08FEB05A	100	SUBMIT DRAFT REMEDIAL DESIGN PLAN TO NAVY



Start Date	30SEP03
Finish Date	18JAN08
Data Date	28APR06
Run Date	27APR06 10:53

© Primavera Systems, Inc.

Early Bar
Target Bar
Progress Bar

C96P

CONTRACT TASK ORDER NO. 96

BETHPAGE, NEW YORK

GM-38 PUMP AND TREAT SYSTEM

Early Start	Early Finish	% Comp	
07FEB05A	24FEB05A	100	OPT. TSK2 DRILL & CONST IW-1
08FEB05A	14MAR05A	100	NAVY & 3RD PARTY REV'W OF DRFT RMDL DSGN PLN
24FEB05A	07MAR05A	100	CLEAR GRUB & INST'L ACCESS RD ON NYSDOT ROW (PA)
14MAR05A	11NOV05A	100	REV'S DRFT RMDL DSN BAS'D ON NAVY COMTS & FLD
14MAR05A	08APR05A	100	OPT.TSK2 DRILL & CONST RW-1 & MW IN NYSDOT
18APR05A	24JUN05A	100	OPTIONAL TASK 3 SAMPLING TREATABILITY STUDY
25APR05A	29APR05A	100	RECOVERY WELL PUMP TESTS & INJECTION WELL TEST
02MAY05A	20MAY05A	100	OPT. TSK2 SITE PREDESIGN RESTORATION
02MAY05A	19MAY05A	100	DRILLING/ DEMOBE OF PHASE 1
11NOV05A	11NOV05A	100	SBMIT REVISED DRFT PLN & SPECS TO NYSDEC & RAB
14NOV05A	18JAN06A	100	REGULATOR/ PUBLIC REVIEW PERIOD
Tentative Meetings			
04AUG04A	04AUG04A	100	MEETINGS W/REG/ NAVY
23SEP04A	23SEP04A	100	COMMUNITY WORK SHOP
02NOV04A	02NOV04A	100	MEETINGS W/REG/ NAVY
06APR05A	06APR05A	100	MEETINGS W/REG/ NAVY
16JUN05A	16JUN05A	100	PUBLIC MEETING
Phase 2 Groundwater Remediation			
27APR05A	27APR05A	100	MOD AWARD

2003 2004 2005 2006 2007

J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J

Start Date	30SEP03
Finish Date	18JAN08
Data Date	28APR06
Run Date	27APR06 10:53

Early Bar
Target Bar
Progress Bar

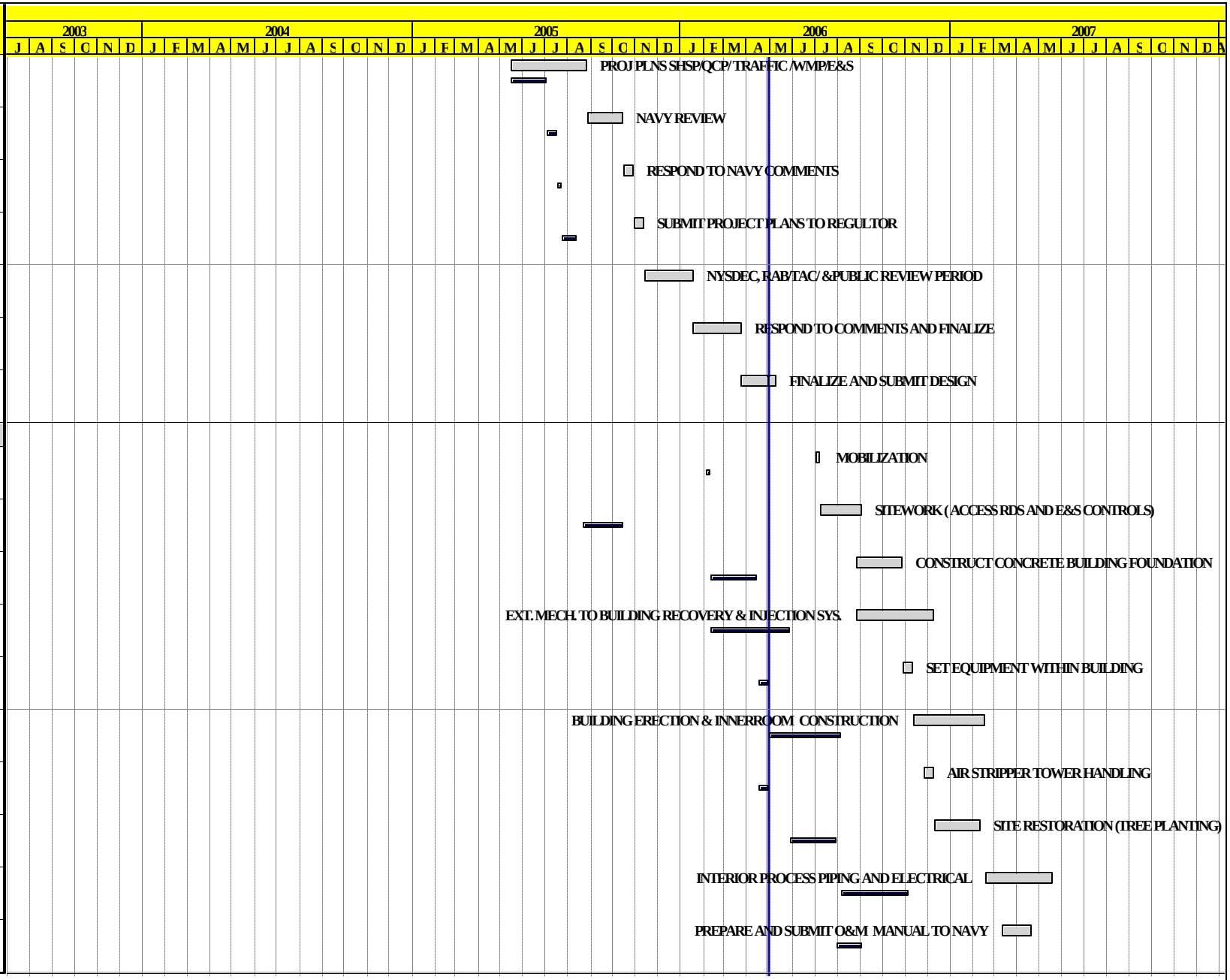
© Primavera Systems, Inc.

CONTRACT TASK ORDER NO. 96

BETHPAGE, NEW YORK

GM-38 PUMP AND TREAT SYSTEM

Early Start	Early Finish	% Comp	Activity
16MAY05A	26AUG05A	100	PROJ PLNS SHSP/QCP/ TRAFFIC /WMP/E&S
29AUG05A	14OCT05A	100	NAVY REVIEW
17OCT05A	28OCT05A	100	RESPOND TO NAVY COMMENTS
31OCT05A	11NOV05A	100	SUBMIT PROJECT PLANS TO REGULTOR
14NOV05A	18JAN06A	100	NYSDEC, RAB/TAC/ &PUBLIC REVIEW PERIOD
19JAN06A	23MAR06A	100	RESPOND TO COMMENTS AND FINALIZE
24MAR06A	08MAY06	72	FINALIZE AND SUBMIT DESIGN
Groundwater Remediation			
03JUL06*	07JUL06	0	MOBILIZATION
10JUL06	01SEP06	0	SITEWORK (ACCESS RDS AND E&S CONTROLS)
28AUG06	27OCT06	0	CONSTRUCT CONCRETE BUILDING FOUNDATION
28AUG06	08DEC06	0	EXT. MECH. TO BUILDING RECOVERY & INJECTION SYS.
30OCT06	10NOV06	0	SET EQUIPMENT WITHIN BUILDING
13NOV06	16FEB07	0	BUILDING ERECTION & INNERROOM CONSTRUCTION
27NOV06	08DEC06	0	AIR STRIPPER TOWER HANDLING
11DEC06	09FEB07	0	SITE RESTORATION (TREE PLANTING)
19FEB07	18MAY07	0	INTERIOR PROCESS PIPING AND ELECTRICAL
12MAR07	20APR07	0	PREPARE AND SUBMIT O&M MANUAL TO NAVY



Start Date	30SEP03
Finish Date	18JAN08
Data Date	28APR06
Run Date	27APR06 10:53

Early Bar
Target Bar
Progress Bar

C96P Sheet 3 of 4

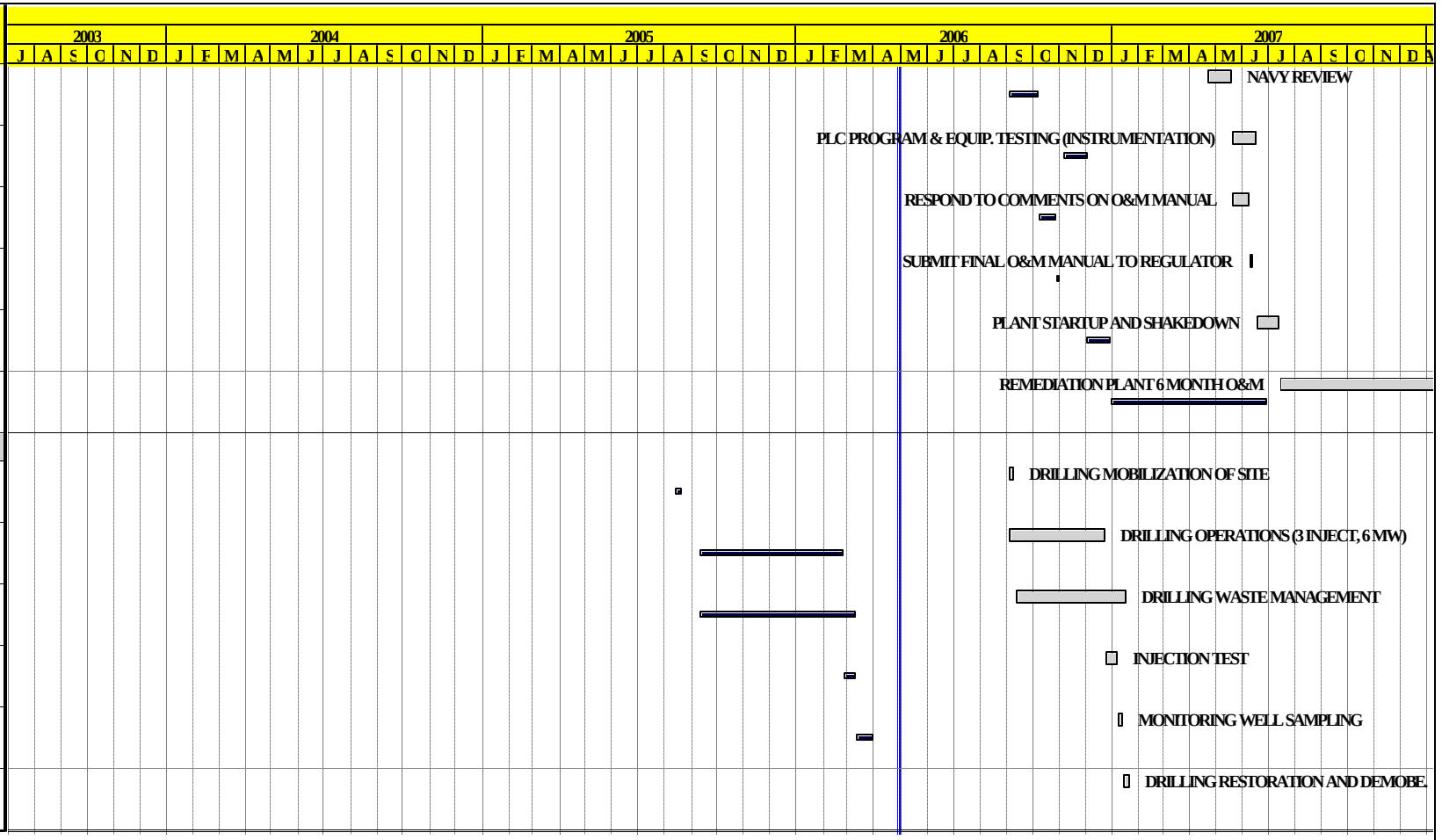
CONTRACT TASK ORDER NO. 96

BETHPAGE, NEW YORK

GM-38 PUMP AND TREAT SYSTEM

© Primavera Systems, Inc.

Early Start	Early Finish	% Comp
23APR07	18MAY07	0
21MAY07	15JUN07	0
21MAY07	08JUN07	0
11JUN07	11JUN07	0
18JUN07	13JUL07	0
16JUL07	18JAN08	0
Drilling		
04SEP06*	08SEP06	0
05SEP06	22DEC06	0
12SEP06	15JAN07	0
25DEC06	05JAN07	0
08JAN07	12JAN07	0
15JAN07	19JAN07	0



Start Date	30SEP03
Finish Date	18JAN08
Data Date	28APR06
Run Date	27APR06 10:53

Early Bar
Target Bar
Progress Bar

© Primavera Systems, Inc.

C96P

CONTRACT TASK ORDER NO. 96

BETHPAGE, NEW YORK

GM-38 PUMP AND TREAT SYSTEM

Appendix B

New York State Department of Transportation
Standard Specifications Section 619

618.58 M	Tar (RT-10)	Liter
618.59 M	Tar (RT-11)	Liter
618.60 M	Tar (RT-12)	Liter
618.61 M	Tar (CB-5)	Liter
618.62 M	Tar (CB-6)	Liter
618.90 M	Asphalt Emulsion Tack Coat	Liter

SECTION 619 - MAINTENANCE AND PROTECTION OF TRAFFIC

619-1 DESCRIPTION

619-1.01 General. This work shall consist of maintaining traffic and protecting the public from damage to person and property within the limits of and for the duration of the contract.

619-1.02 Basic Maintenance and Protection of Traffic. Traffic shall be maintained over a reasonably smooth traveled way which shall be so marked by signs, delineators, guiding devices and other methods that a person who has no knowledge of conditions may safely and with a minimum of discomfort and inconvenience ride, drive or walk, day or night, over all or any portion of the highway and/or structure under construction where traffic is to be maintained. All work shall conform to the requirements of the M.U.T.C.D. The basic maintenance and protection requirements shall be as follows:

A. Surface. Maintain the surface condition of the traveled way so it is consistent with the appropriate speed limit.

B. Drainage. Maintain the drainage facilities and other highway elements, old or new, including those on detours.

C. Bus Stops. Maintain existing bus stops so bus passengers are reasonably accommodated.

D. Pedestrian Traffic. Provide adequate protection for pedestrian traffic during all phases of construction.

E. Intersecting Highways. Provide ingress and egress to and from intersecting highways, homes, business and commercial establishments.

F. Dust Control and Spillage. Control dust and keep the traveled way free from materials spilled from hauling equipment. This shall also apply to dust control and spilled material resulting from the Contractor's operations in the areas outside the contract limits.

G. Flagger. Provide the necessary traffic control equipment and flaggers for adequate traffic control.

H. Repairs. Make the necessary repairs to existing pavement and structure wearing surfaces as required to provide a reasonably smooth roadway where vehicle operation is maintained.

I. Responsibility to the Public. Protect the public from damage to person and property which may result directly or indirectly from any construction operation. The specification requirements of section 107, Legal Relations and Responsibility to Public, shall apply.

J. Schedule. Schedule work to keep to a minimum, and consistent with the physical requirements of the contract, the amount of existing pavement and/or facilities that are destroyed or substantially torn-up at any one time. Unless otherwise indicated on the plans or in the proposal the length of existing facility destroyed shall not exceed two kilometers, nor shall any part be closed to traffic during seasonal shutdown periods, unless the Contractor has submitted and the Engineer has approved a detailed schedule of operations reflecting a proposal to the contrary.

K. Snow and Ice Control. Maintain the traveled way in such a condition and conduct operations in such a manner that snow and ice may be readily controlled by others as and when necessary, and in such a manner that proper drainage is provided for the melting of snow in the banks resulting

from normal plowing. This shall include, but not be limited to, the cutting of weeps through banked or accumulated snow to provide proper drainage of surface runoff into the highway ditches and/or culverts. The Contractor shall not, however, be responsible for snow and ice control on the pavement or shoulders.

L. Delineation and Guiding Devices. Provide and maintain delineation and channelization devices which shall include delineators, plastic drums, cones, temporary curb 300 x 300 mm and smaller exposed section, and other similar materials or methods acceptable to the Engineer.

The installation, moving and removing of any such delineators or channelization devices together with removal of existing pavement markings shall be included in the work.

M. Project Site Patrol. The Contractor shall provide personnel to patrol the contract area as necessary to ensure that conditions on the site are adequate for public safety and convenience at all times. The Contractor is placed on notice that maintenance and protection of traffic over a highway during construction is considered as important as the construction itself. The Contractor shall, therefore, at all times conduct the operations in a manner to ensure the convenience of all travelers and the abutting property owners and their safety as well as the safety of the Contractor's own employees.

Such conduct shall include, but not be limited to: ensuring that all construction materials and equipment are removed from the work site during non-working hours, or are protected in such manner that they shall not constitute a traffic hazard; conducting the operations in such a manner as to minimize the amount of time during which fixed objects and steep side slopes are without guide rail protection; conducting shoulder construction and paving operations in such a manner as to minimize the period of time the traveling public is exposed to sharp dropoffs; and not allowing workers to park personal vehicles in the shoulder area on roads with operating speeds less than 70 km/h and within ten meters of the traveled way on other roads, unless protected by barrier.

N. Shadow Vehicle. For purposes of these specifications, a shadow vehicle is defined as a slowly moving or stopped vehicle operating or placed in a traffic lane, or adjacent thereto, upstream of a construction work zone. The purpose of shadow vehicles is to guide traffic around a construction work area or to reduce the possibility of harm to workers in the work area. Shadow vehicles shall be required when shown on the plans or for all slowly moving work areas in travel lanes, except where the travel lane is closed to traffic by barrier, barricades, plastic drums, arrow panels, flagpersons or cones. Slowly moving work areas are those which move at a speed of 2km/h or more but at least 25km/h less than the legal speed limit. Shadow vehicles shall weigh 8200 kg to 9100 kg. Ballast may be used to bring a lighter weight vehicle up to the indicated weight. Shadow vehicles shall be equipped with Mobile Construction Zone Impact Attenuators, §712-06 and one Type B Arrow Panel as described in the M.U.T.C.D. On roads with posted speed limits of 65 mph within 335 meters upstream of the shadow vehicle, or whenever indicated on the plans or in the proposal, the Mobile Construction Zone Impact Attenuator shall be listed as a National Cooperative Highway Research Report 350 Test Level 3 device on the Approved List. On other roads the attenuator shall meet the requirements of NCHRP 350 Test Level 3 or Test Level 2, NCHRP 230, or other testing protocol as stated in §712-06.

619-1.03 Construction Signs, Temporary Box Beam Barrier, Temporary Concrete Barrier, Construction Barricades, and Lighting for Construction Barricades. The Contractor shall furnish, install, move, and maintain construction signs, temporary box beam barrier, temporary concrete barrier, construction barricades, and lighting for construction barricades where shown on the plans or when ordered by the Engineer, and in accordance with the M.U.T.C.D.

619-1.04 Temporary Structures and Approaches. The Contractor shall construct,move or remove, as directed, temporary structures, approaches, detours, pavements and necessary appurtenances.

619-1.05 (Vacant).

619-1.06 Short-Term Pavement Markings. Short-term pavement markings are intended for use on any new pavement or milled surface until the subsequent pavement course is placed or the final pavement markings are installed. The Contractor shall furnish, apply and when so ordered, remove short-term pavement markings where shown on the plans, or directed by the Engineer, in accordance with these specifications.

619-1.07 Temporary Traffic Signals. The Contractor shall furnish, install, move, remove and maintain temporary traffic signals and necessary components where indicated on the plans or as directed by the Engineer. The temporary traffic signals and necessary components that are furnished by the Contractor shall remain the property of the Contractor.

619-1.08 Mailboxes. During construction, the Contractor shall maintain in a usable condition and location specified by U.S. Postal requirements, postal route mailboxes serviced from motor vehicles.

619-1.09 Opening Highway to Traffic Prior to Contract Acceptance. This work includes the maintenance and protection of traffic on any portion of pavement, structure, or ramp directed in writing by the Regional Director to be opened to traffic prior to contract acceptance and on which traffic was not specified to be maintained and protected during construction. Pavement sections on new locations which are indicated to be used in the maintenance of traffic plan or which are requested by the Contractor to be used to maintain traffic, shall not fall in this category.

619-1.10 Railroad Protection. Where the contract work affects railroad companies, the maintenance and protection of traffic requirements specified in §105-09, Work Affecting Railroads and special provisions of the contract proposal shall apply.

619-1.11 Duration of Contract. The duration of the contract, for the purpose of this work, shall be from the date any work is started on the contract, including moving in equipment, signs, offices, shops and the like, until the date the contract is officially accepted.

619-1.12 Maintain Traffic Signal Equipment. The Contractor shall maintain in proper operation, existing, relocated, modified or newly installed traffic signals indicated in the contract documents or directed by the engineer for the period specified in the contract documents.

619-1.13 Flashing Arrow Board. Furnish, install, maintain and remove Flashing Arrow Board warning devices in accordance with plans, NYS Manual of Uniform Traffic Control Devices or the directions of the Engineer. Flashing arrow boards are intended for use as temporary traffic warning devices during construction and obstruction periods, and under this item the Contractor shall provide Flashing Arrow Boards made necessary by the operations. The number and type required shall be the number and type necessary, in accordance with the criteria given below, to satisfactorily guide traffic through the construction. The actual number will depend on the Contractor's sequence of operations.

619-1.14 Construction Zone Pavement Markings. The Contractor shall furnish, apply, maintain and remove construction zone pavement markings conforming to the NYSMUTCD at the locations, and in accordance with the patterns, indicated in the contract documents or directed by the Engineer. These pavement markings are intended for use in detours, temporary pavement realignments and crossovers, lane shifts and closures, and other temporary traffic patterns associated with the construction activities.

619-1.15 Maintenance and Protection of Traffic During Nighttime Operations. Nighttime operations consists of work specifically scheduled to occur after sunset and before sunrise. In addition to the requirements of basic maintenance and protection of traffic, additional requirements for maintenance and protection of traffic during nighttime operations shall be as follows:

A. Traffic Control Supervision. The Contractor shall provide a full-time traffic control supervisor for nighttime operations with adequate training, experience, and authority to implement and maintain all traffic control operations. The traffic control supervisor must be approved by the

Engineer based on a written request by the Contractor detailing the training and experience of the traffic control supervisor. The traffic control supervisor shall be assisted by a full-time traffic control crew equipped with a suitable vehicle or vehicles and a mobile communications system consisting of radios or cellular phones. The duties and responsibilities of the traffic control supervisor shall be included in the plan of nighttime operations. During setup and removal of lane closures and other traffic control setups, the traffic control supervisor and crew shall be assisted by additional workers as necessary.

B. Plan of Nighttime Operations. Thirty days prior to the start of night work, the contractor shall submit a written plan for nighttime operations to the Engineer. The plan shall detail all aspects of the traffic control setup; lighting plans; the functions, responsibilities and identities of the traffic control supervisor and crew; and other details as necessary. It shall include a contingency plan identifying foreseeable problems and emergencies that may arise, and the approach that will be used to address them. This plan shall be revised and updated by the contractor as necessary during the progress of the work to accommodate actual conditions on the project.

C. Project Site Patrol. During nighttime operations, the traffic control supervisor and crew shall constantly patrol the contract area to ensure that conditions on the site are adequate for public safety and convenience at all times, to ensure worker safety from intrusions into the worksite, and to ensure that the provisions for maintenance and protection of traffic in the contract documents and in the plan for nighttime operations are adhered to. The traffic control crew shall maintain and adjust signs, channelizing devices, area lighting and other traffic control devices as necessary.

D. Waiver of Requirements. When the work does not require closure of an active lane, roadway, or ramp and when no construction operations occur adjacent to active traffic lanes; the requirements for a full-time traffic control supervisor and full-time project site patrol shall be waived. However, the contractor shall provide a competent supervisor and workers to install, maintain, adjust, and remove traffic control devices as required by the work operations. The details of the supervision and site patrol to be provided under this waiver shall be included in the plan of nighttime operations.

E. Trained Flaggers. All flaggers used in nighttime operations shall be formally trained in flagging operations. This training may consist of ATSSA (American Traffic Safety Services Association), Union, or trade association training, or training by an individual who has received formal training from a recognized program or agency in work zone traffic control. Prior to the start of work, the contractor shall provide the Engineer with a written summary of training for each individual flagger. When requested by the Engineer, flaggers shall demonstrate their competency in flagging procedures. Flaggers not thoroughly competent in flagging procedures to the satisfaction of the Engineer shall be replaced at once.

F. Emergency Flares. A supply of emergency flares shall be maintained by the Contractor for use in the event of unanticipated situations such as traffic accidents, equipment breakdowns, failure of lighting equipment, etc.

619-2 MATERIALS. All materials used shall comply with the requirements of the appropriate subsections of Section 700, Materials, or as established by this section, the applicable standard sheets or the plans.

619-2.01 Existing Pavement Repair. Existing pavements shall be kept in repair using materials compatible with the pavement. In general, plant-mixed bituminous concrete is suitable for all pavement surfaces. Material other than plant-mixed bituminous concrete may be used if approved by the Engineer.

619-2.02 Construction Signs, Other Signs, and Sign Covers. Rigid sign panels may be aluminum, fiberglass, galvanized steel, or plywood, except that sign panels placed on Type III Breakaway Barricades shall be aluminum.

Rigid lightweight plastic may also be used for sign panels, but not for panels larger than 1200 X

1200 mm. The rigid lightweight plastic substrate shall consist of at least two parallel surfaces of plastic separated by plastic foam or stiffener/spacers. A single piece plastic extrusion simulating this construction will also be acceptable. External stiffeners may be used to prevent warping and excessive flexing, or to attach the panel to posts. If through bolting is used to attach the panel to stiffeners, or to attach the panel directly to the posts, the bolt heads shall be provided with clear washers to minimize obscuring the legend. The rigid lightweight plastic substrate, plus any external stiffeners, shall not have a combined mass of more than 6 kg/m2.

On rigid panels, all colors of sign faces, except orange, shall be reflectorized and meet the requirements of §730-05 Reflective Sheeting, Materials Designation 730-05.02 (Class B). When orange signs on rigid panels are specified they shall be fabricated using reflectorized fluorescent orange colored sheeting meeting Materials Designation 730-05.04 (Class D).

Flexible sign panels shall be a solid, orange colored, durable elastomeric material. Flexible sign panels fabricated from mesh will not be allowed.

Flexible signs shall be orange in color and a reasonable visual match to Munsell Book Notation 2.5 YR 5.5/14. The orange color flexible panels shall be approved by the Engineer prior to use. Flexible sign panels need not be reflectorized.

Black sign characters shall be non-reflective, and shall conform to the requirements of §730-13 Reflectorized Sheeting Sign Characters (Type V).

White sign characters shall meet the requirements of either §730-12 Reflectorized Sheeting Sign Characters (Type IV) or §730-13 Reflectorized Sheeting Sign Characters (Type V).

Covers used to inactivate unneeded signs shall match the size and shape of the sign and shall cover the entire sign face. More than one layer of fabric may be required to prevent legibility of the sign legend to be covered. The covers shall be a heavy duty, opaque material; and dark green, brown, or black, in color. The sign cover shall be attached to the sign in a secure manner using straps or other means approved by the Engineer. The finished sign covers shall be neat in appearance, with all fasteners secured on the backside of the sign face.

619-2.03 Delineators, Temporary Box Beam Barrier, Temporary Concrete Barrier, Construction Barricades, Lighting for Construction Barricades, Tubular Markers, and Short-Term Pavement Markings. Delineators, barricades, lighting for construction barricades, short-term pavement markings, tubular markers and similar materials shall meet the requirements of these specifications and shall be in accordance with the plans, applicable standard sheets and the M.U.T.C.D. No materials or methods which will cause damage to any pavement or paving course that will be retained shall be employed in the removal of pavement markings.

Tubular markers shall meet the requirements of §730-09 Tubular Markers for Construction Zone Channelization. Tubular markers and cones purchased after October 1, 1998 shall be certified by their manufacturers or vendors as complying with NCHRP 350 testing requirements. The basis for such certifications shall be full or simplified crash testing or satisfactory in-service performance of identical or similar devices.

Temporary box beam barrier shall meet the requirements of box beam median barrier as specified in §710-21 Box Beam Guide Railing and Median Barrier. After the removal of the barrier, the pavement repairs shall be made in accordance with the applicable requirements of Section 402 - Hot Mix Asphalt (HMA) Pavements or Section 502 Portland Cement Concrete Pavement.

Temporary concrete barriers shall conform to the dimensions, joint connections, materials details, and anchoring details shown on the standard sheet or approved material details. The barrier sections shall be precast concrete units. The Manufacturer shall certify that the temporary concrete barrier units conform to the details shown on the standard sheet or approved materials details.

The details for temporary concrete barrier shown on the standard sheet or approved materials details are standard. Designs, other than those shown on the standard sheet or the approved materials details, may be proposed and, if found acceptable, they will be placed on the approved list. No variation in the method of connecting the units together will be approved unless evidence that the temporary concrete barrier, with the proposed joint system, has been successfully crash tested by a recognized testing agency. The test vehicle shall be smoothly redirected without showing any evidence of penetrating or

vaulting. The tests shall be conducted in accordance with NCHRP 350 under the following criteria:

1. Test vehicle shall be the 2000P
2. Impact angle 25° ±2°.
3. Impact speed 100 km/h.

In no case shall the tested deflection of the barrier exceed 400 mm.

The cross sectional dimensions shown on the standard sheet shall be used in all cases without variation.

The Engineer will inspect the temporary concrete barrier sections upon delivery to the project site for conformance to specifications. Any barrier sections having damage and/or defects in the concrete and/or joint connections will be rejected by the Engineer when, in the Engineer's judgement, the performance of the barriers will be affected.

The temporary concrete barrier sections shall form a smooth and continuous barrier when joined together. Any sections damaged or misaligned while in service shall be corrected or replaced to the satisfaction of the Engineer.

When reflectorization is required by the M.U.T.C.D. reflective sheet material shall be used and it shall conform to §730-05, Reflective Sheeting, Material Designations 730-05.02 (Class B) or 730-05.03 (Class C), except where glass or plastic buttons are used as delineators. Construction barricades, cones and drums may be reflectorized with reflective sheeting conforming to the requirements of §730-05, Reflective Sheeting, Materials Designation 730-05.01 (Class A). All traffic cones 700 mm in height, when used after dark, shall have two (2) white horizontal stripes of reflective material near the tip. The reflective material shall conform to the requirements of §730-05 Reflective Sheeting, Class A, B or C. The upper stripe shall be 150 mm wide with its upper edge 75 to 100 mm below the top of the cone. The lower stripe shall be 100 mm wide with its upper edge 50 mm below the upper stripe.

When reflectorization is not required, any paints utilized shall be of an exterior type conforming to the appropriate Highway Color Tolerance Chart PR Colors No. 1 through No. 6. These requirements must be maintained throughout the period of the contract with repair or replacement made by the Contractor as necessary.

Short-term pavement markings shall consist of reflectorized pavement marking paints, removable reflectorized pavement marking tape, non-removable reflectorized pavement marking tape, or removable raised reflectorized pavement markers. Removable reflectorized pavement marking tape and raised reflectorized pavement markers shall be selected from the Department's Approved List of "Removable Reflectorized Pavement Markings". Pavement marking paints shall meet the material requirements of Section 640 Reflectorized Pavement Marking Paints. Non-removable pavement marking tape shall be specifically designed for use as a pavement marking and shall be approved by the Engineer prior to application. All line segments shall be not less than 100 nor more than 150 mm in width and the colors shall be as specified in the M.U.T.C.D.

619-2.04 Temporary Structures and Approaches. When specific details are shown on the plans for temporary structures, the materials specified shall be used, except that substitutions or alterations may be permitted if approved by D.C.E.S. Mill inspection will not be required for structural steel furnished under this item. Certified copies of the manufacturer's test results shall be submitted to the Engineer. When specific details are not shown on the plans, the Contractor shall assume all liability and responsibility for determining that all materials required conform to the current AASHTO specifications for Highway Bridges unless otherwise approved by the DCES. Used material shall not be furnished for Fracture Critical Members. Excluded from this provision are pedestrian and pre-engineered (fabricated) proprietary structures.

619-2.05 Temporary Traffic Signals. All span wire, inductance loop wire, shielded lead-in cable, traffic signal cable, and other wire used for temporary traffic signals shall be new material meeting the applicable requirements of §680-2 of the Standard Specifications.

All other equipment for temporary traffic signals shall meet the requirements of §680-2 of the Standard Specifications except for the following modifications:

A. Used Equipment. Used equipment in good operating condition may be furnished to provide the required operation of the signals.

B. Manufacturer's Certification. Manufacturer's certification of compliance will not be required.

C. Signal Controller. The signal controller may be either solid state or electro-mechanical.

D. Traffic Signal Heads. The material and painting requirements of §724-04 Traffic Signal Heads, shall not apply except that the signal head housing shall be made of aluminum alloy and shall be painted with an exterior dark green enamel paint or epoxy powder coating.

E. Conflict Monitor. Means shall be provided to prevent the signal from displaying indications which will result in two or more conflicting traffic movements being permitted simultaneously.

619-2.06 Type III Construction Barricades. Type III construction barricades shall meet the requirements of the following specifications:

A. Barricade Frames. Barricade frames for Type III construction barricades shall meet the requirements of the following specifications:

1. PVC Pipe Barricade Frames for Alternate "A" and "B". PVC Pipe barricade frames shall be fabricated from plastic pipe conforming to the following table:

TABLE OF ACCEPTABLE MATERIALS FOR PVC PIPE BARRICADES

NPS DESIG-NATION	PIPE		FITTINGS	
	A.S.T.M.	*SDR RANGE	ALTERNATE A	ALTERNATE B
3	D2241	21.0 TO 32.5	D2665 OR D2466	D2468, D2661, D2665, D2466
3	D2665	---	D2665 OR D2466	D2468, D2661,D2665, D2466
3-½ **	D2241	21.0 TO 41.0	D2466	D2468,D2466
4 **	D2241	21.0 TO 64.0	D2665 OR D2466	D2468, D2661, D2665, D2466
4	D2665	---	D2665 OR D2466	D2468, D2661, D2665,D2466
4	D2729	---	D2729	D2729

* SDR (Standard Dimension Ratio) as specified in the various A.S.T.M. Designations.

** NPS 3-½ OR 4 A.S.T.M. D2241 SDR 21 to SDR 26 shall be used on barricades which are extended for sign mounting. These pipes shall not be used on other barricades.

All joints in Alternate "A" shall be glued with a solvent cement compatible with the pvc pipe chosen by the Contractor.

All joints in Alternate "B" shall be free to separate upon vehicle impact. Pipes and fittings shall be tied together with a braided nylon rope as shown on the Standard Sheet.

2. Metal Barricade Frames for Alternate "M". Square tubing for the Alternate "M" barricades shall be either perforated or unperforated steel conforming to one of the following:

12 Ga. ASTM A653M Grade A
14 Ga. ASTM A1011 Grade 50

The brackets shall be fabricated from 6 mm plate conforming to ASTM A653M Grade A or ASTM A1011 Grade 50.

The bolts shall be ASTM F568 Class 4.6 and the nuts shall be ASTM A563M Grade 0. Both the nuts and the bolts shall be galvanized in accordance with the requirements of §719-01 Type II.

The Contractor may at its option supply ungalvanized square steel tube and brackets. However, any rust which may, as determined by the Engineer, impair the collapse of the barricade upon impact may result in the rejection of the barricade unit.

3. Polyethylene Barricade Frames for Alternate "C". Base and upright for the Alternate "C" barricade shall consist of molded medium density polyethylene tubing meeting the requirements of ASTM D1248-IIA3. The angled brace shall consist of extruded high density PE meeting the requirements of ASTM D1248-IIIA4. Polyethylene tubing and miscellaneous hardware shall be of the dimensions and sizes indicated on the standard sheets. All joints in the PE components shall have tight friction fits designed to withstand normal wind and construction site conditions but to separate on impact.

B. Panels for Rails or Signs. Barricade rails and signs mounted on the barricade shall be aluminum or high density polyethylene (HDPE) panels . Aluminum rail and sign panels shall be 0.635 and 3.2 mm thick respectively and shall conform to the requirements of §730-01 Aluminum Sign Panels. HDPE panels shall be 3.2 mm nominal thickness and shall conform to the requirements of ASTM D1248-IIIA5.

The three rails of the barricade shall have 150 mm wide reflectorized orange and white diagonal stripes sloping at an angle of 45°. The stripes shall slope downward toward the side on which traffic is to pass. The reflective sheeting for the stripes shall conform to the requirements of §730-05 Reflective Sheeting, Materials Designation 730-05.01 (Class A) or 730-05.02 (Class B) or 730-05.03 (Class C) at the Contractor's option.

619-2.07 Maintain Traffic Signal Equipment. All traffic signal hardware including but not limited to wire, cable, conduit, pullboxes, switchpacks, modules and relays, signal heads, poles, and pedestrian push buttons used to maintain proper operation shall meet the applicable requirements of §680-2 materials. Parts and materials which are to continue in operation beyond the contract duration shall be new.

619-2.08 Flashing Arrow Board. The Flashing Arrow Boards shall be trailer mounted self contained units or, with permission of the Engineer, truck mounted self-contained units. Flashing Arrow Boards shall display a flashing symbol consisting of flashing yellow lights arranged on a panel to form an arrow.

The arrow panel shall consist of 1200 X 2400 mm rectangular solid panel finished in non-reflective black, and shall be mounted so that the bottom of the panel is a minimum of 2.1 m above the roadway. The arrow indication shall cover the entire area of the panel, and shall be composed of lamp units with five lamps in the arrowhead and five lamps in the shaft.

Lamps shall be arranged and controlled to provide the following mode selections: Left Arrow, Right Arrow, Left and Right Arrow, and Caution. In the three directional modes, the lamps in the shaft next to the arrow point shall not illuminate. The caution mode shall consist of either two pairs of alternately flashing lamps arranged in a pattern that does not indicate direction, or four lamps simultaneously flashing in each of the four corners of the board. The rear face of the arrow panel shall contain one or more clear lamps to indicate that the arrow board is operating properly. Arrow panel operation controls shall be mounted in a lockable enclosure.

The lamps shall flash at a rate of not less than 25 nor more than 40 flashes per minute with a minimum lamp "on time" of at least 50 percent of the cycle. The lamps shall be recess mounted or alternatively equipped with an upper hood of not less than 180 degrees. The lamps shall be equipped with an automatic solar cell controlled dimming switch activated at a level of approximately five candellas. The solar cell dimming switch shall be equipped with a delay to prevent undesirable actuation from car lights. The dimming voltage to the lamps shall be manually controllable over a five to twelve volts effective range.

Flashing Arrow Boards shall be powered by line voltage, diesel motor generator system, or by a solar charged battery system. Boards powered by diesel motor generator system shall be capable of sustained operation for 72 continuous hours at normal operating voltage. Solar charged arrow boards shall be capable of continuous operation on battery power only for the same period at normal operating

voltage. The flashing arrows of diesel or line powered boards shall be legible at a minimum distance of 1600 meters on a bright sunny day or a clear night. The flashing arrows of solar charged boards shall be clearly legible continuously from any point on the traveled way or shoulder from the beginning of the lane closure taper to an upstream distance of 500 meters on a bright sunny day or a clear night.

619-2.09 Plastic Drums. Plastic Drums may be used for channelization devices, provided they are of the proper size and reflectorized as indicated in the M.U.T.C.D. Plastic drums purchased after October 1, 1998 must be certified by their manufacturers or vendors as complying with NCHRP 350 testing requirements. The basis for such certifications shall be full or simplified crash testing or satisfactory in-service performance of identical or similar devices. The plastic drums shall have provisions for the installation of ballast (weights) or retainer rings to prevent the drums from blowing over due to wind loading. The ballast or retainer rings must be designed to separate from the drum on impact. The ballast shall be located at or near ground level and consist of bagged sand, or other material approved by the Engineer, weighing no more than 22 kilograms. The sand shall be contained in waterproof closed bags or in a waterproof compartment of the device specifically designed for the purpose. For two-piece drums, only the base shall be detachable no more than 100 mm above the pavement. For one-piece drums, the base shall be elongated to accept ballast on one or more sides. No open or top metal drums will be permitted.

619-2.10 Construction Zone Pavement Markings. These markings shall consist of reflectorized pavement marking paints, removable reflectorized pavement marking tape, or removable raised reflectorized pavement markers. Pavement marking paints shall meet the material requirements of §640-2. Removable reflectorized pavement marking tape and raised reflectorized pavement markers shall meet the requirements of §727-02 and shall be selected from the Department's Approved list of "Removable Reflectorized Pavement Markings." All longitudinal line segments shall be not less than 100 mm nor more than 150 mm in width and colors shall be as specified in the MUTCD and shown on the plans.

The type of pavement marking material to be supplied shall be as required by the pay item. In the case of the "Optional Construction Zone Pavement Markings" pay items, the Contractor may select the type of material to be used from the choices permitted in the preceding paragraph, except that reflectorized pavement marking paint shall not be used on any top pavement course that is to remain in place without overlaying at the completion of the project, except where the location of those markings coincide with final painted pavement markings. Raised reflectorized pavement markers shall not be used to simulate marking letters or symbols.

619-3 CONSTRUCTION DETAILS

619-3.01 Basic Maintenance and Protection of Traffic. Under this work, the Contractor shall maintain and protect traffic in accordance with the following:

A. General. The Contractor shall generally provide a traveled way suitable for two lanes of moving traffic, or more lanes if shown on the plans, or in the proposal. The traveled way shall be kept reasonably smooth and hard at all times, and shall be well drained and free of potholes, bumps, irregularities and depressions that hold or retain water. Construction operations shall be conducted to insure a minimum of delay to traffic. Stopping traffic for more than five minutes shall not be permitted unless specifically authorized in writing by the Engineer. The necessary equipment and personnel to attain and maintain a satisfactory riding surface shall be available and used as needed at all times when work is under way and when work is temporarily suspended for any period of time. Special attention to maintenance of a satisfactory traveled way shall be given during weekends, holidays and the winter season.

B. Cleaning of Highways. The Contractor shall keep the traveled way free of foreign objects such as spilled earth, rock, timber and other items that may fall from transporting vehicles. Materials spilled by or dropped from the undercarriage of any carrying vehicle used in the Contractor's hauling operations along or across any public traveled way both within and outside the contract limits shall be removed immediately.

C. Dust Control. Dusty conditions resulting from the Contractor's operations shall be corrected by the use of calcium chloride and/or water. Water used as a dust palliative shall be distributed uniformly over a minimum width of 2400 mm by the use of suitable spray heads or spray bar.

Nothing in these specifications shall preclude the use of a dust palliative which has been evaluated and found to be environmentally compatible and is used in conformance with any conditions placed on its use. This use shall be at no additional cost to the State and as approved by the Engineer. A list of acceptable dust palliatives is available from the Director, Geotechnical Engineering Bureau or a Departmental Soils Engineer.

D. Traffic Control. Whenever it becomes necessary to maintain traffic on one lane, the Contractor shall provide adequate traffic controls on the section of highway on which vehicle operation is maintained. The Contractor shall employ a sufficient number of competent flagpersons and/or temporary traffic signals to control one lane traffic continuously. In the event the length of the one lane operation is extremely short and conditions are favorable for safe operation, the Engineer may, in writing, authorize the Contractor to dispense with flaggers or traffic control signals. The Contractor shall also provide a sufficient number of competent flaggers in areas where construction equipment is operating in potential conflict with public traffic, regardless of the volume of traffic or the sight distance. Flaggers shall wear orange hard hats meeting current OSHA standards for impact, electrical shock, and burn protection and vests in conformance with the M.U.T.C.D., and shall direct traffic in conformance with said manual. Signal Paddles meeting the requirements of Section 293.2 of the MUTCD shall be used as the standard signaling device for flagging operations where one or more flaggers are controlling a single stream of traffic, or two alternating streams of traffic proceeding in opposite directions. Signal flags may be substituted where display of the STOP and SLOW faces in opposite directions may be inappropriate or misleading, or in other situations, when approval is granted by the Engineer.

E. Drainage. The Contractor shall devote particular attention to all drainage facilities, keeping them fully operative at all times. Ditches shall be provided at all times, even during grading operations and periods of accumulated plowed snow, to adequately drain the traveled way and the remainder of the right-of-way areas.

F. Ingress and Egress. The Contractor shall provide and maintain, at all times, safe and adequate ingress and egress to and from intersecting highways, homes, business and commercial establishments at existing or at new access points, consistent with the work, unless otherwise authorized by the Engineer. The Contractor will not be responsible for snow removal from driveways or entrances. On highways on which motor bus service is maintained, the Contractor shall provide suitable areas or locations for the loading and unloading of passengers. The existing pavement, at improved intersecting streets, shall not be disturbed without prior consent of the Engineer.

G. Channelization, Delineation, Pavement Edge Drop-off Protection. The Contractor shall furnish, erect, move, maintain and remove delineators, channelizing devices, and traffic barrier as required by the contract documents and as directed by the Engineer. In areas where grading is being done, a safe and easily traveled roadway shall be properly marked at all times either by the use of delineation and channelizing devices or flaggers. Where private driveways, pedestrian or handicapped facilities exist, the entire access area shall be kept safe and smooth for convenient ingress and egress. Any area determined by the Engineer to be particularly hazardous shall be marked by the use of flashing warning lights conforming to the requirements of the MUTCD in addition to the channelizing or delineation devices.

1. Channelization. Channelizing devices shall be provided as shown in the plans and proposal, or as required by the Engineer, to physically separate traffic from the portion of roadway not available for travel, and to mark the limits of the roadway that is available for travel. Channelizing devices shall consist of cones, plastic drums, tubular markers, Type III

Barricades, or vertical panels. The design and usage of these devices shall conform to the requirements of the MUTCD.

The placement and spacing of these devices in tapers shall not exceed the values given in the MUTCD. Along pavement edge drop-offs, placement and spacing shall be in accordance with Table 619-1 of these specifications. At locations other than tapers and pavement edge drop-offs, unless specific placement and spacing of devices is shown in the contract documents, the placement and spacing between devices shall be selected by the Contractor subject to the Engineer's approval. The spacing shall be sufficiently close to clearly indicate the intended path through the work zone and the portions of the roadway not available for use. If, after deployment of the selected devices, the Engineer is not satisfied that the spacing and placement is sufficient, the Engineer may direct that a different spacing be used.

All channelizing devices shall be maintained upright, in proper alignment and orientation, and kept clean at all times. If ballast is used to maintain alignment and position of the devices, it shall consist of dry sand or other material approved by the Engineer, and placed at ground level. The sand shall be contained in waterproof closed bags or in a waterproof compartment of the device specifically designed for the purpose. Under no circumstances shall ballast be placed on top of a drum or at any point above ground level on any of these devices. If plastic drums are used, they shall be two-piece devices with detachable bases or one-piece devices with elongated bases provided to hold the ballast. In the case of one-piece devices, the ballast shall be placed on the side from which traffic approaches. In no case will the use of steel drums or open-top plastic drums be permitted. Where warning lights are attached to the channelization devices, a bolt, nut and washer shall be used for the attachment as recommended by the manufacturer, and the battery should be located at ground level.

2. Delineation. If post-mounted delineators are used, they shall be securely mounted and placed in accordance with the requirements of the MUTCD. They shall be placed only behind curbing or to mark the outside limits of usable shoulders. Post-mounted delineators are not required to be installed behind channelizing devices, but such an installation is not prohibited. Other delineators for mounting on traffic barriers or other purposes may be circular or rectangular in shape and shall be constructed of reflective sheeting having a minimum area of 12 900 square millimeters or a reflective button having a minimum diameter of 75 mm.

3. Drop-off Protection. For drop-offs within three meters of the travel lanes, except bridge drop-offs or other drop-offs in excess of 1.8 m deep, the Contractor shall provide traffic protection in accordance with the provisions of Table 619-1, "Required Protection for Pavement-edge Drop-offs" and its accompanying notes, unless otherwise shown in the Contract documents. In all cases, construction operations shall be conducted so as to minimize to the extent practicable the time, depth, and length of drop-offs to which motorists are exposed. At the close of work each day, the Contractor shall provide the treatment shown in Table 619-1. At the time a drop-off condition first occurs, the protection treatment shall be installed based on the anticipated number of days the traffic will be exposed to the drop-off. The anticipated exposure time shall be determined by the Contractor, subject to verification by the Engineer. If at any time subsequent to installation of the protection treatment, the Engineer determines that the anticipated exposure time is likely to increase such that additional protection is required, that increased protection shall be installed as soon as practicable, and it shall be based on the revised anticipated exposure time measured from the first day the drop-off condition existed. In addition, "LOW SHOULDER" or "NO SHOULDER" signs, as appropriate, shall be used for all drop-offs within 1.5 m of the shoulder edge. For long drop-offs, these signs shall be placed beyond intersections and at spacing not exceeding 300 meters. For drop-offs less than 50 mm deep, the "LOW SHOULDER" sign will not be necessary after edge lines are installed.

If a ramp is required by Table 619-1, it shall be constructed from the pavement surface to the surface of the excavated area using a slope not steeper than the slope shown in the table. Ramp material shall be erosion resistant, fully compacted, and compatible with the material in

the excavated area. At the Contractor's option, a preformed ramp may be used provided it is adequately anchored to the underlying course. Unless indicated otherwise in the plans or permitted in writing by the Engineer, channelizing devices or positive barrier used to protect drop-offs shall not intrude into the travel way to the extent that they reduce available lane width to less than 3 meters on roadways with actual operating speeds of 70 km/h or less or 3.35 m on all other roadways. Channelizing devices may be placed in the drop-off area only for depths of up to 150 mm if their placement on the roadway would reduce lane widths below the values specified above. For drop-offs deeper than 150 mm, the channelizing devices must be placed entirely on the pavement.

If the Contractor's operations are scheduled or delayed such that positive barrier is required by Table 619-1, or if the Contractor chooses, with written approval from the Engineer, to provide a positive barrier in lieu of the treatment shown in Table 619-1, the barrier shall be installed at no additional cost to the State. The positive barrier shall meet all the requirements of the Standard Specifications and Standard Sheets for temporary concrete barrier. (Box Beam Guide Railing or Heavy Post Blocked-Out Corrugated Beam Guide Rail may be used if approved in writing by the Engineer and the distance from the back of the rail to the drop off is at least 1.2 m for the corrugated beam rail and 1.5 m for the box beam.) Any anticipated or proposed use of positive barrier by the contractor shall require submittal of a plan for approval by the Regional Director. The plan shall include barrier type, location, terminal and end treatment, and any necessary traffic control devices such as signing, barricades, channelizing devices etc in accordance with the MUTCD. The contractor shall construct his plan under the following guidelines.

Approach ends of positive barrier shall be flared at the taper rate shown in Table 619-2. When operating speeds are over 65 km/h, an approved safety terminal or sand barrel array will be required on approach ends of temporary concrete barrier when the offset from the edge of traveled way to end of the full section barrier is less than 3.7 m. In traversable medians, gores and other areas where impacts on a tapered concrete end section could allow vehicles to penetrate into opposing or adjacent lanes of traffic, the use of the tapered concrete end section is prohibited. Box beam and heavy post blocked-out corrugated beam guide rail shall be anchored with the appropriate end assemblies and anchorage units shown on the standard sheets for these systems. Alternate methods of terminating positive barrier such as connecting to existing barrier or shielding behind other barrier will be considered for approval. If a work zone crash cushion is used, any work zone crash cushion purchased after 10/1/98 must comply with NCHRP 350. The test level shall be as indicated in §712-06. Work zone crash cushions purchased before 10/1/98 may be phased out as they complete their normal service life.

H. Signs

1. Control and Authority. All existing highway signs, markers, delineators and their supports (authorized by the Department of Transportation) within the contract limits shall remain under the control and jurisdiction of the Engineer and shall be maintained for the duration of the contract by the Contractor if directed by the Engineer. Any signs not authorized by the Department of Transportation, shall be removed from the right-of-way if ordered by the Engineer.

2. Maintenance of Route Marker Signs. Route marker signs shall be maintained by the Contractor during construction. Should relocations be necessary at various stages of construction, they shall be in conformance with the M.U.T.C.D. and the directions of the Engineer to locations visible to traffic. Appropriate directional signing shall also be used in conjunction with route marker signs.

3. Storage of Existing Signs, Markers and Delineators. The Contractor, when ordered, shall remove existing signs, markers and delineators and their supports which interfere with the construction operations; store, protect, clean and replace them on the contract as directed to

locations approved by the Engineer. Signs, markers and delineators not to be replaced, shall be cleaned and delivered to the Engineer as directed. Signs, markers and delineators lost or damaged because of negligence on the part of the Contractor, shall be replaced at the Contractor's expense.

TABLE 619-1 REQUIRED TREATMENT FOR PAVEMENT EDGE DROP-OFFS

Depth of Drop-off (mm.)	Anticipated Exposure Time (Calendar Days)	AADT ≤ 7500		AADT ≥ 7500 and all Freeways and Expressways	
		Operating Speed ≤70 km/h	Operating Speed > 70 km/h	Operating Speed ≤ 70 km/h	Operating Speed >70 km/h
50 to 150	≤7	30	45	15	15
	8 to 60	30 / 1:1	60/ 1:1	15 / 1:1	30 / 1:1
	60+	30 / 1:1	60 / 1:1	15 / 1:3	60/ 1:3
150 to 600	≤7	15	15	15	15
	8 to 60	15	60 / 1:3	30 / 1:3	60 / 1:3
	60+	15	60 / 1:3	30 / 1:3	60 / 1:3
600+	≤7	15	15	15	15
	8 to 60	30 / 1:3	60 / 1:3	30 / 1:3	60 / 1:3
	60+	30 / 1:3	60 / 1:3	30 / 1:3	Positive Barrier

DEVICE SPACING / RAMP SLOPE
METERS / VERT. :HORIZ.

Notes

1. The table shows spacing for drums or Type III barricades. The spacing shall be halved if other channelizing devices are used. Type III barricades may be used instead of drums, if space permits, but no separate payment will be made unless otherwise shown on the plans
2. For drop-off lengths shorter than the maximum devices spacing shown in Table 619-1, or for drop-offs at intersections, the device spacing shall be shortened to provide adequate channelizing as directed by the Engineer.
3. Two flashing warning lights shall be used at the beginning of each work zone drop-off.
4. The ramp from the pavement surface to the excavated area shall not exceed the slope shown in the Table. Cases where no slope is shown, no sloped ramp is required.
5. Whenever it is not practicable in the opinion of the Engineer to achieve the desired ramp slope shown in the Table, the flattest practicable ramp shall be constructed and the device spacing shall match the 7 day spacing, except positive barrier shall be required for drop-offs exceeding 600 mm on roadways with traffic volumes exceeding 7500 vehicles per day.
6. At the Contractor's option, required 1:3 ramps may be flattened to 1:4 and device spacing increased to 60 meters.
7. For drop-offs located more than 3 meters from the edge of the travel lane, ramping shall not be required and the minimum required spacing for drums and Type III barricades shall be 30 meters. (15 meters for alternate devices). Drums or Type III Barricades spaced at 15 meters or other approved devices spaced at 15 meters may be substituted for positive barrier. Signs and flashing warning lights shall be provided as required in this Section for drop-offs greater than 150 mm.
8. For winter shutdown periods, the Contractor shall restore the roadway to the normal operating

condition whenever possible. If this cannot be achieved, a compacted 1:4 ramp shall be provided at all pavement edge drop-offs. If a 1:4 ramp cannot be provided, a positive barrier shall be required, unless otherwise directed by the Regional Construction Engineer, at no additional cost to the State.

9. For drop-offs exceeding 600 mm in depth for exposure times of 7 days or less, and when an offset of at least 600 mm cannot be provided from the edge of travel lane to the drop-off, alternate traffic control plans may be required by the Engineer.

Table 619-2 TAPER RATES FOR POSITIVE BARRIER

OPERATING SPEED (km/h)	50	65	80	90	100	110
TAPER RATE FOR TEMPORARY CONCRETE BARRIER	8:1	11:1	14:1	16:1	18:1	20:1
TAPER RATE FOR BOX BEAM OR HEAVY POST CORRUGATED BEAM	7:1	9:1	11:1	12:1	13:1	15:1

I. Existing Pavement Markings. The Contractor shall remove, as soon as practicable, existing pavement markings where indicated on the plans, in the proposal or where ordered by the Engineer. This shall include any pavement markings that are added during the course of the work. If darkness or inclement weather interferes with removal operations, such operations should be accomplished during the next daylight period or as soon thereafter as weather conditions permit.

The method of removal is subject to the approval of the Engineer. Obliterated markings shall be unidentifiable as pavement markings under day or night, wet or dry conditions. Overlaying existing stripes with black paint or asphalt does not meet the requirements of covering, removal or obliteration; however, the use of removable, nonreflective, preformed tape is permitted where markings need to be covered temporarily. Grinding, sandblasting, etc., must be conducted in such a manner that the finished pavement surface is not damaged or left in a pattern that will mislead or misdirect the motorist.

J. Exposed Guide Railing, Median Barrier, and Bridge Railing Ends. During non-work hours, when traffic is being maintained on the facility, all exposed approach ends (free ends) of guide railing, median barrier, and bridge railing shall be marked with a reflectorized drum and temporarily terminated. Corrugated beam guide railing and median barrier, and heavy post blocked out corrugated beam guide railing and median barrier shall be temporarily terminated by having the exposed approach ends (free ends) dropped to the ground and pinned in a manner approved by the Engineer. The approach ends of box beam guide railing, median barrier and bridge railing shall be temporarily terminated with box beam guide railing end assemblies utilizing two splice plates and the proper number of bolts per connection. No posts for anchorages will be required. Special temporary splice plates will be needed to adapt box beam guide railing end assemblies to box beam median barriers.

619-3.02 Construction Signs, Reflectorized Signs, and Sign Covers. The Contractor shall furnish and erect appropriate construction signs to adequately and safely inform and direct the motorist and to satisfy legal requirements. All signs shall indicate actual conditions, and shall be removed and/or relocated, or changed immediately as required in the contract documents and as directed by the Engineer.

All signs shall be the property of the Contractor and shall be maintained in good condition for the duration of the contract. All signs shall be removed from the work site when the contract is accepted.

Sign sizes and details shall conform to the standard sheets, MUTCD, and the contract documents. The number of signs indicated on the standard sheets, in the MUTCD, and in the contract documents are a minimum number and the contractor shall have an adequate quantity of these signs available for immediate use, as required. The Engineer may order that additional signs be used.

All wood supports, and backs of plywood sign panels shall be painted with two coats of white paint.

All signs shall be kept clean, mounted at the required height on adequate supports, and placed in the

proper position and alignment so as to give maximum visibility. In general, sign orientation shall conform to the MUTCD, Section 201.5, subdivision (g). All sign supports shall display the sign panel in as vertical an orientation as possible. The deviation angle from vertical shall not exceed ±5 degrees.

Signs that are erected and removed or relocated on a daily basis, or that must be frequently relocated to adjust to the location of construction operations, may be mounted on portable sign supports. Signs that are to remain at a fixed location may be supported on posts mounted in the ground. The type of sign supports used shall be selected by the contractor, subject to the approval of the Engineer. If rigid diagonal bracing is used, the high end of the bracing shall face away from approaching traffic. All supports, except those located beyond the deflection distances of guiderail or temporary barrier, or otherwise protected against impact by errant vehicles, shall meet the following safety requirements for portable and fixed supports.

A. Portable Supports. Ballast used to stabilize supports shall be bagged sand or other suitable material approved by the Engineer, and shall be located at ground level. Portable supports shall comply with one of the following:

1. Manufactured portable supports designed for the display of signs in temporary traffic area. For manufactured supports purchased after October 1, 2000, the Contractor shall obtain from the supplier, and provide to the Engineer upon request, a certification that the support meets the requirements of NCHRP 350 Test Level 2 or Test Level 3. The use of devices certified as meeting Test Level 2 shall be limited to roadways with a posted speed limit of 40 mph or less. Test Level 3 devices may be used on all roadways.

2. Wood supports of a configuration which has been satisfactorily crash tested as indicated in # 1 above.

3. Metal supports fabricated in accordance with the details shown on the standard sheet entitled "Type III Construction Barricades".

Fabricated wood or metal supports shall not be placed on their sides unless they are placed behind a barrier or removed a safe distance from the roadway, as determined by the Engineer.

B. Fixed Supports. If stakes are used to attach the lower end of diagonal braces to the ground, they shall not protrude more than 100 mm above the ground surface. Fixed supports shall comply with one of the following:

1. Type A Sign Supports meeting the requirements of §730-24 and the applicable Materials Details may be used for sign sizes appropriate for those supports.

2. Sign posts and footings meeting the requirements of §730-20 and the applicable Standard Sheets may be used for sign sizes appropriate for those supports.

3. Wood posts, excluding any synthetic or composite wood product, may be used as follows:

a. Wood posts up to 89 mm by 89 mm with no holes drilled.

b. Wood posts up to 89 mm by 140 mm having 2 holes of 38 mm diameter, drilled in the direction perpendicular to the flow of traffic and located 100 mm and 450 mm above ground level. These holes shall be filled with flexible caulking.

No more than two posts of acceptable sizes as listed above shall be located within a single 2.1 meter width, and no more than one post of acceptable size as listed below shall be located within a single 2.1 meter width.

c. Wood posts up to 89 mm by 140 mm with no holes drilled.

d. Wood posts up to 140 mm by 184 mm having 2 holes of 75 mm diameter, drilled in the direction perpendicular to the flow of traffic and located 100 mm and 450 mm above

ground level. These holes shall be filled with flexible caulking.

Wood posts larger than 140 mm by 184 mm shall not be used.

4. Any other support that the Contractor may select, upon submission of documentation to the Engineer demonstrating that the post selected meets the current AASHTO and NCHRP criteria for impact performance of Highway Sign Supports.

Supports for construction signs shielded by barrier or guiderail, and located beyond the deflection distance described below, do not have to conform to the above safety requirements.

TABLE 619-3 GUIDERAIL & CONCRETE BARRIER DEFLECTION DISTANCES

Guide Rail Type	Post Spacing	Deflection Distances
Cable	4880 mm	3350 mm
	3660 mm	2900 mm
	2440 mm	2440 mm
	1220 mm	2130 mm
Corrugated Beam (Weak Post)	3810 mm	2440 mm
	1900 mm	1830 mm
	1270 mm	1520 mm
Corrugated Beam (Heavy Post)	1900 mm	1220 mm
	950 mm	610 mm
Box Beam	1830 mm	1520 mm
	910 mm	1220 mm
Concrete Barrier	NOT APPLICABLE	0 mm

Flexible signs will only be allowed for short-term, daytime use, for portable type signs that are deployed for use on a daily basis. They may not be used overnight, or for signs mounted on supports installed in the ground, or on portable supports that are left in place continuously for more than one work day. All flexible sign panels shall be mounted on supports with adequate bracing, so as to minimize flutter and to support the intended shape of the sign.

Intermixing reflective fluorescent orange colored signs with non-fluorescent orange colored flexible signs within the same series of signs shall not be allowed.

All construction signs shall be mounted in accordance with the MUTCD. Signs on rigid panels, except rigid lightweight plastic sign panels, shall be mounted at a minimum height of 1.5 m. Flexible sign panels, including rigid lightweight plastic sign panels, shall be mounted at a minimum height of 1.5 m, or optionally as low as 0.3 m when the following conditions are met:

A. On two lane, two-way roadways and four lane divided highways, when signs are placed on the left and the right sides of the roadway.

B. Where there will be no parked vehicles to obstruct the view.

C. When at least one advance work zone warning sign, mounted at a height of 1.5 m is located upstream of any flexible signs to alert motorists that they are entering a construction zone.
D. When the Engineer determines that the lower mounting height does not adversely affect the motorists' visibility of the sign.

If signs are temporarily covered, the cover shall be attached in a manner that completely covers the face of the sign. No adhesive shall be applied to the face of the sign, and the method of attaching the cover shall not damage the sign face. Sign covers shall be secured firmly to prevent dislodging and shall be maintained in good condition to present a neat appearance and minimize distraction to motorists traveling through the work zone. Sign covers shall contain no wording or images. Damaged covers which are determined by the Engineer to be no longer effective shall be replaced.

On limited access highways, when the normal legal speed limit is 50 MPH and higher, the Contractor shall have available at the project site, sufficient warning signs as described below, to inform oncoming traffic of a stopped, or very slow traffic condition. These signs shall be placed, moved, covered, maintained and removed in a manner directed by the Engineer.

The sign shall measure 1.2 m x 1.2 m, and letters shall be 175 mm Series D, similar to a W8-10, except it shall read "BE PREPARED TO STOP." The background color shall be fluorescent orange (Materials Designation 730-05.04, Class D). Each sign shall be mounted on a suitable portable support, and each shall be equipped with a pair of warning flags conforming to the requirements of the MUTCD, Section 294.2. Both sides of the approach shall be signed unless the median is too narrow, or if there are fewer than three lanes in the approach.

The sign shall be posted approximately 460 m upstream of the end of the queue, and when the end of the queue moves, the sign shall also be moved to maintain that spacing. If the resulting location places the sign upstream of the first warning sign for the project, the contractor shall also furnish and place an appropriate general work zone sign. The work zone sign shall be placed approximately 300 m in advance of the "BE PREPARED TO STOP" sign.

Whenever a reduced regulatory speed limit for a highway work area has been legally established by any means, the R-2 speed limit signs and, if used, the R2-10 speed zone ahead signs for the reduced speed shall be supplemented by a work zone warning panel as described below.

The work zone warning panels shall be the same width as the speed limit sign they are supplementing. They shall be 150 mm high with 75 mm Series B lettering when used with size B speed limit signs; 200 mm high with 100 mm Series B lettering when used with size C speed limit signs; 300 mm high with 150 mm Series B lettering when used with size D speed limit signs and 400 mm high with 200 mm Series B lettering when used with size E speed limit signs. The panel shall read "WORK ZONE" with black legend and fluorescent orange background (Materials Designation 730-05.04, Class D). These panels shall be placed on the same posts and immediately above the speed limit signs.

Signing advising motorists of increased fines for speeding within a highway work area shall be installed on the mainline in advance of any highway construction or maintenance work area where the work encroaches on a travel lane. It shall also be installed where work encroaches on the shoulder for more than one day unless otherwise indicated by the Engineer. The signing shall conform to one of the following methods as shown on the plans or directed by the Engineer:

The "FINES DOUBLED FOR SPEEDING IN WORK ZONES" sign shall be installed upstream of the first advance warning sign. It shall not be placed between a warning sign and the condition to which it relates, or within a warning sign countdown series. To avoid the aforementioned conditions, install the sign approximately 300 m upstream of the first warning sign on highways with 85th percentile speeds equal to or greater than 70 km/h (45 mph) and 100-150 m upstream for speeds under 70 km/h (45 mph.) The sign shall have black legend and border on a white background (Materials Designation 730-05.01, Class A) except for the top of the sign which has black background and white "STATE LAW" legend. If not otherwise detailed in the plans, the sign shall be a minimum of 600 mm wide by 900 mm high with "STATE LAW" in 75 mm Series D white lettering on a black background and "FINES DOUBLED FOR SPEEDING IN WORK ZONES" in 75 mm Series C black lettering. Unless otherwise indicated in the plans, a double sized sign shall be used in freeway and multilane applications where the 85th percentile

speed equals or exceeds 55 mph.

If indicated on the plans or approved by the Engineer as an alternative to the "FINES DOUBLED FOR SPEEDING IN WORK ZONES" sign, a reduced work area speed limit sign may be supplemented by an R2-13 "FINES DOUBLE" panel in addition to the "WORK ZONE"panel. The R2-13 "FINES DOUBLE" panels shall be the same width as the speed limit sign they are supplementing. They shall be 300 mm high with 75 mm Series D lettering when used with size B speed limit signs; 450 mm high with 100 mm Series D lettering when used with size C speed limit signs; 600 mm high with 150 mm Series D lettering when used with size D speed limit signs and 900 mm high with 200 mm Series D lettering when used with size E speed limit signs. The panel shall read "FINES DOUBLE" with black legend and borders and white background (Materials Designation 730-05.02, Class B). These panels shall be placed on the same posts and immediately below the speed limit signs. If the R2-13 "FINES DOUBLE" panel is added to a previously installed speed limit assembly, it may be necessary to install additional sign posts based on an assessment of the adequacy of the existing posts to support the additional panel. It may also be necessary to adjust sign mounting heights to meet the 1500 mm minimum mounting height requirement in §619-3.02 B.

Both the work zone warning and the fines double panels shall be completely covered or otherwise removed from view when the R-2 speed limit sign is covered or removed.

619-3.03 Temporary Box Beam Barrier, Temporary Concrete Barrier, Construction Barricades, and Lighting for Construction Barricades. The Contractor shall furnish, erect, move and remove, temporary concrete barrier, construction barricades and lighting for construction barricades where and as indicated on the plans, on the standard sheets, in the M.U.T.C.D., or as directed by the Engineer. Posts and painted members or bands used to delineate drop-offs will not be considered barricades. The contractor shall provide and maintain delineation on temporary barriers. This delineation shall make the barrier visible to approaching traffic as well as traffic which is adjacent to the barrier. The contractor shall have the choice of using one, or more, of the following: Warning lights, delineators, pavement marking, reflectorized tape placed on the barrier, reflective paint, or any other device subject to the approval of the Engineer. The delineation devices shall be maintained dirt and snow free and visible throughout the term of the contract including shutdown periods.

Where indicated on the plans or in the proposal, construction barricades shall be supplemented by approved flashing or steady burning lights, as indicated.

Temporary box beam barrier shall be erected in accordance with the requirements for box beam median barrier specified in §606-3.01 and §606-3.03.

Each run, or bay, of temporary concrete barrier units shall be fastened together to form a continuous chain. After placement each successive unit shall be moved longitudinally to remove the slack in the joint between units. The units at each end of a run or bay shall be anchored as shown on the standard sheet. In order to reduce movement of the barrier on structures, areas where limited deflection is desired, or where directed by the Engineer, one of the methods shown on the standard sheet shall be used. Where shown on the plans or directed by the Engineer, the ends of the barrier run shall be fitted with an impact attenuation device or fitted with a tapered end section and flared back as directed.

Steady burning or flashing barricade lights have a minimum nominal diameter of 175 mm and shall emit yellow light. Steady burning lights may be used to supplement other channelizing devices to delineate the traveled way. Flashing lights shall not be used for delineation or channelizing purposes.

Flashing barricade lights shall be either Type A, Low Intensity, or Type B, High Intensity conforming to the requirements of section 294.3 of the M.U.T.C.D. High intensity lights shall be used where barricade lights are required to operate 24 hours per day. Low intensity lights shall be used where barricade lights are required only at night. In that event, the hours for operation of the low intensity lights shall be dusk to dawn.

Steady burning lights shall have a minimum beam intensity of 2 candelas maintained within a solid angle of 9° on each side of the vertical axis, and 5° above and 5° below the horizontal axis. The hours for operation of steady burning barricade lights shall be dusk to dawn.

619-3.04 Temporary Structures and Approaches. Temporary structures and their approaches or existing structures that are moved to provide temporary structures along with their temporary approaches shall be constructed in such a manner and sequence that interference with and inconvenience to the traveling public and the abutting owners is kept to a minimum. The Contractor shall be responsible for the workmanship, upkeep and safety of all temporary structures and approaches. All fabrication shall conform to the current AASHTO Specifications for Highway Bridges, Division II except as modified herein. Fabrication shall be performed by an AISC Category III Certified Fabricator

When specific details are not indicated on the plans, the Contractor shall design all elements of the temporary structure and approaches including the railing system. Design shall be done in conformance with the A.A.S.H.T.O. standard specifications for Highway Bridges which is current on the date of advertisement for bids. Design live load shall be MS 18 unless otherwise noted on the plans. Plans and design computations shall bear the stamp and signature of a Professional Engineer licensed to practice in the State of New York.

Prior to beginning construction of any structure designed by the Contractor or the Contractor's agents the Contractor shall submit detailed plans to the D.C.E.S. for review and approval in accordance with §585-3.02. Such review, however, shall not relieve the Contractor of the responsibility for the adequacy and design of such temporary structures and approaches. If the Contractor proposes to construct with used materials, the Contractor's Engineer shall submit with the plans the method for documenting that all primary member material meets the design. In the absence of Mill Certification Reports, physical testing shall be performed. Excluded from this provision are proprietary structures. All welding required for the fabrication of temporary steel structures shall be performed in accordance with the provisions of the New York State Steel Construction Manual. Complete joint penetration groove welds in main material shall be radiographed as described therein. The DCES reserves the right to perform in-process fabrication inspection. The Contractor shall notify the DCES of the fabrication Schedule 10 days prior to commencement of work.

619-3.05 Tubular Markers. Tubular markers shall be installed according to the manufacturer's instructions on asphalt or concrete pavement that has been properly cleaned with a wire brush to remove all paints, dirt, oil or any substance which will interfere with the proper bond. Bonding agents shall be of sufficient amount or size to ensure proper bonding of the base to the pavement. When epoxy is used the epoxy shall be applied evenly to the bottom of the base of the marker and the base shall be pressed firmly on the pavement surface until a bead of epoxy appears around the edge. When installing the marker with a butyl pad, the pad shall cover the entire bottom of the base of the marker. Tubular markers not installed properly along the required line, as determined by the Engineer, shall be removed and reset.

Tubular markers damaged by the Contractor's operation or by traffic shall be replaced within 24 hours or as directed by the Engineer. The Engineer shall direct the Contractor to replace damaged reflective sheeting as required. This sheeting shall be removed and disposed of in an approved manner at the time as directed by the Engineer.

619-3.06 Short-Term Pavement Markings. The Contractor shall furnish, apply, maintain, and when so ordered, remove short-term pavement markings, where shown in the contract documents or where directed by the Engineer. Any pavement upon which traffic will be maintained shall be properly marked before nightfall or the end of the working day, whichever comes sooner, in accordance with this subsection.

Short-term pavement markings shall be installed and maintained in accordance with the patterns and colors indicated for pavement marking, Parts 260 to 263 of the M.U.T.C.D. or as directed by the Engineer. Where the limits of passing and no-passing zone have not been determined prior to construction, the Contractor shall allow the Engineer one week after the placement of binder or top course to determine these limits. If the Engineer codes these limits right on the pavement surface, this coding shall be preserved, by the Contractor, offset from the roadway.

Alternately, if the pay item 'Determination of No-Passing Zones and Pavement Coding' is included in the contract, this determination shall be made by the Contractor either on binder course or top course.

The following pavement marking patterns shall be installed as short-term pavement markings:

1. Yellow broken lines, partial barrier lines and full barrier lines used to separate opposing traffic flows on two-way roadways.
2. White broken lane lines to separate traffic flows in the same direction on multi-lane highways.

Stop bars, hatch lines and edge lines will not normally be required under short-term pavement markings but may be ordered by the Engineer. Broken lines may be as short as 1200 mm. Short-term pavement markings as described above, will be considered acceptable as the only pavement markings in place for periods normally not longer than fourteen (14) days, unless otherwise extended by the Engineer.

Within 14 days after paving, or the time period as extended by the Engineer, if the Contractor fails to install either the succeeding pavement course, or the final pavement markings on contracts with pay items for such, the short-term pavement markings shall be supplemented (at no additional expense to the State) with edge lines, 3 meter broken lines, stop bars, cross walks and arrows. In the event the project is to remain uncompleted over the winter, other than for staged construction when indicated, the short-term pavement markings shall be supplemented (at no additional expense to the State) by full pavement markings in accordance with the pattern indicated in the plans. If no full pavement marking pattern is given in the plans, the short-term pavement markings shall be supplemented as directed by the Engineer. The pavement markings used to supplement the minimum short-term pavement markings shall be designated as 'Temporary Pavement Markings' and use the materials as described below.

Removable tape and raised markers can be used as short-term pavement markings for solid and broken lines on any pavement course. However, on the final pavement surface, these shall be offset, if possible, from the location of the final mark in order to prevent interference with the adhesion of the final mark.

Pavement marking paint can be used as short-term pavement markings for solid and broken lines on all underlying pavement courses (ie base, binder, leveling and shim). On top course, or final pavement surface, paint may only be used if the final marking pattern is known prior to paving, and the contract does not contain durable markings (ie thermoplastic or epoxy marks). Where paint is used on the final pavement surface, it shall be applied before nightfall in the final location. If the Contractor is unable to place the final pavement marking paint before nightfall on contracts with pay items for Reflectorized Pavement Marking Paints (Section 640), then removable short-term pavement markings shall be installed before nightfall offset from the final location at no additional cost to the State.

Non-removable tape may be used as short-term pavement markings only for broken lines on underlying pavement courses. Non-removable tape will not be allowed to mark barrier lines on any pavement course.

If paint is used for short-term pavement markings, it shall be applied in accordance with the requirements of Section 640, Reflectorized Pavement Marking Paints. If tape is used, it shall be applied to a clean, dry pavement in accordance with the manufacturer's recommendations. Tape shall conform to the shape of, and adhere to the surface upon which it is applied. If raised marker units are used, they shall be of a color in accordance with the M.U.T.C.D. A raised marker unit spaced every 1500 mm may be used as a substitute for a solid line. Three raised marker units, evenly spaced 600 mm apart, may be used as a substitute for a 1200 mm long broken line. Four raised marker units, evenly spaced one meter apart, may be used as a substitute for a three meter long broken line.

Any markings, including raised markers, that fail to adhere to the pavement, become abraded, dislodged by snowplowing, or in the opinion of the Engineer become ineffective in any manner during the "period of use" shall be replaced by the Contractor at no additional expense to the State. The "period of use" shall be defined as the time from when the short-term pavement markings are first applied to the time when the markings are either paved over, the project's final markings are applied, or contract acceptance, whichever is first. After their period of use, short-term pavement markings, and temporary markings added to supplement short-term pavement markings shall be removed from the pavement by the Contractor, if ordered by the Engineer, as described in Section 635 Cleaning and Preparation of Pavement Surfaces.

In the event of sudden, unforeseen precipitation or other extraordinary situations, Do Not Pass signs may be used in lieu of short-term pavement markings for up to three consecutive calendar days on two or three lane, two-way, roadways under the following conditions:

1. The signs meet the requirements of Section 214.2 of the NYSDOT MUTCD and spaced not more than 300 meters apart.
2. The signs shall be supplemented with delineators and/or plastic drums spaced as directed by the Engineer, but not more than 60 meters apart and meeting the requirements of Section 291.2 of the NYSDOT MUTCD and §619-3.01G. of the Standard Specifications, respectively.
3. No payment will be made for the installation of Do Not Pass signs, delineators and plastic drums when necessitated by the Contractor's failure to place short-term pavement markings.

619-3.07 Temporary Traffic Signals. The traffic signal system shall be constructed in such a manner that interference with and inconvenience to the traveling public is kept to a minimum. The Contractor shall maintain in proper operation, all temporary signals used for Maintenance and Protection of Traffic until approved removal. The Contractor shall be responsible for their continuous 24-hour operation except for reasonable shutdown during relocation and transfer operations.

If for any reason a signal is not functioning as required, the Contractor shall commence repair work on this signal within two hours after notification of a malfunction. The Contractor shall provide a flagger at each malfunctioning traffic signal during repair work. The flagger control shall be provided until the temporary traffic signal is restored to proper operation.

On each approach, one signal face shall be at the right side of the roadway or over the right half of the roadway. One signal face shall also be installed at the left side of the roadway or over the left half of the roadway.

The lateral distance between signal faces for each approach shall be a minimum of 2400 mm and a maximum of 8230 mm.

In the event flashing operation occurs, all signal faces shall show flashing red indications. Flashing operation of signal is considered a malfunction.

In the event the Contractor elects to use temporary traffic signals to control traffic in lieu of flaggers, the Contractor shall submit complete plans of the proposed work to the Engineer for approval at least 30 days before signals are required for the maintenance of traffic. Plans shall show type of proposed equipment, details of construction, and table of operation of the temporary signal system.

619-3.08 Mailboxes. The Contractor shall not move any mailbox which contains mail. The Contractor will advise the owner to remove such mail before the box is moved. Before acceptance of the work, any mailbox which has been disturbed or removed, shall be replaced by the Contractor in a location approved by the Engineer.

In the event the original mounting post has been lost, damaged, or is unusable, the Contractor shall furnish a similar device or mounting acceptable to the Engineer, or when directed shall furnish a galvanized pipe mounting post of 25 mm (minimum) diameter with flanged top fitting and will firmly install the new mounting and mailbox at the designated location and at the proper height in accordance with the requirements of the U.S. Postal Service and to the satisfaction of the Engineer.

619-3.09 Opening Highway to Traffic Prior to Contract Acceptance. The construction details specified in §619-3.01 through §619-3.08 shall apply when required.

619-3.10 Maintain Traffic Signal Equipment. General. Existing, relocated, modified or newly installed traffic signals identified in the contract documents or by the Engineer shall be maintained in proper operation as specified in Requirement A, B or C of this subsection as called for in the contract documents.

Proper operation shall include the maintenance of all features of the traffic signal operation in effect and operating at the time any work begins on the contract as defined in §619-1.11, Duration of Contract. Traffic actuated phases shall be maintained actuated and signals operating within signal systems shall remain in step with the remainder of the system unless otherwise approved by the Engineer. Except for

emergencies, no changes in the signal operation or timing shall be made without prior approval by the Engineer. If emergency conditions dictate a change in the operation, the Engineer shall be notified accordingly by the start of the next work day. Unless otherwise approved by the Engineer, an altered signal operation must be returned to the original signal operation within 24 hours.

The Contractor shall maintain in operation all equipment including signal heads, supports, cable, wiring, existing and new span wire mounted signing, controllers, master controllers, detector systems, conflict and current monitors, relays, switch packs, and all other accessory and necessary equipment. Maintenance shall also include the repair and replacement of existing detector loops, under separate items. All parts, supplies, equipment and labor shall be furnished by the Contractor.

The Contractor shall have capable traffic signal repair personnel on call 24 hours a day ,seven days a week, and shall provide to the Engineer a single telephone number for contacting them. If for any reason, a signal is not functioning properly, the Contractor shall commence work on the signal within two hours notification. If directed by the Engineer, the Contractor shall notify the appropriate police agency for traffic control operations. If the police agency cannot or will not provide traffic control, the Contractor shall provide flaggers at locations specified by the Engineer within the two hour time period. The Contractor shall continue the flagger services until the signal is in proper operation. Reflectorized "Flagger Ahead" signs shall be used in conformance with the M.U.T.C.D. on all approaches to an intersection controlled by flaggers.

The Contractor shall, on a daily basis, provide the Engineer with a record of all maintenance calls received and responded to, as well as a record of all corrective action taken by the Contractor.

Where the Contractor is required to temporarily relocate existing traffic signals because of his construction operations, all existing equipment, fittings, wire, cable, conduit, and related materials shall be reinstalled and extended where necessary. Temporary timber poles (Class 2), guys and related material shall be furnished and installed where necessary. Temporary timber poles shall be treated with an appropriate wood preservative in accordance with the American Wood Preserver's Association Standard C2. Preservative retentions shall be appropriate for the specie when used in ground contact application.

Requirement A. The contractor shall maintain in proper operation,for the duration of the contract, the indicated existing, relocated, modified and newly installed signals as required by the contract documents. If such signals are to be removed, the Contractor shall be responsible for the operation and maintenance of them until their approved removal. The Contractor shall be responsible for their continuous operation except for reasonable shutdown periods authorized by the Engineer during relocation and transfer operations. All of the requirements in the "General" subsection of this specification shall apply.

Requirement B. All requirements of the "General" subsection shall apply except that the State shall assume operation and maintenance responsibility for the signal from the Contractor following successful completion by the Contractor of the installation/modification testing as required by §680-3.32, Tests. Assumption of operation and maintenance responsibility by the State shall not relieve the Contractor of the responsibility under §104-08, Warranties and Guarantees, for the correction of defects in material or labor provided by the Contractor. However, the six month period shall be measured from the day the State assumes maintenance responsibility. The Contractor is specifically notified that State assumption of maintenance responsibility shall not relieve the Contractor of any responsibilities under §107-09, Damage.

Requirement C. All the requirements of the "General" subsection shall apply except that at relocated, modified or newly installed signals, the State will assume responsibility for the following four items after successful testing as required by §680-3.32, Tests, has been completed. At existing microcomputer traffic signals, the State shall be responsible for those four items for the duration of the contract.

1. Supply and maintenance of the microcomputer assembly and software.
2. Programming of the microcomputer furnished by the State.

3. Operation or timing changes directed by the Engineer.
4. Normal (no abuse, or vandalism) equipment failures of existing, relocated, modified or new traffic signal equipment furnished by the State.

All other operational features and signal equipment shall be maintained by the Contractor in accordance with the "General" provisions of this subsection for the duration of the contract. Prior to the assumption by the State of maintenance responsibility for relocated, modified or newly installed signals, the Contractor shall maintain such signals under the "General" provisions of this specification. It shall be the Contractor's responsibility to investigate all maintenance calls as outlined in the "General" provisions. If the malfunction is in the equipment supplied by the State, the Contractor shall notify Regional Traffic and Safety personnel and, if directed by the Engineer, provide flaggers until the arrival of State maintenance personnel. Such flagging operations in excess of four hours per maintenance call shall be paid for as extra work.

Assumption of the above listed responsibilities by the State shall not relieve the Contractor of the responsibility for operation and maintenance of the signal as required by this section. Further, the Contractor will not be relieved of any responsibility required under §104-08, Warranties and Guarantees, for the correction of defects in material or workmanship provided by the Contractor. The Contractor shall also be aware that State assumption of the above responsibilities shall not relieve the Contractor of responsibilities under §107-09, Damage.

619-3.11 Flashing Arrow Boards. The Contractor shall provide Flashing Arrow Boards on multilane highways with preconstruction posted speed limits of 45 mph and higher whenever a lane is closed to traffic and vehicles are required to merge with traffic in adjacent lanes. One Flashing Arrow Board is required for each lane closed to traffic, regardless of the duration. Flashing Arrow Boards shall also be provided at locations where posted speeds are below 45 mph when shown on the plans or when indicated in the proposal.

Flashing Arrow Boards will not be required where they would interfere with the operation of a 3 color signal or flasher or where there is an operation controlled by a signal or flagger. Flashing Arrow Boards will not be required for alignment changes or lane diversions where the number of through traffic lanes is not reduced unless specifically indicated on the plans.

Flashing Arrow Boards shall be placed in accordance with the Manual of Uniform Traffic Control Devices. They shall be used as a substitute for the W1-11B; W1-11C; W1-12B; or W1-12C large arrow sign located nearest the beginning of the taper. The arrow boards shall be mounted so that the base of the panel is at least 2.1 m above the pavement surface and properly aligned to provide optimum viewing by approaching motorists. Flashing Arrow Boards may be relocated or reoriented on a daily basis or more frequently as ordered by the Engineer.

Where the posted preconstruction speed limit on the highway is 45 mph or greater within 2.0 km upstream of the board, only diesel or line powered arrow boards shall be used, unless indicated or directed otherwise. Where the posted preconstruction speed limit is below 45 mph for at least 2.0 km upstream of the taper, diesel powered, line powered or solar charged boards shall be used as approved or as directed by the Engineer.

The Contractor shall be responsible for maintenance, repair and continuous operation of the Flashing Arrow Board until progress of work no longer requires its use, as directed by the Engineer.

619-3.12 Construction Zone Pavement Markings. All pavement markings and patterns shall be placed as shown on the plans, or directed by the Engineer, and in accordance with the MUTCD.

Except when other spacings are permitted by the plans or proposal, raised reflectorized pavement markings shall be spaced as required in this paragraph. When raised reflectorized pavement markers are used to simulate a solid line, they shall be spaced 1500 mm apart; and when these markers are used to simulate a 3 m broken line, 4 equally spaced markers shall be used, with a marker at beginning and end of each line segment. Other line patterns shall be as specified in the MUTCD. When used to supplement a solid or broken line, markers shall be spaced a maximum of 24 m on tangents and a maximum of 12 m for curves with a radius less than 860 m.

The application of pavement markings on roadways open to traffic shall be done in the direction of traffic.

When required by the Engineer, the Contractor shall establish marking line points at 9 m intervals as necessary to control the lateral position of the line.

A. Application. All pavement marking materials shall be installed in accordance with the manufacturer's instructions. In addition, pavement marking paints shall be installed according to the provisions of §640-3.

B. Maintenance of Pavement Markings. The Contractor shall be responsible for maintaining the construction zone pavement markings for the duration of the temporary traffic pattern or detour. Any marking material that fails to provide for any reason, both satisfactory daytime and nighttime delineation, in the opinion of the Engineer, shall be replaced immediately by the Contractor at no additional cost to the State. Replacement shall, as a minimum, be required for the following degrees of material loss:

1. Removable Tape. Any gap exceeding 15 m in length in a solid line, or loss of shorter segments exceeding 10 percent of the total length in any 250 m segment of solid line, or more than two consecutive segments of broken line.

2. Raised Markers. Loss of more than 2 markers used to simulate a 3 m broken line; loss of more than 3 consecutive markers used to simulate a solid line, or more than 5 percent of the markers within a 250 m segment of solid line; when used to supplement a line, loss of 2 or more consecutive markers or more than 5 percent of the markers within a 1000 m segment of solid or broken line.

3. Traffic Paint. Abrasion of the line such that more than 10 percent of the underlying pavement is visible within any segment of broken line or within any 100 m section of solid line; failure of any line to be clearly visible at night under low-beam headlamp illumination when viewed from a distance of 60 m.

If the Contractor elects to use raised pavement markers as the marking material under the optional construction zone pavement markings items, the Contractor shall be responsible for maintaining these markings in acceptable condition during winter months, including loss of markers by snow plows. The Contractor shall either replace lost markers between storms, or place an alternate marking material as allowed by this specification to maintain all markings in acceptable condition, subject to the approval of the Engineer. No additional payment shall be provided for such replacement of lost markers.

The Contractor shall not be responsible for snowplow damage or loss of raised markers provided under pay items requiring the use of these markers. In the event that such markers are damaged or lost, the Engineer shall decide whether to replace the lost markers in kind or with other marking materials at the time the loss occurs. Payment shall be provided under the appropriate item for any markers replaced, or for alternate marking materials installed.

C. Removal of Pavement Markings. Construction zone pavement markings used to delineate temporary traffic patterns shall be removed at the completion of that phase of the work and prior to the installation of the next temporary pattern, or return to the permanent pattern.

Traffic paint shall be removed by mechanical means subject to their ability to achieve satisfactory results. After removal, there shall be no paint residue or pavement scarring that conflicts with successive pavement markings under any viewing conditions - wet or dry, day or night.

Marking tapes and raised markers shall be removed, intact or in large pieces, using manual methods or a mechanical roll-up device. The use of heat, solvents or other chemicals, grinders, or blasters will not be allowed on top-course pavement that is to remain in place without overlaying, or on other pavement surfaces where subsequent temporary traffic patterns are to be placed. After

removal, there shall be no resultant damage to or permanent marks or scars on the pavement surface.

Temporary adhesive residues that will eventually be worn from the pavement will be allowed to remain, providing that they are not left in a pattern that will mislead or misdirect motorists. The Engineer will be the sole determiner of misleading temporary marks.

The removal of construction zone pavement markings shall not be required from detours or other areas directed by the Engineer where they do not conflict with permanent markings at the completion of the work. Removal shall be required where it is necessary to transition pavement marking patterns on the detour into permanent markings at the completion of the detour phase.

D. Damage to Pavement Surfaces. Any damage to the finished pavement surface, any permanent marks or scars on the finished pavement surface (including remaining pavement marking material), or any adhesive residues left in a pattern that may mislead or misdirect traffic, that results from the removal of pavement markings shall be removed or repaired as directed by and to the satisfaction of the Engineer at no expense to the State, including complete removal and/or replacement of the damaged pavement section if necessary. The Engineer shall be the sole determiner of satisfactory repair.

619-3.13 Maintenance and Protection of Traffic During Nighttime Operations. In addition to the requirements of basic maintenance and protection of traffic, additional requirements for maintenance and protection of traffic during nighttime operations shall be as follows:

A. Worker Protection. All workers involved in nighttime operations shall, at all times, wear reflective hard hats and vests or high visibility apparel as described below:

1. Hard hats shall be equipped with a minimum of 7600 mm^2 of reflective tape on all four sides (i.e. 1900 mm^2 per side).

2. Vests and high visibility apparel shall be orange, yellow, or strong yellow-green in color or fluorescent versions of these colors (flaggers shall wear orange) and shall include retroreflective material, white or silver in color, visible for a minimum of 300 m in all directions under headlight illumination.

3. Retroreflective clothing shall be designed to clearly identify the wearer as a person and shall be visible through a full range of body motions.

4. Retroreflective clothing and vests shall be closed front and rear. Open front vests shall not be permitted.

5. All retroreflective clothing and vests shall be in clean condition or replaced as necessary to maintain visibility and reflectivity.

These requirements apply to truck drivers and equipment operators when out of an enclosed cab.

B. Vehicle Protection. All vehicles and equipment in the traffic control zone shall be equipped with rotating amber beacons which shall be visible from all directions for a minimum of 300 m during daylight. Beacons shall be mounted in a manner which does not cause glare for the driver or operator.

Vehicles operating or parked on the pavement of a closed roadway or travel lane shall display 4-way flashers or beacons at all times.

Rollers shall display a 50 mm band of reflective tape on the front and rear (60 000 mm^2 per end minimum).

All trucks shall display a minimum of 60 000 mm^2 of reflective tape on the rear.

Haul trucks shall display a 600 mm by 1200 mm orange reflective sign with the legend "Construction Vehicle - Do Not Follow" in black lettering on the tailgate.

All construction equipment when moving at a speed below the operating speed of traffic in an open travel lane or on a shoulder adjacent to an open travel lane shall be equipped with an amber rotating beacon and shall be followed by a chase vehicle equipped with an amber rotating beacon

and 4-way flashers.

Vehicles (except for rollers) shall travel facing in the same direction as adjacent traffic in order to avoid glare and confusion to drivers.

C. Signs, Delineation and Guiding Devices. All signs, delineators and guiding devices for nighttime operations shall be kept clean and visible with good reflectivity.

Type III construction barricades shall be used whenever an entire roadway or ramp is closed to traffic.

Plastic drums or 300 mm by 600 mm vertical panels shall be used for channelizing and delineating lane closures. Oversize (900 mm) cones may be used on tangent runs beyond the completion of the lane closure tapers. Spacing shall be in accordance with the following:

Estimated Operating Speed (km/h)	Maximum Spacing (m)
30	6.0
50	9.0
≥70	12.0

Delineation at gores or intersections shall be spaced at intervals equal to one-half of the above table values and shall consist of plastic drums or 300 mm by 600 mm vertical panels except that every other device may be an oversize (900 mm) cone at the Contractor's option.

When traffic will be traveling adjacent to closed travel lanes; two plastic drums, two 300 mm by 600 mm vertical panels or two oversize (900 mm) cones shall be placed transversely in each closed lane at 225 m maximum intervals (unless a lesser spacing is shown on the plans) except where it would interfere with paving, rolling or other ongoing operations. A Type III construction barricade may be substituted at the Contractor's option. No additional payment for Type III construction barricades will be made when used for this purpose.

619-4 METHOD OF MEASUREMENT

619-4.01 Basic Maintenance and Protection of Traffic. Payment for Basic Maintenance and Protection of Traffic will be made on a lump sum basis.

619-4.02 Construction Signs. Payment for signs will be made on a lump sum basis.

619-4.03 Temporary Box Beam Barrier, and Temporary Concrete Barriers. The quantity of temporary box beam barrier, and temporary concrete barrier shall be computed by the number of meters, measured to the nearest meter, placed in accordance with the contract documents and/or direction of the Engineer. Temporary box beam barrier shall be measured in accordance with the requirements of §606-4.01. Temporary concrete barrier shall be measured along the centerline of the uppermost surface. Temporary concrete barrier installed at the option of the Contractor, or required solely by a delay in the Contractor's operations, shall not be included in the measurement or payment for temporary concrete barrier.

619-4.04 Construction Barricades. Barricades will be computed for payment by the number of meters measured to the one tenth, along the face of each barricade unit installed. No payment will be made for spaces between individual barricade units. Type III Construction Barricades used at the option of the Contractor in lieu of drums or other channelizing devices shall not be included in the measurement or payment for Type III Construction Barricades.

Whenever barricades are moved to a new location or the diagonal stripes are changed to allow traffic to pass on the other side of the barricade, measurement will be made in the same manner as if it were a new barricade. Minor movements of the barricade from one side of the roadway to the other side, daily replacement to the same location or rearrangement within a work area, not requiring any change in the diagonal stripes, will not be considered as movement to a new location and will not be measured as additional barricades

619-4.05 Lighting for Construction Barricades. Lighting for construction barricades (powered from electrical power line or self-powered flashers) will be computed for payment by the number of meters of barricade actually lighted. Measurement shall be made to the nearest one-tenth meter along the face of each barricade unit. No payment will be made for spaces between individual barricade units. No separate measurement will be made for the two flashing warning lights used at the beginning of each work zone drop-off, as required by these specifications.

619-4.06 Temporary Structures and Approaches. Temporary structures and their respective approaches will be computed for payment on a unit price basis for each structure including its approaches.

619-4.07 Flashing Arrow Board. When this work is specified to be measured as lump sum, it shall be measured on a lump sum basis, for the Flashing Arrow Boards of the required type satisfactorily furnished, installed, maintained, and removed in accordance with these specifications.

619-4.08 Short Term Pavement Markings. Short Term Pavement Markings will be measured in meters along the center line of the pavement stripe and shall be based on a 100 mm wide stripe. Measurement for striping with a plan width greater or less than the basic 100 mm, as shown on the plans or as directed by the Engineer, will be made by the following method:

$$\frac{\textit{Plan Width of Striping (millimeters)} \times \textit{Number of Meters}}{\textit{100 millimeters}}$$

No payment will be made for the length of skips in the dashed line.

If raised marker units are used, reimbursement will be made as if the substituted line were in place. For example, for three raised marker units substituted for a 1200 mm long broken line, reimbursement will be made for 1.2 meters.

619-4.09 Temporary Traffic Signals. Payment for Temporary Traffic Signals will be made on a lump sum basis.

619-4.10 Mailboxes. Mailboxes will be computed for payment on the basis of each mailbox moved or replaced. Where multiple mailboxes are installed on a single post, payment shall be based upon the number of mailboxes so installed.

619-4.11 Opening Highway to Traffic Prior to Contract Acceptance. The additional basic maintenance and protection of traffic required for the highway opened to traffic in accordance with §619-1.09 will be computed by the lane kilometers, measured to the nearest tenth, per calendar day. The lane-kilometer per calendar days to be paid for shall not include the length of temporary connections, length of ramps, or any pavement opened for the convenience of or at the request of the Contractor.

619-4.12 Maintain Traffic Signal Equipment. Maintenance of existing and new traffic signal equipment will be computed for payment on a monthly basis for each signalized intersection being maintained. Payment will be made to the nearest 1/4 month increment.

619-4.13 Tubular Markers. This work shall be measured as the number of tubular markers furnished and installed to the satisfaction of the Engineer.

619-4.14 Construction Zone Pavement Markings. Pavement striping will be measured by meter along the centerline of the pavement stripe, and will be based on a 100 mm wide stripe. When raised pavement markers are used to simulate or to supplement a pavement marking, they shall be measured as the number of linear meters of simulated or supplemented pavement stripe (e.g. a 3 meter longitudinal line segment is simulated by four, or more, individual marker units; the pavement striping will be measured as 3 meters, regardless of the number of markers installed). Measurement for striping with a plan width greater than the basic 100 mm as shown on the plans or as directed by the Engineer, will be made by the following method:

$$\frac{\text{Plan Width of Striping (millimeters) x Number of Meters}}{\text{100 (millimeters)}}$$

No measurement will be made for the number of meters of gaps between broken and dotted line segments. All payments for longitudinal lines shall be made on the basis of the theoretical required plan quantity.

Letters and symbols will be measured by each unit applied. A unit will consist of one letter or one symbol. Example: "SCHOOL" would be measured as six units. Double and triple headed arrows will be measured as a single unit, each "R" in a railroad grade crossing marking will be measured as a single unit, but the "X" in railroad grade crossing markings (MUTCD figure 263-33) will be measured by the number of meters of 100 mm stripe.

When raised pavement markers are used to supplement a pavement marking stripe, the supplemental raised pavement markers will be measured and paid separately from the appropriate pavement marking stripe.

619-5 BASIS OF PAYMENT

No payment will be made under Basic Maintenance and Protection of Traffic for each calendar day during which there are substantial deficiencies in compliance with the specification requirements of any subsection of this section, as determined by the Engineer, including but not limited to Basic Maintenance and Protection of Traffic, Construction Signs, Construction Barricades, Barriers, Temporary Impact Attenuators, Impact Attenuators, Crash Cushions, Crash Terminals, Lighting for Construction Barricades, Temporary Structures and Approaches, Short-Term Pavement Marking, Construction Zone Pavement Markings, Temporary Traffic Signals, Mailboxes, Maintain Traffic Signal Equipment and Opening Highway to Traffic Prior to Contract Acceptance.

The amount of such calendar day non-payment will be determined by dividing the lump sum amount bid for Basic Maintenance and Protection of Traffic by the number of calendar days between the date the Contractor commences work and the date of completion as designated in the proposal, without regard to any extension of time.

In addition, liquidated damages will be assessed at the rate shown in Table 108-1 of §108-03 for each subsequent calendar day or part thereof that a cited deficiency resulting in non-payment, as prescribed herein, is not corrected or is permitted to recur.

If the Contractor fails to adequately conform to the provisions required under Construction Signs, Barriers, Temporary Impact Attenuators, Impact Attenuators, Crash Cushions, Crash Terminals, Construction Barricades, Lighting for Construction Barricades, Temporary Structures and Approaches, Short-Term Pavement Marking, Construction Zone Pavement Markings, Temporary Traffic Signals, Mailboxes, Maintain Traffic Signal Equipment and Opening Highway to Traffic Prior to Contract Acceptance, to the degree that such failure is deemed by the Engineer to adversely affect the maintenance and protection of traffic, the above liquidated damages will be assessed in addition to any payment deductions from Basic Maintenance and Protection of Traffic for inadequate work as specified herein. The assessment of liquidated damages will not exceed the above amount per calendar day regardless of the number of violations.

If the Contractor fails to maintain and protect traffic adequately and safely for a period of 24 hours, the Engineer shall correct the adverse conditions by any means deemed appropriate, and shall deduct the cost of the corrective work from any monies due the Contractor. The cost of this work shall be in addition to the liquidated damages and non-payment for Basic Maintenance and Protection of Traffic listed above.

However, where major nonconformance with the requirements of this specification is noted by the Engineer, and prompt Contractor compliance is deemed not to be obtainable, all contract work may be stopped by direct order of the Engineer, regardless of whether corrections are made by the Engineer as stated in the paragraph above.

619-5.01 Basic Maintenance and Protection of Traffic. The lump sum price bid for Basic Maintenance and Protection of Traffic shall include all equipment, materials and labor necessary to adequately and safely maintain and protect traffic, except as provided for in separate payment items in the proposal. However, if the Contractor elects to utilize temporary traffic signals to control traffic in lieu of flaggers, the cost of such signals together with all costs of installation, operation and removal shall be included in the price bid for Basic Maintenance and Protection of Traffic.

The cost of temporarily terminating guide railing, median barrier, or bridge rail during non-work hours shall be included in the lump sum price bid for this item.

In the event the proposal does not include a separate item of payment for Opening Highway to Traffic Prior to Contract Acceptance and the Regional Director directs, in writing, any portion of pavement, structure or ramp to be opened to traffic prior to contract acceptance and on which traffic was not specified to be maintained and protected during construction, the price bid for Basic Maintenance and Protection of Traffic shall include any and all costs for opening said portion or portions to traffic prior to contract acceptance.

In the event the contract completion date is extended, no additional payment will be made for Basic Maintenance and Protection of Traffic.

Progress payments will be made for this item in proportion to the total amount of contract work completed less any deductions for unsatisfactory maintenance and protection of traffic.

619-5.02 Construction Signs. The lump sum price bid shall include the cost of labor, equipment and material, necessary to erect, remove, relocate, protect, maintain, store or replace any construction signs required to properly sign the contract. The lump sum price bid shall also include the cost of repairing or replacing reflectorized signs, when the Engineer determines that the reflective sheeting material no longer meets the specifications.

No payment will be made under Section 619 Basic Maintenance and Protection of Traffic for each calendar day during which there are substantial deficiencies in compliance with the requirements of this specification, as determined by the Engineer. The amount of each calendar day non-payment will be determined by dividing the lump sum bid by the number of calendar days between the date the Contractor commences work and the date of contract completion, as designated in the contract proposal, without regard to any extension of time.

In addition, liquidated damages will be assessed at the rate shown in Table 108-1 of §108-03, for each calendar day or part thereof that a cited deficiency, which results in non-payment, is not corrected, or is permitted to recur.

Partial payments will be made. Fifty (50) percent of the lump sum price will be paid when ten (10) percent of the contract work has been completed. The remaining fifty (50) percent will be paid proportionally in accordance with the total contract work completed, beginning with the estimate following the initial payment on this item.

619-5.03 Temporary Box Beam Barrier, and Temporary Concrete Barrier. The unit price bid per meter of temporary box beam barrier, and temporary concrete barrier shall include all material, equipment, and labor necessary to erect, maintain, and remove the required barrier, including any required connection devices, end treatments, delineation or guiding devices, repair of pavement after removal of box beam barriers, and devices for pinning and connecting temporary precast concrete barrier units. Any movement of temporary box beam barrier or temporary concrete barrier, except movements of the concrete barrier necessary to maintain, realign, or replace damaged units will be considered as a movement to a new location and the Contractor will be entitled to payment for the movement.

After placement, payment will be made for ninety (90) percent of the quantity of temporary box beam barrier, or temporary concrete barrier furnished and erected in accordance with the contract requirements. The remaining ten (10) percent will be paid upon removal. Temporary concrete barrier installed at the option of the Contractor, or required solely by a delay in the Contractor's operations, shall not be included in the measurement or payment for temporary concrete barrier.

619-5.04 Construction Barricades. The unit price bid per meter of barricade shall include all material, equipment and labor necessary to erect, maintain and remove required barricades. Whenever barricades are moved to a new location or the diagonal stripes are changed to allow traffic to pass on the other side of the barricade, payment will be made in the same manner as if it were a new barricade. Minor movements of the barricade from one side of the roadway to the other side, daily replacement to the same location or rearrangement within a work area, not requiring any change in the diagonal stripes, will not be considered as movement to a new location and will not be paid for as additional barricades.

After placement, payment will be made for ninety (90) percent of the quantity of barricade furnished and erected in accordance with the contract requirements. The remaining ten (10) percent will be paid upon removal. Type III Construction Barricades used at the option of the Contractor in lieu of drums or other channelizing devices shall not be included in the measurement or payment for Type III Construction Barricades

619-5.05 Lighting for Construction Barricades. The unit price bid shall include the cost of furnishing all labor, materials, equipment, and power necessary to provide, maintain, and remove Lighting for Construction Barricades. Should a barricade that is lighted be moved to a new location or the diagonal stripes be changed to allow traffic to pass on the other side of the barricade, payment shall be made in the same manner as if it were a new installation of lighting for barricades. Minor movements of barricades that are lighted, such as a movement from one side of the road to the other side or rearrangements within the same work area not requiring any change in the diagonal stripes, will not be considered as a movement to a new location. This will be true, regardless of the source of power.

After installation and demonstration of satisfactory operation, payment will be made for seventy-five (75) percent of the quantity of barricade lighting furnished and installed in accordance with the contract requirements. The remaining twenty-five (25) percent will be paid for upon removal. No separate payment will be made for the two flashing warning lights used at the beginning of each work zone drop-off, as required by this specification.

619-5.06 Temporary Structures and Approaches. The unit price bid shall include all labor, material and equipment necessary to build, move, remove, dismantle and/or store the structure specified together with all work related to construction, removing and restoring approaches.

Payment will be made at the unit price bid for each temporary structure and its approaches as follows:

Seventy-five (75) percent when the temporary structures and approaches are complete and operable.

Twenty-five (25) percent when the temporary structures and approaches or appurtenances are permanently removed.

619-5.07 Tubular Markers. The unit price bid for tubular markers shall include the cost of furnishing all labor, materials, equipment, and all incidentals necessary to complete the work in accordance with this specification and as directed by the Engineer. The unit price bid shall include the cost of replacing damaged reflective sheeting. The cost to remove and reset tubular markers due to contractor error shall be borne by the Contractor. Removal at the completion of the work or when no longer needed shall also be included in the unit bid price. Tubular markers that are in good condition may be relocated as directed by the Engineer. Whenever tubular markers are moved to a new location, payment will be made as if it were a new tubular marker.

619-5.08 Short-Term Pavement Markings. The unit price bid shall include the cost of furnishing all labor, material and equipment necessary to apply, maintain and remove short-term pavement markings in compliance with the requirements of §619-3.06. A separate payment will be made each time short-term pavement markings are first applied on a pavement course in accordance with the contract requirements. No payment will be made for the application, maintenance and removal of "temporary pavement markings" required after 14 days, or for short-term pavement marking necessitated by the Contractor's failure to place the final pavement marking paint before nightfall.

No payment will be made for the installation of Do Not Pass signs, delineators and plastic drums when necessitated by the Contractor's failure to place short-term pavement markings

619-5.09 Temporary Traffic Signal. The lump sum price bid for this item shall include the cost of all labor, materials, and equipment necessary to furnish, install, operate, maintain, move, and remove the signals for the required duration of the work. The bid price shall include the cost of electric power necessary to operate the signals until their removal is approved or ordered by the Engineer. Permanent signal control equipment will be paid for under separate contract items.

For the purposes of progress payment, the lump sum bid for the item shall be apportioned equally between the number of signals called for in the plans and proposal. If it becomes evident that a different number of temporary signals will be used, the lump sum bid should be apportioned equally between the revised number of signals and progress payments adjusted accordingly.

Payments will be made on each individual signal as follows:

Sixty (60) percent when the signal is installed and is in proper operation.

Forty (40) percent when all necessary work for this item is completed.

619-5.10 Mailboxes. The unit price for each mailbox shall include all equipment, material and labor necessary to move, maintain or replace rural route mailboxes in their final position or location. Only one payment for each mailbox will be made regardless of the number of times it is moved or replaced and shall be made when the mailbox has been placed in its final location.

619-5.11 Opening Highway to Traffic Prior to Contract Acceptance. Payment will be made for additional basic maintenance and protection of traffic as indicated in §619-1.09. The unit price bid shall include the cost of all materials, equipment and labor to provide the basic maintenance and protection of traffic.

In the event that additional signs, barricades, or other items are required to supplement the work under this item, payment shall be made upon erection as follows:

A. Where contract unit bid items, exclusive of lump sum items, cover the supplementary work ordered, payment will be made at the contract unit bid prices.

B. Where lump sum items, exclusive of the Basic Maintenance and Protection of Traffic item, or no contract unit bid items cover the supplementary work ordered, payment will be made at agreed prices or by force account.

No payment will be made under this item during any period for which the Contractor has been granted an extension of time with engineering charges and/or for which the Contractor has been assessed liquidated damages.

619-5.12 Other Work. The work required for Clearing and Grubbing, Furnishing and Applying Water, and Furnishing and Applying Calcium Chloride for dust control, and for placing bituminous plant mixed material for patching existing pavement, or where specifically ordered by the Engineer or as shown on the plans shall be paid for under their respective pay items. During the winter period when plant mixed bituminous material is unavailable the material used for patching shall be a suitable "winter mix" approved by the Materials Bureau. Payment for the bituminous patching material used, regardless of the type, will be made under the top course roadway paving item.

No payment will be made for any bituminous concrete determined by the Engineer to be necessary as a result of the Contractor's failure to complete paving operations prior to the weather and seasonal limitations, pursuant to §402-3.01. Also, no separate payment will be made for interim pavement markings, applied, maintained, or removed pursuant to §619-3.06 Short Term Pavement Markings.

Whenever any of the above items do not appear in the contract, payment for the work equivalent to such item will be included in the lump sum price bid for Basic Maintenance and Protection of Traffic.

619-5.13 Damage. Payment for damage to any phase of the work included in this section shall comply with the requirements of §107-09, Damage.

619-5.14 Maintain Traffic Signal Equipment. The unit bid price per signalized intersection per month shall include the cost of all labor, materials and equipment necessary to perform the work with the exception of inductance loop replacement which will be paid for separately. The cost of the electric power shall be the responsibility of the original maintaining agency. No payment will be made during any period for which the contractor has been granted an extension of time with engineering charges.

619-5.15 Flashing Arrow Board. The lump sum amount bid for this work shall include the cost of all material, equipment, labor, maintenance, and electrical power necessary to complete this work in a manner approved by the Engineer.

Progress payments will be made for this work in proportion to the total amount of contract work completed.

619-5.16 Construction Zone Pavement Markings. The unit price bid shall include the cost of furnishing all labor, materials, and equipment necessary to install, maintain, and remove pavement markings as required by §619-3.12. No payment shall be made under these items for short term pavement markings installed to meet the requirements of §619-3.06. When raised pavement markers are used to supplement a pavement marking stripe, payment shall be made for each item.

The non-payment and Liquidated Damage provisions of §619-5 Basis of Payment - General shall apply to these items of work.

Progress payments will be made. Quantities will be measured for payment when the pavement striping is satisfactorily installed and payment will be 75%. The remaining 25% will be measured for payment following satisfactory removal of the pavement striping.

Payment will be made under:

Item No.	Item	Pay Unit
619.01 M	Basic Maintenance and Protection of Traffic	Lump Sum
619.02 M	Construction Signs	Lump Sum
619.0303 M	Flashing Arrow Boards	Lump Sum
619.0413 M	Type III Construction Barricades	Meter
619.0502 M	Lighting for Construction Barricades	Meter
619.06 M*	Temporary Structures and Approaches	Each
619.10 M	Mailboxes	Each
619.1101 M	Opening Highway to Traffic Prior to Contract Acceptance	Lane Kilometer- Calendar Day
619.13 M	Temporary Traffic Signals	Lump Sum
619.1502 M	Short Term Pavement Markings	Meter
619.1611 M	Maintain Traffic Signal Equipment (Requirement A)	Intersection Month
619.1612 M	Maintain Traffic Signal Equipment (Requirement B)	Intersection Month
619.1613 M	Maintain Traffic Signal Equipment (Requirement C)	Intersection Month
619.17 M	Temporary Concrete Barrier	Meter
619.18 M	Temporary Box Beam Barrier	Meter
619.2001 M	Tubular Markers White Tape	Each
619.2101 M	Construction Zone Pavement Marking Stripes (Optional)	Meters
619.2102 M	Construction Zone Pavement Marking Letters (Optional)	Each
619.2103 M	Construction Zone Pavement Marking Symbols (Optional)	Each
619.2104 M	Construction Zone Pavement Marking Stripes - Removable Tape	Meters
619.2105 M	Construction Zone Pavement Marking Letters - Removable Tape	Each
619.2106 M	Construction Zone Pavement Marking Symbols - Removable Tape	Each
619.2107 M	Construction Zone Pavement Marking Stripes - Simulated by Raised Markers	Meters
619.2108 M	Construction Zone Pavement Marking Stripes - Supplemented by Raised Markers	Meters

* Refer to the Standard Contract Pay Item Catalog for full Item Number and full description.

FINAL SOIL EROSION AND SEDIMENT CONTROL PLAN
FOR
CONSTRUCTION TASKS
GM-38 AREA GROUNDWATER REMEDIATION
AT
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BETHPAGE, NEW YORK

Issued:

May 8, 2006

Prepared for:

Engineering Field Activity, Northeast
Naval Facilities Engineering Command
10 Industrial Highway, Mail Stop #82
Lester, Pennsylvania 19113-2090

Remedial Action Contract No. N62472-99-D-0032
Contract Task Order No. 96

Prepared by:

Tetra Tech EC, Inc.
Bucks Town Corporate Campus
820 Town Center Drive, Suite 100
Langhorne, PA 19047-1748

Revision	Date	Prepared By	Approved By	Pages Affected
0	5/8/06	Joseph Gray	Stavros Patselas	All

TABLE OF CONTENTS

1.0 OBJECTIVE 1
1.1 Regulatory Drivers 1
2.0 PROJECT DESCRIPTION 1
3.0 SOILS 3
4.0 SEQUENCE OF OPERATIONS 4
5.0 SOIL EROSION AND SEDIMENT CONTROLS 5
5.1 Site Fencing 5
5.2 Stabilized Construction Entrance 6
5.3 Dust Control 6
5.4 Temporary Decontamination Pad 6
5.5 Site Restoration 7
6.0 QUALITY CONTROL 7

LIST OF FIGURES

Figure 1 Site Location Map 2

LIST OF APPENDICES

Appendix A Drawing C-7 Soil Erosion and Sediment Control Details and Notes

ABBREVIATIONS AND ACRONYMS

µg/L	micrograms per liter
bgs	below ground surface
NGC	Northrop Grumman Corporation
NWIRP	Naval Weapons Industrial Reserve Plant
PQCM	Project Quality Control Manager
TtEC	Tetra Tech EC, Inc.
VOC	Volatile Organic Compounds

1.0 OBJECTIVE

Tetra Tech EC Inc. (TtEC) has prepared this Soil Erosion and Sediment Control Plan to satisfy the requirements of Remedial Action Contract Number N62472-99-D-0032, Contract Task Order Number 96. This Soil Erosion and Sediment Control Plan identifies the applicable soil erosion and sediment control concerns relevant to the construction activities at the GM-38 Area at the Bethpage Naval Weapons Industrial Reserve Plant (NWIRP) located in Bethpage, NY. Refer to Appendix A Drawing C-7 for Soil Erosion and Sediment Control Details and Notes. The Project Manager, Mr.Starvos Patselas, will be responsible for verifying that all project personnel are aware of the requirements outlined in this Soil Erosion and Sediment Control Plan.

1.1 Regulatory Drivers

The United States Environmental Protection Agency delegated responsibility for the National Pollutant Discharge Elimination System Permit to New York on October 1, 1992. New York Sate issued its State Pollutant Discharge Elimination System, General Permit GP-93-06 on August 1, 1993. This was issued pursuant to Article 17, Titles 7, 8 and Article 70 of the Environmental Conservation Law. The permit requires a stormwater pollution prevention plan be prepared for any construction activity that disturbs five or more acres. This Soil Erosion and Sediment Control Plan must address soil erosion and sediment control and stormwater management. The New York Guidelines for Urban Erosion and Sediment Control have been adopted by the New York State Department of Environmental Conservation as criteria for the soil erosion and sediment control component of this plan.

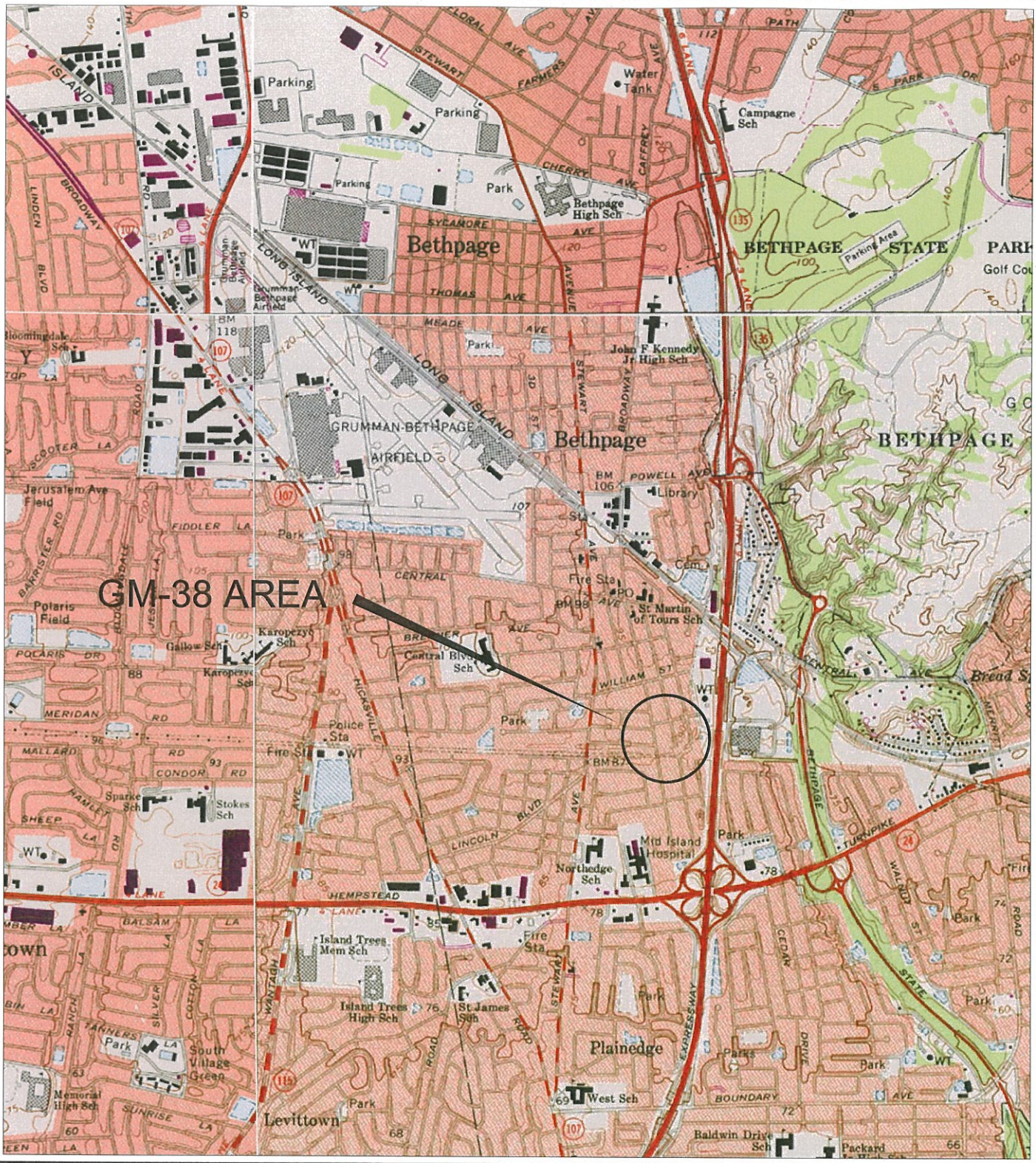
The construction activities at GM-38 will be conducted pursuant to the requirements, policies, and procedures set forth in the New York Guidelines for Urban Erosion and Sediment Control.

2.0 PROJECT DESCRIPTION

NWIRP Bethpage is located in east central Nassau County, Long Island, New York, approximately 30 miles east of New York City (Figure 1 Site Location Map). The Navy's property totaled approximately 109.5 acres and was formerly a Government Owned Contractor-Operated facility that was operated by the Northrop Grumman Corporation (NGC) until September 1998. NWIRP Bethpage is bordered on the north, west, and south by property owned, or formerly owned, by NGC that covered approximately 605 acres, and, on the east, by a residential neighborhood.

The GM-38 Area is approximately 8,500 feet south-southeast and hydraulically downgradient of NWIRP Bethpage. Specifically, the center of the project area is a utility easement that is located east of Broadway Avenue, west of the Seaford – Oyster Bay Expressway, and between the north and south dead ends of Windhorst and Herman Streets.

The GM-38 Area refers to a cluster of monitoring wells that were installed in the 1990s by NGC and that first identified an isolated groundwater contaminant plume in this area. Chlorinated volatile organic compounds (VOCs) were identified in moderately deep groundwater (220 to 470 feet below ground surface [bgs]) at concentrations greater than 500 micrograms per liter (μg/L).



Source: U.S.G.S. Topographic Maps (7.5 Minute)
Amityville, Freeport, Hicksville, Huntington, NY Quadrangles

U.S. Navy RAC
Engineering Field Activity, Northeast

GM-38 Area (Offsite)
NWIRP Bethpage
Bethpage, NY

Figure 1
Site Location Map

TETRA TECH EC, INC.

P:\Bethpage\CAD - GIS\Site Location Map.dwg, 04/28/2004 03:22:20 PM

The contaminated groundwater in the area represents a relatively large mass of chlorinated VOCs that would remain for extended periods and could adversely affect public water supplies in the area, as well as other downgradient water supplies. Two public water supply systems are present in the general area and extract groundwater at depths ranging from 540 to 740 feet bgs.

The Navy's selected remedy in the vicinity of the GM-38 Area is construction of a groundwater extraction and treatment system near the GM-38 monitoring well cluster to facilitate the mass removal of contaminants in the groundwater.

3.0 SOILS

The sites are underlain by five geologic/hydrogeologic formations (descending from ground surface):

- Pleistocene deposits (Upper Glacial Aquifer) consisting of various sands and gravels intermixed with discontinuous low permeability clay lenses, approximately 100 feet thick.
- Magothy Formation (Magothy Aquifer) consisting of various sands and gravels varying in thickness interlaced with low permeability confining layers.
- Raritan Clay Formation.
- Lloyd Sand Formation (Lloyd Aquifer).
- Bedrock.

The Upper Glacial Formation (commonly referred to as glacial deposits) forms the surface deposits across the entire NWIRP Bethpage facility. The glacial deposits beneath the site consist of coarse sands and gravels. These deposits are generally about 30 to 45 feet thick; local variations in thickness are common due to the irregular and undulating interface of the glacial deposits with the underlying Magothy Formation. The interface between the two formations was defined in the field as the horizon where gravel becomes very rare to absent, and finer sands, silts, and clays predominate. The generally coarse nature of both formations near their interface, however, may make this differentiation either difficult or rather subjective.

The Upper Glacial Formation and the Magothy Formation comprise the aquifer of concern at NWIRP Bethpage. Regionally, these formations are generally considered to form a common, interconnected aquifer as the coarse nature of each unit near their interface and the lack of any regionally confining clay unit allow for the unrestricted flow of groundwater between these two formations.

Although the water table beneath NWIRP Bethpage occurs below the glacial deposits, these deposits are hydrogeologically important because their high permeability allows for the rapid recharge of precipitation to the underlying Magothy Formation. In addition, the large quantity of groundwater withdrawn daily from the Magothy passes back through part of the glacial deposits via the recharge basins to the Magothy Formation.

The Magothy aquifer is the major source of public water in Nassau County. The most productive water-bearing zones are the discontinuous lenses of sand and gravel that occur within the generally siltier matrix. The major water-bearing zone is the base gravel.

4.0 SEQUENCE OF OPERATIONS

The following is a list of the proposed construction activities and the sequence in which they will be conducted:

- Site Preparation
    - Clearing and grubbing of vegetation and site grading as required.
    - Installation and maintenance of access road(s) and construction entrance as required.
    - Installation of impermeable spill containment around any storage tanks, and any other systems.
    - Construction of all necessary temporary structures or services.
    - Installation and maintenance of site drainage improvements and soil erosion and sediment control measures during implementation of the work.
    - Construction and maintenance of decontamination pad as necessary.
- Access Road Construction
    - Construction of permanent and temporary access roads to the treatment building and drainage facilities/structures as indicated on the Drawings.
- Treatment Building Construction
    - Construction of a pre-fabricated metal building, including all foundations, slabs, equipment pads, doors, vents, internal rooms, and furnishings. This work will include all utility connection work including but not limited; to electrical supply, potable water supply, sanitary sewer connections, and telephone connections; and all building systems including heating/ventilation/air systems, security systems, and fire protection systems.
- Groundwater/Vapor Extraction System Installation
    - Installation of all groundwater extraction materials and equipment from the 2 recovery wells. The groundwater extraction system will include extraction wellhead manholes and covers; submersible well pumps; instrumentation including level and flow controls; well vault piping, fitting and valves; well vault

cable, all electrical conduit and wiring for power and instrumentation; extraction line piping from the well vaults to the treatment building; and vapor piping from the well vaults to the treatment building.

- Treated Water Discharge System Installation

    - Installation of the treated water discharge system which will include piping from the treatment system building to groundwater via a minimum of 4 re-injection wells located approximately 1,000 feet south of the treatment plant building. The treated water discharge system will include all piping, fittings, valves, and controls.

- Fencing and Landscaping

    - Installation of site fencing, and landscaping.

- Site Restoration

    - Repair of any areas damaged by construction activities, which will include re-grading of affected areas, provision and placement of topsoil, seeding, and provision and installation of landscaping materials. In addition, any private or municipal roads or parking areas disturbed by construction activities will be restored to original or better conditions.

5.0 SOIL EROSION AND SEDIMENT CONTROLS

The soil erosion and sediment control measures discussed in this Soil Erosion and Sediment Control Plan are also presented in Appendix A on Drawing C-7. Prior to any removal activities, soil erosion and sediment controls will be installed and maintained in each area. This will include filter geotextile and woven wire fencing (silt fencing) installed in and around all work areas. Soil erosion and sediment control measures employed will be subject to approval and inspection by governing agencies having jurisdiction over such work.

Some details for these soil erosion and sediment control measures follow are as follows:

- Filter geotextile cloth: Filter X, Mirafi 100X, Stablelink T140N or approved equal.
- Fence: Woven wire, 14.5 gauge, 6 inch maximum mesh opening.
- Posts: Steel, either “T” or “U” type or 2 inch hardwood.
- Prefabricated unit: Geofab, Envirofence or approved equal.

5.1 Site Fencing

TtEC will use standard silt fence fabric. A 4-inch trench will be excavated and the silt fence will be installed and the trench will be backfilled. Refer to Appendix A Detail 1 on Drawing C-7 for Silt Fence Detail.

5.2 Stabilized Construction Entrance

A stabilized construction entrance will be installed at the temporary Broadway Avenue entrance and at the permanent Sophia Street entrance to prevent tracking of soil from vehicles and equipment leaving the Site onto public streets. The stabilized construction entrance will be maintained in a condition that will prevent tracking or flowing of sediment onto the public roads. This may require periodic top dressing with additional stone as conditions demand and repair and/or cleanout of any measures used to trap sediment. All sediment spilled, dropped, washed or tracked onto the site access road or public right-of-way will be removed by TtEC or subcontractors.

The stabilized construction entrance will be constructed of two-inch crushed stone. The stabilized construction entrance will be constructed so that it is not less than 12 inches thick and it will be as wide as the width at all points of ingress or egress, but not less than 16 feet.

When necessary, wheels will be cleaned to remove sediment prior to entrance onto public roads. When washing is required, it will be conducted on the temporary decontamination pad.

5.3 Dust Control

Dust control and suppression measures will also be employed during the entire construction process. These measures will include reducing speeds of vehicles traveling in and out of the site, and using water as dust suppression on access roads. Dust control will be accomplished by the sprinkling of water or a dilute solution (less then 0.05%) of water plus bio-degradable surfactant. Sprinkling, where used, must be repeated at such intervals as to keep all parts of the disturbed area at least damp at all times. Dust control will be performed as the work proceeds and whenever a dust nuisance or hazard occurs.

Water for dust control purposes shall be from fire hydrants in proximity to the construction area. A fire hydrant use permit shall be obtained from the local water district. It is anticipated that fire hydrants located at the dead ends of North and South Windhorst Avenue and North and South Herman Avenue shall be identified for use in the fire hydrant use permit application.

5.4 Temporary Decontamination Pad

A temporary decontamination pad will be constructed outside of the construction zones. The decontamination pad will consist of a framed enclosure constructed from wood and polyethylene sheeting (30 mil). It will be constructed to contain all decontamination fluids and solids, and sloped to make the liquid portion flow to a low point to facilitate collection and disposal. All equipment coming into contact with any contaminated soil or groundwater will be decontaminated using a pressure washer prior to leaving the site. Decontamination water will be collected in 55-gallon 1A1 drums for disposal.

For vehicles and equipment not coming into contact with contaminated materials (i.e. the exclusion zones), care will be taken to minimize contact with soils in order to prevent tracking

soil onto roadways. During muddy conditions, vehicles and equipment will be required to wash visible soil from their wheels before entering the roadway

5.5 Site Restoration

Disturbed areas will be restored to its original conditions (both grade and cover type).

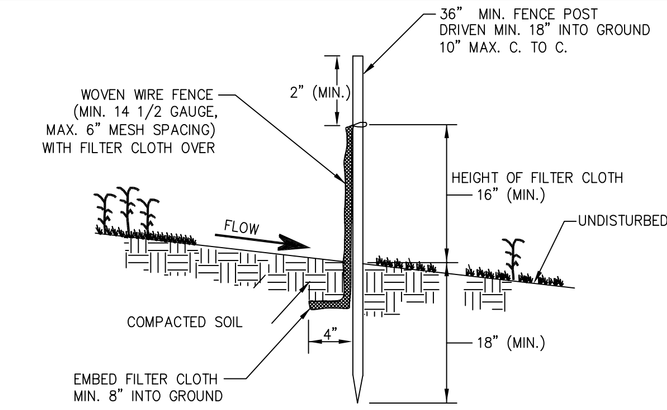
6.0 QUALITY CONTROL

Soil erosion and sediment control measures will be established at the beginning of construction and maintained during the entire period of construction. All land-disturbing activities will be planned and conducted to minimize the size of the area to be exposed at any one time and the length of the time of exposure and minimize off-site sedimentation damage. Surface water run-off originating upgrade of exposed areas will be controlled to reduce soil erosion and sediment loss during the period of exposure.

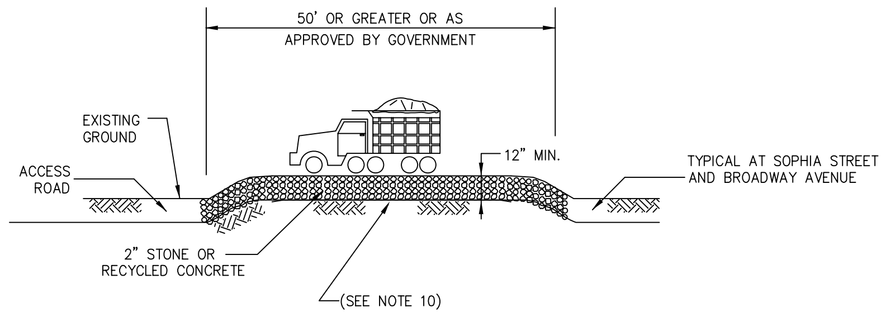
The Project Quality Control Manager (PQCM) will be on-site full-time during the removal activity. The PQCM will be responsible for ensuring that soil erosion and sediment controls are in-place and properly functioning. The PQCM will conduct inspections of soil erosion and sediment controls daily and before and after significant rain events. The condition of the soil erosion and sediment controls will be recorded in the site logbook and the daily Construction Quality Control Report.

Appendix A

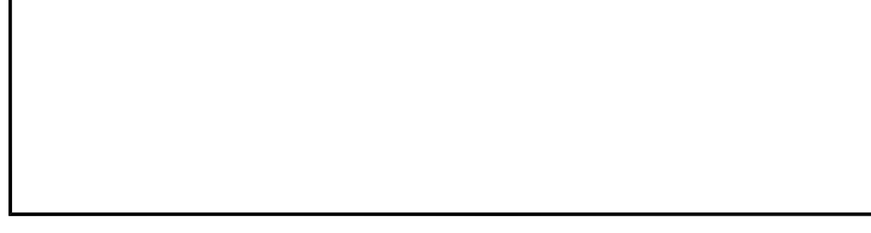
Drawing C-7 Soil Erosion and Sediment Control Details and Notes



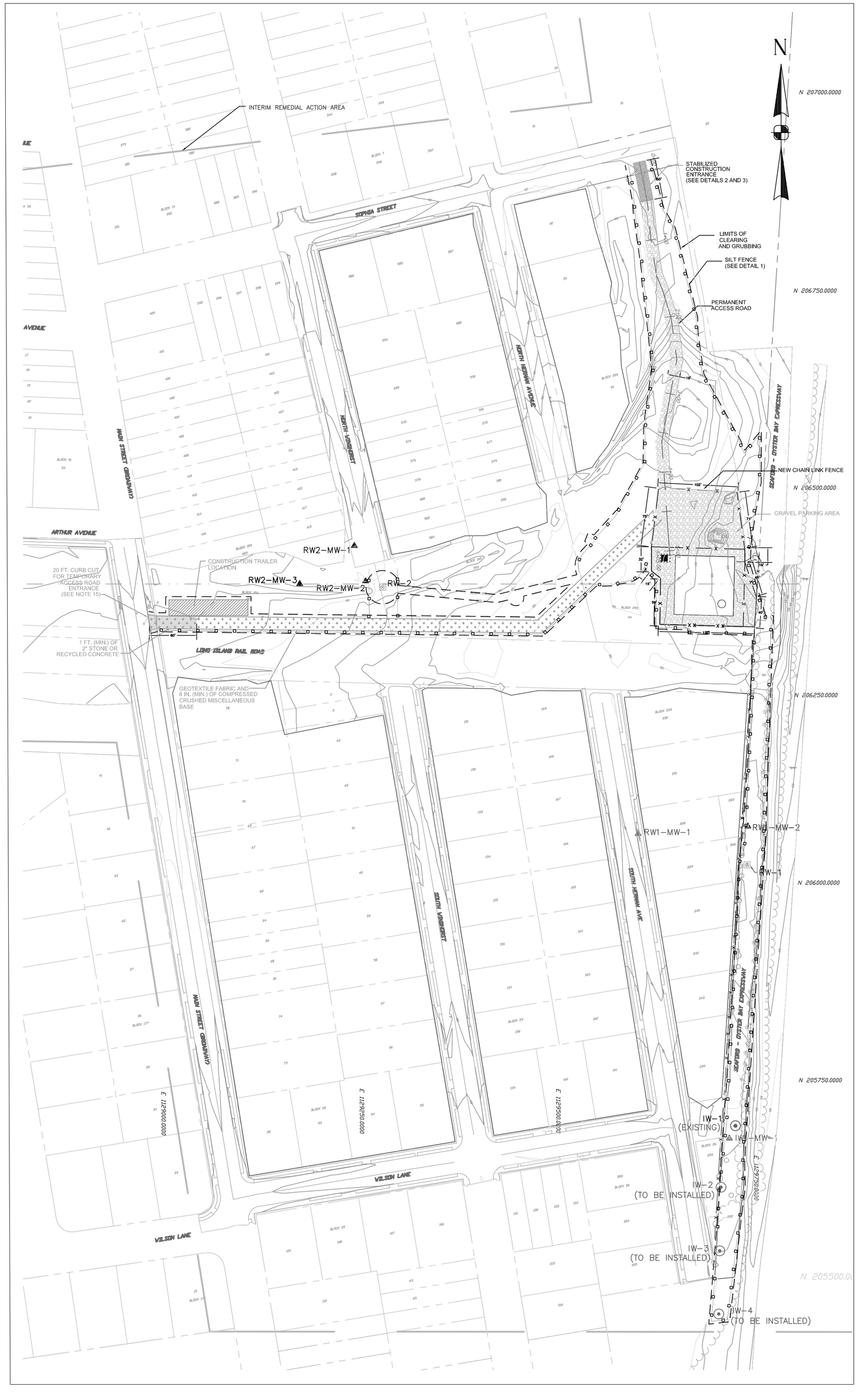
DETAIL (N.T.S.) 1 C-7 SILT FENCE (TYP.)



DETAIL (N.T.S.) 2 C-7 STABILIZED CONSTRUCTION ENTRANCE



DETAIL (N.T.S.) 3 C-7 STABILIZED CONSTRUCTION ENTRANCE – PLAN VIEW



SILT FENCE NOTES:

1. WOVEN WIRE FENCE TO BE FASTENED SECURELY TO FENCE POSTS WITH WIRE TIES OR STAPLES.
2. FILTER CLOTH TO BE FASTENED SECURELY TO WOVEN WIRE FENCE WITH TIES SPACED EVERY 24 INCHES AT TOP AND MID SECTION.
3. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER THEY SHALL BE OVERLAPPED BY 6 INCHES AND FOLDED.
4. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED WHEN "BULGES" DEVELOP IN THE SILT FENCE.
5. MATERIALS:
   POSTS: STEEL EITHER "T" OR "U" TYPE OR 2 INCH HARDWOOD
   FENCE: WOVEN WIRE, 14 1/2 GA., 6 INCH MAXIMUM MESH OPENING.
   FILTER CLOTH: FILTER X, MIRAFI 100X, STABLELINK T140N, OR APPROVED EQUAL.
   PREFABRICATED UNIT: GEOFAB, ENVIROFENCE, OR APPROVED EQUAL.

CONSTRUCTION ENTRANCE NOTES:

1. STONE SIZE – USE 2 INCH STONE OR RECLAIMED OR RECYCLED CONCRETE EQUIVALENT.
2. LENGTH – NOT LESS THAN 50 FEET.
3. THICKNESS – NOT LESS THAN (12) INCHES.
4. WIDTH – SIXTEEN (16) FEET MINIMUM. BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS OR EGRESS OCCURS. TWENTY-FOUR (24) FOOT IF SINGLE ENTRANCE TO SITE.
5. FILTER CLOTH – WILL BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING OF STONE.
6. SURFACE WATER – ALL SURFACE WATER FLOWING OR DIVERTED TOWARD CONSTRUCTION ENTRANCES SHALL BE PIPED ACROSS THE ENTRANCE, IF PIPING IS IMPRACTICAL, A MOUNTABLE BERM WITH 5:1 SLOPES WILL BE PERMITTED.
7. MAINTENANCE – THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACTED ONTO PUBLIC RIGHTS-OF-WAY MUST BE REMOVED IMMEDIATELY.
8. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH STONE AND WHICH DRAINS INTO AN APPROVED SEDIMENT TRAPPING DEVICE.
9. PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED AFTER EACH RAIN.
10. FOR THE STABILIZED CONSTRUCTION ENTRANCE, PERMANENT ACCESS ROAD, AND PARKING AREAS, USE HEAVY DUTY ROAD FILTER CLOTH SUCH AS TREVIRA SPUNBOND 1135, MIRAFT 600X, OR EQUIVALENT, WITH THE FOLLOWING PROPERTIES:

FABRIC PROPERTIES	HEAVY DUTY HAUL ROADS ROUGH GRADED	TEST METHOD
GRAB TENSILE STRENGTH (LBS)	220	ASTM D1682
ELONGATION AT FAILURE (%)	60	ASTM D1682
MULLEN BRUST STRENGTH (LBS)	430	ASTM D3786
PUNCTURE STRENGTH (LBS)	125	ASTM D751 MODIFIED
EQUIVALENT	40-80	US STD SIEVE
OPENING SIZE	---	CW-02215
AGGREGATE DEPTH (IN)	10	---

LEGEND:

- = EXISTING GRADE–MAJOR CONTOUR
- = EXISTING GRADE–MINOR CONTOUR
- = PROPOSED GRADE
- = TAX LOT LINE
- OH OH OH OH = OVERHEAD ELECTRIC WIRES
- E E E E = UNDERGROUND ELECTRIC WIRES
- W W W W = WATER MAIN
- G G G G = GAS MAIN
- D D = DRAINAGE LINES (STORM SEWER)
- S S S S = SANITARY SEWER MAIN
- = WOODED AREA
- X X X = CHAIN–LINK OR BOARD FENCE
- = DIRT TRAIL
- = LIMITS OF CLEARING
- = SILT FENCE
- NE NE NE = NEW UNDERGROUND ELECTRIC WIRES
- NW NW NW = NEW WATER LINE
- NS NS NS = NEW SANITARY SEWER MAIN
- = HDPE PIPE AND ELECTRICAL CONDUIT
- 242 = TAX LOT NUMBER
- = WATER VALVE
- GV = GAS VALVE
- RW1-MW-1 = MONITORING WELL
- RW-1 = RECOVERY WELL
- IW-1 = INJECTION WELL
- PB = PULL BOX
- = LEAK DETECTION ACCESS PORT
- = EXISTING DECIDUOUS TREE
- = EXISTING CONIFEROUS TREE
- = WHITE PINE TREE LOCATION
- = SIGN
- = MANHOLE
- = GRAVEL
- + + = TEMPORARY ACCESS ROAD
- 6916 = PUBLIC WATER SUPPLY WELL

GRAPHIC SCALE

80 0 40 80 160 240

(IN FEET)
1 inch = 80 ft.

TETRA TECH EC, INC.

DESCRIPTION	REV	PREP BY	DATE	APPRVD		
					DSGN:	
					DR:	
					CHK:	
					QA ENG:	
					SUPVR:	
					SUBMITTED BY:	(DATE)
					(TITLE)	
					(FIRM NUMBER)	
					NO:	
					NO:	
					NO:	
					DR:	
					PPC	
					OFFICER IN CHARGE	
					APPROVED	DATE

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
NORTHEAST
ENGINEERING FIELD ACTIVITY
PHILADELPHIA, PENNSYLVANIA
SERVICE CENTER
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BETHPAGE, NEW YORK
GM-38 AREA
GROUNDWATER TREATMENT PLANT
SOIL EROSION AND SEDIMENT CONTROL DETAILS AND NOTES
APPROVED
DATE
EFANE FOR COMMANDER, NAVFAC

STATE OF NEW YORK
CHUNG YI CHIOU
No. 057830-0
LICENSED PROFESSIONAL ENGINEER

C.Y. Chiou, P.E.
TYPE NO. 057830-0
SIGNATURE
DATE

THIS DRAWING PRODUCED ON AUTOCAD
DO NOT REVISE MANUALLY

"THIS DOCUMENT IS THE PROPERTY OF NAVAL FACILITIES ENGINEERING COMMAND, PREPARED BY TETRA TECH EC, INC., AND IS PROVIDED UPON THE CONDITION THAT IT WILL NOT BE REPRODUCED, COPIED, OR ISSUED TO A THIRD PARTY, AND WILL BE USED SOLEY FOR THE ORGINAL INTENDED PURPOSE AND SOLEY FOR THE EXECUTION OR REVIEW OF THE ENGINEERING CONSTRUCTION OF THE PROJECT".

IT IS A VIOLATION OF THE NEW YORK STATE EDUCATION LAW, ARTICLE 145, FOR ANY PERSON, UNLESS UNDER THE DIRECTION OF A NEW YORK STATE LICENSED PROFESSIONAL ENGINEER, TO ALTER AN ITEM ON THIS DOCUMENT IN ANY WAY.

CODE I.D. NO.	80091
SCALE : AS SHOWN	
SPEC. NO.	
CONSTRN. CONTR. NO.	N62472-99-D-0032
NAVFAC DRAWING NO.	
SHEET	OF
SIZE: D	DIS. SH. NO. C-7

P:\Bethpage\CAD - GIS\from UKU Nov 2004\DRVE_D\04033.000 (Naval Weapons Industrial Reserve Plant - GM-38)\dwg\FINAL DWGS\C-7_FINAL.dwg, 5/4/2006 12:10:31 PM

FINAL SITE-SPECIFIC HEALTH AND SAFETY PLAN
FOR
CONSTRUCTION TASKS
GM-38 AREA GROUNDWATER REMEDIATION
AT
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BETHPAGE, NEW YORK

Issued:

May 8, 2006

Prepared for:

Engineering Field Activity, Northeast
Naval Facilities Engineering Command
10 Industrial Highway, Mail Stop #82
Lester, Pennsylvania 19113-2090

Remedial Action Contract No. N62472-99-D-0032
Contract Task Order No. 96

Prepared by:

Tetra Tech EC, Inc.
Bucks Town Corporate Campus
820 Town Center Drive, Suite 100
Langhorne, PA 19047-1748

Revision	Date	Prepared By	Approved By	Pages Affected
0	5/8/06	E. Casey	S. Patselas	All

APPROVALS

By their signature, the undersigned hereby certify that this Site-Specific Health and Safety Plan (SHSP) has been reviewed and approved for use during the remedial actions involving the construction of the groundwater treatment plant for the GM-38 Area Groundwater Remediation Construction Tasks at the Bethpage, NY Site.

PROJECT MANAGER	DATE
PROJECT SUPERINTENDENT	DATE
PROJECT ENVIRONMENTAL AND SAFETY MANAGER	DATE
SITE HEALTH AND SAFETY OFFICER	DATE

TABLE OF CONTENTS

FINAL SITE-SPECIFIC HEALTH AND SAFETY PLAN 1
FOR 1
CONSTRUCTION TASKS 1

1.0 INTRODUCTION 1
1.1 Scope of Work 1
1.1.1 Mobilization and Site Preparation 1
1.2 Treatment Plant Building Construction 2
1.2.1 Treatment Building Systems Installation 2
1.2.2 Extraction System Construction 2
1.2.3 Groundwater Injection System Installation 3
1.2.4 Groundwater Treatment System Installation 3
1.2.5 Site Restoration 3
1.2.6 Startup and Shakedown of Treatment Plant 3
1.2.7 New Groundwater Monitoring Well Installation 3
1.2.8 New Injection Well Installation 4
1.2.9 Off-Site Waste Transportation and Disposal 4
1.2.10 Demobilization 4
1.3 Application 4

2.0 PROJECT ORGANIZATION 4
2.1 Project Manager (PM) 4
2.2 PESM 5
2.3 Project Superintendent (PS) 5
2.4 SHSO 5
2.5 Site Personnel 6

3.0 SITE LOCATION AND DESCRIPTION 7
3.1 Site Location 7
3.2 Site Background and Description 7

4.0 POTENTIAL HAZARDS 9
4.1 Chemical Hazards 9
4.2 Biological Hazards 13
4.2.1 Animals 13
4.2.2 Insects 13
4.2.2.1 Lyme Disease 13
4.2.3 Snakes 15
4.2.4 Plants 16
4.3 Physical Hazards 16
4.3.1 Heat Stress 16
4.3.2 Cold Stress 17
4.3.3 Noise 17
4.3.4 Underground Utilities 17
4.3.5 Excavation and Trenching 17
4.3.6 Falls 18
4.3.7 Hazardous Energy Control 18

TABLE OF CONTENTS - *continued*

4.3.8 Other Physical Hazards 19

5.0 AHA 19

6.0 PPE 20
6.1 Hazard Assessment for Selection of PPE 20
6.2 Respirator Cartridge Change-Out Schedule 22

7.0 AIR MONITORING 23
7.1 Real Time Air Monitoring 23
7.2 Frequency and Location of Real Time Air Monitoring 24
7.3 Integrated Air Monitoring 24
7.4 Data Quality Assurance 24
7.4.1 Calibration 24
7.4.2 Operations 25
7.4.3 Data Review 25
7.5 Noise Monitoring 25

8.0 ZONES, PROTECTION AND COMMUNICATION 25
8.1 Site Control 25
8.2 Contamination Control 26
8.2.1 Personnel Decontamination Station 26
8.2.2 Minimization of Contact with Contaminants 26
8.2.3 Personnel Dry Decontamination Sequence 26
8.2.4 Heavy Equipment Decontamination 27
8.3 Communication 27

9.0 MEDICAL SURVEILLANCE PROCEDURES 28
9.1 Medical Surveillance Requirements 28
9.2 Medical Data Sheet 28

10.0 SAFETY CONSIDERATIONS 28
10.1 General Health and Safety Work Rules 28
10.2 General Construction Hazards 28
10.3 High Loss Potential Hazards 29
10.3.1 Underground Utilities 29
10.3.2 Excavation and Trenching 30

11.0 WASTE DISPOSAL PROCEDURES 30

12.0 EMERGENCY RESPONSE PLAN 31
12.1 Responsibilities 31
12.1.1 PESM 31
12.1.2 SHSO 31
12.1.3 EC 31
12.1.4 Site Personnel 32
12.2 Communication 32
12.2.1 Radio Communication 32
12.2.2 Telephone Communication 32
12.2.3 Air Horns 32

TABLE OF CONTENTS - *continued*

12.2.4 Hand Signals 32
12.3 Local Emergency Support Units 33
12.4 Pre-Emergency Planning 33
12.5 Emergency Medical Treatment 34
12.6 Emergency Site Evacuation Routes and Procedures 34
12.6.1 Evacuation Drills 35
12.7 Fire Prevention and Protection 35
12.7.1 Fire Prevention 35
12.7.2 Fire Protection 36
12.8 Overt Chemical Exposure 36
12.9 Decontamination During Medical Emergencies 36
12.10 Accident/Incident Reporting 37
12.11 Adverse Weather Conditions 37
12.12 Spill Control and Response 37
12.13 Emergency Equipment 38
12.14 Postings 38
12.15 Restoration and Salvage 39

13.0 TRAINING 39
13.1 General Health and Safety Training 39
13.1.1 Three Day Supervised On-the-Job Training 39
13.2 Annual Eight-Hour Refresher Training 39
13.3 Supervisory Training 39
13.4 Site-Specific Training 39
On-Site Safety Briefings 40
13.5 First Aid and CPR 40
13.6 Hazard Communication 40

14.0 LOGS, REPORTS AND RECORD KEEPING 40
14.1 CRF 40
14.2 Medical and Training Records 40
14.3 On-Site Log 41
14.4 Weekly/Monthly Safety Reports 41
14.5 Exposure Records 41
14.6 Accident/Incident Reports 41
14.7 OSHA Form 300 41
14.8 Health and Safety Logbook 41
14.9 Hazard Communication Program/MSDS 41
14.10 Work Permits 42

15.0 FIELD PERSONNEL REVIEW 43

16.0 REFERENCES 44

TABLE OF CONTENTS - *continued*

LIST OF TABLES

Table 4-1	Contaminants of Concern Groundwater Concentrations	10
Table 4-2	Chemical Data	11
Table 6-1	PPE Selection	21
Table 7-1	Real Time Air Monitoring Action Levels	24
Table 7-2	Frequency and Location of Air Monitoring	24
Table 12-1	Emergency Telephone Numbers	33

LIST OF APPENDICES

Appendix A	Change Request Form
Appendix B	Material Safety Data Sheets
Appendix C	Activity Hazard Analysis
Appendix D	Temperature Extremes
Appendix E	Underground Utilities
Appendix F	Excavation and Trenching
Appendix G	Fall Protection
Appendix H	PPE Selection Form
Appendix I	Medical Data Sheet
Appendix J	Work Rules
Appendix K	Critical Lifts
Appendix L	Hospital Route Map
Appendix M	Weekly/Monthly Safety Reports

ACRONYMS AND ABBREVIATIONS

1,1,1-TCA	1,1,1-trichloroethane
1,2-DCE	1,2-dichloroethene
ACGIH	American Conference of Governmental Industrial Hygienists
AHA	Activity Hazard Analysis
AIHA	American Industrial Hygiene Association
amp	ampere
ANSI	American National Standards Institute
bgs	below ground surface
BWD	Bethpage Water District
BZ	Breathing Zone
°C	Degrees Celsius
CFR	Code of Federal Regulations
CGI/O_2/CO	Combustible Gas Indicator/Oxygen/Carbon Monoxide
CIH	Certified Industrial Hygienist
CNS	Central Nervous System
CPR	Cardiopulmonary Resuscitation
CRF	Change Request Form
CRZ	Contamination Reduction Zone
CSP	Certified Safety Professional
CSQ	Client Service Quality
CTO	Contract Task Order
EC	Emergency Coordinator
EFANE	Engineering Field Activity, Northeast
EHS	Environmental Health and Safety
ESQ	Environmental Safety Quality
EZ	Exclusion Zone
°F	Degrees Fahrenheit
GFCI	Ground Fault Circuit Interrupters
GOCO	Government Owned Contractor-Operated
GPR	Ground Penetrating Radar
kV	kilovolt
MSDS	Material Safety Data Sheets
NEC	National Electric Code
NGC	Northrop Grumman Corporation
NWIRP	Naval Weapons Industrial Reserve Plant
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSDOT	New York State Department of Transportation
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
PCBs	Polychlorinated Biphenyls
PCE	Tetrachloroethene
PESM	Project Environmental and Safety Manager

PID	Photo Ionization Detector
PM	Project Manager
POTW	Publicly Owned Treatment Works
ppb	parts per billion
PPE	Personal Protective Equipment
ppm	parts per million
PS	Project Superintendent
ROD	Record of Decision
RW	Recovery Well
SHSO	Site Health and Safety Officer
SHSP	Site-Specific Health and Safety Plan
SVOCs	Semi-Volatile Organic Compounds
SZ	Support Zone
TAC	Technical Advisory Committee
TCE	Trichloroethene
TLVs	Threshold Limit Values
TtEC	Tetra Tech EC, Inc.
µg/L	micrograms per liter
UL	Underwriters Laboratories
USACE	United States Army Corps of Engineers
VOCs	Volatile Organic Compounds
VPBs	Vertical Profile Borings
WBGT	Wet Bulb Globe Temperature
ZIP	Zero Incident Performance

1.0 INTRODUCTION

Tetra Tech EC, Inc. (TtEC) has been contracted by the Engineering Field Activity, Northeast (EFANE) with the Construction Tasks for the groundwater treatment plant for the GM-38 Area Groundwater Remediation located at Naval Weapons Industrial Reserve Plant (NWIRP), Bethpage, NY. This Site-Specific Health and Safety Plan (SHSP) addresses the health and safety practices that will be employed by all site workers participating in field operations. This SHSP takes into account the specific hazards inherent to the site work and presents procedures to be followed by TtEC, its subcontractors and all other on-site personnel in order to avoid and, if necessary, protect against health and/or safety hazards. Activities performed on this Contract Task Order (CTO) will comply with this SHSP, Occupational Safety and Health Administration (OSHA) Regulations 29 Code of Federal Regulations (CFR) Parts 1910 and 1926, United States Army Corps of Engineers (USACE) EM 385-1-1, as well as the TtEC Health and Safety Program. A copy of this SHSP will be on-site during site activities. Modifications to this SHSP may be made with the approval of the Project Environmental and Safety Manager (PESM) and the Navy using the Change Request Form (CRF) in Appendix A.

1.1 Scope of Work

The work will include, but not be limited to the following construction-related tasks:

- Mobilization and site preparation.
- Treatment plant building construction.
- Treatment building systems installation.
- Extraction system construction.
- Groundwater injection system installation.
- Groundwater treatment system installation.
- Site restoration.
- Startup and shakedown of treatment plant.
- New groundwater monitoring well installation.
- New injection well installation.
- Off-site Waste Transportation and Disposal.
- Demobilization.

1.1.1 Mobilization and Site Preparation

The Navy will obtain access agreements, if needed, and will provide copies to TtEC, prior to the start of field activities. TtEC will mobilize all necessary personnel, equipment, and materials to the site. All subcontractor personnel and equipment will be mobilized to the site.

Underground utility mark-out will be performed. TtEC will contact the New York State (NYS) One-Call System, and screen excavation and drilling locations using geophysical techniques, such as ground penetrating radar (GPR) or magnetometer.

Erosion control systems will be installed (e.g., hay bales, silt fencing).

Clearing and grubbing will be conducted, including construction of a temporary access road. Pre-Design cleanup activities will include landscaping, tree plantings and installation of fence along the New York State Department of Transportation (NYSDOT) right-of-way.

Surveying will be performed and the building perimeter fence (chain-link with barbed wire) will be installed alone with the associated parking areas. Vehicle and personnel access gate(s) will also be installed.

Installation of shoring, excavation of building sumps, and all concrete work associated with the installation of the building sumps will be performed.

1.2 Treatment Plant Building Construction

TtEC will perform excavation and backfill for the building construction, complete all concrete work, erect the pre-engineered steel building, prepare a Critical Lift Plan for crane use, and construct the office/control room and mezzanine deck.

1.2.1 Treatment Building Systems Installation

TtEC will complete the following mechanical/electrical tasks associated with the installation of associated building systems, including building utilities, fire alarm systems and security systems:

- Trench excavation and backfilling for utility systems.
- Potable water service hook-up.
- Water piping installation.
- Bathroom accessories and associated plumbing.
- Water heater and associated plumbing.
- Heating, ventilation and air conditioning system installation.
- Sanitary sewer installation.
- Fire detection, alarm and monitoring system installation.
- Security alarm and monitoring system installation.

1.2.2 Extraction System Construction

Work will include the following tasks:

- Trench excavation and backfilling associated with connecting the recovery wells to the treatment building.
- Installation of pipe and electrical conduit.
- Installation of well vaults and associated piping, instrumentation and pumps.
- Installation of all electrical components.

1.2.3 Groundwater Injection System Installation

The following tasks will be performed:

- Well vault installation.
- Trench excavation and backfilling associated with connecting the injection wells to the treatment building.
- Construction of the Treated Groundwater Injection System.

1.2.4 Groundwater Treatment System Installation

For the construction of the groundwater treatment system, installation work will include the following tasks:

- Equalization tank.
- Sodium hydroxide chemical feed system.
- Crane operation, including preparation of a Critical Lift Plan.
- Particulate Filtration Unit.
- Liquid- and Vapor-phase granular activated carbon units.
- Process pumps and sump pumps.
- Air compressor and drier system.

1.2.5 Site Restoration

The following restoration tasks will be performed:

- Placing sod, seed and hay as needed.
- Placing topsoil, fertilizer and mulching as needed.
- Planting trees within the NYSDOT right-of-way and other properties/site locations.
- Constructing a berm around the treatment plant.
- Repair areas where damage may have occurred, including the replacement of roadways, curbs and sidewalks (including the curb/sidewalk along Broadway Avenue).

1.2.6 Startup and Shakedown of Treatment Plant

Work will include the following:

- Material, mechanical and pipe tests.
- Electrical, acceptance and hydraulic tests/testing.

1.2.7 New Groundwater Monitoring Well Installation

The tasks will include installing new groundwater monitoring wells and well vaults.

1.2.8 New Injection Well Installation

The tasks will include installing new injection wells and well vaults.

1.2.9 Off-Site Waste Transportation and Disposal

The following wastes will be removed from the site:

- Cleared and grubbed debris.
- General trash/Construction debris.
- Drill Cuttings in Roll-off boxes.
- Development/purge water in frac tanks.
- Old stripper tower packing.

1.2.10 Demobilization

Upon completion and approval of the project, all potentially contaminated equipment and facilities will be pressure washed prior to demobilization. All equipment and supplies will be removed from the site.

1.3 Application

The SHSP applies to all personnel involved in the above tasks who wish to gain access to active work areas, including but not limited to:

- Client representatives - The Navy is responsible for ensuring that its personnel comply with OSHA and USACE EM 385-1-1 applicable requirements.
- Federal, state or local representatives.

TtEC employees and subcontractors will develop Activity Hazard Analysis (AHA) that will be reviewed by TtEC prior to start of work.

2.0 PROJECT ORGANIZATION

2.1 Project Manager (PM)

The PM is Stavros Patselas. His responsibilities include the following:

- Ensures implementation of this program through coordination with the responsible PESM.
- Conducts monthly inspections.
- Participates in all incident investigations.
- Ensures the SHSP has all of the required approvals before any site work is conducted.

- Ensures that the PESM or Site Health and Safety Officer (SHSO) is informed of project changes which require modifications of the SHSP.
- Has overall project responsibility for Project Health and Safety.

2.2 PESM

The PESM is an individual certified by the American Board of Industrial Hygiene as a Certified Industrial Hygienist (CIH) or by the Board of Certified Safety Professionals as a Certified Safety Professional (CSP) with experience in hazardous waste site remediation activities. The PESM is Grey Coppi, CIH, CSP. His responsibilities include the following:

- Provides for the development and approval of the SHSP.
- Serves as the primary contact to review health and safety matters that may arise.
- Approves revised or new safety protocols for field operations.
- Approves individuals who are assigned SHSO responsibilities.
- Approves SHSO to fulfill other project roles.
- Coordinates revisions of this SHSP with field personnel.
- Coordinates upgrading or downgrading of personal protective equipment (PPE) with the SHSO.
- Assists in the investigation of all incidents.
- Conducts quarterly inspections for compliance with the SHSP.

2.3 Project Superintendent (PS)

The PS is Ed Urbanek. His responsibilities include the following:

- Ensures that the SHSP is implemented in conjunction with the designated PESM and SHSO.
- Ensures that field work is scheduled with adequate personnel and equipment resources to complete the job safely.
- Ensures that adequate communication between field crews and emergency response personnel is maintained.
- Ensures that field site personnel are adequately trained and qualified to work at the site.
- Enforces site health and safety rules.
- Investigates all incidents.
- Conducts daily safety briefings.
- Conducts weekly site inspections.
- Acts as Emergency Coordinator (EC).

2.4 SHSO

The SHSO is Ed Casey. The SHSO is responsible for the following:

- Works as a member of the project team to ensure implementation of the SHSP.

- Ensures that all health and safety activities identified in the SHSP are conducted and/or implemented.
- Identifies operational changes which require modifications to health and safety procedures and the SHSP, and ensures that the procedure modifications are implemented and documented through changes to the SHSP.
- Directs and coordinates health and safety monitoring activities.
- Ensures that proper PPE is utilized by field teams.
- Assists in conducting and documenting daily safety briefings.
- Monitors compliance with this SHSP.
- Notifies PESM of all accidents/incidents.
- Coordinates with PM in any accident/incident investigation.
- Maintains Accident/Incident Report Forms.
- Determines upgrades or downgrades of PPE based on site conditions and/or real-time monitoring results.
- Ensures that monitoring instruments are calibrated.
- Reports to PESM to provide summaries of field operations and progress.
- Maintains health and safety field log books.
- Displays/maintains postings and handbooks such as:
    - OSHA Job Safety and Health Poster.
    - OSHA Noise Regulation.
    - Department of Labor Postings (Minimum wage, fair labor standards).
    - Hazard Warning Signs.
    - Noise Hazard Warning Sign.
    - Do It Right Poster.
    - Client Service Quality (CSQ) Poster.
    - TtEC Shared Vision.
    - TtEC Mission Statement.
    - TtEC Hot Line Poster.
    - TtEC Work Rules.
    - TtEC Environmental Safety Quality (ESQ) Policy Poster.
    - Zero Incident Performance (ZIP) Bulletins.
    - Flash reports.
    - Emergency telephone numbers.
    - Diagrams showing the location of fire extinguishers and emergency equipment.
    - Emergency exit, evacuation routes and staging area.
    - Project Rules Handbook.

2.5 Site Personnel

Site Personnel responsibilities include the following:

- Report any unsafe or potentially hazardous conditions to the SHSO.
- Maintain knowledge of the information, instructions and emergency response actions contained in the SHSP.

- Comply with rules, regulations and procedures as set forth in this SHSP and any revisions.
- Prevent admittance to work sites by unauthorized personnel.
- Inspect all tools and equipment, including PPE, daily prior to use.

3.0 SITE LOCATION AND DESCRIPTION

3.1 Site Location

NWIRP Bethpage is located in east central Nassau County, Long Island, New York, approximately 30 miles east of New York City. The Navy's property totaled approximately 109.5 acres and was formerly a Government Owned Contractor-Operated (GOCO) facility that was operated by the Northrop Grumman Corporation (NGC) until September 1998. NWIRP Bethpage is bordered on the north, west, and south by property owned, or formerly owned, by NGC that covered approximately 605 acres, and, on the east, by a residential neighborhood.

The facilities at NWIRP Bethpage include four plants (Nos. 3, 5, and 20, used for assembly and prototype testing; and No. 10, which contains a group of quality control laboratories), two warehouse complexes, a salvage storage area, water recharge basins, an industrial wastewater treatment plant, and several smaller support buildings.

The GM-38 Area is approximately 8,500 feet south-southeast and hydraulically downgradient of NWIRP Bethpage.

3.2 Site Background and Description

NWIRP Bethpage was established in 1933. Since inception, the primary mission of the facility has been the research, prototyping, testing, design engineering, fabrication, and primary assembly of military aircraft. Historical operations that resulted in hazardous material generation at the facility included metal finishing processes, maintenance operations, painting of aircraft and components, and other activities that involved aircraft manufacturing. Wastes generated by plant operations were disposed of directly into either drainage sumps, dry wells, and/or on the ground surface, resulting in the disposal of a number of hazardous wastes, including the Volatile Organic Compounds (VOCs) tetrachloroethene (PCE) and trichloroethene (TCE), the semi-volatile organic compounds (SVOCs) polychlorinated biphenyls (PCBs), and the inorganics chromium and cadmium at the site. Some of these contaminants have migrated from the points of disposal to surrounding areas, including the soils of these sites and the groundwater beneath and downgradient of the NWIRP Bethpage property.

The GM-38 Area refers to a cluster of monitoring wells that were installed in the 1990s by NGC and that first identified an isolated groundwater contaminant plume in this area. Chlorinated VOCs were identified in moderately deep groundwater (220 to 470 feet below ground surface [bgs]) at concentrations greater than 500 micrograms per liter (μg/L). The contaminated groundwater in the area represents a relatively large mass of chlorinated VOCs that would remain for extended periods and could adversely affect public water supplies in the area, as well

as other downgradient water supplies. Two public water supply systems are present in the general area and extract groundwater at depths ranging from 540 to 740 feet bgs.

The contaminated groundwater plumes emanating from the Navy and NGC sites is estimated to total more than 2,000 acres in area and extend more than 700 feet deep in some locations. Recent groundwater data from the Navy's vertical profile borings indicate that the contaminated groundwater plume has migrated south beyond the Hempstead Turnpike.

To date, the off-site groundwater plume(s) have impacted or threatened three public water supply wellfields operated by the Bethpage Water District (BWD). There are treatment systems in place at each of the three impacted or threatened wellfields. The water that is distributed to the community is tested on a monthly basis to ensure that the drinking water standards promulgated by the New York State Department of Health (NYSDOH) are met. In addition, the BWD has a policy of providing its consumers with drinking water that contains no detectable concentrations of site-related contaminants. Given the proximity of the contaminants to the BWD well fields, nine outpost or sentry wells were installed upgradient of the water supplies. These wells have been sampled on a quarterly basis since March 1995. The purpose of this quarterly sampling is to provide the BWD with the data necessary to ensure that the existing treatment systems are adequate to treat the level of contaminants that may impact their public supply wells. The data are also used to make decisions about the need for groundwater remediation.

Based upon a review of the sentry well data, there is an area surrounding monitoring well cluster GM-38 that contains high concentrations, in excess of 1,000 parts per billion (ppb), of site-related contamination. The outpost wells will continue to be monitored to determine the groundwater concentrations of these site-related contaminants.

Remediation of the GM-38 Area groundwater is identified in the New York State Department of Environmental Conservation (NYSDEC) Record of Decision (ROD) for Operable Unit (OU) 2 Groundwater for Site Numbers 1-30-003A & B, dated March 2001, and the Navy's ROD for OU 2 – Groundwater for Site Number 1-30-003B, dated April 2003 (Rev. 1).

The remedial action selected in the ROD addresses on-site contaminated groundwater beneath the Navy's 105-acre parcel, as well as contaminated groundwater that has migrated off-site beyond the boundaries of NWIRP Bethpage.

The Navy's selected remedy for on-site groundwater includes an institutional control consisting of the placement of a restriction in the deed of transfer to the County of Nassau, New York prohibiting extraction of groundwater from within the boundaries of the 105-acre or Plant 20 parcels located at the Navy's former NWIRP Bethpage facility. This remedy is based on the recognition that an existing groundwater extraction and treatment system, known as the On-site Containment System, is containing and remediating VOC-contaminated groundwater emanating from the Navy's property. The system was constructed and is operated by NGC as part of the March 2001 ROD for Regional Groundwater issued by NYSDEC. If the system fails to continue to operate for any reason, the Navy will re-evaluate the remedy for on-site groundwater and implement necessary measures to ensure that the remedy is still protective of human health and the environment.

The Navy's selected remedy for off-site groundwater includes the following:

- Groundwater Remedial Program:
  - Contaminant removal through groundwater extraction and treatment at an off-site area near the GM-38 monitoring well cluster.
  - Pre-design investigation to determine the optimal groundwater extraction locations in the GM-38 Area.
  - Operation and maintenance of the GM-38 Area remedy.
  - Additional investigation in the vicinity of well GM-75D2, or any other area identified as requiring additional groundwater investigation, to determine if a contaminant removal program similar to the GM-38 program is necessary.
  - Continued participation in the Technical Advisory Committee (TAC) established by NYSDEC.

- Public Water Supply Protection Program:
  - Installation of Vertical Profile Borings (VPBs) to gather water quality and lithologic data to aid in the placement of outpost monitoring wells.
  - Development of a Public Water Supply Well Contingency Plan.
  - Installation of outpost monitoring wells in areas upgradient of potentially affected water supply wellfields as outlined in the Public Water Supply Well Contingency Plan.
  - Public water supply wellhead treatment or comparable alternative measures, if necessary, for wellfields that become affected in the future by site-related contaminants.
  - Provision of public water to residential or commercial users that have private drinking water wells determined to be affected or potentially affected by site-related contaminants.

4.0 POTENTIAL HAZARDS

This section presents an assessment of the chemical, biological, and physical hazards that may be encountered during the tasks specified under SHSP Section 1.1. Additional information can be found in Appendix B- Material Safety Data Sheets or in Appendix C-Activity Hazard Analyses.

4.1 Chemical Hazards

The contaminants previously detected in groundwater are listed below in Table 4-1:

Table 4-1
Contaminants of Concern Groundwater Concentrations

Contaminant	Average Concentration (µg/L)	
	RW-1	RW-2
1,1,1-Trichloroethane	4.1	0
1,1-Dichloroethene	2.0	0.6
1,2-Dichloroethene	41.8	3.5
Trichloroethene	461.1	277.3
Tetrachloroethene	45.8	1.3
Vinyl Chloride	6.5	0.1

Note: RW = Recovery Well

The contaminants of concern for the site are PCE, TCE, 1,2-dichloroethene (1,2-DCE), 1,1,1-trichloroethane (1,1,1-TCA), vinyl chloride, and other related chlorinated solvents.

Exposure to these compounds, listed in Table 4-1, may occur through inhalation of contaminated dust particles, inhalation of volatile contaminants, dermal absorption, skin contamination, or accidental ingestion of the contaminant.

The action levels for the contaminants of concern were based upon the known concentration of contaminants, physical and chemical properties, toxicity, and distribution of these compounds at the site. Due to the vapor pressures of these chemicals, inhalation is the primary route of exposure. Skin absorption is also a possible route of exposure, leading to the same symptoms as inhalation overexposure. Symptoms of exposure to these potential site contaminants, especially if they are encountered in their pure form, can range from irritation of skin, mucous membranes and other sensitive tissues such as the eyes, to nausea and vomiting, fatigue, lightheadedness/dizziness and headache. Potential damage of major organ systems (e.g., liver, kidneys, central nervous system (CNS), blood forming organs, reproductive systems) could result from chronic exposure or acute exposure to high concentrations of the materials. VOCs are potent narcotics and may cause CNS and lung damage. Some of the site contaminants that may potentially be encountered are suspected carcinogens.

Due to the nature of the work being performed, the anticipated levels of exposure to potential site contaminants are expected to be moderate. Table 4-2 contains a summary of the toxicological and chemical properties of the compounds that may be encountered during field activities.

Table 4-2
Chemical Data

COMPOUNDS	ACGIH TLV	OSHA PEL	NIOSH IDLH	ROUTES OF EXPOSURE	SYMPTOMS OF EXPOSURE	TARGET ORGANS	PHYSICAL DATA
1,1,1-Trichloroethane	350 ppm	350 ppm		Inhalation, Ingestion, Contact	Headache, dizziness, weakness, nausea, vomiting, eye irritation, dermatitis, potential carcinogen	Skin, eyes, respiratory system; liver, kidneys, CNS	MW: 133.40; IP: 11.25 ev; Sp. Gr.: 1.34; LEL: 7%; UEL: 16%; VP: 100 mmHg
1,1,2-Trichloroethane	10 ppm	10 ppm	100 ppm	Inhalation, Ingestion, Contact	Drunkenness, eye and skin irritation, vomiting, headache	CNS, liver	MW: 133.4; IP: 11 ev; Sp. Gr.: 1.4416; LEL: N/A; UEL: N/A; VP: 17 mmHg
1,1-Dichloroethene	5 ppm	1 ppm	1000 ppm	Inhalation, Ingestion, Contact	Drunkenness, severe eye and skin irritation	CNS, liver	MW: 96.64; IP: 10 ev; Sp. Gr.: 1.213; LEL: 5.6%; UEL: 11.4%; VP: 400 mmHg
1,1-Dichloroethane	100 ppm	100 ppm	3000 ppm	Inhalation, Ingestion, Contact, Absorption	Nausea, headache, dizziness, vomiting, weakness, skin irritation	Skin, liver, kidneys, lungs, CNS	MW: 98.97; IP: 11.06 ev; Sp. Gr.: 1.174; LEL: 5.6%; UEL: N/A; VP: 230 mmHg
1,2-Dichloroethene	200 ppm	200 ppm	1000 ppm	Inhalation, Ingestion, Contact	Eye and skin irritation, nausea, vomiting, drowsiness, drunkenness	CNS	MW: 96.94; IP: 9.66 ev; Sp. Gr.: 1.2837; LEL: 9.7%; UEL: 12.8%; VP: 400 mmHg
1,2-Dichloroethane	10 ppm	50 ppm	50 ppm	Inhalation, Ingestion, Contact, Absorption	Headache, weakness, nausea, vomiting, diarrhea, skin and eye irritation, possible carcinogen	Eyes, skin, kidneys, liver, CNS, cardiovascular system	MW: 98.96; IP: 11.04 ev; Sp. Gr.: 1.24; LEL: 6.2%; UEL: 15.9%; VP: 87 mmHg

Table 4-2
Chemical Data

COMPOUNDS	ACGIH TLV	OSHA PEL	NIOSH IDLH	ROUTES OF EXPOSURE	SYMPTOMS OF EXPOSURE	TARGET ORGANS	PHYSICAL DATA
Tetrachloroethene	25 ppm	100 ppm	150 ppm	Inhalation, Ingestion, Contact, Absorption	Irritable eyes, nose, throat; nausea; flush face, neck; vertigo, dizziness, giddiness, incoordination, headache, skin erythema (skin redness), suspect carcinogen	Eyes, skin, respiratory system, liver, kidneys, CNS	MW: 165.83; IP: 9.32ev; Sp. Gr.: 1.62; VP: 14 mmHg
Trichloroethene	50 ppm	100 ppm	1000 ppm	Inhalation, Ingestion, Contact	Headache, vertigo, visual disturbance, tremors, vomiting, eye irritation, dermatitis, fatigue, giddiness, potential carcinogen	Eyes, skin, respiratory system, heart, liver, CNS	MW: 131.39; IP: 9.4ev; Sp. Gr.: 1.46; LEL: 10.5%; UEL: NA; VP: 58 mmHg
Vinyl Chloride	1 ppm	1 ppm		Inhalation, Ingestion, Contract	Eye and skin irritation, nausea, difficulty breathing, headache, drowsiness, dizziness, known carcinogen	CNS	MW: 62.5; IP: 10.0 ev; Sp. Gr.: 0.9106; LEL:3.6 %; UEL: 33%; VP: 2515.6 mmHg

Abbreviations:
ACGIH = American Conference of Governmental Industrial Hygienists
CNS = Central Nervous System
Hg = Mercury
IDLH = Immediately Dangerous to Life and Health
IP = Ionization Potential
LEL = Lower Explosive Limit
mm = millimeter
MW = Molecular Weight
NA = Not Applicable
NIOSH = National Institute for Occupational Safety and Health
OSHA = Occupational Safety & Health Administration
PEL = Permissible Exposure Limit
ppm = Parts Per Million
Sp. Gr. = Specific Gravity
TLV = Threshold Limit Value
UEL = Upper Explosive Limit
VP = Vapor Pressure

4.2 Biological Hazards

During the course of the project, there is a potential for workers to encounter biological hazards such as animals, insects and plants.

4.2.1 Animals

During site operations, animals such as dogs, cats, raccoons, skunks, mice, and snakes may be encountered. Workers will use discretion and avoid all contact with animals. If these animals present a problem, efforts will be made to remove these animals from the site by contacting a licensed pest control technician.

4.2.2 Insects

Insects, such as mosquitoes, ticks, bees and wasps may be present during certain times of the year. Workers will be encouraged to wear repellents (DEET for Ticks) when working in areas where insects are expected to be present. If insects are prevalent, efforts will be made to remove them from the site by contacting a licensed pest control technician.

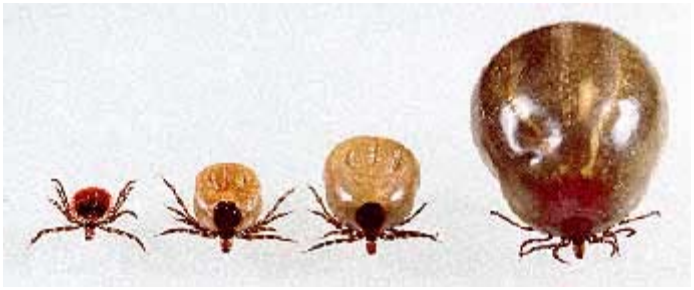
Rocky Mountain Ticks

Left to Right: female, male

4.2.2.1 Lyme Disease

Since the site is located in the mid-Atlantic region, the potential for coming into contact with deer ticks exists. Lyme disease is caused by an infection from a deer tick that is about the size of the head of a pin. After a blood feeding, the tick becomes engorged and may vomit its stomach contents into the host, a microorganism (spirochete) may be transmitted into the bloodstream that may lead to Lyme disease. The feeding time is 24 to 48 hours. The effects of the disease vary from person to person, which often makes it difficult to diagnose. Typically, the incubation period ranges from two days to two weeks. In most cases, the infected area will resemble a red bull's eye with concentric rings. Within the same period, flu-like symptoms may develop. If left untreated, the red ringed area will eventually fade and Lyme disease may further develop into an arthritis-like condition.

Deer tick - Black Legged tick



The changing face as the deer tick engorges

Left to Right: unengorged female, 1/4 engorged, 1/2 engorged and fully engorged

The best method for stopping insect borne disease is to avoid the bite. Control measures to prevent Lyme Disease include the following:

- Avoid dense or high brush, when possible.
- Wear light colored clothing.
- Spray DEET on your skin and Permethrin on clothing and work boots.
- Tuck pant legs into socks and shirts into gloves, if possible.
- Self/Buddy check of neck, hairline, groin and body after working in areas that may contain deer ticks.
- Wear light colored tyvek or clothing.
- Wear booties over work boots.
- Look for ticks upon returning from field work.
- Shower as soon as possible.
- If a tick is found, suffocate it with baby oil applied to the tick, then remove it by pulling gently at the head with tweezers or better, the Pro-Tick removal system (see below).
- Report any of the above symptoms and all tick bites to the SHSO for evaluation. Employees bitten by deer ticks during the course of employment or one who finds an engorged tick on their body, will be given a medical examination.

- Analysis of the tick for Spirochete may be warranted. Administration of antibiotic therapy may be warranted. Either action may be taken with the concurrence of the Corporate Medical Consultant.

A source for Pro-Tick removal systems as well as Deet and Permethrin based lotions and sprays as well as sun screen can be found on-line at http://www.scs-mall.com/store/

The following is from the "Pro-Tick Remover" ad on the above web site: Pro-Tick Remedy (now includes a 5X magnifier) makes this sometimes difficult and distasteful task easier than any other tool. The Pro-Tick has consistently tested superior when tested against other tick removers and tweezers. Here's a quote from a research paper published in 1995. ***" . . . while others (tick removers and tweezers) broke the tip of the hypostrome and chelicerae (mouthparts) in at least one tick. The Pro-Tick remedy succeeded in removing all fifty-one ticks without damaging any mouthparts . . . results indicate that the Pro-Tick Remedy removed the most tick cement while causing the least damage . . ."*** More recent tests against nymph ticks (the dangerous immature ones) showed that the Pro-Tick Remedy removes nymph ticks better than any other instrument.

4.2.3 Snakes

Snakes are a hazard in the forests and wetlands, if you see a snake, avoid it! If you are bitten, try to identify the snake and seek emergency medical help immediately. Venomous snakes native to this area include:

- **Northern Copperhead:** This snake grows to 24 inches to 36 inches in length. The Northern Copperhead Snake has a stocky body that may be copper, orange or pinkish in color. Dark, chestnut-colored bands cross the body, breaking the color pattern into alternating bands of darker and lighter color. Young copperheads are lighter in color than the adults, and they have a yellow-tipped tail that they often flick.

- **Timber Rattlesnake:** It often lives on rocky hillsides and in wooded areas. The Timber Rattlesnake has a head and body that are pinkish-gray to yellowish-brown with a pattern of dark bands on the back and a grayish-white belly. The tail is black with a rattle. Size of average adult is 3 - 4.5 feet long.

4.2.4 Plants

Plants such as poison ivy and poison oak may be prevalent at the site during certain times of the year. Workers will be trained to recognize these plants and to minimize contact with them. Employees may wear PPE to reduce the potential for exposure. Pre-exposure topical lotions such as Tecnu may be applied prophylactically. "Ivy Block" is an easy to use non-prescription, pre-exposure lotion. You apply it like sunscreen to all exposed skin. It dries quickly and the active ingredient, bentoquatam, guards you against the harmful oil in poison ivy, oak and sumac. Remove lotion with running water and soap after risk of exposure has ended. Toll FREE ORDER LINE (800) 421-1223.

The use of Clorox wipes to decontaminate reusable clothing to preclude exposure to poison ivy may prove valuable. Gloves should be worn during decontamination and removal of PPE.

4.3 Physical Hazards

Most safety hazards are discussed in the AHAs in Appendix C for the different phases of the project. In addition to the AHAs, general work rules and other safety procedures are described in Section 10 of this SHSP.

4.3.1 Heat Stress

Heat stress is a significant potential hazard, which is greatly exacerbated with the use of PPE in hot environments. A heat stress prevention program will be implemented when ambient temperatures exceed 70 degrees Fahrenheit (°F) for personnel wearing impermeable clothing and for other personnel when the Wet Bulb Globe Temperature (WBGT) index exceeds the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs). The following are the main elements of the TtEC Environmental Health and Safety (EHS) Program (EHS 4-6) related to temperature extremes, which can be found in Appendix D.

- Selection of PPE to reduce the risk of heat related illness.
- Hydration.
- Cool rest areas.
- Engineering Controls (i.e., air conditioned cabs, drenching).
- Administrative Controls (work schedules, acclimatization, work/rest regimens).
- PPE (i.e., ice vests, vortex tubes).
- Monitoring (body core temperature, pulse rate).

- Identification of heat related illnesses (heat cramps, heat exhaustion, and heat stroke).
- Employee training.

4.3.2 Cold Stress

At certain times of the year, workers may be exposed to the hazards of working in cold environments. Potential hazards in cold environments include frostbite, trench foot or immersion foot, hypothermia as well as slippery surfaces, brittle equipment, poor judgment and unauthorized procedural changes. The following are the main elements of the TtEC EHS Program 4-6 related to temperature extremes, which can be found in Appendix D.

- PPE (i.e. hard hat liners, boot and glove liners, insulated coveralls).
- Engineering controls (i.e. heaters, wind shields, covered metal handles).
- Administrative controls (i.e. work/warm up schedule, acclimatization).
- Recognition of Cold Stress Related Injury (frostbite and hypothermia).
- Warm rest area.
- Employee training.

4.3.3 Noise

Noise is a potential hazard associated with the operation of heavy equipment, power tools, pumps and generators. All employees routinely working within 10 feet of these operations will wear hearing protection. All employees receive a pre-employment audiogram as part of their physical examination. High noise areas will be designated.

4.3.4 Underground Utilities

When intrusive work activities are conducted on-site the threat of contact with underground utilities exists. Underground utilities include lines such as electrical, gas, and sewer. An assessment of the presence of underground utilities will be made before conducting any intrusive activities. In preparing the AHA, TtEC's EHS Procedure 3-15 was considered.

Striking underground utilities is a possible hazard whenever excavation is conducted. All steps will be taken to locate underground utilities as per EHS 3-15, which can be found in Appendix E. This will include white lining the area of excavation, calling the NYS One-Call System, having utilities located and when on private property, use of a private locating service to perform a geophysical survey.

4.3.5 Excavation and Trenching

Excavation will be conducted in accordance with the Excavation and Trenching Procedure, ESH 6-3 of the TtEC EHS Program. Procedures in this document incorporate the requirements of 29 CFR 1926, Subpart P-Excavations. EHS 6-3 requires the designation of a "Competent Person" by the PM and approval by the PESM and requirements for safe excavating practices. A checklist of competency elements must be completed to assess ability of the designated

competent person to fulfill the requirements of Procedure EHS 6-3, which can be found in Appendix F. A competency determination must be completed and documented prior to assignment.

The Excavation and Trenching Program also includes requirements for the monitoring of potentially hazardous atmospheres; protection from water hazards; analyzing and maintaining the stability of adjacent structures; daily competent person inspections; soil classification; sloping and benching; protective systems; and training.

Trenching to a depth greater than four feet will require atmospheric monitoring and the use of ladders for safe entry/egress. The competent person will determine the need for cave-in protection. If trenches exceed five feet in depth, cave-in protection will be implemented in accordance with the Excavation and Trenching Procedure, EHS 6-3.

Competent persons will have an adequate combination of experience and training to classify soil types and select protective systems outlined in EHS 6-3. Training and experience pertaining to qualification as a competent person will be documented and will include the following:

- Knowledge of general safety practices related to working in/near open excavations.
- Inspection requirements and techniques.

The competent person(s) will be the PS and is responsible for the following:

- Day-to-day oversight and inspection of open excavations and trenches.
- Conducting soil classifications.
- Selection of protective systems.
- Providing the SHSO with all required documentation on a daily basis.

4.3.6 Falls

Fall protection, in the form of safety nets, guardrails, or personal fall arrest systems, will be provided as needed and whenever any worker is exposed to a fall distance of greater than six feet. TtEC's Fall Protection Procedure, EHS 3-8, will be followed for providing the proper body harness and anchor point to avoid falls, which can be found in Appendix G. All fall protection equipment must meet American National Standards Institute (ANSI) Z359.1 requirements. A "competent person," able to evaluate the hazards of fall protection systems and stop work when required, will be appointed by the PM.

4.3.7 Hazardous Energy Control

Energy-using devices as well as overhead/underground power lines pose a danger of shock or electrocution if workers contact/sever them during site operations. Training will be provided to anyone involved in any phase of this work.

The following safe work practices will be implemented:

- Ground fault circuit interrupters (GFCI) will be used on all 15 ampere (amp), 20 amp, and 120 volt circuits.
- Inspect all extension cords daily for structural integrity, ground continuity, and damage. Inspect extension cord connections. Extension cords must be of the "hard" or "extra hard" service type.
- Elevate or cover electric wire or flexible cord passing through work area to protect it from damage by foot traffic, vehicles, sharp corners, projections, or pinching.
- Keep plugs and receptacles out of water unless they are approved submersible-types.
- Ground all electrical circuits in accordance with the National Electrical Code (NEC) or other applicable standards and regulations.
- A minimum 15-foot safe separation distance will be maintained between equipment and 50 kilovolt (kV) overhead electrical lines. This distance will increase 0.4 inches for each 1 kV above 50 kV.

4.3.8 Other Physical Hazards

Other physical hazards at the site include the following:

- Drill rig.
- Possible explosive atmosphere during drilling.
- Crane.
- Other heavy equipment.

5.0 AHA

An AHA has been developed for each task. The AHA considers the hazards discussed in Section 4.0.

An additional or expanded AHA will be developed by the SHSO, or subcontractors, for all unanticipated work and/or prior to working on a new task.

The AHA will be used to instruct workers on the hazards of the associated activities during a safety meeting.

AHAs are included in Appendix C for the following phases of work:

- Mobilization, Site Preparation & Demobilization.
- Treatment Plant Building Construction.
- Treatment Building Systems Installation.
- Extraction System Construction.
- Groundwater Injection System Installation.
- Groundwater Treatment System Installation.
- Site Restoration.

- Treatment Plant Startup & Shakedown.
- New Groundwater Monitoring Wells Installation.
- Off-Site Waste Transportation & Disposal.

Subcontracted work will be evaluated for hazards in a manner consistent with self-performed work. The PS or SHSO is responsible to obtain and review AHA from subcontractors or will develop accurate AHA for subcontracted work.

6.0 PPE

For the purposes of PPE selection, the PESM and SHSO are considered competent persons. The signatures on the front of this SHSP constitute certification of the hazard assessment. As established in this SHSP, the initial level of PPE will be modified Level D for all activities. Sampling data and past experience indicate a relatively low hazard for exposure.

For activities not covered by an AHA, the SHSO will conduct the hazard assessment and select the PPE using the form provided in Appendix H and will certify the assessment by signing the form. PPE selection will be made in consultation with the PESM. Modifications for initial PPE selection may also be made by the SHSO in consultation with the PESM. A written justification for downgrades will be provided to the PESM for approval by the Navy as a CRF.

Table 6-1 describes PPE for site tasks.

6.1 Hazard Assessment for Selection of PPE

The initial levels of protection were selected by performing a hazard assessment taking into consideration the following:

- Potential chemical and physical hazards present or suspected.
- Work operations to be performed.
- Potential routes of exposure.
- Characteristics, capabilities and limitations of PPE.
- Hazards that the PPE presents or magnifies.

The primary routes of exposure for the contaminants are skin contact and inhalation, ingestion is a secondary route of exposure. During well installation and development activities there is a potential for skin contact with chemical contaminants; the SHSO will need to exercise judgment in determining an upgrade in level of PPE. Additionally, the type of respiratory protection will be dependent on real-time air monitoring results. The air monitoring program, along with use of respirators equipped with organic vapor cartridges, if necessary, will provide adequate respiratory protection to minimize potential exposure via inhalation. Strict adherence to decontamination and personal hygiene procedures will effectively eliminate ingestion as a potential route of exposure.

Table 6-1
PPE Selection

TASK	HEAD	EYES/FACE	FEET	HANDS	BODY	HEARING	RESPIRATORY
Mobilization, Site Preparation & Demobilization	HH	SG; (SG & PFS for Equipment Decon)	STB	LWG	WC	EP as needed	Initial LOP: D; Upgrades based on real time readings and conditions
Treatment Plant Building Construction	HH	SG	STB	Nit	WC	EP as needed	Initial LOP: D; Upgrades based on real time readings and conditions
Treatment Building Systems Installation	HH	SG	STB	Nit	WC	EP as needed	Initial LOP: D; Upgrades based on real time readings and conditions
Extraction System Construction	HH	SG	STB	Nit	WC	EP as needed	Initial LOP: D; Upgrades based on real time readings and conditions
Groundwater Injection System Installation	HH	SG	STB	Nit	WC	EP as needed	Initial LOP: D; Upgrades based on real time readings and conditions
Groundwater Treatment System Installation	HH	SG	STB	Nit	WC	EP as needed	Initial LOP: D; Upgrades based on real time readings and conditions
Site Restoration	HH	SG	STB	Nit	WC	EP as needed	Initial LOP: D; Upgrades based on real time readings and conditions
Treatment Plant Startup & Shakedown	HH	SG	STB	LWG	WC	EP as needed	Initial LOP: D; Upgrades based on real time readings and conditions
New Groundwater Monitoring Wells Installation	HH	SG	STB	Nit	WC	EP as needed	Initial LOP: D; Upgrades based on real time readings and conditions
New Injection Well Installation	HH	SG	STB	Nit	WC	EP as needed	Initial LOP: D; Upgrades based on real time readings and conditions
Off-Site Waste Transportation & Disposal	HH	SG	STB	Nit	WC	EP as needed	Initial LOP: D; Upgrades based on real time readings and conditions

Legend:
EP = Ear Plugs
HH = Hard Hat
Nit = Nitrile Gloves
LWG = Leather Work Gloves
PFS = Plastic Face Shield
SG = Safety Glasses
STB= Steel Toe Boots
WC = Work Clothes

6.2 Respirator Cartridge Change-Out Schedule

A respirator cartridge change-out schedule has been developed in order to comply with 29 CFR 1910.134. The respirator cartridge change-out schedule for this project is as follows:

- Cartridges will be removed and disposed of after four (4) hours of use, when cartridges become wet or wearer experiences breakthrough, whichever occurs first.
- If the humidity exceeds 85%, then cartridges will be removed and disposed of after two (2) hours of use.

Respirators will not be stored at the end of the shift with contaminated cartridges left on. Cartridges will not be reused on another shift, regardless of use time on a previous shift.

The schedule was developed based on the following scientific information and assumptions:

- Analytical data that is available regarding site contaminants.
- Using the Rules of Thumb provided by the American Industrial Hygiene Association (AIHA).
- All of the chemicals have boiling points greater than 70 degrees Celsius (°C).
- Total airborne concentration of contaminants is anticipated to be less than 200 parts per million (ppm).
- The humidity is expected to be less than 85%.
- Desorption of contaminants (including those with poor warning properties) after partial use of the chemical cartridge can occur after a short period (hours) without use (i.e. overnight) and result in a non-use exposure.

The following is a partial list of factors that may affect the usable cartridge service life and/or the degree of respiratory protection attainable under actual workplace conditions. These factors have been considered when developing the cartridge change-out schedule.

- Type of contaminant(s).
- Contaminant concentration.
- Relative humidity.
- Breathing rate.
- Temperature.
- Changes in contaminant concentration, humidity, breathing rate and temperature.
- Mixtures of contaminants.
- Accuracy in the determination of the conditions.
- The contaminant concentration in the workplace can vary greatly. Consideration must be given to the quality of the estimate of the workplace concentration.
- Storage conditions between multiple uses of the same respirator cartridges. It is recommended that the chemical cartridges be replaced after each work shift. Contaminants adsorbed on a cartridge can migrate through the carbon bed without airflow.
- Age of the cartridge.
- Condition of the cartridge and respirator.

- Respirator and cartridge selection.
- Respirator fit.
- Respirator assembly, operation, and maintenance.
- User training, experience and medical fitness.
- Warning properties of the contaminant.
- The quality of the warning properties should be considered when establishing the chemical cartridge change schedule. Good warning properties may provide a secondary or back-up indication for cartridge change-out.

7.0 AIR MONITORING

The following sections contain information describing the type, frequency and location of real time air monitoring.

7.1 Real Time Air Monitoring

This section addresses the real time air monitoring that will be conducted, including instrumentation selection, frequency and location of air sampling. At a minimum, real-time air monitoring will be conducted during excavation, well installation and well development. Air monitoring will continue in this manner until sufficient data is developed to consider a frequency reduction or cessation for a particular activity. Table 7-1 lists the Real Time Air Monitoring Action Levels to be used in all work areas. Table 7-2 presents a breakdown of each main activity and provides the instrumentation, frequency and location of real-time air monitoring for the site. All air monitoring readings will be recorded, regardless of concentrations.

The following instruments will be used for real-time air monitoring:

- Photo Ionization Detector (PID) with an 11.7 eV lamp.
- Combustible Gas Indicator/Oxygen ($CGI/O_2/CO$).
- Detector tube for vinyl chloride, low range tube, able to detect < 1 ppm.

Organic vapor concentrations will be measured using the PID and vinyl chloride detector tubes. Measurements will be recorded during the above activities, at a minimum. The monitoring for organic vapors will consist of measurements recorded at the breathing zone (BZ) height in the area of highest employee exposure risk. Readings will be taken in accordance with Table 7-2.

Monitoring for combustible gases will be conducted during well installation and development activities and any other activities that may generate combustible gas or vapors.

Based on real time air monitoring readings and site conditions, the SHSO or designee may increase/decrease the frequency at which the readings are taken, using professional judgment. Table 7-1 provides the real-time air monitoring action levels. Real-time air monitoring will be conducted in order to confirm the “no exposure scenario.”

Real-time air monitoring results for on-site activities will be reviewed with craft labor periodically by the SHSO in site daily health and safety briefings.

Table 7-1
Real Time Air Monitoring Action Levels

Air Monitoring Instrument	Monitoring Location	Action Level	Site Action	Reason
PID w/11.7 lamp	Breathing Zone	>0.5 ppm	Use detector tube for vinyl chloride	Conservative action level based on the potential exposure to vinyl chloride
	Breathing Zone	< 2.5 ppm, no vinyl chloride	Level D	Conservative action level based on the potential exposure to carbon tetrachloride.
	Breathing Zone	>2.5 – 25 ppm, no vinyl chloride	Level C	Based on increasing potential for exposure to VOCs
	Breathing Zone	>25 ppm no vinyl chloride	Level B	Assume conservative protection factor for respirators
Vinyl Chloride Detector Tube	Breathing Zone	<1 ppm	Level D	PEL for vinyl chloride is 1 ppm
	Breathing Zone	>1 ppm	Cease activities, contact PM and PESM for further instruction	There are currently no approved cartridges for vinyl chloride
CGI/O_2/CO	Breathing Zone, borehole	1% LEL-10% LEL	Investigate possible cause, use caution	Increasing potential for ignition of vapors
	Breathing Zone, borehole	Conc. > 10% LEL	Cease activities, contact PM and PESM for further instruction	Potential for ignition of vapors

7.2 Frequency and Location of Real Time Air Monitoring

Table 7-2 provides the frequency and location of real time air monitoring.

Table 7-2
Frequency and Location of Air Monitoring

Activity	Air Monitoring Instrument	Frequency And Location
Excavation, Well installation and development	PID, CGI/O_2/CO, and VC tubes	BZ: every 15-30 minutes

7.3 Integrated Air Monitoring

Integrated air monitoring will not be performed due to the nature of the work and the contaminants.

7.4 Data Quality Assurance

7.4.1 Calibration

Instrument calibration will be documented and included in a dedicated Health and Safety Logbook or on separate calibration pages. All instruments will be calibrated before and will be

subject to a continuous calibration check after each shift. Calibration checks may be used during the day to confirm instrument accuracy. Duplicate readings may be taken to confirm individual instrument response.

7.4.2 Operations

All instruments will be operated in accordance with the manufacturer's specifications. Manufacturers' literature, including an operations manual for each piece of air monitoring equipment will be maintained on-site by the SHSO for reference.

7.4.3 Data Review

The SHSO will interpret all monitoring data based on Table 7-1 and professional judgment. The SHSO will review the monitoring and sampling data with the PESM to evaluate the potential for worker exposure and upgrades/downgrades in level of protection.

7.5 Noise Monitoring

Noise monitoring will not be conducted. Hearing protection will be worn by workers in proximity to heavy equipment, fans, blowers and pumps. When equipment requires the wearing of ear muffs the equipment will be labeled as hazardous to hearing, and the hazard radius noted on the warning.

8.0 ZONES, PROTECTION AND COMMUNICATION

8.1 Site Control

Site zones are intended to control the potential spread of contamination throughout the site and to assure that only authorized individuals are permitted into potentially hazardous areas. A three-zone approach will be utilized. It will include an Exclusion Zone (EZ), Contamination Reduction Zone (CRZ) and a Support Zone (SZ). Specific zones will be established on the work site when operations begin. A map showing these zones will be developed on-site and posted in the field office. All maps will be posted at the site and used during initial site-specific training.

This project is a hazardous waste remediation project, and any person working in an area where the potential for exposure to site contaminants exists, will only be allowed access after providing the SHSO with evidence of proper training and medical documentation.

The zones are based upon current knowledge of proposed site activities. It is possible that the zone configurations may be altered due to work plan revisions. Should this occur, the Site Zones will be adjusted accordingly.

The following will be used for guidance in revising these preliminary zone designations, if necessary.

SZ **-** The SZ is an uncontaminated area (trailers, offices, etc.) that will be the field support area for most operations. The SZ provides for field team communications and staging for emergency response. Appropriate sanitary facilities and safety equipment will be located in this zone. Potentially contaminated personnel/materials are not allowed in this zone. The only exception will be appropriately packaged/decontaminated and labeled samples.

CRZ **-** The CRZ is established between the EZ and the SZ. The CRZ contains the contamination reduction corridor and provides for an area for decontamination of personnel and portable hand-held equipment, tools and heavy equipment. A personnel decontamination area will be prepared at each EZ. The CRZ will be used for EZ entry and egress in addition to access for heavy equipment and emergency support services.

EZ **-** All activities that may involve exposure to site contaminants, hazardous materials and/or conditions should be considered an EZ. This zone will be clearly delineated by cones, tapes or other means. The SHSO may establish more than one EZ where different levels of protection may be employed or different hazards exist. The size of the EZ will be determined by the SHSO allowing adequate space for the activity to be completed, field members and emergency equipment.

Site personnel and visitors must log in and out of the EZ and CRZ daily.

8.2 Contamination Control

Decontamination areas will be established for the following activities:

8.2.1 Personnel Decontamination Station

Personnel hygiene, coupled with diligent decontamination, will significantly reduce the potential for exposure of off-site areas to contaminants from the site. When participating in potentially dust-raising activities, such as excavating soil, it will be crucial for field personnel to adhere to the following personal hygiene guidelines:

- Wash hands and face after leaving the CRZ.
- Every effort will be made to reduce dust production through engineering controls (i.e., watering, if deemed necessary based on weather conditions).

8.2.2 Minimization of Contact with Contaminants

During completion of all site activities, personnel will attempt to minimize contact with contaminated materials. This involves a conscientious effort to keep “clean” during site activities. This may ultimately minimize the degree of decontamination required and the generation of waste materials from site operations.

8.2.3 Personnel Dry Decontamination Sequence

When decontamination is needed, a dry decon will be used whenever possible. Personal decontamination procedures are as follows:

Perform dry decon if contact with contaminants occurred.

- Remove exterior protective clothing carefully and dispose of same.
- Remove and clean respirator, if applicable.
- Remove gloves without touching outside surface of gloves and dispose of same.
- Wash hands and face thoroughly.

8.2.4 Heavy Equipment Decontamination

Heavy equipment and hand held equipment that has come into contact with contaminated material will be decontaminated upon completion of the required project operations and after traveling from the EZ into other work zones from the site. Decontaminate rinsate will then be containerized in approved 55-gallon drums before being disposed off-site.

Heavy equipment will not be permitted to leave the EZ unless it has been thoroughly decontaminated and visually inspected by the SHSO or their designee.

8.3 Communication

The following communications equipment will be specified as appropriate:

- Hand-held two-way radios are utilized as appropriate by field teams for communication with the site office trailer.
- Telephones - A telephone will be located in the site office trailer in the SZ for communication with emergency support services/facilities.
- Air Horns - Air horns will be carried by field teams or be strategically located within the EZ and will be maintained as the means for announcing emergency evacuation procedures and backup for other forms of communication.
- Hand Signals - Hand signals will be used by field teams along with the buddy system. They will be known by the entire field team before operations commence and their use covered during site-specific training. Typical hand signals are the following:

SIGNAL	**MEANING**
Hand gripping throat.	Out of air, can't breathe..
Grip on a partner's wrist or placement of both hands around a partner's waist.	Leave the area immediately, no debate.
Hands on top of head.	Need general assistance.
Hands raised above head.	Need immediate assistance.
Thumbs up.	Okay, I'm all right, I understand.
Thumbs down.	No, negative.

9.0 MEDICAL SURVEILLANCE PROCEDURES

All contractor and subcontractor personnel performing field work where potential exposure to contamination exists are required to have passed a medical surveillance examination in accordance with 29 CFR 1910.120(f).

The TtEC Medical Surveillance Program is described in detail in EHS 4-5 of the EHS Program. The Corporate Medical Consultant is WorkCare, located in Anaheim, California. Dr. Peter Greaney, the Director, is Board certified in occupational medicine and may be reached at 800-455-6155.

9.1 Medical Surveillance Requirements

A physician's medical release for work will be confirmed by the SHSO before an employee can work in the EZ. The examination will be taken annually at a minimum and upon termination of hazardous waste site work if the last examination was not taken within the previous six months. Additional medical testing may be required by the PESM in consultation with the Corporate Medical Consultant and the SHSO if an over-exposure or accident occurs, if an employee exhibits symptoms of exposure, or if other site conditions warrant further medical surveillance.

9.2 Medical Data Sheet

A medical data sheet is provided in Appendix I. This medical data sheet is voluntary and should be completed by all on-site personnel and will be maintained at the site. Where possible, this medical data sheet will accompany the personnel needing medical assistance. The medical data sheet will be maintained in a secure location, treated as confidential, and used only on a need-to-know basis.

10.0 SAFETY CONSIDERATIONS

10.1 General Health and Safety Work Rules

A list of work rules and general safe work practices has been included from the TtEC EHS Program, EHS 3-6. These rules have been incorporated into the SHSP as Appendix J. The work rules will be posted in a conspicuous location at the site.

10.2 General Construction Hazards

The following is a list of applicable safety considerations for the major tasks. Further information is provided in the specific AHA and the specific TtEC EHS Program.

- Slips/Trips/Falls.
- Punctures/Cuts.
- Lifting/Materials Handling.

10.3 High Loss Potential Hazards

Activities that have the potential for a serious injury to occur, include the following:

- Excavation/Intrusive activities.
- Exposure to energized electric lines / underground utility lines.
- Heavy Equipment operation (See Appendix K Critical Lifts)
- Building assembly.
- Drill Rig operation.

10.3.1 Underground Utilities

Striking underground utilities is a possible hazard whenever intrusive activities are conducted. All steps will be taken to locate underground utilities as per Procedure EHS 3-15 (see Appendix E, Underground Utilities). This includes white lining the area of intrusive activity and calling the "One-Call" number to have underground utilities located and marked.

Underground utility avoidance requires a "competent person" be designated. "Competent person" means 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 authorization to take prompt corrective measures to eliminate them.

The Competent Person will be responsible for the following:

- Obtaining a copy of, and understanding the applicable regulations for NYS.
- Contacting the appropriate One-Call agency or private locating service, as applicable.
- Recording One-Call locate numbers.
- If necessary, renewing One-Call locate numbers before expiration.
- Ensuring that white-lining of the area of intrusive work is performed.
- Ensuring that a "positive response" has been received from every utility owner/operator identified by the One-Call agency and that they have located their underground utilities and have appropriately marked any potential conflicts with the areas of planned intrusive activities.
- Completion of the *Underground Utilities Locating and Marking Checklist* and the *Underground Utilities Management Checklist.*
- Reviewing applicable AHA with all project members before work begins.
- Conducting training on communication protocols to be used by the intrusive activities observer and equipment operator.
- Ensuring implementation of appropriate work practices during intrusive activities.
- Conducting daily inspections of the intrusive activities area to make sure that all markings are intact.
- Maintaining required records.
- Providing the SHSO with all required documentation on a daily basis.

10.3.2 Excavation and Trenching

Excavation will be conducted in accordance with the Excavation and Trenching Program, EHS 6-3 of the TtEC Corporate EHS Program, which is in Appendix F. Procedures in this document incorporate the requirements of 29 CFR 1926, Subpart P-Excavations. EHS 6-3 requires the designation of a "Competent Person" by the PM and requirements for safe excavating practices. The program also includes requirements for the monitoring of potentially hazardous atmospheres; protection from water hazards; analyzing and maintaining the stability of adjacent structures; daily competent person inspections; soil classification; sloping and benching; protective systems; and training.

TtEC technical personnel will assist the Competent Person in their duties.

Trenches 4 feet or greater in depth will require atmospheric monitoring and ladders for safe entry/egress. The Competent Person will determine the need for cave-in protection. If trenches exceed 5 feet in depth, cave-in protection will be implemented in accordance with the Excavation and Trenching Program, EHS 6-3 of the TtEC Corporate EHS Program.

The competent person(s) will be responsible for the following:

- Day-to-day oversight of open excavations and trenches.
- Conducting soil classifications.
- Selection of protective systems.
- Conducting daily inspections of open excavations and trenches.
- Providing the SHSO with all required documentation on a daily basis.

Competent persons will have an adequate combination of experience and training to classify soil types and select protective systems as outlined in EHS 6-3. Training and experience pertaining to qualification as a competent person will be documented and include the following:

- General safety practices related to working in or near open excavations.
- Inspection requirements and techniques.
- Classification of soils in accordance with EHS 6-3.
- Uses, limitations, and specifications of protective systems in accordance with EHS 6-3.

Prior to any excavation or underground work, utilities will be identified and located following EHS 3-15 of the TtEC EHS Program.

11.0 WASTE DISPOSAL PROCEDURES

All discarded materials, waste materials or other objects will be handled in such a way as to preclude the potential for spreading contamination, creating a sanitary hazard or causing litter to be left on site. To the extent possible, cuttings will be placed back into boreholes. Water from well purging and well development can be discharged to the Publicly Owned Treatment Works (POTW) without prior treatment. All potentially contaminated materials, e.g., clothing, gloves,

etc., will be bagged or drummed as necessary, labeled and segregated for disposal. All non-contaminated materials will be collected and bagged for appropriate disposal as non-hazardous solid waste. Additional waste disposal procedures may be developed with the ESQ Department Regulatory Specialist as applicable.

12.0 EMERGENCY RESPONSE PLAN

This section establishes procedures and provides information for use during a project emergency. Emergencies happen unexpectedly and quickly, and require an immediate response; therefore, contingency planning and advanced training of staff is essential. Specific elements of emergency support procedures which are addressed in the following subsections include communications, local emergency support units, and preparation for medical emergencies, first aid for injuries incurred on site, record keeping, and emergency site evacuation procedures.

12.1 Responsibilities

12.1.1 PESM

The PESM is Grey Coppi, CIH, CSP.

The PESM oversees and approves the Emergency Response/Contingency Plan and performs audits to determine that the Emergency Response/Contingency Plan is in effect and that all pre-emergency requirements are met. The PESM acts as a liaison to applicable regulatory agencies and notifies OSHA of reportable accidents.

12.1.2 SHSO

The SHSO is Ed Casey.

The SHSO is responsible for ensuring that all personnel are evacuated safely and that machinery and processes are shut down or stabilized in the event of a stop work order or evacuation. The SHSO is required to immediately notify the PESM of any fatalities or catastrophes (three or more workers injured and hospitalized) so that the PESM can notify OSHA within the required time frame. The PESM will be notified of all OSHA recordable injuries, fires, spills, releases or equipment damage in excess of $500 within 24 hours. The SHSO also serves as the Alternate EC.

12.1.3 EC

The EC is Ed Urbanek.

The EC will make contact with Local Emergency Response personnel prior to beginning work on site. In these contacts the EC will inform interested parties about the nature and duration of work expected on the site and the type of contaminants and possible health or safety effects of emergencies involving these contaminants. The EC will locate emergency phone numbers and

identify hospital routes prior to beginning work on site. The EC will make necessary arrangements to be prepared for any emergencies that could occur.

The EC will implement the Emergency Response/Contingency Plan whenever conditions at the site warrant such action.

12.1.4 Site Personnel

Site personnel are responsible for knowing the Emergency Response/Contingency Plan and the procedures contained herein. Personnel are expected to notify the EC of situations that could constitute a site emergency.

12.2 Communication

A variety of communication systems may be utilized during emergency situations. These are discussed in the following sections.

12.2.1 Radio Communication

The primary form of communication during an emergency between field groups in the EZ and the EC will be radio communications. Each field team within the EZ will have a radio. During an emergency situation, the lines will be kept clear so that all field teams can receive instructions.

12.2.2 Telephone Communication

A telephone will be maintained in the office trailer.

12.2.3 Air Horns

Air horns will be used to alert site personnel of emergencies. The following signals will be used:

- Two short blasts - shut down equipment, clear radio channels, await instructions.
- Three short blasts - injured employee, first-aid providers respond.
- One continuous blast - site evacuation.

Air horns can be found in the office trailer and site vehicles. The procedure to activate the air horns consists of depressing the air horn button or switch while pointing it in the direction of the area to be signaled. Air horns will be tested at least monthly to ensure that they are working properly.

12.2.4 Hand Signals

Field teams will employ hand signals (Section 8.3) where necessary for communication during an emergency.

12.3 Local Emergency Support Units

In order to be able to deal with any emergency that might occur during remedial activities at the site, Table 12-1 will be posted prominently in the field office and in all places where telephone service is available.

A route map from the site to the nearest hospital is located in Appendix K. This map will be posted adjacent to the above emergency telephone numbers in the field office and in all places where telephone service is available. It should also be placed in all on site vehicles.

Table 12-1
Emergency Telephone Numbers

Contact	Firm or Agency	Telephone Number
Police	Nassau County Police Department	516-573-6800
Fire	Bethpage Fire Department	516-931-2660
Hospital	New Island Hospital 4295 Hempstead Turnpike Bethpage, New York 11714	516-579-6000
Ambulance	Bethpage EMS	516-931-0666
Non-emergency Medical Clinic – approved by WorkCare	Island Occupational Medical 4 Dorothy Gate Massapequa, New York	516-795-5544
PM - Stavros Patselas	TtEC	Office - 215-702-4099 Cell - 267-688-9967
PS - Ed Urbanek	TtEC	Cell - 401-225-6346
SHSO – Ed Casey	TtEC	Cell – 610-842-3973
PESM - Grey Coppi	TtEC	Office - 973-630-8101 Cell - 215-327-0751
Facility Contact, Al Taormina	J.A. Jones Management Services NWIRP Bethpage	516-346-0344 516-702-5861
RPM- James Colter	EFANE	610-595-0567 ext. 163
Navy ROICC – Bob Ingram		516-575-2121
WorkCare	Anaheim, California	800-455-6155
Poison Control Center		800-222-1222
National Response Center		800-424-8802

12.4 Pre-Emergency Planning

TtEC will communicate directly with administrative personnel from the emergency room at the hospital in order to determine whether the hospital has the facilities and personnel needed to treat cases of trauma resulting from exposure to any of the contaminants expected to be found on the site. Instructions for finding the hospital will be posted conspicuously in the site office and in each site vehicle.

Before the field activities begin, the local emergency response personnel will be notified of the schedule for field activities and about the materials that are thought to exist on the site so that they will be able to respond quickly and effectively in the event of a fire, explosion, or other emergency.

12.5 Emergency Medical Treatment

The procedures and rules in this SHSP are designed to prevent employee injury. However, should an injury occur, no matter how slight, it will be reported to the SHSO immediately. First-aid equipment will be available on site at the following locations:

- First Aid Kit: Field Office and Site Vehicles
- Emergency Eye Wash (Meets ANSI Z.358.1-2004 for a 15 minute flush): Field Office and CRZ

During the site safety briefing, project personnel will be informed of the location of the first aid station(s). Unless they are in immediate danger, severely injured persons will not be moved until paramedics can attend to them. Some injuries, such as severe cuts and lacerations or burns, may require immediate treatment. Any first aid instructions that can be obtained from doctors or paramedics, before an emergency-response squad arrives at the site or before the injured person can be transported to the hospital, will be followed closely.

TtEC will provide at least two personnel with current First Aid and Cardiopulmonary Resuscitation (CPR) certification on each active work shift. When personnel are transported to the hospital, the SHSO will provide a copy of the Medical Data Sheet to the paramedics and treating physician.

Only in non-emergency situations will an injured person be transported to the hospital by means other than an ambulance. The WorkCare-approved clinic is:

Clinic	**Hospital**
Island Occupational Medical	New Island Hospital
4 Dorothy Gate	4295 Hempstead Turnpike
Massapequa, NY	Oyster Bay, NY
516-795-5544	516-579-6000

12.6 Emergency Site Evacuation Routes and Procedures

In order to mobilize the manpower resources and equipment necessary to cope with a fire or other emergency, a clear chain of authority will be established. The EC will take charge of all emergency response activities and dictate the procedures that will be followed for the duration of the emergency. The EC will report immediately to the scene of the emergency, assess the seriousness of the situation, and direct whatever efforts are necessary until the emergency response units arrive. At their discretion, the EC also may order the closure of the site for an indefinite period.

All project personnel will be instructed on proper emergency response procedures and locations of emergency telephone numbers during the initial site safety meeting. If an emergency occurs, including but not limited to fire, explosion or significant release of toxic gas into the atmosphere, an air horn will be sounded on the site. The horn will sound continuously for one blast, signaling that immediate evacuation of all personnel is necessary due to an immediate or impending danger. All heavy equipment will be shut down and all personnel will evacuate the work areas and assemble at the assigned locations.

The EC will give directions for implementing whatever actions are necessary. Any project team member may be assigned to be in charge of emergency communications during an emergency.

The project team member will attend the site telephone specified by the EC from the time the alarm sounds until the emergency has ended.

After sounding the alarm and initiating emergency response procedures, the EC will check and verify that access roads are not obstructed. If traffic control is necessary, as in the event of a fire or explosion, a project team member, who has been trained in these procedures and designated at the site safety meeting, will take over these duties until local police and fire fighters arrive.

The EC will remain at the site to provide any assistance requested by emergency-response squads as they arrive to deal with the situation. A map showing evacuation routes, meeting places, and location of emergency equipment will be developed on site and will be posted in all field offices and vehicles and used during site-specific training.

12.6.1 Evacuation Drills

An evacuation drill will be conducted within two weeks of mobilization to test the emergency notification and response system.

The drill will simulate situations that may be likely to occur on-site. The SHSO will critique the drill according to TtEC EHS Program, EHS 2-1.

12.7 Fire Prevention and Protection

In the event of a fire or explosion, procedures will include immediately evacuating the site (air horn will sound for a single continuous blast), and notification of local fire and police departments. No personnel will fight a fire beyond the stage where it can be put out with a portable extinguisher (incipient stage).

12.7.1 Fire Prevention

The major workplace fire hazards are flammable liquids and fuels, motorized vehicles and equipment.

Fires will be prevented by adhering to the following precautions:

- Good housekeeping and storage of materials.
- Storage of flammable liquids and gases away from oxidizers.
- No smoking in the EZ or any work area.
- No hot work without a properly executed hot work permit.
- Shutting off engines to refuel.
- Grounding and bonding metal containers during transfer of flammable liquids.
- Use of Underwriters Laboratories (UL) approved flammable storage cans. The use of plastic cans to store flammable/combustible liquids is not permitted.
- Fire extinguishers rated at least 10 pounds ABC located on all heavy equipment, in all trailers and near all hot work activities.
- Monthly inspections of all fire extinguishers.

12.7.2 Fire Protection

A map of all fire extinguisher locations will be developed on-site and posted in the field office.

The person responsible for the maintenance of fire prevention and/or control equipment is the SHSO.

The person responsible for the control of fuel source hazards is the SHSO.

12.8 Overt Chemical Exposure

The following are standard procedures to treat chemical exposures. Other, specific procedures detailed on the Material Safety Data Sheet (MSDS) or recommended by the Corporate Medical Consultant will be followed, when necessary. He may be reached at (800) 455-6155.

SKIN AND EYE CONTACT: Use copious amounts of water. Rinse affected areas thoroughly, then provide appropriate medical attention. Eyes and skin should be rinsed for 15 minutes upon chemical contamination.

INHALATION: Move to fresh air. Decontaminate and transport to hospital or local medical provider.

INGESTION: Decontaminate and transport to emergency medical facility.

PUNCTURE WOUND OR LACERATION: Decontaminate and transport to emergency medical facility.

12.9 Decontamination During Medical Emergencies

If emergency life-saving first aid and/or medical treatment is required, normal decontamination procedures may need to be abbreviated or postponed. The SHSO or designee will accompany contaminated victims to the medical facility to advise on matters involving decontamination,

when necessary. The outer garments can be removed if they do not cause delays, interfere with treatment or aggravate the problem. Respiratory equipment must always be removed. Protective clothing can be cut away. If the outer contaminated garments cannot be safely removed on-site, a plastic barrier placed between the injured individual and clean surfaces should be used to help prevent contamination of the inside of ambulances and/or medical personnel. Outer garments may then be removed at the medical facility. No attempt will be made to wash or rinse the victim if their injuries are life threatening, unless it is known that the individual has been contaminated with an extremely toxic or corrosive material which could also cause severe injury or loss of life to emergency response personnel. For minor medical problems or injuries, the normal decontamination procedures will be followed.

12.10 Accident/Incident Reporting

As soon as first aid and/or emergency response needs have been met, the following parties are to be contacted by telephone:

- PESM - Grey Coppi, CIH, CSP, (973) 630-8101, cell (215) 327-0751
- PM – Stavros Patselas (215) 702-4099, cell (267) 688-9967
- The employer of any injured worker who is <u>not</u> a TtEC employee.

Written confirmation of verbal reports is to be submitted within 24 hours. The accident/incident report is found in the TtEC EHS Program EHS 1-7. If the employee involved is not a TtEC employee, their employer will receive a copy of the report.

12.11 Adverse Weather Conditions

In the event of adverse weather conditions, the SHSO or designee will determine if work can continue without potentially risking the safety of all field workers. Some of the items to be considered prior to determining if work should continue are:

- Potential for heat/cold stress injuries.
- Treacherous weather-related working conditions (hail, rain, snow, ice, high winds).
- Limited visibility (fog).
- Potential for electrical storms.
- Other major incidents.

Site activities will be limited to daylight hours, or when suitable artificial light is provided, and acceptable weather conditions prevail. The SHSO will determine the need to cease field operations or observe daily weather reports and evacuate, if necessary, in case of severe inclement weather conditions.

12.12 Spill Control and Response

All small hazardous spills/environmental releases will be contained as close to the source as possible. Whenever possible, the MSDS will be consulted to assist in determining the best

means of containment and cleanup. For small spills, sorbent materials such as sand, sawdust or commercial sorbents should be placed directly on the substance to contain the spill and aid recovery. Any acid spills should be diluted or neutralized carefully prior to attempting recovery. Berms of earthen or sorbent materials can be used to contain the leading edge of the spills. Drains or drainage areas should be blocked. All spill containment materials will be properly disposed. An EZ of 50-100 feet around the spill area should be established depending on the size of the spill.

The following steps, in order, should be taken by the EC:

- Determine the nature, identity and amounts of major spill components.
- Make sure all unnecessary persons are removed from the spill area.
- Notify appropriate response teams and authorities and PM as well as PESM.
- Use proper PPE.
- If a flammable liquid, gas or vapor is involved, remove all ignition sources and use non-sparking and/or explosive proof equipment to contain or clean up the spill (diesel only vehicles, air operated pumps, etc).
- If possible, try to stop the leak with appropriate material.
- Remove all surrounding materials that can react or compound with the spill.
- Contact Lee Dixon at (617) 457-8258 for spill reporting information and assistance.

12.13 Emergency Equipment

The following minimum emergency equipment will be kept and maintained on-site:

- Industrial first aid kit.
- Burn kit.
- Portable eye washes (one per field team) (Meets ANSI Z.358.1-2004 for 15 minute flush.).
- Air horns (one per field team).
- Fire extinguishers (one per trailer/vehicle, trailers and located at hot work stations).
- Two-way radios.
- Absorbent material.

12.14 Postings

The following information will be posted at various, conspicuous locations throughout the site:

- Emergency telephone numbers.
- Diagrams showing the location of fire extinguishers and emergency equipment.
- Emergency exit, evacuation routes and staging area.
- Hospital route map.

12.15 Restoration and Salvage

After an emergency, prompt restoration of utilities, fire protection equipment, medical supplies and other equipment will reduce the possibility of further losses. Some of the items that may need to be addressed include:

- Refilling fire extinguishers.
- Refilling medical supplies.
- Recharging eyewashes and/or showers.
- Replenishing spill control supplies.
- Replacing used air horns.

13.0 TRAINING

13.1 General Health and Safety Training

In accordance with TtEC policy, and pursuant to 29 CFR 1910.120, hazardous waste site workers will, at the time of job assignment, have received a minimum of 40 hours of initial health and safety training for hazardous waste site operations unless otherwise noted in the above reference. At a minimum, the training will have consisted of instruction in the topics outlined in the standard. Personnel who have not met the requirements for initial training will not be allowed to work in any site activity in which they may be exposed to hazards (chemical or physical).

13.1.1 Three Day Supervised On-the-Job Training

In addition to the required initial hazardous waste operations training, each employee will have received three days of directly supervised on-the-job training. This training will address the duties the employees are expected to perform.

13.2 Annual Eight-Hour Refresher Training

Annual eight-hour refresher training will be required of all hazardous waste site field personnel in order to maintain their qualifications for fieldwork. The training will cover a review of 1910.120 requirements and related company programs and procedures.

13.3 Supervisory Training

Personnel acting in a supervisory capacity will have received 8 hours of instruction in addition to the initial 40 hours training.

13.4 Site-Specific Training

Prior to commencement of field activities, all field personnel assigned to the project will have completed training that will specifically address the activities, procedures, monitoring, and equipment used in the site operations. It will include site and facility layout, hazards and

emergency services at the site and will highlight all provisions contained within this SHSP. This training will also allow field workers to clarify anything they do not understand and to reinforce their responsibilities regarding safety and operations for their particular activity.

On-Site Safety Briefings

Project personnel and visitors will be given on-site health and safety briefings daily by the SHSO to assist site personnel in safely conducting their work activities. The briefings will include information on new operations to be conducted, changes in work practices or changes in the site's environmental conditions, as well as periodic reinforcement of previously discussed topics. The briefings will also provide a forum to facilitate conformance with safety requirements and to identify performance deficiencies related to safety during daily activities or as a result of safety inspections. The meetings will also be an opportunity for the SHSO to periodically update the workers on air monitoring results. Prior to starting any new activity, a training session using the AHA will be held for workers involved in the activity.

13.5 First Aid and CPR

The SHSO will identify those individuals requiring First Aid and CPR training in order to ensure that emergency medical treatment is available during field activities. The training will be consistent with the requirements of the American Red Cross Association and include Bloodborne Pathogens training.

13.6 Hazard Communication

Hazard communication training will be provided in accordance with the requirements contained in the TtEC EHS Program, EHS 4-2.

14.0 LOGS, REPORTS AND RECORD KEEPING

The following is a summary of required health and safety logs, reports and record keeping.

14.1 CRF

A CRF is to be completed for initiating a change to the SHSP. The Navy, PESM and PM or designee approval is required. The original will be kept in the project file. Approved changes will be reviewed with affected field personnel at a safety briefing. Copies will be distributed to the Client Representative.

14.2 Medical and Training Records

Copies or verification of training (40 hour, 8 hour, supervisor, site-specific training and documentation of three day on-the-job) and medical clearance for hazardous waste site work and respirator use will be maintained on-site. Records for all subcontractor employees will also be kept on-site. All employee medical records will be maintained by the Corporate Medical Consultant – WorkCare in accordance with TtEC EHS Program, EHS 1-9.

14.3 On-Site Log

A log of personnel on-site each day will be kept by the PS or designee.

14.4 Weekly/Monthly Safety Reports

The SHSO will complete and submit weekly and monthly safety reports to the PESM. The reports are provided in Appendix L.

14.5 Exposure Records

All personal air monitoring results, laboratory reports, calculations and air sampling data sheets are part of an employee exposure record. These records will be maintained by the SHSO during site work. At the end of the project they will be maintained according to 29 CFR 1910.1020 and TtEC EHS Program, EHS 1-9.

14.6 Accident/Incident Reports

Completion of all incident and investigation reports will be in accordance with TtEC EHS Program, EHS 1-7.

14.7 OSHA Form 300

An OSHA Form 300 will be kept at the project site. All recordable injuries or illnesses will be recorded on this form. At the end of the project, the original will be sent to the PESM for maintenance. Subcontractor employers must also meet the requirements of maintaining an OSHA 300 form. The incident report form referenced in Section 12.10 meets the requirements of the OSHA Form 301(supplemental record) and must be maintained with the OSHA Form 300 for all recordable injuries or illnesses.

14.8 Health and Safety Logbook

The SHSO will maintain a logbook during site work. The daily site conditions, personnel, air monitoring results and significant events will be recorded. The original logbook will become part of the exposure records file.

14.9 Hazard Communication Program/MSDS

MSDS will be obtained for applicable substances and included in the site hazard communication file. The hazard communication program will be maintained onsite in accordance with 29 CFR 1910.1200 and TtEC EHS Program EHS 4-2.

14.10 Work Permits

All work permits, including confined space entry, hot work, lockout/tagout, and line breaking permits will be maintained in the project files.

15.0 FIELD PERSONNEL REVIEW

This form serves as documentation that field personnel have read, or have been informed of, and understand the provisions of the SHSP. It is maintained on-site by the SHSO as a project record.

Each field person team will sign this section after site-specific training is completed and before being permitted to work on site.

I have read, or have been informed of, this SHSP for GM-38 Area Groundwater Remediation Construction Tasks at NWIRP, Bethpage, NY, and understand the information presented. I will comply with the provisions contained therein.

Name (Print and Sign)	Date

16.0 REFERENCES

American Conference of Governmental Industrial Hygienists, Inc., 1992, Documentation of the Threshold Limit Values and Biological Exposure Indices; 6th Ed., ACGIH, Cincinnati, Ohio.

American Conference of Governmental Industrial Hygienists, Inc., 1987, Guidelines For The Selection of Chemical Protective Clothing; Third Edition, ACGIH, Cincinnati, Ohio, February 1987.

American Conference of Governmental Industrial Hygienists, Inc., 2005, Threshold Limit Values For Chemical Substances And Physical Agents In The Work Environment And Biological Exposure Indices; ACGIH, Cincinnati, Ohio.

Federal Acquisition Regulation, F.A.R. Clause 52.236-13: Accident Prevention.

NIOSH/OSHA/USCG/EPA, 1985, Occupational Safety and Health, Guidance Manual For Hazardous Waste Site Activities; October 1985.

NIOSH Pocket Guide to Chemical Hazards, 1997, U.S. Department of Health and Human Services; Public Health Service, Centers for Disease Control and Prevention, June 1997.

Sax, N. Irving, 1992, Dangerous Properties of Industrial Materials, 8th Ed; Van Nostrand Reinhold Co. Inc., New York, NY.

TtEC, TtEC Health and Safety Program.

U.S. Army Corps of Engineers, 1996, Safety and Health Requirements Manual; EM 385-1-1.

U.S. Department of Labor, Occupational Safety and Health Administration, 1989, 29 CFR Part 1910 Hazardous Waste Operations and Emergency Response, draft rule, March 6, 1989; Construction Industry Standards, 29 CFR 1926; and General Industry Standards, 29 CFR 1910.

U.S. Environmental Protection Agency, Standard Operating Safety Guides; June 1992.

U.S. Environmental Protection Agency, no date, Response Safety Decision-Making; Course Manual, Office of Emergency and Remedial Response, Hazardous Response Support Division.

Appendix A

Change Request Form

Tetra Tech EC, Inc.
Change Request Form

Section 1 through 4 to be filled out by Tetra Tech EC, Inc., Section 5 to be filled out by Navy

PROJECT:	OFS No.:	Change Request Form:
Navy RAC CTO 96	**2282-0096**	**CRF - 001** **Rev. 0**

To: _____ Dept.: _____ Location: _____ Date: _____

Re: ☐ Drawing No. _____ Title _____

☐ Spec. No. _____ Title _____

☐ Other _____

1. DESCRIPTION *(Items involved, submit sketch if applicable)*

2. REASONS FOR CHANGE *(If from disposition of nonconformance report, list report number)*

3. RECOMMENDED DISPOSITION

☐ Technical Clarification [NTR & COTR approval required]
☐ In Scope Adjustment [COTR approval required]
☐ Out of Scope [CO & COTR approval required]
☐ Cost Growth
☐ ROM Estimate (If Applicable) $
☐ Schedule Impact (describe below)

TtEC Initiator (Signature/Title):

4. TtEC Project Manager (Signature)	Date	Project Superintendent Concurrence (Signature)	Date

5. NAVY DISPOSITION

☐ Approved per recommended disposition
☐ Not approved (give reason)
☐ Approved with modification(s) [describe below]

NTR Concurrence *(signature)*	Date	ROICC Concurrence *(Signature)*	Date
Contracting Officer Technical Representative Approval *(Signature)*		Contracting Officer Approval *(Signature)*	Date

Engineer signs and transmits to Resident Engineer with copies to:

_____ Project Manager
_____ Project Superintendent
_____ Quality Control
Others as Required _____
File: _____
_____

Appendix B

Material Safety Data Sheets

Material Safety Data Sheets

Division of Facilities Services

DOD Hazardous Material Information (ANSI Format)
For Cornell University Convenience Only

111 TRICHLOROETHANE

Section 1 - Product and Company Identification	Section 9 - Physical & Chemical Properties
Section 2 - Compositon/Information on Ingredients	Section 10 - Stability & Reactivity Data
Section 3 - Hazards Identification Including Emergency Overview	Section 11 - Toxicological Information
Section 4 - First Aid Measures	Section 12 - Ecological Information
Section 5 - Fire Fighting Measures	Section 13 - Disposal Considerations
Section 6 - Accidental Release Measures	Section 14 - MSDS Transport Information
Section 7 - Handling and Storage	Section 15 - Regulatory Information
Section 8 - Exposure Controls & Personal Protection	Section 16 - Other Information

The information in this document is compiled from information maintained by the United States Department of Defense (DOD). Anyone using this information is solely reponsible for the accuracy and applicability of this information to a particular use or situation.
Cornell University does not in any way warrant or imply the applicability, viability or use of this information to any person or for use in any situation.

Section 1 - Product and Company Identification
111 TRICHLOROETHANE

Product Identification: 111 TRICHLOROETHANE
Date of MSDS: 01/01/1987 **Technical Review Date:** 12/05/1998
FSC: 6810 **NIIN:** 00-930-6311
Submitter: G AW
Status Code: C
MFN: 01
Article: N
Kit Part: N

Manufacturer's Information

Manufacturer's Name: DIHOMA CHEMICAL MANUFACTURING, INC.
Manufacturer's Address1: ROUTE 3, BOX 375
Manufacturer's Address2: MULLINS, SC 29574
Manufacturer's Country: US
General Information Telephone: 803-423-7799
Emergency Telephone: 803-423-7799
Emergency Telephone: 803-423-7799
MSDS Preparer's Name: N/P
Proprietary: N
Reviewed: Y
Published: Y
CAGE: 0FMP6
Special Project Code: N

Item Description

Item Name: TRICHLOROETHANE,TECHNICAL
Item Manager:
Specification Number: 0-T-620
Type/Grade/Class: TYPE III
Unit of Issue:
Unit of Issue Quantity:
Type of Container: CAN

Contractor Information

Contractor's Name: DIHOMA CHEMICAL & MFG INC
Contractor's Address1: RT 3
Contractor's Address2: MULLINS, SC 29574
Contractor's Telephone: 803-423-7799
Contractor's CAGE: 0FMP6

Section 2 - Compositon/Information on Ingredients
111 TRICHLOROETHANE

Ingredient Name: 111 TRICHLORO ETHANE
Ingredient CAS Number: 71-55-6 **Ingredient CAS Code:** M
RTECS Number: KJ2975000 **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: <95.0

% Enviromental Weight:
Other REC Limits: NONE RECOMMENDED
OSHA PEL: 350 PPM **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: 350 PPM **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity: 1000 LBS
DOT Reporting Quantity: 1000 LBS
Ozone Depleting Chemical: 1

Ingredient Name: CARBON DIOXIDE (PROPELLANT)
Ingredient CAS Number: 124-38-9 **Ingredient CAS Code:** M
RTECS Number: FF6400000 **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: NK
% Enviromental Weight:
Other REC Limits: NONE RECOMMENDED
OSHA PEL: NOT ESTABLISHED **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: NOT ESTABLISHED **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical: N

Section 3 - Hazards Identification, Including Emergency Overview
111 TRICHLOROETHANE

Health Hazards Acute & Chronic: N/P

Signs & Symptoms of Overexposure:
N/P

Medical Conditions Aggravated by Exposure:
N/P

LD50 LC50 Mixture: N/P

Route of Entry Indicators:
Inhalation: N/P
Skin: N/P

Ingestion: N/P

Carcenogenicity Indicators
NTP: N/P
IARC: N/P
OSHA: N/P

Carcinogenicity Explanation: N/P

Section 4 - First Aid Measures
111 TRICHLOROETHANE

First Aid:
N/P

Section 5 - Fire Fighting Measures
111 TRICHLOROETHANE

Fire Fighting Procedures:
N/P
Unusual Fire or Explosion Hazard:
N/P
Extinguishing Media:
N/P
Flash Point: Flash Point Text: NONE

Autoignition Temperature:
Autoignition Temperature Text: NK
Lower Limit(s):
Upper Limit(s):

Section 6 - Accidental Release Measures
111 TRICHLOROETHANE

Spill Release Procedures:
N/P

Section 7 - Handling and Storage
111 TRICHLOROETHANE

Handling and Storage Precautions:

Other Precautions:

Section 8 - Exposure Controls & Personal Protection
111 TRICHLOROETHANE

Repiratory Protection:
N/P
Ventilation:

N/P
Protective Gloves:
N/P
Eye Protection: N/P
Other Protective Equipment: N/P
Work Hygenic Practices: N/P
Supplemental Health & Safety Information: N/P

Section 9 - Physical & Chemical Properties
111 TRICHLOROETHANE

HCC: V2
NRC/State License Number:
Net Property Weight for Ammo:
Boiling Point: Boiling Point Text: N/A
Melting/Freezing Point: Melting/Freezing Text: N/A
Decomposition Point: Decomposition Text: N/A
Vapor Pressure: N/P **Vapor Density:** N/P
Percent Volatile Organic Content:
Specific Gravity: N/P
Volatile Organic Content Pounds per Gallon:
pH: N/P
Volatile Organic Content Grams per Liter:
Viscosity: NK
Evaporation Weight and Reference: N/P
Solubility in Water: N/P
Appearance and Odor:
Percent Volatiles by Volume: N/P
Corrosion Rate: N/P

Section 10 - Stability & Reactivity Data
111 TRICHLOROETHANE

Stability Indicator: N/P
Materials to Avoid:
N/P
Stability Condition to Avoid:
N/P
Hazardous Decomposition Products:
N/P
Hazardous Polymerization Indicator: N/P
Conditions to Avoid Polymerization:
N/P

Section 11 - Toxicological Information
111 TRICHLOROETHANE

Toxicological Information:
N/P

Section 12 - Ecological Information
111 TRICHLOROETHANE

Ecological Information:
N/P

Section 13 - Disposal Considerations
111 TRICHLOROETHANE

Waste Disposal Methods:
N/P

Section 14 - MSDS Transport Information
111 TRICHLOROETHANE

Transport Information:
N/P

Section 15 - Regulatory Information
111 TRICHLOROETHANE

SARA Title III Information:
N/P
Federal Regulatory Information:
N/P
State Regulatory Information:
N/P

Section 16 - Other Information
111 TRICHLOROETHANE

Other Information:
N/P

HMIS Transportation Information

Product Identification: 111 TRICHLOROETHANE
Transporation ID Number: 92803
Responsible Party CAGE: 0FMP6
Date MSDS Prepared: 01/01/1987
Date MSDS Reviewed: 10/09/1996
MFN: 10/09/1996
Submitter: G AW
Status Code: C

Container Information
Unit of Issue:
Container Quantity:
Type of Container: CAN
Net Unit Weight: NK

Article without MSDS: N
Technical Entry NOS Shipping Number: NK
Radioactivity: NK
Form:
Net Explosive Weight: NK

Coast Guard Ammunition Code: NK
Magnetism: N/P
AF MMAC Code: NK
DOD Exemption Number: NK
Limited Quantity Indicator:
Multiple Kit Number: 0
Kit Indicator: N
Kit Part Indicator: N
Review Indicator: Y
Additional Data:
NK

Department of Transportation Information

DOT Proper Shipping Name: CONSUMER COMMODITY
DOT PSN Code: DTJ
Symbols: D
DOT PSN Modifier:
Hazard Class: ORM-D
UN ID Number:
DOT Packaging Group:
Label: NONE
Special Provision(s):
Packaging Exception:
Non Bulk Packaging: 156,306
Bulk Packaging: NONE
Maximum Quanity in Passenger Area: 30KGGROSS
Maximum Quanity in Cargo Area: 30KGGROSS
Stow in Vessel Requirements: A
Requirements Water/Sp/Other:

IMO Detail Information

IMO Proper Shipping Name: AEROSOLS/AEROSOL PRODUCT ?
IMO PSN Code: AKH
IMO PSN Modifier:
IMDG Page Number: SEE 9022
UN Number: 1950
UN Hazard Class: 9?
IMO Packaging Group: -
Subsidiary Risk Label: -
EMS Number: 2-13
Medical First Aid Guide Number:

IATA Detail Information

IATA Proper Shipping Name: AEROSOLS, FLAMMABLE
IATA PSN Code: ALS
IATA PSN Modifier: (EACH NOT EXCEEDING 1 L CAPACITY)
IATA UN Id Number: 1950
IATA UN Class: 2.1
Subsidiary Risk Class:
UN Packaging Group:
IATA Label: FLAMMABLE GAS
Packaging Note for Passengers: 203
Maximum Quantity for Passengers: 75KG

Packaging Note for Cargo: 203
Maximum Quantity for Cargo: 150KG
Exceptions:

AFI Detail Information

AFI Proper Shipping Name: AEROSOLS, FLAMMABLE, N.O.S.
AFI Symbols: *
AFI PSN Code: ALR
AFI PSN Modifier: (EACH NOT EXCEEDING 1L CAPACITY)
AFI UN Id Number: UN1950
AFI Hazard Class: 2.1
AFI Packing Group: N/A
AFI Label:
Special Provisions: P4
Back Pack Reference: A6.3

HAZCOM Label Information

Product Identification: 111 TRICHLOROETHANE
CAGE: 0FMP6
Assigned Individual: N
Company Name: DIHOMA CHEMICAL & MFG INC
Company PO Box:
Company Street Address1: RT 3
Company Street Address2: MULLINS, SC 29574 US
Health Emergency Telephone: 803-423-7799
Label Required Indicator: Y
Date Label Reviewed: 10/12/1999
Status Code: A
Manufacturer's Label Number:
Date of Label:
Year Procured: N/K
Organization Code: G
Chronic Hazard Indicator: N/P
Eye Protection Indicator: N/P
Skin Protection Indicator: N/P
Respiratory Protection Indicator: N/P
Signal Word: N/P
Health Hazard:
Contact Hazard:
Fire Hazard:
Reactivity Hazard:

Material Safety Data Sheets

Division of Facilities Services

DOD Hazardous Material Information (ANSI Format)
For Cornell University Convenience Only

F29 1,1-DICHLOROETHENE

Section 1 - Product and Company Identification	Section 9 - Physical & Chemical Properties
Section 2 - Compositon/Information on Ingredients	Section 10 - Stability & Reactivity Data
Section 3 - Hazards Identification Including Emergency Overview	Section 11 - Toxicological Information
Section 4 - First Aid Measures	Section 12 - Ecological Information
Section 5 - Fire Fighting Measures	Section 13 - Disposal Considerations
Section 6 - Accidental Release Measures	Section 14 - MSDS Transport Information
Section 7 - Handling and Storage	Section 15 - Regulatory Information
Section 8 - Exposure Controls & Personal Protection	Section 16 - Other Information

The information in this document is compiled from information maintained by the United States Department of Defense (DOD). Anyone using this information is solely reponsible for the accuracy and applicability of this information to a particular use or situation.
Cornell University does not in any way warrant or imply the applicability, viability or use of this information to any person or for use in any situation.

Section 1 - Product and Company Identification
F29 1,1-DICHLOROETHENE

Product Identification: F29 1,1-DICHLOROETHENE
Date of MSDS: 01/26/1995 **Technical Review Date:** 04/10/1996
FSC: 6550 **NIIN: LIIN:** 00F037520
Submitter: F BT
Status Code: C
MFN: 02
Article: N
Kit Part: N

Manufacturer's Information

Manufacturer's Name: CHEM SERVICE INC
Post Office Box: 3108
Manufacturer's Address1: 660 TOWER LN
Manufacturer's Address2: WEST CHESTER, PA 19381-3108
Manufacturer's Country: US
General Information Telephone: 215-692-3026/800-452-9994
Emergency Telephone: 215-386-2100/215-692-3026
Emergency Telephone: 215-386-2100/215-692-3026
MSDS Preparer's Name: N/P
Proprietary: N
Reviewed: Y
Published: Y
CAGE: 84898
Special Project Code: N

Preparer Information

Preparer's Name: CHEM SERVICE INC
Post Office Box: 3108
Preparer's Address1: N/K
Preparer's Address2: WEST CHESTER, PA 19381
Preparer's CAGE: 84898
Assigned Individual: N

Contractor Information

Contractor's Name: CHEM SERVICE INC
Post Office Box: 3108
Contractor's Address1: N/K
Contractor's Address2: WEST CHESTER, PA 19381
Contractor's Telephone: 215-692-3026
Contractor's CAGE: 84898

Contractor Information

Contractor's Name: CHEM SERVICE, INC
Post Office Box: 599
Contractor's Address1: 660 TOWER LN
Contractor's Address2: WEST CHESTER, PA 19301-9650
Contractor's Telephone: 610-692-3026
Contractor's CAGE: 8Y898

Section 2 - Compositon/Information on Ingredients
F29 1,1-DICHLOROETHENE

Ingredient Name: VINYLIDENE CHLORIDE, 1,1-DICHLOROETHENE, 1,1-DICHLOROETHYLENE, VDC
Ingredient CAS Number: 75-35-4 **Ingredient CAS Code:** M
RTECS Number: KV9275000 **RTECS Code:** M

=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: N/K
% Enviromental Weight:
Other REC Limits: 5 PPM
OSHA PEL: N/K **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: 20 MG/CUM **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity: 100 LBS
DOT Reporting Quantity: 100 LBS
Ozone Depleting Chemical: N

Section 3 - Hazards Identification, Including Emergency Overview
F29 1,1-DICHLOROETHENE

Health Hazards Acute & Chronic: SKIN: IRRITATION & SENSITIZATION, CAN CAUSE AN ALLERGIC SKIN REACTION. INHALATION: CAN BE IRRITATING TO MUCOUS MEMBRANES. NARCOTIC AT HIGH CONCENTRATIONS, EXPOSURE CAN CAUSE LIVER & KIDNEY DAMAGE, NER VOUS SYSTEM INJURY & CARDIOVASCULAR SYSTEM INJURY. CAN CAUSE DELAYED ADVERSE HEALTH EFFECTS.

Signs & Symptoms of Overexposure:
IRRITATION.

Medical Conditions Aggravated by Exposure:
N/K

LD50 LC50 Mixture: ORAL LD50(RAT/MOUSE): 200 MG/KG

Route of Entry Indicators:
- **Inhalation:** YES
- **Skin:** NO
- **Ingestion:** NO

Carcenogenicity Indicators
- **NTP:** NO
- **IARC:** NO
- **OSHA:** NO

Carcinogenicity Explanation: NONE

Section 4 - First Aid Measures
F29 1,1-DICHLOROETHENE

First Aid:
EYES: FLUSH CONTINUOUSLY W/WATER FOR 15-20 MINS. SKIN: FLUSH W/WATER FOR 15-20 MINS. IF NO BURNS HAVE OCCURED-USE SOAP & WATER TO CLEANSE. INHALATION: REMOVE TO FRESH AIR. GIVE OXYGEN/MOUTH TO MOUTH I F NEEDED. CONTINUE LIFE SUPPORTING MEASURES UNTIL MEDICAL ASSISTANCE HAS ARRIVED. KEEP WARM & QUIET. INGESTION: DON'T GIVE LIQUIDS/INDUCE VOMITING TO AN UNCONSCIOUS/CONVULSING PERSON. (SEE SUPP)

Section 5 - Fire Fighting Measures
F29 1,1-DICHLOROETHENE

Fire Fighting Procedures:
N/K
Unusual Fire or Explosion Hazard:
FLAMMABLE CHEMICAL.
Extinguishing Media:
CO2, DRY CHEMICAL POWDER. DON'T USE WATER!
Flash Point: Flash Point Text: 5F

Autoignition Temperature:
Autoignition Temperature Text: N/A
Lower Limit(s): 6.5
Upper Limit(s): 15.5

Section 6 - Accidental Release Measures
F29 1,1-DICHLOROETHENE

Spill Release Procedures:
EVACUATE AREA. WEAR APPROPRIATE OSHA REGULATED EQUIPMENT. VENTILATE AREA. ABSORB ON VERMICULITE/SIMILAR MATERIAL. SWEEP UP & PLACE IN AN APPROPRIATE CONTAINER. HOLD FOR DISPOSAL. WASH CONTAMINATED SUR FACES TO REMOVE ANY RESIDUES.

Section 7 - Handling and Storage
F29 1,1-DICHLOROETHENE

Handling and Storage Precautions:

Other Precautions:

Section 8 - Exposure Controls & Personal Protection
F29 1,1-DICHLOROETHENE

Repiratory Protection:
USE APPROPRIATE OSHA/MSHA APPROVED SAFETY EQUIPMENT.
Ventilation:
CHEMICAL HOOD.

Protective Gloves:
N/K
Eye Protection: GLASS SHIELDS
Other Protective Equipment: N/K
Work Hygenic Practices: REMOVE/LAUNDER CONTAMINATED CLOTHING BEFORE REUSE.
Supplemental Health & Safety Information: IF PATIENT IS VOMITING-WATCH CLOSELY TO MAKE SURE AIRWAY DOESN'T BECOME OBSTRUCTED BY VOMIT. OBTAIN MEDICAL ATTENTION IN ALL CASES. AN ANTIDOTE IS A SUBSTANCE INTENDED TO COUNTERACT THE EFFECT OF A PO ISON. IT SHOULD BE GIVEN ONLY BY A PHYSICIAN/TRAINED EMERGENCY PERSONNEL. GET MEDICAL ADVICE FROM POISON CONTROL CENTER.

Section 9 - Physical & Chemical Properties
F29 1,1-DICHLOROETHENE

HCC:
NRC/State License Number:
Net Property Weight for Ammo:
Boiling Point: Boiling Point Text: 89.06F
Melting/Freezing Point: Melting/Freezing Text: -188.5F
Decomposition Point: Decomposition Text: N/K
Vapor Pressure: 500 **Vapor Density:** N/K
Percent Volatile Organic Content:
Specific Gravity: N/K
Volatile Organic Content Pounds per Gallon:
pH: N/K
Volatile Organic Content Grams per Liter:
Viscosity: N/P
Evaporation Weight and Reference: N/K
Solubility in Water: SLIGHT
Appearance and Odor: COLORLESS LIQUID W/FRUITY/PLEASANT ODOR
Percent Volatiles by Volume: N/K
Corrosion Rate: N/K

Section 10 - Stability & Reactivity Data
F29 1,1-DICHLOROETHENE

Stability Indicator: YES
Materials to Avoid:
INCOMPATIBLE MATERIALS
Stability Condition to Avoid:
HEAT, AIR, PRESSURE.
Hazardous Decomposition Products:
N/K
Hazardous Polymerization Indicator: YES
Conditions to Avoid Polymerization:
MAY POLYMERIZE UPON STANDING.

Section 11 - Toxicological Information
F29 1,1-DICHLOROETHENE

Toxicological Information:
N/P

Section 12 - Ecological Information
F29 1,1-DICHLOROETHENE

Ecological Information:
N/P

Section 13 - Disposal Considerations
F29 1,1-DICHLOROETHENE

Waste Disposal Methods:
BURN IN A CHEMICAL INCINERATOR EQUIPPED W/AN AFTERBURNER & SCRUBBER IAW/FEDERAL, STATE & LOCAL REGULATIONS.

Section 14 - MSDS Transport Information
F29 1,1-DICHLOROETHENE

Transport Information:
N/P

Section 15 - Regulatory Information
F29 1,1-DICHLOROETHENE

SARA Title III Information:
N/P
Federal Regulatory Information:
N/P
State Regulatory Information:
N/P

Section 16 - Other Information
F29 1,1-DICHLOROETHENE

Other Information:
N/P

HAZCOM Label Information

Product Identification: F29 1,1-DICHLOROETHENE
CAGE: 84898
Assigned Individual: N
Company Name: CHEM SERVICE INC
Company PO Box: 3108
Company Street Address1: N/K
Company Street Address2: WEST CHESTER, PA 19381 US
Health Emergency Telephone: 215-386-2100/215-692-3026
Label Required Indicator: Y
Date Label Reviewed: 12/16/1998
Status Code: C
Manufacturer's Label Number:
Date of Label: 12/16/1998
Year Procured: N/K
Organization Code: G
Chronic Hazard Indicator: N/P

Eye Protection Indicator: N/P
Skin Protection Indicator: N/P
Respiratory Protection Indicator: N/P
Signal Word: N/P
Health Hazard:
Contact Hazard:
Fire Hazard:
Reactivity Hazard:

8/8/2002 4:23:16 PM

Material Safety Data Sheets

Division of Facilities Services

DOD Hazardous Material Information (ANSI Format)
For Cornell University Convenience Only

1,2-DIBROMO-1,1-DICHLOROETHANE, O-632

Section 1 - Product and Company Identification	Section 9 - Physical & Chemical Properties
Section 2 - Compositon/Information on Ingredients	Section 10 - Stability & Reactivity Data
Section 3 - Hazards Identification Including Emergency Overview	Section 11 - Toxicological Information
Section 4 - First Aid Measures	Section 12 - Ecological Information
Section 5 - Fire Fighting Measures	Section 13 - Disposal Considerations
Section 6 - Accidental Release Measures	Section 14 - MSDS Transport Information
Section 7 - Handling and Storage	Section 15 - Regulatory Information
Section 8 - Exposure Controls & Personal Protection	Section 16 - Other Information

The information in this document is compiled from information maintained by the United States Department of Defense (DOD). Anyone using this information is solely reponsible for the accuracy and applicability of this information to a particular use or situation.
Cornell University does not in any way warrant or imply the applicability, viability or use of this information to any person or for use in any situation.

Section 1 - Product and Company Identification
1,2-DIBROMO-1,1-DICHLOROETHANE, O-632

Product Identification: 1,2-DIBROMO-1,1-DICHLOROETHANE, O-632
Date of MSDS: 09/01/1988 **Technical Review Date:** 12/27/1995
FSC: 6810 **NIIN: LIIN:** 00N067782
Submitter: N EN
Status Code: C
MFN: 01
Article: N
Kit Part: N

Manufacturer's Information

Manufacturer's Name: CHEM SERVICE INC
Post Office Box: 3108
Manufacturer's Address1:
Manufacturer's Address2: WEST CHESTER, PA 19381
Manufacturer's Country: US
General Information Telephone: 215-692-3026
Emergency Telephone: 215-692-3026
Emergency Telephone: 215-692-3026
MSDS Preparer's Name: N/P
Proprietary: N
Reviewed: N
Published: Y
CAGE: 84898
Special Project Code: N

Contractor Information

Contractor's Name: CHEM SERVICE INC
Post Office Box: 3108
Contractor's Address1: N/K
Contractor's Address2: WEST CHESTER, PA 19381
Contractor's Telephone: 215-692-3026
Contractor's CAGE: 84898

Contractor Information

Contractor's Name: CHEM SERVICE, INC
Post Office Box: 599
Contractor's Address1: 660 TOWER LN
Contractor's Address2: WEST CHESTER, PA 19301-9650
Contractor's Telephone: 610-692-3026
Contractor's CAGE: 8Y898

Section 2 - Compositon/Information on Ingredients
1,2-DIBROMO-1,1-DICHLOROETHANE, O-632

Ingredient Name: 1,2-DIBROMO-1,1-DICHLOROETHANE
Ingredient CAS Number: 75-81-0 **Ingredient CAS Code:** M
RTECS Number: RTECS Code: X
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:

% Text: N/K
% Enviromental Weight:
Other REC Limits: N/K
OSHA PEL: N/K (FP N) **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: N/K (FP N) **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical:

Section 3 - Hazards Identification, Including Emergency Overview
1,2-DIBROMO-1,1-DICHLOROETHANE, O-632

Health Hazards Acute & Chronic: ACUTE: CAN CAUSE EYE AND SKIN IRRITATION. CAN BE IRRITATING TO MUCOUS MEMBRANES. CAN BE HARMFUL IF INHALED, SWALLOWED, OR ABSORBED THROUGH THE SKIN. CHRONIC: CAN CAUSE LIVER AND KIDNEY INJURY. PROLONG ED EXPOSURE MAY CAUSE NAUSEA, HEADACHE,DIZZINESS AND/OR EYE DAMAGE.

Signs & Symptoms of Overexposure:
SEE HEALTH HAZARDS.

Medical Conditions Aggravated by Exposure:
NONE SPECIFIED BY MANUFACTURER.

LD50 LC50 Mixture: NONE SPECIFIED BY MANUFACTURER.

Route of Entry Indicators:
Inhalation: YES
Skin: YES
Ingestion: YES

Carcenogenicity Indicators
NTP: NO
IARC: NO
OSHA: NO

Carcinogenicity Explanation: NOT RELEVANT.

Section 4 - First Aid Measures
1,2-DIBROMO-1,1-DICHLOROETHANE, O-632

First Aid:
AN ANTIDOTE IS A SUBSTANCE INTENDED TO COUNTERACT EFT OF POIS. IT SHOULD BE ADMIN ONLY BY MD/TRAINED EMER PERS. MED ADVICE CAN BE OBTAINED FROM POIS CTL CTR. EYES: FLUSH CONTINUOUSLY W/WATER FOR AT LE AST 15 MIN. SKIN: FLUSH W/WATER FOR 15-20 MIN. IF NO BURNS HAVE OCCURRED, USE SOAP & WATER TO CLEANSE SKIN. INHAL: REMOVE TO FRESH AIR. ADMIN OXYGEN IF DFCLT BRTHG. IF BRTHG HAS STOPPED, (SUP DAT)

Section 5 - Fire Fighting Measures
1,2-DIBROMO-1,1-DICHLOROETHANE, O-632

Fire Fighting Procedures:
WEAR NIOSH/MSHA APPROVED SCBA & FULL PROTECTIVE EQUIPMENT (FP N).
Unusual Fire or Explosion Hazard:
NONE SPECIFIED BY MANUFACTURER.
Extinguishing Media:
USE CARBON DIOXIDE, DRY CHEMICAL POWDER OR WATER SPRAY.
Flash Point: Flash Point Text: N/K

Autoignition Temperature:
Autoignition Temperature Text: N/A
Lower Limit(s): N/K
Upper Limit(s): N/K

Section 6 - Accidental Release Measures
1,2-DIBROMO-1,1-DICHLOROETHANE, O-632

Spill Release Procedures:
EVACUATE AREA. WEAR APPROPRIATE OSHA-REGULATED EQUIPMENT. VENTILATE AREA. ABSORB ON VERMICULITE OR SIMILAR MATERIAL. SWEEP UP AND PLACE IN AN APPROPRIATE CONTAINER. HOLD FOR DISPOSAL. WASH CONTAMINATE D SURFACES TO REMOVE ANY RESIDUES.

Section 7 - Handling and Storage
1,2-DIBROMO-1,1-DICHLOROETHANE, O-632

Handling and Storage Precautions:

Other Precautions:

Section 8 - Exposure Controls & Personal Protection
1,2-DIBROMO-1,1-DICHLOROETHANE, O-632

Repiratory Protection:
USE NIOSH/MSHA APPROVED RESPIRATOR APPROPRIATE FOR EXPOSURE OF CONCERN (FP N).
Ventilation:
THIS CHEMICAL SHOULD BE HANDLED ONLY IN A HOOD.
Protective Gloves:
IMPERVIOUS GLOVES (FP N).
Eye Protection: ANSI APPRVD CHEM WORKERS GOGGS (FP N).
Other Protective Equipment: EMERGENCY EYEWASH & DELUGE SHOWER MEETING ANSI DESIGN CRITERIA (FP N).
Work Hygenic Practices: CONTACT LENSES SHOULD NOT BE WORN IN THE LABORATORY.
Supplemental Health & Safety Information: FIRST AID PROC: ADMIN ARTF RESP. IF PATIENT IN CARD ARREST, ADMIN CPR. CONTINUE LIFE SUPPORTING MEASURES UNTIL MED ASSIST HAS ARRIVED. OTHER PREC: THIS PROD MAY NOT BE USED AS DRUGS,

COSMETICS, AGRICU LTURAL/PESTICIDAL PRODS, FOOD ADDITIVES/AS HOUSEHOLD CHEMICALS.

Section 9 - Physical & Chemical Properties
1,2-DIBROMO-1,1-DICHLOROETHANE, O-632

HCC:
NRC/State License Number:
Net Property Weight for Ammo:
Boiling Point: Boiling Point Text: 347F,175C
Melting/Freezing Point: Melting/Freezing Text: N/K
Decomposition Point: Decomposition Text: N/K
Vapor Pressure: N/K **Vapor Density:** N/K
Percent Volatile Organic Content:
Specific Gravity: N/K
Volatile Organic Content Pounds per Gallon:
pH: N/K
Volatile Organic Content Grams per Liter:
Viscosity: N/P
Evaporation Weight and Reference: N/K
Solubility in Water: INSOLUBLE
Appearance and Odor: COLORLESS LIQUID, WITH ETHER-LIKE ODOR
Percent Volatiles by Volume: N/K
Corrosion Rate: N/K

Section 10 - Stability & Reactivity Data
1,2-DIBROMO-1,1-DICHLOROETHANE, O-632

Stability Indicator: YES
Materials to Avoid:
INCOMPATIBLE WITH STRONG OXIDIZING AGENTS, STRONG BASES.
Stability Condition to Avoid:
COMBUSTIBLE.
Hazardous Decomposition Products:
DECOMPOSITION LIBERATES TOXIC FUMES. DECOMPOSITION PRODUCTS ARE CORROSIVE.
Hazardous Polymerization Indicator: NO
Conditions to Avoid Polymerization:
NOT RELEVANT.

Section 11 - Toxicological Information
1,2-DIBROMO-1,1-DICHLOROETHANE, O-632

Toxicological Information:
N/P

Section 12 - Ecological Information
1,2-DIBROMO-1,1-DICHLOROETHANE, O-632

Ecological Information:
N/P

Section 13 - Disposal Considerations
1,2-DIBROMO-1,1-DICHLOROETHANE, O-632

Waste Disposal Methods:
BURN IN A CHEMICAL INCINERATOR EQUIPPED WITH AN AFTERBURNER AND SCRUBBER. DISPOSE OF IN ACCORDANCE W/LOCAL, STATE & FEDERAL REGULATIONS (FP N).

Section 14 - MSDS Transport Information
1,2-DIBROMO-1,1-DICHLOROETHANE, O-632

Transport Information:
N/P

Section 15 - Regulatory Information
1,2-DIBROMO-1,1-DICHLOROETHANE, O-632

SARA Title III Information:
N/P
Federal Regulatory Information:
N/P
State Regulatory Information:
N/P

Section 16 - Other Information
1,2-DIBROMO-1,1-DICHLOROETHANE, O-632

Other Information:
N/P

HAZCOM Label Information

Product Identification: 1,2-DIBROMO-1,1-DICHLOROETHANE, O-632
CAGE: 84898
Assigned Individual: N
Company Name: CHEM SERVICE INC
Company PO Box: 3108
Company Street Address1: N/K
Company Street Address2: WEST CHESTER, PA 19381 US
Health Emergency Telephone: 215-692-3026
Label Required Indicator: Y
Date Label Reviewed: 12/27/1995
Status Code: C
Manufacturer's Label Number:
Date of Label: 12/27/1995
Year Procured: N/K
Organization Code: G
Chronic Hazard Indicator: Y
Eye Protection Indicator: YES
Skin Protection Indicator: YES
Respiratory Protection Indicator: YES
Signal Word: CAUTION
Health Hazard: Slight
Contact Hazard: Slight

Fire Hazard: Slight
Reactivity Hazard: None

8/9/2002 9:28:22 AM

Material Safety Data Sheets

Division of Facilities Services

DOD Hazardous Material Information (ANSI Format)
For Cornell University Convenience Only

TRANS-1,2-DICHLOROETHENE, O-660

Section 1 - Product and Company Identification	Section 9 - Physical & Chemical Properties
Section 2 - Compositon/Information on Ingredients	Section 10 - Stability & Reactivity Data
Section 3 - Hazards Identification Including Emergency Overview	Section 11 - Toxicological Information
Section 4 - First Aid Measures	Section 12 - Ecological Information
Section 5 - Fire Fighting Measures	Section 13 - Disposal Considerations
Section 6 - Accidental Release Measures	Section 14 - MSDS Transport Information
Section 7 - Handling and Storage	Section 15 - Regulatory Information
Section 8 - Exposure Controls & Personal Protection	Section 16 - Other Information

The information in this document is compiled from information maintained by the United States Department of Defense (DOD). Anyone using this information is solely reponsible for the accuracy and applicability of this information to a particular use or situation.
Cornell University does not in any way warrant or imply the applicability, viability or use of this information to any person or for use in any situation.

Section 1 - Product and Company Identification
TRANS-1,2-DICHLOROETHENE, O-660

Product Identification: TRANS-1,2-DICHLOROETHENE, O-660
Date of MSDS: 09/01/1988 **Technical Review Date:** 12/27/1995
FSC: 6810 **NIIN: LIIN:** 00N067797
Submitter: N EN
Status Code: C
MFN: 01
Article: N
Kit Part: N

Manufacturer's Information

Manufacturer's Name: CHEM SERVICE INC
Post Office Box: 3108
Manufacturer's Address1:
Manufacturer's Address2: WEST CHESTER, PA 19381
Manufacturer's Country: US
General Information Telephone: 215-692-3026
Emergency Telephone: 215-692-3026
Emergency Telephone: 215-692-3026
MSDS Preparer's Name: N/P
Proprietary: N
Reviewed: N
Published: Y
CAGE: 84898
Special Project Code: N

Contractor Information

Contractor's Name: CHEM SERVICE INC
Post Office Box: 3108
Contractor's Address1: N/K
Contractor's Address2: WEST CHESTER, PA 19381
Contractor's Telephone: 215-692-3026
Contractor's CAGE: 84898

Contractor Information

Contractor's Name: CHEM SERVICE, INC
Post Office Box: 599
Contractor's Address1: 660 TOWER LN
Contractor's Address2: WEST CHESTER, PA 19301-9650
Contractor's Telephone: 610-692-3026
Contractor's CAGE: 8Y898

Section 2 - Compositon/Information on Ingredients
TRANS-1,2-DICHLOROETHENE, O-660

Ingredient Name: ETHYLENE, 1,2-DICHLORO-, (E)-; (TRANS-1,2-DICHLOROETHYLENE) (SARA 313) (CERCLA)
Ingredient CAS Number: 156-60-5 **Ingredient CAS Code:** M
RTECS Number: KV9400000 **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:

% High Volume: % High Volume Code:
% Text: N/K
% Enviromental Weight:
Other REC Limits: N/K
OSHA PEL: 200 PPM (MFR) **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: 200 PPM (MFR) **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity: 1000 LBS
DOT Reporting Quantity: 1000 LBS
Ozone Depleting Chemical: N

Section 3 - Hazards Identification, Including Emergency Overview
TRANS-1,2-DICHLOROETHENE, O-660

Health Hazards Acute & Chronic: ACUTE: CAN BE HARMFUL IF ABSORBED THRU SKIN, INHALED/SWALLOWED. CAN CAUSE SKIN AND EYE IRRITATION. CAN BE IRRITATING TO MUCOUS MEMBRANES. VAPORS AND/OR DIRECT EYE CONTACT CAN CAUSE SEVERE EYE BURNS. C HRONIC: PROLONGED EXPOSURE MAY CAUSE NAUSEA, HEADACHE, DIZZINESS AND/OR EYE DAMAGE. CAN CAUSE LIVER & KIDNEY INJURY.

Signs & Symptoms of Overexposure:
SEE HEALTH HAZARDS.

Medical Conditions Aggravated by Exposure:
NONE SPECIFIED BY MANUFACTURER.

LD50 LC50 Mixture: LD50 (ORAL RAT): 7536 MG/KG.

Route of Entry Indicators:
- **Inhalation:** YES
- **Skin:** YES
- **Ingestion:** YES

Carcenogenicity Indicators
- **NTP:** NO
- **IARC:** NO
- **OSHA:** NO

Carcinogenicity Explanation: NOT RELEVANT.

Section 4 - First Aid Measures
TRANS-1,2-DICHLOROETHENE, O-660

First Aid:
AN ANTIDOTE IS A SUBSTANCE INTENDED TO COUNTERACT EFT OF POIS. IT SHOULD BE ADMIN ONLY BY MD/TRAINED EMER PERS. MED ADVICE CAN BE OBTAINED FROM POIS CTL CTR. EYES: FLUSH CONTINUOUSLY W/WATER FOR AT LE AST 15 MIN. SKIN: FLUSH W/WATER FOR 15-20 MIN. IF NO BURNS HAVE OCCURRED, USE SOAP & WATER TO CLEANSE SKIN. INHAL: REMOVE TO FRESH AIR. ADMIN OXYGEN IF DFCLT BRTHG. IF

BRTHG HAS STOPPED, (SUP DAT)

Section 5 - Fire Fighting Measures
TRANS-1,2-DICHLOROETHENE, O-660

Fire Fighting Procedures:
WEAR NIOSH/MSHA APPROVED SCBA & FULL PROTECTIVE EQUIPMENT (FP N).
Unusual Fire or Explosion Hazard:
NONE SPECIFIED BY MANUFACTURER.
Extinguishing Media:
USE CARBON DIOXIDE, DRY CHEMICAL POWDER OR WATER SPRAY.
Flash Point: Flash Point Text: 42.8F,6.0C

Autoignition Temperature:
Autoignition Temperature Text: N/A
Lower Limit(s): N/K
Upper Limit(s): N/K

Section 6 - Accidental Release Measures
TRANS-1,2-DICHLOROETHENE, O-660

Spill Release Procedures:
EVACUATE AREA. WEAR APPROPRIATE OSHA-REGULATED EQUIPMENT. VENTILATE AREA. ABSORB ON VERMICULITE OR SIMILAR MATERIAL. SWEEP UP AND PLACE IN AN APPROPRIATE CONTAINER. HOLD FOR DISPOSAL. WASH CONTAMINATE D SURFACES TO REMOVE ANY RESIDUES.

Section 7 - Handling and Storage
TRANS-1,2-DICHLOROETHENE, O-660

Handling and Storage Precautions:

Other Precautions:

Section 8 - Exposure Controls & Personal Protection
TRANS-1,2-DICHLOROETHENE, O-660

Repiratory Protection:
USE NIOSH/MSHA APPROVED RESPIRATOR APPROPRIATE FOR EXPOSURE OF CONCERN (FP N).
Ventilation:
THIS CHEMICAL SHOULD BE HANDLED ONLY IN A HOOD.
Protective Gloves:
IMPERVIOUS GLOVES (FP N).
Eye Protection: ANSI APPRVD CHEM WORKERS GOGGS (FP N).
Other Protective Equipment: EMERGENCY EYEWASH & DELUGE SHOWER MEETING ANSI DESIGN CRITERIA (FP N).
Work Hygenic Practices: CONTACT LENSES SHOULD NOT BE WORN IN THE LABORATORY.
Supplemental Health & Safety Information: FIRST AID PROC: ADMIN ARTF RESP. IF PATIENT IN CARD ARREST, ADMIN CPR. CONTINUE LIFE SUPPORTING MEASURES UNTIL MED

ASSIST HAS ARRIVED. INGEST: CALL MD IMMED (FP N). OTHER PREC: THIS PROD MAY NOT BE US ED AS DRUGS, COSMETICS, AGRICULTURAL/PESTICIDAL PRODS, FOOD ADDITIVES/AS HOUSEHOLD CHEMICALS.

Section 9 - Physical & Chemical Properties
TRANS-1,2-DICHLOROETHENE, O-660

HCC:
NRC/State License Number:
Net Property Weight for Ammo:
Boiling Point: Boiling Point Text: 118F,48C
Melting/Freezing Point: Melting/Freezing Text: -58F,-50C
Decomposition Point: Decomposition Text: N/K
Vapor Pressure: N/K **Vapor Density:** N/K
Percent Volatile Organic Content:
Specific Gravity: 1.257
Volatile Organic Content Pounds per Gallon:
pH: N/K
Volatile Organic Content Grams per Liter:
Viscosity: N/P
Evaporation Weight and Reference: N/K
Solubility in Water: INSOLUBLE
Appearance and Odor: COLORLESS LIQUID
Percent Volatiles by Volume: N/K
Corrosion Rate: N/K

Section 10 - Stability & Reactivity Data
TRANS-1,2-DICHLOROETHENE, O-660

Stability Indicator: YES
Materials to Avoid:
INCOMPATIBLE WITH STRONG OXIDIZING AGENTS, STRONG BASES. REACTS WITH WATER AND MOST REACTIVE HYDROGEN COMPOUNDS.
Stability Condition to Avoid:
FLAMMABLE.
Hazardous Decomposition Products:
DECOMPOSITION LIBERATES TOXIC FUMES. DECOMPOSITION PRODUCTS ARE CORROSIVE.
Hazardous Polymerization Indicator: NO
Conditions to Avoid Polymerization:
NOT RELEVANT.

Section 11 - Toxicological Information
TRANS-1,2-DICHLOROETHENE, O-660

Toxicological Information:
N/P

Section 12 - Ecological Information
TRANS-1,2-DICHLOROETHENE, O-660

Ecological Information:

N/P

Section 13 - Disposal Considerations
TRANS-1,2-DICHLOROETHENE, O-660

Waste Disposal Methods:
BURN IN A CHEMICAL INCINERATOR EQUIPPED WITH AN AFTERBURNER AND SCRUBBER. DISPOSE OF IN ACCORDANCE W/LOCAL, STATE & FEDERAL REGULATIONS (FP N).

Section 14 - MSDS Transport Information
TRANS-1,2-DICHLOROETHENE, O-660

Transport Information:
N/P

Section 15 - Regulatory Information
TRANS-1,2-DICHLOROETHENE, O-660

SARA Title III Information:
N/P
Federal Regulatory Information:
N/P
State Regulatory Information:
N/P

Section 16 - Other Information
TRANS-1,2-DICHLOROETHENE, O-660

Other Information:
N/P

HAZCOM Label Information

Product Identification: TRANS-1,2-DICHLOROETHENE, O-660
CAGE: 84898
Assigned Individual: N
Company Name: CHEM SERVICE INC
Company PO Box: 3108
Company Street Address1: N/K
Company Street Address2: WEST CHESTER, PA 19381 US
Health Emergency Telephone: 215-692-3026
Label Required Indicator: Y
Date Label Reviewed: 12/27/1995
Status Code: C
Manufacturer's Label Number:
Date of Label: 12/27/1995
Year Procured: N/K
Organization Code: G
Chronic Hazard Indicator: Y
Eye Protection Indicator: YES
Skin Protection Indicator: YES
Respiratory Protection Indicator: YES
Signal Word: DANGER

Health Hazard: Moderate
Contact Hazard: Slight
Fire Hazard: Severe
Reactivity Hazard: Slight

8/9/2002 9:28:25 AM

Material Safety Data Sheets

Division of Facilities Services

DOD Hazardous Material Information (ANSI Format)
For Cornell University Convenience Only

TETRACHLOROETHENE, 0-663

Section 1 - Product and Company Identification	Section 9 - Physical & Chemical Properties
Section 2 - Compositon/Information on Ingredients	Section 10 - Stability & Reactivity Data
Section 3 - Hazards Identification Including Emergency Overview	Section 11 - Toxicological Information
Section 4 - First Aid Measures	Section 12 - Ecological Information
Section 5 - Fire Fighting Measures	Section 13 - Disposal Considerations
Section 6 - Accidental Release Measures	Section 14 - MSDS Transport Information
Section 7 - Handling and Storage	Section 15 - Regulatory Information
Section 8 - Exposure Controls & Personal Protection	Section 16 - Other Information

The information in this document is compiled from information maintained by the United States Department of Defense (DOD). Anyone using this information is solely reponsible for the accuracy and applicability of this information to a particular use or situation.
Cornell University does not in any way warrant or imply the applicability, viability or use of this information to any person or for use in any situation.

Section 1 - Product and Company Identification
TETRACHLOROETHENE, 0-663

Product Identification: TETRACHLOROETHENE, 0-663
Date of MSDS: 07/01/1988 **Technical Review Date:** 11/03/1994
FSC: 6810 **NIIN: LIIN:** 00N054677
Submitter: N EN
Status Code: C
MFN: 01
Article: N
Kit Part: N

Manufacturer's Information

Manufacturer's Name: CHEM SERVICE INC
Post Office Box: 3108
Manufacturer's Address1:
Manufacturer's Address2: WEST CHESTER, PA 19381
Manufacturer's Country: US
General Information Telephone: 215-692-3026
Emergency Telephone: 215-692-3026
Emergency Telephone: 215-692-3026
MSDS Preparer's Name: N/P
Proprietary: N
Reviewed: N
Published: Y
CAGE: 84898
Special Project Code: N

Contractor Information

Contractor's Name: CHEM SERVICE INC
Post Office Box: 3108
Contractor's Address1: N/K
Contractor's Address2: WEST CHESTER, PA 19381
Contractor's Telephone: 215-692-3026
Contractor's CAGE: 84898

Contractor Information

Contractor's Name: CHEM SERVICE, INC
Post Office Box: 599
Contractor's Address1: 660 TOWER LN
Contractor's Address2: WEST CHESTER, PA 19301-9650
Contractor's Telephone: 610-692-3026
Contractor's CAGE: 8Y898

Section 2 - Compositon/Information on Ingredients
TETRACHLOROETHENE, 0-663

Ingredient Name: ETHYLENE, TETRACHLORO-; (TETRACHLOROETHYLENE) (SARA III)
Ingredient CAS Number: 127-18-4 **Ingredient CAS Code:** M
RTECS Number: KX3850000 **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:

% Text: N/K
% Enviromental Weight:
Other REC Limits: N/K
OSHA PEL: 25 PPM **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: 25 PPM;100 PPM STEL **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity: 100 LBS
DOT Reporting Quantity: 100 LBS
Ozone Depleting Chemical: N

Ingredient Name: EYE PROTECTION: FULL LENGTH FACESHIELD (FP N).
Ingredient CAS Number: Ingredient CAS Code: X
RTECS Number: 9999999ZZ **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: N/K
% Enviromental Weight:
Other REC Limits: N/K
OSHA PEL: N/K (FP N) **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: N/K (FP N) **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical:

Ingredient Name: ING 2: ARRIVED. INGESTION: CALL MD IMMEDIATELY (FP N).
Ingredient CAS Number: Ingredient CAS Code: X
RTECS Number: 9999999ZZ **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: N/K
% Enviromental Weight:
Other REC Limits: N/K

OSHA PEL: N/K (FP N) **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: N/K (FP N) **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical:

Ingredient Name: SUPP DATA: RESPS. IF PATIENT IS IN CARD ARREST ADMIN CPR. CONTINUE LIFE SUPPORTING MEASURES UNTIL MED ASSIST HAS (ING 3)
Ingredient CAS Number: Ingredient CAS Code: X
RTECS Number: 9999999ZZ **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: N/K
% Enviromental Weight:
Other REC Limits: N/K
OSHA PEL: N/K (FP N) **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: N/K (FP N) **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical:

Section 3 - Hazards Identification, Including Emergency Overview
TETRACHLOROETHENE, 0-663

Health Hazards Acute & Chronic: CONT LENSES SHOULD NOT BE WORN IN LAB. ALL CHEMS SHOULD BE CONSIDERED HAZ-AVOID DIRECT PHYS CONT! CAN BE HARMFUL IF ABSORB THRU SKIN. CAN BE HARMFUL IF INHALED. CAN BE FATAL IF ABSORB THRU SKIN! CAN B E FATAL IF INHALED! MAY BE FATAL IF SWALLOWED! SUSPECTED CARCIN-MAY PRDCE CANCER. LACHRYMATOR-CAUSES (EFTS OF OVEREXP)

Signs & Symptoms of Overexposure:
HLTH HAZ: SEV EYE IRRIT. VAPS &/OR DIRECT EYE CONT CAN CAUSE SEV EYE BURNS. CAN CAUSE EYE IRRIT. VAPS &/OR DIRECT EYE CONT CAN CAUSE SEV EYE BURNS. CAN CAUSE EYE IRRIT. CAN CAUSE SKIN IRRIT. CAN CAUSE SKIN BURNS. CAN CAUSE SEV SKIN BURNS. CAN BE HARMFUL IF SWALLOWED. CAN CAUSE LIVER INJ. CAN CAUSE KIDNEY INJ. (SUPDAT)

Medical Conditions Aggravated by Exposure:

NONE SPECIFIED BY MANUFACTURER.

LD50 LC50 Mixture: LD50 (ORAL,RAT): 8850 MG/KG.

Route of Entry Indicators:
Inhalation: YES
Skin: YES
Ingestion: YES

Carcenogenicity Indicators
NTP: YES
IARC: YES
OSHA: NO

Carcinogenicity Explanation: TETRACHLOROETHYLENE: IARC MONOGRAPHS SUPP, VOL 7, PG 355, 1987: GRP 2B. NTP 7TH ANNUAL REPORT ON CARCINS, 1994: (SUPDAT)

Section 4 - First Aid Measures
TETRACHLOROETHENE, 0-663

First Aid:
AN ANTIDOTE IS SUBSTANCE INTENDED TO COUNTERACT EFT OF POIS. IT SHOULD BE ADMIN ONLY BY PHYS/TRAINED EMER PERS. MED ADVICE CAN BE OBTAINED FROM POIS CNTRL CNTR. EYE: FLUSH CONTINUOUSLY W/WATER FOR AT LST 15-20 MINS. SKIN: FLUSH W/WATER FOR15-20 MINS. IF NO BURNS HAVE OCCURRED-USE SOAP & WATER TO CLEANSE SKIN. INHAL: REMOVE PATIENT TO FRESH AIR. ADMIN OXYGEN IF PATIENT IS HAVING DFCLTY (SUPDAT)

Section 5 - Fire Fighting Measures
TETRACHLOROETHENE, 0-663

Fire Fighting Procedures:
WEAR NIOSH/MSHA APPROVED SCBA AND FULL PROTECTIVE EQUIPMENT (FP N).
Unusual Fire or Explosion Hazard:
NONE SPECIFIED BY MANUFACTURER.
Extinguishing Media:
CARBON DIOXIDE, DRY CHEMICAL POWDER OR SPRAY.
Flash Point: Flash Point Text: NON-FLAMMABLE

Autoignition Temperature:
Autoignition Temperature Text: N/A
Lower Limit(s): N/A
Upper Limit(s): N/A

Section 6 - Accidental Release Measures
TETRACHLOROETHENE, 0-663

Spill Release Procedures:
EVACUATE AREA. WEAR APPROPRIATE OSHA REGULATED EQUIPMENT. VENTILATE AREA. ABSORB ON VERMICULITE OR SIMILAR MATERIAL. SWEEP UP AND PLACE IN AN

APPROPRIATE CONTAINER. HOLD FOR DISPOSAL. WASH CONTAMINATE D SURFACES TO REMOVE ANY RESIDUES.

Section 7 - Handling and Storage
TETRACHLOROETHENE, 0-663

Handling and Storage Precautions:

Other Precautions:

Section 8 - Exposure Controls & Personal Protection
TETRACHLOROETHENE, 0-663

Repiratory Protection:
WEAR NIOSH/MSHA APPROVED RESPIRATOR APPROPRIATE FOR EXPOSURE OF CONCERN (FP N).
Ventilation:
CHEMICAL SHOULD BE HANDLED ONLY IN HOOD.
Protective Gloves:
IMPERVIOUS GLOVES (FP N).
Eye Protection: ANSI APPRVD CHEM WORKERS GOGG & (ING 4)
Other Protective Equipment: USE APPROPRIATE OSHA/MSHA APPROVED SAFETY EQUIPMENT.EMER EYEWASH & DELUGE SHOWER WHICH MEET ANSI DESIGN CRITERIA (FP N).
Work Hygenic Practices: NONE SPECIFIED BY MANUFACTURER.
Supplemental Health & Safety Information: EXPLAN OF CARCIN: ANTIC TO BE CARCIN. ANIMAL: LIVER TUMORS. EFTS OF OVEREXP: CAN BE IRRIT TO MUC MEMB. PRLNGD EXPOS MAY CAUSE NAUS/HDCH, DIZZ &/OR EYE DMG. AVOID CONSUMPTION OF ALCOHOL BEFORE & AFTER HNDLG OF CMPD BECAUSE IT WILL INCR TOX OF CMPD. FIRST AID PROC: BRTHG. IF PATIENT HAS STOPPED BRTHG ADMIN ARTF (ING 2)

Section 9 - Physical & Chemical Properties
TETRACHLOROETHENE, 0-663

HCC:
NRC/State License Number:
Net Property Weight for Ammo:
Boiling Point: Boiling Point Text: 250F,121C
Melting/Freezing Point: Melting/Freezing Text: 71.6F,22C
Decomposition Point: Decomposition Text: N/K
Vapor Pressure: 14 @ 20C **Vapor Density:** N/A
Percent Volatile Organic Content:
Specific Gravity: 1.623
Volatile Organic Content Pounds per Gallon:
pH: N/K
Volatile Organic Content Grams per Liter:
Viscosity: N/P
Evaporation Weight and Reference: NOT APPLICABLE
Solubility in Water: INSOLUBLE
Appearance and Odor: COLORLESS LIQUID.
Percent Volatiles by Volume: N/K

Corrosion Rate: N/K

Section 10 - Stability & Reactivity Data
TETRACHLOROETHENE, 0-663

Stability Indicator: YES
Materials to Avoid:
STRONG BASES, OXIDIZING AGENTS.
Stability Condition to Avoid:
NONE SPECIFIED BY MANUFACTURER.
Hazardous Decomposition Products:
DECOMPOSITION LIBERATES TOXIC FUMES. DECOMPOSITION PRODUCTS ARE CORROSIVE.
Hazardous Polymerization Indicator: NO
Conditions to Avoid Polymerization:
NOT RELEVANT.

Section 11 - Toxicological Information
TETRACHLOROETHENE, 0-663

Toxicological Information:
N/P

Section 12 - Ecological Information
TETRACHLOROETHENE, 0-663

Ecological Information:
N/P

Section 13 - Disposal Considerations
TETRACHLOROETHENE, 0-663

Waste Disposal Methods:
BURN IN CHEMICAL INCINERATOR EQUIPPED WITH AN AFTERBURNER AND SCRUBBER. DISPOSE OF IN ACCORDANCE WITH FEDERAL, STATE AND LOCAL REGULATIONS (FP N).

Section 14 - MSDS Transport Information
TETRACHLOROETHENE, 0-663

Transport Information:
N/P

Section 15 - Regulatory Information
TETRACHLOROETHENE, 0-663

SARA Title III Information:
N/P
Federal Regulatory Information:
N/P
State Regulatory Information:
N/P

Section 16 - Other Information
TETRACHLOROETHENE, 0-663

Other Information:
N/P

HAZCOM Label Information

Product Identification: TETRACHLOROETHENE, 0-663
CAGE: 84898
Assigned Individual: N
Company Name: CHEM SERVICE INC
Company PO Box: 3108
Company Street Address1: N/K
Company Street Address2: WEST CHESTER, PA 19381 US
Health Emergency Telephone: 215-692-3026
Label Required Indicator: Y
Date Label Reviewed: 11/03/1994
Status Code: C
Manufacturer's Label Number:
Date of Label: 11/03/1994
Year Procured: N/K
Organization Code: G
Chronic Hazard Indicator: Y
Eye Protection Indicator: YES
Skin Protection Indicator: YES
Respiratory Protection Indicator: YES
Signal Word: WARNING
Health Hazard: Moderate
Contact Hazard: Moderate
Fire Hazard: None
Reactivity Hazard: None

Material Safety Data Sheets

Division of Facilities Services

DOD Hazardous Material Information (ANSI Format)
For Cornell University Convenience Only

TRICHLOROETHENE, 0-664

Section 1 - Product and Company Identification	Section 9 - Physical & Chemical Properties
Section 2 - Compositon/Information on Ingredients	Section 10 - Stability & Reactivity Data
Section 3 - Hazards Identification Including Emergency Overview	Section 11 - Toxicological Information
Section 4 - First Aid Measures	Section 12 - Ecological Information
Section 5 - Fire Fighting Measures	Section 13 - Disposal Considerations
Section 6 - Accidental Release Measures	Section 14 - MSDS Transport Information
Section 7 - Handling and Storage	Section 15 - Regulatory Information
Section 8 - Exposure Controls & Personal Protection	Section 16 - Other Information

The information in this document is compiled from information maintained by the United States Department of Defense (DOD). Anyone using this information is solely reponsible for the accuracy and applicability of this information to a particular use or situation.
Cornell University does not in any way warrant or imply the applicability, viability or use of this information to any person or for use in any situation.

Section 1 - Product and Company Identification
TRICHLOROETHENE, 0-664

Product Identification: TRICHLOROETHENE, 0-664
Date of MSDS: 01/07/1993 **Technical Review Date:** 10/26/1994
FSC: 6810 **NIIN: LIIN:** 00N054683
Submitter: N EN
Status Code: C
MFN: 01
Article: N
Kit Part: N

Manufacturer's Information

Manufacturer's Name: CHEM SERVICE INC
Post Office Box: 3108
Manufacturer's Address1:
Manufacturer's Address2: WEST CHESTER, PA 19381
Manufacturer's Country: US
General Information Telephone: 215-692-3026
Emergency Telephone: 215-692-3026
Emergency Telephone: 215-692-3026
MSDS Preparer's Name: N/P
Proprietary: N
Reviewed: N
Published: Y
CAGE: 84898
Special Project Code: N

Contractor Information

Contractor's Name: CHEM SERVICE INC
Post Office Box: 3108
Contractor's Address1: N/K
Contractor's Address2: WEST CHESTER, PA 19381
Contractor's Telephone: 215-692-3026
Contractor's CAGE: 84898

Contractor Information

Contractor's Name: CHEM SERVICE, INC
Post Office Box: 599
Contractor's Address1: 660 TOWER LN
Contractor's Address2: WEST CHESTER, PA 19301-9650
Contractor's Telephone: 610-692-3026
Contractor's CAGE: 8Y898

Section 2 - Compositon/Information on Ingredients
TRICHLOROETHENE, 0-664

Ingredient Name: ETHYLENE, TRICHLORO-; (TRICHLOROETHYLENE) (SARA III). LD50: (ORAL,RAT) 4920 MG/KG.
Ingredient CAS Number: 79-01-6 **Ingredient CAS Code:** M
RTECS Number: KX4550000 **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:

% High Volume: % High Volume Code:
% Text: N/K
% Enviromental Weight:
Other REC Limits: N/K
OSHA PEL: 100 PPM **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: 50 PPM;100 STEL **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity: 100 LBS
DOT Reporting Quantity: 100 LBS
Ozone Depleting Chemical: N

Ingredient Name: OTHER PREC:CAUSE THE FORMATION OF HCL &/OR PHOSGENE (FP N).
Ingredient CAS Number: Ingredient CAS Code: X
RTECS Number: 9999999ZZ **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: N/K
% Enviromental Weight:
Other REC Limits: N/K
OSHA PEL: NOT APPLICABLE **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: NOT APPLICABLE **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical:

Ingredient Name: SUPDAT:BY MD/TRAINED EMERGENCY PERSONNEL. MEDICAL ADVICE CAN BE OBTAINED FROM A POISON CONTROL CENTER.
Ingredient CAS Number: Ingredient CAS Code: X
RTECS Number: 9999999ZZ **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: N/K

% Enviromental Weight:
Other REC Limits: N/K
OSHA PEL: NOT APPLICABLE **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: NOT APPLICABLE **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical:

Section 3 - Hazards Identification, Including Emergency Overview
TRICHLOROETHENE, 0-664

Health Hazards Acute & Chronic: ALL CHEMS SHOULD BE CONSIDERED HAZ - AVOID DIRECT PHYSICAL CONT! SUSPECTED CARCIN - MAY PRDCE CANCER. MAY BE HARMFUL IF ABSORBED THRU SKIN, INHALED/SWALLOWED. LACHRYMATOR - CAUSES SEV EYE IRRIT. VAPS &/OR DIRECT EYE CONT CAN CAUSE SEV EYE BURNS. CAN CAUSE SKIN/EYE IRRIT. CAUSE CAUSE SKIN BURNS. CAN (EFTS OF OVEREXP)

Signs & Symptoms of Overexposure:
HLTH HAZ:CAUSE SEV SKIN BURNS. EXPOS CAN CAUSE LIVER/KIDNEY DMG. CAN CAUSE GI DISTURBS. CAN BE IRRIT TO MUC MEMBS. PRLNG EXPOS MAY CAUSE NAUS, HDCH, DIZZ &/OR EYE DMG. CAN CAUSE SENSIT BY SKIN CONT. C HLOROCARBON MATLS HAVE PRDCD SENSIT OF MYOCARDIUM TO EPINEPHRINE IN LAB ANIMALS & COULD HAVE SIMILAR EFT IN (SUPP DATA)

Medical Conditions Aggravated by Exposure:
NONE SPECIFIED BY MANUFACTURER.

LD50 LC50 Mixture: SEE INGREDIENT.

Route of Entry Indicators:
- **Inhalation:** YES
- **Skin:** YES
- **Ingestion:** YES

Carcenogenicity Indicators
- **NTP:** NO
- **IARC:** NO
- **OSHA:** NO

Carcinogenicity Explanation: NOT RELEVANT

Section 4 - First Aid Measures
TRICHLOROETHENE, 0-664

First Aid:
INGEST:CALL MD IMMED (FP N). EYES:FLUSH CONTINUOUSLY W/WATER FOR AT LST 15-20 MINS. SKIN:FLUSH W/WATER FOR 15-20 MINS. IF NO BURNS HAVE OCCURRED - USE SOAP & WATER TO CLEANSE SKIN. INHAL:REMOVE PATIEN T TO FRESH AIR. ADMIN

OXYGEN IF PATIENTIS HAVING DFCLTY BRTHG. IF PATIENT HAS STOPPED BRTHG ADMIN ARTF RESP. IF PATIENT IS IN CARDIAC ARREST ADMIN CPR. CONTINUE LIFE SUPPORTING MEASURES UNTIL(SUPDAT)

Section 5 - Fire Fighting Measures
TRICHLOROETHENE, 0-664

Fire Fighting Procedures:
USE NIOSH/MSHA APPROVED PRESSURE DEMAND SCBA & FULL PROTECTIVE EQUIPMENT (FP N).
Unusual Fire or Explosion Hazard:
THERMAL DECOMPOSITION PRODUCTS MAY INCLUDE HCL & PHOSGENE (FP N).
Extinguishing Media:
CARBON DIOXIDE, DRY CHEMICAL POWDER OR SPRAY.
Flash Point: Flash Point Text: NON-FLAMMABLE

Autoignition Temperature:
Autoignition Temperature Text: N/A
Lower Limit(s): 11%
Upper Limit(s): 41%

Section 6 - Accidental Release Measures
TRICHLOROETHENE, 0-664

Spill Release Procedures:
EVACUATE AREA. WEAR APPROPRIATE OSHA REGULATED EQUIPMENT. VENTILATE AREA. ABSORB ON VERMICULITE OR SIMILAR MATERIAL. SWEEP UP & PLACE IN AN APPROPRIATE CONTAINER. HOLD FOR DISPOSAL. WASH CONTAMINATED SURFACES TO REMOVE ANY RESIDUES.

Section 7 - Handling and Storage
TRICHLOROETHENE, 0-664

Handling and Storage Precautions:

Other Precautions:

Section 8 - Exposure Controls & Personal Protection
TRICHLOROETHENE, 0-664

Repiratory Protection:
NIOSH/MSHA APPROVED RESPIRATOR APPROPRIATE FOR EXPOSURE OF CONCERN (FP N).
Ventilation:
THIS CHEMICAL SHOULD ONLY BE HANDLED IN A HOOD.
Protective Gloves:
IMPERVIOUS GLOVES (FP N).
Eye Protection: ANSI APPROVED CHEM WORKERS GOGGS (FP N).
Other Protective Equipment: USE APPROPRIATE NIOSH/MSHA APPROVED SAFETY EQUIPMENT.

Work Hygenic Practices: CONTACT LENSES SHOULD NOT BE WORN IN THE LABORATORY. ANSI APPRVD EYE WASH & DELUGE SHOWER (FP N).
Supplemental Health & Safety Information: EFTS OF OVEREXP:HUMANS. ADRENOMIMETICS (E.G., EPINEPRHINE) MAY BE CONTRAINDICATED EXCEPT FOR LIFE-SUSTAINING USES IN HUMANS ACUTELY/CHRONICALLY EXPOS TO CHLOROCARBONS (FP N). FIRST AID PROC:MED ASSIST ANCE HAS ARRIVED. NOTE:AN ANTIDOTE IS ASUBSTANCE INTENDED TO COUNTERACT EFT OF A POIS. IT SHOULD BE ADMIN ONLY (ING 2)

Section 9 - Physical & Chemical Properties
TRICHLOROETHENE, 0-664

HCC:
NRC/State License Number:
Net Property Weight for Ammo:
Boiling Point: Boiling Point Text: 189F,87C
Melting/Freezing Point: Melting/Freezing Text: -125F,-87C
Decomposition Point: Decomposition Text: N/K
Vapor Pressure: 58 @ 20C **Vapor Density:** N/K
Percent Volatile Organic Content:
Specific Gravity: 1.462
Volatile Organic Content Pounds per Gallon:
pH: N/K
Volatile Organic Content Grams per Liter:
Viscosity: N/P
Evaporation Weight and Reference: N/K
Solubility in Water: INSOL (IMMISCIBLE)
Appearance and Odor: COLORLESS LIQUID.
Percent Volatiles by Volume: N/K
Corrosion Rate: N/K

Section 10 - Stability & Reactivity Data
TRICHLOROETHENE, 0-664

Stability Indicator: YES
Materials to Avoid:
INCOMPATIBLE W/STRONG BASES, STRONG OXIDIZING AGENTS.
Stability Condition to Avoid:
NONE SPECIFIED BY MANUFACTURER.
Hazardous Decomposition Products:
DECOMPOSITION LIBERATES TOXIC FUMES. DECOMPOSTION PRODUCTS ARE CORROSIVE. VOLATILE. HCL, PHOSGENE (FP N).
Hazardous Polymerization Indicator: NO
Conditions to Avoid Polymerization:
NOT RELEVANT

Section 11 - Toxicological Information
TRICHLOROETHENE, 0-664

Toxicological Information:
N/P

Section 12 - Ecological Information

TRICHLOROETHENE, 0-664

Ecological Information:
N/P

Section 13 - Disposal Considerations
TRICHLOROETHENE, 0-664

Waste Disposal Methods:
DISPOSAL MUST BE I/A/W FEDERAL, STATE & LOCAL REGULATIONS (FP N). BURN IN A CHEMICAL INCINERATOR EQUIPPED W/AFTERBURNER & SCRUBBER.

Section 14 - MSDS Transport Information
TRICHLOROETHENE, 0-664

Transport Information:
N/P

Section 15 - Regulatory Information
TRICHLOROETHENE, 0-664

SARA Title III Information:
N/P
Federal Regulatory Information:
N/P
State Regulatory Information:
N/P

Section 16 - Other Information
TRICHLOROETHENE, 0-664

Other Information:
N/P

HAZCOM Label Information

Product Identification: TRICHLOROETHENE, 0-664
CAGE: 84898
Assigned Individual: N
Company Name: CHEM SERVICE INC
Company PO Box: 3108
Company Street Address1: N/K
Company Street Address2: WEST CHESTER, PA 19381 US
Health Emergency Telephone: 215-692-3026
Label Required Indicator: Y
Date Label Reviewed: 10/26/1994
Status Code: C
Manufacturer's Label Number:
Date of Label: 10/26/1994
Year Procured: N/K
Organization Code: G
Chronic Hazard Indicator: Y
Eye Protection Indicator: YES
Skin Protection Indicator: YES

Respiratory Protection Indicator: YES
Signal Word: DANGER
Health Hazard: Moderate
Contact Hazard: Severe
Fire Hazard: None
Reactivity Hazard: None

8/9/2002 8:48:03 AM

Material Safety Data Sheets

Division of Facilities Services

DOD Hazardous Material Information (ANSI Format)
For Cornell University Convenience Only

PLASTISOL, VINYL CHLORIDE

Section 1 - Product and Company Identification	Section 9 - Physical & Chemical Properties
Section 2 - Compositon/Information on Ingredients	Section 10 - Stability & Reactivity Data
Section 3 - Hazards Identification Including Emergency Overview	Section 11 - Toxicological Information
Section 4 - First Aid Measures	Section 12 - Ecological Information
Section 5 - Fire Fighting Measures	Section 13 - Disposal Considerations
Section 6 - Accidental Release Measures	Section 14 - MSDS Transport Information
Section 7 - Handling and Storage	Section 15 - Regulatory Information
Section 8 - Exposure Controls & Personal Protection	Section 16 - Other Information

The information in this document is compiled from information maintained by the United States Department of Defense (DOD). Anyone using this information is solely reponsible for the accuracy and applicability of this information to a particular use or situation.
Cornell University does not in any way warrant or imply the applicability, viability or use of this information to any person or for use in any situation.

Section 1 - Product and Company Identification
PLASTISOL, VINYL CHLORIDE

Product Identification: PLASTISOL, VINYL CHLORIDE
Date of MSDS: 01/01/1996 **Technical Review Date:** 07/09/1997
FSC: 8030 **NIIN:** 00-763-4841
Submitter: G AW
Status Code: C
MFN: 01
Article: N
Kit Part: Y

Manufacturer's Information

Manufacturer's Name: INTERNATIONAL COATINGS CO
Manufacturer's Address1: 13929 EAST 166TH ST
Manufacturer's Address2: CERRITOS, CA 90701
Manufacturer's Country: US
General Information Telephone: 310-925-0747
Emergency Telephone: 310-926-8332
Emergency Telephone: 310-926-8332
MSDS Preparer's Name: EISENHARD
Proprietary: N
Reviewed: Y
Published: Y
CAGE: 0M246
Special Project Code: N

Item Description

Item Name: COATING COMPOUND,PLASTISOL
Item Manager: GSA
Specification Number: NK
Type/Grade/Class: NK
Unit of Issue: KT
Unit of Issue Quantity: 4
Type of Container: NK

Contractor Information

Contractor's Name: CHEMICAL COMMODITIES AGENCY, INC.
Contractor's Address1: 27447 PACIFIC STREET
Contractor's Address2: HIGHLAND, CA 92346-2640
Contractor's Telephone: 909-864-2310
Contractor's CAGE: 60777

Contractor Information

Contractor's Name: INTERNATIONAL COATINGS
Contractor's Address1: 7059 BARRY ST
Contractor's Address2: ROSEMONT, IL 60018
Contractor's Telephone: 312-824-6070
Contractor's CAGE: 0M246

Section 2 - Compositon/Information on Ingredients
PLASTISOL, VINYL CHLORIDE

Ingredient Name: DIBASIC LEAD PHTHLATE
Ingredient CAS Number: 7439-92-1 **Ingredient CAS Code:** M
RTECS Number: OF7525000 **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:

>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: 2.75
% Enviromental Weight:
Other REC Limits: NONE RECOMMENDED
OSHA PEL: 0.05 MG/M3 **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: 0.15 MG/M3 **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity: 1 LB
DOT Reporting Quantity: 1 LB
Ozone Depleting Chemical: N

Ingredient Name: VINYL CHLORIDE MONOMER (SARA III)
Ingredient CAS Number: 75-01-4 **Ingredient CAS Code:** M
RTECS Number: KU9625000 **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: <0.003
% Enviromental Weight:
Other REC Limits: NK
OSHA PEL: 1 PPM; 5 PPM CEILING **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: 5 PPM **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity: 1 LB
DOT Reporting Quantity: 1 LB
Ozone Depleting Chemical: N

Section 3 - Hazards Identification, Including Emergency Overview
PLASTISOL, VINYL CHLORIDE

Health Hazards Acute & Chronic: CHRONIC: SEVERE DAMAGE TO BLOOD, GI, NERVOUS & REPRODUCTIVE SYSTEMS. INGEST: HARMFUL. SKIN/EYE: IRRITATION, ABSORPTION.

Signs & Symptoms of Overexposure:
NK

Medical Conditions Aggravated by Exposure:
NK

LD50 LC50 Mixture: NK

Route of Entry Indicators:
Inhalation: YES
Skin: YES
Ingestion: YES

Carcenogenicity Indicators
NTP: NO
IARC: YES
OSHA: NO

Carcinogenicity Explanation: LEAD CHROMATE IS LISTED AS A SUSPECTED CARCINOGEN.

Section 4 - First Aid Measures
PLASTISOL, VINYL CHLORIDE

First Aid:
EYE: FLUSH W/WATER FOR >15 MINUTES. SKIN: WASH W/SOAP & WATER. INHAL: REMOVE TO FRESH AIR. INGEST: GIVE FLUIDS. SEEK MEDICAL ATTENTION IN ALL CASES.

Section 5 - Fire Fighting Measures
PLASTISOL, VINYL CHLORIDE

Fire Fighting Procedures:
USE NIOSH/MSHA APPROVED SCBA & FULL PROTECTIVE EQUIPMENT.
Unusual Fire or Explosion Hazard:
CLOSED CONTAINERS MAY EXPLODE W/HEAT.
Extinguishing Media:
WATER SPRAY, FOAM, CARBON DIOXIDE, DRY CHEMICAL.
Flash Point: Flash Point Text: 415F,213C

Autoignition Temperature:
Autoignition Temperature Text: NK
Lower Limit(s): 0.4%
Upper Limit(s): NA

Section 6 - Accidental Release Measures
PLASTISOL, VINYL CHLORIDE

Spill Release Procedures:
ABSORB, TRANSFER TO CONTAINER FOR DISPOSAL AS HAZARDOUS WASTE.

Section 7 - Handling and Storage
PLASTISOL, VINYL CHLORIDE

Handling and Storage Precautions:

Other Precautions:

Section 8 - Exposure Controls & Personal Protection
PLASTISOL, VINYL CHLORIDE

Repiratory Protection:
NONE REQUIRED.
Ventilation:
GOOD VENTILATION SHOULD BE PROVIDED
Protective Gloves:
IMPERVIOUS GLOVES (NEOPRENE).
Eye Protection: CHEM WORKERS GOGGS.
Other Protective Equipment: NOT REQUIRED.
Work Hygenic Practices: WASH HANDS AFTER USE, BEFORE EATING, DRINKING OR SMOKING.
Supplemental Health & Safety Information: MORE INFORMATION ON FILE.

Section 9 - Physical & Chemical Properties
PLASTISOL, VINYL CHLORIDE

HCC:
NRC/State License Number: NK
Net Property Weight for Ammo: NK
Boiling Point: Boiling Point Text: 410F,210C
Melting/Freezing Point: Melting/Freezing Text: NK
Decomposition Point: Decomposition Text: NK
Vapor Pressure: NIL **Vapor Density:** >1.0
Percent Volatile Organic Content:
Specific Gravity: 1-1.4
Volatile Organic Content Pounds per Gallon:
pH: NK
Volatile Organic Content Grams per Liter:
Viscosity: NK
Evaporation Weight and Reference: NIL (BUTYL ACETATE=1)
Solubility in Water: NIL
Appearance and Odor: SMOOTH THICK LIQUID; FAINT ODOR.
Percent Volatiles by Volume: NK
Corrosion Rate: NK

Section 10 - Stability & Reactivity Data
PLASTISOL, VINYL CHLORIDE

Stability Indicator: YES
Materials to Avoid:
STRONG OXIDIZERS.
Stability Condition to Avoid:
ELEVATED TEMPERATURES.
Hazardous Decomposition Products:

CARBON MONOXIDE, CARBON DIOXIDE, HYDROGEN CHLORIDE, ACETIC ACID, TOXIC METAL FUMES.
Hazardous Polymerization Indicator: NO
Conditions to Avoid Polymerization:
NK

Section 11 - Toxicological Information
PLASTISOL, VINYL CHLORIDE

Toxicological Information:
N/P

Section 12 - Ecological Information
PLASTISOL, VINYL CHLORIDE

Ecological Information:
N/P

Section 13 - Disposal Considerations
PLASTISOL, VINYL CHLORIDE

Waste Disposal Methods:
DISPOSE OF ALL WASTES I/A/W FEDERAL, STATE & LOCAL REGULATIONS.

Section 14 - MSDS Transport Information
PLASTISOL, VINYL CHLORIDE

Transport Information:
N/P

Section 15 - Regulatory Information
PLASTISOL, VINYL CHLORIDE

SARA Title III Information:
N/P
Federal Regulatory Information:
N/P
State Regulatory Information:
N/P

Section 16 - Other Information
PLASTISOL, VINYL CHLORIDE

Other Information:
N/P

HMIS Transportation Information

Product Identification: PLASTISOL, VINYL CHLORIDE
Transporation ID Number: 84766
Responsible Party CAGE: 0M246
Date MSDS Prepared: 01/01/1996
Date MSDS Reviewed: 07/09/1997
MFN: 07/09/1997

Submitter: G AW
Status Code: C

Container Information
Unit of Issue: KT
Container Quantity: 4
Type of Container: NK
Net Unit Weight: NK

Article without MSDS: N
Technical Entry NOS Shipping Number: NK
Radioactivity: NK
Form:
Net Explosive Weight: NK
Coast Guard Ammunition Code: NK
Magnetism: N/P
AF MMAC Code: NK
DOD Exemption Number: NK
Limited Quantity Indicator:
Multiple Kit Number: 0
Kit Indicator: N
Kit Part Indicator: Y
Review Indicator: Y
Additional Data:
NK

Department of Transportation Information
DOT Proper Shipping Name: NOT REGULATED BY THIS MODE OF TRANSPORTATION
DOT PSN Code: ZZZ
Symbols: N/R
DOT PSN Modifier:
Hazard Class: N/R
UN ID Number: N/R
DOT Packaging Group: N/R
Label: N/R
Special Provision(s): N/R
Packaging Exception: N/R
Non Bulk Packaging: N/R
Bulk Packaging: N/R
Maximimum Quanity in Passenger Area: N/R
Maximimum Quanity in Cargo Area: N/R
Stow in Vessel Requirements: N/R
Requirements Water/Sp/Other: N/R

IMO Detail Information
IMO Proper Shipping Name: NOT REGULATED FOR THIS MODE OF TRANSPORTATION
IMO PSN Code: ZZZ
IMO PSN Modifier:
IMDG Page Number: N/R
UN Number: N/R
UN Hazard Class: N/R
IMO Packaging Group: N/R

Subsidiary Risk Label: N/R
EMS Number: N/R
Medical First Aid Guide Number: N/R

IATA Detail Information

IATA Proper Shipping Name: NOT REGULATED BY THIS MODE OF TRANSPORTATION
IATA PSN Code: ZZZ
IATA PSN Modifier:
IATA UN Id Number: N/R
IATA UN Class: N/R
Subsidiary Risk Class: N/R
UN Packaging Group: N/R
IATA Label: N/R
Packaging Note for Passengers: N/R
Maximum Quantity for Passengers: N/R
Packaging Note for Cargo: N/R
Maximum Quantity for Cargo: N/R
Exceptions: N/R

AFI Detail Information

AFI Proper Shipping Name: NOT REGULATED BY THIS MODE OF TRANSPORTATION
AFI Symbols:
AFI PSN Code: ZZZ
AFI PSN Modifier:
AFI UN Id Number: N/R
AFI Hazard Class: N/R
AFI Packing Group: N/R
AFI Label: N/R
Special Provisions: N/A
Back Pack Reference: N/A

HAZCOM Label Information

Product Identification: PLASTISOL, VINYL CHLORIDE
CAGE: 0M246
Assigned Individual: N
Company Name: INTERNATIONAL COATINGS
Company PO Box:
Company Street Address1: 7059 BARRY ST
Company Street Address2: ROSEMONT, IL 60018 US
Health Emergency Telephone: 310-926-8332
Label Required Indicator: Y
Date Label Reviewed: 10/12/1999
Status Code: A
Manufacturer's Label Number:
Date of Label:
Year Procured: N/K
Organization Code: G
Chronic Hazard Indicator: N/P
Eye Protection Indicator: N/P
Skin Protection Indicator: N/P
Respiratory Protection Indicator: N/P
Signal Word: N/P
Health Hazard:
Contact Hazard:

Fire Hazard:
Reactivity Hazard:

8/8/2002 12:17:48 AM

Appendix C

Activity Hazard Analysis

ACTIVITY HAZARD ANALYSES

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: General Site Hazards

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
General Site Hazards	Back Injuries	Back Injuries ♦ Site personnel will be instructed on proper lifting techniques. ♦ Mechanical devices should be used to reduce manual handling of materials. ♦ Team lifting should be utilized if mechanical devices are not available.
	Slips/Trips/Falls	Slips/Trips/Falls ♦ Maintain work areas safe and orderly. ♦ Unloading areas should be on even terrain. ♦ Mark and repair if possible tripping hazards.
	Vehicular Traffic	Vehicular Traffic ♦ Spotters will be used when backing up trucks and heavy equipment and when moving equipment.
	Overhead Hazards	Overhead Hazards ♦ Personnel will be required to wear hard hats that meet ANSI Standard Z89.1. ♦ All ground personnel will stay clear of suspended loads. ♦ All equipment will be provided with guards, canopies or grills to protect the operator from falling or flying objects. ♦ All overhead hazards will be identified prior to commencing work operations.
	Dropped Objects	Dropped Objects ♦ Steel toe boots meeting ANSI Standard Z41 will be worn.
	Noise	Noise ♦ Hearing protection will be worn with a noise reduction rating capable of maintaining personal exposure below 85 dBA (ear muffs or plugs). ♦ SHSO will determine the need for hearing protection. ♦ All equipment will be equipped with manufacturer's required mufflers.
	Eye Injuries	Eye Injuries Safety glasses meeting ANSI Standard Z87 will be worn. ANSI approved, tight fitting, safety goggles will be worn during high wind or dust generating tasks/conditions. http://www.shop.com/op/~AO_Safety_Maxim_153_2x2_Goggle-prod-12292770

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: General Site Hazards

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Heavy Equipment (overhead hazards, spills, struck by or against)	Heavy Equipment ♦ Equipment will have seat belts. ♦ Operators will wear seat belts when operating equipment. ♦ Do not operate equipment on grades that exceed manufacturer's recommendations. ♦ Equipment will have guards, canopies or grills to protect from flying objects. ♦ Ground personnel will stay clear of all suspended loads. ♦ Spill and absorbent materials will be readily available. ♦ Drip pans, polyethylene sheeting or other means will be used for secondary containment. ♦ Ground personnel will stay out of the swing radius. ♦ Eye contact with operators will be made before approaching equipment. ♦ Operator will acknowledge eye contact by removing his hands from the controls. ♦ Equipment will not be approached on blind sides. ♦ All equipment will have backup alarms.
	Heat Stress	Heat Stress ♦ Drink adequate amounts of liquids throughout the workday. ♦ Eat three meals a day to supply nourishment. ♦ Seek cool area and rest when needed. ♦ Watch fellow workers for signs of heat stress. ♦ Institute work/rest regimens as necessary. ♦ Physiological monitoring to be conducted when ambient temperatures greater than 85°F.
	Cold Stress	Cold Stress ♦ Wear adequate number of dry layered clothing. ♦ Seek heated area when needed. ♦ Watch fellow workers for signs of cold stress.
	Struck by vehicle/equipment	Struck by vehicle/equipment ♦ Be aware of heavy equipment operations. ♦ Keep out of the swing radius of heavy equipment. ♦ Ground personnel in the vicinity of heavy equipment operations will be within the view of the operator at all times. ♦ Ground personnel will be aware of the counterweight swing and maintain an adequate buffer zone. ♦ Ground personnel will not stand directly behind heavy equipment when it is in operation. ♦ Drivers will keep workers on foot in their vision at all times, if you lose sight of someone, Stop!

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: General Site Hazards

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Struck by tools	Struck by tools ♦ Cut resistant Kevlar work gloves will be worn when working with sharp objects. ♦ All hand and power tools will be maintained in safe condition. ♦ Guards will be kept in place while using hand and power tools.
	Caught in/on/between	Caught in/on/between ♦ Workers will not position themselves between equipment and a stationary object. ♦ Workers will not wear long hair or jewelry if working with tools/machinery.
	Contact with electricity/lightning	Contact with electricity/lightning ♦ All electrical tools and equipment will be equipped with GFCI. ♦ Electrical extension cords will be of the "Hard" or "Extra Hard" service type. ♦ All electrical work will be conducted by a licensed electrician. ♦ All utilities will be marked prior to excavation activities proceeding, follow EHS 3-15 "Underground Utilities" (Appendix E). ♦ All equipment will stay a minimum of 15 feet from overhead energized electrical lines (50 kV); this distance will increase .4 inches for each 1 kV above 50 kV. ♦ The weather will be monitored for approaching electrical storms. All outside work will stop if lightning is sighted and will not resume until 30 minutes after the last report of lightning.

EQUIPMENT USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
1. Heavy Equipment 2. Small tools 3. Appropriate PPE 4. First Aid Kits 5. Portable Eyewash	1. Inspections will be performed on equipment prior to each use. 2. Inspections will be performed on tools prior to each use. 3. Inspections will be performed on PPE prior to each use. 4. Weekly inspections will be performed on first aid kits. 5. Portable eye wash will be inspected weekly	1. Personnel have read and comply with SHSP & AHA. 2. Site specific training. 3. Qualified operators will be used for equipment operation. 4. At least two individuals on-site will have current CPR, First aid and bloodborne pathogen training.

ACTIVITY HAZARD ANALYSES

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Mobilization/Demobilization, Site Preparation

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
Mobilization/Demobilization of Equipment and Supplies	Struck by Heavy Equipment/Vehicles	Struck by Heavy Equipment/Vehicles ♦ Be aware of heavy equipment operations. ♦ Keep out of the swing radius of heavy equipment. ♦ Ground personnel in the vicinity of heavy equipment operations will be within the view of the operator at all times. ♦ Ground personnel will be aware of the counterweight swing and maintain an adequate buffer zone. ♦ Ground personnel will not stand directly behind heavy equipment when it is in operation. ♦ All vehicles & equipment will be operated at a reasonable speed. ♦ Only qualified persons will operate equipment.
	Struck by Equipment/Supplies	Struck by Equipment/Supplies ♦ Workers will maintain proper space around their work area, if someone enters it, stop work. ♦ When entering another worker's workspace, give a verbal warning so they know you are there.
	Overexertion Unloading/Loading Supplies	Overexertion Unloading/Loading Supplies ♦ Train workers on proper body mechanics, do not bend or twist at the waist while exerting force or lifting. ♦ Avoid repetitive tasks; rotate personnel at regular intervals. ♦ No person should lift loads over 50 lbs. alone.
	Caught in/on/between	Caught in/on/between ♦ Do not place yourself between two vehicles or between a vehicle and a fixed object.
	Slip/Trip/Fall	Slip/Trip/Fall ♦ Immediately report slip/trip/fall hazards to workers & supervisors. ♦ Mark all holes and low spots in area with banner tape. Instruct personnel to avoid these areas. ♦ Unloading areas should be on even terrain. ♦ Drivers will maintain 3 point contact when mounting/dismounting vehicles/equipment. ♦ Drivers will check surface before stepping, not jumping down. ♦ Any ladders used will be tied off to a support structure. ♦ Personnel will not work at heights greater than 6 feet above a surface without fall protection consisting of guardrails or personal fall arrest systems with approved anchors.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Mobilization/Demobilization, Site Preparation

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
Site Preparation	Overexertion Installing Soil Erosion Controls	Overexertion Installing Soil Erosion Controls ♦ Train workers on proper body mechanics, do not bend or twist at the waist while exerting force or lifting.
	Struck against wood stakes	Struck against wood stakes ♦ Wear Leather Work Gloves as per Table 6-1 to prevent splinters.
EQUIPMENT USED	**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**
1. Heavy Equipment 2. Appropriate PPE 3. First Aid Kits 4. Portable Eyewash 5. Fire Extinguishers 6. Air Monitoring Equipment	1. Inspections will be performed on equipment prior to each use. 2. Inspections will be performed on PPE prior to each use. 3. Weekly inspections will be performed on first aid kits. 4. Portable eye wash will be inspected weekly 5. Weekly inspections will be performed on fire extinguishers. 6. Air monitoring equipment will be pre- and post calibrated according to manufacturer's specifications.	1. Personnel have read and comply with SHSP 2. Site specific training 3. Qualified operators will be used for equipment operation 4. At least two individuals on-site will have current CPR, First aid and bloodborne pathogen training 5. Instruct personnel on proper use of fire extinguishers 6. Qualified individuals will use air monitoring equipment.

ACTIVITY HAZARD ANALYSES

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Clearing & Grubbing

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
Clearing and Grubbing	Slip, Trip and Fall	Slip, Trip and Fall ♦ Maintain work area free of clutter and debris. ♦ Mark holes, drop offs and uneven surfaces in work area and inform workers to avoid these areas.
	Operating Heavy Equipment	Operating Heavy Equipment ♦ Prior to start-up and operation of a piece of heavy equipment, a visual walk-around inspection shall be performed. ♦ Operators shall always maintain three points of contact when getting on or off equipment. ♦ Operators of heavy equipment shall be qualified to operate the equipment they are assigned to. ♦ Seat belts shall be worn at all times during operation. ♦ All heavy equipment shall be operated in a manner consistent with the manufacturer's recommendations for the work being performed. ♦ Passengers shall not be allowed on construction equipment. ♦ Heavy equipment shall not be used as a personnel lift (elevator) or as a work platform. ♦ Riding in the bed of a dump truck shall not be permitted. ♦ When parking heavy equipment, operators shall utilize the proper braking and parking techniques for the equipment, such as lowering buckets or blades to the ground, using chocks on the wheels, or lowering of forks. ♦ Review Emergency Response Plan for liquid spills including oils, fuels, etc. and ensure equipment/material is available for clean-up.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Clearing & Grubbing

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
Clearing and Grubbing (cont'd)	Working Near Heavy Equipment	Working Near Heavy Equipment ♦ Drivers/Operators will keep workers on foot in sight at all times, if you lose sight of someone, Stop! ♦ Do not approach heavy equipment unless eye contact with appropriate hand signals has been made with the operator to cease activity. Equipment operators shall confirm that eye contact had been made by stopping operation and clearly showing their hands are off of the controls. ♦ Keep out of the swing radius of heavy equipment. ♦ Ground personnel in the vicinity of heavy equipment operations shall be within the view of the operator at all times. ♦ Ground personnel shall be aware of the counterweight swing and an adequate buffer zone shall be barricaded to prevent entry.
Clearing using weed wacker	Struck by flying debris in eyes	Struck by flying debris in eyes ♦ Safety glasses will be worn while on site. ANSI approved, tight fitting, safety goggles will be worn during high wind or dust generating tasks/conditions. http://www.shop.com/op/~AO_Safety_Maxim_153_2x2_Goggle-prod-12292770 ♦ Face shield will be worn in addition to safety glasses while using weed wacker.
	Fall on same level	Fall on same level ♦ Personnel will stay away from debris covered areas when possible. ♦ Area will be cleared before walking in it.
	Contact with biological hazards (e.g., poison ivy; ticks)	Contact with biological hazards (e.g., poison ivy; ticks) ♦ Avoid animals and insects, poison ivy/oak, animal/bird droppings, and poisonous snakes. ♦ Get first aid for any insect bites and report to supervisor or Site Health and Safety Officer (SHSO). ♦ Identify personnel with a known allergic reaction to insect bites or stings at the site orientation. ♦ Personnel will wear tyvek and use insect repellant when walking/working in overgrown areas. ♦ Personnel will conduct frequent checks for ticks.
	Contact with heat/hot engines	Contact with heat/hot engines ♦ Instruct personnel to avoid contact with hot engines.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Clearing & Grubbing

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Contact with noise	Contact with noise ♦ Personnel will wear ear plug or ear muffs while operating weed wacker.
Use farm-type tractor with mower attachment to clear areas	Struck by flying debris in eyes	♦ Safety glasses will be worn while on site. ANSI approved, tight fitting, safety goggles will be worn during high wind or dust generating tasks/conditions. http://www.shop.com/op/~AO_Safety_Maxim_153_2x2_Goggle-prod-12292770
	Caught in rotating shaft	Caught in rotating shaft ♦ Guard shaft.
	Contact with biological hazards	Contact with biological hazards ♦ Personnel will wear tyvek and use insect repellant when walking/working in overgrown areas. ♦ Personnel will conduct frequent checks for ticks.
	Contact with heat/hot engines	Contact with heat/hot engines ♦ Equipment will be shut off during re-fueling. ♦ Fire extinguisher will be kept in area during re-fueling.
	Contact with noise	Contact with noise ♦ Personnel will wear ear plug or ear muffs while operating weed wacker.
	Environmental release while fueling/operating tractor	Environmental release while fueling/operating tractor ♦ Equipment fuels and maintenance fluids will be kept in approved safety containers and flammable storage cabinets. ♦ Spill control kits will be kept in re-fueling area.
Use chain saw to cut small trees	Struck by flying debris in eyes	Struck by flying debris in eyes ♦ Safety glasses will be worn while on site. ♦ Face shield will be worn while using chain saw.
	Struck by chain saw blade	Struck by chain saw blade ♦ Wear Kevlar chaps; always use two hands when starting and operating chain saw. ♦ Start chain saw on ground; cut below shoulder height. ♦ Avoid kickback by not cutting with blade nose or tip, or having tip strike another object.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Clearing & Grubbing

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Struck by falling trees	Struck by falling trees ♦ Wear steel-toed safety boots. ♦ Carefully plan cuts; determine escape route before felling tree (45° from direction of fall of tree). ♦ When tree (> 4" diameter) starts to fall- turn off chain saw, set it down and proceed along escape route- do not return until tree is not moving.
	Contact with heat/hot engines	Contact with heat/hot engines ♦ Equipment will be shut off during re-fueling. ♦ Fire extinguisher will be kept in area during re-fueling.
	Contact with noise	Contact with noise ♦ Personnel will wear ear plug or ear muffs while operating weed wacker.
Feed material to chipper	Struck by flying debris in eyes	Struck by flying debris in eyes ♦ Safety glasses will be worn while on site. Cordon off area with tape. ANSI approved, tight fitting, safety goggles will be worn during high wind or dust generating tasks/conditions. http://www.shop.com/op/~AO_Safety_Maxim_153_2x2_Goggle-prod-12292770
	Struck by brush	Struck by brush ♦ Workers will maintain a safe distance from each other when manually moving brush.

EQUIPMENT USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
1. Heavy Equipment 2. Chain Saw 3. Tractor with mower attachment 4. Chipper	1. Heavy equipment shall be inspected on arrival and daily prior to use. 2. Inspect saw prior to use- ensure teeth are sharpened, check tension and lubrication system for proper function; Also check air filter, sparkplug and muffler. 3. Inspect to ensure mover/blade is secured and guards are in place. 4. Inspect tow hitch and ensure jack is raised for towing; check infeed, belts, hoses and hydraulic fittings; check function of safety bar.	1. Operators shall be trained and qualified to operate the equipment. 2. Site specific training 3. Operator has training on proper use and maintenance of chain saw. 4. Operator has training on proper use and maintenance of brush hog. 5. Operator has training on proper use and maintenance of chipper.

ACTIVITY HAZARD ANALYSES

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Fence Installation

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
Drill holes for fence posts	Strike against Underground Utilities	Strike against Underground Utilities ♦ Follow EHS 3-15 "Underground Utilities". ♦ Mark area to be excavated with white lines. ♦ Call the "One-Call" center to have utilities on public property located and marked. ♦ On private property, a private locating service will be needed and/or a Geophysical Survey will need to be done.
	Overhead Hazards	Overhead Hazards ♦ Personnel will be required to wear hard hats that meet ANSI Standard Z89.1. ♦ All ground personnel will stay clear of suspended loads. ♦ All equipment will be provided with guards, canopies or grills to protect the operator from falling or flying objects. ♦ All overhead hazards will be identified prior to commencing work operations. ♦ All equipment will stay a minimum of 15 feet from energized electrical lines (50kV). This distance will increase .4 inches for each 1kV above 50 kV.
	Struck by Heavy Equipment/Vehicles	Struck by Heavy Equipment/Vehicles ♦ Speed limit for traffic is 15 mph for all areas of the site. ♦ Operators/Drivers will submit a copy of their valid driver's license on initial arrival for each vehicle brought on site. ♦ Drivers will maintain workers on foot in sight, if you lose sight of someone, Stop! ♦ Design the site to minimize backing operations. ♦ Personnel are not allowed to use a cellular phone while driving a vehicle on-site. ♦ Use spotters for traffic control whenever there is "blind spots", backing, or where there are road hazards or unsafe road conditions. ♦ Do not approach heavy equipment unless eye contact with appropriate hand signals has been made with the operator to cease activity. ♦ Equipment operators will confirm that eye contact had been made by stopping operation and clearly showing their hands are off of the controls.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Fence Installation

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Struck By/Against/ Caught By	Struck By/Against/ Caught By ♦ No loose clothing, gauntlet-type gloves, rings, or watches will be worn by personnel operating drill rig equipment. ♦ Personnel will be trained as to the manufacturer recommended procedures prior to commencing operations. ♦ Personnel will understand and review hand signals. ♦ Drill rigs and support equipment will be equipped with backup alarms. ♦ The drill rig operator will verbally alert employees and visually ensure employees are clear from dangerous parts of the equipment prior to starting or engaging equipment. ♦ All drill rig equipment shall be equipped with emergency shutoff devices. Internal combustion engines will be equipped with an ignition or grounding switch. Diesel engines will be equipped with quick closing valves, which will shut off air to the intake manifold. Electric motors will be equipped with suitable switch in motor circuits.
	Chemical hazards	Chemical Hazards ♦ If a gas powered hole digger is used, try to work upwind because the unit gives off carbon monoxide.
	Flying Objects and Debris	Flying Objects and Debris ♦ Safety glasses meeting ANSI Standard Z87 will be worn. ANSI approved, tight fitting, safety goggles will be worn during high wind or dust generating tasks/conditions. http://www.shop.com/op/~AO_Safety_Maxim_153_2x2_Goggle-prod-12292770 ♦ Splash shields and chemical goggles meeting ANSI Standard Z87 will be worn where applicable. ♦ A portable eye wash station will be located adjacent to the work area.
	Fire	Fire ♦ ABC type fire extinguishers shall be readily available; no smoking in work area.
	Fuel Spills	Fuel Spills ♦ Spill and absorbent materials will be readily available.
Install fence posts and fence	Pinch/Cut/Smash Overhead Hazards	Pinch/Cut/Smash ♦ Cut resistant work gloves such as Kevlar will be worn when dealing with sharp objects. ♦ All hand and power tools will be maintained in safe condition. ♦ Guards will be kept in place while using hand and power tools. ♦ Overhead Hazards. ♦ All personnel will wear hard hats meeting ANSI Standard Z89.1. ♦ All equipment will stay a minimum of 15 feet from energized electrical lines. This distance will increase as the voltage of the power lines increase.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Fence Installation

EQUIPMENT USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
1. Heavy Equipment 2. Post Hole Digger 3. Appropriate PPE 4. First Aid Kits 5. Portable Eyewash	1. Heavy equipment will be inspected daily prior to use. 2. Inspections will be performed on equipment prior to each use. 3. Inspections will be performed on PPE prior to each use. 4. Weekly inspections will be performed on first aid kits. 5. Portable eye wash will be inspected weekly	1. Personnel have read and comply with SHSP. 2. Site-specific training. 3. Qualified operators will be used for equipment operation. 4. At least two individuals on-site will have current CPR, First aid and bloodborne pathogen training.

ACTIVITY HAZARD ANALYSES

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Excavation & Backfilling

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
Excavation & Backfilling	Strike against Underground Utilities	Strike against Underground Utilities ♦ Follow EHS 3-15 "Underground Utilities". ♦ Mark area to be excavated with white lines. ♦ Call the "One-Call" center to have utilities on public property located and marked. ♦ On private property a private locating service will be needed and/or a Geophysical Survey will need to be done.
	Fall into Excavation	Fall into Excavation ♦ Fill all excavations as soon as possible. ♦ Workers who must work near edge of trench should wear fall protection. ♦ Barricade excavations to prevent falls. ♦ Do not go closer than 5 feet to the open excavation without fall protection, such as guardrails.
	Cave-ins	Cave-ins ♦ All excavation work shall be performed in accordance with 29 CFR 1926, Subpart P. ♦ A "designated" competent person shall evaluate and approve the stability of excavations and ensure proper personnel protection systems are in place. ♦ Stockpile excavated material at least 3 feet from the edge of excavations. ♦ Do not leave excavations open overnight whenever possible. ♦ Install open trench warning devices/barricades.
	Equipment Tipping Over	Equipment Tipping Over ♦ Heavy equipment shall have rollover equipment as required by 29 CFR 1926.1000. ♦ Seat belts shall be worn at all times during operation. ♦ Operators shall not use equipment on slopes steeper than 1.5H:1.0V unless operation is consistent with manufacturer's recommendations. ♦ Operators of heavy equipment with blades, buckets, beds, etc. shall keep them lowered or in a stable position while on slopes. ♦ Ensure ground personnel are located out of the way of potential equipment turnover or failure (including buckets). ♦ Operators and spotters are to be in constant visual sight. ♦ When dumping a load, a spotter will be used (at a safe distance) to determine if load is not releasing sufficiently. ♦ Equipment not to be left running unattended.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Excavation & Backfilling

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Struck by cave-in	Struck by cave-in ♦ Worker engaged in collecting soil samples for screening or analysis should collect samples from the bucket of the excavator and not enter the pit/trench if it can be avoided. ♦ Follow EHS 6-3 "Excavation and Trenching". ♦ Slope or bench sides of excavation or use shoring or a trench box if workers must enter the excavation. ♦ Keep all soil and other burden at least three feet from edge of trench.
	Struck by Heavy Equipment/Vehicles	Struck by Heavy Equipment/Vehicles ♦ Speed limit for traffic is 15 mph for all areas of the site. ♦ Operators/Drivers will submit a copy of their valid driver's license on initial arrival for each vehicle brought on site. ♦ Drivers will maintain workers on foot in sight, if you lose sight of someone, Stop! ♦ Design the site to minimize backing operations. ♦ Personnel are not allowed to use a cellular phone while driving a vehicle on-site. ♦ Use spotters for traffic control whenever there is "blind spots", backing, or where there are road hazards or unsafe road conditions. ♦ Do not approach heavy equipment unless eye contact with appropriate hand signals has been made with the operator to cease activity. Equipment operators will confirm that eye contact had been made by stopping operation and clearly showing their hands are off of the controls.
	Exposure to Dust	Exposure to Dust ♦ All workers will work upwind from dust generation. ♦ Dust control procedures will be initiated whenever visible dust is generated. ♦ Wear proper PPE as per Table 6-1. ANSI approved, tight fitting, safety goggles will be worn during high wind or dust generating tasks/conditions. http://www.shop.com/op/~AO_Safety_Maxim_153_2x2_Goggle-prod-12292770
	Struck By/Against/ Caught By	Struck By/Against/ Caught By ♦ Personnel will be trained as to the manufacturer recommended procedures prior to commencing operations. ♦ Personnel will understand and review hand signals. ♦ Heavy equipment will be equipped with backup alarms.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Excavation & Backfilling

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Flying Objects and Debris	Flying Objects and Debris ♦ Safety glasses meeting ANSI Standard Z87 will be worn. ♦ ANSI approved, tight fitting, safety goggles will be worn during high wind or dust generating tasks/conditions. http://www.shop.com/op/~AO_Safety_Maxim_153_2x2_Goggle-prod-12292770 ♦ Splash shields and chemical goggles meeting ANSI Standard Z87 will be worn where applicable. ♦ A portable eye wash station will be located adjacent to the work area.
	Overhead Hazards	Overhead Hazards ♦ All personnel will wear hard hats meeting ANSI Standard Z89.1. ♦ All personnel will stay clear of the GeoProbe working area. ♦ All equipment will stay a minimum of 15 feet from energized electrical lines. This distance will increase as the voltage of the power lines increase.
EQUIPMENT USED	**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**
1. Heavy Equipment 2. Appropriate PPE 3. First Aid Kits 4. Portable Eyewash	1. Inspections will be performed on equipment prior to each use. 2. Inspections will be performed on PPE prior to each use. 3. Weekly inspections will be performed on first aid kits. 4. Portable eye wash will be inspected weekly	1. Personnel have read and comply with SHSP. 2. Site-specific training. 3. Qualified operators will be used for equipment operation. 4. At least two individuals on-site will have current CPR, First aid and bloodborne pathogen training.

ACTIVITY HAZARD ANALYSES

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Installation of Access Road & Parking Areas

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
Place & compact base material	Struck by Heavy Equipment/Vehicles	Struck by Heavy Equipment/Vehicles ♦ Speed limit for traffic is 15 mph for all areas of the site. ♦ Operators/Drivers will submit a copy of their valid driver's license on initial arrival for each vehicle brought on site. ♦ Drivers will maintain sight contact with workers on foot, if you lose sight of someone, Stop! ♦ Design the site to minimize backing operations. ♦ Personnel are not allowed to use a cellular phone while driving a vehicle on-site. ♦ Use spotters for traffic control whenever there is "blind spots", backing, or where there are road hazards or unsafe road conditions. ♦ Do not approach heavy equipment unless eye contact with appropriate hand signals has been made with the operator to cease activity. Equipment operators will confirm that eye contact had been made by stopping operation and clearly showing their hands are off the controls.
	Fall into Excavation	Fall into Excavation ♦ Do not leave excavations open overnight, fill them whenever possible or barricade. ♦ Install open trench warning devices/barricades.
	Caught on/in/between	Caught on/in/between ♦ Do not place yourself between two vehicles or between a vehicle and a fixed object.
	Struck By/Against	Struck By/Against ♦ Eye contact with operators will be made before approaching equipment. ♦ Equipment will not be approached on blind sides. ♦ Personnel will avoid equipment swing areas and blind sides. ♦ Personnel will understand and review hand signals. ♦ All machines will be equipped with backup alarms.
	Rollovers	Rollovers ♦ Equipment will have rollover protective structures and seat belts, if applicable. ♦ Operators will wear seat belts when operating equipment, if feasible. ♦ Equipment will not be operated on grades which exceed manufacturer's recommendations.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Installation of Access Road & Parking Areas

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Flying Objects and Debris	Flying Objects and Debris ♦ ANSI approved safety glasses will be worn. ANSI approved, tight fitting, safety goggles will be worn during high wind or dust generating tasks/conditions. http://www.shop.com/op/~AO_Safety_Maxim_153_2x2_Goggle-prod-12292770 ♦ Windows and doors will be closed during equipment operation (if so equipped).
	Overhead Hazards	Overhead Hazards ♦ Equipment will be provided with guards, canopies or grills (if applicable) to protect the operator from falling or flying objects. ♦ All personnel will wear hard hats. ♦ All slings, chains and ropes will be rated for the load in which it is expected to lift. ♦ All ground personnel will stay clear of all suspended loads. ♦ All equipment will stay a minimum of 10 feet from power lines. This distance will increase as the voltage of the power lines increase.
	Inhalation Hazards in the Exclusion Zone	Inhalation Hazards in the Exclusion Zone ♦ Work will not be conducted in exclusion zone areas (for Early Action Phase).
	Contaminant Exposure	Contaminant Exposure ♦ Exclusion zone areas will be identified. Work will not be conducted in exclusion zone areas.
	Noise	Noise ♦ All equipment will be equipped with manufacturers required mufflers. ♦ Hearing protection will be provided with a noise reduction rating capable of maintaining personal exposure below 85 dBA (ear muffs or plugs will be worn).
	Open Excavations	Open Excavations ♦ No excavations are required for this operation, however some small areas of old pavement may be removed. ♦ The areas of removed pavement will be barricaded to prevent field personnel from falling into the open area.
EQUIPMENT USED	**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**
1. Heavy Equipment 2. Appropriate PPE 3. First Aid Kits 4. Portable Eyewash	1. Inspections will be performed on equipment prior to each use. 2. Inspections will be performed on PPE prior to each use. 3. Weekly inspections will be performed on first aid kits. 4. Portable eye wash will be inspected weekly	1. Personnel have read and comply with SHSP. 2. Site-specific training. 3. Qualified operators will be used for equipment operation. 4. At least two individuals on-site will have current CPR, First aid and bloodborne pathogen training.

ACTIVITY HAZARD ANALYSES

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Installation of Treatment Building Sumps

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
Concrete Placement & Finishing	Collapse of Concrete Formwork or Uncured Concrete	Collapse of Concrete Formwork or Uncured Concrete ♦ Formwork & shoring shall be designed to support all loads that my be reasonable anticipated. ♦ Forming & shoring shall be installed by experienced & competent craftsmen per the specified erection drawings. ♦ Formwork & shoring shall be inspected for defects or deviations from specifications by a qualified person prior to, during, and immediately after placement of concrete. ♦ No additional loads, or any applied force of any kind, shall be placed on uncured concrete and its formwork, which exceed the specified limits for the affected area. ♦ No formwork, shoring or bracing shall be removed until the concrete has sufficient strength to support its own weight and the total loads involved. The Engineer shall specify the minimum cure period & strength that is acceptable.
	Specifications for Concrete Strength & Curing Time Not Provided	Specifications for Concrete Strength & Curing Time Not Provided ♦ Testing of concrete shall be performed by qualified personnel to assure compliance with the design specification.
	Employee Contact With Wet Concrete	Employee Contact With Wet Concrete ♦ Employees placing concrete shall wear full length pants, long sleeve shirts, rubber boots and gloves. Washing facilities or waterless soap & eyewash solution shall be provided on-site. ♦ Where appropriate on slab placements, place wire mesh on top rebar layer to prevent workers from falling through opening in rebar grid. ♦ Review MSDSs for concrete, cement, and associated chemical admixtures with all personnel directly involved with this phase of work. ♦ Contact lenses shall not be worn when working with concrete.
	Struck by Concrete Pump or Other Heavy Equipment	Struck by Concrete Pump or Other Heavy Equipment ♦ Designate one person to signal the boom pump truck operator. ♦ Restrict activities within swing radius of equipment. ♦ Ensure all guards and shields are in place. ♦ Restrict activities in vicinity of pump during concrete placing activities. ♦ Utilize experienced and competent craftsman.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Installation of Treatment Building Sumps

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Injuries Resulting From Falls From, Or Contact With Concrete Buckets	Injuries Resulting From Falls From, Or Contact With Concrete Buckets ♦ Ensure bucket is in good operating condition and that gates close tightly keeping concrete in bucket during lifting operations. ♦ Employees shall not ride in/on concrete buckets. ♦ Tag line(s) shall be required on all loads unless tag lines create a safety hazard, i.e., dragging on a high voltage line, critical valves, becoming stuck on rebar, causing a tripping hazard for personnel walking a load, etc. Use as many tag lines as necessary to adequately control the load. ♦ Personnel shall not place hands on load until it is at least shoulder height and arm is kept fully extended. If area of placement is congested and if sudden load shift would trap personnel between loads and other objects, the shoulder method shall not be used (only taglines; until load is within 1 foot of ground or cribbing). ♦ Employees shall not work under concrete buckets.
	Electric Shock	Electric Shock ♦ All overhead power lines that may come in contact with placing equipment shall be de-energized or guarded to protect from electrical shock. If unable to de-energized or guard, contact Project Superintendent for evaluation. ♦ Handles on bull floats, when used where the possibility exists to contact electrical lines, shall be constructed of a non-conductive material or insulated with a non-conductive sheath. ♦ When using wet cutting concrete saws, care should be taken that waste water does not come in contact with nearby electrical cords and equipment. ♦ All electric power tools and equipment shall have GFCI, except double insulated tools such as concrete vibrators.
	Runaway Powered Troweling Machines	Runaway Powered Troweling Machines ♦ Manually guided, fuel powered troweling machines shall be equipped with an automatic shutoff, which stops the machine when the operator removes his hands.
	Hazardous Atmospheres	Hazardous Atmospheres ♦ Where fuel powered troweling machines are used inside buildings or enclosed areas, the air shall be monitored for hazardous atmospheres.
	Protruding Ends Of Reinforcing Steel	Protruding Ends Of Reinforcing Steel ♦ All ends of reinforcing steel which could cause an impalement hazard to employees shall be covered.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Installation of Treatment Building Sumps

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Contact with or struck-by pressure washer	Contact with or struck-by pressure washer ♦ Operator of pressure washer shall be trained in operation and safety practices prior to using equipment. ♦ Operator prior to starting operation shall ensure initial blast area is clear of personnel. ♦ Personnel working in the area are responsible for maintaining a safe distance from pressure washing operations (20 feet). ♦ Personnel working in the area wanting to approach the operator of the pressure washing equipment must make eye contact prior to approaching within 20 feet.
Mixing Mortar With Machine	Contact with mortar mixing machinery	Contact with mortar mixing machinery ♦ Operator of mixing machine shall be trained in operation and safety practices prior to using equipment. ♦ Personnel working in the area are responsible for maintaining a safe distance from mixing machine operations. ♦ Personnel working in the area wanting to approach the operator of the mixing machine must make eye contact prior to approaching within 10 feet.
Working Near Exposed Rebar	Impalement Hazard	Impalement Hazard ♦ Rebar that is of a height to create an impalement hazard shall be guarded.
Activities that Involve Potential for Falls	Falls From Elevations Greater Than Six Feet	Falls From Elevations Greater Than Six Feet ♦ All employees working six feet or more from the ground or next level shall be provided with fall protection 100% of the time. Fall protection shall consist of one of the following: standard railing, warning line system, catch platform, rebar positioning hook, safety monitoring system, or a full body harness equipped with a pig-tail, shock-absorbing lanyard.
	Failure Of Damaged Fall Protection Equipment	Failure Of Damaged Fall Protection Equipment ♦ All fall protection equipment shall be inspected for damage or wear prior to use on the job site and daily before each use. ♦ Fall protection equipment shall not be modified. Synthetic materials shall not be painted.
	Damage Occurring To Fall Protection Equipment Due To Improper Storage or Maintenance	Damage Occurring To Fall Protection Equipment Due To Improper Storage or Maintenance ♦ Fall protection equipment shall be stored and maintained as per manufacturer's recommendations.
	Failure Of Standard Railings	Failure Of Standard Railings ♦ All standard railings shall be constructed to withstand a load of 200 lbs. in any direction with minimal deflection.
	Failure of Tie-Off Point To Withstand Force of Falling Individual	Failure Of Standard Railings ♦ Tie-off points shall be capable of supporting 5,000 lbs. of dead weight.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Installation of Treatment Building Sumps

EQUIPMENT USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
1. Heavy Equipment 2. Appropriate PPE 3. First Aid Kits 4. Portable Eyewash 5. Mortar Mixing Machine 6. Power Masonry Saws	1. Inspections will be performed on equipment prior to each use. 2. Inspections will be performed on PPE prior to each use. 3. Weekly inspections will be performed on first aid kits. 4. Portable eye wash will be inspected weekly	1. Personnel have read and comply with SHSP. 2. Site-specific training. 3. Qualified operators will be used for equipment operation. 4. At least two individuals on-site will have current CPR, First aid and bloodborne pathogen training.

ACTIVITY HAZARD ANALYSIS

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Treatment Plant Building Construction

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
Placing & Securing Concrete Forms for Building Foundation	Slip/Trip/Fall	Slip/Trip/Fall ♦ Personnel will clear walkways of equipment & materials. ♦ Other obstructions will be marked, identified or barricaded. ♦ Debris will not be allowed to accumulate where it becomes a hazard.
	Back Injuries	Back Injuries ♦ Site personnel will be instructed on proper lifting techniques. ♦ Mechanical devices will be utilized to reduce manual material handling. ♦ Team lifting will be utilized in lieu of mechanical devices.
	Overhead Hazards	Overhead Hazards ♦ All personnel are required to wear hard hats. ♦ All slings, chains & ropes will be rated for the load it is expected to lift. ♦ All ground personnel will stay clear of suspended loads.
	Sharp Objects	Sharp Objects ♦ Cur resistant work gloves such as Kevlar will be worn. ♦ All hand & power tools will be maintained in safe condition. ♦ First aid kits will be readily available. ♦ Guards will be kept in place while using hand or power tools.
	Flying Objects & Debris	Flying Objects & Debris ♦ ANSI-approved safety glasses will be worn. ♦ ANSI approved, tight fitting, safety goggles will be worn during high wind or dust generating tasks/conditions. http://www.shop.com/op/~AO_Safety_Maxim_153_2x2_Goggle-prod-12292770
	Dropped Objects	Dropped Objects ♦ Steel toe boots will be worn.
Rebar Placement/Tying Rebar	Sharp Objects	Sharp Objects ♦ Cut resistant work gloves such as Kevlar will be worn. ♦ All hand & power tools will be maintained in safe condition. ♦ First aid kits will be readily available. ♦ Caps will be placed on the protruding ends of rebar.
	Slip/Trip/Fall	Slip/Trip/Fall ♦ Personnel will clear walkways of equipment & materials. ♦ Other obstructions will be marked, identified or barricaded. ♦ Tripping & poor footing hazards will be repaired as they are discovered or will be clearly identified.
	Dropped Objects	Dropped Objects ♦ Steel toe boots will be worn.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Treatment Plant Building Construction

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Fire	Fire ♦ 10-lb. ABC type fire extinguisher will be located adjacent to the work area. ♦ Smoking will not be allowed in the work areas. ♦ Hot work permits will be required for all cutting, welding, open flame & flames/spark-producing equipment. ♦ A fire watch will be assigned to watch for dangerous sparks in the areas during hot work operations. ♦ After completion of hot work, the fire watch will be maintained for 30 minutes. ♦ All requirements outlined in EM 385-1-1, Section 10 and 29 CFR 1926, Subpart J will be followed.
	Dermal Burns	Dermal Burns ♦ Protective equipment will be worn to prevent burns from hot slag.
	Flying Objects & Debris	Flying Objects & Debris ♦ ANSI approved safety glasses will be worn.
	Back Injuries	Back Injuries ♦ Site personnel will be instructed on proper lifting techniques. ♦ Mechanical devices will be utilized to reduce manual material handling. ♦ Team lifting will be utilized in lieu of mechanical devices.
	Overhead Hazards	Overhead Hazards ♦ All personnel are required to wear hard hats. ♦ All slings, chains & ropes will be rated for the load it is expected to lift, and will be inspected prior to each use. Damaged equipment will be tagged & removed from service. ♦ All ground personnel will stay clear of suspended loads.
Oiling Forms	Chemical Exposure	Chemical Exposure ♦ Protective clothing (nitrile inner gloves, tyvek & booties) will be worn. ♦ Exclusion zone areas will be identified. ♦ Skin will be rinsed with water if contact with hazardous chemicals occurs.
	Fire	Fire ♦ All fuel tanks/trucks will be grounded during fueling operations. ♦ All equipment will be equipped with 10-lb. ABC type fire extinguishers. ♦ 10-lb. ABC type fire extinguishers will be located by work area. ♦ Smoking & open flames are not permitted in areas of fueling & greasing operations.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Treatment Plant Building Construction

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Spills	Spills ♦ Drum of forming oil will be stored in a posted, covered & bermed containment area. ♦ Spill & absorbent materials will be readily available. ♦ Employees will be instructed on chemical transfer operations.
	Eye Injury	Eye Injury ♦ ANSI approved safety glasses will be worn. ANSI approved, tight fitting, safety goggles will be worn during high wind or dust generating tasks/conditions. http://www.shop.com/op/~AO_Safety_Maxim_153_2x2_Goggle-prod-12292770 ♦ An eye wash station will be readily available by the work area.
Pouring of Concrete	Flying Debris (Splash)	Flying Debris (Splash) ♦ ANSI approved safety glasses will be worn. ANSI approved, tight fitting, safety goggles will be worn during high wind or dust generating tasks/conditions. http://www.shop.com/op/~AO_Safety_Maxim_153_2x2_Goggle-prod-12292770
	Struck By/Against	Struck By/Against ♦ Eye contact with operators will be made before approaching equipment. ♦ Equipment will not be approached on blind sides. ♦ Personnel will avoid equipment swing areas & blind spots. ♦ Personnel will understand & review hand signals. ♦ All machines will be equipped with backup alarms.
	Fire	Fire ♦ All equipment will be equipped with 10-lb. ABC type fire extinguishers. ♦ 10-lb. ABC type fire extinguishers will be located by work area. ♦ Smoking & open flames are not permitted in work area.
	Chemical	Chemical ♦ Protective clothing (nitrile inner gloves & outer work gloves) will be worn. ♦ Skin will be rinsed with water if contact with hazardous chemicals occurs.
	Spills	Spills ♦ Employees will be instructed on proper cleanup operations.
	Overhead Hazards	Overhead Hazards ♦ All ground personnel will stay clear of the concrete truck boom. ♦ All personnel will wear hard hats.
	Leg Injury	Leg Injury ♦ All personnel will avoid walking in wet concrete.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Treatment Plant Building Construction

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Noise	Noise ♦ All equipment will be equipped with manufacturer's required mufflers. ♦ Hearing protection will be provided with a noise reduction rating capable of maintaining personal exposures to less than 85 dBA (ear muffs or ear plugs will be worn).
Concrete Pouring – Vibrator Operations	Noise	Noise ♦ All equipment will be equipped with manufacturer's required mufflers. ♦ Hearing protection will be provided with a noise reduction rating capable of maintaining personal exposures to less than 85 dBA (ear muffs or ear plugs will be worn).
	Slip/Trip/Fall	Slip/Trip/Fall ♦ Personnel will clear walkways of equipment & materials. ♦ Other obstructions will be marked, identified or barricaded. ♦ Tripping & poor footing hazards will be repaired as they are discovered or will be clearly identified.
	Dropped Objects	Dropped Objects ♦ Steel toe boots will be worn.
	Electrocution	Electrocution ♦ Ground fault circuit interrupters will be used. ♦ Cords will be kept off of & out of wet areas. ♦ Work will not be conducted in the rain. ♦ Cords will be inspected prior to each use for damage. Damaged equipment will be tagged & taken out of service.
	Fire	Fire ♦ 10-lb. ABC type fire extinguishers will be located by work area. ♦ Smoking & open flames are not permitted in work areas.
	Back Injuries	Back Injuries ♦ Site personnel will be instructed on proper lifting techniques. ♦ Mechanical devices will be utilized to reduce manual material handling. ♦ Team lifting will be utilized in lieu of mechanical devices.
	Sharp Objects	Sharp Objects ♦ Cut resistant work gloves such as Kevlar will be worn. ♦ First aid kits will be readily available.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Treatment Plant Building Construction

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
Removal of Concrete Forms	Struck By/Against	Struck By/Against ♦ Eye contact with operators will be made before approaching equipment. ♦ Equipment will not be approached on blind sides. ♦ Personnel will avoid equipment swing areas & blind spots. ♦ Personnel will understand & review hand signals. ♦ All machines will be equipped with backup alarms. ♦ Personnel will stay clear of post drivers & rotating equipment when operating. ♦ All equipment will be inspected prior to use. All defective equipment will be tagged & taken out of service.
	Flying Objects & Debris Overhead Hazards	Flying Objects & Debris ♦ ANSI approved safety glasses will be worn. ANSI approved, tight fitting, safety goggles will be worn during high wind or dust generating tasks/conditions. http://www.shop.com/op/~AO_Safety_Maxim_153_2x2_Goggle-prod-12292770 ♦ Windows & doors will be closed during operations if equipped. Overhead Hazards ♦ All heavy equipment will be provided with guards, canopies or grills to protect the operator from falling and/or flying objects. ♦ All personnel are required to wear hard hats. ♦ All slings, chains & ropes will be rated for the load it is expected to lift, and will be inspected prior to each use. Damaged equipment will be tagged & removed from service. ♦ All ground personnel will stay clear of suspended loads.
	Noise	Noise ♦ All equipment will be equipped with manufacturer's required mufflers. ♦ Hearing protection will be provided with a noise reduction rating capable of maintaining personal exposures to less than 85 dBA (ear muffs or ear plugs will be worn).

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Treatment Plant Building Construction

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Confined Space (Removal of forms in the foundation of the treatment building)	Confined Space ♦ If the dimensions of the sump areas fall within the definition of a confined space outlined in 29 CFR 1910.146 and EM 385-1-1, Section 06.I, then all procedures outlined within these standards will be followed. ♦ Prior to removing the forms, the crew members must go through a confined space training class, consisting of confined space awareness, entrant, attendant, supervisory and equipment training. ♦ Workers entering the confined space are required to wear a full body harness which is attached to a retrieval line. ♦ An attendant is required to monitor the space. ♦ Emergency equipment (SCBA units) must be readily available. ♦ One person involved in the confined space entry must be trained in first aid & CPR.
	Fire	Fire ♦ 10-lb. ABC type fire extinguishers will be located by work area. ♦ Smoking & open flames are not permitted in work areas.
Working Off of Scaffolding	Injuries Resulting From Falls From Scaffolding	Injuries Resulting From Falls From Scaffolding ♦ Scaffolds shall be erected, dismantled, or modified under the supervision of a Competent Person. ♦ Fall protection equipment, full body harness with shock absorbing lanyard & lifelines (when there are no anchorage points), shall be used when erecting scaffold or working from incomplete scaffold. ♦ All scaffolding shall be provided with an access ladder. ♦ Scaffolding greater than four (4) feet high, and less than 45 inches wide in any horizontal dimension, shall be equipped with a standard railing. ♦ No work shall be performed from scaffold during high winds or electrical storms.
	Falls from Scaffold	Falls from Scaffold ♦ Employees shall not ride rolling scaffolds. Employee will exit the scaffold before moving. ♦ Caster brakes shall be applied at all times, except when scaffold is being moved. ♦ The height of rolling scaffold must not exceed 4 times the smallest base dimension.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Treatment Plant Building Construction

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Failure of Scaffold	Failure of Scaffold ♦ Scaffolds shall be designed to withstand 4 times the intended load. ♦ At no time shall scaffold loads exceed the manufacturer recommendations. ♦ Lumber used in the construction of scaffolding shall be dressed, straight grained, and free of knots or other defects. ♦ Platform lumber shall be select grade, undressed tested planks. These shall be clearly identified as scaffold platform lumber. ♦ Damaged or excessively rusted scaffold sections shall not be used.
	Scaffold Tipping Over of Blowing Over	Scaffold Tipping Over of Blowing Over ♦ Scaffold shall be adequately secured to the building at intervals not to exceed 30 feet horizontally and 26 feet vertically.
	Material/Tools Falling From Scaffold	Material/Tools Falling From Scaffold ♦ Toeboards shall be provided for all scaffolds when personnel are working below. ♦ Personnel shall not access the area below scaffolding. In situations where persons are required to work or pass under scaffolding, a screen between the toeboard and guardrail, or other acceptable barrier, shall be provided. ♦ Only materials being used for work in progress shall be on the scaffolding.
	Electric Shock	Electric Shock ♦ Scaffold shall not be erected within 15 feet of energized power lines unless Lockout/Tagout is performed or other protective measures such as insulating blankets are used.
Construction Work Involving Floor and Wall Openings	Falls From Open Sided Floors of Platforms Greater Than Six (6) Feet	Falls From Open Sided Floors of Platforms Greater Than Six (6) Feet ♦ All employees working six (6) feet or more from the ground or next level shall be provided with fall protection 100% of the time. Fall protection shall consist of one of the following: standard railing, warning line system, catch platform, rebar positioning hook, safety monitoring system, or a full body harness equipped with a pig-tail, shock-absorbing lanyard.
	Fall Through Unguarded Wall Openings From Which There Is a Drop Of Four (4) Feet or More	Fall Through Unguarded Wall Openings From Which There Is a Drop Of Four (4) Feet or More ♦ Wall openings in which the bottom of the opening is less than three (3) feet above the working surface shall be provided with either an intermediate or standard rail.
	Materials Or Tools Being Dropped or Knocked Through Wall Openings	Materials Or Tools Being Dropped or Knocked Through Wall Openings ♦ Wall openings from which the bottom is less than four (4) inches above the working surface shall be provided with a standard toeboard or protective screen.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Treatment Plant Building Construction

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Falls Through Unguarded Floor Openings or Holes	Falls Through Unguarded Floor Openings or Holes ♦ All floor openings or holes shall be guarded by either a standard railing or a floor opening cover capable of supporting, without failure, at least twice the weight of employees, equipment, and materials that may be imposed on the cover at any one time and secured to guard against displacement and marked "Danger – Hole Cover".
	Fall From A Runway Four (4) Feet or More Above Ground Level	Fall From A Runway Four (4) Feet or More Above Ground Level ♦ Runways shall be guarded by standard railings on all open sides.
Steel Erection	Falls From Structural Steel During Erection Activities	Falls From Structural Steel During Erection Activities ♦ 100% fall protection over six (6) feet or within six (6) feet of an unprotected edge, shall be required for employees erecting steel. Fall protection shall consist of one or more of the following: standard railing, warning line system, catch platform, rebar positioning hook, safety monitoring system, or a full body harness equipped with a pig-tail, shock-absorbing lanyard.
	Equipment or Materials Falling From Overhead	Equipment or Materials Falling From Overhead ♦ Containers shall be provided for storing and carrying bolts, rivets and other fasteners. These containers shall be secured against accidental displacement. ♦ Impact wrenches shall be provided with locking devices to retain the sockets. ♦ When bolts, rivets, or drift pins are being knocked-out, a means shall be provided to prevent them from falling.
	Collapse of Structure During Erection	Collapse of Structure During Erection ♦ During placement of solid web structural members, the load shall not be released from the hoisting line until the member is secured with not less than two wrench tight bolts, or the equivalent at each connection. ♦ During erection, structural steel members shall be braced to resist horizontal forces such as wind. ♦ At no time shall there be more than two floors or 24 vertical feet of unfinished bolting or welding above the uppermost permanently secured floor. ♦ No open web joist shall be placed on any structural steel framework until the framework is safely bolted or welded. ♦ Loads shall not be placed on unsecured open web joist.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Treatment Plant Building Construction

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Steel Members Swinging Into Employees or Other Structures	Steel Members Swinging Into Employees or Other Structures ♦ Tag line(s) shall be required on all loads unless tag lines create a safety hazard, (i.e., dragging on a high voltage line, critical valves, becoming stuck on rebar, causing a tripping hazard for personnel walking a load, etc.). Use as many tag lines as necessary to adequately control the load. ♦ Personnel shall not place hands on load until it is at least shoulder height and arm is kept fully extended. If area of placement is congested and if sudden load shift would trap personnel between loads and other objects shoulder method shall not be used (only taglines; until load is within 1 foot of ground or cribbing).
	Falls From Temporary Floors	Falls From Temporary Floors ♦ Temporary flooring shall be secured to prevent accidental displacement.
Lift Slab Construction	Failure of Lift Slab Operations	Failure of Lift Slab Operations ♦ Lift Slab operations shall be designed & planned by a registered professional engineer who is competent in lift slab construction.
	Injuries to Employees During Failed Lift	Injuries to Employees During Failed Lift ♦ Only essential workers shall be allowed in the immediate area of the building or structure being lifted.
Use of Hand and Power Tools	Contusions, Abrasions, Cuts & Amputations	Contusions, Abrasions, Cuts & Amputations ♦ Tools shall be inspected quarterly and prior to use. ♦ All power tools originally equipped with a safety guard of any type shall only be used with the guard in place and functioning properly. ♦ Defective tools shall be tagged and removed from service. ♦ Tools shall be used only for their intended purpose. ♦ Electric tools shall be unplugged when changing attachments or performing maintenance. ♦ Pneumatic tools shall be disconnected and air pressure released before repair or adjustments are made. ♦ Sections of air hoses that are not equipped with quick release fittings shall be secured together with a safety chain or tie.
	Electric Shock	Electric Shock ♦ Electric tools with missing ground prongs, or cut or frayed cords shall be removed from service. ♦ Electric tools used in highly conductive locations, such as where the employee may contact water, shall be approved for use in those locations. ♦ Power for portable electric tools shall be supplied from a GFCI receptacle. Electrical tools must be grounded, except tools that are equipped with double insulation. ♦ Electric tools shall not be used in hazardous locations such as flammable or explosive atmospheres unless they are approved for such locations.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Treatment Plant Building Construction

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Burns	Burns ♦ Fuel powered tools (generators, tamps, pumps, etc.) shall be turned off and allowed to cool down three (3) minutes prior to refueling.
	Burns From Welding Iron used in water stop application	Burns From Welding Iron used in water stop application ♦ Be aware of hand positioning when using the welding iron. ♦ Leather gloves shall be worn during use of welding iron. ♦ When leaving iron unattended, caution flagging shall be placed around area to warn other employees.
	Crushing Injuries	Crushing Injuries ♦ The rated capacity of hydraulic jacks shall not be exceeded.
	Asphyxiation	Asphyxiation ♦ The use of fuel powered tools in confined spaces shall be monitored.
	Puncture Wounds	Puncture Wounds ♦ When using powder actuated tools the user shall guard against firing through the material. Individuals must be trained on the use of powder actuated tools.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Treatment Plant Building Construction

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
Crane Operations	Operator Error	Operator Error ♦ Cranes shall only be operated by qualified operators or trainees under the direct supervision of a qualified supervisor. ♦ The operator shall use the crane in accordance with the manufacturer's operating instructions. ♦ Operators shall be in constant visual or radio contact with signal-person(s) before and during every lift. ♦ The operator of the crane will sound an air-horn to warn personnel prior to having a load pass over the building area that is under construction. ♦ Operators shall consider the total weight of the lift and the capacity of the crane, and be able to accurately use load and lift charts provided by the crane manufacturer. If in the judgment of the operator, a load will approach the cranes capacity in a particular configuration, the operator's supervisor is responsible for providing the operator with the actual or calculated weight of the load. Total load shall include all rigging and equipment below the hook. Note: Weather loading (i.e., ice buildup). ♦ Operators shall not leave the control station of a crane during a lift or pick, except under the following conditions: • The load is lowered or raised to a safe landing area and fully supported with no tension on the load line. • After positioning all brakes, pawls, switches, or clutches in a safe position, to turn the crane over to another qualified operator. • When required to do so by an approved emergency procedure. ♦ The equipment operator shall not engage any by-pass, override, or otherwise disable any crane safety feature.
	Crane Failure During Lift	Crane Failure During Lift ♦ All applicable inspections shall be performed on cranes by a qualified inspector following manufacturer's recommendations and specifications. ♦ No modifications shall be made to any crane without the prior written approval of the manufacturer. ♦ Crane load charts and the operator's manual shall be posted in the cab of every crane.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Treatment Plant Building Construction

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Crane Instability	Crane Instability ♦ Cranes equipped with outriggers shall have outriggers fully extended or as allowed by manufacturer's instructions and set on firm footings before every lift. If setting outriggers on soft surfaces or over buried pipe cannot be avoided, oak blocking should be used under the outrigger loads to distribute the crane loads over sufficient area to ensure crane stability. If outriggers are utilized, tires must not be in contact with the ground. The crane shall be level within 1% of the grade.
	Contact With the Crane or Load During Operation	Contact With the Crane or Load During Operation ♦ The swing radius of the crane counterweight shall be flagged or barricaded. Employees shall not get on or off a crane while it is in motion. Adjustments, repairs, or lubrication shall not be permitted on moving equipment unless it is required by manufacturer's recommendations. Tool boxes, oil cans, sling racks, water coolers, or other items shall not be placed within the swing radius of the counterweight. The oiler, where required, shall stand clear of the swing radius and assist the operator in keeping other employees outside the swing radius. ♦ Note: Cranes with the counterweight located higher than 8 feet above the surrounding personnel access level need not be guarded unless a platform or other circumstance would allow personnel to be struck or crushed by the rotating counterweight. Guy wires within the swing radius of the crane or load shall be marked with highly visible flagging or rope. ♦ Personnel shall not stand, pass or place any body part under a suspended load.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Treatment Plant Building Construction

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Contact With Energized Power Lines of Work Near Critical Systems or Piping	Contact With Energized Power Lines of Work Near Critical Systems or Piping ♦ The Project Superintendent, SHSO, and Rigging Supervisor shall evaluate if any part of the hoisting equipment or load: ♦ Could approach 15 feet of 50 to 200 kV overhead electrical distribution and transmission lines. ♦ Are within 15 feet of 50 to 200 kV overhead electrical distribution and transmission lines. ♦ Is near transmitter towers where an electrical charge can be induced in the equipment or load. ♦ The maximum achievable boom length and 360 degree boom rotation shall be assumed when making the above clearance determinations. Notes: ♦ Lines shall be considered energized unless the person owning such line or the Project Superintendent verifies that it is not an energized line. ♦ Lines having long spans tend to move laterally and vertically due to wind and this potential must be considered in determining minimum clearance. ♦ For minimum allowable distance to distribution and transmission lines with voltages greater than 200 kV, refer to 29 CFR 1926.550(a)(15)(ii).
	Critical Lifts	Critical Lifts ♦ A written Critical Lift Plan shall be developed specifying job details and special safety measures.
	Crane Being Struck by Lightning	Crane Being Struck by Lightning ♦ Crane operations shall cease when dangerous weather is imminent.
	Load Instability	Load Instability ♦ Tag line(s) shall be required on all loads unless tag lines create a safety hazard, (i.e., dragging on a high voltage line, critical valves, becoming stuck on rebar, causing a tripping hazard for personnel walking a load, etc.). Use as many tag lines as necessary to adequately control the load. ♦ The load shall be safely landed (supported) and determined to be stable before workers are permitted to approach the load. ♦ Crane operations shall cease if wind loading becomes questionable due to wind direction or velocity, boom length, boom angle, or size or weight of load.
	Fire on Crane	Fire on Crane ♦ An accessible fire extinguisher with a minimum 10ABC rating shall be provided on every crane.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Treatment Plant Building Construction

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
Hoisting and Rigging	Failure of Slings, Chains, Chokers, or Other Hoisting & Rigging Equipment	Failure of Slings, Chains, Chokers, or Other Hoisting & Rigging Equipment ♦ All hoisting and rigging equipment shall be inspected for excessive wear and defects prior to, during, and after each use. ♦ Hoisting and rigging equipment shall not be loaded in excess of its safe working load limit (WLL).
	Defective or Unsafe Hoisting And Rigging Equipment Being Used On The Job Site	Defective or Unsafe Hoisting And Rigging Equipment Being Used On The Job Site ♦ Job or shop hooks and links, or makeshift devices, formed from bolts, rods, etc., or other such attachments shall not be used. ♦ Only equipment designed for hoisting and rigging shall be used in hoisting and rigging operations. ♦ Wire rope shall not be secured by knots.
	Failure of Custom Lifting Devices	Failure of Custom Lifting Devices ♦ Custom lifting devices shall be marked with the safe working load limit. ♦ Custom lifting devices shall have a documented proof test prior to initial use and PE stamp.
	Slings or Shackles Coming Loose From Hooks	Slings or Shackles Coming Loose From Hooks ♦ Hooks used for hoisting and rigging operations shall be provided with safety latches.
	Unqualified Persons Performed Rigging Activities	Unqualified Persons Performed Rigging Activities ♦ Only trained and qualified persons shall engage in rigging and signaling activities.
	Unforeseen Problems During A Lift	Unforeseen Problems During A Lift ♦ Every employee involved in lifting operations shall have the authority to stop a lift if any condition or situation occurs that could affect the safety or success of the lift.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Treatment Plant Building Construction

EQUIPMENT USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
1. Heavy Equipment	1. Initial inspection will be conducted prior to use.	1. Hydraulic license for operators is required.
2. Fire Extinguishers	2. Monthly inspections will be performed.	2. Personnel will be given instructions on proper use of fire extinguishers.
3. PID and CGI/O2 meter	3. Pre and Post Calibration/system checks will be performed daily.	3. Proficiency training for users will be given.
4. PPE (coveralls, tyvek, full faced masks, booties, steel toe boots, hard hats, safety glasses, leather or Kevlar gloves, ear plugs or ear muffs and SCBA units).	4. An initial inspection of each lot of PPE will be performed. SCBA units will be inspected prior to each confined space entry.	4. Personnel will be given training on proper donning/doffing procedures. Personnel will be given proficiency training for all potential users of SCBA units.
5. First Aid Kits	5. Daily safety & weekly inspections will be performed.	5. Personnel with first aid & CPR training will be identified. Bloodborne pathogen training will be reviewed with CPR & first aid trained employees.
6. Diesel Fuel/Oil & Other Potentially Hazardous Materials	6. Daily safety inspection of storage & use areas will be conducted.	6. Hazard communication training will be given.
7. Spill Control Materials	7. Daily safety inspection of spill control materials will be conducted.	7. Personnel will be given training on how to respond to spilled materials.
8. Chains, Slings or Ropes	8. Inspections prior to each use will be conducted.	8. Personnel will be trained on proper inspection & use of chains, slings & ropes.
9. Hand Tools (e.g., hammers)	9. Initial inspections will be conducted prior to use.	9. Personnel will be given training on the safety procedures associated with hand tools.
10. Augers & Fence Post Drivers	10. Initial inspections will be conducted prior to use.	10. Proficiency training will be given.
11. Safety Cans	11. Daily safety inspections of storage & use areas will be performed.	11. Use & storage procedures will be reviewed.
12. Concrete Trucks	12. Initial inspections will be conducted prior to use.	12. Proficiency training will be conducted.
13. Concrete Vibrators	13. Initial inspections will be conducted prior to use.	13. Proficiency training will be conducted.
14. GFIs	14. Monthly inspections will be performed.	14. Personnel will be instructed on proper use of GFIs.
15. Extension Cords	15. Monthly inspections will be performed.	15. Personnel will be instructed on proper use of extension cords.
16. Ladders	16. Monthly inspections will be performed.	16. Personnel will be instructed on proper use of ladders.

ACTIVITY HAZARD ANALYSES

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Treatment Building Systems Installation

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
Potable Water Service Hook-Up	Slip, Trip and Fall	Slip, Trip and Falls ♦ Maintain work area free of clutter and debris. ♦ Mark holes, drop offs and uneven surfaces in work area and inform workers to avoid these areas. ♦ Keep walking surfaces dry. ♦ Practice good housekeeping.
Use of Hand and Power Tools	Contusions, Abrasions, Cuts & Amputations	Contusions, Abrasions, Cuts & Amputations ♦ Tools shall be inspected quarterly and prior to use. ♦ All power tools originally equipped with a safety guard of any type shall only be used with the guard in place and functioning properly. ♦ Defective tools shall be tagged and removed from service. ♦ Tools shall be used only for their intended purpose. ♦ Electric tools shall be unplugged when changing attachments or performing maintenance. ♦ Pneumatic tools shall be disconnected and air pressure released before repair or adjustments are made. ♦ Sections of air hoses that are not equipped with quick release fittings shall be secured together with a safety chain or tie.
Piping Installation	Back Injuries	Back Injuries ♦ Site personnel will be instructed on proper lifting techniques. ♦ Mechanical devices will be utilized to reduce manual material handling. ♦ Team lifting will be utilized in lieu of mechanical devices.
	Chemical Contact	Chemical Contact ♦ Review the MSDS for the proper PPE to be worn when handling the chemicals (e.g., pipe cement) used for connecting piping. ♦ Wash any exposed skin that may have contacted pipe cement; wash hands before hand to mouth activities.
	Overhead Hazards	Overhead Hazards ♦ All personnel will be required to wear ANSI approved hard hats (Standard Z89.1). ♦ All wire ropes, chains & slings will be rated for the load that it is expected to lift. All lifting materials will be inspected at the beginning of each work shift and prior to each use. Defective equipment will be tagged and taken out of service. ♦ All ground personnel will stay clear of all suspended loads.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Treatment Building Systems Installation

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
Plumbing Installation	Slip, Trip and Fall	Slip, Trip and Fall ♦ Maintain work area free of clutter and debris. ♦ Mark holes, drop offs and uneven surfaces in work area and inform workers to avoid these areas. ♦ Keep walking surfaces dry. ♦ Practice good housekeeping. ♦ The anchor point of a lanyard shall be strong enough to support at least two times the potential impact load of the employee's fall. ♦ Ladders shall be extended three feet beyond the landing zone. ♦ Ladders shall be placed on firm, level surfaces and tied off at both the top & bottom. ♦ When utilizing man and scissor lifts, do not exceed the manufacturer's recommended platform load capacities. ♦ A full-body harness and lanyard shall be used when operating an extend-a-boom lift. ♦ All man and scissor lifts shall meet the requirements outlined in 29 CFR 1910.68. ♦ Fall protection shall be provided to workers exposed to falls of 6 feet or more, as specified by EM 385-1-1 Section 21 and 29 CFR 1926.500.
	Back Injuries	Back Injuries ♦ Site personnel will be instructed on proper lifting techniques. ♦ Mechanical devices will be utilized to reduce manual material handling. ♦ Team lifting will be utilized in lieu of mechanical devices.
Heating, Ventilation & Air Conditioning System Installation	Back Injuries	Back Injuries ♦ Site personnel will be instructed on proper lifting techniques. ♦ Mechanical devices will be utilized to reduce manual material handling. ♦ Team lifting will be utilized in lieu of mechanical devices.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Treatment Building Systems Installation

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Slip, Trip and Fall	Slip, Trip and Fall ♦ Maintain work area free of clutter and debris. ♦ Mark holes, drop offs and uneven surfaces in work area and inform workers to avoid these areas. ♦ Keep walking surfaces dry. ♦ Practice good housekeeping. ♦ The anchor point of a lanyard shall be strong enough to support at least two times the potential impact load of the employee's fall. ♦ Ladders shall be extended three feet beyond the landing zone. ♦ Ladders shall be placed on firm, level surfaces and tied off at both the top & bottom. ♦ When utilizing man and scissor lifts, do not exceed the manufacturer's recommended platform load capacities. ♦ A full-body harness and lanyard shall be used when operating an extend-a-boom lift. ♦ All man and scissor lifts shall meet the requirements outlined in 29 CFR 1910.68. ♦ Fall protection shall be provided to workers exposed to falls of 6 feet or more, as specified by EM 385-1-1 Section 21 and 29 CFR 1926.500.
	Overhead Hazards	Overhead Hazards ♦ All personnel will be required to wear ANSI approved hard hats (Standard Z89.1). ♦ All wire ropes, chains & slings will be rated for the load that it is expected to lift. All lifting materials will be inspected at the beginning of each work shift and prior to each use. Defective equipment will be tagged and taken out of service. ♦ All ground personnel will stay clear of all suspended loads.
Sanitary Sewer Installation	Back Injuries	Back Injuries ♦ Site personnel will be instructed on proper lifting techniques. ♦ Mechanical devices will be utilized to reduce manual material handling. ♦ Team lifting will be utilized in lieu of mechanical devices.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Treatment Building Systems Installation

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Slip, Trip and Fall	Slip, Trip and Fall ♦ Maintain work area free of clutter and debris. ♦ Mark holes, drop offs and uneven surfaces in work area and inform workers to avoid these areas. ♦ Keep walking surfaces dry. ♦ Practice good housekeeping. ♦ The anchor point of a lanyard shall be strong enough to support at least two times the potential impact load of the employee's fall. ♦ Ladders shall be extended three feet beyond the landing zone. ♦ Ladders shall be placed on firm, level surfaces and tied off at both the top & bottom. ♦ When utilizing man and scissor lifts, do not exceed the manufacturer's recommended platform load capacities. ♦ A full-body harness and lanyard shall be used when operating an extend-a-boom lift. ♦ All man and scissor lifts shall meet the requirements outlined in 29 CFR 1910.68. ♦ Fall protection shall be provided to workers exposed to falls of 6 feet or more, as specified by EM 385-1-1 Section 21 and 29 CFR 1926.500.
	Overhead Hazards	Overhead Hazards ♦ All personnel will be required to wear ANSI approved hard hats (Standard Z89.1). ♦ All wire ropes, chains & slings will be rated for the load that it is expected to lift. All lifting materials will be inspected at the beginning of each work shift and prior to each use. Defective equipment will be tagged and taken out of service. ♦ All ground personnel will stay clear of all suspended loads.
Fire Detection, Alarm & Monitoring System Installation	Back Injuries	Back Injuries ♦ Site personnel will be instructed on proper lifting techniques. ♦ Mechanical devices will be utilized to reduce manual material handling. ♦ Team lifting will be utilized in lieu of mechanical devices.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Treatment Building Systems Installation

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Slip, Trip and Fall	Slip, Trip and Fall ♦ Maintain work area free of clutter and debris. ♦ Mark holes, drop offs and uneven surfaces in work area and inform workers to avoid these areas. ♦ Keep walking surfaces dry. ♦ Practice good housekeeping. ♦ The anchor point of a lanyard shall be strong enough to support at least two times the potential impact load of the employee's fall. ♦ Ladders shall be extended three feet beyond the landing zone. ♦ Ladders shall be placed on firm, level surfaces and tied off at both the top & bottom. ♦ When utilizing man and scissor lifts, do not exceed the manufacturer's recommended platform load capacities. ♦ A full-body harness and lanyard shall be used when operating an extend-a-boom lift. ♦ All man and scissor lifts shall meet the requirements outlined in 29 CFR 1910.68. ♦ Fall protection shall be provided to workers exposed to falls of 6 feet or more, as specified by EM 385-1-1 Section 21 and 29 CFR 1926.500.
	Overhead Hazards	Overhead Hazards ♦ All personnel will be required to wear ANSI approved hard hats (Standard Z89.1). ♦ All wire ropes, chains & slings will be rated for the load that it is expected to lift. All lifting materials will be inspected at the beginning of each work shift and prior to each use. Defective equipment will be tagged and taken out of service. ♦ All ground personnel will stay clear of all suspended loads.
Security Alarm & Monitoring System Installation	Back Injuries	Back Injuries ♦ Site personnel will be instructed on proper lifting techniques. ♦ Mechanical devices will be utilized to reduce manual material handling. ♦ Team lifting will be utilized in lieu of mechanical devices.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Treatment Building Systems Installation

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Slip, Trip and Fall	Slip, Trip and Fall ♦ Maintain work area free of clutter and debris. ♦ Mark holes, drop offs and uneven surfaces in work area and inform workers to avoid these areas. ♦ Keep walking surfaces dry. ♦ Practice good housekeeping. ♦ The anchor point of a lanyard shall be strong enough to support at least two times the potential impact load of the employee's fall. ♦ Ladders shall be extended three feet beyond the landing zone. ♦ Ladders shall be placed on firm, level surfaces and tied off at both the top & bottom. ♦ When utilizing man and scissor lifts, do not exceed the manufacturer's recommended platform load capacities. ♦ A full-body harness and lanyard shall be used when operating an extend-a-boom lift. ♦ All man and scissor lifts shall meet the requirements outlined in 29 CFR 1910.68. ♦ Fall protection shall be provided to workers exposed to falls of 6 feet or more, as specified by EM 385-1-1 Section 21 and 29 CFR 1926.500.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Treatment Building Systems Installation

EQUIPMENT USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
1. Heavy Equipment	1. Initial inspection will be conducted prior to use.	1. Only qualified equipment operators will be used.
2. Fire Extinguishers	2. Monthly inspections will be performed.	2. Personnel will be given instructions on proper use of fire extinguishers.
3. PID, and CGI/O2 meter	3. Pre and Post Calibration/system checks will be performed daily.	3. Proficiency training for users will be given.
4. PPE (coveralls, tyvek, full faced masks, booties, steel toe boots, hard hats, safety glasses, leather or Kevlar gloves, ear plugs or ear muffs).	4. An initial inspection of each lot of PPE will be performed.	4. Personnel will be given training on proper donning/doffing procedures.
5. First Aid Kits	5. Daily safety & weekly inspections will be performed.	5. Personnel with first aid & CPR training will be identified. Bloodborne pathogen training will be reviewed with CPR & first aid trained employees.
6. Diesel Fuel/Oil & Other Potentially Hazardous Materials	6. Daily safety inspection of storage & use areas will be conducted.	6. Hazard communication training will be given.
7. Spill Control Materials	7. Daily safety inspection of spill control materials will be conducted.	7. Personnel will be given training on how to respond to spilled materials.
8. Chains, Slings or Ropes	8. Inspections prior to each use will be conducted.	8. Personnel will be trained on proper inspection & use of chains, slings & ropes.
9. Hand Tools (e.g., wrenches, hammers)	9. Initial inspections will be conducted prior to use.	9. Personnel will be given training on the safety procedures associated with hand tools.
10. Safety Cans	10. Daily safety inspections of storage & use areas will be performed.	10. Use & storage procedures will be reviewed.
11. Extension Cords	11. Monthly inspections will be performed.	11. Personnel will be instructed on proper use of extension cords.
12. Ladders	12. Monthly inspections will be performed.	12. Personnel will be instructed on proper use of ladders.
13. Torches, welders and grinders	13. Initial inspections will be conducted prior to use.	13. Proficiency training for users will be given.
14. Powered Tools	14. Initial inspections will be conducted prior to use.	14. Personnel will be given training on the safety procedures associated with powered tools.
15. Man Lifts/Scissor Lifts	15. Initial inspections will be conducted prior to use.	15. Personnel will be instructed on fall protection requirements.
16. Full-Body Harnesses and Lanyards	16. Initial inspections will be conducted prior to use.	16. Personnel will be trained on proper use of full-body harnesses and lanyards.
17. GFCIs	17. Monthly inspections will be performed.	17. Personnel will be instructed on proper use of GFIs.

ACTIVITY HAZARD ANALYSIS

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Extraction System Construction

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
Installation of Pipe and Electrical Conduit	Back Injuries	Back Injuries ♦ Site personnel will be instructed on proper lifting techniques. ♦ Mechanical devices will be utilized to reduce manual material handling. ♦ Team lifting will be utilized in lieu of mechanical devices.
	Slip, Trip and Fall	Slip, Trip and Fall ♦ Maintain work area free of clutter and debris. ♦ Mark holes, drop offs and uneven surfaces in work area and inform workers to avoid these areas. ♦ Keep walking surfaces dry. ♦ Practice good housekeeping.
Use of Hand and Power Tools	Contusions, Abrasions, Cuts & Amputations	Contusions, Abrasions, Cuts & Amputations ♦ Tools shall be inspected quarterly and prior to use. ♦ All power tools originally equipped with a safety guard of any type shall only be used with the guard in place and functioning properly. ♦ Defective tools shall be tagged and removed from service. ♦ Tools shall be used only for their intended purpose. ♦ Electric tools shall be unplugged when changing attachments or performing maintenance. ♦ Pneumatic tools shall be disconnected and air pressure released before repair or adjustments are made. ♦ Sections of air hoses that are not equipped with quick release fittings shall be secured together with a safety chain or tie.
Installation of Well Vaults and Associated Piping, Instrumentation and Pumps	Back Injuries	Back Injuries ♦ Site personnel will be instructed on proper lifting techniques. ♦ Mechanical devices will be utilized to reduce manual material handling. ♦ Team lifting will be utilized in lieu of mechanical devices.
	Slip, Trip and Fall	Slip, Trip an Fall ♦ Maintain work area free of clutter and debris. ♦ Mark holes, drop offs and uneven surfaces in work area and inform workers to avoid these areas. ♦ Keep walking surfaces dry. ♦ Practice good housekeeping.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Extraction System Construction

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
Crane Operations	Operator Error	Operator Error ♦ Cranes shall only be operated by qualified operators or trainees under the direct supervision of a qualified supervisor. ♦ The operator shall use the crane in accordance with the manufacturer's operating instructions. ♦ Operators shall be in constant visual or radio contact with signal-person(s) before and during every lift. ♦ The operator of the crane will sound an air-horn to warn personnel prior to having a load pass over the building area that is under construction. ♦ Operators shall consider the total weight of the lift and the capacity of the crane, and be able to accurately use load and lift charts provided by the crane manufacturer. If in the judgment of the operator, a load will approach the cranes capacity in a particular configuration, the operator's supervisor is responsible for providing the operator with the actual or calculated weight of the load. Total load shall include all rigging and equipment below the hook. ♦ Operators shall not leave the control station of a crane during a lift or pick, except under the following conditions: • The load is lowered or raised to a safe landing area and fully supported with no tension on the load line. • After positioning all brakes, pawls, switches, or clutches in a safe position, to turn the crane over to another qualified operator. • When required to do so by an approved emergency procedure. ♦ The equipment operator shall not engage any by-pass, override, or otherwise disable any crane safety feature.
	Crane Failure During Lift	Crane Failure During Lift ♦ All applicable inspections shall be performed on cranes by a qualified inspector following manufacturer's recommendations and specifications. ♦ No modifications shall be made to any crane without the prior written approval of the manufacturer. ♦ Crane load charts and the operator's manual shall be posted in the cab of every crane.
	Crane Instability	Crane Instability ♦ Cranes equipped with outriggers shall have outriggers fully extended or as allowed by manufacturer's instructions and set on firm footings before every lift. If setting outriggers on soft surfaces or over buried pipe cannot be avoided, oak blocking should be used under the outrigger loads to distribute the crane loads over sufficient area to ensure crane stability. If outriggers are utilized, tires must not be in contact with the ground. The crane shall be level within 1% of the grade.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Extraction System Construction

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Contact With the Crane or Load During Operation	Contact With the Crane or Load During Operation ♦ The swing radius of the crane counterweight shall be flagged or barricaded. Employees shall not get on or off a crane while it is in motion. Adjustments, repairs, or lubrication shall not be permitted on moving equipment unless it is required by manufacturer's recommendations. Tool boxes, oil cans, sling racks, water coolers, or other items shall not be placed within the swing radius of the counterweight. The oiler, where required, shall stand clear of the swing radius and assist the operator in keeping other employees outside the swing radius. ♦ Note: Cranes with the counterweight located higher than 8 feet above the surrounding personnel access level need not be guarded unless a platform or other circumstance would allow personnel to be struck or crushed by the rotating counterweight. Guy wires within the swing radius of the crane or load shall be marked with highly visible flagging or rope. ♦ Personnel shall not stand, pass or place any body part under a suspended load.
	Contact With Energized Power Lines of Work Near Critical Systems or Piping	Contact With Energized Power Lines of Work Near Critical Systems or Piping ♦ The Project Superintendent, SHSO, and Rigging Supervisor shall evaluate if any part of the hoisting equipment or load: ♦ Could approach 15 feet of 50 to 200 kV overhead electrical distribution and transmission lines. ♦ Are within 15 feet of 50 to 200 kV overhead electrical distribution and transmission lines. ♦ Is near transmitter towers where an electrical charge can be induced in the equipment or load. ♦ The maximum achievable boom length and 360 degree boom rotation shall be assumed when making the above clearance determinations. Notes: • Lines shall be considered energized unless the person owning such line or the Project Superintendent verifies that it is not an energized line. • Lines having long spans tend to move laterally and vertically due to wind and this potential must be considered in determining minimum clearance. • For minimum allowable distance to distribution and transmission lines with voltages greater than 200 kV, refer to 29 CFR 1926.550(a)(15)(ii).
	Critical Lifts	Critical Lifts ♦ A written Critical Lift Plan shall be developed specifying job details and special safety measures.
	Crane Being Struck by Lightning	♦ Crane Being Struck by Lightning. ♦ Crane operations shall cease when dangerous weather is imminent.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Extraction System Construction

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Load Instability	Load Instability ♦ Tag line(s) shall be required on all loads unless tag lines create a safety hazard, (i.e., dragging on a high voltage line, critical valves, becoming stuck on rebar, causing a tripping hazard for personnel walking a load, etc.). Use as many tag lines as necessary to adequately control the load. ♦ The load shall be safely landed (supported) and determined to be stable before workers are permitted to approach the load. ♦ Crane operations shall cease if wind loading becomes questionable due to wind direction or velocity, boom length, boom angle, or size or weight of load.
	Fire on Crane	Fire on Crane ♦ An accessible fire extinguisher with a minimum 10ABC rating shall be provided on every crane.
Installation of Electrical Components	Back Injuries	Back Injuries ♦ Site personnel will be instructed on proper lifting techniques. ♦ Mechanical devices will be utilized to reduce manual material handling. ♦ Team lifting will be utilized in lieu of mechanical devices.
	Slip, Trip and Fall	Slip, trip and fall ♦ Maintain work area free of clutter and debris. ♦ Mark holes, drop offs and uneven surfaces in work area and inform workers to avoid these areas. ♦ Keep walking surfaces dry. ♦ Practice good housekeeping.
Use of Hand and Power Tools	Contusions, Abrasions, Cuts & Amputations	Contusions, Abrasions, Cuts & Amputations ♦ Tools shall be inspected quarterly and prior to use. ♦ All power tools originally equipped with a safety guard of any type shall only be used with the guard in place and functioning properly. ♦ Defective tools shall be tagged and removed from service. ♦ Tools shall be used only for their intended purpose. ♦ Electric tools shall be unplugged when changing attachments or performing maintenance. ♦ Pneumatic tools shall be disconnected and air pressure released before repair or adjustments are made. ♦ Sections of air hoses that are not equipped with quick release fittings shall be secured together with a safety chain or tie.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Extraction System Construction

EQUIPMENT USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
1. Heavy Equipment	1. Initial inspection will be conducted prior to use.	1. Only qualified equipment operators will be used.
2. Fire Extinguishers	2. Monthly inspections will be performed.	2. Personnel will be given instructions on proper use of fire extinguishers.
3. PID, and CGI/O2 meter	3. Pre and Post Calibration/system checks will be performed daily.	3. Proficiency training for users will be given.
4. PPE (coveralls, tyvek, full faced masks, booties, steel toe boots, hard hats, safety glasses, leather or Kevlar gloves, ear plugs or ear muffs).	4. An initial inspection of each lot of PPE will be performed.	4. Personnel will be given training on proper donning/doffing procedures.
5. First Aid Kits	5. Daily safety & weekly inspections will be performed.	5. Personnel with first aid & CPR training will be identified. Bloodborne pathogen training will be reviewed with CPR & first aid trained employees.
6. Diesel Fuel/Oil & Other Potentially Hazardous Materials	6. Daily safety inspection of storage & use areas will be conducted.	6. Hazard communication training will be given.
7. Spill Control Materials	7. Daily safety inspection of spill control materials will be conducted.	7. Personnel will be given training on how to respond to spilled materials.
8. Chains, Slings or Ropes	8. Inspections prior to each use will be conducted.	8. Personnel will be trained on proper inspection & use of chains, slings & ropes.
9. Hand Tools (e.g., hammers)	9. Initial inspections will be conducted prior to use.	9. Personnel will be given training on the safety procedures associated with hand tools.
10. Augers & Fence Post Drivers	10. Initial inspections will be conducted prior to use.	10. Proficiency training will be given.
11. Safety Cans	11. Daily safety inspections of storage & use areas will be performed.	11. Use & storage procedures will be reviewed.
12. Concrete Trucks	12. Initial inspections will be conducted prior to use.	12. Proficiency training will be conducted.
13. Concrete Vibrators	13. Initial inspections will be conducted prior to use.	13. Proficiency training will be conducted.
14. GFIs	14. Monthly inspections will be performed.	14. Personnel will be instructed on proper use of GFIs.
15. Extension Cords	15. Monthly inspections will be performed.	15. Personnel will be instructed on proper use of extension cords.
16. Ladders	16. Monthly inspections will be performed.	16. Personnel will be instructed on proper use of ladders.

ACTIVITY HAZARD ANALYSIS

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Groundwater Injection System Construction

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
Crane Operations	Operator Error	Operator Error ♦ Cranes shall only be operated by qualified operators or trainees under the direct supervision of a qualified supervisor. ♦ The operator shall use the crane in accordance with the manufacturer's operating instructions. ♦ Operators shall be in constant visual or radio contact with signal-person(s) before and during every lift. ♦ The operator of the crane will sound an air-horn to warn personnel prior to having a load pass over the building area that is under construction. ♦ Operators shall consider the total weight of the lift and the capacity of the crane, and be able to accurately use load and lift charts provided by the crane manufacturer. If in the judgment of the operator, a load will approach the cranes capacity in a particular configuration, the operator's supervisor is responsible for providing the operator with the actual or calculated weight of the load. Total load shall include all rigging and equipment below the hook. Note: Weather loading (i.e., ice buildup). ♦ Operators shall not leave the control station of a crane during a lift or pick, except under the following conditions: • The load is lowered or raised to a safe landing area and fully supported with no tension on the load line. • After positioning all brakes, pawls, switches, or clutches in a safe position, to turn the crane over to another qualified operator. • When required to do so by an approved emergency procedure. ♦ The equipment operator shall not engage any by-pass, override, or otherwise disable any crane safety feature.
	Crane Failure During Lift	Crane Failure During Lift ♦ All applicable inspections shall be performed on cranes by a qualified inspector following manufacturer's recommendations and specifications. ♦ No modifications shall be made to any crane without the prior written approval of the manufacturer. ♦ Crane load charts and the operator's manual shall be posted in the cab of every crane.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Groundwater Injection System Construction

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Crane Instability	Crane Instability ♦ Cranes equipped with outriggers shall have outriggers fully extended or as allowed by manufacturer's instructions and set on firm footings before every lift. If setting outriggers on soft surfaces or over buried pipe cannot be avoided, oak blocking should be used under the outrigger loads to distribute the crane loads over sufficient area to ensure crane stability. If outriggers are utilized, tires must not be in contact with the ground. The crane shall be level within 1% of the grade.
	Contact With the Crane or Load During Operation	Contact With the Crane or Load During Operation ♦ The swing radius of the crane counterweight shall be flagged or barricaded. Employees shall not get on or off a crane while it is in motion. Adjustments, repairs, or lubrication shall not be permitted on moving equipment unless it is required by manufacturer's recommendations. Tool boxes, oil cans, sling racks, water coolers, or other items shall not be placed within the swing radius of the counterweight. The oiler, where required, shall stand clear of the swing radius and assist the operator in keeping other employees outside the swing radius. ♦ Note: Cranes with the counterweight located higher than 8 feet above the surrounding personnel access level need not be guarded unless a platform or other circumstance would allow personnel to be struck or crushed by the rotating counterweight. Guy wires within the swing radius of the crane or load shall be marked with highly visible flagging or rope. ♦ Personnel shall not stand, pass or place any body part under a suspended load.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Groundwater Injection System Construction

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Contact With Energized Power Lines of Work Near Critical Systems or Piping	Contact With Energized Power Lines of Work Near Critical Systems or Piping ♦ The Project Superintendent, SHSO, and Rigging Supervisor shall evaluate if any part of the hoisting equipment or load: • Could approach 15 feet of 50 to 200 kV overhead electrical distribution and transmission lines. • Are within 15 feet of 50 to 200 kV overhead electrical distribution and transmission lines. • Is near transmitter towers where an electrical charge can be induced in the equipment or load. ♦ The maximum achievable boom length and 360 degree boom rotation shall be assumed when making the above clearance determinations. Notes: • Lines shall be considered energized unless the person owning such line or the Project Superintendent verifies that it is not an energized line. • Lines having long spans tend to move laterally and vertically due to wind and this potential must be considered in determining minimum clearance. • For minimum allowable distance to distribution and transmission lines with voltages greater than 200 kV, refer to 29 CFR 1926.550(a)(15)(ii).
	Critical Lifts	Critical Lifts ♦ A written Critical Lift Plan shall be developed specifying job details and special safety measures.
	Crane Being Struck by Lightning	Crane Being Struck by Lightning ♦ Crane operations shall cease when dangerous weather is imminent.
	Load Instability	Load Instability ♦ Tag line(s) shall be required on all loads unless tag lines create a safety hazard, (i.e., dragging on a high voltage line, critical valves, becoming stuck on rebar, causing a tripping hazard for personnel walking a load, etc.). Use as many tag lines as necessary to adequately control the load. ♦ The load shall be safely landed (supported) and determined to be stable before workers are permitted to approach the load. ♦ Crane operations shall cease if wind loading becomes questionable due to wind direction or velocity, boom length, boom angle, or size or weight of load.
	Fire on Crane	Fire on Crane ♦ An accessible fire extinguisher with a minimum 10BC rating shall be provided on every crane.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Groundwater Injection System Construction

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
Install New Injection Wells	Struck By/Against/ Caught By	Struck By/Against/ Caught By ♦ No loose clothing, gauntlet-type gloves, rings, or watches will be worn by personnel operating drill rig.
	Underground Hazards	Underground Hazards ♦ All underground utilities will be identified prior to drilling. The New York State One-Call System will be contacted and drilling locations will be screened using geophysical techniques, such as GPR or magnetometer. ♦ All marked utilities will be inspected so that personnel are familiar with types and locations of utilities. Any drilling will take place at least five feet away from any marked utilities. ♦ Follow EHS procedure 3-15: Underground Utilities.
	Flying Objects and Debris	Flying Objects and Debris ♦ Safety glasses meeting ANSI Standard Z87 will be worn. ♦ Splash shields and chemical goggles meeting ANSI Standard Z87 will be worn where applicable.
	Overhead Hazards	Overhead Hazards ♦ All personnel will wear hard hats meeting ANSI Standard Z89.1. ♦ All ropes will be rated for the load which it is expected to lift. All ropes will be inspected at the beginning of each work shift. ♦ All ground personnel will stay clear of all suspended loads.
	Inhalation Hazards	Inhalation Hazards ♦ Work activities will be conducted in modified Level D PPE, with upgrades in respiratory protection based on real time air monitoring results, site conditions and the SHSO's judgment. ♦ Air monitoring will be performed per the SHSP. The frequency of monitoring may be reduced at the discretion of the SHSO.
	Spills	Spills ♦ Absorbent material will be readily available. ♦ Drip pans, polyethylene sheeting or other means will be used for secondary containment.
	Noise	Noise ♦ All equipment will be equipped with manufacturers required mufflers. ♦ Hearing protection will be worn with a noise reduction rating capable of maintaining personal exposure below 85 dBA (earmuffs or plugs).
	Fire	Fire ♦ Smoking and open flames are not permitted. ♦ All equipment shall be equipped with 10 lb. ABC type fire extinguishers. ♦ 10 lb. ABC type fire extinguishers shall be readily available.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Groundwater Injection System Construction

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Slip/Trip/Fall	Slip/Trip/Fall ♦ Personnel will clear walkways and stairs of equipment and materials. ♦ Other obstructions will be marked, identified, or barricaded. ♦ Tripping and poor footing hazards will be repaired as they are discovered or will be clearly identified. ♦ Debris will not be allowed to accumulate where it becomes a hazard. ♦ Cover all open boreholes at the end of the work day.
	Back Injuries	Back Injuries ♦ Site personnel will be instructed on proper lifting techniques. ♦ Mechanical devices will be utilized to reduce manual material handling. ♦ No person shall lift more than 50 lbs. unaided. ♦ Team lifting will be utilized in lieu of mechanical devices.
	Electrical Hazards	Electrical Hazards ♦ Use GFCI devices with any items that plug into an electrical outlet. ♦ Inspect electrical and extension cords prior to use. Repair or dispose of any frayed cords.
	Sharp Objects	Sharp Objects ♦ Cut resistant work gloves will be worn when handling sharp objects. ♦ Only use utility knives with self-retracting blades or those equipped with a guard over the blade. See www.martor.com for knife types. ♦ Do not use pocket knives or knife found on Leatherman-type tools. ♦ All hand and power tools will be maintained in safe condition. ♦ First aid kits will be available by work area.
	Eye Injury	Eye Injury ♦ ANSI approved safety glasses will be worn. ANSI approved, tight fitting, safety goggles will be worn during high wind or dust generating tasks/conditions. http://www.shop.com/op/~AO_Safety_Maxim_153_2x2_Goggle-prod-12292770 ♦ Portable eye wash station will be available.
Equipment Decontamination	Back Injuries	Back Injuries ♦ Site personnel will be instructed on proper lifting techniques. ♦ Mechanical devices will be utilized to reduce manual material handling. ♦ Team lifting will be utilized in lieu of mechanical devices.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Groundwater Injection System Construction

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Struck By (Water Stream)	Struck By (Water Stream) ♦ Proper instruction on safe use of pressure washers will be conducted. ♦ Operators will not fix the hand trigger in the open position such that if the wand were left unattended, water would spray from the tip. ♦ Operator will not hold any equipment while washing it. ♦ All pressure washers will be equipped with a deadman's switch. ♦ Use nominal temperature and pressure. ♦ Use wand extenders only. ♦ Pressure washers shall not be left running unattended. ♦ Pressure washers will be inspected daily and prior to use (hoses gaskets, tips, connections). Ones that are not in good working order will be red tagged (removed from service) and repaired before use. ♦ First aid kit will be located adjacent to work area. ♦ Face-shields will be worn when pressure washing, face-shields are to be worn in addition to safety glasses not in lieu of them. ♦ Washers will be utilized in a manner that they were designed for, no changes to the operational condition will be accepted. (i.e. operational pressures will not be increased). ♦ Turn pressure washer off when performing maintenance or changing out tips.
	Eye Injury from Liquids and Foreign Objects	Eye Injury from Liquids and Foreign Objects ♦ Safety glasses and full faced shield complying with ANSI Standard Z87 will be worn. ♦ ANSI approved, tight fitting, safety goggles will be worn during high wind or dust generating tasks/conditions. http://www.shop.com/op/~AO_Safety_Maxim_153_2x2_Goggle-prod-12292770 ♦ A portable eye wash station will be located by work area.
	Sharp Objects	Sharp Objects ♦ Cut resistant work gloves such as Kevlar will be worn. ♦ All hand and power tools will be maintained in safe condition. ♦ First aid kits will be readily available. ♦ Guards will be kept in place while using hand or power tools. ♦ Only use utility knives with self-retracting blades or those equipped with a guard over the blade. See www.martor.com for knife types. ♦ Do not use pocket knives, box cutters or knife found on Leatherman-type tools.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Groundwater Injection System Construction

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Slip/Trip/Fall	Slip/Trip/Fall ♦ Work areas and means of access shall be maintained safe and orderly. ♦ Obstructions will be marked, identified, or barricaded. ♦ Tripping and poor footing hazards will be repaired as they are discovered or will be clearly identified. ♦ Wet surfaces will be marked and identified. ♦ Accumulation of ice or standing water will be removed as necessary during decon work.
	Fire	Fire ♦ Refueling or maintenance will only be performed when the pressure washer has been shut down. Always keep Gasoline, Diesel away from any potential ignition sources that may exist within the refueling area. ♦ Pressure washers will not be started unless a steady flow of water is running to the machine (pressure washers shall not be run dry). ♦ 10 lb. ABC type fire extinguishers will be located adjacent to work area.
	Overhead Hazards	Overhead Hazards ♦ All personnel are required to wear hard hats.
	Dropped Objects	Dropped Objects ♦ All personnel are required to wear steel toe boots. ♦ All tools will be tethered.
Install Piping from Wells to Treatment Building	Slip, Trip and Fall	Slip/Trip/Fall ♦ Maintain work area free of clutter and debris. ♦ Mark holes, drop offs and uneven surfaces in work area and inform workers to avoid these areas. ♦ Practice good housekeeping.
	Back Injuries	Back Injuries ♦ Site personnel will be instructed on proper lifting techniques. ♦ Mechanical devices will be utilized to reduce manual material handling. ♦ Team lifting will be utilized in lieu of mechanical devices.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Groundwater Injection System Construction

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
Use of Hand and Power Tools	Contusions, Abrasions, Cuts & Amputations	Contusions, Abrasions, Cuts & Amputations ♦ Tools shall be inspected quarterly and prior to use. ♦ All power tools originally equipped with a safety guard of any type shall only be used with the guard in place and functioning properly. ♦ Defective tools shall be tagged and removed from service. ♦ Tools shall be used only for their intended purpose. ♦ Electric tools shall be unplugged when changing attachments or performing maintenance. ♦ Pneumatic tools shall be disconnected and air pressure released before repair or adjustments are made. ♦ Sections of air hoses that are not equipped with quick release fittings shall be secured together with a safety chain or tie.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Groundwater Injection System Construction

EQUIPMENT USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
1. Heavy Equipment	1. Initial inspection will be conducted prior to use.	1. Only qualified equipment operators will be used.
2. Fire Extinguishers	2. Monthly inspections will be performed.	2. Personnel will be given instructions on proper use of fire extinguishers.
3. PID and CGI/O_2 meter	3. Pre and Post Calibration/system checks will be performed daily.	3. Proficiency training for users will be given.
4. PPE (coveralls, tyvek, full faced masks, booties, steel toe boots, hard hats, safety glasses, leather or Kevlar gloves, ear plugs or ear muffs).	4. An initial inspection of each lot of PPE will be performed.	4. Personnel will be given training on proper donning/doffing procedures.
5. First Aid Kits	5. Daily safety & weekly inspections will be performed.	5. Personnel with first aid & CPR training will be identified. Bloodborne pathogen training will be reviewed with CPR & first aid trained employees.
6. Diesel Fuel/Oil & Other Potentially Hazardous Materials	6. Daily safety inspection of storage & use areas will be conducted.	6. Hazard communication training will be given.
7. Spill Control Materials	7. Daily safety inspection of spill control materials will be conducted.	7. Personnel will be given training on how to respond to spilled materials.
8. Chains, Slings or Ropes	8. Inspections prior to each use will be conducted.	8. Personnel will be trained on proper inspection & use of chains, slings & ropes.
9. Hand Tools (e.g., hammers)	9. Initial inspections will be conducted prior to use.	9. Personnel will be given training on the safety procedures associated with hand tools.
10. Augers & Fence Post Drivers	10. Initial inspections will be conducted prior to use.	10. Proficiency training will be given.
11. Safety Cans	11. Daily safety inspections of storage & use areas will be performed.	11. Use & storage procedures will be reviewed.
12. Concrete Trucks	12. Initial inspections will be conducted prior to use.	12. Proficiency training will be conducted.
13. Concrete Vibrators	13. Initial inspections will be conducted prior to use.	13. Proficiency training will be conducted.
14. GFIs	14. Monthly inspections will be performed.	14. Personnel will be instructed on proper use of GFIs.
15. Extension Cords	15. Monthly inspections will be performed.	15. Personnel will be instructed on proper use of extension cords.
16. Ladders	16. Monthly inspections will be performed.	16. Personnel will be instructed on proper use of ladders.

ACTIVITY HAZARD ANALYSIS

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Groundwater Treatment System Installation

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
Equalization Tank Installation	Slip, Trip and Fall	Slip/Trip and Fall ♦ Maintain work area free of clutter and debris. ♦ Mark holes, drop offs and uneven surfaces in work area and inform workers to avoid these areas. ♦ Keep walking surfaces dry. ♦ Practice good housekeeping.
	Back Injuries	Back Injuries ♦ Site personnel will be instructed on proper lifting techniques. ♦ Mechanical devices will be utilized to reduce manual material handling. ♦ Team lifting will be utilized in lieu of mechanical devices.
Sodium Hydroxide Chemical Feed System Installation	Slip, Trip and Fall	Slip, Trip and Fall ♦ Maintain work area free of clutter and debris. ♦ Mark holes, drop offs and uneven surfaces in work area and inform workers to avoid these areas. ♦ Keep walking surfaces dry. ♦ Practice good housekeeping.
	Back Injuries	Back Injuries ♦ Site personnel will be instructed on proper lifting techniques. ♦ Mechanical devices will be utilized to reduce manual material handling. ♦ Team lifting will be utilized in lieu of mechanical devices.
Use of Hand and Power Tools	Contusions, Abrasions, Cuts & Amputations	Contusions, Abrasions, Cuts & Amputations ♦ Tools shall be inspected quarterly and prior to use. ♦ All power tools originally equipped with a safety guard of any type shall only be used with the guard in place and functioning properly. ♦ Defective tools shall be tagged and removed from service. ♦ Tools shall be used only for their intended purpose. ♦ Electric tools shall be unplugged when changing attachments or performing maintenance. ♦ Pneumatic tools shall be disconnected and air pressure released before repair or adjustments are made. ♦ Sections of air hoses that are not equipped with quick release fittings shall be secured together with a safety chain or tie.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Groundwater Treatment System Installation

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
Crane Operations	Operator Error	Operator Error ♦ Cranes shall only be operated by qualified operators or trainees under the direct supervision of a qualified supervisor. ♦ The operator shall use the crane in accordance with the manufacturer's operating instructions. ♦ Operators shall be in constant visual or radio contact with signal-person(s) before and during every lift. ♦ The operator of the crane will sound an air-horn to warn personnel prior to having a load pass over the building area that is under construction. ♦ Operators shall consider the total weight of the lift and the capacity of the crane, and be able to accurately use load and lift charts provided by the crane manufacturer. If in the judgment of the operator, a load will approach the cranes capacity in a particular configuration, the operator's supervisor is responsible for providing the operator with the actual or calculated weight of the load. Total load shall include all rigging and equipment below the hook. ♦ Operators shall not leave the control station of a crane during a lift or pick, except under the following conditions: • The load is lowered or raised to a safe landing area and fully supported with no tension on the load line. • After positioning all brakes, pawls, switches, or clutches in a safe position, to turn the crane over to another qualified operator. • When required to do so by an approved emergency procedure. ♦ The equipment operator shall not engage any by-pass, override, or otherwise disable any crane safety feature.
	Crane Failure During Lift	Crane Failure During Lift ♦ All applicable inspections shall be performed on cranes by a qualified inspector following manufacturer's recommendations and specifications. ♦ No modifications shall be made to any crane without the prior written approval of the manufacturer. ♦ Crane load charts and the operator's manual shall be posted in the cab of every crane.
	Crane Instability	Crane Instability ♦ Cranes equipped with outriggers shall have outriggers fully extended or as allowed by manufacturer's instructions and set on firm footings before every lift. If setting outriggers on soft surfaces or over buried pipe cannot be avoided, oak blocking should be used under the outrigger loads to distribute the crane loads over sufficient area to ensure crane stability. If outriggers are utilized, tires must not be in contact with the ground. The crane shall be level within 1% of the grade.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Groundwater Treatment System Installation

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Contact With the Crane or Load During Operation	Contact With the Crane or Load During Operation ♦ The swing radius of the crane counterweight shall be flagged or barricaded. Employees shall not get on or off a crane while it is in motion. Adjustments, repairs, or lubrication shall not be permitted on moving equipment unless it is required by manufacturer's recommendations. Tool boxes, oil cans, sling racks, water coolers, or other items shall not be placed within the swing radius of the counterweight. The oiler, where required, shall stand clear of the swing radius and assist the operator in keeping other employees outside the swing radius. ♦ Note: Cranes with the counterweight located higher than 8 feet above the surrounding personnel access level need not be guarded unless a platform or other circumstance would allow personnel to be struck or crushed by the rotating counterweight. Guy wires within the swing radius of the crane or load shall be marked with highly visible flagging or rope. ♦ Personnel shall not stand, pass or place any body part under a suspended load.
	Contact With Energized Power Lines of Work Near Critical Systems or Piping	Contact With Energized Power Lines of Work Near Critical Systems or Piping ♦ The Project Superintendent, SHSO, and Rigging Supervisor shall evaluate if any part of the hoisting equipment or load: • Could approach 15 feet of 50 to 200 kV overhead electrical distribution and transmission lines. • Are within 15 feet of 50 to 200 kV overhead electrical distribution and transmission lines. • Is near transmitter towers where an electrical charge can be induced in the equipment or load. ♦ The maximum achievable boom length and 360 degree boom rotation shall be assumed when making the above clearance determinations. Notes: • Lines shall be considered energized unless the person owning such line or the Project Superintendent verifies that it is not an energized line. • Lines having long spans tend to move laterally and vertically due to wind and this potential must be considered in determining minimum clearance. • For minimum allowable distance to distribution and transmission lines with voltages greater than 200 kV, refer to 29 CFR 1926.550(a)(15)(ii).
	Critical Lifts	Critical Lifts ♦ A written Critical Lift Plan shall be developed specifying job details and special safety measures.
	Crane Being Struck by Lightning	Crane Being Struck by Lightning ♦ Crane operations shall cease when dangerous weather is imminent.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Groundwater Treatment System Installation

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Load Instability	Load Instability ♦ Tag line(s) shall be required on all loads unless tag lines create a safety hazard, (i.e., dragging on a high voltage line, critical valves, becoming stuck on rebar, causing a tripping hazard for personnel walking a load, etc.). Use as many tag lines as necessary to adequately control the load. ♦ The load shall be safely landed (supported) and determined to be stable before workers are permitted to approach the load. ♦ Crane operations shall cease if wind loading becomes questionable due to wind direction or velocity, boom length, boom angle, or size or weight of load.
	Fire on Crane	Fire on Crane ♦ An accessible fire extinguisher with a minimum 10ABC rating shall be provided on every crane.
Particulate Filtration Unit Installation	Slip, Trip and Fall	Slip, Trip and Fall ♦ Maintain work area free of clutter and debris. ♦ Mark holes, drop offs and uneven surfaces in work area and inform workers to avoid these areas. ♦ Keep walking surfaces dry. ♦ Practice good housekeeping.
	Back Injuries	Back Injuries ♦ Site personnel will be instructed on proper lifting techniques. ♦ Mechanical devices will be utilized to reduce manual material handling. ♦ Team lifting will be utilized in lieu of mechanical devices.
Use of Hand and Power Tools	Contusions, Abrasions, Cuts & Amputations	Contusions, Abrasions, Cuts & Amputations ♦ Tools shall be inspected quarterly and prior to use. ♦ All power tools originally equipped with a safety guard of any type shall only be used with the guard in place and functioning properly. ♦ Defective tools shall be tagged and removed from service. ♦ Tools shall be used only for their intended purpose. ♦ Electric tools shall be unplugged when changing attachments or performing maintenance. ♦ Pneumatic tools shall be disconnected and air pressure released before repair or adjustments are made. ♦ Sections of air hoses that are not equipped with quick release fittings shall be secured together with a safety chain or tie.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Groundwater Treatment System Installation

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
Liquid-and Vapor-Phase GAC Units Installation	Slip, Trip and Fall	Slip, Trip and Fall ♦ Maintain work area free of clutter and debris. ♦ Mark holes, drop offs and uneven surfaces in work area and inform workers to avoid these areas. ♦ Keep walking surfaces dry. ♦ Practice good housekeeping.
	Back Injuries	Back Injuries ♦ Site personnel will be instructed on proper lifting techniques. ♦ Mechanical devices will be utilized to reduce manual material handling. ♦ Team lifting will be utilized in lieu of mechanical devices.
Process Pumps and Sump Pumps Installation	Slip, Trip and Fall	Slip, Trip and Fall ♦ Maintain work area free of clutter and debris. ♦ Mark holes, drop offs and uneven surfaces in work area and inform workers to avoid these areas. ♦ Keep walking surfaces dry. ♦ Practice good housekeeping.
	Back Injuries	Back Injuries ♦ Site personnel will be instructed on proper lifting techniques. ♦ Mechanical devices will be utilized to reduce manual material handling. ♦ Team lifting will be utilized in lieu of mechanical devices.
Air Compressor and Drier System Installation	Slip, Trip and Fall	Slip, Trip and Fall ♦ Maintain work area free of clutter and debris. ♦ Mark holes, drop offs and uneven surfaces in work area and inform workers to avoid these areas. ♦ Keep walking surfaces dry. ♦ Practice good housekeeping.
	Back Injuries	Back Injuries ♦ Site personnel will be instructed on proper lifting techniques. ♦ Mechanical devices will be utilized to reduce manual material handling. ♦ Team lifting will be utilized in lieu of mechanical devices.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Groundwater Treatment System Installation

EQUIPMENT USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
1. Heavy Equipment	1. Initial inspection will be conducted prior to use.	1. Only qualified equipment operators will be used.
2. Fire Extinguishers	2. Monthly inspections will be performed.	2. Personnel will be given instructions on proper use of fire extinguishers.
3. PID and CGI/O2 meter	3. Pre and Post Calibration/system checks will be performed daily.	3. Proficiency training for users will be given.
4. PPE (coveralls, tyvek, full faced masks, booties, steel toe boots, hard hats, safety glasses, leather or Kevlar gloves, ear plugs or ear muffs).	4. An initial inspection of each lot of PPE will be performed.	4. Personnel will be given training on proper donning/doffing procedures.
5. First Aid Kits	5. Daily safety & weekly inspections will be performed.	5. Personnel with first aid & CPR training will be identified. Bloodborne pathogen training will be reviewed with CPR & first aid trained employees.
6. Diesel Fuel/Oil & Other Potentially Hazardous Materials	6. Daily safety inspection of storage & use areas will be conducted.	6. Hazard communication training will be given.
7. Spill Control Materials	7. Daily safety inspection of spill control materials will be conducted.	7. Personnel will be given training on how to respond to spilled materials.
8. Chains, Slings or Ropes	8. Inspections prior to each use will be conducted.	8. Personnel will be trained on proper inspection & use of chains, slings & ropes.
9. Hand Tools (e.g., hammers)	9. Initial inspections will be conducted prior to use.	9. Personnel will be given training on the safety procedures associated with hand tools.
10. Augers & Fence Post Drivers	10. Initial inspections will be conducted prior to use.	10. Proficiency training will be given.
11. Safety Cans	11. Daily safety inspections of storage & use areas will be performed.	11. Use & storage procedures will be reviewed.
12. Concrete Trucks	12. Initial inspections will be conducted prior to use.	12. Proficiency training will be conducted.
13. Concrete Vibrators	13. Initial inspections will be conducted prior to use.	13. Proficiency training will be conducted.
14. GFIs	14. Monthly inspections will be performed.	14. Personnel will be instructed on proper use of GFIs.
15. Extension Cords	15. Monthly inspections will be performed.	15. Personnel will be instructed on proper use of extension cords.
16. Ladders	16. Monthly inspections will be performed.	16. Personnel will be instructed on proper use of ladders.

ACTIVITY HAZARD ANALYSIS

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Site Restoration

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
Placing Sod, Seed and Hay	Eye Injury	Eye Injury ♦ Proper face and eye protection shall be worn during the application of seed. ANSI approved, tight fitting, safety goggles will be worn during high wind or dust generating tasks/conditions. http://www.shop.com/op/~AO_Safety_Maxim_153_2x2_Goggle-prod-12292770
	Strain	Strain ♦ Use proper lifting techniques and if appropriate use mechanical lifting devices.
	Dust	Dust ♦ Use appropriate respiratory protection, if required. ♦ ANSI approved, tight fitting, safety goggles will be worn during high wind or dust generatingtasks/conditions. http://www.shop.com/op/~AO_Safety_Maxim_153_2x2_Goggle-prod-12292770
	Slip/Trip/Fall	Slip/Trip/Fall ♦ Mark all low spots in area with banner tape. Instruct personnel to use care in these areas.
Placing Topsoil, Fertilizer and Mulching	Equipment Tipping Over	Equipment Tipping Over ♦ Heavy equipment shall have rollover equipment as required by 29 CFR 1926.1000. ♦ Seat belts shall be worn at all times during operation. ♦ Operators shall not use equipment on slopes steeper than 1.5H:1.0V unless operation is consistent with manufacturer's recommendations. ♦ Operators of heavy equipment with blades, buckets, beds, etc. shall keep them lowered or in a stable position while on slopes. ♦ Ensure ground personnel are located out of the way of potential equipment turnover or failure (including buckets). ♦ Operators and spotters are to be in constant radio contact or visual sight. ♦ Equipment not to be left running unattended.
	Eye Injury	Eye Injury ♦ Proper face and eye protection shall be worn during the application of seed. ANSI approved, tight fitting, safety goggles will be worn during high wind or dust generating tasks/conditions. http://www.shop.com/op/~AO_Safety_Maxim_153_2x2_Goggle-prod-12292770
	Dust	Dust ♦ Use appropriate respiratory protection, if required. ANSI approved, tight fitting, safety goggles will be worn during high wind or dust generating tasks/conditions. http://www.shop.com/op/~AO_Safety_Maxim_153_2x2_Goggle-prod-12292770
	Back Injury	Back Injury ♦ Use proper lifting techniques and if appropriate use mechanical lifting devices.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Site Restoration

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
Planting Trees	Slip/Trip/Fall	Slip/Trip/Fall ♦ Mark all low spots in area with banner tape. Instruct personnel to use care in these areas.
	Eye Injury	Eye Injury ♦ Proper face and eye protection shall be worn during the application of seed. ANSI approved, tight fitting, safety goggles will be worn during high wind or dust generating tasks/conditions. http://www.shop.com/op/~AO_Safety_Maxim_153_2x2_Goggle-prod-12292770
	Dust	Dust ♦ Use appropriate respiratory protection, if required. ♦ ANSI approved, tight fitting, safety goggles will be worn during high wind or dust generating tasks/conditions. http://www.shop.com/op/~AO_Safety_Maxim_153_2x2_Goggle-prod-12292770
	Back Injury	Back Injury ♦ Use proper lifting techniques and if appropriate use mechanical lifting devices.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Site Restoration

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
Construction of Berm Around Treatment Building	Slip/Trip/Fall	Slip/Trip/Fall ♦ Mark all low spots in area with banner tape. Instruct personnel to use care in these areas.
	Back Injury	Back Injury ♦ Use proper lifting techniques and if appropriate use mechanical lifting devices.
Repair Damaged Roadways, Curbs and Sidewalks	Slip/Trip/Fall	Slip/Trip/Fall ♦ Mark all low spots in area with banner tape. Instruct personnel to use care in these areas.
	Back Injury	Back Injury ♦ Use proper lifting techniques and if appropriate use mechanical lifting devices.

EQUIPMENT USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
1. Heavy Equipment	1. Initial inspection will be conducted prior to use.	1. Only qualified equipment operators will be used.
2. Fire Extinguishers	2. Monthly inspections will be performed.	2. Personnel will be given instructions on proper use of fire extinguishers.
3. PID and CGI/O2 meter	3. Pre and Post Calibration/system checks will be performed daily.	3. Proficiency training for users will be given.
4. PPE (coveralls, tyvek, full faced masks, booties, steel toe boots, hard hats, safety glasses, leather or Kevlar gloves, ear plugs or ear muffs).	4. An initial inspection of each lot of PPE will be performed.	4. Personnel will be given training on proper donning/doffing procedures.
5. First Aid Kits	5. Daily safety & weekly inspections will be performed.	5. Personnel with first aid & CPR training will be identified. Bloodborne pathogen training will be reviewed with CPR & first aid trained employees.
6. Diesel Fuel/Oil & Other Potentially Hazardous Materials	6. Daily safety inspection of storage & use areas will be conducted.	6. Hazard communication training will be given.
7. Spill Control Materials	7. Daily safety inspection of spill control materials will be conducted.	7. Personnel will be given training on how to respond to spilled materials.
8. Hand Tools (e.g., hammers)	8. Initial inspections will be conducted prior to use.	8. Personnel will be given training on the safety procedures associated with hand tools.
9. Safety Cans	9. Daily safety inspections of storage & use areas will be performed.	9. Use & storage procedures will be reviewed.
10. Concrete Trucks	10. Initial inspections will be conducted prior to use.	10. Proficiency training will be conducted.
11. Concrete Vibrators	11. Initial inspections will be conducted prior to use.	11. Proficiency training will be conducted.
12. GFIs	12. Monthly inspections will be performed.	12. Personnel will be instructed on proper use of GFIs.

ACTIVITY HAZARD ANALYSIS

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Startup and Shakedown of Treatment Plant

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
Mobilization of Equipment & Supplies	Slips/Trip/Fall	Slip/Trip/Fall ♦ Work areas and means of access shall be maintained safely & orderly. ♦ Even terrain will be utilized as unloading areas. ♦ Tripping & poor footing hazards will be repaired as they are discovered or clearly identified/marked.
	Vehicular Traffic	Vehicular Traffic ♦ Spotters will be used when backing up trucks & moving equipment.
	Back Injuries	Back Injuries ♦ Site personnel will be instructed on proper lifting techniques. ♦ Mechanical devices will be utilized to reduce manual handling of materials. ♦ Team lifting will be used if mechanical devices are not available.
	Dropped Objects	Dropped Objects ♦ ANSI approved steel toe boots will be worn.
	Overhead Hazards	Overhead Hazards ♦ Personnel will be required to wear ANSI approved hard hats.
	Eye Injury	Eye Injury ♦ ANSI approved safety glasses will be worn. ♦ ANSI approved, tight fitting, safety goggles will be worn during high wind or dust generating tasks/conditions. http://www.shop.com/op/~AO_Safety_Maxim_153_2x2_Goggle-prod-12292770
	Spills	Spills ♦ Spill & absorbent materials will be readily available. ♦ All process chemicals will be stored in their appropriate storage areas inside the treatment building. ♦ Incompatible materials will be stored separately.
	Chemical Exposure	Chemical Exposure ♦ Protective clothing (i.e., chemical gloves, aprons & safety goggles) will be worn when handling process chemicals. ♦ Skin will be rinsed with water if contact with hazardous materials occurs. ♦ Hazard communication training will be conducted.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Startup and Shakedown of Treatment Plant

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Heat Stress	Heat Stress ♦ Drink adequate amounts of liquids throughout the workday. ♦ Eat three meals a day to supply nourishment. ♦ Seek cool area and rest when needed. ♦ Watch fellow workers for signs of heat stress. ♦ Institute work/rest regimens as necessary. ♦ Physiological monitoring to be conducted when ambient temperatures greater than 85°F.
	Cold Stress	Cold Stress ♦ Wear adequate number of dry, layered clothing (insulated coveralls, gloves, hats). ♦ Seek heated area when needed. ♦ Watch fellow workers for signs of cold stress. ♦ Air temperature and wind chill should be monitored.
Material Handling - Manual	Slip/Trip/Fall	Slip/Trip/Fall ♦ Work areas and means of access shall be maintained safely & orderly. ♦ Even terrain will be utilized as unloading areas. ♦ Tripping & poor footing hazards will be repaired as they are discovered or clearly identified/marked.
	Overhead Hazards	Overhead Hazards ♦ Personnel will be required to wear ANSI approved hard hats (Standard Z89.1). ♦ All wire ropes, chains & slings will be rated for the load that it is expected to lift. All lifting materials will be inspected at the beginning of each work shift and prior to each use. ♦ All ground personnel will stay clear of all suspended loads.
	Dropped Objects	Dropped Objects ♦ Steel toe boots meeting ANSI standard Z41 will be worn. ♦ Ground personnel will be instructed to stay clear of suspended loads. ♦ Personnel will be instructed on proper rigging procedures.
	Eye Injury	Eye Injury ♦ ANSI approved safety glasses will be worn. ANSI approved, tight fitting, safety goggles will be worn during high wind or dust generating tasks/conditions. http://www.shop.com/op/~AO_Safety_Maxim_153_2x2_Goggle-prod-12292770
	Noise	Noise ♦ Hearing protection (ear muffs or ear plugs) shall be worn in work areas where the decibel level may be above 85dbA. ♦ Wear hearing protection when in the vicinity of heavy equipment, pumps or other noise producing machinery or if having difficulty speaking with someone when standing 3 feet apart.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Startup and Shakedown of Treatment Plant

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Back Injuries	Back Injuries ♦ Site personnel will be instructed on proper lifting techniques. ♦ Mechanical devices will be utilized to reduce manual handling of materials. ♦ Team lifting will be used if mechanical devices are not available.
	Sharp Objects	Sharp Objects ♦ Cut resistant work gloves such as Kevlar will be worn. ♦ All hand & power tools will be maintained in safe condition. ♦ First aid kits will be available adjacent to work areas. ♦ Guards will be kept in place on all hand & power tools.
	Chemical Exposure	Chemical Exposure ♦ Protective clothing (i.e., chemical gloves, aprons & safety goggles) will be worn when handling process chemicals. ♦ Skin will be rinsed with water if contact with hazardous materials occurs. ♦ Hazard communication training will be conducted.
	Spills	Spills ♦ Spill an absorbent materials will be readily available. ♦ All process chemicals will be stored in their appropriate storage areas inside the treatment building. ♦ Incompatible materials will be stored separately.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Startup and Shakedown of Treatment Plant

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
Electrical Testing	Electrocution/Contact with Electricity	Electrocution/Contact with Electricity ♦ All electrical work/testing will be conducted or supervised by a licensed electrician. ♦ All lockout/tagout procedures will be followed. ♦ Live parts of wiring or equipment shall be guarded to protect all persons or objects from contacting them. ♦ When working/testing on live parts of wiring or equipment less than 480 volts, insulated tools must be used. ♦ When it is necessary to work/test on energized lines or equipment greater than or equal to 480 volts, rubber gloves & other protective equipment or hotline tools meeting the provisions of ANSI/ASTM standards shall be used. Insulation mats or platforms of substantial construction and providing good footing shall be placed on the floors & on the frames of equipment that has exposed live parts so that the operator or person cannot come into contact with the live parts. ♦ In the following situations, at least two persons shall work together – one person trained to recognize electrical hazards shall be delegated to watch the movements of the others during work to provide warning if they get dangerously close to line conductors or perform other unsafe acts and so that assistance can be provided in case of an accident: ♦ Work involving handling energized conductors or apparatus. ♦ Work at remote or isolated locations. ♦ Work at night or during inclement weather. ♦ Work in substations where wiring is congested. ♦ Barriers will be established to prevent equipment & people from entering a work area. ♦ Plugs & receptacles shall be kept out of water unless they are of the approved submersible type. ♦ All electrical tools and equipment will be equipped with GFCI. ♦ Electrical extension cords will be of the “Hard” or “Extra Hard” service type.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Startup and Shakedown of Treatment Plant

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Dropped Objects	Dropped Objects ♦ ANSI approved steel toe boots will be worn.
	Fire	Fire ♦ 10-lb. ABC type fire extinguisher will be located adjacent to the work area. ♦ Smoking will not be allowed in the work area.
	Struck By/Caught Between	Struck By/Caught Between ♦ The lift and swing path of man/scissor lifts will be maintained clear of obstructions. ♦ All personnel will maintain a safe distance from man/scissor lifts when raising & lowering.
	Heat Stress	Heat Stress ♦ Drink adequate amounts of liquids throughout the workday. ♦ Eat three meals a day to supply nourishment. ♦ Seek cool area and rest when needed. ♦ Watch fellow workers for signs of heat stress. ♦ Institute work/rest regimens as necessary. ♦ Physiological monitoring to be conducted when ambient temperatures greater than 85°F.
	Cold Stress	Cold Stress ♦ Wear adequate number of dry, layered clothing (insulated coveralls, gloves, hats). ♦ Seek heated area when needed. ♦ Watch fellow workers for signs of cold stress. ♦ Air temperature and wind chill should be monitored.
	Flying Objects and Debris	Flying Objects and Debris ♦ ANSI approved safety glasses will be worn. ANSI approved, tight fitting, safety goggles will be worn during high wind or dust generating tasks/conditions. http://www.shop.com/op/~AO_Safety_Maxim_153_2x2_Goggle-prod-12292770
	Noise	Noise ♦ Hearing protection (ear muffs or ear plugs) shall be worn in work areas where the decibel level may be above 85dbA. ♦ Wear hearing protection when in the vicinity of heavy equipment, pumps or other noise producing machinery or if having difficulty speaking with someone when standing 3 feet apart.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Startup and Shakedown of Treatment Plant

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Slip/Trip/Fall	Slip/Trip/Fall ♦ Personnel will clear walkways of equipment & materials. ♦ Other obstructions will be marked, identified or barricaded. ♦ Tripping and poor footing hazards will be repaired as they are discovered or will be clearly identified. ♦ Even terrain will be utilized for equipment use. ♦ The anchor point of a lanyard shall be strong enough to support at least two times the potential impact load of the employee's fall. ♦ Ladders shall be extended three feet beyond the landing zone. ♦ Ladders shall be placed on firm, level surfaces and tied off at both the top & bottom. ♦ When utilizing man and scissor lifts, do not exceed the manufacturer's recommended platform load capacities. ♦ A full-body harness and lanyard shall be used when operating an extend-a-boom lift. ♦ All man and scissor lifts shall meet the requirements outlined in 29 CFR 1910.68. ♦ Fall protection shall be provided to workers exposed to falls of 6 feet or more, as specified by EM 385-1-1 Section 21 and 29 CFR 1926.500.
Instrumentation/Mechanical Tests	Dropped Objects	Dropped Objects ♦ ANSI approved steel toe boots will be worn.
	Fire	Fire ♦ 10-lb. ABC type fire extinguisher will be located adjacent to the work area. ♦ Smoking will not be allowed in the work area.
	Struck By/Caught Between	Struck By/Caught Between ♦ The lift and swing path of man/scissor lifts will be maintained clear of obstructions. ♦ All personnel will maintain a safe distance from man/scissor lifts when raising & lowering. ♦ When it is necessary to observe/test energized mechanical equipment, the following precautions should be taken: • Barriers will be established to prevent equipment and people from entering a work area. • Personnel will keep hands and loose clothing away from all moving parts. • Personnel will be briefed on emergency shut down procedures. • Only necessary guards will be removed to observe/test equipment. • All lockout/tagout procedures will be followed, if manual tests on any of the equipment are performed.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Startup and Shakedown of Treatment Plant

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Heat Stress	Heat Stress ♦ Drink adequate amounts of liquids throughout the workday. ♦ Eat three meals a day to supply nourishment. ♦ Seek cool area and rest when needed. ♦ Watch fellow workers for signs of heat stress. ♦ Institute work/rest regimens as necessary. ♦ Physiological monitoring to be conducted when ambient temperatures greater than 85ºF.
	Cold Stress	Cold Stress ♦ Wear adequate number of dry, layered clothing (insulated coveralls, gloves, hats). ♦ Seek heated area when needed. ♦ Watch fellow workers for signs of cold stress. ♦ Air temperature and wind chill should be monitored.
	Flying Objects and Debris	Flying Objects and Debris ♦ ANSI approved safety glasses will be worn. ♦ ANSI approved, tight fitting, safety goggles will be worn during high wind or dust generatingtasks/conditions. http://www.shop.com/op/~AO_Safety_Maxim_153_2x2_Goggle-prod-12292770 ♦ ANSI approved safety goggles and splash shields will be worn if a splash potential exists.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Startup and Shakedown of Treatment Plant

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Slip/Trip/Fall	Slip/Trip/Fall ♦ Personnel will clear walkways of equipment & materials ♦ Other obstructions will be marked, identified or barricaded. ♦ Tripping and poor footing hazards will be repaired as they are discovered or will be clearly identified. ♦ Even terrain will be utilized for equipment use. ♦ The anchor point of a lanyard shall be strong enough to support at least two times the potential impact load of the employee's fall. ♦ Ladders shall be extended three feet beyond the landing zone. ♦ Ladders shall be placed on firm, level surfaces and tied off at both the top & bottom. ♦ When utilizing man and scissor lifts, do not exceed the manufacturer's recommended platform load capacities. ♦ A full-body harness and lanyard shall be used when operating an extend-a-boom lift. ♦ All man and scissor lifts shall meet the requirements outlined in 29 CFR 1910.68. ♦ Fall protection shall be provided to workers exposed to falls of 6 feet or more, as specified by EM 385-1-1 Section 21 and 29 CFR 1926.500.
	Electrocution/Contact with Electricity	Electrocution/Contact with Electricity ♦ Live parts of wiring or equipment shall be guarded to protect all persons or objects from contacting them. ♦ Plugs & receptacles shall be kept out of water unless they are of the approved submersible type. ♦ Cords will be kept from heat and sharp edges. ♦ All electrical tools and equipment will be equipped with GFCI.
	Noise	Noise ♦ Hearing protection (ear muffs or ear plugs) shall be worn in work areas where the decibel level may be above 85dbA. ♦ Wear hearing protection when in the vicinity of heavy equipment, pumps or other noise producing machinery or if having difficulty speaking with someone when standing 3 feet apart.
System Tests	Dropped Objects	Dropped Objects ♦ ANSI approved steel toe boots will be worn.
	Fire	Fire ♦ 10-lb. ABC type fire extinguisher will be located adjacent to the work area. ♦ Smoking will not be allowed in the work area.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Startup and Shakedown of Treatment Plant

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Struck By/Caught Between	Struck by/Caught Between ♦ The lift and swing path of man/scissor lifts will be maintained clear of obstructions. ♦ All personnel will maintain a safe distance from man/scissor lifts when raising & lowering. ♦ When it is necessary to observe/test energized mechanical equipment, the following precautions should be taken: ♦ Barriers will be established to prevent equipment and people from entering a work area, ♦ Personnel will keep hands and loose clothing away from all moving parts. ♦ Personnel will be briefed on emergency shut down procedures. ♦ Only necessary guards will be removed to observe/test equipment. ♦ All lockout/tagout procedures will be followed, if manual tests on any of the equipment is performed. ♦ Personnel shall stand to the side when opening & closing valve assemblies.
	Heat Stress	Heat Stress ♦ Drink adequate amounts of liquids throughout the workday. ♦ Eat three meals a day to supply nourishment. ♦ Seek cool area and rest when needed. ♦ Watch fellow workers for signs of heat stress. ♦ Institute work/rest regimens as necessary. ♦ Physiological monitoring to be conducted when ambient temperatures greater than 85°F.
	Cold Stress	Cold Stress ♦ Wear adequate number of dry, layered clothing (insulated coveralls, gloves, hats). ♦ Seek heated area when needed. ♦ Watch fellow workers for signs of cold stress. ♦ Air temperature and wind chill should be monitored.
	Flying Objects and Debris	Flying Objects and Debris ♦ ANSI approved safety glasses will be worn. ♦ ANSI approved safety goggles and splash shields will be worn if a splash potential exists.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Startup and Shakedown of Treatment Plant

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Slip/Trip/Fall	Slip/Trip/Fall ♦ Personnel will clear walkways of equipment & materials. ♦ Other obstructions will be marked, identified or barricaded. ♦ Tripping and poor footing hazards will be repaired as they are discovered or will be clearly identified. ♦ Even terrain will be utilized for equipment use. ♦ The anchor point of a lanyard shall be strong enough to support at least two times the potential impact load of the employee's fall. ♦ Ladders shall be extended three feet beyond the landing zone. ♦ Ladders shall be placed on firm, level surfaces and tied off at both the top & bottom. ♦ When utilizing man and scissor lifts, do not exceed the manufacturer's recommended platform load capacities. ♦ A full-body harness and lanyard shall be used when operating an extend-a-boom lift. ♦ All man and scissor lifts shall meet the requirements outlined in 29 CFR 1910.68. ♦ Fall protection shall be provided to workers exposed to falls of 6 feet or more, as specified by EM 385-1-1 Section 21 and 29 CFR 1926.500.
	Electrocution/Contact with Electricity	Electrocution/Contact with Electricity ♦ Live parts of wiring or equipment shall be guarded to protect all persons or objects from contacting them. ♦ Plugs & receptacles shall be kept out of water unless they are of the approved submersible type. ♦ Cords will be kept from heat and sharp edges. ♦ All electrical tools and equipment will be equipped with GFCI.
Repairs (Electrical, Plumbing, Mechanical)	Dropped Objects	Dropped Objects ♦ ANSI approved steel toe boots will be worn.
	Fire	Fire ♦ 10-lb. ABC type fire extinguisher will be located adjacent to the work area. ♦ Smoking will not be allowed in the work area.
	Struck By/Caught Between	Struck By/Caught Between ♦ The lift and swing path of man/scissor lifts will be maintained clear of obstructions. ♦ All personnel will maintain a safe distance from man/scissor lifts when raising & lowering. ♦ Lockout/Tagout procedures will be followed.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Startup and Shakedown of Treatment Plant

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Chemical Exposure	Chemical Exposure ♦ Protective clothing (i.e., chemical gloves & safety glasses) will be worn. ♦ Skin will be rinsed with water if contact with hazardous materials occurs. ♦ Hazard communication training will be conducted.
	Inhalation Hazard	Inhalation Hazards ♦ Air monitoring will be performed per the SHSP. ♦ Respiratory protection will be required if air monitoring levels exceed recommended exposure limits.
	Confined Space Entry	Confined Space Entry ♦ Confined space entry procedures outlined in 29 CFR 1910.146, EM 385-1-1 Section 06.I will be followed.
	Noise	Noise ♦ Hearing protection (ear muffs or ear plugs) shall be worn in work areas where the decibel level may be above 85dbA. ♦ Wear hearing protection when in the vicinity of heavy equipment, pumps or other noise producing machinery or if having difficulty speaking with someone when standing 3 feet apart.
	Electrocution/Contact with Electricity	Electrocution/Contract with Electricity ♦ Live parts of wiring or equipment shall be guarded to protect all persons or objects from contacting them. ♦ Plugs & receptacles shall be kept out of water unless they are of the approved submersible type. ♦ Cords will be kept from heat and sharp edges. ♦ All electrical tools and equipment will be equipped with GFCI.
	Back Injuries	Back Injuries ♦ Site personnel will be instructed on proper lifting techniques. ♦ Mechanical devices will be utilized to reduce manual handling of materials. ♦ Team lifting will be used if mechanical devices are not available.
	Sharp Objects	Sharp Objects ♦ Cut resistant work gloves such as Kevlar will be worn. ♦ All hand & power tools will be maintained in safe condition. ♦ First aid kits will be available adjacent to work areas. ♦ Guards will be kept in place on all hand & power tools.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Startup and Shakedown of Treatment Plant

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Heat Stress	Heat Stress ♦ Drink adequate amounts of liquids throughout the workday. ♦ Eat three meals a day to supply nourishment. ♦ Seek cool area and rest when needed. ♦ Watch fellow workers for signs of heat stress. ♦ Institute work/rest regimens as necessary. ♦ Physiological monitoring to be conducted when ambient temperatures greater than 85ºF.
	Cold Stress	Cold Stress ♦ Wear adequate number of dry, layered clothing (insulated coveralls, gloves, hats). ♦ Seek heated area when needed. ♦ Watch fellow workers for signs of cold stress. ♦ Air temperature and wind chill should be monitored.
	Slip/Trip/Fall	Slip/Trip/Fall ♦ Personnel will clear walkways of equipment & materials. ♦ Other obstructions will be marked, identified or barricaded. ♦ Tripping and poor footing hazards will be repaired as they are discovered or will be clearly identified. ♦ Even terrain will be utilized for equipment use. ♦ The anchor point of a lanyard shall be strong enough to support at least two times the potential impact load of the employee's fall. ♦ Ladders shall be extended three feet beyond the landing zone. ♦ Ladders shall be placed on firm, level surfaces and tied off at both the top & bottom. ♦ When utilizing man and scissor lifts, do not exceed the manufacturer's recommended platform load capacities. ♦ A full-body harness and lanyard shall be used when operating an extend-a-boom lift. ♦ All man and scissor lifts shall meet the requirements outlined in 29 CFR 1910.68. ♦ Fall protection shall be provided to workers exposed to falls of 6 feet or more, as specified by EM 385-1-1 Section 21 and 29 CFR 1926.500.
Hand Tools (Non-powered)	Flying Objects and Debris	Flying Objects and Debris ♦ ANSI approved safety glasses will be worn.
	Dropped Objects	Dropped Objects ♦ ANSI approved steel toe boots will be worn.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Startup and Shakedown of Treatment Plant

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Struck By	Struck By ♦ Work gloves will be worn. ♦ First aid kits will be available adjacent to the work area.
	Slip/Trip/Fall	Slip/Trip/Fall ♦ Tools will be kept in storage when not in use. ♦ Work areas and means of access will be maintained safe and orderly. ♦ Other obstructions will be marked, identified or barricaded. ♦ Tripping and poor footing hazards will be repaired as they are discovered or will be clearly identified.
	Overhead Hazards	Overhead Hazards ♦ All personnel are required to wear ANSI approved hard hats.
	Back Injuries	Back Injuries ♦ Site personnel will be instructed on proper lifting techniques. ♦ Mechanical devices will be utilized to reduce manual handling of materials. ♦ Team lifting will be used if mechanical devices are not available.
Powered Tools	Flying Objects and Debris	Flying Objects and Debris ♦ ANSI approved safety glasses will be worn. ANSI approved, tight fitting, safety goggles will be worn during high wind or dust generating tasks/conditions. http://www.shop.com/op/~AO_Safety_Maxim_153_2x2_Goggle-prod-12292770
	Dropped Objects	Dropped Objects ♦ ANSI approved steel toe boots will be worn. ♦ When work is being performed overhead, tools not in use shall be secured or placed in holders.
	Struck By	Struck By ♦ Work gloves will be worn. ♦ First aid kits will be available adjacent to the work area.
	Slip/Trip/Fall	Slip/Trip/Fall ♦ Personnel will clear walkways of equipment & materials. ♦ Other obstructions will be marked, identified or barricaded. ♦ Tripping and poor footing hazards will be repaired as they are discovered or will be clearly identified.
	Overhead Hazards	Overhead Hazards ♦ All personnel are required to wear ANSI approved hard hats.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Startup and Shakedown of Treatment Plant

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Back Injuries	Back Injuries ♦ Site personnel will be instructed on proper lifting techniques. ♦ Mechanical devices will be utilized to reduce manual handling of materials. ♦ Team lifting will be used if mechanical devices are not available.
	Noise	Noise ♦ Hearing protection (ear muffs or ear plugs) shall be worn in work areas where the decibel level may be above 85dbA. ♦ Wear hearing protection when in the vicinity of heavy equipment, pumps or other noise producing machinery or if having difficulty speaking with someone when standing 3 feet apart.
	Fire	Fire ♦ 10-lb. ABC type fire extinguisher will be located adjacent to the work area. ♦ Smoking will not be allowed in the work area.
	Sharp Objects	Sharp Objects ♦ Cut resistant work gloves such as Kevlar will be worn. ♦ All power tools will be maintained in safe condition. ♦ First aid kits will be available adjacent to work areas. ♦ Guards will be kept in place on all power tools.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Startup and Shakedown of Treatment Plant

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Struck By	Struck By ♦ All saws will be equipped with guards that automatically & completely enclose the cutting edges, splitters & anti-kickback devices. ♦ For saws equipped with upper & lower guards, when the tool is withdrawn from work, the lower guard will automatically & instantly return to the covered position. ♦ Power saws will not be left running unattended. ♦ Power tolls shall be disconnected when not in use, before servicing, and when changing accessories, such as blades, bits and cutters. ♦ Tools shall be secured to the working surface where applicable to free both hands to operate the tool. ♦ Good footing and balance shall be maintained when operating machinery. ♦ Power tolls designed to accommodate guards shall be equipped with such guards when in use. Reciprocating, rotating and moving parts of equipment shall be guarded if exposed to contact by personnel or otherwise create a hazard. ♦ Hand-held powered tools including: drills, tappers, fastener drivers; horizontal, vertical & angle grinders with wheels larger than 2 inches in diameter; disc & belt sanders, reciprocating saws, saber saws, and other similar tool shall be equipped with a momentary contact On-Off control switch. These tools also may be equipped with a lock-on control provided that turnoff can be accomplished by a single motion of the same finger or fingers that turn it on. ♦ Hand-held powered tools including: platen sanders, disc sanders & grinders with discs 2 inches or less in diameter; routers, planners, laminated trimmers, nibblers, shears, scroll saws and jigsaws with blade shanks ¼-inch wide or less shall be equipped with a positive On-Off control switch. ♦ Hand-held powered tools such as circular saws having a blade diameter greater than 2 inches, chain saws & percussion tools without positive accessory holding means must be equipped with a constant pressure switch that will shut off the power when the pressure is released. ♦ A push-stick, block or other safe means shall be used on all operations close to high-speed cutting edges. ♦ The use of cracked, bent or otherwise defective parts, such as saw blades, cutters or knives is prohibited.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Startup and Shakedown of Treatment Plant

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Electrocution/Contact with Electricity	Electrocution/Contact with Electricity ♦ Ground fault circuit interrupters (GFCIs) will be used. ♦ Exterior work will not be conducted in the rain. ♦ Cords will be inspected for damage prior to each use. Damaged equipment will be tagged & taken out of service. ♦ All equipment will be unplugged after use. ♦ Cords shall be kept off of & out of wet areas unless they are of the approved submersible type. ♦ Powered tools will not be carried by the cord or hose. ♦ Powered tools will not be disconnected from the receptacle by yanking the cord. ♦ Cords will be kept from heat and sharp edges. ♦ Powered tools will be equipped with either three-wire cords with ground and be grounded, be double-insulated, or be powered by a low-voltage isolation transformer.
Cutting/Welding & Abrasion of Steel (Torches/Chop Saws/Grinder)	Fire	Fire ♦ Hot work permits will be required for all cutting, welding, open flame and flame/spark-producing equipment. ♦ A fire watch will be assigned to watch for dangerous sparks in the areas during hot work operations. ♦ After completion of hot work, the fire watch will be maintained for 30 minutes. ♦ All requirements outlined in EM 385-1-1, Section 10 and 29 CFR 1926 Subpart J will be followed. ♦ 10-lb. ABC type fire extinguisher will be located adjacent to the work area. ♦ Smoking will not be allowed in the work area.
	Dermal Burns	Dermal Burns ♦ Protective equipment will be worn to prevent burns from hot slag.
	Sharp Objects	Sharp Objects ♦ Cut resistant work gloves such as Kevlar will be worn. ♦ All hand & powered tools will be maintained in safe condition. ♦ First aid kits will be available adjacent to work areas. ♦ Guards will be kept in place on all powered tools.
	Slip/Trip/Fall	Slip/Trip/Fall ♦ Personnel will clear walkways of equipment & materials. ♦ Other obstructions will be marked, identified or barricaded. ♦ Tripping and poor footing hazards will be repaired as they are discovered or will be clearly identified.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Startup and Shakedown of Treatment Plant

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Flying Objects and Debris	Flying Objects and Debris ♦ Safety goggles (the appropriate type of eye protection for the task will be chosen) meeting ANSI Standard Z87 will be worn. ANSI approved, tight fitting, safety goggles will be worn during high wind or dust generating tasks/conditions. http://www.shop.com/op/~AO_Safety_Maxim_153_2x2_Goggle-prod-12292770
	Dropped Objects	Dropped Objects ♦ Steel toe boots meeting ANSI Standard Z41 will be worn.
Chemical Handling	Inhalation Hazards	Inhalation Hazards ♦ Air monitoring will be performed per the SHSP. ♦ Respiratory protection will be required if air monitoring levels exceed recommended exposure limits.
	Chemical Exposure	Chemical Exposure ♦ Protective clothing (i.e., chemical gloves, aprons & safety goggles) will be worn when handling process chemicals. ♦ Skin will be rinsed with water if contact with hazardous materials occurs. ♦ Hazard communication training will be conducted.
	Spills	Spills ♦ Spill & absorbent materials will be readily available. ♦ All process chemicals will be stored in their appropriate storage areas inside the treatment building. ♦ Incompatible materials will be stored separately.
	Back Injuries	Back Injuries ♦ Site personnel will be instructed on proper lifting techniques. ♦ Mechanical devices will be utilized to reduce manual handling of materials. ♦ Team lifting will be used if mechanical devices are not available.
	Sharp Objects	Sharp Objects ♦ Cut resistant work gloves will be worn. ♦ All hand & powered tools will be maintained in safe condition. ♦ First aid kits will be available adjacent to work areas. ♦ Guards will be kept in place on all powered tools.
	Eye Injury	Eye Injury ♦ ANSI approved safety goggles or full-faced respirator will be worn. ANSI approved, tight fitting, safety goggles will be worn during high wind or dust generating tasks/conditions. http://www.shop.com/op/~AO_Safety_Maxim_153_2x2_Goggle-prod-12292770 ♦ Portable eye wash station will be readily available.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Startup and Shakedown of Treatment Plant

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Slip/Trip/Fall	Slip/Trip/Fall ♦ Personnel will clear walkways of equipment & materials. ♦ Other obstructions will be marked, identified or barricaded. ♦ Tripping and poor footing hazards will be repaired as they are discovered or will be clearly identified. ♦ Debris will not be allowed to accumulate where it becomes a hazard. ♦ Even terrain will be utilized for equipment use.
	Noise	Noise ♦ Hearing protection (ear muffs or ear plugs) shall be worn in work areas where the decibel level may be above 85dbA. ♦ Wear hearing protection when in the vicinity of heavy equipment, pumps or other noise producing machinery or if having difficulty speaking with someone when standing 3 feet apart.
	Overhead Hazards	Overhead Hazards ♦ All personnel will be required to wear ANSI approved hard hats (Standard Z89.1). ♦ All wire ropes, chains & slings will be rated for the load that it is expected to lift. All lifting materials will be inspected at the beginning of each work shift and prior to each use. Defective equipment will be tagged and taken out of service. ♦ All ground personnel will stay clear of all suspended loads.
	Heat Stress	Heat Stress ♦ Drink adequate amounts of liquids throughout the workday. ♦ Eat three meals a day to supply nourishment. ♦ Seek cool area and rest when needed. ♦ Watch fellow workers for signs of heat stress. ♦ Institute work/rest regimens as necessary. ♦ Physiological monitoring to be conducted when ambient temperatures greater than 85ºF.
	Cold Stress	Cold Stress ♦ Wear adequate number of dry, layered clothing (insulated coveralls, gloves, hats). ♦ Seek heated area when needed. ♦ Watch fellow workers for signs of cold stress. ♦ Air temperature and wind chill should be monitored.
	Dropped Objects	Dropped Objects ♦ Steel toe boots meeting ANSI Standard Z41 will be worn. ♦ Ground personnel will be instructed to stay clear of suspended loads. ♦ Personnel will be instructed on proper rigging procedures.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Startup and Shakedown of Treatment Plant

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Fire	Fire ♦ 10-lb. ABC type fire extinguisher will be located adjacent to the work area. ♦ Smoking will not be allowed in the work area.
Material and Pipe Tests	Dropped Objects	Dropped Objects ♦ ANSI approved steel toe boots will be worn.
	Fire	Fire ♦ 10-lb. ABC type fire extinguisher will be located adjacent to the work area. ♦ Smoking will not be allowed in the work area.
	Struck By/Caught Between	Struck By/Caught Between ♦ The lift and swing path of man/scissor lifts will be maintained clear of obstructions. ♦ All personnel will maintain a safe distance from man/scissor lifts when raising & lowering. ♦ When it is necessary to observe/test energized mechanical equipment, the following precautions should be taken: • Barriers will be established to prevent equipment and people from entering a work area. • Personnel will keep hands and loose clothing away from all moving parts. • Personnel will be briefed on emergency shut down procedures. • Only necessary guards will be removed to observe/test equipment. • All lockout/tagout procedures will be followed, if manual tests on any of the equipment is performed. • Personnel shall stand to the side when opening & closing valve assemblies.
	Heat Stress	Heat Stress ♦ Drink adequate amounts of liquids throughout the workday. ♦ Eat three meals a day to supply nourishment. ♦ Seek cool area and rest when needed. ♦ Watch fellow workers for signs of heat stress. ♦ Institute work/rest regimens as necessary. ♦ Physiological monitoring to be conducted when ambient temperatures greater than 85ºF.
	Cold Stress	Cold Stress ♦ Wear adequate number of dry, layered clothing (insulated coveralls, gloves, hats). ♦ Seek heated area when needed. ♦ Watch fellow workers for signs of cold stress. ♦ Air temperature and wind chill should be monitored.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Startup and Shakedown of Treatment Plant

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Flying Objects and Debris	Flying Objects and Debris ♦ ANSI approved safety glasses will be worn. ♦ ANSI approved, tight fitting, safety goggles will be worn during high wind or dust generatingtasks/conditions. http://www.shop.com/op/~AO_Safety_Maxim_153_2x2_Goggle-prod-12292770 ♦ ANSI approved safety goggles and splash shields will be worn if a splash potential exists.
	Slip/Trip/Fall	Slip/Trip/Fall ♦ Personnel will clear walkways of equipment & materials ♦ Other obstructions will be marked, identified or barricaded. ♦ Tripping and poor footing hazards will be repaired as they are discovered or will be clearly identified. ♦ Even terrain will be utilized for equipment use. ♦ The anchor point of a lanyard shall be strong enough to support at least two times the potential impact load of the employee's fall. ♦ Ladders shall be extended three feet beyond the landing zone. ♦ Ladders shall be placed on firm, level surfaces and tied off at both the top & bottom. ♦ When utilizing man and scissor lifts, do not exceed the manufacturer's recommended platform load capacities. ♦ A full-body harness and lanyard shall be used when operating an extend-a-boom lift. ♦ All man and scissor lifts shall meet the requirements outlined in 29 CFR 1910.68. ♦ Fall protection shall be provided to workers exposed to falls of 6 feet or more, as specified by EM 385-1-1 Section 21 and 29 CFR 1926.500.
	Electrocution/Contact with Electricity	Electrocution/Contact with Electricity ♦ Live parts of wiring or equipment shall be guarded to protect all persons or objects from contacting them. ♦ Plugs & receptacles shall be kept out of water unless they are of the approved submersible type. ♦ Cords will be kept from heat and sharp edges. ♦ All electrical tools and equipment will be equipped with GFCI.
Acceptance and Hydraulic Tests/Testing	Ruptures/Leaks	Rupture/Leaks ♦ Use clean water for hydrostatic test (no air or process water allowed) ♦ Do not exceed tank & valve pressure ratings. ♦ If a leak is detected, relieve pressure prior to repair or adjustment. ♦ No tightening or adjusting while under pressure. ♦ Relieve & confirm pressure when testing is complete.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Startup and Shakedown of Treatment Plant

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Dropped Objects	Dropped Objects ♦ ANSI approved steel toe boots will be worn.
	Fire	Fire ♦ 10-lb. ABC type fire extinguisher will be located adjacent to the work area. ♦ Smoking will not be allowed in the work area.
	Struck By/Caught Between	Struck by/Caught Between ♦ The lift and swing path of man/scissor lifts will be maintained clear of obstructions. ♦ All personnel will maintain a safe distance from man/scissor lifts when raising & lowering. ♦ When it is necessary to observe/test energized mechanical equipment, the following precautions should be taken: • Barriers will be established to prevent equipment and people from entering a work area. • Personnel will keep hands and loose clothing away from all moving parts. • Personnel will be briefed on emergency shut down procedures. • Only necessary guards will be removed to observe/test equipment. • All lockout/tagout procedures will be followed, if manual tests on any of the equipment is performed. • Personnel shall stand to the side when opening & closing valve assemblies.
	Heat Stress	Heat Stress ♦ Drink adequate amounts of liquids throughout the workday. ♦ Eat three meals a day to supply nourishment. ♦ Seek cool area and rest when needed. ♦ Watch fellow workers for signs of heat stress. ♦ Institute work/rest regimens as necessary. ♦ Physiological monitoring to be conducted when ambient temperatures greater than 85ºF.
	Cold Stress	Cold Stress ♦ Wear adequate number of dry, layered clothing (insulated coveralls, gloves, hats). ♦ Seek heated area when needed. ♦ Watch fellow workers for signs of cold stress. ♦ Air temperature and wind chill should be monitored.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Startup and Shakedown of Treatment Plant

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Flying Objects and Debris	Flying Objects and Debris ♦ ANSI approved safety glasses will be worn. ♦ ANSI approved, tight fitting, safety goggles will be worn during high wind or dust generatingtasks/conditions. http://www.shop.com/op/~AO_Safety_Maxim_153_2x2_Goggle-prod-12292770 ♦ ANSI approved safety goggles and splash shields will be worn if a splash potential exists.
	Slip/Trip/Fall	Slip/Trip/Fall ♦ Personnel will clear walkways of equipment & materials. ♦ Other obstructions will be marked, identified or barricaded. ♦ Tripping and poor footing hazards will be repaired as they are discovered or will be clearly identified. ♦ Even terrain will be utilized for equipment use. ♦ The anchor point of a lanyard shall be strong enough to support at least two times the potential impact load of the employee's fall. ♦ Ladders shall be extended three feet beyond the landing zone. ♦ Ladders shall be placed on firm, level surfaces and tied off at both the top & bottom. ♦ When utilizing man and scissor lifts, do not exceed the manufacturer's recommended platform load capacities. ♦ A full-body harness and lanyard shall be used when operating an extend-a-boom lift. ♦ All man and scissor lifts shall meet the requirements outlined in 29 CFR 1910.68. ♦ Fall protection shall be provided to workers exposed to falls of 6 feet or more, as specified by EM 385-1-1 Section 21 and 29 CFR 1926.500.
	Electrocution/Contact with Electricity	Electrocution/Contact with Electricity ♦ Live parts of wiring or equipment shall be guarded to protect all persons or objects from contacting them. ♦ Plugs & receptacles shall be kept out of water unless they are of the approved submersible type. ♦ Cords will be kept from heat and sharp edges. ♦ All electrical tools and equipment will be equipped with GFCI.
Hot Start-Up Procedures	Inhalation Hazards	Inhalation Hazards ♦ Air monitoring will be performed per the SHSP. ♦ Respiratory protection will be required if air monitoring levels exceed recommended exposure limits.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Startup and Shakedown of Treatment Plant

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Chemical Exposure	Chemical Exposure ♦ Protective clothing (per the SHSP) will be worn. ♦ Skin will be rinsed with water if contact with hazardous materials occurs. ♦ Hazard communication training will be conducted to review the hazards associated with the chemicals to be handled.
	Spills	Spills ♦ Spill and absorbent materials will be readily available. ♦ All process chemicals will be stored in their appropriate storage areas inside the treatment building. ♦ Incompatible materials will be stored separately.
	Back Injuries	Back Injuries ♦ Site personnel will be instructed on proper lifting techniques. ♦ Mechanical devices will be utilized to reduce manual handling of materials. ♦ Team lifting will be used if mechanical devices are not available.
	Sharp Objects	Sharp Objects ♦ Cut resistant work gloves will be worn. ♦ All hand & powered tools will be maintained in safe condition. ♦ First aid kits will be available adjacent to work areas.
	Eye Injury	Eye Injury ♦ ANSI approved safety goggles or full-faced respirator will be worn. ANSI approved, tight fitting, safety goggles will be worn during high wind or dust generating tasks/conditions. http://www.shop.com/op/~AO_Safety_Maxim_153_2x2_Goggle-prod-12292770 ♦ Portable eye wash station will be readily available.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Startup and Shakedown of Treatment Plant

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Slip/Trip/Fall	Slip/Trip/Fall ♦ Personnel will clear walkways of equipment & materials. ♦ Other obstructions will be marked, identified or barricaded. ♦ Tripping and poor footing hazards will be repaired as they are discovered or will be clearly identified. ♦ Debris will not be allowed to accumulate where it becomes a hazard. ♦ Even terrain will be utilized for equipment use. ♦ The anchor point of a lanyard shall be strong enough to support at least two times the potential impact load of the employee's fall. ♦ Ladders shall be extended three feet beyond the landing zone. ♦ Ladders shall be placed on firm, level surfaces and tied off at both the top & bottom. ♦ When utilizing man and scissor lifts, do not exceed the manufacturer's recommended platform load capacities. ♦ A full-body harness and lanyard shall be used when operating an extend-a-boom lift. ♦ All man and scissor lifts shall meet the requirements outlined in 29 CFR 1910.68. ♦ Fall protection shall be provided to workers exposed to falls of 6 feet or more, as specified by EM 385-1-1 Section 21 and 29 CFR 1926.500.
	Noise	Noise ♦ Hearing protection (ear muffs or ear plugs) shall be worn in work areas where the decibel level may be above 85dbA. ♦ Wear hearing protection when in the vicinity of heavy equipment, pumps or other noise producing machinery or if having difficulty speaking with someone when standing 3 feet apart.
	Overhead Hazards	Overhead Hazards ♦ All personnel will be required to wear ANSI approved hard hats (Standard Z89.1). ♦ All wire ropes, chains & slings will be rated for the load that it is expected to lift. All lifting materials will be inspected at the beginning of each work shift and prior to each use. Defective equipment will be tagged and taken out of service. ♦ All ground personnel will stay clear of all suspended loads.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Startup and Shakedown of Treatment Plant

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Heat Stress	Heat Stress ♦ Drink adequate amounts of liquids throughout the workday. ♦ Eat three meals a day to supply nourishment. ♦ Seek cool area and rest when needed. ♦ Watch fellow workers for signs of heat stress. ♦ Institute work/rest regimens as necessary. ♦ Physiological monitoring to be conducted when ambient temperatures greater than 85ºF.
	Cold Stress	Cold Stress ♦ Wear adequate number of dry, layered clothing (insulated coveralls, gloves, hats). ♦ Seek heated area when needed. ♦ Watch fellow workers for signs of cold stress. ♦ Air temperature and wind chill should be monitored.
	Dropped Objects	Dropped Objects ♦ Steel toe boots meeting ANSI Standard Z41 will be worn. ♦ Ground personnel will be instructed to stay clear of suspended loads. ♦ Personnel will be instructed on proper rigging procedures.
	Fire	Fire ♦ 10-lb. ABC type fire extinguisher will be located adjacent to the work area. ♦ Smoking will not be allowed in the work area.
Sampling Effluent, Groundwater and Extraction Wells	Eye Injury	Eye Injury ♦ ANSI approved safety goggles or full-faced respirator will be worn. ♦ ANSI approved, tight fitting, safety goggles will be worn during high wind or dust generatingtasks/conditions. http://www.shop.com/op/~AO_Safety_Maxim_153_2x2_Goggle-prod-12292770 ♦ Portable eye wash station will be readily available.
	Slip/Trip/Fall	Slip/Trip/Fall ♦ Personnel will clear walkways of equipment & materials. ♦ Other obstructions will be marked, identified or barricaded. ♦ Tripping and poor footing hazards will be repaired as they are discovered or will be clearly identified. ♦ Debris will not be allowed to accumulate where it becomes a hazard. ♦ Even terrain will be utilized for equipment use.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Startup and Shakedown of Treatment Plant

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Noise	Noise ♦ Hearing protection (ear muffs or ear plugs) shall be worn in work areas where the decibel level may be above 85dbA. ♦ Wear hearing protection when in the vicinity of heavy equipment, pumps or other noise producing machinery or if having difficulty speaking with someone when standing 3 feet apart.
	Overhead Hazards	Overhead Hazards ♦ All personnel will be required to wear ANSI approved hard hats (Standard Z89.1).
	Heat Stress	Heat Stress ♦ Drink adequate amounts of liquids throughout the workday. ♦ Eat three meals a day to supply nourishment. ♦ Seek cool area and rest when needed. ♦ Watch fellow workers for signs of heat stress. ♦ Institute work/rest regimens as necessary. ♦ Physiological monitoring to be conducted when ambient temperatures greater than 85ºF.
	Cold Stress	Cold Stress ♦ Wear adequate number of dry, layered clothing (insulated coveralls, gloves, hats). ♦ Seek heated area when needed. ♦ Watch fellow workers for signs of cold stress. ♦ Air temperature and wind chill should be monitored.
	Dropped Objects	Dropped Objects ♦ Steel toe boots meeting ANSI Standard Z41 will be worn.
	Fire	Fire ♦ 10-lb. ABC type fire extinguishers will be located adjacent to the work area. ♦ Smoking will not be allowed in the work area.
	Inhalation Hazards	Inhalation Hazards ♦ Air monitoring will be performed per the SHSP. ♦ Respiratory protection will be required if air monitoring levels exceed recommended exposure limits.
	Chemical Exposure	Chemical Exposure ♦ Protective clothing (per the SHSP) will be worn. ♦ Skin will be rinsed with water if contact with hazardous materials occurs. ♦ Hazard communication training will be conducted to review the hazards associated with the chemicals to be handled.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Startup and Shakedown of Treatment Plant

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Spills	Spills ♦ Spill and absorbent materials will be readily available.
Off-Gas Effluent Monitoring	Dermal Burns	Dermal Burns ♦ When handling sample lines & equipment, insulated gloves will be worn. ♦ Hot surfaces will be labeled with warning signs. ♦ When opening valves, personnel will stand to the side and not in front of the valve that is to be opened.
	Inhalation Hazards	Inhalation Hazards ♦ Air monitoring will be performed per the SHSP. ♦ Respiratory protection will be required if air monitoring levels exceed recommended exposure limits.
	Chemical Exposure	Chemical Exposure ♦ Protective clothing (per the SHSP) will be worn. ♦ Skin will be rinsed with water if contact with hazardous materials occurs. ♦ Hazard communication training will be conducted to review the hazards associated with the chemicals to be handled.
	Overhead Hazards	Overhead Hazards ♦ All personnel will be required to wear ANSI approved hard hats (Standard Z89.1).
	Dropped Objects	Dropped Objects ♦ Steel toe boots meeting ANSI Standard Z41 will be worn.
	Fire	Fire ♦ 10-lb. ABC type fire extinguishers will be located adjacent to the work area. ♦ Smoking will not be allowed in the work area.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Startup and Shakedown of Treatment Plant

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Slip/Trip/Fall	Slip/Trip/Fall ♦ Personnel will clear walkways of equipment & materials. ♦ Other obstructions will be marked, identified or barricaded. ♦ Tripping and poor footing hazards will be repaired as they are discovered or will be clearly identified. ♦ Debris will not be allowed to accumulate where it becomes a hazard. ♦ Even terrain will be utilized for equipment use. ♦ The anchor point of a lanyard shall be strong enough to support at least two times the potential impact load of the employee's fall. ♦ Ladders shall be extended three feet beyond the landing zone. ♦ Ladders shall be placed on firm, level surfaces and tied off at both the top & bottom. ♦ When utilizing man and scissor lifts, do not exceed the manufacturer's recommended platform load capacities. ♦ A full-body harness and lanyard shall be used when operating an extend-a-boom lift. ♦ All man and scissor lifts shall meet the requirements outlined in 29 CFR 1910.68. ♦ Fall protection shall be provided to workers exposed to falls of 6 feet or more, as specified by EM 385-1-1 Section 21 and 29 CFR 1926.500.
	Eye Injury	Eye Injury ♦ ANSI approved safety goggles or full-faced respirator will be worn. ANSI approved, tight fitting, safety goggles will be worn during high wind or dust generatingtasks/conditions. http://www.shop.com/op/~AO_Safety_Maxim_153_2x2_Goggle-prod-12292770 ♦ Portable eye wash station will be readily available.

EQUIPMENT USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
1. Heavy Equipment	1. Initial inspection will be conducted prior to use.	1. Only qualified equipment operators will be used.
2. Fire Extinguishers	2. Monthly inspections will be performed.	2. Personnel will be given instructions on proper use of fire extinguishers.
3. PID, Detector Tubes, and CGI/O2 meter	3. Pre and Post Calibration/system checks will be performed daily.	3. Proficiency training for users will be given.
4. PPE (coveralls, tyvek, full faced masks, booties, steel toe boots, hard hats, safety glasses, leather or Kevlar gloves, ear plugs or ear muffs).	4. An initial inspection of each lot of PPE will be performed.	4. Personnel will be given training on proper donning/doffing procedures.
5. First Aid Kits	5. Daily safety & weekly inspections will be performed.	5. Personnel with first aid & CPR training will be identified. Bloodborne pathogen training will be reviewed with CPR & first aid trained employees.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Startup and Shakedown of Treatment Plant

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
6. Diesel Fuel/Oil & Other Potentially Hazardous Materials	6. Daily safety inspection of storage & use areas will be conducted.	6. Hazard communication training will be given.
7. Spill Control Materials	7. Daily safety inspection of spill control materials will be conducted.	7. Personnel will be given training on how to respond to spilled materials.
8. Chains, Slings or Ropes	8. Inspections will be performed prior to each work shift and each use.	8. Personnel will be trained on proper use of chains, slings and ropes.
9. Hand Tools (non-powered)	9. Initial inspections will be conducted prior to use.	9. Personnel will be given training on the safety procedures associated with hand tools.
10. Torches, welders and grinders	10. Initial inspections will be conducted prior to use.	10. Proficiency training for users will be given.
11. Powered Tools	11. Initial inspections will be conducted prior to use.	11. Personnel will be given training on the safety procedures associated with powered tools.
12. Safety Cans	12. Daily safety inspections of storage & use areas will be performed.	12. Use & storage procedures will be reviewed.
13. Man Lifts/Scissor Lifts	13. Initial inspections will be conducted prior to use.	13. Personnel will be instructed on fall protection requirements.
14. Full-Body Harnesses and Lanyards	14. Initial inspections will be conducted prior to use.	14. Personnel will be trained on proper use of full-body harnesses and lanyards.
15. GFCIs	15. Monthly inspections will be performed.	15. Personnel will be instructed on proper use of GFIs.
16. Extension Cords	16. Monthly inspections will be performed.	16. Personnel will be instructed on proper use of extension cords.
17. Ladders	17. Monthly inspections will be performed.	17. Personnel will be instructed on proper use of ladders.

ACTIVITY HAZARD ANALYSIS

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: New Groundwater Monitoring Well Installation

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
Drill Rig Operations	Struck By/Against/ Caught By	Struck By/Against/Caught By ♦ No loose clothing, gauntlet-type gloves, rings, or watches will be worn by personnel operating drill rig.
	Underground Hazards	Underground Hazards ♦ All underground utilities will be identified prior to drilling. The New York State One-Call System will be contacted and drilling locations will be screened using geophysical techniques, such as GPR or magnetometer. ♦ All marked utilities will be inspected so that personnel are familiar with types and locations of utilities. Any drilling will take place at least five feet away from any marked utilities.
	Flying Objects and Debris	Flying Objects and Debris ♦ Safety glasses meeting ANSI Standard Z87 will be worn. ♦ ANSI approved, tight fitting, safety goggles will be worn during high wind or dustgeneratingtasks/conditions. http://www.shop.com/op/~AO_Safety_Maxim_153_2x2_Goggle-prod-12292770 ♦ Splash shields and chemical goggles meeting ANSI Standard Z87 will be worn where applicable.
	Overhead Hazards	Overhead Hazards ♦ All personnel will wear hard hats meeting ANSI Standard Z89.1. ♦ All ropes will be rated for the load which it is expected to lift. All ropes will be inspected at the beginning of each work shift. ♦ All ground personnel will stay clear of all suspended loads.
	Inhalation Hazards	Inhalation Hazards ♦ Work activities will be conducted in modified Level D PPE, with upgrades in respiratory protection based on real time air monitoring results, site conditions and the SHSO's judgment. ♦ Air monitoring will be performed per the SHSP. The frequency of monitoring may be reduced at the discretion of the SHSO.
	Spills	Spills ♦ Absorbent material will be readily available. ♦ Drip pans, polyethylene sheeting or other means will be used for secondary containment.
	Noise	Noise ♦ All equipment will be equipped with manufacturers required mufflers. ♦ Hearing protection will be worn with a noise reduction rating capable of maintaining personal exposure below 85 dBA (earmuffs or plugs).

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: New Groundwater Monitoring Well Installation

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Fire	Fire ♦ Smoking and open flames are not permitted. ♦ All equipment shall be equipped with 10 lb. ABC type fire extinguishers. ♦ 10 lb. ABC type fire extinguishers shall be readily available.
	Slip/Trip/Fall	Slip/Trip/Fall ♦ Personnel will clear walkways and stairs of equipment and materials. ♦ Other obstructions will be marked, identified, or barricaded. ♦ Tripping and poor footing hazards will be repaired as they are discovered or will be clearly identified. ♦ Debris will not be allowed to accumulate where it becomes a hazard. ♦ Cover all open boreholes at the end of the work day.
	Back Injuries	Back Injuries ♦ Site personnel will be instructed on proper lifting techniques. ♦ Mechanical devices will be utilized to reduce manual material handling. ♦ No person shall lift more than 50 lbs. unaided. ♦ Team lifting will be utilized in lieu of mechanical devices.
	Electrical Hazards	Electrical Hazards ♦ Use GFCI devices with any items that plug into an electrical outlet. ♦ Inspect electrical and extension cords prior to use. Repair or dispose of any frayed cords.
	Sharp Objects	Sharp Objects ♦ Cut resistant work gloves such as Kevlar will be worn when handling sharp objects. ♦ Only use utility knives with self-retracting blades or those equipped with a guard over the blade. See www.martor.com for knife types. ♦ Do not use pocket knives, box cutters or knife found on Leatherman-type tools. ♦ All hand and power tools will be maintained in safe condition. ♦ First aid kits will be available by work area.
	Eye Injury	Eye Injury ♦ ANSI approved safety glasses will be worn. ♦ ANSI approved, tight fitting, safety goggles will be worn during high wind or dust generatingtasks/conditions. http://www.shop.com/op/~AO_Safety_Maxim_153_2x2_Goggle-prod-12292770 ♦ Portable eye wash station will be available.
Equipment Decontamination	Back Injuries	Back Injuries ♦ Site personnel will be instructed on proper lifting techniques. ♦ Mechanical devices will be utilized to reduce manual material handling. ♦ Team lifting will be utilized in lieu of mechanical devices.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: New Groundwater Monitoring Well Installation

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Eye Injury from Liquids and Foreign Objects	Eye Injury from Liquids and Foreign Objects ♦ Safety glasses and full faced shield complying with ANSI Standard Z87 will be worn. ♦ ANSI approved, tight fitting, safety goggles will be worn during high wind or dust generatingtasks/conditions. http://www.shop.com/op/~AO_Safety_Maxim_153_2x2_Goggle-prod-12292770 ♦ A portable eye wash station will be located by work area.
	Sharp Objects	Sharp Objects ♦ Cut resistant work gloves such as Kevlar will be worn. ♦ All hand and power tools will be maintained in safe condition. ♦ First aid kits will be readily available. ♦ Guards will be kept in place while using hand or power tools. ♦ Only use utility knives with self-retracting blades or those equipped with a guard over the blade. See www.martor.com for knife types. ♦ Do not use pocket knives, box cutters or knife found on Leatherman-type tools.
	Slip/Trip/Fall	Slip/Trip/Fall ♦ Work areas and means of access shall be maintained safe and orderly. ♦ Obstructions will be marked, identified, or barricaded. ♦ Tripping and poor footing hazards will be repaired as they are discovered or will be clearly identified. ♦ Wet surfaces will be marked and identified. ♦ Accumulation of ice or standing water will be removed as necessary during decon work.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: New Groundwater Monitoring Well Installation

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Struck By (Water Stream)	Struck by (Water Stream) ♦ Proper instruction on safe use of pressure washers will be conducted. ♦ Operators will not fix the hand trigger in the open position such that if the wand were left unattended, water would spray from the tip. ♦ Operator will not hold any equipment while washing it. ♦ All pressure washers will be equipped with a deadman's switch. ♦ Use nominal temperature and pressure. ♦ Use wand extenders only. ♦ Pressure washers shall not be left running unattended. ♦ Pressure washers will be inspected daily and prior to use (hoses gaskets, tips, connections). Ones that are not in good working order will be red tagged (removed from service) and repaired before use. ♦ First aid kit will be located adjacent to work area. ♦ Face-shields will be worn when pressure washing, face-shields are to be worn in addition to safety glasses not in lieu of them. ♦ Washers will be utilized in a manner that they were designed for, no changes to the operational condition will be accepted. (i.e. operational pressures will not be increased). ♦ Turn pressure washer off when performing maintenance or changing out tips.
	Fire	Fire ♦ Refueling or maintenance will only be performed when the pressure washer has been shut down. Always keep Gasoline, Diesel away from any potential ignition sources that may exist within the refueling area. ♦ Pressure washers will not be started unless a steady flow of water is running to the machine (pressure washers shall not be run dry). ♦ 10 lb. ABC type fire extinguishers will be located adjacent to work area.
	Overhead Hazards	Overhead Hazards ♦ All personnel are required to wear hard hats.
	Dropped Objects	Dropped Objects ♦ All personnel are required to wear steel toe boots. ♦ All tools will be tethered.
	Chemical Exposure	Chemical Exposure ♦ Protective clothing (poly-coated tyveks, chemical gloves, safety glasses, full faced splash shields, and chemical boots) will be worn. Level D respiratory protection will be worn unless PID readings require upgrade. ♦ Skin will be rinsed with water if contact with hazardous materials occurs.
EQUIPMENT USED	**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: New Groundwater Monitoring Well Installation

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
1. Drill Rig	1. Initial inspection by TtEC will be conducted prior to use. Daily inspection thereafter.	1. Only qualified drillers will operate drill rig.
2. Fire Extinguishers	2. Monthly inspections will be performed.	2. Personnel will be given instructions on proper use of fire extinguishers.
3. PID and CGI/O_2 Meter	3. Pre and post calibrations/system checks will be performed daily.	3. Proficiency training for users will be given.
4. Level D and Level C PPE	4. An initial inspection of each lot of PPE will be performed.	4. Personnel will be given training on proper donning and doffing procedures.
5. First Aid Kits	5. Daily safety and weekly inspections will be performed.	5. Personnel with first aid and CPR will be identified. Bloodborne pathogen training will be reviewed with CPR and first aid trained employees.
6. Diesel Fuel/Oil and Other Potentially Hazardous Materials	6. Daily safety inspection of storage and use areas will be conducted.	6. Hazard communication training will be given.
7. Spill Control Materials	7. Weekly inspections of spill control materials will be conducted.	7. Personnel will be given training on how to respond to spilled materials.
8. Hand Tools (e.g., hammers)	8. Initial inspections will be conducted prior to use.	8. Personnel will be given training on the safety procedures associated with hand tools.
9. Safety Cans	9. Daily safety inspections of storage & use areas will be performed.	9. Use & storage procedures will be reviewed.
10. Pressure Washers	10. Daily inspections and inspections prior to use will be performed (hoses gaskets, tips, connections).	10. Personnel will be given instructions on the safe use of pressure washers.

ACTIVITY HAZARD ANALYSIS

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Off-Site Waste Transportation and Disposal

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
Place Waste into Roll-off Boxes, Frac Tanks or Drums	Struck By/Against/ Caught By	Struck by/Against/Caught By ♦ Be aware of heavy equipment operations. ♦ Keep out of the swing radius of heavy equipment. ♦ Ground personnel in the vicinity of heavy equipment operations will be within the view of the operator at all times. ♦ Ground personnel will be aware of the counterweight swing and maintain an adequate buffer zone. ♦ Ground personnel will not stand directly behind heavy equipment when it is in operation. ♦ Drivers will keep workers on foot in their vision at all times, if you lose sight of someone, Stop!
	Flying Objects and Debris	Flying Objects and Debris ♦ Safety glasses meeting ANSI Standard Z87 will be worn. ♦ ANSI approved, tight fitting, safety goggles will be worn during high wind or dust generatingtasks/conditions. http://www.shop.com/op/~AO_Safety_Maxim_153_2x2_Goggle-prod-12292770
	Noise	Noise ♦ All equipment will be equipped with manufacturers required mufflers. ♦ Hearing protection will be worn with a noise reduction rating capable of maintaining personal exposure below 85 dBA (earmuffs or plugs).
	Fire	Fire ♦ Smoking and open flames are not permitted. ♦ All equipment shall be equipped with 10 lb. ABC type fire extinguishers. ♦ 10 lb. ABC type fire extinguishers shall be readily available.
	Slip/Trip/Fall	Slip/Trip/Fall ♦ Personnel will clear walkways and stairs of equipment and materials. ♦ Other obstructions will be marked, identified, or barricaded. ♦ Tripping and poor footing hazards will be repaired as they are discovered or will be clearly identified. ♦ Debris will not be allowed to accumulate where it becomes a hazard. ♦ Cover all open boreholes at the end of the work day.
	Back Injuries	Back Injuries ♦ Site personnel will be instructed on proper lifting techniques. ♦ Mechanical devices will be utilized to reduce manual material handling. ♦ No person shall lift more than 50 lbs. unaided. ♦ Team lifting will be utilized in lieu of mechanical devices.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Off-Site Waste Transportation and Disposal

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Sharp Objects	Sharp Objects ♦ Cut resistant work gloves such as Kevlar will be worn when handling sharp objects. ♦ Only use utility knives with self-retracting blades or those equipped with a guard over the blade. See www.martor.com for knife types. ♦ Do not use pocket knives, box cutters or knife found on Leatherman-type tools. ♦ All hand and power tools will be maintained in safe condition. ♦ First aid kits will be available by work area.
	Eye Injury	Eye Injury ♦ ANSI approved safety glasses will be worn. ♦ ANSI approved, tight fitting, safety goggles will be worn during high wind or dust generatingtasks/conditions. http://www.shop.com/op/~AO_Safety_Maxim_153_2x2_Goggle-prod-12292770 ♦ Portable eye wash station will be available.
Hand Tools (e.g., spark-proof bung wrench, ratchets)	Struck By	Struck By ♦ Work gloves will be worn. ♦ First aid kits will be available adjacent to the work area.
	Slips/Trips/Falls	Slips/Trips/Falls ♦ Tools will be kept in storage. ♦ Work areas and means of access shall be maintained safe and orderly. ♦ Other obstructions will be marked, identified or barricaded. ♦ Tripping or poor footing hazards will be repaired as they are discovered or will be clearly identified.
	Dropped Objects	Dropped Objects ♦ Steel toe boots will be worn.
	Overhead Hazards	Overhead Hazards ♦ All personnel are required to wear hard hats.
	Flying Objects and Debris	Flying Objects and Debris ♦ ANSI approved safety glasses will be worn. ♦ ANSI approved, tight fitting, safety goggles will be worn during high wind or dust generatingtasks/conditions. http://www.shop.com/op/~AO_Safety_Maxim_153_2x2_Goggle-prod-12292770
Drum Handling	Vehicular Traffic	Vehicular Traffic ♦ Spotters will be used when backing up trucks and moving equipment. ♦ Vehicles will be equipped with backup alarms.

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Off-Site Waste Transportation and Disposal

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	Back Injuries	Back Injuries ♦ Site personnel will be instructed on proper lifting techniques. ♦ Mechanical devices will be utilized to reduce manual material handling. ♦ Team lifting will be utilized in lieu of mechanical devices.
	Overhead Hazards	Overhead Hazards ♦ All personnel will wear hard hats.
	Dropped Objects	Dropped Objects ♦ Steel toe boots will be worn.
	Flying Debris	Flying Debris ♦ ANSI approved safety glasses will be worn. ♦ ANSI approved, tight fitting, safety goggles will be worn during high wind or dust generatingtasks/conditions. http://www.shop.com/op/~AO_Safety_Maxim_153_2x2_Goggle-prod-12292770

Project: GM-38 Area Groundwater Treatment Building & Systems-NWIRP Location: Bethpage, NY
Activity: Off-Site Waste Transportation and Disposal

EQUIPMENT USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
1. Heavy Equipment	1. Initial inspection will be conducted prior to use.	1. Only qualified equipment operators will be used.
2. Fire Extinguishers	2. Monthly inspections will be performed.	2. Personnel will be given instructions on proper use of fire extinguishers.
3. Level D and Level C PPE	3. An initial inspection of each lot of PPE will be performed.	3. Personnel will be given training on proper donning and doffing procedures.
4. First Aid Kits	4. Daily safety and weekly inspections will be performed.	4. Personnel with first aid and CPR will be identified. Bloodborne pathogen training will be reviewed with CPR and first aid trained employees.
5. Diesel Fuel/Oil and Other Potentially Hazardous Materials	5. Daily safety inspection of storage and use areas will be conducted.	5. Hazard communication training will be given.
6. Spill Control Materials	6. Weekly inspections of spill control materials will be conducted.	6. Personnel will be given training on how to respond to spilled materials.
7. Hand Tools (e.g., wrench, hammers)	7. Initial inspections will be conducted prior to use.	7. Personnel will be given training on the safety procedures associated with hand tools.
8. Safety Cans	8. Daily safety inspections of storage & use areas will be performed.	8. Use & storage procedures will be reviewed.

Appendix D

Temperature Extremes

EHS 4-6: Temperature Extremes (Previously HS 4-6)

Purpose
The purpose of this program is to prevent heat and cold stress related injuries and illnesses at field operations.

Version Date: 10/13/2005 - Revised
Original Issue Date: 02/01/95
Category: Company Procedures
Sub Category: Departmental/Discipline
Keyword Index: EHS Compliance/Waste Management, Monitoring, Operational Control, Training

Approved by:
Sections: ESQ - Environmental Health & Safety Programs
Document Type: Procedure
Document Owner: Philip Bartley

Table of Contents

See Below

1.0 PURPOSE

The purpose of this program is to prevent heat and cold stress related injuries and illnesses at field operations.

2.0 SCOPE

This program applies to all Tetra Tech EC, Inc. ("the Company") and subcontractor field personnel that may be exposed to heat or cold stress during the performance of their field work assignments.

3.0 MINIMUM REQUIREMENTS

3.1 Responsibilities

3.1.1 Line Management

Site Supervisors have the responsibility to:

a. Provide resources and facilities necessary to prevent health effects from temperature extremes

b. Enforce work rules related to such prevention

c. Ensure implementation of the requirements of this program as specified in the Site Environmental, Safety and Health (EHS) plans.

3.1.2 Environmental, Health and Safety Personnel

The Project Environmental and Safety Manager (PESM) will make the initial determination of heat and cold stress prevention requirements as part of the site EHS Plan (see EHS 3-2, EHS Plans) and oversee the implementation of this program on a project basis for all Company field programs.

The Environmental Safety Supervisor (ESS) will assist with implementation of heat and cold stress prevention programs. The ESS will, in most cases, be the person responsible for monitoring heat and cold stress on the job, determining work/rest and work/warm-up schedules where used, and will implement emergency response or corrective action, if needed. The ESS will train site personnel on the effects of temperature extremes and the site prevention program, and will maintain records related to this program.

The ESS will implement the appropriate heat stress or cold stress requirements when temperatures indicate a potential heat or cold stress condition. The ESS will work with the line management to implement work rest regimens or other administrative controls such as ceasing certain activities, changing PPE, or engineering controls such as warming areas, cooling areas or shifting work schedules.

3.2 General Program Requirements

Adverse weather conditions must be considered when planning site operations. Excessively hot or cold working environments can produce a number of different injuries. Critical to the ability to care for those injuries is a basic understanding of the way in which the body maintains its temperature and how it physiologically adjusts to extremes of heat and cold. Attachment 1 provides information on the body's physiological responses to heat and cold stress.

Proper care of victims who are suffering from the effects of heat or cold exposure will help to minimize injuries and speed recovery. On the other hand, improper treatment of these emergencies can result in serious injury, disability, or death.

The most effective first aid for any injury is prevention. When acceptable monitoring and prevention programs are followed, there should be no victims.

3.3 Heat Stress

A heat stress prevention program will be implemented when ambient temperatures exceed 70°F (21° C) for personnel wearing impermeable clothing and for other personnel when the WBGT index exceeds the ACGIH Threshold Limit Values. When a WBGT is not available or applicable (enclosed work areas, work over asphalt or reflective materials etc.) physiological (pulse, temperature) monitoring may be used in its place.

WBGT devices located away from the project (up to several miles) maybe used for monitoring the project if the general weather and measured work surfaces are similar.

3.3.1 Selection of Chemical Protective Clothing

The PESM will review site data and working conditions and select the personal protective equipment ensemble that best protects the employees from site hazards. The risk of heat related illness will be fully considered in balancing the risks and benefits of the PPE.

Where contact with a waste material is unlikely; contact is not expected to result in a serious dermal hazard; and significant absorption of the contaminants is not likely to occur, then impermeable clothing should not be required. In this case, the risk of heat related illness may grossly outweigh the benefits provided by such equipment. Even when chemical protective clothing is needed, the PESM should consider the probable exposure scenarios and select protective equipment accordingly. For example, if dermal exposure is likely to be localized, strong consideration should be given to using gloves, boots, gauntlets, leggings, aprons, bibs, face shields, etc., in lieu of full body coveralls and respirators.

3.3.2 Hydration

The Company will supply cool (50°–59°F) potable water or other suitable drinks (e.g., sport electrolyte replacements) for fluid replacement. Employees involved in the heat stress prevention program will be trained and encouraged to drink at a rate of approximately 8 oz. every 20 minutes. Individual cups will be used and kept in closed containers or dispensers.

3.3.3 Cool Rest Areas

Shaded rest areas will be provided. On large remediation projects, air conditioned rest

areas should be provided for workers exposed to heat stress conditions. In low humidity locations, evaporative coolers or misting devices and fans can be used to provide cool down locations. On smaller projects, personnel can use air-conditioned vehicles as cool down areas.

3.3.4 Other Prevention Elements

The PESM, ESS and the Project Manager will incorporate other elements into the heat stress prevention program as necessary. The selected elements will be described in the EHS plans. Engineering controls are preferred. Where their use is not feasible, the program must incorporate administrative/work practice controls, personal protective equipment, or a combination. Examples of prevention program elements include:

a. Engineering Controls

- Air conditioned cabs for heavy equipment and vehicles (Such controls may eliminate the need for other program elements)
- Fans or blowers
- Cold water for drenching personnel in impermeable clothing. This can be provided through a garden hose, a garden sprayer filled with ice water, a clean drum full of water for "hard hat dipping" or containers of ice water and clean towels in the rest area to hasten cool down

b. Administrative and Work Practice Controls

- Adjusting work schedules to do the bulk of the work during the cooler parts of the day
- Acclimatizing workers
- Implementing work/rest regimens (See Attachment 2 for Work/Rest Regimen Procedures)

c. Personal Protective Equipment

- Ice vests
- Circulating water vests
- Vortex tubes and air circulating vests

Where ice vests and circulating water vests are used, rest periods of approximately 15 minutes should be taken when ice packs or batteries need to be changed. Continuous work over long periods of time with these devices may present an increased musculoskeletal injury risk due to the extra weight. Since the duration of the cooling effectiveness of these devices will vary with heat and work loads, users must be instructed to leave the area to replenish ice or batteries at the first sign of loss of cooling.

d. Monitoring

A program of environmental and physiological monitoring must be established in order to use work/rest regimens to verify the effectiveness of the regimens. The monitoring procedures are described in Attachment 2.

3.3.5 Training

All site personnel must receive training on the following topics:

a. Health effects of hot environments and symptoms of heat related illness

b. Personal risk factors; work loads

c. Effect of personal protective equipment on heat stress conditions

d. Preventive measures

- Physiological monitoring methods and thresholds
- Acclimatization

e. Fluid replacement; including taking frequent breaks for fluid replacement on an as-needed basis

f. Elements of the site Heat Stress Prevention Program

g. First aid and emergency response

Records shall be maintained in accordance with EHS 1-9, Recordkeeping

3.4 Cold Stress

At certain times of the year, workers may be exposed to the hazards of working in cold environments. Potential hazards in cold environments include frostbite, trenchfoot or immersion foot, and hypothermia as well as slippery surfaces, brittle equipment, poor judgment and taking short cuts. The current ACGIH threshold limit values (TLVs) for cold stress will be used as a guideline. The Company will implement the following cold stress prevention program elements when there is a potential for cold related injuries.

3.4.1 Personnel Protective Equipment

The following personal protective equipment will be provided as necessary to Company employees when conditions indicate a potential for cold-related injury. Subcontractors will be expected to supply appropriate equipment to their employees.

a. Hard hat liners

b. Gloves or glove liners

c. Rain gear or water impermeable coveralls and gloves for potentially wet operations

d. Fleeced boot liners where rubber steel-toe boots are used

e. Winter coveralls

3.4.2 Engineering Controls

A variety of engineering controls shall be evaluated to minimize cold stress. These include:

a. General or spot heating should be used to increase temperature at the workplace.

b. If fine work is to be performed with bare hands in a cold environment, special provisions should be made to keep the workers' hands warm. Warm air jets, radiant heaters, or contact warm plates can be used

c. The work area should be shielded from winds and drafts that may affect the wind chill factor

d. The air velocity in refrigerated rooms should be minimized as much as possible, and should not exceed 1m/sec in the work zone

e. At temperatures below freezing, metal handles of tools and control bars should be covered with thermal insulating material

f. Unprotected metal chair sets should not be used as they conduct heat away from the body

g. When necessary, equipment and processes should be substituted, isolated, relocated, or redesigned to reduce cold stress at the worksite

h. Power tools, hoists, cranes, or lifting aids should be used to reduce metabolic workload

i. Heated warming shelters such as tents and cabins should be made available if work is performed continuously in an equivalent chill temperature of 20°F or below

j. The ESS may implement a work-rest schedule to reduce exposure to cold stress

k. Scheduled rest breaks should be enforced

l. Personnel exposed to the cold should be provided the opportunity for frequent intake of warm, sweet, caffeine-free, nonalcoholic liquids or soup

m. Work should be moved to warmer areas whenever possible

n. Extra workers should be assigned to highly demanding tasks

o. Workers should be allowed to pace themselves, taking breaks when needed

p. Workers shall be trained in the prevention, symptoms, and emergency response to cold stress

q. Utilize the "buddy system" to monitor cold stress symptoms among the workers

r. Allow new employees time to adjust or "acclimate" to cold conditions

s. Minimize the need to sit or stand in one place for long periods of time

t. Minimize the amount of work time spent in a cold environment

u. Allow for the weight and bulkiness of protective clothing when estimating work performance goals and tasks

3.4.3 Warm Rest Areas

The Company will make warm rest areas, e.g., heated trailers, available for rest breaks in cold weather. Employees will be permitted and encouraged to use the heated trailers whenever they experience symptoms of cold stress.

3.4.4 Work/Warm-Up Schedules

The work/warm-up schedule found in the ACGIH TLVs for cold stress will be followed. In addition, the Company will make warm-up periods available to employees who need to change into dry clothing to prevent immersion foot or hypothermia.

3.4.5 Training

All Company employees and subcontractors will be trained in:

a. The effects of cold stress, including frostbite, immersion foot and hypothermia

b. Personal risk factors

c. Recognition of the symptoms

d. Methods employees can use to protect themselves

e. First aid procedures and recognition of medical emergencies

Records shall be maintained in accordance with EHS 1-9, Recordkeeping

4.0 GUIDELINES

This section shall contain optional guidance information to successfully execute the procedure or guideline.

4.1 Definitions

4.1.1 Adjusted Temperature

The dry bulb temperature adjusted to account for solar radiation, to be used as a heat stress indicator for personnel in impermeable protective clothing.

4.1.2 Deep Frostbite

The tissue beneath the skin is solid to the touch; it may involve a full thickness freeze to the bone. This is an extreme emergency and can result in permanent tissue loss.

4.1.3 Frostbite

Freezing of body tissue.

4.1.4 Frostnip or Incipient Frostbite

A cold related injury that progresses slowly and is painless while developing. The

victim is usually unaware that he/she has frost nip. The skin first becomes reddened, then changes to white; no freezing of tissue occurs.

4.1.5 Heat Cramp

Painful muscle spasms usually occurring on the arms, legs, and abdomen; caused by excessive loss of body electrolytes from profuse sweating.

4.1.6 Heat Exhaustion/Fatigue

Heat Exhaustion is a form of shock that occurs when the body loses large amounts of water and electrolytes from excessive perspiration after exposure to heat and physical activity; also called heat prostration. Symptoms include profuse sweating, pale, cool, sweaty skin and other symptoms identified in Attachment 1, Section 1.3.

Heat fatigue refers to the temporary state of discomfort and mental or psychologic strain arising from prolonged heat exposure. Works unaccustomed to the heat are particularly susceptible and can suffer, to varying degrees, a decline in task performance, coordination, alertness, and vigilance.

4.1.7 Heat Rash

Profuse tiny raised red vesicles (blister-like) on affected areas of the skin which cause a prickling sensation during heat exposure.

4.1.8 Heat Stroke

A life-threatening condition caused by rapidly rising body core temperature that occurs when the body's temperature regulating mechanisms are overwhelmed. Sweating stops and the skin is dry and hot.

4.1.9 Hyperthermia

A rise in body core temperature above 99.6 F.

4.1.10 Hypothermia

Decreased body core temperature from prolonged exposure to freezing or near-freezing temperatures. This is the most life-threatening cold injury and affects the entire body with possible localized severe cooling.

4.1.11 Superficial Frostbite

Frostbite which affects the skin and tissue just beneath the skin. The skin is firm and waxy, tissue beneath is soft and numb. The skin turns purple and may tingle and burn during warming.

4.1.12 Wet-Bulb Globe Temperature (WBGT)

Method used to measure the environmental factors (e.g., temperature, relative humidity) which impacts the body's physiological responses to heat.

4.1.13 Wind-Chill Factor or Equivalent Chill Temperature (ECT)

An index describing the effect of the cooling power of moving air on exposed flesh. The effect of wind velocity at a certain temperature is expressed as the equivalent cooling effect of a lower temperature with still air.

4.1.14 Work/Rest Regimen

The ratio of time spent working to time spent resting in an area designed to relieve heat related conditions. This ratio is expressed in one hour periods. Example: A work/rest regimen of 75% work, 25% rest corresponds to 45 minutes work, 15 minutes rest each hour.

5.0 REFERENCES

Please Describe Your Reference Here	Place Your Link in this Column
1. ACGIH (American Conference of Government Industrial Hygienists) Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, 2005	
2. Fundamentals of Industrial Hygiene. Third Edition, 1988	
3. National Safety Council	
4. NIOSH (National Institute for Occupational Safety and Health)	
5. NIOSH/OSHA/EPA/USCG/EPA	
6. Occupational Exposure to Hot Environments, Revised Criteria 1986	
7. Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities - October 1985	
8. EHS 1-9, Recordkeeping	
9. EHS 3-2, Environmental, Health & Safety Plan(s)	
10.	

6.0 ATTACHMENTS

Please Provide a Description of the Attachment	Place Your Attachments Here
1. Heat and Cold Stress Information	EHS 4-6, Attachment 1.doc
2. Work/Rest Regimens and Monitoring	EHS 4-6, Attachment 2, 9-7-05.doc
3.	
4.	
5.	

Tetra Tech EC, Inc.

NOTICE OF OWNERSHIP AND CONDITIONS OF USE

This document is the property of Tetra Tech EC, Inc. (TtEC) and is to be used only for the duration and connection with the performance of work for TtEC. Written deviations to this document may be authorized when appropriate in accordance with the Quality Rule. This document is not to be construed as an employment contract or any binding obligation of TtEC. This document may be modified or rescinded at any time with or without prior notice at the sole discretion of TtEC. Hard copies of this document may not contain the most current information. The current version of this document can be found on the TtEC online Corporate Reference Library.

Copyright© 1995, 1998

Tetra Tech EC, Inc.

Proprietary Information

ATTACHMENT 1

HEAT AND COLD STRESS INFORMATION

1.0 HEAT STRESS

Hot weather can cause physical discomfort, loss of efficiency, and personal injury. The human body strives to maintain a constant core temperature of 98.6 F (37° C). If this temperature is to be maintained, heat loss must equal heat production. This balance is maintained by variations in the blood flow to the outer part of the body. When the core temperature rises, blood vessels beneath the skin dilate, and the blood brings increased heat to the skin, where it is dissipated by radiation and convection. This works only as long as the skin temperature is higher than the temperature of the outside environment. Heat loss by radiation convection is impossible when the temperature of the outside air approaches or exceeds the temperature of the skin. The body will now rely on dissipation through evaporation of sweat. But the sweat mechanism also has limits. The normal adult can sweat only about one liter per hour and can sweat at that rate for only a few hours at a time. In addition, sweating is effective only if the relative air humidity is low. Sweat evaporation ceases entirely when the relative humidity reaches 75 percent.

Of particular concern in heat stress monitoring is the use of personal protective clothing which decreases natural body ventilation and greatly increases the temperature and humidity to the skin. If precautions are not taken, heat stress will progress into a heat-related injury. Heat-related injuries fall into three major categories: heat cramps/fatigue, heat exhaustion, and heat stroke.

1.1 Heat Cramps

Heat cramps are the least common and least severe of heat injuries. Heat cramps occur when the electrolytic balance in the blood between water, calcium, and sodium (salt) is altered. Low blood salt level, from profuse sweating and inadequate salt consumption, is the usual cause.

1.1.1 Symptoms

a. Severe muscle cramps and pain, especially of the upper legs, calves, and abdomen, and occasionally in the arms

b. Faintness and dizziness

c. Possible nausea and vomiting

1.1.2 Treatment

Emergency care will include:

a. Remove victim from the hot environment

b. Dilute one level tablespoon of salt in 15 quarts of water or use a commercial product with a low glucose content; allow victim to sip this solution at the rate of one-half glassful every 15 minutes

c. To relieve pain, gently stretch the involved muscle group; gently message cramps as long as it does not increase the pain or discomfort

Copyright © 1995, 1998, 2005

The victim should avoid exertion of any kind for 12 hours. A victim of heat cramps is prone to recurrence.

1.2 Heat Fatigue

Heat Fatigue is most likely to affect new, or un-acclimatized workers.

1.2.1 Symptoms

a. Loss of energy, extreme tiredness

b. Stumbling, staggering, or loss of balance. The loss of balance is a particular risk to workers on elevated surfaces or climbing.

c. Excessive skin redness as body moves blood to surface

d. Lack of judgment recognizing the onset of heat fatigue and taking action to remove themselves from the environment for cool down and hydration

1.2.2 Treatment

a. Remove from the hot work environment for cool down

b. Extend cool-down period or cessation of work for the day with extra hydration and rest

c. Enhance observations by other workers and physiological monitoring

d. Provide individual work/rest regimens until acclimatized

1.3 Heat Exhaustion

1.3.1 Symptoms

Heat exhaustion is the most common heat injury and usually occurs in an individual who is involved with heavy physical exertion in a hot, humid environment, and is wearing protective clothing. Heat exhaustion is a mild state of physical shock caused by the pooling of blood in the vessels just below the skin, causing blood to flow away from the major organs of the body. Due to prolonged and profuse sweating, the body also loses large amounts of salt and water.

The symptoms of heat exhaustion include:

a. Profuse sweating

b. Pale, cool, sweaty skin

c. Headache and extreme weakness, fatigue

d. Nausea and possible vomiting

e. Dizziness and faintness

f. Collapse and possible brief unconsciousness

g. Body core temperature normal, may even be slightly below normal

Copyright © 1995, 1998, 2005

1.3.2 Treatment

Emergency care will include:

a. Remove victim from the hot environment and out of the exclusion zone

b. Lie victim down with feet slightly raised

c. Remove as much clothing as reasonable (especially personal protective clothing); loosen what cannot be removed

d. Apply cold, wet compresses to the skin; fanning will also aid in cooling

e. If the victim is fully alert, allow him/her to drink water or the same solution, at the same rate, that was used for the emergency care of heat cramps

f. If the victim vomits, do not give fluids by mouth, transport him/her to a hospital immediately (dehydration is the most critical problem in heat exhaustion victim; intravenous fluids will have to be given)

g. Take oral temperature every 10 minutes, if the victim's temperature is above 101°F (38.3 C) or shows a steady increase, transport to a hospital immediately and start sponging him/her off with cool water

1.4 Heat Stroke

Heat stroke is a true life-threatening emergency having a mortality rate of 20 to 70 percent. This condition results when the heat regulating mechanisms of the body breaks down and fail to cool the body sufficiently. The body temperature rises to between 105° F and 110° F (40.6 – 43.3° C); no sweating occurs in about 50 percent of the victims. Because no cooling takes place, the body stores increasingly more heat, and eventually brain cells are damaged, causing permanent disability or death. About 4,000 Americans die of heat stroke annually.

There are two basic kinds of heat stroke: classic heat stroke and exertional heat stroke. Classic heat stroke, in which people lose the ability to sweat, generally effects the elderly or chronically ill. Exertional heat stroke, in which victims retain the ability to sweat, is accompanied by physical exertion and muscle stress. Exertional heat stroke is the type that will be most commonly encountered on a field operation requiring strenuous physical activity.

1.4.1 Symptoms

a. Oral temperature of 105 F (40.6 C) or higher

b. Hot, reddish skin, skin is usually dry

c. Headache

d. Dry mouth

e. Shortness of breath

f. Nausea or vomiting

g. Increasing dizziness and weakness

Copyright © 1995, 1998, 2005

h. Mental confusion and anxiety; victims may show unusual irritability, aggression, combative agitation, or hysterical behavior

i. Convulsions, sudden collapse and possible unconsciousness; all heat stroke victims having varying levels of consciousness, ranging from disorientation to coma

1.4.2 Treatment

Emergency care will include:

a. Remove the victim from the hot environment and from the exclusion zone

b. Call for trained emergency medical personnel **immediately**

c. Remove as much clothing as reasonable (especially personal protective clothing); cut clothing with bandage scissors, if necessary, being careful not to injure victim

d. Pour cool water over the victim, avoiding his nose and mouth

e. Fan the victim

f. Place cold packs under the arms and against neck and ankles

g. Wrap victim in a wet blanket

h. Continue a combination of these methods until the oral temperature falls below 103 F (39.4 C) (take measures to prevent chilling, if necessary, i.e., use slower cooling if the victim starts shivering

i. Elevate the head and shoulders slightly during cooling

j. Never give the victim anything to drink unless fully conscious and vomiting is unlikely

Because heat stroke involves the entire body, a number of complications may result:

Brain swelling, convulsions, coma, kidney failure, liver failure, high blood pressure and heart failure.

Therefore, always transport the victim to a hospital even if the body core temperature has lowered to near normal.

1.5 Heat Stroke Verses Heat Exhaustion

The two most reliable and distinct differences between heat stroke and heat exhaustion are:

1.5.1 Heat Stroke

a. Skin flushed (red); may be dry; hot to touch

b. Oral temperature above 105°F (40.6 C)

1.5.2 Heat Exhaustion

a. Skin pale; wet or clammy; cool to touch

Copyright © 1995, 1998, 2005

b. Oral temperature usually normal

2.0 COLD STRESS

Hypothermia is a drop in the core body temperature below 98.6 F (37 C). The first symptoms of hypothermia are uncontrollable shivering and the sensation of cold; this is followed by a slowed and sometimes irregular heart beat, a weakened pulse and a drop in blood pressure. Vague or slow slurred speech, memory lapses, apathy, incoherence and drowsiness can occur. Other symptoms may include cool skin, slow, irregular breathing, apparent exhaustion, and fatigue after rest.

2.1 Prevention

Hypothermia is caused by prolonged exposure to a cold environment, whether air, water, or snow and ice. Adequate dry clothing with appropriate insulating capacity must be provided to workers to prevent hypothermia, especially if work is performed in air temperatures below 40 F (4.4 C). Wind chill is a critical factor. Work at a slow but steady pace. The job should be a "no sweat" operation.

Unless there are unusual or extenuating circumstances, cold injury to other than the extremities (hands, feet, and head) is not likely to occur without the development of the initial signs of hypothermia. Older workers or workers with circulatory problems require special precautionary protection against hypothermia. The use of extra insulating clothing and/or a reduction in the duration of the exposure period are special precautions that should be considered for these workers. The precautionary actions to be taken will depend upon the physical condition of the worker and should be determined with the advice of a physician with knowledge of the cold stress factors and the medical condition of the worker.

2.2 Treatment

First aid for mild hypothermia will be performed as follows:

a. End the exposure - get the victim out of the cold and wet

b. Replace wet clothing with dry or add insulation to clothing

c. Offer warm, non-alcoholic fluids

d. Increase exercise

e. Seek shelter from wind, wet and cold

CAUTION: If the victim remains cold for a number of hours, chemical changes may have taken place which, on rewarming, may cause major medical problems for the victim and which could result in death. Severely hypothermic victims are best warmed in the hospital under controlled conditions. If a severely hypothermic victim cannot be transported to a hospital within a few hours, re-warming should begin in the field.

2.3 Frostbite

2.3.1 Prevention

Frostbite can be prevented by wearing sufficient protection to prevent skin from coming into prolonged contact with a freezing environment. The following steps can be taken.

Copyright © 1995, 1998, 2005

a. Wear sufficient clothing. Mittens are better than gloves. Face masks and wool stocking caps are better than hats. Wind and waterproof hoods protect the face and neck.

b. Clothing should be loose enough to prevent constriction of blood vessels. Boots must be roomy enough to permit movement of the toes with no feeling of tightness.

c. Do not contact conductive metals or contact gasoline or other solvents with bare skin as rapid evaporation of solvents may quickly lead to frozen tissues in a cold environment.

d. Exercise the toes and fingers to maintain circulation.

e. Observe the condition of your partners' face, hands and ears frequently for signs of frostbite.

f. Avoid smoking and drinking alcoholic beverages.

2.3.2 Symptoms

Frostbite can occur either before or after the onset of hypothermia when body tissue (usually an extremity) is exposed to freezing temperatures. Frostbite occurs when the fluids surrounding tissue cells freezes. The danger of frostbite increases with increased wind chill and/or reduced temperatures below 32 F (0 C). Frostbite can also occur if tissues are in prolonged contact with a frozen material or object. Skin contact with frozen metal, for example, can result in frostbite in a short period of time, even in a warm environment.

There are three degrees of frostbite:

a. First degree - freezing without blistering or peeling, "frostnip"

b. Second degree - freezing with blistering and/or peeling, and

c. Third degree - freezing resulting in the death of skin tissue and possibly the death of underlying tissues as well

Symptoms of frostbite include the following:

a. The skin changes color to white or grayish-yellow, progresses to reddish-violet, and finally turns black as the tissue dies

b. Pain may be felt at first, but subsides

c. Blisters may appear, and

d. The affected area is cold and numb

2.3.3 Treatment

First aid for superficial (first degree) frostbite is as follows:

a. Place a warm body part next to the frozen area, applying firm, steady pressure.

b. DO NOT RUB THE AREA. Rubbing may cause further damage to already injured skin.

c. Protect the area from further freezing.

Copyright © 1995, 1998, 2005

First aid for deep frostbite (second and third degree) is as follows:

a. KEEP THE FROZEN PART FROZEN!

b. Prevent further injury: avoid rubbing and further freezing of unaffected tissue.

c. If the part has thawed, the part should NOT be allowed to refreeze or bear weight. A victim with thawed feet should be carried out.

d. Give the victim plenty of fluids and evacuate to medical assistance as soon as possible.

2.4 Trench Foot

2.4.1 Symptoms

This condition may be caused by long, continuous exposure to cold without freezing, combined with persistent dampness or actual immersion in water. Edema (swelling), tingling, itching, and severe pain occur, and may be followed by blistering, death of skin tissue, and ulceration. When other areas of the body are affected besides the feet, the condition is known as chilblains.

2.4.2 Prevention

Trench foot and chilblains can be prevented by keeping the body as dry as possible at all times. Waterproof boots should be worn when required, but provisions must be made for preventing excessive perspiration to accumulate inside the boots. Socks should be changed at least twice daily and the boots wiped dry inside with each change of socks. The feet should also be wiped dry and foot powder applied.

2.4.3 Treatment

Affected body parts should not be rubbed or massaged, but bathed in water using plain white soap. Dry thoroughly and elevate the body part, allowing the body part to be exposed at room temperatures. If the feet are affected, do not walk during treatment.

Copyright © 1995, 1998, 2005

ATTACHMENT 2

WORK/REST REGIMEN AND MONITORING

1.0 INTRODUCTION

Establishing a work/rest regimen that allows work to be completed in a timely manner while providing adequate rest time to prevent heat stress requires involvement of the ESS, FOL, and individuals involved. In many cases, particularly when wearing normal field type clothing (i.e., level D), awareness and communication are the key elements to a successful program. Allowing and encouraging rest periods on an "as needed" basis while ensuring vigilance for initial symptoms of heat stress, encourages this success.

There are times when this approach is not appropriate. When heat stress contributing protective clothing (e.g., respirators, impermeable coveralls) are worn for extended periods, or when "as needed" work/rest regimens adversely impact either the individuals exposed to the heat source or work completion, a more formal work/rest regimen will be established.

Formal work/rest regimens are based either on 1) monitoring ambient conditions (e.g., with a Wet Bulb Globe Temperature (WBGT), estimating work loads and establishing work/rest times, 2) monitoring physiological conditions and adjusting work/rest periods, or 3) using personnel heat stress monitors.

The WBGT, physiological monitors, and personnel heat stress monitors will be used in accordance with manufacturer's instructions. Personnel heat stress monitors will be approved for use by the PESM.

This attachment includes guidance for monitoring and preventing heat stress and heat strain in accordance with the 2005 ACGIH.

2.0 WBGT-BASED WORK/REST REGIMENS

2.1 Work/Rest Regimens

When required, the WBGT will be used in conjunction with the work load to determine the appropriate work/rest regimen for personnel wearing regular work clothing or semi permeable disposal coveralls (uncoated Tyvek). Light work examples include sitting or standing or performing light hand or arm work. Moderate work includes walking about with moderate lifting and pushing. Heavy work corresponds to pick and shovel-type work.

The work/rest regimen using the WBGT procedure will be used as a guideline, as the WBGT is only an index of the environment. Table 2-A and 2-B outlines the work/rest regimen guidelines based upon WBGT temperature and workload for un-acclimatized and acclimatized workers respectively. Table 2-C identifies the correction factors. The WBGT temperature will be determined in accordance with Section 2.3 of this attachment. Table 2-D provides examples of work activity categories. Rest areas should be near the work areas, shaded, and with adequate supplies of cool water. Aids to assist in evaporative cooling such as fans or blowers should be considered.

2.2 Acclimatization

Acclimatization is a gradual physiological adaptation that improves an individual’s ability to tolerate heat stress. Full heat acclimatization requires up to 3 weeks of continued physical

Copyright © 1995, 1998, 2005

activity under heat-stress conditions similar to those anticipated for the work. Its loss begins when the activity under those heat-stress conditions is discontinued, and a noticeable loss occurs after 4 days. With a recent history of heat stress exposures (e.g. 5 of the last 7 days), a worker can be considered acclimatized for the purpose of using Table 2-B.

Numerous factors can affect acclimatization and a worker's ability to work in heat, including age and off-work activities (amount of sleep, consumption of alcoholic beverages, prescription and nonprescription mediations (e.g. antihistamines and other medications that decrease the body's ability to carry water or reduce sweating).

WORK/REST REGIMENS AND MONITORING

Table 2-A
Examples of Permissible Heat Exposure Threshold Limit Values
For Un-acclimatized Workers
(Values are given in °F and (^{o}C) WGBT)*

Work - Rest Regimen	Work Load Category			
	Light	Moderate	Heavy	Very Heavy
Continuous work	81.5 (27.5)	77 (25.0)	72.5 (22.5)	--
75% Work - 25% Rest, each hour	84.2 (29.0)	79.7 (26.5)	76.1 (24.5)	--
50% Work - 50% Rest, each hour	86 (30.0)	82.4 (28.0)	79.7 (26.5)	77 (25.0)
25% Work - 75% Rest, each hour	87.8 (31.0)	84 (29.0)	82.4 (28.0)	79.7 (26.5)

Table 2-B
Examples of Permissible Heat Exposure Threshold Limit Values
For Acclimatized Workers
(Values are given in °F and (^{o}C) WGBT)*

Work - Rest Regimen	Work Load Category			
	Light	Moderate	Heavy	Very Heavy
Continuous work	85.1 (29.5)	80 (27.5)	77 (26)	--
75% Work - 25% Rest, each hour	87 (30.5)	82 (28.5)	78 (27.5)	--
50% Work - 50% Rest, each hour	89 (31.5)	85 (29.5)	82 (28.5)	83 (27.5)
25% Work - 75% Rest, each hour	90 (32.5)	88 (31)	86 (30)	85 (29.5)

Notes on Table 2-A & 2-B:

a. These values are for fully acclimatized workers wearing light weight pants and shirts. For conditions other than this use this table with the correction factors from Table 2-B.

b. These values assume that workers drink frequently and have properly increased salting of food prior to exposure.

c. These values are guidelines. Actual levels may be modified based on individual physiological response and actual work and rest conditions.

d. These values assume that the rest location is cool enough to alleviate heat load conditions.

Copyright © 1995, 1998, 2005

Table 2-C
Correction Factors for Table 2-A in °F*

Clothing Type	WBGT Correction
Summer work uniform	0 F
Cotton overalls	-3.5 F
Double Cloth (woven material Coveralls	-5 F
Winter work uniform	-7 F
Water barrier, permeable	-11 F

Notes on Table 2-C:
To use this table, identify the most restrictive applicable clothing type involved. Modify Table 2-A temperatures by this amount. For example, the Table 2-A TLV for continuous work, light workload is 86° F. If cotton overalls (+3.5 F) are used with acclimatized workers the Corrected Temperature is 89.5° F.

Table 2-D
Examples of Activities within Metabolic Rate Categories

Categories	Example Activities
Resting	Sitting quietly
	Sitting with moderate arm movements
Light	Sitting with moderate arm and leg movements
	Standing with light work at machine or bench while using mostly arms
	Using a table saw
	Standing with a light or moderate work at machine or bench and some walking about
Moderate	Scrubbing in a standing position
	Walking about with moderate lifting or pushing
	Walking on level at 3.5 mph (6 km/hr) while carrying a 6.6 lb (3 Kg) weight load
Heavy	Carpenter sawing by hand
	Shoveling dry sand
	Heavy assembly work on a noncontinuous basis
	Intermittent heavy lifting with pushing or pulling (e.g. pick and shovel work)
Very Heavy	Shoveling wet sand

Copyright © 1995, 1998, 2005

2.3 WBGT Determination

If the Wet Bulb Globe Temperature (WBGT) is used to determine if field conditions are conducive to heat stress illnesses, the WBGT is determined through the following equations:

Outdoors with solar load: WBGT = 0.7 NWB + 0.2GT + 0.1DB	(1)
Indoors or outdoors with no solar load: WBGT = 0.7 NWB + 0.3GT	(2)

Where:

WGBT = Wet Bulb Globe Temperature Index
NWB = Natural Wet-Bulb Temperature
DB = Dry-Bulb Temperature
GT = Globe Thermometer Temperature

The factors involved in the above equations can be measured in the following manner:

a. Through the use of a direct-reading heat stress monitor capable of measuring all of the individual factors associated with the WBGT equation. For example, the Reuter-Strokes, Metronics, or Quest heat stress monitors.

b. By measuring the individual factors manually using the following type of equipment

- Natural Wet-Bulb Temperature Thermometer
- Dry-Bulb Temperature Thermometer
- Globe Temperature Thermometer

WBGT should be operated in accordance with the manufacturer's instructions. The location of the WBGT device should be evaluated based on the work. Work inside buildings (no wind), within depressions or excavations, over asphalt or black liners (such as HPDE) would dictate that the device should be located near the area to account for the difference in the globe temperature due to radiance and reflection. Work on open soil/gravel will have a lesser affect on the readings and will allow the readings to be indicative of a large area (up to several miles). (Note WBGT readings for the area can frequently be obtained on a realtime basis from weather stations, or from the internet).

3.0 ADJUSTED TEMPERATURE BASED WORK/REST REGIMENS

When wearing impermeable protective clothing, the use of work/rest regimens based on WBGT is **not** recommended. The WBGT index is designed to account for the effects of evaporative cooling. Vapor barrier clothing impedes the evaporation of sweat and renders the WBGT an inappropriate physiological model. The most important environmental conditions related to heat stress for workers wearing impermeable protective clothing have been suggested to be the ambient dry bulb temperature and the radiant solar heat. These factors are combined into an index called the adjusted temperature using the following formula:

T° adjusted = ambient dry bulb temperature + (13 x % sunshine)

Where: % sunshine is an estimate of the amount of time the sun is covered by clouds thick enough to produce a shadow. The thermometer bulb should be shielded from radiant heat when taking measurements.

Copyright © 1995, 1998, 2005

The adjusted temperature values are then used to determine the initial work/rest regimen and physiological monitoring frequency. Table 2-E gives the work period and monitoring frequency. Initially, rest periods will be at least 15 minutes. Physiological monitoring that is normally recommended is pulse rate and body temperature. Procedures for each are described below. Initially, both should be done. Pulse rate monitoring may be discontinued with the approval of the PESM if temperature monitoring proves to be effective.

4.0 PHYSIOLOGICAL MONITORING

As the metabolic rate increases in response to work demands, the guideline values in Table 2-A & 2-B decrease to ensure that most workers will not experience a core body temperature above 100.4 F (38 C) for un-acclimatized workers or 101.3 F (38.5 C) for acclimatized workers. One or more of the following measures may mark excessive heat strain, and an individual's exposure to heat stress should be discontinued when any of the following occur.

Physiological monitoring will commence at the discretion of the ESS or when WBGT monitoring is not performed and ambient temperatures exceed 70 F (21 C). . Physiological monitoring should be used whenever work/rest regimens are implemented to verify the effectiveness of the work/rest ratio including the cool down periods.

4.1 Pulse Rate Monitoring

Sustained (several minutes) heart rate is in excess of 180 beats per minute (bpm) minus the individual's age in years (180-age), for individuals with normal cardiac performance, or recovery heart rate greater than 110 bmp after a peak work effort.

Take the pulse immediately at the start of the rest period (P1). Take the pulse again 1 minute into the rest period. If any of the following conditions exist, shorten the next work period by a third:

P1 > 110 beats per minute (bpm)

P2 > 90 bpm

P1 - P2 < 10 bpm.

Pulse rates can be taken with an electronic pulse meter, or manually with a stopwatch for 30 seconds.

4.2 Body Core Temperature

Obtaining an accurate body core temperature for sustained work can be difficult, as the body will start to cool as soon as work is stopped or if protective clothing is removed and evaporation rates are increased. Monitor personnel as soon as possible to obtain an accurate temperature following the manufacturer's instructions for the particular instrument used.

Take the oral, ear or temporal temperature immediately at the start of the rest period. If the temperature exceeds 99.5 F (37.5 C) shorten the next work period by a third. Do not return the worker to hot work in semi-permeable or impermeable clothing until the body temperature is less than 99.5 F (37.5 C).

Body temperatures may be taken with disposable oral thermometers or infrared ear drum scanners, such as the Thermoscan. Note: If a Thermoscan unit is purchased, the Pro Model should be selected. The home model available through drugstores cannot be recalibrated. Temporal infrared thermometers are also available and may be considered to be less intrusive to the workers than oral or ear measurement devices.

Copyright © 1995, 1998, 2005

(Note- Instruments coming in contact with skin or body fluids (sweat, saliva, etc) should either be used with disposal covers or sanitized between use.)

4.3 Removal from Exposure

If an individual requires a shortening of the work period on more than two consecutive monitoring periods, or repeatedly over a few days, they should be removed from exposure to hot environments, wearing semi-permeable impermeable protective clothing until examined and cleared for such work by the consulting physician.

Table 2-E
Initial Work Period and Physiological Monitoring Frequency

ADJUSTED TEMPERATURES	SCHEDULE
90° F or above	15 minutes
87.5° - 90° F	30 minutes
82.5° - 87.5° F	60 minutes
77.5° - 82.5° F	90 minutes
70° - 77.5° F	120 minutes

Notes on Table 2-E:

a. Schedule is for fit and acclimatized workers in impermeable protective clothing.

b. Work in impermeable protective clothing should include consideration of a buddy rule (no lone workers), particularly at higher temperatures. The observers should be watching for sudden or severe fatigue, lightheadedness, loss of balance, loss of judgment or clumsiness that may be indicative of heat fatigue or heat stress.

c. The above temperatures should be adjusted for the % of sunshine as indicated in Section 3.0.

d. Personnel should be permitted to self-limit exposures and encouraged to observe co-worker observation to detect signs and symptoms of heat strain in others.

e. The monitoring frequencies may be adjusted for individuals after experience with their work in heat stress environments has been gained provided the work involved, PPE, and other factors remain the same.

Copyright © 1995, 1998, 2005

Appendix E

Underground Utilities

EHS 3-15: Underground Utilities

Purpose

This program provides requirements and recommendations relative to identification, location, avoidance, and management of underground utilities, appurtenances, and structures during intrusive activities.

Version Date: 05/16/2002 - Revised

Original Issue Date: 02/20/2002

Approved by:

Category: Company Procedures

Sections: ESQ - Environmental Health & Safety Programs

Sub Category: Departmental/Discipline

Document Type: Procedure

Keyword Index: EHS Compliance/Waste Management, Field Activities/Science, Operational Control, Training, Monitoring

Document Owner: Mike McSherry

Table of Contents

Section

1.0 PURPOSE
2.0 SCOPE
3.0 MAINTENANCE
4.0 DEFINITIONS
4.1 Aggressive Methods
4.2 Buffer Zone
4.3 Competent Person
4.4 De-Energize
4.5 Excavation
4.6 Jurisdiction
4.7 Locate
4.8 Locate Request
4.9 Observer
4.10 One-Call Agency
4.11 Positive Response
4.12 Potholing
4.13 Underground Utility
4.14 Underground Utility Owner
4.15 White Lining
5.0 DISCUSSION
5.1 Responsibilities
5.1.1 Competent Person
5.1.2 Observer
5.1.3 Line Management
5.1.4 Environmental, Health and Safety Personnel
5.2 Procedure
5.2.1 Identifying and Locating Underground Utilities
5.2.1.1 Pre-Planning and the Site EHSP
5.2.1.2 “One-Call” Locating and Marking Services
5.2.1.3 Private Utility Locating and Marking Services
5.2.1.4 Self-Performance of Utility Locating and Marking
5.2.2 Working Near or Around Underground Utilities
5.2.2.1 Work Site Review
5.2.2.2 Preservation of Marks
5.2.2.3 Excavation Observer
5.2.2.4 Excavation Within The Buffer Zone
5.2.2.5 Protection of Underground Utilities
5.2.2.6 De-Energizing Utilities
5.2.2.7 Damage Discovery
5.2.3 Encountering or Contacting Underground Utilities
5.2.3.1 Encountering Underground Utilities
5.2.3.2 Contacting Underground Utilities
5.3 Training
6.0 SOURCES OF INFORMATION
6.1 Organizations
6.2 Vendors and Commercial Sites
7.0 REFERENCES
8.0 ATTACHMENTS
Attachment A – Underground Utilities Locating and Marking Checklist
Attachment B – Underground Utilities Management Checklist

1.0 PURPOSE

This program provides requirements for identification, location, and avoidance of underground utilities, appurtenances, and structures during intrusive activities, as defined in Section 4.0. The program also addresses actions to be taken in response to encountering or contacting underground utilities.

2.0 SCOPE

These requirements are applicable to all Tetra Tech FW, Inc. (TtFW) operations. The procedures address the requirements and recommendations for identifying and locating, working around, and encountering or contacting underground utilities.

3.0 MAINTENANCE

The Director, Environmental, Safety and Quality (ESQ) Programs, is responsible for updating this procedure. Approval authority rests with TtFW's President and Chief Executive Officer. Suggestions for revision shall be submitted to both the department responsible for updating the procedure and the Executive Director, Administration and Compliance.

4.0 DEFINITIONS

4.1 Aggressive Methods

The use of mechanized equipment such as excavators, backhoes, drill rigs, directional drilling, road saws, etc. Non-Aggressive methods involve the use of manual or non-mechanized methods such as hand-digging with shovels and air/hydro/vacuum methods.

4.2 Buffer Zone

As defined in this procedure, the area around a utility where only non-aggressive excavation methods may be utilized, unless specific conditions are met.

The definition cited above, and the excavation requirements and restrictions associated with it, will vary depending on the particular state regulations. TtFW requires the imposition of a four-foot Buffer Zone on all sides of the utility as measured from the outside edges of the utility, both horizontally and vertically. Since most jurisdictions recognize Buffer Zones which vary somewhere in the range of 18 to 36 inches, this distance must be verified by consulting the applicable state regulations before excavating so that adjustments to surface markings can be

made to achieve the TtFW-required four-foot buffer zone.

Referred to as the “Tolerance Zone”, “Safety Zone”, or “Approximate Location of Underground Utilities” in some jurisdictions.

Information relative to excavation within the buffer zone is contained in Section 5.2.2.4.

4.3 Competent Person

A Competent Person has the ability to recognize hazards associated with underground utilities and the authority to stop or direct operations to ensure the safety of personnel and conformance with this procedure. The Competent Person has an understanding of this procedure, and the “One-Call” system requirements for the jurisdiction where excavation is occurring. The Competent Person must be capable of notifying One-Call agencies and maintaining and tracking One-Call Locate Numbers. Additionally, they must have knowledge of methods and work practices for utility identification, avoidance, and protection.

4.4 De-Energize

As applicable to a utility, to physically eliminate and/or prevent the presence, transmission, flow, or release of energy or materials which may cause harm to personnel or property.

4.5 Excavation

An operation for the purpose of movement or removal of earth, rock, or the materials in the ground, including but not limited to; digging, blasting, augering, backfilling, test boring, drilling, pile driving, directional drilling, grading, plowing-in, hammering, pulling-in, jacking-in, trenching, tunneling, structural demolition, milling, scraping, tree and root removal (grubbing), fence or sign post installation. TtFW requires that the designated One-Call agency for the applicable jurisdiction be contacted any time an intrusive activity is planned.

4.6 Jurisdiction

The authority having legal jurisdiction relative to regulations and requirements for notification of excavation activities and associated identification and marking. In the United States, the states have jurisdiction, and most consider the regulations applicable when excavation is to be performed in any location, including any public or private way, any company right-of-way or easement, or any public or privately owned land or way.

4.7 Locate

To indicate the existence of a utility by establishing a mark through the use of flags, pins, stakes, paint, or some other customary manner, that approximately determines the location of a line or facility.

4.8 Locate Request

A communication between an entity performing intrusive activities and a utility marking agency (One-Call, etc).

4.9 Observer

The person assigned to visually monitor and, as needed, signal the operator during mechanized intrusive activity when the activity is occurring within four feet of the outside edge of the buffer zone. This person remains in close communication with the equipment operator(s) and will stop the activity if needed.

4.10 One-Call Agency

An entity that administers a system through which a person can notify owners/operators of underground lines or utilities of the intent to perform intrusive activities in proposed public areas.

4.11 Positive Response

Communication with the entity performing intrusive activities, prior to the activity, to ensure that all contacted (typically via the One-Call agency) owner/operators have located and marked the underground utilities.

4.12 Potholing

The practice of exposing an underground facility by safe, non-aggressive excavation methods in order to ascertain the precise horizontal and vertical position and orientation of underground lines or utilities.

4.13 Underground Utility

An underground or submerged conductor, pipe, or structure used in providing electric or

communications service (including but not limited to, traffic control loops and similar underground or submerged devices), or an underground or submerged pipe used in carrying, providing, or gathering gas, oil or oil product, sewage, storm drainage, water or other liquid service (including, but not limited to, irrigation systems), and appurtenances thereto. As used in this procedure, utility includes all underground appurtenances and structures.

The following are examples of the types of underground utilities that may be present in a given location:

- Natural gas pipelines
- High voltage electric cables
- Water pipelines
- Fiber optic telecommunications lines
- Steam pipelines
- Gasoline, oil, or other fuels
- Sewer pipelines
- Hazardous Materials
- Underground Storage Tanks (USTs)
- Abandoned underground structures containing hazardous materials, hazardous wastes, and radioactive materials

Note: Electrical and pressurized mechanical underground utilities that are not energized shall be considered as applicable to the requirements of this procedure until they are disconnected and removed or protected by a lockout/tagout system approved by TtFW (see Section 5.2.2.6)

4.14 Underground Utility Owner

Any person, utility, municipality, authority, political subdivision or other person or entity who owns, operates, or controls the operation of an underground line/facility.

4.15 White Lining

The practice whereby the entity which intends to perform intrusive activities pre-marks the site with an outline of the area where intrusive activities will occur. This involves the use of white paint, flags, stakes, or a combination thereof to mark the extent of where work is to be performed. The marking may vary depending on what intrusive activities are to be conducted. For example, for general excavation, an areal outline of the excavation shall be marked, while for drilling, the individual boreholes shall be marked. Studies have shown that pre-marking is a practice that does prevent utility contact incidents.

5.0 DISCUSSION

5.1 Responsibilities

5.1.1 Competent Person

The Competent Person shall be responsible for:

- Obtaining a copy of, and understanding the applicable regulations for the state of jurisdiction where the excavation activities are to be performed.
- Contacting the appropriate One-Call agency or private locating service, as applicable.
- Recording One-Call locate numbers.
- If necessary, renewing One-Call locate numbers before expiration.
- Ensuring that white-lining of the area to be excavated is performed.
- Ensuring that a "positive response" has been received from every utility owner/operator identified by the One-Call agency and that they have located their underground utilities and have appropriately marked any potential conflicts with the areas of planned intrusive activities.
- Completion of the *Underground Utilities Locating and Marking Checklist* (Attachment A) and the *Underground Utilities Management Checklist* (Attachment B).
- Reviewing applicable AHAs with all project members before work begins.
- Conducting training on communication protocols to be used by the excavation observer and equipment operator.
- Ensuring Implementation of appropriate work practices during intrusive activities (including maintaining the prescribed buffer zone for use of aggressive methods).
- Conducting daily inspections of the excavation area to make sure that all markings are intact.
- Maintaining required records.
- Providing the Environmental and Safety Supervisor (ESS) with all required documentation on a daily basis.

5.1.2 Observer

Whenever intrusive operations with mechanized equipment are being conducted within four feet of the outside edge of the buffer zone, horizontally and vertically, an observer must be assigned to monitor the activities. The observer is responsible for:

- Observing the operation to ensure that the operator stops operations if utilities are observed.
- Reviewing hand signals and other forms of communication with the operator.
- Properly signaling the operator.
- Stopping the operation immediately if the observer's attention must be diverted even momentarily.
- Stopping the operation immediately if a hand signal or other directive is not followed. Operations will not resume until the observer and operator mutually agree that the reason(s) for not complying with the directive(s) are/is identified and fully corrected.
- Maintaining required records, such as logbook entries, or other, as requested by line management.

5.1.3 Line Management

The Project Manager (PM) shall be responsible for:

- Ensuring compliance with this procedure.
- Providing the necessary resources for compliance with this procedure.
- Designating Competent Personnel in consultation with the Project Environmental, Health

and Safety Manager (PESM) prior to the start of work.

5.1.4 Environmental, Health and Safety Personnel

The Environmental and Safety Supervisor (ESS) shall be responsible for:

- Providing oversight on the implementation of the requirements contained in this procedure.
- Consulting with the PM and Competent Person on underground utility issues.

5.2 Procedure

The following sections provide the requirements and recommendations of this procedure, which are intended to prevent injury to personnel, damage to infrastructure, and associated indirect effects associated with encountering or contacting underground utilities during the execution of intrusive work. Underground utilities present multiple potential hazards that must be recognized before and during work which occurs near them, therefore, this procedure is divided into sections addressing underground utility identification and location, working around or near underground utilities, and actions to be taken in the event that underground utilities are encountered or contacted. Hazards that may be presented by underground utilities include explosion and fire, electrocution, toxic exposures, pathogens, and drowning.

5.2.1 Identifying and Locating Underground Utilities

The possibility of the existence of underground utilities must be evaluated as early as possible in the planning phase for any project which involves intrusive activities, as defined in Section 4.2. The Task Initiation Procedure (TIP) form should be used for documentation of the identification of this potential hazard and the procedures to be followed to address them. The following sections describe various methods for identifying and locating utilities on a site. Plans should be verified during the readiness review. The *Underground Utilities Locating and Marking Checklist* (Attachment A) and the *Underground Utilities Management Checklist* (Attachment B) must be completed before any activities meeting the definition of excavation in Section 4.2 are conducted. Attachment A is intended to be used as a guide during the process of locating and marking utilities in the area to be excavated. Attachment B is intended to be used as a guide in the overall process of underground utilities management during the course of the project.

All underground utilities on a site involving excavation as defined in Section 4.4, must be located and identified before intrusive activities commence, by one or more of the following entities:

- The Utility Owner
- A Private or Public Utility Locating Service
- An Approved TtFW Competent Person

These options are described in greater detail in the following Sub-Sections:

5.2.1.1 Pre-Planning and the Site EHSP

- The Site-Specific Environmental Health and Safety Plan (EHSP) developed for the

project must:

- Identify the location and types of underground utilities that are believed to be present on the site.
- Reference this procedure (EHS 3-15), and describe how it will be implemented on the project.
- Contain an Activity Hazard Analysis in which the hazards associated with underground utilities are identified, as well as the measures used to control them.
- Contain, as an appendix, a copy of the applicable regulations from the state of jurisdiction where excavation activities are to be performed. These can usually be obtained via the Internet.
- Contain clear and concise procedures to be followed in the event that contact with underground utilities occurs.
- Address underground utilities and potential associated scenarios in the emergency response section of the EHSP.

5.2.1.2 "One-Call" Locating and Marking Services

Every state has utility marking service programs having various names such as "One-Call", "Dig-Safe", "Call-Before-You-Dig", "Dig-Safely", and many others. These services will identify the types and locations of any utility that may exist in an area to be excavated, as long as the property is in the public domain.

- The appropriate One-Call service for the jurisdiction where the project is located must be contacted prior to beginning excavation work. The One-Call agency should be given as detailed a description of the property as possible; address, cross street, utility pole numbers, physical description, etc.
- Notification to the One-Call service shall allow sufficient lead time for the agency to mark the utilities before excavation begins. The lead times vary, but range from two to ten days, depending on the state of jurisdiction.
- A complete listing of One-Call agencies and telephone numbers for all states is available in the *"Call-Before-You-Dig Call Center Directory"* , which can be accessed on the Internet at the WebPage (http://underspace.com/index.htm) sponsored by *"Underground Focus"* magazine.
- Once notified, the One-Call agency will provide the contractor with a unique "locate number" or "reference number". This reference number must be kept in the project files by the Competent Person or designee. Additionally, the reference numbers have expiration dates, which may vary depending on the particular One-Call agency. The valid period of the locate number and required renew notification date shall be requested from the One-Call agency.
- On a project with multiple contractors, each contractor must request a separate locate number. Under no circumstances will any other contractor or entity be allowed to "work under our locate number". Subcontractors to TtFW may excavate under the locate number secured by TtFW, provided that they are excavating within the area which was previously white-lined by TtFW and subsequently marked. **However, the One-Call agency must be contacted and notified of this arrangement so that the subcontractor can be recorded as working under the existing locate number.** If a TtFW subcontractor will be excavating in an area not white-lined by TtFW, then the TtFW subcontractor must request a new locate.
- The area where work is to be performed shall be white-lined by TtFW personnel before the locating service goes to the site.
- It is good practice to arrange a pre-excavation meeting at the project site with the personnel performing the utility location and marking. This meeting will facilitate communications, coordinate the marking with actual excavation, and assure identification of high-priority utilities.

- The One-Call agency should provide the identities of the utility owners that will be notified of the locate request. This information shall be recorded on the Underground Utility Locating and Marking Checklist (Appendix A) and maintained in the project files. The contact person and phone number for each utility owner shall also be recorded.
- The utility owners should provide a "positive response" relative to the locate request, which can consist of two types of action by the utility owner. The facility owner or operator is required to 1) mark it's underground utilities with stakes, paint, or flags, or 2) notify the excavator that the utility owner/operator has no underground utilities in the area of the excavation.
- The positive responses shall be recorded on the Underground Utility Locating and Marking Checklist (Appendix A) and cross-checked with the list of utility owners that the One-Call agency stated that they would notify. If it is discovered that a utility owner has not provided a positive response, then the One-Call agency must be notified.
- Excavation shall not be conducted until positive responses have been received from all utility owners identified by the One-Call agency as having underground utilities on the property.
- Before beginning excavation, the excavator must verify that the location marked was correct, and the distinct, color-coded markings of all utility owners are present.
- Examine the site to check for any visible signs of underground utilities that have not been located and marked such as pedestals, risers, meters, warning signs, manholes, pull boxes, valve boxes, patched asphalt or concrete pavement, areas of subsidence, fresh sod or grass, lack of grass or vegetation, and new trench lines.
- The markings placed by the utility owners must be documented by TtFW using a still, digital, or video camera. The photo-documentation shall be maintained with the project files indefinitely.
- The markings placed by the utility owners or marking services shall follow the American Public Works Association Uniform Color Code as described in ANSI Standard Z 535.1. This code appears below.

American Public Works Association Uniform Color Code

Red		Electric Power Lines, Cables, Conduit
Orange		Communications, Telephone, Cable TV
Yellow		Gas, Oil, Steam, Petroleum or Gaseous Materials
Green		Sewers and Drains
Blue		Potable Water Systems
Purple		Reclaimed Water, Irrigation, Slurry Lines
Pink		Temporary Survey Markings
White		Proposed Excavation

5.2.1.3 Private Utility Locating and Marking Services

- As discussed in Section 5.2.1.1, One-Call agencies arrange for the identification and marking of underground utilities only on public property, up to the point of contact with private property. In the event that excavation activities are to be conducted on non-public properties, the presence, location, depth, and orientation of all underground utilities within the white-lined area shall be ascertained through records review, including any site plot plans, utility layout plans, and as-built drawings available from the property owner, as well as through interviews with knowledgable personnel associated with the property. Additionally, the information gathered from these sources shall be verified by physical detection methods (non-aggressive), performance of a geophysical survey, or by procuring the services of a private utility locating and marking service. If any detection

methods are to be self-performed, the requirements of 5.2.1.4. must be followed.

The above requirements are also intended to address the potential presence of unknown or undocumented underground utilities, therefore, the area to be excavated must also be evaluated by the PM to determine if the potential for unknown or undocumented underground utilities exist. If the determination is made that the presence of these unknown or undocumented underground utilities is unlikely, then a variance should be requested to eliminate the requirement to identify them.

A list of vendors providing locating and marking services can be found in the *"Network of Underground Damage Prevention Professionals"* which can be accessed on the Internet at the *"Underspace"* WebPage (http://underspace.com/index.htm).

- Variance to this requirement above must be approved by the PM and PESM.

5.2.1.4 Self-Performance of Utility Locating and Marking

The techniques and instruments used to locate and characterize underground utilities can be extremely complicated and difficult to use effectively. Additionally, interpretation of the data generated by this instrumentation can be difficult. The utility marking services described in 5.2.1.1 and 5.2.1.2 are staffed by well-trained, experienced professionals who perform locating activities on a regular basis. For these reasons, it is most desirable that these professional services are used for utility location and marking on projects.

- In some instances, such as long-term projects where excavation is a primary task, and the presence of underground utilities is extensive, it may be prudent to self-perform locating and marking activities.
- If locating and marking is to be self-performed, all personnel using instrumentation will be trained on the use of the equipment that will be used, and the interpretation of the data.
- There are variety of locating methods which may be utilized for self-performance of utility locating as categorized below:
- Magnetic field-based locators or path tracers
- Buried electronic marker systems (EMS)
- Ground penetration radar-based buried –structure detectors
- Acoustics-based plastic pipe locators
- Active probes, beacons, or sondes for non-metallic pipes
- Magnetic polyethylene pipe
- Before self-performing any underground utility locating on a project, approval must be obtained from the TtFW Director, EHS Services.

5.2.2 Working Near or Around Underground Utilities

After the site has been properly evaluated for the presence of underground utilities, intrusive activities may begin. Since there is no perfect way of eliminating the hazards presented by underground utilities, an effort must be made to perform the tasks following the direction and guidance as described by the following best practices that should be implemented during the execution of the project.

5.2.2.1 Work Site Review

Before beginning intrusive activities, a meeting shall be held between all members of the project team. This shall consist of a review of the marked utility locations with the equipment operators, observers, laborers, etc.

5.2.2.2 Preservation of Marks

During excavation, efforts must be made to preserve the markings placed by the utility owners until they are no longer required. If any markings are obliterated, the One-Call agency must be contacted for re-marking. No intrusive activities are to take place if markings are not visible.

5.2.2.3 Excavation Observer

Whenever intrusive operations are being conducted within four feet of the edge of the buffer zone, an observer must be assigned to monitor the activities. The observer will be designated each day, and a review of hand signals and other forms of communication between the observer and operator will be conducted. The directives of the observer will be followed precisely and immediately by those operating equipment.

5.2.2.4 Excavation Within The Buffer Zone

Performing intrusive activities within the buffer zone requires careful adherence to proper guidelines and procedures to minimize the risk of contact with underground utilities.

The purpose of the buffer zone is to designate and define an area where careful, prudent, and reasonable excavation practices are to be used to prevent contact with underground utilities. However, there may be occasions where it is necessary to perform aggressive excavation methods in this designated area.

The boundaries of the buffer zone as defined in Section 4.1 will be observed at all times during intrusive activities. Aggressive excavation methods (excavators, backhoes, drill rigs) must be restricted to areas outside of the 4-foot buffer zone unless a special exemption to this requirement is obtained.

Consider whether the objective of the project can be completed without performing intrusive activities in the buffer zone at all. This will greatly reduce the risks presented by performing work in close proximity to underground utilities. If after consideration, the determination is made that intrusive activities in the buffer zone are necessary, then a formal exemption request shall be made to the PESM according to the guidelines below.

A request to utilize aggressive excavation methods in the buffer zone may be made if:

- There is no other appropriate and reasonable alternative to using aggressive methods in the buffer zone; and
- The utility has been de-energized (and purged if necessary), verified as de-energized, and locked-out (per Section 5.2.2.6); or

- the depth and orientation of the utility has been adequately and visually determined through the use of non-aggressive methods such as air/hydro/vacuum excavation, potholing, probing, hand-digging, or a combination thereof; and

- for utilities containing electrical energy, the depth of the existing water table is below the location of the utility; and
- application for the exemption has been submitted to the PESM via a Field Change Notification (FCN); and
- the exemption has been granted and approved in writing by the PESM on the FCN form.

The following conditions will apply to this request:

- Aggressive methods may be used in the buffer zone only to the extent allowed by the applicable state or other jurisdictional regulations.
- Appropriate physical protection measures for exposed utilities as described in Section 5.2.2.5 shall be implemented to eliminate the potential for equipment contact with utilities.
- The extent of the project excavation area to be covered by the exemption request must be specified in the FCN.
- When evaluating the use of aggressive excavation methods in the buffer zone, the PESM will consider the type of utility involved and the associated risk potential.

Based on this evaluation, the PESM may impose further conditions and requirements, which will be detailed in the FCN.

Even if the above exemption conditions are met, the PESM has authority to deny the request, the reasons for which will be described in the FCN.

Unless exempted according to the above provisions of this procedure, only non-aggressive methods may be used within the buffer zone. Non-aggressive, or non-mechanized equipment is used in order to prevent mechanical contact with underground utilities which could result in damage to the utility and create the potential for personal injury and property damage. Following are examples of non-aggressive excavation methods:

- Hand-digging
- Non-conductive hand tools must be used when digging within the buffer zone surrounding underground electrical utilities.
- If conductive hand tools must be used near electrical lines, then the PESM shall be consulted to determine additional requirements relative to safe electrical practices, procedures, and equipment.
- Hydro-excavation (water pressure).
- Air excavation (air pressure).
- Vacuum extraction (soil excavation/removal).
- Air excavation/vacuum extraction combination.
- Aggressive methods may be used for the removal of pavement over a utility, if allowed by the state regulations.

5.2.2.5 Protection of Underground Utilities

It is very important that consideration be given to the protection of underground utilities when performing adjacent intrusive activities. This is necessary not only to prevent physical damage and associated indirect effects, but also to prevent the potential for injury to employees and the

public.

- When using aggressive excavation methods within the buffer zone around exposed underground utilities, physical protection may be appropriate. Basically, this involves creation of a physical barrier between the mechanized operation and the utility. The following are some possible types of physical protective measures:
- Heavy timbers, similar to swamp mats.
- Sheets of plywood.
- Blasting mats.
- Once exposed, underground utilities no longer have the support provided by surrounding soil and may need to be physically supported to prevent shifting, bending, separation, or collapse, which could result in damage to the utility, and possibly personnel. Following are suggested support methods:
- Timber shoring underneath the utility.
- Timbers or girders over the top of the excavation fitted with hangers that support the utility.
- Design by a PE for complicated or large applications.
- Utilities must also be protected from objects that may fall into the excavation such as rocks and equipment. This can be accomplished by following these guidelines:
- Cast spoils as far away from the excavation as possible. Excavated and loose materials shall be kept two feet from the edge of excavations, as required by OSHA.
- Relocate large rocks, cobbles, and boulders away from the excavation and sloped spoils piles.
- When vehicles and machinery are operating adjacent to excavations, warning systems such as soil berms, stop logs or barricades shall be utilized to prevent vehicles from entering the excavation or trench.
- Scaling or barricades shall be used to prevent rock and soils from falling into the excavation.
- Barriers shall be provided to prevent personnel from inadvertently falling into an excavation.

5.2.2.6 De-Energizing Utilities

Utilities can carry many types of potential energy, including electricity, flowing liquids, liquids under pressure, gasses under pressure, etc. A release, such as may happen if a utility conveyance is compromised, could result in personal injury, property damage, and other indirect effects. If the white lines of the proposed excavation area overlaps or extends into the buffer zone of a known underground utility, then if at all possible, that utility shall be de-energized to physically prevent the transmission, flow, or release of energy. Conversely, if the buffer zone of the known utility lies outside of the white-lined, proposed excavation area, then de-energization is not required.

- The owner of the utility shall be contacted to determine the feasibility and methodology of de-energizing the utility. Plenty of lead-time should be provided for this since it may take utility companies weeks to de-energize some utilities.
- Depending on the utility and the material being conveyed, isolation points which may be suitable for de-energizing include but are not limited to the following:
- Electrical circuit breakers
- Slide gate
- Disconnect switches
- Piping flanges
- Other similar devices
- When utilities are de-energized, it must be verified by demonstration. This can be

accomplished by testing equipment, switching on a machine or lighting, opening a valve, etc. For any current-carrying electrical equipment, such as cables, electrical panels, etc., successful de-energization must be certified through the use of appropriate electrical testing equipment.

- Whenever a utility is de-energized, a means of ensuring that the energy isolation device and equipment cannot be operated until the device is removed must be provided. Typically, this is achieved by utilizing a lockout device, accompanied by a written tag, that physically controls the configuration of the energy isolation point. Lockout devices include but are not limited to the following:
- Locks
- Chains
- Valve covers
- Circuit breaker hasps
- Blind flanges
- Slip blinds, and
- Multiple lock hasps
- When de-energizing and locking out of utilities is practiced, the provisions of EHS 6-4 Lockout/Tagout, shall be followed, as applicable.
- In the event that a utility is de-energized, but there is no means of adequately providing a physical locking-out of the utility, then a spotter must be posted at the point of isolation to ensure that the utility is not re-energized. The spotter must be supplied with a communication device such as a site radio.

5.2.2.7 Damage Discovery

During excavation, utility damage may be discovered which is pre-existing or otherwise not related to a known contact. Disclosure to the utility owner is very important because the possibility of utility failure or endangerment of the surrounding population increases when damage has occurred. The utility may not immediately fail as a result of damage, but the utility owner or operator must be afforded the opportunity to inspect the utility and make a damage assessment and effect repairs if necessary. The following guidance applies:

- Observe and photograph the utility from a safe distance and determine in there is damage. Damage would be all breaks, leaks, nicks, dents, gouges, grooves, or other damages to utility lines, conduits, coatings, or cathodic protection systems.
- The One-Call agency or private location service must be contacted immediately.

5.2.3 Encountering or Contacting Underground Utilities

In the event that encountering or contacting an underground utility occurs, it is imperative that the appropriate actions are taken to minimize damage to the utility, prevent personal injury, and minimize indirect effects.

5.2.3.1 Encountering Underground Utilities

It is possible that underground utilities will be encountered in locations that have previously been “cleared” of having underground utilities by the locating service, or are found outside of the area which has been marked as having underground utilities. In either case, if this occurs, the following applies:

- Intrusive activities must be curtailed

- The One-Call agency or private location service must be contacted immediately
- The PM and PESM must be notified
- No further intrusive activities may be conducted until:
- The One-Call agency/private location service and/or the subject utility owner visit the site;
- Identification of the utility owner and the type of material/energy being conveyed by the utility has been made; and
- The orientation and depth of the subject utility has been determined and suitably marked.
- A TtFW Incident Report and Investigation form must be completed per EHS 1-7. The report should be accompanied by photographs clearly showing the marking(s), and the actual location, with a distance gauge to document how far off the mark the utility was encountered.

5.2.3.2 Contacting Underground Utilities

If excavation or other equipment being used for intrusive activities makes contact with an underground utility, the following guidelines apply:

- Intrusive activities must be stopped immediately.
- Observe the utility from a safe distance and determine if there is damage. Damage would be all breaks, leaks, nicks, dents, gouges, grooves, scratched coatings, cathodic protection compromise, material leakage, obvious electrical energy.
- Move all personnel to the evacuation meeting point as described in the SSHP.

EXCEPTION: If an electrical line has been contacted and it is your belief that equipment (such as an excavator) is electrically energized, do not approach the equipment. Order the operator to remain in the equipment until emergency personnel can de-energize the source (unless the equipment is on fire, at which time the operator should jump off of the vehicle and shuffle along the ground to a safe area). Shuffling is required because current flows outward through the soil in a ripple pattern called a power gradient, creating a pattern of high and low potential, Shuffling decreases the chance that these gradients could be bridged, causing current to flow through the body, resulting in electrocution.

- Secure the area to prevent the public from entering.
- Contact emergency responders as specified in the SSHP.
- The One-Call agency or if known, the utility owner must be contacted immediately.
- The PM and PESM must be notified.
- No further intrusive activities may be conducted until:
- The utility owner inspects the scene and after repairs, verifies that all danger has passed.
- The orientation and depth of the subject utility has been determined and suitably marked.
- Permission from the emergency responders to resume work has been given.
- A TtFW Incident Report and Investigation form must be completed per EHS 1-7. The report should be accompanied by photographs clearly showing the marking(s), and the actual location, with a distance gauge to document how far off the mark the utility was encountered.
- State and Local regulations must be reviewed to determine if reporting to any additional agencies is required.

5.3 Training

Competent Persons shall have adequate experience and/or training to carry out the requirements

of this procedure.

6.0 SOURCES OF INFORMATION

6.1 Organizations

- Common Ground Alliance
  http://www.commongroundalliance.com/wc.dll?cga~toppage
- Center for Subsurface Strategic Action (CSSA)
  http://underspace.com/cs/index.htm
- DigSafely
  http://www.digsafely.com/digsafely/default.asp
- National Utility Contractors Association (NUCA)
  http://www.nuca.com/
- National Utility Locating Contractors Association (NULCA)
  http://underspace.com/nu/index.htm
- Underground Focus Magazine
  http://underspace.com/uf/index.htm
- NUCA State Listing of One-Call centers
  http://www.nuca.com/
- Utility Safety Magazine
  http://www.utilitysafety.com/

6.2 Vendors and Commercial Sites

- RadioDetection, Inc. (Detection Instruments)
  http://www.radiodee.com/
- Heath Consultants (Detection Instruments)
  http://www.heathus.com/
- Ben Meadows Company (Detection Instruments)
  http://www.benmeadows.com/cgi-bin/SoftCart.exe/index.html?E+scstore
- So-Deep, Inc. (Complete Utilities Services)
  http://www.sodeep.com/
- Concept Engineering Group, Inc. (Air Excavation Equipment)
  http://www.air-spade.com/index.html
- Rycom Instruments, Inc. (Detection Instruments)
  http://www.rycominstruments.com/

- Schonstedt Instrument Company (Detection Instruments)
  http://www.schonstedt.com/

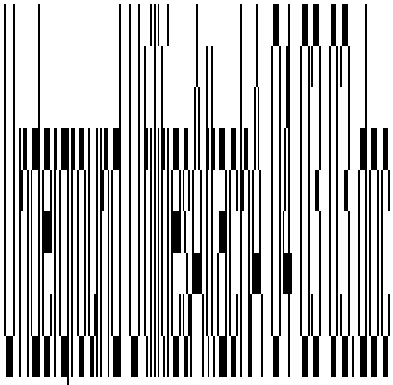
- Forestry Suppliers, Inc. (Fiberglass Probe – "Fiberglass Tile Probe", Part #77543, Approx. $20.00, Telephone 800-647-5368)
  http://www.forestry-suppliers.com/

7.0 REFERENCES

- Common Ground Study of One-Call Systems and Damage Prevention Best Practices, August, 1999, Sponsored by US DOT.

8.0 ATTACHMENTS

Attachment A – Underground Utilities Locating and Marking Checklist
Attachment B – Underground Utilities Management Checklist

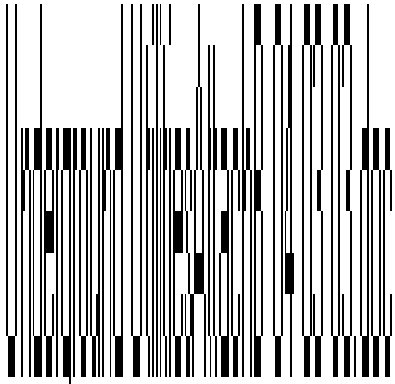


A

UNDERGROUND U KING CHECKLIST

Click t nload.

Select the "Detach" button in the pop-up window to save a copy to a disk or hard drive.



UNDERGRO **CHECKLIST**

Click t **nload.**

Select the "Detach" button in the pop-up window to save a copy to a disk or hard drive.

Tetra Tech EC, Inc.

NOTICE OF OWNERSHIP AND CONDITIONS OF USE

This document is the property of Tetra Tech EC, Inc. (TtEC) and is to be used only for the duration and connection with the performance of work for TtEC. Written deviations to this document may be authorized when appropriate in accordance with the Quality Rule. This document is not to be construed as an employment contract or any binding obligation of TtEC. This document may be modified or rescinded at any time with or without prior notice at the sole discretion of TtEC. Hard copies of this document may not contain the most current information. The current version of this document can be found on the TtEC online Corporate Reference Library.

Copyright© 2002

Tetra Tech EC, Inc.

Proprietary Information

EHS 3-15 - ATTACHMENT A
UNDERGROUND UTILITY LOCATING AND MARKING CHECKLIST

TETRA TECH FW, INC.

To be Completed by PM and/or "Competent Person"
Complete Form as Location/Marking Progresses and Maintain in Site Files

PROJECT INFORMATION:	Location:
Project Name:	Task/Activity:
Tetra Tech FW Competent Person:	Start Date of Work:
Tetra Tech FW Subcontractor: ☐ No ☐ Yes:	Private Locating Service Required: ☐ Yes ☐ No
Property Owner:	If Not, Explain:
NOTIFICATION:	
Locating Service Name:	Locating Service Tel. Number:
Date Locating Service Notified:	Locate Ticket Number:
Address of Property to be Marked:	Locate Ticket Expiration Date:
Nearest Intersecting Street:	
Are There Any Utilities on the Properties That the Locating Service Will Not Contact? ☐ Yes ☐ No	
Specify:	
Enter Utility Information in Table 1 Below. In Addition to Utility Locating Services, Consult Client, Utility Owners, Drawings, Facility Personnel, Maintenance Personnel, Municipalities, etc.	

TABLE 1
ON-SITE UTILITY INFORMATION

NAME OF UTILITY COMPANY	TYPE OF UTILITY	COLOR CODE	UTILITY PRESENT ON-SITE?	EMERGENCY PHONE NUMBER	DATE MARKS COMPLETED
	Electric	RED			
	Communications, Phone, CATV	ORANGE			
	Gas, Oil, Steam, Petroleum	YELLOW			
	Sewers, Drains	GREEN			
	Potable Water	BLUE			
	Reclaimed Water, Irrigation	PURPLE			
	Temporary Survey Markings	PINK			
To be performed by excavator prior to utility mark-out.	Proposed Excavation	WHITE			

White-Lining Completed? ☐ No Explain: _____ ☐ Yes: Date: _____ By Whom? _____

LOCATING AND MARKING:

Have All Utilities Identified in Table 1 Been Marked? ☐ Yes ☐ No (If Not, Contact Locating Service for Resolution)
Problem(s) With Markings?
☐ Yes ☐ No ☐ No Marks ☐ Incorrect Location ☐ Too Wide
☐ Other: _____ ☐ Not All Utilities Marked Per Table 1 (notify marking service)
Measurements Taken: ☐ Yes ☐ No
Documentation of Marks: ☐ Photos ☐ Video ☐ Other: _____

EXCAVATION:

Utilities Accurately Marked? ☐ Yes ☐ No
If no, describe: _____
Were Unmarked or Mis-Marked Utilities Encountered? ☐ Yes ☐ No
If Yes, Specify: _____
Locating Service Notified? ☐ Yes ☐ No
Will Excavation Continue Past Locate Number Expiration? ☐ Yes ☐ No
If Yes, Locate Number Renewed? ☐ Yes ☐ No New Expiration Date: _____
Any Other Problems/Concerns? Specify: _____

Form Completed By:	Signature:	Date:

EHS 3-15 - ATTACHMENT B

UNDERGROUND UTILITIES MANAGEMENT CHECKLIST

TETRA TECH FW, INC.

To be Completed by PM and/or "Competent Person"
Complete Form as Project Progresses and Maintain in Site Files.

PHASE		TASK	YES	NO	NA	COMMENTS Required if Response is No or NA. (Reference Item Number)
Pre-Planning	1.	Excavation in Work Scope? (As defined in EHS 3-15, Section 4.4)				
	2.	Underground Utilities Identified in TIP?				
	3.	Competent Person Assigned?				
	4.	Has a Copy of the Applicable State Regulations Been Obtained, Read, Understood?				
	5.	EHS Plan Addresses Underground Utilities? (AHAs, Contingency Plan, State Regulations Appendix)				
Identifying, Locating and Marking	6.	Locating and Marking Checklist Initiated? (Attachment A)				
	7.	Identification and Address of Property Determined, Including Nearest Intersection?				
	8.	One-Call Agency Contacted?				
	9.	Additional Locating and Marking Required on Property? (One-Call agency marks to public property line only)				
	10.	Additional Marker/Locator Identified?				
	11.	Additional Marker/Locator Qualified?				
	12.	TtFW Self-Performing Location and Marking?				
	13.	If Yes to 12 Above, Approval From TtFW Director EHS Services?				
	14.	Area of Excavation "White-Lined" by TtFW?				
	15.	TtFW Present When Markings Completed?				
	16.	All Utilities Marked? (Refer to Attachment A, Table 1)				
	17.	All Markings Photo/Video Documented?				
	18.	Area Checked for Signs of Previous Excavation? (subsidence, new grass, patching, etc)				
	19.	All Applicable Information Recorded on Attachment A?				
	20.	Multiple Contractors Excavating On-Site?				
	21.	Separate Locate Requests for All Contractors?				
	22.	TtFW Subcontractors Excavating in TtFW White-Lined Area(s)?				
	23.	If Yes to 22 Above, One-Call Agency Contacted to Determine if TtFW Subcontractor Can be Added to Existing Locate Ticket?				
Excavation Activities	24.	Meeting and Site Walk-Over Conducted with Project Personnel? (Managers, Equipment Operators, Laborers, Competent Person, Excavation Observer, etc)				
	25.	AHA and EHSP Review Conducted With Personnel?				
	26.	Do Site Activities Have Potential to Obliterate Utility Markings?				
Excavation Activities – Cont'd	27.	If Yes to 26 Above, Have Provisions Been Made to Preserve Markings?				

EHS 3-15 - ATTACHMENT B

UNDERGROUND UTILITIES MANAGEMENT CHECKLIST

PHASE		TASK	YES	NO	NA	COMMENTS Required if Response is No or NA. (Reference Item Number)
	28.	Has an Excavation Observer Been Designated to Monitor Excavation When Occurring within 4 Feet of the Buffer Zone?				
	29.	Have Operator and Observer Reviewed Commands and Signals?				
	30.	Has TtFW-Required 4-Foot Buffer Zone Been Marked on Either Side of Markings Placed by Locator?				
Excavation Within Buffer Zone	31.	Is Excavation Within The Buffer Zone Absolutely Necessary?				
	32.	If Yes to 31 Above, Can Non-Aggressive Methods Be Used For Excavation In The Buffer Zone? If Yes, Identify Appropriate Non-Aggressive Methods.				
	33.	If No to 32 Above, Has a Buffer Zone Exemption Request (FCN) Been Approved by The PESM? If No, then Aggressive Methods May Not Be Used in The Buffer Zone.				
	34.	If Yes to 33 Above, Has the Utility Been De-Energized, Purged, Verified/Tested, and Locked-Out? Or, Has The Depth and Orientation of the Utility Been Adequately and Visually Determined Through The Use of Non-Aggressive Methods?				
	35.	If Yes to 34 Above, Have All of The Following Conditions Been Met? For Utilities Containing Electrical Energy, Is The Depth of The Water Table Below The Depth of The Utility? Have Regulations Been Consulted to Determine Specific State Requirements Relative to Excavating in The Buffer Zone? Have Appropriate Physical Protection Measures Been Implemented to Prevent Equipment Contact With Utilities and to Prevent Damage to Utilities? Has The FCN Requesting The Buffer Zone Exemption Been Signed by The PESM? If No to Any of The Above Conditions, Then Only Non-Aggressive Excavation Methods May Conducted in The Buffer Zone, Since The Conditions of The Exemption Have Not Been Satisfied.				
Working Around Exposed Utilities	36.	If Necessary, Have Provisions Been Made to Support the Utility During Work Activities?				
	37.	Have Spoils Been Placed as far Away From the Excavation as Feasible?				
	38.	Has the Utility Been De-Energized? (If Any Portion of the 4-Foot Buffer Zone around a Utility is Inside of the White-Lined Area)				
	39.	Has the Isolation Point for the De-Energized Utility Been Physically Locked-Out?				
Working Around Exposed Utilities –Cont'd	40.	If No to 39 Above, Has a Spotter Been Assigned to Monitor Isolation Point?				
	41.	If Yes to 40 Above, Does the Spotter Have Adequate Communications? (Radio, Telephone, etc)				
	42.	Has the Isolation Point Been Tagged?				
Damage Discovery	43.	Has Pre-Existing Damage to a Utility Been Discovered During Excavation?				
	44.	If Yes to 43 Above, Has the One-Call Agency and/or Utility Owner Been Notified?				
	45.	If Yes to 43 Above, Have Photographs Been taken?				

EHS 3-15 - ATTACHMENT B

UNDERGROUND UTILITIES MANAGEMENT CHECKLIST

PHASE		TASK	YES	NO	NA	COMMENTS Required if Response is No or NA. (Reference Item Number)
Encountering or Contacting Underground Utilities	46.	Have Utilities Been Encountered in Locations That Have Not Been Marked?				
	47.	If Yes to 46 Above, Has the One-Call Agency or Other Locating Service Been Contacted?				
	48.	If Yes to 46 Above, Has the PM and PESM Been Notified?				
	49.	If Yes to 46 Above, Has a TtFW Incident Report per EHS 1-7 Been Completed? (Include Photographs)				
	50.	Has Excavation Equipment Come In Contact With Underground utilities?				
	51.	If Yes to 50 Above, Were Intrusive Activities Immediately Curtailed?				
	52.	If Yes to 50 Above, Has a Damage Determination Been Made From a Safe Distance?				
	53.	If Yes to 50 Above, Has the Area Been Secured?				
	54.	If Yes to 50 Above, Have Emergency Responders Been Notified?				
	55.	If Yes to 50 Above, Has the Locating Agency and/or Utility Owner Been Notified?				
	56.	If Yes to 50 Above, Have State and Local Reporting Requirements Been Met?				
	57.	If Yes to 50 Above, Were Intrusive Activities Curtailed Until; Inspection From Utility Owner, Orientation and Depth of Utility Was Determined and Marked, Permission From Emergency Responders Given?				
	58.	If Yes to 50 Above, Has a TtFW Incident Report per EHS 1-7 Been Completed? (Include Photographs)				

CHECKLIST COMPLETED BY:

NAME	SIGNATURE	DATE
NAME	SIGNATURE	DATE

Appendix F

Excavation and Trenching

EHS 6-3: Excavation and Trenching (Previously HS6-4)

Purpose
This program provides the requirements for activities involving excavations in accordance with 29 CFR 1926, Subpart P - Excavations.

Version Date: 07/03/2001 - Revised
Original Issue Date: 02/01/95
Category: Company Procedures
Sub Category: Departmental/Discipline
Keyword Index: EHS Compliance/Waste Management, Field Activities/Science, Operational Control, Training, Monitoring

Approved by:

Sections: ESQ - Environmental Health & Safety Programs
Document Type: Procedure
Document Owner: Mike McSherry

Table of Contents

Section

1.0 PURPOSE

2.0 SCOPE

3.0 MAINTENANCE

4.0 DEFINITIONS

4.1 Benching
4.2 Competent Person
4.3 Excavation
4.4 Hazardous Atmosphere
4.5 Protective Systems
4.6 Sloping
4.7 Support System
4.8 Trench

5.0 DISCUSSION

5.1 Responsibilities
5.1.1 Competent Person
5.1.2 Line Management
5.1.3 Environmental, Health and Safety Personnel
5.2 Designation of Competent Personnel
5.3 General Requirements
5.4 Hazardous Atmospheres
5.5 Protection From Water Hazards
5.6 Stability of Adjacent Structures
5.7 Daily Inspections
5.8 Soil Classification
5.9 Sloping and Benching
5.10 Protective Systems
5.11 Training

6.0 REFERENCES

7.0 ATTACHMENTS

1.0 PURPOSE

This program provides the requirements for activities involving excavations in accordance with 29 CFR 1926, Subpart P - Excavations.

2.0 SCOPE

These requirements are applicable to all Tetra Tech FW, Inc. (TtFW) operations.

3.0 MAINTENANCE

The Director, Environmental, Safety and Quality (ESQ) Programs is responsible for updating this procedure. Approval authority rests with TtFW's President and Chief Executive Officer. Suggestions for revision shall be submitted to both the department responsible for updating the procedure and the Executive Director, Administration and Compliance.

4.0 DEFINITIONS

4.1 Benching

A method of protecting employees from cave-ins by excavating the sides of an excavation to form one or a series of horizontal levels or steps, usually with vertical or near-vertical surfaces between levels.

4.2 Competent Person

A competent person is 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 authorization to take prompt corrective measures to eliminate them.

4.3 Excavation

Any man-made cut, cavity, trench, or depression in an earth surface, formed by earth removal.

4.4 Hazardous Atmosphere

An atmosphere which by reason of being explosive, flammable, poisonous, corrosive, oxidizing, irritating, oxygen deficient, toxic, or otherwise harmful, may cause death, illness, or injury.

4.5 Protective Systems

A method of protecting employees from cave-ins, from material that could fall or roll from an excavation face or into an excavation, or from the collapse of adjacent structures. Protective systems include support systems, sloping and benching systems, shield systems, and other systems that provide the necessary protection.

4.6 Sloping

A method of protecting employees from cave-ins by forming sides of an excavation that are inclined away from the excavation so as to prevent cave-ins. The angle of incline required to prevent a cave-in varies with differences in such factors as the soil type, environmental conditions of exposure, and application of surcharge loads.

4.7 Support System

A structure such as underpinning, bracing, or shoring, which provides support to an adjacent structure, underground installation, or the sides of an excavation.

4.8 Trench

A narrow excavation made below the surface of the ground. In general the depth is greater than the width, but the width of a trench measured at the bottom is not greater than 15 feet. If forms or other structures are installed or constructed in an excavation so as to reduce the dimension measured from the forms or structure to the side of the excavation to 15 feet or less, the excavation is also considered to be a trench.

5.0 DISCUSSION

5.1 Responsibilities

5.1.1 Competent Person

The competent person(s) shall be responsible for:

- Day-to-day oversight of open excavations and trenches
- Conducting soil classifications
- Selection of protective systems
- Conducting daily inspections of open excavations and trenches; and
- Providing the Environmental and Safety Supervisor (ESS) with all required documentation on a daily basis.

5.1.2 Line Management

The Project Manager (PM) shall be responsible for:

- Ensuring compliance with this procedure
- Providing the necessary resources for compliance with this procedure; and
- Designating competent personnel in consultation with the Project Environmental, Health and Safety Manager (PESM)

5.1.3 Environmental, Health and Safety Personnel

The ESS shall be responsible for:

- Providing oversight on the implementation of the requirements contained in this procedure
- Conducting periodic reviews of open trenches and excavations
- Consulting with the project manager and competent person on excavation issues; and
- Maintaining required records.

5.2 Designation of Competent Personnel

Prior to the start of any excavation work the project manager shall designate a competent person to fulfill the requirements of this procedure.

5.3 General Requirements

The following section provides general requirements governing activities in and around excavation and trenches, as well as the requirements for the selection and use of protective systems.

- Surfaces surrounding open trenches and excavations shall have all surface hazards removed.
- All utilities shall be located and cleared prior to initiating digging. Public or facility utility groups shall be utilized where possible for this purpose. In the absence of either, the ESS shall specify the procedures to be used to clear utilities in consultation with the project PESM and project manager. When the excavation is open, utilities shall be supported and protected from damage. Clearance and support methods shall be documented on the daily inspection checklist.
- Where structural ramps are used for egress they shall be installed in accordance with 29 CFR 1926.651(c)(1).
- Stairways, ladders, or ramps shall be provided as means of egress in all trenches 4 feet or more in depth. Travel distance shall be no more than 25 feet between means of exit.

- Employees exposed to vehicular traffic shall wear traffic vests.
- No employee shall be permitted under loads being lifted or under loads being unloaded from vehicles.
- When vehicles and machinery are operating adjacent to excavations warning systems such as stop logs or barricades shall be utilized to prevent vehicles from entering the excavation or trench.
- Scaling or barricades shall be used to prevent rock and soils from falling on employees.
- Excavated and loose materials should be kept at least 3 feet from the edge of excavations, but at a minimum of 2 feet from the edge of the excavation in accordance with OSHA requirements.
- Walkways or bridges with standard railing shall be provided at points employees are to cross over excavations or trenches.
- Barriers shall be provided to prevent personnel from inadvertently falling into an excavation.

5.4 Hazardous Atmospheres

Where atmospheres containing less than 19.5 percent oxygen or other types of hazardous atmospheres may exist the following requirements shall be implemented.

- Atmospheric testing shall be done prior to employees entering excavations 4 feet or greater in depth.
- Testing methods shall be listed on the daily inspection checklist and results documented daily in field logs.
- Control measures such as ventilation and personal protective equipment (PPE) shall be used to control employee exposure to hazardous atmospheres below published exposure limits.
- Ventilation shall be used to control flammable and combustible vapors to below 10 percent of their lower explosive limit.
- Testing shall be repeated as often as necessary to ensure safe levels of airborne contaminants.
- Emergency equipment shall be provided and attended when the potential for a hazardous atmosphere exists. This equipment shall include but not be limited to emergency breathing apparatus, harnesses, lifelines, and basket stretchers. Required equipment will be listed on the daily inspection checklist and reviewed daily.

5.5 Protection From Water Hazards

When water has collected or is collected in excavations and trenches the following requirements shall be applied.

- Employees shall not work in excavations in which water has, or is, accumulating without the use of additional protection such as special support systems or water removal.
- Water removal shall be monitored by a competent person.
- Barriers such as ditches and dikes shall be used to divert runoff from excavations and trenches.
- Trenches shall be reinspected prior to re-entry after water accumulation due to heavy rainfall or seepage.

5.6 Stability of Adjacent Structures

When excavating or trenching near an adjacent structure the following practices shall be implemented.

- Support systems such as shoring, bracing, or underpinning shall be provided where the stability of buildings, walls, or other structures is endangered by excavation.
- Excavation bases or footings of foundations shall be prohibited unless support systems are used, the excavation is in stable rock, a professional engineer has determined the structure is sufficiently removed from the site as to not pose a hazard, or the PE determines that the excavation shall not pose a hazard to employees due to the structure.
- Support systems shall be used when it is necessary to undermine sidewalks, pavements, and appurtenant structures.
- Surcharge load sources and adjacent encumbrances shall be listed with their evaluation date on the daily inspection checklist.

5.7 Daily Inspections

Inspections shall be performed daily on all excavations, adjacent areas, and protective systems before personnel enter the trench. The checklist provided in Attachment A or equivalent shall be used.

5.8 Soil Classification

To perform soil classification, the competent person shall use a thumb test, pocket penetrometer, or shear vane to determine the unconfined compressive strength of the soils being excavated. In soils with properties that change (i.e., one soil type mixed with another within a given area) several tests may be necessary. When different soil types are present the overall classification shall be that of the type with the lowest unconfined compressive strength. Classifications shall result in a soil rating of Stable Rock, Type A, Type B, or Type C in accordance with 29 CFR 1926.652, Appendix A. Soil classifications shall be listed on the daily inspection checklist. The

soils analysis checklist provided in Attachment B or equivalent shall be used for soil classifications.

5.9 Sloping and Benching

All sloping and benching shall be done in accordance with 29 CFR 1926.652, Appendix B. Selection of the sloping method and evaluation of surface surcharge loads shall be made by a competent person familiar with the requirements contained therein. Sloping and benching methods and specifications shall be listed on the daily inspection checklist.

5.10 Protective Systems

Protective systems are required on all excavations over 5 feet in depth or in excavations less than 5 feet when examination of the ground by a competent person reveals conditions that may result in cave-ins.

Selection and installation of protective systems shall be done in accordance with 29 CFR 1926.652, Appendices C & D, or manufacturers data for shoring and shielding systems. Selection of a protective system shall be made based upon soil classification and job requirements by a competent person. Protective systems and specifications shall be listed on the daily inspection checklist.

5.11 Training

Competent persons shall have an adequate combination of experience and training to classify soil types and select protective systems as outlined in 29 CFR 1926.652. Training and experience pertaining to qualification as a competent person shall be documented and include the following:

- General safety practices related to working in or near open excavations;
- Inspection requirements and techniques;
- Classification of soils in accordance with 29 CFR 1926.652, Appendix A; and
- Uses, limitations, and specifications of protective systems in accordance with 29 CFR 1926.652.

Training records shall be maintained in accordance with EHS 1-9, Recordkeeping.

6.0 REFERENCES

29 CFR 1926, Subpart P, Excavations.
Environmental, Health & Safety - Programs Procedure EHS 1-9, Recordkeeping
OSHA (U.S. Department of Labor, Occupational Safety and Health Administration),

7.0 ATTACHMENTS

Attachment A - Daily Excavation Inspection Checklist
Attachment B - Soils Analysis Checklist

EHS 6-3 ATTACHMENT A
DAILY EXCAVATION INSPECTION CHECKLIST

Click the icon below to launch or download.

EHS 6-3 Attachment A 04-03-03.doc

Select the "Detach" button in the pop-up window to save a copy to a disk or hard drive.

EHS 6-3 ATTACHMENT B
SOILS ANALYSIS CHECKLIST

Click the icon below to launch or download.

EHS 6-3 Attachment B.doc

Select the "Detach" button in the pop-up window to save a copy to a disk or hard drive.

Tetra Tech EC, Inc.

NOTICE OF OWNERSHIP AND CONDITIONS OF USE

This document is the property of Tetra Tech EC, Inc. (TtEC) and is to be used only for the duration and connection with the performance of work for TtEC. Written deviations to this document may be authorized when appropriate in accordance with the Quality Rule. This document is not to be construed as an employment contract or any binding obligation of TtEC. This document may be modified or rescinded at any time with or without prior notice at the sole discretion of TtEC. Hard copies of this document may not contain the most current information. The current version of this document can be found on the TtEC online Corporate Reference Library.

Copyright© 1995, 1998, 2000, 2001

Tetra Tech EC, Inc.

Proprietary Information

EHS 6-3 ATTACHMENT A

TETRA TECH FW, INC.

DAILY EXCAVATION INSPECTION CHECKLIST

To be completed by a "Competent Person"

Site location _____

Date _____ Time _____ Competent Person _____

Soil Type(s) _____

Soil Classification(s) _____ Excavation depth _____ Excavation width _____

Type of protective system used _____

Indicate for each item by circling: Y (Yes), N (No), - Address in Comments, Not Applicable (N/A.)

I.	**General Inspection of Job Site**			
A.	Surface encumbrances removed or supported	Y	N	N/A
B.	Employees protected from loose rock or soil that could pose a hazard by falling or rolling into the excavation	Y	N	N/A
C.	Hard hats worn by all employees	Y	N	N/A
D.	Spoils, materials, and equipment set back at least 2 feet from the edge of the excavation	Y	N	N/A
E.	Barriers provided at all remotely located excavations, wells, pits, shafts, etc.	Y	N	N/A
F.	Walkways and bridges over excavations 4 feet or more in depth are equipped with standard guardrails	Y	N	N/A
G.	Warning vests or other highly visible clothing provided and worn by all employees exposed to public vehicular traffic	Y	N	N/A
H.	Warning system established and utilized when mobile equipment is operated near the edge of the excavation	Y	N	N/A
I.	Employees prohibited from working on the faces of sloped or benched excavations above other employees	Y	N	N/A
II.	**Utilities**			
A.	Utility companies contacted and/or utilities located	Y	N	N/A
B.	Exact location of utilities marked when approaching the utilities	Y	N	N/A
C.	Underground installations protected, supported or removed when excavation is open	Y	N	N/A
III.	**Means of Access and Egress**			
A.	Lateral travel to means of egress no greater than 25 feet in excavations 4 feet or more in depth	Y	N	N/A
B.	Ladders used in excavations secured and extended 3 feet above the edge of the trench	Y	N	N/A
C.	Structural ramps used by employees designed by a competent person	Y	N	N/A
D.	Structural ramps used for equipment designed by a registered professional engineer (RPE)	Y	N	N/A
E.	Ramps constructed of materials of uniform thickness, cleated together on the bottom, equipped with a no-slip surface	Y	N	N/A
F.	Employees protected from cave-ins when entering or exiting the excavation	Y	N	N/A

EHS 6-3 ATTACHMENT A
DAILY EXCAVATION INSPECTION CHECKLIST

IV.	**Wet Conditions**			
A.	Precautions taken to protect employees from the accumulation of water	Y	N	N/A
B.	Water removal equipment monitored by a competent person	Y	N	N/A
C.	Surface water or runoff diverted or controlled to prevent accumulation in the excavation	Y	N	N/A
D.	Inspections made after every rainstorm or other hazard increasing occurrence	Y	N	N/A
V.	**Hazardous Atmospheres**			
A.	Atmosphere within the excavation tested where there is a reasonable possibility of an oxygen deficiency, combustible or other harmful contaminant exposing employees to a hazard	Y	N	N/A
B.	Ventilation	Y	N	N/A
C.	Testing conducted often to ensure that the atmosphere remains safe	Y	N	N/A
D.	Emergency equipment, such as breathing apparatus, safety harness and line, and basket stretcher readily available where hazardous atmospheres could or do exist	Y	N	N/A
E.	Safety harness and life line used and individually attended when entering deep confined excavations	Y	N	N/A
VI.	**Support Systems**			
A.	Materials and/or equipment for support systems selected based on soil analysis, trench depth and expected loads	Y	N	N/A
B.	Materials and equipment used for protective systems inspected and in good condition	Y	N	N/A
C.	Materials and equipment not in good condition have been removed from service	Y	N	N/A
D.	Damaged materials and equipment used for protective systems inspected by a RPE after repairs and before being placed back into service	Y	N	N/A
E.	Protective systems installed without exposing employees to the hazards of cave-ins, collapses or from being struck by materials or equipment	Y	N	N/A
F.	Members of support system securely fastened to prevent failure	Y	N	N/A
G.	Support systems provided to insure stability of adjacent structures, buildings, roadways, sidewalks, walls, etc.	Y	N	N/A
H.	Excavations below the level of the base or footing approved by an RPE	Y	N	N/A
I.	Removal of support systems progresses from the bottom and members are released slowly as to note any indication of possible failure	Y	N	N/A
J.	Backfilling progresses with removal of support system	Y	N	N/A
K.	Excavation of material to a level no greater than 2 feet below the bottom of the support system and only if the system is designed to support the loads calculated for the full depth	Y	N	N/A
L.	Shield system placed to prevent lateral movement	Y	N	N/A
M.	Employees are prohibited from remaining in shield system during vertical movement	Y	N	N/A

VII. Comments

EHS 6-3 ATTACHMENT B

TETRA TECH FW, INC.
SOILS ANALYSIS CHECKLIST

This checklist must be completed when soil analysis is made to determine the soil type(s) present in the excavation. A separate analysis must be performed on each layer of soil in excavation walls. A separate analysis must also be performed if the excavation (trench) is stretched over a distance where soil type may change.

Site location: _____

Date: _____ Time: _____ Competent Person _____

Where was the sample taken from? _____

Excavation: Depth: _____ Width: _____ Length: _____

VISUAL TEST

Particle type: ___ Fine Grained (cohesive) ___ Course grained (sand or gravel)

Water conditions: ___ Wet ___ Dry ___ Surface water present ___ Submerged

Previously disturbed soils? ___ Yes ___ No

Underground utilities? ___ Yes ___ No

Layered soils? ___ Yes ___ No

Layered soil dipping into excavation? ___ Yes ___ No

Excavation exposed to vibrations: ___ Yes ___ No

Crack-like openings or spallings observed? ___ Yes ___ No

Conditions that may create a hazardous atmosphere? ___ Yes ___ No

If yes, identify condition and source: _____

Surface encumbrances: ___ Yes ___ No

Work to be performed near public vehicular traffic? ___ Yes ___ No

Possible confined space exposure? ___ Yes ___ No

MANUAL TEST

Plasticity: ___ Cohesive ___ Non-cohesive

Dry Strength: ___ Granular (crumbles easily) ___ Cohesive (broken with difficulty)

EHS 6-3 ATTACHMENT B
SOILS ANALYSIS CHECKLIST

NOTE: The following unconfined compressive strength tests should be performed on undisturbed soils.

THUMB TEST (used to estimate unconfined compressive strength of cohesive soil)

Test performed: ___ Yes ___ No

___ Type A (soil indented by thumb with very great effort)

___ Type B (soil indented by thumb with some effort)

___ Type C (soil easily penetrated several inches by thumb with little or no effort). If soil is submerged, seeping water, subjected to surface water, runoff, exposed to wetting.

PENETROMETER OR SHEARVANE (used to estimate unconfined compressive strength of cohesive soils)

Test performed: ___ Yes ___ No

___ Type A (soil with unconfined compressive strength of 1.5 tsf or greater)

___ Type B (soil with unconfined compressive strength of 0.5 tsf to 1.5 tsf)

___ Type C (soil with unconfined compressive strength of 1.5 tsf or less). If soil is submerged, seeping water, subjected to surface water, runoff, exposed to wetting.

WET SHAKING TEST (used to determined percentage of granular and cohesive materials). Compare results to soil textural classification chart to determine soil type.

Test performed ___ Yes ___ No

___ Type A (clay, silty clay, sandy clay, clay loam, and in some cases silty clay, loam and sandy clay loam)

___ Type B [angular gravel (similar to crushed rock), silt, silt loam, sandy loam, and in some cases, silty clay loam and sandy clay loam

___ Type C(granular soil including gravel, sand and loamy sand)

___ % granular ___ % cohesive ___ % silt

NOTE: Type A -- no soil is Type "A" if soil is fissured; subject to vibration; previously disturbed; layered dipping into the excavation on a slope of 4H:1V.

SOIL CLASSIFICATION

___ Type A

___ Type B

___ Type C

SELECTION OF PROTECTIVE SYSTEM

___ Sloping, Specify angle:

___ Timber Shoring

___ Aluminum Hydraulic Shoring

NOTE: Although OSHA will accept the above tests in most cases, some states will not. Check your state safety requirements for trenching regulations.

Appendix G

Fall Protection

EHS 3-8: Fall Protection (Previously HS3-8)

Purpose

The purpose of this program is to prevent injuries due to falls from elevated work surfaces and to comply with Occupational, Safety and Health Administration (OSHA) fall protection standards in 29 CFR 1926, Subpart M.

Version Date: 03/12/98 - Revised

Approved by:

Original Issue Date: 02/01/95

Category: Company Procedures

Sections: ESQ - Environmental Health & Safety Programs

Sub Category: Departmental/Discipline

Document Type: Procedure

Keyword Index: Operational Control, Training

Document Owner: Mike McSherry

Table of Contents

Section

1.0 PURPOSE

2.0 SCOPE

3.0 MAINTENANCE

4.0 DEFINITIONS

- 4.1 Competent Person
- 4.2 Dangerous Equipment
- 4.3 Hole
- 4.4 Opening
- 4.5 Personal Fall Arrest System
- 4.6 Walking/Working Surface

5.0 DISCUSSION

- 5.1 Responsibilities
  - 5.1.1 Line Management
  - 5.1.2 Environmental, Health and Safety Personnel
- 5.2 General Requirements
- 5.3 Hoist Areas
- 5.4 Excavations
- 5.5 Dangerous Equipment
- 5.6 Guardrail Systems
- 5.7 Personal Fall Arrest Systems
- 5.8 Protection From Falling Objects
- 5.9 Other Fall Protection Requirements
- 5.10 Training
  - 5.10.1 General
  - 5.10.2 Retraining
  - 5.10.3 Certification of Training
  - 5.10.4 Previous Training

6.0 REFERENCES

1.0 PURPOSE

The purpose of this program is to prevent injuries due to falls from elevated work surfaces and to comply with Occupational, Safety and Health Administration (OSHA) fall protection standards in 29 CFR 1926, Subpart M.

2.0 SCOPE

This program applies to all Tetra Tech FW, Inc. (TtFW) and/or TtFW subcontractor field operations.

3.0 MAINTENANCE

The Director, Environmental, Safety and Quality (ESQ) Programs is responsible for updating this procedure. Approval authority rests with TtFW's President and Chief Executive Officer. Suggestions for revision shall be submitted to both the department responsible for updating the procedure and the Executive Director, Administration and Compliance.

4.0 DEFINITIONS

4.1 Competent Person

A person possessing the skills, knowledge, experience, and judgement to perform assigned tasks or activities satisfactorily.

4.2 Dangerous Equipment

Dangerous equipment means equipment which, as a result of form or function, may be hazardous to employees who fall onto or into such equipment. Examples provided in Subpart M include tanks, degreasing units, machinery, and electrical equipment.

4.3 Hole

Hole means a gap or void 2 inches or more in its least dimension, in a floor, roof, or other walking/working surface.

4.4 Opening

An opening means a gap or void 30 inches or more high and 18 inches or more wide through which employees can fall to a lower level.

4.5 Personal Fall Arrest System

A personal fall arrest system consists of an anchorage, connectors, body harness, and may include a lanyard, deceleration device, lifeline, or suitable combination of these. Body belts are not permitted in personal fall arrest systems on TtFW projects.

4.6 Walking/Working Surface

A walking/working surface is any surface, whether horizontal or vertical, on which an employee walks or works, including but not limited to floors, roofs, ramps, bridges, runways, formwork and concrete reinforcing steel, but not including ladders, vehicles, or trailers on which employees must be to perform their job duties.

5.0 DISCUSSION

5.1 Responsibilities

5.1.1 Line Management

Site Supervisors have the responsibility to ensure that fall protection is provided as required by this program and site Environmental, Health and Safety (EHS) plans for all TtFW operations.

5.1.2 Environmental, Health and Safety Personnel

The Project Environmental and Safety Manager (PESM) will audit implementation of this program as part field inspection pursuant EHS 3-3, inspections.

The Environmental and Safety Supervisor (ESS) is responsible for providing fall protection training for all site personnel and monitoring compliance with this program.

5.2 General Requirements

Employees shall only be allowed to work on walking/working surfaces which have the strength and integrity to support employees safely. Walking/working surfaces for this requirement include the edges of trenches.

Employees performing work on a walking/working surface with an unprotected side or edge which is 6 feet or more above a lower level shall be protected from falling by the use of guardrail systems, safety net systems, or personal fall arrest systems.

For roof work on low-slope roofs, work on steep roofs, and work near wall openings, fall protection provisions as described in 29 CFR 1926.501(b) shall be utilized.

5.3 Hoist Areas

Employees in a hoist area shall be protected from falling 6 feet or more to lower levels by guardrail systems or personal fall arrest systems. If guardrail systems are removed to facilitate the hoisting operations and the employee must lean out over the edge of the platform to guide the materials being hoisted, then a personal fall arrest system shall be used.

5.4 Excavations

The edge of an excavation 6 feet or more in depth shall be demarcated by guardrail systems, fences, or barricades when the excavation is not readily seen. The measures described above or covers shall be used for wells, pits, shafts, or similar excavations.

The Site Supervisor and PESM shall determine when employees must use personal fall arrest systems at the edge of an excavation 6 feet or more in depth. The decision shall be based on the condition of the soil at the edge of the excavation, i.e., slippery, stable, etc., and the nature of the work at the edge of the excavation.

5.5 Dangerous Equipment

Each employee working 6 feet or less above dangerous equipment shall be protected by guardrail systems or by equipment guards or if working at more than 6 feet by guardrail systems, personal fall arrest systems or safety net systems.

5.6 Guardrail Systems

Guardrail systems must meet the criteria specified in 29 CFR 1926.502(b).

5.7 Personal Fall Arrest Systems

Personal fall arrest systems shall meet the criteria specified in 29 CFR 1926.502(d).

5.8 Protection From Falling Objects

Toeboards, when used as falling object protection, shall meet the criteria specified in 29 CFR 1926.502(j); shall have a minimum of 3.5 inches from their top edge to the level of the walking working surface; and no more than a 0.25 inch clearance from the bottom edge to the walking/working surface.

5.9 Other Fall Protection Requirements

Whenever a fall hazard of 6 feet or more exists on a TtFW jobsite, 29 CFR 1926, Subpart M shall be consulted for applicable requirements. If Subpart M does not specifically address the fall hazard, then the Site Supervisor and PESM shall determine if fall protection measures are required.

5.10 Training

5.10.1 General

All site personnel who might be exposed to fall hazards on a TtFW jobsite shall receive training by a competent person. The training shall be conducted at the time of the site orientation. The competent person must meet the applicable requirements of 29 CFR 1926.503(a)(2). The training shall include enabling the employee to recognize the hazards of falling and the procedures to be followed in order to minimize fall hazards.

5.10.2 Retraining

Retraining shall be conducted when changes occur in the workplace which present a new fall hazard, when fall protection systems or equipment is changed, or when it appears that the employee has not retained the requisite understanding or skill regarding the fall hazards or protective measures.

5.10.3 Certification of Training

Certification of training or retraining shall include the name of the employee, the date of the training, the content of the training, and the signature of the person who conducted the training.

Training certification shall be maintained as part of the project file.

5.10.4 Previous Training

TtFW shall not rely on fall protection training from other TtFW jobsites or other employers to meet the training requirements of this program unless the Site Supervisor or ESS prepares a new certification record which indicates the date it was determined that the prior training was adequate and why it was considered adequate.

6.0 REFERENCES

29 CFR 1926, Subpart M, Safety Standards for Fall Protection in the Construction Industry
Environmental, Health & Safety - Programs Procedure EHS 3-3, Inspections
OSHA (U.S. Department of Labor, Occupational Safety and Health Administration)

Tetra Tech EC, Inc.

NOTICE OF OWNERSHIP AND CONDITIONS OF USE

This document is the property of Tetra Tech EC, Inc. (TtEC) and is to be used only for the duration and connection with the performance of work for TtEC. Written deviations to this document may be authorized when appropriate in accordance with the Quality Rule. This document is not to be construed as an employment contract or any binding obligation of TtEC. This document may be modified or rescinded at any time with or without prior notice at the sole discretion of TtEC. Hard copies of this document may not contain the most current information. The current version of this document can be found on the TtEC online Corporate Reference Library.

Copyright© 1995, 1998

Tetra Tech EC, Inc.

Proprietary Information

Appendix H

PPE Selection Form

TABLE 6.1 - PPE SELECTION

ACTIVITY: _____

TASK	HEAD	EYE/FACE	FEET	HANDS	BODY	HEARING	RESPIRATOR

SHSO_____

Appendix I

Tetra Tech EC, Inc.

MEDICAL DATA SHEET

The brief medical data sheet will be completed by all on-site personnel and will be kept in the Support Zone by the SHSO as a project record during the conduct of site operations. It accompanies any personnel when medical assistance is needed or if transport to a hospital is required.

Project: _____

Name: _____ Home Telephone: _____

Address: _____

Age: _____ Height: _____ Weight: _____ Blood Type: _____

Name and Telephone Number of Emergency Contact: _____

_____

Drug or Other Allergies: _____

Particular Sensitivities: _____

Do You Wear Contacts? _____

Provide A Check List Of Previous Illnesses: _____

What Medications Are You Presently Using? _____

Do You Have Any Medical Restrictions? _____

Name, Address, And Phone Number Of Personal Physician: _____

_____

_____

_____

Appendix J

TETRA TECH EC, INC.

GENERAL HEALTH AND SAFETY RULES

1. All site personnel must attend each day's Daily Briefing.
2. Any individual taking prescribed drugs will inform the Site Health and Safety Officer (SHSO) of the type of medication. The SHSO will review the matter with the Project Environmental and Safety Manager (PESM) and the Corporate Medical Consultant (CMC), who will decide if the employee can safely work on-site while taking the medication.
3. The personal protective equipment specified by the SHSO and in the SHSP will be worn by all site personnel. This includes hard hats and safety glasses which must be worn at all times in active work areas.
4. Facial hair (beards, long sideburns or mustaches) which may interfere with a satisfactory fit of a respirator mask is not allowed on any person who may be required to wear a respirator.
5. All personnel must sign the site log and the exclusion zone log when used at the site.
6. Personnel must follow proper decontamination procedures and shower at the end of the work shift.
7. Eating, drinking, chewing tobacco or gum, smoking and any other practice that may increase the possibility of hand-to-mouth contact is prohibited in the exclusion zone or the contamination reduction zone.
8. All lighters, matches, cigarettes and other forms of tobacco are prohibited in the Exclusion Zone.
9. All signs and demarcations will be followed. Such signs and demarcation will not be removed except as authorized by the SHSO.
10. No one will enter a permit-required confined space without a permit. Confined space entry permits will be implemented as issued.
11. All personnel must follow Hot Work Permits as issued.
12. All personnel must use the Buddy System in the Exclusion Zone.
13. All personnel must follow the work-rest regimens and other practices required by the heat stress program.
14. All personnel must follow lockout/tagout procedures when working on equipment involving moving parts or hazardous energy sources.
15. No person will operate equipment unless trained and authorized. No one may enter an excavation greater than four feet deep unless authorized by the Competent Person. Excavations must be sloped or shored properly. Safe means of access and egress from excavations must be maintained.
16. Ladders and scaffolds will be solidly constructed, in good working condition and inspected prior to use. No one may use defective ladders or scaffolds.
17. Fall protection or fall arrest systems must be in place when working at elevations greater than six feet for temporary working surfaces and four feet for fixed platforms.
18. Safety belts, harnesses and lanyards must be selected by the Supervisor. The user must inspect the equipment prior to use. No defective personal fall protection equipment will be used. Personal fall protection that has been shock loaded must be discarded.

TETRA TECH EC, INC.

GENERAL HEALTH AND SAFETY RULES

19. Hand and portable power tools must be inspected prior to use. Defective tools and equipment will not be used.
20. Ground fault interrupters will be used for cord and plug equipment used outdoors or in damp locations. Electrical cords will be kept out of walkways and puddles unless protected and rated for the service.
21. Improper use, mishandling or tampering with health and safety equipment and samples is prohibited.
22. Horseplay of any kind is prohibited.
23. Possession or use of alcoholic beverages, controlled substances or firearms on any site is forbidden.
24. All incidents, no matter how minor must be reported immediately to the Supervisor.
25. All personnel will be familiar with the Site Emergency Response Plan.

The above Health and Safety Rules are not all inclusive and it is your responsibility to comply with all regulations set forth by OSHA, the TtEC Health and Safety Programs, the SHSP, the client, TtEC Supervisors and the SHSO.

Appendix K

Critical Lifts

CP-13: Critical Lifts

Purpose
The purpose of this procedure is to provide a means to ensure that critical lift operations are planned, reviewed, and conducted with specific documented instructions that identify appropriate additional, special, and/or unusual precautions, methods, and/or safety requirements that must be accounted for before or during any lifting operation.

Version Date: 10/04/99 - Revised

Approved by: Donald Rogers

Original Issue Date: 06/03/96

Category: Company Procedures

Sections: Construction

Sub Category: Departmental/Discipline

Document Type: Procedure

Keyword Index: Field Activities/Environmental H&S, Critical Lifts, Field Activities/Science, Training, Operational Control, Field Activities/Const/Rem d/D&D

Document Owner: Frank Jones

Table of Contents

Section

1.0 PURPOSE

2.0 SCOPE

3.0 MAINTENANCE

4.0 DEFINITIONS

5.0 DISCUSSION

6.0 ATTACHMENTS

7.0 REFERENCES

1.0 PURPOSE

The purpose of this procedure is to provide a means to ensure that critical lift operations are planned, reviewed, and conducted with specific documented instructions that identify appropriate additional, special, and/or unusual precautions, methods, and/or safety requirements that must be accounted for before or during any lifting operation.

2.0 SCOPE

2.1 This procedure applies to all Tetra Tech EC, Inc. (TtEC) projects that include a construction component, including remediation construction, that involve critical lifts, as defined in Section 4.0, Definitions. This procedure applies to lifting operations performed by TtEC's personnel and to lifting operations performed using crane operators provided with rented or leased cranes. This procedure may be applicable to work performed by subcontractors; however, the applicability shall be addressed in the subcontract agreement terms and conditions.

2.2 The terms "crane" and "lifting equipment" are used throughout this procedure. It shall be understood that these terms are inclusive of any equipment or tools utilized for lifting operations, including, but not limited to, crawler cranes and truck mounted cranes, including those with lattice booms or telescoping booms; forklifts; backhoes; excavators; loaders; derricks; chainfalls; tuggers; and come-alongs. It is the intent that the requirements or guidance set forth in this procedure are to be applied to any device used for lifting activities, with appropriate adjustment to the instructions as required to address the specific situation. (For example, when using a chainfall for a lift of more than 75% of its rated capacity, the Critical Lift Plan checklist entry for "Foundation Support Checked" would require checking the structural integrity for the supporting member to which the chainfall is attached.)

3.0 MAINTENANCE

The Vice President Remedial Construction is responsible for updating this procedure. Approval authority rests with TtEC's Chief Operating Officer. Suggestions for revision shall be submitted to both the department responsible for updating the procedure and the Executive Director Compliance and Corporate Counsel.

4.0 DEFINITIONS

4.1 Competent Person

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 authorization to take prompt corrective measures to eliminate them. (OSHA 29 CFR 1926)

4.2 Crane Operator Aids

Devices which are used to assist a crane operator in the safe operation of a crane, including: two-block warning devices, two-block prevention devices, load and load moment indicator devices, boom angle and radius indicators, boom and jib stops, boom hoist disengaging devices, limit switches, drum rotation indicators, etc.

4.3 Critical Lift

A non-routine lift requiring additional detailed planning and additional or more than normal safety precautions. Critical lifts include lifts made when the load weight is 75% or more of the rated capacity of the lifting equipment at a specific configuration (boom angle, lift radius, swing, etc.); lifts which require the load to be lifted, swung, or placed out of the operator's view; lifts made with more than one piece of lifting equipment; lifts involving non-routine or technically difficult rigging arrangement(s); hoisting of personnel with a crane or derrick; or any lift which the lifting equipment operator believes should be considered critical. Any lift of 30,000 pounds or more should be considered a critical lift, regardless of the crane capacity. The 30,000 pound criteria should be evaluated by the Project Manager and the Project Environmental and Safety Manager (PESM) for the advisability of lowering the criteria based on project-specific factors such as capacity of the lifting equipment to be employed on the project, frequency and nature of the lifting activities, and availability of experienced personnel, among other factors. Establishment of project-specific criteria for determination of critical lifts should be documented by the Project Manager.

4.4 Critical Lift Plan

A plan prepared by the crane operator, Lift Supervisor, Project Engineer (or designee), and rigger, as applicable, prior to making a critical lift. The Critical Lift Plan shall be documented, and shall be reviewed and signed by all personnel involved with the lift.

4.5 Failure Mode

There are two generally recognized modes of failure of cranes when the rated capacity is exceeded, depending on the crane configuration: a structural failure occurs when the boom, jib, or other component of the crane suddenly fails (there is usually no advance warning of an impending structural failure); an overturning failure occurs when the crane is pulled over by the weight of the load (there may be advance warning of an impending overturning failure as weight is transferred from the outboard tires, crawler track, or outriggers, causing these to rise as the back side of the crane becomes "light").

4.6 Lift Supervisor

A competent person who has extensive knowledge and experience in lifting operations.

4.7 Qualified Operator

An operator who is qualified to operate the crane in accordance with the standards promulgated in 29 CFR 1926.550, who is licensed or certified to operate the crane, or who has extensive knowledge and experience, and who has successfully demonstrated the ability to operate the equipment and to solve or resolve problems related to operation of the equipment.

4.8 Qualified Person

One who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience, has successfully demonstrated the ability to solve or resolve problems relating to the subject matter, the work, or the project. (OSHA 29 CFR 1926)

4.9 Tailing Crane Lift

A procedure sometimes used in erecting large vessels or structural elements in which one crane (lead crane) lifts the top of the load and a second crane (tail crane), rigged to the bottom of the load, either secures the bottom of the load from movement or assists in the horizontal positioning of the load. (USACE Safety and Health Program Manual)

4.10 Tandem Crane Lift

The use of two or more cranes to lift a load. (USACE Safety and Health Program Manual)

4.11 Two-blocking

A condition which occurs when the lower load block or hook assembly comes in contact with the upper load block, or when the load block comes in contact with the boom tip. (USACE Safety and Health Program Manual)

5.0 DISCUSSION

5.1 Qualifications

5.1.1 Lift Supervisor Qualifications

5.1.1.1 The Lift Supervisor shall have the capability of determining the total weight and center of gravity of the load; selecting the appropriate lifting equipment and rigging materials rated for the load and the particular lifting configuration; evaluating the lifting configuration and conditions affecting the lift; and evaluating the condition of the equipment and rigging. The Lift Supervisor shall have demonstrated the ability to solve or resolve problems related to lifting operations through experience, certification, or other means to the satisfaction of the Vice President Remedial Construction and the Project Manager.

5.1.2 Crane Operator Qualifications

5.1.2.1 Individual states and/or municipalities may have licensing requirements for crane operators. Where there are no licensing requirements, a certification of competency is recommended. Requirements for competency certification shall be included in subcontracts or purchase orders if

this is to be a requirement of the project. The Project Manager should coordinate with the TtEC Labor Relations Representative for the project to ensure inclusion of the competency certification requirement in the Project Labor Agreement as appropriate.

5.1.2.2 The Lift Supervisor shall be responsible for determining the applicable qualification requirements for the crane operator in accordance with this procedure, state and local licensing agency requirements, OSHA requirements, ANSI/ASME B30 standards, Client requirements, or equipment manufacturer's recommendations. The U.S. Army Corps of Engineers (USACE), for example, requires proficiency qualification of operators, which includes a written examination and a physical examination, on USACE projects. Assistance in determining state and local licensing agency requirements may be obtained from a TtEC Regulatory Specialist.

5.1.2.3 Crane operators shall be physically, mentally, medically, and emotionally qualified for performing the duties required of the position. Some factors to be considered in determining qualifications of crane operators are strength, endurance, agility, coordination, and visual and hearing acuity.

5.1.2.4 TtEC crane operators shall be required to demonstrate to the satisfaction of the Lift Supervisor their knowledge of the following:

- Responsibilities of the operator, rigger, signalpersons, and lift supervisor;
- Knowledge of crane safety requirements (such as required safety equipment, clearance from power lines, overhead lifts, etc.) and the crane's operator manual;
- Ability to determine the crane configuration, to determine the weight and center of gravity of loads, and to determine the crane's capacity using the load chart;
- Ability to determine whether the crane would be in either the structural and overturning failure mode for the crane's configuration and the lift radius, using the crane's load chart;
- Use and limitations of the crane operator aids;
- Crane inspection, testing and maintenance requirements;
- Determination of ground conditions and outrigger matting requirements;
- Crane set-up, assembly, dismantling, and demobilization procedures;
- Signaling and communication procedures; and
- Factors which reduce rated capacity.

5.1.2.5 TtEC crane operators shall pass a practical operating examination, conducted by the Lift Supervisor, which demonstrates their ability to perform the following:

- Inspecting the crane (refer to Construction Procedure CP-7, Construction Tools and Equipment, Attachment 2, for a Daily Equipment Inspection checklist);
- Establishing a stable foundation and leveling the crane;
- Raising, lowering, extending, retracting and swinging the boom;
- Raising and lowering the load line;
- Attaching the load, holding the load, and moving the load;
- Reading and understanding the signs, load charts, signals and operating instructions in use;

and

- Reading the load, boom angle, and other indicating devices.

During the practical examination the crane operators should demonstrate the ability to operate the crane smoothly, with no sudden starts, stops or impact loading.

5.1.2.6 Results of crane operators' qualification examinations should be documented by the Lift Supervisor in the cranes' log books and/or other appropriate on-site project file.

5.1.3 Rigger Qualifications

5.1.3.1 The rigger shall demonstrate, to the satisfaction of the Lift Supervisor, a knowledge of safe rigging practices and the abilities to select the proper rigging hardware, slings and accessories of adequate capacity; to inspect the rigging and determine its condition, acceptability for use and load capacity; and to position the load in the lifting devices, assuring that the load is well secured, stable and balanced.

5.1.4 Signalperson Qualifications

5.1.4.1 The signalperson shall demonstrate, to the satisfaction of the Lift Supervisor, the ability to communicate, verbally and through the use of standard signals, with the crane operator, other workers, and the Lift Supervisor. The signalperson shall possess the visual and hearing acuity required for the performance of the duties associated with the position. The signalperson shall demonstrate a knowledge of the operation of any radio or other communication devices required for the lifting operation.

5.2 Responsibilities

5.2.1 The Vice President Remedial Construction is responsible for providing qualified personnel to support the project as requested by the Project Manager.

5.2.2 The Project Manager is responsible for ensuring that a qualified Lift Supervisor and Project Engineer are assigned to the project for the performance of critical lifts. The Project Engineer may delegate authority to perform functions relative to critical lifts to a qualified Field Engineer but should maintain oversight of activities. The Project Manager is responsible for communicating to the Site Superintendent and the Lift Supervisor that the Lift Supervisor is to be assigned the authority to take any actions, including but not limited to exercising Stop Work Authority, required for the safe execution of the critical lift.

5.2.3 The Site Superintendent is responsible for ensuring that no critical lifts are performed without the completion and approval of a Critical Lift Plan in accordance with this procedure, that no critical lifts are scheduled without the knowledge of the Lift Supervisor, and that the Lift Supervisor is assigned the authority discussed in Section 5.2.2, above.

5.2.4 The Lift Supervisor is responsible for the execution of critical lifts, including selection of appropriate equipment of sufficient capacity, selection of qualified operators, and direct supervision of the critical lift operation and all personnel involved in the critical lift, including the operator, rigger, and signalperson. The Lift Supervisor is responsible for ensuring that all personnel associated with the critical lift are aware of their responsibilities as addressed in this procedure, any applicable project procedure(s), and/or the Critical Lift Plan.

5.2.5 The crane operator is responsible for the performance of the pre-operational inspections prior to each use of a crane, safe operation of the crane, and the performance of the critical lift in accordance with the requirements of the Critical Lift Plan and the instructions of the Lift Supervisor. The crane operator is responsible for ensuring that the following documents are with the crane at all times, and that the documents are completed as required:

5.2.5.1 A copy of the operating manual developed by the manufacturer for the specific make and model of crane.

5.2.5.2 A copy of the operating manual for any crane operator aids with which the crane is equipped.

5.2.5.3 The load rating chart for the crane. The US Army Corps of Engineers (USACE) Safety and Health Requirements Manual, EM 385-1-1, requires the following information to be included on the load rating chart for lifting equipment to be used on a USACE project:

- The crane make and model, serial number and year of manufacture;
- Load ratings for all crane operating configurations, including optional equipment;
- Wire rope type, size and reeving; line pull, line speed and drum capacity; and
- Operating limits in windy or cold weather conditions.

When circumstances are encountered where all of the required information listed above is not included on the load rating chart for lifting equipment to be used on a USACE project, the USACE's project representative shall be requested to provide direction. For lifting equipment to be used on projects where the requirements of EM 385-1-1 do not apply, the Lifting Supervisor should determine the project's requirements concerning the information listed above.

5.2.5.4 The crane's log book which shall be used to record operating hours and all crane inspections, tests, maintenance and repair. The log shall be updated daily as the crane is used and shall be signed by the operator and supervisor. Service mechanics shall sign the log after conducting maintenance and repairs on the crane.

5.2.6 The Lift Supervisor is responsible for the selection of rigging slings, spreaders, shackles, and miscellaneous rigging materials in accordance with the requirements of the Critical Lift Plan. The Lift Supervisor is responsible for the arrangement and configuration of the rigging, and the attachment of the rigging to the load and to the lifting hook in accordance with safe rigging practices and the Critical Lift Plan.

5.2.7 The signalperson is responsible for familiarity with the proper use of hand signals, radio communications, or other signal devices as appropriate for the Critical Lift Plan.

5.2.8 Roles and responsibilities of TtEC personnel for lifting activities performed by subcontractors, vendors and suppliers shall be as established in the subcontract agreement terms and conditions and site-specific procedures.

5.3 Critical Lift Plan Preparation, Review and Approval

5.3.1 Prior to commencing any lift meeting the requirements of a critical lift, as defined in Section 4.0 of this procedure, the Site Superintendent shall ensure that a Critical Lift Plan is prepared, reviewed and approved. The Critical Lift Plan shall be prepared with appropriate input from the Lift Supervisor, Project Engineer (or designee), crane operator, rigger and the Environmental and Safety Supervisor (ESS). The Critical Lift Plan shall be approved by the Project Manager or designee, and shall be signed by all personnel involved in the lift.

5.3.2 The Project Manager shall ensure that personnel performing calculations for total lift weight, determination of center of gravity, and capacity of the crane at the operating radius, as well as all other calculations required for the critical lift, possess the necessary qualifications. The Project Engineer may establish requirements for the performance of calculation reviews by a checker, and an independent verification of calculations, in accordance with the TtEC Engineering Procedures. State and/or federal regulations may require a Professional Engineer to stamp the calculations for the Critical Lift Plan. Assistance in determining specific regulations applicable to a project may be obtained from a Regulatory Specialist.

5.3.3 Attachment 1, Critical Lift Plan Forms, provides a standard form which may be utilized to document the Critical Lift Plan. Other forms or project generated formats may be utilized provided that they address all of the areas required by this procedure.

5.3.4 After completion of the Critical Lift Plan, and immediately before the lift, the Lift Supervisor shall hold a meeting to be attended by all personnel involved in the lift. The purpose of the meeting is to communicate the roles and responsibilities of the personnel, particularly the role of the Lift Supervisor as the person with the overall responsibility for the lift and the authority to direct the actions of all personnel involved in the lift; and to review the lift equipment selection, rigging selection, lift configuration, lift operation sequence, and all hazards involved in the lift. The pre-lift meeting should be documented in the crane's log book.

5.3.5 For multiple, repetitive lifts with the same basic crane configuration and only minor variations in load weight, lift radius, or other variables, as determined by the Lift Supervisor, the Project Manager or designee may authorize the use of a single Critical Lift Plan to document all of the involved lifts. In those cases, the Lift Supervisor shall analyze the various lifts and ensure that the Critical Lift Plan adequately addresses the worst case combination of all of the variables involved.

5.3.6 For multiple, repetitive lifts utilizing one Critical Lift Plan, as described in Section 5.3.4 above, and

conducted during the same work shift, The Project Manager or designee may determine that only one pre-lift meeting is required. Waiver of the pre-lift meeting should be documented in the crane' s log book. Critical lifts performed on separate shifts or workdays should require additional, documented pre-lift meetings as described in Section 5.3.3 above.

5.4 Critical Lift Plan Content

5.4.1 The Critical Lift Plan shall specify the exact size and weight of the load to be lifted as well as all crane and rigging components which add to the weight. Calculations required for determination of total weight, lift radius, % of crane's capacity, and center of gravity shall be included in or attached to the Critical Lift Plan. Documentation of any required calculation checks and independent verifications shall also be attached to the Critical Lift Plan.

5.4.2 The Critical Lift Plan shall specify the lift geometry and procedures, including the crane position, height of the lift, the load radius or boom angle, and the boom length, for the entire range of the lift. Sketches may be used when appropriate to adequately describe the layout.

5.4.3 The Critical Lift Plan shall designate the crane operator, Lift Supervisor, and rigger. The Lift Supervisor shall be identified as the person in charge of the lift.

5.4.4 The Critical Lift Plan shall include a rigging plan which shows the lift points and forces and describes the rigging procedures and the hardware requirements. Sketches may be used when required to adequately describe the configuration and attachment points to the load.

5.4.5 The Critical Lift Plan shall include the sequence of the lift operation's activities, including verification of preparation activities (setup, inspections, testing).

5.4.6 The Critical Lift Plan shall describe the ground conditions, outrigger or crawler track requirements, and, if necessary, the design of cribbing or mats, necessary to achieve a level, stable foundation of sufficient bearing capacity for the lift. For floating cranes or derricks, the Critical Lift Plan shall describe the operating base (platform) condition.

5.4.7 The Critical Lift Plan shall list the environmental conditions (rain, snow, ice, lightning, reduced visibility, etc.) under which the lift operations shall be curtailed or stopped.

5.4.8 The Critical Lift Plan shall specify the coordination and communication requirements for the lift operation.

5.4.9 For tandem or tailing crane lifts, the Critical Lift Plan shall specify the make and model of the cranes, the line, boom and swing speeds, and requirements for an equalizer beam.

5.4.10 The Project Engineer or designee shall review and approve the strength and stability of the foundation or supports to receive the load. Refer to Section 5.6 of this procedure for additional discussion of this subject associated with all lifts.

5.5 Special Considerations for Critical Lifts

5.5.1 When two or more cranes are used to lift a load, the responsibility of the Lift Supervisor as the one person in charge of the lift shall be emphasized to all personnel involved in the lift. If the Lift Supervisor delegates any authority to a crane operator, this delegation shall be clearly communicated to all personnel involved in the lift.

5.5.2 When two or more cranes are used in a lift, the total capacity of the cranes shall be at least equal to or greater than the total weight to be lifted including the load, lifting beams, rigging, hooks and attachments. Particular attention shall be given to the distribution of the load between the cranes to eliminate the overloading of a crane due to unbalanced load distribution. The Lift Supervisor shall consider the rigging configuration to ensure that there is no possibility of an unacceptable load transfer between cranes, such as when one of the cranes sets the load prior to the other crane. Such a load transfer may overload a crane. For tandem lifts, no crane should be loaded to more than 75% of its net capacity.

5.5.3 Consideration shall be given to the possibility that the load may not be successfully placed in its intended location due to unanticipated occurrences (wind, obstacles, etc.). The Critical Lift Plan shall address contingency plans to return the load to its original or an alternate location. Refer to Section 5.6 of this procedure for additional discussion on this subject.

5.5.4 Consideration shall be given to the performance of a test lift to demonstrate the ability to safely perform a lift when, in the judgment of the Project Manager or the Lift Supervisor, there is a significant risk of a loss occurring during the actual lift. In evaluating the need for a test lift, consideration should be given to the complexity of the lifting operation, the value of the component being lifted, the potential impact to other installations, and potential schedule impacts, among other factors.

5.6 General Considerations for All Lifts

5.6.1 Cranes should be positioned as near as possible to the load, maintaining a safe operating distance, without contacting the boom and outriggers, and with consideration for minimizing the swing and the setting radii. The operator shall verify that the load line is vertical and over the load's center of gravity prior to lifting the load to ensure that the load does not drift when lifted.

5.6.2 The immediate area of the lift should be checked for any electrical wires. A minimum safe distance of 10 feet shall be maintained from power lines rated 50 kV or less. The USACE Safety and Health Requirements Manual, Section 11, shall be consulted for minimum safe distances from electric lines with a higher system voltage. Alternately, the minimum safe distance may be calculated as follows:

minimum safe distance = 10 ft + 0.4 in for each 1 kV of lines rated over 50 kV;
or
twice the length of the line insulator (but never less than 10 feet).

Refer to ANSI/ASME B30.5a for specific guidance concerning the operation of cranes in proximity to electrical transmission lines. Special precautions including de-energizing and grounding the lines may be required depending on the proximity and possibility of the crane, the load line, or the load becoming a conductive path.

5.6.3 The required bearing capacity for the ground or foundation supporting the crane should be calculated, and the actual bearing capacity should be verified to be sufficient to support the crane and the load being lifted.

5.6.4 The Lift Supervisor should also ensure that:

5.6.4.1 The swing area of the crane is barricaded to protect personnel in the immediate area;

5.6.4.2 Loads are not lifted over personnel;

5.6.4.3 All loose load objects are secured or removed;

5.6.4.4 Tag lines are used to control loads except where their use will create a hazard;

5.6.4.5 The crane is not subjected to sudden lifting, stopping or impact loading;

5.6.4.6 Riding on loads, hooks, buckets, material hoists, or other material hoisting equipment not meant for personnel use is absolutely prohibited;

5.6.4.7 Rigging attachment points are as specified by the equipment vendor, if applicable, or as specified in the Critical Lift Plan; and

5.6.4.8 Softeners are used at contact points between rigging and load as necessary to avoid damage to the load or the rigging.

5.6.5 Environmental conditions under which lifting operations should not be performed, such as wind, precipitation, reduced visibility, etc., should be established and communicated to project personnel through the Work Plan, Environmental, Health, and Safety (EHS) Plan, and by verbal instructions.

5.6.6 Prior to performing any lift, the Lift Supervisor should give consideration to a contingency plan should conditions prohibit the load from being placed in it's intended position. Contingency plans could include placement back in its original position or an alternate temporary location, and should include ensuring that adequate cribbing, dunnage, or tie downs are provided for the alternate location.

5.6.7 The Lift Supervisor shall determine that the foundation or supports to receive any load have been

reviewed for stability and strength prior to performing the lift. This may be considered as a risk sensitive item, and if so, calculations performed shall be checked and have an independent verification prior to use in accordance with CP-11, Field Engineering. Temporary supports such as dunnage, cribbing, tie downs, and falsework shall be reviewed with consideration given to the load's weight, center of gravity, and resistance to overturning forces. Stability and bearing capacity of soils to support loads shall be verified.

5.6.8 Review and approval of permanent foundations or supports is performed as part of the design; however, there may be instances where a load is to be placed in it's final, designed location prior to completion of all construction associated with support of that load. (Examples: Backfill may not have been placed against foundations, concrete may not have achieved full design strength, or structural steel framing may not be complete.) These instances shall require review and approval by the Project Engineer prior to the lift being performed.

5.6.9 Prior to placement of any load in storage or otherwise temporarily staged prior to placement in its final, designed location, consideration shall be given to any access requirements, maintenance activities, ability to perform future lifting or handling, and construction activities to be performed in the vicinity of the stored or staged load.

5.7 Rigging Requirements

5.7.1 Certification of all lift accessories, including the results of proof tests for custom designed accessories, shall be available at the on-site project offices and maintained in a file as part of the project filing system.

5.7.2 The total weight of the load to be lifted, including all lifting beams, rigging, hooks and attachments, shall be determined before a safe lift can be planned.

5.7.3 The determination of the exact location of the center of gravity of the load is critical in ensuring that the load is rigged in a stable configuration. The location of the attachments of the rigging to the load should be above the center of gravity where possible. Where the location of attachments is below the center of gravity, extreme care must be taken to ensure stability of the load. Special precautions shall be taken in the selection of sling lengths and attachment configurations to ensure that the load is stable. Rigging of loads in this configuration should only be performed by personnel with extensive experience in rigging.

5.7.4 Consideration shall be made in any lifting operation for the possibility of a load becoming unstable during lifts intended only to reposition a load, such as uprighting or turning a load over. The center of gravity shall be calculated for the load in all positions anticipated in order to ensure stability.

5.7.5 The load shall be safely rigged within the rated capacity of all rigging equipment.

5.7.6 Sling capacities shall be reduced from their full rated capacities based on sling configuration (vertical, choker or basket hitch) and sling leg angle, as well as based on sling condition. Only personnel with extensive experience in rigging should be given the authority to determine the capacity of slings showing signs of wear or other deterioration.

5.7.7 Custom designed grabs, hooks, clamps, or other lifting accessories shall be marked to indicate the safe working loads and shall be proof-tested prior to use to 125% of their rated load.

5.8 Crane Inspections

5.8.1 Inspection Classification: Crane inspections are divided into two classifications by the ANSI/ASME B30 standards:

5.8.1.1 Initial Inspection: Prior to initial use, all new and altered cranes shall be inspected by a qualified person to verify compliance with the applicable provisions of the ANSI/ASME B30 standards.

5.8.1.2 Regular Inspection: The inspection procedure for cranes in regular service is further divided into two general classifications based on the intervals at which inspections should be performed. The intervals are dependent in turn on the nature of the critical components of the crane and the degree of their exposure to wear, deterioration, or malfunction. The two general classifications of regular inspections are designated as “frequent” and “periodic”, with respective intervals between inspections defined as:

- Frequent Inspection - intervals from one to thirty days, performed by a person designated by the Lift Supervisor; and
- Periodic Inspection - intervals from one to twelve months (or as specifically recommended by the manufacturer or by a qualified person), performed by a qualified person.

5.8.1.3 Specific requirements for each of the above inspections are included in the ANSI/ASME B30 standards.

5.8.2 Implementation of the inspection requirements listed above for TtEC projects shall be in accordance with the following:

5.8.2.1 Prior to initial use, all new and altered cranes to be used by TtEC shall be inspected (initial inspection) by a certified crane inspector to ensure compliance with the applicable portions of the ANSI/ASME B30 standards, or the Power Crane and Shovel Association Standard #4 for draglines.

5.8.2.2 Cranes to be used by TtEC shall receive pre-operational inspections (frequent inspections) performed by the crane operator daily, prior to every use. Refer to the USACE Safety and Health Requirements Manual, Appendix H, Crane and Derrick Inspection, for a checklist of items to be inspected. Pre-operational inspections of rented or leased cranes, performed by a TtEC employee (e.g. either a certified crane inspector, the Lift Supervisor, or the crane operator) should not be documented or used in lieu of or as a periodic inspection.

5.8.2.3 Cranes to be used by TtEC shall receive periodic inspections conducted by a qualified person on an annual basis, or more frequently if recommended by the manufacturer. Because of liability considerations, the vendor renting or leasing the crane shall be responsible for performing and documenting the periodic inspections.

5.8.2.4 Cranes which have been idle for a period of one month or longer, but less than six months, shall be given a pre-operational inspection, conforming to the requirements for frequent crane inspections and frequent wire rope inspections, by a qualified person before being placed into service.

5.8.2.5 Cranes which have been idle for a period of over six months shall be given a complete inspection, conforming to the requirements for frequent and periodic crane inspections and for frequent and periodic wire rope inspections, by a qualified person prior to being placed into service.

5.9 Crane Performance Load Tests

5.9.1 Cranes to be used by TtEC shall receive performance load tests by a qualified person under the following circumstances:

5.9.1.1 Prior to initial use of cranes in which load sustaining parts have been altered, replaced, or repaired (excluding replacement of the rope);

5.9.1.2 Every time it is reconfigured or reassembled after disassembly; and

5.9.1.3 Every four years.

5.9.2 A crane boom stop field test shall be conducted to verify the proper setup of the boom stops and functioning of the boom hoist disengaging device. This test shall be conducted, and deficiencies noted shall be corrected, prior to initiating the load performance test. Refer to the USACE Safety and Health Program Manual, Appendix I, for a checklist for the crane boom stop field test.

5.9.3 Performance load tests shall be conducted in accordance with the manufacturer's recommendations. Test loads shall not exceed 100% of the manufacturer's load rating capacity chart for any configuration of the test, except where a specific requirement exists.

5.9.4 Written reports of the load test, showing test procedures and confirming the adequacy of repairs or alterations, shall be maintained with the crane or at the on-site project office.

5.10 Applicability to Subcontractors

5.10.1 Subcontractors performing work on TtEC projects are required (by subcontract addendum) to comply with the requirements of the TtEC Safety Plan(s) for the site work, or to develop and implement a Site Safety Plan in accordance with TtEC requirements (in accordance with the TtEC Health and Safety Program, Procedure HS 1-4, Subcontractor Selection and Management).

5.10.2 This critical lift procedure is not applicable to subcontractors unless specifically addressed in the subcontract terms and conditions. The Project Manager may provide copies of this procedure to subcontractors for their use in developing their own Critical Lift Plans; however, this should only be done with the express, written agreement that TtEC has no responsibility or liability for the acceptability and/or implementation of this procedure in the subcontractors' plans.

6.0 REFERENCES

American National Standards Institute, ANSI/ASME B30 standards, B30.1 through B30.25, including the B30.5a-1995 Addenda to ASME B30.5-1994
Health and Safety Program, Procedure EHS 1-4, Subcontractor Selection and Management
Mobile and Locomotive Cranes
OSHA 29 CFR 1926 Subpart N - Cranes, Derricks, Hoists, Elevators, and Conveyors 7
Power Crane and Shovel Association Standard #4
USACE Safety and Health Requirements Manual, Publication EM 385-1-1, October 1992, or latest issue

7.0 ATTACHMENTS

Attachment 1 - Critical Lift Plan Forms

ATTACHMENT 1
Tetra Tech EC, Inc.
CRITICAL LIFT PLAN FORMS

Click the icon below to download and complete.

CP13-Att1.doc

Select the "Detach" button in the pop-up window to save a copy to a disk or hard drive.

Tetra Tech EC, Inc.

NOTICE OF OWNERSHIP AND CONDITIONS OF USE

This document is the property of Tetra Tech EC, Inc. (TtEC) and is to be used only for the duration and connection with the performance of work for TtEC. Written deviations to this document may be authorized when appropriate in accordance with the Quality Rule. This document is not to be construed as an employment contract or any binding obligation of TtEC. This document may be modified or rescinded at any time with or without prior notice at the sole discretion of TtEC. Hard copies of this document may not contain the most current information. The current version of this document can be found on the TtEC online Corporate Reference Library.

Copyright© 1996, 1999

Tetra Tech EC, Inc.

Proprietary Information

Appendix L

Hospital Route Map

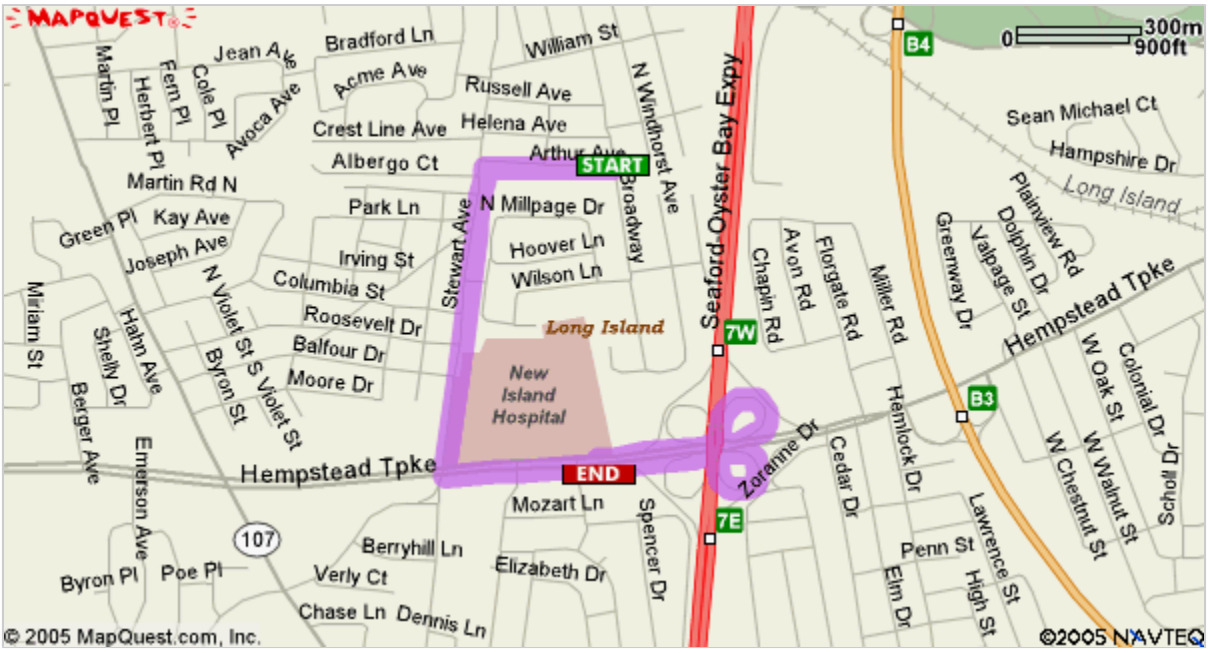
New Island Hospital
4295 Hemptead Turnpike
Bethpage, NY 11714-5713
516-579-6000

Start: **Broadway & Arthur Ave**
Bethpage, NY 11714, US

End: **4295 Hempstead Tpke**
Bethpage, NY 11714-5713, US

Directions	Distance
Total Est. Time: 5 minutes **Total Est. Distance:** 1.70 miles	
1: Start out going WEST on ARTHUR AVE toward LEROY AVE.	0.1 miles
2: Turn LEFT onto STEWART AVE.	0.4 miles
3: Turn LEFT onto HEMPSTEAD TURNPIKE / NY-24 E / BETHPAGE TURNPIKE.	0.4 miles
4: Merge onto SEAFORD-OYSTER BAY EXPY / NY-135 N toward OYSTER BAY.	0.2 miles
5: Merge onto HEMPSTEAD TURNPIKE / NY-24 W / BETHPAGE TURNPIKE via EXIT 7W toward HEMPSTEAD.	0.3 miles
6: End at **4295 Hempstead Tpke** Bethpage, NY 11714-5713, US	
Total Est. Time: 5 minutes **Total Est. Distance:** 1.70 miles	

Directions to New Island Hospital



Start:
Broadway & Arthur Ave
Bethpage, NY 11714, US

End:
4295 Hempstead Tpke
Bethpage, NY 11714-5713, US

Island Occupational Medical
4 Dorothy Gate
Massapequa, NY 11758-3521
516-795-5544

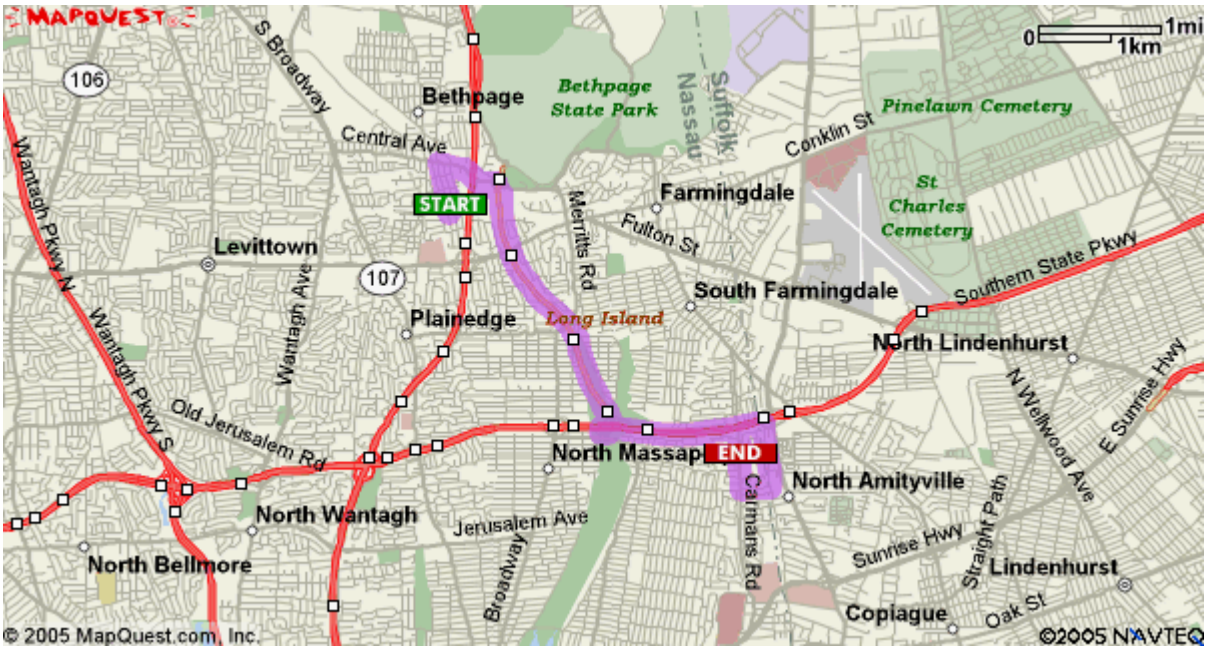
Start: **Broadway & Arthur Ave**
Bethpage, NY 11714, US

End: **4 Dorothy Gate**
Massapequa, NY 11758-3521, US

Directions	Distance
Total Est. Time: 12 minutes **Total Est. Distance:** 5.99 miles	
1: Start out going NORTH on BROADWAY toward HELENA AVE.	0.4 miles
2: Turn RIGHT onto CENTRAL AVE.	0.5 miles
3: Take the BETHPAGE PKWY SOUTH ramp.	0.1 miles
4: Merge onto PHILIP B HEALEY MEMORIAL PKWY / BETHPAGE PKWY / BETHPAGE STATE PKWY.	2.1 miles
5: Take the SOUTHERN STATE PKWY EAST exit- EXIT B1- on the LEFT toward BAY SHORE.	0.3 miles
6: Merge onto SOUTHERN STATE PKWY / SOUTHERN PKWY E.	1.2 miles
7: Take the RT-110 S exit- EXIT 32S.	<0.1 miles
8: Turn SLIGHT RIGHT onto COUNTY LINE RD.	0.5 miles
9: Turn RIGHT onto PLYMOUTH DR.	0.2 miles
10: Turn RIGHT onto CARMANS RD.	0.3 miles
11: Turn RIGHT onto DOROTHY GATE.	<0.1 miles

END **12:** End at **4 Dorothy Gate**
Massapequa, NY 11758-3521, US

Total Est. Time: 12 minutes **Total Est. Distance:** 5.99 miles



Start:
Broadway & Arthur Ave
Bethpage, NY 11714, US

End:
4 Dorothy Gate
Massapequa, NY 11758-3521, US

Appendix M

Weekly/Monthly Safety Reports

TETRA TECH EC, INC.
EFANE WEEKLY HEALTH AND SAFETY REPORT

Project Name: _____
Location: _____

SITE INFORMATION
Week Ending _____

Hours
Worked: Craft: _____ PS: _____ Subs: _____

Check Level of Protection
For the week: B ___ C ___ D ___

INJURIES AND ILLNESSES
Yes_____ No_____

Describe:
_____
_____
_____

MAJOR ACTIVITIES CONDUCTED THIS WEEK:
(drum handling, sampling, excavation, abatement/T&D, etc.)
_____
_____
_____

SIGNIFICANT EVENTS THIS WEEK:
(regulatory visits, equipment malfunctions, process start-up or shutdown):
_____
_____
_____

FUTURE ISSUES:
(schedule, manpower allocation, monitoring equipment, other resources needed)
_____
_____
_____
_____

SITE AUDIT/INSPECTIONS CONDUCTED Yes _____ No _____
(describe outstanding findings and attach results)
_____
_____
_____
_____
_____

HIPO ACTIVITIES

Hot Work.....Yes _____ No _____ Dates: _____
Lockout/Tagout .....Yes _____ No _____ Dates: _____
Confined Space Entry .....Yes _____ No _____ Dates: _____
Soils Analysis Classification .....Yes _____ No _____ Dates: _____
Excavation Daily Check List.....Yes _____ No _____ Dates: _____
Crane On-Site .....Yes _____ No _____ Dates: _____
Critical Lift Plan Performed .....Yes _____ No _____ Dates: _____

TETRA TECH EC, INC.
EFANE WEEKLY HEALTH AND SAFETY REPORT

REAL TIME AIR MONITORING

Major Activity	Location(s)	Worker Occupation Monitored	FID/PID Range and Readings	CGI/02 Range and Readings	PDM Range and Readings	Other

PERSONAL AIR MONITORING

Activity Monitored	Location	Occupation	Type of Sample	Analyte	Result

SUBCONTRACTORS ON SITE

Company Name	Task or Function	Return to Site Next Week (Y/N)	Performed Subcontractor Review (Y/N)

_____ _____

Site Health and Safety Officer - Signature Date

Monthly Statistical Report

PROJECT:_____ MONTH:_____ PROJECT START DATE: ____/____/____	TtEC MANUAL			TtEC NON-MANUAL			SUBCONTRACTOR TOTALS			PROJECT TOTALS		
	Month	YTD	PTD	Month	YTD	PTD	Month	YTD	PTD	Month	YTD	PTD
1. First Aid Cases												
2. Total OSHA Recordables												
3. Restricted Duty Cases												
4. Restricted Duty Workdays												
5. Lost Time Cases												
6. Lost Time Workdays												
7. Hours Worked - Estimated												
8. Property Losses >$500												
9. High Loss Potential Incidents												
10. Total Incidents Investigated												

Project Incident Rates	YTD	PTD	Nat'l Avg.
Total OSHA Recordable Rate			10.6
Lost Workday Rate			4.9
Lost Workday Severity Rate			39

OSHA Recordable Rate = $\frac{\text{\# Recordables x 200,000}}{\text{\# of hours worked}}$

Lost Work Day Rate = $\frac{\text{Total \# of lost time cases and restricted duty cases x 200,0}}{\text{\# of hours worked}}$

Lost Work Day Severity Rate = $\frac{\text{Total \# of days lost and days restricted x 200,000}}{\text{\# of hours worked}}$

Monthly Health and Safety Report

PROJECT: _____ **MONTH:** _____

I. Descriptive Summary of Accidents/Incidents

II. Summary of Site Safety Inspections and Audits

III. Other Issues

1. Recognition and awards program:
2. Site specific training:
3. OSHA/third party inspections:
4. H&S program administration/implementation:
5. Subcontractor H&S performance:
6. Unique exposure hazards:
7. Site specific loss control programs:
8. Site management concerns:

FINAL CONSTRUCTION QUALITY CONTROL PLAN
FOR
CONSTRUCTION TASKS
GM-38 AREA GROUNDWATER REMEDIATION
AT
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BETHPAGE, NEW YORK

Issued:

May 8, 2006

Prepared for:

Engineering Field Activity, Northeast
Naval Facilities Engineering Command
10 Industrial Highway, Mail Stop #82
Lester, Pennsylvania 19113-2090

Remedial Action Contract No. N62472-99-D-0032
Contract Task Order No. 96

Prepared by:

Tetra Tech EC, Inc.
Bucks Town Corporate Campus
820 Town Center Drive, Suite 100
Langhorne, PA 19047-1748

Revision	Date	Prepared By	Approved By	Pages Affected
0	5/8/06	Joseph Gray	Stavros Patselas	All

TABLE OF CONTENTS

1.0 INTRODUCTION 1-1
2.0 QC ORGANIZATION 2-1
2.1 General 2-1
2.2 Project QC Organization Chart 2-1
3.0 NAMES AND QUALIFICATIONS 3-1
3.1 QCPM 3-1
3.2 PQCM 3-1
4.0 DUTIES, RESPONSIBILITIES AND AUTHORITIES 4-1
4.1 General 4-1
4.2 QCPM 4-1
4.3 PQCM 4-1
5.0 SUBMITTAL PROCEDURES AND INITIAL SUBMITTAL REGISTER 5-1
5.1 Types of Submittals 5-1
5.2 Review and Approval Authority 5-1
5.3 Constraints 5-1
5.4 Scheduling 5-1
5.5 PQCM Responsibilities 5-1
5.6 Site QC Organization Responsibilities 5-2
5.7 Government Submittal Actions 5-3
5.8 Format of Submittals 5-4
5.8.1 Transmittal Form 5-4
5.8.2 Identifying Submittals 5-4
5.9 Quantity of Submittals 5-4
5.10 Submittal Register 5-4
6.0 TESTING LABORATORY INFORMATION 6-1
6.1 Accreditation/Certification 6-1
6.2 Capability Check 6-1
6.3 Test Results 6-1
7.0 TESTING PLAN AND LOG 7-1
8.0 PROCEDURES TO COMPLETE REWORK ITEMS 8-1
8.1 Rework Item - General 8-1
8.2 Control of Rework Items 8-1
8.3 Maintenance and Distribution 8-1
9.0 DOCUMENTATION PROCEDURES 9-1
9.1 Contractor Production Report 9-1
9.2 CQCR 9-2
9.3 Record of QC Meetings 9-2
9.4 Testing Plan and Log 9-3
9.5 Rework Items List 9-3
9.6 As-Built Records 9-3
10.0 DESIGN CHANGES 10-1
10.1 RFI 10-1
10.2 CRF 10-1
10.3 DCN 10-1

11.0 LIST OF DFOW 11-1
11.1 DFOW 11-1
11.2 DFOW Sources 11-1
11.3 Listing 11-1
12.0 PROCEDURES FOR PERFORMING THE THREE PHASES OF CONTROL 12-1
12.1 Preparatory Phase 12-1
12.2 Initial Phase 12-1
12.3 Follow-Up Phase 12-2
12.4 Notification of the Three Phases of Control for Off-Site Work 12-2

LIST OF FIGURES

Figure 1 Project QC Organization Chart 2-1

LIST OF APPENDICES

Appendix A RESUMES
QCPM Resume
PQCM Resume

Appendix B QC FORMS
Submittal Register
Testing Plan and Log
Rework Items List
Contractor Production Reports
CQCR
Record of Quality Control Meeting/Minutes
RFI
CRF
DCN
List of DFOW
Preparatory Phase Checklist
Initial Phase Inspection Checklist

LIST OF ACRONYMS AND ABBREVIATIONS

AALA	American Association for Laboratory Accreditation
AASHTO	American Association of State Highway and Transportation Officials
AHA	Activity Hazard Analyses
CO	Contracting Officer
CQC	Construction Quality Control
CQCR	Construction Quality Control Report
CRF	Change Request Form
DCN	Design Change Notification
DFOW	Definable Feature of Work
EFANE	Engineering Field Activity, Northeast
NIST	National Institute of Standards and Technology
NTR	Navy Technical Representative
NVLAP	National Voluntary Laboratory Accreditation Program
NWIRP	Naval Weapons Industrial Reserve Plant
OSHA	Occupational Safety and Health Administration
PM	Project Manager
PQCM	Project Quality Control Manager
QC	Quality Control
QCPM	Quality Control Program Manager
RAC	Remedial Action Contract
RFI	Request for Information
SHSP	Site-Specific Health and Safety Plan
TtEC	Tetra Tech EC, Inc.

1.0 INTRODUCTION

Tetra Tech EC, Inc. (TtEC) has prepared this Construction Quality Control (CQC) Plan in accordance with Remedial Action Contract (RAC) Number N62472-99-D-0032, Contract Task Order (CTO) Number 0096.

This document presents the CQC Plan for the GM-38 Area Groundwater Remediation project at the Naval Weapons Industrial Reserve Plant (NWIRP), in Bethpage, NY. This CQC Plan will be considered one of the contract documents for this project. The purpose of this CQC Plan is to specify the methods, procedures and frequency of inspection and testing activities to verify the quality of the construction activities during this project in accordance with the approved Contract Drawings and Technical Specifications. The data and information collected during this program will be used as the basis to verify that the construction has been completed in accordance with the Contract Drawings and Technical Specifications.

The Quality Control (QC) program outlined in this CQC Plan was developed to verify that the placement and quality of the materials used in construction are in compliance with the Contract Drawings and Technical Specifications. This QC program applies to all work performed by TtEC on this project as well as all subcontractors to TtEC.

2.0 QC ORGANIZATION

2.1 General

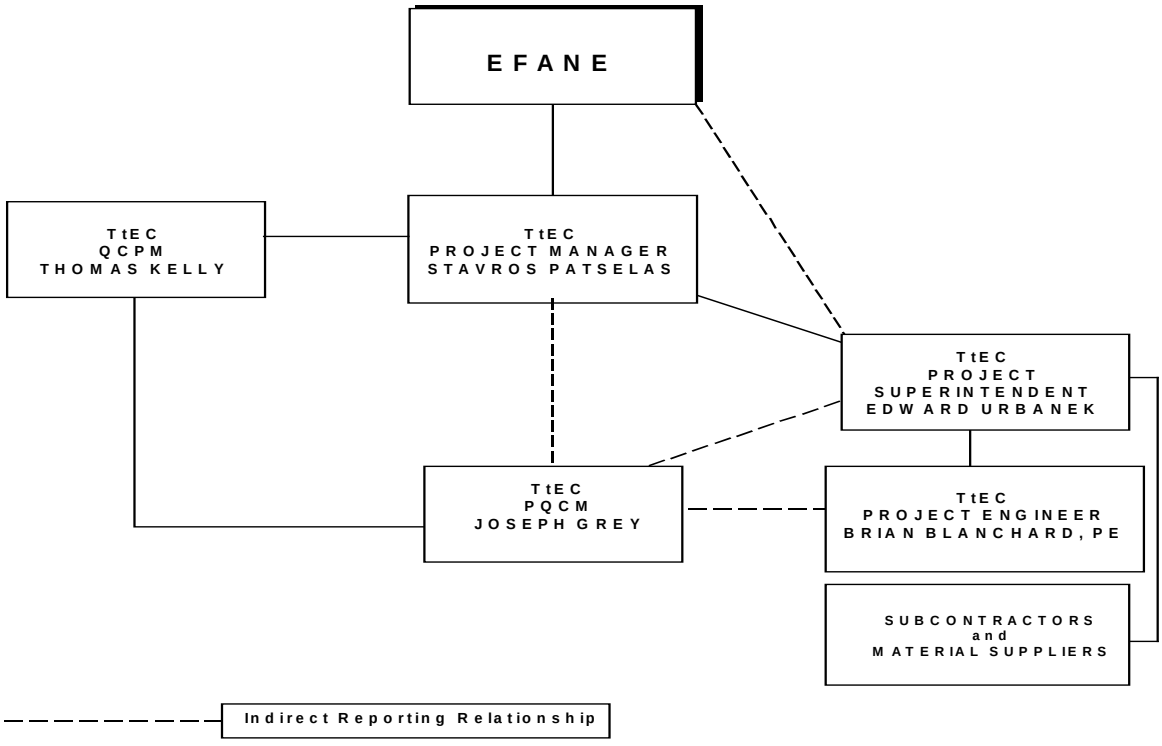
The organizations involved in this project include the Department of the Navy, Engineering Field Activity, Northeast (EFANE) and the Remedial Action Contractor (Contractor). TtEC is acting as the Contractor for the GM-38 Area Groundwater Remediation project. CQC representatives of the RAC will be the QC Program Manager (QCPM), the Project QC Manager (PQCM), and QC Specialists, as required.

The roles of the CQC personnel are described within this CQC Plan.

2.2 Project QC Organization Chart

The following Figure 1 shows the Project QC Organization Chart for this project.

FIGURE 1
PROJECT QC ORGANIZATION CHART
GM-38 AREA
GROUNDWATER REMEDIATION
BETHPAGE, NY



3.0 NAMES AND QUALIFICATIONS

3.1 QCPM

The QCPM for this project is Thomas Kelly. Reference Appendix A for Mr. Kelly's resume.

3.2 PQCM

The PQCM for this project is Joseph Grey. Reference Appendix A for Mr. Grey's resume.

4.0 DUTIES, RESPONSIBILITIES AND AUTHORITIES

4.1 General

TtEC is the Contractor for work at the GM-38 area. The Contractor is responsible for implementation of construction activities in strict accordance with design criteria, Contract Drawings and Technical Specifications using the necessary construction procedures and techniques. The Contractor is also responsible for formulating and implementing a CQC Plan which addresses the rules and responsibilities of project and CQC personnel, and outlines inspection and testing procedures to be conducted by CQC personnel and/or subcontractors.

4.2 QCPM

The QCPM, Thomas Kelly, reports to the TtEC RAC Program Manager on all quality-related matters. The QCPM interfaces with the PQCM and the TtEC Project Manager (PM) on all matters affecting quality. Specific tasks to be performed by the QCPM include the following:

- Review and approve the CQC Plan and any revisions.
- Assure all relevant portions of the CQC Plan are implemented on the project.
- Issue reports to the PM on any deviation of the approved plans.
- Authorize the PQCM to act on his behalf for all site-related QC activities.
- Assist the PQCM with resolving quality-related issues that are raised beyond resolution at the site level.

4.3 PQCM

The PQCM, Joseph Grey, reports to the QCPM on all matters affecting quality and interfaces on a daily basis with the Project Superintendent. The PQCM or designated representative will monitor site activities on a full-time basis. The results of inspections and surveillance will be documented in the daily Construction Quality Control Report (CQCR). The PQCM will also be responsible for the following:

- Implementation of the CQC Plan, including performance and documentation of the Three Phases of Control for all construction activities.
- Performance of CQC inspection/testing and preparation of inspection and testing reports.
- Assuring proper collection of samples for laboratory testing and review of test results.
- Preparation and maintenance of the Rework Items List and ensuring closure/compliance of all listed items.
- Maintenance of the latest applicable Contract Drawings and Technical Specifications with amendments and/or approved modifications at the job site and assuring that they are used for shop drawings, fabrication, construction inspections, and testing.
- Assuring maintenance and availability of Record Drawings.
- Maintenance of a Contractor-generated Submittal Register for the duration of the contract, reviewing the Submittal Register at least monthly and taking appropriate actions should slippages or other changes so necessitate.

- Reviewing all submittals for compliance with the Construction Drawings and Technical Specifications prior to approval or submission to the Contracting Officer (CO) or designated Navy Technical Representative (NTR).
- Scheduling, conducting and documenting periodic QC Meetings.
- Stop Work Authority in concert with the PM.

5.0 SUBMITTAL PROCEDURES AND INITIAL SUBMITTAL REGISTER

5.1 Types of submittals

Types of submittals include, but are not limited to, shop drawings, samples, catalog cuts, certifications, manuals, parts lists, laboratory results, inspections, and test reports.

5.2 Review and Approval Authority

The PQCM or designee is responsible for reviewing and certifying that the submittals are in compliance with contract requirements. The approving authority is the PQCM unless submission to the CO or designated NTR is required for the specific submittal.

5.3 Constraints

The following submittal constraints are defined for this project:

- Submission: Submittals will be complete for each definable feature of work (DFOW). Components of the definable features inter-related as a system will be submitted at the same time.
- Acceptability: If submittal acceptability is dependent on conditions, items, or materials included in separate subsequent submittals, the submittal will be not be accepted and will be returned without review.
- Approval: Approval of a separate material, product, or component does not imply approval of the assembly in which the item functions.

5.4 Scheduling

Scheduling requirements are outlined below:

- Coordination: The preparation and processing of submittals will be coordinated with performance of the work so that submittal processing or the need for resubmission will not delay work.
- Review Period: Except as specified otherwise, the review period, beginning with receipt by the approving authority, is at least 15 working days for submittals requiring PQCM approval and 20 working days for submittals requiring CO or designated NTR approval. The period of review for submittals with Navy or designated representative approval begins when the Navy receives the submittal from TtEC's QC organization. The period of review for each re-submittal is the same as for the initial submittal.

5.5 PQCM Responsibilities

The various PQCM responsibilities include, but are not limited to the following:

- Verify Field Conditions: Determine and verify field measurements, materials and field construction criteria. Review each submittal and check and coordinate each submittal with requirements of the work and contract documents.
- Transmission: Transmit submittals to the CO or designated NTR in an orderly sequence, in accordance with the submittal register, in order to prevent delays in the work, delays to the Navy, or delays to separate subcontractors.
- Revisions: Correct and re-transmit submittals as directed by the CO or designated NTR. Direct specific attention, in writing on resubmitted submittal, to revisions not requested by the CO or designated NTR on previous or original submissions.
- Copies: Furnish additional copies of submittals when requested by the CO or designated NTR, to a limit of 20 submittals.
- Completion of Work: Plan to complete submittal preparation work in time to allow the submittal to occur as scheduled.
- Approval: Ensure no work has begun until submittals for that work have been approved by the PQCM or in the case where approval authority is with the CO or designated NTR.

5.6 Site QC Organization Responsibilities

The various Site QC Organization responsibilities include, but are not limited to the following:

- Receiving Date: Note the date on which the submittal was transmitted to the CO or designated NTR on each submittal for which the PQCM is the approving authority.
- Verify Field Conditions: Determine and verify field measurements, materials, and field construction criteria. Review each submittal and check and coordinate each submittal with requirements of the work and contract documents.
- Review: Review submittals for conformance with project design concepts and compliance with the contract documents.
- Action: Act on submittals, determining the appropriate action CO Officer or designated NTR.

    - When the PQCM is the approving authority, take the appropriate action on the submittal from the possible actions defined in the paragraph entitled "Government Submittal Actions".
    - When the CO or designated NTR is the approving authority or when a variation has been proposed, forward the submittal to the Navy with the certifying statement or act on a returned submittal marked "not reviewed" or "revise and resubmit".

- Legible: Ensure that material is clearly legible.
- Certification Stamp: Stamp each sheet of each submittal with the certification stamp, except that data submitted in bound volume or on one sheet printed on two sides may be stamped on the front of the first sheet only.

    - When the approving authority is the CO or designated NTR, the QC organization will certify submittals forwarded to the CO or designated NTR with the following certifying statement:

I hereby certify that the (equipment) (material) (article) shown and marked in this submittal is that proposed to be incorporated into Contract Number N62472-99-D-0032, is in compliance with the Contract Drawings and Technical Specifications, can be installed in the allocated spaces, and is submitted for Government approval.

Certified by Submittal Reviewer _____Date _____
(signature)

Certified by PQCM_____ Date _____
(signature)

- When the approving authority is the PQCM, the PQCM will use the following approval statement when forwarding submittals to the CO or designated NTR as "Approved" or "Approved as Noted."

I hereby certify that the (equipment) (material) (article) shown and marked in this submittal is that proposed to be incorporated into Contract Number N62472-99-D-0032, is in compliance with the Contract Drawings and Technical Specifications, can be installed in the allocated spaces, and is approved for use.

Certified by Submittal Reviewer _____Date _____
(signature)

Approved by PQCM _____Date _____
(signature)

- Signature: Sign the certifying statement or approval statement. The person signing the certifying statements shall be the QCPM, PQCM or a person designated in writing by the QCPM as having that authority. The signatures will be in original ink. Stamped signatures are not acceptable.
- Submittal Register: Update the submittal register as submittal actions occur and maintain the submittal register at the project site until final acceptance of work by the CO or designated NTR.
- Retention: Retain a copy of approved submittals at the project site.
- Distribution: When the approving authority is the PQCM, forward two copies of each approved submittal, except "samples," where one set is required, to the CO or designated NTR, unless otherwise noted at the pre-construction meeting.

5.7 Government Submittal Actions

Submittals can be returned with one of the following notations:

- Not Approved: Submittals marked "not reviewed" will indicate the submittal has been previously reviewed and approved, is not required as a submittal, does not have evidence of being reviewed and approved by the PQCM, or is not complete. A

submittal marked "not reviewed" will be returned with an explanation of the reason it is not reviewed. Returned submittals deemed to lack review by TtEC or to be incomplete will be resubmitted with appropriate action, coordination, or change.

- Approved: Submittals marked "approved" or "approved as submitted" authorize TtEC to proceed with the work covered.
- Approval as Noted: Submittals marked "approved as noted" authorize TtEC to proceed with the work as noted provided TtEC takes no exception to the notations.
- Revise and Resubmit: Submittals marked "revise and resubmit" or "disapproved" indicate the submittal is incomplete or does not comply with the design concept or the requirements of the Contract documents and will be resubmitted with appropriate changes.

5.8 Format of Submittals

5.8.1 Transmittal Form

Transmit each submittal, except sample installations and sample panels, to the office of the CO or designated NTR. Transmit submittals with a transmittal form prescribed by the CO or designated NTR . The transmittal form will identify the submittal as being from TtEC, indicate the date of the submittal, and include information prescribed by the transmittal form and required in the following section, Identifying Submittals, 5.8.2.

5.8.2 Identifying Submittals

Identify submittals, except sample panel and sample installation, with the following information permanently adhered to or noted on each separate component of each submittal and noted on the transmittal form. Mark each copy of each submittal identically, with the following:

- Project title and location.
- Construction contract number and CTO.
- The remedial specification section by which the submittal is required.
- The name, address, and telephone number of the subcontractor, supplier, manufacturer and any other second tier subcontractor associated with the submittal.
- Product identification and location in project.

5.9 Quantity of Submittals

Submit five copies of all submittals except when exceptions are noted in specific Technical Specifications.

5.10 Submittal Register

The initial Submittal Register will be determined based on requirements set forth in the various Technical Specifications. The final CQC Plan will include the Initial Submittal Register. A sample Submittal Register can be found in Appendix B.

6.0 TESTING LABORATORY INFORMATION

An independent qualified laboratory or laboratories will be provided to perform testing required by this project. All laboratories performing testing and analysis services will be accredited/certified in the methods specified by project requirements.

6.1 Accreditation/Certification

The CO or designated NTR will be provided with a copy of the certificate of accreditation, scope of accreditation, and the latest directory of the accrediting organization for accredited laboratories. The scope of the laboratory's accreditation will include the test methods required for the project.

Acceptable accreditation programs are as follows:

- National Institute of Standards and Technology (NIST).
- National Voluntary Laboratory Accreditation Program (NVLAP).
- American Association of State Highway and Transportation Officials (AASHTO).
- American Association for Laboratory Accreditation (AALA).

The CO or designated NTR must approve any deviation from the above in writing.

6.2 Capability Check

The CO or designated NTR retains the right to check laboratory equipment in the proposed laboratory and review the laboratory's testing procedures, techniques, and other items pertaining to testing, for compliance with project requirements.

6.3 Test Results

The PQCM will maintain all project test results at the project site. The actual laboratory test results will be submitted to the CO or designated NTR and placed on the updated submittal register. These results will be reviewed by the PQCM for conformance with the project requirements. The cover page for these results will be conspicuously stamped in red with 'Conforms' or 'DOES NOT CONFORM' to the project requirements, whichever is applicable.

A summary report of the results of all field testing will be attached to the last daily CQCR for each month.

7.0 TESTING PLAN AND LOG

The testing plan and log identifies all tests, on-site and off-site, to be performed on materials throughout the course of the project. The document includes the following information:

- Specification Section and relevant paragraph number.
- Test Required.
- Accredited laboratory requirements.
- Sampler and tester identification.
- Location of test (field vs. laboratory).
- Frequency of test.
- Date completed.

See Appendix B for the Sample Testing Plan and Log.

8.0 PROCEDURES TO COMPLETE REWORK ITEMS

8.1 Rework Item – General

A Rework Item is a part or aspect of a DFOW that does not comply with the contract. This item can be, but is not limited to placed or delivered material; a delivered, installed or fabricated piece of equipment; or deficient workmanship that can cause a material, equipment or functionality of a system to perform less than specified by the requirements for that item.

8.2 Control of Rework Items

During the conducting of field activities, if an identification is made of an item or a feature of work that does not comply with project requirements, it will be noted by a full description in the CQCR

If the item or feature of work is brought into compliance before the end of the work day, this will be noted in the CQCR and no further documentation is required.

If the item or feature of work is not brought into compliance by the end of the work day, it is logged onto the Rework Items List. See Appendix B for a Sample Rework Items List. The following information is required for initial logging of an item:

- Unique identifying number
- Date identified
- Description
- Requirement (i.e. technical specification section, construction drawing detail, etc.)
- Immediate action taken by the PQCM

Once the resolution is decided and acted on, the following is added to the rework item to close it out:

- Resolution to bring the item or feature of work into compliance
- Date of completion

8.3 Maintenance and Distribution

The rework items list is maintained by the PQCM at the project site. Items to be included on this list, also include those identified by the CO or designated NTR. A copy of the Rework Items list will be included with the last CQCR of each month.

9.0 DOCUMENTATION PROCEDURES

The PQCM will maintain a current and complete set of records that document the quality of the constructed project. A copy of these records will be maintained at the project site and will be readily available to the CO or designated NTR for review or audit purposes. At a minimum, these records include, but are not limited to the following sections:

9.1 Contractor Production Report

A Contractor Production Report is required for each day that work is performed and will be attached to the daily CQCR prepared for the same day. Each calendar day will be accounted for throughout the life of the project. The reporting of the work will be identified by terminology consistent with the construction schedule. Contractor Production Reports will be prepared, signed and dated by the Project Superintendent and will contain the following information:

- Date of report, report number, name of Contractor (TtEC), contract number, project title, project location and superintendent present.
- Weather conditions in the morning and in the afternoon including maximum and minimum temperatures.
- A list of Contractor (TtEC) and subcontractor personnel on the work site, their trades, employer, work location, description of work performed and hours worked.
- A list of job safety action taken and safety inspections conducted. Indicate that safety requirements have been met including the results of the following:

    - Was a job safety meeting held? (If YES, attach a copy of the meeting minutes)
    - Were there any lost time accidents? (If YES, attach a copy of the completed Occupational Safety and Health Administration (OSHA) report)
    - Was trenching, scaffold, high-voltage electrical, or high work done? (If YES, attach a statement or checklist showing inspection performed)
    - Was hazardous material or waste released into the environment? (If YES, attach description of incident and proposed action)

- A list of equipment and material received each day that is incorporated into the job.
- A list of construction and plant equipment on the work site including the number of hours used, idle and down for repair.
- Include a ‘Remarks’ section, which will contain pertinent information including directions received, problems encountered during construction, work progress and delays, conflicts or errors in the drawings or specifications, field changes, safety hazards encountered, instructions given and corrective action taken and a record of visitors to the work site.

See Appendix B for a Sample Contractor Production Reports.

9.2 CQCR

A CQCR is required for each day that work is performed and for every seven consecutive days of no-work, on the last day of that no-work period. Each calendar day will be accounted for throughout the life of the project. The reporting of work will be identified by terminology consistent with the construction schedule. CQCRs will be prepared, signed and dated by the PQCM and will contain the following information:

- Identify the control phase and the DFOW.
- Results of the preparatory phase meetings held, including the location of the DFOW, that drawings and specifications have been reviewed, submittals have been approved, materials comply with approved submittals, materials are stored properly, preliminary work has been done correctly, the testing plan has been reviewed and work methods have been discussed.
- Results of initial phase meetings held, including the location of the DFOW and a list of personnel present at the meeting. Verify in the report that for this DFOW, the preliminary work was done correctly, samples have been prepared and approved, the workmanship is satisfactory, test results are acceptable, work is in compliance with project requirements, the required testing has been performed and a list of who performed the tests.
- Results of follow-up phase inspections held, including the location of the DFOW. Verify in the CQCR for this DFOW that the work complies with project requirements as approved in the initial phase, required testing has been performed and a list of who performed the tests.
- Results of the three phases of control for off-site work, if applicable, including actions taken.
- List rework items identified, only if not corrected by close of business.
- As rework items are corrected, a revised rework items list will be provided along with the corrective actions taken.
- Include a 'Remarks' section, which will contain pertinent information including directions received, QC problem areas, deviations from the CQC Plan, construction deficiencies encountered, QC meetings held, acknowledgment that as-built drawings have been updated, corrective direction given by the PQCM and corrective actions taken.

See Appendix B for a Sample CQCR.

9.3 Record of QC Meetings

After the start of site work, the PQCM will conduct QC meetings as required by the CO or designated NTR at the work site, with the Project Superintendent and the foreman responsible for the upcoming work. Meetings conducted will be recorded within the CQCR. The CO or designated NTR will be notified at least 24 hours in advance of the QC meeting and may attend any of these meetings. These meetings may be held in conjunction with other meetings (i.e. tool box safety meetings). As a minimum, the following will be accomplished at each meeting:

- Review the minutes of the previous meeting.
- Review the schedule.
- Work or testing accomplished since last meeting.
- Rework items identified since last meeting.
- Rework items completed since last meeting.
- Review the status of submittals.
  - Submittals reviewed and approved since last meeting.
  - Submittals required in the near future.
- Review the work to be accomplished in the next two weeks and documentation required. Schedule the three phases of control and testing.
- Establish completion dates for rework items.
- Preparatory phases required.
- Initial phases required.
- Follow-up phases required.
- Testing required.
- Status of off-site work or testing.
- Documentation required.
- Resolve QC and production problems.
- Address items that may require revising the CQC Plan.
  - Changes in procedures.

See Appendix B for a sample Record of QC Meetings/Minutes form.

9.4 Testing Plan and Log

As tests and inspections are performed, the PQCM will update the Testing Plan and Log. A copy of the lasted updated Test Plan and Log will be attached to the last CQCR of each month.

9.5 Rework Items List

As new rework items are identified and old items are corrected, the PQCM will update the Rework Items List. A copy of the last updated Rework Items List will be attached to the last CQCR of each month.

9.6 As-Built Records

The PQCM will review the as-built records to ensure they are kept current on a daily basis and are clearly marked to show deviations that have been made from the contract drawings.

10.0 DESIGN CHANGES

Throughout the construction activities at the site, instances may arise when clarifications or changes to the design are required by TtEC in order to complete the project. If a clarification of a construction issue is required that is not provided by the contract documents, TtEC will submit a Request for Information (RFI) to the CO or designated NTR for review. If a change to the design is required, TtEC will present the proposed change to the CO or designated NTR using the Change Request From (CRF). The PM and the CO or designated NTR review proposed changes to the design. TtEC may also issue a Design Change Notification (DCN) if there is need to implement change to a completed design document prior to the issuance of a document revision.

10.1 RFI

The RFI form will be used to request clarification on construction issues that were not provided by the contract documents. The form is also used to request modifications in the materials or methods used to construct certain portions of the remediation system. RFI forms will be prepared and submitted by the PQCM for review by the PM and the Design NTR. TtEC, prior to a RFI being approved or denied, will convey recommendations regarding the RFI to the Design NTR. Signature of the RFI forms by the Design NTR will be required to constitute final approval. A sample RFI form is provided as Appendix B.

10.2 CRF

The CRF was developed to allow field changes to the methods outlined in the project documents to be proposed for implementation on the project. The CRF form will be submitted by the PQCM for review by the PM and the CO or designated NTR. TtEC, prior to a CRF being approved or denied, will convey recommendations regarding the CRF to the CO or designated NTR. The CO or designated NTR will provide a signature approval of the CRF. A sample CRF form is provided as Appendix B.

10.3 DCN

A DCN will be issued by TtEC to implement changes to a completed design document prior to the issuance of a document revision. A DCN may be processed to document a change initiated by TtEC, or it may be processed to document a major change initiated by the CO or designated NTR. A sample DCN is provided as Appendix B.

11.0 LIST OF DFOW

11.1 DFOW

A DFOW is a task which is separate and distinct from other tasks and requires separate QC requirements. A DFOW can be identified by different trades or disciplines; by an item or activity on the construction schedule; specification sections; or critical path activities.

11.2 DFOW Sources

DFOW's are determined from a review of the pre-construction documentation such as task related work plans, design drawings, shop drawings, statements of work, scopes of work, pre-construction letters of direction, and approved pre-construction change requests.

11.3 Listing

See Appendix B for the List of DFOW for the GM-38 Area Groundwater Remediation project.

12.0 PROCEDURES FOR PERFORMING THE THREE PHASES OF CONTROL

The PQCM will perform the three phases of control for each DFOW to ensure that the work complies with contract requirements. DFOW are specified in the CQC Plan and approved by the CO or designated NTR. The three phases of control will adequately cover appropriate on-site and off-site work and will include the following sections:

12.1 Preparatory Phase

The CO or designated NTR will be notified at least two working days in advance of each Preparatory Phase. The PQCM will conduct the Preparatory Phase with the Project Superintendent and the foreman responsible for the DFOW. The results of the Preparatory Phase will be documented daily in the CQCR. This Preparatory Phase will be performed prior to beginning work on each DFOW and will include as a minimum the following:

- Review each paragraph of the applicable specification sections.
- Review the contract drawings.
- Verify the appropriate shop drawings and submittals for materials and equipment have been submitted and approved. Verify receipt of approved factory test results, when required.
- Review the testing plan and ensure that provisions have been made to provide the required QC testing.
- Examine the work area to ensure that the required preliminary work has been completed.
- Examine the required materials and equipment, and sample work to ensure that materials and equipment are on hand and conform to the approved shop drawings and submitted data.
- Review the Site-Specific Health and Safety Plan (SHSP) and appropriate Activity Hazard Analysis (AHA) to ensure that applicable safety requirements are met, and that required Material Safety Data Sheets (MSDS) are submitted.
- Discuss construction methods.

See Appendix B for the Preparatory Phase Checklist.

12.2 Initial Phase

The CO or designated NTR will be notified when crews are ready to start work on a DFOW. The PQCM will perform a surveillance/observation of the initial segment of the DFOW to ensure that the work complies with the contract requirements. The results of the Initial Phase will be documented daily in the CQCR. The Initial Phase will be repeated when acceptable levels of specified quality are not being met. This Initial Phase will be performed at least once on each DFOW and will include as a minimum the following:

- Establish the quality of workmanship required.
- Resolve conflicts.

- Review the SHSP and the appropriate AHA to ensure that applicable safety requirements are met.

See Appendix B for the Initial Phase Checklist.

12.3 Follow-Up Phase

The following will be performed for on-going work daily, or more frequently as necessary until the completion of each DFOW and documented daily in the CQCR:

- Ensure that the work is in compliance with contract requirements.
- Maintain the quality of workmanship required.
- Ensure that testing is performed.
- Ensure that rework items are being corrected.

12.4 Notification of the Three Phases of Control for Off-Site Work

The CO or designated NTR will be notified at least two weeks prior to the start of the Preparatory and Initial Phases for Off-Site work.

APPENDIX A
RESUMES

EXPERIENCE SUMMARY

More than 30 years of professional experience, including 18 years of construction management experience responsible for construction quality control (CQC) of large-scale, multi-site remedial projects, including Comprehensive Environmental Response Compensation and Liability Act of 1980 (Superfund) (CERCLA), Resource Conservation and Recovery Act (RCRA), and private client sites. More than 18 years of experience in CQC for the US Army Corps of Engineers (USACE) in the New York, Philadelphia, Baltimore, and New England Districts and the US Navy Engineering Field Activity - Northeast (EFANE). Includes onsite soil incineration, wastewater treatment, onsite soil low temperature thermal desorption, installation of lateral support systems for deep excavations, installation of landfill cap systems, installation of gas collection and thermal oxidation gas treatment systems, underground storage tank (UST) removal, drum excavation, overpacking and removal, demolition, leachate collection system, installation of groundwater extraction wells, and UXO work.

EDUCATION

BS, Civil Engineering, Drexel University, 1976

REGISTRATIONS/CERTIFICATIONS

Certified Operator of Nuclear Compaction Testing, Earned 1/1/88
Construction Quality Management Certificate, U.S., Earned 10/17/01, Expires 10/17/06

TRAINING

40-Hour Hazardous Waste Site Training Course, OSHA 29 CFR 1910.120(e)(3), 1987
8-Hour Hazardous Waste Refresher Course, OSHA 29 CFR 1910.120(e)(8), 2004
8-Hour Supervisory Training, OSHA, 1987
Competent Person Training for excavation, 1991
HM 181/126F Hazardous Waste Shipping Training, 2003
Sampling Training, 1994
USDOT/IATA HAZMAT Shipping Training, 2003
USACE Construction Quality Management for Contractors, 1996, 2001
Waste Management Training, 2004

CORPORATION PROJECT EXPERIENCE

Supervisory Remediation Engineer (1998 - Present)
Tetra Tech EC, Inc., Langhorne, PA
Responsible for providing construction quality control of large-scale, cost reimbursable, multi-site design/build remedial action projects. Responsible for developing, maintaining, and auditing QA/QC programs.

Program Quality Control Manager
U.S. Navy Engineering Field Activity Northeast, RAC, Pennsylvania
Responsible for the QC Program for this $125 million cost reimbursable contract. Responsible for managing QC issues for all work including investigation, engineering, construction, and O&M to achieve closures at military installations located in the Northeastern United States. Responsible for overseeing contract-wide QC compliance, identifying appropriate staff for assignment to task orders, preparing task order QC plans, and resolving any significant quality issues.

Quality Control Supervisor
USACE New England District, TERC, New England
Responsible for the QC Program for this $260 million cost reimbursable contract. Responsible for managing QC issues for all work including investigation, engineering, construction, and O&M to achieve

closures at Superfund and military sites. Responsible for overseeing contract-wide QC compliance, identifying appropriate staff for assignment to task orders, preparing task order QC plans, and resolving any significant quality issues.

Quality Control Manager
USACE Baltimore District, Aberdeen Proving Ground RAC, Maryland
Responsible for the implementation of the QC Program for this $25 million cost reimbursable contract. Responsible for managing QC issues for all work including investigation, engineering, construction, and UXO Clearance. Responsible for overseeing contract-wide QC compliance, identifying appropriate staff for assignment to task orders, preparing task order QC plans, and resolving any significant quality issues.

PREVIOUS EXPERIENCE

Roy F. WESTON, Inc., West Chester, PA
Quality Control (QC) Manager,1996 – 1998
USACE, Old O- Field Permeable Infiltration Unit Superfund Site Remedial Action (RA), Aberdeen Proving Ground (APG), Edgewood, MD
Responsible for ensuring project quality by verifying that all project activities are conducted in compliance with contract specifications; federal, state, and local regulations; WESTON Health, Safety, and Environmental policies; and Division standard operating procedures(SOPs). Responsible for conducting and supervising the inspection and testing of all aspects of field work for conformance with the applicable specifications, submittals, regulations, and standards. Developed and maintained a QC reporting and recordkeeping system to meet the requirements of the project. The project includes the construction of the permeable infiltration unit, startup of the system, 1 year of operations and maintenance (O&M) of the permeable infiltration unit on Old O-Field at the Edgewood Area of APG. Old O-Field is a 5-acre hazardous waste and ordnance disposal site that consists of approximately 35 disposal trenches that were used for the burial of chemical munitions, bulk chemical warfare materials, and contaminated materials. The work includes unexploded ordnance (UXO) clearance, site preparation, road construction, utilities installation, construction of the initial sand layer, construction of an auxiliary subsurface trickling system, construction of a subsurface air monitoring system, construction of the final sand layer, construction of the erosion control layer, and construction of a sprinkler system, pump house, and ground water storage tank. The initial site preparation and initial sand layer, will be accomplished using remotely operated low-ground pressure CAT D6H dozer and CAT 320 L excavator equipped with various end effectors.

OHM Remediation Services Corp. (Formerly known as Rust Remedial Services, Inc. & Chemical Waste Management, Inc.), Trenton, NJ
QC Manager, 1989 – 1996
USEPA, Cinnaminson Groundwater Contamination Superfund Site RA, Cinnaminson, NJ
Responsible for ensuring project quality by verifying that all project activities are conducted in compliance with contract specifications; federal, state, and local regulations; OHM health, safety environmental policies; and Division SOPs. Responsible for conducting and supervising the inspection and testing of all aspects of field work for conformance with, the applicable specifications, submittals, regulations, and standards. Developed and maintained a QC reporting and recordkeeping system to meet the requirements of the project. The work involved consists of providing all monitoring and analytical services, temporary facilities, utilities, access roadways, and site preparation. The construction of an expanded landfill gas management system for two adjacent landfills includes the installation of 28 new gas extraction wells, 5 new replacement gas extraction wells, and approximately 16,700 linear feet (lf) of high density polyethylene (HDPE) gas header pipe varying in diameter from 4 to 10 inches. Installed approximately 4,500 lf of double-walled HDPE condensate force main along with 4 HDPE condensate drains and 4 double-walled HDPE condensate pump stations. In addition, installed a landfill gas blower and enclosed flare system. The project also involves the abandonment of approximately 4,700 lf of

existing HDPE gas header pipe and the decommissioning of six condensate traps and one blower house; restoration of the landfill clay cap, sand drainage layer, and topsoil layer; grading of the site to facilitate drainage from the site after remediation; and revegetation of the site.

QC Manager
USACE, Drake Chemical Superfund Site RA, Lock Haven, PA
Responsible for ensuring project quality by verifying that all project activities are conducted in compliance with contract specifications; federal, state, and local regulations; RRS health, safety, and environmental policies; and Division SOPs. Responsible for conducting and supervising the inspection and testing of all aspects of field work for conformance with the applicable specifications, submittals, regulations, and standards. Developed and maintained a QC reporting and recordkeeping system to meet the requirements of the project. The work involved consists of providing all monitoring and analytical services, temporary facilities, utilities, access roadways, site security fencing, and site preparation; the excavation and onsite incineration of all soils within 9.63 acres of the site above elevation 545 ft mean sea level (msl) (approximately 194,520 cubic yards [yd3]); dewatering of a leachate lagoon (approximately 330,000 gallons); design and installation of a lateral support system for deep excavation around the perimeter of the site; design, construction, operation, and closure of an onsite thermal destruction facility; design, construction, operation, and closure of an onsite wastewater treatment plant (WWTP) and stormwater treatment facility; relocation of water and sewer line running through the site; backfilling site excavation with incinerated soil or decontaminated debris; grading of the site to facilitate drainage from the site after remediation; and revegetation of the site.

QC Manager
USEPA, IndustriPlex Superfund Site RA, Woburn, MA
Responsible for ensuring project quality by verifying that all project activities are conducted in compliance with contract specifications; federal, state, and local regulations; CWM health, safety, and environmental policies; and Division SOPs. Responsible for conducting and supervising the inspection and testing of all aspects of field work for conformance with the applicable specifications, submittals, regulations, and standards. Developed and maintained a QC reporting and recordkeeping system to meet the requirements of the project. The work involved consists of the construction of a permeable cover in developed areas comprising geotextile and soil, asphalt, or other cover equivalent totaling approximately 24 acres. Constructed a permeable cover comprising geosynthetics and soil on undeveloped areas consisting of 60 mil textured HDPE, other geosynthetics, and soil totaling approximately 4.4 acres. Other activities included: capping or dredging and capping in wetlands totaling approximately 8.4 acres; installation and startup of a gas collection and thermal oxidation gas treatment system; construction of clean utility corridors and culverts; decommissioning of approximately 120 groundwater wells and piezometers, structures, underground and aboveground tanks, and miscellaneous underground facilities; placement of approximately 3,430 lf of gravel/cobble lining in streams and channels; creation of approximately 5.8 acres of mitigation wetland involving excavation, capping, and vegetation; and revegetation of capped wetlands.

QC Manager
USACE, Waldick Aerospace Superfund Site RA, Wall Township, NJ
Responsible for ensuring that project activities are conducted according to contract specifications and all applicable regulations, corporate policies, and regional practices. Conduct and supervise inspection and testing of field work for conformance with requirements; and develop and maintain QC reporting and recordkeeping system. Project involves UST removal, drum overpacking and removal, asbestos abatement, structural decontamination and demolition, excavation of soils contaminated with metals and volatiles, low temperature thermal desorption, offsite stabilization and disposal of treated soils, design and installation of lateral support system for deep excavation.

QC Supervisory Engineer
USACE, Moyer Landfill Superfund Site RA, Collegeville, PA
Responsible for ensuring that project activities are conducted according to contract specifications and all applicable regulations, corporate policies, and regional practices. Conduct and supervise inspection and testing of field work for conformance with requirements; and develop and maintain QC reporting and recordkeeping system. Project involved regrading of existing landfill; backfilling with common and select fill; installation of 40mil very low density polyethylene (VLDPE) liner, upper and lower geotextile, geonet, and soil cover over a 65acre site; installation of leachate collection trench around perimeter, vertical gas vents, drainage ditches, culverts, groundwater cutoff test trench, and nine extraction wells; abandonment of monitor wells; and demolition of existing structures and utilities.

QC Manager
USACE, Heleva Landfill Supertund Site RA, Omrod, PA
Responsible for inspecting and testing all work items to ensure conformance with contract specifications and drawings. Project involved regrading of existing landfill; placing common and select fill; installing geotextile, HDPE liner, geonet, and select fill and topsoil over a 20-acre site; and installation of vertical gas vents, drainage ditches, and culverts.

Rollins Environmental Services, Inc.
Chadds Ford, PA
Project Manager, 1987 - 1989
Hazardous Management Site Services, Lockheed Missiles and Space Company, San Francisco, CA
Responsible for a hazardous waste site services contract for an operations and research facility. Performed day to day management of professional and technical staff analysis, packaging, transportation, and disposal of hazardous materials being generated at 56 different buildings.

Project Manager
Ford Motor Company, Milpitas, CA
Responsible for the removal, inspection, drainage, flushing, shipment, transportation, and disposal of 22 polychlorinated biphenyl (PCB) transformers. In addition, conducted health and safety spill control, and regulatory compliance management.

QC Engineer
Lanchester Landfill, Honey Brook, PA
Responsible for compaction testing, testing of lines and grades, and site management of field crews and subcontractors. Project involved the installation of a cap, including placement of clay, 50mil polyvinyl chloride (PVC) liner, sand with drainage pipes, geotextile, and cover soil over a 10-acre site.

QC Engineer
USACE, BROS Superfund Site RA, Bridgeport, NJ
Responsible for construction and operation of an aqueous waste treatment system processing 25 million gallons of liquid from a waste oil lagoon; subcontractor management; compaction testing; and staking of site for magnetometer survey.

Cape Atlantic Crane Co., Inc., Glassboro, NJ
Project Engineer, 1983 – 1987
Responsible for the installation of utility mains,(water main, gas lines, and sewer lines) in compliance with contract specifications and drawings at various, locations in New Jersey. Reviewed blueprints and engineering drawings, supervised crews, maintained and reviewed material inventory, obtained construction permits, and performed QC checks of site work.

Project Manager, 1980 – 1983
Krane Corp., Port Elizabeth, NJ
Responsible for the installation of foundation piles, bulkheads, and docks in compliance with contract specifications and drawings at various locations in New Jersey. Supervised subcontractors and inspected site work to ensure compliance with contract specifications and drawings. Acquired construction permits and scheduled manpower and equipment.

Project Manager, 1978 – 1980
Brian Michael Corp., Folcroft, PA
Responsible for the construction of new homes in Wildwood Crest, NJ. Supervised subcontractor and inspected site work to ensure compliance with contract specifications and drawings. Acquired construction permits and scheduled manpower and equipment.

A.V. Smith Engineering Company, Narberth, PA
Project Engineer, 1976 – 1978
Responsible for a cathodic protection system for an ocean outfall line in Bethany Beach, DE. Inspected and tested contractor's site work to ensure compliance with contract specifications and drawings.

Project Engineer, 1976 – 1978
Phase II Infiltration/Inflow (I/I) Analysis, Moultrie, Georgia
Responsible for Phase II I/I analysis of a municipal sewer system in Moultrie, GA. Responsible for inspecting and testing cathodic protection systems for municipal and industrial piping systems in Philadelphia, PA.

Co-op Engineer, 1974 - 1975
Betz Environmental Engineers, Plymouth Meeting, PA
Responsible for Phase I I/I analysis of a municipal sewer system and industrial wastewater collection systems.

Co-op Engineer, 1973 – 1974
Howard, Needles, Tamen and Bergendoff, Haverford, PA
Responsible for design of highways in Pennsylvania for the Pennsylvania Department of Transportation.

Co-op Engineer, 1972 – 1973
City of Philadelphia Engineering Department, Philadelphia, PA
Responsible for design of city sewer mains.

Joseph P. Gray
Project Engineer and Project Quality Control Manager

EXPERIENCE SUMMARY

Over nine years experience in environmental engineering, relating to hazardous waste investigation and remediation. Past duties involved aspects of project management, interfacing with clients and regulatory agencies, preparation of contract specifications, supervision of personnel and subcontractors and the preparation of project related technical documents.

EDUCATION

- M.S., Environmental Engineering, Temple University, In Progress (1995-present)
- B.S., Environmental Engineering Technology, Temple University, 1994

TRAINING

- Project Management Training, Level 100
- Project Management Training, Level 200
- PADEP Land Recycling (Act 2) Training
- Asbestos Hazard Emergency Response Act (AHERA) Asbestos Contractor/Supervisor Training, 8-Hour refresher, 2003
- AHERA Asbestos Contractor/Supervisor Initial, 40-Hour Training, 2002
- OSHA Hazardous Waste and Health and Safety Training, 8-hour refresher-Current.
- Gas Chromatograph Operation Training-1997
- Gamma Ray Spectrometer Operation Training-1994
- PADEP Hazard Ranking System Training, 1994

CORPORATION PROJECT EXPERIENCE

Pennsylvania Department of Environmental Protection (PADEP) GTAC-3, Industrial Solvents and Chemical Company Site, Newberry Township, PA, Resident Inspector - Provided bid phase services including, meeting support and site visits with subcontractors for the site closure project. Prepared a scope of work document for an asbestos survey and provided oversight during the survey. Assisted in the preparation of the cost estimate during the site closure project. Assigned as Resident Inspector to provide construction oversight of PADEP contractor for demolition, asphalt cap installation, and construction of stormwater management structures.

PADEP GTAC-3, Valley Forge Asbestos Release Site, Valley Forge National Historic Park, Valley Forge, PA, Field Operations Lead - FOL for work conducted during the Remedial Investigation. Supervised field crews and subcontractors during the soil waste investigation, geophysical investigation, ecological investigation, site survey, monitoring well installation and groundwater assessment, investigative derived waste management and disposal, and site restoration. Prepared reports daily to document activities, identify issues for resolution, present preliminary air monitoring results, and to track project progress. Provided support to Pennsylvania Department of Environmental Protection during interagency project status meetings. Authored several sections of the Remedial Investigation Report.

PADEP GTAC-3; Baghurst Alley Site, Upper Salford PA; Site Characterization; FOL and Environmental Safety Supervisor; - Supervised field crews and subcontractors during the characterization of a groundwater plume contaminated with chlorinated solvents. The scope of work for the project included monitoring well installation, preparation of boring logs, packer testing, and analysis of groundwater samples in an on-site laboratory.

PADEP GTAC-3, East 10th Street Site, Marcus Hook, PA, Field Operations Lead - Foster Wheeler Environmental Corporation's FOL for work conducted during the Site Investigation (SI). Prepared scope of work documents used by subcontractors to submit bids on various tasks of the SI. Supervised the following subcontractors during the data collection for the SI: site survey subcontractor, geophysical survey subcontractor, and geoprobe® subcontractor. Ensured subcontractor work was completed in compliance with the work plan and scope of work documents. Supervised field crews during the collection of groundwater, surface water, sediment, soil, and miscellaneous waste samples. Prepared Technical Direction Memorandums (TDM) for several phases of the SI. TDMs were used to present data and preliminary findings regarding individual phases of the SI.

PADEP GTAC-1, Multiple Locations in Pennsylvania; - Developed Hazard Ranking System (HRS) Scoring Packages to assist Pennsylvania Department of Environmental Protection in their assessment of the relative potential for site contamination to adversely impact human health and the environment. Completed HRS scoring packages in accordance with the federally mandated HRS final rule. Submitted HRS scoring packages for final review and acceptance by Pennsylvania Department of Environmental Protection.

USEPA; Multiple Locations; - Developed Site Investigation Prioritization reports to assess a site's relative threat associated with actual or potential releases of hazardous substances for potential placement on the National Priorities List. Supervised on-site reconnaissance. Researched site histories by performing regulatory file searches and review of historical and analytical data to determine HRS eligibility.

U.S Navy, Northern Division RAC I; Naval Air Warfare Center, Trenton, New Jersey Groundwater remediation Utilizing Carbon Adsorption Units; - Utilized a gas chromatograph to analyze groundwater samples for volatile organic compounds to monitor compliance for a National Pollution Discharge Elimination System permit. Prepared Scope of Work Documents that were used as guides by contractors to bid on subcontracts for the change over from remediation by carbon adsorption to remediation by air sparging followed by a catalytic oxidizer. Revised the Operations and Maintenance manual to reflect process changes.

AlliedSignal/Sumitomo Machinery Corporation of America, Industrial Sites Recovery Act; Low Level Radiation Assessment and Site Remediation, New Jersey: - Supervised craft and labor during on-site thermal desorption of mixed waste. Performed on-site analysis of soil samples for ^{226}Ra and ^{232}Th utilizing gamma-ray spectroscopy. Responsible for sample collection and documentation to comply with a New Jersey Department of Environmental Protection air pollution control permit and to determine disposal options. Supervised the excavation of mixed waste soil and the decontamination of rocks and debris to segregate the materials for hazardous and non-hazardous disposal.

Pennsylvania Department of Environmental Protection (Pennsylvania Department of Environmental Protection); Multiple Locations in Pennsylvania; - Developed Hazard Ranking System (HRS) Scoring Packages to assist Pennsylvania Department of Environmental Protection in their assessment of the relative potential for site contamination to adversely impact human health and the environment. Completed HRS scoring packages in accordance with the federally mandated HRS final rule. Submitted HRS scoring packages for final review and acceptance by Pennsylvania Department of Environmental Protection.

APPENDIX B
QC FORMS

TETRA TECH EC, INC.
SUBMITTAL REGISTER

Contract Number: N62472-99-D-0032 CTO No. 0096 Project Title: GM-38 Area Groundwater Remediation

Location: Bethpage, NY Contractor: Tetra Tech EC, Inc.

							CONTRACTOR ACTION			APPROVING AUTHORITY ACTION				CONTR	
Spec Section No.	Description Item Submitted	Spec Para No.	Classif/ Appr by CO*	Govt or A/E Revwr	Trans Control No.	Planned Submittal Date	Act. Code	Date of Action	Date Fwd to Appr Auth/Date Rec'd from Contr	Date Fwd to Other Reviewer	Date Rec'd from Other Reviewer	Act. Code	Date of Action	Mailed to Contr/Rec'd from Appr Auth.	Remarks
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(I)	(j)	(k)	(l)	(m)	(n)	(o)	(p)

TESTING PLAN AND LOG

CONTRACT NUMBER
N62472-99-D-0032/CTO NO. 0096

PROJECT TITLE AND LOCATION
GM-38 AREA GROUNDWATER REMEDIATION

CONTRACTOR
TETRA TECH EC, INC.

SPECIFICATION SECTION & PARAGRAPH NO.	ITEM OF WORK	TEST REQUIRED	ACCREDITED/ APPROVED LAB		SAMPLED BY	TESTED BY	LOCATION OF TEST		FREQUENCY	DATE COMPLETED	DATE FORWARDED TO CO	REMARKS
			YES	NO			ON-SITE	OFF-SITE				

TETRA TECH EC, INC.
REWORK ITEMS LIST

Contract No. and Title: _____

Contractor: _____

NUMBER	DATE IDENTIFIED	DESCRIPTION	CONTRACT REQUIREMENT (Spec. Section and Par. No., Drawing No., and Detail No., etc.	ACTION TAKEN BY PQCM	RESOLUTION	DATE COMPLETED

TETRA TECH EC, INC.

CONTRACTOR PRODUCTION REPORT					
(ATTACH ADDITIONAL SHEETS IF NECESSARY)					
CONTRACT NUMBER N62472-99-D-0032 Contract Task Order No. 0096		TITLE AND LOCATION GM-38 Area, Bethpage, NY			Report Number
CONTRACTOR Tetra Tech EC, Inc.		SUPERINTENDENT			
AM WEATHER	PM WEATHER	MAX TEMP (°F)	MIN TEMP (°F)	Precip. (in)	

WORK PERFORMED TODAY

REMARKS	EMPLOYER	NUMBER	TRADE	HRS

JOB SAFETY	Was a Job Safety meeting held this date?	Yes	Total work hours	
	(If yes attach copy of minutes)	No	on job site this date	0.0
	Were there any lost time accidents this date?	Yes	Cumulative Total of work	
	(If yes attach copy of OSHA report)	No	hours from previous report	
			Total work hours from start of construction	0.0

Was trenching / scaffold / HV electrical ? High work done _____Yes _____No
(If Yes attach statements or checklist showing inspection performed)
Was Hazardous Material / Waste released into the environment?
(If Yes attach description of incident and proposed action) _____Yes _____No

List of Actions taken today / safety inspections conducted.

See daily safety report

Equipment / material received today to be incorporated in job.

See material receiving report

Construction equipment on job site today, including number of hours used today.

see equipment usage report

Remarks

00-Jan-00

Contractor / Superintendent Date

TETRA TECH EC, INC. **DAILY SAFETY REPORT**		Project: CTO 0096	**0**		
		CONTRACT:N62472-99-D-0032			
Client: U.S. Navy, Engineering Field Activity Northeast					
Subcontractor(s): See Daily Production Report		Visitors to Site: See Daily Production Report			
00-Jan-00	0	MAX TEMP (°F)		MIN TEMP (°F)	

	WORK ACTIVITY	LEVEL OF PROTECTION
1		
2		
3		
4		
5		
6		
7		

AIR MONITORING RESULTS : none

PERSONNEL ON SITE :

DAILY INSPECTIONS :		

MONITORING EQUIPMENT USED :

ACCIDENTS OR BREACH OF PROCEDURES :

PHYSICAL CONDITION OF WORKERS :

REMARKS :

NAME :	SIGNED: _____

TETRA TECH EC, INC. GM-38 Area, Bethpage, NY NAVY RAC CONTRACT NO. N62472-99-D-0032 MATERIAL RECEIVING REPORT					0 Sheet __1__ Of __1__ Date: Receiving Date
Item No.	Brief Description of Material Received	Legend	Shipping Document ID Number	Transportation / Supplier Name	Purchase Order Number
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					
36					
37					
38					
39					

TETRA TECH EC, INC.					
EQUIPMENT USAGE REPORT					DATE
EQUIPMENT		STATUS HOURS			Task Description
TYPE, MODEL NO.	ID NO. OR SERIAL NO.	IN USE	IDLE	REPAIR	(IF IN USE)

TETRA TECH EC, INC. **CONSTRUCTION QUALITY CONTROL REPORT**	Project: CTO No. 0096	**DATE:**	Page 1 of 2
	Contract: N62472-99-D-0032		
	Project: GM-38 Groundwater Remediation - Bethpage, NY		
Client: U.S. Navy, Engineering Field Activity Northeast	NAVFAC Spec: N/A		
Location: NWIRP - Bethpage, NY	Contract Task Order: 0096		
Subcontractor(s): See Daily Production Report	Visitors to Site: See Daily Production Report		
	MAX TEMP (^{o}F)	MIN TEMP (^{o}F)	

	FIELD INSPECTIONS PERFORMED:	Spec. Section	Paragraph	V	W	P
1						
2						
3						
4						
5						
6						
7						

DOCUMENTATION SUBMITTED

1
2
3

DOCUMENTATION RECEIVED

1
2
3
4

REWORK ITEMS IDENTIFIED TODAY	REWORK ITEMS CORRECTED TODAY	DATE IDENTIFIED
1	1	
2	2	
3	3	

V = Verified - Confirmed by evidence that function or requirements are true
W = Witnessed - Personal observation while task(s) or test(s) are performed
P = Personal performance of task(s) or function(s)

CQC REMARKS:

On behalf of the contractor, I certify that this report is complete and correct and equipment and material used and work performed during the reporting period is in compliance with the contract drawings and specifications to the best of my knowledge, except as noted in the report.

SIGNED: _____

GOVERNMENT QUALITY ASSURANCE REPORT;

REMARKS AND/OR EXCEPTIONS TO THIS REPORT:

TETRA TECH EC, INC.		Contract Task Order: 0096			DATE:		PAGE 2 OF 2
NUMBER	IDENTIFICATION OF FIELD INSPECTION	SPECIFICATION SECTION AND PARAGRAPH NO.			PHASE OF CONTROL		METHOD OF INSPECTION
1	0	SECTION:	0		PREPARATORY	0	VERIFIED
					INITIAL	0	WITNESSED
		PARAGRAPH:	0		FOLLOW UP	0	PERFORMED
DETAILS OF ACTIVITIES :							
2	0	SECTION:	0		PREPARATORY	0	VERIFIED
					INITIAL	0	WITNESSED
		PARAGRAPH:	0		FOLLOW UP	0	PERFORMED
DETAILS OF ACTIVITIES :							
3	0	SECTION:	0		PREPARATORY	0	VERIFIED
					INITIAL	0	WITNESSED
		PARAGRAPH:	0		FOLLOW UP	0	PERFORMED
DETAILS OF ACTIVITIES :							
4	0	SECTION:	0		PREPARATORY	0	VERIFIED
					INITIAL	0	WITNESSED
		PARAGRAPH:	0		FOLLOW UP	0	PERFORMED
DETAILS OF ACTIVITIES :							
5	0	SECTION:	0		PREPARATORY	0	VERIFIED
					INITIAL	0	WITNESSED
		PARAGRAPH:	0		FOLLOW UP	0	PERFORMED
DETAILS OF ACTIVITIES :							
6	0	SECTION:	0		PREPARATORY	0	VERIFIED
					INITIAL	0	WITNESSED
		PARAGRAPH:	0		FOLLOW UP	0	PERFORMED
DETAILS OF ACTIVITIES :							
7	0	SECTION:	0		PREPARATORY	0	VERIFIED
					INITIAL	0	WITNESSED
		PARAGRAPH:	0		FOLLOW UP	0	PERFORMED
DETAILS OF ACTIVITIES :							

TETRA TECH EC, INC.

RECORD OF QUALITY CONTROL MEETING/MINUTES

EFANE
Contract No. N62472-99-D-0032

Contract Task Order No. 0096
Project Title: GM-38 Area Groundwater Remediation

Meeting Date: _____ Meeting No.: _____

	MEETING AGENDA	☑
1.	Review Minutes of previous meeting.	
2.	Review Schedule and status of work.	
3.	Review status of submittals.	
4.	Review work to be accomplished in the next 2 weeks and documentation required.	
5.	Resolve QC and production problems.	
6.	Address items that may require revising the QC Plan	
7.		
8.		

ATTENDEES

	PRINT NAME	SIGNATURE	REPRESENTING	TITLE
1.			TtEC	Project Quality Control Manger
2.			TtEC	Project Superintendent
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				

	OLD BUSINESS & ACTION ITEMS	ACTION BY:

TETRA TECH EC, INC.
REQUEST FOR INFORMATION

TO: ROICC RFI: _____ DATE: _____

Contract: N62472-99-D-0032
CTO No. 0096

Attn: _____

FROM: _____
Project Engineer/PQCM

REFERENCES: _____
DRAWING: _____
SPEC SECTION: _____

Reply Needed By: _____

QUESTION (#1):

Name: _____

REPLY: Date: _____

This reply is given with the expressed understanding that it does not constitute the basis for a change to the price or time for the contract.

If you do not concur, DO NOT PROCEED, and notify the writer immediately.

Name: _____

Title: _____

TETRA TECH EC, INC.
Change Request Form

Section 1 through 4 to be filled out by Tetra Tech EC, Inc., Section 5 to be filled out by Navy

PROJECT: **EFANE CTO NO. 0096**	OFS No.:	Change Request Form: **CRF -** **Rev.**

To: _____ Dept.: _____ Location: _____ Date: _____

Re: ☐ Drawing No. _____ Title _____

☐ Spec. No. _____ Title _____

☐ Other _____

1. DESCRIPTION *(Items involved, submit sketch if applicable)*

2. REASONS FOR CHANGE *(If from disposition of nonconformance report, list report number)*

3. RECOMMENDED DISPOSITION

☐ Technical Clarification [NTR & COTR approval required]
☐ In Scope Adjustment [COTR approval required]
☐ Out of Scope [CO & COTR approval required]
☐ Cost Growth
☐ ROM Estimate (If Applicable) $
☐ Schedule Impact (describe below)

TtEC Initiator (Signature/Title):

4. TtEC Project Manager (Signature)	Date	Project Superintendent Concurrence (Signature)	Date

5. NAVY DISPOSITION

☐ Approved per recommended disposition
☐ Not approved (give reason)
☐ Approved with modification(s) [describe below]

NTR Concurrence *(signature)*	Date	ROICC Concurrence *(Signature)*	Date
Contracting Officer Technical Representative Approval *(Signature)*		Contracting Officer Approval *(Signature)*	Date

Engineer signs and transmits to Resident Engineer with copies to:

_____ Project Manager
_____ Project Superintendent
_____ Quality Control

Others as Required _____
File: _____

TETRA TECH EC, INC.
DESIGN CHANGE NOTIFICATION

PROJECT	PROJ. NO.	DESIGN CHANGE NO.

TO _____ DEPT. _____ LOCATION _____ DATE _____

RE: ☐ DRAWING NO. _____ TITLE _____

☐ SPEC NO. _____ PAGE _____

☐ OTHER. ANTICIPATED REVISION DATE OF FORMAL DOCUMENTS

☐ ENGINEERING "HOLD" PLACED ON CONSTRUCTION ACTIVITIES IN AREA DEFINED HEREIN PENDING RECEIPT OF FORMALLY REVISED DOCUMENT(S) AND/OR REVISED DCN, PE SIGNATURE NOT REQUIRED.

☐ RELEASED FOR CONSTRUCTION ON BASIS OF MODIFICATION(S) PRESCRIBED BY THIS DCN.

APPLICABLE DOCUMENTS WILL BE REVISED BY:

☐ HOME OFFICE ☐ SITE (Project Engineer to assign Open Engineering Item No.) _____

☐ AS-BUILT DRAWING BY RESIDENT ENGINEER'S STAFF ☐ OTHER _____

PROPOSED CHANGE

DESCRIPTION

_____

_____

_____

_____

_____

_____

REASON FOR CHANGE

☐ FIELD CHANGE REQUEST (FCR No.) _____

☐ REQUIRED MODIFICATIONS TO DESIGN OR SPECIFICATION

☐ DISPOSITION OF NONCONFORMING ITEM

☐ CHANGES IN REGULATORY OR OTHER REQUIREMENTS

☐ OPERATIONAL EXPERIENCE

☐ OTHER _____

EXHIBITS ATTACHED ☐ NO ☐ YES - IF YES, CHECK APPLICABLE BOX(ES)

☐ COPIES OF MARKED-UP AREA OF DRAWING(S)

☐ FIELD CHANGE REQUEST (FCR No. _____) ☐ OTHER (Describe) _____

COMMENTS SCHEDULED ERECTED/PLACEMENT DATE(S) _____

ORIGINATOR _____ DATE _____

DISTRIBUTION (*Check as applicable and fill in name. Indicate with an asterisk (*) personnel who are to perform a QA review.)*

☐ Project Manager _____	☐ Health and Safety _____	☐ Chemical _____
☐ Project Engineer _____	☐ Construction _____	☐ Regulatory _____
☐ Architectural _____	☐ Electrical _____	☐ Structural _____
☐ CAD _____	☐ Environmental _____	☐ Science (Specify) _____
☐ Building _____	☐ I&C _____	☐ PQAE _____
☐ Mechanical _____	☐ Security _____	☐ Project Supt _____
☐ Process _____	☐ Estimating _____	☐ Vendor Supt _____
☐ Civil _____	☐ Quality Assurance _____	☐ Site Manager _____

NOTE: Personnel indicated with an asterisk (*) are to perform a QA review and inform Originator of any comments, or approve and sign, as applicable, by _____ (date).

LEAD DISCIPLINE ENGINEER OR DESIGNEE (Signature)	DATE	PROJECT ENGINEER OR DESIGNEE (Signature)	DATE

QA REVIEWER (if indicated above) ☐ COMMENTS (Attached) ☐ NO COMMENTS		PROJECT MANAGER (After acceptance of all reviews)	
SIGNATURE	DATE	SIGNATURE	DATE

FIELD EVALUATION

☐ IMPLEMENT RECOMMENDED DISPOSITION ☐ DEFER RECOMMENDED DISPOSITION

_____ _____

RESIDENT ENGINEER (signature) DATE

Tetra Tech EC, Inc.
GM-38 Area, Bethpage, NY
CTO 0096
List of Definable Features of Work

Task 1 – Mobilization and Demobilization
- a. Mobilization
- b. Site Setup
- c. Office Facilities
- d. Demobilization

Task 2 – Site Work
- a. Equipment/Material Storage Area
- b. Erosion Control
- c. Clearing and Grubbing (including construction of Temporary Access Road)
- d. Construction of Permanent Access Road
- e. Pre-Design Cleanup (includes Landscaping, Tree Plantings, installation of fence along NYSDOT right-of-way)
- f. Surveying
- g. Building Perimeter Fencing
- h. Shoring to support and Excavation of Interior Building Sumps (2)

Task 3 – Treatment Plant Building Footings & Foundations
- a. Plant Concrete and Reinforcement
- b. Pre-Engineered Steel Building (75’ x 75’ x 25’)

Task 4 – Treatment Building Systems
- a. Building Utilities
- b. Building Fire and Security Systems

Task 5 – Extraction System
- a. Trench Excavation and Backfilling and Compaction
- b. Pipe and conduit from Treatment Bldg. to Recovery Wells (2)
- c. Pre-cast concrete vaults with Aluminum doors
- d. Submersible Well Pumps
- e. Carbon Steel Pipe in Well Vaults with Heat Trace
- f. Pipe and Pump Support Systems in Well Vaults
- g. Pre-cast well vaults for future expansion (2)

Task 6 – Injection System
- a. Install three (3) Additional Injection Wells each to a depth of 210 feet bgs
- b. Pre-cast concrete vaults with Aluminum doors (3)
- c. Trench Excavation and Backfilling and Compaction
- d. Pipe and conduit from Treatment Bldg. to Injection Wells (4)

Tetra Tech EC, Inc.
GM-38 Area, Bethpage, NY
CTO 0096
List of Definable Features of Work

Task 7 – Groundwater Treatment Equipment

a. 20,000 gallon Equilization Tank w/ Ladder & Mixer
b. Chemical Feed System
c. Erect Air Stripping Tower
d. Remove old Tower Packing and Replace with New
e. Particulate Filtration Unit with Filters
f. 20,000 lb Liquid-Phase Carbon Vessels (2)
g. 18,000 lb Vapor-Phase Carbon Vessels (3)
h. Centrifugal Process Pump/Sump Pumps
i. Air Compressor/Drier System
j. Air Steam Heaters

Task 8 – Electrical (including MCC)/Mechanical Construction

Task 9 – Process Control System

Task 10 – Site Grading/Restoration

Task 11 – System Startup and Shakedown

Task 12 – Prepare and Implement Operation, Maintenance and Monitoring (OM&M) Plan

a. Install 6 new groundwater monitoring wells
b. Well Vaults

Task 13 – Off-Site Transportation & Disposal

a. Cleared and Grubbed Material
b. General Trash/Construction Debris
c. Drill Cutting in Roll-off Boxes
d. Development/Purge Water in 21,000 gallon Frac Tanks (4)
e. Renew POTW Discharge Permit
f. Old Stripper Tower Packing

Tetra Tech EC, Inc.

PREPARATORY INSPECTION CHECKLIST

CONTRACT No: N62472-99-D-0032 CTO#0096 DATE: _____

TITLE: _____ SPEC SECTION: _____

MAJOR DEFINABLE SEGMENT OF WORK: _____

A. PERSONNEL PRESENT:

	NAME	POSITION	COMPANY
1.			
2.			
3.			
4.			
5.			
6.			

(List additional personnel on reverse side)

B. SUBMITTALS INVOLVED REVIEW - SPECIFICATIONS AND DRAWINGS:

	NUMBER & ITEM	COC APPROVAL	NAVY APPROVED
1.			
2.			
3.			
4.			
5.			
6.			

B.1 HAVE ALL ITEMS BEEN APPROVED? YES: _____ NO: _____

B.2 WHAT ITEMS HAVE NOT BEEN APPROVED?

	ITEM	STATUS
1.		
2.		
3.		
4.		
5.		

C. ARE ALL MATERIALS ON HAND? YES: _____ NO: _____

C.1 ARE ALL MATERIALS ON HAND IN ACCORDANCE WITH APPROVALS?
YES: _____ NO: _____

C.2 ITEMS NOT ON HAND OR NOT IN ACCORDANCE WITH SUBMITTALS:

1. _____
2. _____
3'. _____

D. TESTS REQUIRED IN ACCORDANCE WITH CONTRACT REQUIREMENTS:

	TEST	PARAGRAPH
1.		
2.		
3.		

E. ACCIDENT PREVENTION PREPLANNING - HAZARD CONTROL MEASURES:

E.1 WHAT ARE THE HAZARDS AND CONTROLS? (or attach activity hazard analysis)

1.
2.
3.
4.

F. EXAMINED THE WORK AREA TO ENSURE THAT THE REQUIRED PRELIMINARY WORK HAS BEEN COMPLETED. YES: _____ NO: _____

G. DISCUSSED THE PROCEDURES FOR CONTROLLING QUALITY OF THE WORK INCLUDING REPETITIVE DEFICIENCIES. YES: _____ NO: _____

H. DISCUSSION OF THE INITIAL CONTROL PHASE. YES: _____ NO: _____

_____
QUALITY CONTROL MANAGER

Tetra Tech EC, Inc.

INITIAL INSPECTION CHECKLIST

OBSERVE THE INITIAL SEGMENT OF THE DEFINABLE FEATURE OF WORK TO ENSURE THAT THE WORK COMPLIES WITH CONTRACT REQUIREMENTS.

CONTRACT No: N62472-99-D-0032 CTO.: 0096 DATE: _____

TITLE: _____ SPEC SECTION: _____

MAJOR DEFINABLE SEGMENT OF WORK: _____

DESCRIPTION AND LOCATION OF WORK INSPECTED: _____

_____

REFERENCE CONTRACT DRAWINGS: _____

A. PERSONNEL PRESENT:

	NAME	POSITION	COMPANY
1.			
2.			
3.			
4.			
5.			
6.			

(List additional personnel on reverse side)

B. MATERIALS BEING USED ARE IN STRICT COMPLIANCE WITH THE CONTRACT PLANS AND SPECIFICATIONS: YES: _____ NO: _____

IF NOT, EXPLAIN _____

_____

_____

C. PROCEDURES AND/OR WORK METHODS WITNESSED ARE IN STRICT COMPLIANCE WITH THE REQUIREMENTS OF THE CONTRACT SPECIFICATIONS:

YES: _____ NO: _____

IF NOT, EXPLAIN _____

_____

_____

D. WORKMANSHIP IS ACCEPTABLE: YES: _____ NO: _____

STATE AREAS WHERE IMPROVEMENT IS NEEDED: _____

_____

E. ENSURE THAT TESTING HAS BEEN PERFORMED BY APPROVED LABORATORY:

YES: _____ NO: _____

F. SAFETY VIOLATIONS AND CORRECTIVE ACTION TAKEN: _____

_____

REPEAT THE INITIAL PHASE FOR EACH NEW CREW TO WORK ON-SITE, OR WHEN ACCEPTABLE LEVELS OF SPECIFIED QUALITY ARE NOT MET.

_____

QUALITY CONTROL MANAGER

FINAL WASTE MANAGEMENT PLAN
FOR
CONSTRUCTION TASKS
GM-38 AREA GROUNDWATER REMEDIATION
AT
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BETHPAGE, NEW YORK

Issued:

MAY 8, 2006

Prepared for:

Engineering Field Activity, Northeast
Naval Facilities Engineering Command
10 Industrial Highway, Mail Stop #82
Lester, Pennsylvania 19113-2090

Remedial Action Contract No. N62472-99-D-0032
Contract Task Order No. 96

Prepared by:

Tetra Tech EC, Inc.
Bucks Town Corporate Campus
820 Town Center Drive, Suite 100
Langhorne, PA 19047-1748

Revision	Date	Prepared By	Approved By	Pages Affected
0	5/8/06	Joseph Gray	Stavros Patselas	All

TABLE OF CONTENTS

1.0 Introduction 1
1.1 Site Location and Description 1
1.2 Scope of Work 1
2.0 Waste Types 2
2.1 Well Purging and Development Water 2
2.2 Decontamination Water 2
2.3 Excess Cuttings and Drilling Mud 3
2.4 Personal Protective Equipment and Disposable Sampling Equipment 3
2.5 Cleared and Grubbed Material 3
2.6 General Construction Debris and Trash 3
2.7 Concrete and Asphalt 3
2.8 Spent Air Stripper Tower Packing 4
2.9 Recyclable Materials 4
2.9.1 Recycling Procedures 4
2.10 Contact Information 4
3.0 Procedures for Handling Contaminated Solids and Liquids 5
4.0 Off-Site Transportation 6
5.0 Off-Site Disposal 9
6.0 Recordkeeping 9
7.0 Hazardous Materials 10

LIST OF APPENDICES

APPENDIX A Drawing C-4 Groundwater Treatment Plant Piping and Utility Route Detail

APPENDIX B Drawing C-5 Groundwater Treatment Plant Piping and Utility Route Detail

ACRONYMS AND ABBREVIATIONS

bgs	below ground surface
CFR	Code of Federal Regulations
CTO	Contract Task Order
EFANE	Engineering Field Activity, Northeast
EHS	Environmental Health and Safety
GOCO	Government Owned Contractor Operated
lbs	pounds
n.o.s.	not otherwise specified
NGC	Northrop Grumman Corporation
NTR	Navy Technical Representative
NWIRP	Naval Weapons Industrial Reserve Plant
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
OSHA	Occupational Safety and Health Administration
PM	Project Manager
POTW	Publicly Owned Treatment Works
PPE	personal protective equipment
RAC	Remedial Action Contract
RCRA	Resource Conservation and Recovery Act
ROICC	Resident Officer in Charge of Construction
SHSP	Site-Specific Health and Safety Plan
TAGM	Technical and Administrative Guidance Memorandum
TCLP	Toxicity Characteristic Leaching Procedure
TDS	total dissolved solids
TSS	total suspended solids
TtEC	Tetra Tech EC, Inc.
ug/L	micrograms per liter
USDOT	United States Department of Transportation
USEPA	United States Environmental Protection Agency
VOCs	volatile organic compounds

1.0 INTRODUCTION

Tetra Tech EC, Inc. (TtEC) has been contracted by the United States Department of the Navy, Engineering Field Activity, Northeast (EFANE) to construct a pump and treat system for the GM-38 Area groundwater remediation at the Naval Weapons Industrial Reserve Plant (NWIRP) Bethpage, in Bethpage, New York. This Waste Management Plan has been prepared to satisfy the requirements of Remedial Action Contract (RAC) Number N62472-99-D-0032, Contract Task Order (CTO) Number 96.

1.1 Site Location and Description

NWIRP Bethpage is located in east central Nassau County, Long Island, New York, approximately 30 miles east of New York City. The Navy's property totaled approximately 109.5 acres and was formerly a Government Owned Contractor Operated (GOCO) facility that was operated by the Northrop Grumman Corporation (NGC) until September 1998. NWIRP Bethpage is bordered on the north, west, and south by property owned, or formerly owned, by NGC that covered approximately 605 acres, and, on the east, by a residential neighborhood.

The GM-38 Area refers to a cluster of monitoring wells that were installed in the 1990s by NGC and that first identified an isolated groundwater contaminant plume in this area. Chlorinated volatile organic compounds (VOCs) were identified in moderately deep groundwater (220 to 470 feet below ground surface [bgs]) at concentrations greater than 500 micrograms per liter (ug/L). The contaminated groundwater in the area represents a relatively large mass of chlorinated VOCs that would remain for extended periods and could adversely affect public water supplies in the area, as well as other downgradient water supplies. Two public water supply systems are present in the general area and extract groundwater at depths ranging from 540 to 740 feet bgs. Navy and contractor funded systems are in place at the public water supply wells to remove VOCs from the water prior to distribution.

The GM-38 Area is approximately 8,500 feet south southeast and hydraulically downgradient of NWIRP Bethpage. Specifically, the center of the project area is a utility easement that is located east of Broadway Avenue, west of the Seaford – Oyster Bay Expressway, and between the north and south dead ends of Windhorst and Herman Streets.

1.2 Scope of Work

The scope of work includes the following:

- Construction of a groundwater extraction system.
- Construction of a groundwater treatment plant.
- Construction of a groundwater re-injection system.
- Installation of all associated piping and utilities, including a new sanitary sewer main and new underground electric wiring.
- Construction of an access road and parking area.

2.0 WASTE TYPES

Waste materials that are determined to be non-hazardous will be managed in compliance with applicable New York solid waste regulations. If Resource Conservation and Recovery Act (RCRA) hazardous wastes are identified, they will be managed in accordance with New York State (NYS) Hazardous Waste Regulations. TtEC employees will have current RCRA Hazardous Waste (HW) and United States Department of Transportation (USDOT) Hazardous Material Transportation Training. Waste generation activities will be conducted under the worker protection provisions of regulations promulgated by the Occupational Safety and Health Administration (OSHA) in 29 Code of Federal Regulations (CFR) Parts 1910 and 1926.

Wastes generated from the site activities are expected to be non-hazardous and may include the following:

- Well purging and development water.
- Decontamination water.
- Excess cuttings and drilling mud.
- Personal protective equipment and disposable sampling equipment.
- Cleared and grubbed material.
- General construction debris and trash.
- Concrete and asphalt.
- Spent air stripper tower packing.

The following sections provide further detail on management of anticipated waste streams.

2.1 Well Purging and Development Water

Groundwater from well purging and development will be containerized prior to discharge to the Cedar Creek Water Pollution Control Plant of the County of Nassau – Department of Public Works. Waste characterization samples will be collected and analyzed for VOCs, total dissolved solids (TDS), total suspended solids (TSS), cadmium and chromium, in accordance with the County of Nassau Department of Public Works Wastewater Acceptance Limits. If the containerized groundwater meets the Wastewater Acceptance Limits, TtEC will proceed to discharge into designated sewer manholes at a flow rate not to exceed 200 gallons per minute. Groundwater will either be pre-treated prior to sewer discharge or shipped off-site for disposal if concentrations exceed the Wastewater Acceptance Limits. It is not anticipated that this water will need to be pre-treated. The Appendices contains drawings C-4 and C-5 that identify the location of the sewer manholes to be used as discharge points.

2.2 Decontamination Water

All decontamination liquids, including those generated from cleaning the air stripper tower, will be containerized in 55-gallon USDOT-approved drums. Waste characterization samples will be collected and analyzed for VOCs, TDS, TSS, and metals, in accordance with the County of Nassau Department of Public Works Wastewater Acceptance Limits. If the decontamination liquids meet the Wastewater Acceptance Limits, they will be discharged to the Publicly Owned

Treatment Works (POTW); otherwise, the liquids will be pre-treated prior to sewer discharge or will be shipped off-site for treatment and disposal.

2.3 Excess Cuttings and Drilling Mud

Excess soils cuttings and drilling mud will be initially drummed and then consolidated into roll-off containers. Composite samples will be collected from the roll-off containers and analyzed for VOCs in accordance with New York State Department of Environmental Conservation (NYSDEC) Technical and Administrative Guidance Memorandum (TAGM) 4046. The TAGM soil objectives set residential and commercial/industrial soil cleanup standards for soils and are used to determine if soils can be reused on-site or must be disposed off-site. If the analytical results meet the applicable soil cleanup objectives, the soil cuttings and drilling mud will be disposed of as non-hazardous waste at an approved a NYSDEC permitted RCRA Subtitle D solid waste landfill or temporarily stockpiled on-site for future use. With regulatory approval of concentrations that meet the applicable soil clean-up objective, these soils could be used in earthen berms to be constructed in the project area as visual barriers. Materials that do not meet the TAGM standard shall be transported to an approved disposal facility. All containers will be shipped using a Bill of Lading or non-hazardous waste manifest.

2.4 Personal Protective Equipment and Disposable Sampling Equipment

Used personal protective equipment (PPE) and disposable sampling equipment will be stored in USDOT-approved containers prior to off-site disposal. Since the cuttings and purge water are anticipated to be non-hazardous, PPE and sampling equipment contaminated with these materials are expected to be non-hazardous. These wastes will be regulated as non-hazardous wastes by NYSDEC and will be transported by a non-hazardous solid waste transporter to a NYSDEC permitted RCRA Subtitle D solid waste landfill. Wastes will be shipped using a Bill of Lading or non-hazardous waste manifest.

2.5 Cleared and Grubbed Material

Since surface soils and vegetation are not contaminated, cleared trees, bushes, and other vegetative matter will be loaded and transported off-site to be chipped and recycled at a NYSDEC licensed recycling facility.

2.6 General Construction Debris and Trash

Construction debris and trash are expected to be non-hazardous will be placed into roll-off containers for disposal as non-hazardous waste at an approved off-site facility.

2.7 Concrete and Asphalt

Concrete and asphalt from construction activities will be non-hazardous and will be placed into roll-off containers for off-site recycling or disposal as non-hazardous waste at an NYSDEC licensed recycling facility or NYS DEC permitted RCRA Subtitle D solid waste landfill.

2.8 Spent Air Stripper Tower Packing

Spent air stripper tower packing will be containerized USDOT-approved roll-off containers. Waste characterization samples will be collected and analyzed for toxicity characteristic leaching procedure (TCLP) metals and TCLP VOCs. Based on the analytical results, it is expected that the spent air stripper tower packing will be suitable for disposal at a permitted RCRA Subtitle D solid waste landfill; if not, it will be disposed of as hazardous waste at a RCRA Subtitle C landfill.

2.9 Recyclable Materials

The following uncontaminated recyclable materials may be generated during project activities and will be recycled if suitable recycling facilities are available:

- Metals.
- Paper and cardboard.
- Glass, metal, and plastic beverage containers.
- Mechanical and electrical products and equipment.

2.9.1 Recycling Procedures

The necessary containers and bins for recycling will be provided at the project site. They will be clearly and appropriately marked. Contamination of recyclable materials due to contact with incompatible products and materials will be prevented by good housekeeping practices.

Construction waste at the project site will be separated by one of the following methods:

- Source Separated Method: Recyclable waste products and materials are separated from trash and sorted into appropriately marked separate containers and then transported to the respective recycling facility for further processing. Trash will be transported to a permitted Subtitle D landfill.

- Co-Mingled Method: All construction waste is placed into a single container and then transported to a recycling facility, where the recyclable materials are sorted and processed and the remaining trash is transported to a landfill or incinerator.

- Other methods approved by the Contracting Officer.

As procurement activities progress, details regarding recycling methods, means of transporting recyclables, and destination will be provided prior to any off-site shipment of material.

2.10 Contact Information

As treatment, disposal, and recycling facilities are procured, names, addresses, and phone numbers of the facilities will be provided.

3.0 PROCEDURES FOR HANDLING CONTAMINATED SOLIDS AND LIQUIDS

Procedures for handling contaminated solids and liquids include, but are not limited to, the following:

- The contaminated area will remain isolated, and site access will be restricted to authorized TtEC employees, subcontractors, and authorized Navy employees. The Exclusion Zone will be barricaded with signs and caution tape. Entry to the Exclusion Zone will be restricted to one passageway and signage will be displayed.

- A majority of decontamination activities will be conducted within the NWIRP Bethpage property. During decontamination activities, contaminated solids and liquids will be collected in a manner intended to prevent contact with personnel. This will include the use of appropriate PPE. All on-site personnel will be informed of the known hazards and will be properly trained in safe handling procedures contained herein and in the Site-Specific Health and Safety Plan (SHSP).

- During collection of the contaminated solids, proper equipment and work procedures will be utilized to control the flow of material and to eliminate the potential for any of the material to reach an uncontaminated surface.

- Contaminated solid material will be collected in the appropriate sized containers (USDOT approved drums or roll-off boxes with liners) and immediately covered. Polyethylene sheeting will be used when necessary for spill protection while containers are being filled. Spill control materials will be on-site during all waste handling activities. All containers will be inspected prior to use. Containers will be placed in the waste staging area to await off-site disposal at an approved facility. Waste container exteriors will be inspected and any waste material adhering to the exterior of the waste container will be removed prior to off-site transportation. Containers will be labeled with non-hazardous waste labels. All waste containers will also be labeled with the waste description, the generation date and location, and a unique container identifier number using indelible markers or paints. All waste containers will be securely closed or tarped while being stored prior to off-site disposal.

- Solid wastes will be securely containerized to prevent release to the environment. They will be stored on-site for no more than ninety (90) days and will be inspected weekly to ensure that containers are sound and not leaking. Inspections will be documented on a TtEC Drum/Container Inspection Form and will be retained in the project file.

- Solid waste and liquids will be disposed according to the following procedures.

    - Manifests and Shipping Papers - TtEC will organize and maintain the material shipment records/manifests required by RCRA (Public Law 94-580), NYS, and the disposal facility. All manifests will be signed by the designated NWIRP Bethpage representative. Copies of all final completed manifests, including final waste quantities and disposition, will be submitted during the project to the

NWIRP representative, retained in the TtEC project file, and will be included in TtEC's Final Report submitted to the Navy.

- TtEC will coordinate the schedule for truck arrival and material deliveries at the disposal site to meet the approved schedule. The schedule will be compatible with the availability of equipment and personnel for material handling operations.

- Roll-off Containers (if required) - Lined and tarped, USDOT-approved roll-off containers will be provided by the selected transport or disposal facility and will be located in the lay down area. Roll-offs will be inspected before loading to verify that the liners are present and intact. Necessary steps for spill prevention and control of spills will be implemented during loading and containers will be labeled. Roll-offs will be labeled with non-hazardous waste labels.

- Drums - Solid waste that should be containerized will be placed in USDOT-specified, 1A2 55-gallon drums or similar USDOT-approved container. At least 6 to 12 inches of empty space will be allowed in each drum to facilitate the addition of absorbent, if necessary. Spill prevention and control steps will be taken and the containers will be labeled.

Once filled, drums will be stored on pallets under a shelter. The drums will be arranged in rows of two pallets with adequate space between rows. This arrangement allows access to any drum without rearranging drums. Drums will be arranged so the numbers on the sides are facing outward and are visible after staging. Drums will not be stacked on top of each other unless the contents are known to be non-explosive and non-flammable. If stacked, drum layers must be separated using pallets. Under no circumstances will drums be stacked more than two high.

4.0 OFF-SITE TRANSPORTATION

TtEC is responsible for all transportation of waste. TtEC will prepare all waste manifests and other shipping documents for the NWIRP representative's signature as generator. TtEC will not sign any waste manifests/shipping document or assume generator status for transportation purposes.

All waste materials destined for off-site disposal are expected to be non-hazardous and not meet the definition of a USDOT hazardous material; however, in the event hazardous materials are encountered, TtEC will follow the following requirements for waste and sample shipments. Hazardous materials will be assigned the proper hazard class, described, packaged, marked, labeled, and in condition for shipment as required by 49 CFR 171.

Waste that does not exhibit one of the nine USDOT hazard class characteristics (i.e., explosive, flammable, poison, combustible, etc.) is not regulated under USDOT rules for the transportation of hazardous material. If waste is suspected to be hazardous, then it will be shipped under the suspected hazard class. If a particular hazard class is unable to be determined, then the soil or water may be shipped under either of the following:

Shipping Name	Hazard Class	ID Number	Packing Group	Label
Environmentally hazardous substances, liquid, n.o.s.	9	UN3082	III	CLASS 9
Environmentally hazardous substances, solid, n.o.s.	9	UN3077	III	CLASS 9

When using either one of these "not otherwise specificed" (n.o.s.) shipping names, at least two technical names must follow (i.e., "Environmentally hazardous substances, liquid, n.o.s. [Benzene and Acetone]").

The shipping name, identification number, packing group, instructions, cautions, weights, United States Environmental Protection Agency (USEPA) waste code numbers and consignee/consignor designations will be marked on packages for shipment. Labeling provides information regarding the USDOT hazard class.

The label to be placed on the material will depend upon the results of sampling. Once the waste is characterized, reference should be made to the Hazardous Materials Table in 49 CFR 172.101 to determine the appropriate label. The package (or drum) will be marked and labeled as specified in 49 CFR 172.301.

The person offering hazardous material for shipment will offer placards, if the amount of hazardous material meets placarding threshold requirements (49 CFR 172.506). Any quantity of material listed in Table 1 of the regulations will be placarded. However, if there is less than 1,000 pounds (lbs) of a Table 2 material, no placard is required. A Class 9 placard is not required for domestic shipments. If a placard is required, the label referenced above will be affixed on each side and each end of the vehicle(s).

Hazardous material shipping papers will have the following description of the hazardous material, in the following order:

- Proper shipping name.
- Hazard class or division.
- Identification number.
- Packaging group.
- Total quantity (must appear either before or after the above information).
- Technical and chemical group names may be entered in parentheses between the proper shipping name and hazard class or following the basic description (e.g., "Flammable liquids, n.o.s. [contains xylene and benzene], 3 UN1993, PG II").

Other required information includes:

- USEPA identification number (on manifests).
- Emergency Response Guidebook numbers.
- Twenty-four hour emergency response number, supplied by the generator and answered by a knowledgeable person.
- Signatures.

- Shipper's certification.

Although the site wastes are anticipated to be non-hazardous, if they are determined to be hazardous, a USDOT Hazardous Materials Security Plan may be required. A USDOT Hazardous Material Security Plan is required and will be prepared for any shipments of high hazard materials (i.e. USDOT Class 1 explosives, Class 2.3 Poison inhalation hazards, Class 7 Radioactive materials) or any placarded quantity of Class 3 Flammable Liquids or Class 9 materials. If these materials are encountered, the Project Manager (PM) will contact the TtEC Regulatory Specialist to prepare a USDOT Hazardous Materials Security Plan.

All TtEC and subcontractor personnel involved in USDOT Hazardous Material Shipment activities will have been trained in accordance with USDOT Hazardous Material Regulations. All waste transporters and disposal/recycling facilities will be reviewed and approved by TtEC prior to disposal in accordance with TtEC Environmental Health and Safety (EHS) Procedure 1-4 - *Subcontractor Selection and Management.*

Additional procedures for transportation include, but are not limited to, the following:

- TtEC will utilize fully licensed, permitted, appropriate vehicles and operating practices to prevent spillage or leakage of contaminated material from occurring en-route.

- TtEC will not deliver waste to any facility other than the disposal facility(s) listed on the shipping manifest/bill of lading.

- TtEC will coordinate vehicle inspection, manifest review, and recording of quantities leaving the site with the Navy. These quantities will be verified with recorded quantities at the disposal facility(s). If any deviation between the two weight records occurs, the matter will be reported in a timely manner to the Resident Officer in Charge of Construction (ROICC) and Navy Technical Representative (NTR).

- TtEC will use an approved designated transport route to haul waste off-site. This route will be determined based on facility requirements.

- TtEC will ensure that trucks are protected against contamination by properly covering and lining them with compatible material or by decontaminating them prior to any use other than hauling contaminated materials.

- Liquid-containing drums, if generated, will be sealed by TtEC or its subcontractor in a manner such that tampering with the contents cannot occur without breaking the seal.

- The designated NWIRP representative will sign the manifest as the generator. Copies of all final completed manifests will be submitted to the NWIRP Bethpage representative within one week after removal of waste from the site. The Navy will review waste profiles before wastes are shipped off-site.

5.0 OFF-SITE DISPOSAL

Procedures for off-site disposal include, but are not limited to, the following:

- TtEC will use only approved treatment, disposal, and/or recycling facilities. All facilities and transporters will be approved prior to use in accordance with TtEC EHS Procedure 1-4 *Subcontractor Selection and Management*). Substitutions or additions will not be permitted without prior written approval from the Navy.

- TtEC will ensure that the facility is properly permitted to accept the stated material and that the facility provides the stated treatment and/or disposal services.

6.0 RECORDKEEPING

TtEC will obtain manifest forms and complete the shipment manifest records as required by the appropriate regulatory agencies for verifying the material type (Code No.) and quantity of each load in unit of volume and weight. Copies of each manifest will be submitted to the Navy within one week following shipment, and as soon as possible after notification of receipt of the disposal facility. Copies of the manifests and all waste documentation will be retained in the TtEC project file and will be returned to the client with the project closeout report. Any manifest discrepancies will be reported immediately to the Navy ROICC and NTR, and will be resolved by TtEC.

TtEC will maintain a Drum/Container Log for all wastes generated. The log will contain the date and location where the waste was generated, the waste name, the waste classification, the sampling date (if applicable), shipment date, and manifest/bill of lading number. A Daily Shipment Log that documents each day's off-site waste shipments will be maintained. Both logs will be retained in the project file.

TtEC will maintain in the project file copies of all waste documentation including drum/container inventory and inspection forms, waste characterization analyses and waste determinations, waste profile sheets and waste manifests/shipping papers for all waste shipments. TtEC will maintain a tickler file on the project site for all waste manifests. Copies of the outgoing manifests will be maintained in the project file, which will be checked weekly. TtEC will review final manifest copies returned from the disposal facility and match them with the initial copies. Both copies will be retained in the project file. If the returned manifest copy has not been received within 30 days after the shipment date, TtEC will contact the disposal facility to obtain the copy. If the manifest copy is not received within 45 days after the shipment date, TtEC will contact the Navy and will prepare a Manifest Discrepancy letter, which will be signed by the Navy and sent to the USEPA Region II Regional Administrator.

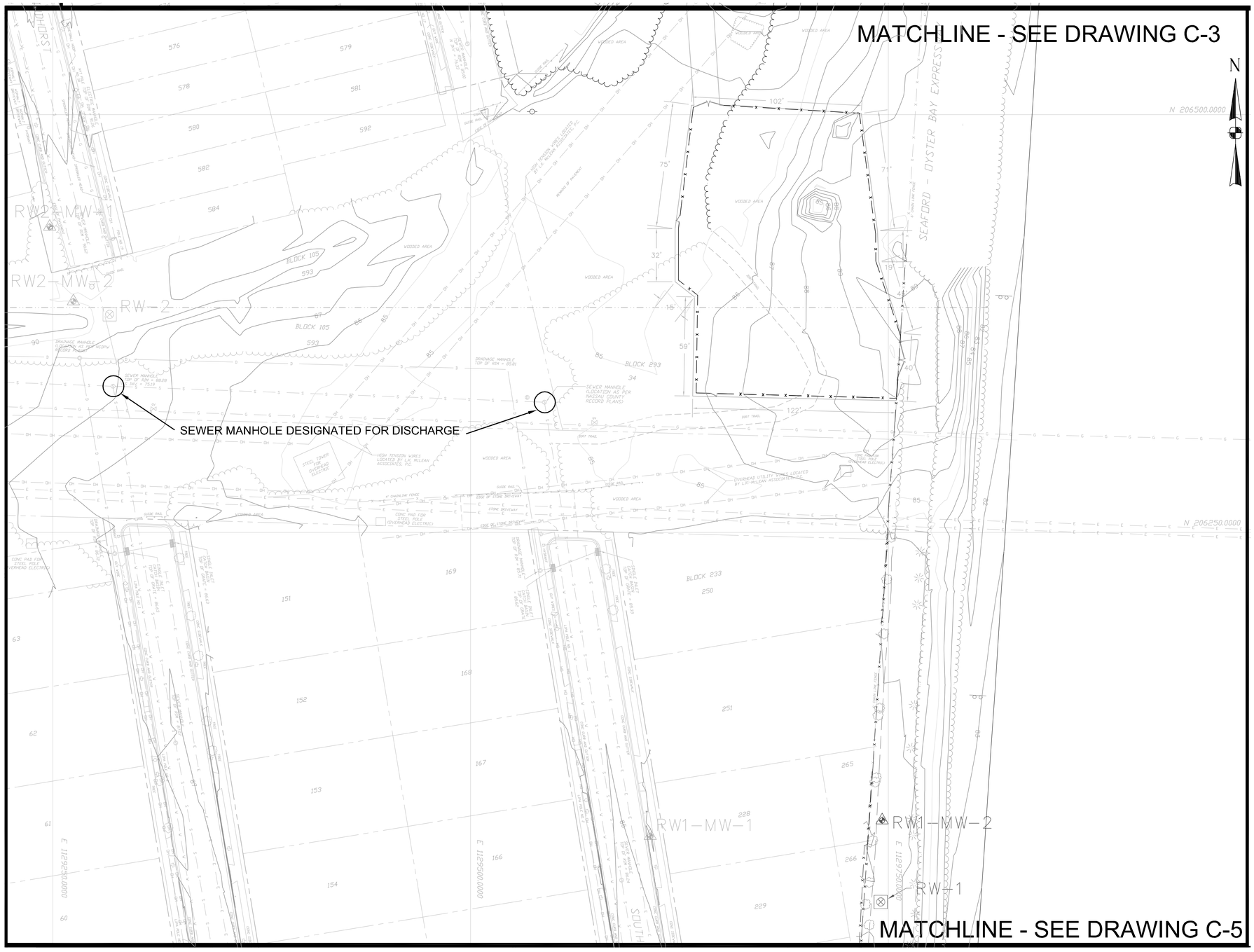
Waste drum/container storage areas will be inspected weekly, and will be documented either in the project notebooks or on a TtEC Drum/Container Inspection Sheet. Deficiencies will be corrected immediately.

7.0 HAZARDOUS MATERIALS

Hazardous materials are not expected to be encountered or generated during this project. However, if hazardous materials are encountered, TtEC will notify the Contracting Officer and ROICC. In the unlikely event that hazardous waste is generated, it will be stored, handled, transported, and disposed in accordance with federal, state, and local regulations.

Appendix A

Drawing C-4 – Groundwater Treatment Plant Piping and Utility Route Detail



NOTES:

1. SEE NOTES ON DRAWING C-2.
2. FOR CONCRETE PULL BOX SEE DETAIL 1 ON DRAWING E-4.
3. FOR RECOVERY WELL CONSTRUCTION DETAILS, SEE DETAIL 1 ON DRAWING C-10.
4. FOR LEAK DETECTION ACCESS PORT DETAILS, SEE DETAIL 5 ON DRAWING C-10.

REFERENCE:

L. K. McLEAN ASSOCIATES, P.C.
437 SO. COUNTRY ROAD, BROOKHAVEN, NY
TOPOGRAPHIC SURVEY, NAVAL WEAPONS INDUSTRIAL RESERVE PLANT, GM-38 AREA, FILE # 04033.000
AUGUST 2, 2004

LEGEND:

	= EXISTING GRADE-MAJOR CONTOUR
	= EXISTING GRADE-MINOR CONTOUR
	= PROPOSED GRADE
	= TAX LOT LINE
OH OH OH	= OVERHEAD ELECTRIC WIRES
E E E	= UNDERGROUND ELECTRIC WIRES
W W W	= WATER MAIN
G G G	= GAS MAIN
D D D	= DRAINAGE LINES (STORM SEWER)
S S S	= SANITARY SEWER MAIN
	= WOODED AREA
x x x	= CHAIN-LINK OR BOARD FENCE
	= DIRT TRAIL
	= LIMITS OF CLEARING
	= SILT FENCE
	= NEW UNDERGROUND ELECTRIC WIRES
	= NEW WATER LINE
	= NEW SANITARY SEWER MAIN
	= HDPE PIPE AND ELECTRICAL CONDUIT
242	= TAX LOT NUMBER
	= WATER VALVE
	= GAS VALVE
RW1-MW-1	= MONITORING WELL
RW-1	= RECOVERY WELL
	= INJECTION WELL
PB	= PULL BOX
	= LEAK DETECTION ACCESS PORT
	= EXISTING DECIDUOUS TREE
	= EXISTING CONIFEROUS TREE
	= WHITE PINE TREE LOCATION
	= SIGN
	= MANHOLE
	= GRAVEL
	= TEMPORARY ACCESS ROAD
6916	= PUBLIC WATER SUPPLY WELL

GRAPHIC SCALE

30 0 15 30 60 120

SCALE: 1 INCH = 30 FEET

THIS DRAWING PRODUCED ON AUTOCAD
DO NOT REVISE MANUALLY

"THIS DOCUMENT IS THE PROPERTY OF NAVAL FACILITIES ENGINEERING COMMAND, PREPARED BY TETRA TECH EC, INC., AND IS PROVIDED UPON THE CONDITION THAT IT WILL NOT BE REPRODUCED, COPIED, OR ISSUED TO A THIRD PARTY, AND WILL BE USED SOLEY FOR THE ORGINAL INTENDED PURPOSE AND SOLEY FOR THE EXECUTION OR REVIEW OF THE ENGINEERING CONSTRUCTION OF THE PROJECT".

IT IS A VIOLATION OF THE NEW YORK STATE EDUCATION LAW, ARTICLE 145, FOR ANY PERSON, UNLESS UNDER THE DIRECTION OF A NEW YORK STATE LICENSED PROFESSIONAL ENGINEER, TO ALTER AN ITEM ON THIS DOCUMENT IN any WAY.

TETRA TECH EC, INC.

	REV	DESCRIPTION	PREP. BY	DATE	APPRVD
DSGN:					
DR:					
CHK:					
CH ENG:					
SUBMITTED BY:					
(TtNA MEMBER)					
(TITLE)					
(DATE)					
NORTHDIV					
DM:					
PIC:					
OFFICER IN CHARGE					

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
LESTER, PENNSYLVANIA
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE, NEW YORK

ENGINEERING FIELD ACTIVITY - NORTHEAST

GM-38 AREA
GROUNDWATER TREATMENT PLANT
PIPING AND UTILITY ROUTE DETAIL (SHEET 2 OF 3)

APPROVED DATE
EFANE FOR COMMANDER, NAVFAC

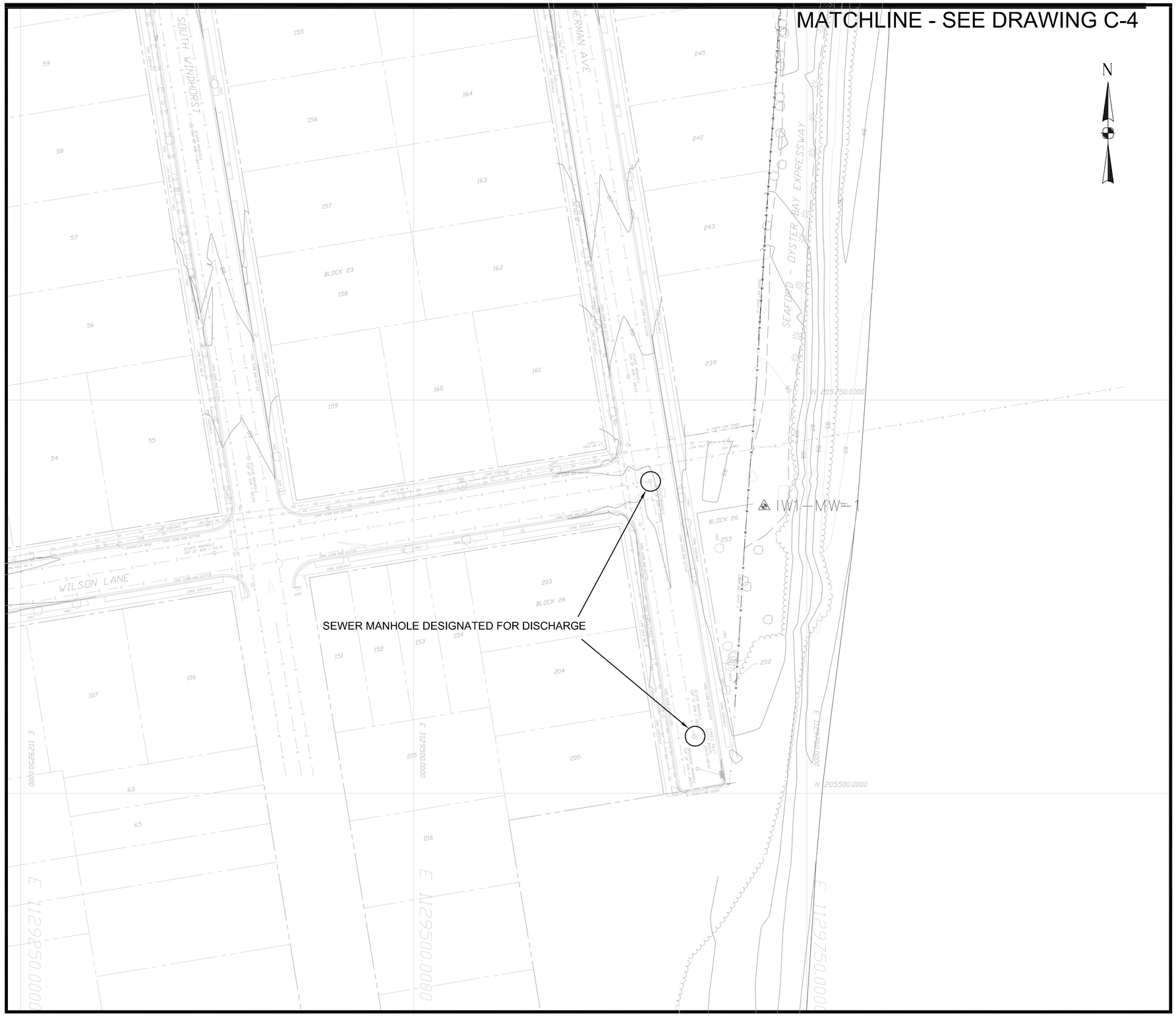
SEAL AREA

SAT TO	DATE
CODE I.D. NO.	80091
SCALE : AS SHOWN	
SPEC. NO.	
CONSTRN. CONTR. NO.	N62472-99-D-0032
NAVFAC DRAWING NO.	
SHEET	OF
SIZE: D	DIS. SH. NO. WMP-4

P:\Bethpage\CAD - GIS\Waste Management Plan\WMP-4_5.dwg, 5/4/2006 3:28:09 PM

Appendix B

Drawing C-5 – Groundwater Treatment Plant Piping and Utility Route Detail



NOTES:

1. SEE NOTES ON DRAWING C-2.
2. FOR INJECTION WELLHEAD VAULT CONSTRUCTION DETAILS, SEE DETAIL 2 ON DRAWING C-10.
3. INJECTION WELL IW-1 IS CURRENTLY EXISTING. INJECTION WELLS NOS. 2 THROUGH 4 ARE TO BE INSTALLED DURING CONSTRUCTION PHASE. LOCATIONS OF THE INJECTION WELLS (3) TO BE INSTALLED ARE APPROXIMATE AND MAY BE ADJUSTED BASED ON REQUIREMENTS OF PROPERTY OWNERS (NYS DOT).

REFERENCE:

L. K. McLEAN ASSOCIATES, P.C.
437 SO. COUNTRY ROAD, BROOKHAVEN, NY
TOPOGRAPHIC SURVEY, NAVAL WEAPONS INDUSTRIAL RESERVE PLANT,
GM-38 AREA, FILE # 04033.000
AUGUST 2, 2004

LEGEND:

	= EXISTING GRADE-MAJOR CONTOUR
	= EXISTING GRADE-MINOR CONTOUR
	= PROPOSED GRADE
	= TAX LOT LINE
OH	= OVERHEAD ELECTRIC WIRES
E	= UNDERGROUND ELECTRIC WIRES
W	= WATER MAIN
G	= GAS MAIN
D	= DRAINAGE LINES (STORM SEWER)
S	= SANITARY SEWER MAIN
	= WOODED AREA
x	= CHAIN-LINK OR BOARD FENCE
	= DIRT TRAIL
	= LIMITS OF CLEARING
	= SILT FENCE
	= NEW UNDERGROUND ELECTRIC WIRES
	= NEW WATER LINE
	= NEW SANITARY SEWER MAIN
	= HDPE PIPE AND ELECTRICAL CONDUIT
242	= TAX LOT NUMBER
	= WATER VALVE
GV	= GAS VALVE
RW1-MW-1	= MONITORING WELL
RW-1	= RECOVERY WELL
	= INJECTION WELL
PB	= PULL BOX
	= LEAK DETECTION ACCESS PORT
	= EXISTING DECIDUOUS TREE
	= EXISTING CONIFEROUS TREE
	= WHITE PINE TREE LOCATION
	= SIGN
	= MANHOLE
	= GRAVEL
+ +	= TEMPORARY ACCESS ROAD
6916	= PUBLIC WATER SUPPLY WELL

GRAPHIC SCALE

30 0 15 30 60 120

SCALE: 1 INCH = 30 FEET

THIS DRAWING PRODUCED ON AUTOCAD DO NOT REVISE MANUALLY

"THIS DOCUMENT IS THE PROPERTY OF NAVAL FACILITIES ENGINEERING COMMAND, PREPARED BY TETRA TECH EC, INC., AND IS PROVIDED UPON THE CONDITION THAT IT WILL NOT BE REPRODUCED, COPIED, OR ISSUED TO A THIRD PARTY, AND WILL BE USED SOLEY FOR THE ORIGINAL INTENDED PURPOSE AND SOLEY FOR THE EXECUTION OR REVIEW OF THE ENGINEERING CONSTRUCTION OF THE PROJECT".

IT IS A VIOLATION OF THE NEW YORK STATE EDUCATION LAW, ARTICLE 145, FOR ANY PERSON, UNLESS UNDER THE DIRECTION OF A NEW YORK STATE LICENSED PROFESSIONAL ENGINEER, TO ALTER AN ITEM ON THIS DOCUMENT IN ANY WAY.

TETRA TECH EC, INC.

DSGN: DR: CHK:
SUPV: CH ENG:
SUBMITTED BY: (FIRM NUMBER) (TITLE) (DATE)
NORTHDIV DM: HD: HD: FPE: DIR:
OFFICER IN CHARGE
APPROVED DATE

REV	DESCRIPTION	PREP BY	DATE	APPRVD

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
LESTER PENNSYLVANIA
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE, NEW YORK

ENGINEERING FIELD ACTIVITY - NORTHEAST

GM-38 AREA
GROUNDWATER TREATMENT PLANT
PIPING AND UTILITY ROUTE DETAIL (SHEET 3 OF 3)

APPROVED DATE EFANE FOR COMMANDER, NAVFAC

SEAL AREA

SAT TO DATE
CODE I.D. NO. 80091
SCALE : AS SHOWN
SPEC. NO.
CONSTRN. CONTR. NO. N62472-99-D-0032
NAVFAC DRAWING NO.
SHEET OF
SIZE: D DIS. SH. NO. WMP-5

P:\Bethpage\CAD - GIS\Waste Management Plan\WMP-4_5.dwg, 5/4/2006 3:35:30 PM