Crosman Corporation Site

ONTARIO COUNTY

EAST BLOOMFIELD, NEW YORK

SITE MANAGEMENT PLAN

NYSDEC Site Number: 835012

Prepared for:

Crosman Corporation

and

New Coleman Holdings, Inc.

Prepared by:

Arcadis

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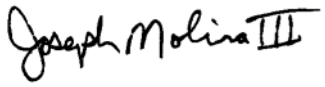
Revisions to Final Approved Site Management Plan:

Revision No.	Date Submitted	Summary of Revision	NYSDEC Approval Date

APRIL 2021

CERTIFICATION STATEMENT

I, JOSEPH MOLINA, certify that I am currently a New York State-registered professional engineer and that this Site Management Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).



JOSEPH MOLINA III, P.E.

_APRIL 13, 2021_DATE

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Crosman Corporation Site

ONTARIO COUNTY

EAST BLOOMFIELD, NEW YORK

SITE MANAGEMENT PLAN

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List of Acronyms

Arcadis	Arcadis of New York, Inc.
AST	aboveground storage tank
BBL	Blasland, Bouck & Lee, Inc.
bgs	below ground surface
cm/s	centimeters per second
DAR	Division of Air Resources
DER	Division of Environmental Remediation
EC	Engineering Control
EWP	Excavation Work Plan
GAC	granular-activated carbon
gpm	gallons per minute
HASP	Health and Safety Plan
IC	Institutional Control
LaBella	LaBella Associates, P.C.
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYCRR	New York Codes, Rules and Regulations
NYS	New York State
PRR	Periodic Review Report
PSA	Preliminary Site Assessment
RAO	remedial action objective
RI	Remedial Investigation
ROD	Record of Decision
ROI	radius of influence
RSO	Remedial System Optimization
SCG	Standards, Criteria and Guidance
SCO	Soil Cleanup Objective
Site	Crosman Corporation Site located in East Bloomfield, New York
SMP	Site Management Plan
SPDES	State Pollutant Discharge Elimination System
SSDS	sub-slab depressurization system
SVE	soil vapor extraction
TCE	trichloroethene
µg/kg	microgram per kilogram
$\mu g/m^3$	microgram per cubic meter
VI	vapor intrusion
VOC	volatile organic compound

ES EXECUTIVE SUMMARY

The following provides a brief summary of the controls implemented for the Site, as well as the inspections, monitoring, maintenance, and reporting activities required by this Site Management Plan:

Site Identification: Site ID# 835012
Crosman Corporation Site
7629 Routes 5 and 20
East Bloomfield, New York

Institutional Controls:	1. The property may be used for commercial and industrial use.
	2. A deed restriction has been placed on the property as an Institutional Control.
	3. Inspection of all Engineering Controls for the property is performed on a monthly or annual basis, as identified in this SMP.
Engineering Controls:	1. Sub-slab depressurization system (SSDS).
	2. Cover system of a concrete floor over the remaining soil contamination found on the west side of building, as illustrated in Table 3 and on Figure 7.
	3. Operation of production well PW-1 if its usage for manufacturing by Crosman is ever decreased to the extent that groundwater monitoring indicates that the TCE plume will no longer be contained on-site.

Inspections:	Frequency
1. SSDS inspection	Monthly
2. Site-wide inspection	Annually
Monitoring:	
1. SSDS Influent and Effluent	Monthly

Site Identification: Site ID# 835012
Crosman Corporation Site
7629 Routes 5 and 20
East Bloomfield, New York

2. Production Well PW-1 and Groundwater Monitoring Wells MW-4, MW-5, MW-13, MW-14, and MW-15	Semi-Annually unless and until NYSDEC approves switching to Annually
3. Groundwater Monitoring Wells MW-3A, MW-17, MW-18, MW-19, and MW-20	Annually
Maintenance:	
1. SSDS maintenance	As needed
2. If ever insufficiently used for manufacturing purposes to maintain control of the plume, then PW-1 maintenance	As needed
Reporting:	
1. SSDS Status Report	Annually in the PRR
2. Production Well PW-1 and Groundwater Monitoring Wells MW-4, MW-5, MW-13, MW-14, and MW-15	Semi-Annually unless and until NYSDEC approves switching to Annually
3. Groundwater Monitoring Wells MW-3A, MW-17, MW-18, MW-19, and MW-20	Annually in the PRR
4. Periodic Review Report (PRR)	Annually

Further descriptions of the above requirements are provided in detail in the latter sections of this Site Management Plan.

1.0 INTRODUCTION

1.1 General

This Site Management Plan (SMP) is a required element of the remedial program for the Crosman Corporation Site located in East Bloomfield, New York (hereinafter referred to as the "Site"; see Figure 1). The Site is currently in the New York State (NYS) Inactive Hazardous Waste Disposal Site Remedial Program, Site No. 835012, which is administered by the New York State Department of Environmental Conservation (NYSDEC).

The Crosman Corporation and New Coleman Holdings, Inc. entered into two Orders on Consent on September 23, 1993 and March 25, 1998 with the NYSDEC to remediate the Site. A figure showing the site location and boundaries of this Site is provided on Figure 2. The boundaries of the Site are more fully described in the metes and bounds site description that is part of the Deed Restriction provided in Appendix A.

After completion of the remedial work, some contamination was left at this Site, which is hereafter referred to as "remaining contamination". Institutional and Engineering Controls (ICs and ECs) have been incorporated into the site remedy to control exposure to remaining contamination to ensure protection of public health and the environment. A Deed Restriction, which has been recorded with the Ontario County Clerk, requires compliance with this SMP and all ECs and ICs placed on the Site.

This SMP was prepared to manage remaining contamination at the Site until the Deed Restriction is extinguished with the approval of the NYSDEC. This plan has been approved by the NYSDEC, and compliance with this plan is required by the grantor of the Deed Restriction and the grantor's successors and assigns. This SMP may only be revised with the approval of the NYSDEC.

It is important to note that:

- This SMP details the site-specific implementation procedures that are required by the Deed Restriction. Failure to properly implement the SMP is a violation of the Deed Restriction, which is grounds for revocation of the Certificate of Completion; and

- Failure to comply with this SMP is also a violation of Environmental Conservation Law, 6 New York Codes, Rules, and Regulations (NYCRR) Part 375 and the 1998 Order on Consent (Index #B8-0404-92-04; Site #835012) for the Site, and thereby subject to applicable penalties.

All reports associated with the Site can be viewed by contacting the NYSDEC or its successor agency managing environmental issues in NYS. A list of contacts for persons involved with the Site is provided in Appendix B of this SMP.

This SMP was prepared by Arcadis of New York, Inc. (Arcadis), on behalf of Crosman Corporation and New Coleman Holdings, Inc. (collectively, "Crosman"), in accordance with the requirements of the NYSDEC's Division of Environmental Remediation (DER-10) ("Technical Guidance for Site Investigation and Remediation"), dated May 2010, and the guidelines provided by the NYSDEC. This SMP addresses the means for implementing the ICs and/or ECs that are required by the Deed Restriction for the Site.

1.2 Revisions

Revisions to this plan will be proposed in writing to the NYSDEC's project manager. Revisions will be necessary upon, but not limited to, the following occurring: a change in media monitoring requirements, upgrades to or shut-down of a remedial system, post-remedial removal of contaminated sediment or soil, or other significant change to the site conditions. In accordance with the Deed Restriction for the Site, the NYSDEC will provide a notice of any approved changes to the SMP, and append these notices to the SMP that is retained in its files.

1.3 Notifications

Notifications will be submitted by the property owner to the NYSDEC, as needed, in accordance with NYSDEC's DER-10 for the following reasons:

- 60-day advance notice of any proposed changes in site use that are required under the terms of the Orders on Consent, 6 NYCRR Part 375, and/or Environmental Conservation Law.
- 7-day advance notice of any field activity associated with the remedial program.
- 15-day advance notice of any proposed ground-intrusive activity pursuant to the Excavation Work Plan (EWP).
- Notice within 48 hours of any damage or defect to the foundation, structures or EC that reduces or has the potential to reduce the effectiveness of an EC, and likewise, any action to be taken to mitigate the damage or defect.

- Verbal notice by noon of the following day of any emergency, such as a fire; flood; or earthquake that reduces or has the potential to reduce the effectiveness of ECs in place at the Site, with written confirmation within 7 days that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public.

- Follow-up status reports on actions taken to respond to any emergency event requiring ongoing responsive action submitted to the NYSDEC within 45 days describing and documenting actions taken to restore the effectiveness of the ECs.

Any change in the ownership of the Site or the responsibility for implementing this SMP will include the following notifications:

- At least 60 days prior to the change, the NYSDEC will be notified in writing of the proposed change. This will include a certification that the prospective purchaser/Remedial Party has been provided with a copy of the Orders on Consent, and all approved work plans and reports, including this SMP.

- Within 15 days after the transfer of all or part of the Site, the new owner's name, contact representative, and contact information will be confirmed in writing to the NYSDEC.

Table 1 below includes contact information for the above notification. The information in this table will be updated as necessary to provide accurate contact information. A full listing of site-related contact information is provided in Appendix B.

Table 1: Notifications*

Name	**Contact Information**
Todd M. Caffoe, P.E. NYSDEC Project Manager	(585) 226-5350 todd.caffoe@dec.ny.gov
David G. Pratt, P.E. NYSDEC Regional HW Engineer	(585) 226-5355 david.pratt@dec.ny.gov
Kelly Lewandowski NYSDEC Site Control	(518) 402-9553 kelly.lewandowski@dec.ny.gov
Anthony Perretta NYSDOH	(518) 402-7860 anthony.perretta@health.ny.gov

* Note: Notifications are subject to change and will be updated as necessary.

2.0 SUMMARY OF PREVIOUS INVESTIGATIONS AND REMEDIAL ACTIONS

2.1 Site Location and Description

The Site is located in East Bloomfield, Ontario County, New York and is identified as Section 80.00 Block 1 and Lot 4.000 on the Town of East Bloomfield Tax Map (see Figure 2). The Site is an approximately 49.7-acre area and is bounded by NYS Routes 5 and 20 to the north, agricultural land to the south, undeveloped land to the east, and agricultural land to the west (see Figures 1 and 2). The boundaries of the Site are more fully described in Appendix A – Deed Restriction. The owner(s) of the Site parcel(s) at the time of issuance of this SMP is Crosman Corporation.

2.2 Physical Setting

2.2.1 Land Use

The Site consists of the following: a 219,000-square-foot manufacturing building, parking areas, non-contact cooling water retention pond, and grassy areas. The Site is zoned General Industrial and is currently utilized for manufacturing purposes. Crosman Corporation is the only current site occupant.

The properties adjoining the Site and in the neighborhood surrounding the Site include a mix of residential, industrial, and agricultural properties. The properties immediately south of the Site include undeveloped land and agricultural properties; the properties immediately north of the Site include residential, including multiple residence properties; the properties immediately east of the Site include industrial properties; and the properties west of the Site include agricultural properties.

2.2.2 Geology

Figures 3 through 5 provide geologic cross sections for the Site. As shown on cross section A-A' (Figure 4), the overburden on the Site consists of interbedded sand, gravel, silt, and clay layers, which are underlain by glacial till. The thickness of the interbedded interval ranges from 30 feet at the north side of the Site to 90 feet at the south side. The distribution of the sand, gravel, silt, and clay of the interbedded interval varies significantly across the Site. However, overall, the predominant grain size of subsurface material on the south side of the Site is fine sand and silt. There is, nevertheless, a shallow layer of dense

glacial till on the southwest side of the Site that was encountered during the implementation of the *West Side Soil Boring Investigation Work Plan* (Arcadis 2014). At the north side of the Site, sand and gravel are predominant, with thick sandy clay zones present in the middle of the Site.

The composition, grain size, and distribution of the various materials comprising the interbedded interval indicate that these materials are glacial outwash and lacustrine deposits. The sand and gravel at the north side of the Site is interpreted to be a glacial outwash deposit, which is highly transmissive, based on the yield from production well PW-1.

The glacial till that underlies the interbedded interval ranges in thickness to approximately 120 feet and is composed of silt, very fine sand, and clay.

Based on data collected from monitoring well MW-11 and a test boring drilled by Crosman Corporation near production well PW-1, bedrock underlying the till is black shale of the Skaneateles or Ludlowville Formations.

Site-specific boring logs are provided in Appendix C.

2.2.3 Hydrogeology

Data collected from monitoring wells at the Site indicate hydraulic conductivities ranging from 2.3×10^{-5} to 5.3×10^{-3} centimeters per second (cm/s), with a geometric mean of 2.57×10^{-4} cm/s. This mean is representative of a moderate capability of transmitting groundwater. The range of values (two orders of magnitude) is indicative of the heterogeneous material in which the monitoring wells are screened. The hydraulic conductivities do not indicate any directional increase or decrease across the Site. However, an evaluation of the hydraulic conductivities for monitoring wells aligned south to north in the center of the Site (MW-2A, MW-4, MW-8, MW-9, MW-10, MW-12, and MW-13) indicates a geometric mean hydraulic conductivity of 1.0×10^{-3} cm/s, suggesting a potentially higher rate of groundwater flow at and directly downgradient of the former east side source area.

The glacial till underlying the Site and present at shallow depths on the southwest side of the facility is interpreted to have a low hydraulic conductivity due to its composition of fine-grained material (clay, silt, and very fine sand).

Table 2 summarizes groundwater elevation data obtained from monitoring wells across the Site over the course of the groundwater monitoring program. Groundwater elevations are highest in the southern portion of the Site and lowest in the north. A groundwater elevation contour map generated from a round of water-level measurements collected in October 2017 is provided as Figure 6. Figure 6 shows a groundwater elevation of 970.4 feet near the former source area (southeastern side of the Site) and 958 feet near production well PW-1 (northern side of the Site) and indicates that groundwater flow direction is from the south to the north.

As shown on Figure 6, the operation of production well PW-1 creates a capture zone that extends across the southern portion of the Site and captures groundwater from, and beyond, monitoring well MW-16 in the east and monitoring well MW-17 in the west.

Groundwater monitoring well construction logs are provided in Appendix D.

2.3 Investigation and Remedial History

The first manufacturing building was constructed, and operations were initiated at the Site in 1966. Prior to this time, the Site was used for agricultural purposes. The lined retention pond was constructed in 1968 to hold non-contact cooling water and stormwater, and was also used for fire protection. A production well (PW-1) was installed in 1970 to supply non-potable process and non-contact cooling water.

Airguns, BBs, pellets, zinc-plated carbon dioxide gas cartridges, and rangefinders are manufactured at the plant. The manufacturing processes have generated multiple waste streams, including (in the past) spent trichloroethene (TCE). By July 1995, however, Crosman Corporation had completely phased out its use of TCE at the facility.

Historically, groundwater has been pumped from production well PW-1 to two pressurized storage tanks at an average rate of up to 55 gallons per minute (gpm), yielding an average of up to 80,000 gallons per day. Approximately 80 to 90% of the water from PW-1 is used for non-contact cooling water throughout the plant, before it is discharged to the retention pond for cooling. The pond ultimately discharges at Outfall #001 into a swale that flows into a tributary of Fish Creek. The discharge is authorized by State Pollutant Discharge Elimination System (SPDES) Permit #0103039 and is monitored on a monthly basis.

The remaining water pumped from production well PW-1 is used as process water at the plant. Spent process water is conveyed to a freestanding onsite treatment building for pre-treatment, prior to discharge to the sanitary sewer system.

TCE, while in use at the Site from 1966 to 1995, was stored in two aboveground storage tanks (ASTs) until the mid-1980s, when the ASTs were removed. The ASTs reportedly had capacities of 175 and 250 gallons and were located outside of the plant, adjacent to the walls on the eastern and western sides of the facility. The use of both tanks was discontinued in 1986. From the mid-1980s until 1995, all TCE was strictly handled in 55-gallon drums.

The following narrative provides a remedial history timeline and a brief summary of the available project records to document key investigative and remedial milestones for the Site. Full titles for each of the reports referenced below are provided in Section 8.0 – References.

While there are no documented records of improper TCE disposal or release at the facility, it appears that an inadvertent release or releases occurred. In October 1990, TCE contamination was detected in a sample collected from production well PW-1. After notifying the NYSDEC, an assessment was initiated, the results of which are reported in the *Preliminary Site Assessment Report* (PSA) (LaBella Associates, P.C. [LaBella] 1993). The PSA indicated the presence of TCE in the groundwater and soil onsite and indicated a potential source area near the former AST located on the eastern side of the building. Offsite private wells were sampled, and while trace amounts of TCE were potentially detected in one well, resampling by the New York State Department of Health (NYSDOH) did not detect any site-related contaminants.

A *Remedial Investigation* (RI) (Blasland, Bouck & Lee, Inc. [BBL] 1996) was completed for the Site. The RI confirmed the PSA (LaBella 1993), finding that TCE was present in the onsite soils and groundwater and identified the former east side TCE AST as the probable source of the release. The RI identified a well-defined plume of TCE in groundwater, which originated from the former east side TCE AST area and was captured onsite by production well PW-1. Soil samples collected during the RI revealed that only one of the 48 samples collected exceeded the applicable NYSDEC Standard, Criteria, and

Guidance (SCG) values. Surface-water and sediment samples collected during the RI did not reveal the presence of site-related contaminants.

The *Interim Remedial Measures Work Plan* (BBL 1994) details the construction of a groundwater pump and treat system, which operated at the Site from 1995 to 1998. The groundwater pump and treat system was designed and operated to provide hydraulic control of the source area by pumping groundwater from recovery well IRM-1 (which has since been re-designated as MW-20), with treatment accomplished through air stripping. The system was discontinued in 1998.

The *Remedial Design/Remedial Action Work Plan* (BBL 1997) details the design of the soil vapor extraction (SVE) system that operated at the Site from 1998 to 2001. The SVE system was designed to remove TCE mass from the unsaturated zone of the east side TCE source area in order to remove a potential continuing impact to groundwater. The SVE system was discontinued in 2001 with NYSDEC approval after having reached asymptotic conditions.

Groundwater Monitoring Reports have been routinely prepared and submitted to the NYSDEC from 2000 to present. The frequency of these reports changed from quarterly to semi-annual in 2009 when the monitoring frequency was reduced. The Groundwater Monitoring Reports provide details on TCE concentrations within and at the perimeter of the groundwater plume at the Site, including providing continuing documentation that hydraulic control of the TCE plume at the Site has been maintained by the routine operation of production well PW-1 for manufacturing purposes.

The *Soil Vapor Intrusion Assessment* (Arcadis 2010) documents the sampling and analysis of soil vapor sample locations at the northern end of the Site adjoining the nearest offsite residence. This evaluation concluded that no site-related contaminants were detected in soil vapor samples, and therefore, were not migrating offsite.

The *Vapor Intrusion Investigation and West Side Soil Boring Investigation Report* (Arcadis 2015a) documents the vapor intrusion (VI) investigation and subsequent soil boring sampling that was conducted inside the plant building in 2014. Results of the paired indoor air and sub-slab soil vapor samples were evaluated using the chemical-specific matrices from the NYSDOH's Guidance for Evaluating Soil Vapor Intrusion in the State of New York (October 2006), with the results indicating that mitigation was recommended

for areas at the eastern and western end of the plant. As requested by the NYSDEC, six soil borings were then advanced at the western end of the building. The analytical results indicated that TCE was present at an elevated concentration in soil collected at one of the locations (although concentrations were below NYSDEC Soil Cleanup Objectives [SCOs] for Commercial Use). VI mitigation was recommended at both the eastern and western ends of the building.

To determine appropriate VI mitigation, Arcadis conducted a radius of influence (ROI) test, the results of which are summarized in the *Sub-Slab Depressurization Systems – Radius of Influence Summary* (Arcadis 2015b). Based on the VI and ROI findings, sub-slab depressurization was selected as the mitigation. Arcadis completed a sub-slab depressurization system (SSDS) design, which was approved by NYSDEC in a letter dated February 24, 2016. The SSDS utilizes a vacuum blower to extract vapors from two sub-slab extraction points, with extracted vapors conveyed via overhead piping to a treatment system. While operational, the treatment system consisted of granular-activated carbon (GAC) to remove volatile organic compounds (VOCs), including TCE, before discharge to the atmosphere. The *Construction Completion Report* (Arcadis 2017) for the SSDS was approved by the NYSDEC in a letter dated April 27, 2017. After 4 years of operation, the SSDS discharge was remodeled using current data. The modeling results (provided in Appendix E) showed that concentrations being extracted from the sub-slab environment had decreased to the point that treatment was no longer necessary. As discussed with the NYSDEC and as indicated in an October 9, 2020 email approval from the Department, treatment through GAC is no longer required before discharge to the atmosphere.

As requested by the NYSDEC in a November 22, 2019 letter, sampling for emerging contaminants 1,4-dioxane and per- and polyfluoroalkyl substances in groundwater was performed on June 18, 2020. As reported in the *Emerging Contaminant Assessment Report* (Arcadis 2020), no emerging contaminants were detected at concentrations exceeding the established drinking water maximum contaminant levels.

2.4 Remedial Action Objectives

The remedial action objectives (RAOs) for the Site, as listed in the Record of Decision (ROD) dated March 25, 1997, are as follows:

- Mitigate the threat to surface waters by regulating TCE discharges from the lined cooling pond through the existing SPDES Permit;
- Eliminate the potential for direct human ingestion of contaminated groundwater;
- Mitigate the impacts of contaminated groundwater to the environment; and
- Provide for attainment of SCG values for groundwater quality at the limits of the area of concern to the extent practicable.

2.5 Remaining Contamination

2.5.1 Soil

The site-specific cleanup level for soil containing TCE published in the March 1997 ROD is 550 micrograms per kilogram (µg/kg), and the Unrestricted Use SCO for TCE is 470 µg/kg. Soils with TCE concentrations exceeding either of these levels are deemed remaining contamination for the purposes of this SMP. No offsite soil is deemed to be remaining contamination because TCE has not been detected in offsite soils.

As illustrated in Table 3 and on Figure 7, TCE was detected in the soil beneath the floor of the west side of the building during the 2014 soil boring investigation at two of the soil boring locations (SB-3 at 13 to 14 feet below ground surface [bgs] and SB-4 at 7 to 8 feet bgs and 8 to 9 feet bgs) at concentrations exceeding the 550 µg/kg site-specific cleanup level published in the March 1997 ROD and the Unrestricted Use SCO for TCE of 470 µg/kg. This soil is remaining contamination. As shown on Figure 7, samples collected above, below, and surrounding these locations sufficiently delineated the extent of the soil remaining contamination beneath the west side of the building exceeding the site-specific cleanup level published in the March 1997 ROD and the Unrestricted Use SCO for TCE. Because the soil boring samples were collected from beneath active portions of the building, this remaining soil contamination has been left in place.

2.5.2 Groundwater

As summarized in Table 4 and on Figure 8, there is a well-defined plume of remaining groundwater contamination at the Site that contains concentrations of TCE exceeding the applicable SCG of 5 micrograms per liter. There are also two monitoring wells (MW-5 and MW-13) where concentrations of cis-1,2-dichloroethene exceed the applicable SCG. However, all remaining groundwater contamination is contained onsite,

and within the hydraulic containment of production well PW-1. The highest concentrations of TCE are detected at the southern (MW-17, MW-3A, MW-20) and central (MW-13) portions of the Site.

2.5.3 Soil Vapor

Concentrations of sub-slab soil vapor remaining contamination are found at the eastern and western ends of the building, with the higher concentrations detected at the western end of the building. During initial sampling of sub-slab soil vapor, TCE was detected at concentrations ranging from non-detectable up to 12,000,000 micrograms per cubic meters ($\mu g/m^3$) (at location SS-4/SDS-1). However, within 1 month of startup of the SSDS on July 8, 2016, concentrations of TCE at the SDS-1 location quickly dropped to 650,000 $\mu g/m^3$ (for sample collected on July 29, 2016), and continued to decline to 13,000 $\mu g/m^3$ (for sample collected on July 22, 2020).

Figure 9 summarizes the results of all samples of soil vapor collected at the Site, with Table 5A providing data for sub-slab soil vapor samples, and Table 5B providing data for the soil vapor samples collected at the northern end of the Site.

3.0 INSTITUTIONAL AND ENGINEERING CONTROL PLAN

3.1 General

Because remaining contamination exists at the Site, ICs and ECs are required to protect human health and the environment. This IC/EC Plan describes the procedures for the implementation and management of all IC/ECs at the Site. The IC/EC Plan is one component of the SMP and is subject to revision by the NYSDEC.

This plan provides:

- A description of all IC/ECs on the Site;
- The basic implementation and intended role of each IC/EC;
- A description of the key components of the ICs set forth in the Deed Restriction;
- A description of the controls to be evaluated during each required inspection and periodic review;
- A description of plans and procedures to be followed for implementation of IC/ECs, such as the implementation of the EWP (as provided in Appendix F) for the proper handling of any defined or suspected remaining soil contamination that may be disturbed during maintenance or redevelopment work on the Site; and
- Any other provisions necessary to identify or establish methods for implementing the IC/ECs required by the site remedy, as determined by the NYSDEC.

3.2 Institutional Controls

A series of ICs is required by the ROD to: (1) implement, maintain, and monitor EC systems; (2) prevent future exposure to remaining contamination; and (3) limit the use and development of the Site to commercial and industrial uses only and consistent with zoning. Adherence to these ICs on the Site is required by the Deed Restriction and will be implemented under this SMP. ICs identified in the Deed Restriction may not be discontinued without an amendment to or extinguishment of the Deed Restriction. The IC boundaries are the site boundaries, as shown on Figure 2. These ICs are:

- The property may be used for commercial and industrial use consistent with zoning;
- All ECs must be operated and maintained as specified in this SMP;
- All ECs must be inspected at a frequency and in a manner defined in this SMP;

- The use of groundwater underlying the property as drinking water is prohibited without necessary water quality treatment as determined by the NYSDOH or the Ontario County Department of Health to render it safe for use as drinking water, and the user must first notify and obtain written approval to do so from the Department, provided however, that this prohibition is inapplicable to the continued use of the groundwater underlying the property as non-contact cooling and process water with subsequent discharge pursuant to an SPDES Permit (presently, SPDES Permit No.: NY-0103039) to an unnamed tributary of Fish Creek;

- Groundwater and soil vapor monitoring must be performed as defined in this SMP;

- Data and information pertinent to site management must be reported at the frequency and in a manner as defined in this SMP;

- All future activities that will disturb remaining contaminated material must be conducted in accordance with this SMP;

- Monitoring to assess the performance and effectiveness of the remedy, including groundwater monitoring, must be performed as defined in this SMP;

- Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical component of the remedy shall be performed as defined in this SMP;

- Access to the Site must be provided to agents, employees, or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by the Deed Restriction; and

- The potential for VI must be evaluated for any buildings developed in the area within the IC boundaries noted on Figure 2, and any potential impacts that are identified must be monitored or mitigated.

3.3 Engineering Controls

3.3.1 Cover System

Exposure to remaining contamination detected in the soil beneath the floor of the west side of the building, as illustrated in Table 3 and on Figure 7, is prevented by the concrete floor which acts as a cover system. The EWP, provided in Appendix F, outlines the procedures required to be implemented in the event the cover system is breached, penetrated or temporarily removed, and any underlying remaining contamination is disturbed. Procedures for the inspection of this cover are provided in the Monitoring and

Sampling Plan included in Section 4.0 of this SMP. Any work conducted pursuant to the EWP must also be conducted in accordance with the procedures defined in a Health and Safety Plan (HASP) and associated Community Air Monitoring Plan prepared for the site and provided in Appendix G.

3.3.2 Sub-Slab Depressurization Systems

Procedures for operating and maintaining the SSDS are documented in the Operation and Maintenance Plan (Section 5.0 of this SMP). As built drawings, signed and sealed by a professional engineer, are included in Appendix H – Operation, Maintenance, and Monitoring Plan. Figure 10 shows the location of the SSDS at the Site.

3.3.3 Potential Operation of PW-1

The operation of production well PW-1 is not presently an EC under the ROD because the routine operation of PW-1 for manufacturing purposes has maintained hydraulic control of groundwater at the Site and the TCE plume is controlled onsite. Should manufacturing usage decrease and subsequent groundwater sampling find that the TCE plume is potentially moving offsite, this SMP will be modified to add operation of PW-1 as an EC. If added as an EC, the procedures for operating and maintaining production well PW-1 are documented in the Operation and Maintenance Plan (Section 5.0 of this SMP). Figure 2 shows the location of PW-1 at the Site.

3.3.4 Criteria for Completion of Remediation/Termination of Remedial Systems

Generally, remedial processes are considered complete when monitoring indicates that the remedy has achieved the RAOs identified by the decision document. The framework for determining when remedial processes are complete is provided in Section 6.4 of NYSDEC DER-10.

3.3.4.1 Cover

The concrete floor over the remaining soil contamination on the west side of the building is a permanent control, and the quality and integrity of this system will be inspected at defined, regular intervals in accordance with this SMP in perpetuity.

3.3.4.2 Sub-Slab Depressurization System

The active SSDS will not be discontinued unless prior written approval is granted by the NYSDEC and NYSDOH. In the event that monitoring data indicates that the SSDS

may no longer be required, a proposal to discontinue the SSDS will be submitted by the remedial party to the NYSDEC and NYSDOH.

3.3.4.3 Discontinuance of the Potential Operation of PW-1

The operation of production well PW-1 is not presently an EC under the ROD because the routine operation of PW-1 for manufacturing purposes has maintained hydraulic control of groundwater at the Site and the TCE plume is controlled onsite. Should manufacturing usage decrease and subsequent groundwater sampling find that the TCE plume is potentially moving offsite, this SMP will be modified to add operation of PW-1 as an EC. If added as an EC, the operation of production well PW-1 will not be discontinued unless prior written approval is granted by the NYSDEC. In the event that monitoring data indicates that the operation of PW-1 may no longer be required, a proposal to discontinue the system, including the results of an impact study, will be submitted by the remedial party. Conditions that may warrant discontinuing the operation of PW-1 include contaminant concentrations in groundwater that: (1) reach levels that are consistently below ambient water quality standards or the site SCGs as appropriate, (2) have become asymptotic to a low level over an extended period of time as accepted by the NYSDEC, or (3) the NYSDEC has determined that the operation of PW-1 has reached the limit of its effectiveness. This assessment will be based in part on post-remediation contaminant levels in groundwater collected from monitoring wells located throughout the Site. Systems will remain in place and operational until permission to discontinue their use is granted in writing by the NYSDEC.

4.0 MONITORING AND SAMPLING PLAN

4.1 General

This Monitoring and Sampling Plan describes the measures for evaluating the overall performance and effectiveness of the remedy. This Monitoring and Sampling Plan may only be revised with the approval of the NYSDEC. Details regarding the sampling procedures, data quality usability objectives, analytical methods, etc. for all samples collected as part of site management for the Site are included in the Quality Assurance Project Plan provided in Appendix I.

This Monitoring and Sampling Plan describes the methods to be used for:

- Sampling and analysis of all appropriate media (e.g., groundwater, soil vapor, soils);
- Assessing compliance with applicable NYSDEC SCGs, particularly groundwater standards, NYSDOH's Guidance for SVI Decisions-Matrices A, B, and C dated 2017 and Part 375 SCOs for soil; and
- Evaluating site information periodically to confirm that the remedy continues to be effective in protecting public health and the environment.

To adequately address these issues, this Monitoring and Sampling Plan provides information on:

- Sampling locations, protocol and frequency;
- Information on all designed monitoring systems;
- Analytical sampling program requirements;
- Inspection and maintenance requirements for monitoring wells;
- Monitoring well decommissioning procedures; and
- Annual inspection and periodic certification.

Reporting requirements are provided in Section 7.0 of this SMP.

4.2 Site-Wide Inspection

Site-wide inspections will be performed annually. Modification to the frequency or duration of the inspections will require approval from the NYSDEC. Site-wide inspections

will also be performed after all severe weather conditions that may affect ECs or monitoring devices. During these inspections, an inspection form will be completed as provided in Appendix J – Site Management Forms. The form will compile sufficient information to assess the following:

- Compliance with all ICs, including site usage;
- An evaluation of the condition and continued effectiveness of ECs;
- General site conditions at the time of the inspection;
- The site management activities being conducted, including, where appropriate, confirmation sampling and a health and safety inspection; and
- Confirm that site records are up to date.

Inspections of all remedial components installed at the Site will be conducted. A comprehensive site-wide inspection will be conducted and documented according to the SMP schedule, regardless of the frequency of the Periodic Review Report (PRR). The inspections will determine and document the following:

- Whether ECs continue to perform as designed;
- If these controls continue to be protective of human health and the environment;
- Compliance with requirements of this SMP and the Deed Restriction;
- Achievement of remedial performance criteria; and
- If site records are complete and up to date.

Reporting requirements are outlined in Section 7.0 of this plan.

Inspections will also be performed in the event of an emergency. If an emergency, such as a natural disaster or an unforeseen failure of any of the ECs occurs that reduces or has the potential to reduce the effectiveness of ECs in place at the Site, verbal notice to the NYSDEC must be given by noon the following day. In addition, an inspection of the Site will be conducted within 5 days of the event to verify the effectiveness of the IC/ECs implemented at the Site by a qualified environmental professional, as determined by the NYSDEC. Written confirmation must be provided to the NYSDEC within 7 days of the event that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public.

4.3 Treatment System Monitoring and Sampling

4.3.1 Remedial System Monitoring

Monitoring of the SSDS, the TCE plume, and the Cover System (concrete floor over the soil remaining contamination on the west side of the building) will be performed on a routine basis, as identified in Table 6 – Remedial System Monitoring Requirements and Schedule (see below). Modification to the frequency or sampling requirements will require approval from the NYSDEC. A visual inspection of the complete system will be conducted during each monitoring event. Unscheduled inspections and/or sampling may take place when a suspected failure of the SSDS or PW-1 has been reported or an emergency occurs that is deemed likely to affect the operation of any of the systems. The SSDS and PW-1 operation monitoring will include, but are not limited to, the components included in Table 6 below.

Table 6: Remedial System Monitoring Requirements and Schedule

Remedial System Component	Monitoring Parameter	Operating Range	Monitoring Schedule
Extraction Well Pump	Flow Rate	Per design	Monthly
SSDS Vacuum Blower	Vacuum	Per design	Monthly
Concrete Floor (west side of the building)	Integrity of Cover:	Visual	Annual

A complete list of components to be inspected is provided in the Inspection Checklist, provided in Appendix J – Site Management Plan Forms. If any equipment readings are not within their specified operation range, any equipment is observed to be malfunctioning or the system is not performing within specifications; maintenance and repair, as per the Operation and Maintenance Plan, is required immediately.

4.3.2 Remedial System Sampling

Samples shall be collected from the SSDS on a routine basis. Sampling locations, required analytical parameters, and schedule are provided in Table 7 – Remedial System Sampling Requirements and Schedule below. Modification to the frequency or sampling requirements will require approval from the NYSDEC.

Table 7: Remedial System Sampling Requirements and Schedule

Sampling Location	Analytical Parameters	Schedule
	VOC (EPA Method TO-15)	
SSDS Influent and Effluent	X	Annually

Sampling of the SSDS effluent will be collected directly from the sample port at the effluent of the SSDS, while the system is operating. Detailed sample collection and analytical procedures and protocols are provided in Appendix K – Field Sampling Plan and Appendix I – Quality Assurance Project Plan.

4.4 Post-Remediation Media Monitoring and Sampling

Samples shall be collected from the SSDS and production well PW-1 on a routine basis. Samples shall be collected from SDS-1 and SDS-2 after shutdown of the SSDS on a schedule to be proposed to and approved by the NYSDEC. Sampling locations, required analytical parameters, and schedule are provided in Table 8 – Post-Remediation Sampling Requirements and Schedule below. Modification to the frequency or sampling requirements will require approval from the NYSDEC.

Table 8: Post-Remediation Sampling Requirements and Schedule

Sampling Location	Analytical Parameters		Schedule
	VOCs (EPA Method 8260)	VOC (EPA Method TO-15)	
Production Well PW-1	X		Semi-Annually
MW-3A	X		Annually
MW-4	X		Semi-Annually
MW-5	X		Semi-Annually
MW-13	X		Semi-Annually
MW-14	X		Semi-Annually
MW-15	X		Semi-Annually
MW-17	X		Annually
MW-18	X		Annually
MW-19	X		Annually
MW-20	X		Annually

Sampling Location	Analytical Parameters		Schedule
	VOCs (EPA Method 8260)	VOC (EPA Method TO-15)	
SDS-1 and SDS-2		X	Following shutdown of the SSDS, as proposed to and approved by the NYSDEC

Detailed sample collection and analytical procedures and protocols are provided in Appendix K – Field Sampling Plan and Appendix I – Quality Assurance Project Plan.

4.4.1 Groundwater Sampling

Groundwater monitoring will be performed to assess the performance of the remedy. Groundwater monitoring of certain wells will be performed on a semi-annual basis and other wells on an annual basis for 2 years, at which point, the sampling frequency will be reduced to annually for all wells. Modification to the frequency or sampling requirements will require approval from the NYSDEC.

The network of monitoring wells has been installed to monitor upgradient, onsite, and downgradient groundwater conditions at the Site, including monitoring continued onsite containment of the plume. The network of onsite wells and one downgradient, offsite well is shown on Figure 8. If the groundwater monitoring demonstrates that the long-term trend in TCE concentrations at the Site is no longer stable and/or declining or that the plume is no longer being contained onsite, then additional removal, treatment, and/or control measures will be evaluated.

Table 9 summarizes the well's identification number, as well as the purpose, location, depths, diameter, and screened intervals of the wells. As part of the groundwater monitoring, 10 onsite wells and one downgradient, offsite well are sampled to evaluate the effectiveness of the remedial system. All groundwater samples are analyzed for VOCs via Method 8260. Production well PW-1 and groundwater monitoring wells MW-4, MW-5, MW-13, MW-14, and MW-15 shall be sampled semi-annually for 2 years, unless and until the NYSDEC approves switching to annually, and groundwater monitoring wells MW-3A, MW-17, MW-18, MW-19, and MW-20 shall be sampled annually.

Table 9: Monitoring Well Construction Details

Monitoring Well ID	Well Location	Well Diameter (inches)	Elevation (above mean sea level)			
			Casing	Surface	Screen Top	Screen Bottom
MW-3A	Onsite	2	1017.81	1015.2	938.2	933.2
MW-4	Downgradient	2	976.42	976.84	952.74	937.74
MW-5	Onsite	2	978.93	977.0	937.40	927.40
MW-13	Onsite	2	996.97	997.4	940.4	925.4
MW-14	Onsite	2	1021.66	1019.8	942.8	927.8
MW-15	Offsite	2	971.90	972.1	946.1	936.1
MW-17	Onsite	2	1024.17	1024.4	972.5	952.5
MW-18	Onsite	2	1002.64	1001.1	941.5	926.5
MW-19	Onsite	2	979.81	977.4	954.4	938.4
MW-20 (formerly IRM-1)	Onsite	8	1026.09	1026.1	986.9	946.9
PW-1	Onsite	8	971.85	969.85	943.85	933.85

Monitoring well construction logs are included in Appendix D of this SMP.

If biofouling or silt accumulation occurs in the onsite and/or offsite monitoring wells, the wells will be physically agitated/surged and redeveloped. Additionally, monitoring wells will be properly decommissioned and replaced if an event renders the wells unusable.

Repairs and/or replacement of wells in the monitoring well network will be performed based on assessments of structural integrity and overall performance.

The NYSDEC will be notified prior to any repair or decommissioning of any monitoring well for the purpose of replacement, and the repair or decommissioning and replacement process will be documented in the subsequent PRR. Well decommissioning without replacement will be done only with the prior approval of the NYSDEC. Well abandonment will be performed in accordance with the NYSDEC's guidance entitled "CP-43: Groundwater Monitoring Well Decommissioning Procedures." Monitoring wells that

are decommissioned because they have been rendered unusable will be replaced in kind in the nearest available location, unless otherwise approved by the NYSDEC.

The sampling frequency may only be modified with the approval of the NYSDEC. This SMP will be modified to reflect changes in sampling plans approved by the NYSDEC.

Deliverables for the groundwater monitoring program are specified in Section 7.0 – Reporting Requirements.

4.4.2 Non-Remedial Surface-Water Sampling

The water from PW-1 that is used for non-contact cooling water is ultimately discharged to the retention pond for cooling. The pond discharges at Outfall #001 into a swale that flows into a tributary of Fish Creek. The discharge is authorized by SPDES Permit #0103039 and is not part of the ROD.

Although this surface-water discharge monitoring is not required in order to assess the performance of the remedy, and therefore, technically not part of this SMP, the SPDES discharge is monitored on a monthly basis and the results of that monitoring will be documented for informational purposes in the subsequent PRR. Modification to the frequency or sampling requirement under the SPDES Permit requires NYSDEC approval.

4.4.3 Soil Vapor Sampling

Soil vapor sampling will be performed annually to assess the performance of the remedy. Modification to the frequency or sampling requirements will require approval from the NYSDEC.

The network of onsite soil vapor sample locations includes SDS-1 and SDS-2. During soil vapor sampling, samples will be collected from each SDS location (immediately beneath the floor slab). All soil vapor samples will be analyzed for VOCs via Method TO-15. The location of SDS-1 and SDS-2 are shown on Figure 10.

The sampling frequency may only be modified with the approval of the NYSDEC. This SMP will be modified to reflect changes in sampling plans approved by the NYSDEC.

Deliverables for the soil vapor sampling program are specified in Section 7.0 – Reporting Requirements.

4.4.4 Monitoring and Sampling Protocol

All sampling activities under this SMP will be recorded in a field book and associated sampling log as provided in Appendix J – Site Management Plan Forms. Other observations (e.g., groundwater monitoring well integrity) will be noted on the sampling log. The sampling log will serve as the inspection form for the monitoring network. Additional detail regarding monitoring and sampling protocols are provided in the site-specific Field Sampling Plan provided as Appendix K of this SMP.

5.0 OPERATION AND MAINTENANCE PLAN

5.1 General

This Operation and Maintenance Plan provides a brief description of the measures necessary to operate, monitor, and maintain the mechanical components of the remedy selected for the Site. This Operation and Maintenance Plan:

- Includes the procedures necessary to allow individuals unfamiliar with the Site to operate and maintain the SSDS, and if added to this SMP, production well PW-1;
- Will be updated periodically to reflect changes in site conditions or the manner in which the SSDS is operated and maintained; and
- If necessary, this SMP will be modified to include non-manufacturing-related operation and maintenance of production well PW-1.

Further detail regarding the operation and maintenance of the SSDS is provided in Appendix H – Operation, Maintenance, and Monitoring Plan. A copy of this Operation, Maintenance, and Monitoring Plan, together with the complete SMP, is to be maintained at the Site. This Operation and Maintenance Plan is not to be used as a stand-alone document, but as a component document of this SMP.

Production well PW-1 was installed in 1970 to supply non-potable process and non-contact cooling water. Historically, groundwater has been pumped from production well PW-1 to two pressurized storage tanks at an average rate of up to 55 gpm, yielding an average of up to 80,000 gallons per day. The Groundwater Monitoring Reports prepared and submitted to the NYSDEC from 2000 to present document that the routine manufacturing use of production well PW-1 incidentally provides continuous hydraulic control of the groundwater system and associated TCE plume at the Site.

Should the manufacturing facility ever discontinue the current rate of usage of production well PW-1, and subsequent groundwater monitoring indicate that the TCE plume is not still being wholly contained onsite, this SMP will be modified to the satisfaction of the NYSDEC to include non-manufacturing operation of PW-1 to regain and maintain hydraulic control of the groundwater system and associated TCE plume at the Site.

5.2 Remedial System (or other Engineering Control) Performance Criteria

The minimum operating and discharge requirements for the SSDS and the operation of production well PW-1 are provided below.

Table 10: Remedial System Performance Criteria

Remedial System	Minimum Operating Requirements	Discharge Requirements
SSDS	Maintain negative sub-slab differential pressure across the target depressurization areas	Modeled effluent impact (as per Division of Air Resources (DAR)-1 Policy) remains below Annual Guideline Concentrations and Short-Term Guideline Concentrations listed in DAR-1
Production Well PW-1 (Potential)	Maintain hydraulic control of contaminant plume	SPDES Permit #0103039 Discharge Limits: pH: 6.0 – 9.0 Temperature: <90°F TCE: 10 µg/L (action level)

5.3 Operation and Maintenance of Sub-Slab Depressurization System

The following sections provide a description of the operations and maintenance of the SSDS. Cut-sheets and as-built drawings for the SSDS are provided in Appendix H – Operation, Maintenance, and Monitoring Plan.

5.3.1 System Start-Up and Testing

The system start-up and testing procedures are fully described in the SSDS Operation, Maintenance, and Monitoring Plan, included in Appendix H, and will be conducted if, in the course of the SSDS lifetime, the system goes down or significant changes are made to the system and the system must be restarted.

5.3.2 Routine System Operation and Maintenance

The SSDS operates in a fully automated mode, utilizing vacuum transmitters and level gauges to monitor if the system begins operating outside of design parameters. Daily summaries of the SSDS operational runtime are emailed to project personnel, and personnel can access the system remotely to check on system parameters to confirm operation. In addition, the system is visually inspected on a routine basis (biweekly to monthly).

Routine maintenance of the SSDS is limited to draining condensate as it accumulates. Removal of condensate is performed when levels in the knock-out tank are visually observed to be filling the sight tube, or when the high level alarm is activated.

Appendix H provides further details on the operation and maintenance of the SSDS.

5.3.3 Non-Routine Operation and Maintenance

In the event of an alarm condition, or if the SSDS is turned off for an extended period of time, the cause of the alarm/downtime will be investigated and the problem resolved as quickly as possible. After resolving the issue, the SSDS will be restarted as quickly as possible.

5.3.4 System Monitoring Devices and Alarms

The SSDS has a warning device to indicate that the system is not operating properly. In the event that the warning device is activated, applicable maintenance and repairs will be conducted, as specified in the Operation and Maintenance Plan, and the SSDS will be restarted. Operational problems will be noted in the PRR to be prepared for that reporting period.

5.4 Potential Non-Manufacturing Operation and Maintenance of Production Well PW-1

Should the manufacturing facility ever discontinue the current rate of usage of water from production well PW-1, and subsequent groundwater monitoring indicate that the TCE plume is not still being wholly contained onsite, this SMP will be modified to the satisfaction of the NYSDEC to include non-manufacturing operation of PW-1 to regain and maintain hydraulic control of the groundwater system and associated TCE plume at

the Site. The following sections provide a description of the operations and maintenance of production well PW-1 in the event that it is necessary to include the operation of PW-1 as an EC for the Site due to the manufacturing facility not using enough water from production well PW-1 to maintain hydraulic control of the groundwater system and associated TCE plume at the Site.

5.4.1 Potential Routine System Operation and Maintenance

Production well PW-1 operates automatically in an "on demand" state, providing non-contact cooling water and a limited amount of process water to the facility. Operation of PW-1 is initiated when water levels in the facility's pressure tank drop below a set level, and operation stops when the pressure tank fills to a set point. If the usage of non-contact cooling water declines at the manufacturing facility, and subsequent groundwater monitoring indicate that the TCE plume is not still being wholly contained onsite, this SMP will be modified to the satisfaction of the NYSDEC to include non-manufacturing operation of PW-1 to regain and maintain hydraulic control of the groundwater system and associated TCE plume at the Site.

Nevertheless, routine maintenance of the production well PW-1 well pump is not required under this SMP because, in all foreseeable circumstances, PW-1 will be maintained as part of the manufacturing occurring at the facility.

5.4.2 Potential Non-Routine Operation and Maintenance

Presently and in all foreseeable circumstances, in the event of an alarm condition, or if production well PW-1 is down for an extended period of time, the manufacturing facility will immediately investigate the cause of the alarm/downtime and resolve the problem in a manner that allows PW-1 to be restarted as quickly as possible.

5.4.3 Potential System Monitoring Devices and Alarms

The production well PW-1 system has warning devices to indicate that the system is not operating, including a red flashing light at the pump vault. In the event that a warning device is activated, applicable maintenance and repairs will be conducted by the manufacturing facility, and PW-1 will be restarted.

If production well PW-1 is added to this SMP because manufacturing water usage alone is no longer sufficient to contain the TCE plume onsite, then operational problems will be noted in the PRR to be prepared for that reporting period.

6.0 PERIODIC ASSSESSMENTS/EVALUATIONS

6.1 Climate Change Vulnerability Assessment

Increases in both the severity and frequency of storms/weather events, an increase in sea level elevations, including accompanying flooding impacts, shifting precipitation patterns, and wide temperature fluctuation, resulting from global climactic change and instability, have the potential to significantly impact the performance, effectiveness, and protectiveness of a given site and associated remedial systems. Vulnerability assessments provide information so that the site and associated remedial systems are prepared for the impacts of the increasing frequency and intensity of severe storms/weather events and associated flooding.

A formal vulnerability assessment has not been completed for the Site. However, the nature of the remedial systems in place (SSDS, concrete cover, and monitoring wells) at this Site minimizes their susceptibility to climate change fluctuations. The following is provided as justification for not performing a formal vulnerability assessment:

- The Site is not located within a flood plain or other low-lying area.
- The entire Site has a pronounced slope from south to north that prevents flooding during severe rain events, except for a few localized areas at the northern end of the Site. However, short-term flooding in these areas does not impact the ECs.
- The nature of the surface at the Site (well established vegetation and paved surfaces) ensures against significant erosion ever occurring (and never being observed) at the Site.
- The SSDS is located within a shipping container located in a corner of the rear parking lot, bounded on two sides by the plant building, with nothing on the other two sides that would be susceptible to high winds.
- The SSDS requires electricity for operation. Interruption of electrical supply would cause the system to shut down. The SSDS, however, is designed to be able to be shut down without impacting the overall effectiveness of the system. Furthermore, the Crosman Corporation facility operates 24 hours/7 days a week; therefore, any electrical outages at the Site will be immediately detected and promptly rectified.
- Storm-related damage would not cause any damage at the Site that would leave the SSDS susceptible to a spill or contaminant release.

To the extent that the SMP is ever modified to add production well PW-1 as an EC due to insufficient usage of non-contact cooling water by the manufacturing facility to provide hydraulic containment of the TCE plume, its pump is located in a vault, well away from any objects that may be susceptible to high winds, and all piping associated with PW-1 is underground and not susceptible to erosion.

6.2 Green Remediation Evaluation

NYSDEC's DER-31 Green Remediation requires that green remediation concepts and techniques be considered during all stages of the remedial program, including site management, with the goal of improving the sustainability of the cleanup and summarizing the net environmental benefit of any implemented green technology. This section of the SMP provides a summary of any green remediation evaluations to be completed for the Site during site management, and as reported in the PRR.

- Waste Generation: The SSDS has the potential to generate condensate water as a waste stream. When generated, condensate water is treated onsite.

- Energy Usage: The SSDS uses electrical power provided by the facility. If ever added as an EC, production well PW-1 also uses electrical power.

- Emissions: Emissions from the SSDS are monitored on a routine basis, with monthly analytical samples to document that emissions do not exceed DAR-1 standards. Emissions generated via transportation to and from the Site are minimized by utilizing personnel that live in close proximity to the Site. If ever added as an EC, production well PW-1 water flows to a lined retention pond, the discharge of which is regulated by SPDES Permit #0103039.

- Water Usage: The SSDS does not utilize water, and PW-1 provides non-contact cooling water to the plant, reducing the need for municipal water.

- Land/Ecosystem Disturbance: The SSDS is not disturbing any land or ecosystems.

6.2.1 Timing of Green Remediation Evaluations

For major remedial system components, green remediation evaluations and corresponding modifications will be undertaken as part of a formal Remedial System Optimization (RSO), or at any time that the Project Manager feels appropriate (e.g., during significant maintenance events or in conjunction with storm recovery activities).

Modifications resulting from green remediation evaluations will be routinely implemented and scheduled to occur during planned/routine operation and maintenance activities. Reporting of these modifications will be presented in the PRR.

6.2.2. Remedial Systems

Remedial systems will be operated properly considering the current site conditions to conserve materials and resources to the greatest extent possible. Consideration will be given to operating rates and use of consumables. Spent materials will be sent for recycling, as appropriate.

6.2.3 Building Operations

Structures, including buildings and sheds, will be operated and maintained to provide for the most efficient operation of the remedy, while minimizing energy, waste generation, and water consumption.

6.2.4 Frequency of System Checks, Sampling, and Other Periodic Activities

Transportation to and from the Site and use of consumables in relation to visiting the Site in order to conduct system checks and or collect samples and shipping samples to a laboratory for analyses have direct and/or inherent energy costs. The schedule and/or means of these periodic activities have been prepared so that these tasks can be accomplished in a manner that does not impact remedy protectiveness but reduces expenditure of energy or resources.

6.2.5 Reporting

As discussed in Section 7.0 and as shown in Appendix J – Site Management Plan Forms, information on energy usage, solid waste generation, transportation and shipping, water usage, and land use and ecosystems will be recorded to facilitate and document consistent implementation of green remediation during site management and to identify corresponding benefits.

6.3 Remedial System Optimization

An RSO study will be conducted any time that the NYSDEC or the remedial party requests in writing that an in-depth evaluation of the remedy is needed. An RSO may be appropriate if any of the following occur:

- The remedial actions have not met or are not expected to meet RAOs in the time frame estimated in the Decision Document;
- The management and operation of the remedial system is exceeding the estimated costs;
- The remedial system is not performing as expected or as designed;
- Previously unidentified source material may be suspected;
- Plume shift has potentially occurred;
- Site conditions change due to development, change of use, change in groundwater use, etc.;
- There is an anticipated transfer of the site management to another remedial party or agency; and
- A new and applicable remedial technology becomes available.

An RSO will provide a critique of a site's conceptual model, give a summary of past performance, document current cleanup practices, summarize progress made toward the site's cleanup goals, gather additional performance or media-specific data and information, and provide recommendations for improvements to enhance the ability of the present system to reach RAOs or to provide a basis for changing the remedial strategy.

The RSO study will focuses on overall site cleanup strategy, process optimization and management with the intent of identifying impediments to cleanup and improvements to site operations to increase efficiency, cost effectiveness, and remedial time frames. Green remediation technology and principals are to be considered when performing the RSO.

7.0. REPORTING REQUIREMENTS

7.1 Site Management Reports

All site management inspection, maintenance, and monitoring events will be recorded on the appropriate site management forms provided in Appendix J. These forms are subject to NYSDEC revision.

All applicable inspection forms and other records, including media sampling data and system maintenance reports, generated for the Site during the reporting period will be provided in electronic format to the NYSDEC in accordance with the requirements of Table 11 and summarized in the PRR.

Table 11: Schedule of Interim Monitoring/Inspection Reports

Task/Report	Reporting Frequency*
Cover System Inspection Report	Annually, with PRR
Periodic Review Report	Annually, or as otherwise determined by the Department
Groundwater Monitoring Report	Semi-annually unless and until NYSDEC approves switching to annually
SSDS Status Report	Monthly Inspections, reported annually, with PRR

* The frequency of events will be conducted as specified until otherwise approved by the NYSDEC.

Although not required as part of this SMP, the average rate of usage (in gallons per day) of water from production well PW-1 and the SPDES monthly monitoring reports for the discharge from the non-contact cooling water pond will be included for informational purposes in the PRR.

All interim monitoring/inspections reports will include, at a minimum:

- Date of event or reporting period;
- Name, company, and position of person(s) conducting monitoring/inspection activities;
- Description of the activities performed;

- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet);
- Type of samples collected (e.g., sub-slab vapor, groundwater);
- Copies of all field forms completed (e.g., well sampling logs, chain-of-custody documentation);
- Sampling results in comparison to appropriate standards/criteria;
- A figure illustrating sample type and sampling locations;
- Copies of all laboratory data sheets and the required laboratory data deliverables required for all points sampled (to be submitted electronically in the NYSDEC-identified format);
- Any observations, conclusions, or recommendations; and
- A determination as to whether contaminant conditions have changed since the last reporting event.

Routine maintenance event reporting forms will include, at a minimum:

- Date of event;
- Name, company, and position of person(s) conducting maintenance activities;
- Description of maintenance activities performed;
- Any modifications to the system;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet); and
- Other documentation, such as, but not limited to, copies of invoices for maintenance work and receipts for replacement equipment (attached to the checklist/form).

Non-routine maintenance event reporting forms will include, at a minimum:

- Date of event;
- Name, company, and position of person(s) conducting non-routine maintenance/repair activities;
- Description of non-routine activities performed;

- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents (included either on the form or on an attached sheet); and

- Other documentation, such as, but not limited to, copies of invoices for repair work and receipts for replacement equipment (attached to the checklist/form).

Data will be reported in digital format as determined by the NYSDEC. Currently, data is to be supplied electronically and submitted to the NYSDEC EQuIS™ database in accordance with the requirements found at this link http://www.dec.ny.gov/chemical/62440.html.

7.2 Periodic Review Report

The PRR shall be due 12 months after submission of the voluntary 2020 PRR (i.e., first required PRR shall be due on April 15, 2021). After submittal of the initial PRR, the next PRR shall be submitted annually to the Department or at another frequency as may be required by the Department. In the event that the Site is subdivided into separate parcels with different ownership, a single PRR will be prepared that addresses the site described in Appendix A – Deed Restriction. The report will be prepared in accordance with NYSDEC's DER-10 and submitted within 30 days of the end of each certification period. Media sampling results will also be incorporated into the PRR. The report will include:

- Identification, assessment, and certification of all ECs/ICs required by the remedy for the Site.

- Results of the required annual site inspections and severe condition inspections, if applicable.

- All applicable site management forms and other records generated for the Site during the reporting period in the NYSDEC-approved electronic format, if not previously submitted.

- A summary of any discharge monitoring data and/or information generated during the reporting period, with comments and conclusions.

- Data summary tables and graphical representations of contaminants of concern by media (e.g., groundwater, soil vapor), which include a listing of all compounds analyzed, as well as with the applicable standards, with all exceedances highlighted. These will include a presentation of past data as part of an evaluation of contaminant concentration trends.

- Results of all analyses, copies of all laboratory data sheets, and the required laboratory data deliverables for all samples collected during the reporting

period will be submitted in digital format as determined by the NYSDEC. Currently, data is supplied electronically and submitted to the NYSDEC EQuIS™ database in accordance with the requirements found at this link: http://www.dec.ny.gov/chemical/62440.html.

- A site evaluation, which includes the following:
  - The compliance of the remedy with the requirements of the site-specific ROD;
  - The operation and the effectiveness of all treatment units, etc., including identification of any needed repairs or modifications;
  - Any new conclusions or observations regarding site contamination based on inspections or data generated by the Monitoring and Sampling Plan for the media being monitored;
  - Recommendations regarding any necessary changes to the remedy and/or Monitoring and Sampling Plan;
  - Trends in contaminant levels in the affected media will be evaluated to determine if the remedy continues to be effective in achieving remedial goals as specified by the Decision Document; and
  - The overall performance and effectiveness of the remedy.
- A performance summary for all treatment systems at the Site during the calendar year, including information such as:
  - The number of days the system operated for the reporting period;
  - The contaminant mass removed;
  - A description of breakdowns and/or repairs, including an explanation for any significant downtime;
  - A description of the resolution of significant performance problems;
  - Alarm conditions;
  - Trends in equipment failure (if observed);
  - A summary of the performance, effluent and/or effectiveness monitoring; and
  - Comments, conclusions, and recommendations based on data evaluation.

7.2.1 Certification of Institutional and Engineering Controls

Following the last inspection of the reporting period, a Professional Engineer licensed to practice in NYS will prepare, and include in the PRR, the following certification as per the requirements of NYSDEC DER-10:

"For each institutional or engineering control identified for the site, I certify that all of the following statements are true:

- *The inspection of the site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under my direction;*
- *The institutional control and/or engineering control employed at this site is unchanged from the date the control was put in place, or last approved by the Department;*
- *Nothing has occurred that would impair the ability of the control to protect the public health and environment;*
- *Nothing has occurred that would constitute a violation or failure to comply with any site management plan for this control;*
- *Access to the site will continue to be provided to the Department to evaluate the remedy, including access to evaluate the continued maintenance of this control;*
- *Use of the Site is compliant with Declaration of Restrictions and Covenants;*
- *The engineering control systems are performing as designed and are effective;*
- *To the best of my knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program and generally accepted engineering practices; and*
- *The information presented in this report is accurate and complete.*

I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law. I, [name], of [business address], am certifying as Crosman's Designated Site Representative ."

The signed certification will be included in the PRR.

The PRR will be submitted, in electronic format, to the NYSDEC Central Office, Regional Office in which the Site is located and the NYSDOH Bureau of Environmental

Exposure Investigation. The PRR may need to be submitted in hard-copy format, as requested by the NYSDEC's Project Manager.

7.3 Corrective Measures Work Plan

If any component of the remedy is found to have failed, or if the periodic certification cannot be provided due to the failure of an IC or EC, a Corrective Measures Work Plan will be submitted to the NYSDEC for approval. This plan will explain the failure and provide the details and schedule for performing work necessary to correct the failure. Unless an emergency condition exists, no work will be performed pursuant to the Corrective Measures Work Plan until it has been approved by the NYSDEC.

7.4 Remedial Site Optimization Report

In the event that an RSO is to be performed (see Section 6.3), upon completion of an RSO, an RSO report must be submitted to the Department for approval. A general outline for the RSO report is provided in Appendix L. The RSO report will document the research/investigation and data gathering that was conducted, evaluate the results and facts obtained, present a revised conceptual site model, and present recommendations. RSO recommendations are to be implemented upon approval from the NYSDEC. Additional work plans, design documents, HASPs etc., may still be required to implement the recommendations, based upon the actions that need to be taken. A final engineering report and update to the SMP may also be required.

The RSO report will be submitted, in electronic format, to the NYSDEC Central Office, Regional Office in which the Site is located, Site Control and the NYSDOH Bureau of Environmental Exposure Investigation.

8.0 REFERENCES

6 NYCRR Part 375. 2006. Environmental Remediation Programs. December 14, 2006.

Arcadis. 2010. Soil Vapor Intrusion Assessment. Crosman Corporation Site, East Bloomfield, New York. July 2010.

Arcadis. 2014.West Side Soil Boring Investigation Work Plan. Crosman Corporation Site, East Bloomfield, New York.

Arcadis. 2015a. Vapor Intrusion Investigation and West Side Soil Boring Investigation Report. Crosman Corporation Site, East Bloomfield, New York. January 2015.

Arcadis. 2015b. Sub-Slab Depressurization Systems – Radius of Influence Summary. July 24, 2015.

Arcadis. 2017. Construction Completion Report (for SSDS). January 24, 2017.

Arcadis. 2020. Emerging Contaminant Assessment Report – 1,4-Dioxane and PFAS in Site Groundwater. September 11, 2020.

BBL. 1994. Interim Remedial Measures Work Plan. Crosman Corporation Site, East Bloomfield, New York. June 1994.

BBL. 1996. Remedial Investigation. Crosman Corporation Site, East Bloomfield, New York. October 1996.

BBL. 1997. Remedial Design/Remedial Action Work Plan. Crosman Corporation Site, East Bloomfield, New York. May 1997.

LaBella Associates, P.C. 1993. Preliminary Site Assessment Report. August 1993.

NYSDEC. DER-10 – "Technical Guidance for Site Investigation and Remediation".

NYSDEC. 1998. Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1. June 1998 (April 2000 addendum).

NYSDEC. 1997. Record of Decision. March 1997.

NYSDOH. 2006. Guidance for Evaluating Soil Vapor Intrusion in the State of New York. October 2006.

Tables

Table 2
Groundwater Elevation Data
Site Management Plan
Crosman Site
East Bloomfield, New York

Location I.D.	T.O.R. Reference Elevation	October 22, 2010		April 21, 2011		October 20, 2011		April 16, 2012	
		Depth to Water	Groundwater Elevation	Depth to Water	Groundwater Elevation	Depth to Water	Groundwater Elevation	Depth to Water	Groundwater Elevation
MW-1	1053.97	13.65	1038.44	6.02	1046.07	15.31	1038.66	8.59	1045.38
MW-1A	1053.86	72.08	979.78	72.12	979.74	71.15	982.71	71.60	982.26
MW-2	1020.06	51.12	966.88	48.64	969.36	50.57	969.49	51.18	968.88
MW-3	1020.21	27.53	990.78	26.40	991.91	27.01	993.2	28.72	991.49
MW-3A	1019.71	50.22	967.59	48.51	969.3	49.43	970.28	48.79	970.92
MW-4	978.46	21.44	954.98	14.34	962.08	21.80	956.66	18.24	960.22
MW-5	980.91	18.14	960.79	19.23	959.7	17.87	963.04	15.76	965.15
MW-6	1017.85	48.80	967.15	46.27	969.68	48.08	969.77	46.54	971.31
MW-7	981.19	18.70	960.61	13.60	965.71	18.59	962.6	16.52	964.67
MW-8	1027.75	50.39	975.23	49.84	975.78	NR	---	49.05	978.70
MW-9	1028.02	53.69	972.40	53.59	972.5	52.50	975.52	52.76	975.26
MW-10	1025.68	54.56	969.31	53.08	970.79	53.29	972.39	52.79	972.89
MW-11	1018.46	55.40	961.08	53.48	963	54.72	963.74	54.05	964.41
MW-12	983.83	27.27	954.57	20.12	961.72	27.54	956.29	23.87	959.96
MW-13	998.94	33.52	963.45	29.85	967.12	33.34	965.6	31.41	967.53
MW-14	1023.58	58.35	963.31	54.70	966.96	57.75	965.83	56.02	967.56
MW-15	973.61	19.36	952.54	10.13	961.77	19.39	954.22	14.09	959.52
MW-16	1028.80	56.52	970.36	55.42	971.46	55.22	973.58	55.81	972.99
MW-17	1025.86	50.61	973.56	53.83	970.34	49.59	976.27	53.09	972.77
MW-18	1004.65	39.20	963.44	37.42	965.22	36.15	968.5	37.95	966.70
MW-19	981.95	23.59	956.22	16.13	963.68	24.35	957.6	20.60	961.35
MW-20 (1)	1027.56	53.84	972.25	53.29	972.8	52.34	975.22	52.44	975.12
MW-21	1027.97	53.93	---	53.52	---	48.85	---	-	---
PZ-1	1026.28	53.24	971.09	52.78	971.55	51.98	974.3	51.92	974.36
PZ-2	1026.75	56.53	968.36	54.87	970.02	55.62	971.13	54.68	972.07
PZ-3	980.30	24.24	954.99	16.54	962.69	24.40	955.9	21.03	959.27
PW-1	975.57	20.01	951.84	12.09	959.76	20.22	955.35	16.43	959.14

Notes on page 5.

Table 2
Groundwater Elevation Data
Site Management Plan
Crosman Site
East Bloomfield, New York

Location I.D.	T.O.R. Reference Elevation	October 10, 2012		April 8, 2013		October 16, 2013		April 9, 2014	
		Depth to Water	Groundwater Elevation	Depth to Water	Groundwater Elevation	Depth to Water	Groundwater Elevation	Depth to Water	Groundwater Elevation
MW-1	1053.97	18.25	1035.72	8.97	1045.00	15.55	1038.42	6.67	1047.30
MW-1A	1053.86	72.08	981.78	24.39	1029.47	24.37	1029.49	24.35	1029.51
MW-2	1020.06	51.70	968.36	51.15	968.91	50.80	969.26	50.45	969.61
MW-3	1020.21	27.98	992.23	27.81	992.40	27.95	992.26	25.57	994.64
MW-3A	1019.71	50.49	969.22	50.98	968.73	50.13	969.58	50.49	969.22
MW-4	978.46	22.80	955.66	18.37	960.09	18.60	959.86	14.79	963.67
MW-5	980.91	19.10	961.81	20.05	960.86	15.35	965.56	14.74	966.17
MW-6	1017.85	49.22	968.63	48.80	969.05	48.34	969.51	48.20	969.65
MW-7	981.19	19.76	961.43	17.57	963.62	17.75	963.44	14.72	966.47
MW-8	1027.75	49.85	977.90	24.31	1003.44	50.15	977.60	51.23	976.52
MW-9	1028.02	53.57	974.45	34.89	993.13	53.67	974.35	54.82	973.20
MW-10	1025.68	54.51	971.17	55.09	970.59	54.23	971.45	54.74	970.94
MW-11	1018.46	55.88	962.58	55.05	963.41	55.22	963.24	54.55	963.91
MW-12	983.83	29.14	954.69	24.01	959.82	24.73	959.10	20.69	963.14
MW-13	998.94	34.49	964.45	38.94	960.00	32.68	966.26	31.33	967.61
MW-14	1023.58	58.88	964.70	57.72	965.86	57.34	966.24	56.54	967.04
MW-15	973.61	16.71	956.90	18.12	955.49	13.96	959.65	12.30	961.31
MW-16	1028.80	56.31	972.49	57.12	971.68	56.11	972.69	56.81	971.99
MW-17	1025.86	50.59	975.27	52.09	973.77	50.84	975.02	51.92	973.94
MW-18	1004.65	36.92	967.73	38.35	966.30	35.59	969.06	13.77	990.88
MW-19	981.95	25.50	956.45	21.80	960.15	22.33	959.62	15.45	966.50
MW-20 (1)	1027.56	53.39	974.17	54.81	972.75	53.49	974.07	54.44	973.12
MW-21	1027.97	53.59	---	54.95	---	53.59	---	--	---
PZ-1	1026.28	52.96	973.32	54.23	972.05	53.03	973.25	53.93	972.35
PZ-2	1026.75	56.66	970.09	56.87	969.88	56.18	970.57	56.45	970.30
PZ-3	980.30	26.07	954.23	20.94	959.36	21.82	958.48	17.51	962.79
PW-1	975.57	21.19	954.38	16.81	958.76	17.55	958.02	12.57	963.00

Notes on page 5.

Table 2
Groundwater Elevation Data
Site Management Plan
Crosman Site
East Bloomfield, New York

Location I.D.	T.O.R. Reference Elevation	October 29, 2014		April 22, 2015		October 21, 2015		April 18, 2016	
		Depth to Water	Groundwater Elevation	Depth to Water	Groundwater Elevation	Depth to Water	Groundwater Elevation	Depth to Water	Groundwater Elevation
MW-1	1053.97	13.33	1040.64	6.30	1047.67	12.89	1041.08	8.41	1045.56
MW-1A	1053.86	24.55	1029.31	24.75	1029.11	71.11	982.75	NR	---
MW-2	1020.06	50.14	969.92	48.75	971.31	49.75	970.31	49.25	970.81
MW-3	1020.21	27.77	992.44	26.63	993.58	27.74	992.47	28.29	991.92
MW-3A	1019.71	49.53	970.18	48.71	971.00	49.40	970.31	49.12	970.59
MW-4	978.46	20.45	958.01	15.70	962.76	21.55	956.91	17.94	960.52
MW-5	980.91	17.19	963.72	14.29	966.62	16.80	964.11	15.70	965.21
MW-6	1017.85	47.69	970.16	46.09	971.76	47.16	970.69	46.59	971.26
MW-7	981.19	17.71	963.48	14.59	966.60	18.18	963.01	14.15	967.04
MW-8	1027.75	49.26	978.49	49.05	978.70	48.61	979.14	49.18	978.57
MW-9	1028.02	52.75	975.27	52.59	975.43	51.95	976.07	52.75	975.27
MW-10	1025.68	53.33	972.35	52.60	973.08	52.75	972.93	52.93	972.75
MW-11	1018.46	54.63	963.83	53.31	965.15	54.43	964.03	54.09	964.37
MW-12	983.83	26.11	957.72	21.52	962.31	27.70	956.13	23.82	960.01
MW-13	998.94	32.63	966.31	21.33	977.61	28.11	970.83	31.35	967.59
MW-14	1023.58	57.14	966.44	55.11	968.47	57.08	966.50	56.00	967.58
MW-15	973.61	15.32	958.29	10.59	963.02	15.60	958.01	13.54	960.07
MW-16	1028.80	55.14	973.66	54.56	974.24	54.45	974.35	54.80	974.00
MW-17	1025.86	50.00	975.86	50.21	975.65	49.55	976.31	50.27	975.59
MW-18	1004.65	35.34	969.31	NR	---	34.58	970.07	34.62	970.03
MW-19	981.95	22.59	959.36	16.73	965.22	23.29	958.66	20.16	961.79
MW-20 (1)	1027.56	52.55	975.01	52.24	975.32	51.71	975.85	52.48	975.08
MW-21	1027.97	60.87	---	50.71	---	50.91	---	54.15	---
PZ-1	1026.28	51.95	974.33	NR	---	51.33	974.95	51.93	974.35
PZ-2	1026.75	55.34	971.41	54.45	972.30	54.93	971.82	54.84	971.91
PZ-3	980.30	23.19	957.11	18.05	962.25	24.60	955.70	20.70	959.60
PW-1	975.57	18.35	957.22	12.68	962.89	19.72	955.85	15.63	959.94

Notes on page 5.

Table 2
Groundwater Elevation Data
Site Management Plan
Crosman Site
East Bloomfield, New York

Location I.D.	T.O.R. Reference Elevation	October 26, 2016		April 19, 2017		October 17, 2017		April 3, 2018	
		Depth to Water	Groundwater Elevation	Depth to Water	Groundwater Elevation	Depth to Water	Groundwater Elevation	Depth to Water	Groundwater Elevation
MW-1	1053.97	19.50	1034.47	6.97	1047.00	12.71	1041.26	5.59	1048.38
MW-1A	1053.86	NR	---	NR	---	NR	---	NR	---
MW-2	1020.06	52.78	967.28	50.25	969.81	48.31	971.75	46.36	973.70
MW-3	1020.21	26.39	993.82	26.71	993.50	27.09	993.12	26.33	993.88
MW-3A	1019.71	52.07	967.64	50.37	969.34	47.82	971.89	46.14	973.57
MW-4	978.46	23.47	954.99	14.80	963.66	14.96	963.50	12.90	965.56
MW-5	980.91	20.03	960.88	14.42	966.49	16.00	964.91	11.57	969.34
MW-6	1017.85	50.28	967.57	47.56	970.29	45.89	971.96	43.82	974.03
MW-7	981.19	20.51	960.68	14.35	966.84	15.05	966.14	11.50	969.69
MW-8	1027.75	51.02	976.73	51.24	976.51	48.28	979.47	46.80	980.95
MW-9	1028.02	55.78	972.24	54.93	973.09	51.86	976.16	50.74	977.28
MW-10	1025.68	55.60	970.08	NR	---	52.08	973.60	50.58	975.10
MW-11	1018.46	56.73	961.73	54.48	963.98	53.11	965.35	51.33	967.13
MW-12	983.83	29.69	954.14	20.88	962.95	19.72	964.11	19.00	964.83
MW-13	998.94	35.45	963.49	31.05	967.89	30.20	968.74	27.70	971.24
MW-14	1023.58	59.86	963.72	56.03	967.55	54.95	968.63	52.66	970.92
MW-15	973.61	17.60	956.01	13.23	960.38	13.12	960.49	9.25	964.36
MW-16	1028.80	57.42	971.38	56.84	971.96	53.93	974.87	52.47	976.33
MW-17	1025.86	51.44	974.42	52.25	973.61	49.65	976.21	48.53	977.33
MW-18	1004.65	38.28	966.37	34.64	970.01	34.27	970.38	31.69	972.96
MW-19	981.95	26.32	955.63	14.88	967.07	19.51	962.44	14.70	967.25
MW-20 (1)	1027.56	54.28	973.28	54.85	972.71	51.61	975.95	50.44	977.12
MW-21	1027.97	54.35	---	54.45	---	51.80	---	50.59	---
PZ-1	1026.28	53.92	972.36	53.93	972.35	50.91	975.37	49.78	976.50
PZ-2	1026.75	55.50	971.25	55.38	971.37	53.90	972.85	53.23	973.52
PZ-3	980.30	26.83	953.47	17.51	962.79	17.14	963.16	15.13	965.17
PW-1	975.57	22.60	952.97	13.08	962.49	12.38	963.19	10.16	965.41

Notes on page 5.

Table 2
Groundwater Elevation Data
Site Management Plan
Crosman Site
East Bloomfield, New York

Location I.D.	T.O.R. Reference Elevation	October 26, 2018		April 23, 2019		October 31, 2019		April 21, 2020	
		Depth to Water	Groundwater Elevation	Depth to Water	Groundwater Elevation	Depth to Water	Groundwater Elevation	Depth to Water	Groundwater Elevation
MW-1	1053.97	11.52	1042.45	6.94	1047.03	13.23	1040.74	7.13	1046.84
MW-1A	1053.86	69.89	983.97	68.02	985.84	69.06	984.80	69.06	984.80
MW-2	1020.06	48.68	971.38	46.49	973.57	48.81	971.25	46.97	973.09
MW-3	1020.21	28.31	991.90	27.67	992.54	27.90	992.31	27.77	992.44
MW-3A	1019.71	47.83	971.88	45.91	973.80	48.04	971.67	46.45	973.26
MW-4	978.46	17.24	961.22	14.63	963.83	17.82	960.64	14.55	963.91
MW-5	980.91	15.29	965.62	12.71	968.20	15.67	965.24	12.99	967.92
MW-6	1017.85	46.22	971.63	43.80	974.05	46.26	971.59	44.27	973.58
MW-7	981.19	15.90	965.29	13.15	968.04	16.34	964.85	13.41	967.78
MW-8	1027.75	47.54	980.21	45.82	981.93	46.91	980.84	46.20	981.55
MW-9	1028.02	51.25	976.77	49.70	978.32	50.81	977.21	50.20	977.82
MW-10	1025.68	NR	---	50.09	975.59	NR	---	NR	---
MW-11	1018.46	52.93	965.53	51.26	967.20	53.02	965.44	51.52	966.94
MW-12	983.83	22.75	961.08	20.38	963.45	NR	---	NR	---
MW-13	998.94	30.98	967.96	28.50	970.44	31.26	967.68	28.50	970.44
MW-14	1023.58	55.55	968.03	53.05	970.53	55.72	967.86	53.35	970.23
MW-15	973.61	13.54	960.07	10.86	962.75	14.59	959.02	11.04	962.57
MW-16	1028.80	53.80	975.00	51.84	976.96	53.42	975.38	52.48	976.32
MW-17	1025.86	48.43	977.43	47.31	978.55	47.78	978.08	47.48	978.38
MW-18	1004.65	33.86	970.79	31.91	972.74	34.20	970.45	32.13	972.52
MW-19	981.95	20.00	961.95	17.55	964.40	20.95	961.00	17.50	964.45
MW-20 (1)	1027.56	51.02	976.54	49.42	978.14	50.51	977.05	50.03	977.53
MW-21	1027.97	51.13	976.84	49.58	978.39	50.53	977.44	50.12	977.85
PZ-1	1026.28	50.57	975.71	48.91	977.37	50.16	976.12	49.35	976.93
PZ-2	1026.75	53.99	972.76	51.95	974.80	53.86	972.89	52.49	974.26
PZ-3	980.30	19.69	960.61	16.91	963.39	20.23	960.07	16.72	963.58
PW-1	975.57	15.30	960.27	12.30	963.27	15.62	959.95	12.24	963.33

Notes:
All data are expressed in feet.
Wells MW-17, MW-18, MW-19, IRM-1, PZ-1, and PZ-2 were installed during October and November 1994.
MW-21 was installed July 31, 2000 through August 3, 2000.
PZ-3 was installed on May 14, 2001.
** = Reference elevation for all wells re-established with October 2018 survey by Fisher Associates.
(1) Monitoring well MW-20 was formerly IRM-1.
--- = not measured
NR = not recorded
T.O.R. = top of polyvinyl chloride riser

Table 3
Soil Analytical Results
Site Management Plan
Crosman Corporation
East Bloomfield, New York

ARCADIS Design & Consultancy for natural and built assets

Location ID:			SB-1	SB-1	SB-2	SB-2	SB-3	SB-3	SB-3	SB-3	SB-4	SB-4	SB-4	SB-4	SB-5	SB-5	SB-5	SB-6	SB-6
Sample Depth (ft bgs):		Site SCG	0.5 - 1.0	6.0. - 8.0	0.5 - 2.0	6.0 - 8.0	0.5 - 1.0	13.0 - 14.0	16.0 - 17.0	23.0 - 24.0	0.5 - 1.0	7.0 - 8.0	8.0 - 9.0	16.0 - 16.5	0.5 - 1.0	8.0 - 8.8	9.5 - 10.0	0.5 - 2.0	24.0 - 25.1
Date Collected:	Units	Value **	07/19/14	07/19/14	07/19/14	07/19/14	08/02/14	08/02/14	08/02/14	08/02/14	08/02/14	08/02/14	08/02/14	08/02/14	08/02/14	08/02/14	08/02/14	07/19/14	07/19/14
Trichloroethene	µg/kg	550	**17.5**	8.47 U	7.8 U	7.61 U	**218**	**10100**	**55**	**214**	**217**	**11400**	**14100**	**53.4**	**9.67**	9.27 U	**8.61**	8.45 U	7.24 U

Notes:
Detected constituents are presented in **bold**.
** = As published in the March 1997 Record of Decision for the Site.
ft bgs = feet below ground surface
SCG = Standards, Criteria, and Guidance
U = The compound was analyzed for but not detected. The associated value is the compound quantitation limit.
µg/kg = microgram per kilogram

Table 4
Program Monitoring Wells
Groundwater Analytical Results
Site Management Plan
Crosman Site
East Bloomfield, New York

Well I.D.	MW-3A									
Date Sampled	**21-Apr-11**	**16-Apr-12**	**8-Apr-13**	**9-Apr-14**	**22-Apr-15**	**18-Apr-16**	**19-Apr-17**	**3-Apr-18**	**23-Apr-19**	**21-Apr-20**
Volatiles										
Acetone	-	-	-	-	-	-	-	-	-	-
Benzene	-	-	-	-	-	-	-	-	-	-
Bromodichloromethane	-	-	-	-	-	-	-	-	-	-
Bromoform	-	-	-	-	-	-	-	-	-	-
Carbon Disulfide	-	-	-	-	-	-	-	-	-	-
Carbon Tetrachloride	-	-	-	-	-	-	-	-	-	-
Chlorobenzene	-	-	-	-	-	-	-	-	-	-
Chloroform	-	-	-	-	-	-	-	-	-	-
cis-1,2-Dichloroethene	-	-	-	-	-	-	-	-	-	-
trans-1,2-Dichloroethene	-	-	-	-	-	-	-	-	-	-
Dibromochloromethane	-	-	-	-	-	-	-	-	-	-
1,1-Dichloroethane	-	-	-	-	-	-	-	-	-	-
1,1-Dichloroethene	-	-	-	-	-	-	-	-	-	-
1,1,2,2-Tetrachloroethane	-	-	-	-	-	-	-	-	-	-
Methylene Chloride	-	-	-	-	-	-	-	-	-	-
Tetrachloroethene	-	-	-	-	-	-	-	-	-	-
Trichloroethene	240	210	190	280	250	350	260	190	130	220 D
Toluene	-	-	-	-	-	-	-	-	-	-
Xylenes (total)	-	-	-	-	-	-	-	-	-	-

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Table 4
Program Monitoring Wells
Groundwater Analytical Results
Site Management Plan
Crosman Site
East Bloomfield, New York

Well I.D.	MW-4								
Date Sampled	**21-Apr-11**	**20-Oct-11**	**16-Apr-12**	**10-Oct-12**	**8-Apr-13**	**16-Oct-13**	**9-Apr-14**	**29-Oct-14**	**22-Apr-15**
Volatiles									
Acetone	-	-	-	-	-	-	-	-	-
Benzene	-	-	-	-	-	-	-	-	-
Bromodichloromethane	-	-	-	-	-	-	-	-	-
Bromoform	-	-	-	-	-	-	-	-	-
Carbon Disulfide	-	-	-	-	-	-	-	-	-
Carbon Tetrachloride	-	-	-	-	-	-	-	-	-
Chlorobenzene	-	-	-	-	-	-	-	-	-
Chloroform	-	-	-	-	-	-	-	-	-
cis-1,2-Dichloroethene	-	-	-	-	-	-	-	-	-
trans-1,2-Dichloroethene	-	-	-	-	-	-	-	-	-
Dibromochloromethane	-	-	-	-	-	-	-	-	-
1,1 - Dichloroethane	-	-	-	-	-	-	-	-	-
1,1 - Dichloroethene	-	-	-	-	-	-	-	-	-
1,1,2,2 - Tetrachloroethane	-	-	-	-	-	-	-	-	-
Methylene Chloride	-	-	-	-	-	-	-	-	-
Tetrachloroethene	-	-	-	-	-	-	-	-	-
Trichloroethene	-	-	-	-	4.06	-	-	-	-
Toluene	-	-	-	-	-	-	-	-	-
Xylenes (total)	-	-	-	-	-	-	-	-	-

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Table 4
Program Monitoring Wells
Groundwater Analytical Results
Site Management Plan
Crosman Site
East Bloomfield, New York

Well I.D.	MW-4 (cont.)									
Date Sampled	21-Oct-15	18-Apr-16	26-Oct-16	19-Apr-17	17-Oct-17	3-Apr-18	26-Oct-18	23-Apr-19	31-Oct-19	21-Apr-20
Volatiles										
Acetone	-	-	-	-	-	-	-	-	-	-
Benzene	-	-	-	-	-	-	-	-	-	-
Bromodichloromethane	-	-	-	-	-	-	-	-	-	-
Bromoform	-	-	-	-	-	-	-	-	-	-
Carbon Disulfide	-	-	-	-	-	-	-	-	-	-
Carbon Tetrachloride	-	-	-	-	-	-	-	-	-	-
Chlorobenzene	-	-	-	-	-	-	-	-	-	-
Chloroform	-	-	-	-	-	-	-	-	-	-
cis-1,2-Dichloroethene	-	-	-	-	-	-	-	-	-	-
trans-1,2-Dichloroethene	-	-	-	-	-	-	-	-	-	-
Dibromochloromethane	-	-	-	-	-	-	-	-	-	-
1,1 - Dichloroethane	-	-	-	-	-	-	-	-	-	-
1,1 - Dichloroethene	-	-	-	-	-	-	-	-	-	-
1,1,2,2 - Tetrachloroethane	-	-	-	-	-	-	-	-	-	-
Methylene Chloride	-	-	-	-	-	-	-	-	-	-
Tetrachloroethene	-	-	-	-	-	-	-	-	-	-
Trichloroethene	-	-	-	-	-	-	-	-	-	-
Toluene	-	-	-	-	-	-	-	-	-	-
Xylenes (total)	-	-	-	-	-	-	-	-	-	-

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Table 4
Program Monitoring Wells
Groundwater Analytical Results
Site Management Plan
Crosman Site
East Bloomfield, New York

Well I.D.	MW-5									
Date Sampled	**22-Oct-10**	**21-Apr-11**	**20-Oct-11**	**16-Apr-12**	**10-Oct-12**	**8-Apr-13**	**16-Oct-13**	**9-Apr-14**	**29-Oct-14**	**22-Apr-15**
Volatiles										
Acetone	-	-	-	-	-	-	-	-	-	-
Benzene	-	-	-	-	-	-	-	-	-	-
Bromodichloromethane	-	-	-	-	-	-	-	-	-	-
Bromoform	-	-	-	-	-	-	-	-	-	-
Carbon Disulfide	-	-	-	-	-	-	-	-	-	-
Carbon Tetrachloride	-	-	-	-	-	-	-	-	-	-
Chlorobenzene	-	-	-	-	-	-	-	-	-	-
Chloroform	-	-	-	-	-	-	-	-	-	-
cis-1,2-Dichloroethene	-	-	-	-	-	6.28	9.6	-	8.8	17
trans-1,2-Dichloroethene	-	-	-	-	-	-	-	-	-	-
Dibromochloromethane	-	-	-	-	-	-	-	-	-	-
1,1-Dichloroethane	-	-	-	-	-	-	-	-	-	-
1,1-Dichloroethene	-	-	-	-	-	-	-	-	-	-
1,1,2,2-Tetrachloroethane	-	-	-	-	-	-	-	-	-	-
Methylene Chloride	-	-	-	-	-	-	-	-	-	-
Tetrachloroethene	-	-	-	-	-	-	-	-	-	-
Trichloroethene	29	29	27	23	33	16.4	19	7.9	8.7	5.7
Toluene	-	-	-	-	-	-	-	-	-	-
Xylenes (total)	-	-	-	-	-	-	-	-	-	-

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Table 4
Program Monitoring Wells
Groundwater Analytical Results
Site Management Plan
Crosman Site
East Bloomfield, New York

Well I.D.	MW-5 (cont.)									
Date Sampled	**21-Oct-15**	**18-Apr-16**	**26-Oct-16**	**19-Apr-17**	**17-Oct-17**	**3-Apr-18**	**26-Oct-18**	**23-Apr-19**	**31-Oct-19**	**21-Apr-20**
Volatiles										
Acetone	-	-	-	-	-	-	12	-	-	-
Benzene	-	-	-	-	-	-	-	-	-	-
Bromodichloromethane	-	-	-	-	-	-	-	-	-	-
Bromoform	-	-	-	-	-	-	-	-	-	-
Carbon Disulfide	-	-	-	-	-	-	-	-	-	-
Carbon Tetrachloride	-	-	-	-	-	-	-	-	-	-
Chlorobenzene	-	-	-	-	-	-	-	-	-	-
Chloroform	-	-	-	-	-	-	-	-	-	-
cis-1,2-Dichloroethene	15	14	9.4	8.8	9.6	11	8.0	9.5	9.4	8.5
trans-1,2-Dichloroethene	-	-	-	-	-	-	-	-	-	-
Dibromochloromethane	-	-	-	-	-	-	-	-	-	-
1,1-Dichloroethane	-	-	-	-	-	-	-	-	-	-
1,1-Dichloroethene	-	-	-	-	-	-	-	-	-	-
1,1,2,2-Tetrachloroethane	-	-	-	-	-	-	-	-	-	-
Methylene Chloride	-	-	-	-	-	-	-	-	-	-
Tetrachloroethene	-	-	-	-	-	-	-	-	-	-
Trichloroethene	6.4	-	6.1	5.0	17	11	11	9.5	9.1	7.8
Toluene	-	-	-	-	-	-	-	-	-	-
Xylenes (total)	-	-	-	-	-	-	-	-	-	-

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Table 4
Program Monitoring Wells
Groundwater Analytical Results
Site Management Plan
Crosman Site
East Bloomfield, New York

Well I.D.	MW-13									
Date Sampled	**22-Oct-10**	**21-Apr-11**	**20-Oct-11**	**16-Apr-12**	**10-Oct-12**	**8-Apr-13**	**16-Oct-13**	**9-Apr-14**	**29-Oct-14**	**22-Apr-15**
Volatiles										
Acetone	-	-	-	-	-	-	-	-	-	-
Benzene	-	-	-	-	-	-	-	-	-	-
Bromodichloromethane	-	-	-	-	-	-	-	-	-	-
Bromoform	-	-	-	-	-	-	-	-	-	-
Carbon Disulfide	-	-	-	-	-	-	-	-	-	-
Carbon Tetrachloride	-	-	-	-	-	-	-	-	-	-
Chlorobenzene	-	-	-	-	-	-	-	-	-	-
Chloroform	-	-	-	-	-	-	-	-	-	-
cis-1,2-Dichloroethene	11	29	-	28	28	19.2	-	-	-	-
trans-1,2-Dichloroethene	-	-	-	-	-	-	-	-	-	-
Dibromochloromethane	-	-	-	-	-	-	-	-	-	-
1,1-Dichloroethane	-	-	-	-	-	-	-	-	-	-
1,1-Dichloroethene	-	-	-	-	-	-	-	-	-	-
1,1,2,2-Tetrachloroethane	-	-	-	-	-	-	-	-	-	-
Methylene Chloride	-	-	-	-	-	-	-	-	-	-
Tetrachloroethene	-	-	-	-	-	-	-	-	-	-
Trichloroethene	630 D	590	610	460	640	381	480	310	190	180
Toluene	-	-	-	-	-	-	-	-	-	-
Xylenes (total)	-	-	-	-	-	-	-	-	-	-

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Table 4
Program Monitoring Wells
Groundwater Analytical Results
Site Management Plan
Crosman Site
East Bloomfield, New York

Well I.D.	MW-13 (cont.)										
Date Sampled	**22-Apr-15**	**21-Oct-15**	**18-Apr-16**	**26-Oct-16**	**19-Apr-17**	**17-Oct-17**	**3-Apr-18**	**26-Oct-18**	**23-Apr-19**	**31-Oct-19**	**21-Apr-20**
Volatiles											
Acetone	-	-	-	-	-	-	-	16	-	-	-
Benzaldehyde	-	-	-	-	-	-	-	-	-	-	-
Benzene	-	-	-	-	-	-	-	-	-	-	-
Bromodichloromethane	-	-	-	-	-	-	-	-	-	-	-
Bromoform	-	-	-	-	-	-	-	-	-	-	-
Carbon Disulfide	-	-	-	-	-	-	-	-	-	-	-
Carbon Tetrachloride	-	-	-	-	-	-	-	-	-	-	-
Chlorobenzene	-	-	-	-	-	-	-	-	-	-	-
Chloroform	-	-	-	-	-	-	-	-	-	-	-
cis-1,2-Dichloroethene	-	29	-	13	16	-	-	15	-	-	19
trans-1,2-Dichloroethene	-	-	-	-	-	-	-	-	-	-	-
Dibromochloromethane	-	-	-	-	-	-	-	-	-	-	-
1,1-Dichloroethane	-	-	-	-	-	-	-	-	-	-	-
1,1-Dichloroethene	-	-	-	-	-	-	-	-	-	-	-
1,2-Dichloroethene (total)	-	-	-	-	-	-	-	-	-	-	-
1,1,2,2-Tetrachloroethane	-	-	-	-	-	-	-	-	-	-	-
Methylene Chloride	-	-	-	-	-	-	-	-	-	-	-
Naphthalene	-	-	-	-	-	-	-	-	-	-	-
Tetrachloroethene	-	-	-	-	-	-	-	-	-	-	-
Trichloroethene	180	400 D	130	96	250 D	110	51	140	34	58	340 D
Toluene	-	-	-	-	-	-	-	-	-	-	-
Xylenes (total)	-	-	-	-	-	-	-	-	-	-	-

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Table 4
Program Monitoring Wells
Groundwater Analytical Results
Site Management Plan
Crosman Site
East Bloomfield, New York

Well I.D.	MW-14									
Date Sampled	**22-Oct-10**	**21-Apr-11**	**20-Oct-11**	**16-Apr-12**	**10-Oct-12**	**8-Apr-13**	**16-Oct-13**	**9-Apr-14**	**29-Oct-14**	**22-Apr-15**
Volatiles										
Acetone	-	-	-	-	-	-	-	-	-	-
Benzene	-	-	-	-	-	-	-	-	-	-
Bromodichloromethane	-	-	-	-	-	-	-	-	-	-
Bromoform	-	-	-	-	-	-	-	-	-	-
Carbon Disulfide	-	-	-	-	-	-	-	-	-	-
Carbon Tetrachloride	-	-	-	-	-	-	-	-	-	-
Chlorobenzene	-	-	-	-	-	-	-	-	-	-
Chloroform	-	-	-	-	-	-	-	-	-	-
cis-1,2-Dichloroethene	-	-	-	-	-	-	-	-	-	-
trans-1,2-Dichloroethene	-	-	-	-	-	-	-	-	-	-
Dibromochloromethane	-	-	-	-	-	-	-	-	-	-
1,1-Dichloroethane	-	-	-	-	-	-	-	-	-	-
1,1-Dichloroethene	-	-	-	-	-	-	-	-	-	-
1,1,2,2-Tetrachloroethane	-	-	-	-	-	-	-	-	-	-
Methylene Chloride	-	-	-	-	-	-	-	-	-	-
Tetrachloroethene	-	-	-	-	-	-	-	-	-	-
Trichloroethene	-	-	-	-	-	-	-	-	-	-
Toluene	-	-	-	-	-	-	-	-	-	-
Xylenes (total)	-	-	-	-	-	-	-	-	-	-

Notes on page 20.

Table 4
Program Monitoring Wells
Groundwater Analytical Results
Site Management Plan
Crosman Site
East Bloomfield, New York

Well I.D.	MW-14 (cont.)									
Date Sampled	21-Oct-15	18-Apr-16	26-Oct-16	19-Apr-17	17-Oct-17	3-Apr-18	26-Oct-18	23-Apr-19	31-Oct-19	21-Apr-20
Volatiles										
Acetone	-	-	-	-	-	-	-	-	-	-
Benzaldehyde	-	-	-	-	-	-	-	-	-	-
Benzene	-	-	-	-	-	-	-	-	-	-
Bromodichloromethane	-	-	-	-	-	-	-	-	-	-
Bromoform	-	-	-	-	-	-	-	-	-	-
Carbon Disulfide	-	-	-	-	-	-	-	-	-	-
Carbon Tetrachloride	-	-	-	-	-	-	-	-	-	-
Chlorobenzene	-	-	-	-	-	-	-	-	-	-
Chloroform	-	-	-	-	-	-	-	-	-	-
cis-1,2-Dichloroethene	-	-	-	-	-	-	-	-	-	-
trans-1,2-Dichloroethene	-	-	-	-	-	-	-	-	-	-
Dibromochloromethane	-	-	-	-	-	-	-	-	-	-
1,1-Dichloroethane	-	-	-	-	-	-	-	-	-	-
1,1-Dichloroethene	-	-	-	-	-	-	-	-	-	-
1,2-Dichloroethene (total)	-	-	-	-	-	-	-	-	-	-
1,1,2,2-Tetrachloroethane	-	-	-	-	-	-	-	-	-	-
Methylene Chloride	-	-	-	-	-	-	-	-	-	-
Naphthalene	-	-	-	-	-	-	-	-	-	-
Tetrachloroethene	-	-	-	-	-	-	-	-	-	-
Trichloroethene	-	-	-	-	-	-	-	-	-	-
Toluene	-	-	-	-	-	-	-	-	-	-
Xylenes (total)	-	-	-	-	-	-	-	-	-	-

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Table 4
Program Monitoring Wells
Groundwater Analytical Results
Site Management Plan
Crosman Site
East Bloomfield, New York

Well I.D.	MW-15									
Date Sampled	**22-Oct-10**	**21-Apr-11**	**20-Oct-11**	**16-Apr-12**	**10-Oct-12**	**8-Apr-13**	**16-Oct-13**	**9-Apr-14**	**29-Oct-14**	**22-Apr-15**
Volatiles										
Acetone	-	-	-	-	-	-	-	-	-	-
Benzene	-	-	-	-	-	-	-	-	-	-
Bromodichloromethane	-	-	-	-	-	-	-	-	-	-
Bromoform	-	-	-	-	-	-	-	-	-	-
Carbon Disulfide	-	-	-	-	-	-	-	-	-	-
Carbon Tetrachloride	-	-	-	-	-	-	-	-	-	-
Chlorobenzene	-	-	-	-	-	-	-	-	-	-
Chloroform	-	-	-	-	-	-	-	-	-	-
cis-1,2-Dichloroethene	-	-	-	-	-	-	-	-	-	-
trans-1,2-Dichloroethene	-	-	-	-	-	-	-	-	-	-
Dibromochloromethane	-	-	-	-	-	-	-	-	-	-
1,1-Dichloroethane	-	-	-	-	-	-	-	-	-	-
1,1-Dichloroethene	-	-	-	-	-	-	-	-	-	-
1,1,2,2-Tetrachloroethane	-	-	-	-	-	-	-	-	-	-
Methylene Chloride	-	-	-	-	-	-	-	-	-	-
Tetrachloroethene	-	-	-	-	-	-	-	-	-	-
Trichloroethene	-	-	-	-	-	-	-	-	-	-
Toluene	-	-	-	-	-	-	-	-	-	-
Xylenes (total)	-	-	-	-	-	-	-	-	-	-

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Table 4
Program Monitoring Wells
Groundwater Analytical Results
Site Management Plan
Crosman Site
East Bloomfield, New York

Well I.D.	MW-15 (cont.)									
Date Sampled	21-Oct-15	18-Apr-16	26-Oct-16	19-Apr-17	17-Oct-17	3-Apr-18	26-Oct-18	23-Apr-19	31-Oct-19	21-Apr-20
Volatiles										
Acetone	-	-	-	-	-	-	15	-	-	-
Benzene	-	-	-	-	-	-	-	-	-	-
Bromodichloromethane	-	-	-	-	-	-	-	-	-	-
Bromoform	-	-	-	-	-	-	-	-	-	-
Carbon Disulfide	-	-	-	-	-	-	-	-	-	-
Carbon Tetrachloride	-	-	-	-	-	-	-	-	-	-
Chlorobenzene	-	-	-	-	-	-	-	-	-	-
Chloroform	-	-	-	-	-	-	-	-	-	-
cis-1,2-Dichloroethene	-	-	-	-	-	-	-	-	-	-
trans-1,2-Dichloroethene	-	-	-	-	-	-	-	-	-	-
Dibromochloromethane	-	-	-	-	-	-	-	-	-	-
1,1-Dichloroethane	-	-	-	-	-	-	-	-	-	-
1,1-Dichloroethene	-	-	-	-	-	-	-	-	-	-
1,1,2,2-Tetrachloroethane	-	-	-	-	-	-	-	-	-	-
Methylene Chloride	-	-	-	-	-	-	-	-	-	-
Tetrachloroethene	-	-	-	-	-	-	-	-	-	-
Trichloroethene	-	-	-	-	-	-	-	-	-	-
Toluene	-	-	-	-	-	-	-	-	-	-
Xylenes (total)	-	-	-	-	-	-	-	-	-	-

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Table 4
Program Monitoring Wells
Groundwater Analytical Results
Site Management Plan
Crosman Site
East Bloomfield, New York

Well I.D.	MW-17									
Date Sampled	21-Apr-11	16-Apr-12	8-Apr-13	9-Apr-14	22-Apr-15	18-Apr-16	19-Apr-17	3-Apr-18	23-Apr-19	21-Apr-20
Volatiles										
Acetone	-	-	-	-	-	-	-	-	-	-
Benzene	-	-	-	-	-	-	-	-	-	-
Bromodichloromethane	-	-	-	-	-	-	-	-	-	-
Bromoform	-	-	-	-	-	-	-	-	-	-
Carbon Disulfide	-	-	-	-	-	-	-	-	-	-
Carbon Tetrachloride	-	-	-	-	-	-	-	-	-	-
Chlorobenzene	-	-	-	-	-	-	-	-	-	-
Chloroform	-	-	-	-	-	-	-	-	-	-
cis-1,2-Dichloroethene	-	-	6.48	-	-	-	-	-	-	-
trans-1,2-Dichloroethene	-	25	13.4	-	-	-	-	-	15	-
Dibromochloromethane	-	-	-	-	-	-	-	-	-	-
1,1-Dichloroethane	-	-	-	-	-	-	-	-	-	-
1,1-Dichloroethene	-	-	-	-	-	-	-	-	-	-
1,1,2,2-Tetrachloroethane	-	-	-	-	-	-	-	-	-	-
Methylene Chloride	-	-	-	-	-	-	-	-	-	-
Tetrachloroethene	-	-	-	-	-	-	-	-	-	-
Trichloroethene	510	370	324	440	400	340	500 D	470	440	440
Toluene	-	-	-	-	-	-	-	-	-	-
Xylenes (total)	-	-	-	-	-	-	-	-	-	-

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Table 4
Program Monitoring Wells
Groundwater Analytical Results
Site Management Plan
Crosman Site
East Bloomfield, New York

Well I.D.	MW-18					
Date Sampled	**22-Oct-10**	**21-Apr-11**	**20-Oct-11**	**16-Apr-12**	**8-Apr-13**	**9-Apr-14**
Volatiles						
Acetone	-	-	-	-	-	-
Benzene	-	-	-	-	-	-
Bromodichloromethane	-	-	-	-	-	-
Bromoform	-	-	-	-	-	-
Carbon Disulfide	-	-	-	-	-	-
Carbon Tetrachloride	-	-	-	-	-	-
Chlorobenzene	-	-	-	-	-	-
Chloroform	-	-	-	-	-	-
cis-1,2-Dichloroethene	-	-	-	-	-	-
trans-1,2-Dichloroethene	-	-	-	-	-	-
Dibromochloromethane	-	-	-	-	-	-
1,1-Dichloroethane	-	-	-	-	-	-
1,1-Dichloroethene	-	-	-	-	-	-
1,1,2,2-Tetrachloroethane	-	-	-	-	-	-
Methylene Chloride	-	-	-	-	-	-
Tetrachloroethene	-	-	-	-	-	-
Trichloroethene	-	-	-	-	-	-
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Xylenes (total)	-	-	-	-	-	-

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Table 4
Program Monitoring Wells
Groundwater Analytical Results
Site Management Plan
Crosman Site
East Bloomfield, New York

Well I.D.	MW-18 (cont.)					
Date Sampled	22-Apr-15	18-Apr-16	19-Apr-17	3-Apr-18	23-Apr-19	21-Apr-20
Volatiles						
Acetone	-	-	-	-	-	-
Benzene	-	-	-	-	-	-
Bromodichloromethane	-	-	-	-	-	-
Bromoform	-	-	-	-	-	-
Carbon Disulfide	-	-	-	-	-	-
Carbon Tetrachloride	-	-	-	-	-	-
Chlorobenzene	-	-	-	-	-	-
Chloroform	-	-	-	-	-	-
cis-1,2-Dichloroethene	-	-	-	-	-	-
trans-1,2-Dichloroethene	-	-	-	-	-	-
Dibromochloromethane	-	-	-	-	-	-
1,1-Dichloroethane	-	-	-	-	-	-
1,1-Dichloroethene	-	-	-	-	-	-
1,1,2,2-Tetrachloroethane	-	-	-	-	-	-
Methylene Chloride	-	-	-	-	-	-
Tetrachloroethene	-	-	-	-	-	-
Trichloroethene	-	-	-	-	-	-
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Xylenes (total)	-	-	-	-	-	-

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Table 4
Program Monitoring Wells
Groundwater Analytical Results
Site Management Plan
Crosman Site
East Bloomfield, New York

Well I.D.	MW-19					
Date Sampled	22-Oct-10	21-Apr-11	20-Oct-11	16-Apr-12	8-Apr-13	9-Apr-14
Volatiles						
Acetone	-	-	-	-	-	-
Benzene	-	-	-	-	-	-
Bromodichloromethane	-	-	-	-	-	-
Bromoform	-	-	-	-	-	-
Carbon Disulfide	-	-	-	-	-	-
Carbon Tetrachloride	-	-	-	-	-	-
Chlorobenzene	-	-	-	-	-	-
Chloroform	-	-	-	-	-	-
cis-1,2-Dichloroethene	-	-	-	-	-	-
trans-1,2-Dichloroethene	-	-	-	-	-	-
Dibromochloromethane	-	-	-	-	-	-
1,1-Dichloroethane	-	-	-	-	-	-
1,1-Dichloroethene	-	-	-	-	-	-
1,1,2,2-Tetrachloroethane	-	-	-	-	-	-
Methylene Chloride	-	-	-	-	-	-
Tetrachloroethene	-	-	-	-	-	-
Trichloroethene	-	-	-	-	-	-
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Xylenes (total)	-	-	-	-	-	-

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Table 4
Program Monitoring Wells
Groundwater Analytical Results
Site Management Plan
Crosman Site
East Bloomfield, New York

Well I.D.	MW-19 (cont.)					
Date Sampled	**22-Apr-15**	**18-Apr-16**	**19-Apr-17**	**3-Apr-18**	**23-Apr-19**	**21-Apr-20**
Volatiles						
Acetone	-	-	-	-	-	-
Benzene	-	-	-	-	-	-
Bromodichloromethane	-	-	-	-	-	-
Bromoform	-	-	-	-	-	-
2-Butanone	-	-	-	-	-	-
Carbon Disulfide	-	-	-	-	-	-
Carbon Tetrachloride	-	-	-	-	-	-
Chlorobenzene	-	-	-	-	-	-
Chloroform	-	-	-	-	-	-
cis-1,2-Dichloroethene	-	-	-	-	-	-
trans-1,2-Dichloroethene	-	-	-	-	-	-
Dibromochloromethane	-	-	-	-	-	-
1,1-Dichloroethane	-	-	-	-	-	-
1,1-Dichloroethene	-	-	-	-	-	-
1,2-Dichloroethene (total)	-	-	-	-	-	-
2-Hexanone	-	-	-	-	-	-
1,1,2,2-Tetrachloroethane	-	-	-	-	-	-
4-Methyl-2-pentanone	-	-	-	-	-	-
Methylene Chloride	-	-	-	-	-	-
Tetrachloroethene	-	-	-	-	-	-
Trichloroethene	-	-	-	-	-	-
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Xylenes (total)	-	-	-	-	-	-

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Table 4
Program Monitoring Wells
Groundwater Analytical Results
Site Management Plan
Crosman Site
East Bloomfield, New York

Well I.D.	PW-1									
Date Sampled	**22-Oct-10**	**21-Apr-11**	**20-Oct-11**	**16-Apr-12**	**10-Oct-12**	**8-Apr-13**	**16-Oct-13**	**9-Apr-14**	**29-Oct-14**	**27-Apr-15**
Volatiles										
Acetone	-	-	-	-	-	-	-	-	-	-
Benzene	-	-	-	-	-	-	-	-	-	-
Bromodichloromethane	-	-	-	-	-	-	-	-	-	-
Bromoform	-	-	-	-	-	-	-	-	-	-
Carbon Disulfide	-	-	-	-	-	-	-	-	-	-
Carbon Tetrachloride	-	-	-	-	-	-	-	-	-	-
Chlorobenzene	-	-	-	-	-	-	-	-	-	-
Chloroform	-	-	-	-	-	-	-	-	-	-
cis-1,2-Dichloroethene	-	-	-	-	-	-	-	-	-	-
trans-1,2-Dichloroethene	-	-	-	-	-	-	-	-	-	-
Dibromochloromethane	-	-	-	-	-	-	-	-	-	-
1,1-Dichloroethane	-	-	-	-	-	-	-	-	-	-
1,1-Dichloroethene	-	-	-	-	-	-	-	-	-	-
1,1,2,2-Tetrachloroethane	-	-	-	-	-	-	-	-	-	-
Methylene Chloride	-	-	-	-	-	-	-	-	-	-
Tetrachloroethene	-	-	-	-	-	-	-	-	-	-
Trichloroethene	200 D	92	160	130	150	105	140	120	110	69
Notes on page 20.	-	-	-	-	-	-	-	-	-	-
Xylenes (total)	-	-	-	-	-	-	-	-	-	-

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Table 4
Program Monitoring Wells
Groundwater Analytical Results
Site Management Plan
Crosman Site
East Bloomfield, New York

Well I.D.	PW-1 (cont.)								
Date Sampled	**21-Oct-15**	**18-Apr-16**	**26-Oct-16**	**19-Apr-17**	**3-Apr-18**	**26-Oct-18**	**23-Apr-19**	**31-Oct-19**	**21-Apr-20**
Volatiles									
Acetone	-	-	-	-	-	-	-	-	-
Benzene	-	-	-	-	-	-	-	-	-
Bromodichloromethane	-	-	-	-	-	-	-	-	-
Bromoform	-	-	-	-	-	-	-	-	-
Carbon Disulfide	-	-	-	-	-	-	-	-	-
Carbon Tetrachloride	-	-	-	-	-	-	-	-	-
Chlorobenzene	-	-	-	-	-	-	-	-	-
Chloroform	-	-	-	-	-	-	-	-	-
cis-1,2-Dichloroethene	-	-	-	-	-	-	-	-	-
trans-1,2-Dichloroethene	-	-	-	-	-	-	-	-	-
Dibromochloromethane	-	-	-	-	-	-	-	-	-
1,1-Dichloroethane	-	-	-	-	-	-	-	-	-
1,1-Dichloroethene	-	-	-	-	-	-	-	-	-
1,1,2,2-Tetrachloroethane	-	-	-	-	-	-	-	-	-
Methylene Chloride	-	-	-	-	-	-	-	-	-
Tetrachloroethene	-	-	-	-	-	-	-	-	-
Trichloroethene	98	79	92	41	14	22	15	15	14
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Xylenes (total)	-	-	-	-	-	-	-	-	-

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Table 4
Program Monitoring Wells
Groundwater Analytical Results
Site Management Plan
Crosman Site
East Bloomfield, New York

Well I.D.	MW-20 (formerly IRM-1)									
Date Sampled	**21-Apr-11**	**16-Apr-12**	**8-Apr-13**	**9-Apr-14**	**22-Apr-15**	**18-Apr-16**	**19-Apr-17**	**3-Apr-18**	**23-Apr-19**	**21-Apr-20**
Volatiles										
Acetone	-	-	-	-	-	-	-	-	-	-
Benzene	-	-	-	-	-	-	-	-	-	-
Bromodichloromethane	-	-	-	-	-	-	-	-	-	-
Bromoform	-	-	-	-	-	-	-	-	-	-
Carbon Disulfide	-	-	-	-	-	-	-	-	-	-
Carbon Tetrachloride	-	-	-	-	-	-	-	-	-	-
Chlorobenzene	-	-	-	-	-	-	-	-	-	-
Chloroform	-	-	-	-	-	-	-	-	-	-
cis-1,2-Dichloroethene	-	-	-	-	-	-	-	-	-	-
trans-1,2-Dichloroethene	-	-	-	-	-	-	-	-	-	-
Dibromochloromethane	-	-	-	-	-	-	-	-	-	-
1,1-Dichloroethane	-	-	-	-	-	-	-	-	-	-
1,1-Dichloroethene	-	-	-	-	-	-	-	-	-	-
1,1,2,2-Tetrachloroethane	-	-	-	-	-	-	-	-	-	-
Methlyene Chloride	-	-	-	-	-	-	-	-	-	-
Tetrachloroethene	-	-	-	-	-	-	-	-	-	-
Trichloroethene	150	130	138	170	110	120	160	120	150	180
Toluene	-	-	-	-	-	-	-	-	-	-
Xylenes (total)	-	-	-	-	-	-	-	-	-	-

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Table 4
Program Monitoring Wells
Groundwater Analytical Results
Qualifiers and Notes
Site Management Plan
Crosman Site
East Bloomfield, New York

J :	The compound was positively identified; however, the associated numerical value is an estimated concentration.
N :	Spiked sample recovery was not within control limits.
S :	The reported value was determined by the method of standard additions (MSA).
D :	Denotes a secondary dilution.
E :	Exceeds calibration range.
NA :	Denotes not analyzed.
- :	Denotes a nondetectable concentration.

Water quality results are expressed in micrograms per liter (µg/L), equivalent to parts per billion.

Table 5A
Sub-Slab Soil Vapor Sampling Results
Site Management Plan
Crosman Site
East Bloomfield, New York

Sample Type:	Sub-Slab Soil Vapor										
Sample ID:	SS-1	SS-2	SS-3	SS-4	SS-5	SS-6	SDS-1*	SDS-1*	SDS-1*	SDS-1*	SDS-1*
Sample Date:	1/28/2014	1/28/2014	1/28/2014	1/28/2014	1/28/2014	1/28/2014	7/8/2016	7/29/2016	8/25/2016	9/22/2016	10/26/2016
Units:	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3
Vinyl Chloride	0.10 U	0.10 U	0.10 U	1,400 U	4.6 U	0.10 U	**4,800 J**	480 U	240 U	270 U	130 U
1,1-Dichloroethene	0.79 U	0.79 U	0.79 U	11,000 U	36 U	0.79 U	37,000 U	3,700 U	1,800 U	2,100 U	1,000 U
Acetone	12 U	12 U	12 U	160,000 U	540 U	12 U	**780,000**	**71,000**	**8,100 J**	**40,000**	16,000 U
Methylene Chloride	1.7 U	1.7 U	1.7 U	24,000 U	79 U	1.7 U	81,000 U	8,100 U	4,000 U	4,600 U	2,300 U
trans-1,2-Dichloroethene	0.79 U	0.79 U	0.79 U	11,000 U	36 U	0.79 U	37,000 U	3,700 U	1,800 U	2,100 U	1,000 U
1,1-Dichloroethane	0.81 U	0.81 U	0.81 U	11,000 U	37 U	0.81 U	38,000 U	3,800 U	1,900 U	2,200 U	1,100 U
cis-1,2-Dichloroethene	0.79 U	0.79 U	0.79 U	11,000 U	36 U	0.79 U	37,000 U	3,700 U	1,800 U	2,100 U	1,000 U
1,2-Dichloroethene (total)	0.79 U	0.79 U	0.79 U	11,000 U	**48**	0.79 U	74,000 U	7,400 U	3,700 U	4,200 U	2,100 U
1,1,1-Trichloroethane	1.1 U	1.1 U	1.1 U	15,000 U	49 U	**1.1**	51,000 U	5,100 U	2,500 U	2,900 U	1,400 U
Carbon Tetrachloride	**0.34**	**0.48**	**0.57**	3,400 U	11 U	0.25 U	12,000 U	1,200 U	580 U	670 U	330 U
Benzene	**0.83**	**2.0**	**0.67**	8,700 U	**98**	**8.4**	30,000 U	3,000 U	1,500 U	1,700 U	840 U
Trichloroethene (TCE)	**15**	**1.4**	**260 D**	**12,000,000 D**	**27,000 D**	**0.94**	**2,800,000**	**650,000**	**320,000**	**420,000**	**140,000**
Toluene	**4.0**	**4.7**	**2.2**	10,000 U	**270**	**32**	35,000 U	3,500 U	1,700 U	2,000 U	990 U
Tetrachloroethene (PCE)	1.4 U	1.4 U	1.4 U	18,000 U	61 U	1.4 U	64,000 U	6,300 U	3,100 U	3,600 U	1,800 U
Chlorobenzene	0.92 U	0.92 U	0.92 U	13,000 U	42 U	0.92 U	43,000 U	4,300 U	2,100 U	2,400 U	1,200 U
Xylene (m,p)	**5.7**	**3.9**	2.2 U	30,000 U	**230**	**31**	100,000 U	10,000 U	5,000 U	5,800 U	2,900 U
Xylene (o)	**1.5**	**1.2**	0.87 U	12,000 U	**81**	**8.5**	41,000 U	4,100 U	2,000 U	2,300 U	1,100 U
Bromoform	2.1 U	2.1 U	2.1 U	28,000 U	94 U	2.1 U	97,000 U	9,700 U	4,800 U	5,500 U	2,700 U
1,1,2,2-Tetrachloroethane	1.4 U	1.4 U	1.4 U	19,000 U	62 U	1.4 U	64,000 U	6,400 U	3,200 U	3,700 U	1,800 U

Notes:
Samples were analyzed using USEPA Method TO-15.
Bold results indicate a detection.
D = Concentration is the result of a dilution.
U = Not detected at the reporting limit.
µg/m^3 = micrograms per cubic meter
* = SDS-1 installed at same location as SS-4
** = SDS-2 installed at same location as SS-5
NA** = Not Available; analytical data has been rejected due to condensate entering the sample container during collection.

Table 5A
Sub-Slab Soil Vapor Sampling Results
Site Management Plan
Crosman Site
East Bloomfield, New York

Sample Type:	Sub-Slab Soil Vapor										
Sample ID:	SDS-1*	SDS-1*	SDS-1*	SDS-1*	SDS-1*	SDS-1*	SDS-1*	SDS-1*	SDS-1*	SDS-1*	SDS-1*
Sample Date:	11/30/2016	12/20/2016	1/25/2017	2/22/2017	3/28/2017	4/19/2017	5/16/2017	6/29/2017	7/31/2017	8/23/2017	9/27/2017
Units:	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3
Vinyl Chloride	81 U	NA**	75 U	66 U	48 U	81 U	70 U	35 U	31 U	51 U	31 U
1,1-Dichloroethene	630 U	NA**	580 U	510 U	370 U	630 U	540 U	270 U	240 U	400 U	240 U
Acetone	9,400 U	NA**	8,700 U	7,600 U	5,600 U	9,400 U	8,100 U	4,000 U	3,600 U	5,900 U	3,600 U
Methylene Chloride	1,400 U	NA**	1,300 U	1,100 U	810 U	**210 JB**	**370 J**	590 U	530 U	870 U	520 U
trans-1,2-Dichloroethene	630 U	NA**	580 U	510 U	370 U	630 U	540 U	270 U	240 U	400 U	240 U
1,1-Dichloroethane	640 U	NA**	590 U	520 U	380 U	640 U	550 U	270 U	250 U	400 U	240 U
cis-1,2-Dichloroethene	630 U	NA**	580 U	510 U	370 U	630 U	540 U	270 U	240 U	400 U	240 U
1,2-Dichloroethene (total)	1,300 U	NA**	1,200 U	1,000 U	740 U	1,300 U	1,100 U	540 U	480 U	790 U	480 U
1,1,1-Trichloroethane	860 U	NA**	800 U	700 U	510 U	860 U	750 U	370 U	330 U	550 U	330 U
Carbon Tetrachloride	200 U	NA**	180 U	160 U	120 U	200 U	170 U	85 U	76 U	130 U	76 U
Benzene	510 U	NA**	470 U	410 U	300 U	500 U	440 U	220 U	190 U	**72 J**	190 U
Trichloroethene (TCE)	**100,000**	NA**	**120,000**	**86,000**	**67,000 B**	**67,000**	**57,000**	**55,000**	**47,000**	**67,000**	**58,000**
Toluene	600 U	NA**	550 U	480 U	350 U	600 U	520 U	250 U	230 U	120 J	230 U
Tetrachloroethene (PCE)	1,100 U	NA**	990 U	870 U	640 U	1,100 U	930 U	460 U	410 U	680 U	410 U
Chlorobenzene	730 U	NA**	670 U	590 U	430 U	730 U	630 U	310 U	280 U	460 U	280 U
Xylene (m,p)	1,700 U	NA**	1,600 U	1,400 U	1,000 U	1,700 U	1,500 U	730 U	660 U	1,100 U	650 U
Xylene (o)	690 U	NA**	630 U	560 U	410 U	690 U	590 U	290 U	260 U	430 U	260 U
Bromoform	1,600 U	NA**	1,500 U	1,300 U	970 U	1,600 U	1,400 U	700 U	630 U	1,000 U	620 U
1,1,2,2-Tetrachloroethane	1,100 U	NA**	1,000 U	880 U	640 U	1,100 U	940 U	460 U	420 U	690 U	410 U

Notes:
Samples were analyzed using USEPA Method TO-15.
Bold results indicate a detection.
D = Concentration is the result of a dilution.
U = Not detected at the reporting limit.
µg/m^3 = micrograms per cubic meter
* = SDS-1 installed at same location as SS-4
** = SDS-2 installed at same location as SS-5
NA** = Not Available; analytical data has been rejected due to condensate entering the sample container during collection.

Table 5A
Sub-Slab Soil Vapor Sampling Results
Site Management Plan
Crosman Site
East Bloomfield, New York

Sample Type:	Sub-Slab Soil Vapor										
Sample ID:	SDS-1*	SDS-1*	SDS-1*	SDS-1*	SDS-1*	SDS-1*	SDS-1*	SDS-1*	SDS-1*	SDS-1*	SDS-1*
Sample Date:	10/17/2017	11/27/2017	12/19/2017	1/24/2018	2/22/2018	3/29/2018	4/26/2018	5/22/2018	6/18/2018	7/31/2018	8/29/2018
Units:	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3
Vinyl Chloride	100 U	31 U	38 U	34 U	30 U	48 U	20 U	23 U	20 U	32 U	13 U
1,1-Dichloroethene	790 U	240 U	290 U	260 U	47 U	75 U	31 U	36 U	32 U	50 U	21 U
Acetone	12,000 U	3,600 U	4,400 U	3,900 U	4,000 U	6,400 U	2,600 U	3,100 U	2,700 U	4,300 U	1,800 U
Methylene Chloride	1,700 U	520 U	640 U	570 U	590 U	930 U	380 U	450 U	400 U	620 U	260 U
trans-1,2-Dichloroethene	790 U	240 U	290 U	260 U	270 U	430 U	180 U	200 U	180 U	280 U	120 U
1,1-Dichloroethane	810 U	240 U	300 U	270 U	280 U	430 U	180 U	210 U	190 U	290 U	120 U
cis-1,2-Dichloroethene	790 U	240 U	290 U	260 U	47 U	75 U	31 U	36 U	32 U	50 U	21 U
1,2-Dichloroethene (total)	1,600 U	470 U	590 U	520 U	540 U	850 U	350 U	410 U	360 U	570 U	240 U
1,1,1-Trichloroethane	1,100 U	330 U	400 U	360 U	370 U	590 U	240 U	280 U	250 U	390 U	160 U
Carbon Tetrachloride	250 U	75 U	93 U	82 U	75 U	120 U	49 U	57 U	50 U	79 U	33 U
Benzene	640 U	190 U	240 U	210 U	220 U	340 U	140 U	160 U	150 U	230 U	96 U
Trichloroethene (TCE)	**60,000**	**45,000**	**47,000**	**42,000**	**42,000**	**29,000**	**32,000**	**27,000**	**24,000**	**38,000**	**25,000**
Toluene	750 U	**44 J**	280 U	250 U	260 U	400 U	170 U	190 U	170 U	270 U	110 U
Tetrachloroethene (PCE)	1,400 U	**140 J**	500 U	440 U	460 U	730 U	300 U	350 U	310 U	490 U	200 U
Chlorobenzene	920 U	280 U	340 U	300 U	310 U	490 U	200 U	240 U	210 U	330 U	140 U
Xylene (m,p)	2,200 U	650 U	800 U	710 U	740 U	1200 U	480 U	560 U	500 U	780 U	330 U
Xylene (o)	870 U	260 U	320 U	280 U	300 U	470 U	190 U	220 U	200 U	310 U	130 U
Bromoform	2,100 U	620 U	760 U	680 U	700 U	1,100 U	460 U	530 U	470 U	740 U	310 U
1,1,2,2-Tetrachloroethane	1,400 U	410 U	510 U	450 U	470 U	740 U	300 U	350 U	310 U	490 U	210 U

Notes:
Samples were analyzed using USEPA Method TO-15.
Bold results indicate a detection.
D = Concentration is the result of a dilution.
U = Not detected at the reporting limit.
µg/m^3 = micrograms per cubic meter
* = SDS-1 installed at same location as SS-4
** = SDS-2 installed at same location as SS-5
NA** = Not Available; analytical data has been rejected due to condensate entering the sample container during collection.

Table 5A
Sub-Slab Soil Vapor Sampling Results
Site Management Plan
Crosman Site
East Bloomfield, New York

Sample Type:	Sub-Slab Soil Vapor										
Sample ID:	SDS-1*	SDS-1*	SDS-1*	SDS-1*	SDS-1*	SDS-1*	SDS-1*	SDS-1*	SDS-1*	SDS-1*	SDS-1*
Sample Date:	9/25/2018	10/26/2018	11/29/2018	12/18/2018	1/31/2019	2/21/2019	3/19/2019	4/23/2019	5/28/2019	6/24/2019	7/31/2019
Units:	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3
Vinyl Chloride	31 U	29 U	56 U	24 U *	9.3 U	9.1 U *	8.9 U	18 U	13 U	30 U	16 U
1,1-Dichloroethene	49 U	46 U	87 U	38 U	14 U	14 U	14 U	28 U	20 U	21 U	11 U
Acetone	4,200 U	3,900 U	7,400 U	3200 U	1200 U	1200 U	1200 U	2400 U	1700 U	1800 U	950 U
Methylene Chloride	610 U	570 U	1,100 U	470 U	180 U	180 U *	170 U	350 U	250 U	260 U	140 U
trans-1,2-Dichloroethene	280 U	260 U	500 U	220 U	82 U	81 U	79 U	160 U	110 U	120 U	63 U
1,1-Dichloroethane	280 U	270 U	510 U	220 U	84 U	82 U	81 U	160 U	120 U	120 U	**16 J**
cis-1,2-Dichloroethene	49 U	46 U	87 U	38 U	14 U	14 U	14 U	28 U	20 U	30 U	16 U
1,2-Dichloroethene (total)	560 U	520 U	990 U	430 U	160 U	160 U	160 U	320 U	230 U	240 U	130 U
1,1,1-Trichloroethane	380 U	360 U	680 U	300 U	110 U	110 U	110 U	220 U	160 U	160 U	1700
Carbon Tetrachloride	77 U	72 U	140 U	60 U	23 U	22 U	22 U	44 U	32 U	33 U	18 U
Benzene	220 U	210 U	400 U	170 U	66 U	65 U	64 U	130 U	92 U	96 U	51 U
Trichloroethene (TCE)	**22,000**	**41,000**	**22,000**	**33,000**	**17,000**	**18,000**	**20,000**	**17,000**	**14,000**	**17,000**	**21,000 D**
Toluene	260 U	250 U	470 U	210 U	78 U	77 U	75 U	150 U	110 U	110 U	60 U
Tetrachloroethene (PCE)	470 U	450 U	850 U	370 U	140 U	140 U	140 U	270 U	200 U	200 U	110 U
Chlorobenzene	320 U	300 U	580 U	250 U	96 U	94 U	92 U	180 U	130 U	140 U	74 U
Xylene (m,p)	760 U	710 U	1,400 U	590 U	230 U	220 U	220 U	430 U	310 U	330 U	170 U
Xylene (o)	300 U	290 U	540 U	240 U	90 U	88 U	87 U	170 U	130 U	130 U	69 U
Bromoform	720 U	680 U	1,300 U	570 U	220 U	210 U	210 U	410 U	300 U *	310 U	170 U
1,1,2,2-Tetrachloroethane	480 U	450 U	860 U	380 U	140 U	140 U	140 U	270 U	200 U	210 U	110 U

Notes:
Samples were analyzed using USEPA Method TO-15.
Bold results indicate a detection.
D = Concentration is the result of a dilution.
U = Not detected at the reporting limit.
µg/m^3 = micrograms per cubic meter
* = SDS-1 installed at same location as SS-4
** = SDS-2 installed at same location as SS-5
NA** = Not Available; analytical data has been rejected due to condensate entering the sample container during collection.

Table 5A
Sub-Slab Soil Vapor Sampling Results
Site Management Plan
Crosman Site
East Bloomfield, New York

Sample Type:	Sub-Slab Soil Vapor										
Sample ID:	SDS-1*	SDS-1*	SDS-1*	SDS-1*	SDS-1*	SDS-1*	SDS-1*	SDS-1*	SDS-1*	SDS-1*	SDS-1*
Sample Date:	8/21/2019	9/25/2019	10/31/2019	11/19/2019	12/17/2019	1/29/2020	2/26/2020	3/31/2020	4/22/2020	5/27/2020	6/23/2020
Units:	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3
Vinyl Chloride	28 U	20 U	7 U	39 U	6 U *	4 U	8 U	2 U	10 U	6 U	5.6 U
1,1-Dichloroethene	20 U	14 U	4.9 U	27 U	4.1 U	2.8 U	5.5 U	1.4 U	6.9 U	4.2 U	3.9 U
Acetone	1700 U	1200 U	420 U	2300 U	360 U	**140 J**	470 U	120 U	590 U	360 U	330 U
Methylene Chloride	250 U	170 U	61 U	340 U	52 U	35 U	69 U	17 U	87 U	52 U	49 U
trans-1,2-Dichloroethene	110 U	79 U	28 U	150 U	24 U	16 U	32 U	**2.1 J**	40 U	24 U	22 U
1,1-Dichloroethane	110 U	81 U	28 U	160 U	24 U	16 U	32 U	8.1 U	40 U	24 U	23 U
cis-1,2-Dichloroethene	28 U	20 U	**7.6**	39 U	5.9 U	4 U	7.9 U	4.9	9.9 U	5.9 U	5.6 U
1,2-Dichloroethene (total)	220 U	160 U	56 U	310 U	47 U	32 U	63 U	**6.9 J**	79 U	48 U	44 U
1,1,1-Trichloroethane	150 U	110 U	38 U	210 U	33 U	22 U	44 U	11 U	55 U	33 U	31 U
Carbon Tetrachloride	31 U	22 U	7.7 U	43 U	6.6 U	4.4 U	8.8 U	2.2 U	11 U	6.6 U	6.2 U
Benzene	91 U	64 U	22 U	120 U	19 U	13 U	25 U	**3.1 J**	32 U	19 U	18 U
Trichloroethene (TCE)	**18,000**	**34,000 D**	**21,000 D**	**14,000**	**18,000 D**	**23,000 D**	**25,000 D**	**14,000 D**	**15000 D**	**9300 D**	**13,000**
Toluene	110 U	75 U	26 U	150 U	23 U	**47**	30 U	**41**	**45**	23 U	21 U
Tetrachloroethene (PCE)	190 U	140 U	47 U	260 U	41 U	27 U	54 U	**3.4 J**	68 U	41 U	38 U
Chlorobenzene	130 U	92 U	32 U	180 U	28 U	18 U	37 U	9.2 U	46 U	28 U	26 U
Xylene (m,p)	310 U	220 U	76 U	420 U	65 U	43 U	87 U	**19 J**	110 U	65 U	61 U
Xylene (o)	120 U	87 U	30 U	170 U	26 U	17 U	35 U	**6 J**	43 U	26 U	24 U
Bromoform	290 U	210 U	72 U	400 U	62 U	41 U	82 U	21 U	100 U	62 U	58 U
1,1,2,2-Tetrachloroethane	190 U	140 U	48 U	270 U	41 U	27 U	55 U	14 U	69 U	41 U	38 U

Notes:
Samples were analyzed using USEPA Method TO-15.
Bold results indicate a detection.
D = Concentration is the result of a dilution.
U = Not detected at the reporting limit.
µg/m^3 = micrograms per cubic meter
* = SDS-1 installed at same location as SS-4
** = SDS-2 installed at same location as SS-5
NA** = Not Available; analytical data has been rejected due to condensate entering the sample container during collection.

Table 5A
Sub-Slab Soil Vapor Sampling Results
Site Management Plan
Crosman Site
East Bloomfield, New York

Sample Type:	Sub-Slab Soil Vapor								
Sample ID:	SDS-1*	SDS-2**	SDS-2**	SDS-2**	SDS-2**	SDS-2**	SDS-2**	SDS-2**	SDS-2**
Sample Date:	7/22/2020	7/8/2016	7/29/2016	8/25/2016	9/22/2016	10/26/2016	11/30/2016	12/20/2016	1/25/2017
Units:	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3
Vinyl Chloride	6 U	470 U	41 U	64 U	92 U	27 U	68 U	25 U	29 U
1,1-Dichloroethene	4.2 U	3,600 U	320 U	500 U	720 U	210 U	530 U	200 U	230 U
Acetone	360 U	**430,000**	**1,400 J**	**4,100 J**	**2,200 J**	3,100 U	7,900 U	3,000 U	3,400 U
Methylene Chloride	52 U	7,900 U	700 U	1,100 U	1,600 U	450 U	1,200 U	430 U	500 U
trans-1,2-Dichloroethene	24 U	3,600 U	**90 J**	500 U	720 U	210 U	530 U	200 U	230 U
1,1-Dichloroethane	24 U	3,700 U	320 U	510 U	730 U	210 U	540 U	200 U	230 U
cis-1,2-Dichloroethene	5.9 U	**2,600 J**	**5,600**	**5,700**	**4,900**	**2,100**	**3,600**	**2,100**	**2,400**
1,2-Dichloroethene (total)	48 U	**2,600 J**	**5,600**	**5,600**	**4,800**	**2,100**	**3,600**	**2,100**	**2,400**
1,1,1-Trichloroethane	33 U	5,000 U	440 U	680 U	990 U	280 U	720 U	270 U	310 U
Carbon Tetrachloride	6.6 U	1,100 U	100 U	160 U	230 U	66 U	170 U	63 U	72 U
Benzene	19 U	2,900 U	260 U	400 U	580 U	170 U	420 U	160 U	180 U
Trichloroethene (TCE)	**13,000**	**78,000**	**76,000**	**87,000**	**69,000**	**31,000**	**49,000**	**33,000**	**41,000**
Toluene	23 U	3,400 U	300 U	470 U	680 U	200 U	500 U	190 U	220 U
Tetrachloroethene (PCE)	41 U	6,200 U	540 U	**100 J**	1,200 U	350 U	**100 J**	340 U	**53 J**
Chlorobenzene	28 U	4,200 U	370 U	580 U	830 U	240 U	610 U	230 U	260 U
Xylene (m,p)	65 U	9,900 U	870 U	1,400 U	2,000 U	570 U	1,400 U	540 U	620 U
Xylene (o)	26 U	4,000 U	350 U	540 U	790 U	230 U	580 U	220 U	250 U
Bromoform	62 U	9,400 U	830 U	1,300 U	1,900 U	540 U	1,400 U	510 U	590 U
1,1,2,2-Tetrachloroethane	41 U	6,300 U	550 U	860 U	1,200 U	360 U	910 U	340 U	390 U

Notes:
Samples were analyzed using USEPA Method TO-15.
Bold results indicate a detection.
D = Concentration is the result of a dilution.
U = Not detected at the reporting limit.
µg/m^3 = micrograms per cubic meter
* = SDS-1 installed at same location as SS-4
** = SDS-2 installed at same location as SS-5
NA** = Not Available; analytical data has been rejected due to condensate entering the sample container during collection.

Table 5A
Sub-Slab Soil Vapor Sampling Results
Site Management Plan
Crosman Site
East Bloomfield, New York

Sample Type:	Sub-Slab Soil Vapor										
Sample ID:	SDS-2**	SDS-2**	SDS-2**	SDS-2**	SDS-2**	SDS-2**	SDS-2**	SDS-2**	SDS-2**	SDS-2**	SDS-2**
Sample Date:	2/22/2017	3/28/2017	4/19/2017	5/16/2017	6/29/2017	7/31/2017	8/23/2017	9/27/2017	10/17/2017	11/27/2017	12/19/2017
Units:	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3
Vinyl Chloride	33 U	38 U	34 U	29 U	44 U	31 U	51 U	28 U	36 U	11 U	36 U
1,1-Dichloroethene	250 U	290 U	270 U	230 U	340 U	240 U	400 U	220 U	280 U	88 U	280 U
Acetone	3,800 U	**10,000**	4,000 U	3,400 U	5,100 U	3,600 U	**2,400 J**	3,200 U	4,200 U	1,300 U	4,200 U
Methylene Chloride	550 U	650 U	**95 JB**	**140 J**	**160 J**	520 U	**150 J**	470 U	610 U	190 U	610 U
trans-1,2-Dichloroethene	250 U	290 U	270 U	230 U	340 U	240 U	400 U	220 U	280 U	88 U	280 U
1,1-Dichloroethane	260 U	300 U	270 U	230 U	340 U	240 U	400 U	220 U	280 U	90 U	280 U
cis-1,2-Dichloroethene	**2,700**	**2,500**	**2,100**	**2,200**	**1,600**	**1,500**	**2,500**	**2,200**	**1,900**	**1,200**	**1,100**
1,2-Dichloroethene (total)	**2,700**	**2,500**	**2,100**	**2,100**	**1,500**	**1,500**	**2,500**	**2,300**	**1,900**	**1,200**	**1,100**
1,1,1-Trichloroethane	350 U	410 U	370 U	310 U	460 U	330 U	550 U	300 U	380 U	120 U	380 U
Carbon Tetrachloride	80 U	94 U	85 U	72 U	110 U	76 U	130 U	68 U	88 U	28 U	88 U
Benzene	200 U	**68 J**	210 U	180 U	270 U	190 U	**49 J**	170 U	220 U	71 U	220 U
Trichloroethene (TCE)	**44,000**	**42,000**	**34,000**	**28,000**	**28,000**	**27,000**	**50,000**	**46,000**	**33,000**	**21,000**	**22,000**
Toluene	240 U	**57 J**	250 U	220 U	320 U	230 U	380 U	210 U	260 U	84 U	260 U
Tetrachloroethene (PCE)	430 U	500 U	**53 JB**	**69 J**	580 U	410 U	**100 J**	**35 J**	470 U	**28 J**	470 U
Chlorobenzene	290 U	340 U	310 U	260 U	390 U	280 U	460 U	250 U	320 U	100 U	320 U
Xylene (m,p)	690 U	810 U	730 U	620 U	920 U	650 U	1,100 U	590 U	760 U	240 U	760 U
Xylene (o)	280 U	320 U	290 U	250 U	370 U	260 U	430 U	240 U	300 U	97 U	300 U
Bromoform	660 U	770 U	690 U	590 U	880 U	620 U	1,000 U	560 U	720 U	230 U	720 U
1,1,2,2-Tetrachloroethane	440 U	510 U	460 U	390 U	580 U	410 U	690 U	370 U	480 U	150 U	480 U

Notes:
Samples were analyzed using USEPA Method TO-15.
Bold results indicate a detection.
D = Concentration is the result of a dilution.
U = Not detected at the reporting limit.
µg/m^3 = micrograms per cubic meter
* = SDS-1 installed at same location as SS-4
** = SDS-2 installed at same location as SS-5
NA** = Not Available; analytical data has been rejected due to condensate entering the sample container during collection.

Table 5A
Sub-Slab Soil Vapor Sampling Results
Site Management Plan
Crosman Site
East Bloomfield, New York

Sample Type:	Sub-Slab Soil Vapor										
Sample ID:	SDS-2**	SDS-2**	SDS-2**	SDS-2**	SDS-2**	SDS-2**	SDS-2**	SDS-2**	SDS-2**	SDS-2**	SDS-2**
Sample Date:	1/24/2018	2/22/2018	3/29/2018	4/26/2018	5/22/2018	6/18/2018	7/31/2018	8/29/2018	9/25/2018	10/26/2018	11/29/2018
Units:	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3
Vinyl Chloride	20 U	11 U	31 U	15 U	19 U	16 U	18 U	19 U	21 U	9.1 U	24 U
1,1-Dichloroethene	160 U	17 U	48 U	24 U	29 U	25 U	27 U	29 U	33 U	14 U	37 U
Acetone	2,400 U	1,500 U	4,100 U	2,000 U	2,500 U	2,100 U	2,300 U	2,500 U	2,900 U	1,200 U	3,200 U
Methylene Chloride	350 U	**29 J B**	600 U	300 U	360 U	310 U	340 U	360 U	420 U	180 U	470 U
trans-1,2-Dichloroethene	160 U	97 U	270 U	130 U	160 U	140 U	160 U	170 U	190 U	81 U	210 U
1,1-Dichloroethane	160 U	99 U	280 U	140 U	170 U	150 U	160 U	170 U	190 U	83 U	220 U
cis-1,2-Dichloroethene	**1,300**	**1,200**	**970**	**1000**	**980**	**990**	**1,300**	**1,100**	**590**	**460**	**430**
1,2-Dichloroethene (total)	**1,300**	**1,200**	**950**	**990**	**990**	**990**	**1,300**	**1,100**	**590**	**480**	**440**
1,1,1-Trichloroethane	220 U	130 U	380 U	190 U	230 U	200 U	210 U	230 U	260 U	110 U	290 U
Carbon Tetrachloride	50 U	27 U	76 U	37 U	46 U	40 U	43 U	46 U	53 U	22 U	59 U
Benzene	130 U	78 U	220 U	110 U	130 U	120 U	130 U	130 U	150 U	65 U	170 U
Trichloroethene (TCE)	**26,000**	**23,000**	**20,000**	**22,000**	**22,000**	**24,000**	**34,000**	**29,000**	**15,000**	**12,000**	**11,000**
Toluene	150 U	92 U	260 U	130 U	160 U	140 U	150 U	160 U	180 U	**65 J**	200 U
Tetrachloroethene (PCE)	**32 J**	**29 J**	470 U	230 U	280 U	240 U	270 U	**77 J**	330 U	140 U	360 U
Chlorobenzene	180 U	110 U	320 U	160 U	190 U	170 U	180 U	190 U	220 U	94 U	250 U
Xylene (m,p)	430 U	270 U	750 U	370 U	450 U	390 U	430 U	460 U	520 U	220 U	580 U
Xylene (o)	170 U	110 U	300 U	150 U	180 U	160 U	170 U	180 U	210 U	89 U	230 U
Bromoform	410 U	250 U	710 U	350 U	430 U	370 U	410 U	430 U	500 U	210 U	550 U
1,1,2,2-Tetrachloroethane	270 U	170 U	470 U	230 U	280 U	250 U	270 U	290 U	330 U	140 U	370 U

Notes:
Samples were analyzed using USEPA Method TO-15.
Bold results indicate a detection.
D = Concentration is the result of a dilution.
U = Not detected at the reporting limit.
µg/m^3 = micrograms per cubic meter
* = SDS-1 installed at same location as SS-4
** = SDS-2 installed at same location as SS-5
NA** = Not Available; analytical data has been rejected due to condensate entering the sample container during collection.

Table 5A
Sub-Slab Soil Vapor Sampling Results
Site Management Plan
Crosman Site
East Bloomfield, New York

Sample Type:	Sub-Slab Soil Vapor										
Sample ID:	SDS-2**	SDS-2**	SDS-2**	SDS-2**	SDS-2**	SDS-2**	SDS-2**	SDS-2**	SDS-2**	SDS-2**	SDS-2**
Sample Date:	12/18/2018	1/31/2019	2/21/2019	3/19/2019	4/23/2019	5/28/2019	6/24/2019	7/31/2019	8/21/2019	9/25/2019	10/31/2019
Units:	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3
Vinyl Chloride	20 U *	7.8 U	8.8 U *	6.2 U	14 U	10 U	26 U		20 U	16 U	3.4 U
1,1-Dichloroethene	30 U	12 U	14 U	9.6 U	22 U	16 U	18 U		14 U *	11 U	2.4 U
Acetone	2600 U	1000 U	1200 U	820 U	1900 U	1300 U	1500 U		1200 U	940 U	200 U
Methylene Chloride	380 U	150 U	170 U *	120 U	280 U	190 U	220 U		170 U	140 U	30 U
trans-1,2-Dichloroethene	170 U	69 U	78 U	55 U	130 U	89 U	100 U		80 U	63 U	13 U
1,1-Dichloroethane	180 U	70 U	80 U	56 U	130 U	91 U	100 U		82 U	64 U	14 U
cis-1,2-Dichloroethene	**1,200**	**540**	**890**	**340**	**320**	**430**	**420**		**390**	**970**	**240**
1,2-Dichloroethene (total)	**1,200**	**560**	**870**	**340**	**320**	**440**	**440**		**390**	**950**	**240**
1,1,1-Trichloroethane	240 U	95 U	110 U	75 U	170 U	120 U	140 U		110 U	86 U	19 U
Carbon Tetrachloride	48 U	19 U	22 U	15 U	35 U	25 U	28 U	NS [6]	22 U	17 U	3.7 U
Benzene	140 U	56 U	63 U	44 U	100 U	72 U	82 U		64 U	50 U	11 U
Trichloroethene (TCE)	**28,000**	**15,000**	**20,000**	**13,000**	**15,000**	**11,000**	**13,000**		**14,000**	**36,000 D**	**7,800 D**
Toluene	160 U	66 U	74 U	52 U	120 U	84 U	97 U		76 U	59 U	**6.9 J**
Tetrachloroethene (PCE)	300 U	120 U	**20 J**	**19 J**	220 U	150 U	170 U		140 U	**30 J**	**10 J**
Chlorobenzene	200 U	80 U	91 U	64 U	150 U	100 U	120 U		93 U	73 U	16 U
Xylene (m,p)	470 U	190 U	210 U	150 U	350 U	240 U	280 U		220 U	170 U	37 U
Xylene (o)	190 U	76 U	86 U	60 U	140 U	97 U	110 U		87 U	69 U	15 U
Bromoform	450 U	180 U	200 U	140 U	330 U	230 U *	270 U		210 U	160 U	35 U
1,1,2,2-Tetrachloroethane	300 U	120 U	140 U	95 U	220 U	150 U	180 U		140 U	110 U	23 U

Notes:
Samples were analyzed using USEPA Method TO-15.
Bold results indicate a detection.
D = Concentration is the result of a dilution.
U = Not detected at the reporting limit.
µg/m^3 = micrograms per cubic meter
* = SDS-1 installed at same location as SS-4
** = SDS-2 installed at same location as SS-5
NA** = Not Available; analytical data has been rejected due to condensate entering the sample container during collection.

Table 5A
Sub-Slab Soil Vapor Sampling Results
Site Management Plan
Crosman Site
East Bloomfield, New York

Sample Type:	Sub-Slab Soil Vapor								
Sample ID:	SDS-2**	SDS-2**	SDS-2**	SDS-2**	SDS-2**	SDS-2**	SDS-2**	SDS-2**	SDS-2**
Sample Date:	11/19/2019	12/17/2019	1/29/2020	2/26/2020	3/31/2020	4/22/2020	5/27/2020	6/23/2020	7/22/2020
Units:	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3
Vinyl Chloride	30 U	3.6 U *	4 U	2 U	4 U	4 U	5 U	4 U	3 U
1,1-Dichloroethene	21 U	2.5 U	2.8 U	1.4 U	2.8 U	2.8 U	3.5 U	2.8 U	2.1 U
Acetone	1800 U	210 U	240 U	120 U	240 U	240 U	300 U	240 U	**220**
Methylene Chloride	260 U	31 U	35 U	17 U	35 U	35 U	43 U	35 U	26 U
trans-1,2-Dichloroethene	120 U	14 U	**3.6 J**	**4 J**	**3.8 J**	16 U	5.6 J	16 U	12 U
1,1-Dichloroethane	120 U	15 U	16 U	8.1 U	16 U	16 U	20 U	16 U	12 U
cis-1,2-Dichloroethene	**330**	**240**	**280**	**270**	**220**	**230**	**380**	**260**	**210**
1,2-Dichloroethene (total)	**330**	**240**	**280**	**270**	**230**	**230**	**390**	**260**	**210**
1,1,1-Trichloroethane	160 U	20 U	22 U	11 U	22 U	22 U	27 U	22 U	16 U
Carbon Tetrachloride	33 U	4 U	4.4 U	2.2 U	4.4 U	4.4 U	5.5 U	4.4 U	3.3 U
Benzene	96 U	**4.5 J**	13 U	6.4 U	13 U	13 U	16 U	**6.9 J**	9.6 U
Trichloroethene (TCE)	**11,000**	**5,600 D**	**12,000 D**	**11,000 D**	**8,300 D**	**8,100 D**	**10,000 D**	**9,400**	**7,500**
Toluene	110 U	14 U	15 U	7.5 U	**9 J**	15 U	**14 J**	**99**	**33**
Tetrachloroethene (PCE)	200 U	**10 J**	**11 J**	**15**	**13 J**	**12 J**	**21 J**	**15 J**	**11 J**
Chlorobenzene	140 U	17 U	18 U	9.2 U	18 U	18 U	23 U	18 U	14 U
Xylene (m,p)	330 U	39 U	43 U	22 U	43 U	43 U	54 U	48	**6.7 J**
Xylene (o)	130 U	16 U	17 U	8.7 U	17 U	17 U	**6.2 J**	**16 J**	**4.4 J**
Bromoform	310 U	37 U	41 U	21 U	41 U	41 U	52 U	41 U	31 U
1,1,2,2-Tetrachloroethane	210 U	25 U	27 U	14 U	27 U	27 U	34 U	27 U	21 U

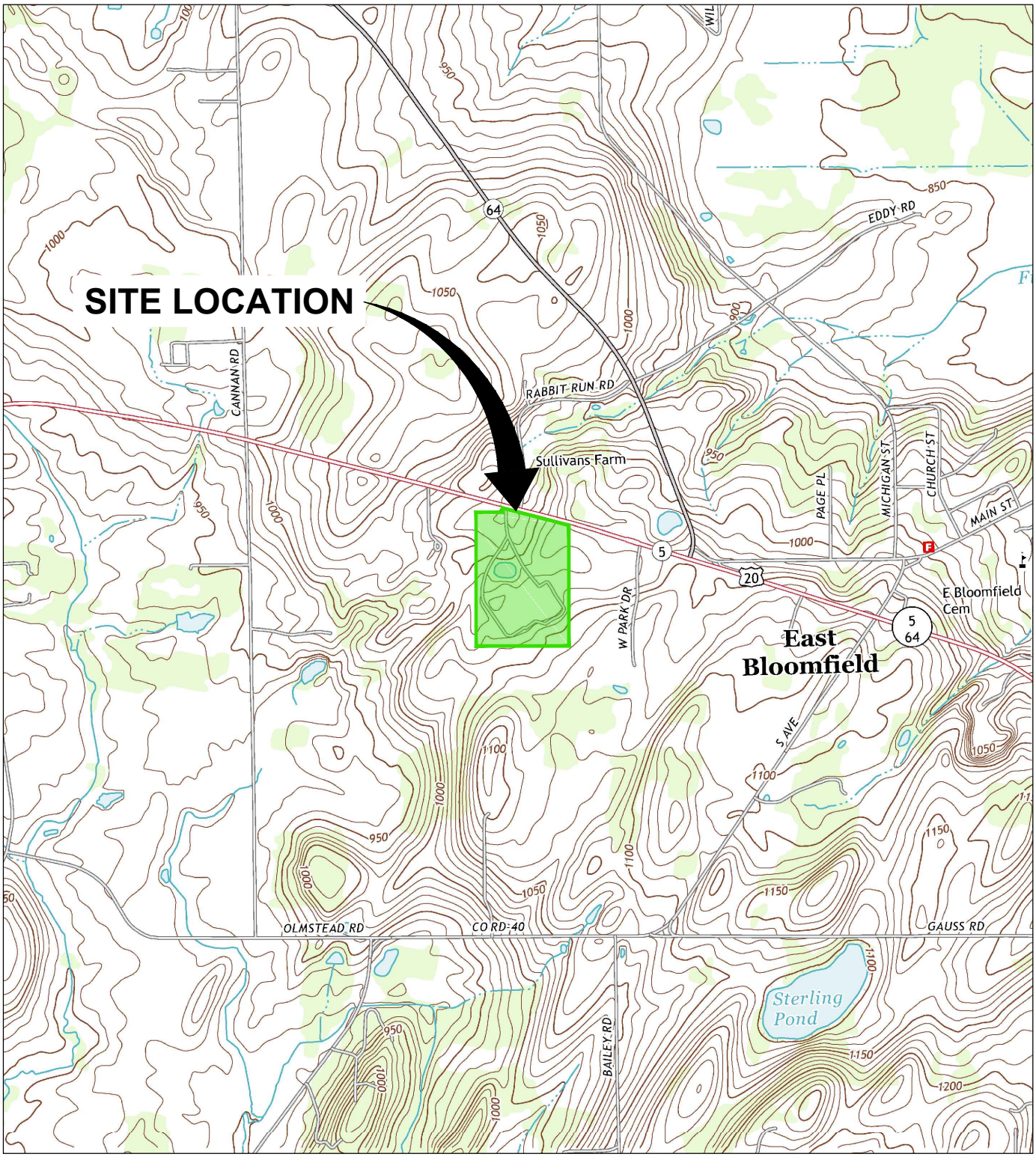
Notes:
Samples were analyzed using USEPA Method TO-15.
Bold results indicate a detection.
D = Concentration is the result of a dilution.
U = Not detected at the reporting limit.
µg/m^3 = micrograms per cubic meter
* = SDS-1 installed at same location as SS-4
** = SDS-2 installed at same location as SS-5
NA** = Not Available; analytical data has been rejected due to condensate entering the sample container during collection.

Table 5B
Soil Vapor Sampling Results
Site Management Plan
Crosman Site
East Bloomfield, New York

	Soil Vapor Results	
Sample Location	**SV-MW19-E**	**SV-MW19-E**
Sample Date	**6/3/2010**	**6/3/2010**
Compound	**(µg/m^3)**	**(µg/m^3)**
1,1,1-Trichloroethane	1.1 U	1.1 U
1,1,2,2-Tetrachloroethane	1.4 U	1.4 U
1,1,2-Trichloroethane	1.1 U	1.1 U
1,1-Dichloroethane	0.81 U	0.81 U
1,1-Dichloroethene	0.79 U	0.79 U
1,2,4-Trichlorobenzene	3.7 U	3.7 U
1,2,4-Trimethylbenzene	21	29
1,2-Dibromoethane	1.5 U	1.5 U
1,2-Dichlorobenzene	1.2 U	1.2 U
1,2-Dichloroethane	0.81 U	0.81 U
1,2-Dichloropropane	0.92 U	0.92 U
1,2-Dichlorotetrafluoroethane	1.4 U	1.4 U
1,3,5-Trimethylbenzene	8.4	12
1,3-Butadiene	2.9	10
1,3-Dichlorobenzene	1.2 U	1.2 U
1,4-Dichlorobenzene	1.2 U	1.2 U
4-Ethyltoluene	3	4.9
Acetone	40	33
Benzene	27	26
Bromodichloromethane	1.3 U	1.3 U
Bromoform	2.1 U	2.1 U
Bromomethane	0.78 U	0.78 U
Carbon disulfide	2.1	4
Carbon tetrachloride	1.3 U	1.3 U
Chlorobenzene	0.92 U	0.92 U
Chloroethane	1.3 U	1.3 U
Chloroform	0.98 U	0.98 U
Chloromethane	1 U	1 U
cis-1,2-Dichloroethene	0.79 U	0.79 U
cis-1,3-Dichloropropene	0.91 U	0.91 U
Cyclohexane	29	69
Dibromochloromethane	1.7 U	1.7 U
Dichlorodifluoromethane	2.5 U	2.5 U
Ethylbenzene	6.1	9.6
Freon TF	1.5 U	1.5 U
Hexachlorobutadiene	2.1 U	2.1 U
Methyl Butyl Ketone	2 U	2 U
Methyl Ethyl Ketone	11	11
Methyl Isobutyl Ketone	2 U	2 U
Methyl tert-Butyl Ether	1.8 U	1.8 U
Methylene chloride	1.7 U	1.7 U
n-Heptane	37	94
n-Hexane	53	130
Styrene	0.85 U	0.85 U
Tetrachloroethene	1.4 U	1.4 U
Tetrahydrofuran	15 U	15 U
Toluene	38	64
trans-1,2-Dichloroethene	0.79 U	0.79 U
trans-1,3-Dichloropropene	0.91 U	0.91 U
Trichloroethene	1.1 U	1.1 U
Trichlorofluoromethane	1.1 U	1.2
Vinyl Chloride	0.51 U	0.51 U
Xylene (m,p)	40	61
Xylene (o)	14	20

Notes:
Samples were analyzed using USEPA Method TO-15.
U = compound not detected above reporting limit
µg/m^3 = micrograms per cubic meter
USEPA = United States Environmental Protection Agency

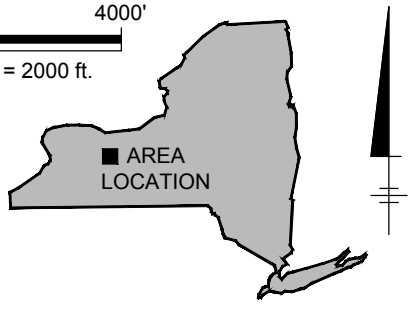
Figures



REFERENCE: BASE MAP USGS 7.5. MIN. TOPO. QUAD., VICTOR AND BRISTOL CENTER, NY, 2013.

0 2000' 4000'

Approximate Scale: 1 in. = 2000 ft.



CROSMAN CORPORATION SITE
EAST BLOOMFIELD, NEW YORK
SITE MANAGEMENT PLAN

SITE LOCATION MAP

ARCADIS Design & Consultancy for natural and built assets

FIGURE 1

CITY: SYRACUSE NY DIV/GROUP: ENVCAD DB: E. KRAHMER LD: (Opt.) PIC/PM: W. POPHAM APM/TM: A. RICHARDSON LYR:(Opt)ON=*;OFF=*REF*
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NY_Victor_20130308_TM_geo.png



LEGEND:

- GROUNDWATER MONITORING WELL
- PRODUCTION WELL
- PIEZOMETER
- APPROXIMATE PROPERTY BOUNDARY
- 67.00-1-60.200 ONTARIO COUNTY TAX ID NUMBER

NOTES:

1. BASE MAP REFERENCES:
   - 1.1. BOUNDARY LINES TAKEN FROM ONTARIO COUNTY REAL PROPERTY TAX MAPS, TOWN OF EAST BLOOMFIELD, LAST REVISED 5-15-2007.
   - 1.2. AERIAL PHOTOGRAPHY: NEW YORK STATE ORTOHOIMAGERY, DATED 2012.
2. LOCATION OF WELLS ARE APPROXIMATE.

0 300' 600'

GRAPHIC SCALE

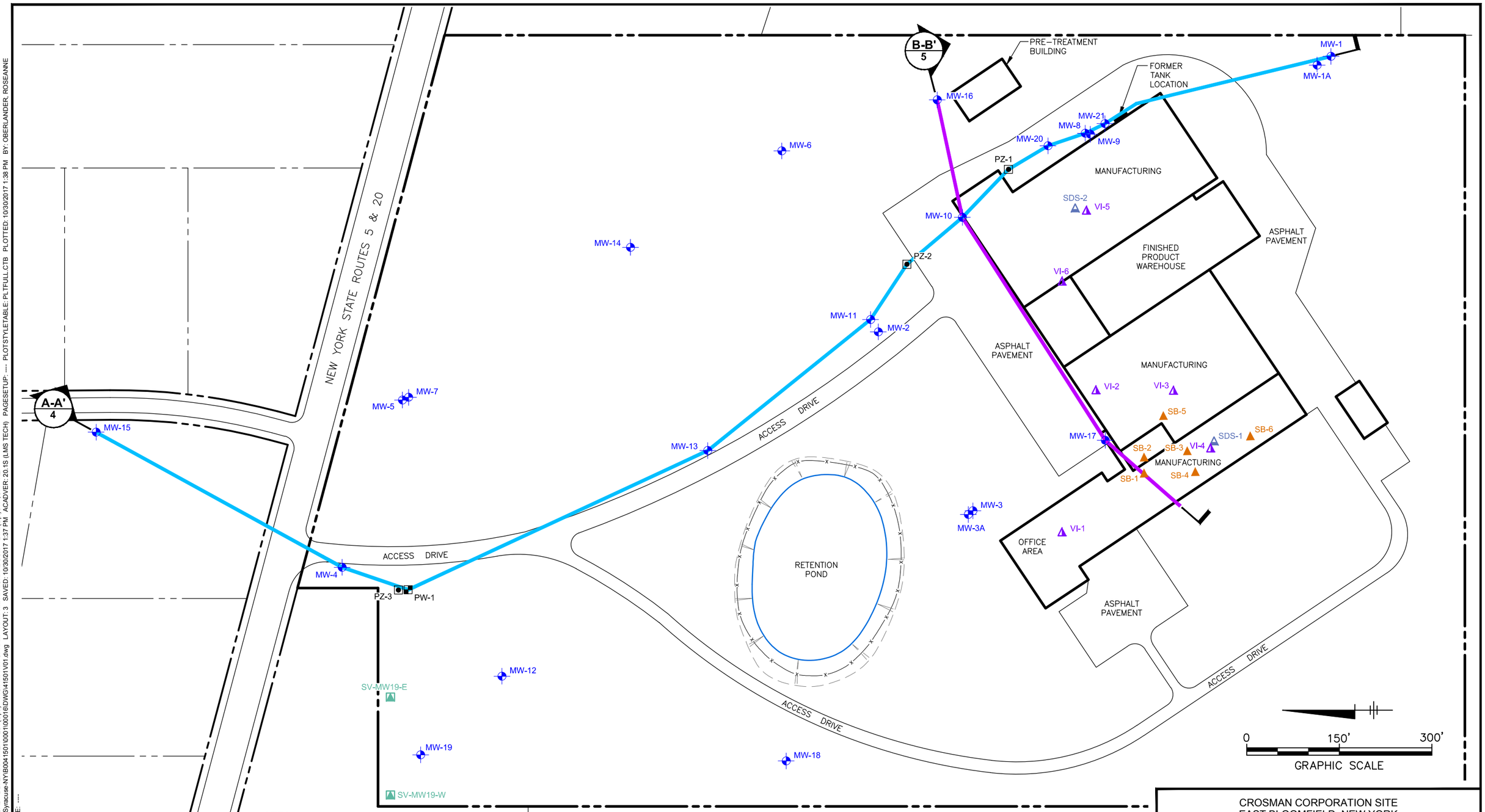
CROSMAN CORPORATION SITE
EAST BLOOMFIELD, NEW YORK
SITE MANAGEMENT PLAN

AERIAL SITE LOCATION MAP

ARCADIS Design & Consultancy for natural and built assets

FIGURE 2

CITY: SYRACUSE NY DIV/GROUP: ENVCAD DB: E.KRAHMER LD: (Opt.) PIC/PM: W. POPHAM APM/TM: A. RICHARDSON LYR:(Opt)ON=;OFF=*REF
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c_05881056_24_19200_4bd_2012.tif



NOTES:

1. BASE MAP REFERENCES:
   - 1.1. CROSMAN CORPORATION, "REMEDIAL INVESTIGATION/ INTERIM REMEDIAL MEASURES," PREPARED BY LABELLA, DATED JUNE, 1993.
   - 1.2. NEW YORK STATE ORTHOIMAGERY, DATED 2013.
2. PROJECT BENCHMARK AT TOP OF CASING ON MW-7, ASSUMED LABELLA DATUM ELEV.= 979.71' ABOVE MEAN SEA LEVEL.
3. ALL LOCATIONS ARE APPROXIMATE.

LEGEND:

- GROUNDWATER MONITORING WELL
- SOIL BORING LOCATION
- 2010 SOIL VAPOR SAMPLE LOCATION
- VAPOR INTRUSION SAMPLE LOCATION
- SDS LOCATION
- PRODUCTION WELL
- PIEZOMETER
- APPROXIMATE PROPERTY BOUNDARY
- A-A' 4 CROSS SECTION LOCATION

CROSMAN CORPORATION SITE
EAST BLOOMFIELD, NEW YORK
SITE MANAGEMENT PLAN

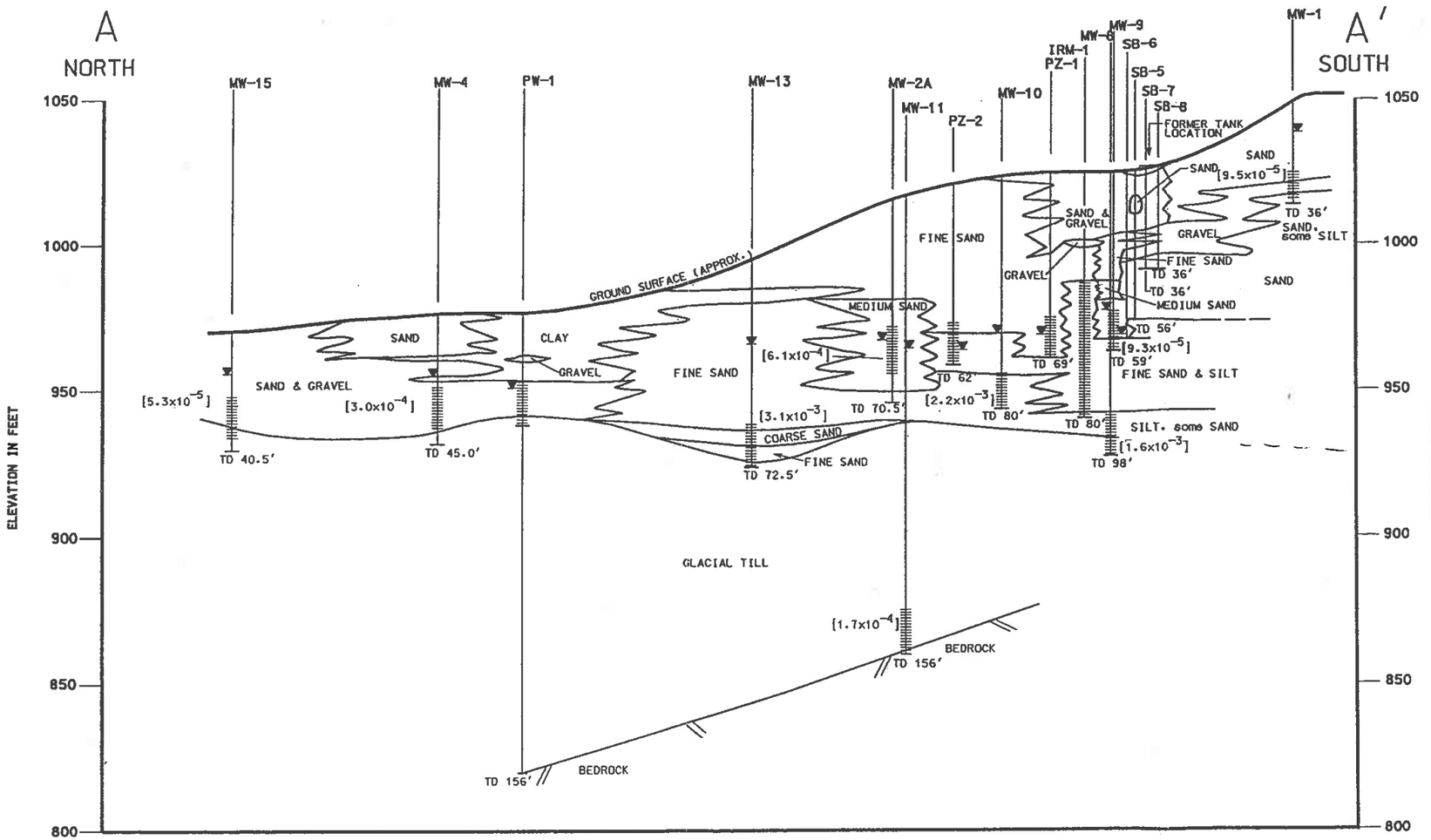
CROSS SECTION LOCATION MAP

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FIGURE 3

CITY: SYRACUSE NY DIV/GROUP: ENVCAD DB: E. KRAHMER LD:(Opt.) PIC:PM: W. POPHAM APM/TM: A. RICHARDSON LYR:(Opt)ON=OFF=REF
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41501XLB
41501X01

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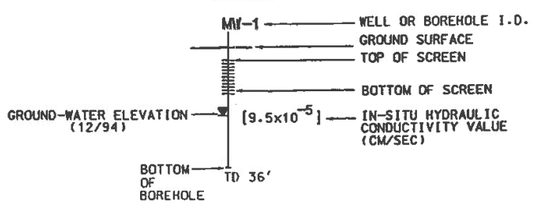
NOTES:

1. ELEVATIONS BASED ON AN ASSUMED ELEVATION.

HORIZONTAL SCALE IN FFET

250' 0 250'

LEGEND:

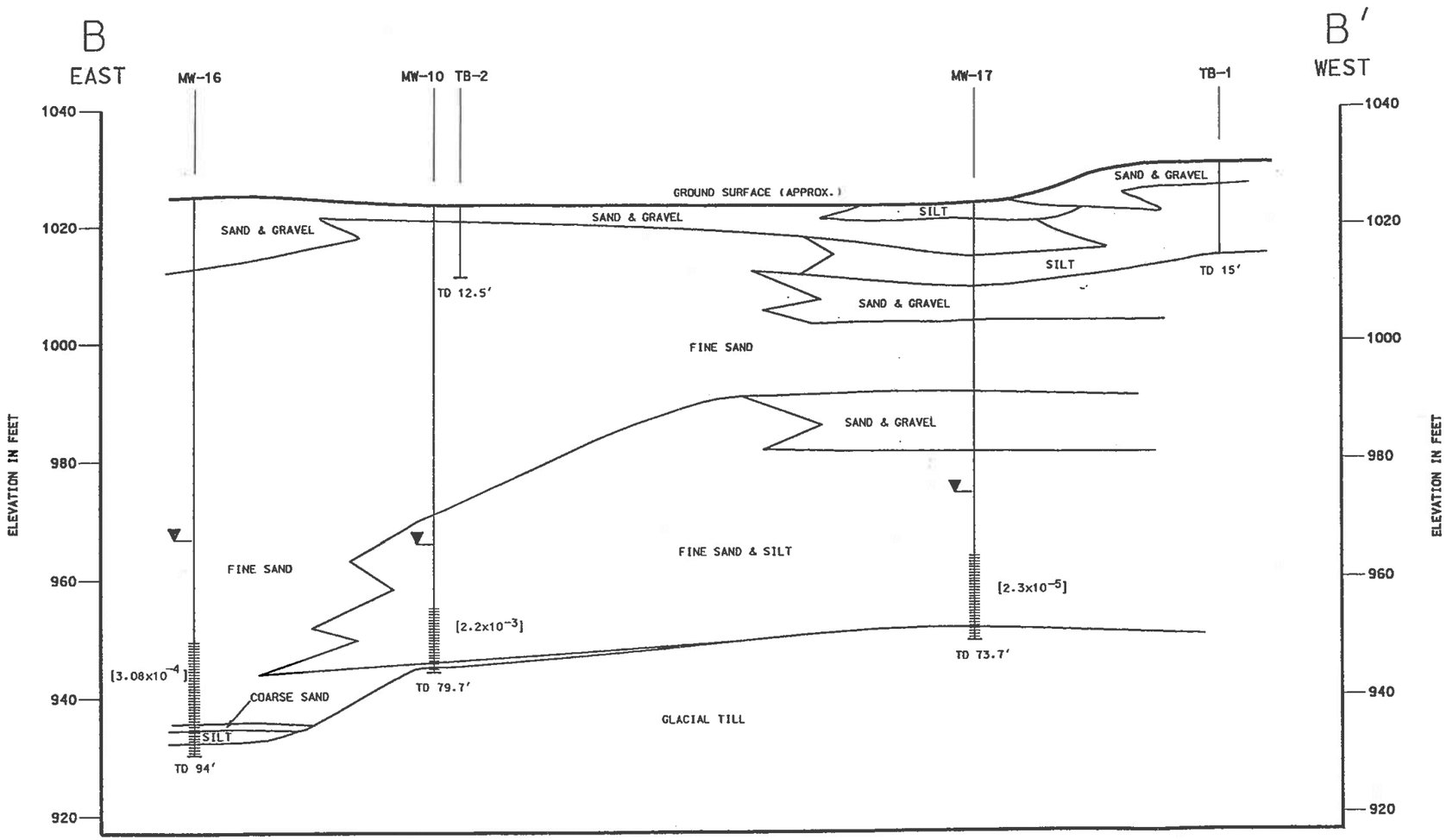


CROSMAN CORPORATION SITE
EAST BLOOMFIELD, NEW YORK
SITE MANAGEMENT PLAN

CROSS SECTION A-A'

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4



NOTES:

1. ELEVATIONS BASED ON AN ASSUMED ELEVATION.

HORIZONTAL SCALE IN FFET

100' 0 100'

LEGEND:

MW-1 — WELL OR BOREHOLE I.D.
GROUND SURFACE
TOP OF SCREEN
BOTTOM OF SCREEN
GROUND-WATER ELEVATION (12/94) — [3.6x10^{-4}] — IN-SITU HYDRAULIC CONDUCTIVITY VALUE (CM/SEC)
BOTTOM OF BOREHOLE — TD 36'

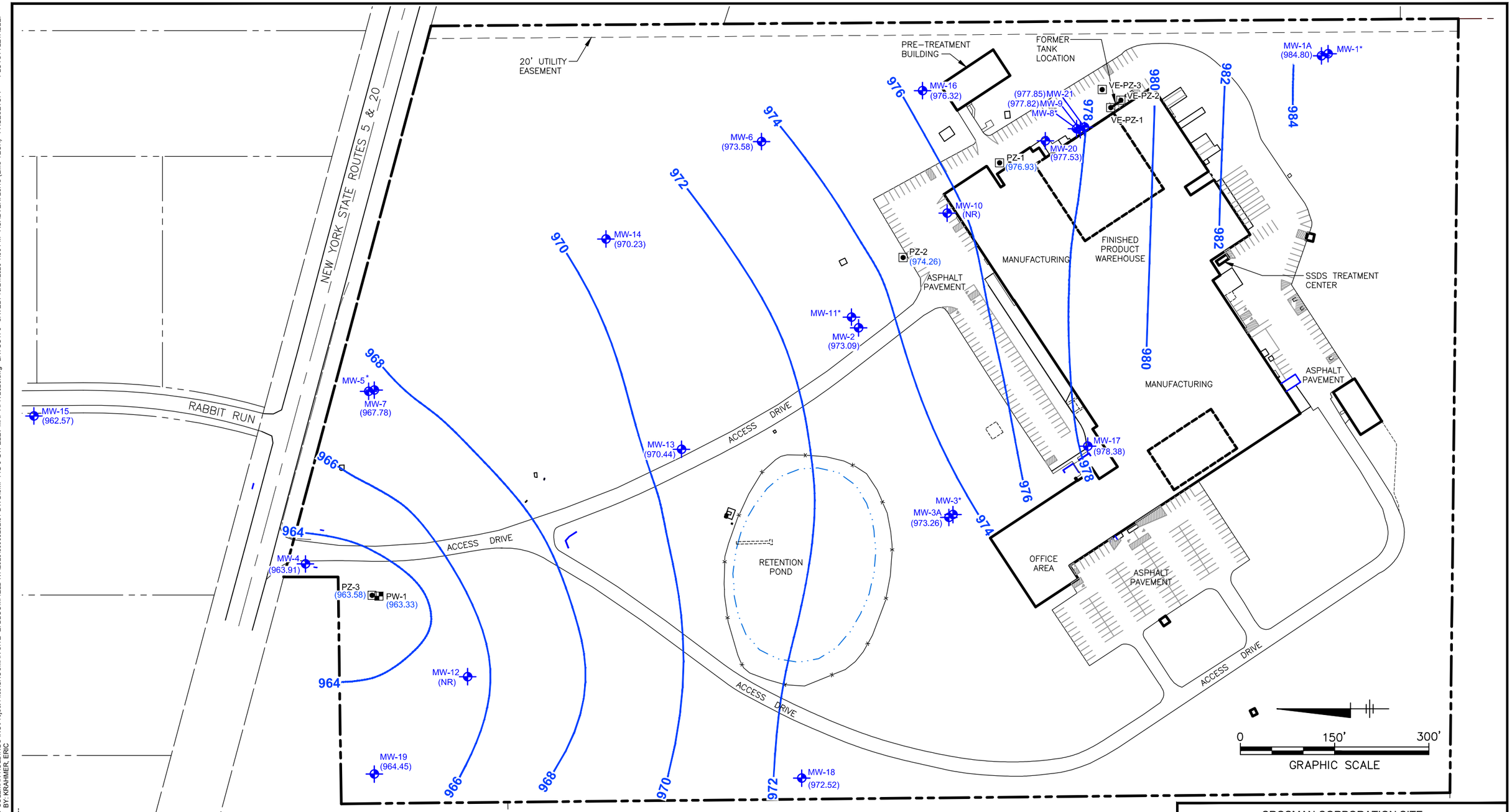
CROSMAN CORPORATION SITE
EAST BLOOMFIELD, NEW YORK
SITE MANAGEMENT PLAN

CROSS SECTION B-B'

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FIGURE
5

CITY: SYRACUSE NY DIV/GROUP: ENVCAD DB: E. KRAHMER LD: (Opt.) PIC/PM: W. POPHAM APM/TM: A. RICHARDSON LYR:(Opt)ON=*;OFF=*REF*
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41501XLB Section B-B.tiff



LEGEND:

- GROUNDWATER MONITORING WELL
- PRODUCTION WELL
- PIEZOMETER
- APPROXIMATE PROPERTY BOUNDARY
- (960.00) GROUNDWATER ELEVATION (FEET AMSL)
- 966 GROUNDWATER ELEVATION CONTOUR (FEET AMSL) (DASHED WHERE INFERRED)

NOTES:

1. BASE MAP REFERENCE:
   1.1. SURVEY BY FISHER ASSOCIATES, ROCHESTER, NY. COMPLETED NOVEMBER 27, 2018
2. PROJECT BENCHMARK AT TOP OF CASING ON MW-7, ASSUMED LABELLA DATUM ELEV.= 979.71' ABOVE MEAN SEA LEVEL.
3. MONITORING WELL ELEVATIONS SURVEYED BY FISHER ASSOCIATES IN OCTOBER 2018.
4. * MONITORING WELLS MW-1, MW-3, MW-5, MW-8, AND MW-11 WERE NOT USED IN CONTOURING.
5. AMSL = ABOVE MEAN SEA LEVEL.

CROSMAN CORPORATION SITE
EAST BLOOMFIELD, NEW YORK

SITE MANAGEMENT PLAN

GROUNDWATER ELEVATION CONTOUR MAP - APRIL 21, 2020

ARCADIS Design & Consultancy for natural and built assets

FIGURE 6

CITY: SYRACUSE NY DIVGROUP: ENVCAD DB: E. KRAHMER LD: (Opt.) PIC/PM: W. POPHAM APM/TM: A. RICHARDSON LYR:(Opt)ON=*;OFF=*REF*
C:\Users\EKrahmer\BIM 360\Arcadis\ANA – NEW COLEMAN HOLDINGS INC\Project Files\CROSMAN SITE- E. BLOOMFIELD NY\2020\300052020\01-DWG\SMP-FIG 6-GW ELEV MAP APR 2020.dwg LAYOUT: 6 SAVED: 10/21/2020 1:00 PM ACADVER: 23.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE:
PLTFULL.CTB PLOTTED: 10/21/2020 1:11 PM BY: KRAHMER, ERIC PROJECTNAME: ----
XREFS: IMAGES:
SMP-X-TITLE SHEET
SMP-X-BASE

SB-1		
Date	7/20/2014	7/20/2014
Depth	0.5-1.0	6.0-8.0
Trichloroethene	**18**	8.47 U

SB-2		
Date	7/19/2014	7/19/2014
Depth	0.5-2.0	6.0-8.0
Trichloroethene	7.80 U	7.61 U

SB-5			
Date	8/2/2014	8/2/2014	8/2/2014
Depth	0.5-1.0	8.0-8.8	9.5-10.0
Trichloroethene	**9.7**	9.27 U	**8.6**

SB-3				
Date	8/2/2014	8/2/2014	8/2/2014	8/2/2014
Depth	0.5-1.0	13.0-14.0	16.0-17.0	23.0-24.0
Trichloroethene	**218**	**10,100**	**55**	**214**

SB-4				
Date	8/2/2014	8/2/2014	8/2/2014	8/2/2014
Depth	0.5-1.0	7.0-8.0	8.0-9.0	16.0-16.5
Trichloroethene	**217**	**11,400**	**14,100**	**53.4**

SB-6		
Date	7/19/2014	7/19/2014
Depth	0.5-2.0	24.0-25.1
Trichloroethene	8.45 U	7.24 U

ACCESS DRIVE

ASPHALT PAVEMENT

PRE-TREATMENT BUILDING

SHOP

ASSEMBLY

TOOL ROOM

TOOL CLOSET

SHOP

SUMP/PIT

BLUING

SB-1

SB-2

PUNCH PRESS

SUMP/PIT

SB-5

SB-3

ASSEMBLY

SHIPPING/ RECEIVING

AMMO

SB-4

FINISHING

SCREW MACHINE

SERVICE

SB-6

PAINT

ASPHALT PAVEMENT

ACCESS DRIVE

LEGEND:

- SOIL BORING LOCATION
- AREA SUBJECT TO EXCAVATION WORK PLAN

NOTES:

1. ALL LOCATIONS ARE APPROXIMATE.
2. ANALYTICAL RESULTS ARE PRESENTED IN MICROGRAMS PER KILOGRAM (µg/kg).
3. BOLD RESULTS INDICATE A DETECTED CONCENTRATION.
4. U = COMPOUND WAS ANALYZED BUT NOT DETECTED. THE ASSOCIATED VALUE IS THE COMPOUND QUANTITATION LIMIT.
5. EXCAVATION WITHIN THE HIGHLIGHTED AREA IS SUBJECT TO THE REQUIREMENTS OF THE EXCAVATION WORK PLAN.

0 100' 200'

GRAPHIC SCALE

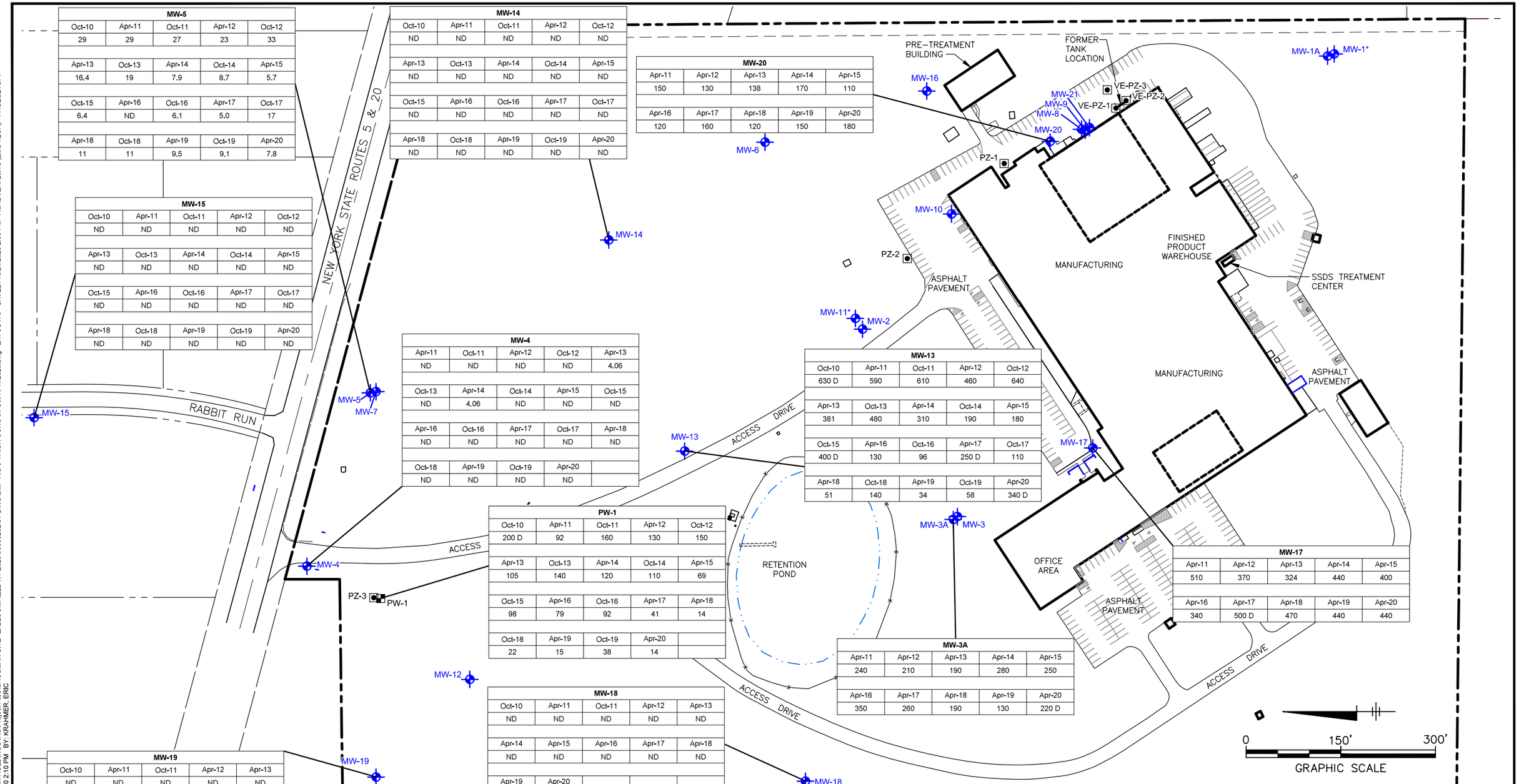
CROSMAN CORPORATION SITE
EAST BLOOMFIELD, NEW YORK
SITE MANAGEMENT PLAN

SOIL BORING LOCATIONS AND ANALYTICAL RESULTS

ARCADIS Design & Consultancy for natural and built assets

FIGURE 7

CITY: SYRACUSE NY DIV/GROUP: ENV/CAD DB: E. KRAHMER LD: (Opt) PIC/PM: W. POPHAM APM/TM: A. RICHARDSON LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\SYRACUSE\ACTIB\04150100\100015\DWG\41501C03.dwg LAYOUT: 7 SAVED: 11/16/2016 12:37 PM ACADVER: 19.1S (LMS TECH) PAGESETUP: --- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 11/16/2016 12:40 PM BY: KRAHMER, ERIC
XREFS: 41501X05 41501XLB IMAGES: PROJECTNAME: ---



LEGEND:

- GROUNDWATER MONITORING WELL
- PRODUCTION WELL
- PIEZOMETER
- APPROXIMATE PROPERTY BOUNDARY

NOTES:

1. BASE MAP REFERENCE:
   1.1. SURVEY BY FISHER ASSOCIATES, ROCHESTER, NY. COMPLETED NOVEMBER 27, 2018
2. PROJECT BENCHMARK AT TOP OF CASING ON MW-7, ASSUMED LABELLA DATUM ELEV.= 979.71' ABOVE MEAN SEA LEVEL.
3. ALL RESULTS ARE IN MICROGRAMS PER LITER (µg/L).
4. ABBREVIATIONS:
   4.1. D = CONCENTRATION IS THE RESULT OF A SECONDARY DILUTION.
   4.2. E = EXCEEDS CALIBRATION RANGE.
   4.3. J = THE COMPOUND WAS POSITIVELY IDENTIFIED, HOWEVER, THE ASSOCIATED NUMERICAL VALUE IS AN ESTIMATED CONCENTRATION ONLY.
   4.4. ND = NOT DETECTED. COMPOUNDS DETECTED IN MS/MSD ARE NOT SHOWN.

CROSMAN CORPORATION SITE
EAST BLOOMFIELD, NEW YORK
SITE MANAGEMENT PLAN

MAP OF TRICHLOROETHYLENE CONCENTRATIONS IN GROUNDWATER

ARCADIS Design & Consultancy for natural and built assets

FIGURE 8

CITY: SYRACUSE NY DIV/GROUP: ENVCAD DB: E. KRAHMER LD: (Opt.) PIC/PM: W. POPHAM APM/TM: A. RICHARDSON LYR:(Opt)ON=*;OFF=*REF*
C:\Users\EKrahmer\BIM 360\Arcadis\ANA – NEW COLEMAN HOLDINGS INC\Project Files\CROSMAN SITE- E. BLOOMFIELD NY\2020\300052020 1-DWG\SMP-FIG 8-TRICH CONC IN GW APR 2020.dwg LAYOUT: 8 SAVED: 10/21/2020 2:09 PM ACADVER: 23.1S (LMS TECH) PAGESETUP: ----
PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 10/21/2020 2:10 PM BY: KRAHMER, ERIC
XREFS: IMAGES PROJECTNAME: ----
SMP-X-TITLE SHEET
SMP-X-BASE

CITY: SYRACUSE NY DIV/GROUP: ENVCAD DB: E. KRAHMER LD: (Opt.) PIC/PM: W. POPHAM APM/TM: A. RICHARDSON LYR:(Opt)ON=-OFF=REF
C:\Users\EKrahmer\BIM 360\Arcadis\ANA - NEW COLEMAN HOLDINGS INC\Project Files\CROSMAN SITE - E. BLOOMFIELD NY\2020\300\05202\01-DWG\SMP-FIG 9-VOCs IN SOIL VAPOR.dwg LAYOUT: 9 SAVED: 10/21/2020 3:28 PM ACADVER: 23.1S (LMS TECH) PAGESETUP: --- PLOTSTYLETABLE:
PLTFULL.CTB PLOTTED: 10/21/2020 3:29 PM BY: KRAHMER, ERIC PROJECTNAME: ---
XREFS: IMAGES:
SMP-X-TITLE SHEET
SMP-X-BASE

SDS-2

Date						7/8/2016	7/29/2016	8/25/2016	9/22/2016	10/26/2016	11/30/2016	12/20/2016
Acetone	SYSTEM NOT INSTALLED					430,000	1,400 J	4,100 J	2,200 J	3,100 U	7,900 U	3,000 U
1,2-Dichloroethene (total)						2,600 J	5,600	5,600	4,800	2,100	3,600	2,100
Benzene						2,900 U	260 U	400 U	580 U	170 U	420 U	160 U
Trichloroethene (TCE)						78,000	76,000	87,000	69,000	31,000	49,000	33,000
Tetrachloroethene (PCE)						6,200 U	540 U	100 J	1,200 U	350 U	100 J	340 U

Date	1/25/2017	2/22/2017	3/28/2017	4/19/2017	5/16/2017	6/29/2017	7/31/2017	8/23/2017	9/27/2017	10/17/2017	11/27/2017	12/19/2017
Acetone	3,400 U	3,800 U	10,000	4,000 U	3,400 U	5,100 U	3,600 U	2,400 J	3,200 U	4,200 U	1,300 U	4,200 U
1,2-Dichloroethene (total)	2,400	2,700	2,500	2,100	2,100	1,500	1,500	2,500	2,300	1,900	1,200	1,100
Benzene	180 U	200 U	68 J	210 U	180 U	270 U	190 U	49 J	170 U	220 U	71 U	220 U
Trichloroethene (TCE)	41,000	44,000	42,000	34,000	28,000	28,000	27,000	50,000	46,000	33,000	21,000	22,000
Tetrachloroethene (PCE)	53 J	430 U	500 U	53 JB	69 J	580 U	410 U	100 J	35 J	470 U	28 J	470 U

Date	1/24/2018	2/22/2018	3/29/2018	4/26/2018	5/22/2018	6/18/2018	7/31/2018	8/29/2018	9/25/2018	10/26/2018	11/29/2018	12/18/2018
Acetone	2,400 U	1,500 U	4,100 U	2,000 U	2,500 U	2,100 U	2,300 U	2,500 U	2,900 U	1,200 U	3,200 U	2,600 U
1,2-Dichloroethene (total)	1,300	1,200	950	990	990	990	1,300	1,100	590	480	440	1,200
Benzene	130 U	78 U	220 U	110 U	130 U	120 U	130 U	130 U	150 U	65 U	170 U	140 U
Trichloroethene (TCE)	26,000	23,000	20,000	22,000	22,000	24,000	34,000	29,000	15,000	12,000	11,000	28,000
Tetrachloroethene (PCE)	32 J	29 J	470 U	230 U	280 U	240 U	270 U	77 J	330 U	140 U	360 U	300 U

Date	1/31/2019	2/21/2019	3/19/2019	4/23/2019	5/28/2019	6/24/2019	7/31/2019	8/21/2019	9/25/2019	10/31/2019	11/19/2019	12/17/2019
Acetone	1,000 U	1,200 U	820 U	1,900 U	1,300 U	1,500 U		1,200 U	940 U	200 U	1,800 U	210 U
1,2-Dichloroethene (total)	560	870	340	320	440	440		390	950	240	330	240
Benzene	56 U	63 U	44 U	100 U	72 U	82 U	No Sample	64 U	50 U	11 U	96 U	4.5 J
Trichloroethene (TCE)	15,000	20,000	13,000	15,000	11,000	13,000		14,000	36,000 D	7,800 D	11,000	5,600 D
Tetrachloroethene (PCE)	120 U	20 J	19 J	220 U	150 U	170 U		140 U	30 J	10 J	200 U	10 J

Date	1/29/2020	2/26/2020	3/31/2020	4/22/2020	5/27/2020	6/23/2020	7/22/2020
Acetone	240 U	120 U	240 U	240 U	300 U	240 U	220
1,2-Dichloroethene (total)	280	270	230	230	390	260	210
Benzene	13 U	6.4 U	13 U	13 U	16 U	6.9 J	9.6 U
Trichloroethene (TCE)	12,000 D	11,000 D	8,300 D	8,100 D	10,000 D	9,400	7,500
Tetrachloroethene (PCE)	11 J	15	13 J	12 J	21 J	15 J	11 J

SV-MW19-E

Date	6/3/2010
1,2,4-Trimethylbenzene	21
1,3,5-Trimethylbenzene	8.4
1,3-Butadiene	2.9
4-Ethyltoluene	3
Acetone	40
Benzene	27
Carbon disulfide	2.1
cis-1,2-Dichloroethene	0.79 U
Cyclohexane	29
Ethylbenzene	6.1
Methyl Ethyl Ketone	11
n-Heptane	37
n-Hexane	53
Tetrachloroethene	1.4 U
Toluene	38
Trichloroethene	1.1 U
Trichlorofluoromethane	1.1 U
Vinyl Chloride	0.51 U
Xylene (m,p)	40
Xylene (o)	14

SV-MW19-W

Date	6/3/2010
1,2,4-Trimethylbenzene	29
1,3,5-Trimethylbenzene	12
1,3-Butadiene	10
4-Ethyltoluene	4.9
Acetone	33
Benzene	26
Carbon disulfide	4
cis-1,2-Dichloroethene	0.79 U
Cyclohexane	69
Ethylbenzene	9.6
Methyl Ethyl Ketone	11
n-Heptane	94
n-Hexane	130
Tetrachloroethene	1.4 U
Toluene	64
Trichloroethene	1.1 U
Trichlorofluoromethane	1.2
Vinyl Chloride	0.51 U
Xylene (m,p)	61
Xylene (o)	20

VI-2

ID	IA-2	SS-2
Date	1/28/2014	1/28/2014
Acetone	12 U	12 U
1,2-Dichloroethene (Total)	0.79 U	0.79 U
1,1,1-Trichloroethane	1.1 U	1.1 U
Carbon Tetrachloride	0.36	0.48
Benzene	0.64 U	2
Trichloroethene (TCE)	0.88	1.4
Toluene	2.8	4.7
Tetrachloroethene (PCE)	1.4 U	1.4 U
Xylene (m,p)	2.2 U	3.9
Xylene (o)	0.87 U	1.2

VI-3

ID	IA-3	SS-3
Date	1/28/2014	1/28/2014
Acetone	36	12 U
1,2-Dichloroethene (Total)	0.81 U	0.79 U
1,1,1-Trichloroethane	0.79 U	1.1 U
Carbon Tetrachloride	0.47	0.57
Benzene	0.86	0.67
Trichloroethene (TCE)	0.76	260 D
Toluene	6.9	2.2
Tetrachloroethene (PCE)	2.7	1.4 U
Xylene (m,p)	3.2	2.2 U
Xylene (o)	1.1	0.87 U

SDS-1

Date						7/8/2016	7/29/2016	8/25/2016	9/22/2016	10/26/2016	11/30/2016	12/20/2016
Vinyl Chloride	SYSTEM NOT INSTALLED					4,800 J	480 U	240 U	270 U	130 U	81 U	
Acetone						780,000	71,000	8,100 J	40,000	16,000 U	9,400 U	No Sample
Trichloroethene (TCE)						2,800,000	650,000	320,000	420,000	140,000	100,000	
Toluene						35,000 U	3,500 U	1,700 U	2,000 U	990 U	600 U	

Date	1/25/2017	2/22/2017	3/28/2017	4/19/2017	5/16/2017	6/29/2017	7/31/2017	8/23/2017	9/27/2017	10/17/2017	11/27/2017	12/19/2017
Vinyl Chloride	75 U	66 U	48 U	81 U	70 U	35 U	31 U	51 U	31 U	100 U	31 U	38 U
Acetone	8,700 U	7,600 U	5,600 U	9,400 U	8,100 U	4,000 U	3,600 U	5,900 U	3,600 U	12,000 U	3,600 U	4,400 U
Trichloroethene (TCE)	120,000	86,000	67,000 B	67,000	57,000	55,000	47,000	67,000	58,000	60,000	45,000	47,000
Toluene	550 U	480 U	350 U	600 U	520 U	250 U	230 U	120 J	230 U	750 U	44 J	280 U

Date	1/24/2018	2/22/2018	3/29/2018	4/26/2018	5/22/2018	6/18/2018	7/31/2018	8/29/2018	9/25/2018	10/26/2018	11/29/2018	12/18/2018
Vinyl Chloride	34 U	30 U	48 U	20 U	23 U	20 U	32 U	13 U	31 U	29 U	56 U	24 U *
Acetone	3,900 U	4,000 U	6,400 U	2,600 U	3,100 U	2,700 U	4,300 U	1,800 U	4,200 U	3,900 U	7,400 U	3,200 U
Trichloroethene (TCE)	42,000	42,000	29,000	32,000	27,000	24,000	38,000	25,000	22,000	41,000	22,000	33,000
Toluene	250 U	260 U	400 U	170 U	190 U	170 U	270 U	110 U	260 U	250 U	470 U	210 U

Date	1/31/2019	2/21/2019	3/19/2019	4/23/2019	5/28/2019	6/24/2019	7/31/2019	8/21/2019	9/25/2019	10/31/2019	11/19/2019	12/17/2019
Vinyl Chloride	9.3 U	9.1 U *	8.9 U	18 U	13 U	30 U	16 U	28 U	20 U	7 U	39 U	6 U *
Acetone	1200 U	1200 U	1200 U	2400 U	1700 U	1800 U	950 U	1700 U	1200 U	420 U	2300 U	360 U
Trichloroethene (TCE)	17,000	18,000	20,000	17,000	14,000	17,000	21,000 D	18,000	34,000 D	21,000 D	14,000	18,000 D
Toluene	78 U	77 U	75 U	150 U	110 U	110 U	60 U	110 U	75 U	26 U	150 U	23 U

Date	1/29/2020	2/26/2020	3/31/2020	4/22/2020	5/27/2020	6/23/2020	7/22/2020
Vinyl Chloride	4 U	8 U	2 U	10 U	6 U	5.6 U	6 U
Acetone	140 J	470 U	120 U	590 U	360 U	330 U	360 U
Trichloroethene (TCE)	23,000 D	25,000 D	14,000 D	15,000 D	9,300 D	13,000	13,000
Toluene	47	30 U	41	45	23 U	21 U	23 U

VI-5

ID	IA-5	SS-5
Date	1/28/2014	1/28/2014
Acetone	93	540 U
1,2-Dichloroethene (Total)	0.79 U	48
1,1,1-Trichloroethane	1.1 U	49 U
Carbon Tetrachloride	0.52	11 U
Benzene	3.8	98
Trichloroethene (TCE)	2.4	27,000 D
Toluene	17	270
Tetrachloroethene (PCE)	1.4 U	61 U
Xylene (m,p)	2.2 U	230
Xylene (o)	0.87 U	81

VI-6

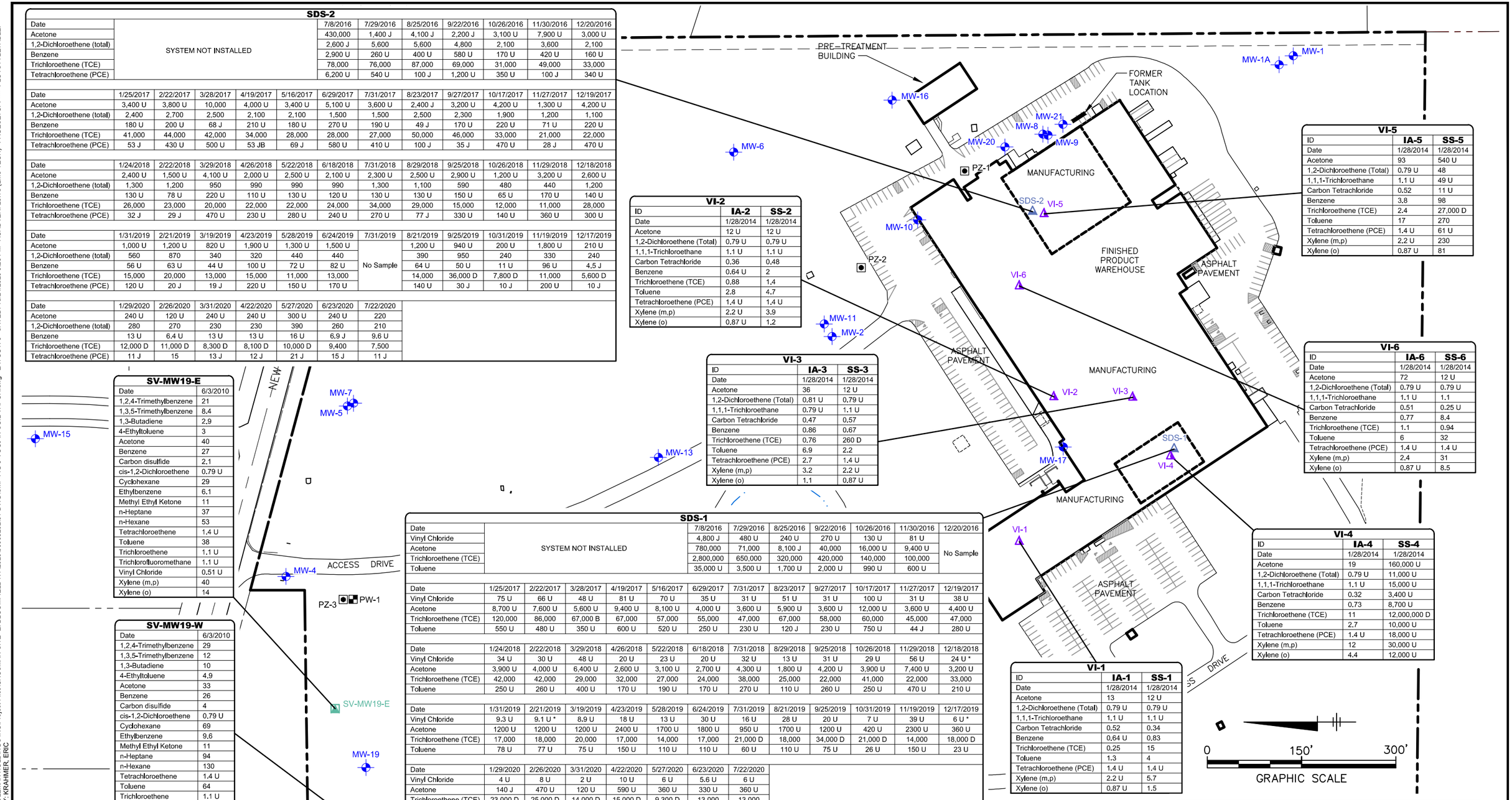
ID	IA-6	SS-6
Date	1/28/2014	1/28/2014
Acetone	72	12 U
1,2-Dichloroethene (Total)	0.79 U	0.79 U
1,1,1-Trichloroethane	1.1 U	1.1
Carbon Tetrachloride	0.51	0.25 U
Benzene	0.77	8.4
Trichloroethene (TCE)	1.1	0.94
Toluene	6	32
Tetrachloroethene (PCE)	1.4 U	1.4 U
Xylene (m,p)	2.4	31
Xylene (o)	0.87 U	8.5

VI-4

ID	IA-4	SS-4
Date	1/28/2014	1/28/2014
Acetone	19	160,000 U
1,2-Dichloroethene (Total)	0.79 U	11,000 U
1,1,1-Trichloroethane	1.1 U	15,000 U
Carbon Tetrachloride	0.32	3,400 U
Benzene	0.73	8,700 U
Trichloroethene (TCE)	11	12,000,000 D
Toluene	2.7	10,000 U
Tetrachloroethene (PCE)	1.4 U	18,000 U
Xylene (m,p)	12	30,000 U
Xylene (o)	4.4	12,000 U

VI-1

ID	IA-1	SS-1
Date	1/28/2014	1/28/2014
Acetone	13	12 U
1,2-Dichloroethene (Total)	0.79 U	0.79 U
1,1,1-Trichloroethane	1.1 U	1.1 U
Carbon Tetrachloride	0.52	0.34
Benzene	0.64 U	0.83
Trichloroethene (TCE)	0.25	15
Toluene	1.3	4
Tetrachloroethene (PCE)	1.4 U	1.4 U
Xylene (m,p)	2.2 U	5.7
Xylene (o)	0.87 U	1.5



NOTES:

1. BASE MAP REFERENCES:
   - 1.1. CROSMAN CORPORATION, "REMEDIAL INVESTIGATION/ INTERIM REMEDIAL MEASURES," PREPARED BY LABELLA, DATED JUNE, 1993.
   - 1.2. NEW YORK STATE ORTHOIMAGERY, DATED 2013.
2. PROJECT BENCHMARK AT TOP OF CASING ON MW-7, ASSUMED LABELLA DATUM ELEV.= 979.71' ABOVE MEAN SEA LEVEL.
3. LOCATION OF WELLS ARE APPROXIMATE.
4. ABBREVIATIONS:
   - 4.1. D = CONCENTRATION IS THE RESULT OF A SECONDARY DILUTION
   - 4.2. IA = INDOOR AIR
   - 4.3. SS = SUB SLAB
   - 4.4. U = COMPOUND WAS ANALYZED FOR BUT NOT DETECTED. ASSOCIATED VALUE IS THE COMPOUND QUANTITATION LIMIT
   - 4.5. J = ESTIMATED CONCENTRATION; RESULT IS LESS THAN REPORTING LIMIT, BUT GREATER THAN METHOD DETECTION LIMIT.
   - 4.6. NA** = NOT AVAILABLE; ANALYTICAL DATA REJECTED DUE TO CONDENSATE ENTERING THE SAMPLE CONTAINER DURING COLLECTION.

LEGEND:

- GROUNDWATER MONITORING WELL
- 2010 SOIL VAPOR SAMPLE LOCATION
- VAPOR INTRUSION SAMPLE LOCATION
- SDS LOCATION
- PRODUCTION WELL
- PIEZOMETER
- APPROXIMATE PROPERTY BOUNDARY

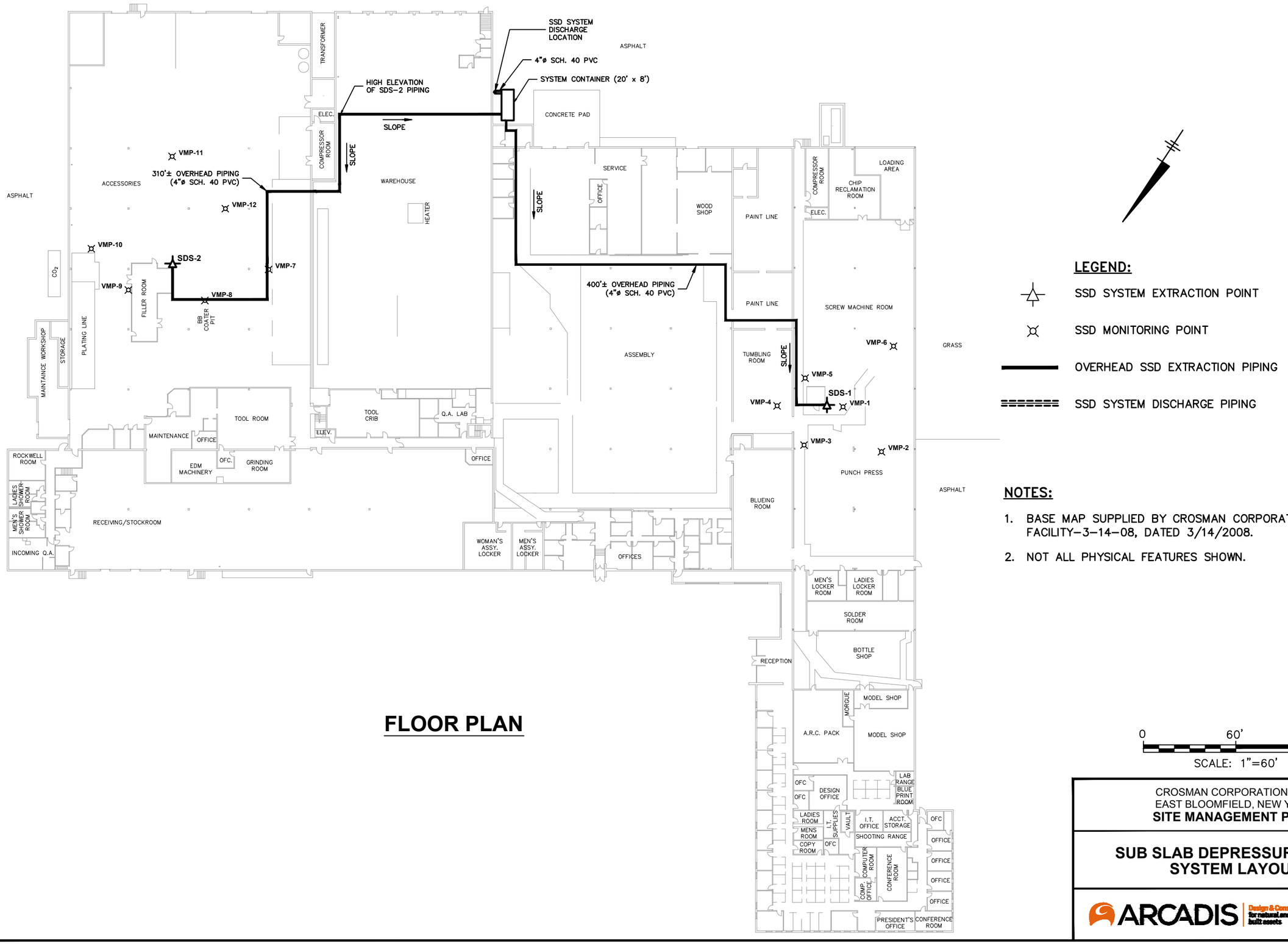
CROSMAN CORPORATION SITE
EAST BLOOMFIELD, NEW YORK

SITE MANAGEMENT PLAN

MAP OF VOCs IN SOIL VAPOR

ARCADIS Design & Consultancy for natural and built assets

FIGURE 9



FLOOR PLAN

LEGEND:

- SSD SYSTEM EXTRACTION POINT
- SSD MONITORING POINT
- OVERHEAD SSD EXTRACTION PIPING
- SSD SYSTEM DISCHARGE PIPING

NOTES:

1. BASE MAP SUPPLIED BY CROSMAN CORPORATION, DRAWING FACILITY-3-14-08, DATED 3/14/2008.
2. NOT ALL PHYSICAL FEATURES SHOWN.

0 60' 120'

SCALE: 1"=60'

CROSMAN CORPORATION SITE
EAST BLOOMFIELD, NEW YORK
SITE MANAGEMENT PLAN

SUB SLAB DEPRESSURIZATION SYSTEM LAYOUT

ARCADIS Design & Consultancy for natural and built assets

FIGURE
10

CITY: SYRACUSE NY DIV/GROUP: ENV/CAD DB: E. KRAHMER LD: (Opt.) PIC/PM: W. POPHAM APM/TM: A. RICHARDSON LYR:(Opt)ON=;OFF=REF*
G:\ENV\CAD\SYRACUSE\ACTIVE\B0041501\0010\0014\DWG\41501G02.dwg LAYOUT: 10 SAVED: 9/6/2016 2:57 PM ACADVER: 19.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 9/6/2016 3:14 PM BY: KRAHMER, ERIC
XREFS: IMAGES: PROJECTNAME: ---
41501X02
41501XLB

Appendix A

Deed Restriction with Metes and Bounds Survey

Ontario County Clerk Recording Page

Return To

Stewart Title Insurance Company - Upstate

Matthew J. Hoose, County Clerk
Ontario County Clerk
20 Ontario Street
Canandaigua, New York 14424
(585) 396-4200

Document Type: **DECLARATION**

Receipt Number: 493204

Grantor (Party 1)
CROSMAN CORPORATION

Grantee (Party 2)

Fees	
Recording Fee	$20.00
Pages Fee	$30.00
State Surcharge	$20.00
Total Fees Paid:	$70.00

Control #: 202005130107

Property located in **Town of East Bloomfield**

State of New York
County of Ontario

Recorded on May 13th, 2020 at 4:52:59 PM
in Liber **01450** of **Deeds**
beginning at page **0324**, ending at page **0329, with a total page count of 6**.

Matthew J Hoose

Ontario County Clerk

This sheet constitutes the Clerk's endorsement required by section 319 of the Real Property Law of the State of New York

SC

Do Not Detach

DECLARATION of COVENANTS and RESTRICTIONS

THIS COVENANT is made the 4th day of May 2020, by Crosman Corporation, a corporation organized and existing under the laws of the State of Delaware and having an office for the transaction of business at 7629 Routes 5 and 20, East Bloomfield, New York 14443.

WHEREAS, the Crosman Corporation Site, (Site # 835012) is the subject of an Order on Consent executed by Crosman Corporation and New Coleman Holdings, Inc. (collectively, the "Respondents") as part of the New York State Department of Environmental Conservation's (the "Department's") State Superfund Program, namely that parcel of real property located at the address of 7629 Routes 5 and 20 (Tax Map ID# 080.00-1-04.000), Town of East Bloomfield, County of Ontario, State of New York, being the same as (or part of) that property conveyed to Crosman Corporation by Crosman Products, Inc., by deed(s) dated August 27, 1990, and recorded on September 13, 1990 at the Ontario County Clerk in Liber 900, Page 1065, and being more particularly described in Schedule "A," attached to this declaration and made a part hereof, and hereinafter referred to as the "Property"; and

WHEREAS, the Department approved a remedy to eliminate or mitigate all significant threats to the environment presented by the contamination disposed at the Property and such remedy requires that the Property be subject to restrictive covenants.

NOW, THEREFORE, Crosman Corporation, for itself and its successors and/or assigns, covenants that:

First, the Property subject to this Declaration of Covenants and Restrictions is as described in Schedule "A" and made a part hereof.

Second, unless prior written approval by the Department or, if the Department shall no longer exist, any New York State agency or agencies subsequently created to protect the environment of the State and the health of the State's citizens, hereinafter referred to as the "Relevant Agency," is first obtained, where contamination remains at the Property subject to the provisions of the Site Management Plan ("SMP"), including any and all Department-approved amendments to the SMP, there shall be no construction, use or occupancy of the Property that results in the disturbance or excavation of the Property which threatens the integrity of the engineering controls or which results in unacceptable human exposure to contaminated soils. An up-to-date version of the SMP may be obtained from the New York State Department of Environmental Conservation, Division of Environmental Remediation, Site Control Section, 625 Broadway, Albany, New York, 12233 or DERWEB@dec.ny.gov.

Third, the owner of the Property shall not disturb, remove, or otherwise interfere with the installation, use, operation, and maintenance of engineering controls required for

Record & Return to:
Barclay Damon LLP
2000 Five Star Bank Plaza
100 Chestnut Street
Rochester NY 14604

the Remedy, which are described in the SMP, unless in each instance the owner first obtains a written waiver of such prohibition from the Department or Relevant Agency.

Fourth, the owner of the Property shall prohibit the Property from ever being used for purposes other than for Commercial use as described in 6 NYCRR Part 375-1.8(g)(2)(iii) or Industrial use as described in 6 NYCRR Part 375-1.8(g)(2)(iv), consistent with zoning, without the express written waiver of such prohibition by the Department or Relevant Agency.

Fifth, the use of groundwater underlying the Property as drinking water is prohibited without necessary water quality treatment as determined by the New York State Department of Health or the Ontario County Department of Health to render it safe for use as drinking water, and the user must first notify and obtain written approval to so use the groundwater as drinking water from the Department; provided, however, that this prohibition is inapplicable to the continued use of the groundwater underlying the Property as non-contact cooling and process water with subsequent discharge primarily pursuant to a State Pollution Discharge Elimination System permit (presently, SPDES Permit No.: NY-0103039) to an unnamed tributary of Fish Creek, but also to an extent, with subsequent discharge to the East Bloomfield Publicly Owned Treatment Works.

Sixth, the owner of the Property shall, at such time as the Department may require pursuant to the SMP, provide a periodic certification, prepared and submitted by a professional engineer or environmental professional acceptable to the Department or Relevant Agency, which will certify that the institutional and engineering controls put in place are unchanged from the previous certification, comply with the SMP, and have not been impaired, unless one or both of the Respondents have already provided such periodic certification which has been accepted by the Department pursuant to the SMP.

Seventh, the owner of the Property shall continue in full force and effect any institutional and engineering controls required by the Remedy, which are described in the SMP, unless the owner first obtains permission to discontinue such controls from the Department or Relevant Agency, in compliance with the approved SMP, which is incorporated and made enforceable hereto, subject to modifications as approved by the Department or Relevant Agency.

Eighth, this Declaration is and shall be deemed a covenant that shall run with the land and shall be binding upon all future owners of the Property, and shall provide that the owner and its successors and assigns consent to enforcement by the Department or Relevant Agency of the prohibitions and restrictions that the Order on Consent requires to be recorded, and hereby covenant not to contest the authority of the Department or Relevant Agency to seek enforcement.

Ninth, access to the Property must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by this Declaration of Covenants and Restrictions.

Tenth, the potential for vapor intrusion must be evaluated for any buildings developed on the Property, and any potential impacts that are identified must be monitored or mitigated.

Eleventh, any deed of conveyance of the Property, or any portion thereof, shall recite, unless the Department or Relevant Agency has consented to the termination of such covenants and restrictions, that said conveyance is subject to this Declaration of Covenants and Restrictions.

IN WITNESS WHEREOF, the undersigned has executed this instrument the day written below.

Crosman Corporation

By: _____

Print Name: Daniel J. Maier

Title: Vice President of Finance Date: 05/04, 2020

Grantor's Acknowledgment

STATE OF NEW YORK)
)ss:
COUNTY OF ONTARIO)

On the 4 day of May in the year 2020, before me, the undersigned, personally appeared Daniel Maier, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signatures(s) on the instrument, the individual(s), or the person on behalf of which the individual(s) acted, executed the instrument.

Julie Dewey Woodhams
Signature

Notary Stamp & Expiration Date: 3/31/21

Notary Public State of New York

JULIE DEWEY WOODHAMS
Notary Public - State of New York
NO. 01WO4835219
Qualified in Ontario County
My Commission Expires 3/31/21

SCHEDULE "A"
to
Declaration of Covenants and Restrictions
For Crosman Corporation Site
Site No. 835012

METES AND BOUNDS DESCRIPTION OF RESTRICTED PROPERTY AS FILED IN ONTARIO COUNTY CLERK'S OFFICE AT LIBER 900 PAGE 1065

ALL THAT CERTAIN PLOT, PIECE OR PARCEL OF LAND, with the buildings and improvements thereon erected, situate, lying and being in the Lot Nos. 28 and 44, Township 10, Range 4, Town of East Bloomfield, County of Ontario and State of New York, bounded and described as follows:

BEGINNING at an iron pipe on the south line of New York State Highway (Routes 5 and 20), on the west line of land formerly owned by Charles Page and now reputedly owned by John Toomey, and

RUNNING THENCE South 8 degrees 32 minutes West along land reputedly owned by said Toomey, 1635.15 feet to an iron pipe at the northeast corner of land reputedly owned by David Hamlin;

THENCE North 80 degrees 26 minutes West along land reputedly owned by said Hamlin, 1231.60 feet to an iron pipe at the southeast corner of land formerly owned by Bridget McDonnell and Bertha M. McKeon and now reputedly owned by Alvin Ayres;

THENCE North 8 degrees 22 minutes East along land reputedly owned by said Ayres, 1764.70 feet to an iron pipe at the southwest corner of land formerly owned by Luella Olmstead, and now reputedly owned by Konrad Meier;

THENCE the following courses and distances along land reputedly owned by said Meier, South 81 degrees 51 minutes East 361.02 feet to an iron pipe and North 8 degrees 57 seconds East 86.55 feet to an iron pipe on the south line of the aforesaid highway;

THENCE South 66 degrees 06 minutes East along the south line of said highway, 907.40 feet to the point or place of BEGINNING.

METES AND BOUNDS DESCRIPTION OF RESTRICTED PROPERTY (AS MEASURED) IN THE INSTRUMENT SURVEY COMPLETED BY FISHER ASSOCIATES, P.E., L.S. OCTOBER 23, 2018 BEING AND INTENDING TO DESCRIBE THE SAME PROPERTY AS THE ABOVE LEGAL DESCRIPTION

All that tract or parcel of land situate in Town Lots 28 and 44, Township 10, Range 4, Town of East Bloomfield, County of Ontario, State of New York, bounded and described as follows:

Beginning at a point in the southerly highway boundary of the existing New York Route 5 and US Route 20 (99.0' wide), at its intersection with the division line between the lands now or formerly of Crosman Corporation (Tax 10 No. 80.00-1-4) on the west and the lands now or formerly of Lynn Farash LLC (Tax ID No. 80.00-1-5.013) on the east; thence

1. South 00°24'24" East along the easterly line of Crosman Corporation (Tax ID No. 80.00-1-4) a distance of 1635.16 feet to a point on the division line between the hands now or formerly of Crosman Corporation (Tax ID No, 80.00-1-4) on the north and the lands now or formerly of John Lane and Kelly Lane (Tax ID No. 79.00-3-9.1) on the south; thence

2. North 89°22'24" West along the last mentioned division line, a distance of 1231.60 feet to a point on the division line between the lands now or formerly of Crosman Corporation (Tax ID No. 80.00-1-4) on the east and the lands now or formerly of Duane A. Ayers and Paulette M. Ayers (Tax ID No. 80.00-1-2.21) on the west; thence

3. North 00°34'24" West along the last mentioned division line a distance of 1764.70 feet to a point on the division line between the lands now or formerly of Crosman Corporation (Tax ID No. 80.00-1-4) on the south and the lands now or formerly of Gregory T. Hart and Melissa L Hart (Tax ID No. 80.00-1-3) on the north; thence

4. Easterly and Northerly along the last mentioned division line the following two (2) courses and distances:

    1. North 89°-12'36" East, a distance of 361.02 feet to a point; thence

    2. North 00°01'36" East, a distance of 86.55 feet to a point in the southerly highway boundary of the existing New York Route 5 and 20 (99.0' wide); thence

5. South 75°01'24" East along the southerly highway boundary of the existing New York Route 5 and US Route 20 (99.0' wide), a distance of 907.38 feet to the point of beginning, being 49.684+ acres.

Appendix B

Site Contact List

APPENDIX B – LIST OF SITE CONTACTS

Name	Phone/Email Address
Site Owner Gina Thomas Crosman Corporation	(585) 657-3120 gthomas@crosman.com
Remedial Party Tim Martin New Coleman Holdings Inc.	TMartin@MAFGRP.com
Qualified Environmental Professional William Popham Arcadis	(585) 662-4012 William.Popham@arcadis.com
NYSDEC DER Project Manager Todd M. Caffoe, P.E.	(585) 226-5350 Todd.Caffoe@dec.ny.gov
NYSDEC Regional HW Engineer David G. Pratt, P.E.	(585) 226-5355 David.Pratt@dec.ny.gov
NYSDEC Site Control Kelly Lewandowski	(518) 402-9553 Kelly.Lewandowski@dec.ny.gov
NYSDOH Anthony Perretta	(518) 402-7860 Anthony.Perretta@health.ny.gov
Remedial Party Attorney Thomas F. Walsh Barclay Damon, LLP	(585) 295-4414 TWalsh@barclaydamon.com

Notes:
DER = Division of Environmental Remediation
NYSDEC = New York State Department of Environmental Protection

Appendix C

Boring Logs

LABELLA ASSOCIATES, P.C. 300 STATE STREET, ROCHESTER, NEW YORK ENVIRONMENTAL ENGINNEERING CONSULTANTS	PROJECT CROSMAN CORPORATION ROUTES 5 & 20 EAST BLOOMFIELD, NEW YORK	BORING # TB-1 SHEET 1 OF 1 JOB # 91243 CHKD. BY DP

CONTRACTOR	NOTHNAGLE DRILLING INC.	BORING LOCATION	
DRILLER	DANNY PEARSE	GROUND SURFACE ELEVATION	DATUM
LABELLA REPRESENTATIVE	DENNIS PECK	START DATE 12/10/91 END DATE	12/10/91

TYPE OF DRILL RIG	CME-45
AUGER SIZE AND TYPE	2-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD	1-3/8 inch I.D. Split spoon
ROCK DRILLING METHOD	NA

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS

DEPTH	BLOW / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	RECOVERY (INCHES)	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	MOISTURE	HNU	NOTES
1	9	S-1	0-2	19	4	Medium dense brown SAND and GRAVEL		Moist	BG	
	8									
	11									
2	16									
	20	S-2	2-4	57	17	Very dense brown fine SAND, trace Gravel		Moist	BG	
3	21					grading to SAND, some Gravel				
	36									
4	53									
	19	S-3	4-6	44	19			Moist	0.2	
5	21									
	23									
6	20					. . . dense				
	31	S-4	6-8	70	20			Moist	BG	
7	38					Very dense brown fine SAND, trace Silt				
	32									
8	40									
	44	S-5	8-10	127	23			Moist	BG	
9	60					. . . little gravel, trace Silt, trace Clay				
	67									
10	54									
	28	S-6	10-12	196	13			Moist	BG	
11	73					. . . little Gravel, little Silt, trace Clay				
	123									
12	100/4									
	55	S-7	12-14	186	15			Dry	BG	
13	88					Gray SAND and SILT, little Gravel				
	98					trace Clay		Dry	BG	
14	88									
	72	S-8	14-15	198	12					
15	99									1
						Boring terminated at 15'				

LEGEND

S - SPLIT SPOON SOIL SAMPLE
U - UNDISTURBED SOIL SAMPLE
C - ROCK CORE SAMPLE

NOTES:

1. Boring backfilled with cuttings

GENERAL NOTES:

1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE

LABELLA ASSOCIATES, P.C. 300 STATE STREET, ROCHESTER, NEW YORK ENVIRONMENTAL ENGINNEERING CONSULTANTS	PROJECT CROSMAN CORPORATION ROUTES 5 & 20 EAST BLOOMFIELD, NEW YORK	BORING # TB-2 SHEET 1 OF 1 JOB # 91243 CHKD. BY DP

CONTRACTOR	NOTHNAGLE DRILLING INC.	BORING LOCATION	
DRILLER	DANNY PEARSE	GROUND SURFACE ELEVATION	DATUM
LABELLA REPRESENTATIVE	DENNIS PECK	START DATE 12/10/91 END DATE	12/11/91

TYPE OF DRILL RIG	CME-45
AUGER SIZE AND TYPE	2-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD	1-3/8 inch I.D. Split spoon
ROCK DRILLING METHOD	NA

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS

DEPTH	SAMPLE BLOW / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	RECOVERY (INCHES)	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	MOISTURE	HNU	NOTES
1	15	S-1	0-2	35	5	Dense SAND and GRAVEL		Moist	BG	
	20									
	15									
2	12									
	8	S-2	2-4	17	16	Medium dense brown SAND, little Gravel		Moist	BG	
3	8					trace Silt				
	9									
4	11									
	7	S-3	4-6	16	17	Brown SAND, little Silt, little Gravel		Wet	BG	
5	8					trace Clay				
	8									
6	8									
	13	S-4	6-8	30	15			Moist	BG	
7	12									
	18									
8	19									
	12	S-5	8-10	32	22	. . . dense, clay lenses		Moist	BG	
9	15									
	17									
10	22									
	16	S-6	10-12	95	21	. . . very dense		Moist	BG	
11	39									
	56									
12	100/5									1
13						Boring terminated at 12.5'				
						Boring backfilled with cuttings				
14										
15										

LEGEND

S - SPLIT SPOON SOIL SAMPLE
U - UNDISTURBED SOIL SAMPLE
C - ROCK CORE SAMPLE

NOTES:

1. Boring terminated at 12.5' due to obstruction

GENERAL NOTES:

1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE

LABELLA ASSOCIATES, P.C. 300 STATE STREET, ROCHESTER, NEW YORK ENVIRONMENTAL ENGINNEERING CONSULTANTS	PROJECT CROSMAN CORPORATION ROUTES 5 &20 EAST BLOOMFIELD, NEW YORK	BORING # TB-3 SHEET 1 OF 1 JOB # 91243 CHKD. BY DP

CONTRACTOR	NOTHNAGLE DRILLING INC.	BORING LOCATION	
DRILLER	DANNY PEARSE	GROUND SURFACE ELEVATION	DATUM
LABELLA REPRESENTATIVE	DENNIS PECK	START DATE 12/11/91	END DATE 12/11/91

TYPE OF DRILL RIG	CME-45
AUGER SIZE AND TYPE	2-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD	1-3/8 inch I.D. Split spoon
ROCK DRILLING METHOD	NA

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS

DEPTH	BLOW /6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	RECOVERY (INCHES)	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	MOISTURE	HNU	NOTES
1	12	S-1	0-2	16	5	Medium dense, brown SAND and GRAVEL little Silt		Moist	2.6	
	9									
	7									
2	6									
	7	S-2	2-4	19	23	Medium dense, brown SAND, some Gravel little Silt		Wet at top then moist	3.0	
3	8									
	11									
4	19									
	24	S-3	4-6	75	19	. . . very dense, trace Clay		Moist	23.0	1
5	30									
	45									
6	62									
	24	S-4	6-8	48	17			Moist	40	2 3
	23									
	25									
8	100/3									
	100/5	S-5	8.5	100	0.1					
9						boring terminated at 8'due to obstruction				
						Boring grouted to surface				
10										
11										
12										
13										
14										
15										

LEGEND

S - SPLIT SPOON SOIL SAMPLE
U - UNDISTURBED SOIL SAMPLE
C - ROCK CORE SAMPLE

NOTES:

1. Soil cuttings containerized due to high HNU readings
2. Rock wedged in tip of split spoon
3. Granitic rock fragment

GENERAL NOTES:

1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE

LABELLA ASSOCIATES, P.C. 300 STATE STREET, ROCHESTER, NEW YORK ENVIRONMENTAL ENGINNEERING CONSULTANTS	PROJECT CROSMAN CORPORATION ROUTES 5 &20 EAST BLOOMFIELD, NEW YORK	BORING # TB-3A SHEET 1 OF 2 JOB # 91243 CHKD. BY DP

CONTRACTOR	NOTHNAGLE DRILLING INC.	BORING LOCATION	
DRILLER	DANNY PEARSE	GROUND SURFACE ELEVATION	DATUM
LABELLA REPRESENTATIVE	DENNIS PECK	START DATE 12/11/91	END DATE 12/12/91

TYPE OF DRILL RIG	CME-45
AUGER SIZE AND TYPE	2-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD	1-3/8 inch I.D. Split spoon
ROCK DRILLING METHOD	NA

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS

DEPTH	BLOW/6"	NO.	DEPTH (FT.)	N-VALUE/RQD(%)	RECOVERY (INCHES)	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	MOISTURE	HNU	NOTES
1						Refer to boring TB-3 for subsurface description between 0 and 6 feet				
2										
3										
4										
5										
6										
7	23 31 38	S-1	6-8	69	19	Very dense, brown fine SAND, some Gravel, trace Silt		Moist	5-40	1
8	76 56	S-2	8-9.2	170	12			Moist	100	
9	70 100/2									
10										
11	46 63 76	S-3	10-12	141	20	Very dense, brown SAND little Gravel		Moist	250	2
12	61									
13	28 52 49	S-4	12-14	101	18	brown SAND		Moist	50-200	
14	70									
15	70 70 87	S-5	14-16	157	20	. . . little Gravel		Moist	200-300	
16	100/5									

LEGEND

S - SPLIT SPOON SOIL SAMPLE
U - UNDISTURBED SOIL SAMPLE
C - ROCK CORE SAMPLE

NOTES:

1. Cuttings drummed due to high HNU readings
2. Sample obtained for VOA analysis including Quality control (MS/MSD)

GENERAL NOTES:

1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE

LABELLA ASSOCIATES, P.C. 300 STATE STREET, ROCHESTER, NEW YORK ENVIRONMENTAL ENGINNEERING CONSULTANTS	PROJECT CROSMAN CORPORATION ROUTES 5 &20 EAST BLOOMFIELD, NEW YORK	BORING # TB-3A SHEET 2 of 2 JOB # 91243 CHKD. BY DP

DEPTH	SAMPLE BLOW / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	RECOVERY (%)	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	Moisture	HNU	NOTES
17	55	S-6	16-17	--	11	Very dense, brown SAND		Moist	90	3
	100/5					little rounded Gravel				
18										
	100/5	S-7	18-18.5	100	5	. . . little Silt		Dry	50	
19										
20										
	100/2	S-8	20	100	2			Dry	20	
21										
22										
	100/4	S-9	22	100	2			Dry	30	
23						Boring terminated at 22'				
						Boring grouted to surface				
24										
25										
26										
28										
29										
30										
31										
32										
33										
34										
35										
36										

LEGEND

S - SPLIT SPOON SOIL SAMPLE
U - UNDISTURBED SOIL SAMPLE
C - ROCK CORE SAMPLE

NOTES:

3. Soil samples very hot due to difficult auguring and high blow count

GENERAL NOTES:

1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE

LABELLA ASSOCIATES, P.C. 300 STATE STREET, ROCHESTER, NEW YORK ENVIRONMENTAL ENGINNEERING CONSULTANTS	PROJECT CROSMAN CORPORATION Routes 5 & 20 EAST BLOOMFIELD, NEW YORK	BORING # TB-4 SHEET 1 OF 1 JOB # 91243 CHKD. BY DP

CONTRACTOR	NOTHNAGLE DRILLING INC.	BORING LOCATION	
DRILLER	Steve Spring	GROUND SURFACE ELEVATION	DATUM
LABELLA REPRESENTATIVE	DENNIS PECK	START DATE 12/11/91	END DATE 12/12/91

TYPE OF DRILL RIG	Diedrich D25
AUGER SIZE AND TYPE	2-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD	1-3/8 inch I.D. Split spoon
ROCK DRILLING METHOD	NA

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS

DEPTH	SAMPLE BLOW/6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	RECOVERY (INCHES)	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	MOISTURE	HNU	NOTES
1	25	S-1	0-2	26	16	Medium dense, brown SAND, some gravel, little Silt		Moist	40-70	1
	13									
	13									
2	40									
	21	S-2	2-4	50	16	. . . Very dense, little Silt, trace Gravel		Moist	30	
3	22									
	28									
4	25									
	5	S-3	4-6	64	18			Moist	35	2
5	29									
	35									
6	39									
	37	S-4	6-7	100	10			Dry	8	3
7	100/5									
8										
	28	S-5	8-9		10			Dry	2	4
9	96									
	100/1									
10										
	69	S-6	10-11		10			Dry	3	
11	100/5									
12						Boring terminated at 12'				
						Boring grouted to surface				
13										
14										
15										

LEGEND

S - SPLIT SPOON SOIL SAMPLE
U - UNDISTURBED SOIL SAMPLE
C - ROCK CORE SAMPLE

NOTES:
1. Soil cuttings containerized due to high HNU readings
2. Sample obtained for laboratory analysis
3. Rock wedged in tip of split spoon
4. Soil samples very hot due to difficult auguring and high blow count

GENERAL NOTES:

1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE

1196DPB

LABELLA ASSOCIATES, P.C. 300 STATE STREET, ROCHESTER, NEW YORK ENVIRONMENTAL ENGINNEERING CONSULTANTS	PROJECT CROSMAN CORPORATION ROUTES 5 &20 EAST BLOOMFIELD, NEW YORK	BORING # MW-1 SHEET 1 OF 2 JOB # 91243 CHKD. BY DP

CONTRACTOR	NOTHNAGLE DRILLING INC.	BORING LOCATION	
DRILLER	STEVE LARANTY	GROUND SURFACE ELEVATION	DATUM
ABELLA REPRESENTATIVE	DENNIS PECK	START DATE 1/22/92 END DATE	1/23/92

TYPE OF DRILL RIG	CME-75
AUGER SIZE AND TYPE	4-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD	1-3/8 inch I.D. Split spoon
ROCK DRILLING METHOD	NA

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS

DEPTH	BLOW /6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	RECOVERY (INCHES)	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	HNU	NOTES
1	2	S-1	0-2	4	10	Very loose, brown, fine SAND and Silt, moist	Concrete seal (0 - 1 feet)	BG	
	2								
	2								
2	2						4 inch I.D. protective steel casing		
3									
4									
	9	S-2	4-6	22	22	Medium dense, brown, medium SAND, little fine Gravel, trace Silt, moist		BG	
5	9								
	13								
6	14						2 inch I.D. schedule 10 PVC riser (0.0 - 23.9 feet)		
7									
							Cement grout (1.0 - 19.0 feet)		
9									
	9	S-3	9-11	30	18			BG	1
10	15								
	15								
11	26								
12									
13									
14									
	13	S-4	14-16	99	21	. . . very dense,		BG	
15	54								
	45					Gravel seam at 15 feet, wet			
16	36								

LEGEND

S - SPLIT SPOON SOIL SAMPLE
U - UNDISTURBED SOIL SAMPLE
C - ROCK CORE SAMPLE

NOTES:

1. Small wet zone at 9.5 feet

GENERAL NOTES:

1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE

Date Start/Finish: 10/28/93 / 11/1/93
Drilling Company: Nothnagle Drilling
Driller's Name: N. Short
Drilling Method: Hollow Stem Auger
Auger Size : 4.25-in.
Rig Type: Diedrich D-25 (skid)
Spoon Size: 2-in. O.D.
Hammer Weight: 140-lb
Height of Fall: 30-in.

Borehole Depth: 26.0 ft.
Ground Surface Elev.: 1027.7 ft.

Geologist: Todd J. Farmen

Boring No. SB-1

Site:
Crosman Corporation, East Bloomfield, NY

Client:
New Coleman Holdings, Inc.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 in.	N	Recovery (ft.)	PID (ppm) Field/Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Boring Construction
gs elevation 1027.7 ft.										GROUND SURFACE	
										CONCRETE	
		1		53 48 49	97	0.2	2.5			Light brown fine to coarse GRAVEL, some fine to coarse sand, very dense, dry.	← Soil boring grouted to surface.
	1025	2		46 18 18 42	32	2.0	30.0			Same.	
5		3		48 52 79 100/.2	131	1.1	20.0			Same.	
		4		58 100/.5	158	0.9	25.0			Same.	
	1020	5		100/.4	---	0.5	25.0			Light brown fine to coarse SAND and SILT, little gravel and clay.	
10		6		100/.3	---	0.2	60.0			Same, except darker brown.	
	1015	7		100/.4	---	0.3	2.0			Same.	
15		8		100/.3	---	0.3	2.0				

BLASLAND, BOUCK & LEE INC.
ENGINEERS & SCIENTISTS

Remarks:
SB-1 located in building.

Saturated Zones

Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Site:
Crosman Corporation, East Bloomfield, NY

Boring No. SB-1

Total Depth = 28.0 ft.

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Field/Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Boring Construction
	8			—	0.3	2.0				
1010	9		37 35 129/.6	164	1.0	2.0			Dark brown fine to coarse SAND, some fine to medium gravel, very dense, dry.	
	10		100/.3	—	0.4	1.0			Same.	
20	11		100/.4	—	0.2	0.0			Same.	
1005	12		100/.2	—	0.1	0.0			Same.	
25	13		139/.6	—	0.7	0.0			Total depth = 28.0 feet	
1000										
30										
995										
35										

BLASLAND, BOUCK & LEE, INC.
ENGINEERS & SCIENTISTS

Remarks:

Saturated Zones

Date / Time	Elevation	Depth

Date Start/Finish: 11/29/93 / 11/29/93
Drilling Company: Nothnagle Drilling
Driller's Name: N. Short
Drilling Method: Hollow Stem Auger
Auger Size: 4.25-in.
Rig Type: Ellerich D-25 (skid)
Spoon Size: 2-in. O.D.
Hammer Weight: 140-lb
Height of Fall: 30-in.

Borehole Depth: 16.0 ft.
Ground Surface Elev.: 1027.7 ft.

Geologist: Todd J. Farmen

Boring No.: SB-3

Site:
Crosman Corporation, East Bloomfield, NY

Client:
New Coleman Holdings, Inc.

DEPTH / ELEVATION	Sample / Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Field/Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Boring Construction
gs elevation 1027.7 ft.									**GROUND SURFACE**	
									CONCRETE	
	1		35 25 39	64	0.7	0.0			Light to dark brown fine to coarse SAND, some fine to medium gravel, medium dense, dry.	← Soil boring grouted to surface.
1025	2		9 11 10 7	21	1.7	0.0			Same, except more dense.	
5	3		7 8 15 19	23	1.8	0.0			Same.	
	4		31 51 58 75	107	1.8	0.0			Rock fragments at 7.5 feet.	
1020	5		75 92 100/.4	192	1.3	0.0			Same.	
10	6		30 82 86 79	168	2.0	0.0			Same.	
1015	7		28 73 108	181	1.3	0.0			Same.	
15	8		38 52	105	2.0	0.0			Same.	

BLASLAND, BOUCK & LEE INC.
ENGINEERS & SCIENTISTS

Remarks:
SB-3 located in building.

Saturated Zones

Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Site:
Crosman Corporation, East Bloomfield, NY

Boring No. SB-3
Total Depth = 16.0 ft.

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Field/Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Boring Construction
	8		53 95	105	2.0	0.0				
									Total depth = 16.0 feet	

1010
20
1005
25
1000
30
995
35

BLASLAND, BOUCK & LEE, INC.
ENGINEERS & SCIENTISTS

Remarks:

Saturated Zones

Date / Time	Elevation	Depth

Project: 415.01
Script: CROSBORE
Date: 06/23/94

Date Start/Finish: 11/30/93 / 12/1/93
Drilling Company: Nothnagle Drilling
Driller's Name: N. Short
Drilling Method: Hollow Stem Auger
Auger Size : 4.25-in.
Rig Type: Diedrich D-25 (skid)
Spoon Size: 2-in. O.D.
Hammer Weight: 140-lb
Height of Fall: 30-in.

Borehole Depth: 21.0 ft.
Ground Surface Elev.: 1027.7 ft.

Geologist: Todd J. Farmen

Boring No. SB-4

Site:
Crosman Corporation, East Bloomfield, NY

Client:
New Coleman Holdings, Inc.

DEPTH / ELEVATION	Sample / Run Number	Sample/Int/Type	Blows/6 in.	N	Recovery (ft)	PID (ppm) Field/Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Boring Construction
gs elevation 1027.7 ft.									**GROUND SURFACE**	
									CONCRETE	
	1		33 38 38	74	0.5	3.0			Light to medium brown fine to medium SAND, some fine to coarse gravel, medium to very dense, dry.	← Soil boring grouted to surface.
1025	2		37 40 80 70	120	1.1	10.0			Rock fragments at 3.0 to 3.5 feet. Rock fragments at 4.0 to 5.0 feet.	
5	3		150/.3	---	0.0	---				
	4		167 112 76 84	188	1.3	20.0			Rock fragments at 8.5 feet.	
1020	5		200/.4	---	0.2	2.0			Same.	
10	6		52 100/.5	152	1.0	10.0			Same.	
1015	7		80 100/.5	180	0.7	20.0			Same.	
	8		62 100/.3	162	1.0	2.0			Same.	
15										

BLASLAND, BOUCK & LEE INC.
ENGINEERS & SCIENTISTS

Remarks:
SB-4 located in building.

Saturated Zones

Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Site:
Crosman Corporation, East Bloomfield, NY

Boring No. SB-4
Total Depth = 21.0 ft.

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 in.	N	Recovery (ft.)	PID (ppm) Field/Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Boring Construction
	8			162	1.0	2.0			Same.	
	9		100/.5	—	0.3	1.0				
1010	10		103 100/.4	203	0.8	1.0			Same.	
20	11		86 100/.2	186	0.5	1.0			Light brown fine SAND, trace silt, trace clay, trace fine gravel, very dense, dry.	
1005									Total depth = 21.0 feet. (Roller bit refusal)	
25										
1000										
30										
995										
35										

BLASLAND, BOUCK & LEE, INC.
ENGINEERS & SCIENTISTS

Remarks:

Saturated Zones

Date / Time	Elevation	Depth

Project: 415.01
Script: CROSBORE
Date: 08/23/94

Date Start/Finish: 12/2/93 / 12/3/93
Drilling Company: Nothnagle Drilling
Driller's Name: N. Short
Drilling Method: Hollow Stem Auger
Auger Size: 4.25-in.
Rig Type: Diedrich D-25 (skid)
Spoon Size: 2-in. O.D.
Hammer Weight: 140-lb
Height of Fall: 30-in.

Borehole Depth: 50.0 ft.
Ground Surface Elev.: 1028.2 ft.

Geologist: Todd J. Farmen

Boring No.: SB-5

Site:
Crosman Corporation, East Bloomfield, NY

Client:
New Coleman Holdings, Inc.

DEPTH / ELEVATION	Sample / Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Field/Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Boring Construction
gs elevation 1028.2 ft.									GROUND SURFACE	
1025	1		4 5 8 14	13	1.5	0.0			Medium brown fine SAND, some silt, little gravel, loose, damp.	← Soil boring grouted to surface.
	2		31 48 44 55	92	1.8	0.0			Medium brown fine to coarse SAND, little gravel, little silt, very dense, moist to dry.	
5	3		13 17 29 41	46	1.5	0.0			Brown GRAVEL, some fine to coarse sand, little silt, very dense, damp.	
1020	4		38 56 42 49	98	1.7	6.4				
	5		21 57 58 59	115	1.2	64.2			Same.	
10										
1015	6		86 83 100/.3	183	1.0	140			Brown fine to medium SAND, some silt and gravel, trace clay.	
	7		38 45 52 55	97	1.1	256			Brown fine to coarse SAND, little gravel, trace silt, very dense, damp.	
15	8		34 44	144	1.0	245			Same.	

BLASLAND, BOUCK & LEE INC.
ENGINEERS & SCIENTISTS

Remarks:

Saturated Zones

Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Boring No. SB-5
Total Depth = 50.0 ft.

Site:
Crosman Corporation, East Bloomfield, NY

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Field/Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Boring Construction
	8		100/.3	144	1.0	245				
1010	9		45 58 100/.4	158	1.3	50.0			Same.	
	10		63 100/.3	163	0.8	13.0			Gray GRAVEL, little fine to coarse sand, trace silt, very dense, damp.	
20										
1005	11		32 32 40 100/.1	72	1.3	50.0			Same.	
	12		28 100/.4	128	0.7	100			Same.	
	13		25 100/.3	125	0.8	8.0			Same.	
25										
1000	14		52 100	152	1.0	0.0			Same.	
	15		30 100/.1	130	0.6	0.0			Gray GRAVEL, very dense, damp.	
30									Light brown very fine SAND, medium dense, dry.	
995	16		12 19 50 52	69	2.0	3.0				
	17		9 18 36 40	54	2.0	2.0			Same.	
35	18		9 18	44	1.7	10.0			Same.	

BLASLAND, BOUCK & LEE INC.
ENGINEERS & SCIENTISTS

Remarks:

Saturated Zones

Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Boring No. SB-5
Total Depth = 50.0 ft.

Site:
Crosman Corporation, East Bloomfield, NY

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft)	PID (ppm) Field/Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Boring Construction
		18		28 29	44	1.7	10.0			Same.	
	990	19		9 22 27 28	49	1.4	5.0			Same.	
		20		10 25 38 45	83	1.5	10.0			Same.	
40		21		12 19 37 41	56	1.5	1.0			Same.	
	985	22		12 18 45 47	63	1.7	1.0			Same.	
		23		10 18 24 35	42	1.5	1.0			Same.	
45	980	24		12 18 22 31	40	1.5	0.0			Groundwater encountered at 48 feet.	
		25		12 20 30 32	50	1.8	0.0			Brown SILT, some fine sand, trace clay and gravel.	
50										Total depth = 50.0 feet	
	975										
55											

BLASLAND, BOUCK & LEE, INC.
ENGINEERS & SCIENTISTS

Remarks:

Saturated Zones

Date / Time	Elevation	Depth

Date Start/Finish: 11/3/94 / 11/4/94
Drilling Company: Nothnagle Drilling
Driller's Name: Kevin Busch
Drilling Method: Hollow Stem Auger
Auger Size: I.D.= 4.25-in.
Rig Type: CME-75
Spoon Size: 2
Hammer Weight: 140-lb
Height of Fall: 30-in.

Borehole Depth: 56.0 ft.
Ground Surface Elev.: 1026.26 ft.

Geologist: Michael R. Arlauckas

Boring No. SB-6

Site:
Crosman Corp., East Bloomfield, N.Y.

Client:
New Coleman Holdings, Inc.

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Field/Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Boring Construction
gs elevation 1026.26 ft.									**GROUND SURFACE**	
									ASPHALT	
1025	1		11 13 11	24	0.9	6.6			Medium brown fine SAND, little silt, trace gravel, medium dense, damp	
	2		5 3 2 5	5	0.5	5.8			(little medium to coarse gravel)	
5	3		1 1 1 1	2	0.5	5.0			Brown fine SAND, some fine to coarse gravel, little clay, trace silt, very loose, damp	
1020	4		25 3 15 16	18	0.7	3.2			Light brown to gray fine SAND and medium to coarse GRAVEL, little silt, trace clay, moist	
	5		7 42 35 30	77	1.7	9.6			Light brown fine SAND, some gravel, trace silt, trace clay, very dense, moist	
10										
1015	6		30 45 47 62	92	2.0	10.2				
	7		31 25 28 37	58	2.0	8.6			Brown fine to medium SAND, little fine to medium gravel, very dense, moist	
15	8		14 35	75	1.8	17.6				Soil boring backfilled to surface.

BLASLAND, BOUCK & LEE INC.
ENGINEERS & SCIENTISTS

Remarks:

Saturated Zones

Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Boring No. SB-6

Total Depth = 58.0 ft.

Site:
Crosman Corp., East Bloomfield, N.Y.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Field/Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Boring Construction
		8		40 36	75	1.8	17.6				
	1010	9		23 53 39 35	92	1.3	15.3			Brown fine SAND and fine to coarse GRAVEL, little silt, trace clay, very dense, moist to dry	
		10		27 100/.5	127	0.8	60.4			Gray to brown fine to coarse GRAVEL, some fine sand, trace and trace clay, very dense, dry	
20		11		79 96 100/.5	196	1.5	16.2			Brown fine SAND and medium to coarse GRAVEL, trace silt, very dense, dry	
	1005	12		47 95 100/.6	195	0.8	24.1				
25		13		53 100/.5	153	0.7	32.2			Light gray to gray fine to coarse GRAVEL, trace sand, very dense, dry	
	1000	14		67 100/.2	167	0.8	49.8				
		15		25 47 100/.5	147	1.4	39.7			Brown SILT and CLAY, trace fine sand, very dense, damp	
30										Dark gray to brown coarse SAND, some fine to medium gravel	
	995	16		100/.6	100	0.8	16.4			Brown SILT and CLAY, little gravel, very dense, dry	
		17		40 100/.4	140	0.3	20.4			Brown, fine SAND and fine to medium GRAVEL, little clay and silt, very dense, wet	
35		18		25 35	72	1.8	11.3			Light brown, fine SAND, trace silt, very dense, damp	

BLASLAND, BOUCK & LEE INC.
ENGINEERS & SCIENTISTS

Remarks:

Saturated Zones

Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Boring No. SB-6

Total Depth = 58.0 ft.

Site:
Crosman Corp., East Bloomfield, N.Y.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Field/Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Boring Construction
		18		37 52	72	1.8	11.3				
	990	19		20 35 37 47	72	1.8	9.8				
		20		16 32 44 51	76	1.6	14.3				
40		21		32 39 42 48	81	2.0	21.6				
	985	22		18 22 38 58	60	2.0	15.7			Light brown fine SAND, little silt, trace clay, very dense, damp to moist	
45		23		18 40 50 55	90	2.0	12.7				
	980	24		18 31 44 55	75	2.0	11.8				
		25		17 33 44 45	77	2.0	23.7				
50		26		11 29 36 40	65	1.8	46.8				
	975	27		17 27 33 37	60	2.0	128			(Wet)	
55		28			43	2.0	140				

BLASLAND, BOUCK & LEE INC.
ENGINEERS & SCIENTISTS

Remarks:

Saturated Zones

Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Boring No. SB-6

Total Depth = 56.0 ft.

Site:
Crosman Corp., East Bloomfield, N.Y.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Field/Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Boring Construction
		28			43	2.0	140				
	970									Total Depth = 56.0'	
60											
	965										
65											
	960										
70											
	955										
75											

BLASLAND, BOUCK & LEE INC.
ENGINEERS & SCIENTISTS

Remarks:

Saturated Zones

Date / Time	Elevation	Depth

Date Start/Finish: 11/10/94 / 11/10/94
Drilling Company: Nothnagle Drilling
Driller's Name: Kevin Busch
Drilling Method: Hollow Stem Auger
Auger Size: I.D.= 4.25-in.
Rig Type: CME-75
Spoon Size: 2
Hammer Weight: 140-lb
Height of Fall: 30-in.

Borehole Depth: 36.0 ft.
Ground Surface Elev.: 1026.23 ft.

Geologist: Michael R. Arlauckas

Boring No. SB-7

Site:
Crosman Corp., East Bloomfield, N.Y.

Client:
New Coleman Holdings, Inc.

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Field/Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Boring Construction
gs elevation 1026.23 ft.										
									GROUND SURFACE	
									ASPHALT	
1025	1		1 3 3 4	6	0.0	0.0			Brown, fine SAND, little silt, trace gravel, medium dense, damp	Soil boring tremie grouted to surface.
	2		4 6 8 9	14	1.3	173				
5	3		13 25 6 26	31	1.2	305				
1020	4		29 34 27 31	61	2.0	207			Brown, fine SAND, some fine to medium gravel, trace silt, very dense, damp	
	5		12 34 36 36	70	2.0	417				
10										
1015	6		16 86 68 52	154	1.6	563				
	7		82 100/.1 – –	182	0.3	542			rock fragment lodged in split spoon's tip	
	8		13 19	47	1.7	582			Brown, fine SAND, little silt, trace gravel, very dense, damp	
15										

BLASLAND, BOUCK & LEE INC.
ENGINEERS & SCIENTISTS

Remarks:

Saturated Zones

Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Boring No. SB-7

Total Depth = 36.0 ft.

Site:
Crosman Corp., East Bloomfield, N.Y.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Field/Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Boring Construction
		8		28 31	47	1.7	582				
	1010	9		51 39 59 79	98	2.0	215				
		10		44 77 55 68	132	2.0	548				
20		11		27 100/.4 – –	127	0.3	328			Brown to gray GRAVEL, little fine to coarse sand, trace silt, very dense, dry	
	1005	12		64 100/.4 – –	164	0.4	155				
25		13		100/.3 – – –	100	0.0	0.0			rock fragment lodged in split spoon's tip	
	1000	14		51/100.3 – – –	151	0.4	115			Gray GRAVEL, some fine to medium sand, trace silt, very dense, dry	
		15		100/. – – –	100	0.0	0.0			No sample, split spoon refusal	
30		16		14 23 29 26	52	2.0	110			Light brown, fine SAND, trace silt, very dense, dry	
	995	17		20 31 32 26	63	2.0	27.5				
35		18		23 27	62	2.0	39.1				

BLASLAND, BOUCK & LEE INC.
ENGINEERS & SCIENTISTS

Remarks:

Saturated Zones

Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Boring No. SB-7

Total Depth = 36.0 ft.

Site:
Crosman Corp., East Bloomfield, N.Y.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Field/Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Boring Construction
		18		35 31	62	2.0	39.1				
	990									Total Depth = 36.0'	
40											
	985										
45											
	980										
50											
	975										
55											

BLASLAND, BOUCK & LEE INC.
ENGINEERS & SCIENTISTS

Remarks:

Saturated Zones

Date / Time	Elevation	Depth

Date Start/Finish: 11/3/94 / 11/4/94
Drilling Company: Nothnagle Drilling
Driller's Name: Kevin Busch
Drilling Method: Hollow Stem Auger
Auger Size: I.D.= 4.25-in.
Rig Type: CME-75
Spoon Size: 2
Hammer Weight: 140-lb
Height of Fall: 30-in.

Borehole Depth: 36.0 ft.
Ground Surface Elev.: 1026.2 ft.

Geologist: Michael R. Arlauckas

Boring No. SB-8

Site:
Crosman Corp., East Bloomfield, N.Y.

Client:
New Coleman Holdings, Inc.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Field/Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Boring Construction
gs elevation 1026.2 ft.										**GROUND SURFACE**	
										ASPHALT	
	1025	1		2 3 7 12	10	1.3	39.2			Brown, fine SAND, little silt, trace gravel, medium dense, damp	Soil boring tremie grouted to surface.
		2		26 100/.2 – –	126	0.7	39.4				
5		3		7 17 26 29	43	2.0	241				
	1020	4		36 76 74 40	150	1.6	197			Brown, fine SAND, some fine to medium gravel, trace silt, very dense, damp	
		5		15 23 29 40	52	1.7	291				
10											
	1015	6		14 39 100/.3 –	139	1.5	412				
		7		12 32 83 89	115	2.0	385			Brown, fine SAND, little silt, trace gravel, very dense, dry	
15		8		55 45	94	2.0	361			Brown to gray fine SAND and GRAVEL, very dense, dry	

BLASLAND, BOUCK & LEE INC.
ENGINEERS & SCIENTISTS

Remarks:

Saturated Zones

Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Boring No. SB-8

Total Depth = 38.0 ft.

Site:
Crosman Corp., East Bloomfield, N.Y.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Field/Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Boring Construction
		8		49 43	94	2.0	361				
	1010	9		41 100/.4 – –	141	1.6	352				
		10		27 100/.5 – –	70	1.6	468			Brown to gray, GRAVEL, little fine to coarse sand, trace silt, very dense	
20		11		24 29 87 95	116	2.0	297				
	1005	12		86 100/.3 – –	186	0.4	126			Gray, GRAVEL, little fine to medium sand, trace silt, very dense, dry	
25		13		100/.4 – – –	100	0.7	0.0			No sample, rock fragments lodged in split spoon	
	1000	14		73 100/.2 – –	173	0.6	145			No sample, rock lodged in split spoon	
		15		150/.3 – – –	150	0.4	19.3			Gray to light brown, GRAVEL, little fine to medium sand, trace silt, very dense, dry	
30		16		7 14 28 29	42	2.0	59.4			Light brown, fine SAND, trace silt, very dense, dry	
	995	17		31 34 35 39	69	2.0	42.7				
35		18		30 31	68	2.0	38.2				

BLASLAND, BOUCK & LEE INC.
ENGINEERS & SCIENTISTS

Remarks:

Saturated Zones

Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Boring No. SB-8

Total Depth = 36.0 ft.

Site:
Crosman Corp., East Bloomfield, N.Y.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Field/Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Boring Construction
		18		37 35	68	2.0	38.2				
	990									Total Depth = 36.0'	
40											
	985										
45											
	980										
50											
	975										
55											

BLASLAND, BOUCK & LEE INC.
ENGINEERS & SCIENTISTS

Remarks:

Saturated Zones

Date / Time	Elevation	Depth

Date Start/Finish: 7/20/14
Drilling Company: Nothnagle Drilling, Inc.
Driller's Name: Neil Short
Drilling Method: 3.25" ID Hollow Stem Auger
Sampling Method: 4' Acetate Liner
Rig Type: Propane Skid Rig

Northing: NA
Easting: NA
Casing Elevation: NA

Borehole Depth: 22' bgs
Surface Elevation: 1028.24' AMSL

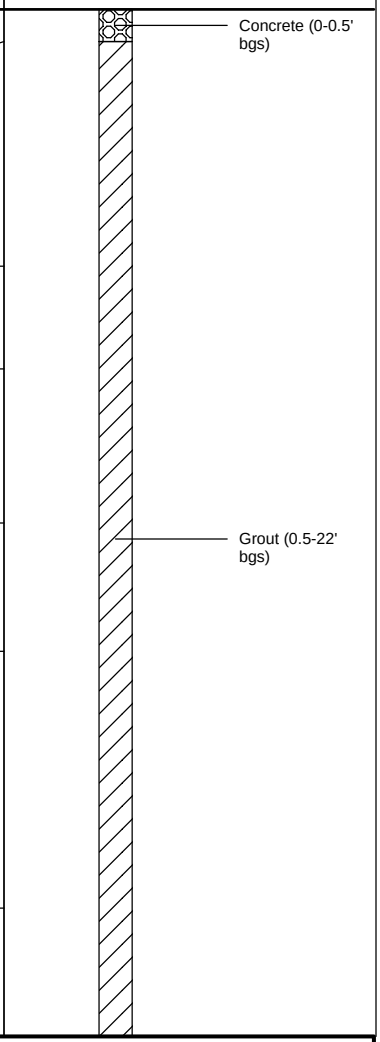
Descriptions By: Nicholas (Klaus) Beyrle

Well/Boring ID: **SB-1**

Client: Crosman Corporation

Location: 7629 Routes 5 & 20
Bloomfield, NY 14469

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery	PID Headspace (ppm)	Geologic Column	Stratigraphic Description
1030 / 0						
0						Concrete.
	1	0-4	0.5	0.0		Brown fine SAND, little Silt, trace fine Gravel, moist.
1025						
5	2	4-8	2.8	0.9		Brown fine SAND, trace fine Gravel, moist.
						Brown very fine SAND, little Silt grading to some Silt, little fine Sand, trace fine Gravel, moist.
1020	3	8-10	1.3	0.0		Brown SILT, trace fine Gravel, moist.
10	4	10-14	0.5	0.3		Gray SILT, trace fine Sand, trace fine Gravel, stiff.
1015						
15						Brown to gray-brown SILT, little fine Sand, trace fine Gravel, trace Clay. Sampler refusal at 16' bgs, augered to 18' bgs.



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Remarks: ags = above ground surface; bgs = below ground surface; NA = Not Applicable/Available; AMSL = Above Mean Sea Level.

Client: Crosman Corporation

Well/Boring ID: **SB-1**

Borehole Depth: 22' bgs

Site Location:
7629 Routes 5 & 20
Bloomfield, NY 14469

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well/Boring Construction
	5	14-18	1.4	0.3		Brown to gray-brown SILT, little fine Sand, trace fine Gravel, trace Clay. No Clay after 18' bgs. Sampler refusal at 19.3' bgs, augered to 20' bgs. Sampler refusal at 21.8' bgs, augered to 22' bgs.	
1010	6	18-20	1.2	0.0			Grout (0.5-22' bgs)
20	7	20-22	1.7	0.0			
						End of boring at 22' bgs. Auger Refusal at 22' bgs.	
1005							
25							
1000							
30							
995							
35							

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Remarks: ags = above ground surface; bgs = below ground surface; NA = Not Applicable/Available; AMSL = Above Mean Sea Level.

Date Start/Finish: 7/19/14
Drilling Company: Nothnagle Drilling, Inc.
Driller's Name: Neil Short
Drilling Method: 3.25" ID Hollow Stem Auger
Sampling Method: 4' Acetate Liner
Rig Type: Propane Skid Rig

Northing: NA
Easting: NA
Casing Elevation: NA

Borehole Depth: 23' bgs
Surface Elevation: 1028.24' AMSL

Descriptions By: Nicholas (Klaus) Beyrle

Well/Boring ID: **SB-2**

Client: Crosman Corporation

Location: 7629 Routes 5 & 20
Bloomfield, NY 14469

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well/Boring Construction
1030 / 0							
	1	0-2	1.3	0.0 0.0		Concrete. Brown fine to coarse SAND, trace fine Gravel, dry.	Concrete (0-0.5' bgs)
1025 / 5	2	2-4	2	0.0		Gray-brown fine SAND, some fine Gravel, dry.	
	3	4-8	3	0.2 1.9		Brown fine SAND, trace fine Gravel, moist.	
1020 / 10	4	8-10	NA	0.5		Brown SILT, little fine Sand, trace fine Gravel, moist.	Grout (0.5-23' bgs)
	5	10-14	1.3	1.1		Brown to gray-brown SILT, trace fine Sand, trace Clay, trace fine Gravel, moist.	
1015 / 15						Gray SILT, trace fine Sand, trace Clay, trace fine Gravel, moist.	

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Remarks: ags = above ground surface; bgs = below ground surface; NA = Not Applicable/Available; AMSL = Above Mean Sea Level.

Client: Crosman Corporation

Well/Boring ID: **SB-2**

Borehole Depth: 23' bgs

Site Location:
7629 Routes 5 & 20
Bloomfield, NY 14469

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well/Boring Construction
	6	14-18	4	0.1		Gray SILT, trace fine Sand, trace Clay, trace fine Gravel, moist.	
1010	7	18-20	1.4	0.0			Grout (0.5-23' bgs)
20	8	20-23	1.4	0.0			
1005						End of boring at 23' bgs. Auger Refusal at 23' bgs.	
25							
1000							
30							
995							
35							

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Remarks: ags = above ground surface; bgs = below ground surface; NA = Not Applicable/Available; AMSL = Above Mean Sea Level.

Date Start/Finish: 8/2/2014
Drilling Company: Nothnagle Drilling, Inc.
Driller's Name: Tom Mangiafrida
Drilling Method: Direct Push
Sampling Method: 4' Acetate Liner
Rig Type: Geoprobe 6610DT

Northing: NA
Easting: NA
Casing Elevation: NA

Borehole Depth: 24' bgs
Surface Elevation: 1028.24' AMSL

Descriptions By: Nicholas (Klaus) Beyrle

Well/Boring ID: **SB-3**

Client: Crosman Corporation

Location: 7629 Routes 5 & 20
Bloomfield, NY 14469

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery	PID Headspace (ppm)	Geologic Column	Stratigraphic Description
1030						
0						Concrete.
				7.7		Brown SILT, little very fine to medium subrounded Gravel, little very fine Sand, moist to dry.
	1	0-4	2.6	35.1 64.4 23.1		Brown very fine SAND and SILT, little very fine to very coarse subangular Gravel, moist to dry.
1025				47.3		
				88.1		Brown very fine SAND and SILT, little very fine to medium subangular Gravel, trace Clay, medium stiff, moist to wet.
5				56.6		
	2	4-8	4.0	81.3		Brown SILT, some to little very fine Sand, little very fine to medium subangular Gravel, medium stiff, moist. Rock in tip of sampler.
				48.2		
1020						Brown SILT and very fine SAND, little very fine Gravel, trace Clay, stiff, moist.
				113.9		
10	3	8-12	4.0	130.8 117.8		
				70.8		
				87.3		Brown SILT, some very fine Sand, little very fine to medium subangular to subrounded Gravel, trace very coarse subangular to subrounded Gravel, stiff, moist.
1015				1324		
	4	12-16	3.4	255.6		
				83.3		Gray SILT, trace very fine Sand, little to trace very fine to coarse subangular to rounded Gravel, very stiff, moist. TILL at 14' bgs.
15				15.9		

Well/Boring Construction: Concrete (0-0.5' bgs); Grout (0.5-24' bgs)

Remarks: ags = above ground surface; bgs = below ground surface; NA = Not Applicable/Available; AMSL = Above Mean Sea Level.

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Client: Crosman Corporation

Well/Boring ID: SB-3

Borehole Depth: 24' bgs

Site Location:
7629 Routes 5 & 20
Bloomfield, NY 14469

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well/Boring Construction
1010	5	16-19	1.0	1.2 1.6		Gray SILT, little very fine Sand, little to trace very fine to coarse subangular to subrounded Gravel, stiff, medium.	
20	6	19-21	2.5	2.8 3.7 1.1		Gray very fine SAND and SILT, some very fine to medium subangular to subrounded Gravel, stiff, brittle, moist. Brown very fine SAND and SILT, some very fine to medium subangular to subrounded Gravel, trace very coarse Gravel, stiff, brittle, moist. Possible cave-in material from above.	Grout (0.5-24' bgs)
	7	21-22.5	2.4	31.9 80.2 6.9		Gray very fine SAND and SILT, some very fine to medium subangular to subrounded Gravel, medium loose, brittle, moist. Possible cave-in material from above. Brown very fine SAND and SILT, some very fine to medium subangular to subrounded Gravel, trace very coarse Gravel, medium loose, brittle, moist. Possible cave-in material from above.	
1005	8	22.5-23	1.8	0.6 6.2 4.1		Brown SILT and very fine SAND, little very fine to coarse subrounded Gravel, loose, moist.	
25						End of boring at 24' bgs.	
1000							
30							
995							
35							

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Remarks: ags = above ground surface; bgs = below ground surface; NA = Not Applicable/Available; AMSL = Above Mean Sea Level.

Date Start/Finish: 8/2/14
Drilling Company: Nothnagle Drilling, Inc.
Driller's Name: Steve Loranty
Drilling Method: 3.25" ID Hollow Stem Auger
Sampling Method: 4' Acetate Liner
Rig Type: Propane Skid Rig

Northing: NA
Easting: NA
Casing Elevation: NA

Borehole Depth: 19.5' bgs
Surface Elevation: 1028.24' AMSL

Descriptions By: Nicholas (Klaus) Beyrle

Well/Boring ID: **SB-4**

Client: Crosman Corporation

Location: 7629 Routes 5 & 20
Bloomfield, NY 14469

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery	PID Headspace (ppm)	Geologic Column	Stratigraphic Description
1030						
0						Concrete.
				1.4		Brown SILT, trace fine Sand, trace fine Gravel, moist.
	1	0-4	3.5	4.9		Red-brown very fine SAND, little Silt, moist.
1025				3.2		Tan very fine SAND, little Silt, moist.
5	2	4-7	3.0	1.3		Tan, very fine SAND, some Silt, trace fine Gravel, wet.
				33.6		Tan-light brown very fine SAND and SILT, trace fine Gravel, stiff.
				161.4		Gray SILT, little very fine Sand, trace fine Gravel.
1020	3	7-10	2.9	2478		
				1466		Gray SILT, little very fine Sand, fine Gravel, trace Clay.
10						Gray SILT, trace very fine Sand, trace Clay, trace fine Gravel.
				44.6		
	4	10-13	2.9	31.8		
				10.9		
1015						
	5	13-16	0.8	0.0		
15						

Well/Boring Construction: Concrete (0-0.5' bgs); Grout (0.5-19.5' bgs)

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Remarks: ags = above ground surface; bgs = below ground surface; NA = Not Applicable/Available; AMSL = Above Mean Sea Level.

Client: Crosman Corporation

Well/Boring ID: **SB-4**

Borehole Depth: 19.5' bgs

Site Location:
7629 Routes 5 & 20
Bloomfield, NY 14469

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well/Boring Construction
1010	6	16-19.5	2.5	0.0		Gray SILT, trace very fine Sand, trace Clay, trace fine Gravel, hard, stiff.	Grout (0.5-19.5' bgs)
20 / 1005 / 25 / 1000 / 30 / 995 / 35						End of boring at 19.5' bgs.	

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Remarks: ags = above ground surface; bgs = below ground surface; NA = Not Applicable/Available; AMSL = Above Mean Sea Level.

Date Start/Finish: 8/2/14
Drilling Company: Nothnagle Drilling, Inc.
Driller's Name: Steve Loranty
Drilling Method: 3.25" ID Hollow Stem Auger
Sampling Method: 4' Acetate Liner
Rig Type: Propane Skid Rig

Northing: NA
Easting: NA
Casing Elevation: NA

Borehole Depth: 18.5' bgs
Surface Elevation: 1028.24' AMSL

Descriptions By: Nicholas (Klaus) Beyrle

Well/Boring ID: **SB-5**

Client: Crosman Corporation

Location: 7629 Routes 5 & 20
Bloomfield, NY 14469

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well/Boring Construction
1030							
0						Concrete.	Concrete (0-0.5' bgs)
				1.0		Brown fine SAND, trace fine Gravel, trace Silt.	
						Rock fragments.	
	1	0-4	2.4	0.3		Brown SILT, some to little very fine Sand, trace fine Gravel. Rock fragments at 1.8' bgs.	
1025				0.0			
	2	4-7	1.8	0.1		Brown SILT, some to little very fine Sand, trace fine Gravel.	
5							
	3	7-9	1.8	0.0		Brown SILT, trace fine Sand, trace fine Gravel, trace rock fragments.	
1020							Grout (0.5-18.5' bgs)
	4	9-12	2.5	0.0		Brown SILT, trace fine Sand, trace fine Gravel, trace rock fragments, dry.	
10							
	5	12-14.5	1.8	0.0			
1015							
15	6	14.5-16.5	1.6	0.0			

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Remarks: ags = above ground surface; bgs = below ground surface; NA = Not Applicable/Available; AMSL = Above Mean Sea Level.

Client: Crosman Corporation

Well/Boring ID: **SB-5**

Borehole Depth: 18.5' bgs

Site Location:
7629 Routes 5 & 20
Bloomfield, NY 14469

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well/Boring Construction
1010	7	16.5-18.5	1.2	0.0		Brown SILT, trace fine Sand, trace fine Gravel, trace rock fragments, dry.	Grout (0.5-18.5' bgs)
						End of boring at 18.5' bgs.	

20
1005
25
1000
30
995
35

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Remarks: ags = above ground surface; bgs = below ground surface; NA = Not Applicable/Available; AMSL = Above Mean Sea Level.

Date Start/Finish: 7/19/14 - 7/20/2014
Drilling Company: Nothnagle Drilling, Inc.
Driller's Name: Tom Mangiafrida
Drilling Method: Hollow Stem Auger
Sampling Method: 4' Acetate Liner
Rig Type: CME LC 50

Northing: NA
Easting: NA
Casing Elevation: NA

Borehole Depth: 49.85' bgs
Surface Elevation: 1028.24' AMSL

Descriptions By: Nicholas (Klaus) Beyrle

Well/Boring ID: **SB-6**

Client: Crosman Corporation

Location: 7629 Routes 5 & 20
Bloomfield, NY 14469

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well/Boring Construction
1030 / 0							
1025 / 0						Concrete.	Concrete (0-0.5' bgs)
	1	0-4	3.2	0.0 0.1 0.1 0.1		Brown SILT, little to trace very fine Sand, little very coarse angular to subrounded Gravel, moist.	
1020 / 5	2	4-8	4	0.1 0.2 0.1 0.2		Brown SILT, little to trace medium to very coarse angular to subrounded Gravel, trace very fine Sand, trace Clay, medium stiff, dry to moist.	
	3	8-10	2.2	0.0 0.8		Brown SILT, little to trace medium to very coarse angular to subrounded Gravel, little to trace Clay, trace very fine Sand, medium stiff, dry to moist.	Grout (0.5-49.85' bgs)
1015 / 10	4	10-14	3.4	0.0 0.0 0.0 0.0		Brown SILT, little to trace very fine Sand, little to trace medium to very coarse rounded Gravel, medium stiff, moist to dry. Wet 12.8-13' bgs. Sampler refusal at 13' bgs, augered from 13-14' bgs.	
15				0.0 0.0		Brown SILT, little to trace very fine Sand, little to trace medium to very coarse rounded Gravel, trace Clay, medium stiff, moist. Sampler refusal at 15' bgs, augered from 15-18' bgs.	

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Remarks: ags = above ground surface; bgs = below ground surface; NA = Not Applicable/Available; AMSL = Above Mean Sea Level.

Location drilled with 4.25" ID hollow stem augers 0-27' bgs and 4" rollerbit 27-49.85' bgs.

Client: Crosman Corporation

Well/Boring ID: **SB-6**

Borehole Depth: 49.85' bgs

Site Location:
7629 Routes 5 & 20
Bloomfield, NY 14469

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well/Boring Construction
	5	14-18	1.3	0.0 0.0		Brown SILT, little to trace very fine Sand, little to trace medium to very coarse rounded Gravel, trace Clay, medium stiff, moist. Sampler refusal at 15' bgs, augered from 15-18' bgs.	
1010	6	18-20	1.2	0.0 0.1		Brown SILT, little to trace very fine Sand, little to trace medium to very coarse rounded Gravel, trace Clay, medium stiff, moist. Brown very fine to fine SAND and SILT, trace very fine subrounded gravel, medium soft, moist.	
20	7	20-21	0.3	0.3		Brown very fine to fine SAND and very fine to very coarse angular GRAVEL, trace Clay, stiff, moist.	
1005	8	21-24	0.35	0.0 0.0 0.0		Brown very fine to fine SAND and very fine to very coarse angular GRAVEL, trace Clay, stiff, moist. Sampler refusal at 21.35' bgs, augered to 24' bgs.	
25	9	24-25.1	1.3	1.7		Brown very fine to fine SAND and very fine to very coarse angular GRAVEL, trace Clay, stiff, moist. Sampler refusal at 25.1' bgs, augered to 27' bgs.	Grout (0.5-49.85' bgs)
1000	NA	NA	NA	0.0		Ran roller bit from 27-20' bgs. Large boulder from 27-29.5' bgs.	
30	10	30-31.4	1.6	0.0 0.0		Dark brown Silt, little to trace fine to very coarse rounded Gravel, very hard, moist. Sampler refusal at 31.4' bgs, ran roller bit down to 34' bgs.	
995	NA	NA	NA	0.0			
	11	34-34.5	0.2	0.0			
35						Sampler refusal at 34.5 ft bgs, ran roller bit down to 49 ft bgs. No sampling conducted.	

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Remarks: ags = above ground surface; bgs = below ground surface; NA = Not Applicable/Available; AMSL = Above Mean Sea Level.

Location drilled with 4.25" ID hollow stem augers 0-27' bgs and 4" rollerbit 27-49.85' bgs.

Client: Crosman Corporation

Well/Boring ID: **SB-6**

Borehole Depth: 49.85' bgs

Site Location:
7629 Routes 5 & 20
Bloomfield, NY 14469

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well/Boring Construction
990 / 40	NA	NA	NA	NA		Sampler refusal at 34.5' bgs, ran roller bit down to 49' bgs. No sampling conducted.	Grout (0.5-49.85' bgs)
985 / 45							
980	15	49-49.85	0.4	0.0		Brown fine to medium SAND and SILT, little very fine to very coarse rounded Gravel, medium stiff, moist to wet.	
50 / 975 / 55						End of boring at 49.85' bgs.	

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Remarks: ags = above ground surface; bgs = below ground surface; NA = Not Applicable/Available; AMSL = Above Mean Sea Level.

Location drilled with 4.25" ID hollow stem augers 0-27' bgs and 4" rollerbit 27-49.85' bgs.

Appendix D

Monitoring Well Construction Logs

1230 WEST ELIZABETH AVE., LINDEN, N.J. [redacted]

LOG OF WELL

Well No. 1 Job No. R - 338 Test No. .....

Log of Well for (Owner) Crosman Arms Co., Inc.

Address East Bloomfield

Representative, if any .....

Well Located at No. 4 plant in Monroe County, State of New York

Furnish sketch of location ..... Date Drilling started 7-14-70 Date Test Hole Completed 7-16-70

Total depth to bottom of Well 38' Diameter Test Hole 12" Elevation at Ground Level, if available .....

Elevation at Ground Level, if available ..... Distance from where measurements were taken to ground level .....

Water stands when not pumping 1' feet 4" inches from the surface of the ground

All Measurements taken from Top of casing 2' above ground

THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATA	Length of Core Taken	FORMATION FOUND EACH STRATUM	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATA	Length of Core Taken	FORMATION FOUND EACH STRATUM
2'	2'		Topsoil				
22'	24'		Brown sandy clay				
12'	36'		Large medium small gravel and some sand				

Remarks and opinion of Test

CHECK TYPE OF RIG USED: Reverse, Rotary, Cable Tool X, Auger, Other

N. J. Kahler
Driller

LAYNE-NEW YORK CO., INC.
1630 WEST ELIZABETH AVE., LEYDEN, N. J.

DRILLERS REPORT

JOB No. R - 338 DRILLER N. J. Kahler CUSTOMER WELL No. 1
CUSTOMER Crossman Arms Co., Inc. LAYNE WELL No. 1
WELL LOCATION No. 4 Plant East Bloomfield, N.Y. STATE PERMIT No.

FORMATION | SKETCH OF SETTING 12" pipe - 2' above ground REMARKS

Topsoil 2'

Brown sandy clay 24'

Large, medium & small gravel and sand 36'

Pulled out - Cemented

18"

12"

8"

Pulled out - Cemented

28'

PIPE SET:

DIA.	WALL	LGTH.	MATL.	T & C 10S' WELDED
12"		13' 3" 14' 9" 28'		

PIPE LEFT IN PLACE:

DIA.	WALL	LGTH.	MATL	T & C 10S' WELDED
8'	Screen	10' 3' 5" 14' 10' 7" 38'		

SCREEN:
NOM. SIZE 8 I.D. LGTH. 10 OPNG. 5
MFG. LAYNE TYPE SHUTTER METAL EVERDUR DIA. No.
SET IN GRAVEL FORMATION
WELL UNDERREAMED TO DIAMETER

MISCELLANEOUS:
R & L BACK OFF CUT OFF PACKER TYPE

CONE:
DIA. TOP DIA. BOTT. LGTH. MTL.

PLUG:
DIA. LGTH. MTL.

GRAVEL: AMT. 3 BARRELS SIZE 5W
CLAY: BAGS PWDR. REQ. BAGS LAYNEITE REQ.

CEMENT: BAGS USED YDS. CONCRETE 1½
CLAY CEMENT LGTH. 14'
SEAL:

METHOD OF DRILLING:
☐ STD. ROT. ☐ REV. ROT. ☒ CABLE TOOL ☐ AIR ROT.
☐ OTHER

MEASUREMENTS:
GROUND ELEV. ABOVE SEA LEVEL
DEPTH OF WELL AFTER PLUG. DEPTH TO GRAVEL WALL } FROM ☐ GRD. LEV. ☐ TOP OF CASING ☐ ORIG. GRD. LEV.

MISCELLANEOUS:
DATE WORK STARTED July 14 DATE FIRST PUMPED July 22
DID WELL CLEAN UP YES HOW SOON 1 HR.
WAS SAND PUMPED HOW LONG
HOW LONG AGITATED 10 HR. HOW LONG PUMPED 14 HR.
CHEM. USED TO DEVELOP SAMPLE TAKEN YES

PRELIMINARY TEST DATA: 29 1970
STATIC LEVEL 16.4 DATE JULY 29 WATER TEMP.
CAPACITY 100 GPM WITH 21.35 PUMPING LEVEL

SKETCH OF LOCATION

N. J. KAHLER
SIGNATURE OF DRILLER

Well No. ..... Job No. ..... Test No. 1

Log of Well for (Owner) Crosman Arms Co.

Address 2001 South Rts. 5 & 20

Representative, if any .....

Well Located at 150' East of Plant Driveway Ontario County, State of New York

Furnish sketch of location..... Date Drilling started 5/26/70 Date Test Hole Completed 5/27/70

Total depth to bottom of Well..... Diameter Test Hole 6-3/4" Elevation at Ground Level, if available .....

Elevation at Ground Level, if available ..... Distance from where measurements were taken to ground level .....

Water stands when not pumping 10 feet ..... inches from the surface of the ground

All Measurements taken from .....

THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATA	Length of Core Taken	FORMATION FOUND EACH STRATUM	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATA	Length of Core Taken	FORMATION FOUND EACH STRATUM
8	8		Brown Clay				
10	18		Gray Clay				
1	19		Brown & Gray Clay & Gravel				
1	20		Boulders & Clay				
4	24		Gravel & Sand				
3	27		Gravel & Gray Clay				
4	31		Brown clay & gravel				
6	37		Gray & Brown Clay & gravel				
90	127		Gray clay & Gravel				
6	133		Gravel & Gray Clay				
21	154		Boulders & clay				
2	156		Gray Shale				
			Originally set 10'2" screen to depth 133'				
			Air agitated, would not produce.				
			Pulled screen back to 30' level.				
			Pumped 25 GPM. Very sandy.				

Remarks and opinion of Test

CHECK TYPE OF RIG USED: Reverse Rotary XX; Cable Tool; Wash; Other

N.E.Henrich
Driller

FC- 6-90 THU 16:02 CROSMAN P.05

LAYNE-NEW YORK CO., INC.

1250 WEST ELIZABETH AVE., LINDEN, N. J.

LOG OF WELL

Well No. ..... Job No. ..... Test No. 1

Log of Well for (Owner) Crosman Arms Co.

Address 2001 South Rt. 5-20

LAYNE-NEW YORK CO., INC.

1250 WEST ELIZABETH AVE., LINDEN, N. J.

LOG OF WELL

Well No. ..... Job No. ..... Test No. 1

Log of Well for (Owner) Crosman Arms Co.

Address 2001 South Rte 5-20

Representative, if any .....

Well Located at 75' West of Plant Driveway in Ontario County, State of New York

Furnish sketch of location..... Date Drilling started 5/21/60 Date Test Hole Completed 5/22/70

Total depth to bottom of Well..... Diameter Test Hole 6-3/4" Elevation at Ground Level, if available.....

Elevation at Ground Level, if available ..... Distance from where measurements were taken to ground level .....

Water stands when not pumping 16 feet inches from the surface of the ground

All Measurements taken from .....

THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATA	Length of Core Taken	FORMATION FOUND EACH STRATUM	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATA	Length of Core Taken	FORMATION FOUND EACH STRATUM
6	6		Brown clay				
10	16		Gray clay & gravel				
3	19		Brown clay				
2	21		Gravel & brown clay				
12	33		Gravel & sand				
3	36		Gravel & Sand - Red iron stain				
1	37		Brown clay & gravel				
6	43		Gray clay & Gravel				
			10'2" screen set to depth 33'.				
			Observation well drilled 5' from pumping well.				
			Pump Test completed, results accompanying this log.				
			Water Sample collected for analysis.				

Remarks and opinion of Test .....

CHECK TYPE OF RIG USED { Reverse Rotary X, Cable Tool, Wash, Other }

N.E.Henrich

Driller

HYDRO GROUP, INC.

INSTALLER'S REPORT

Completion Date June 12, 1992

Owner Crossman Arms Customer's Well No. 1

Location Route 5 & 20 L. N. Y. Co. Well No. 1

City E. Bloomfield State New York

PUMP

Pump No. 64734 Type DRELC Setting to Suction Flange 32'10" Suction - of -

Basket - Size Discharge 4" Size of Tubing 1½" Size of Shafting 7/8"

Make Layne Size Pump 6" No. of Stages 4 Impellers Br. or C. I. Br.

Head TF413 Max. Lgth. Disch. 30' Weight Pump 750 Fgd. or Cpld. Discharge Cpld.

Changes in Pump, if any All new column, tubing and shafting

How long did you operate Pump? 1 hour Length of Air Line from Base Plate 32'

Operating instructions given to ..... Title.....

Report by letter any difficulties or extra expense on job .....

MOTOR

Make US Volts 220/440 Phase 3 H. P. 7½

Frame 184TP Model ..... Type HU Cycle 60

Amperes 18.4/9.2 R. P. M. 3500 Form ..... Serial GP1032304

Upper Bearing No. 40BC02XE Lower Bearing No. 35BT034

WELL

Capacity (GPM) ..... Pumping Level ..... Static Level ..... Pressure .....

Size of Air Release Valve 1" Depth of Well from Base Plate 34'

Installer..... What changes did you make in Well? .....

LIST ON REVERSE SIDE, ALL PARTS USED AND ANY OTHER REMARKS.

TEST

TIME	R.P.M.	PUMPING LEVEL	G.P.M.	PUMP PRESSURE	MAIN PRESSURE	VOLTAGE	AMP.	H.P.
	No test run to waste due to contamination of well water.							
	Pump ran okay. Well had 1 ft. D.D. at 80 psi going into system.							

M. L. Weir

FOR HYDRO GROUP, INC.

TOTAL P.03

LABELLA ASSOCIATES, P.C.
300 STATE STREET, ROCHESTER, NEW YORK
ENVIRONMENTAL ENGINNEERING CONSULTANTS

PROJECT
CROSMAN CORPORATION
ROUTES 5 &20
EAST BLOOMFIELD, NEW YORK

BORING # MW-1
SHEET 2 of 2
JOB # 91243
CHKD. BY DP

DEPTH	SAMPLE BLOW / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	RECOVERY (INCHES)	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	HNU	NOTES
17							Cement grout (1.0 - 19.0 feet)		
18									
19									
	33	S-5	19-21	37	20	Dense, brown, medium SAND,		BG	
20	16					little fine Gravel, trace Silt, moist			
	21								
21	28						Bentonite pellet seal (19.0 - 22.0 feet)		
22									
23							2 inch I.D. schedule 10 PVC riser (0.0 - 23.9 feet)		
24									
	13	S-6	24-26	38	18			BG	
25	17								
	21								
26	25								
	35	S-7	26-28	45	20	Dense, brown medium SAND, homogeneous, wet		BG	2
	15								
	30								
28	34								
	100/1	S-8	28	100	24	. . . very dense, Coarse SAND and Gavel wet	No. 3 QROK Sand pack (22.0 - 33.9 feet)	BG	
29									
30							2 inch I.D. No. 10 slot PVC screen (23.9 - 33.9 feet)		
	100/5	S-9	30-30.5	100	5	. . . little Gravel		BG	
31									
32									
	14	S-10	32-34	69	21	Very dense, fine SAND, some Silt, moist		BG	
33	24								
	45								
34	56								
	23	S-11	34-36	104	20			BG	
35	50								
	54								
36	63					Bottom of boring at 34', sampled to 36'			

LEGEND
S - SPLIT SPOON SOIL SAMPLE
U - UNDISTURBED SOIL SAMPLE
C - ROCK CORE SAMPLE

NOTES:
2. Water table encountered at 25.5 feet

GENERAL NOTES:
1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE

8A

BORING # MW-1

812/66DPE

LABELLA ASSOCIATES, P.C. 300 STATE STREET, ROCHESTER, NEW YORK ENVIRONMENTAL ENGINNEERING CONSULTANTS	PROJECT CROSMAN CORPORATION ROUTES 5 &20 EAST BLOOMFIELD, NEW YORK	BORING # MW-2 SHEET 1 OF 4 JOB # 91243 CHKD. BY DP

CONTRACTOR	NOTHNAGLE DRILLING INC.	BORING LOCATION	
DRILLER	STEVE LARANTY	GROUND SURFACE ELEVATION	DATUM
LABELLA REPRESENTATIVE	DENNIS PECK	START DATE 1/24/92	END DATE 1/27/92

TYPE OF DRILL RIG	CME-75
AUGER SIZE AND TYPE	4-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD	1-3/8 inch I.D. Split spoon
ROCK DRILLING METHOD	NA

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS

DEPTH	SAMPLE BLOW /6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	RECOVERY (INCHES)	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	HNU	NOTES
1	3	S-1	0-2	8	16	Loose, brown SILT and SAND, trace Gravel little roots, moist			1
	3								
	5								
2	6								
3									
4									
	3	S-2	4-6	10	20	Loose, light brown, fine SAND, little Silt little Gravel, moist			
5	4								
	6								
6	8								
8									
9									
	15	S-3	9-11	42	23	. . . Dense			
10	20								
	22								
11	24								
12									
13									
14									
	12	S-4	14-16	63	21	. . . Very dense			
15	25								
	38								
16	32								

Cement grout 0 - 22 feet

LEGEND

S - SPLIT SPOON SOIL SAMPLE
U - UNDISTURBED SOIL SAMPLE
C - ROCK CORE SAMPLE

NOTES:

1. Boring was abandoned, no monitoring well was installed

GENERAL NOTES:

1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED. FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE

LABELLA ASSOCIATES, P.C. 300 STATE STREET, ROCHESTER, NEW YORK ENVIRONMENTAL ENGINNEERING CONSULTANTS	PROJECT CROSMAN CORPORATION ROUTES 5 &20 EAST BLOOMFIELD, NEW YORK	BORING # MW-2 SHEET 2 of 4 JOB # 91243 CHKD. BY DP

DEPTH	SAMPLE BLOW /6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	RECOVERY (INCHES)	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	HNU	NOTES
17									
18									
19									
	20	S-5	19-21	70	24	Very dense, fine SAND, little Silt,		Cement grout 0 - 22 feet	
20	33					little Gravel, moist			
	37								
21	65								
22									
23									
24									
	27	S-6	24-26	51	24	Very dense, brown SAND, little gravel, moist			
25	17								
	34								
26	42								
27								Indigenous Sand	
28									
29									
	19	S-7	29-31	62	24	Very dense, light brown, fine SAND,			
30	29					dry, homogeneous			
	33								
31	48								
32									
33									
34									
	15	S-8	34-36	61	24				
35	27								
	34								
36	45								

LEGEND

S - SPLIT SPOON SOIL SAMPLE

U - UNDISTURBED SOIL SAMPLE

C - ROCK CORE SAMPLE

NOTES:

GENERAL NOTES:

1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE

LABELLA ASSOCIATES, P.C. 300 STATE STREET, ROCHESTER, NEW YORK ENVIRONMENTAL ENGINNEERING CONSULTANTS	PROJECT CROSMAN CORPORATION ROUTES 5 &20 EAST BLOOMFIELD, NEW YORK	BORING # MW-2 SHEET 3 of 4 JOB # 91243 CHKD. BY DP

DEPTH	SAMPLE					SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	HNU	NOTES
	BLOW /6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	RECOVERY (INCHES)				
37									
38									
39									
40	18	S-9	39-41	70	24	Very dense, brown-gray medium SAND, moist, stratified,			
	34								
41	36								
	48								
42									
43								Indigenous Sand	
44									
45	17	S-10	44-46	64	24	. . . dry			
	26								
46	38								
	46								
47									
48									
49									
50	15	S-11	49-51	72	24	. . . wet (water table at approximately 49')			
	30								
51	42								
	48								
52									
53									
54									
55	14	S-12	54-56	70	24				
	28								
56	42								
	45								

LEGEND

S - SPLIT SPOON SOIL SAMPLE
U - UNDISTURBED SOIL SAMPLE
C - ROCK CORE SAMPLE

NOTES:

GENERAL NOTES:

1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE

LABELLA ASSOCIATES, P.C. 300 STATE STREET, ROCHESTER, NEW YORK ENVIRONMENTAL ENGINNEERING CONSULTANTS	PROJECT CROSMAN CORPORATION ROUTES 5 &20 EAST BLOOMFIELD, NEW YORK	BORING # MW-2 SHEET 4 of 4 JOB # 91243 CHKD. BY DP

DEPTH	SAMPLE					SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	HNU	NOTES
	BLOW /6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	RECOVERY (INCHES)				
57									
58									
59									
	18	S-13	59-61	65	24	Very dense, brown-gray, medium SAND, wet			
60	22								
	43								
61	47								
62									
63									
64									
	6	S-14	64-66	38	22				
65	13								
	25								
66	78								
67								Indigenous Sand	
68									
69									
	10								
70	26								
	100/5								
71						Bottom of boring at 70.5 feet			2
72									
73									
74									
75									
76									

LEGEND

S - SPLIT SPOON SOIL SAMPLE
U - UNDISTURBED SOIL SAMPLE
C - ROCK CORE SAMPLE

NOTES:

2. Boring abandoned, caved to 22 feet with indigenous material, then grouted to surface

GENERAL NOTES:

1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE

LABELLA ASSOCIATES, P.C. 300 STATE STREET, ROCHESTER, NEW YORK ENVIRONMENTAL ENGINNEERING CONSULTANTS	PROJECT CROSMAN CORPORATION ROUTES 5 &20 EAST BLOOMFIELD, NEW YORK	BORING # MW-2A SHEET 1 OF 3 JOB # 91243 CHKD. BY DP

CONTRACTOR	NOTHNAGLE DRILLING INC.	BORING LOCATION	
DRILLER	STEVE LARANTY	GROUND SURFACE ELEVATION	DATUM
LABELLA REPRESENTATIVE	DENNIS PECK	START DATE 1/29/92 END DATE	1/30/92

TYPE OF DRILL RIG	CME-75
AUGER SIZE AND TYPE	4-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD	1-3/8 inch I.D. Split spoon
ROCK DRILLING METHOD	NA

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS

DEPTH	BLOW / 6"	SAMPLE NO.	DEPTH (FT.)	N-VALUE /RQD(%)	RECOVERY (INCHES)	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG		HNU	NOTES
1						Refer to boring log for MW-2 for subsurface description from 0 to 9 feet		Concrete seal (0 - 1 feet)		1
								4 inch I.D. protective steel casing		
2										
3										
4										
5								2 inch I.D. schedule 10 PVC riser (0 - 43.1 feet)		
6										
7										
8										
9										
10	8	S-1	9-11	100	10	Brown SAND, some Gravel		Cement grout (0 -38.3 feet)	BG	
	20					Very dense, brown SILT, some Gravel,				
	100/5					trace Sand, dry				
11										
12	17	S-2	11-13	40	23	. . . dense, little Sand, little Gravel			BG	
	20									
	20									
13	37									
14	17	S-3	13-15	70	24	. . . very dense, grading to fine SAND, some Gravel			BG	
	31									
	39									
15	37									
16	13	S-4	15-17	57	22				BG	
	31									
	26									
17	28									

LEGEND

S - SPLIT SPOON SOIL SAMPLE
U - UNDISTURBED SOIL SAMPLE
C - ROCK CORE SAMPLE

NOTES:

1. Boring MW-2A is approximately 10 feet west of boring MW-2

GENERAL NOTES:

1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE

LABELLA ASSOCIATES, P.C.
300 STATE STREET, ROCHESTER, NEW YORK
ENVIRONMENTAL ENGINNEERING CONSULTANTS

PROJECT
CROSMAN CORPORATION
ROUTES 5 &20
EAST BLOOMFIELD, NEW YORK

BORING # MW-2A
SHEET 2 of 3
JOB # 91243
CHKD. BY DP

DEPTH	SAMPLE BLOW / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	RECOVERY (INCHES)	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	HNU	NOTES
18	13	S-5	17-19	108	22	Very dense, brown fine SAND		BG	
	32					some rounded Gravel, moist			
	76								
19	48								
	13	S-6	19-21	90	19			BG	
20	36								
	54								
21	56								
	24	S-7	21-23	63	20	. . . medium to coarse SAND, some Gravel		BG	
22	40								
	23								
23	48								
	16	S-8	23-25	50	18	. . . Silt seams			
24	30							BG	
	20								
25	25								
	28	S-9	25-26.4	100/4	12			BG	
26	50								
	100/4								
27									
	12	S-10	27-29	50	24				
28	22					Dense light brown, fine SAND		BG	
	28					moist, homogeneous			
	34								
	20	S-11	29-31	67	24	. . . very dense, trace Silt, dry			
30	33							BG	
	34								
31	40								
	22	S-12	31-33	66	24				
32	31							BG	
	35								
33	50								
	20	S-13	33-35	76	24				
34	40							BG	
	36								
35	37								
	8	S-14	35-37	50	24				
36	24							BG	
	26								
37	28								

2 inch I.D. schedule 10 PVC riser (0 - 43.1 feet)

Cement grout (0 -38.3 feet)

LEGEND
S - SPLIT SPOON SOIL SAMPLE
U - UNDISTURBED SOIL SAMPLE
C - ROCK CORE SAMPLE

NOTES:

GENERAL NOTES:

1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE

LABELLA ASSOCIATES, P.C. 300 STATE STREET, ROCHESTER, NEW YORK ENVIRONMENTAL ENGINNEERING CONSULTANTS	PROJECT CROSMAN CORPORATION ROUTES 5 &20 EAST BLOOMFIELD, NEW YORK	BORING # MW-2A SHEET 3 of 3 JOB # 91243 CHKD. BY DP

DEPTH	SAMPLE BLOW / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	RECOVERY (INCHES)	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	HNU	NOTES
38	9 19 35	S-15	37-39	54	24	Vey dense, brown fine to medium SAND, trace Silt, moist	Cement grout (0 -38.3 feet)	BG	
39	34								
40	20 25 35	S-16	39-41	60	24	. . . stratified, Gravel seam at 40 '	Bentonite pellet seal (38.3 - 41.5 feet)	BG	
41	44							BG	
42							2 inch I.D. schedule 10 PVC riser (0 - 43.1 feet)		
43									
44									
45	20 34	S-17	44-46	77	24	. . . grading to fine SAND		BG	
46	43 50								
47	29 46	S-18	46-48	109	24		2 inch I.D. No. 10 slot PVC screen (43.1 - 58.1 feet)	BG	
48	63 65								
9	7 26	S-19	48-50	66	24	. . . wet		BG	2
50	40 48								3
51							No. 3 QROK sand pack (41.5 - 58.1 feet)		
52									
53	15 22	S-20	52-54	53	24			BG	
54	31 39								
55									
56									
57	11 26	S-21	56-58	61	24			BG	
58	35 42					Bottom of boring at 58 feet			

LEGEND

S - SPLIT SPOON SOIL SAMPLE
U - UNDISTURBED SOIL SAMPLE
C - ROCK CORE SAMPLE

NOTES:

2. Water table encountered at 49 feet
3. 15 foot screen set to intercept water table during seasonal fluctuations

GENERAL NOTES:

1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE

LABELLA ASSOCIATES, P.C. 300 STATE STREET, ROCHESTER, NEW YORK ENVIRONMENTAL ENGINNEERING CONSULTANTS	PROJECT CROSMAN CORPORATION ROUTES 5 &20 EAST BLOOMFIELD, NEW YORK	BORING # MW-3 SHEET 1 OF 3 JOB # 91243 CHKD. BY DP

CONTRACTOR	NOTHNAGLE DRILLING INC.	BORING LOCATION	
DRILLER	STEVE LARANTY	GROUND SURFACE ELEVATION	DATUM
LABELLA REPRESENTATIVE	DENNIS PECK	START DATE 1/27/92	END DATE 1/28/92

TYPE OF DRILL RIG	CME-75
AUGER SIZE AND TYPE	4-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD	1-3/8 inch I.D. Split spoon
ROCK DRILLING METHOD	NA

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS

DEPTH	SAMPLE BLOW /6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	RECOVERY (INCHES)	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	HNU	NOTES
1	1	S-1	0-2	7	16	Brown topsoil			
	2					Loose, brown, SAND, some Silt		Concrete seal (0 - 1 feet)	
	5					trace Gravel, moist		BG	
2	7							4 inch I.D. protective steel casing	
3									
4									
	5	S-2	4-6	5	18			2 inch I.D. schedule BG	
5	2							PVC riser (0.0 - 17.1 feet)	
	3					Loose, Brown SAND, little Gravel			
6	4					trace Silt, moist (small wet seam at 5')			
8								Cement grout	
								(1.0 - 12.0 feet)	
9									
	5	S-3	9-11	11	12	. . . medium dense, SAND, little Gravel		BG	
10	4								
	7								
11	15								
12									
13									
									1
14								Bentonite pellet seal	
	13	S-4	14-16	36	23	. . . little rounded Gravel		(12 - 15 feet)	
15	16							BG	
	20								
16	18							No.3 QROK sand pack	
								(15 - 27 feet)	

LEGEND

S - SPLIT SPOON SOIL SAMPLE
U - UNDISTURBED SOIL SAMPLE
C - ROCK CORE SAMPLE

NOTES:

1. Difficult augering, cuttings reveal coarse gravel and boulders

GENERAL NOTES:

1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE

LABELLA ASSOCIATES, P.C.
300 STATE STREET, ROCHESTER, NEW YORK
ENVIRONMENTAL ENGINNEERING CONSULTANTS

PROJECT
CROSMAN CORPORATION
ROUTES 5 &20
EAST BLOOMFIELD, NEW YORK

BORING # MW-3
SHEET 2 of 3
JOB # 91243
CHKD. BY DP

DEPTH	SAMPLE BLOW/6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	RECOVERY (INCHES)	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	HNU	NOTES
17									
18								No.3 QROK sand pack (15 - 27 feet)	
19									
20	15	S-5	19-21	60	24	Brown SAND, little Gravel, moist		BG	2
	25					Very dense, yellow-brown SILT, dry			
21	35								
	38					Very dense, brown SAND, little Gravel, moist			
22									
23								2 inch I.D. No. 10 slot PVC screen (17.1 - 27.1 feet)	
24									
25	10	S-6	24-26	57	24	. . . trace Gravel, Silt seams, wet		BG	3
	27								
26	29								
	35								
27								BG	
28								No. 3 QROK Sand pack (27.1 - 28 feet)	4
29	96	S-7	28-30	88	24	Dolomite boulder fragments		BG	
	42					Very dense, SILT, some gravel, little Sand, dry		Bentonite pellet seal (28 - 30 feet)	
30	46								
	60								
31								BG	
32									
33								BG	
34								No. 3 QROK Sand pack (30 - 41 feet)	
	30	S-8	34-36	151	24	Very dense, SAND, some Gravel, dry (glacial till)			
35	59							BG	
	92								
36	75								

LEGEND
S - SPLIT SPOON SOIL SAMPLE
U - UNDISTURBED SOIL SAMPLE
C - ROCK CORE SAMPLE

NOTES: 2. Outside of split spoon was wet indicating water zone
3. Water-bearing zone encountered at 24 feet
4. Bottom of well set at 27 feet after additional sampling revealed dry, compact soils
Boring backfilled as indicated on equipment log from 27 - 41 feet

GENERAL NOTES:

1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE

LBA

LABELLA ASSOCIATES, P.C. 300 STATE STREET, ROCHESTER, NEW YORK ENVIRONMENTAL ENGINNEERING CONSULTANTS	PROJECT CROSMAN CORPORATION ROUTES 5 &20 EAST BLOOMFIELD, NEW YORK	BORING # MW-3 SHEET 3 of 3 JOB # 91243 CHKD. BY DP

DEPTH	SAMPLE					SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	HNU	NOTES
	BLOW / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	RECOVERY (INCHES)				
37									
								No.3 QROK sand pack	
38								(30 - 41 feet)	
39									
	5	S-9	39-41	117	23	Very dense, SAND, some Gravel, dry		BG	
40	41					(glacial till?)			
	76								
41	81					Bottom of boring at 41 feet			
42									
43									
44									
45									
46									
47									
48									
49									
50									
51									
52									
53									
54									
55									
56									

LEGEND

S - SPLIT SPOON SOIL SAMPLE
U - UNDISTURBED SOIL SAMPLE
C - ROCK CORE SAMPLE

NOTES:

GENERAL NOTES:

1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE

LABELLA ASSOCIATES, P.C. 300 STATE STREET, ROCHESTER, NEW YORK ENVIRONMENTAL ENGINNEERING CONSULTANTS	PROJECT CROSMAN CORPORATION ROUTES 5 &20 EAST BLOOMFIELD, NEW YORK	BORING # MW-4 SHEET 1 OF 3 JOB # 91243 CHKD. BY DP

CONTRACTOR	NOTHNAGLE DRILLING INC.	BORING LOCATION	
DRILLER	STEVE LARANTY	GROUND SURFACE ELEVATION	DATUM
LABELLA REPRESENTATIVE	DENNIS PECK	START DATE 1/28/92	END DATE 1/29/92

TYPE OF DRILL RIG	CME-75
AUGER SIZE AND TYPE	4-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD	1-3/8 inch I.D. Split spoon
ROCK DRILLING METHOD	NA

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS

DEPTH	SAMPLE BLOW / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	RECOVERY (INCHES)	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	HNU	NOTES
0	4	S-1	0-2	4	18	Loose, Dark brown SAND, some Silt		BG	
1	2					moist		Concrete seal (0 - 1 feet)	
	2					Light brownSAND, little Gravel, trace Clay		4 inch I.D. protective	
2	2							steel casing	
3									
4									
	1	S-2	4-6	4	16			2 inch I.D. schedule	BG
5	2					Loose Brown fine SAND, trace Silt		PVC riser (0.0 - 24.1 feet)	
	2					homogeneous, moist			
6	3								
7									1
								Cement grout	
8								(1.0 - 18.0 feet)	
9									
	2	S-3	9-11	6	20	. . . wet			BG
10	2								
	4								
11	5								
	4	S-4	11-13	7	20				
12	4								
	3								
13	5								
	4	S-5	13-15	13	21				
14	6								
	7					Medium dense, gray SAND and Silt			BG .
15	8					clay seams, trace Gravel, moist			
	5	S-6	15-17	13	14	Stiff, gray CLAY, some Gravel, moist			
16	6								
	7					Medium dense, gray Gravel, some Sand,			
17	6					wet			

LEGEND

S - SPLIT SPOON SOIL SAMPLE
U - UNDISTURBED SOIL SAMPLE
C - ROCK CORE SAMPLE

NOTES:

1. Soil cuttings wet at approximately 7 feet

GENERAL NOTES:

1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE

LABELLA ASSOCIATES, P.C. 300 STATE STREET, ROCHESTER, NEW YORK ENVIRONMENTAL ENGINNEERING CONSULTANTS	PROJECT CROSMAN CORPORATION ROUTES 5 &20 EAST BLOOMFIELD, NEW YORK	BORING # MW-4 SHEET 2 of 3 JOB # 91243 CHKD. BY DP

DEPTH	SAMPLE BLOW /6"	NO.	DEPTH (FT.)	N-VALUE /ROD(%)	RECOVERY (INCHES)	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	HNU	NOTES
18	5	S-7	17-19	12	6	Medium dense, gray GRAVEL, little Sand trace Clay, wet			
	6								
	6								
19	10								
	6	S-8	19-21	11	14				
20	7								
	4					Stiff, Gray SILT and CLAY, trace Sand, dry		Bentonite pellet seal (18 - 21 feet)	BG
21	7								
	13	9	21-23	21	17	Medium dense, gray coarse SAND, little Gravel, little Clay, wet			
22	11								
	10					Medium dense, brown SAND, some Silt moist			
23	17								
	12	S-10	23-25	33	5	Medium dense, brown Gravel, some Sand trace Clay, wet			
24	19								
	14								
25	13								
	7	S-11	25-27	16	18	Medium dense, brown SAND, trace Silt, wet			BG
26	8								
	8								
27	9								
	6	S-12	27-29	15	16				BG
	6								
	9								
29	17								
	17	S-13	29-31	41	6				BG
30	19								
	22					Dense GRAVEL, some coarse Sand wet			
31	14								
	14	S-14	31-33	37	12			2 inch I.D. No. 10 slot PVC screen (24.1 - 39.1 feet)	
32	18								BG
	19								
33	15								
	12	S-15	33-35	26	11				BG
34	14							No. 3 QROK Sand pack (21 - 39.1 feet)	
	12								
35	17								
	27	S-16	35-37	31	12				BG
36	18								
	13								
37	10								

LEGEND

S - SPLIT SPOON SOIL SAMPLE
U - UNDISTURBED SOIL SAMPLE
C - ROCK CORE SAMPLE

NOTES:

GENERAL NOTES:

1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE

LABELLA ASSOCIATES, P.C. 300 STATE STREET, ROCHESTER, NEW YORK ENVIRONMENTAL ENGINNEERING CONSULTANTS	PROJECT CROSMAN CORPORATION ROUTES 5 &20 EAST BLOOMFIELD, NEW YORK	BORING # MW-4 SHEET 3 of 3 JOB # 91243 CHKD. BY DP

DEPTH	SAMPLE BLOW / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	RECOVERY (INCHES)	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	HNU	NOTES
	21	S-17	37-39	29	18				
38	16								
	13							No.3 QROK sand pack	
39	15							(30 - 41 feet)	
	19	S-18	39-41	48	24				
40	21								
	27							BG	
41	25								
	49	S-19	41-43	102	72				
42	50					Very dense, gray Clayey SILT, little Gravel			
	52					trace Sand, dry			
43	54								
	15								
44	30	S-20	43-45	62	16			Indigenous Sand	
	32								
45	33								
	33								
46						Bottom of boring at 45 feet			
47									
48									
49									
50									
51									
52									
53									
54									
55									
56									
57									

LEGEND

S - SPLIT SPOON SOIL SAMPLE
U - UNDISTURBED SOIL SAMPLE
C - ROCK CORE SAMPLE

NOTES:

GENERAL NOTES:

1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE

LABELLA ASSOCIATES, P.C. 300 STATE STREET, ROCHESTER, NEW YORK ENVIRONMENTAL ENGINNEERING CONSULTANTS	PROJECT CROSMAN CORPORATION ROUTES 5 &20 EAST BLOOMFIELD, NEW YORK	BORING # MW-5 SHEET 1 OF 4 JOB # 91243 CHKD. BY DP

CONTRACTOR	NOTHNAGLE DRILLING INC.	BORING LOCATION	
DRILLER	STEVE LARANTY	GROUND SURFACE ELEVATION	
LABELLA REPRESENTATIVE	DENNIS PECK	START DATE 7/6/92	END DATE 7/7/92

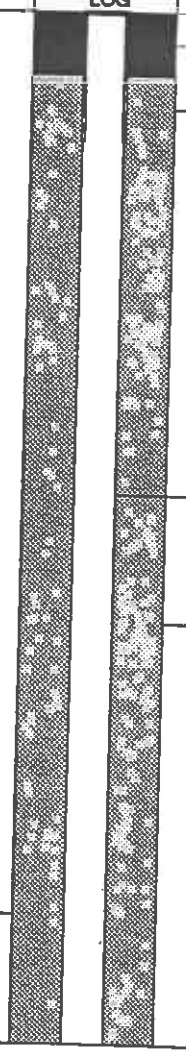
TYPE OF DRILL RIG	CME-75
AUGER SIZE AND TYPE	6-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD	1-3/8 inch I.D. Split spoon
ROCK DRILLING METHOD	NA

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS

DEPTH	BLOW /6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	RECOVERY (INCHES)	SAMPLE DESCRIPTION
1	2	S-1	0-2	5	20	Brown SILT, moist
	2					
	3					
2	4					
	2	S-2	2-4	6	20	Brown Silty CLAY, moist
3	3					low permeability
	3					
4	5					
	2	S-3	4-6	5	20	Medium, Brown CLAY and SILT, wet
5	3					low permeability
	2					
6	3					
	5	S-4	6-8	8	22	. . . Stiff
7	3					
	5					
	6					
	3	S-5	8-10	11	21	. . . Seams of Silty SAND, iron and
9	5					magnesium stains at partings
	6					
10	11					
	2	S-6	10-12	6	22	Medium, Gray Silty CLAY, highly palstic
11	3					very low permeability, wet
	3					
12	3					
	2	S-7	12-14	5	23	
13	2					
	3					
14	3					
	5	S-8	14-16	14	21	Medium dense Silty SAND, wet
15	7					low to moderate permeability
	7					
16	9					

EQUIPMENT INSTALLATION LOG



HNU

Concrete Seal (0 - 1 feet)

BG

4 inch I.D. protective steel casing

BG

BG

BG

2 inch I.D. schedule 10 PVC riser (0.0 - 39.6 feet)

BG

Cement grout (1.0 - 34.5 feet)

BG

BG

BG

NOTES

LEGEND

S - SPLIT SPOON SOIL SAMPLE
U - UNDISTURBED SOIL SAMPLE
C - ROCK CORE SAMPLE

NOTES:

GENERAL NOTES:

1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE

LABELLA ASSOCIATES, P.C. 300 STATE STREET, ROCHESTER, NEW YORK ENVIRONMENTAL ENGINNEERING CONSULTANTS	PROJECT CROSMAN CORPORATION ROUTES 5 &20 EAST BLOOMFIELD, NEW YORK	BORING # MW-5 SHEET 2 of 4 JOB # 91243 CHKD. BY DP

DEPTH	BLOW /6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	RECOVERY (INCHES)	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	HNU	NOTES
17	7	S-9	16-18	34	22	Dense medium to coarse SAND, wet		BG	
	18					seams of Silty SAND, saturated			
	16					high permeability			
18	13								
	8	S-10	18-20	24	22			BG	
19	12					. . . some Gravel			
	12								
20	24								
	7	S-11	20-22	73	22			BG	
21	25								
	48								
22	62								
	17	S-12	22-24	41	20	Dense medium to coars SAND,		BG	
23	18					some Gravel, wet, high permeability			
	23								
24	33								
	9	S-13	24-26	35	20		2 inch I.D. schedule 10		
25	14						PVC riser (0.0 - 39.6 feet)		
	21							BG	
26	30								
	6	S-14	26-28	36	20	Medium to very coarse SAND,	Cement grout		
27	12					very high permeability	(1.0 - 34.5 feet)	BG	
	24								
28	26								
	6	S-15	28-30	15	20	Very coarse SAND, some Gravel		BG	
29	5								
	10								
30	21								
	5	S-16	30-32	28	21	Medium dense, medium to coarse SAND		BG	
31	6					medium to high permeability			
	22								
32	27								
	4	S-17	32-34	60	21	. . . very dense		BG	
33	20								
	40								
34	63								
	4	S-18	34-36	8	20	Loose, medium to Coarse SAND,		BG	
35	5					high permeability			
	3						Bentonite pellet seal		
36	3						(34.5 - 37.0 feet)		

LEGEND

S - SPLIT SPOON SOIL SAMPLE
U - UNDISTURBED SOIL SAMPLE
C - ROCK CORE SAMPLE

NOTES:

GENERAL NOTES:

1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE

LABELLA ASSOCIATES, P.C.
300 STATE STREET, ROCHESTER, NEW YORK
ENVIRONMENTAL ENGINNEERING CONSULTANTS

PROJECT
CROSMAN CORPORATION
ROUTES 5 &20
EAST BLOOMFIELD, NEW YORK

BORING # MW-5
SHEET 3 of 4
JOB # 91243
CHKD. BY DP

DEPTH	BLOW /6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	RECOVERY (INCHES)	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	HNU	NOTES
	4	S-19	36-38	8	20	Loose, Medium to Coarse SAND, wet			
37	2						Bentonite pellet seal		
	6						(34.5 - 37.0 feet)	BG	
38	20								
	20	S-20	38-40	9	21	. . . Coarse, high permeability	2 inch I.D. schedule 10		
39	3						PVC riser (0.0 - 39.6 feet)		
	3							BG	
40	6								
	30	S-21	40-42	128	23	Very dense, medium SAND,			
41	56					medium permeability	Sand Pack	BG	
	72						(37 - 52 feet)		
42	100/4								
	18	S-22	42-44	74	21	. . . little Gravel			
43	31							BG	
	43								
44	75								
	11	S-23	44-46	61	18	Very dense Silty SAND, trace Clay			
45	23					medium permeability		BG	
	38								
46	58						Grade 0 Sand pack		
	11	S-24	46-48	42	22	. . . 10" Gray CLAY layer	(37.0 - 52.0 feet)		
47	20							BG	
	22						2 inch I.D. No. 10 slot		
48	55						PVC screen (39.6 - 49.6 feet)		
	10	S-25	48-50	30	21	Medium dense brown fine SAND			
49	12					medium permeability		BG	
	18								
50	32								
	13	S-26	50-52	56	23				
51	16							BG	
	40								
52	44					Hard, Gray Silty CLAY, trace rounded Gravel, moist, low permeability			1
	18	S-27	52-54	77	24				
53	28					Hard, Gray CLAY, little rounded Gravel	Bentonite pellets	BG	
	49					very low permeability	(52 - 70 feet)		
54	74								
	22	S-28	54-56	109	22				
55	44							BG	
	65								
56	83								

LEGEND
S - SPLIT SPOON SOIL SAMPLE
U - UNDISTURBED SOIL SAMPLE
C - ROCK CORE SAMPLE

NOTES:
1. Boring was advanced from 52' to 70' using a tri-coned roller bit inside the hollow stem augers, potable water was used as a drilling medium to wash out cuttings, the open hole was then backfilled with bentonite pellets to 52'

GENERAL NOTES:
1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE

LABELLA ASSOCIATES, P.C. 300 STATE STREET, ROCHESTER, NEW YORK ENVIRONMENTAL ENGINNEERING CONSULTANTS	PROJECT CROSMAN CORPORATION ROUTES 5 &20 EAST BLOOMFIELD, NEW YORK	BORING # MW-5 SHEET 4 of 4 JOB # 91243 CHKD. BY DP

DEPTH	SAMPLE BLOW / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	RECOVERY (INCHES)	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	HNU	NOTES
57									
58									
59									
	18	S-29	59-61	63	24	Hard, Gray CLAY, little rounded Gravel			
60	26					very low permeability		Bentonite pellets	BG
	37							(52 - 70 feet)	
61	66								
62									
63									
64									
	17	S-30	64-66	77	23				
65	26								BG
	51								
66	62								
67									
68									
69									
	57	S-31	69-70	100/6	8				
70	100/6					Bottom of boring at 70 feet			BG
71									
72									
73									
74									
75									
76									

LEGEND

S - SPLIT SPOON SOIL SAMPLE
U - UNDISTURBED SOIL SAMPLE
C - ROCK CORE SAMPLE

NOTES:

GENERAL NOTES:

1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE

LABELLA ASSOCIATES, P.C. 300 STATE STREET, ROCHESTER, NEW YORK ENVIRONMENTAL ENGINNEERING CONSULTANTS	PROJECT CROSMAN CORPORATION ROUTES 5 &20 EAST BLOOMFIELD, NEW YORK	BORING # MW-6 (abandoned) SHEET 1 OF 3 JOB # 91243 CHKD. BY DP

CONTRACTOR NOTHNAGLE DRILLING INC. BORING LOCATION
DRILLER STEVE LARANTY GROUND SURFACE ELEVATION
ABELLA REPRESENTATIVE DENNIS PECK START DATE 7/8/92 END DATE 7/9/92

TYPE OF DRILL RIG	CME-75
AUGER SIZE AND TYPE	4-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD	1-3/8 inch I.D. Split spoon
ROCK DRILLING METHOD	NA

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS

DEPTH	BLOW / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	RECOVERY (INCHES)	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	HNU	NOTES
1	2	S-1	0-2	8	9	Brown Topsoil		BG	1
	4								
	4							2 inch PVC monitoring well (abandoned) well filled with cement grout	
2	5								
	5	S-2	2-4	33	13	Brown Sandy SILT, rock fragments, dry			
3	15							BG	
	18								
4	27								
	22	S-3	4-6	152	18	Very dense Brown Silty SAND and Gravel, dry (rock fragments from boulders)			
5	80							BG	2
	72								
6	50								
	8	4	6-7.5	100/5	14				
7	90							BG	
	100/5								
9									
10									
11									
12								driller noted change in drilling rate at 11'	
13									
	54	S-5	13-15	76	12	Light Brown Sandy SILT, little Clay trace Gravel, moist, low permeability			
14	30							BG	
	46								
15	51								
	20	S-6	15-17	154	24				
16	76							BG	
	78								
17	79								

LEGEND
S - SPLIT SPOON SOIL SAMPLE
U - UNDISTURBED SOIL SAMPLE
C - ROCK CORE SAMPLE

NOTES: 1. A monitoring well was completed to a depth of 55'in this boring but was abandoned after it was discovered that the PVC riser was broken or loose and cement grout had infiltrated into well
2. Very difficult drilling due to boulders and cobbles

GENERAL NOTES:

1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE

LABELLA ASSOCIATES, P.C.
300 STATE STREET, ROCHESTER, NEW YORK
ENVIRONMENTAL ENGINNEERING CONSULTANTS

PROJECT
CROSMAN CORPORATION
ROUTES 5 &20
EAST BLOOMFIELD, NEW YORK

BORING # MW-6 (abandoned)
SHEET 2 of 3
JOB # 91243
CHKD. BY DP

DEPTH	SAMPLE BLOW / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	RECOVERY (INCHES)	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	HNU	NOTES
18	36	S-7	17-19	94	22	Light Brown Sandy SILT, little Clay trace Gravel, moist, low permeability		BG	
	42								
	52								
19	56								
	16	S-8	19-21	127	20			BG	
20	37								
	90								
21	58							2 inch PVC monitoring well (abandoned) well filled with cement grout	
22									
23								Driller noted change in drilling rate at 22.5'	
24									
	9	S-9	24-26	30	18	Dense brown fine SAND, clean, medium permeability, moist		BG	
25	10								
	20								
26	22								
	11	S-10	26-28	49	24			BG	
27	21								
	28								
28	40								
	19	S-11	28-30	89	24	. . . very dense		BG	
29	39								
	50								
30	56								
	24	S-12	30-32	74	24			BG	
31	30								
	44								
32	48								
	12	S-13	32-34	73	24			BG	
33	35								
	38								
34	44								
35									
36									
37									

LEGEND
S - SPLIT SPOON SOIL SAMPLE
U - UNDISTURBED SOIL SAMPLE
C - ROCK CORE SAMPLE

NOTES:

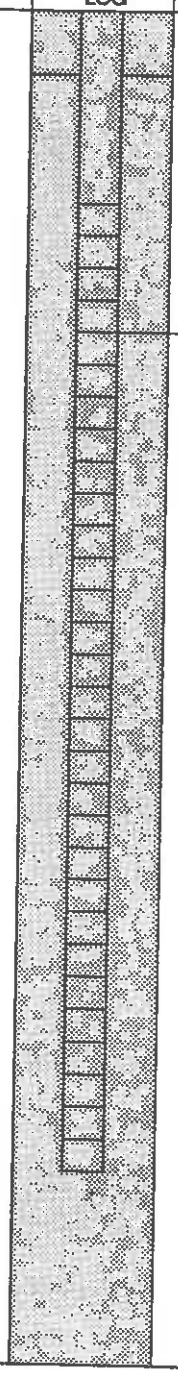
GENERAL NOTES:

1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE

LABELLA ASSOCIATES, P.C. 300 STATE STREET, ROCHESTER, NEW YORK ENVIRONMENTAL ENGINNEERING CONSULTANTS	PROJECT CROSMAN CORPORATION ROUTES 5 &20 EAST BLOOMFIELD, NEW YORK	BORING # MW-6 (abandoned) SHEET 3 of 3 JOB # 91243 CHKD. BY DP

DEPTH	SAMPLE BLOW / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	RECOVERY (INCHES)	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	HNU	NOTES
38									
39									
	12	S-14	39-41	47	24	Dense brown fine SAND, clean,		BG	
40	19					medium permeability, moist			
	28					1" red clay layer at 40'			
41	34								
42									
43									
44									
	9	S-15	44-46	55	24				
45	21							BG	
	34					. . . very dense, water table encountered			
46	35					at approximately45'			
	10	S-16	46-48	54	24				
47	21					. . . 6" of medium sand at 47'		BG	
	33								
48	43								
	8	S-19	48-50	45	24				
49	20							BG	
	25								
50	35								
	4	S-20	50-52	35	24				
51	16							BG	
	19								
52	36								
53									
54									
55									
	10	S-21	55-57	30	24				
56	10							BG	
	20								
57	30								
58									

2 inch PVC monitoring well
(abandoned)
well filled with cement grout



LEGEND

S - SPLIT SPOON SOIL SAMPLE
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NOTES:

GENERAL NOTES:

1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE

LABELLA ASSOCIATES, P.C. 300 STATE STREET, ROCHESTER, NEW YORK ENVIRONMENTAL ENGINNEERING CONSULTANTS	PROJECT CROSMAN CORPORATION ROUTES 5 &20 EAST BLOOMFIELD, NEW YORK	BORING # MW-6A SHEET 1 OF 3 JOB # 91243 CHKD. BY DP

CONTRACTOR	NOTHNAGLE DRILLING INC.	BORING LOCATION	
DRILLER	STEVE LARANTY	GROUND SURFACE ELEVATION	
LABELLA REPRESENTATIVE	DENNIS PECK	START DATE 7/10/92	END DATE 7/10/92

TYPE OF DRILL RIG	CME-75
AUGER SIZE AND TYPE	4-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD	1-3/8 inch I.D. Split spoon
ROCK DRILLING METHOD	NA

WATER LEVEL DATA				
DATE	TIME	WATER	CASING	REMARKS

DEPTH	SAMPLE BLOW / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	RECOVERY (INCHES)	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	HNU	NOTES
1						Refer to boring log for MW-6 for subsurface description from 0 - 55 feet		Concrete Seal (0 - 1 feet)	1
2						Boring MW-6 was abandoned after well completion due to puncture in PVC riser and infiltration of grout into well		4 inch I.D. protective steel casing	
3									
4						MW-6A was then drilled to replace it			
5									
6						Brown Sandy SILT and boulders (as described at MW-6)			
7									
8								2 inch I.D. schedule 10 PVC riser (0.0 - 39.7 feet)	
9									
10								Cement grout (1.0 - 35.0 feet)	
11									
12									
13						Sandy SILT, some Gravel very low permeability (as described at MW-6)			
14									
15									
16									
17									

LEGEND

S - SPLIT SPOON SOIL SAMPLE
U - UNDISTURBED SOIL SAMPLE
C - ROCK CORE SAMPLE

NOTES:

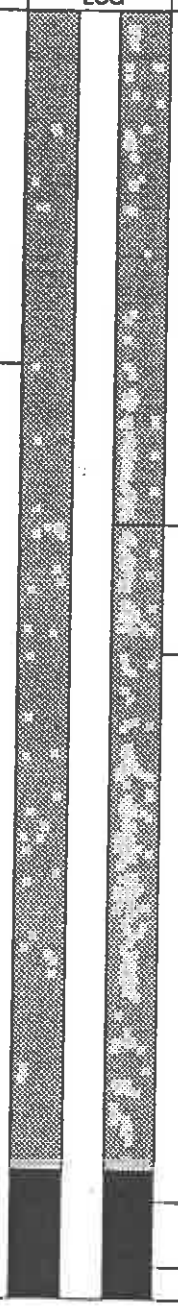
1. Boring MW-6A is approximately 10 feet east of boring MW-6

GENERAL NOTES:

1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE

LABELLA ASSOCIATES, P.C. 300 STATE STREET, ROCHESTER, NEW YORK ENVIRONMENTAL ENGINNEERING CONSULTANTS	PROJECT CROSMAN CORPORATION ROUTES 5 &20 EAST BLOOMFIELD, NEW YORK	BORING # MW-6A SHEET 2 of 3 JOB # 91243 CHKD. BY DP

DEPTH	SAMPLE BLOW / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	RECOVERY (INCHES)	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	HNU	NOTES
18						Sandy SILT, some Gravel very low permeability (as described at MW-6)			
19									
20									
21									
22									
23						Brown fine SAND, clean, moist moderate permeability (as described at MW-6)			
24									
25									
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									



LEGEND

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NOTES:

GENERAL NOTES:

1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE

LABELLA ASSOCIATES, P.C. 300 STATE STREET, ROCHESTER, NEW YORK ENVIRONMENTAL ENGINNEERING CONSULTANTS	PROJECT CROSMAN CORPORATION ROUTES 5 &20 EAST BLOOMFIELD, NEW YORK	BORING # MW-6A SHEET 3 of 3 JOB # 91243 CHKD. BY DP

DEPTH	SAMPLE BLOW / 6"	SAMPLE NO.	SAMPLE DEPTH (FT.)	SAMPLE N-VALUE /RQD(%)	SAMPLE RECOVERY (INCHES)	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	HNU	NOTES
38						Brown fine SAND, clean, moist moderate permeability (as described at MW-6)		Bentonite pellets (35.9 - 38.0 feet)	
39								2 inch I.D. schedule 10 PVC riser (0.0 - 39.7 feet)	
40									
41									
42									
43									
44									
45						Water table encountered at approximately 45 feet (as described at MW-6)			
46									
47								Grade 0 Sand pack (35.0 - 55.0 feet)	
48									
50								2 inch I.D. No. 10 slot PVC screen (39.7 - 54.7 feet)	
51									
52									
53									
54									
55						Bottom of boring at 55'			
56									
57									
58									

LEGEND

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NOTES:

GENERAL NOTES:

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LABELLA ASSOCIATES, P.C. 300 STATE STREET, ROCHESTER, NEW YORK ENVIRONMENTAL ENGINNEERING CONSULTANTS	PROJECT CROSMAN CORPORATION ROUTES 5 &20 EAST BLOOMFIELD, NEW YORK	BORING # MW-7 SHEET 1 OF 2 JOB # 91243 CHKD. BY DP

CONTRACTOR	NOTHNAGLE DRILLING INC.	BORING LOCATION	
DRILLER	STEVE LARANTY	GROUND SURFACE ELEVATION	DATUM
LABELLA REPRESENTATIVE	DENNIS PECK	START DATE 7/9/92	END DATE 7/9/92

TYPE OF DRILL RIG	CME-75
AUGER SIZE AND TYPE	4-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD	1-3/8 inch I.D. Split spoon
ROCK DRILLING METHOD	NA

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS

DEPTH	SAMPLE BLOW /6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	RECOVERY (INCHES)	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	HNU	NOTES
1						Refer to boring log for MW-5 for subsurface description from 0 - 22 feet			1
2						Brown Silty CLAY, low permeability (as described in MW-5)			
3									
4									
5									
6									
7									
8									
9									
10									
11						Gray Silty CLAY, highly plastic very low permeability,wet (as described in MW-5)			
12									
13									
14									
15						Silty SAND (as described in MW-5)			
16									

Concrete seal (0 - 1 feet)

4 inch I.D. protective steel casing

2 inch I.D. schedule 10 PVC riser (0.0 - 14.1 feet)

Cement grout (1.0 - 9.0 feet)

Bentonite pellet seal (9 - 12 feet)

2 inch I.D. No. 10 slot PVC screen (14.1 - 24.1 feet)

LEGEND

S - SPLIT SPOON SOIL SAMPLE
U - UNDISTURBED SOIL SAMPLE
C - ROCK CORE SAMPLE

NOTES:

1. Boring MW-7 is approximately 10 feet south of MW-5

GENERAL NOTES:

1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE

LABELLA ASSOCIATES, P.C. 300 STATE STREET, ROCHESTER, NEW YORK ENVIRONMENTAL ENGINNEERING CONSULTANTS	PROJECT CROSMAN CORPORATION ROUTES 5 &20 EAST BLOOMFIELD, NEW YORK	BORING # MW-7 SHEET 2 of 2 JOB # 91243 CHKD. BY DP

DEPTH	SAMPLE BLOW / 6"	SAMPLE NO.	SAMPLE DEPTH (FT.)	SAMPLE N-VALUE /RQD(%)	SAMPLE RECOVERY (INCHES)	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	HNU	NOTES
17						Medium to Coarse SAND, wet high permeability, some Gravel (as described in MW-5)		No.3 QROK sand pack (12 - 24 feet)	
18									
19									
20								2 inch I.D. No. 10 slot PVC screen (14.1 - 24.1 feet)	
21									
22									
23									
24						Bottom of boring at 24.1 feet			
25									
26									
28									
29									
30									
31									
32									
33									
34									
35									
36									

LEGEND

S - SPLIT SPOON SOIL SAMPLE
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NOTES:

GENERAL NOTES:

1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
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Date Start/Finish: 12/7/93 / 12/7/93
Drilling Company: Nothnagle Drilling
Driller's Name: N. Short
Drilling Method: Hollow Stem Auger
Auger Size : 4.25-in.
Rig Type: BK-81 Mobile Drill
Spoon Size: 2-in. O.D.

PVC Casing Elev.: 1017.81 ft.
Borehole Depth: 77.0 ft.
Ground Surface Elev.: 1015.2 ft.

Geologist: Todd J. Farmen

Well No. MW-3A

Site:
Crosman Corporation, East Bloomfield, NY

Client:
New Coleman Holdings, Inc.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 in.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
gs elevation 1015.2 ft.										GROUND SURFACE	Stainless steel protective casing installed with locking cap.
0	1015										
											2-inch diameter SCH 40 PVC riser from 82.0' below ground level to 2.8' above ground level.
5	1010										
											Cement bentonite grout from 58.5' to surface.
10	1005										
15											

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

No sampling from 0.0 to 40.0 feet due to proximity to MW-3 in this interval. For subsurface information, see MW-3 soil boring log prepared by LaBella.

Water Levels

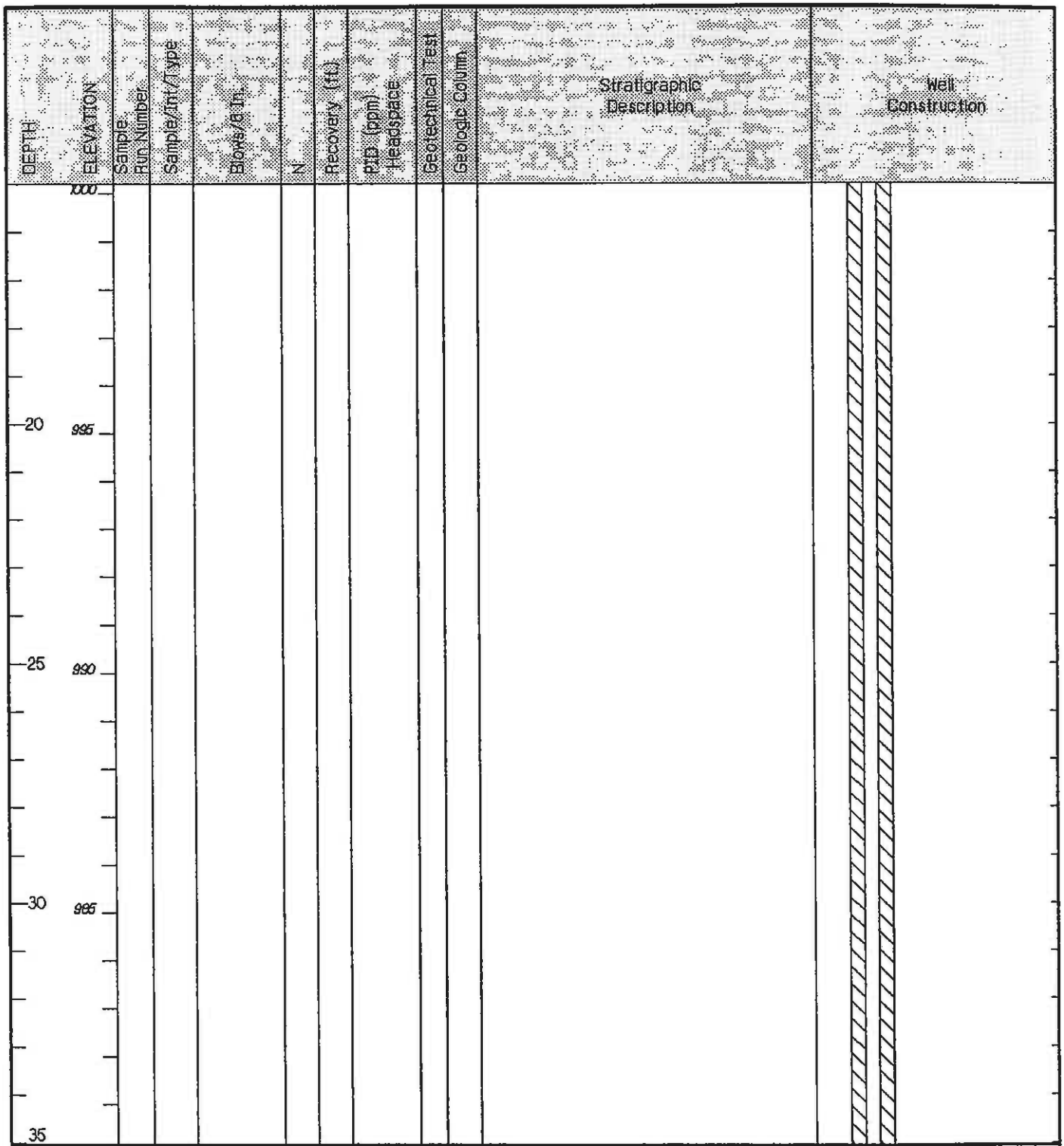
Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Well No. MW-3A

Total Depth = 77.0 ft.

Site:
Crosman Corporation, East Bloomfield, NY



BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Site:
Crosman Corporation, East Bloomfield, NY

Well No. MW-3A

Total Depth = 77.0 ft.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 in.	N	Recovery (ft)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
	980										
40	975	1		18 25 47 53	72	1.8	0.0			Light brown fine SAND, medium dense, dry.	
45	970	2		18 27 36 39	63	1.5	0.0			Groundwater encountered at 48 feet. Brown fine SAND and SILT, trace clay and gravel.	
50	965	3		22 22 24 26	26	2.0	0.0			Same.	
55										Same.	

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Site:
Crosman Corporation, East Bloomfield, NY

Well No. MW-3A
Total Depth = 77.0 ft.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
	960										
		4		25 25 30 33	55	2.0	0.0				
60	955									Same.	Hydrated bentonite seal from 58.5' to 58.5'.
		5		35 35 100/.3	135	2.0	0.0				Grade "0" sorted fine sand filter pack from 77.0' to 58.5'.
65	950									Same, except more dense.	
		6		40 47 68 72	115	2.0	0.0				
70	945									Gray fine SAND, little silt, very dense, wet.	2-inch diameter SCH 40 PVC, 0.010-inch slot well screen from 77.0' to 62.0'.
		7		22 25 60 62	85	2.0	0.0				
75											

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Site:
Crosman Corporation, East Bloomfield, NY

Well No. MW-3A

Total Depth = 77.0 ft.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
0	940	8		38 40 52 55	92	2.0	0.0			Brown SILT, some fine to medium sand, little gravel and clay, dry to moist.	
										Total depth = 77.0 feet.	
80	935										
85	930										
90	925										
95											

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Project: 415.01

Script: CRO-well
Date: 06/23/94

Date Start/Finish: 11/2/93 / 11/4/93
Drilling Company: Nothnagle Drilling
Driller's Name: N. Short
Drilling Method: Hollow Stem Auger
Auger Size : 4.25-in.
Rig Type: BK-81 Mobile Drill
Spoon Size: 2-in O.D.

PVC Casing Elev.: 1025.81 ft.
Borehole Depth: 98.0 ft.
Ground Surface Elev.: 1026.3 ft.

Geologist: Todd J. Farmen

Well No. MW-8

Site:
Crosman Corporation, East Bloomfield, NY

Client:
New Coleman Holdings, Inc.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 in.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
gs elevation 1026.3 ft.											Flush mount curb-box with bolted lid.
											Concrete from 0.5' to ground level.
										GROUND SURFACE	
										ASPHALT	
	1025	1		11 12 14	23	0.5	0.0			Medium to dark brown fine to coarse SAND, some fine to coarse gravel, medium dense, moist.	
		2		13 16 22 22	38	1.7	0.0			Same.	Grade "0" sand drain from 3.0' to 0.5'.
5		3		10 17 25 42	42	1.9	0.0			Same.	
	1020	4		7 18 27 27	45	1.8	0.0			Same.	4-inch diameter SCH 40 PVC riser from 80.0' below ground level to ground level.
		5		25 33 50/.0	83	1.0	0.0			Same.	
10											Cement bentonite grout from 78.0' to 3.0'.
		6		15 27 39 53	66	1.7	0.0			Same.	
	1015	7		17 40 78 100/.1	118	1.2	0.0			Same.	
15		8		12 24	61	1.2	0.0			Same.	

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Well No. MW-8
Total Depth = 98.0 ft.

Site:
Crosman Corporation, East Bloomfield, NY

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 in.	N	Recovery (ft)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
		8		37 49	61	1.2	0.0			Same.	
	1010	9		1 10 15 25	25	1.0	0.0			Same.	
		10		15 20 49 54	69	1.0	0.0			Same.	
20		11		12 18 100/.4	118	0.5	0.0			Medium to light brown and gray fine to coarse GRAVEL, some fine to coarse sand, medium to very dense, dry.	
	1005	12		23 14 100/.4	114	0.7	0.0			Same.	
		13		19 35 53 100/.4	88	1.0	0.0			Same.	
25		14		13 21 90 43	111	1.2	0.0			Same.	
	1000	15		12 32 100/.1	132	0.6	0.0			Same.	
		16		45 100/.1	145	0.5	0.0			Same.	
30	995	17		20 21 50/.0	71	0.5	0.0			Same.	
		18		10 17	117	0.3	0.0			Same.	
35											

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Site:
Crosman Corporation, East Bloomfield, NY

Well No. MW-8
Total Depth = 98.0 ft.

DEPTH	ELEVATION	Sample Run Number	Sample Int./Type	Blows/6 In.	N	Recovery - (ft)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
		18		100/.1	117	0.3	0.0				
	990	19		8 17 39 40	56	2.0	0.0			Light brown fine to medium SAND, trace clay, medium dense, dry.	
		20		8 10 23 29	33	1.5	0.0			Same, except finer sand.	
40		21		14 14 15 26	29	2.0	0.0			Same.	
	985	22		8 10 22 26	32	1.8	0.0			Same.	
		23		8 13 27 31	40	1.7	0.0			Same.	
45		24		8 20 52 66	72	1.3	0.0			Light brown fine SAND, trace clay, trace silt, medium dense, moist.	
	980	25		10 21 29 42	50	1.5	0.0			Groundwater encountered at 50 feet.	
50		26		17 24 27 35	51	1.4	0.0			Light brown SILT, some sand, trace clay, trace gravel.	
	975	27		10 10 17 22	27	1.7	0.0			Rock fragments at 52.5 feet.	
55		28		8 10	25	1.5	0.0			Same.	

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Well No. MW-8

Total Depth = 98.0 ft.

Site:
Crosman Corporation, East Bloomfield, NY

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 in.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
		28		15 19	25	1.5	0.0				
	970	29		8 25 31 35	56	1.5	0.0			Same.	
		30		8 11 17 26	28	1.8	0.0			Same.	
60		31		8 12 27 31	39	2.0	0.0			Same.	
	965	32		15 15 22 26	37	1.8	0.0			Same.	
65		33		10 10 11 19	21	1.5	0.0			Same.	
	960	34		18 18 22 25	40	1.0	0.0			Same.	
		35		15 15 21 25	36	1.5	0.0			Same.	
70		36		11 12 12 18	24	1.8	0.0			Same.	
	955	37		25 25 27 29	52	1.8	0.0			Same.	
75		38		10 10	20	1.8	0.0			Same.	

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Well No. MW-8
Total Depth = 98.0 ft.

Site:
Crosman Corporation, East Bloomfield, NY

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 in.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
		38		10 10	20	1.8	0.0			Same.	
	950	39		7 7 18 20	25	2.0	0.0			Light brown fine SAND, some silt, trace clay, loose to medium dense, wet.	
80		40		8 40 43 51	83	2.0	0.0			Same.	
	945	41		10 25 31 35	56	1.8	0.0			Same.	
		42		14 20 23 26	43	2.0	0.0			Light brown SILT, some sand, trace fine gravel, trace clay, medium dense, wet.	
85		43		13 18 27 32	45	2.0	0.0			Clay layer (approximately 8 inches thick at 83.0 feet). Same.	
	940	44		10 16 31 35	47	0.0	0.0			Gray to brown SILT, trace clay, trace sand, trace fine gravel, medium dense, wet. (TILL)	
		45		14 14 22 28	36	2.0	0.0			Light gray brown fine SAND, some silt, little clay and gravel, wet.	
90		46		14 18 32 35	50	2.0	0.0				
	935	47		14 18 32 35	50	2.0	0.0			Dark brown coarse SAND, trace fine sand, trace fine gravel from 82.0 to 85.2 feet.	
95		48		65 54	154	2.0	0.0				

Hydrated bentonite seal from 78.0' to 76.0'.

Grade "0" sand pack from 85.0' to 78.0'.

4-inch diameter SCH 40 PVC, 0.010-inch slot well screen from 85.0' to 80.0' with 0.5' sump at bottom.

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Site:
Crosman Corporation, East Bloomfield, NY

Well No. MW-8

Total Depth = 98.0 ft.

DEPTH	ELEVATION	Sample Run Number	Sample Int./Type	Blows/6 in.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
		48		100/.3	154	2.0	0.0			Brown to gray SILT, trace clay, trace sand, trace fine gravel, very dense, wet.	
	930	49		25 32 75 100/.1	107	2.0	0.0				
100										Total depth = 98.0 feet	Native collapse material 98.0' to 95.0'.
	925										
105											
	920										
110											
	915										

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS.

Remarks:

Water Levels

Date / Time	Elevation	Depth

Project: 415.01

Script: CRO-well
Date: 06/28/94

Date Start/Finish: 11/6/93 / 11/8/93
Drilling Company: Nothnagle Drilling
Driller's Name: N. Short
Drilling Method: Hollow Stem Auger
Auger Size : 4.25-in.
Rig Type: BK-81 Mobile Drill
Spoon Size: 2-in O.D.

PVC Casing Elev.: 1026.09 ft.
Borehole Depth: 58.8 ft.
Ground Surface Elev.: 1026.4 ft.

Geologist: Todd J. Farmen

Well No. MW-8

Site:
Crosman Corporation, East Bloomfield, NY

Client:
New Coleman Holdings, Inc.

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 in.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
gs elevation 1026.4 ft.									GROUND SURFACE	Flush mount curb-box with bolted lid. Concrete from 0.5' to ground level. Grade "0" sand drain from 3.0' to 0.5'. 2-inch diameter SCH 40 PVC riser from 48.8' below ground level to ground level. Cement bentonite grout from 44.0' to 3.0'.

1025
5
1020
10
1015
15

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:
For subsurface information, see Blasland, Bouck and Lee subsurface log for MW-8.

Water Levels

Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Site:
Crosman Corporation, East Bloomfield, NY

Well No. MW-8
Total Depth = 58.8 ft.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 in.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
0	1010										
20	1005										
25	1000										
30	995										
35											

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Site:
Crosman Corporation, East Bloomfield, NY

Well No. MW-9

Total Depth = 58.8 ft.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
	990										
40											
	985										
45											Hydrated bentonite seal from 46.0' to 44.0'.
	980										
50											Grade "0" sand pack from 58.8' to 46.0'.
	975										
55											

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Site:
Crosman Corporation, East Bloomfield, NY

Well No. MW-8

Total Depth = 58.8 ft.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
60	970									Total depth = 58.8 feet	4-inch diameter SCH 40 PVC, 0.010-inch slot well screen from 58.8' to 48.8'.
65	965										
70	960										
75	955										

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Date Start/Finish: 10/26/93 / 10/27/93
Drilling Company: Nothnagle Drilling
Driller's Name: N. Short
Drilling Method: Hollow Stem Auger
Auger Size : 4.25-in.
Rig Type: BK-81 Mobile Drill
Spoon Size: 2-in O.D.

PVC Casing Elev.: 1023.87 ft.
Borehole Depth: 79.7 ft.
Ground Surface Elev.: 1024.1 ft.

Geologist: Todd J. Farmen

Well No. MW-10

Site:
Crosman Corporation, East Bloomfield, NY

Client:
New Coleman Holdings, Inc.

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
gs elevation 1024.1 ft.									GROUND SURFACE	Flush mount curb-box with bolted lid. Concrete from 0.5' to ground level.
1020 / 5										Grade "0" sand drain from 2.2' to 0.5'.
1015 / 10										2-inch diameter SCH 40 PVC riser from 69.7' below ground level to ground level.
										Cement bentonite grout from 65.5' to 2.2'.
	1		12 42 60 100/.2	102	1.8	0.0			Light brown fine to coarse SAND, little gravel, trace silt, very dense, dry.	
1010 / 15	2		12 38	100	1.2	0.0			Same.	

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

No sampling from 0.0 to 12.0 feet due to proximity to soil boring TB-2. For subsurface information in this interval, see TB-2 soil log prepared by LaBella.

Water Levels

Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Site:
Crosman Corporation, East Bloomfield, NY

Well No. MW-10

Total Depth = 79.7 ft.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
		2		62 59	100	1.2	0.0			Same.	
		3		13 29 100/.5	129	1.4	0.0			Same.	
	1005	4		48 100/.4	148	0.9	0.0				
20		5		25 35 37 38	72	1.5	0.0			Light brown fine to coarse SAND, little gravel, trace silt, trace clay, very dense, dry.	
		6		21 26 43 56	69	2.0	0.0			Same.	
	1000	7		12 13 28 41	41	1.7	0.0			Light brown fine SAND, trace clay, medium dense, dry.	
25		8		14 14 26 40	40	1.6	0.0			Same.	
	995	9		8 14 35 36	49	1.6	0.0			Same.	
30		10		12 19 35 42	54	2.0	0.0			Same.	
		11		12 18 37 38	55	1.2	0.0			Same.	
	990	12		15 27	101	1.6	0.0			Same.	
35											

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Well No. MW-10

Total Depth = 79.7 ft.

Site:
Crosman Corporation, East Bloomfield, NY

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
		12		74 83	101	1.6	0.0				
		13		15 33 55 75	88	1.5	0.0			Same.	
		14		19 28 36 44	64	1.7	0.0			Same.	
40	985	15		17 25 27 34	52	1.0	0.0			Light brown fine SAND, trace clay, trace silt, very dense, dry.	
		16		27 29 40 49	69	2.0	0.0			Same.	
45	980	17		10 17 25 31	42	1.7	0.0			Same.	
		18		24 28 39 52	67	1.7	0.0			Same.	
50	975	19		17 17 32 40	49	1.8	0.0			Same.	
		20		11 17 26 34	43	1.1	0.0			Groundwater encountered at 50 feet. Same.	
		21		12 18 32 35	50	1.5	0.0			Same.	
55	970	22		14 18	40	1.5	0.0			Light to medium brown SILT and fine SAND, trace clay, medium dense, wet.	

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Well No. MW-10
Total Depth = 79.7 ft.

Site:
Crosman Corporation, East Bloomfield, NY

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
	22		22 28	40	1.5	0.0			Same.	
	23		8 10 19 29	29	1.2	0.0			Same.	
965	24		10 17 21 24	38	1.4	0.0			Same.	
60	25		10 15 21 29	36	1.4	0.0			Same.	
	26		9 10 17 23	27	1.5	0.0			Same.	
960	27		10 22 13 18	35	1.8	0.0			Same.	
65	28		8 8 16 37	24	1.8	0.0			Same.	Hydrated bentonite seal from 67.5' to 65.5'.
	29		9 21 39 78	60	1.8	0.0			Same.	
955	30		10 22 34 36	56	1.9	0.0			Same.	Grade "0" sand pack from 79.7' to 67.5'.
70	31		10 14 27 38	41	1.8	0.0			Same.	
950	32		18 32	87	1.8	0.0			Same.	
75										

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Site:
Crosman Corporation, East Bloomfield, NY

Well No. MW-10

Total Depth = 79.7 ft.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 in.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
		32		55 63	87	1.8	0.0			Same.	
		33		14 46 100/.3	146	1.2	0.0			Light brown fine SAND, some silt, trace clay.	2-inch diameter SCH 40 PVC, 0.010-inch slot well screen from 79.7' to 69.7'.
80	945	34		26 57 63 65	120	2.0	0.0			Total depth = 79.7 feet	
85	940										
90	935										
95	930										

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Date Start/Finish: 11/10/93 / 11/16/93
Drilling Company: Nothnagle Drilling
Driller's Name: N. Short
Drilling Method: Hollow Stem Auger
Auger Size : 4.25-in.
Rig Type: BK-81 Mobile Drill
Spoon Size: 2-in O.D.

PVC Casing Elev.: 1016.48 ft.
Borehole Depth: 156.0 ft.
Ground Surface Elev.: 1014.3 ft.

Geologist: Todd J. Farmen

Well No. MW-11

Site:
Crosman Corporation, East Bloomfield, NY

Client:
New Coleman Holdings, Inc.

DEPTH	ELEVATION	Sample Run Number	Sample Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
gs elevation 1014.3 ft.										GROUND SURFACE	Stainless steel protective casing installed with locking cap.
5	1010										2-inch diameter SCH 40 PVC riser from 138.0' below ground level to 2.2' above ground level.
10	1005										Cement bentonite grout from 134.0' to surface.
15	1000										

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:
No sampling from 0.0 to 70.0 feet due to proximity to MW-2. For subsurface information in this interval, see boring log MW-2 prepared by LaBella.

Water Levels

Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Well No. MW-11

Total Depth = 158.0 ft.

Site:
Crosman Corporation, East Bloomfield, NY

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
20	995										
25	990										
30	985										
35	980										

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

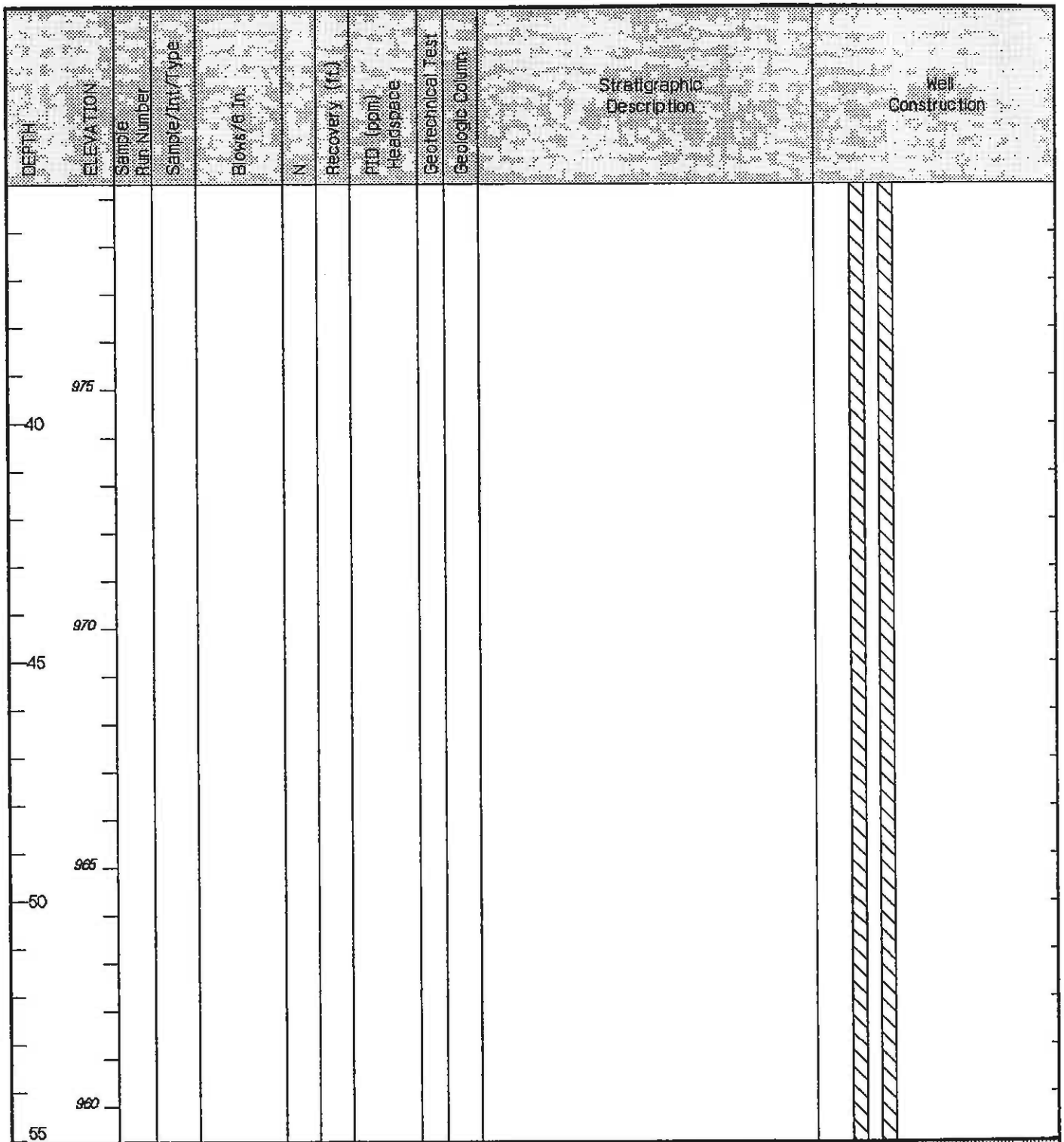
Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Site:
Crosman Corporation, East Bloomfield, NY

Well No. MW-11

Total Depth = 158.0 ft.



BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Project: 415.01

Script: CRO-well
Date: 08/23/94

Client:
New Coleman Holdings, Inc.

Well No. MW-11

Total Depth = 156.0 ft.

Site:
Crosman Corporation, East Bloomfield, NY

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
60	955										
65	950										
70	945	1		10 10 10 10	20	1.5	0.0			Light brown fine SAND, trace silt, loose to medium dense, wet.	
		2		7 7 12 18	19	1.5	0.0			Same.	
75	940	3		14 17	39	2.0	0.0			Brown fine to coarse SAND, trace silt, medium dense, wet.	

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Well No. MW-11

Total Depth = 158.0 ft.

Site:
Crosman Corporation, East Bloomfield, NY

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 in.	N	Recovery (ft)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
		3		22 28	39	2.0	0.0				
		4		14 44 70 76	114	2.0	0.0				
	935	5		32 100/.4	132	1.2	0.0				
80		6		72 100/.2	172	0.7	0.0			Brown SILT, some fine to coarse sand, little clay and gravel, wet.	
		7		100/.4	---	0.0	0.0			Gray SILT, trace fine gravel, trace clay, very dense, wet. (TILL)	
	930	8		30 32 48 50	80	0.5	0.0			Same.	
85		9		36 100/.4	136	0.0	0.0			Same.	
		10		62 100/.3	162	0.1	0.0			Same.	
	925	11		50 65 82 95	142	1.0	0.0			Same.	
90		12		40 66 100/.4	166	0.8	0.0			Same.	
	920	13		26 45	145	0.1	0.0			Same.	
95											

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Site:
Crosman Corporation, East Bloomfield, NY

Well No. MW-11

Total Depth = 158.0 ft.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 in.	N	Recovery (ft)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
		13		100/.4	145	0.1	0.0			Same.	
		14		35 60 100/.2	160	1.2	0.0			Same.	
	915	15		60 100/.4	160	0.3	0.0			Same.	
100		16		100/.4	---	0.2	0.0			Same.	
		17		50 100/.4	150	0.8	0.0			Same.	
	910	18		53 100/.2	153	0.6	0.0			Same.	
105		19		75 100/.2	175	0.3	0.0			Same.	
		20		73 100/.2	173	0.3	0.0			Gray. very fine SAND, some silt, trace fine gravel, trace clay, very dense, wet.	
	905	21		100/.3	---	0.1	0.0			Same.	
110		22		100/.4	---	0.0	0.0			Same.	
	900	23		82 100/.2	182	0.2	0.0			Same.	
115											

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Site:
Crosman Corporation, East Bloomfield, NY

Well No. MW-11

Total Depth = 158.0 ft.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
		23		82 100/.2	182	0.2	0.0				
		24		80 100/.4	180	0.5	0.0			Same.	
		25		84 100/.2	184	0.0	0.0			Same.	
120	895	26		82 100/.3	182	0.5	0.0			Same.	
		27		75 100/.4	175	0.5	0.0			Same.	
125	890	28		85 100/.2	185	0.3	0.0			Same.	
		29		53 100/.3	153	0.0	0.0			Same.	
		30		100/.4	---	0.2	0.0			Same.	
130	885	31		50 62 100/.2	162	0.4	0.0			Gray SILT, trace sand, trace fine gravel, very dense, wet. (Standard sampling begins at 130.0 feet) Same.	
135	880										

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

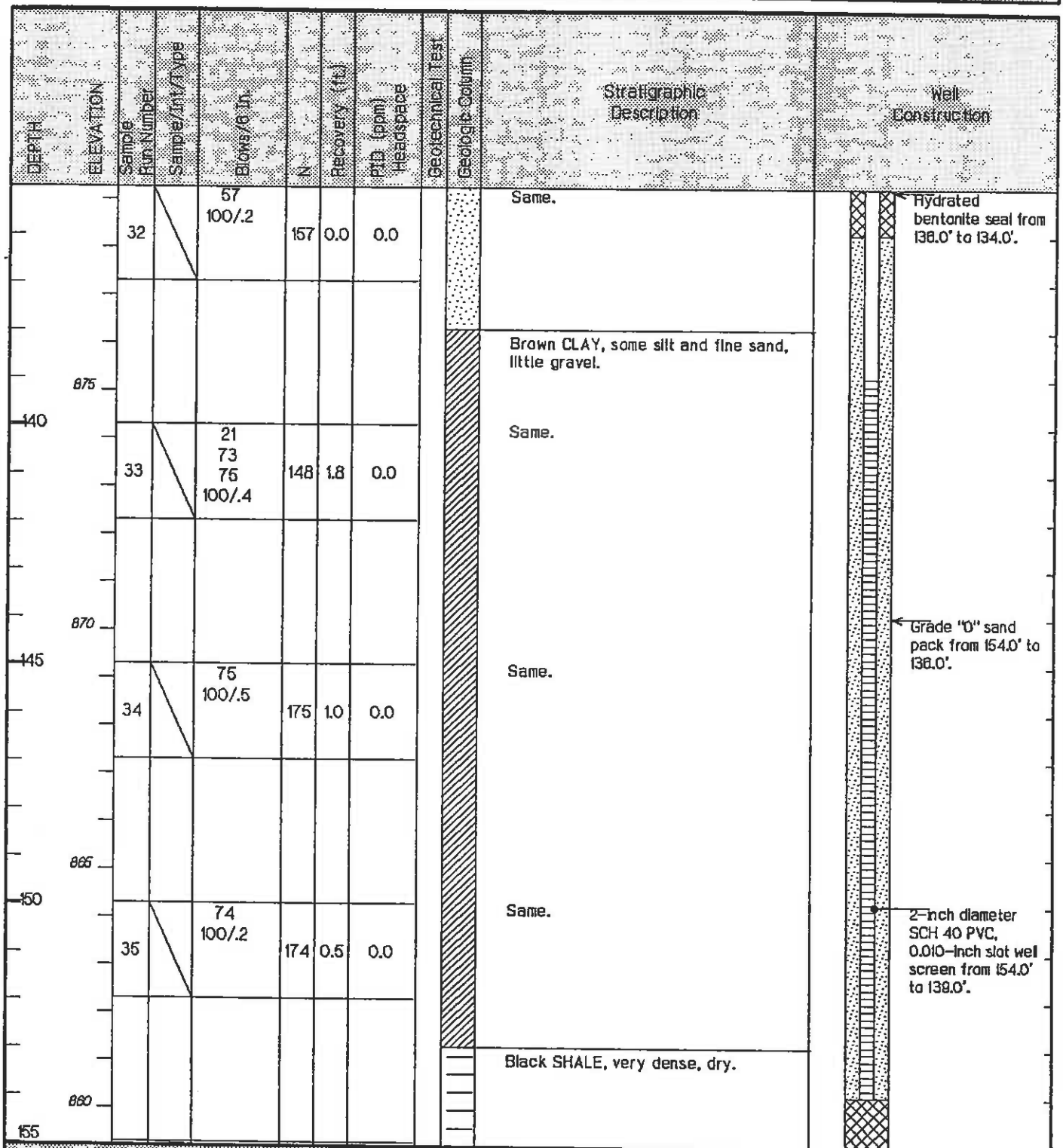
Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Site:
Crosman Corporation, East Bloomfield, NY

Well No. MW-11

Total Depth = 158.0 ft.



BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:
Top of rock at 153 feet.

Water Levels

Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Site:
Crosman Corporation, East Bloomfield, NY

Well No. MW-11

Total Depth = 158.0 ft.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
		36		87 150/.3	237	0.1	0.0			Total depth = 158.0 feet	Hydrated bentonite seal from 158.0' to 154.0'.
	855										
160											
	850										
165											
	845										
170											
	840										
175											

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Date Start/Finish: 10/6/93 / 12/6/93
Drilling Company: Nothnagle Drilling
Driller's Name: N. Short
Drilling Method: Hollow Stem Auger
Auger Size : 4.25-in.
Rig Type: BK-81 Mobile Drill
Spoon Size: 2-in O.D.-in.

PVC Casing Elev.: 981.84 ft.
Borehole Depth: 42.0 ft.
Ground Surface Elev.: 979.5 ft.

Geologist: Todd J. Farmen

Well No. MW-12

Site:
Crosman Corporation, East Bloomfield, NY

Client:
New Coleman Holdings, Inc.

DEPTH	ELEVATION	Sample/Run Number	Sample/Int/Type	Blows/6 in.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
gs elevation 979.5 ft.											Stainless steel protective casing installed with locking cap.
										GROUND SURFACE	
		1		1 1 1 2	2	1.0	0.0			Dark brown fine to medium SAND, trace gravel, some roots/grass, loose, moist.	
										Medium brown fine SAND, some clay, trace fine gravel, medium dense, moist.	2-inch diameter SCH 40 PVC riser from 29.5' below ground level to 2.3' above ground level.
	975										
5		2		4 8 10 16	18	1.8	0.0			Same.	
	970										Cement bentonite grout from 25.0' to surface.
10		3		14 26 27 17	53	0.9	0.0			Gray to brown fine SILT, trace fine gravel, some clay, medium dense, moist.	
	965										
15											

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Well No. MW-12

Total Depth = 42.0 ft.

Site:
Crosman Corporation, East Bloomfield, NY

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
		4		7 8 20 24	28	2.0	0.0			Gray to brown CLAY, little silt, loose to medium dense, moist.	
	960									Gray to brown fine to coarse SAND, some fine to coarse gravel, very dense, dry.	
20		5		21 21 100/.3	121	0.7	0.0			Same.	
										Groundwater encountered at 23 feet.	
	955										
25		6		10 38 40 42	78	1.0	0.0			Brown fine to coarse SAND, some gravel, trace silt and clay.	Hydrated bentonite seal from 27.0' to 25.0'.
	950										
30		7		10 10 19 28	29	1.0	0.0			Same.	2-inch diameter SCH 40 PVC, 0.010-inch slot well screen from 39.5' to 29.5'.
	945										
35											

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Site:
Crosman Corporation, East Bloomfield, NY

Well No. MW-12
Total Depth = 42.0 ft.

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 in.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
	8		11 11 12 14	23	2.0	0.0			Same.	
940									Gray to brown SILT, trace fine gravel, very dense, wet.	Grade "0" sand pack from 39.5' to 27.0'.
40	9		65 59 100/.4	159	1.3	0.0			Brown SILT, some clay and sand, trace gravel.	
									Total depth = 42.0 feet	Native collapse material from 42.0' to 39.5'.
935										
45										
930										
50										
925										
55										

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Date Start/Finish: 12/8/93 / 12/9/93
Drilling Company: Nothnagle Drilling
Driller's Name: N. Short
Drilling Method: Hollow Stem Auger
Auger Size : 4.25-in.
Rig Type: BK-81 Mobile Drill
Spoon Size: 2-in O.D.

PVC Casing Elev.: 996.97 ft.
Borehole Depth: 72.5 ft.
Ground Surface Elev.: 997.4 ft.

Geologist: Todd J. Farmen

Well No. MW-13

Site:
Crosman Corporation, East Bloomfield, NY

Client:
New Coleman Holdings, Inc.

DEPTH / ELEVATION	Sample Run Number	Sample Int/Type	Blows/6 in.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
gs elevation 997.4 ft.										Flush mount curb-box with bolted lid.
									GROUND SURFACE	Concrete from 0.5' to ground level.
995	1		4 3 2 7	5	1.3	0.0			Dark brown fine to medium SAND, trace fine gravel, trace roots/grass. trace silt, loose, moist.	Grade "0" sand drain from 3.0' to 0.5'.
5	2		4 4 6 8	10	1.3	0.0			Dark brown fine SAND, little clay, trace silt, trace fine gravel, loose, moist. Same.	2-inch diameter SCH 40 PVC riser from 57.0' below ground level to ground level.
990										Cement bentonite grout from 52.0' to 3.0'.
10	3		5 5 5 7	10	1.7	0.0			Dark reddish brown CLAY, little sand, trace silt, trace fine gravel, loose, moist.	
985										
15										

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Project: 415.01
Script: CRO-well
Date: 07/19/94

Client:
New Coleman Holdings, Inc

Site:
Crosman Corporation, East Bloomfield, NY

Well No. MW-13
Total Depth = 72.5 ft.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 in.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
		4		5 5 4 5	9	1.0	0.0			Dark brown fine SAND, trace clay, trace of fine to medium gravel, trace silt, loose, moist.	
	980										
20		5		15 17 11 11	28	1.0	0.0			Same.	
	975									Groundwater encountered at 25 feet.	
25		6		5 5 7 10	12	1.2	0.0			Brown fine SAND, some silt, trace gravel and clay, loose, wet.	
	970										
30		7		12 15 19 25	34	1.2	0.0			Same.	
	965										
35											

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Site:
Crosman Corporation, East Bloomfield, NY

Well No. MW-13

Total Depth = 72.5 ft.

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
	8		12 17 24 30	41	2.0	0.0			Same, except lighter brown.	
960										
40	9		13 16 24 32	40	1.0	0.0			Same.	
955										
45	10		17 32 89 100/.3	121	2.0	0.0			Same.	
950										
50	11		19 35 77 90	112	2.0	0.0			Same.	
945										
55										Hydrated bentonite seal from 54.0' to 52.0'.

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels		
Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Site:
Crosman Corporation, East Bloomfield, NY

Well No. MW-13

Total Depth = 72.5 ft.

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 in.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
	12		13 47 100/.5	147	1.6	0.0			Same.	Grade "D" sand pack from 72.0' to 54.0'.
940										
60	13		39 100/.4	134	2.0	0.0			Medium to light brown coarse SAND, very dense, wet.	
935										
65	14		16 16 29 69	45	2.0	0.0			Light brown fine SAND, trace fine gravel, very dense, wet.	
930										
70	15		26 27 52 58	79	2.0	0.0			Gray SILT, little sand, trace fine gravel, very dense, moist.	2-inch diameter SCH 40 PVC, 0.010-inch slot well screen from 72.0' to 57.0'.
									Gray SILT, trace fine gravel, very dense, dry. (TILL)	
925	16		100/.5	---	0.6	0.0			Brown SILT, some fine sand, little clay and gravel.	
75									Total depth = 72.5 feet	

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Date Start/Finish: 12/9/93 / 12/14/93 **Drilling Company:** Nothnagle Drilling **Driller's Name:** N. Short **Drilling Method:** Hollow Stem Auger **Auger Size :** 4.25-in. **Rig Type:** BK-81 Mobile Drill **Spoon Size:** 2-in O.D.	**PVC Casing Elev.:** 1021.66 ft. **Borehole Depth:** 92.0 ft. **Ground Surface Elev.:** 1019.8 ft. **Geologist:** Todd J. Farmen	**Well No.** MW-14 **Site:** Crosman Corporation, East Bloomfield, NY **Client:** New Coleman Holdings, Inc.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 in.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
gs elevation 1019.8 ft.											Stainless steel protective casing installed with locking cap.
										GROUND SURFACE	
		1		1 2 4 4	6	1.0	0.0			Dark brown fine to medium SAND, trace fine gravel, trace roots/grass, loose, moist.	
										Light brown fine to coarse SAND, some gravel, very dense, dry.	2-inch diameter SCH 40 PVC riser from 77.0' below ground level to 1.9' above ground level.
5	1015	2		34 52 49 58	101	2.0	0.0			Same.	
											Cement bentonite grout from 72.0' to surface.
10	1010	3		36 100/.4	136	1.0	0.0			Same.	
15	1005										

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Site:
Crosman Corporation, East Bloomfield, NY

Well No. MW-14

Total Depth = 92.0 ft.

DEPTH	ELEVATION	Sample Run Number	Sample/Art/Type	Blows/6 in.	N	Recovery (ft)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
										Same.	
		4		49 88 82 72	170	2.0	0.0				
20	1000										
		5		27 68 100/.4	168	1.1	0.0			Same.	
25	995										
		6		29 35 100/.3	136	1.2	0.0			Perched water zone at approximately 25.0 to 45.0 feet. Same.	
30	990										
		7		19 34 48 49	82	1.7	0.0			Same, except trace of black organic matter at 31.7 feet.	
35	985										

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Site:
Crosman Corporation, East Bloomfield, NY

Well No. MW-14

Total Depth = 92.0 ft.

DEPTH	ELEVATION	Sample Run Number	Sample Int./Type	Blows/6 in.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
		8		18 36 100/.3	136	1.0	0.0			Same.	
40	980										
		9		17 29 100/.4	129	1.2	0.0			Light brown fine SAND, trace fine gravel, trace clay, very dense, wet.	
45	975										
		10		17 19 49 52	68	1.4	0.0			Light brown fine to coarse SAND, dry.	
50	970										
		11		25 25 100/.4	125	1.4	0.0			Same.	
55	965									Groundwater encountered at 54 feet.	

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Site:
Crosman Corporation, East Bloomfield, NY

Well No. MW-14

Total Depth = 82.0 ft.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
		12		9 10 18 26	28	1.0	0.0			Brown fine SAND, trace silt, clay and gravel.	
60	960	13		20 25 26 29	51	2.0	0.0			Same.	
65	955	14		17 18 22 29	40	2.0	0.0			Light brown fine SAND, medium dense, wet.	
70	950	15		10 11 21 100/.3	32	2.0	0.0			Same.	
75	945										Hydrated bentonite seal from 74.0' to 72.0'.

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Site:
Crosman Corporation, East Bloomfield, NY

Well No. MW-14

Total Depth = 92.0 ft.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
		16		12 26 42 100/.2	68	2.0	0.0			Same.	Grade "0" sand pack from 92.0' to 74.0'.
80	940	17		20 20 20 44	40	2.0	0.0			Same.	
85	935	18		14 14 32 52	46	2.0	0.0			Gray fine SAND, some silt, medium dense, wet.	
90	930	19		19 74 100/.3	174	1.3	0.0			Brown fine SAND and SILT, trace gravel and clay, very dense, moist/dry. Total depth = 92.0 feet	2-inch diameter SCH 40 PVC, 0.010-inch slot well screen from 92.0' to 77.0'.
95	925										

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Date Start/Finish: 11/23/93 / 11/24/93 **Drilling Company:** Nothnagle Drilling **Driller's Name:** N. Short **Drilling Method:** Hollow Stem Auger **Auger Size :** 4.25-in. **Rig Type:** BK-81 Mobile Drill **Spoon Size:** 2-in O.D.	**PVC Casing Elev.:** 971.90 ft. **Borehole Depth:** 40.5 ft. **Ground Surface Elev.:** 972.1 ft. **Geologist:** Todd J. Farmen	**Well No.** MW-15 **Site:** Crosman Corporation, East Bloomfield, NY **Client:** New Coleman Holdings, Inc.

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
gs elevation 972.1 ft.										Flush mount curb-box with bolted lid. Concrete from 0.5' to ground level.
									GROUND SURFACE	
	1		2 2 2 3	4	1.0	0.0			Dark brown fine to medium SAND, some fine to medium gravel, some roots/grass, loose, moist.	
970									Dark to light brown fine to medium SAND, some fine to medium gravel, loose to medium dense, dry.	2-inch diameter SCH 40 PVC riser from 28.0' below ground level to ground level.
	2		3 13 23 33	36	1.1	0.0				
5	3		7 20 19 33	39	1.0	0.0				
	4		33 43 49 54	92	1.0	0.0			Light brown-gray fine to coarse GRAVEL, some fine to coarse sand, medium dense, dry.	
965	5		19 23 44 49	67	1.2	0.0			Same.	Cement bentonite grout from 21.5' to 0.5'.
10	6		14 27 29 30	56	0.7	0.0			Same.	
960	7		14 15 19 22	34	0.1	0.0			Same.	
	8		4 5	13	0.1	0.0			Groundwater encountered at 14 feet.	
15										

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Site:
Crosman Corporation, East Bloomfield, NY

Well No. MW-15

Total Depth = 40.5 ft.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 in.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
		8		8 10	13	0.1	0.0			Same.	
	955	9		18 18 19 26	37	2.0	0.0				
		10		17 23 28 29	51	1.0	0.0			Light brown-gray fine to medium SAND, some fine gravel, loose to medium dense, wet.	
20		11		20 20 24 26	44	1.0	0.0			Brown GRAVEL, some fine to coarse sand, little silt, trace clay.	
	950	12		19 20 33 34	53	0.8	0.0			Same.	Hydrated bentonite seal from 23.5' to 21.5'.
25		13		40 42 100/.4	142	1.0	0.0			Same.	
	945	14		20 25 49 50	74	1.0	0.0			Gray, fine SAND, some fine to medium gravel, very dense, wet.	Grade "0" sand pack from 38.0' to 23.5'.
		15		20 27 35 42	62	1.0	0.0			Same.	
30		16		50 45 45 52	90	1.0	0.0			Same.	
	940	17		25 28 44 45	72	1.0	0.0			Gray fine SILT, trace sand, some fine gravel, very dense, wet. (TILL)	
35		18		20 20	47	1.0	0.0				

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Project: 415.01

Script: CRO-well
Date: 08/23/94

Client:
New Coleman Holdings, Inc.

Site:
Crosman Corporation, East Bloomfield, NY

Well No. MW-15
Total Depth = 40.5 ft.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 in.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
		18		27 31	47	1.0	0.0				2-inch diameter SCH 40 PVC, 0.010-inch slot well screen from 38.0' to 28.0'.
	935	19		25 25 27 29	52	1.2	0.0			Brown fine to coarse SAND, some silt, little gravel and clay, dry.	
		20		25 37 44 45	81	1.0	0.0			Gray fine SAND, some silt, some fine to medium gravel, very dense, dry.	
40		21		100/.4	---	0.0	0.0			Total depth = 40.5 feet	Hydrated bentonite seal from 40.0' to 38.0'.
	930										
45											
	925										
50											
	920										
55											

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Date Start/Finish: 11/18/93 / 11/18/93
Drilling Company: Nothnagle Drilling
Driller's Name: N. Short
Drilling Method: Hollow Stem Auger
Auger Size : 4.25-in.
Rig Type: BK-81 Mobile Drill
Spoon Size: 2-in O.D.

PVC Casing Elev.: 1026.88 ft.
Borehole Depth: 94.0 ft.
Ground Surface Elev.: 1024.7 ft.

Geologist: Todd J. Farmen

Well No. MW-16

Site:
Crosman Corporation, East Bloomfield, NY

Client:
New Coleman Holdings, Inc.

DEPTH / ELEVATION	Sample Rin Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
gs elevation 1024.7 ft.										Stainless steel protective casing installed with locking cap.
									GROUND SURFACE	
	1		2 3 5 2	8	1.0	0.0			Dark brown fine to coarse SAND, some fine to medium gravel, some roots/grass, loose, damp.	
									Dark brown fine to medium SAND, some fine to medium gravel, loose, dry.	2-inch diameter SCH 40 PVC riser from 76.3' below ground level to 2.2' above ground level.
1020 5	2		3 5 17 12	12	1.0	0.0			Same.	
1015 10	3		8 31 35 48	66	1.3	0.0			Same, except coarser gravel.	Cement bentonite grout from 70.8' to surface.
1010 15									Light brown fine SAND, trace fine gravel, loose, dry.	

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Project: 415.01
Script: CRO-well
Date: 07/19/94

Client:
New Coleman Holdings, Inc.

Site:
Crosman Corporation, East Bloomfield, NY

Well No. MW-16
Total Depth = 84.0 ft.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
		4		5 5 9 12	14	1.8	0.0				
20	1005	5		12 43 45 56	88	1.3	0.0			Same. Rock fragment at 21 feet.	
25	1000	6		10 100/.4	110	1.0	0.0			Same.	
30	995	7		15 53 100/.3	153	1.1	0.0			Same.	
35	990									Light brown fine SAND, medium dense, dry.	

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Site:
Crosman Corporation, East Bloomfield, NY

Well No. MW-16

Total Depth = 84.0 ft.

DEPTH	ELEVATION	Sample Run Number	Sample/Int./Type	Blows/6 in.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
		8		20 30 46 55	76	1.5	0.0				
40	985	9		20 20 42 54	62	1.5	0.0			Same.	
45	980	10		15 19 35 36	54	1.2	0.0			Same.	
50	975	11		25 25 29 33	54	1.5	0.0			Same.	
55	970									Groundwater encountered at 53 feet.	

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Project: 415.01

Script: CRO-well
Date: 08/23/94

Client:
New Coleman Holdings, Inc.

Site:
Crosman Corporation, East Bloomfield, NY

Well No. MW-18

Total Depth = 94.0 ft.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
		12		20 20 25 25	45	1.7	0.0			Same.	
60	965	13		18 19 23 25	42	2.0	0.0			Same.	
65	960	14		19 21 25 27	46	1.5	0.0			Same.	
70	955	15		10 11 11 12	22	2.0	0.0			Same.	Hydrated bentonite seal from 72.8' to 70.8'.
75	950										

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Client: New Coleman Holdings, Inc.

Site: Crosman Corporation, East Bloomfield, NY

Well No. MW-16

Total Depth = 84.0 ft.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
		16		10 10 10 10	20	2.0	0.0			Same.	
	945										
80		17		15 17 17 19	34	2.0	0.0			Same.	
	940										
85		18		18 20 18 23	38	2.0	0.0			Same.	Grade "0" sand pack from 81.3' to 72.8'.
	935									Light to dark brown coarse SAND, trace fine gravel, very dense, wet.	
90		19		77 150/.4	227	1.0	0.0			Gray fine SILT, trace fine gravel, very dense, wet. (TILL)	2-inch diameter SCH 40 PVC, 0.010-inch slot well screen from 81.3' to 78.3'.
		20		25 36 49 120/.4	85	1.0	0.0				
										Total depth = 84.0 feet	
95	930										

BLASLAND, BOUCK & LEE, ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Date Start/Finish: 11/7-8/94 /
Drilling Company: Nothnagle Drilling
Driller's Name: Neal Short
Drilling Method: Hollow Stem Auger
Auger Size : I.D.= 4.25-in.
Rig Type: CME 75
Spoon Size: 2

PVC Casing Elev.: 1024.4 ft.
Borehole Depth: 74 ft.
Ground Surface Elev.: 1024.4 ft.

Geologist: Michael R. Arlauckas

Well No. MW-17

Site:
Crosman Corp., East Bloomfield, N.Y.

Client:
New Coleman Holdings, Inc.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 in.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
gs elevation 1024.4 ft.											Flush mount curb-box with bolt-on lid
										GROUND SURFACE	Concrete pad from surface to 1.0'
		1		1 2 6 7	8	1.3	1.3			Topsoil Dark brown SILT, little clay and gravel trace fine sand, rootlets, loose, damp	
		2		3 3 4 4	7	1.6	5.1			Dark brown, fine SAND, little silt, trace gravel, loose, damp	Grade "0" sand drain from 1.0' to 3.0'
5	1020	3		3 8 14 22	22	1.6	8.4			Dark brown fine SAND and GRAVEL, trace silt, dense, loose	
		4		23 30 21 14	51	1.5	6.5				
		5		7 13 15 15	28	1.2	4.2			Brown fine to medium SAND, little fine gravel, dense, damp	2-inch diameter SCH 40 PVC riser from surface to 51.9' below ground level
10	1015	6		12 15 17 23	32	1.7	4.3			Dark brown medium to coarse Sand, very dense, dry	
		7		8 17 37 39	54	1.8	10.1			Brown SILT, little fine to medium gravel, trace clay, very dense, dry	
15	1010	8		10 29	72	2.0	23.7			Light brown fine SAND, and fine to medium GRAVEL, trace silt and clay, very dense	

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Project: 415.01

Script: CRO-well
Date: 07/18/95

Client:
New Coleman Holdings, Inc.

Site:
Crosman Corp., East Bloomfield, N.Y.

Well No. MW-17

Total Depth = 74 ft.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
		8		33 54	72	2.0	23.7				
		9		37 57 100/.3	157	1.6	53.2				
		10		63 100/.2	163	0.5	82.1			(rock fragment wedged in slit spoon tip)	
	1005										
20		11		15 44 45 66	89	2.0	24.8			Light brown very fine to fine SAND, trace clay, very dense, dry	Cement bentonite grout from surface to 47.7'
		12		66 68 47 49	115	2.0	25.1			Dark brown, fine to medium SAND, trace silt, very dense, dry	
	1000										
25		13		9 14 17 16	31	1.7	25.6			Brown, fine SAND, trace silt, very dense, dry	
		14		14 16 18 18	34	2.0	30.6			Wet at 27' Brown fine SAND, little clay, trace grades to medium gravel, trace silt, dense, damp	
		15		5 9 15 16	24	2.0	22.7				
	995										
30		16		9 18 44 28	62	1.8	27.8				
		17		29 32 100/.2	132	2.0	28.1				
	990										
35		18		10 25	107	1.5	49.3			Brown fine SAND, little silt, little clay, moist	

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Site:
Crosman Corp., East Bloomfield, N.Y.

Well No. MW-17

Total Depth = 74 ft.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
		18		82 58	107	1.5	49.3			Gray brown fine SAND, little silt, trace clay, very dense, moist	
		19		56 46 31 57	77	1.4	31.3				
		20		34 59 100/.4	159	1.4	37.8			Brown fine SAND and GRAVEL, trace silt and clay, very dense, damp	
40	985										
		21		94 50/0	144	0.5	31.3			Brown fine to medium SAND, some gravel, trace silt and clay, very dense, damp	
		22		59 82 100/.2	182	0.5	29.9				
45	980	23		39 45 49 66	94	1.6	52.3			Lightbrown, fine SAND, trace silt, very dense, dry	
		24		28 41 46 49	87	2.0	58.9				
		25		18	57	1.4	56.1				
50	975	26		11 26 29 33	55	2.0	59.1				
		27		16 22 29 35	51	2.0	88.6				
55	970	28		16 30	65	2.0	97.3			(moist to wet)	

Hydrated bentonite seal from 47.7' to 49.7'

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Site:
Crosman Corp., East Bloomfield, N.Y.

Well No. MW-17

Total Depth = 74 ft.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
		28		35 40	65	2.0	97.3				
		29		21 35 54 55	89	2.0	64.8			Brown fine SAND and SILT, trace clay, very dense, wet	
	965	30		35 49 52 60	101	1.6	15.2				2-inch diameter SCH 40 PVC 0.010-inch slot well screen from 51.9' to 71.9'
60		31		32 51 55 59	106	1.8	16.4				
		32		18 29 37 49	66	2.0	22.6			Dark gray fine SAND, trace silt, very dense, wet	
	960	33		10	40	2.0	62.3				
65		34		6 15 24 30	39	2.0	29.6			Gray fine SAND and SILT, trace gravel and clay, very dense, wet	Grade "0" sand pack from 49.7' to 76.0'
	955	35		18 19 24 30	43	2.0	4.8			Gray SILT, trace fine sand and gravel and clay, very dense, moist	
70		36		17 36 36 75	72	2.0	5.1				
		37		15 34 63 59	97	2.0	2.3				
	950	38			110	2.0	4.1			Total depth = 74.0'	Backfill with sand
75											

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Project: 415.01

Script: CRO-well
Date: 07/18/95

Date Start/Finish: 10/20-21/94 /
Drilling Company: Nothnagle Drilling
Driller's Name: Neal Short
Drilling Method: Hollow Stem Auger
Auger Size : I.D.= 4.25-in.
Rig Type: CME 75
Spoon Size: 2

PVC Casing Elev.: 1002.9 ft.
Borehole Depth: 80 ft.
Ground Surface Elev.: 1001.1 ft.

Geologist: Michael R. Arlauckas

Well No. MW-18

Site:
Crosman Corp., East Bloomfield, N.Y.

Client:
New Coleman Holdings, Inc.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
gs elevation 1001.1 ft.										**GROUND SURFACE**	Stainless steel protective casing equipped with a locking cap
	1000	1		2 3 4 4	7	0.6				Dark brown, SILT, some fine sand, trace clay, rootlets, loose, damp	
		2		4 4 7 7	11	0.9				Dark brown to medium brown, SILT, little fine, trace gravel, trace clay, rootlets, medium dense, damp	Concrete pad from surface to 1.0'
5		3		3 7 11 13	18	0					2-inch diameter SCH 40 PVC riser from 2.5' above ground level to 59.6' below ground level
	995	4		25 25 18 15	43	1.0				Light brown, SILT, little clay, trace gravel, very dense, damp	
		5		2 7 13 8	20	0.9				Light brown, SILT, some clay, trace very fine to fine sand, trace gravel, dense, damp	
10											Cement bentonite grout from surface to 55.4'
	990	6		5 9 13	20	1.3				Light brown, fine SAND, little clay, trace silt, dense, damp, (interbedded with silt)	
		7		12 18 30 33	48	1.4					
15		8		12 32	87	0.7				Light brown, GRAVEL, very dense, dry	

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Site:
Crosman Corp., East Bloomfield, N.Y.

Well No. MW-18

Total Depth = 80 ft.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 in.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
		8		55 46	87	0.7					
	985	9		37 57 100/4 –	157	1.0				Brown SILT, some gravel, trace fine sand, very dense, dry to damp	
		10		9 24 38 49	62	1.7					
20											
	980	11		13 69 100/.2 –	169	1.2				Light brown, SILT, little gravel, trace very fine sand, very dense, damp	
		12		23 52 64 100/.2	116	1.7				Tan, fine SAND, trace gravel and silt and clay	
25		13		16 26 28 28	54	0.9				Gray to brown, SILT, and fine SAND, trace gravel. trace clay, very dense, damp	
	975	14		48 51 100/.4 –	160	1.4					
		15		32 52 53 100/.3	105	1.9				Light brown, fine SAND, little fine to medium gravel, little silt, trace clay, very dense, damp to wet	
30											
	970	16		62 90 100/.3 –	190	1.5				Brown SILT, trace gravel, trace very fine sand, trace clay, very dense, damp	
		17		37 100/.4	137	0.8				Dark gray SILT, some fine sand, little fine to medium gravel, trace clay, very dense, damp	
35		18		31 100/.2	131	0.4				Dark gray GRAVEL, little sand, trace silt and clay, very dense, wet	

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Site:
Crosman Corp., East Bloomfield, N.Y.

Well No. MW-18

Total Depth = 80 ft.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
		18		31 100/.2	131	0.4					
	965	19		48 100/.4 – –	148	0.9				Gray SILT, trace gravel and fine sand and clay, very dense, wet	
		20		100/.2 – – –	100	0.2				Gray fine SAND, little silt, trace gravel and clay, very dense, wet	
40											
	960	21		10 36 45 78	111	1.0				Gray SILT, little fine to medium gravel, trace clay, very dense, dry	
		22		29 68 100/.4 –	168	1.2				Light gray fine SAND, little fine to medium gravel, trace silt, very dense, wet	
45		23		100/.2 – – –	100	0.2				Gray fine to medium GRAVEL, trace fine sand and trace silt, very dense, wet	
	955	24		35 64 51 43	115	1.1				Tan to gray, fine SAND, little fine to medium, trace silt	
		25		27 48 100/.4 –	148	1.2				Gray SILT, little medium gravel, trace clay, very dense, wet	
50											
	950	26		– – – –	0	0					
		27		141 100/.4 – –	241	0.6					
		28		18 37	85	1.6				Dark brown to gray SILT, some fine sand, little fine to medium gravel, trace clay, very dense, damp	
55											

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Well No. MW-18

Total Depth = 80 ft.

Site:
Crosman Corp., East Bloomfield, N.Y.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 in.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
		28		48 49	85	1.6					
	945										
		29		37 63 79 79	142	1.7					
		30		11 46 100/.4	146	1.3					
60											
	940	31		49 56 74 82	130	1.1					
		32		28 35 42 60	77	1.9				Dark brown to gray, fine SAND, some silt, little fine to medium gravel, very dense, damp	
65		33		16 34 45 51	79	1.9					
	935										
		34		41 43 70 96	113	1.9					
		35		6 17 54 64	71	2.0					
70										(wet)	
	930	36		27 36 20 72	56	2.0					
		37		31 27 29 35	56	1.9				Dark brown to gray fine SAND and SILT, trace fine to medium gravel, trace clay, very dense, damp to wet	
75		38			119	2.0					

Hydrated bentonite seal from 55.4' to 57.6'

Grade "0" sand pack from 57.6' to 80.0'

2-inch diameter SCH 40 PVC 0.010-inch slot well screen from 59.6' to 74.6'

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Site:
Crosman Corp., East Bloomfield, N.Y.

Well No. MW-18

Total Depth = 80 ft.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
		38			119	2.0				Dark brown SILT, little fine to medium gravel, trace very fine sand, trace clay, very dense, dry	Backfill with sand
	925	39		28 25 43 58	68	0.6					
		40		25 35 52 57	87	0.9					
80										Total depth = 80.0'	
	920										
85											
	915										
90											
	910										
95											

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Project: 415.01

Script: CRO-well
Date: 07/18/95

Date Start/Finish: 10/19/94 / 10/19/94
Drilling Company: Nothnagle Drilling
Driller's Name: Neal Short
Drilling Method: Hollow Stem Auger
Auger Size : 4.25-in.
Rig Type: CME 75
Spoon Size: 2

PVC Casing Elev.: 979.81 ft.
Borehole Depth: 40.1 ft.
Ground Surface Elev.: 977.40 ft.

Geologist: Michael R. Arlauckas

Well No. MW-19
Site:
Crosman Corp., East Bloomfield, N.Y.
Client:
New Coleman Holding Inc.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
	gs elevation 977.40 ft.									GROUND SURFACE	Stainless steel protective casing installed with locking cap
		1		2 2 2 2	4	1.4	1.4			Dark Brown SILT, trace of sand, trace clay, rootlets, very loose, dry	
	975	2		1 2 2 2	4	.95	1.7			Brown to orange brown fine to medium SAND, little to trace silt, trace gravel, very loose, dry	
5		3		1 1 1 1	2	.8	2.1			Same, except rootlets	2-inch diameter SCH 40 PVC riser from 2.4' above ground level to 24.0' below groud level
	970	4		1 2 3 4	5	.9	1.5			Same, except light brown (grading), loose dense	
		5		1 5 9 9	14	1.1	2.7			Same, except medium dense	
10		6		2 6 8 13	14	1.3	2.8			Same, except no gravel	Cement bentonite grout from surface to 19.0'
	965	7		12 16 16 7	32	1.6	3.4			Light tan very fine to fine SAND, trace gravel, trace silt, very dense, dry	
15		8		6 11	26	1.8	3.3			Same, except trace clay, no gravel	

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth
12-6-94		

Client:
New Coleman Holding Inc.

Site:
Crosman Corp., East Bloomfield, N.Y.

Well No. MW-19
Total Depth = 40.1 ft.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
		8		15 18	26	1.8	3.3			Gray medium to coarse SAND fine to medium gravel, dense, dry	
	960	9		14 14 14 13	28	1.5	3.8			Light brown to gray fine to coarse gravel	
										Light brown to gray SILT, trace gravel, trace clay, dense, moist to wet	
		10		12 26 44 34	70	1.3	2.8			Tan very fine to fine SAND, little to and fine to coarse gravel, trace silt, trace clay, very dense, damp to dry	
20		11		11 23 26 27	49	1.4	3.7			Tan SILT, some to and fine to coarse gravel, trace to little clay, very dense, wet to damp	Hydrated bentonite seal seal from 19.0' to 21.0'
	955	12		5 11 12 19	23	2.0	3.1			Same	
		13		4 10 23 28	33	1.3	3.6			Dark gray-brown CLAY, little fine to medium gravel, trace silt, dense, wet to damp	
25										Same, except very dense	
		14		23 24 24 27	48	1.6	3.4			Same , except dry	
	950									Same	Grade "0" sand pack from 21.0' to 40.0'
		15		8 17 17 19	34	2.0	3.5			Sand lense	
30										Light tan to dark gray SILT, trace clay, very dense, moist	
		16		6 9 11 13	20	2.0				Dark gray vey fine to fine SAND, trace clay, trace silt, dense, wet	
	945									Same	2-inch diameter SCH 40 PVC 0.010-inch slot well screen from 24.0' to 39.0'
		17		5 5 13 24	18	2.0				Dark gray SILT, trace to some very fine to fine sand, trace gravel, trace clay, dense, wet	
35		18		11 11	24	2.0					

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth
12-6-94		

Project: 415.01

Script: CRO-well
Date: 07/18/95

Client:
New Coleman Holding Inc.

Site:
Crosman Corp., East Bloomfield, N.Y.

Well No. MW-19

Total Depth = 40.1 ft.

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
	18		13 19	24	2.0				Same	
940	19		5 12 13 14	25	1.7				Dark gray very fine to fine SAND, little to some silt, trace gravel, trace clay, dense, wet Same	
40	20		22 48 106/.2	154	154				Dark gray SILT, some gravel, little sand, trace clay, very dense, dry Bottom of boring at 40.1'	Backfill
935										
45										
930										
50										
925										
55										

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth
12-6-94		

Date Start/Finish: 10/25/94 / 10/26/94
Drilling Company: Nothnagle Drilling
Driller's Name: Neal Short
Drilling Method: Hollow Stem Auger
Bit Size: **Auger Size :** I.D.= 4.25-in.
Rig Type: CME-75
Spoon Size: 2-in. O. D.
Hammer Weight: 140-lb
Height of Fall: 30-in.

Northing:
Easting:
Corehole Depth: 68.0 ft.
Borehole Depth: ft.
Ground Surface Elev.: 1024.5 ft.
Geologist: Michael R. Arlauckas

Piezometer No. PZ-1
Site:
Crosman Corp., East Bloomfield, N.Y.
Client:
New Coleman Holding, Inc.

DEPTH ELEVATION	Sample	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	HNU (ppm) Headspace	From/To	% Recovery	% RQD	Average rate (min./FT.)	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
gs elevation 1024.5 ft.														
													GROUND SURFACE	Flush mount curb-box with bolt-on lid
													ASPHALT	Concrete from ground level to 0.2 below ground level
	1		24 15 17	32	0.8	1.9							Brown, fine SAND, fine to medium gravel, trace silt and clay, very dense, dry	Grade "0" sand drain from 0.5' to 2.0' below ground level
5	2		15 16 16 19	32	1.8	0.0							Light brown to dark brown, fine SAND and fine to medium GRAVEL, little silt, trace clay, very dense, dry	1-inch diameter SCH 40 PVC riser from 0.5' ti 49.6' below ground level
10	3		18 29 46 55	75	1.8	3.8							Light brown, fine SAND, some silt, fine to medium gravel, trace clay, very dense, damp	
15														

BLASLAND, BOUCK & LEE, INC.
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Project: 415.01 Script: piezom

Client:
New Coleman Holding, Inc.

Site:
Crosman Corp., East Bloomfield, N.Y.

Piezometer No. PZ-1

Total Depth = 88.0 ft.

DEPTH ELEVATION	Sample	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	HNU (ppm) Headspace	From/To	% Recovery	% RQD	Average rate (min./FT.)	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
	4		20 27 28 32	55	1.5	8.4								
20	5		16 29 65 73	94	1.4	0.6							Brown, fine SAND and SILT, little gravel, trace clay, very dense, damp	Cement bentonite grout from 1.5' below ground level to 45.5' below ground level
25	6		35 71 56 39	137	1.8	1.8							Dark gray to brown, fine SAND, some fine to medium gravel, trace silt and clay, very dense, dry	
30	7		14 41 37 72	78	1.4	6.7							Light brown, fine SAND, trace silt, very dense, damp	
35														

BLASLAND, BOUCK & LEE, INC.
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Client:
New Coleman Holding, Inc.

Site:
Crosman Corp., East Bloomfield, N.Y.

Piezometer No. PZ-1

Total Depth = 68.0 ft.

DEPTH ELEVATION	Sample	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	HNU (ppm) Headspace	From/To	% Recovery	% RQD	Average rate (min./FT.)	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
	8		12 20 24 29	44	2.0	3.7							Tan very fine to fine SAND, trace silt, very dense, damp	
40	9		18 40 46 49	86	1.7	6.1								
45	10		12 25 30 30	55	1.9	4.9								Hydrated bentonite seal from 47.5' to 49.6'
50	11		17 29 40 43	69	1.7	22.3								Grade "0" sand pack from 49.6' to 68.0'
55														

BLASLAND, BOUCK & LEE, INC.
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Client:
New Coleman Holding, Inc.

Site:
Crosman Corp., East Bloomfield, N.Y.

Piezometer No. PZ-1

Total Depth = 68.0 ft.

DEPTH ELEVATION	Sample	Sample/Int/Type	Blows/6 in.	N	Recovery (ft.)	HNU (ppm) Headspace	From/To	% Recovery	% RQD	Average rate (min./FT.)	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
	12		5 7 13 13	20	1.7	25.0							Brown, fine SAND, trace silt , dense, wet	
60	13		6 15 25 31	40	2.0	111								1-inch diameter SCH 40 PVC 0.010-inch slot well screen from 49.6' to 64.6'
65	14		9 18 28 32	46	2.0	60.7							Dark brown, fine SAND, some silt, trace clay, very dense, wet	Backfill with sand
70													Total depth = 68.0'	
75														

BLASLAND, BOUCK & LEE, INC.
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Date Start/Finish: 10/27/94 / 10/27/94
Drilling Company: Nothnagle Drilling
Driller's Name: Neal Short
Drilling Method: Hollow Stem Auger
Bit Size: **Auger Size :** I.D.= 4.25-in.
Rig Type: CME-75
Spoon Size: 2-in. O. D.
Hammer Weight: 140-lb
Height of Fall: 30-in.

Northing:
Easting:

Corehole Depth: 62.0 ft.
Borehole Depth: ft.
Ground Surface Elev.: 1022.9 ft.

Geologist: Michael R. Arlauckas

Piezometer No. PZ-2

Site:
Crosman Corp., East Bloomfield, N.Y.

Client:
New Coleman Holding, Inc.

DEPTH ELEVATION	Sample	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	HNU (ppm) Headspace	From/To	% Recovery	% RQD	Average rate (min./FT.)	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
gs elevation 1022.9 ft.														
													GROUND SURFACE	Stainless steel protective casing equipped with a locking cap
	1		2 8 5 5	13	1.0	0.5							ASPHALT Dark brown SILT, some fine sand, trace fine gravel and clay, rootlets, medium dense, damp	Cement from ground level to 1.0' below ground level
5	2		1 3 8 8	11	1.2	1.2							Brown SILT and CLAY, trace fine gravel, medium dense, damp	
10	3		4 8 9 13	17	1.8	1.7							Light brown, fine SAND, some silt and clay, trace gravel dense, damp (sand decreases as silt increases through spoon)	2-inch diameter SCH 40 PVC riser from 2.0' above ground level to 52.5' below ground level
15														

BLASLAND, BOUCK & LEE, INC.
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Client:
New Coleman Holding, Inc.

Site:
Crosman Corp., East Bloomfield, N.Y.

Piezometer No. PZ-2

Total Depth = 62.0 ft.

DEPTH ELEVATION	Sample	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	HNU (ppm) Headspace	From/To	% Recovery	% RQD	Average rate (min./FT.)	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
	4		14 27 29 54	56	2.0	1.8							Light brown, fine SAND, some fine gravel, little silt, trace clay, very dense, damp to dry	
20	5		8 23 37 39	60	1.6	7.6							Brown, fine to medium SAND, some fine to coarse gravel, trace silt and clay, very dense, damp	Cement bentonite grout from ground level to 48.5' below ground level
25	6		32 48 100/.3	148	1.4	8.0							Brown to gray, fine SAND, some gravel, trace silt and clay, very dense, damp	
30	7		11 26 34 39	60	1.8	4.4							Light brown fine SAND, trace silt, very dense, damp	
35														

BLASLAND, BOUCK & LEE, INC.
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Client:
New Coleman Holding, Inc.

Site:
Crosman Corp., East Bloomfield, N.Y.

Piezometer No. PZ-2

Total Depth = 62.0 ft.

DEPTH ELEVATION	Sample	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	HNU (ppm) Headspace	From/To	% Recovery	% RQD	Average rate (min./FT.)	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
	8		11 22 39 54	61	1.7	3.8								
40	9		19 32 39 44	71	1.6	3.5								
45	10		19 39 45 100/.1	84	1.5	3.7							Light brown, fine SAND, trace silt, very dense, damp	
50	11		29 38 47 50	85	1.9	25.7							(moist)	Hydrated bentonite seal from 48.5' to 50.6' Grade "0" sand pack from 50.6' to 63.0'
55														

BLASLAND, BOUCK & LEE, INC.
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Client:
New Coleman Holding, Inc.

Site:
Crosman Corp., East Bloomfield, N.Y.

Piezometer No. PZ-2

Total Depth = 62.0 ft.

DEPTH ELEVATION	Sample	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	HNU (ppm) Headspace	From/To	% Recovery	% RQD	Average rate (min./FT.)	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
	12		21 28 28 29	56	2.0	181								
60	13		8 18 21 27	39	2.0	82.4							Brown, fine SAND, little silt, very dense, wet Total depth = 62.0'	2-inch diamter SCH 40 PVC 0.010-inch slot well screen from 52.5' to 62.5' Backfill with sand
65														
70														
75														

BLASLAND, BOUCK & LEE, INC.
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Project: 415.01 Script: piezom

Date Start/Finish: 10/17-18/94 /
Drilling Company: Nothnagle Drilling
Driller's Name: Neal Short
Drilling Method: Hollow Stem Auger
Auger Size : I.D.= 10.25-in.
Rig Type: CME 75
Spoon Size: 2

PVC Casing Elev.: 1024.1 ft.
Borehole Depth: 84.5 ft.
Ground Surface Elev.: 1026.1 ft.

Geologist: Michael R. Arlauckas

Well No. IRM-1

Site:
Crosman Corp., East Bloomfield, N.Y.

Client:
New Coleman Holdings, Inc.

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
gs elevation 1026.1 ft.									**GROUND SURFACE**	
1025	1		4 4 3 0	7	0.9	3.9			Brown fine to medium SAND, some gravel, little silt, trace clay, loose, damp	
	2		4 4 6 6	10	0.9	6.1			Grades to fine to medium SAND and GRAVEL	
5	3		2 2 4 6	6	1.1	5.5				8-inch diameter SCH 40 PVC riser from 0.5' above ground level to 39.2' below ground level
1020	4		4 5 4 4	9	0.3	2.9				
	5		1 5 21 30	26	1.5	10.7				
10	6		25 31 56 57	87	1.6	7.4			Brown fine to medium SAND, some gravel and silt, trace clay, very dense, dry	Cement bentonite grout from surface to 33.9'
1015	7		41 27 47 35	74	1.6	10.5			Light to dark brown fine to medium SAND, and medium to coarse gravel, trace silt, and clay, very dense, damp	
15	8		16 25	67	1.6	8.0				

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Site:
Crosman Corp., East Bloomfield, N.Y.

Well No. IRM-1

Total Depth = 84.5 ft.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
		8		42 37	67	1.6	8.0				
	1010	9		35 35 42 27	79	1.8	9.1				
		10		15 22 47 83	69	1.9	13.4			Brown to gray medium to coarse GRAVEL, some medium to coarse sand, trace silt, very dense, damp to dry	
20											
	1005	11		10 100/.2	110	0.6	10.7				
		12		26 74 100/.4 –	174	1.2	10.0				
25		13		34 62 56 100/.2	118	1.4	78.7			Brown to gray, grades to coarse GRAVEL as rock fragments, little fine to coarse sand, trace silt and clay, very dense, dry	
	1000	14		74 100/.2	174	0.6	29.2				
		15		16 43 100/.4 –	143	1.2	22.8				
30											
	995	16		19 39 63 65	102	1.7	28.8				
		17		85 100/.1 – –	185	0.6	23.1				
35		18		21 32	89	1.8	12.3			Light brown fine SAND, trace silt, very dense, dry	

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Site:
Crosman Corp., East Bloomfield, N.Y.

Well No. IRM-1

Total Depth = 84.5 ft.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
		18		57 58	89	1.8	12.3				
	990										
		19		24 51 54 75	105	1.8	12.8				
		20		16 39 57 68	96	1.6	19.1				
40											
	985	21		11 28 39 41	67	1.8	23.8				
		22		13 35 31 43	72	1.8	17.5				
45		23		17 29 53 62	82	1.9	12.3			Light brown fine SAND, trace silt, very dense, dry	
	980										
		24		20 47 63 66	110	2.0	12.0				
		25		9 31 42 49	73	1.9	25.2				
50											
	975	26		14 29 35 39	64	2.0	29.4				
		27		10 19 23 32	42	2.0	34.3				
		28		9 18	50	2.0	47.0			Wet at 54'	
55											

Hydrated bentonite seal from 33.9' to 36.1'

Grade "0" sand pack from 36.1' to 84.2'

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

Site:
Crosman Corp., East Bloomfield, N.Y.

Well No. IRM-1

Total Depth = 84.5 ft.

DEPTH	ELEVATION	Sample Run Number	Sample/In/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
		28		32 34	50	2.0	47.0				
	970										
		29		14 17 22 39	39	2.0	135				
		30		29 50 66 100/.3	116	1.6	71.5				
60										(silt content increasing)	
	965	31		13 18 21 27	39	1.9	128				
		32		15 23 33 48	56	1.9	89.2			Light brown fine SAND, little silt, trace gravel and clay, very dense, wet	
										Brown fine SAND, trace silt, medium dense, wet	
65		33		1 15 22 27	37	1.9	90.7				8-inch diameter SCH 40 PVC 0.010-inch slot well screen from 39.2' to 79.2'
	960										
		34		12 17 26 34	43	2.0	54.8				
		35		17 28 32 34	60	2.0	28.5				
70											
	955	36		11 17 24 34	41	2.0	11.2				
		37		17 25 27 29	52	2.0	3.5				
75		38		13 28	65	1.7	0.9				

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Client:
New Coleman Holdings, Inc.

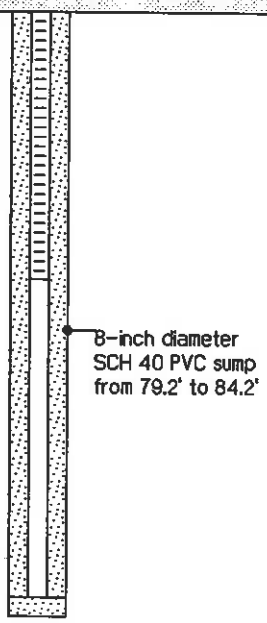
Site:
Crosman Corp., East Bloomfield, N.Y.

Well No. IRM-1

Total Depth = 84.5 ft.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description
		38		37 38	65	1.7	0.9			
	950									Brown fine SAND, little silt
		39		9 15 21 25	37	2.0	0.7			
		40		32 54 79 100/.3	133	1.5	1.8			Brown-red brown SILT and fine SAND, very dense, wet
80										
	945	41		16 43 72 100/.2	115	1.5	1.3			
		42		24 35 56 85	91	2.0	1.5			Gray SILT, trace gravel and sand and clay, very dense, damp
85										Total depth = 84.5'
	940									
90										
	935									
95										

Well Construction



BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth

Project: 415.01

Script: CRO-well
Date: 07/18/95

Appendix E

SSDS Modelling Results

Appendix E - Table 1
SSDS Aerscreen Inputs
Crosman Corporation
Bloomfield, New York

ARCADIS Design & Consultancy for natural and built assets

Parameters	Crossman SSDS Stack	Units
AERSCREEN Model Input		
Lanimator Stack (UTM E)	299769	m
Lanimator Stack (UTM N)	4752097	m
UTM Zone	18	
Source Type	Point	
Emission Rate	1	g/s
Stack Height	38	ft
Stack Height	11.58	m
Stack Inside Diameter	4	in
Stack Inside Diameter	0.102	m
Air Flow Rate	130	cfm
Stack Gas Exit Temperature	100	F
Stack Gas Exit Temperature	310.93	K
Rain Cap?	No	
Land use	Rural	
Stack Orientation	Vertical	
Building Info	BPIP used	ft
Shortest Distance to Property Line	114.00	m

Appendix E - Table 2
SSDS Aerscreen Results
Crosman Corporation
Bloomfield, New York

ARCADIS Design & Consultancy for natural and built assets

Pollutant	Emission Rates		Aerscreen impact at 1 g/s (ug/m3/g/s)		Scaled Impact (ug/m3)		Guideline Conc. (ug/m3)	
	lb/hr	g/s	1-hr	Annual	1-hr	Annual	1-hr	Annual
TCE	1.62E-03	2.04E-04	1741.00	174.1	0.36	0.036	20.00	0.20

Appendix E - Table 3
SSDS Aerscreen Inputs TCE Calculations
Crosman Corporation
Bloomfield, New York

ARCADIS Design & Consultancy for natural and built assets

Date	TCE (ug/m3)	TCE (ug/m3)	Influent Flow Rate (scfm)[1]	Post-Dilution Flow Rate (scfm)[2]	Stack Exit Concentration (ug/m3)	Emission Rate (lb/hr)
1/29/2020	16000 D	16,000	27	130	3323.08	0.00162
2/26/2020	17000 D	17000	21	130	2746.15	0.00134
3/31/2020	11000	11000	26	130	2200.00	0.00107
4/22/2020	6500 D	6500	21	130	1050.00	0.00051
5/27/2020	12000 D	12000	23	130	2123.08	0.00103
6/23/2020	11000	11000	19	130	1607.69	0.00078
7/22/2020	9700	9700	22	130	1641.54	0.00080

(1) Based on anemometer readings at suction points SDS-1 and SDS-2, converted from acfm to scfm.
(2) Typical value, based on blower performance curve.

lb/hr = ug/m3 x 1 g/1,000,000 ug x lb/453.59 g x scfm x 0.028 m3/ft3 x 60 min/hr

Appendix F

Excavation Work Plan

APPENDIX F – EXCAVATION WORK PLAN (EWP)

F-1 NOTIFICATION

At least 15 days prior to the start of any activity that is anticipated to encounter remaining soil contamination beneath the portion of the building footprint identified on Figure 7, the site owner or their representative will notify the New York State Department of Environmental Conservation (NYSDEC). Table F-1 includes contact information for the above notification. The information in this table will be updated as necessary to provide accurate contact information. A full listing of site-related contact information is provided in Appendix B.

Table F-1: Notifications*

Todd M. Caffoe, P.E. Regional Office NYSDEC Representative	(585) 226-5350 Todd.Caffoe@dec.ny.gov
Kelly Lewandowski NYSDEC Site Control	(518) 402-9553 Kelly.Lewandowski@dec.ny.gov
Anthony Perretta NYSDOH	(518) 402-7860 Anthony.Perretta@health.ny.gov

* Note: Notifications are subject to change and will be updated as necessary.

This notification will include:

- A detailed description of the work to be performed, including the location and areal extent of excavation, plans/drawings for site re-grading, intrusive elements or utilities to be installed below the concrete cover, estimated volumes of contaminated soil to be excavated and any work that may impact an engineering control;
- A summary of environmental conditions anticipated to be encountered in the work areas, including the nature and concentration levels of contaminants of concern, potential presence of grossly contaminated media, and plans for any pre-construction sampling;
- A schedule for the work, detailing the start and completion of all intrusive work;
- A summary of the applicable components of this EWP;

- A statement that the work will be performed in compliance with this EWP and 29 Code of Federal Regulations 1910.120;
- A copy of the contractor's health and safety plan (HASP), in electronic format, if it differs from the HASP provided in Appendix G of this Site Management Plan (SMP);
- Identification of disposal facilities for potential waste streams; and
- Identification of sources of any anticipated backfill, along with all required chemical testing results.

F-2 SOIL SCREENING METHODS

Visual, olfactory and instrument-based (e.g., photoionization detector) soil screening will be performed by a qualified environmental professional during all excavations into known or potentially contaminated material (remaining contamination). Soil screening will be performed when invasive work is done in soil beneath the portion of the building footprint identified on Figure 7.

Soils will be segregated based on previous environmental data and screening results into material that requires offsite disposal and material that requires testing to determine if the material can be reused onsite as soil beneath a cover or if the material can be used as cover soil. Further discussion of offsite disposal of materials and onsite reuse is provided in Section F-6 of this Appendix.

F-3 SOIL STAGING METHODS

Soil stockpiles will be continuously encircled with a berm and/or silt fence. Hay bales will be used as needed near catch basins, surface waters and other discharge points.

Stockpiles will be kept covered at all times with appropriately anchored tarps. Stockpiles will be routinely inspected and damaged tarp covers will be promptly replaced.

Stockpiles will be inspected at a minimum once each week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by the NYSDEC.

F-4 MATERIALS EXCAVATION AND LOAD-OUT

A qualified environmental professional or person under their supervision will oversee all invasive work and the excavation and load-out of all excavated material.

The owner of the property and remedial party (if applicable) and its contractors are responsible for safe execution of all invasive and other work performed under this Plan.

The presence of utilities and easements on the Site will be investigated by the qualified environmental professional. It will be determined whether a risk or impediment to the planned work under this SMP is posed by utilities or easements on the Site.

Loaded vehicles leaving the Site will be appropriately lined, tarped, securely covered, manifested, and placarded in accordance with appropriate Federal, State, local, and New York State Department of Transportation (NYSDOT) requirements (and all other applicable transportation requirements).

A truck wash will be operated onsite, as appropriate. The qualified environmental professional will be responsible for ensuring that all outbound trucks will be washed at the truck wash before leaving the Site until the activities performed under this section are complete. Truck wash waters will be collected and disposed of offsite in an appropriate manner.

Locations where vehicles enter or exit the Site shall be inspected daily for evidence of offsite soil tracking.

The qualified environmental professional will be responsible for ensuring that all egress points for truck and equipment transport from the Site are clean of dirt and other materials derived from the Site during intrusive excavation activities. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to site-derived materials.

F-5 MATERIALS TRANSPORT OFFSITE

All transport of materials will be performed by licensed haulers in accordance with appropriate local, State, and Federal regulations, including 6 New York Codes, Rules and Regulations (NYCRR) Part 364. Haulers will be appropriately licensed and trucks properly placarded.

Material transported by trucks exiting the Site will be secured with tight-fitting covers. Loose-fitting canvas-type truck covers will be prohibited. If loads contain wet material capable of producing free liquid, truck liners will be used.

Trucks will be prohibited from stopping and idling in the neighborhood outside the project site.

Egress points for truck and equipment transport from the Site will be kept clean of dirt and other materials during site remediation and development.

Queuing of trucks will be performed onsite in order to minimize offsite disturbance. Offsite queuing will be prohibited.

F-6 MATERIALS DISPOSAL OFFSITE

If confirmed via waste characterization sampling and analysis, materials excavated and removed from the Site will be treated as contaminated and regulated material and will be transported and disposed in accordance with all local, State (including 6NYCRR Part 360) and Federal regulations. If disposal of material from this Site is proposed for unregulated offsite disposal (i.e., clean soil removed for development purposes), a formal request with an associated plan will be made to the NYSDEC. Unregulated offsite management of materials from this Site will not occur without formal NYSDEC approval.

Offsite disposal locations for excavated soils will be identified in the pre-excavation notification. This will include estimated quantities and a breakdown by class of disposal facility if appropriate, i.e., hazardous waste disposal facility, solid waste landfill, petroleum treatment facility, C/D recycling facility, etc. Actual disposal quantities and associated documentation will be reported to the NYSDEC in the Periodic Review Report. This documentation will include: waste profiles, test results, facility acceptance letters, manifests, bills of lading and facility receipts.

Non-hazardous historic fill and contaminated soils taken offsite will be handled, at minimum, as a Municipal Solid Waste per 6NYCRR Part 360-1.2. Material that does not meet Unrestricted Soil Cleanup Objectives is prohibited from being taken to a New York State recycling facility (6NYCRR Part 360-16 Registration Facility).

F-7 MATERIALS REUSE ONSITE

The qualified environmental professional will ensure that procedures defined for materials reuse in this SMP are followed and that unacceptable material does not remain onsite. Contaminated onsite material, including historic fill and contaminated soil, that is acceptable for reuse onsite will be placed below the demarcation layer or impervious surface, and will not be reused within a cover soil layer, above a demarcation layer within landscaping berms, or as backfill for subsurface utility lines.

F-8 FLUIDS MANAGEMENT

All liquids to be removed from the Site as part of the implementation of this Excavation Management Plan with respect to remaining soil contamination, including but

not limited to, excavation dewatering and decontamination waters, and all groundwater monitoring well purge and development waters, will be handled, transported and disposed in accordance with applicable local, State, and Federal regulations. Dewatering, purge and development fluids will not be recharged back to the land surface or subsurface of the Site, and will be managed offsite, unless prior approval is obtained from NYSDEC.

Discharge of water generated during large-scale construction activities to surface waters (i.e. a local pond, stream or river) will be performed under a State Pollutant Discharge Elimination System permit.

F-9 COVER SYSTEM RESTORATION

After the completion of soil removal and any other invasive activities beneath the portion of the building footprint identified on Figure 7, the cover (i.e., the concrete floor) will be restored. A demarcation layer consisting of orange snow fencing material, white geotextile, or equivalent material will be placed to provide a visual reference to the top of the remaining contamination zone (i.e., the zone that requires adherence to special conditions for disturbance of remaining contaminated soils defined in this SMP). A figure showing the impacted area and any NYSDEC-approved modifications to the cover system will be included in the subsequent Periodic Review Report and in an updated SMP.

F-10 BACKFILL FROM OFFSITE SOURCES

All materials proposed for import onto the Site will be approved by the qualified environmental professional and will be in compliance with provisions in this SMP prior to receipt at the Site. A Request to Import/Reuse Fill or Soil form, which can be found at http://www.dec.ny.gov/regulations/67386.html, will be prepared and submitted to the NYSDEC project manager allowing a minimum of 5 business days for review.

Material from industrial sites, spill sites, or other environmental remediation sites or potentially contaminated sites will not be imported to the Site.

All imported soils will meet the backfill and cover soil quality standards established in 6NYCRR 375-6.7(d). Based on an evaluation of the land use, protection of groundwater and protection of ecological resources criteria, the resulting soil quality standards are listed in Table [x]-2. Soils that meet ‘exempt’ fill requirements under 6 NYCRR Part 360, but do not meet backfill or cover soil objectives for this site, will not be imported onto the Site without prior approval by NYSDEC. Solid waste will not be imported onto the Site.

Trucks entering the Site with imported soils will be securely covered with tight fitting covers. Imported soils will be stockpiled separately from excavated materials and covered to prevent dust releases.

F-11 STORMWATER POLLUTION PREVENTION

Barriers and hay bale checks will be installed and inspected once a week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by the NYSDEC. All necessary repairs shall be made immediately.

Accumulated sediments will be removed as required to keep the barrier and hay bale check functional.

All undercutting or erosion of the silt fence toe anchor shall be repaired immediately with appropriate backfill materials.

Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering.

Erosion and sediment control measures identified in the SMP shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters.

Silt fencing or hay bales will be installed around the entire perimeter of the construction area.

F-12 EXCAVATION CONTINGENCY PLAN

If underground tanks or other previously unidentified contaminant sources are found during post-remedial subsurface excavations or development-related construction, excavation activities will be suspended until sufficient equipment is mobilized to address the condition.

Sampling will be performed on product, sediment and surrounding soils, etc. as necessary to determine the nature of the material and proper disposal method. Chemical analysis will be performed for a full list of analytes (Target Analyte List metals; Target Compound List [TCL] volatiles and semi-volatiles, TCL pesticides and polychlorinated biphenyls), unless the site history and previous sampling results provide a sufficient

justification to limit the list of analytes. In this case, a reduced list of analytes will be proposed to the NYSDEC for approval prior to sampling.

Identification of unknown or unexpected contaminated media identified by screening during invasive site work will be promptly communicated by phone to NYSDEC's Project Manager. Reportable quantities of petroleum product will also be reported to the NYSDEC spills hotline. These findings will be also included in the Periodic Review Report.

F-13 COMMUNITY AIR MONITORING PLAN

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress disturbing remaining soil contamination. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., offsite receptors, including residences and businesses and onsite workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities disturbing remaining soil contamination. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities disturbing remaining soil contamination did not spread contamination offsite through the air.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust and odors at a minimum around the work areas disturbing remaining soil contamination.

Community Air Monitoring Plan

Real-time air monitoring for VOCs and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary when performing activities that disturb soil in areas of remaining soil contamination. For the purposes of this plan, that will be limited to remaining contamination beneath the western side of the building.

Continuous monitoring will be required for all ground-intrusive activities disturbing remaining soil contamination and during the demolition of contaminated or potentially contaminated structures. Ground-intrusive activities include, but are not limited

to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs with a hand-held photoionization detector will be required during non-intrusive activities, such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. "Periodic" monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location.

VOC Monitoring, Response Levels, and Actions

VOCs must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified during work which disturbs remaining soil contamination. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

- If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities disturbing the remaining soil contamination must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

- If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities disturbing the remaining soil contamination must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less – but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

- If the organic vapor level is above 25 ppm at the perimeter of the work area disturbing the remaining soil contamination, activities must be shutdown.

All 15-minute readings must be recorded and be available for State (NYSDEC and New York State Department of Health [NYSDOH]) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations when activities will be disturbing the remaining soil contamination. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities disturbing the remaining soil contamination.

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter ($\mu g/m^3$) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area disturbing the remaining soil contamination, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 $\mu g/m^3$ above the upwind level and provided that no visible dust is migrating from the work area.

- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 $\mu g/m^3$ above the upwind level, work disturbing the remaining soil contamination must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 $\mu g/m^3$ of the upwind level and in preventing visible dust migration.

All readings must be recorded and be available for State (NYSDEC and NYSDOH) personnel to review.

Exceedances of action levels listed in the CAMP will be reported to NYSDEC and NYSDOH Project Managers.

F-14 ODOR CONTROL PLAN

This odor control plan is capable of controlling emissions of nuisance odors offsite. Odor control is not required on a routine basis. If nuisance odors are identified at the site boundary, or if odor complaints are received, because of work disturbing the remaining soil contamination, it will be halted and the source of odors will be identified and corrected. Work disturbing the remaining soil contamination will not resume until all nuisance odors have been abated. NYSDEC and NYSDOH will be notified of all odor events and of any other complaints about the project. Implementation of all odor controls, including the halt of work disturbing the remaining soil contamination, is the responsibility of the remedial party's Remediation Engineer, and any measures that are implemented will be discussed in the Periodic Review Report.

All necessary means will be employed to prevent on and offsite nuisances during work disturbing the remaining soil contamination. At a minimum, these measures may include: (a) limiting the area of open excavations and size of soil stockpiles; (b) shrouding open excavations with tarps and other covers; and (c) using foams to cover exposed odorous soils. If odors develop and cannot be otherwise controlled, additional means to eliminate odor nuisances will include: (d) direct load-out of soils to trucks for offsite disposal; (e) use of chemical odorants in spray or misting systems; and, (f) use of staff to monitor odors in surrounding neighborhoods.

If nuisance odors develop during intrusive work disturbing the remaining soil contamination that cannot be corrected, or where the control of nuisance odors cannot otherwise be achieved due to onsite conditions or close proximity to sensitive receptors, odor control will be achieved by sheltering the excavation and handling areas in a temporary containment structure equipped with appropriate air venting/filtering systems.

F-15 DUST CONTROL PLAN

A dust suppression plan that addresses dust management during invasive onsite work disturbing the remaining soil contamination will include, at a minimum, the items listed below:

- Dust suppression will be achieved through the use of a dedicated onsite water truck for road wetting. The truck will be equipped with a water cannon capable of spraying water directly onto off-road areas including excavations and stockpiles.

- Clearing and grubbing of larger areas where remaining soil contamination will be disturbed will be done in stages to limit the area of exposed, unvegetated soils vulnerable to dust production.

- Gravel will be used on roadways to provide a clean and dust-free road surface.

- Onsite roads will be limited in total area to minimize the area required for water truck sprinkling.

F-16 OTHER NUISANCES

If required by NYSDEC or the Town of East Bloomfield, plans to control nuisances, including rodents and noise, will be developed and utilized by the contractor prior to and during site clearing and site grubbing of areas where remaining contamination will be disturbed, and during remedial work.

Appendix G

Health and Safety Plan and Community Air Monitoring Plan

Site Specific Health and Safety Plan

Revision 17h

Project Name:	Crosman Corporation
Project Number:	30005202
Client Name:	Crosman Corporation
Date:	10/20/2020
HASP Expires	10/20/2021
Revision:	

Approvals:

HASP Developer: 

Project Manager: 

HASP Reviewer: 

Revised: 6/1/2020

Arcadis Field and Embedded Staff COVID-19 Guidance

See COVID-19 Plan for More Information Check the Orange Line Daily

ARCADIS Design & Consultancy for natural and built assets

COVID-19 HEALTH AND SAFETY PROCEDURES

PROJECT SITE SAFETY MEASURES:

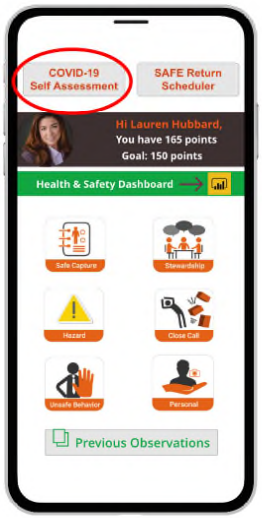


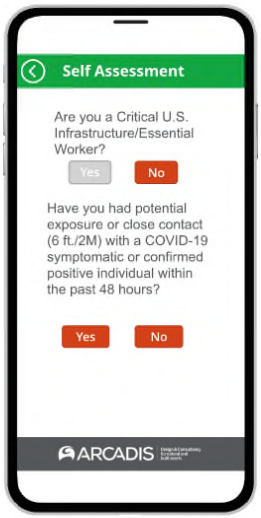
PERSONAL HYGIENE BEST PRACTICES:

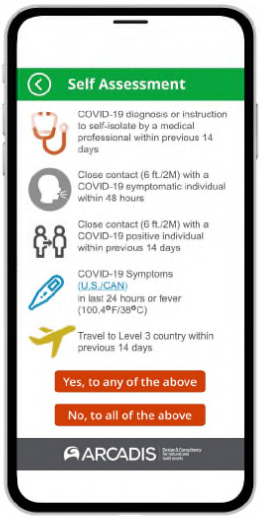


COVID-19 SELF ASSESSMENT

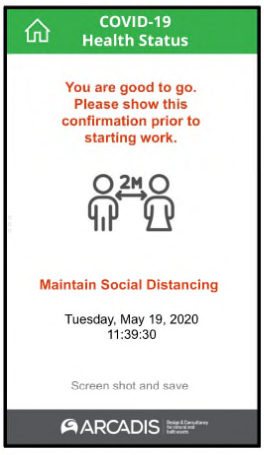
Arcadis staff visiting offices and project sites must complete the COVID-19 Health Screening Self-Assessment Questionnaire prior to each visit. Arcadis staff can now use the H&S App to complete their daily (or multiple times a day, if appropriate) COVID-19 Health Screening Self-Assessment. The data entered into the H&S App COVID-19 Health Screening Self-Assessment form is not stored.



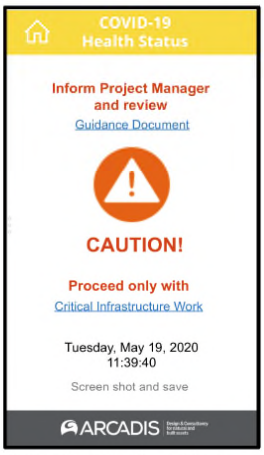




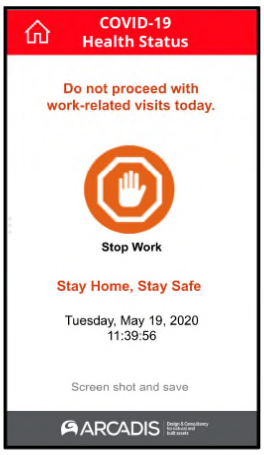
Upon completion of the COVID-19 Health Screening Self-Assessment in the H&S App, the user will receive a green, yellow or red completion message (as shown below).



Green – proceed to the office or project site



Yellow (Caution) – critical infrastructure/essential worker must contact the Project Manager and review the "H&S App Yellow Caution Status Guidance"



Red – do not proceed to the office or project site

Arcadis Culture of Caring

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

☐ Reviewed the HASP including a discussion of hazard identification and controls.

- ☐ If conducting activities deemed by Arcadis to be "High Risk", frontline management has reviewed applicable H&S standards (Job Safety Analysis [JSA] when authorized by H&S) for these activities with field staff.
- ☐ If permit to work is required, frontline management has reviewed the permit(s) with field staff.

☐ Reviewed proactive H&S engagement expectations/injury prevention actions.
☐ Reviewed Stop Work Authority.
☐ Reviewed the incident reporting process and expectations including when WorkCare should be contacted by staff (WorkCare incident intervention for all minor, non-emergency injuries) and that the WorkCare phone number is programmed into field team cell phone.
☐ For Inexperienced Workers, a mentor has been assigned for the new task being performed.

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

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

Mentor/Resource # _____ _____
Name Phone Number

Signed:

_____ Select

* Upon hiring/contracting for the first time.

Emergency Information

Site Address: Crosman Corporation
7629 Routes 5 and 20
Bloomfield, New York 14469

Emergency Phone Numbers:

Emergency (fire, police, ambulance)		911
Emergency (facility specific, if applicable):		
Fire - East Bloomfield-Holcomb Fire		585.657.7422
Police - Ontario County Sheriff		585.396.4500
Emergency Other (specify):		
Primary Client Contact:	Gina Thomas	585.657.3120
WorkCare (non-life-threatening injury/illness):		1-888-449-7787
Project H&S:	Aaron Richardson	585.202.4393
Task Manager:	Klaus Beyrle	585.752.8882
Project Manager:	Aaron Richardson	585.202.4393
Corporate H&S Specialist:	Julie Santaniello	978-551-0033
Corporate H&S Director:	Denis Balcer	614-778-9171

Hospital Name and Address: Thompson Hospital
350 Parrish Street
Canandaigua, New York 14424

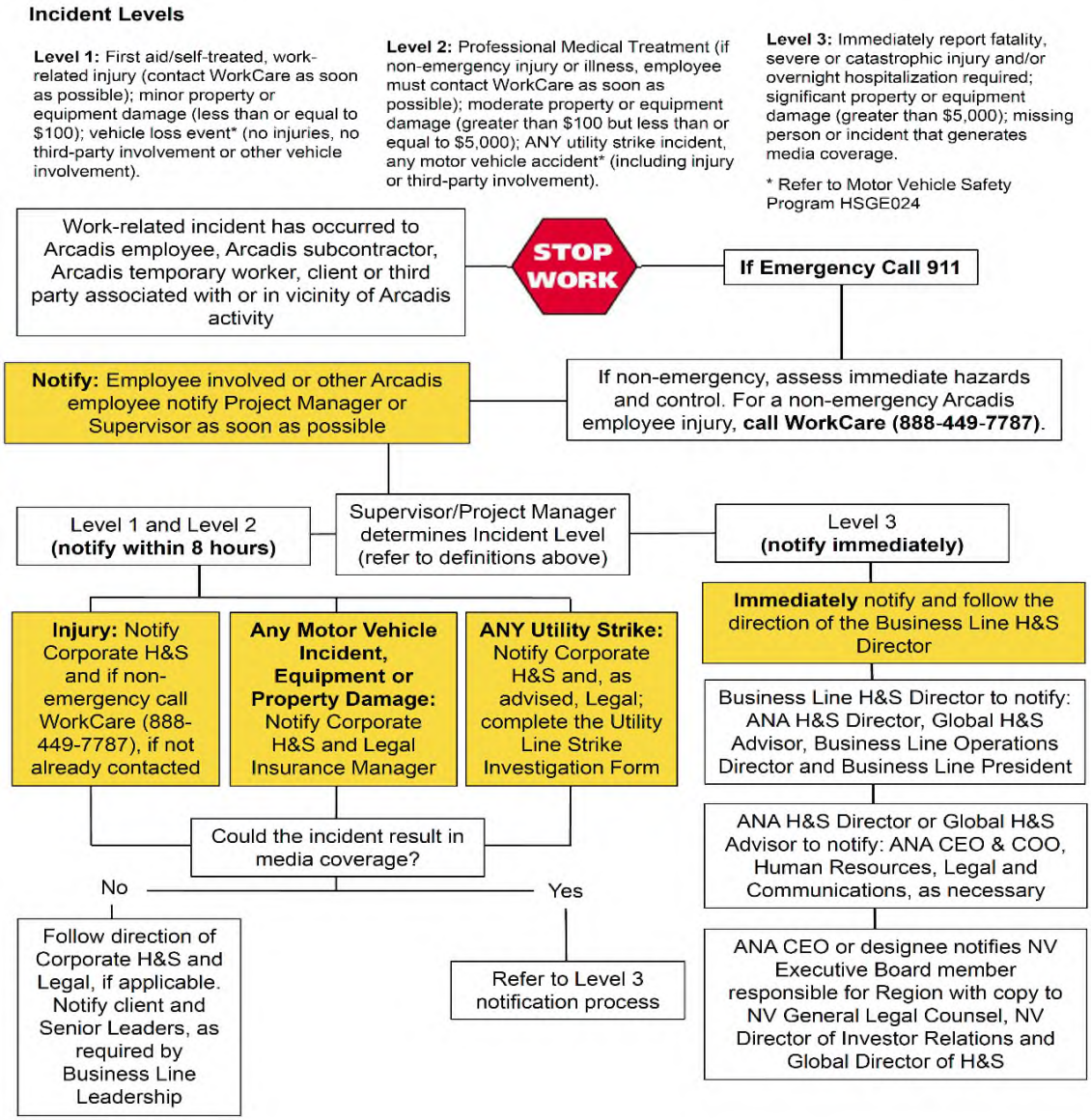
Hospital Phone Number: 585.396.6000

Supplemental Client Contact Information:

Other Important Phone Numbers:

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

Incident Reporting Protocol Within Arcadis



Client Incident Reporting Protocol

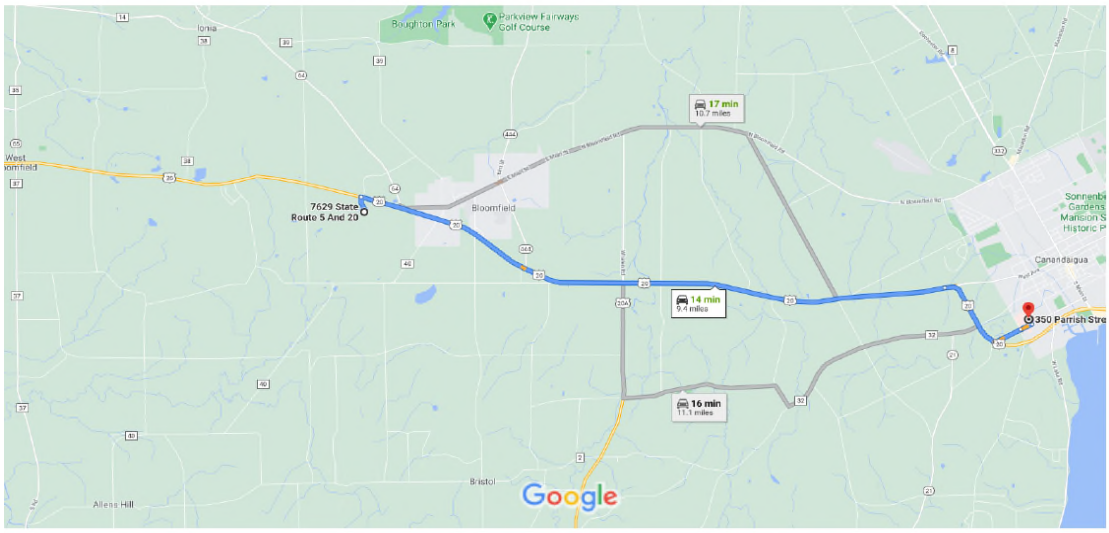
All incidents must be reported to Gina Thomas.

Route to the Hospital

Google Maps

7629 State Rte 5 And 20 to 350 Parrish St, Canandaigua, NY 14424

Drive 9.4 miles, 14 min



Map data ©2020 Google 1 mi

7629 State Rte 5 And 20

Bloomfield, NY 14469

1. Head northwest toward US-20 W — 0.2 mi
2. Turn right onto US-20 E — 7.6 mi
3. Turn right to stay on US-20 E — 1.0 mi
4. Turn left onto Parrish St Ext — 0.4 mi
5. Continue onto Parrish St — 0.2 mi
6. Turn left — 223 ft
7. Turn right
   Destination will be on the right — 164 ft

350 Parrish St

Canandaigua, NY 14424

Site Type

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

Industrial	
Parking Lot/Private Drive (NON ROW)	

Work in parking lots will require preparation of a Non-ROW Traffic Safety Plan.

Surrounding Land Use and Topography

Site is located in a rural area. Site topography is rolling hills.

Simultaneous Operations (SimOps)

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

Site Background

Past manufacturing processes conducted at the plant have generated the following wste streams: spent TCE, oil, petroleum, naphtha, paint and stain solvents, Freon, and non-hazardous irion hydrowide sludge. Previous investigations at the site identified TCE in soil and groundwater as the contaminant of concern.

Project Tasks

The following tasks are identified for this project:

1	Operation and maintenance - Temporary, small or mobile system
2	Sampling - Well sampling using bailers
3	Sampling - Non-pressurized or passive air sampling using summa canisters, sample canisters, tedlar ba
4	Monitor well - Well or boring abandonment contractor oversight
5	Select
6	Select
7	Select
8	Select
9	Select
10	Select
11	Select
12	Select
13	Select
14	Select
15	Select
16	Select
17	Select
18	Select
19	Select
20	Select

Supplemental requirements associated with the above task(s):
Not applicable

[X] Required Checklists/Work Forms

Tailgate Safety Briefing Form
Vehicle Inspection Checklist

[ ] Required Permits

Not Applicable

[ ] Required H&S Standards

Not applicable

Short Service Employees (SSEs)

SSEs (employees who are employed with Arcadis for less than 1 year or are Inexperienced Workers) are not anticipated to be working on this project. If staffing changes occur during this project and SSEs are utilized, the project team working in conjunction with the SSE's administrative supervisor will ensure requirements of ARC HSGE019 "Short Service Employees" are completed. SSE's will be identified in the project Tailgate Safety Meeting Form.

Roles and Responsibilities

	Name	Role	Short Service Employee
1	William Popham	Project Manager (PM)	
2	Aaron Richardson	Associate Project Manager (APM)	
3	Klaus Beyrle	Task Manager	
4	Klaus Beyrle	Field Technical Lead	
5	Klaus Beyrle	Site Safety Officer (SSO)	
6			
7			
8			
9			
10			

Training

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

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

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

	Names or Numbers from above
DOT HazMat #1	2,3,4,5
First Aid/CPR	2,3,4,5
None	
None	
None	
None	
None	
None	
None	
None	
None	
None	
None	
None	
None	
None	
Other:	

The Arcadis Fundamental H&S Principles

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



General Task Hazard Assessment and Risk Control (HARC)

General:	Hazards Applicable to All Project Tasks

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

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

Hazard #1

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

Suggested FHSHB Ref: 3.4
Overall Unmitigated Risk: HIGH
Mitigated Risk: MEDIUM
Comments: Use Smith System "5-Keys" when driving. See Driving JSA for details.

To mitigate this hazard, use TRACK and the following:
Smith System (on line)
JSAs

Hazard #2

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

Suggested FHSHB Ref: 3.4, 3.21
Overall Unmitigated Risk: HIGH
Mitigated Risk: LOW
Comments: Use route planning. Keep eyes moving while driving. See Driving JSA.

To mitigate this hazard, use TRACK and the following:
Smith System (on line)
Driver awareness and use of stop work authority

Hazard #3

Biological - skin/eye irritation or damage from poisonous plants

Suggested FHSHB Ref: 3.17.11
Overall Unmitigated Risk: LOW
Mitigated Risk: LOW
Comments: Use skin pre-treatment lotions when available.

To mitigate this hazard, use TRACK and the following:
Job Briefing/Site Awareness
PPE (see HASP "PPE" section)

Hazard #4

Biological - bites or stings from exposure to insects or arachnids

Suggested FHSHB Ref: 3.17: 2,3,7,8,9,10
Overall Unmitigated Risk: MEDIUM
Mitigated Risk: LOW
Comments: Do body check daily.

To mitigate this hazard, use TRACK and the following:
Job Briefing/Site Awareness
PPE (see HASP "PPE" section)

Hazard #5

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

Suggested FHSHB Ref: 3.17.11
Overall Unmitigated Risk: MEDIUM
Mitigated Risk: LOW
Comments:

To mitigate this hazard, use TRACK and the following:
Job Briefing/Site Awareness
PPE (see HASP "PPE" section)

General Task HARC (continued)

Hazard #6		
Environmental - Thermal stress - Injury or illness from heat or cold		
Suggested FHSHB Ref:	3.16	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	Field H&S Handbook (see ref. above)
Mitigated Risk:	LOW	JSAs
Comments:	Use job rotation or rest breaks. Stay hydrated and eat regularly.	
Hazard #7		
Environmental - Inclement weather -Injury or equipment damage from inclement weather		
Suggested FHSHB Ref:	3.12	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	Weather Monitoring
Mitigated Risk:	LOW	Cont./Emerg. Planning
Comments:	Use 30/30 rule for lightning. See FHSHB for details.	
Hazard #8		
Motion - Musculoskeletal - Injury from lifting, twisting , stooping, or awkward body positions		
Suggested FHSHB Ref:	3.29.1	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	Engineering Controls (specify in comments)
Mitigated Risk:	LOW	Admin. Controls (specify in comments)
Comments:	Use proper lifting techniques. Use job rotation when applicable. See FHSHB for details.	
Hazard #9		
Motion - Musculoskeletal - Injury from repeated work activity or body motion		
Suggested FHSHB Ref:	3.29.2	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	Engineering Controls (specify in comments)
Mitigated Risk:	LOW	Admin. Controls (specify in comments)
Comments:	Use proper lifting techniques. Use job rotation when applicable. See FHSHB for details.	
Hazard #10		
Sound - Noise - Injury or illness due to noise exposure		
Suggested FHSHB Ref:	3.15	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	Engineering Controls (specify in comments)
Mitigated Risk:	LOW	PPE (see HASP "PPE" section)
Comments:	Increase distance from source if possible. Maintain equipment.	
Hazard #11		
Gravity - Falls - Injury due to slips and trips		
Suggested FHSHB Ref:	3.26.4, 4.11	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	Site Awareness
Mitigated Risk:	LOW	Housekeeping
Comments:	Use footwear appropriate for site conditions, plan routes and do not hurry while walking.	
Hazard #12		
None		
Suggested FHSHB Ref:	None	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	Not Ranked	Select
Mitigated Risk:	Not Ranked	Select
Comments:		

Task Specific HARC

Task 1:	Operation and maintenance - Temporary, small or mobile system

HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low): FHSHB Ref: 4

Biological	L	Chemical	M	Driving	-	Electrical	M
Environmental	L	Gravity	M	Mechanical	H	Motion	H
Personal Safety	L	Pressure	M	Radiation	L	Sound	H

Hazard #1

Motion - Struck by - Bodily injury from impact with moving object

Suggested FHSHB Ref:	2.5, 3.22	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	Site Awareness
Mitigated Risk:	LOW	JSAs
Comments:		

Hazard #2

None

Suggested FHSHB Ref:	None	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	Not Ranked	Select
Mitigated Risk:	Not Ranked	Select
Comments:		

Hazard #3

None

Suggested FHSHB Ref:	None	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	Not Ranked	Select
Mitigated Risk:	Not Ranked	Select
Comments:		

Hazard #4

None

Suggested FHSHB Ref:	None	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	Not Ranked	Select
Mitigated Risk:	Not Ranked	Select
Comments:		

Hazard #5

None

Suggested FHSHB Ref:	None	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	Not Ranked	Select
Mitigated Risk:	Not Ranked	Select
Comments:		

Hazard #6

None

Suggested FHSHB Ref:	None	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	Not Ranked	Select
Mitigated Risk:	Not Ranked	Select
Comments:		

Task Specific HARC (continued)

Task 2:	Sampling - Well sampling using bailers

HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low): FHSHB Ref: 3.9

Biological	L	Chemical	M	Driving	-	Electrical	-
Environmental	M	Gravity	M	Mechanical	-	Motion	M
Personal Safety	L	Pressure	L	Radiation	-	Sound	L

Hazard #1

Environmental - Sun or wind -Skin injury from sun or wind exposure

Suggested FHSHB Ref:	3.12	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	JSAs
Mitigated Risk:	LOW	PPE (see HASP "PPE" section)
Comments:		

Hazard #2

Motion - Struck by - Bodily injury from impact with moving object

Suggested FHSHB Ref:	2.5, 3.22	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	Site Awareness
Mitigated Risk:	LOW	JSAs
Comments:		

Hazard #3

None

Suggested FHSHB Ref:	None	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	Not Ranked	Select
Mitigated Risk:	Not Ranked	Select
Comments:		

Hazard #4

None

Suggested FHSHB Ref:	None	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	Not Ranked	Select
Mitigated Risk:	Not Ranked	Select
Comments:		

Hazard #5

None

Suggested FHSHB Ref:	None	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	Not Ranked	Select
Mitigated Risk:	Not Ranked	Select
Comments:		

Hazard #6

None

Suggested FHSHB Ref:	None	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	Not Ranked	Select
Mitigated Risk:	Not Ranked	Select
Comments:		

Task Specific HARC (continued)

Task 3:	Sampling - Non-pressurized or passive air sampling using summa canisters, sampl

HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low): FHSHB Ref: 3.9

Biological	L	Chemical	L	Driving	-	Electrical	-
Environmental	-	Gravity	L	Mechanical	-	Motion	L
Personal Safety	-	Pressure	-	Radiation	-	Sound	-

Hazard #1

Chemical - gasses - injury due to inhalation, asphyxiation, skin/eye contact

Suggested FHSHB Ref:	3.30, 3.32	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	JSAs
Mitigated Risk:	LOW	HASP
Comments:		

Hazard #2

Mechanical - Pinch point - Injury by pinching of body part in mechanical process

Suggested FHSHB Ref:	3.27.4	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	Site Awareness
Mitigated Risk:	LOW	Inspections
Comments:		

Hazard #3

None

Suggested FHSHB Ref:	None	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	Not Ranked	Select
Mitigated Risk:	Not Ranked	Select
Comments:		

Hazard #4

None

Suggested FHSHB Ref:	None	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	Not Ranked	Select
Mitigated Risk:	Not Ranked	Select
Comments:		

Hazard #5

None

Suggested FHSHB Ref:	None	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	Not Ranked	Select
Mitigated Risk:	Not Ranked	Select
Comments:		

Hazard #6

None

Suggested FHSHB Ref:	None	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	Not Ranked	Select
Mitigated Risk:	Not Ranked	Select
Comments:		

Task Specific HARC (continued)

Task 4:	Monitor well - Well or boring abandonment contractor oversight

HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low): FHSHB Ref: 3.9

Biological	L	Chemical	L	Driving	-	Electrical	-
Environmental	L	Gravity	M	Mechanical	L	Motion	L
Personal Safety	-	Pressure	L	Radiation	-	Sound	M

Hazard #1

Gravity - Struck by - Injury from falling object

Suggested FHSHB Ref:	3.26.2	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	H&S Standards
Mitigated Risk:	LOW	PPE (see HASP "PPE" section)
Comments:		

Hazard #2

Mechanical - Pinch point - Injury by pinching of body part in mechanical process

Suggested FHSHB Ref:	3.27.4	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	Machine Guarding
Mitigated Risk:	LOW	PPE (see HASP "PPE" section)
Comments:		

Hazard #3

Motion - Struck by - Bodily injury from impact with moving object

Suggested FHSHB Ref:	2.5, 3.22	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	Site Awareness
Mitigated Risk:	LOW	JSAs
Comments:		

Hazard #4

None

Suggested FHSHB Ref:	None	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	Not Ranked	Select
Mitigated Risk:	Not Ranked	Select
Comments:		

Hazard #5

None

Suggested FHSHB Ref:	None	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	Not Ranked	Select
Mitigated Risk:	Not Ranked	Select
Comments:		

Hazard #6

None

Suggested FHSHB Ref:	None	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	Not Ranked	Select
Mitigated Risk:	Not Ranked	Select
Comments:		

Task Specific HARC (continued)

Task 5:	Select

HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low): FHSHB Ref: NA

Biological	-	Chemical	-	Driving	-	Electrical	-
Environmental	-	Gravity	-	Mechanical	-	Motion	-
Personal Safety	-	Pressure	-	Radiation	-	Sound	-

Hazard #1

None

Suggested FHSHB Ref:	None	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	Not Ranked	Select
Mitigated Risk:	Not Ranked	Select
Comments:		

Hazard #2

None

Suggested FHSHB Ref:	None	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	Not Ranked	Select
Mitigated Risk:	Not Ranked	Select
Comments:		

Hazard #3

None

Suggested FHSHB Ref:	None	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	Not Ranked	Select
Mitigated Risk:	Not Ranked	Select
Comments:		

Hazard #4

None

Suggested FHSHB Ref:	None	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	Not Ranked	Select
Mitigated Risk:	Not Ranked	Select
Comments:		

Hazard #5

None

Suggested FHSHB Ref:	None	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	Not Ranked	Select
Mitigated Risk:	Not Ranked	Select
Comments:		

Hazard #6

None

Suggested FHSHB Ref:	None	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	Not Ranked	Select
Mitigated Risk:	Not Ranked	Select
Comments:		

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

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

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

	Preservatives	Qty
[ ]	Not applicable	
[X]	Hydrochloric acid	<500 ml
[ ]	Nitric acid	<500 ml
[ ]	Sulfuric acid	<500 ml
[ ]	Sodium hydroxide	<500 ml
[ ]	Zinc acetate	<500 ml
[ ]	Ascorbic acid	<500 ml
[ ]	Acetic acid	<500 ml
[ ]	Isopropyl alcohol	< 4 gal.
[ ]	Formalin (<10%)	< 4 gal.
[ ]	Methanol	<500 ml
[ ]	Sodium bisulfate	<500 ml

	Decontamination	Qty
[ ]	Not applicable	
[X]	Alconox	≤ 5 lbs
[ ]	Liquinox	≤ 1 gal
[ ]	Acetone	≤ 1 gal
[ ]	Methanol	≤ 1 gal
[ ]	Hexane	≤ 1 gal
[X]	Isopropyl alcohol	≤ 4 gal
[ ]	Nitric acid	≤ 1 L
[ ]	Other:	

	Calibration	Qty.
[ ]	Not applicable	
[X]	Isobutylene/air	1 cyl
[ ]	Methane/air	1 cyl
[ ]	Pentane/air	1 cyl
[ ]	Hydrogen/air	1 cyl
[ ]	Propane/air	1 cyl
[ ]	Hydrogen sulfide/air	1 cyl
[ ]	Carbon monoxide/air	1 cyl
[X]	pH standards (4,7,10)	≤ 1 gal
[X]	Conductivity standards	≤ 1 gal
[ ]	Other:	

	Fuels	Qty.
[X]	Not applicable	
[ ]	Gasoline	≤ 5 gal
[ ]	Diesel	≤ 5 gal
[ ]	Kerosene	≤ 5 gal
[ ]	Propane	1 cyl
[ ]	Other:	

	Kits	
[X]	Not applicable	
[ ]	Hach (specify):	
[ ]	DTECH (specify):	
[ ]	Other:	

		Qty.
		1 kit
		1 kit
		1 kit

	Remediation	Qty.
[X]	Not applicable	
[ ]		
[ ]		
[ ]		
[ ]		
[ ]		

	Other:	Qty.
[X]	Not applicable	
[ ]	Spray paint	≤ 6 cans
[ ]	WD-40	≤ 1 can
[ ]	Pipe cement	≤ 1 can
[ ]	Pipe primer	≤ 1 can
[ ]	Mineral spirits	≤ 1 gal

	DOT(1):	Qty.
[ ]	MOT eligible soils	
[ ]	MOT eligible water	
[ ]	MOT eligible solids	
[ ]	MOT eligible liquids	
[ ]		
[ ]		
[ ]		

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

SDSs for this project will be available electronically on a designated project field computer. All project workers will be notified of the SDS location in their initial safety briefing.

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

Air Monitoring

[X] There are no atmospheric chemical, radiological, or particulate hazards on this project requiring air monitoring.

[ ] Air monitoring is the responsibility of the client or subcontractor.

Constituents of Interest:

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

None			
TWA	NA	LEL/UEL (%):	NA
STEL	NA	VD (Air = 1):	NA
IDLH	NA	VP (mmHg):	NA
None			
TWA	NA	LEL/UEL (%):	NA
STEL	NA	VD (Air = 1):	NA
IDLH	NA	VP (mmHg):	NA
None			
TWA	NA	LEL/UEL (%):	NA
STEL	NA	VD (Air = 1):	NA
IDLH	NA	VP (mmHg):	NA
None			
TWA	NA	LEL/UEL (%):	NA
STEL	NA	VD (Air = 1):	NA
IDLH	NA	VP (mmHg):	NA
None			
TWA	NA	LEL/UEL (%):	NA
STEL	NA	VD (Air = 1):	NA
IDLH	NA	VP (mmHg):	NA
None			
TWA	NA	LEL/UEL (%):	NA
STEL	NA	RGD (Air = 1):	NA
IDLH	NA	VP (mmHg):	NA

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

Notes:

Required Monitoring Instruments, Action Levels and Monitoring Frequency

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

Air monitoring for volatile organics is not required.

			Computed action levels have been manually adjusted.
<	NA		Continue working
	NA - NA		Levels sustained > 5 minutes, monitor continuously and review engineering controls and PPE. Proceed with caution.
>	NA		Stop work and contact SSO

Particulate/aerosol monitoring is not required. Re-evaluate if visible dusts or aerosols cannot be controlled.

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

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

Select

Multigas (including LEL/O2 and Hg vapor) monitoring is not required.

LEL/O2 Meter	0-5% LEL	Continue work
LEL/O2 Monitoring Not Required	>5-10% LEL	Continually monitor, review engineering controls, proceed with caution
	>10% LEL	Stop work, evacuate, contact SSO
	19.5%-23.5% O2	Normal, continue work
	<19.5% O2	O2 deficient, stop work, evacuate, contact SSO
	>23.5% O2	O2 enriched, stop work, evacuate, contact SSO

Additional Gas/Vapor Monitoring is Not Required

		1/2 TLV	Stop Work Action Level	Comments
	Ammonia	12.5 ppm	25 ppm	
	Carbon dioxide	2500 ppm	5000 ppm	
	Carbon monoxide	12.5 ppm	25 ppm	
	Chlorine	0.05 ppm	0.1 ppm	
	Hydrogen cyanide	2.35 ppm (skin)	4.7 ppm* (skin)	
	Hydrogen sulfide	0.5 ppm	1 ppm	
	Nitrogen dioxide	0.1 ppm	0.2 ppm	
	Phosphine	0.025 ppm	0.05 ppm	
	Sulfur dioxide	0.125 ppm	0.25* ppm	
	Mercury vapor	0.0125 mg/m3	0.025 mg/m3	

* Ceiling or STEL value

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

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

Indicator:		≤TWA	Continue work
	Tube	>TWA	Stop work, review engineering controls and PPE, contact SSO
	Chip		
Compound(s):			

Indicator tube/chip monitoring frequency: Not applicable

Personal Protective Equipment (PPE)

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

Minimum PPE required to be worn by all staff on project:						Specify Type:
X	Hard hat		Snake chaps/guards		Coveralls:	
X	Safety glasses		Briar chaps		Apron:	
	Safety goggles		Chainsaw chaps		Chem. resistant gloves:	
	Face shield		Sturdy boot		Gloves other:	
X	Hearing protection	X	Steel or comp. toe boot		Chemical boot:	
	Rain suit		Metatarsal boot		Boot other:	
	Other:			X	Traffic vest, shirt or coat:	Class II
					Life vest:	

Task specific PPE: Nitrile gloves while groundwater sampling

Comments:

See Control of Ticks and Poisonous Plants section for important PPE information.

Medical Surveillance

Medical surveillance is not required for this project.

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

Hazardous Materials Shipping and Transportation

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

Traffic Safety and Traffic Safety Plans (TSPs)

All or portions of the project work will be conducted in a parking lot and/or private roadway. A Non-ROW TSP addressing this work is attached to this HASP.

Arcadis Commercial Motor Vehicles (CMVs)

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

Site Control

The scope of work on this project does not require use of site control.

Decontamination

The scope of work does not require implementation of decontamination protocols.

Sanitation

Restroom facilities and potable water will be provided by the client for this project. Unless alternate requirements are stipulated in a plan supplement (i.e. Heat Injury and Illness Prevention Plan), permit or JSA, temporary restroom facilities will be provided with one toilet for every 20 project workers and bottled or non-plumbed potable water will be provided to project workers at 1 gallon/worker/day.

Safety Briefings

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

Employee Health and Safety Engagement

The CPM or APM is responsible for reviewing and establishing H&S engagement goals for the project. These goals are summarized below.

Hazard Observations (via H&S App or TIP) required at the following frequency on this project:

2 per year
Close Call reporting (via H&S app) goals for this project:
reported to APM each occurrence
Other (specify):

Safety Equipment and Supplies

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

X	First aid kit	X	Insect repellent: Permethrin*
	Bloodborne pathogens kit	X	Sunscreen
X	Fire extinguisher		Air horn
	Eyewash (ANSI compliant)	X	Traffic cones
X	Eyewash (bottle)		2-way radios
	Drinking water		Heat stress monitor
	Other:		Poisonous plant pre/post exposure lotion/soap

*Apply to clothing prior to arrival at site

Control of Ticks and Poisonous Plants

Work on this project has a medium tick exposure hazard. Use of inspect repellent (20%-40% DEET on skin and/or permethrin on clothing) is an Arcadis requirement unless alternate control is approved by the applicable BL H&S Director. Apply permethrin to clothing at least 4 hours prior to work. Wear light colored clothing to help identify presence of ticks on staff. Keep shirt tails inside pants and pant leg taped to ankle. Perform tick check upon conclusion of work for day.

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

International Travel

International travel is not required for this project.

Spill Control and Containment

Spill control and containment planning and implementation is not required for this project.

Use of Electronic Devices in Areas of Increased Safety Risk

Use of electronic devices (tablets, laptops, and/or cell phones) to collect data or document work is not anticipated on this project. If electronic devices are used, distraction hazards and use must be addressed and documented in the job briefing/safety briefing.

Signatures

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

Printed Name	Signature	Date

Add additional sheets if necessary

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

Attachment A
COVID-19 Prepardness,
Response and Continuity Plan

COVID-19 Preparedness, Response, and Continuity Plan

1.0 Introduction

Currently Arcadis is following CDC and Health Canada guidelines, as well as applicable government directives. The health and safety of our people is of utmost importance to us. Arcadians are empowered to use TRACK to evaluate individual situations and Stop Work Authority anytime safety is at risk. Employees will not come to work if exhibiting any respiratory illness symptoms, including but not limited to COVID-19.

This COVID-19 Preparedness, Response and Continuity Plan (COVID-19 Plan) is designed to provide field and embedded employee guidance to reduce or eliminate transmission of the COVID-19 during project work.

2.0 COVID-19 Symptoms

COVID-19 symptoms may appear 2-14 days after exposure to the virus. People with these symptoms or combinations of symptoms may have COVID-19: cough and shortness of breath or difficulty breathing. Alternatively, any employee exhibiting two or more of the following symptoms should seek medical attention for potential COVID-19 infection: fever, chills, cough, shortness of breath or difficulty breathing, fatigue, muscle or body ache, headache, sore throat, new loss of taste or smell, congestion or runny nose, vomiting or nausea, diarrhea. This list is not all inclusive and a medical professional should be consulted if other symptoms appear that are severe or cause you concern.

3.0 General COVID-19 Prevention Practices for All Work Activities

The best way to prevent illness is to avoid exposure to the virus. CDC and Health Canada recommend common flu and cold season preventative measures, including:

1) Get a flu vaccine.
2) Wash hands often with soap and water for at least 20 seconds. If soap and water are not readily available, use a hand sanitizer with at least 60% alcohol.
3) If hand sanitizer or soap & water are not available on site, bring your own source of water and hand soap to accommodate hand washing.
4) Avoid touching your eyes, nose and mouth.
5) Cover your nose and mouth with a tissue when sneezing or coughing.
6) Do not share Personal Protective Equipment (PPE)/Personal Transmission Mitigation Equipment (PTME).
7) Maintain and thoroughly clean PPE/PTME in accordance with manufacturer's instructions.
8) Avoid sharing phones, offices, tools and equipment. If sharing is necessary, clean and disinfect prior to use.

4.0 Field and Embedded Employee Guidance for Employee Safety and Project Continuity

4.1 Local Orders/Recommendations and Client Requirements

The project site is located in a local with prescribed or recommended COVID-19 prevention requirements (available under separate cover for worker review).

If information in the local/client requirements/recommendations conflicts with this plan, local/client requirements/recommendations will take precedence over requirements in this COVID-19 Plan. Each field worker will be made of aware of the local/client requirements or recommendations during their initial COVID-19 briefing described in section 4.10 below, if required, or in a standard tailgate safety briefing.

Local/client requirements/recommendations under separate cover are located:

4.2 Relationship of this COVID-19 Plan's Requirements to Other HASP Requirements

This requirements of this COVID-19 Plan and applicable supplementary documents described in section 4.1, if applicable, will take precedence over or be performed in addition to other HASP personal protective equipment (PPE), decontamination and job briefing requirements related to efforts to prevent transmission of COVID-19. In the case of respiratory and hand protection, if other HASP requirements require a more stringent control than prescribed by this COVID-19 Plan, the HASP requirement may be followed. It should also be noted that some jurisdictions are requiring gloves be worn while completing essential activities. In this case identify the appropriate glove for the task and include in the HASP, JSA and/or COVID-19 Plan.

4.3 Travel to the Project Site

The project site is located locally (within 50 miles of the office providing field staff for the project) and will not cross a state line. No local travel restrictions are known.

Locations with Travel Restrictions

4.4 Recommendations Associated with Different Modes of Transportation

Drivers of personal vehicles should follow practices to keep their vehicle clean and disinfected as part of normal use.

4.5 Lodging Considerations

The project work does not require use of lodging by a commercial provider or Airbnb type provider.

4.6 Project Staffing

When working in project teams (paired Arcadians, embedded staff, contractors, clients, etc.):

1) If feasible, prior to visiting the site, have a H&S check in to confirm all attendees are complying with CDC or Health Canada guidelines, including:

1(a) Confirm understanding that workers or clients should not go to the job site if they have personally tested positive for COVID-19, have been in close contact to anyone else who has tested positive for COVID-19 or are exhibiting symptoms.

1(b) If a worker discloses close contact with someone COVID-19 positive and the worker is asymptomatic, contact the Project Manager and review the section 4.8 and Appendices A and B below.

2) Out of respect for all, ask everyone to self-disclose if they are not feeling well (exhibiting flu-like symptoms), and request that they should go home.

3) Observe person(s) for symptoms, and use Stop Work, as necessary, and contact Project Manager.

4) Set visual or physical barriers to keep the public away (caution tape and cones).

5) Consider if “split shifts” can be used to limit contact, or if work can be scheduled during hours of low to no facility operations.

6) Arcadis staff plan work activities, continuously use TRACK and re-plan work activities to maximize social distancing and minimize “close contact”:

6(a) Practice good hygiene and clean commonly touched surfaces:

6(a)(i) Clean clipboard and pen prior to use.

6(b)(ii) Bring your own pen.

6(b)(iii) Disinfect shared equipment.

6(b)(iv) Coordinate with sanitation vendor for portable hand washing station (soap and water or hand sanitizer)

6(c) Use work practices and tools to minimize close contact when feasible, such as:

6(c)(i) Single person using a winch instead of a two-person lift.

6(c)(ii) tools to maximize distance.

6(d) Use transmission mitigation equipment in accordance with the Job Safety Analysis (face shield, safety glasses, gloves, etc.)

7) If social distancing or other controls are or become infeasible discuss this with your supervisor and PM, discuss “Is the work necessary?” or “Can the work be rescheduled for a later date?”

8) Subcontractors need to develop and implement their own procedures to protect their workers.

4.7 Special Considerations

No special considerations apply to this project site. Follow the requirements specified in this plan.

4.8 Project Site Entry Requirements

The COVID-19 Health Screening Self-Assessment process flow is provided in Appendix A.

Arcadis staff can use the H&S App to complete their daily (or multiple times a day, if appropriate) COVID-19 Health Screening Self-Assessment as required for entry to the project site. The data entered into the H&S App COVID-19 Health Screening Self-Assessment form is not stored.

Upon completion of the COVID-19 Health Screening Self-Assessment in the H&S App, the user will receive a green, yellow or red completion message:
1) Green – proceed to the office or project site.
2) Yellow (Caution) – critical infrastructure/essential worker must contact the Project Manager and review the "COVID-19 Flow Chart - H&S App Yellow Caution Status Guidance" located in Appendix B.
3) Red – do not proceed to the office or project site.

Hardcopy assessment forms (available for printing in Appendix A) are available on the project site at the primary entry and delivery point for individuals to complete a self-assessment when they do not have access to the app or prefer to not use the app. When completing the hardcopy version of the self-assessment, the individual completing the form will keep the form in their possession for the duration of the workday.

4.9 COVID-19 Prevention Program Implementation and Oversight

The project site will have a COVID-19 prevention program supervisor implementing and overseeing the requirements of this plan and any other applicable plan or supplement identified in this COVID-19 Plan. The individual identified as the COVID-19 prevention program supervisor is identified below.

Entity/individual responsible for COVID-19 Plan Implementation and Oversight:
0

4.10 COVID-19 Safety Briefings

The jurisdiction and client do not have specific COVID-19 mandated safety briefing requirements. The individual listed above will integrate the requirements of this plan into the tailgate safety briefing for the project. This individual will record the names of the workers attending the tailgate safety meeting.

4.11 Social Distancing

The CDC definition of social distancing means remaining out of congregate settings, not shaking hands, avoiding mass gatherings, and maintaining distance (approximately 6 feet or 2 metres) from others, when possible. Situations where social distancing should be practiced are tailgate and safety briefing meetings, breaks in field trailers, entering stores and workstations. Plan and re-plan work activities to maximize social distancing and minimize close contact with others. If there are instances where social distancing is not being practiced, Stop Work and remove yourself from the situation. Contact the Project Manager or your Supervisor and document in the H&S App as an "Close Call" or "Unsafe Behavior." Additional information when working in teams is required is discussed in the "work specific situations" section below.

Note: The CDC defines close contact as: a) being within approximately 6 feet (2 metres) [1] of a COVID-19 case for a prolonged period of time[2]; close contact can occur while caring for, living with, visiting, or sharing a healthcare waiting area or room with a COVID-19 case – or – b) having direct contact with infectious secretions of a COVID-19 case (e.g., being coughed on).

The scope of work on this project site permits social distancing as defined above. While social distancing is achievable, workers should continue to follow the requirements stipulated in section 4.12 in this COVID-19 Plan while working. If work conditions change and social distancing cannot be achieved, the project team should review Appendix C for additional guidance and expectations.

This project does not require a site analysis performed by the entity/individual specified in section 4.9 to identify potential worker bottlenecks and worker grouping situations. However, the entity/individual in section 4.9 should review work activities at the site and implement controls that reduce or eliminate choke points and grouping situations consistent with the operating COVID-19 Plan for the site.

Notes:

[1] Data to inform the definition of close contact are limited. Factors to consider when defining close contact include proximity, the duration of exposure (e.g., longer exposure time likely increases exposure risk), and whether the exposure was to a person with symptoms (e.g., coughing likely increases exposure risk). While research indicates masks may help those who are infected from spreading the infection, there is less information regarding whether masks offer any protection for a contact exposed to a symptomatic or asymptomatic patient. Therefore, the determination of close contact should be made irrespective of whether the person with COVID-19 or the contact was wearing a mask. Because the general public has not received training on proper selection and use of respiratory PPE, it cannot be certain whether respiratory PPE worn during contact with an individual with COVID-19 infection protected them from exposure. Therefore, as a conservative approach, the determination of close contact should generally be made irrespective of whether the contact was wearing respiratory PPE, which is recommended for health care personnel and other trained users, or a mask recommended for the general public.

[2] Data are insufficient to precisely define the duration of time that constitutes a prolonged exposure. Recommendations vary on the length of time of exposure, but 15 minutes of close exposure can be used as an operational definition. Brief interactions are less likely to result in transmission; however, symptoms and the type of interaction (e.g., did the infected person cough directly into the face of the exposed individual) remain important.

4.12 Personal Transmission Mitigation Equipment

If engineering and administrative controls are ineffective in COVID-19 exposure mitigation, PTME must be used. The following PTME is required to be present on site: face mask/covering

As stated in section 4.2, in the case of respiratory protection and hand protection, if the HASP PPE requirement is more stringent than the PTME stated in this COVID-19 Plan, the HASP PPE requirement may be used. Additionally, for certain high hazard activities, such as hot work or confined space entry, an additional hazard review must be performed to ensure PTME controls used do not create an additional hazard. Contact a CIH or CSP for assistance in these

situations.

PTME, or permitted equivalent, is required to be worn by all site workers on the project site even if engineering and administrative controls are effective are reducing COVID-19 exposure.

For more information on face covering use and limitations, see Appendix D.

Arcadis PPE Request Form

4.13 Cleaning and Disinfection

4.13.1 Hand Hygiene

Hand hygiene for infection prevention is an important part of the U.S. and Canada response to COVID-19. Washing hands with soap and water has been and will continue to be our primary method for good hand hygiene. Both CDC and HC recommend that you wash hands often with soap and water for at least 20 seconds especially after you have been in a public place, or after blowing your nose, coughing, or sneezing. Hand washing mechanically removes pathogens.

Alcohol based hand sanitizer is a flammable liquid and vapor. However, there is no evidence to suggest hand sanitizer poses a fire hazard when used according to package directions and warnings. To use hand sanitizer:

1) Follow manufacturer instructions for use.
2) Rub your hands together, covering all surfaces of both hands, including between your fingers and up around your fingertips and nails.
3) Rub hands together for 30 seconds to allow your hands to completely absorb the product.
4) Allow the hand sanitizer to completely dry.
5) Do not touch food or anything until your hands are dry.
6) Refer to the Safety Data Sheet (SDS) for hazards information.

Shipping of hand sanitizers must follow special rules which are in effect until July 2, 2020. Hand sanitizers may only be shipped by ground using an Arcadis shipping guide specific to hand sanitizers located on the Transportation Safety Program Team Site. If air shipping is required, contact Sam Moyers or Alec MacAdam for assistance.

4.13.2 Cleaning and Disinfecting Commonly Touched Surfaces

The entity /individual in section 4.9 above is responsible for identifying site worker(s) or a contracted third party for cleaning frequently touched surfaces in our workplaces (field trailers, client facilities, etc.). Commonly touched surfaces (including equipment) must be cleaned and disinfected after use. This includes tables, doorknobs, light switches, countertops, handles, desks, phones, keyboards, toilets, faucets, sinks, hand tools, and portable field instruments (per manufacturer's instructions). Before using a disinfectant product, understand the appropriate uses and limitations of the disinfectant, and refer to equipment/tool manufacturer care instructions to determine whether the disinfectant is compatible (e.g. using isopropyl alcohol to disinfect an iPhone).

The project site is equipped with permanent or portable facilities capable of providing soap and running water for handwashing and equipment cleaning.

Hand sanitizer is readily available at the project site for worker use.

The scope of work does not indicate the need to stock and utilize disinfecting supplies (sprays, wipes, etc.) on the project site for worker use. If site conditions change, or if the entity/individual in section 4.9 above determines disinfecting supplies are warranted, work on site must cease until the necessary supplies are obtained.

If commercially prepared disinfecting supplies are not available, the CDC and HC have outlined an option to use a diluted household bleach solution (at least 1,000 ppm sodium hypochlorite) as a disinfectant. Standard household bleach is typically 5.25% sodium hypochlorite (52,500 ppm), whereas ultra-strength household bleach is typically 6% sodium hypochlorite (60,000 ppm). In accordance with Hazard Communication requirements, always refer to and have a copy of the Safety Data Sheet (SDS) available and on site with you. To make a daily bleach solution for use as a disinfectant:

1) Mix 5 tablespoons (1/3rd cup) of standard bleach per gallon of water or for a smaller spray bottle size dilution, mix 4 teaspoons bleach per quart of water.

OR
2) 1 teaspoon (5 mL) per cup (250 mL) OR 4 teaspoons (20 mL) per litre (1000mL).

Note: Solution must be mixed daily, because the solution will lose effectiveness as a disinfectant after 24-hours.

Follow manufacturer's instructions (e.g., Clorox) for application and proper ventilation, ensuring a contact time of at least 1 minute (for specific products and contact time information. Check to ensure the product is not past its expiration date. Never mix household bleach with ammonia or any other cleanser. According to the HC, CDC and U.S. EPA, unexpired household bleach will be effective against coronaviruses when properly diluted.

A second alternative is to use an alcohol solution. The solution must have at least 70% isopropanol.

To clean cloth face coverings using a washing machine:
1) Face coverings can be washed with regular laundry
2) Use regular laundry detergent and the warmest appropriate water setting for the cloth used to make the face covering.
3) Use the highest heat setting for the fabric used and leave in the dryer until completely dry.

To clean and disinfect a cloth face covering:
1) 5 tablespoons (1/3rd cup) household bleach per gallon of room temperature water or 4 teaspoons household bleach per quart of room temperature water.

4.13.3 Cleaning and Disinfecting Special Considerations
The project site is equipped with a third party controlled permanent restroom facilities. Cleaning and disinfecting of these restroom facilities will be conducted by the third party. The individual specified in section 4.9 will coordinate with the third party to determine cleaning/disinfecting frequency which will then be communicated to the site workers on the project in the COVID-19 briefing specified in section 4.10 above.

4.14 COVID-19 Prevention Postings
Based on the scope of work being performed, COVID-19 prevention posting/notices are not

required. If site conditions change and posting required, refer to Appendix E for common postings that should be used.

COVID-19 Exposure Prevention Poster for any project site

4.15 COVID-19 and First Aid/CPR Response

The American Heart Association and Hearth & Stroke Foundation of Canada have issued interim hands-only cardiopulmonary resuscitation (CPR) guidelines to reduce the risk when helping victims of cardiac arrest with suspected or confirmed COVID-19. CPR and the use of automated external defibrillators (AED) significantly improve the chance of survival of patients experiencing cardiac arrest. During the COVID-19 pandemic, first aid trained folks and bystanders may feel uncomfortable performing lifesaving CPR and increasing their own risk of contracting the virus.

Hands-only CPR involves performing chest compressions only at a rate of 100 to 120 compressions per minute until an ambulance arrives.
When administering CPR, consider:
1) Wearing a face covering.
2) Laying a cloth, towel, or clothing over the person's mouth and nose.
3) Perform hands-only CPR.
4) Use an AED, if available.

Responders complying with established Arcadis bloodborne pathogens (BBP) PPE requirements should meet PTME expectations required by this COVID-19 Plan.

4.16 COVID-19 Reporting

If you have tested positive for COVID-19 or have been asked to be tested for COVID-19 by a medical professional, please notify Brian Kundert. Your identity will remain confidential.

If you learn you have been in close contact with a worker, client or member of the public who is COVID-19 positive:
1) Stop work.
2) Notify your Supervisor and Project Manager.
3) Self-quarantine and contact your personal physician for additional direction.
4) If you've been tested or asked to be tested for COVID-19 by a medical professional, please notify Brian Kundert. Your identity will remain confidential.

Appendix F provides guidance on what to do if COVID-19 symptoms arise at work. Appendix G provides COVID-19 case management guidance to supervisors and project managers. Finally, Appendix H provides guidance on when to discontinue self isolation after being diagnosed with

COVID-19 or being in close contact with an individual diagnosed with COVID-19.

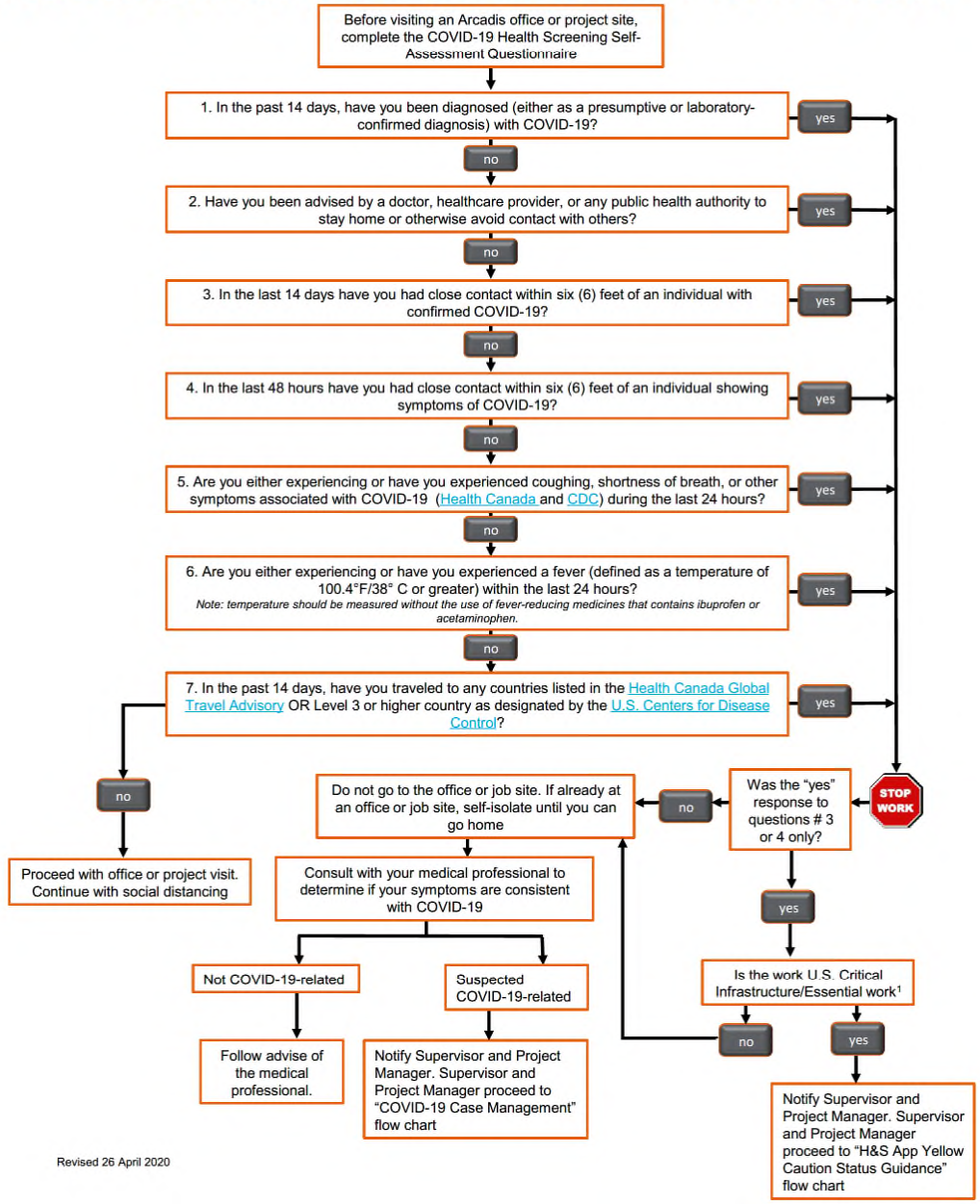
4.17 Employee Questions or Concerns

Employees having questions or concerns about the controls being utilized by Arcadis, subcontractors and/or the client should ask/discuss those questions or concerns with their supervisor or applicable project manager. Technical questions should be addressed to the individual listed in section 4.9 above or may be addressed to the employee's designated business line H&S representative.

Appendix A

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COVID-19 Health Screening Self-Assessment Questionnaire Flow Chart



Health Canada
U.S. Centers for Disease Control
Health Canada Global Travel Advisory

US CDC Travel Guidance

Printable Questionnaires:
Canada COVID-19 Health Screening Self-Assessment Questionnaire for Staff (English)
Canada COVID-19 Health Screening Self-Assessment Questionnaire for Staff (French)
Canada COVID-19 Health Screening Self-Assessment Questionnaire for Visitors (English)
Canada COVID-19 Health Screening Self-Assessment Questionnaire for Visitors (French)
U.S. COVID-19 Health Screening Self-Assessment Questionnaire for Staff, Contractors and Scheduled Visitors (English)
U.S. COVID-19 Health Screening Self-Assessment Questionnaire for Staff, Contractors and Scheduled Visitors (Spanish)
U.S. COVID-19 Health Screening Self-Assessment Questionnaire for Unscheduled Visitors/Guests (English)
U.S. COVID-19 Health Screening Self-Assessment Questionnaire for Unscheduled Visitors/Guests (Spanish)

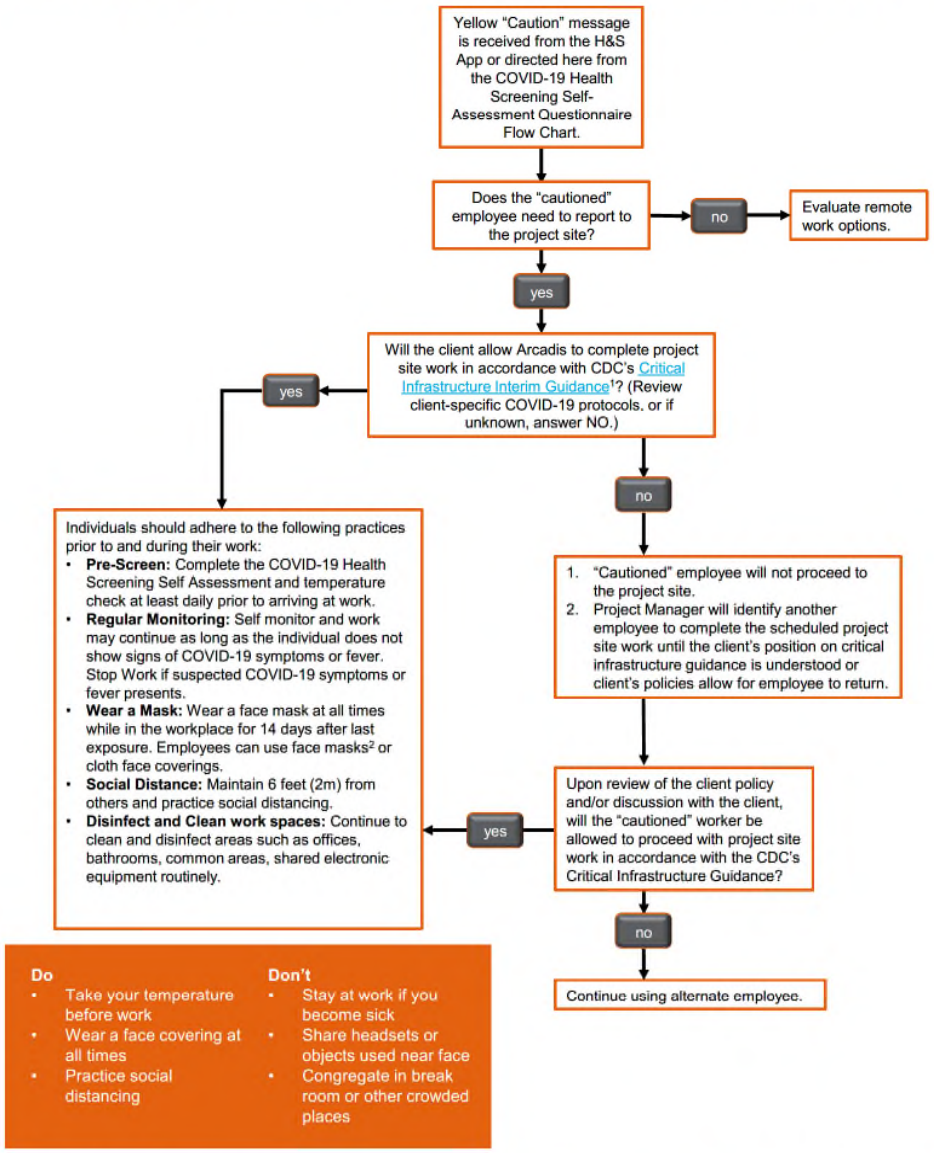
Arcadis Forms and Templates Page

Appendix B

ARCADIS Design & Consultancy for natural and built assets

H&S App Yellow Caution Status Guidance

Based on U.S. CDC Public Health Recommendations for Critical Infrastructure Workers



[1]CDC advises that critical infrastructure workers may be permitted to continue work following potential exposure to COVID-19, provided they remain asymptomatic and additional precautions are implemented to protect them and the community. The U.S. CDC public health recommendations for critical infrastructure/essential workers pertains to critical infrastructure workers in 16 different sectors of work.

[2]Face masks or surgical masks are FDA approved, loose-fitting masks that are fluid resistant and provides the wearer protection against large droplets, splashes, or sprays of bodily or other fluids. Face masks protects others from the wearer's respiratory emissions.

Revised 16 April 2020

Critical Infrastructure Interim Guidance
Critical Infrastructure/Essential Workers

Appendix C

Jurisdiction-Mandated Social Distancing Protocol

Arcadis employees and visitors will adhere to social distancing guidelines. This Social Distancing Protocol is a supplement to meet the requirements of specific jurisdictions requiring a written plan.

The following signs will be posted at the entrance to each active office and project site:
1) Stop: Complete the Arcadis COVID-19 Health Screening Self-Assessment Questionnaire
2) Stop: Social Distancing
3) Novel Coronavirus Prevention Measures
4) Arcadis COVID-19 Health Screening Self-Assessment Questionnaire for unscheduled visitors and
guests (English and Spanish).

Protecting Employee Health

Arcadis has directed all employees who can complete their work duties from home to not come into the office. Through Location Leader communications and the COVID-19 Plan, Arcadis has reinforced social distancing by maintaining separation of at least 6 feet (2 metres).

All employees have been instructed to not come to work if they do not feel well. Prior to leaving for an office or project site, Arcadis employees and scheduled visitors are requested to complete the COVID-19 Health Screening Self-Assessment Questionnaire. Arcadis staff may use the H&S App to complete their daily (or multiple times a day, if appropriate) COVID-19 Health Screening Self-Assessment. Unscheduled visitors will be asked to complete the self-assessment prior to entering the office or project site.

Face coverings will be worn, as appropriate. Refer to section 4.13.2 of the COVID-19 Plan for cleaning and disinfecting information for cloth face coverings.

Facility Information

Cleaning and disinfection of frequently touched surfaces will be completed at Arcadis office and project locations.

Facility Address: _____

_____

_____

Cleaning is the responsibility of: _____

Cleaning is being performed on the following schedule:

Restrooms: _____

Breakrooms: _____

Other: _____

Cleaning and disinfecting supplies are located:

_____

Hand washing stations with soap and water are located:

_____

Hand sanitizer stations are located: ☐ Not applicable soap and water will be used.

_____

Copies of this protocol will be posted and distributed to office or project site Arcadis employees.

You may contact the following person with any questions or comments about this protocol.

Name: _____

Phone: _____

Email: _____

Printable Questionnaires:

Canada COVID-19 Health Screening Self-Assessment Questionnaire for Staff (English)

Canada COVID-19 Health Screening Self-Assessment Questionnaire for Staff (French)

Canada COVID-19 Health Screening Self-Assessment Questionnaire for Visitors (English)

Canada COVID-19 Health Screening Self-Assessment Questionnaire for Visitors (French)

U.S. COVID-19 Health Screening Self-Assessment Questionnaire for Staff, Contractors and Scheduled Visitors (English)

U.S. COVID-19 Health Screening Self-Assessment Questionnaire for Staff, Contractors and Scheduled Visitors (Spanish)

U.S. COVID-19 Health Screening Self-Assessment Questionnaire for Unscheduled Visitors/Guests (English)

U.S. COVID-19 Health Screening Self-Assessment Questionnaire for Unscheduled Visitors/Guests (Spanish)

Arcadis Forms and Templates Page

Appendix D

Interim Guidance for the Use of Face Coverings

Health Canada and CDC recommends wearing cloth face coverings in public settings when around people outside of their household, especially when other social distancing measures are difficult to maintain. (e.g., grocery stores, pharmacies, big box stores, shipping locations). Wearing cloth face coverings is an additional public health measure people should take to reduce the spread of COVID-19. Health Canada and CDC still recommends that you stay at least 6 feet away from other people (social distancing), frequent hand cleaning and other everyday preventive actions.

According to the CDC, recent studies show that a significant portion of individuals with COVID-19 lack symptoms (“asymptomatic”) and that even those who eventually develop symptoms (“pre-symptomatic”) can transmit the virus to others before showing symptoms. This means that the virus can spread between people interacting in close proximity - for example, speaking, coughing, or sneezing—even if those people are not exhibiting symptoms. Face coverings may help prevent people who have COVID-19 from spreading the virus to others and are recommended as a simple barrier to help prevent respiratory droplets from traveling into the air and onto other people.

Considerations for cloth face coverings:
1) Some jurisdictional entities and clients are now requiring the use of cloth face coverings based on Health Canada and CDC guidance.
2) A cloth face covering is not intended to protect the wearer, but it may prevent the spread of virus from the wearer to others. This would be especially important if someone is infected but does not have symptoms.
3) The cloth face coverings recommended are not surgical masks or N-95 respirators.
4) These do not replace other evidence-based measures such as social distancing, frequent hand washing practices, and remaining at home when not doing essential activities.
5) People should also be aware that face coverings can become contaminated on the outside or when touched by unwashed hands.
5a) Avoid moving the face covering around or adjusting it often.
6) Face coverings should not be shared with others.
7) Face coverings with exhalation valves or vents should NOT be worn to help prevent the person wearing the mask from spreading COVID-19 to others (source control).

What is a Cloth Face Covering?

A cloth face covering is a material that covers the nose and mouth. It can be secured to the head with ties or straps or simply wrapped around the lower face. This can be made from a variety of materials, such as cotton, silk, linen or non-woven fabrics. A cloth face covering may be disposable; factory-made; homemade or hand-sewn; or can be improvised from household items such as bandana, scarfs, T-shirts, sweatshirts, or towels and can be used as an additional, voluntary public health measure.

Additional Information Concerning KN95 Masks

During periods of shortages of N95 filtering facepiece respirators (FFRs), the federal government advises that FFRs, air-purifying elastomeric respirators, and compatible filters certified under other countries or jurisdictions (e.g., KN95 made in China) will provide greater protection than surgical masks (i.e., facemasks, other than surgical N95s), homemade masks, or improvised mouth and nose covers, such as bandanas and scarves. Certification in accordance with country or jurisdiction standards ensures that devices provide similar filtration as NIOSH-certified equipment and have an assigned protection factor greater than or equal to 10. If the KN95 is not required PPE as part of a regulatory requirement, the KN95 can be used voluntarily. Voluntary users must review Appendix D of 1910.134. If the KN95 is required PPE as part of a regulatory requirement, the Arcadis country-specific Respiratory Protection H&S Standard applies.

U.S. Federal Government Guidance on KN95 FFRs

Appendix E

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STOP

Everyone entering the site must conduct a health screening self-assessment daily

If you are feeling unwell or have the following symptoms,
please leave the premises and contact your healthcare provider
Then follow-up with your supervisor
and the Arcadis Project Manager or Arcadis Local Point of Contact listed below

DO NOT ENTER if you have:



FEVER



COUGH



SHORTNESS OF BREATH

EMERGENCY – CALL 911

PROJECT ADDRESS:

ARCADIS PROJECT MANAGER:

ARCADIS LOCAL POINT OF CONTACT:

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Everyone entering the site must practice social distancing:

No groups larger than 10

Maintain 6 feet (2 metres) distance to others

Do not shake hands or engage in any unnecessary physical contact

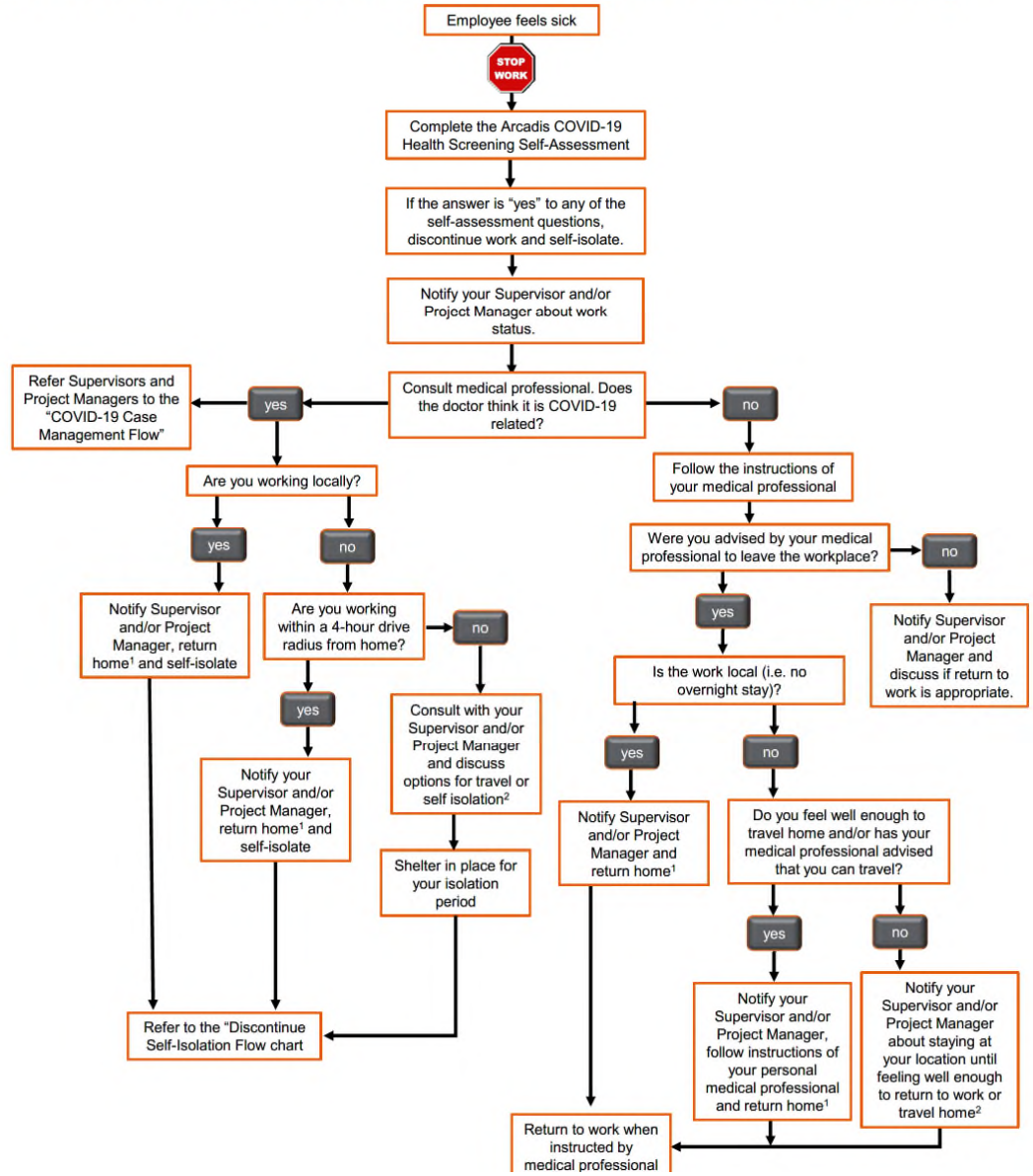
Your cooperation is appreciated



Appendix F

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Decision Flow Chart: Becoming Ill While Working



[1] If immediate medical assistance is not recommended by the medical professional and you are feeling well enough, return home. If you do not feel well enough to drive home and alternate transportation arrangements cannot be made, contact Supervisor or Project Manager to discuss options.
[2] Discuss options and need for sheltering-in-place, understanding that Arcadis will cover the cost of lodging, food delivery arrangements and rental car, if shelter-in-place away from home is required.

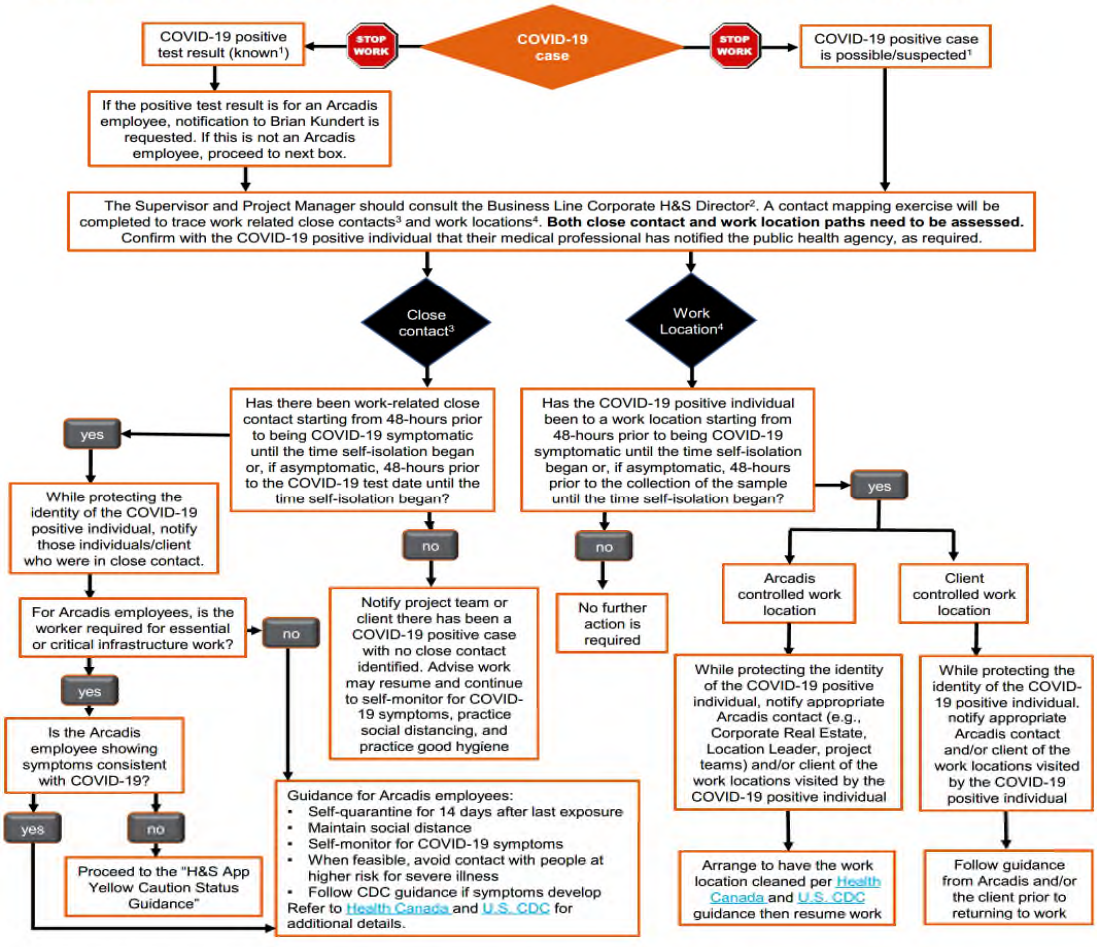
Revised 7 April 2020

Appendix G

COVID-19 Case Management for Supervisors and Project Managers

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Based on U.S. Public Health Recommendations for Community-Related COVID-19 Exposure



[1] Known - COVID-19 positive test. Suspected or possible - medical professional has advised the symptoms are consistent with COVID-19.
[2] Canada – David McClellan, U.S. Corporate – Sam Moyers, U.S. Environment – Denis Balcer, U.S. Infrastructure – Andrew McDonald, U.S. Water – Lauren Hubbard
[3] The CDC defines close contact as: a) being within approximately 6 feet (2 m)* of a COVID-19 case for a prolonged period of time,** close contact can occur while caring for, living with, visiting, or sharing a healthcare waiting area or room with a COVID-19 case – or – b) having direct contact with infectious secretions of a COVID-19 case (e.g., being coughed on).
*Data are limited to define of close contact. Factors to consider when defining close contact include proximity, the duration of exposure (e.g., longer exposure time likely increases exposure risk), whether the individual has symptoms (e.g., coughing likely increases exposure risk) and whether the individual was wearing a facemask (which can efficiently block respiratory secretions from contaminating others and the environment).
**Data are insufficient to precisely define the duration of time that constitutes a prolonged exposure. Recommendations vary on the length of time of exposure from 10 minutes or more to 30 minutes or more. In healthcare settings, it is reasonable to define a prolonged exposure as any exposure greater than a few minutes because the contact is someone who is ill. Brief interactions are less likely to result *in* transmission; however, symptoms and the type of interaction (e.g., did the person cough directly into the face of the individual) remain important.
[4] Work Location examples include Arcadis or client office, client facility, construction trailer, project site.

Revised 8 June 2020

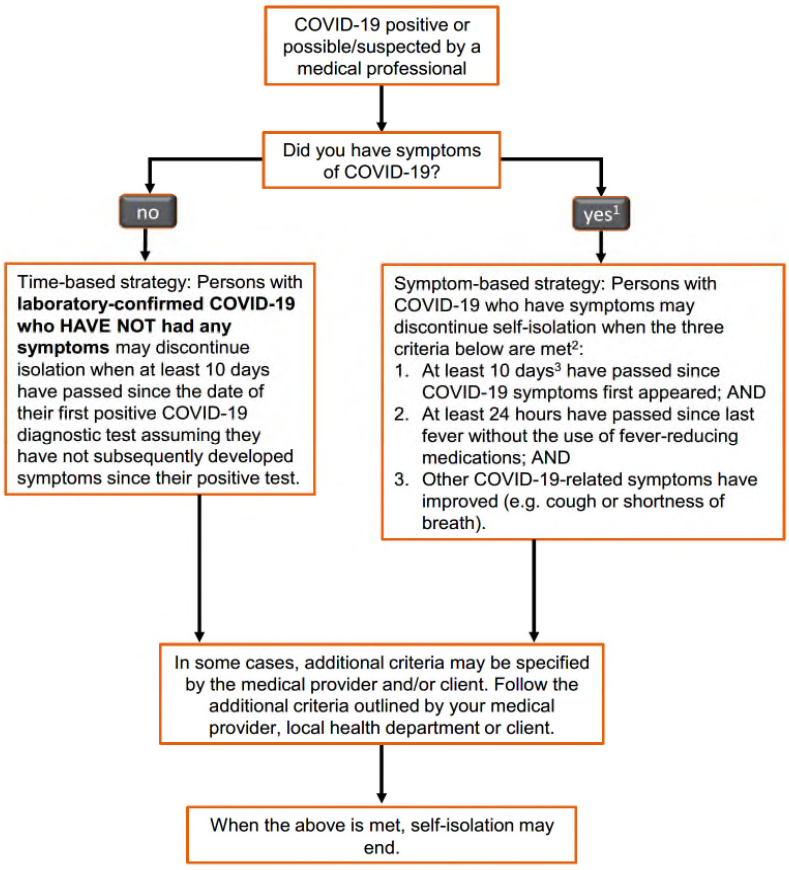
Health Canada Workplace Guidance
U.S. CDC Community Related Exposure Guidance
Health Canada Cleaning and Disinfecting Guidance
U.S. CDC Cleaning and Disinfecting Guidance

Appendix H

ARCADIS Design & Consultancy for natural and built assets

U.S. CDC Interim Guidance for Discontinuation of Isolation for Persons with COVID-19 Not in Healthcare Settings

Process below is directly from CDC for individuals who are not immunocompromised



[1]Based on CDC Discontinuation of Isolation for Persons with COVID-19 Not in Healthcare Settings
[2]In all cases, follow the guidance of your healthcare provider and local health department. The decision to stop self-isolation should be made in consultation with your healthcare provider and state and local health departments. Local decisions depend on local circumstances.
[3]A limited number of persons with severe illness may produce replication-competent virus beyond 10 days, that may warrant extending duration of isolation for up to 20 days after symptom onset. Consider consultation with infection control experts. See Discontinuation of Transmission-Based Precautions and Disposition of Patients with COVID-19 in Healthcare Settings (Interim Guidance).

Revised 22 July 2020

CDC Guidance
CDC Immunocompromised Guidance

Attachment B

Safety Data Sheets

Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Isopropyl Alcohol
ISO5300

Issue Date: 2006-06

Section 1 - Chemical Product and Company Identification 61

Material Name: Isopropyl Alcohol **CAS Number:** 67-63-0
Chemical Formula: C_3H_8O
Structural Chemical Formula: $(CH_3)_2CHOH$
EINECS Number: 200-661-7
ACX Number: X1001458-1
Synonyms: ALCOJEL; ALCOOL ISOPROPILICO; ALCOOL ISOPROPYLIQUE; ALCOSOLVE; ALCOSOLVE 2; AVANTIN; AVANTINE; CHROMAR; COMBI-SCHUTZ; (COMPONENT OF) HIBISTAT; DIMETHYL CARBINOL; DIMETHYLCARBINOL; EPA PESTICIDE CHEMICAL CODE 047501; HARTOSOL; 2-HYDROXYPROPANE; IMSOL A; IPA; ISOHOL; ISOPROPANOL; ISOPROPYL ALCOHOL; ISO-PROPYLALKOHOL; LUTOSOL; 1-METHYLETHANOL; 1-METHYLETHYL ALCOHOL; PETROHOL; PRO; 2-PROPANOL; I-PROPANOL; N-PROPAN-2-OL; PROPAN-2-OL; PROPOL; 2-PROPYL ALCOHOL; I-PROPYL ALCOHOL; SEC-PROPYL ALCOHOL; I-PROPYLALKOHOL; SECONDARY PROPYL ALCOHOL; SPECTRAR; STERISOL HAND DISINFECTANT; TAKINEOCOL; VISCO 1152
Derivation: Treating propylene with sulfuric acid and then hydrolyzing or direct hydration of propylene using superheated steam. Most commonly available as rubbing alcohol (70% IPA).
General Use: As a solvent for gums, shellac, and essential oils, chemical intermediate, dehydrating agent, vehicle for germicidal compounds, de-icing agent for liquid fuels; for denaturing ethyl alcohol, preserving pathological specimens; in extraction of alkaloids, quick-drying inks and oils, and an ingredient of skin lotions, cosmetics, window cleaner, liquid soaps, and pharmaceuticals.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
Isopropyl alcohol	67-63-0	100% vol.

Most commonly sold as 70% isopropyl alcohol (rubbing alcohol).

OSHA PEL
TWA: 400 ppm; 980 mg/m^3.

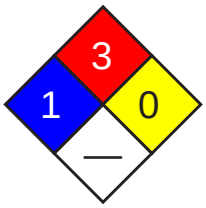
NIOSH REL
TWA: 400 ppm (980 mg/m^3); STEL: 500 ppm (1225 mg/m^3).

DFG (Germany) MAK
TWA: 200 ppm; PEAK: 400 ppm.

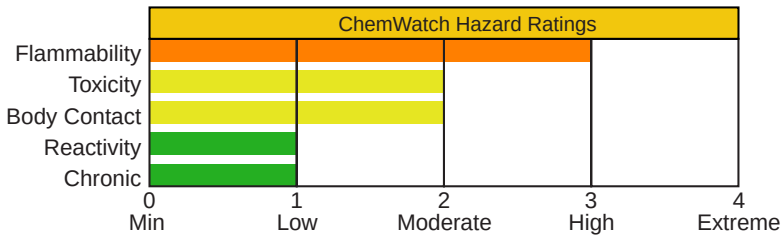
ACGIH TLV
TWA: 200 ppm; STEL: 400 ppm.

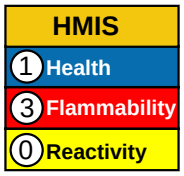
IDLH Level
2000 ppm (10% LEL).

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word
Warning!


Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Volatile liquid. Irritating to eyes/respiratory tract. Other Acute Effects: CNS depression, possible dermatitis, systemic toxicity. Flammable

Potential Health Effects

Target Organs: Eyes, skin, respiratory system.
Primary Entry Routes: Inhalation, ingestion, skin contact/absorption.

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Acute Effects

Inhalation: Vapor inhalation is irritating to the respiratory tract and can cause central nervous system depression at high concentrations. Volunteers exposed to 400 ppm for 3 to 5 min experienced mild eye and respiratory irritation. At 800 ppm, irritation was not severe, but most people found the air uncomfortable to breathe.

Eye: Exposure to the vapor or direct contact with the liquid causes irritation and possible corneal burns.

Skin: Some irritation may occur after prolonged exposure.

Ingestion: Accidental ingestions have provided the most information on isopropyl alcohol toxicity. Symptoms include nausea and vomiting, headache, facial flushing, dizziness, lowered blood pressure, mental depression, hallucinations and distorted perceptions, difficulty breathing, respiratory depression, stupor, unconsciousness, and coma. Kidney insufficiency including oliguria (reduced urine excretion), anuria (absent urine excretion), nitrogen retention, and edema (fluid build-up in tissues) may occur. One post-mortem examination in a case of heavy ingestion showed extensive hemorrhagic tracheobronchitis, broncho pneumonia, and hemorrhagic pulmonary edema. Death can occur in 24 to 36 h post-ingestion due to respiratory paralysis.

Carcinogenicity: NTP - Not listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

Medical Conditions Aggravated by Long-Term Exposure: Dermatitis or respiratory or kidney disorders.

Chronic Effects: Repeated skin contact can cause drying of skin and delayed hypersensitivity reactions in some individuals.

Section 4 - First Aid Measures

See DOT ERG

Inhalation: Remove exposed person to fresh air and support breathing as needed.

Eye Contact: *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately.

Skin Contact: *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. Wash exposed area with soap and water. For reddened or blistered skin, consult a physician.

Ingestion: Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have the *conscious and alert* person drink 1 to 2 glasses of water to dilute. Vomiting may be contraindicated because of the rapid onset of central nervous system depression. Gastric lavage is preferred.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Diagnostic test: acetone in urine. Isopropyl alcohol is oxidized in the body to acetone where it is excreted by the lungs or kidneys. Some acetone may be further metabolized to acetate, formate, and finally carbon dioxide. Probable oral lethal dose is 240 mL.

Section 5 - Fire-Fighting Measures

See DOT ERG

Flash Point: 53 °F (12 °C), Closed Cup

Burning Rate: 2.3 mm/min.

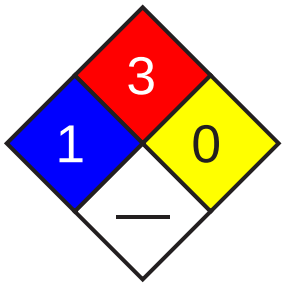
Autoignition Temperature: 750°F (399°C)

LEL: 2 % v/v

UEL: 12.7 % v/v at 200 °F

Flammability Classification: Class 1B Flammable Liquid

Extinguishing Media: Carbon dioxide, dry chemical, water *spray* (solid streams can spread fire), alcohol- resistant foam, or fog.



Fire Diamond

General Fire Hazards/Hazardous Combustion Products: Carbon oxides and acrid smoke. Container may explode in heat of fire. Vapors may travel to an ignition source and flash back. Isopropyl alcohol poses an explosion hazard indoors, outdoors, and in sewers.

Fire-Fighting Instructions: If possible without risk, move container from fire area. Apply cooling water to container side until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use monitor nozzles or unmanned hose holders; if impossible, withdraw and let fire burn. Withdraw immediately if you hear a rising sound from venting safety device or notice any tank discoloration due to fire. *Do not* release runoff from fire control methods to sewers or waterways. Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Structural firefighters' protective clothing provides only limited protection.

Section 6 - Accidental Release Measures

See DOT ERG

Spill/Leak Procedures: Notify safety personnel, isolate and ventilate area, deny entry, and stay upwind. Shut off ignition sources. Cleanup personnel should protect against vapor inhalation and skin/eye contact. Water spray may reduce vapor, but may not prevent ignition in closed spaces.

Small Spills: Take up with earth, sand, vermiculite, or other absorbent, noncombustible material and place in suitable containers.

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Large Spills: For large spills, dike far ahead of liquid spill for later disposal. Do not release into sewers or waterways.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Use non-sparking tools to open containers.
Never eat, drink, or smoke in work areas. Practice good personal hygiene after using isopropyl alcohol, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Recommended Storage Methods: Store in a cool, dry, well-ventilated area away from heat, ignition sources, and incompatibles (Sec 10). Install electrical equipment of Class 1, Group D.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: To prevent static sparks, electrically ground and bond all equipment used with and around IPA. Provide general or local exhaust ventilation systems to maintain airborne levels below OSHA PELs (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.

Administrative Controls: Consider preplacement and periodic medical exams of exposed workers with emphasis on the skin, kidneys, and respiratory system. Be extra cautious when using IPA concurrently with carbon tetrachloride because animal studies have shown it enhances carbon tetrachloride's toxicity.

Personal Protective Clothing/Equipment: Wear chemically protective gloves, boots, aprons, and gauntlets to prevent prolonged or repeated skin contact. Nitrile rubber (breakthrough time > 8 hr), Neoprene and Teflon (breakthrough time > 4 hr) are suitable materials for PPE. Do not use PVA, PVC or natural rubber (breakthrough time < 1 hr). Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Because contact lens use in industry is controversial, establish your own policy.

Respiratory Protection: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. For < 1000 ppm, use any powered, air purifying respirator with organic vapor cartridges or any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s). For < 10,000 ppm, use any supplied-air respirator (SAR) operated in continuous-flow mode. For < 12,000 ppm, use any air- purifying, full facepiece respirator (gas mask) with a chin-style, front-or back-mounted organic vapor canister or any SCBA or SAR with a full facepiece. For emergency or entrance into unknown concentrations, use any SCBA or SAR (with auxiliary SCBA) with a full facepiece and operated in pressure-demand or other positive-pressure mode. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.

Other: Separate contaminated work clothes from street clothes. Launder before reuse. Remove isopropyl alcohol from your shoes and clean personal protective equipment. Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Colorless with a slight odor and bitter taste.

Physical State: Liquid
Odor Threshold: 7.84 to 490 mg/m^3
Vapor Pressure (kPa): 44 mm Hg at 25 °F (77 °C)
Formula Weight: 60.09
Density: 0.78505 at 68°F (20 °C)
Refractive Index: 1.375 at 68 °F (20 °C)
Boiling Point: 180.5 °F (82.5 °C)
Freezing/Melting Point: -129.1 °F (-89.5 °C)
Viscosity: 2.1 cP at 77 °F (25 °C)
Surface Tension: 20.8 dyne/cm at 77 °F (25 °C)
Ionization Potential (eV): 10.10 eV
Critical Temperature: 455 °F (235 °C)
Critical Pressure: 47 atm
Water Solubility: > 10 %
Other Solubilities: Soluble in alcohol, ether, chloroform, and benzene. Insoluble in salt solutions.

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Isopropyl alcohol is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization does not occur. Exposure to heat, ignition sources, and incompatibles.

Storage Incompatibilities: Include acetaldehyde, chlorine, ethylene oxide, acids and isocyanates, hydrogen + palladium, nitroform, oleum, phosgene, potassium *t*-butoxide, oxygen (forms unstable peroxides), trinitromethane, barium perchlorate, tetrafluoroborate, chromium trioxide, sodium dichromate + sulfuric acid, aluminum, aluminum triisopropoxide, and oxidizers. Will attack some forms of plastic, rubber, and coatings.

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Hazardous Decomposition Products: Thermal oxidative decomposition of isopropyl alcohol can produce carbon oxides and acrid smoke.

Section 11 - Toxicological Information

Acute Oral Effects:

Rat, oral, LD_{50}: 5045 mg/kg caused a change in righting reflex, and somnolence (general depressed activity).

Human, oral, TD_{Lo}: 223 mg/kg caused hallucinations, distorted perceptions, lowered blood pressure, and a change in pulse rate.

Human, oral, LD_{Lo}: 3570 mg/kg caused coma, respiratory depression, nausea, and vomiting.

Irritation Effects:

Rabbit, eye: 100 mg caused severe irritation.

Rabbit, skin: 500 mg caused mild irritation.

Other Effects:

Rat, inhalation: 3500 ppm/7 hr given from 1 to 19 days of pregnancy caused fetotoxicity.

See *RTECS* NT8050000, for additional data.

Section 12 - Ecological Information

Environmental Fate: On soil, IPA will volatilize or leach into groundwater. Biodegradation is possible but rates are not found in available literature. It will volatilize (est. half-life = 5.4 days) or biodegrade in water. It is not expected to bioconcentrate in fish. In the air, it reacts with photochemically produced hydroxyl radicals with a half-life of one to several days. Because it is soluble, removal by rain, snow or other precipitation is possible.

Ecotoxicity: Guppies (*Poecilia reticulata*) LC_{50} = 7,060 ppm/7 days; fathead minnow (*Pimephales promelas*) LC_{50} = 11,830 mg/L/1 hr. BOD = 133 %/5 days.

Octanol/Water Partition Coefficient: log K_{ow} = 0.05

Section 13 - Disposal Considerations

Disposal: Microbial degradation is possible by oxidizing isopropyl alcohol to acetone by members of the genus *Desulfovibrio*. Spray waste into incinerator (permit-approved facilities only) equipped with an afterburner and scrubber. Isopropyl alcohol can be settled out of water spills by salting with sodium chloride. Note: Salt may harm aquatic life, so weigh the benefits against possible harm before application. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations. Triple rinse containers.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):



Shipping Name and Description: Isopropanol *or* Isopropyl alcohol
ID: UN1219
Hazard Class: 3 - Flammable and combustible liquid
Packing Group: II - Medium Danger
Symbols:
Label Codes: 3 - Flammable Liquid
Special Provisions: IB2, T4, TP1
Packaging: **Exceptions:** 150 **Non-bulk:** 202 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 5 L **Cargo aircraft only:** 60 L
Vessel Stowage: **Location:** B **Other:**

Section 15 - Regulatory Information

EPA Regulations:

RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Not listed
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

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Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2006-06

Section 1 - Chemical Product and Company Identification 61

Material Name: Isobutene
CAS Number: 115-11-7
Chemical Formula: C_4H_8
Structural Chemical Formula: $(CH_3)_2C=CH_2$
EINECS Number: 204-066-3
ACX Number: X1003822-9
Synonyms: Isobutene; ISOBUTYLENE; ASYM-DIMETHYLETHYLENE; GAMMA-BUTYLENE; 1,1-DIMETHYLETHYLENE; ISO-BUTENE; ISOBUTENE; ISOPROPYLIDENEMETHYLENE; LIQUEFIED PETROLEUM GAS; 2-METHYL-1-PROPENE; 2-METHYLPROPENE; 2-METHYLPROPYLENE; 1-PROPENE,2-METHYL-; PROPENE,2-METHYL-; UNSYM. DIMETHYLETHYLENE
General Use: Production of butene polymers used as adhesives, tackifiers, oil additives.
Butyl rubbers, copolymer resins with butadiene, acrylates and methacrylates.
Also to produce anti-oxidants for foods, food supplements, plastics and in production of isooctane and high-octane aviation gasoline.
Used in closed pressurized systems, fitted with safety relief valve.
Vented gas is flammable, denser than air and will spread. Vent path must not contain ignition sources, pilot lights, bare flames.

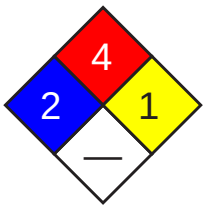
Section 2 - Composition / Information on Ingredients

Name	CAS	%
isobutene	115-11-7	>99

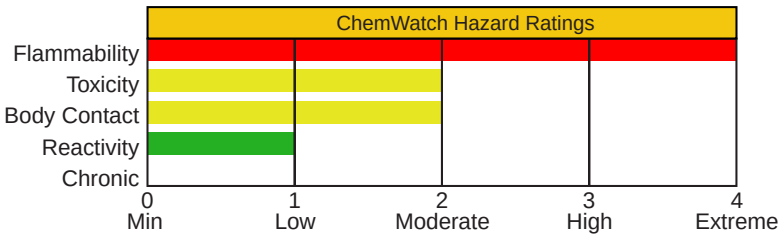
OSHA PEL **NIOSH REL**

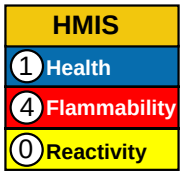
ACGIH TLV

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word

Danger!


Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless gas. Acute Effects: Simple asphyxiant which can displace available oxygen; initial symptoms: rapid respiration, air hunger, diminished mental alertness, impaired muscular coordination. Can form explosive mixtures in air. Flammable.

Potential Health Effects

Target Organs: None reported
Primary Entry Routes: inhalation
Acute Effects
Inhalation: The gas is a simple asphyxiant (precludes access to oxygen) and is harmful if exposure is prolonged and inhalation may cause loss of consciousness.

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Acute effects from inhalation of high concentrations of gas / vapor are pulmonary irritation, including coughing, with nausea; central nervous system depression - characterized by headache and dizziness, increased reaction time, fatigue and loss of coordination.
If exposure to highly concentrated atmosphere of gas is prolonged this may lead to narcosis, unconsciousness, even coma, and unless resuscitated, death.
Iso-butene is a simple asphyxiant and may have a narcotic action.
Material is highly volatile and may quickly form concentrated atmosphere in confined or unventilated area. Vapor is heavier than air and may displace and replace air in breathing zone, acting as a simple asphyxiant. This may happen with little warning of overexposure.
Hydrocarbons may sensitize the heart to adrenalin and other circulatory catecholamines; as a result cardiac arrhythmias and ventricular fibrillation may occur. Abrupt collapse may produce traumatic injury.
Central nervous system (CNS) depression may be evident early. Symptoms of moderate poisoning may include giddiness, headache, dizziness and nausea.
Serious poisonings may result in respiratory depression and may be fatal.
The paraffin gases C1-4 are practically non-toxic below their lower flammability limits (18000-50000 ppm). Above this level, incidental effects include CNS depression and irritation but these are reversible upon cessation of the exposure. The C3 and iso-C5 hydrocarbons show increasing narcotic properties; branching of the chain also enhances the effect.
The C4 hydrocarbons appear to be more highly neurotoxic than the C3 and C5 members. Several fatalities due to voluntary inhalation of butane have been reported, possibly due to central, respiratory and circulatory effects resulting from anesthesia, laryngeal edema, chemical pneumonia or the combined effects of cardiac toxicity and increased sympathomimetic effects.
Inhalation of petroleum gases may produce narcosis, due in part to olefinic impurities. Displacement of oxygen in the air may cyanosis.
If present in sufficient quantity these gases may reduce the oxygen level to below 18% producing asphyxiation.
Symptoms include rapid respiration, mental dullness, lack of coordination, poor judgement, nausea and vomiting.
The onset of cyanosis may lead to unconsciousness and death.

Eye: The liquid is highly discomforting and may cause severe cold burns and is capable of causing pain and severe conjunctivitis.
Corneal injury may develop, with possible permanent impairment of vision, if not promptly and adequately treated.
The gas is regarded as non-irritating to the eyes.

Skin: Vaporizing liquid causes rapid cooling and contact may cause cold burns, frostbite.The liquid is discomforting to the skin and may rapidly cause severe cold burns.
Bare unprotected skin should not be exposed to this material.
There is no evidence of skin absorption but contact may cause frostbite,

Ingestion: Overexposure is unlikely in this form.
Considered an unlikely route of entry in commercial/industrial environments.
The liquid is highly discomforting if swallowed and may cause severe cold burns.

Carcinogenicity: NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

Chronic Effects: Chronic overexposure may produce dermatitis.

Section 4 - First Aid Measures

Inhalation: Avoid becoming a casualty and remove to fresh air.
Lay patient down. If breathing is shallow or has stopped, ensure clear airway and apply resuscitation.
If available, medical oxygen should be administered by trained personnel.
Transport to hospital or doctor, without delay.



Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.
Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: In case of cold burns (frost-bite): Bathe the affected area immediately in cold water for 10 to 15 minutes, immersing if possible and without rubbing.
Do not apply hot water or radiant heat. Apply a clean, dry dressing.
Transport to hospital or doctor.

Ingestion: Contact a Poison Control Center. DO NOT induce vomiting. Observe the patient carefully. Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious. Give water (or milk) to rinse out mouth. Then provide liquid slowly and as much as casualty can comfortably drink. Transport to hospital or doctor without delay.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: For acute or short-term repeated exposures to petroleum distillates or related hydrocarbons:
1.Primary threat to life from pure petroleum distillate ingestion and/or inhalation is respiratory failure.

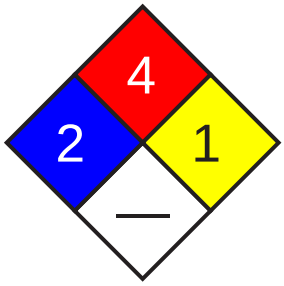
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2.Patients should be quickly evaluated for signs of respiratory distress (e.g. cyanosis, tachypnea, intercostal retraction, obtundation) and given oxygen. Patients with inadequate tidal volumes or poor arterial blood gases (pO_2 <50 mm Hg or pCO_2 >50 mm Hg) should be intubated.
3.Arrhythmias complicate some hydrocarbon ingestion and/or inhalation and electrocardiographic evidence of myocardial injury has been reported; intravenous lines and cardiac monitors should be established in obviously symptomatic patients. The lungs excrete inhaled solvents, so that hyperventilation improves clearance.
4.A chest x-ray should be taken immediately after stabilization of breathing and circulation to document aspiration and detect the presence of pneumothorax.
5.Epinephrine (adrenalin) is not recommended for treatment of bronchospasm because of potential myocardial sensitization to catecholamines.
Inhaled cardioselective bronchodilators (e.g. Alupent, Salbutamol) are the preferred agents, with aminophylline a second choice.
6.Lavage is indicated in patients who require decontamination; ensure use of cuffed endotracheal tube in adult patients.

Section 5 - Fire-Fighting Measures

Flash Point: -76.111 °C
Autoignition Temperature: 465 °C
LEL: 1.8% v/v
UEL: 9.6% v/v
Extinguishing Media: Water spray or fog; dry chemical powder.
Carbon dioxide.
Foam.

See DOT ERG



Fire Diamond

General Fire Hazards/Hazardous Combustion Products: Flammable gas. Liquid and vapor are highly flammable.
Dangerous hazard when exposed to heat, flame and oxidizers.
Gas may form explosive mixtures with air over a wide area.
Decomposes on heating and produces toxic fumes of carbon monoxide (CO) and carbon dioxide (CO_2).
Fire Incompatibility: Avoid contamination with oxidizing agents i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.
Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
Do not extinguish burning gas. If safe to do so, stop flow of gas.
If flow of gas cannot be stopped, leave gas to burn.
Cool fire-exposed containers with water spray from a protected location.
Do not approach cylinders suspected to be hot.
If safe to do so, remove containers from path of fire.
Fight fire from a safe distance, with adequate cover.

Section 6 - Accidental Release Measures

Small Spills: Avoid breathing vapor and any contact with liquid or gas. Protective equipment including respirator should be used. Do NOT enter confined spaces where gas may have accumulated. Shut of all sources of possible ignition and increase ventilation. Clear area of personnel. Stop leak only if safe to so do. Remove leaking cylinders to safe place. Release pressure under safe controlled conditions by opening valve. Keep area clear of personnel until gas has dispersed.

See DOT ERG

Large Spills: DO NOT touch the spill material. Shut off all possible sources of ignition and increase ventilation.
Restrict access to area. Clear area of personnel and move upwind.
May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
Avoid spraying water onto liquid pools.
Use extreme caution to avoid a violent reaction.
Stop leak if safe to do so.
DO NOT enter confined places where gas may have collected. Remove leaking cylinders to a safe place. Fit vent pipes. Release pressure under safe, controlled conditions by opening valve. Burn issuing gas at vent pipes.
Do not exert excessive pressure on valve; do not attempt to operate damaged valve.
Keep area clear of personnel until gas has dispersed
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Use good occupational work practices. Use in a well-ventilated area.

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Obtain a work permit before attempting any repairs.
Do not attempt repair work on lines, vessels under pressure.
Atmospheres must be tested and O.K. before work resumes after leakage.
Wear protective clothing and gloves when handling containers.
No smoking, bare lights, heat or ignition sources.
Use spark-free tools when handling. Ground all lines and equipment.
Prevent concentration in hollows and sumps. DO NOT enter confined spaces until atmosphere has been checked.
Gas may travel a considerable distance to source of ignition.
Vapor may ignite on pumping or pouring due to static electricity.
Avoid physical damage to containers.
DO NOT transfer gas from one cylinder to another.
Natural gases contain a contaminant, radon-222, a naturally occurring radioactive gas. During subsequent processing, radon tends to concentrate in liquified petroleum streams and in product streams having similar boiling points.
Industry experience indicates that the commercial product may contain small amounts of radon-222 and its radioactive decay products (radon daughters). The actual concentration of radon-222 and radioactive daughters in process equipment (IE lines, filters, pumps and reactor units) may reach significant levels and produce potentially damaging levels of gamma radiation. A potential external radiation hazard exists at or near any pipe, valve or vessel containing a radon enriched stream or containing internal deposits of radioactive material. Field studies, however, have not shown that conditions exist that expose the worker to cumulative exposures in excess of general population limits. Equipment containing gamma-emitting decay products should be presumed to be internally contaminated with alpha- emitting decay products which may be hazardous if inhaled or ingested.
During maintenance operations that require the opening of contaminated process equipment, the flow of gas should be stopped and a four hour delay enforced to allow gamma-radiation to drop to background levels. Protective equipment (including high efficiency particulate respirators (P3) suitable for radionucleotides or supplied air) should be worn by personnel entering a vessel or working on contaminated process equipment to prevent skin contamination or inhalation of any residue containing alpha-radiation.
Airborne contamination may be minimized by handling scale and/or contaminated materials in a wet state.

Recommended Storage Methods: Packaging as recommended by manufacturer.
Check that containers are clearly labeled.
Cylinder fitted with valve protector cap.
Ensure the use of equipment rated for cylinder pressure.
Ensure the use of compatible materials of construction.
Cylinder valve must be closed when not in use or when empty.
Cylinder must be properly secured either in use or in storage.
WARNING: Suckback into cylinder may result in rupture.
Use back-flow preventive device in piping.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Use in a well-ventilated areaIf gas concentrations are high: or If risk of overexposure exists, wear NIOSH-approved respirator.
Correct fit is essential to obtain adequate protection.
Used in closed pressurized systems; fitted with temperature and pressure safety relief valves which are vented to allow safe dispersal.
Provide adequate ventilation in warehouse or closed storage areas.

Personal Protective Clothing/Equipment:

Eyes: Safety glasses with side shields; or as required, chemical goggles.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Protective gloves eg. leather gloves or gloves with leather facing. Neoprene rubber gloves.
Safety footwear.

Other: Operators should be trained in correct use & maintenance of respirators Ensure that there is ready access to breathing apparatus.
Protective overalls, closely fitted at neck and wrist. Eye-wash unit.
IN CONFINED SPACES:
1. Non-sparking protective boots.
2. Static-free clothing.
3. Ensure availability of lifeline.
Staff should be trained in all aspects of rescue work.
Ensure there is ready access to an emergency shower.

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Section 9 - Physical and Chemical Properties

Appearance/General Info: Easily liquified flammable gas or colorless highly volatile liquid. Packed as liquid under pressure and remains liquid only under pressure. Sudden release of pressure or leakage may result in rapid vaporization with generation of large volume of highly flammable / explosive gas. Strong gasoline odor. Floats and boils on water giving a flammable / explosive, visible cloud. Soluble in alcohol, ether, benzene and sulphuric acid.

Physical State: Liquefied gas
Odor Threshold: 1.3 to 3.0 mg/m^3
Vapor Pressure (kPa): 182 kPa at 10 °C
Vapor Density (Air=1): 2.01
Formula Weight: 56.11
Specific Gravity (H_2O=1, at 4 °C): 0.59
Evaporation Rate: Very rapid
pH: Not applicable
pH (1% Solution): Not applicable.
Boiling Point: -6.9 °C (20 °F)
Freezing/Melting Point: -140.35 °C (-220.63 °F)
Volatile Component (% Vol): 100
Water Solubility: Practically insoluble in water

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Product is considered stable. Hazardous polymerization will not occur.
Storage Incompatibilities: Avoid contact with oxidizing agents.

The interaction of alkenes and alkynes with nitrogen oxides and oxygen may produce explosive addition products; these may form at very low temperatures and explode on heating to higher temperatures (the addition products from 1,3-butadiene and cyclopentadiene form rapidly at -150 °C and ignite or explode on warming to -35 to -15 C). These derivatives ("pseudo- nitrosites") were formerly used to characterize terpene hydrocarbons.

Exposure to air must be kept to a minimum so as to limit the build-up of peroxides which will concentrate in bottoms if the product is distilled.

The product must not be distilled to dryness if the peroxide concentration is substantially above 10 ppm (as active oxygen) since explosive decomposition may occur. Distillate must be immediately inhibited to prevent peroxide formation. The effectiveness of the antioxidant is limited once the peroxide levels exceed 10 ppm as active oxygen. Addition of more inhibitor at this point is generally ineffective.

Prior to distillation it is recommended that the product should be washed with aqueous ferrous ammonium sulfate to destroy peroxides; the washed product should be immediately re-inhibited.

A range of exothermic decomposition energies for double bonds is given as 40-90 kJ/mol. The relationship between energy of decomposition and processing hazards has been the subject of discussion; it is suggested that values of energy released per unit of mass, rather than on a molar basis (J/g) be used in the assessment. For example, in "open vessel processes" (with man-hole size openings, in an industrial setting), substances with exothermic decomposition energies below 500 J/g are unlikely to present a danger, whilst those in "closed vessel processes" (opening is a safety valve or bursting disk) present some danger where the decomposition energy exceeds 150 J/g.

Avoid reactions with oxidizing agents, organic acids, inorganic acids halogenated compounds, polymerizable esters, oxygen, cyanohydrins and molten sulphur.

Section 11 - Toxicological Information

Toxicity
Inhalation (rat) LC_{50}: 620000 mg/m^3/4h

Irritation
Nil reported

See *RTECS* UD 0890000, for additional data.

Section 12 - Ecological Information

Environmental Fate: No data found.
Ecotoxicity: No data found.
BCF: no food chain concentration potential
Biochemical Oxygen Demand (BOD): none

Section 13 - Disposal Considerations

Disposal: Consult manufacturer for recycling options.
Discharge to burning flare. Return empty cylinders to supplier.

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Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Note: This material has multiple possible HMT entries. Choose the appropriate one based on state and condition of specific material when shipped.

Shipping Name and Description: Isobutylene *see also* Petroleum gases, liquefied
ID: UN1055
Hazard Class: 2.1 - Flammable gas
Packing Group:
Symbols:
Label Codes: 2.1 - Flammable Gas
Special Provisions: 19, T50
Packaging: **Exceptions:** 306 **Non-bulk:** 304 **Bulk:** 314, 315
Quantity Limitations: **Passenger aircraft/rail:** Forbidden **Cargo aircraft only:** 150 kg
Vessel Stowage: **Location:** E **Other:** 40



Shipping Name and Description: Petroleum gases, liquefied *or* Liquefied petroleum gas
ID: UN1075
Hazard Class: 2.1 - Flammable gas
Packing Group:
Symbols:
Label Codes: 2.1 - Flammable Gas
Special Provisions: T50
Packaging: **Exceptions:** 306 **Non-bulk:** 304 **Bulk:** 314, 315
Quantity Limitations: **Passenger aircraft/rail:** Forbidden **Cargo aircraft only:** 150 kg
Vessel Stowage: **Location:** E **Other:**



Section 15 - Regulatory Information

EPA Regulations:

RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Not listed
SARA 40 CFR 372.65: Not listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

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Material Safety Data Sheet

Section 1 – Chemical Product and Company Identification

Catalog Numbers: CS7000-A, CS7000-B, CS7000-C, CS7000-D, CS7000-P, CS7000-Q, CS7000-G, CS7000-T
Product Identity: Conductivity Std., 7000 umho/cm

Chemical Family: Not Applicable
Synonyms: Not Applicable
Recommended Use: Laboratory chemicals

Manufacturer's Name: AquaPhoenix Scientific, Inc., 9 Barnhart Dr., Hanover, PA 17331, (866) 632-1291
Emergency Contact Number (24hr): Chemtel (800) 255-3924

Issue Date: 01/08/07
Revision Date: 06/05/08, 05/12/10, 02/19/12

Section 2 – Hazard Identification

Emergency Overview: Non-flammable, non-corrosive, non-toxic. Does not present significant health hazards. Wash areas of contact with water.
Appearance: Clear, colorless liquid **Odor:** Odorless
Target Organs: Eyes, skin
Potential Health Effects/ Routes of Exposure:
Eyes: May cause slight irritation.
Skin: May cause slight irritation.
Ingestion: Large doses may cause upset stomach.
Inhalation: Not likely to be a hazard.
Chronic Effect / Carcinogenicity: None (IARC, NTP, OSHA)
Aggravated Medical Conditions No information available
These chemicals are not considered hazardous by OSHA.
See section 11 for toxicological information. See section 12 for potential environmental effects.

Section 3 – Composition, Information on Ingredients

Potassium Chloride, CAS# 7447-40-7, < 0.5% w/v
Water, purified, CAS# 7732-18-5, >99% w/v

Section 4 – First Aid

Eyes: Immediately flush eyes with water for at least 15 minutes. Immediately get medical assistance.
Skin: Flush with water for 15 minutes. Get medical assistance if irritation develops.
Ingestion: DO NOT induce vomiting. Dilute with water or milk. Get medical assistance.
Inhalation: Remove to fresh air. Give artificial respiration if necessary. If breathing is difficult, give oxygen.
Notes to Physician Treat symptomatically.

Section 5 – Fire Fighting Measures

Flash Point: Not Applicable **Autoignition Temperature** No information available.
Explosion Limits Upper No data available **Lower** No data available
Extinguishing Media: Use means suitable to extinguishing surrounding fire.
Unsuitable Extinguishing Media: No information available
Fire & Explosion Hazards: Not considered to be a fire or explosion hazard.
Fire Fighting Instructions / Equipment: Use normal procedures. Use protective clothing. Use NIOSH-approved breathing equipment.

Hazardous Combustion Products: No information Available
Sensitivity to mechanical impact No information available.
Sensitivity to static discharge No information available.
Specific Hazards Arising from the Chemical: No information available
NFPA Rating: (estimated) Health: 1; Flammable: 0; Reactivity: 0

Section 6 – Accidental Release Measures

Personal Precautions Use personal protective equipment. Ensure adequate ventilation. Avoid contact with skin, eyes and clothing.
Environmental Precautions Not relevant considering the small amounts used.
Methods for Containment and Clean Up Absorb with suitable material. Always obey local regulations. Always obey local regulations.

Section 7 – Handling and Storage

Handling: Wash hands after handling. Avoid contact with skin and eyes.
Storage: Protect from freezing and physical damage.

Section 8 – Exposure Controls, Personal Protection

Potassium Chloride, CAS# 7447-40-7, ACGIH TLV: NA, OSHA PEL: NA
Water, purified, CAS# 7732-18-5, ACGIH TLV: NA, OSHA PEL: NA

Engineering Measures/ General Hygiene: Normal ventilation is adequate. Ensure eyewash and safety showers are available.
Personal Protection Equipment: Skin Protection: Chemical resistant gloves.
Eye/Face Protection: Safety Glasses or goggles. **Respiratory Protection:** Normal ventilation is adequate

Section 9 – Physical and Chemical Properties

Appearance/Physical State: Clear, colorless liquid

Odor: Odorless	**% Volatility:** No Information Available
Boiling Point: Approx 100.1C	**Specific Gravity:** 1-1.01
Melting Point: Approx (-6)-0 C	**Vapor Pressure:** No Information Available
Vapor Density: No Information Available	**Flash Point:** Not Applicable
Evaporation Rate: No Information Available	**Coefficient of water/oil distribution:** Not Available
pH: Not Available	**Odor Threshold:** Not Available
Flammability: No Information Available	**Decomposition Temperature:** No Information Available
Solubility: Infinite	**Partition Coefficient n-octanol/water:** No data available
Relative Density: No Information Available	**Molecular Weight:** Not available

Section 10 – Stability and Reactivity

Chemical Stability: Stable under normal conditions of use and storage.
Incompatible Materials Strong Oxidizing agents, Lithium, Bromine, Trifluoride.
Conditions to Avoid: No Information Available.
Hazardous Decomposition Products: Oxides of Sodium and fumes of Chloride.
Hazardous Polymerization: Does not occur
Hazardous Reactions: None under normal processing.

Section 11 – Toxicological Information

Routes of Exposure/Symptoms/Corrosiveness – See Section 2
LD50 orl-rat: 3020 mg/kg LC50 inhalation-rat: Not Available
Irritation: No Information Available
Toxicologically Synergistic: No Information Available
Chronic Exposure

Carcinogenicity No Information Available
Sensitization No information available.
Mutagenic Effects No information available.
Reproductive Effects No information available.
Developmental Effects (Immediate/Delayed) No information available.
Teratogenicity No information available.
Other Adverse Effects No Information Available.
Endocrine Disruptor Information No information available

Section 12 – Ecological Information

Ecotoxicity: Not Available.
Persistence and Degradability: No Information Available **Mobility:** No Information Available
Bioaccumulation/ Accumulation: No Information Available

Section 13 – Disposal Considerations

Waste Disposal/Waste Disposal of Packaging: Dilute with water.
All chemical waster generators must determine whether a discarded chemical is classified as hazardous waste. Comply with all local, state, and federal regulations.

Section 14 – Transport Information

DOT - Not Regulated

Section 15 – Regulatory Information (not meant to be all inclusive)

OSHA Status: These chemicals are not considered hazardous by OSHA.
Canada DSL: These chemicals are listed on the Canada DSL list.
TSCA: The components of this solution are listed on the TSCA Inventory
SARA Title III Section 313: Not Applicable
RCRA Status: Not Applicable
CERCLA Reportable Quantity: Not Applicable
WHMIS: Not Applicable.
This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR

Section 16 – Additional Information

Disclaimer: The information on this MSDS applies to this specific material as supplied. It may not be valid for this material if it is used in combination with any other materials. It is the user's responsibility to determine the suitability and completeness of this information for his own particular use. No warranty is implied regarding the accuracy of the data or the results to be obtained from the products use.

Material Safety Data Sheet

Section 1 – Chemical Product and Company Identification

Catalog Numbers: BU5004-A, BU5004-B, BU5004-C, BU5004-D, BU5004-P, BU5004-Q, BU5004-G, BU5004-T

Product Identity: Buffer Solution, pH 4.00

Chemical Family: Not Applicable
Synonyms: Not Applicable
Recommended Use: Laboratory chemicals

Manufacturer's Name: AquaPhoenix Scientific, Inc., 9 Barnhart Dr., Hanover, PA 17331, (866) 632-1291
Emergency Contact Number (24hr): Chemtel (800) 255-3924

Issue Date: 12/28/06
Revision Date: 6/5/08, 02/25/10, 09/14/10, 02/19/12

Section 2 – Hazard Identification

Emergency Overview: Non-flammable, non-corrosive, non-toxic. Does not present significant health hazards. Wash areas of contact with water.
Appearance: Clear, reddish liquid **Odor:** Odorless
Target Organs: Eyes, skin
Potential Health Effects/ Routes of Exposure:
Eyes: May cause slight irritation.
Skin: May cause slight irritation.
Ingestion: May cause diarrhea, nausea, vomiting, and cramps.
Inhalation: Not likely to be a hazard.
Chronic Effect / Carcinogenicity: None (IARC, NTP, OSHA)
Aggravated Medical Conditions No information available
These chemicals are not considered hazardous by OSHA.
See section 11 for toxicological information. See section 12 for potential environmental effects.

Section 3 – Composition, Information on Ingredients

Potassium Acid Phthalate, CAS# 877-24-7, <1% w/v
Water, purified, CAS# 7732-18-5, >98% w/v

Section 4 – First Aid

Eyes: Immediately flush eyes with water for at least 15 minutes. Immediately get medical assistance.
Skin: Flush with water for 15 minutes. Get medical assistance if irritation develops.
Ingestion: DO NOT induce vomiting. Dilute with water or milk. Get medical assistance.
Inhalation: Remove to fresh air. Give artificial respiration if necessary. If breathing is difficult, give oxygen.
Notes to Physician Treat symptomatically.

Section 5 – Fire Fighting Measures

Flash Point: Not Applicable **Autoignition Temperature** No information available.
Explosion Limits Upper No data available **Lower** No data available
Extinguishing Media: Use means suitable to extinguishing surrounding fire.
Unsuitable Extinguishing Media: No information available
Fire & Explosion Hazards: Not considered to be a fire or explosion hazard.

Fire Fighting Instructions / Equipment: Use normal procedures. Use protective clothing. Use NIOSH-approved breathing equipment.
Hazardous Combustion Products: No information Available
Sensitivity to mechanical impact No information available.
Sensitivity to static discharge No information available.
Specific Hazards Arising from the Chemical: No information available
NFPA Rating: (estimated) Health: 1; Flammable: 0; Reactivity: 0

Section 6 – Accidental Release Measures

Personal Precautions Use personal protective equipment. Ensure adequate ventilation. Avoid contact with skin, eyes and clothing.
Environmental Precautions No information available.
Methods for Containment and Clean Up Absorb with suitable material. Always obey local regulations.

Section 7 – Handling and Storage

Handling: Wash hands after handling. Avoid contact with skin and eyes.
Storage: Protect from freezing and physical damage.

Section 8 – Exposure Controls, Personal Protection

Potassium Acid Phthalate, CAS# 877-24-7, ACGIH TLV: NA, OSHA PEL: NA
Water, purified, CAS# 7732-18-5, ACGIH TLV: NA, OSHA PEL: NA

Engineering Measures/ General Hygiene: Normal ventilation is adequate. Ensure eyewash and safety showers are available.
Personal Protection Equipment: Skin Protection: Chemical resistant gloves.
Eye/Face Protection: Safety Glasses or goggles. **Respiratory Protection:** Normal ventilation is adequate

Section 9 – Physical and Chemical Properties

Appearance/Physical State: Clear, reddish liquid

Odor: Odorless	**% Volatility:** No Information Available
Boiling Point: Approx 100C	**Specific Gravity:** Approx 1
Melting Point: Approx 0 C	**Vapor Pressure:** No Information Available
Vapor Density: No Information Available	**Flash Point:** Not Applicable
Evaporation Rate: No Information Available	**Coefficient of water/oil distribution:** Not Available
pH: 4.0	**Odor Threshold:** Not Available
Flammability: No Information Available	**Decomposition Temperature:** No Information Available
Solubility: Infinite	**Partition Coefficient n-octanol/water:** No data available
Relative Density: No Information Available	**Molecular Weight:** Not available

Section 10 – Stability and Reactivity

Chemical Stability: Stable under normal conditions of use and storage.
Incompatible Materials Nitric Acid.
Conditions to Avoid: No Information Available.
Hazardous Decomposition Products: Oxides of potassium and carbon.
Hazardous Polymerization: Does not occur
Hazardous Reactions: None under normal processing.

Section 11 – Toxicological Information

Routes of Exposure/Symptoms/Corrosiveness – See Section 2
LD50 orl-rat: 3200 mg/kg (Potassium Acid Phthalate) LC50 inhalation-rat: NA
Irritation: No Information Available
Toxicologically Synergistic: No Information Available

Chronic Exposure
Carcinogenicity No Information Available
Sensitization No information available.
Mutagenic Effects No information available.
Reproductive Effects No information available.
Developmental Effects (Immediate/Delayed) No information available.
Teratogenicity No information available.
Other Adverse Effects No Information Available.
Endocrine Disruptor Information No information available

Section 12 – Ecological Information

Ecotoxicity: Not Available.
Persistence and Degradability: No Information Available **Mobility:** No Information Available
Bioaccumulation/ Accumulation: No Information Available

Section 13 – Disposal Considerations

Waste Disposal/Waste Disposal of Packaging: Dilute with water.
All chemical waster generators must determine whether a discarded chemical is classified as hazardous waste. Comply with all local, state, and federal regulations.

Section 14 – Transport Information

DOT - Not Regulated

Section 15 – Regulatory Information (not meant to be all inclusive)

OSHA Status: These chemicals are not considered hazardous by OSHA.
Canada DSL: These chemicals are listed on Canada's DSL list.
TSCA: The components of this solution are listed on the TSCA Inventory
SARA Title III Section 313: Not Applicable
RCRA Status: Not Applicable
CERCLA Reportable Quantity: Not Applicable
WHMIS: Not Applicable.
This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR

Section 16 – Additional Information

Disclaimer: The information on this MSDS applies to this specific material as supplied. It may not be valid for this material if it is used in combination with any other materials. It is the user's responsibility to determine the suitability and completeness of this information for his own particular use. No warranty is implied regarding the accuracy of the data or the results to be obtained from the products use.

Material Safety Data Sheet

Section 1 – Chemical Product and Company Identification

Catalog Numbers: BU5010-A, BU5010-B, BU5010-C, BU5010-D, BU5010-P, BU5010-Q, BU5010-G, BU5010-T

Product Identity: Buffer Solution, pH 10.00

Chemical Family: Not Applicable
Synonyms: Not Applicable
Recommended Use: Laboratory chemicals

Manufacturer's Name: AquaPhoenix Scientific, Inc., 9 Barnhart Dr., Hanover, PA 17331, (866) 632-1291
Emergency Contact Number (24hr): Chemtel (800) 255-3924

Issue Date: 12/28/06
Revision Date: 6/5/08, 06/03/10, 02/19/12

Section 2 – Hazard Identification

Emergency Overview: Non-flammable, non-corrosive, non-toxic. Does not present significant health hazards. Wash areas of contact with water.
Appearance: Clear, blue liquid **Odor:** Odorless
Target Organs: Eyes, skin
Potential Health Effects/ Routes of Exposure:
Eyes: May cause slight irritation.
Skin: May cause slight irritation.
Ingestion: May cause diarrhea, nausea, vomiting, and cramps.
Inhalation: Not likely to be a hazard.
Chronic Effect / Carcinogenicity: None (IARC, NTP, OSHA)
Aggravated Medical Conditions No information available
These chemicals are not considered hazardous by OSHA.
See section 11 for toxicological information. See section 12 for potential environmental effects.

Section 3 – Composition, Information on Ingredients

Sodium Bicarbonate, CAS# 144-55-8, <0.5% w/v
Sodium Carbonate, CAS# 497-19-8, <0.5% w/v
Water, purified, CAS# 7732-18-5, >99% w/v

Section 4 – First Aid

Eyes: Immediately flush eyes with water for at least 15 minutes. Immediately get medical assistance.
Skin: Flush with water for 15 minutes. Get medical assistance if irritation develops.
Ingestion: DO NOT induce vomiting. Dilute with water or milk. Get medical assistance.
Inhalation: Remove to fresh air. Give artificial respiration if necessary. If breathing is difficult, give oxygen.
Notes to Physician Treat symptomatically.

Section 5 – Fire Fighting Measures

Flash Point: Not Applicable **Autoignition Temperature** No information available.
Explosion Limits Upper No data available **Lower** No data available
Extinguishing Media: Use means suitable to extinguishing surrounding fire.
Unsuitable Extinguishing Media: No information available
Fire & Explosion Hazards: Not considered to be a fire or explosion hazard.

Fire Fighting Instructions / Equipment: Use normal procedures. Use protective clothing. Use NIOSH-approved breathing equipment.
Hazardous Combustion Products: No information Available
Sensitivity to mechanical impact No information available.
Sensitivity to static discharge No information available.
Specific Hazards Arising from the Chemical: No information available
NFPA Rating: (estimated) Health: 1; Flammable: 0; Reactivity: 0

Section 6 – Accidental Release Measures

Personal Precautions Use personal protective equipment. Ensure adequate ventilation. Avoid contact with skin, eyes and clothing.
Environmental Precautions No information available.
Methods for Containment and Clean Up Absorb with suitable material. Always obey local regulations.

Section 7 – Handling and Storage

Handling: Wash hands after handling. Avoid contact with skin and eyes.
Storage: Protect from freezing and physical damage.

Section 8 – Exposure Controls, Personal Protection

Sodium Bicarbonate, CAS# 144-55-8, ACGIH TLV: NA, OSHA PEL: NA
Sodium Carbonate, CAS# 497-19-8, ACGIH TLV: NA, OSHA PEL: NA
Water, purified, CAS# 7732-18-5, ACGIH TLV: NA, OSHA PEL: NA

Engineering Measures/ General Hygiene: Normal ventilation is adequate. Ensure eyewash and safety showers are available.
Personal Protection Equipment: Skin Protection: Chemical resistant gloves.
Eye/Face Protection: Safety Glasses or goggles. **Respiratory Protection:** Normal ventilation is adequate

Section 9 – Physical and Chemical Properties

Appearance/Physical State: Clear, blue liquid

Odor: Odorless
Boiling Point: Approx 100C
Melting Point: Approx 0 C
Vapor Density: No Information Available
Evaporation Rate: No Information Available
pH: 10.0
Flammability: No Information Available
Solubility: Infinite
Relative Density: No Information Available

% Volatility: No Information Available
Specific Gravity: Approx 1
Vapor Pressure: No Information Available
Flash Point: Not Applicable
Coefficient of water/oil distribution: Not Available
Odor Threshold: Not Available
Decomposition Temperature: No Information Available
Partition Coefficient n-octanol/water: No data available
Molecular Weight: Not available

Section 10 – Stability and Reactivity

Chemical Stability: Stable under normal conditions of use and storage.
Incompatible Materials None identified.
Conditions to Avoid: No Information Available.
Hazardous Decomposition Products: Oxides of sodium.
Hazardous Polymerization: Does not occur
Hazardous Reactions: None under normal processing.

Section 11 – Toxicological Information

Routes of Exposure/Symptoms/Corrosiveness – See Section 2
LD50 orl-rat: 4090 mg/kg (Sodium Carbonate), 4220 mg/kg (Sodium Bicarbonate) LC50 inhalation-rat: NA
Irritation: No Information Available

Toxicologically Synergistic: No Information Available
Chronic Exposure
Carcinogenicity No Information Available
Sensitization No information available.
Mutagenic Effects No information available.
Reproductive Effects No information available.
Developmental Effects (Immediate/Delayed) No information available.
Teratogenicity No information available.
Other Adverse Effects No Information Available.
Endocrine Disruptor Information No information available

Section 12 – Ecological Information

Ecotoxicity: Not Available.
Persistence and Degradability: No Information Available **Mobility:** No Information Available
Bioaccumulation/ Accumulation: No Information Available

Section 13 – Disposal Considerations

Waste Disposal/Waste Disposal of Packaging: Dilute with water.
All chemical waster generators must determine whether a discarded chemical is classified as hazardous waste. Comply with all local, state, and federal regulations.

Section 14 – Transport Information

DOT - Not Regulated

Section 15 – Regulatory Information (not meant to be all inclusive)

OSHA Status: These chemicals are not considered hazardous by OSHA.
Canada DSL: These chemicals are listed on Canada's DSL list.
TSCA: The components of this solution are listed on the TSCA Inventory
SARA Title III Section 313: Not Applicable
RCRA Status: Not Applicable
CERCLA Reportable Quantity: None Reported
WHMIS: Not Applicable.
This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR

Section 16 – Additional Information

Disclaimer: The information on this MSDS applies to this specific material as supplied. It may not be valid for this material if it is used in combination with any other materials. It is the user's responsibility to determine the suitability and completeness of this information for his own particular use. No warranty is implied regarding the accuracy of the data or the results to be obtained from the products use.

Material Safety Data Sheet

Section 1 – Chemical Product and Company Identification

Catalog Numbers: BU5007-A, BU5007-B, BU5007-C, BU5007-D, BU5007-P, BU5007-Q, BU5007-G, BU5007-T

Product Identity: Buffer Solution, pH 7.00

Chemical Family: Not Applicable
Synonyms: Not Applicable
Recommended Use: Laboratory chemicals

Manufacturer's Name: AquaPhoenix Scientific, Inc., 9 Barnhart Dr., Hanover, PA 17331, (866) 632-1291
Emergency Contact Number (24hr): Chemtel (800) 255-3924

Issue Date: 12/28/06
Revision Date: 06/24/09, 08/26/10, 02/19/12, 08/02/12

Section 2 – Hazard Identification

Emergency Overview: Non-flammable, non-corrosive, non-toxic. Does not present significant health hazards. Wash areas of contact with water.
Appearance: Clear, yellowish liquid **Odor:** Odorless
Target Organs: Eyes, skin
Potential Health Effects/ Routes of Exposure:
Eyes: May cause slight irritation.
Skin: May cause slight irritation.
Ingestion: May cause diarrhea, nausea, vomiting, and cramps.
Inhalation: Not likely to be a hazard.
Chronic Effect / Carcinogenicity: None (IARC, NTP, OSHA)
Aggravated Medical Conditions No information available
These chemicals are not considered hazardous by OSHA.
See section 11 for toxicological information. See section 12 for potential environmental effects.

Section 3 – Composition, Information on Ingredients

Sodium Hydroxide, CAS# 1310-73-2, <1% v/v
Potassium Phosphate, Monobasic, CAS# 7778-77-0, <1% w/v
Sorbic Acid, CAS# 110-44-1, <1% w/v
Water, purified, CAS# 7732-18-5, >99% w/v

Section 4 – First Aid

Eyes: Immediately flush eyes with water for at least 15 minutes. Get medical assistance immediately.
Skin: Flush with water for 15 minutes. Get medical assistance if irritation develops.
Ingestion: DO NOT induce vomiting. Dilute with water or milk. Get medical assistance.
Inhalation: Remove to fresh air. Give artificial respiration if necessary. If breathing is difficult, give oxygen.
Notes to Physician Treat symptomatically.

Section 5 – Fire Fighting Measures

Flash Point: Not Applicable **Autoignition Temperature:** No information available.
Explosion Limits Upper No data available **Lower** No data available
Extinguishing Media: Use means suitable to extinguishing surrounding fire.
Unsuitable Extinguishing Media: No information available

Fire & Explosion Hazards: Not considered to be a fire or explosion hazard.
Fire Fighting Instructions / Equipment: Use normal procedures. Use protective clothing. Use NIOSH-approved breathing equipment.
Hazardous Combustion Products: No information Available
Sensitivity to mechanical impact No information available.
Sensitivity to static discharge No information available.
Specific Hazards Arising from the Chemical: No information available
NFPA Rating: (estimated) Health: 1; Flammable: 0; Reactivity: 0

Section 6 – Accidental Release Measures

Personal Precautions Use personal protective equipment. Ensure adequate ventilation. Avoid contact with skin, eyes and clothing.
Environmental Precautions No information available.
Methods for Containment and Clean Up Absorb with suitable material. Always obey local regulations.

Section 7 – Handling and Storage

Handling: Wash hands after handling. Avoid contact with skin and eyes.
Storage: Protect from freezing and physical damage.

Section 8 – Exposure Controls, Personal Protection

Sodium Hydroxide, CAS# 1310-73-2, ACGIH TLV: 2 mg/m3, OSHA PEL: 2mg/m3
Potassium Phosphate, Monobasic, CAS# 7778-77-0, ACGIH TLV: NA, OSHA PEL: NA
Sorbic Acid, CAS# 110-44-1, ACGIH TLV: NA, OSHA PEL: NA
Water, purified, CAS# 7732-18-5, ACGIH TLV: NA, OSHA PEL: NA

Engineering Measures/ General Hygiene: Normal ventilation is adequate. Ensure eyewash and safety showers are available.
Personal Protection Equipment: Skin Protection: Chemical resistant gloves.
Eye/Face Protection: Safety Glasses or goggles. **Respiratory Protection:** Normal ventilation is adequate

Section 9 – Physical and Chemical Properties

Appearance/Physical State: Clear, yellow liquid
Odor: Odorless
Boiling Point: Approx 100C
Melting Point: Approx 0 C
Vapor Density: No Information Available
Evaporation Rate: No Information Available
pH: 7.0
Flammability: No Information Available
Solubility: Infinite
Relative Density: No Information Available
% Volatility: No Information Available
Specific Gravity: Approx 1
Vapor Pressure: No Information Available
Flash Point: Not Applicable
Coefficient of water/oil distribution: Not Available
Odor Threshold: Not Available
Decomposition Temperature: No Information Available
Partition Coefficient n-octanol/water: Not Available
Molecular Weight: Not available

Section 10 – Stability and Reactivity

Chemical Stability: Stable under normal conditions of use and storage.
Incompatible Materials None identified.
Conditions to Avoid: No Information Available.
Hazardous Decomposition Products: Oxides of phosphorus.
Hazardous Polymerization: Does not occur.
Hazardous Reactions: None under normal processing.

Section 11 – Toxicological Information

Routes of Exposure/Symptoms/Corrosiveness – See Section 2

LD50 orl-rat: 1350mg/kg (Sodium Hydroxide) 1700mg/kg (Potassium Phosphate, Monobasic)
LC50 inhalation-rat: NA
Irritation: No Information Available.
Toxicologically Synergistic: No information available.
Chronic Exposure
Carcinogenicity No information available
Sensitization No information available.
Mutagenic Effects No information available.
Reproductive Effects No information available.
Developmental Effects (Immediate/Delayed) No information available.
Teratogenicity No information available.
Other Adverse Effects No information available.
Endocrine Disruptor Information No information available

Section 12 – Ecological Information

Ecotoxicity: Not Available.
Persistence and Degradability: No Information Available **Mobility:** No Information Available
Bioaccumulation/ Accumulation: No Information Available

Section 13 – Disposal Considerations

Waste Disposal/Waste Disposal of Packaging: Dilute with water.
All chemical waste generators must determine whether a discarded chemical is classified as hazardous waste. Comply with all local, state, and federal regulations.

Section 14 – Transport Information

DOT - Not Regulated

Section 15 – Regulatory Information (not meant to be all inclusive)

OSHA Status: These chemicals are not considered hazardous by OSHA.
Canada DSL: These chemicals are listed on Canada's DSL list.
TSCA: These chemicals are listed on the TSCA Inventory.
SARA Title III Section 313: Not Applicable
RCRA Status: Not Applicable
CERCLA Reportable Quantity: Sodium Hydroxide – 1000lb
WHMIS: Not Applicable.
This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR

Section 16 – Additional Information

Disclaimer: The information on this MSDS applies to this specific material as supplied. It may not be valid for this material if it is used in combination with any other materials. It is the user's responsibility to determine the suitability and completeness of this information for his own particular use. No warranty is implied regarding the accuracy of the data or the results to be obtained from the products use.

Safety Data Sheet
according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), and GHS

Printing date: 31.12.2013 **Revision:** 31.12.2013

1 Identification of the substance/mixture and of the company/undertaking

· **1.1 Product identifier**

· **Trade name: ALCONOX**

· **1.2 Relevant identified uses of the substance or mixture and uses advised against**
No further relevant information available.

· **Application of the substance / the mixture:** Cleaning material/ Detergent

· **1.3 Details of the supplier of the Safety Data Sheet**
· **Manufacturer/Supplier:**
Alconox, Inc.
30 Glenn St., Suite 309
White Plains, NY 10603
Phone: 914-948-4040
· **Further information obtainable from:** Product Safety Department

· **1.4 Emergency telephone number:**
ChemTel Inc.
(800)255-3924, +1 (813)248-0585

2 Hazards identification

· **2.1 Classification of the substance or mixture**
· **Classification according to Regulation (EC) No 1272/2008**



GHS05 corrosion
Eye Dam. 1; H318: Causes serious eye damage.



GHS07
Skin Irrit. 2; H315: Causes skin irritation.

· **Classification according to Directive 67/548/EEC or Directive 1999/45/EC**



Xi; Irritant
R38-41: Irritating to skin. Risk of serious damage to eyes.
· **Information concerning particular hazards for human and environment:**
The product has to be labelled due to the calculation procedure of the "General Classification guideline for preparations of the EU" in the latest valid version.
· **Classification system:**
The classification is according to the latest editions of the EU-lists, and extended by company and literature data.
The classification is in accordance with the latest editions of international substances lists, and is supplemented by information from technical literature and by information provided by the company.

· **2.2 Label elements**
· **Labelling according to Regulation (EC) No 1272/2008**
The product is classified and labelled according to the CLP regulation.

(Contd. on page 2)

Safety Data Sheet
according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), and GHS

Printing date: 31.12.2013 **Revision:** 31.12.2013

Trade name: ALCONOX

(Contd. of page 1)

· **Hazard pictograms**



GHS05

· **Signal word:** Danger

· **Hazard-determining components of labelling:**
sodium dodecylbenzene sulfonate
· **Hazard statements**
H315: Causes skin irritation.
H318: Causes serious eye damage.
· **Precautionary statements**
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P264: Wash thoroughly after handling.
P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P310: Immediately call a POISON CENTER or doctor/physician.
P321: Specific treatment (see on this label).
P362: Take off contaminated clothing and wash before reuse.
P332+P313: If skin irritation occurs: Get medical advice/attention.
P302+P352: IF ON SKIN: Wash with plenty of soap and water.
· **Hazard description:**
· **WHMIS-symbols:**
D2B - Toxic material causing other toxic effects



· **NFPA ratings (scale 0 - 4)**



Health = 1
Fire = 0
Reactivity = 0

· **HMIS-ratings (scale 0 - 4)**



Health = 1
Fire = 0
Reactivity = 0

· **HMIS Long Term Health Hazard Substances**
None of the ingredients is listed.

· **2.3 Other hazards**
· **Results of PBT and vPvB assessment**
· **PBT:** Not applicable.
· **vPvB:** Not applicable.

(Contd. on page 3)

Safety Data Sheet
according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), and GHS

Printing date: 31.12.2013 **Revision:** 31.12.2013

Trade name: ALCONOX

(Contd. of page 2)

3 Composition/information on ingredients

· **3.2 Mixtures**
· **Description:** Mixture of substances listed below with nonhazardous additions.

· **Dangerous components:**

CAS: 68081-81-2	sodium dodecylbenzene sulfonate Xn R22; Xi R36 Acute Tox. 4, H302; Eye Irrit. 2, H319	10-25%
CAS: 497-19-8 EINECS: 207-838-8 Index number: 011-005-00-2	Sodium Carbonate Xi R36 Eye Irrit. 2, H319	2,5-10%
CAS: 7722-88-5 EINECS: 231-767-1	tetrasodium pyrophosphate substance with a Community workplace exposure limit	2,5-10%
CAS: 151-21-3 EINECS: 205-788-1	sodium dodecyl sulphate Xn R21/22; Xi R36/38 Acute Tox. 4, H302; Acute Tox. 4, H312; Skin Irrit. 2, H315; Eye Irrit. 2, H319	2,5-10%

· **Additional information:** For the wording of the listed risk phrases refer to section 16.

4 First aid measures

· **4.1 Description of first aid measures**
· **After inhalation:** Supply fresh air; consult doctor in case of complaints.
· **After skin contact:**
Immediately wash with water and soap and rinse thoroughly.
If skin irritation continues, consult a doctor.
· **After eye contact:**
Remove contact lenses if worn.
Rinse opened eye for several minutes under running water. If symptoms persist, consult a doctor.
· **After swallowing:**
Rinse out mouth and then drink plenty of water.
Do not induce vomiting; call for medical help immediately.
· **4.2 Most important symptoms and effects, both acute and delayed**
No further relevant information available.
· **4.3 Indication of any immediate medical attention and special treatment needed**
No further relevant information available.

5 Firefighting measures

· **5.1 Extinguishing media**
· **Suitable extinguishing agents:**
CO2, powder or water spray. Fight larger fires with water spray or alcohol resistant foam.

(Contd. on page 4)

Safety Data Sheet
according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), and GHS

Printing date: 31.12.2013 **Revision:** 31.12.2013

Trade name: ALCONOX

(Contd. of page 3)

· **5.2 Special hazards arising from the substance or mixture:** No further relevant information available.
· **5.3 Advice for firefighters**
· **Protective equipment:**
Wear self-contained respiratory protective device.
Wear fully protective suit.
· **Additional information:** No further relevant information available.

6 Accidental release measures

· **6.1 Personal precautions, protective equipment and emergency procedures**
Product forms slippery surface when combined with water.
· **6.2 Environmental precautions:** Do not allow to enter sewers/ surface or ground water.
· **6.3 Methods and material for containment and cleaning up:**
Pick up mechanically.
Clean the affected area carefully; suitable cleaners are:
Warm water
· **6.4 Reference to other sections**
See Section 7 for information on safe handling.
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.

7 Handling and storage

· **7.1 Precautions for safe handling**
Prevent formation of dust.
Keep receptacles tightly sealed.
· **Information about fire - and explosion protection:** No special measures required.

· **7.2 Conditions for safe storage, including any incompatibilities**
· **Storage:**
· **Requirements to be met by storerooms and receptacles:** No special requirements.
· **Information about storage in one common storage facility:** Not required.
· **Further information about storage conditions:** Protect from humidity and water.
· **7.3 Specific end use(s):** No further relevant information available.

8 Exposure controls/personal protection

· **Additional information about design of technical facilities:** No further data; see item 7.

· **8.1 Control parameters**

· **Ingredients with limit values that require monitoring at the workplace:**	
7722-88-5 tetrasodium pyrophosphate	
REL (USA)	5 mg/m³
TLV (USA)	TLV withdrawn
EV (Canada)	5 mg/m³

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· **Additional information:** The lists valid during the making were used as basis.

· **8.2 Exposure controls**
· **Personal protective equipment:**
· **General protective and hygienic measures:**
Keep away from foodstuffs, beverages and feed.
Immediately remove all soiled and contaminated clothing.
Wash hands before breaks and at the end of work.
Avoid contact with the skin.
Avoid contact with the eyes and skin.
· **Respiratory protection:**
Not required under normal conditions of use.
In case of brief exposure or low pollution use respiratory filter device. In case of intensive or longer exposure use self-contained respiratory protective device.
· **Protection of hands:**


Protective gloves

The glove material has to be impermeable and resistant to the product/ the substance/ the preparation.
Due to missing tests no recommendation to the glove material can be given for the product/ the preparation/ the chemical mixture.
Selection of the glove material on consideration of the penetration times, rates of diffusion and the degradation.
· **Material of gloves**
Butyl rubber, BR
Nitrile rubber, NBR
Natural rubber, NR
Neoprene gloves
The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer. As the product is a preparation of several substances, the resistance of the glove material cannot be calculated in advance and has therefore to be checked prior to the application.
· **Penetration time of glove material**
The exact break through time has to be found out by the manufacturer of the protective gloves and has to be observed.
· **Eye protection:**


Safety glasses

· **Body protection:** Protective work clothing

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9 Physical and chemical properties

· **9.1 Information on basic physical and chemical properties**	
· **General Information**	
· **Appearance:**	
Form:	Powder
Colour:	White
· **Odour:**	Odourless
· **Odour threshold:**	Not determined.
· **pH-value (10 g/l) at 20 °C:**	9,5 (- NA for Powder form)
· **Change in condition**	
Melting point/Melting range:	Not Determined.
Boiling point/Boiling range:	Undetermined.
· **Flash point:**	Not applicable.
· **Flammability (solid, gaseous):**	Not determined.
· **Ignition temperature:**	
Decomposition temperature:	Not determined.
· **Self-igniting:**	Product is not self-igniting.
· **Danger of explosion:**	Product does not present an explosion hazard.
· **Explosion limits:**	
Lower:	Not determined.
Upper:	Not determined.
· **Vapour pressure:**	Not applicable.
· **Density at 20 °C:**	1,1 g/cm³
· **Relative density**	Not determined.
· **Vapour density**	Not applicable.
· **Evaporation rate**	Not applicable.
· **Solubility in / Miscibility with water:**	Soluble.
· **Partition coefficient (n-octanol/water):**	Not determined.
· **Viscosity:**	
Dynamic:	Not applicable.
Kinematic:	Not applicable.
· **Solvent content:**	
Organic solvents:	0,0 %
Solids content:	100 %
· **9.2 Other information**	No further relevant information available.

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10 Stability and reactivity

· **10.1 Reactivity**
· **10.2 Chemical stability**
· **Thermal decomposition / conditions to be avoided:**
No decomposition if used according to specifications.
· **10.3 Possibility of hazardous reactions**
Reacts with acids.
Reacts with strong alkali.
Reacts with strong oxidizing agents.
· **10.4 Conditions to avoid:** No further relevant information available.
· **10.5 Incompatible materials:** No further relevant information available.
· **10.6 Hazardous decomposition products:**
Carbon monoxide and carbon dioxide
Phosphorus compounds
Sulphur oxides (SOx)

11 Toxicological information

· **11.1 Information on toxicological effects**
· **Acute toxicity:**
· **Primary irritant effect:**
· **On the skin:** Irritant to skin and mucous membranes.
· **On the eye:** Strong irritant with the danger of severe eye injury.
· **Sensitization:** No sensitizing effects known.
· **Additional toxicological information:**
The product shows the following dangers according to the calculation method of the General EU Classification Guidelines for Preparations as issued in the latest version:
Irritant
Swallowing will lead to a strong caustic effect on mouth and throat and to the danger of perforation of esophagus and stomach.

12 Ecological information

· **12.1 Toxicity**
· **Aquatic toxicity:** No further relevant information available.
· **12.2 Persistence and degradability:** No further relevant information available.
· **12.3 Bioaccumulative potential:** Not worth-mentioning accumulating in organisms
· **12.4 Mobility in soil:** No further relevant information available.
· **Additional ecological information:**
· **General notes:**
Water hazard class 2 (German Regulation) (Self-assessment): hazardous for water.
Do not allow product to reach ground water, water course or sewage system.
Danger to drinking water if even small quantities leak into the ground.
· **12.5 Results of PBT and vPvB assessment**
· **PBT:** Not applicable.

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· **vPvB:** Not applicable.
· **12.6 Other adverse effects:** No further relevant information available.

13 Disposal considerations

· **13.1 Waste treatment methods**
· **Recommendation**
Smaller quantities can be disposed of with household waste.
Small amounts may be diluted with plenty of water and washed away. Dispose of bigger amounts in accordance with Local Authority requirements.
The surfactant used in this product complies with the biodegradability criteria as laid down in Regulation (EC) No. 648/2004 on detergents. Data to support this assertion are held at the disposal of the competent authorities of the Member States and will be made available to them, at their direct request or at the request of a detergent manufacturer.

· **Uncleaned packaging:**
· **Recommendation:** Disposal must be made according to official regulations.
· **Recommended cleansing agents:** Water, if necessary together with cleansing agents.

14 Transport information

· **14.1 UN-Number** · **DOT, ADR, IMDG, IATA, ICAO**	Not Regulated
· **14.2 UN proper shipping name** · **DOT, ADR, IMDG, IATA, ICAO**	Not Regulated
· **14.3 Transport hazard class(es)** · **DOT, ADR, IMDG, IATA, ICAO** · **Class**	Not Regulated
· **14.4 Packing group** · **DOT, ADR, IMDG, IATA, ICAO**	Not Regulated
· **14.5 Environmental hazards:** · **Marine pollutant:**	No
· **14.6 Special precautions for user**	Not applicable.
· **14.7 Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code**	Not applicable.
· **UN "Model Regulation":**	Not Regulated

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15 Regulatory information

· **15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture**
· **United States (USA)**
· **SARA**

· **Section 355 (extremely hazardous substances):**
None of the ingredients is listed.
· **Section 313 (Specific toxic chemical listings):**
None of the ingredients is listed.
· **TSCA (Toxic Substances Control Act):**
All ingredients are listed.

· **Proposition 65 (California):**

· **Chemicals known to cause cancer:**
None of the ingredients is listed.
· **Chemicals known to cause reproductive toxicity for females:**
None of the ingredients is listed.
· **Chemicals known to cause reproductive toxicity for males:**
None of the ingredients is listed.
· **Chemicals known to cause developmental toxicity:**
None of the ingredients is listed.

· **Carcinogenic Categories**

· **EPA (Environmental Protection Agency)**
None of the ingredients is listed.
· **IARC (International Agency for Research on Cancer)**
None of the ingredients is listed.
· **TLV (Threshold Limit Value established by ACGIH)**
None of the ingredients is listed.
· **NIOSH-Ca (National Institute for Occupational Safety and Health)**
None of the ingredients is listed.
· **OSHA-Ca (Occupational Safety & Health Administration)**
None of the ingredients is listed.

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· **Canada**

· **Canadian Domestic Substances List (DSL)**	
All ingredients are listed.	
· **Canadian Ingredient Disclosure list (limit 0.1%)**	
None of the ingredients is listed.	
· **Canadian Ingredient Disclosure list (limit 1%)**	
497-19-8	Sodium Carbonate
7722-88-5	tetrasodium pyrophosphate
151-21-3	sodium dodecyl sulphate

· **15.2 Chemical safety assessment:** A Chemical Safety Assessment has not been carried out.

16 Other information

This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

· **Relevant phrases**
H302: Harmful if swallowed.
H312: Harmful in contact with skin.
H315: Causes skin irritation.
H319: Causes serious eye irritation.

R21/22: Harmful in contact with skin and if swallowed.
R22: Harmful if swallowed.
R36: Irritating to eyes.
R36/38: Irritating to eyes and skin.

· **Abbreviations and acronyms:**
ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road) IMDG: International Maritime Code for Dangerous Goods DOT: US Department of Transportation
IATA: International Air Transport Association
GHS: Globally Harmonized System of Classification and Labelling of Chemicals
ACGIH: American Conference of Governmental Industrial Hygienists
NFPA: National Fire Protection Association (USA)
HMIS: Hazardous Materials Identification System (USA)
WHMIS: Workplace Hazardous Materials Information System (Canada)

Material Safety Data Sheet Collection
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Issue Date: 2006-06

Hydrochloric Acid
HYD2200

Section 1 - Chemical Product and Company Identification 61

Material Name: Hydrochloric Acid **CAS Number:** 7647-01-0
Chemical Formula: ClH
Structural Chemical Formula: HCl
EINECS Number: 231-595-7
ACX Number: X1002202-3
Synonyms: 4-D BOWL SANITIZER; ACIDE CHLORHYDRIQUE; ACIDO CLORHIDRICO; ACIDO CLORIDRICO; ANHYDROUS HYDROCHLORIC ACID; ANHYDROUS HYDROGEN CHLORIDE; AQUEOUS HYDROGEN CHLORIDE; BOWL CLEANER; CHLOORWATERSTOF; CHLOROHYDRIC ACID; CHLOROWODOR; CHLORURE D'HYDROGENE; CHLORURE D'HYDROGENE ANHYDRE; CHLORURO DE HIDROGENO; CHLORWASSERSTOFF; CLORURO DE HIDROGENO ANHIDRO; EMULSION BOWL CLEANER; EPA PESTICIDE CHEMICAL CODE 045901; HYDROCHLORIC ACID; HYDROCHLORIC ACID GAS; HYDROCHLORIDE; HYDROGEN CHLORIDE; HYDROGEN CHLORIDE (HCL); HYGEIA CREME MAGIC BOWL CLEANER; MURIATIC ACID; MURIATIC ACID); NOW SOUTH SAFTI-SOL BRAND CONCENTRATED BOWL CLEANSE WITHMAGIC ACTIO; PERCLEEN BOWL AND URINAL CLEANER; SPIRITS OF SALT; VARLEY'S OCEAN BLUE SCENTED TOILET BOWL CLEANER; VARLEY POLY-PAK BOWL CREME; WHITE EMULSION BOWL CLEANER; WUEST BOWL CLEANER SUPER CONCENTRATED
General Use: Hydrogen chloride is used to produce pharmaceutical hydrochlorides; vinyl chloride from acetylene; alkyl chlorides from olefins and arsenious chloride from arsenious oxide; electronic grade for etching semiconductor crystals. Used in the chlorination of rubber; in organic reactions involving isomerization, polymerization and alkylation; as a catalyst and condensing agent; for making chlorine where economical; in the separation of cotton from wool and cotton de-linting; as flux in the babbitt type of metal alloy; etching semi-conductor crystals.
Hydrochloric acid is used for pickling and heavy duty cleaning of metal parts; rust and scale removal. The production of chlorides; neutralizing bases; a laboratory reagent. For hydrolyzing starch and proteins in preparations for food. As a catalyst and solvent in organic synthesis. As "spirits of salts" for cleaning of lime and masonry from new brickwork. As flux or flux component for soldering; manufacture of "killed spirits".

Section 2 - Composition / Information on Ingredients

Name	CAS	%
hydrogen chloride	7647-01-0	> 99.0

OSHA PEL
Ceiling: 5 ppm, 7 mg/m^3.

NIOSH REL
Ceiling: 5 ppm (7 mg/m^3).

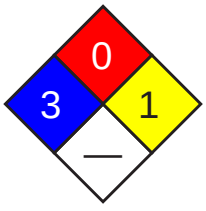
DFG (Germany) MAK
TWA: 5 ppm; PEAK: 5 ppm.

ACGIH TLV
Ceiling: 2 ppm.

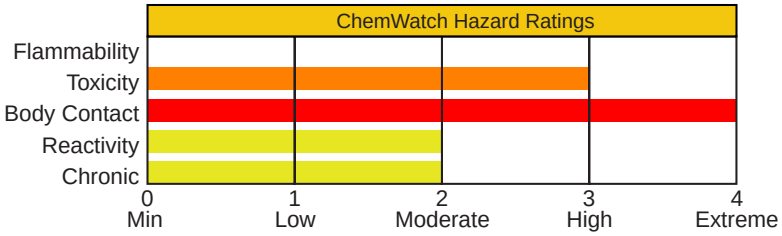
IDLH Level
50 ppm.

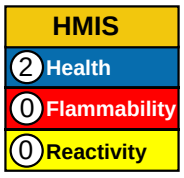
EU OEL
TWA: 5 ppm; STEL: 10 ppm.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word

Danger!


Corrosive Compressed Gas

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless gas; characteristic suffocating, pungent odor. Corrosive. Stored as compressed gas which may cause frostbite. Chronic Effects: erosion of teeth.

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Potential Health Effects

Target Organs: eyes, skin, respiratory system, liver (in animals)
Primary Entry Routes: inhalation, skin contact, eye contact
Acute Effects

Inhalation: The vapor is extremely discomforting to the upper respiratory tract, may cause severe mucous membrane damage and may be harmful if inhaled.
Inhalation of quantities of liquid mist may be extremely hazardous, even lethal due to spasm, extreme irritation of larynx and bronchi, chemical pneumonitis and pulmonary edema.
A single severe exposure may cause coughing and choking; bleeding of nose, inflammation and occasionally ulceration of the nose, throat and larynx. Fluid on the lungs followed by generalized lung damage may follow.
Breathing of vapor may aggravate asthma and inflammatory or fibrotic pulmonary disease.
High concentrations cause necrosis of the tracheal and bronchial epithelium, pulmonary edema, atelectasis and emphysema and damage to the pulmonary blood vessels and liver.
Inhalation hazard is increased at higher temperatures.
The vapor from heated material is extremely discomforting to the upper respiratory tract and lungs if inhaled.
Continued severe exposure can result in pulmonary edema and corrosion of tissues in the nose and throat.

Eye: Hydrogen Chloride: The vapor is extremely discomforting to the eyes and is capable of causing pain and severe conjunctivitis. Corneal injury may develop, with possible permanent impairment of vision, if not promptly and adequately treated.
The material may be irritating to the eye, with prolonged contact causing inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.
Hydrochloric Acid: Eye contact is extremely painful and may cause rapid corneal damage. The liquid is extremely corrosive to the eyes and is capable of causing severe damage with loss of sight.
The vapor is highly discomforting and may be corrosive to the eyes. The vapor from heated material is extremely discomforting to the eyes.

Skin: The material is corrosive to the skin and may cause chemical burns.
Toxic effects may result from skin absorption. Bare unprotected skin should not be exposed to this material. The material may accentuate any pre-existing skin condition.
The vapor is discomforting to the skin.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments.
The liquid is extremely corrosive if swallowed and is capable of causing burns to mouth, throat, esophagus, with extreme discomfort, pain and may be fatal if swallowed in quantity. Ingestion may result in nausea, abdominal irritation, pain and vomiting.

Carcinogenicity: NTP - Not listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

Chronic Effects: Chronic exposure may cause discoloration or erosion of the teeth, bleeding of the nose and gums; and ulceration of the nasal mucous membranes.
Repeated exposures of animals to concentrations of about 34 ppm produced no immediate toxic effects.
Workers exposed to hydrochloric acid suffered from gastritis and a number of cases of chronic bronchitis have also been reported.
Repeated or prolonged exposure to dilute solutions may cause dermatitis. Repeated exposure to low vapor concentrations can cause skin tenderness, bleeding of the nose and gums, chronic bronchitis, gastritis.

Section 4 - First Aid Measures



Inhalation: Remove to fresh air.
Lay patient down. Keep warm and rested.
If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.
Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately flush body and clothes with large amounts of water, using safety shower if available.
Quickly remove all contaminated clothing, including footwear.
Wash affected areas with water (and soap if available) for at least 15 minutes. Transport to hospital or doctor.

Ingestion: Contact a Poison Control Center. Rinse mouth out with plenty of water. Do NOT induce vomiting. Give a glass of water.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: For acute or short-term repeated exposures to strong acids:
1.Airway problems may arise from laryngeal edema and inhalation exposure.
Treat with 100% oxygen initially.
2.Respiratory distress may require cricothyroidotomy if endotracheal intubation is contraindicated by excessive swelling.

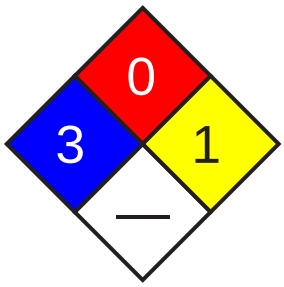
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3. Intravenous lines should be established immediately in all cases where there is evidence of circulatory compromise.
4.Strong acids produce a coagulation necrosis characterized by formation of a coagulum (eschar) as a result of the desiccating action of the acid on proteins in specific tissues.
INGESTION:
1.Immediate dilution (milk or water) within 30 minutes post-ingestion is recommended.
2.Do not attempt to neutralize the acid since exothermic reaction may extend the corrosive injury.
3.Be careful to avoid further vomiting since re-exposure of the mucosa to the acid is harmful. Limit fluids to one or two glasses in an adult.
4.Charcoal has no place in acid management.
5.Some authors suggest the use of lavage within 1 hour of ingestion.
SKIN:
1.Skin lesions require copious saline irrigation. Treat chemical burns as thermal burns with non-adherent gauze and wrapping.
2.Deep second-degree burns may benefit from topical silver sulfadiazine.
EYE:
1.Eye injuries require retraction of the eyelids to ensure thorough irrigation of the conjunctival cul-de-sacs. Irrigation should last at least 20-30 minutes. Do not use neutralizing agents or any other additives. Several liters of saline are required.
2.Cycloplegic drops (1% cyclopentolate for short-term use or 5% homatropine for longer term use), antibiotic drops, vasoconstrictive agents, or artificial tears may be indicated dependent on the severity of the injury.
3.Steroid eye drops should only be administered with the approval of a consulting ophthalmologist.

Section 5 - Fire-Fighting Measures

Flash Point: Nonflammable
Autoignition Temperature: Not applicable
LEL: Not applicable
UEL: Not applicable
Extinguishing Media: Water spray or fog; foam; Bromochlorodifluoromethane (BCF) (where regulations permit); Dry agent; Carbon dioxide.

See DOT ERG



Fire Diamond

General Fire Hazards/Hazardous Combustion Products: Noncombustible liquid. Will not burn, but heat produces highly toxic fumes/vapors.
Heating may cause expansion or decomposition leading to violent rupture of containers. Decomposes on heating and produces toxic fumes of hydrogen chloride. Decomposition may produce toxic fumes of chlorine.
Reacts with metals producing flammable/explosive hydrogen gas. Contact with moisture or water may generate heat causing ignition. Reacts vigorously with alkalis. Moderate fire hazard when in contact with reducing agents.
Fire Incompatibility: Reacts with metals producing flammable/explosive hydrogen gas.
Avoid reactions with metals, metal oxides, hydroxides, amines, carbonates, alkaline materials, acetic anhydride, cyanides, sulphides, sulphites, phosphides, acetylides, borides, carbides, silicides, vinyl acetate, formaldehyde and potassium permanganate, unsaturated organics, metal acetylides, sulphuric acid.
Note: Compatibility with plastics should be confirmed prior to use.
Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation. Cool fire-exposed containers with water spray from a protected location. If safe to do so, remove containers from path of fire. Equipment should be thoroughly decontaminated after use. Water spray or fog may be used to disperse vapor. Do not approach cylinders suspected to be hot. If safe to do so, stop flow of gas.

Section 6 - Accidental Release Measures

Small Spills: DO NOT touch the spill material. Clean up all spills immediately. Wear fully protective PVC clothing and breathing apparatus. Contain and absorb spill with sand, earth, inert material or vermiculite. Use soda ash or slaked lime to neutralize. Collect residues and place in labeled plastic containers with vented lids. Clear area of personnel and move upwind. Avoid breathing vapors and contact with skin and eyes. Do not exert excessive pressure on valve; do not attempt to operate damaged valve. Water spray or fog may be used to disperse vapor.

See DOT ERG

Large Spills: Contact fire department and tell them location and nature of hazard. Clear area of personnel and move upwind. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation. Stop leak if safe to do so. Remove leaking cylinders to a safe place if possible. Release pressure under safe, controlled conditions by opening the valve. Do not exert excessive pressure on valve; do not attempt to operate damaged valve. Shut off all possible sources of ignition and increase ventilation. Water spray or fog may be used to disperse vapor. Use soda ash or slaked lime to neutralize.
Collect and seal in labeled drums for disposal. Wash spill area with large quantities of water. If contamination of

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drains or waterways occurs, advise emergency services. After clean-up operations, decontaminate and launder all protective clothing and equipment before storing and reusing. DO NOT touch the spill material. Contain and absorb spill with sand, earth, inert material or vermiculite.
DO NOT USE WATER OR NEUTRALIZING AGENTS INDISCRIMINATELY ON LARGE SPILLS.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid generating and breathing mist and vapor, breathing vapors and contact with skin and eyes.
Avoid physical damage to containers. Use in a well-ventilated area. Wear protective clothing and gloves when handling containers. Handle and open container with care.
WARNING: To avoid violent reaction, ALWAYS add material to water and NEVER water to material. When handling, DO NOT eat, drink or smoke. Always wash hands with soap and water after handling. Work clothes should be laundered separately. Use good occupational work practices. Observe manufacturer's storing and handling recommendations.
Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.
Local exhaust ventilation may be required for safe working, i.e. to keep exposures below required standards; otherwise, PPE is required.
Keep dry. Reacts violently with water.
Transport containers on a trolley. Avoid sources of heat. DO NOT transfer gas from one cylinder to another.

Recommended Storage Methods: Packaging as recommended by manufacturer. Check that containers are clearly labeled.
Cylinder. Ensure the use of equipment rated for cylinder pressure. Ensure the use of compatible materials of construction. Valve protection cap to be in place until cylinder is secured, connected. Cylinder must be properly secured either in use or in storage. Cylinder valve must be closed when not in use or when empty. Segregate full from empty cylinders. WARNING: Suckback into cylinder may result in rupture. Use back-flow preventive device in piping.
Hydrochloric acid: Packs of 2.5 litres or less require a child-resistant closure. Glass container or Plastic carboy or Polylined drum.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: If risk of overexposure exists, wear air supplied breathing apparatus. Provide adequate ventilation in warehouse or closed storage areas. Use in a well-ventilated area. Local exhaust ventilation may be required for safe working, i. e. , to keep exposures below required standards; otherwise, PPE is required.
If risk of inhalation or overexposure exists, wear NIOSH-approved respirator or work in fume hood. Hydrogen chloride vapors will not be adequately absorbed by organic vapor respirators.

Personal Protective Clothing/Equipment:

Eyes: Chemical goggles. Full face shield.
DO NOT wear contact lenses. Contact lenses pose a special hazard; soft contact lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Neoprene gloves; rubber gloves. Nitrile gloves.
Safety footwear. Rubber boots.
Hydrochloric acid: Barrier cream and Neoprene gloves or Elbow length PVC gloves. Nitrile gloves.
PVC boots or PVC safety gumboots.

Respiratory Protection:
Exposure Range >5 to <50 ppm: Air Purifying, Negative Pressure, Half Mask
Exposure Range 50 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Cartridge Color: white

Other: Ensure there is ready access to a safety shower; Eyewash unit.
Acid-resistant overalls. Full protective suit. Operators should be trained in procedures for safe use of this material.

Glove Selection Index:

BUTYL ..... Best selection
BUTYL/NEOPRENE ..... Best selection
HYPALON ..... Best selection
NEOPRENE..... Best selection
NEOPRENE/NATURAL..... Best selection
NITRILE+PVC ..... Best selection
PE/EVAL/PE ..... Best selection
SARANEX-23 ..... Best selection
VITON/NEOPRENE ..... Best selection
PVC..... Best selection

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NITRILE ..... Best selection
NATURAL RUBBER..... Satisfactory; may degrade after 4 hours continuous immersion
NATURAL+NEOPRENE..... Satisfactory; may degrade after 4 hours continuous immersion
NAT+NEOPR+NITRILE ..... Poor to dangerous choice for other than short-term immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: Hydrogen chloride: Colorless, corrosive gas. Pungent suffocating odor. White fumes in moist air. Soluble in methanol, ethanol, ether and benzene.
Hydrochloric acid: Clear to light yellow (orange tint for inhibited grades) fuming corrosive liquid with sharp, suffocating odor.

Physical State: Hydrogen chloride: Compressed gas; Hydrochloric acid: Liquid
Odor Threshold: 0.26 to 0.3 ppm
Vapor Pressure (kPa): < 24.8 at 25 °C
Vapor Density (Air=1): 1.268 at 20 °C
Formula Weight: 36.461
Specific Gravity (H_2O=1, at 4 °C): < 1.19 at 20 °C
Evaporation Rate: Slow

pH: Hydrochloric acid: < 1
Boiling Point: -85 °C (-121 °F)
Freezing/Melting Point: -114.44 °C (-173.992 °F)
Volatile Component (% Vol): 100
Decomposition Temperature (°C): Not applicable
Water Solubility: 56.1 g/100 cc hot water at 60 °C

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Decomposes in the presence of moisture to produce corrosive acid. May generate sufficient heat to ignite combustible materials. Presence of heat source and direct sunlight (ultra-violet radiation). Product is considered stable under normal handling conditions. Hazardous polymerization will not occur.
Storage Incompatibilities: Hydrogen chloride: Segregate from most common metals and their alloys, alkalis, unsaturated organics, fluorine, metal carbides, metal acetylides, potassium permanganate and sulfuric acid. Compatibility with plastics should be confirmed prior to use.
Hydrochloric acid: Segregate from alkalies, oxidizing agents and chemicals readily decomposed by acids, i.e. cyanides, sulfides, carbonates. Avoid storage with metals, metal oxides, hydroxides, amines, carbonates, alkaline materials, acetic anhydride, cyanides, sulphides, sulphites, phosphides, acetylides, borides, carbides, silicides, vinyl acetate, formaldehyde and potassium permanganate. Reacts with zinc, brass, galvanized iron, aluminum, copper and copper alloys.

Section 11 - Toxicological Information

Toxicity
Inhalation (human) LC_{Lo}: 1300 ppm/30 m
Inhalation (human) LC_{Lo}: 3000 ppm/5 m
Inhalation (rat) LC_{50}: 3124 ppm/60 m
Inhalation (rat) LC_{50}: 4701 ppm/30 m
Oral (rat) LD_{50}: 900 mg/kg

Irritation
Eye (rabbit): 5 mg/30 s - mild

See *RTECS* MW 4025000, for additional data.

Section 12 - Ecological Information

Environmental Fate: No data found.
Ecotoxicity: TL_m Gambusia affinis (mosquito fish) 282 ppm/96 hr (fresh water) /Conditions of bioassay not specified; Lethal Lepomis macrochirus (bluegill sunfish) 3.6 mg/l/48 hr /Conditions of bioassay not specified; LC_{50} Cockle 330 to 1,000 mg/l/48 hr /Conditions of bioassay not specified; LC_{50} Carassius auratus (goldfish) 178 mg/l (1 to 2 hr survival time) /Conditions of bioassay not specified; LC_{50} Shore crab 240 mg/l/48 hr /Conditions of bioassay not specified; LC_{50} Shrimp 100 to 330 ppm/48 hr (salt water) /Conditions of bioassay not specified; LC_{100} Trout 10 mg/l 24 hr /Conditions of bioassay not specified
Biochemical Oxygen Demand (BOD): none

Section 13 - Disposal Considerations

Disposal: Recycle wherever possible. Consult manufacturer for recycling options. Treat and neutralize at an effluent treatment plant. Bury residue in an authorized landfill. Decontaminate empty containers with a lime slurry. Return empty containers to supplier or bury empty containers at an authorized landfill.
Return empty cylinders to supplier.

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Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Note: This material has multiple possible HMT entries. Choose the appropriate one based on state and condition of specific material when shipped.

Shipping Name and Description: Hydrogen chloride, anhydrous
ID: UN1050
Hazard Class: 2.3 - Poisonous gas
Packing Group:
Symbols:
Label Codes: 2.3 - Poison Gas, 8 - Corrosive
Special Provisions: 3
Packaging: **Exceptions:** None **Non-bulk:** 304 **Bulk:** None
Quantity Limitations: **Passenger aircraft/rail:** Forbidden **Cargo aircraft only:** Forbidden
Vessel Stowage: **Location:** D **Other:** 40



Shipping Name and Description: Hydrochloric acid
ID: UN1789
Hazard Class: 8 - Corrosive material
Packing Group: II - Medium Danger
Symbols:
Label Codes: 8 - Corrosive
Special Provisions: A3, A6, B3, B15, IB2, N41, T8, TP2, TP12
Packaging: **Exceptions:** 154 **Non-bulk:** 202 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 1 L **Cargo aircraft only:** 30 L
Vessel Stowage: **Location:** C **Other:**



Shipping Name and Description: Hydrochloric acid
ID: UN1789
Hazard Class: 8 - Corrosive material
Packing Group: III - Minor Danger
Symbols:
Label Codes: 8 - Corrosive
Special Provisions: IB3, T4, TP1, TP12
Packaging: **Exceptions:** 154 **Non-bulk:** 203 **Bulk:** 241
Quantity Limitations: **Passenger aircraft/rail:** 5 L **Cargo aircraft only:** 60 L
Vessel Stowage: **Location:** C **Other:**



Section 15 - Regulatory Information

EPA Regulations:

RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4) 5000 lb (2268 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Listed
RQ: 5000 lb
TPQ: 500 lb
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

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Attachment C

Traffic Safety Plan

Traffic Safety Plan (TSP)

1.0 General

Plan type	Non-Right of Way (Non-ROW)
Project Name:	Crosman Corporation
Project Number:	30005202
Developer Name:	Aaron Richardson
Duration of Project (in hours or days):	2 hours per day, semi-annually
Time Restrictions (Y/N, if Y describe below):	N
Not Applicable	
Not Applicable	
Not Applicable	NA
Not Applicable	
Not Applicable	NA

☐ Working on multiple roads?

Comments:

2.0 Work Description

Provide a brief description of scope of work:

Semi-annual groundwater sampling of monitoring wells. One well is located on shoulder of plant driveway, and 3 wells are located in parking lot area

3.0 Type and Duration

Work locations on this project will be: Short term work (<1 hour per location)

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

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

4.0 Traffic Control Layout, Number of Devices Required, and Phasing

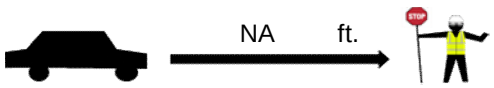
The following Non-ROW requirements in the Traffic Safety Handbook applies:

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

The menu below will be blank and is not applicable.

The menu below will be blank and is not applicable.

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

ROW minimum sign spacing distances for "A", "B" and "C" (as applicable) in referenced DOT Facts.	ROW oncoming traffic minimum site distance required to see Flagger and properly decelerate and stop.
A NA ft. B NA ft. C NA ft.	

ROW Cone Calculation (Values are default. Light grey fields may be modified based on actual road conditions)

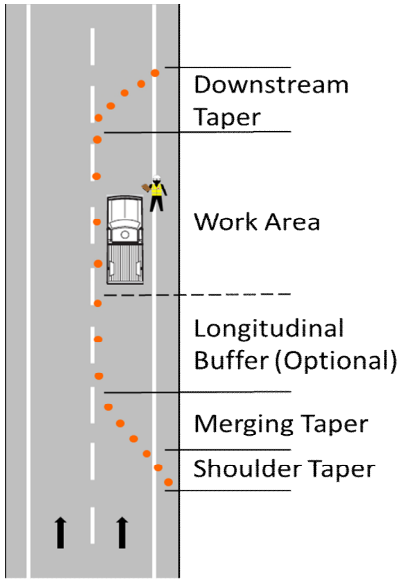
	Active work area length (feet)	200
☐	Apply Optional Longitudinal Buffer (ft)?	0
	Lane width of offset (feet)	12
	Shoulder width of offset (feet)	8
	Posted speed limit	NA

☐ **Shoulder Taper**

Taper Length (feet)	NA
Cones Required	NA
Cones Spacing (max., ft)	NA

☐ **Merging Taper**

Taper Length (feet)	NA
Cones Required	NA
Cones Spacing (max., ft)	NA



☐ **Work Area**

Cone Spacing (max., ft)	NA
Cones Required	NA

☐ **Downstream Taper**

Taper Length (feet)	NA
Cones Required	NA
Cone Spacing (max., ft)	NA

Note: Review taper configuration and cone spacing after ROW implementation to ensure traffic is moving efficiently without motorist confusion in the RWZ.

Cones Required (minimum) NA

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

Check all that apply:	*Wording or Pictogram*	*Number:*
☐ Warning signs		
☐ Warning signs		
☐ Warning signs		
☐ Stop/Slow paddle		
☐ Red flag		
☐ Drums		
☐ Channelizer cone (42 inch height, 10 lb base)		
☐ Channelizer cone (42 inch height, 30 lb base)		
☐ Traffic cones (≥ 18 inches tall)		NA
☐ Barricade:		
☐ Flags for cones		
☐ Lights (for night work)		
☐ Plastic fencing (rolls)		
☐ Caution tape (rolls)		
☐ Other (specify):		

Non-ROW Phasing:

1) Position truck as shield, if practical

2) Deploy traffic control devices

3) Affix flags, caution tape or fencing

4) Unload project equipment

5) Commence work

6) SSO to maintain controls

7) Remove controls in reverse order

Electronic Device Use Safety

Electronic devices (tablets, laptops and cell phones) used for data collection or work documentation are not anticipated to be used on this project. If these devices are used for data collection or work documentation, their use and distraction hazards must be addressed in the safety briefing.

Reviewed By:

HASP Reviewer: _____

Attachment D

Shipping Determination

Arcadis Shipping Determination Form

TRAINING NOTICE

Arcadis requires every employee performing or signing a shipping determination, to be current in HazMat #1 Complete DOT/IATA Shipping and Transportation Training (HazMat #1 Training) or approved equivalent. If you are making decisions concerning the classification and identification of your samples and you think you found a loophole indicating you are exempt from HazMat #1 Training, you are still required to be trained.

Employees who have completed HazMat #12 DOT/IATA Training for AFS and ECS Field Staff are not permitted to complete this form.

DISTRIBUTION NOTICE

Information contained in this Excel workbook is confidential. Distribution of this Excel workbook in the Excel format outside of Arcadis is strictly prohibited. Worksheets titled "Determination", "Field Quick View", "Shipping Guide US001", and printable areas of embedded calculators may be distributed externally in hardcopy or PDF format.

NOTICE TO STAFF PREPARING THIS DETERMINATION

This determination will be VOID if any of the following conditions exists:
1) Unresolved RED TEXT Warnings in the shipping determination.
2) Rationale attached checkbox is checked but the rationale is not attached to the determination.
3) HSSPs or Shipping Guides are referenced but are not attached or provided.

DO NOT RECYCLE SHIPPING DETERMINATION FORMS - ALWAYS START WITH A NEW FORM DOWNLOADED FROM THE TRANSPORTATION SAFETY PROGRAM TEAM SITE

Proceed to the Shipping Determination

SHIPPING DETERMINATION FORM Revision 8c

Date:	8/31/2016
Project Name:	Crosman Corporation
Project Number:	B0041501.0001
Supplemental Information:	None

1) Description of the Material to be Transported or Shipped

1a	Select a description category ===>	Gases
1b	*Air sample with the following constituents*	
1c	TCE	

☐ This material is mixed with water, soil or other inert material

☐ This material will be shipped on wet or blue ice

☐ This material will be shipped on dry ice

2) Classification and Identification

This material is: Not Restricted/Not Regulated

Do not complete section 2a or 2b below

Complete for Hazardous Materials ONLY:

2a	UN/NA/ID# :	NA	2b PG:	NA	Hazard Class:	NA
					Subsidiary Hazard Class:	NA
	PSN:	NA				

☐ See Sect. 7

2c This material is a: No additional criteria applies to this material

3) Packaging, Exceptions and Shipping Information

This material will be shipped (mode of transport and type of shipment):

3a Air as a non-restricted consignment

If using an exception/exemption, list the exception/exemption below

3b None

Carrier/Transporter information:

3c FedEx Express (Air)

Consider entering your desired bottle set in section 3f prior to completing 3a-3c to see if exceptions can be used.

Auth. Air Limits for EQ, LQ and Fully Reg. Shipments and Selected Ground LQ and SQE:

Inner Container Limit (NA- Not Applicable; F- Forbidden; mg, g, or kg for solids; ml or L for liquids):

Glass	NA	NA	Plastic Bag	NA	NA
Metal	NA	NA	Paper Bag	NA	NA
Plastic	NA	NA	Fibre	NA	NA

Outer package Limit:	NA	NA

Air Shipping Specification Package Requirements (NA-Not Available or Not Applicable):

Combination Packages					
Drums:	Steel	Aluminum	Plywood	Fibre	Plastic
	NA	NA	NA	NA	NA
Jerricans:	Steel	Aluminum	Plastic		
	NA	NA	NA		
Boxes:	Steel	Aluminum	Plywood	Fibreboard	Plastic
	NA	NA	NA	NA	NA
Single Packages					
Drums:	Steel	Aluminum	Fibre	Wood	Plastic
	NA	NA	NA	NA	NA
Jerricans:	Steel	Aluminum	Plastic		
	NA	NA	NA		
Boxes:	Steel	Aluminum	Plywood	Fibreboard	Plastic
	NA	NA	NA	NA	NA
Bags:	Textile	Plastic	Paper		
	NA	NA	NA		

Specification packages are not required.

Complete 3d-3f for all Shipments HazMat and Not Regulated/Not Restricted:

3d	Packaging Type:	Combination Package - Non-Bulk			
3e	Inner Container Category:	Summa/sample canister			
3f	Inner Container Specific/Pkg:	Container type		Net Qty. Each Container	
	≤# of Single /Inners: 4	6L	Metal	6	L
	≤# of Single /Inners: 0	None	None		None
	≤# of Single /Inners: 0	None	None		None
	≤# of Single /Inners: 0	None	None		None
	≤# of Single /Inners: 0	None	None		None
	≤# of Single /Inners: 0	None	None		None
3g	Intermediate Packaging:	None			
3h	Outer Packaging:	None			
3i	Other:	None			

- ☐ Arcadis Shipping Guide US-001 attached
- ☐ Specific package closure instructions are attached
- ☐ Arcadis Shipping Guide or HSSP is available for this shipment: NA

4) Marks and Labels

- ☐ PSN, ID # (ID # -12 mm text height required)
- ☐ To/From Address (10 pt. font, Arial)
- ☐ Hazard Class Label(s) :
- ☐ Cargo Aircraft Only Label
- ☐ Orientation Arrows (2 req.)
- ☐ LTD QTY (Ground - no "Y")
- ☐ LTD QTY (Air -"Y")
- ☐ Excepted Quantity
- ☐ Small Quantity Exception by Hwy/Rail
- ☐ OVERPACK (12mm text height required)
- ☐ Dry Ice Class 9 Label
- ☐ Scientific Research Specimen
- ☐ Inside packages meet prescribed spec.
- ☐ RQ (place before PSN on package)
- ☐ Radioactive Matateriał, Exc Package
- ☐ Other: _____

Checked marks and labels are usually required - consult applicable regulation for actual marks/labels required.

5) Documentation

- ☑ No special documentation required
- ☐ Requires a Shipper's Declaration (air) prepared using : None
- ☐ Requires HazMat ground shipping papers prepared using: None
- ☐ Requires a Bill of Lading or Manifest (>MOT, Freight,Trucking Co., Waste Hauler, etc.)
- ☐ Requires Special Permit DOT-SP # _____
- ☐ Other: _____

6) Emergency Response

☐ Use ChemTel 24/7 Emergency Phone and Contract Number
or approved equivalent (authorized client or vendor) for this shipment:
1-800-255-3924 (ChemTel #MIS0007883 Register this shipment with ChemTel:
Have carrier tracking number available. http://Arcadis.chemtel.net/

☐ Ensure current edition of North American Emergency Response Guidebook in vehicle (Arcadis Transport requiring a shipping paper)

7) Special Instructions (Specify any "See Section 7" details in cell B124)

7a

8) References and Rationale for the Determination (add additonal sheets, if requried):

	NA
ICAO/IATA Special Provisions:	
Shipment will consist of Summa canisters with samples collected from a SSDS system and monitoring points. Constituent is TCE which has an LEL of 8%. Historic concentrations of TCE in soil vapor have been as high as 12,000mg/m3 (1.2% LEL) [1% LEL = 10,000 ppm). Concentration is not above the LEL and therefore is not required to be shipped via ground transport.	
☐ See attached for rationale (IF CHECKED, DETERMINATION IS VOID IF RATIONALE NOT ATTACHED)	

9) Signatures

Determination performed by: Nicholas (Klaus) Beyrle
Phone (XXX-XXX-XXXX): 585.662.4044

Determination QA/QC performed by: _____

QUICK VIEW SHIPPING DETERMINATION FORM Revision 8

For Use by Field Staff

Date:	8/31/2016
Project Name:	Crosman Corporation
Project Number:	B0041501.0001

The material you will be shipping includes the following:
Air sample with the following constituents: TCE

If this is not what you are shipping or if you need help, contact Nicholas (Klaus) Beyrle at 585.662.4044 for assistance and guidance.

The material in your shipment has been classified as a: Not Restricted/Not Regulated

This material has been identified as:

PROPER SHIPPING NAME (including applicable modifiers and technical names):

An ID Number, Proper Shipping Name, Hazard Class, and Packing Group are not required for this shipment.

ID NUMBER: **NA** Hazard Class NA (NA) Packing Group NA

☐ The above information in RED is required on the outer package of your shipment as illustrated in the picture

☐ Follow Shipping Guide US-001 to prepare this shipment ☐ Follow Shipping Guide US-015 for dry ice

☐ Refer to the referenced HSSP to right for more information: NA

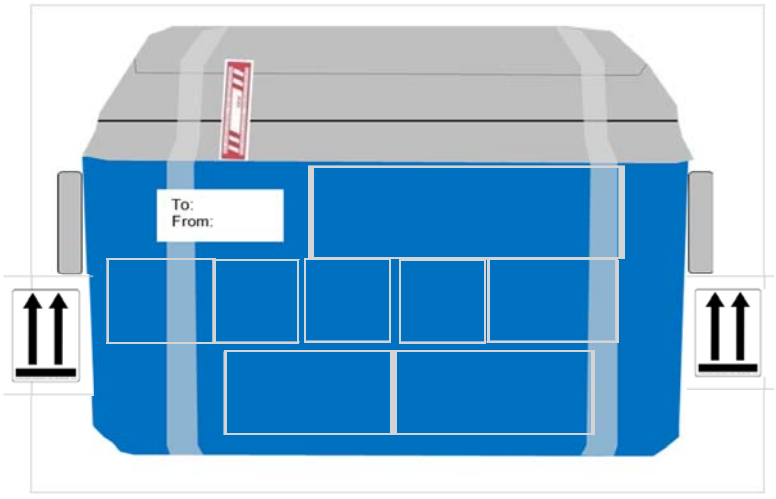
Package preparation configuration per package shipped (not to exceed):

Inner container sizes and quantity:

# of containers	Size	Type	Net Qty Each
4	6L	Metal	6 L
0	None	None	0 None
0	None	None	0 None
0	None	None	0 None
0	None	None	0 None
0	None	None	0 None

Intermediate packaging:	None
Outer packaging:	None

Place marks and labels on same side of package, except orientation arrows should be placed on each end of package.



If you do not have all of the marks or labels shown above. DO NOT GIVE THE PACKAGE TO FEDEX or UPS. Orientation arrows may be red colored. If required, contact the individual listed above for assistance.

☐ Your supervisor (PM, TM, or Field supervisor) must register this shipment with ChemTel (the Arcadis 24 hour emergency phone number provider).

You must offer this shipment to: FedEx Express (Air)

ARCADIS SHIPPING GUIDE NO. US-001

Environmental Sample Cooler Preparation
for Hazardous Materials Shipping
Do Not Use After 12/31/2016

1.0 Overview

This shipping guide provides guidance on the required shipping/transporting configuration for this material per U.S. Department of Transportation (DOT) and the International Air Transport Association (IATA) requirements. This guide **does not exempt** the user from the obligation of performing a proper Shipping Determination for the actual material to be shipped. This guide is subject to the limitations of Section 5.0 below.

2.0 Important Arcadis Prohibitions





Unless otherwise permitted by another Shipping Guide, HazMat Shipping Support Package (HSSP) or as permitted in the project Shipping Determination, ice chests used for hazardous material shipments **must not contain drain plugs** (solid plastic ice chests must be used).

ARCADIS prohibits the use of Igloo® Playmate® type ice chests for hazardous material shipments.

3.0 Preparation of Solid Materials for Shipment

Once collected, soil/solid samples should be promptly placed in a sample cooler on ice for preservation. The following general procedure is applicable to cooler preparation:

1. Select a sample cooler of suitable size for the number of samples to be shipped. In general, sample coolers should not exceed 52 quart capacity to reduce lifting hazards. Sample coolers will be new or clean and should be in good condition (manufacturer supplied handles/lid hinges intact, and no cracks or other impairments that might affect cooler integrity). Samples with large containers (16 oz. soil jars, etc) should be placed in coolers with a nominal capacity of 48 quarts.
2. Line the cooler with a large heavy duty plastic bag.
3. Place absorbent material in the bottom of the plastic bag (usually arrives in the cooler from the analytical laboratory). If not provided or the cooler is new, use vermiculite (approximately 2 inches) or other suitable absorbent. *Absorbent used must be compatible with the sample material, in sufficient quantity to absorb the entire contents of the inner packaging and of a type consistent with project data quality objectives.*
4. Place the soil containers (**with lids taped or secured by other secondary method**) into bubble wrap bags and secure.
5. Group and place soil sample sets **into self-sealing plastic bags**.
6. Place bagged soil sample containers in cooler and **make sure all bottles are in an upright position**.
7. Use blue ice or bag wet ice in self-sealing plastic bags.
8. Place ice on top of sample containers (fill remaining annulus of cooler with as much as possible).
9. Seal bag encompassing the sample containers and ice.
10. Place layer of bubble wrap over bag, if necessary.
11. Place Chain- of- Custody in self sealing plastic bag and secure to lid of cooler with tape.

12. Close and seal cooler with Chain-of-Custody Seals.
13. Tape lid of cooler shut by wrapping strapping tape completely around the cooler and over the Chain-of-Custody Seals.
14. Tape the drain plug, if permitted to be present, of the cooler with duct tape or strapping tape. DO NOT TAPE THE DRAIN PLUG SHUT IF THE COOLER CONTAINS DRY ICE.
15. Affix laboratory name and address label and other labels and marking as required by the applicable shipping guide to the outside of the cooler.
16. Complete air waybill and other shipping papers as required by the Shipping Determination.
17. Offer cooler for shipment.

4.0 Preparation of Liquid Materials for Shipment

Once collected, water samples should be promptly placed in a sample cooler on ice for preservation. The following general procedure is applicable to cooler preparation:

1. Select a sample cooler of suitable size for the number of samples to be shipped. In general, sample coolers should not exceed 52 quart capacity to reduce lifting hazards while maintaining sufficient space for adequate ice placement. Sample coolers will be new or clean and should be in good condition (manufacturer supplied handles/lid hinges intact, and no cracks or other impairments that might affect cooler integrity). Samples with large containers (1L glass, etc.) should be placed in coolers with a nominal capacity of 48 quarts.

2. Line the cooler with a large heavy duty plastic bag.
3. Place absorbent material in the bottom of the plastic bag (usually arrives in the cooler from the analytical laboratory). If not provided or the cooler is new, use vermiculite (approximately 2 inches) or other suitable absorbent. *Absorbent used must be compatible with the sample material, in sufficient quantity to absorb the entire contents of the inner packaging and of a type consistent with project data quality objectives.*
4. Place water containers (**with lids taped or secured by other secondary method)** into bubble wrap bags or wrap in bubble wrap and secure. If VOCs are collected, up to three 40 ml vials may be placed into a single bubble wrap bag. Large glass containers like 1L glass bottles to be double bubble wrapped/bagged for added protection. Sturdy plastic or metal containers do not need to be bubble wrapped.
5. Group and place water sample sets **into self-sealing plastic bags**. Since water sample sets may be large, a sample set may be grouped into several bags. Avoid mixing sample containers from different sample locations into the same bag to reduce potential for cross contamination.
6. Place water sample containers in cooler. **Keep all bottles in upright position**.
7. Use blue ice or bag wet ice in self-sealing plastic bags.
8. Place ice on top of sample containers (fill remaining annulus of cooler with as much as possible).
9. Seal large bag encompassing the sample containers and ice.
10. Place layer of bubble wrap over bag, if necessary.
11. Place Chain- of- Custody in self sealing plastic bag and secure to lid of
12. Close and seal cooler with Chain-of-Custody Seals.
13. Tape lid of cooler shut by wrapping strapping tape completely around the cooler and over the Chain-of-Custody Seals.
14. Tape the drain plug, if permitted to be present, of the cooler with duct tape or strapping tape. DO NOT TAPE THE DRAIN PLUG SHUT IF THE COOLER

CONTAINS DRY ICE.
15. Affix laboratory name and address label along with other required labels and markings as required by applicable shipping guide to the cooler.
16. Affix orientation (“UP”) arrows **on each end of the cooler**.
17. Complete air waybill and other shipping papers as required by the Shipping Determination.
18. Offer cooler for shipment.

5.0 Limitations

This shipping guide is limited to the following conditions:
1) Packaging described must be used, alternate packaging to be approved by ARCADIS Director of Transportation Safety or Transportation Safety Specialist.
2) Sample coolers should be less than or equal to 52 quart in size.
3) Sample cooler used must have good integrity, without any cracks or deformities, with manufacturer supplied handles and lid hinges in good
4) Specific packaging instructions may be presented in selected shipping guides and take precedence over requirements of this guide.
5) Employees preparing coolers for shipment are required to be trained in HazMat #1 or HazMat #12 training.

Attachment E

Tailgate Forms

ARCADIS

Document Control Number:TGM - _____

TGM + *project number plus date as follows: xxxxxxxx.xxxx.xxxxx - dd/mm/year*

TAILGATE HEALTH & SAFETY MEETING FORM

This form documents the tailgate meeting conducted in accordance with the Project HASP. Personnel who perform work operations on-site during the day are required to attend this meeting and to acknowledge their attendance, at least daily.

Project Name:			**Project Location:**
Date:	**Time:**	**Conducted by:**	**Signature/Title:**
Client:		**Client Contact:**	**Subcontractor companies:**

TRACKing the Tailgate Meeting

Think through the Tasks (list the tasks for the day):

1 _____ 3 _____ 5 _____

2 _____ 4 _____ 6 _____

Other Hazardous Activities - Check the box if there are any other ARCADIS, Client or other party activities that may pose hazards to ARCADIS operations ☐ If there are none, write "None" here: _____

If yes, describe them here: _____

How will they be controlled? _____

Prework Authorization - check activities to be conducted that require permit issuance or completion of a checklist or similar before work begins:

	Doc #		Doc #		Doc #
☐ Not applicable		☐ Working at Height		☐ Confined Space	
☐ Energy Isolation (LOTO)		☐ Excavation/Trenching		☐ Hot Work	
☐ Mechanical Lifting Ops		☐ Overhead & Buried Utilities		☐ Other permit	

Discuss following questions (for some review previous day's post activities). **Check if yes :**

☐ Incidents from day before to review?	☐ Lessons learned from the day before?	☐ Any Stop Work Interventions yesterday?
☐ Any corrective actions from yesterday?	☐ Will any work deviate from plan?	☐ If deviations, notify PM & client
☐ JSAs or procedures are available?	☐ Field teams to "dirty" JSAs, as needed?	☐ All equipment checked & OK?
☐ Staff has appropriate PPE?	☐ Staff knows Emergency Plan (EAP)?	☐ Staff knows gathering points?

☐ Topics from Corp H&S to cover?

Comments: _____

Recognize the hazards (check all those that are discussed) (Examples are provided) and **A**ssess the Risks (Low, Medium, High - circle risk level) - Provide an overall assessment of hazards to be encountered today and briefly list them under the hazard category.

☐ Gravity (i.e., ladder, scaffold, trips) (L M H)	☐ Motion (i.e., traffic, moving water) (L M H)	☐ Mechanical (i.e., augers, motors) (L M H)
☐ Electrical (i.e., utilities, lightning) (L M H)	☐ Pressure (i.e., gas cylinders, wells) (L M H)	☐ Environment (i.e., heat, cold, ice) (L M H)
☐ Chemical (i.e., fuel, acid, paint) (L M H)	☐ Biological (i.e., ticks, poison ivy) (L M H)	☐ Radiation (i.e., alpha, sun, laser) (L M H)
☐ Sound (i.e., machinery, generators) (L M H)	☐ Personal (i.e. alone, night, not fit) (L M H)	☐ Driving (i.e. car, ATV, boat, dozer) (L M H)

Continue TRACK Process on Page 2

TAILGATE HEALTH & SAFETY MEETING FORM - Pg. 2

Control the hazards (Check all and discuss those methods to control the hazards that will be implemented for the day): Review the HASP, applicable JSAs, and other control processes. Discuss and document any additional control processes.

☒	**STOP WORK AUTHORITY** (Must be addressed in every Tailgate meeting - (*See statements below*)				
☐	Elimination	☐	Substitution	☐	Isolation
☐	Engineering controls	☐	Administrative controls	☐	Monitoring
☐	General PPE Usage	☐	Hearing Conservation	☐	Respiratory Protection
☐	Personal Hygiene	☐	Exposure Guidelines	☐	Decon Procedures
☐	Emergency Action Plan (EAP)	☐	Fall Protection	☐	Work Zones/Site Control
☐	JSA to be developed/used ***(specify)***	☐	TIP conducted ***(specify job/JSA)***	☐	Traffic Control
☐		☐		☐	Other ***(specify)***
☐		☐		☐	

Signature and Certification Section - Site Staff and Visitors

Name/Company/Signature	Initial & Sign in Time	Initial & Sign out Time	I have read and understand the HASP

Important Information and Numbers

All site staff should arrive fit for work. If not, they should report to the supervisor any restrictions or concerns.

In the event of an injury, employees will call WorkCare at 1.800.455.6155 and then notify the field supervisor who will, in turn, notify Corp H&S at 1.720.344.3844.

In the event of a motor vehicle accident, employees will notify the field supervisor who will then notify Corp H&S at 1.720.344.3844 and then Corp Legal at 1.720.344.3756.

In the event of a utility strike or other damage to property of a client or 3rd party, employees will immediately notify the field supervisor, who will then immediately notify Corp Legal at 1.678.373.9556 and Corp H&S at 1.720.344.3500

Visitor Name/Co - not involved in work

In Out

In Out

In Out

In Out

I will STOP the job any time anyone is concerned or uncertain about health & safety or if anyone identifies a hazard or additional mitigation not recorded in the site, project, job or task hazard assessment.

I will be alert to any changes in personnel, conditions at the work site or hazards not covered by the original hazard assessments.

If it is necessary to **STOP THE JOB,** I will perform **TRACK**; and then amend the hazard assessments or the HASP as needed.

I will not assist a subcontractor or other party with their work unless it is absolutely necessary and then only after I have done TRACK and I have thoroughly controlled the hazard.

Post Daily Activities Review - Review at end of day or before next day's work (Check those applicable and explain:)

- ☐ Lessons learned and best practices learned today: _____
- ☐ Incidents that occurred today: _____
- ☐ Any Stop Work interventions today? _____
- ☐ Corrective/Preventive Actions needed for future work: _____
- ☐ Any other H&S issues: _____

Keep H&S 1st in all things

WorkCare - 1.800.455.6155

Attachment F

JSAs

Job Safety Analysis

General

JSA ID	7272	**Status**	(3) Completed
Job Name	General Industry-Site inspection/walkover - commercial/manufacturin	**Created Date**	4/9/2012
Task Description	Walkover-building	**Completed Date**	04/18/2012
Template	True	**Auto Closed**	False

Client / Project

Client	ARCADIS-AGMI
Project Number	000000100000
Project Name	GENERAL OVERHEAD
PIC	
Project Manager	NO PROJECT MANAGER

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Byers, Susan	4/30/2012	4/9/2012	Edwards, Lauren	o
HASP Reviewer	Edwards, Lauren	4/23/2012	4/18/2012	Balcer, Denis	þ

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
1	PPE verification	1	Lack of adequate PPE at the facility could lead to injury	Prior to traveling to the site, ask the facility representative/escort for information on the types of PPE required. Verify that all necessary PPE is being worn and that PPE is in good working condition.	ARC HSGE015, ARC Field H&S Handbook Sec III-R.
2	Site safety orientation	1	Inability to quickly and safely exit an unfamiliar facility during an emergency	At the start of the site walk, ask the facility representative/escort for information regarding alarms, evacuation routes, and assembly areas.	
		2	Inability to recognize hazards prior to handling chemicals	At the start of the site walk, ask the facility representative/escort for the location of Material Safety Data Sheets.	
3	Building inspection and site walk	1	Slips, trips and falls	Use caution when walking on uneven or wet surfaces. Use proper footwear with good traction. Pay attention to where you are walking-including foot placement. Walk in designated areas and pathways. Maintain a safe distance from open holes and unprotected edges. Use handrails on stairways.	ARC HSIH008, ARC HSGE007, ARC HSFS021, ARC HSFS003, ARC HSIH013, Elevated Heights JSA, FHSB
		2	Acute exposure to hazardous chemicals	Wear appropriate gloves and eye protection when examining containers holding chemicals, wastes, and other potentially hazardous materials. Note the location of nearby eyewash stations and safety showers. Do not handle containers that are unlabeled or that are leaking. Do not open any chemical containers.	
		3	Falling from ladders	Climb ladders slowly, one person at a time. Maintain three points of contact. Do not climb fixed ladders that require fall protection (above 24 feet). Do not use portable ladders	
		4	Falling from elevated heights	Do not walk on elevated areas (greater than 4 feet above lower level) unless protected with a guardrail. Do not walk on scaffolding.	
		5	Falling from roofs	Do not walk on building roofs unless edges are protected with guardrails and skylights are guarded with railing or screens.	
		6	Hearing damage	Wear hearing protection when noise exceeds 85 dBA and in any areas labeled as requiring	ARC Field H&S Handbook Sec III-L

				hearing protection.	
		7	Hazardous atmosphere or entrapment in a confined space	Do not enter confined spaces, crawl spaces, tanks, utility vaults, or trenches.	ARC Field H&S Handbook Sec III-Y
		8	Vehicle / pedestrian accidents	Use caution when walking in areas with vehicle or forklift traffic. Establish eye contact with equipment operators. Maintain a safe distance from moving vehicles and equipment.	
		9	Heat illness	If the site walk involves the inspection of outdoor areas in weather conditions that pose a risk for heat illness (based on temperature, humidity, and sunshine), apply sunscreen and bring drinking water to the site walk.	ARC Field H&S Handbook Sec III-M
		10	Entrapment and pinch points in automatic gates	Do not walk through or underneath automatic gates designed for vehicles or forklifts.	

PPE — Personal Protective Equipment

Type	Personal Protective Equipment	Description	Required
Eye Protection	safety glasses		Required
Foot Protection	steel-toe boots		Required
Hand Protection	chemical resistant gloves (specify type)	as appropriate for chemical hazards	Required
Head Protection	hard hat		Required
Hearing Protection	ear plugs	In excessive noise areas	Required
Miscellaneous PPE	traffic vest--Class II or III		Required

Supplies

Type	Supply	Description	Required
Communication Devices	mobile phone		Required
Miscellaneous	flashlight		Recommended

Review Comments

Reviewer		Comments
Employee: **Role** **Review Type** **Completed Date**	Edwards, Lauren HASP Reviewer Approve 4/18/2012	

Job Safety Analysis

General

JSA ID	4053	**Status**	(3) Completed
Job Name	Infrastructure-Sewer sampling/inspection/measurements	**Created Date**	12/7/2010
Task Description	Confined Space Entry	**Completed Date**	12/08/2010
Template	True	**Auto Closed**	False

Client / Project

Client	ARCADIS-AGMI
Project Number	000000100000
Project Name	GENERAL OVERHEAD
PIC	
Project Manager	NO PROJECT MANAGER

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Casaletta, Robert	4/23/2012	12/7/2010	Kundert, Brian	o
Developer	Rill, Rick	4/23/2012	12/7/2010	Kirsch, Clair	þ
Developer	Tansey, Jason	4/23/2012	12/7/2010	Stevenson, Robert	o
HASP Reviewer	Cameron, Anya	12/21/2010	12/8/2010	Edwards, Lauren	o
Quality Reviewer	Vogelsong, William	12/8/2010	12/8/2010	Suarez, Gustavo	þ

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
1	Inspect all entry equipment and verify that air monitoring equipment is calibrated and functioning properly.	1	Injury or death	Verify that the multigas monitor is properly calibrated and functioning. The meter must have the ability to measure oxygen, lower explosive limit (LEL),hydrogen sulfide (H2S), and carbon monoxide (CO).	ARCADIS H&S Standard (ARC HSFS003) Confined Space Entry/ ARC Field H&S Handbook Sec III-Y
		2	Injury or death	Verify that all equipment is explosion proof or intrinsically safe.	
		3	Injury or death.	Inspect entry equipment (ladder, tri-pod, winch, harness, and other mechanisms) to assure they are in good working condition.	
2	Check weather forecast and coordinate entry operations with client's employees, police, fire and EMS agencies	1	Rain storm can cause flooding in confined space.	Check the weather forecast and weather history to ensure that there is not a chance of flooding during the entry into the confined space.	ARC Field H&S Handbook Sec III-I
		2	Injury in the confined space, as a result of emergency situations or incidents.	As applicable, contact the client, local safety forces (police & fire) and local EMS for any rescue type situations associated with the Confined Space entry work. Ensure that staff have the necessary training associated with emergency situations in the confined space.	ARC Field H&S Handbook Sec III-Y
3	Pre-entry meeting	1	Injury due to personnel not knowing their job requirements.	Assign the roles of entrants, attendants, and supervisor to employees with the required Confined Space training.	ARCADIS H&S Standard (ARC HSFS003) Confined Space Entry, ARC Field H&S Handbook Sec III-Y
		2	Injury or death	Discuss the emergency procedures and review the names of personnel that will be contacted in the event of an emergency.	
		3	Injury or death	Conduct a Tailgate Meeting to review the planned work activities and associated hazards for the confined space work period.	
		4	Injury or death	Complete the Confined Space Entry Checklist in Section 5 of the ARCADIS H&S	

				Standard (HSFS003 Confined Space Entry).	
4	Prepare site and enter confined space.	1	Traffic hazards	Use the buddy system to set up traffic control equipment and devices. Refer to the STAR plan or Traffic Control Plan to ensure proper setup.	ARCADIS H&S Standard (ARC HSFS003) Confined Space Entry/ ARC Field H&S Handbook Sec III-Y.
		2	Injury, death, and inadequate oxygen levels.	Test the air in confined space with multi gas detector prior to entry. Obtain readings at top, middle, and bottom of confined space to determine atmospheric conditions.	
		3	Injury and death, inadequate oxygen, low lighting conditions.	A multi gas meter will be used to continually monitor the air conditions in the confined space. The attendant and the entrant will be in constant contact throughout the entry. Entrant will proceed slowly and will not lose contact with the attendant for any reason while in the confined space.	
		4	Slips, trips, falls, and pinch points	Wear steel-toe boots and leather gloves when lifting heavy objects. Bend at the knees when lifting and have a clear path to the location before lifting it.Use buddy system if object is too heavy or bulky.	
5	Demobilization	1	Traffic hazards, lifting strain, pinch points.	Use the buddy system while removing traffic controls. Wear leather gloves while handling barricades and confined space equipment. Bend at the knees when lifting heavy objects. Have a clear path and a location to place the objects before moving it. Cleanup entry equipment and work area.	

PPE — Personal Protective Equipment

Type	Personal Protective Equipment	Description	Required
Dermal Protection	chemical protective suit (specify type)	Tyvek	Required
	coveralls		Recommended
	long sleeve shirt/pants		Required
Eye Protection	safety glasses		Required
Foot Protection	outer boot covers		Recommended
	steel-toe boots		Required
Hand Protection	work gloves (specify type)	Leather & nitrile	Required
Head Protection	hard hat		Required
Miscellaneous PPE	other	fall arrest rescue harness and tripod	Required
	traffic vest--Class II or III		Required
Respiratory Protection	supplied air		Required

Supplies

Type	Supply	Description	Required
Communication Devices	mobile phone		Required
	walkie talkie		Recommended
Miscellaneous	auxilary lighting	Intrinsically safe Headlamp	Required
	fire extinguisher		Required
	first aid kit		Required
	flashlight	Intrinsically safe	Required
	Other	ladder or tripod w/winch	Required
	Other	duct Tape	Required
	Other	Multi Gas meter	Required
Personal	eye wash (specify type)	Eye saline	Required
	insect repellant	deet>90	Recommended

	water/fluid replacement		Recommended
Traffic Control	barricades		Required
	traffic cones		Required

Review Comments

Reviewer		Comments
Employee: **Role** **Review Type** **Completed Date**	Cameron, Anya HASP Reviewer Approve 12/8/2010	I would remind staff to complete confined space entry checklists which are mandatory and cover most of this information. Otherwise, this is a great reference guide.
Employee: **Role** **Review Type** **Completed Date**	Vogelsong, William Quality Reviewer NA 12/8/2010	Excellent; suggest advising, discussing, coordinating entry operations with client's H&S Mngr prior to.

Job Safety Analysis

General

JSA ID	45	**Status**	(3) Completed
Job Name	Environmental-Groundwater Sampling and free product recovery	**Created Date**	2/4/2009
Task Description	Groundwater sampling	**Completed Date**	02/06/2009
Template	True	**Auto Closed**	False

Client / Project

Client	ARCADIS-AGMI
Project Number	000000100000
Project Name	GENERAL OVERHEAD
PIC	
Project Manager	NO PROJECT MANAGER

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Coppola, Mija	6/12/2012	2/4/2009	Mcburney, Lowell	þ
HASP Reviewer	Coppola, Mija	2/6/2009	2/6/2009	Mcburney, Lowell	þ

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
1	Stage at pre-determined sampling location and set up work zone and sampling equipment	1	Personnel could be hit by vehicular traffic	Set up cones and establish work area. Position vehicle so that field crew is protected from site traffic. Unload as close to work area as safely possible.	ARC Field H&S Handbook Sec III-G
		2	Sampling equipment, tools and monitoring well covers can cause tripping hazard	Keep equipment picked up and use TRACK to assess changes.	
2	Open wells to equilibrate and gauge wells	1	When squatting, personnel can be difficult to see by vehicular traffic.	Wear class II traffic vest if wells are located proximal to vehicular traffic. Use tall cones and the buddy system if practicable.	
		2	Pinchpoints on well vault can pinch or lacerate fingers	Use correct tools to open well vault/cap. Wear leather gloves when removing well vault lids, and chemical protective gloves while gauging. Wear proper PPE including safety boots, knee pads and safety glasses.	
		3	Lifting sampling equipment can cause muscle strain	Unload as close to work area as safely possible; use proper lifting and reaching techniques and body positioning; don't carry more than you can handle, and get help moving heavy or awkward objects.	
		4	Pressure can build up inside well causing cap to release under pressure	Keep head away from well cap when removing. If pressure relief valves are on well use prior to opening well	
3	Begin Purging Well and Collecting Parameter Measurements	1	Electrical shock can occur when connecting/disconnecting pump from the battery.	Make sure equipment is turned off when connecting/disconnecting. Wear leather gloves. Use GFCIs when using powered tools and pumps. Do not use in the rain or run electrical cords through wet areas.	ARC Field H&S Handbook Sec III-AA
		2	Purge water can spill or leak from equipment	Stop purging activities immediately, stop leakage and block any drainage grate with absorbent pads. Call PM to notify them of any reportable spill.	
		3	Water spilling on the ground can cause muddy/slippery conditions	Be careful walking in work area when using plastic around well to protect from spillage	
		4	Lacerations can occur when cutting materials such as plastic tubing	When cutting tubing, use tubing cutter. No open fixed blades should ever be used. When possible wear work gloves, leather type.	

		5	Purge water can splash into eyes	Pour water slowly into buckets/drums to minimize splashing. Wear safety glasses.	
4	Collect GW or Free Product Sample	1	Working with bailer rope can cause rope burns on hands.	Slowly raise and lower the rope or string for the bailer. Wear appropriate gloves for the task.	
		2	Sample containers could break or leak preservative	Discard any broken sampleware or glass properly. Do not overtighten sample containers. Wear chemical protective gloves.	
5	Recovery of Free Product from well	1	Exposure to free product	Additional chemical protection may be necessary based on the type of product. Additionally, safety goggles, a faceshield, or respiratory protection may be required. Verify in the HASP.	
6	Staging of Well Purge water and/or Free Product	1	Muscle strains can occur when moving purge water or drums	If using buckets, do not fill buckets up to the top. Always keep lid on buckets when traveling or moving them to another location. Only half fill buckets so when dumping the buckets weigh less. See drum handling JSA for movement of drums.	ARC Field H&S Handbook Sec III-II

PPE — Personal Protective Equipment

Type	Personal Protective Equipment	Description	Required
Dermal Protection	long sleeve shirt/pants		Recommended
Eye Protection	safety glasses		Required
Foot Protection	steel-toe boots		Required
Hand Protection	chemical resistant gloves (specify type)	Nitrile	Required
	work gloves (specify type)	leather	Required
Head Protection	hard hat		Required
Hearing Protection	ear plugs		Recommended
Miscellaneous PPE	other	Knee pads	Required

Supplies

Type	Supply	Description	Required
Communication Devices	mobile phone		Required
Decontamination	Decon supplies (specify type)	alconox, DI water, spray bottle	Required
Miscellaneous	fire extinguisher		Required
	first aid kit		Required
	flashlight		Required
Personal	eye wash (specify type)	bottle	Required
	insect repellant		Recommended
	sunscreen		Recommended
Traffic Control	barricades		Recommended
	traffic cones		Required

Review Comments

Reviewer		Comments
Employee: **Role** **Review Type** **Completed Date**	Coppola, Mija HASP Reviewer Approve 2/6/2009	

Job Safety Analysis

General

JSA ID	6684	**Status**	(3) Completed
Job Name	Environmental-Air Monitoring	**Created Date**	1/24/2012
Task Description	Indoor Air Sampling	**Completed Date**	01/25/2012
Template	True	**Auto Closed**	False

Client / Project

Client	ARCADIS-AGMI
Project Number	000000100000
Project Name	GENERAL OVERHEAD
PIC	
Project Manager	NO PROJECT MANAGER

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Edwards, Lauren	5/22/2012	1/24/2012	Balcer, Denis	þ
HASP Reviewer	Edwards, Lauren	2/7/2012	1/25/2012	Balcer, Denis	þ
Quality Reviewer	Lee, Johannes	2/6/2012	2/6/2012	Proffitt, David	þ

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
1	Driving to and from sampling locations.	1	Striking or being struck by another object or vehicle	Follow the 5 Keys of Smith System Driving	ARC Field H&S Handbook Sec III-U, Motor Vehicle Safety HS Standard ARCHSGE004
2	Approach residence and communicate with occupant	1	Hostile or agitated occupants. Occupants may be potentially violent.	Use Stop Work Authority. Never approach a residence alone; always use the buddy system. Always have a cell phone. Do not attempt to enter a residence or communicate with it's occupants, if you feel threatened in any way. Leave the property and call 911 if there is clear and present danger. Call PM after contacting the appropriate authorities. Do not attempt to interact with the occupants but leave the area and wait for authorities. Communicate regurlarly with PM, giving addresses of each residence prior to entry.	ARC Field H&S Handbook Sec III-H, Stop Work Authority HS Standard ARCHSGE009
3	Enter home to conduct sampling activities	1	Hostile or agitated occupants. Occupants may be potentially violent. Weapons may be present. Illegal drug use may be occurring.	Use Stop Work Authority. Never approach a residence alone; always use the buddy system. Always have a cell phone. Do not attempt to enter a residence or communicate with its occupants, if you feel threatened in any way. Leave the property and call 911 if there is clear and present danger. Call PM after contacting the appropriate authorities. Do not attempt to interact with the occupants but leave the area and wait for authorities. Communicate regurlary with PM, giving addresses of each residence prior to entry.	Tailgate Meeting HS Standard, PPE HS Standard, Motor Vehicle Safety HS Standard, ARC Field H&S Handbook Sec III-H
		2	Personal hygiene issues in the residence such as extreme filth, animal and/or pet feces, insect infestation.	Use Stop Work Authority. Contact PM and re-evaluate hazards. Do not attempt to communicate with occupants of the residence regarding the conditions of the home. Consult with HR, Legal Department, H&S, project management team, supervisor and client as necessary to determine the safest approach. Re-entry may require additional PPE.	
		3	Visible and excessive rodent feces.	Contact PM and re-evaluate hazards. Do not attempt to communicate with occupants of the residence regarding the conditions of the home. If it is determined the re-entry is	

				possible. Level C PPE must be worn, including a minimum P100 particulate air purifying respirator (APR).	
4	Sample Canister - sampling prep, collection and shipping	1	Heavy Lifting	Use a dolly, when necessary, to move canisters to and from your vehicle. Practice good lifting techniques and keep your back straight. Avoid twisting or awkward movements/positions. Remove canisters from the box and transport individually. If the box or other equipment are too heavy, request assistance in lifting.	ARC Field H&S Handbook Sec III-EE
		2	Cuts or lacerations from opening the box of canisters	Use appropriate cutting tools such as safety knives and cut away from your body when opening the box.	
		3	Pinch points	Use proper tools for adjusting canister valves. Wear gloves when necessary	
		4	Limited visibility - evening hours	Have a flashlight available or a head lamp for hands free light. Try and schedule work during daylight hours and end sampling events early enough to allow for clean up before dusk.	
5	Sub-Slab soil vapor sampling	1	Slips, trips, falls. Pinch points. Eye injury from debris. Injury from lifting and carrying equipment.	Wear work gloves when handling equipment/materials. Practice good housekeeping. Unload equipment as close to work area as possible. Keep equipment and supplies organized. Wear work gloves when handling equipment/materials. Use correct size wrenches when assembling sampling train. Use safety goggles. Practice good lifting techniques and keep your back straight. Avoid twisting or awkward movements/positions. Use two people to lift items heavier than 50 pounds.	ARC Field H&S Handbook Sec III--AA,CC,L.
		2	Electrical shock from the improper use of power tools (electric hammer drill)	Wear appropriate gloves. Do not remove any safety guards from power tools. Inspect power cords for damage/wear. Be aware of potential for hidden electric sources. Make sure your power source is rated appropriately for the equipment being used. Always unplug equipment before peforming any repairs.	
		3	Lacerations from cutting of sample tubing	Use appropriate cutting device and wear gloves when handling blades. Collect purged soil vapor in a Tedlar bag. Discharge purged soil vapor outside building.	
		4	Exposure to constituents in soil vapor	Collect purged soil vapor in a Tedlar bag. Discharge purged soil vapor outside building. Perform air monitoring to monitor exposure.	
		5	Excessive noise generated by hammer drill operation	During drilling operations, hearing protection should be used.	

PPE	**Personal Protective Equipment**		
Type	**Personal Protective Equipment**	**Description**	**Required**
Eye Protection	faceshield		Required
	safety glasses		Required
	safety goggles	When using electric hammer drill	Required
Foot Protection	boots		Required
	steel-toe boots	w/ steel shank	Required
Hand Protection	chemical resistant gloves (specify type)	Nitrile	Required
	work gloves (specify type)	Leather	Required
Head Protection	hard hat	If wearing does not cause hazard	Required
Hearing Protection	ear plugs		Required
Miscellaneous PPE	other	Fall protection when working at heights	Required

Respiratory Protection	full face respirator	When sampling friable asbestos	Required

Supplies

Type	Supply	Description	Required
Communication Devices	mobile phone		Required
Miscellaneous	fire extinguisher		Required
	first aid kit		Required
	flashlight		Recommended
Personal	eye wash (specify type)		Required

Review Comments

Reviewer		Comments
Employee: **Role** **Review Type** **Completed Date**	Edwards, Lauren HASP Reviewer Approve 1/25/2012	
Employee: **Role** **Review Type** **Completed Date**	Lee, Johannes Quality Reviewer NA 2/6/2012	1. Reads like the possibility exists for the building structure to be unsound. If so, beware of trip and fall hazards that may be presented by poor flooring/floor cover conditiion. 2. If sampling involves access to attic spaces, will need to have adequate load-supporting temporary stepping platforms between ceiling joists. 3. Operations requiring climbing/crawling with hands would indicte the need for hands-free illumination (head/hat-mounted lamps).

Job Safety Analysis

General

JSA ID	166	**Status**	(3) Completed
Job Name	Environmental-Sample cooler handling	**Created Date**	5/1/2009
Task Description	Sample cooler handling	**Completed Date**	05/13/2009
Template	True	**Auto Closed**	False

Client / Project

Client	ARCADIS-AGMI
Project Number	000000100000
Project Name	GENERAL OVERHEAD
PIC	
Project Manager	NO PROJECT MANAGER

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Coppola, Mija	12/19/2011	5/11/2009	Mcburney, Lowell	þ
HASP Reviewer	Moyers, Sam	5/25/2009	5/13/2009	Kundert, Brian	þ

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
1	Transfer field samples to sample packing area	1	Lifting heavy coolers may result in muscle strain especially to lower back.	Use proper lifting techniques and keep back straight. Use buddy system for large coolers, Use mechanical aids like hand trucks if readily available to move coolers. Do not over fill coolers with full sample containers for temporary movement to the sample prep area. Ensure an adequate supply of sample coolers are in field.	
		2	Hazards to hands from broken glass caused by over tightening lids or improper placement in cooler	Inspect all bottles and bottle caps for cracks/leaks before and after filling container. Do not over tighten sample lids. Clean up any broken bottles immediately, avoid contact with sample preservatives. Wear leather gloves when handling broken glass.	
		3	Exposure to chemicals (acid preservatives or site contaminants) on the exterior of sample bottles after filling.	Wear protective gloves for acid preservatives and safety glasses with side shields during all sample container handling activities (before and after filling), Once filled follow project specific HASP PPE requirements for skin and eye protection.	
		4	Samples containing hazardous materials may violate DOT/IATA HazMat shipping regulations	All persons filling a sample bottle or preparing a cooler for shipment must have complete ARCADIS DOT HazMat shipping training. Compare the samples collected to the materials described in the Shipping Determination for the Project and ensure consistent. Re-perform all Shipping determinations if free product is collected and not anticipated during planning.	
2	Sample cooler selection	1	Sample coolers with defective handles, lid hinges, lid hasps cracked or otherwise damaged may result in injury (cuts to hands, crushing of feet if handle breaks etc)	Only use coolers that are new or in like new condition, No rope handled coolers unless part of the manufacturer's handle design.	ARCADIS Shipping Guide US-001
		2	Selection of excessively large coolers introduces lifting hazards once the cooler is filled.	Select coolers and instruct lab to only provide coolers of a size appropriate for the material being shipped. For ordinary sample shipping sample coolers should be 48 quart capacity or smaller to reduce lifting hazards.	
3	Pack Samples	1	Pinch points and abrasions	Beware that lid could slam shut; block/brace	

			to hands from cooler lid closing unexpectedly	if needed; be wary of packing in strong winds. New coolers may be more prone to self closing, tilt cooler back slightly to facilitate keeping lid open.	
		2	Awkward body positions and contact stress to legs and knees when preparing coolers on irregular or hard ground surfaces.	Plan cooler prep activities. Situate cooler where neutral body positions can be maintained if practical, like truck tailgate. Avoid cooler prep on rough gravel surfaces unless knees and legs protected during kneeling.	
		3	Frostbite or potential for oxygen deficiency when packing with dry ice. Contact cold stress to fingers handling blue ice or wet ice	Dry ice temperature is -109.30F. Wear thermal protective gloves. DO NOT TOUCH with bare skin! Dry ice sublimates at room temp and could create oxygen deficiency in closed environment. Maintain adequate ventilation! Do not keep dry ice in cab of truck. Wear gloves when handling blue ice or gaging wet ice. Dry Ice is DOT regulated for air shipping, follow procedures in Shipping Determination.	
4	Sealing, labeling and Marking Cooler	1	Cuts to hands and forearms from strapping tape placement or removing old tape and labels	Do not use a fixed, open-blade knife to remove old tags/labels, USE SCISSORS or other safety style cutting device. Only use devices designed for cutting. Do not hurry through task.	
		2	Lifting and awkward body position hazards from taping heavy coolers, dropping coolers on feet during taping.	Do not hurry through the taping tasks, ensure samples in cooler are evenly distributed in cooler to reduce potential for overhanging cooler falling off edge of tailgate/table when taping.	
		3	Improper labeling and marking may result in violation of DOT/IATA HazMat shipping regulations delaying shipment or resulting in regulatory penalty	Do not deviate from ARCADIS Shipping Guide or Shipping Determination marking or labeling requirements.	
5	Offering sample cooler to a carrier or lab courier for shipment.	1	Lifting heavy coolers may result in muscle strain especially to lower back.	See lifting hazard controls above.	
		2	Carrier refusal to accept cooler may cause shipping delay and/or result in violation of DOT HazMat shipping regulations.	Promptly report all rejected and refused shipments to the ARCADIS DOT Program Manager. Do Not re-offer shipment if carrier requires additional labels markings or paperwork inconsistent with your training or Shipping Determination without contacting the ARCADIS DOT Compliance Manager.	

PPE — Personal Protective Equipment

Type	Personal Protective Equipment	Description	Required
Eye Protection	safety glasses		Required
Hand Protection	chemical resistant gloves (specify type)	nitrile	Required
	work gloves (specify type)	leather	Required

Supplies

Type	Supply	Description	Required
Miscellaneous	Other	Scissors	Required

Review Comments

Reviewer		Comments
Employee: **Role** **Review Type** **Completed Date**	Moyers, Sam HASP Reviewer Revise 5/11/2009	Kevlar is required? Leather work gloves are listed. i suggest just leather gloves.

Employee:	Moyers, Sam	
Role	HASP Reviewer	
Review Type	Approve	
Completed Date	5/13/2009	

Job Safety Analysis

General

JSA ID	HASP 1	**Status**	Complete
Job Name	General Industry-Driving - passenger vehicles	**Created Date**	10/20/2020
Task Description	Driving a car, van, or truck on public roadways.	**Completed Date**	10/20/2020

Client / Project

Client	Crosman Corporation
Project Number	30005202
Project Name	Crosman Corporation
Project Manager	William Popham

User Roles

Role	Employee	Due Date	Completed Date
Developer	Aaron Richardson	10/20/2020	10/20/2020
HASP Reviewer	Green, Adam	10/20/2020	10/20/2020
Quality Reviewer			

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
1	Pre-Trip Inspection	1	Failing to perform pre-trip inspections may cause mechanical failure, accident or injury.	Perform walk around of vehicle with particular attention to tire inflation and condition. Check lights, wipers, seatbelts for proper operating condition. Properly adjust seat and mirrors prior to vehicle operation. Use or review vehicle inspection checklist as required under the MVSP.	ARC HSGE024 Motor Vehicle Safety Standard (MVSP)
		2	Scrapes, cuts, burns to hand if inspecting engine fluids and/or tires. Eye splash hazard if inspecting engine fluids. Pinch or crush hazards when opening or closing hood, trunk, or tailgate.	Wear protective gloves and safety glasses as described below when checking under hood or tires. Use TRACK and keep hands clear when opening/closing hood, trunk, or tailgate to avoid crush or pinch hazard.	
		3	Struck by other vehicles while walking around vehicle performing inspections.	Wear high visibility vest, shirt, or coat while performing inspections in parking lots or other areas with a traffic hazard. Remain vigilant of moving vehicles or equipment in area, face oncoming vehicles to extent practical.	
		4	Improperly secured cargo may dislodge creating injury, property damage, or road hazard.	Ensure all cargo is properly secured to prevent movement while the vehicle is in operation. This includes cargo in the cab of the vehicle.	
2	Driving a motor vehicle on public streets	1	Failing to observe traffic flow ahead increases risk of hard braking resulting in potential impact of vehicle ahead, being struck by another vehicle from behind, and decreases decision making time.	Use Smith System Key #1, "Aim High in Steering". **Look ahead (15 seconds if possible) to observe traffic flow and traffic signals.** Adjust speed accordingly to keep vehicle moving and avoid frequent braking. Select lane of least traffic and adjust speed based on observed signal timing when possible. Avoid following directly behind large vehicles that obscure view ahead.	Smith System "5-Keys" is a registered trademark of Smith System Driver Improvement Institute, Inc.

		2	Failing to observe vehicles, pedestrians, bicyclists, and other relevant objects in vicinity of your vehicle increases risk of side swipes, rear ending, and third party injury.	Use Smith System Key #2, "Get the Big Picture". **Maintain 360 degrees of awareness around vehicle.** Check a mirror every 6-8 seconds, maintain space around the vehicle, choose a lane that avoids being boxed in. Look for pedestrian activity ahead in crosswalks or sidewalks. Watch for construction zone approach signs and act early by executing lane changes and reducing speed.	
		3	Failing to keep your eyes moving increases risk of not seeing relevant vehicles, pedestrians, and objects in your vicinity that may impair your ability to make timely and appropriate driving decisions and also increases risk of accident.	Use Smith System Key #3, "Keep Your Eyes Moving". **Move your eyes every 2 seconds and avoid staring while evaluating relevant objects.** Scan major and minor intersections prior to entering them. Check mirrors.	
		4	Failing to maintain space around and in front of your vehicle increases risk of striking another vehicle or being struck by another vehicle. Insufficient space shortens time for effective driving decision making resulting in increased accident risk.	Use Smith System #4, "Leave Yourself an Out". **Use 4 second rule when following a vehicle.** Avoid driving in vehicle clusters by adjusting speed and using lanes that permit maximum space and visibility. When stopped, keep one car length space in front of vehicle ahead or white line.	
		5	Failing to communicate with other drivers and pedestrians increases risk of striking vehicles, pedestrians, or being struck by other vehicles, especially from the rear.	Use Smith System Key #5, "Make Sure They See You". **Brake early and gradually when stopping to reduce potential of being rear ended.** Keep foot on brake while stopped. Use turn signals and horn effectively. Establish eye contact with other drivers and pedestrians to extent practical. Use vehicle positioning that promotes being seen.	
		6	Distractions within the vehicle takes focus off driving, increases risk of accident decreases time for making effective driving decisions.	**Cell phone use (any type or configuration) is prohibited while the vehicle is in motion.** Familiarize yourself with vehicle layout and controls (radio, temperature controls, etc.) prior to operating unfamiliar vehicles. Set controls prior to operating vehicle. Use GPS in unfamiliar areas to avoid use of paper maps/directions while driving. Set GPS prior to vehicle operation. Pull over and stop to modify GPS functions. Avoid consuming food or drink while driving.	
3	Parking	1	Parking vehicle in areas of clustered parked vehicles or near facility entrance may impair visibility to oncoming traffic in lot and increase exposure to pedestrian traffic.	**Use pull through parking or back into parking space when permitted or practical.** When practical and safe to do so, park away from other vehicles and avoid parking near the facility entrance or loading docks. If available, use a spotter to aid in backing activity. Back no further than necessary and back slowly. Get out and look (GOAL) if uncertain of immediate surroundings. Tap horn prior to backing.	

PPE Personal Protective Equipment

Type	Personal Protective Equipment	Description	Required
Eye Protection	safety glasses	While checking engine or tires	Required
Hand Protection	work gloves (specify type)	Leather or equivalent checking engine or	Required

Supplies

Type	Supply	Description	Required
Communication Devices	mobile phone		Required
	other	Vehicle kit (applies to company trucks)	Required
Miscellaneous	fire extinguisher	Applies to company trucks	Required
	first aid kit	Applies to company trucks	Required

Task Improvement Process

General

Observed Company:

Observation Type:

TIP Form: H&S Field Multi-Task (General)

Task Observed:

Observee Name:

Observer Name:

Observation Date:

Project Number: 30005202

Project Name: Crosman Corporation

Supervisor:

Equipment On Site:

Pertinent Information:

Observation

Task	Correct	Questionable	Comments
General			
PPE worn according to HASP/JLA specifications and inspected before use?			
STOP work authority used where appropriate?			
Body Use/Positioning			
Proper lifting/pushing/pulling techniques used (no awkward positions/posture; no twisting or excessive reaching; no straining; no excessive weight; load under control/stable; etc.)?			
Body parts away from pinch points (clear or protected from being caught between objects/equipment or from contacting sharp objects/edges, etc.)?			
Body parts not in the Line of Fire (protected from being struck by traffic, equipment, falling/flying objects, etc.)?			
Work Procedures/Environment			
Correct type and number of barricades/warning devices/cones?			

Communication with others when necessary (hand signals, flags, etc.)?			
Right tools and equipment selected for the job and inspected before use?			
Tools and equipment used properly?			
Housekeeping performed (work areas and pathways clear of hazards, uneven surfaces addressed, etc.)?			
Slip/trip/fall hazards addressed (path selected and cleared, eyes on path, speed footing, etc.)?			
Proper energy control (electrical systems grounded, lock out/tag out performed, isolated, cords/fixtures in good condition, GFCI inspected and utilized when appropriate and used properly, etc.)?			
Protected from overhead/underground utilities (proper clearance, properly marked, spotters as necessary, etc.)?			
Safe work on/near water (appropriate flotation device, appropriate boat for body of water and operation of boat, etc.)?			
Chemical/Radiation protection (decontamination zones set up properly, air monitoring, completed, and logged, etc.)?			
Fall from elevated height prevention (maintains 3-points of contact, appropriate ladder, mounting/dismounting vehicle/equipment, fall arrest system, etc.)?			
Any additional safety issues identified:			

Tip Summary **Enter details of the TIP and follow up discussion provide details on how any questionable items were resolved.**

Discussion following the TIP led by: _____

Date of follow-up discussion: _____

Positive Comments:

Discussion Summary Completed:

- ☐ Supervisor Led
- ☐ Peer to Peer
- ☐ Arcadis Employee to Subcontractor

Summary of Questionable Items

Action Items (Optional) Assign appropriate action items based on the observations made. You can add more than one action item if needed.

Item #	Action Item	Responsible Person	Due Date	Comp. Date
1				
2				
3				

Standard Review

Reviews to be performed after entry of this TIP into 4-Sight.

Quality Review

Quality Reviews to be performed after entry of this TIP into 4-Sight.

Field Validation and Verification

Use the 4-Sight generated copy of this TIP to perform field V&V activities.

Appendix H

Sub Slab Depressurization System Operation, Maintenance and Monitoring Plan

ARCADIS Design & Consultancy for natural and built assets

OPERATION, MAINTENANCE, AND MONITORING PLAN

Crosman Corporation Site
East Bloomfield, New York

Prepared for:
Crosman Corporation and
New Coleman Holdings, Inc.

January 2017



OPERATION, MAINTENANCE, AND MONITORING PLAN

Crosman Corporation Site
East Bloomfield, New York



Aaron Richardson
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January 2017

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B Manufacturer's Manuals for Major System Equipment
C Equipment Layout, Panelboard Layout, Breaker Schedule, and Parts List
D System OMM Logs
E Standard Operating Procedures

ACRONYMS AND ABBREVIATIONS

AFS	air filter/silencer
Arcadis	Arcadis U.S., Inc.
HMI	human machine interface
hp	horsepower
in w.c.	inches of water column
MCP	main control panel
NYSDEC	New York State Department of Environmental Conservation
OMM	operation, maintenance, and monitoring
PVC	polyvinyl chloride
SSDS	sub-slab depressurization system
VI	vapor intrusion
VMP	vacuum monitoring point
VOC	volatile organic compound
VPGAC	vapor-phase granular-activated carbon

1 INTRODUCTION

Arcadis U.S., Inc. (Arcadis) prepared this Operation, Maintenance, and Monitoring Plan for Crosman Corporation and New Coleman Holdings, Inc. (collectively, Crosman) for the sub-slab depressurization system (SSDS) at the Crosman Site located in East Bloomfield, New York (Site). The *Vapor Intrusion Investigation and West Side Soil Boring Investigation Report* (Arcadis 2015a), submitted to the New York State Department of Environmental Conservation (NYSDEC) in January 2015, summarizes the vapor intrusion (VI) investigation activities conducted by Arcadis in January 2014. Arcadis conducted a radius of influence study in May 2015, which was summarized in the *Sub-Slab Depressurization Systems – Radius of Influence Summary* (Arcadis 2015b), submitted to the NYSDEC in July 2015. As a result of VI and radius of influence findings, sub-slab depressurization was selected as the corrective measure to reduce the potential for VI in the target depressurization areas. As defined on Record Drawing G-1 (Appendix A), the target depressurization areas are portions of the screw machine room on the west side of the building and the ammo department on the east side of the building, which are both involved in production.

2 SYSTEM OBJECTIVES

The objective of the SSDS is to mitigate soil vapor concentrations detected in the sub-slab environment beneath the screw machine room and ammo department. A benefit of achieving the objective of the SSDS will be to maintain acceptable indoor air quality by reducing the potential for sub-slab VI from the target depressurization areas into the screw machine room and the ammo department. More specifically, the system operational objectives include:

- Maintain vacuum influence (i.e., negative differential pressure) in the sub-slab environment beneath the building floor across the target depressurization areas.
- Reduce the potential for indoor air concentrations of trichloroethene (TCE) and other volatile organic compounds (VOCs) by decreasing concentrations in the sub-slab environment.

3 SYSTEM OVERVIEW

The SSDS consists of two sub-slab depressurization extraction points, SDS-1 located in the screw machine room, and SDS-2 located in the ammo department. Vacuum is applied to extract sub-slab vapors from each of the extraction points using a 4.6-horsepower (hp) regenerative blower. The blower is designed to continuously apply vacuum at the extraction points to induce a negative sub-slab differential pressure across the target depressurization areas. Sub-slab vapors are conveyed to the SSDS equipment enclosure, which is located outside of the main plant building, adjacent to the southwestern corner of the warehouse. Sub-slab vapors are conveyed through a knockout tank and vapor-phase granular-activated carbon (VPGAC) treatment vessels and discharged to the atmosphere through piping installed along the outside of the warehouse and extending above the roofline. The SSDS is equipped with monitoring devices and instrumentation to allow system operators to confirm proper system operation and to provide notification of system alarm conditions. The SSDS layout is depicted on Record Drawing G-1 in Appendix A.

4 SUB-SLAB DEPRESSURIZATION SYSTEM COMPONENTS

This section describes SSDS components and specifications, including equipment designations for each major system component. An equipment list is provided in Table 1. Record Drawings of the SSDS, including a system layout, extraction point details, and a process and instrumentation diagram, are provided in Appendix A. Manufacturer's manuals for major system equipment are included in Appendix B. Additional system construction details are provided in Appendix C, including an equipment enclosure layout, electrical panel layout, breaker schedule, and parts list.

4.1 Sub-Slab Depressurization System Extraction Points

The SSDS extracts sub-slab soil vapors from two extraction points, SDS-1 and SDS-2. These two extraction points were installed by drilling an 8-inch core hole through the concrete slab. After removing the existing concrete, approximately 1 foot of sub-slab material was removed. A 4-inch-diameter Schedule 40 screened polyvinyl chloride (PVC) pipe was then installed to 1 foot below the concrete slab, with the open sub-slab annulus filled with course gravel to the bottom of the slab. Quickset non-shrinking grout was then placed to seal the remaining void in the concrete slab.

The vertical riser pipes for both extraction points are constructed of 4-inch Schedule 40 PVC pipe and include a vacuum gage, vapor sample port, and a 4-inch butterfly valve to allow for adjustment of applied vacuum at the extraction point. Vapors from the respective extraction points are conveyed separately to the SSDS equipment enclosure via dedicated overhead 4-inch Schedule 40 PVC conveyance piping. Conveyance piping is sloped such that any accumulated water will flow by gravity toward either an extraction point sump or the system knockout tank, with the exception of a short section of exterior piping for SDS-2 where a condensate drain has been installed. All exterior conveyance piping is fitted with 1-inch fiberglass insulation and aluminum jacketing.

The extraction piping for SDS-1 and SDS-2 include vacuum transmitters VT-101 and VT-201, respectively, located immediately inside the system enclosure. Both vacuum transmitters (Wike model #S10-50020021) measure vacuum between 0 and 100 inches of water column (in w.c.).

4.2 Knockout Tank KT-100

Extracted soil vapors from the respective extraction points are combined into a single extraction header after soil vapors reach the system enclosure. Extracted soil vapors are routed through knockout tank KT-100 to remove any accumulated condensation from the vapor stream. KT-100 is a high efficiency moisture separator (Product Level Control model #MDXX-WSR60-XXS) rated for a maximum vacuum of 20 inches of mercury. The liquid capacity of KT-100 is 60 gallons, and two normally closed liquid level switches (LSH-101 and LSHH-101) are installed in the sight gauge for KT-100.

4.3 Air Filter AF-100

Extracted soil vapors are filtered by inline filter AF-100 (Solberg-CSL-235P-300) to remove particulates or other solids.

4.4 Carbon Vessels VPGAC-101, VPGAC-102, VPGAC-103, and VPGAC-104

Vapor-phase treatment consists of four VPGAC vessels (VPGAC-101 through VPGAC-104) arranged in series. The VPGAC vessels (Tetrasolv VFV-1000-SD48) are each filled with 1,000 pounds of virgin coconut-based carbon media. The VPGAC manifold was constructed such that vapors may be directed through VPGAC vessels in a variety of flow paths by adjustment of valve configurations. Potential VPGAC vessel flow paths and the corresponding valve configurations are shown in Table 2.

The flow path through the VPGAC vessels will be in accordance with the Project Engineer's direction and will be based on vapor sampling data and carbon media usage.

4.5 Flow Indicator FI-101

Flow indicator FI-101 measures the combined influent sub-slab soil vapor extraction flow rate. FI-101 is a 2-inch-diameter venturi-style flow meter (Rotron model FM30C250Q) that allows direct reading of flow rates ranging from 45 to 225 standard cubic feet per minute. The flow indicator was installed within the manufacturer's recommended straight pipe length of a minimum of 30 inches on the inlet side and 18 inches on the outlet side. This straight length of piping with a diameter matching the flow meter diameter must be maintained, and the manufacturer's recommended flow meter orientation must be maintained to enable accurate flow measurements.

4.6 Air Filter/Silencer AFS-100

A manual dilution valve assembly on the suction side of the blower allows applied vacuum to the extraction points to be adjusted. The dilution valve assembly includes a 2-inch-diameter brass ball valve (V-119) and combination air filter/silencer AFS-100 (Solberg-FS-31P-200).

4.7 Blower B-300

A 4.6-hp regenerative blower (B-300), Elmo Rietschle Model 2BH1610-7HH26 (60 hz) capable of a flow rate of 175 actual cubic feet per minute at a maximum vacuum of 84 in w.c. is used to apply vacuum at the extraction points. As mentioned previously, a dilution valve assembly located on the suction side of the blower allows for manual adjustment of the soil vapor extraction rate and applied vacuum.

A vacuum relief valve (V-120) is located directly on the suction side of the blower to protect the blower in the event that the influent flow rate is substantially restricted due to line blockage or improper valve configuration. V-120 is factory-set to open at a set point as indicated in Table 1.

4.8 Silencer S-400

The blower discharge line includes adsorptive silencer S-400 (Solberg-SLCRT250) to provide noise reduction for the environment surrounding the system enclosure.

4.9 Controls and Alarms

The SSDS is fed by 480/277 volt, 3-phase power from the Crosman Corporation facility. All major electrical components, including a main disconnect switch, main distribution panel (DP-M), transformer, low-voltage distribution panel (PB-L), and main control panel (MCP), are mounted on the outside of the system enclosure. Electrical and instrumentation Record Drawings are included in Appendix A, and additional electrical information (e.g., panel board layout and breaker schedule) is included in Appendix C.

The SSDS is controlled by a programmable logic controller and is designed to operate automatically. The MCP includes emergency stop and reset buttons. Additionally, a human machine interface (HMI) located on the MCP allows local operators to control the system and view system parameters. The HMI also provides remote control and monitoring capabilities, and is accessible via the internet. Operator notification for all alarm conditions is provided via e-mail. A full list of alarms integrated into the SSDS are summarized in Table 3. Process-related alarms include the following:

- High liquid level in the knockout tank based on level switch LSH-101; results in alarm notification
- High-high liquid level in the knockout tank based on level switch LSHH-101; results in alarm notification and system shutdown
- Low vacuum at vacuum transmitters VT-101 or VT-201; results in alarm notification
- Low-low vacuum at vacuum transmitters VT-101 or VT-201; results in alarm notification and system shutdown

Any tasks involving working on live electrical circuits (e.g., inside the control panel) should only be completed by persons deemed to be qualified and National Fire Protection Association 70E trained.

5 MAINTENANCE AND MONITORING

This section describes basic system operation, maintenance, and monitoring (OMM) requirements. The recommended schedule for OMM tasks is shown in Table 4. All completed log sheets and checklists should be stored onsite in a binder.

5.1 System Monitoring

Onsite system monitoring will be conducted to verify that the system is operating efficiently. The System Monitoring Log included in Appendix D should be completed at the frequency indicated in Table 4. The System Monitoring Log will be used to summarize the visual observations and data necessary to monitor system performance. System monitoring will include, but is not limited to, the following:

- General site inspection to verify that the system is running properly
- Recording influent sub-slab vapor extraction flow rate
- Recording applied vacuum and air velocity at extraction points
- Recording system process gauges for vacuum, pressure, and temperature
- Recording the electric meter reading
- Recording the position of process valves, including the dilution valve and VPGAC manifold valves

5.2 Performance Monitoring

Onsite performance monitoring will be conducted to collect data required to assess the system's effectiveness. The Performance Monitoring Log included in Appendix D should be completed at the frequency indicated in Table 4.

5.2.1 Instantaneous Sub-Slab Differential Pressure Monitoring

Instantaneous sub-slab differential pressures will be measured at vacuum monitoring points (VMPs) at the frequency indicated in Table 5 and recorded in the Performance Monitoring Log. A micromanometer capable of measuring to the nearest 0.001 in w.c. will be used to measure instantaneous differential pressure at the VMPs with the system operating. To measure sub-slab differential pressures, the cap on the VMPs will be removed and a compression fitting and tubing installed. With the other end of the tubing connected to the positive port on the micromanometer, negative readings measured by the micromanometer indicate a vacuum at the VMP. The micromanometer will be zeroed before each VMP measurement with both ports vented to the atmosphere. Micromanometers owned by system operators will be factory-calibrated annually or anytime the unit is dropped or otherwise suspected to be reading inaccurately.

5.2.2 Continuous Sub-Slab Differential Pressure Monitoring

To confirm that a sustained negative sub-slab differential pressure is being achieved, differential pressure data loggers will be installed at VMPs and used to monitor differential pressure for a period of 24 hours

while the system is operating. The schedule for continuous sub-slab differential pressure monitoring, including which VMP locations to monitor, is indicated in Table 5. The SSDS SOP-02 included in Appendix E will be followed when performing continuous sub-slab differential pressure monitoring.

5.2.3 System Vapor Sampling

System vapor sampling will periodically be conducted at extraction points throughout the treatment process, and at the effluent location in accordance with the schedule indicated in Table 6. System effluent sampling will be conducted to demonstrate that the SSDS effluent VOC mass concentrations remain below the Division of Air Resources 1 air emission guideline values. Sampling will also be conducted throughout the treatment process to indicate when carbon media is in need of replacement. Lastly, vapor sampling will be conducted at each extraction point to evaluate the estimated mass extraction rates for each extraction point, monitor for trends over time, and guide any SSDS operational modifications that may be recommended to increase system effectiveness. It should be noted that the sampling schedule (i.e., Table 6) may be revised or reduced in the future. The SSDS-SOP-01 included in Appendix E should be followed when conducting system vapor sampling. Samples will be submitted to the laboratory and analyzed for VOCs using United States Environmental Protection Agency Method TO-15.

5.3 Routine Maintenance

General routine maintenance items for the system's major components are discussed below. Any work requiring lockout/tagout of equipment, or work on energized equipment, will be completed in accordance with the Arcadis Safety Procedures.

5.3.1 Vapor-Phase Granular-Activated Carbon Vessels

Carbon media for vapor-phase treatment vessels (VPGAC-101 through 104) will be replaced as needed based on periodic system sampling results described previously and as recommended by the Project Engineer.

5.3.2 Blower B-300

Blower B-300 should be inspected for abnormal sounds, odor, or vibration on a monthly basis. The performance (i.e., flow rate and applied vacuum) achieved by B-300, as well as the blower effluent temperature, should routinely be compared to the manufacturer's performance curves. If the blower's performance differs appreciably from the manufacturer's performance curves (included in Appendix B), and both inline air filter AF-100 and dilution line air filter/silencer AFS-100 have been inspected, then the blower motor voltage and current draw should be checked by a competent person in accordance with the Arcadis Safety Procedures regarding work on energized equipment. The blower does not require any routine maintenance. For more specific information on the blower maintenance and troubleshooting, see the manufacturer's service and parts manual included in Appendix B.

5.3.3 Air Filters

Both the inline air filter (AF-100) and the dilution line air filter/silencer (AFS-100) capture solids that could damage the blower. These filters should be visually inspected in accordance with the schedule in Table 4.

The AF-100 filter element should be cleaned or replaced based on visual inspection or if the pressure differential across the filter is more than 5 in w.c. greater than the pressure differential when the filter element is new (i.e., 1 in w.c.). The filter element in AFS-100 should be cleaned or replaced based on visual inspection. Replacement or inspection of AF-100 requires a system shutdown, while replacement or inspection of AFS-100 requires dilution line valve V-119 to be closed. Filters fitted with polyester filter elements may be cleaned, while paper filter elements usually require replacement. For more specific information regarding the air filters, see Appendix B.

5.3.4 Knockout Tank KT-100

Maintenance required for knockout tank KT-100 includes observing the liquid level in the tank and draining as needed in accordance with the schedule in Table 4. If draining of the knockout tank liquid is required, then a system shutdown will be initiated. Liquid will be containerized and treated through the onsite water treatment system operated by Crosman. Specific information on the knockout tank is provided in Appendix B.

5.3.5 Vacuum Relief Valve V-112

Vacuum relief valve V-120 should be tested at a frequency in accordance with Table 4. V-120 should open at a set point as indicated in Table 1. To allow vacuum to be solely controlled by nearby dilution line valve V-119, V-119 should be opened 100% and butterfly valves V-101 and V-201 should be closed approximately 50%. V-119 can then be slowly closed to increase vacuum on the suction side of the blower. Vacuum gauge VI-108 should be visually monitored as V-119 closes to confirm the vacuum relief valve V-120 opens at the required set point.

5.3.6 Piping

Extraction point riser piping and discharge stack piping will be inspected from floor/ground level in accordance with the schedule in Table 4. Extraction point riser piping should be inspected for cracked piping or fittings, leaks, and lack of structural integrity. System discharge stack piping should be inspected for leaks, damaged insulation, freezing, potential blockage, lack of structural integrity and abnormal exhaust appearance.

5.3.7 Silencer S-400

Silencer S-400 does not require any routine maintenance.

5.3.8 Condensation

In addition to inspecting knockout tank KT-100 for liquid, condensation drain valve V-401 should be opened and drained of potential condensate or other water in accordance with the schedule in Table 4. Any liquid drained will be containerized and passed through activated carbon and discharged to the ground surface.

5.3.9 System Monitoring Devices

The system has four monitoring devices that are interlocked with the control panel: high liquid level switch LSH-101, high-high liquid level switch LSHH-101, and low vacuum transmitter VT-101 and vacuum transmitter VT-201. Alarm details for each monitoring device are summarized in Table 3. Each monitoring device will be tested at the frequency as indicated in Table 4 to confirm device functioning and alarm response.

6 SYSTEM OPERATION

This section covers the general procedures to be followed when starting the system, performing a system shutdown, and responding to alarm conditions.

6.1 Remote Access

The system HMI may be accessed remotely via the internet to allow system operators to control the system's operation, monitor system parameters, and adjust alarm set points. The SSDS-SOP-03 included in Appendix E may be utilized to remotely connect to the system.

6.2 Starting the System

The following steps should be taken to properly start the system under normal conditions:

1. Communicate with the Crosman Project Manager to confirm that a system startup should be initiated. Follow the Arcadis Safety Procedures protocol in the event that the blower skid is locked or tagged out.
2. Conduct a visual inspection of the system to verify that there are no obvious problems with any system equipment, process piping, or electrical components.
3. Record the blower runtime from the HMI and note the apparent reason for the system being offline.
4. Confirm that the electrical panels are closed securely. Then confirm that the disconnect handle on the control panel is in the "on" position.
5. The HMI controls may be used to start the system. Confirm that the virtual blower hand-off-auto switch is in the "auto" position via the HMI. Initiate a system startup by pressing the green virtual "start" button on the HMI. The blower icon displayed on the HMI system screen should turn green, indicating the blower is running.
6. Complete a System Monitoring Log within 30 minutes after a system startup and provide to the Crosman Project Manager. If the system has been offline for a significant period of time (e.g., more than 1 month), then all routine OMM tasks will be performed in accordance with Table 4 and the Monthly OMM Checklist completed (Appendix D).

6.3 Shutting the System Down

The following steps should be taken to initiate a system shutdown:

1. A normal system shutdown may be initiated via the HMI by pressing the red virtual "stop" button.
2. An emergency stop button mounted on the MCP may also be used to initiate a system shutdown.
3. If lockout/tagout of the system is required (i.e., when work involves potentially exposing personnel to a stored energy source), it will be conducted in accordance with the Arcadis Safety Procedures.

6.4 Responding to Alarms

The following steps should be taken to respond to an alarm condition:

1. Record the blower runtime from the HMI and note which alarm condition is present.
2. Conduct a visual inspection of the system to verify there are no obvious problems with any of the system equipment, process piping, or electrical components.
3. Within the alarms screen on the HMI, press the “reset” button. If the alarm conditions have been corrected, then a system startup may be initiated.
4. If the blower does not start, check the motor starter located inside the control panel to see if it is tripped and reset as necessary. Any tasks involving working on live electrical circuits (e.g., inside the control panel) should only be completed by persons deemed qualified by Arcadis and in accordance with the Arcadis Safety Procedures.
5. If the blower still does not start, investigate the potential causes listed in Table 3 and/or the manufacturer’s manuals included in Appendix B. Utilize a licensed electrician or qualified person in accordance with the Arcadis Safety Procedures for further diagnosis of a blower malfunction as necessary. If necessary, replacement parts should be procured and installed in accordance with manufacturer’s recommendations.
6. If the alarm condition cannot be corrected, consult the Crosman Project Manager.
7. An Alarm Response Log (Appendix D) should be completed documenting alarm response activities.

7 REFERENCES

Arcadis. 2015a. *Vapor Intrusion Investigation and West Side Soil Boring Investigation Report*. January.

Arcadis. 2015b. *Sub-Slab Depressurization Systems – Radius of Influence Summary*. July.

TABLES

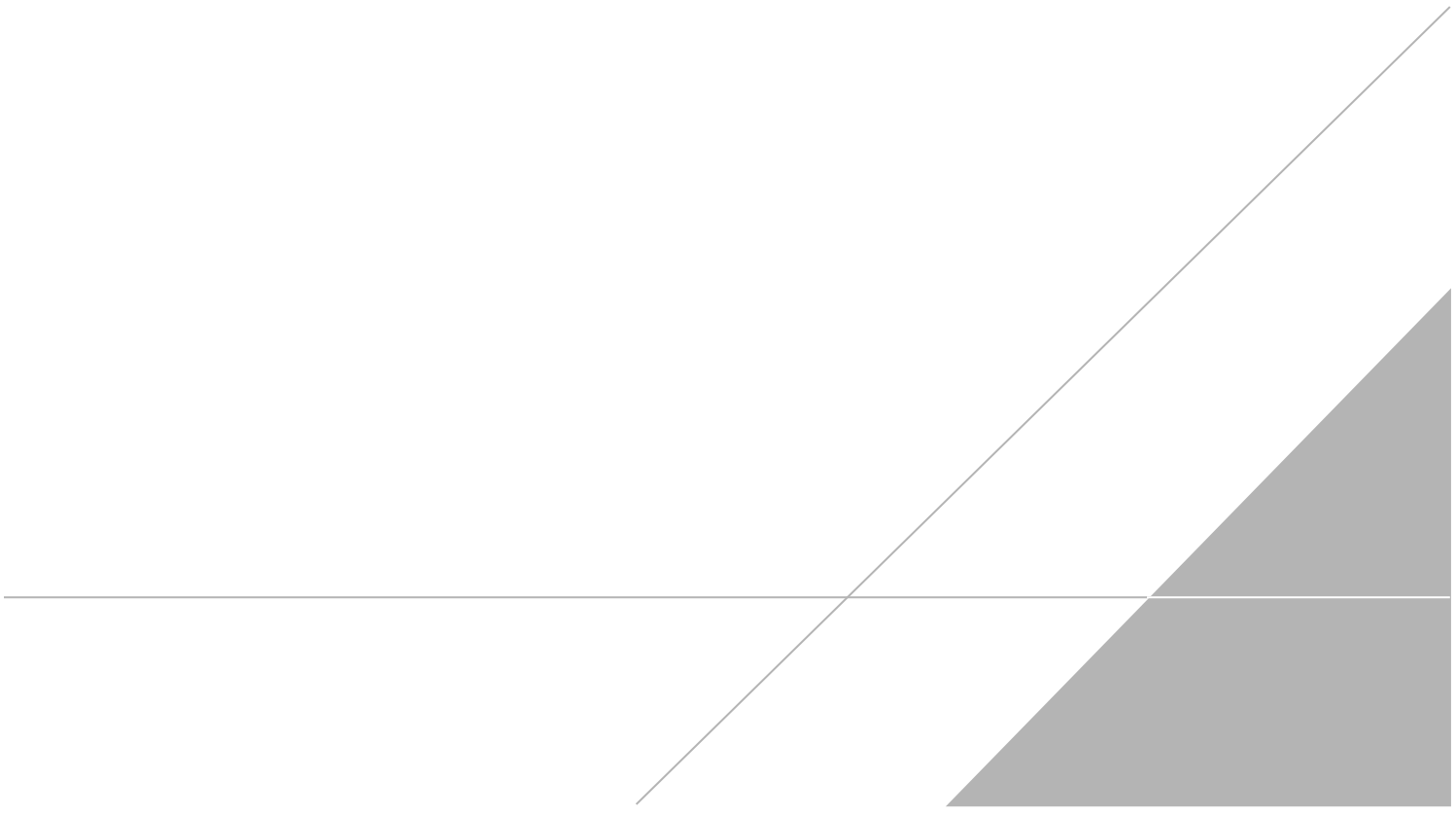


Table 1
Major Equipment List
Operation, Maintenance, and Monitoring Plan
Sub-Slab Depressurization System
Crosman Corporation
East Bloomfield, New York

Quantity	Description	Designation	Specification
1	Regenerative Blower	B-300	Elmo Rietschle Model 2BH1610-7HH26 (60hz), 175 scfm at max vacuum of 84 in w.c., 4.6 hp, three phase
1	Knockout Tank	KT-100	Product Level Control Model MDXX-WSR60-XXS, rated for 20 in Hg vacuum, 60 gallons liquid capacity, manual drain valve
1	Flow Meter	FI-101	Rotron Model FM30C250Q, 2.5 in w.c. loss at 165 scfm, flow range 45-225 scfm
1	Inline Filter	AF-100	Solberg Model CSL-235P-300, rated for 300 acfm, polyester filter element
1	Silencer	S-400	Solberg Model SLCRT250, rated for 385 scfm
1	Filter/Silencer	AFS-100	Solberg Model FS-31P-200, rated for 135 scfm, polyester filter element
1	Vacuum Relief Valve	V-120	Kunkle Model 215V-H01AQE (set for 80 in w.c.)
1	Pressure Relief Valve	V-301	Kunkle Model 0337-H01ANE (set for 1 psi)
2	Liquid Level Sensor	LSH-101 & LSHH-101	Product Level Control 2-float system, both normally closed, mounted vertically inside clear PVC site tube
2	Vacuum Transmitter	VT-101 & VT-201	Wika Model s10(50020021), range 0 to 100 in w.c. 316 S.S. 4-20 mA signal
4	Vapor Phase Carbon	VPGAC-101, 102, 103 & 104	Tetrasolv Model VFV-1000-SD 48, 7 ft^2 bed area, 35 ft^3 bed volume, rated 700 scfm, max vacuum 20 in Hg., 48" Ø x 56" high, with false floor, 4" inlet/outlet, 18" Ø top manway, 1" drain valve
6	Vacuum Gauges	VI-102 through VI-107	PIC Gauges, 0-100 in w.c. vacuum, 2.5" dial, 1/4" MNPT threads
2	Temperature Gauges	TI-102 & TI-301	Trerice Model B831X0205, 20-240 °F, 2.5" dial, 1/2" MNPT threads
1	Pressure Gauge	PI-301	PIC Gauges, 0-60 in w.c. pressure, 2.5" dial, 1/4" MNPT threads
17	Butterfly Valves	V-102 through V-118	Red-White Valve Model 937DESL-4"
2	Butterfly Valves	V-101 & V-201	Milwaukee Model 4CW223E
1	Ball Valve	V-119	MATCO Model 759T08, 2" brass/TFE

Notes:
1) See Appendix B for additional equipment information
2) See Drawing M-1 (Appendix A) for equipment designations

Definitions:

Ø = diameter
AFS = air filter/silencer
B = blower
cfm = cubic feet per minute
FI = flow indicator
hp = horsepower
hz = hertz
inHg = inches of mercury
in. w.c. = inches of water column
KT = knockout tank
LSH = level switch high
LSHH = level switch high-high
MNPT = Male National Pipe Thread
PI = pressure indicator
psi = pounds per square inch
S = silencer
scfm = standard cubic feet per minute
V = valve
VPGAC = vapor-phase granular-activated carbon
VT = vacuum transmitter

Table 2
VPGAC Vessel Valve Configurations
Operation, Maintenance, and Monitoring Plan
Sub-Slab Depressurization System
Crosman Corporation
East Bloomfield, New York

Valve Designation	Flow Path Through VPGAC Vessels[1]											
	101→102→ 103→104	103→104→ 101→102	101→102→ 103	102→103→ 104	103→104→ 101	101→102→ 104	101→102	101→104	102→103	102→104	103→104	104→101
V-102	open	open	open	closed	open	open	open	open	closed	closed	open	closed
V-103	open	closed	open	closed	closed	open	open	open	closed	closed	closed	closed
V-104	open	open	open	closed	open	open	open	open	closed	closed	closed	open
V-105	open	open	open	open	closed	open	open	closed	open	open	closed	closed
V-106	open	closed	open	open	closed	closed	closed	closed	open	closed	closed	closed
V-107	open	open	open	open	open	closed	closed	closed	open	closed	open	closed
V-108	open	open	closed	open	open	open	closed	open	closed	open	open	open
V-109	open	closed	closed	open	closed	open	closed	open	closed	open	open	closed
V-110	closed	closed	closed	open	closed	closed	closed	closed	open	open	closed	open
V-111	closed	closed	closed	open	open	closed	closed	open	open	open	closed	closed
V-112	closed	closed	closed	closed	open	closed	closed	open	closed	closed	closed	open
V-113	closed	open	closed	closed	closed	open	open	closed	closed	open	closed	closed
V-114	closed	closed	open	closed	closed	open	closed	open	open	open	closed	open
V-115	closed	open	open	closed	open	closed	open	closed	open	closed	closed	closed
V-116	closed	open	closed	closed	open	closed	closed	closed	closed	closed	open	closed
V-117	closed	closed	closed	closed	closed	closed	closed	closed	closed	closed	closed	open
V-118	closed	open	closed	closed	open	closed	closed	closed	closed	closed	closed	open

Notes:
1) VPGAC vessel ID's shown. All possible flow paths not shown. Consult project engineer if different flow paths are required.

Definitions:
V = valve
VPGAC = vapor-phase granular-activated carbon

Table 3
Alarm Details
Operation, Maintenance, and Monitoring Plan
Sub-Slab Depressurization System
Crosman Corporation
East Bloomfield, New York

Instrument	Alarm Condition	Type[1]	Alarm Range	Delay	Potential Cause(s)
B-300	Blower Motor Failure	Critical	No run	10 seconds	Power failure, overcurrent breaker tripped, plugged blower inlet or outlet
VT-101	Low vacuum	Non-Critical	< 50 in w.c. vacuum	20 seconds	Blower shutdown, leak in extraction piping, vacuum relief valve stuck open, clogged discharge line
VT-101	Low-Low Vacuum	Critical	< 40 in w.c. vacuum	20 seconds	Blower shutdown, leak in extraction piping, vacuum relief valve stuck open, clogged discharge line
VT-201	Low vacuum	Non-Critical	< 50 in w.c. vacuum	20 seconds	Blower shutdown, leak in extraction piping, vacuum relief valve stuck open, clogged discharge line
VT-201	Low-Low Vacuum	Critical	< 40 in w.c. vacuum	20 seconds	Blower shutdown, leak in extraction piping, vacuum relief valve stuck open, clogged discharge line
VT-101	Transmitter Failure	Critical	No function	5 seconds	Bad wire connection, exceeding transmitter operational range
VT-201	Transmitter Failure	Critical	No function	5 seconds	Bad wire connection, exceeding transmitter operational range
LSH-101	High liquid level knockout tank (KT-100)	Non-Critical	Raised	5 seconds	Knockout tank requires emptying, switch stuck in raised position
LSHH-101	High-High liquid level knockout tank (KT-100)	Critical	Raised	5 seconds	Knockout tank requires emptying, switch stuck in raised position
UPS	UPS Fault	Critical	No function	5 seconds	Power failure or spike, faulty UPS
-	AC Power Failure	Critical	No power	5 seconds	Power failure or spike, tripped breaker

Notes:
1. Critical alarms result in system shutdown and alarm notification. Non-critical alarms result in alarm notification.

Definitions:
B = blower
in w.c. = inches of water column
KT = knockout tank
LSH = level sensor high
LSHH = level sensor high-high
UPS = uninterruptable power supply
VT = vacuum transmitter

Table 4
Operation, Maintenance, and Monitoring Schedule
Operation, Maintenance, and Monitoring Plan
Sub-Slab Depressurization System
Crosman Corporation
East Bloomfield, New York

Task	Frequency	Notes
Complete Monthly OMM Checklist	Monthly	
Complete System Monitoring Log	Monthly	
Complete Performance Monitoring Log	Monthly	
Complete Alarm Response Log	As Needed	Should be completed anytime an alarm response is required.
Conduct Instantaneous Sub-Slab Differential Pressure Monitoring	See Table 5	
Conduct 24-Hour Continuous Differential Pressure Monitoring	See Table 5	
Conduct System Vapor Sampling	See Table 6	
Blower Inspection	Monthly	Inspect for abnormal sounds, odors and vibrations.
Knockout Tank Liquid Level Check and/or Draining (1)	Monthly	If the liquid level is greater than 50% of the tank volume, the water shall be drained.
Condensation Check (1)	Monthly	Condensation shall be drained from valve V-401.
In-Line Air Filter Element Inspection (2)(3)	Monthly	
Dilution Line Air Filter Element Inspection	Monthly	Close dilution valve V-119 100% prior to inspecting filter.
Extraction Point Riser Inspection	Monthly	Inspect for cracked piping or fittings, leaks and structural integrity.
Discharge Stack Inspection	Monthly	Inspect for leaks, potential blockage, structural integrity and abnormal appearance.
Knockout Tank Liquid Level Switches Test (4)(5)	Annual	Confirm LSH-101 functions as non-critical alarm and LSHH-101 as critical alarm.
Vacuum Transmitters Test (4)(6)	Annual	Confirm transmitter functioning including initiation of system shutdown.
Vacuum Relief Valve Test (should open at 80 in w.c. vacuum)	Annual	
VPGAC Changeout	As Needed	As recommended by Project Engineer
Blower Voltage and Current Check (3)	As Needed	Nameplate current maximum of 7.2 amps shall not be exceeded.

Notes:
1) Condensation shall be containerized and disposed of in coordination with Crosman Corporation procedures
2) System shall be shutdown prior to performing
3) Lockout/tagout and work on energized equipment shall be conducted in accordance with Arcadis Safety Procedures
4) Will cause system shutdown.
5) Knockout tank shall be filled with water using lower drain port
6) Vacuum transmitters VT-101 and VT-201 shall read between +/- 5% of vacuum gauges VI-101 and VI-201, respectively

Definitions:
in w.c. = inches of water column
LSH = level sensor high
LSHH = level sensor high-high
OMM = operation, maintenance and monitoring
V = valve
VI = vacuum indicator
VPGAC = vapor-phase granular-activated carbon
VT = vacuum transmitter

Table 5
Sub-Slab Differential Pressure Monitoring Schedule
Operation, Maintenance, and Monitoring Plan
Sub-Slab Depressurization System
Crosman Corporation
East Bloomfield, New York

ARCADIS Design & Consultancy for natural and built assets

Instantaneous Differential Pressure Monitoring Schedule [(1)]

Vacuum Monitoring Point	Frequency
VMP-1	monthly
VMP-2	monthly
VMP-3	monthly
VMP-4	monthly
VMP-5	monthly
VMP-6	monthly
VMP-7	monthly
VMP-8	monthly
VMP-9	monthly
VMP-10	monthly
VMP-11	monthly
VMP-12	monthly

24-Hour Continuous Differential Pressure Monitoring Schedule [(2)]

Vacuum Monitoring Point	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
VMP-1	X			
VMP-2	X			
VMP-3		X		
VMP-4			X	
VMP-5			X	
VMP-6				X
VMP-7	X			
VMP-8		X		
VMP-9		X		
VMP-10			X	
VMP-11				X
VMP-12				X

Notes:
1) A micromanometer capable of measuring +/- 0.001 inches of water column shall be used.
2) Refer to SSD SOP-02 in Appendix E for 24-hour continuous differential monitoring procedure.

Definitions:
SOP = standard operating procedure
VMP = vacuum monitoring point

Table 6
System Vapor Sampling Schedule
Operation, Maintenance, and Monitoring Plan
Sub-Slab Depressurization System
Crosman Corporation
East Bloomfield, New York

Sample Location	Sample Port ID	Phase	PID Readings		Laboratory Analysis		
			Frequency	Sampling Method	Frequency	Sampling Method	Analysis
SDS-1	SP-001	vapor	monthly	vacuum pump and tedlar bag	monthly	grab sample via summa canister	USEPA TO-15
SDS-2	SP-002	vapor	monthly		monthly		
Pre-VPGAC-101[(1)]	SP-103	vapor	monthly		monthly		
Pre-VPGAC-102[(1)]	SP-104	vapor	monthly		monthly		
Pre-VPGAC-103[(1)]	SP-105	vapor	monthly		monthly		
Pre-VPGAC-104[(1)]	SP-106	vapor	monthly		monthly		
Effluent (Post-VPGAC-104/Pre-Dilution)	SP-107	vapor	monthly		monthly		
Effluent (Post-Blower)[(2)]	SP-301	vapor	monthly		monthly		

Notes:
1) Pre-VPGAC vapor sampling for each respective VPGAC vessel shall only be conducted if that respective VPGAC vessel is in use.
2) Post-Blower effluent sample shall only be collected if the dilution valve is opened.
3) Refer to SSDS-SOP-01 in Appendix E for air sampling procedure.

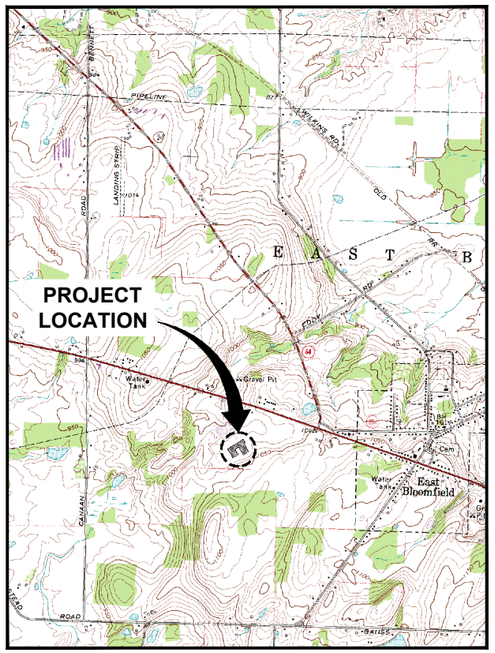
Definitions:
SDS = sub-slab depressurization sump
SOP = standard operating procedure
SP = sample port
USEPA = United States Environmental Protection Agency
VOC = volatile organic compound
VPGAC = vapor-phase granular-activated carbon

APPENDIX A

Record Drawings

RECORD DRAWINGS

SUB-SLAB DEPRESSURIZATION SYSTEM



CROSMAN CORPORATION SITE
7629 ROUTES 5 & 20
EAST BLOOMFIELD, NEW YORK

DATE ISSUED

DECEMBER 2016

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STATE OF NEW YORK
CHRISTOPHER DANIEL ENGLER
NO. 069736
LICENSED PROFESSIONAL ENGINEER

INDEX TO DRAWINGS

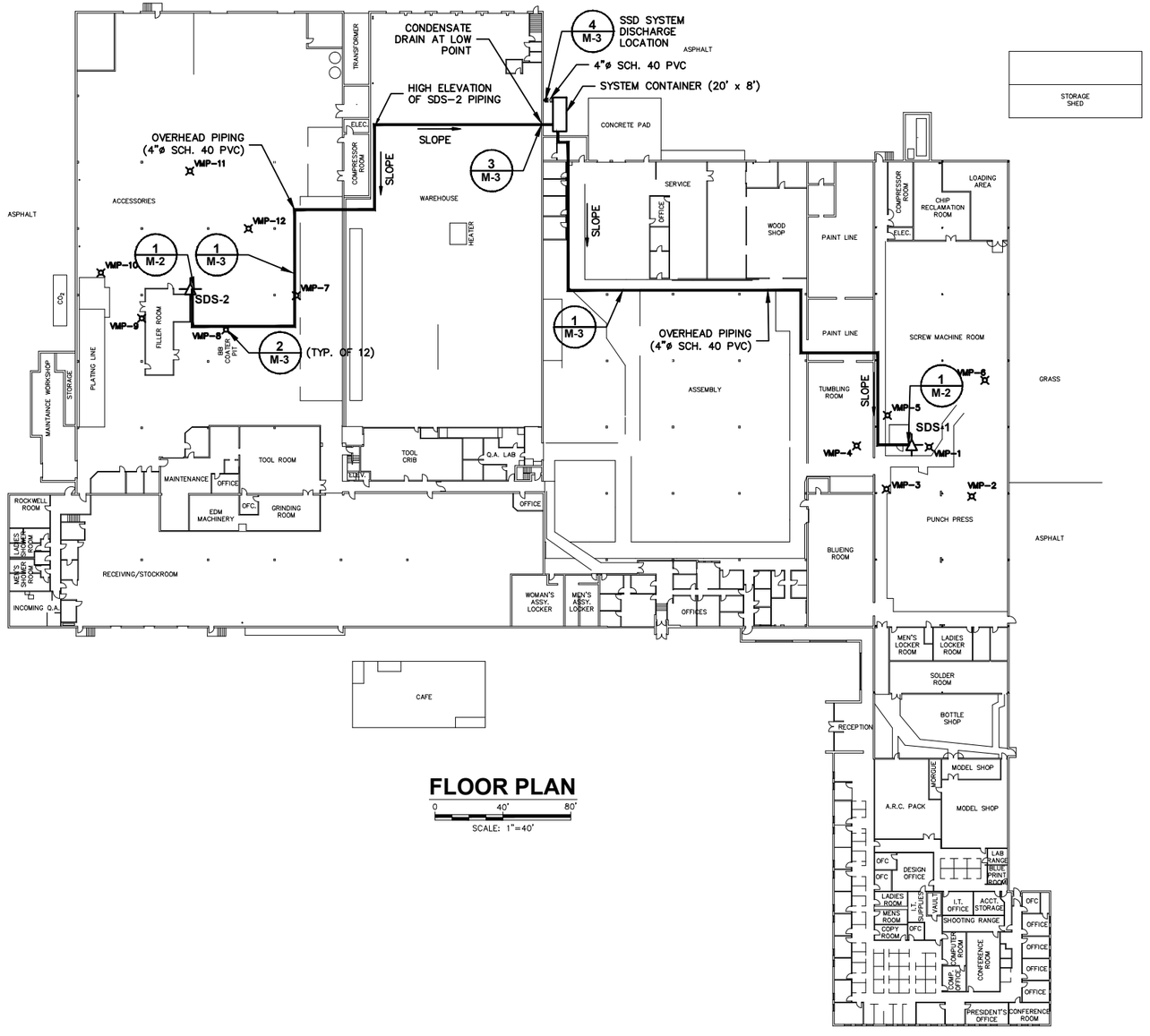
GENERAL
COVER SHEET
G-1 SSD SYSTEM LAYOUT

MECHANICAL
M-1 PROCESS AND INSTRUMENTATION DIAGRAM
M-2 EXTRACTION POINT DETAILS
M-3 MISCELLANEOUS DETAILS

ELECTRICAL
E-1 SINGLE LINE DIAGRAM
E-2 HVAC AND LIGHTING SCHEDULE

INSTRUMENTATION AND CONTROLS
I-1 SSDS PANEL LAYOUTS
I-2 SSDS MAIN CONTROL PANEL POWER DISTRIBUTION
I-3 SSDS MAIN CONTROL PANEL MICROLOGIX DIGITAL INPUTS
I-4 SSDS MAIN CONTROL PANEL MICROLOGIX RELAY OUTPUTS
I-5 SSDS MAIN CONTROL PANEL SLOT 1: ANALOG INPUTS
I-6 SSDS MOTOR STARTER WIRING DETAILS

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FLOOR PLAN

0 40' 80'

SCALE: 1"=40'

LEGEND:

- SSD SYSTEM EXTRACTION POINT
- SSD MONITORING POINT
- OVERHEAD SSD EXTRACTION PIPING
- SSD SYSTEM DISCHARGE PIPING

NOTES:

1. BASE MAP SUPPLIED BY CROSMAN CORPORATION, DRAWING FACILITY-3-14-08, DATED 3/14/2008.
2. NOT ALL PHYSICAL FEATURES SHOWN.
3. ALL LOCATIONS ARE APPROXIMATE.
4. THE SSD SYSTEM IS DESIGNED TO ACHIEVE A 40' RADIUS OF INFLUENCE AT SDS-1 AND 60' RADIUS OF INFLUENCE AT SDS-2.
5. SSD EXTRACTION PIPING SLOPED AS INDICATED TO PROMOTE DRAINAGE OR COLLECTION OF POTENTIALLY ACCUMULATED WATER.
6. LAND SURFACE AT SYSTEM CONTAINER LOCATION IS ASPHALT. CONTAINER LEVELED AS NEEDED USING STEEL SHIMS.
7. SSD SYSTEM DISCHARGE PIPING STACK EXTENDS TO 3 FEET ABOVE ROOFLINE.

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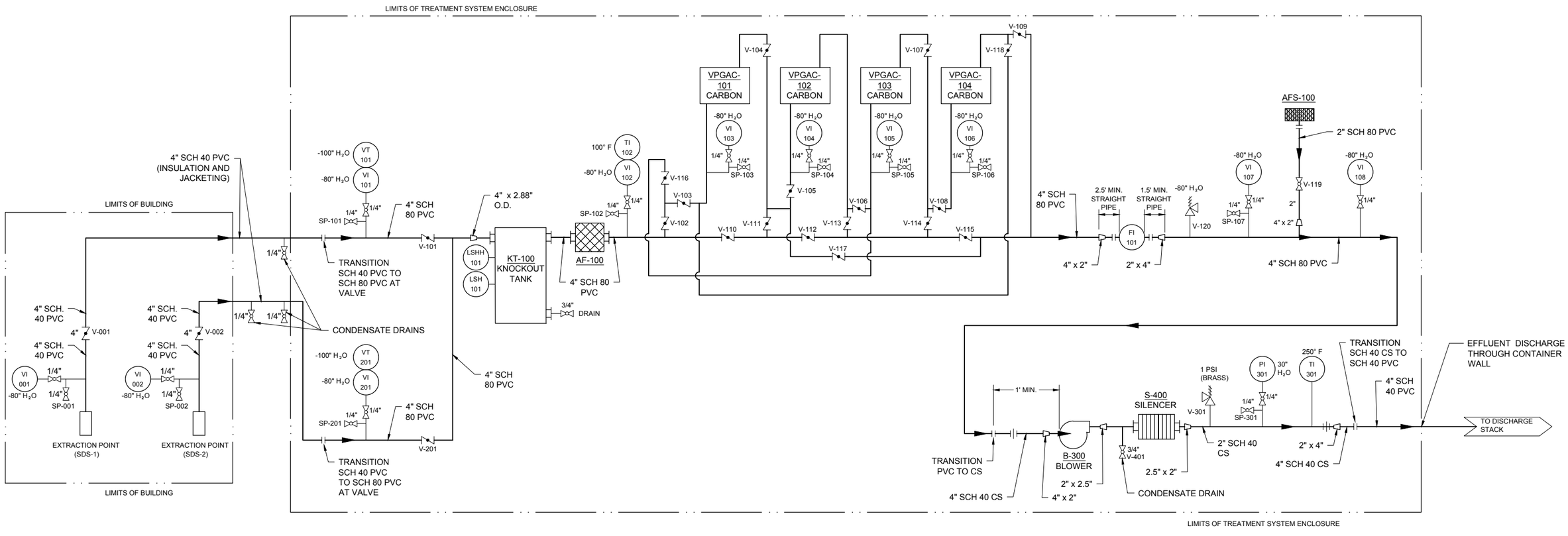
CROSMAN CORPORATION • EAST BLOOMFIELD, NEW YORK
SUB-SLAB DEPRESSURIZATION SYSTEM

SSD SYSTEM LAYOUT

ARCADIS Project No.: B0041501.0001.00010
Date: DECEMBER 2016
ARCADIS 295 Woodcliff Drive, Suite 301 Fairport, NY 14450 Tel. 585-385-0090

G-1

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LEGEND:

- VAPOR PROCESS PIPING
- BUILDING LIMITS
- FLANGE / TRANSITION
- UNION
- BLOWER
- FLANGED BUTTERFLY VALVE
- BALL VALVE
- PRESSURE RELIEF VALVE
- VACUUM RELIEF VALVE
- REDUCER
- AIR FILTER ONLY
- AIR FILTER / SILENCER
- SILENCER ONLY

ABBREVIATIONS:

AF	AIR FILTER
AFS	AIR FILTER/SILENCER
B	BLOWER
CPVC	CHLORINATED POLYVINYL CHLORIDE
CS	CARBON STEEL
FIT	FLOW INDICATING TRANSMITTER
LSH	LEVEL SWITCH HIGH
LSHH	LEVEL SWITCH HIGH-HIGH
KT	KNOCKOUT TANK
PI	PRESSURE INDICATOR
PVC	POLYVINYL CHLORIDE
S	SILENCER
SCH	SCHEDULE
TI	TEMPERATURE INDICATOR
TT	TEMPERATURE TRANSMITTER
V	VALVE
VI	VACUUM INDICATOR
VPGAC	VAPOR PHASE GRANULAR ACTIVATED CARBON
VT	VACUUM TRANSMITTER

NOTES:

1. SEE TABLE 1 OF OM□M PLAN FOR MAKE AND MODEL OF SIGNIFICANT EQUIPMENT.
2. SEE TABLE 3 OF OM□M PLAN FOR SYSTEM ALARM DETAILS.
3. ALL EXTERIOR PIPING INSTALLED WITH 1" FIBERGLASS INSULATION AND ALUMINUM JACKETING.

GENERAL PROCESS DESCRIPTION:

THE SYSTEM IS A SUB-SLAB DEPRESSURI□ATION (SSD) SYSTEM DESIGNED TO EXTRACT SUB-SLAB SOIL VAPORS FROM TWO (2) EXTRACTION POINTS (SDS-1 AND SDS-2) TO CREATE A NEGATIVE SUB-SLAB DIFFERENTIAL PRESSURE ACROSS THE TARGET DEPRESSURI□ATION AREA. BLOWER (B-300) EXTRACTS SOIL VAPORS SIMULTANEOUSLY FROM TWO SEPARATE EXTRACTION HEADERS (SDS-1 AND SDS-2) EACH WITH ITS OWN VACUUM TRANSMITTER (VT-101 AND VT-201). THE TWO EXTRACTION HEADERS COMBINE INTO A SINGLE EXTRACTION HEADER INSIDE THE TREATMENT SYSTEM ENCLOSURE. THE EXTRACTION HEADER INCLUDES A MOISTURE SEPARATOR TANK (KT-100) TO REMOVE ANY CONDENSATE PRESENT IN THE VAPOR STREAM AND IN-LINE AIR FILTER (AF-100). THE MOISTURE SEPARATOR IS EQUIPPED WITH HIGH AND HIGH-HIGH LIQUID LEVEL SENSORS (LSH-101 AND LSHH-101). CARBON TREATMENT INCLUDES FOUR (4) 1,000-POUND VAPOR PHASE CARBON VESSELS (VPGAC-101, VPGAC-102, VPGAC-103 AND VPGAC-104) WITH FLOW PATTERNS ADJUSTABLE VIA VALVE CONFIGURATION. APPLIED VACUUM FROM THE BLOWER ADJUSTABLE VIA A DILUTION LINE EQUIPPED WITH A COMBINATION AIR FILTER/SILENCER. THE PROCESS STREAM ON THE DISCHARGE SIDE OF THE BLOWER INCLUDES AN IN-LINE SILENCER/MUFFLER (S-400). VAPORS DISCHARGED TO THE ATMOSPHERE VIA A DISCHARGE STACK EXTENDING 3' ABOVE THE WAREHOUSE ROOF LINE AT THE PROPOSED LOCATION OF THE SYSTEM CONTAINER.

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Professional Engineer's No.: 069748

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CD	GHS	CDE

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SUB-SLAB DEPRESSURI□ATION SYSTEM

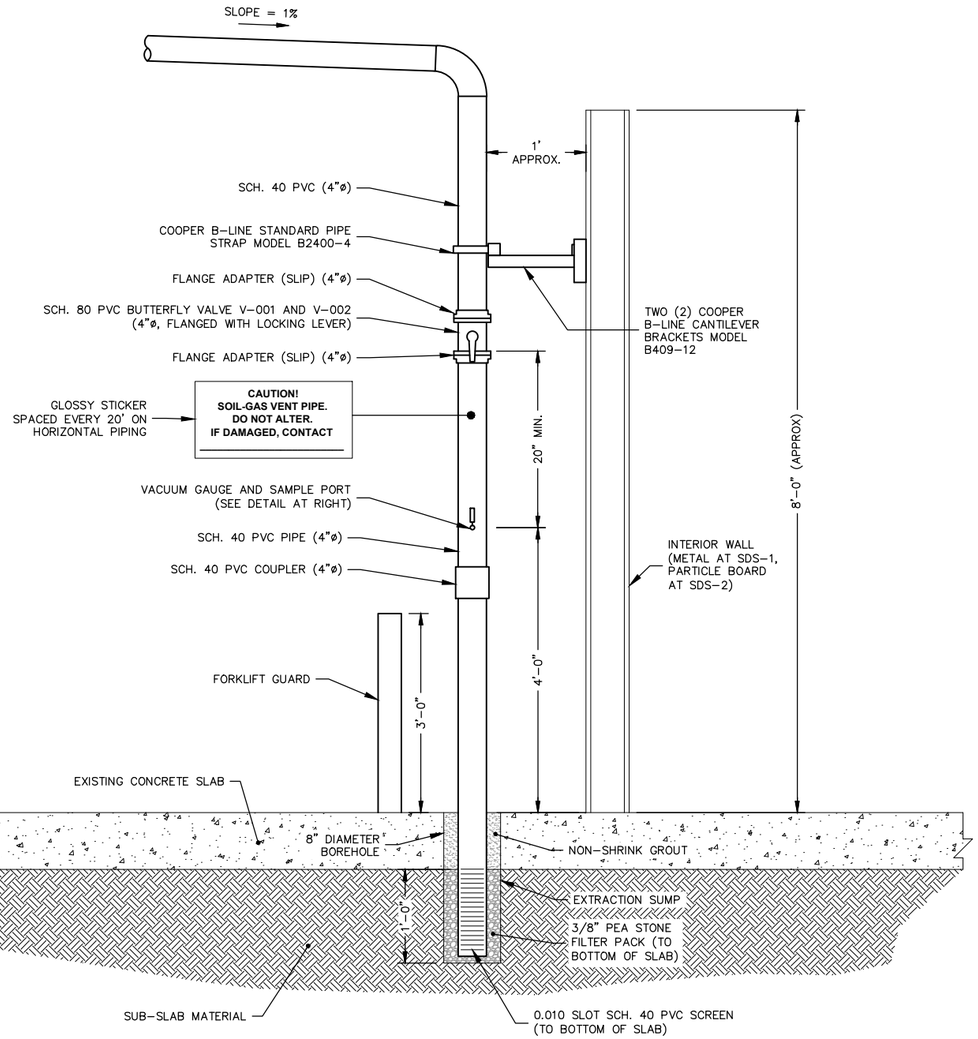
PROCESS AND INSTRUMENTATION DIAGRAM

ARCADIS Pro□ect No.
B0041501.0001.00010

Date
DECEMBER 2016

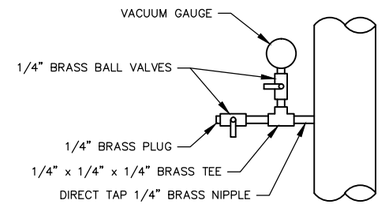
ARCADIS
295 Woodcliff Dri□e, S□ite 301
Fairport, NY 14450
Tel. 585-385-0090

M-1



EXTRACTION POINT RISER DETAIL (1)

NOT TO SCALE



VACUUM GAUGE AND SAMPLE PORT DETAIL

NOT TO SCALE

NOTES:

1. HORIZONTAL PIPE SUPPORTED EVERY 4 FEET. VERTICAL PIPE SUPPORTED EVERY 8 FEET.
2. CEILING HEIGHT IS 16' (APPROX.) EXCEPT IN WAREHOUSE (33' APPROX.).

RECORD DRAWINGS
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SCALE(S) AS INDICATED

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Professional Engineer's Name: CHRISTOPHER D. ENGLER		
Professional Engineer's No.: 069748		
State: NY	Date Signed:	Project Mgr.: WBP
Designed: CD	Drawn: GHS	Checked: CDE

ARCADIS OF NEW YORK, INC.

CROSMAN CORPORATION • EAST BLOOMFIELD, NEW YORK
SUB-SLAB DEPRESSURIZATION SYSTEM

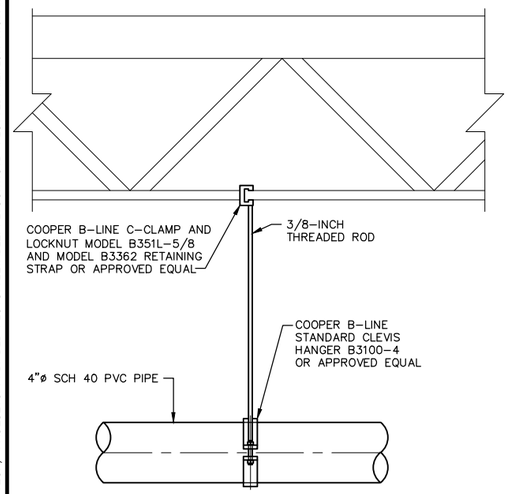
EXTRACTION POINT DETAILS

ARCADIS Project No.: B0041501.0001.00010
Date: DECEMBER 2016

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M-2

CITY:SYRACUSE-NY DIV/GROUP:SER DB:G. STEINBERGER LD:G. STEINBERGER PIC: PM: TM: LYR:ON=*;OFF=*REF*
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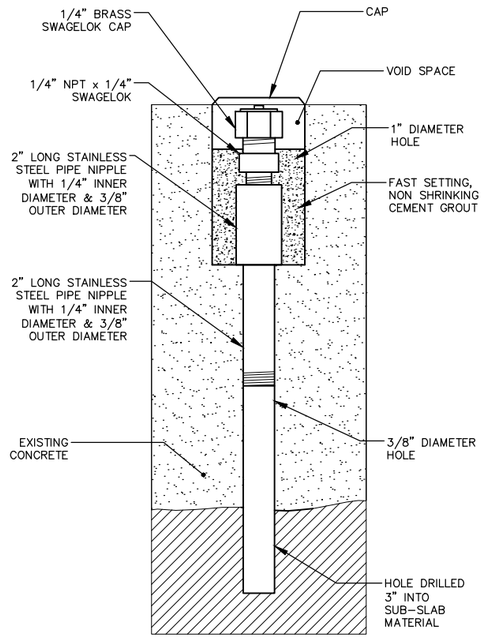


NOTES:

1. HORIZONTAL PIPE SUPPORTED EVERY 4 FEET.
2. HORIZONTAL PIPING PITCHED 1% TOWARDS THE EXTRACTION POINT, UNLESS NOTED OTHERWISE.

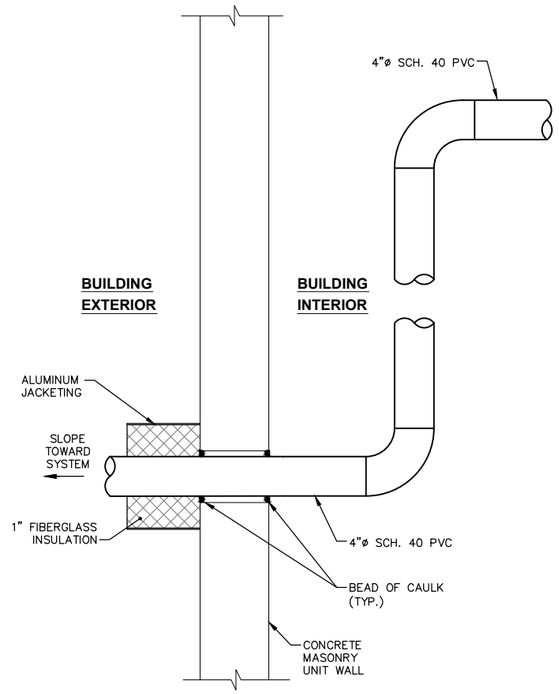
HANGING PIPE SUPPORT DETAIL 1

NOT TO SCALE



SUB-SLAB MONITORING POINT 2

NOT TO SCALE

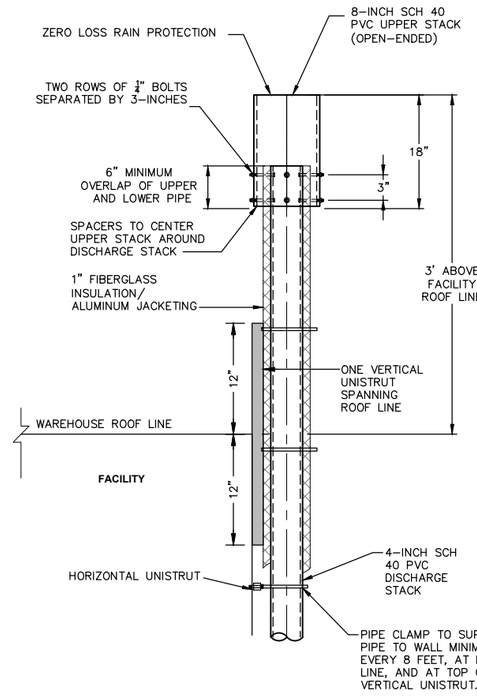


NOTES:

1. ALL EXTERIOR PIPING FITTED WITH FIBERGLASS INSULATION WITH R-VALUE OF 5 AND ALUMINUM JACKETING.
2. PIPING SLOPED AS INDICATED ON DRAWING G-1.

EXTERIOR WALL PENETRATION DETAIL 3

NOT TO SCALE



NOTES:

1. DIMENSIONS ARE RELATIVE TO WAREHOUSE ROOF LINE.
2. UNISTRUT SECURED TO WALL WITH 1/4-INCH CONCRETE SLEEVE ANCHORS SPACED 6" O.C.

NO LOSS CAP DETAIL 4

NOT TO SCALE

RECORD DRAWINGS
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Professional Engineer's Name: CHRISTOPHER D. ENGLER
Professional Engineer's No.: 069748
State: NY | Date Signed: | Project Mgr.: WBP
Designed: CD | Drawn: GHS | Checked: CDE



ARCADIS Design & Consultancy for natural and built assets

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SUB-SLAB DEPRESSURIZATION SYSTEM

MISCELLANEOUS DETAILS

ARCADIS Project No.: B0041501.0001.00010
Date: DECEMBER 2016

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Tel. 585-385-0090

M-3

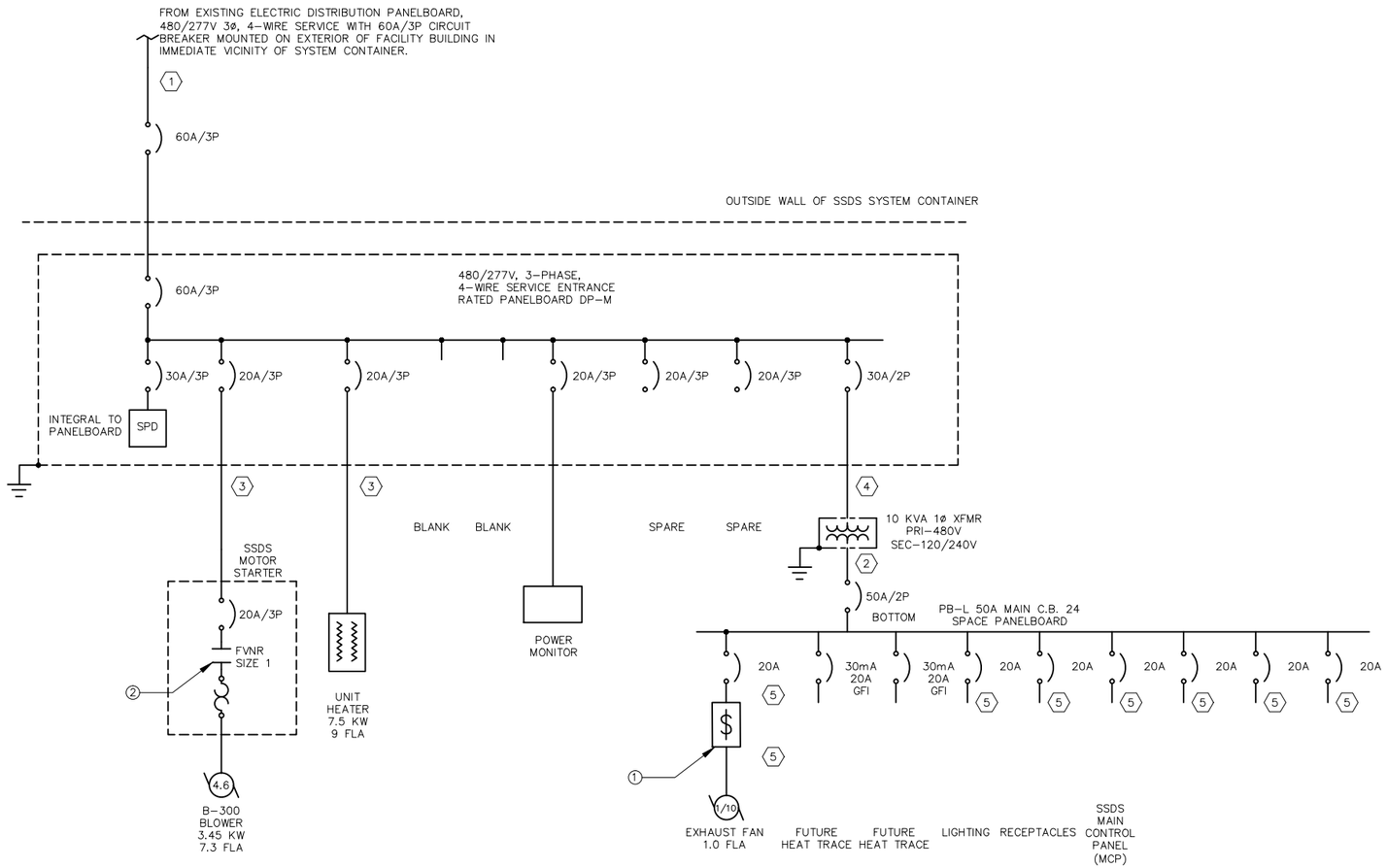
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ELECTRICAL SPECIFICATIONS

GENERAL

1. ALL ELECTRICAL EQUIPMENT IS U.L. LISTED AND LABELED.
2. ALL ELECTRICAL WORK INSTALLED IN ACCORDANCE WITH NFPA–70 NEC.
3. GROUNDING OF ALL ELECTRICAL SYSTEMS AND EQUIPMENT MEETS THE REQUIREMENTS OF NEC ARTICLE 250.
4. ENCLOSURES ARE NEMA RATED FOR LOCATION.
5. 277/480 VAC, THREE PHASE, 4 WIRE

PHASE A – BROWN
PHASE B – ORANGE
PHASE C – YELLOW
NEUTRAL – WHITE
GROUND – GREEN



ELECTRICAL SYMBOL LEGEND

- SERVICE CONNECTION
- METER
- CIRCUIT BREAKER
- DISCONNECT SWITCH
- SURGE PROTECTIVE DEVICE
- MOTOR
- TRANSFORMER
- MOTOR STARTER W/ MOTOR CIRCUIT PROTECTOR AND OVERLOADS
- ELECTRIC UNIT HEATER
- GROUND ROD
- LIGHT SWITCH
  XP: EXPLOSION PROOF

SINGLE LINE DIAGRAM

CONDUIT AND CABLE SCHEDULE

1. (4) #4, (1) #10 G., 1–1/2" C.
2. (3) #4, (1) #8 G., 1–1/4" C.
3. (3) #12, (1) #12 G., 3/4" C.
4. (2) #10, (1) #10 G., 3/4" C.
5. (2) #12, (1) #12 G., 3/4" C.

ELECTRICAL GENERAL NOTES:

1. THIS IS A GENERAL ELECTRICAL SYMBOLS AND GENERAL NOTES SHEET. SOME SYMBOLS AND/OR NOTES MAY NOT BE USED IN THIS SET OF DRAWINGS.

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Professional Engineer's Name: THOMAS P ARMSTRONG JR.
Professional Engineer's No.: 085236

State	Date Signed	Project Mgr.
NY		WBP
Designed	Drawn	Checked
NCP	NCP	TPA

STATE OF NEW YORK * THOMAS PAUL ARMSTRONG JR. * 085236 * LICENSED PROFESSIONAL ENGINEER 12/31/16

ARCADIS Design & Consultancy for natural and built assets

ARCADIS OF NEW YORK, INC.

CROSMAN CORPORATION • EAST BLOOMFIELD, NEW YORK
SUB-SLAB DEPRESSURIZATION SYSTEM

SINGLE LINE DIAGRAM

ARCADIS Project No.: B0041501.0001.00010
Date: DECEMBER 2016

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E-1

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LUMINAIRE SCHEDULE

TYPE	LAMPS		CONNECTED WATTS	LUMINAIRE DESCRIPTION	MANUFACTURER / CATALOG NUMBER	QUANTITY
	QUANTITY	TYPE				
A	2	A33	75	SURFACE MOUNTED INCANDESCENT LUMINARIE, WITH PLAIN GLOBE AND GUARD	CROUSE HINDS CAT NO. VDA2759 OR EQUAL	1

LIGHTING NOTES:

1. INCANDESCENT LIGHTING OF TYPE "A" LUMINAIRE EVENLY SPACED WITHIN THE CARGO CONTAINER.

HVAC SCHEDULE

TYPE	AIRFLOW (CFM)	PROPELLER DIA (IN)	MOTOR DATA			WEIGHT (LBS)	MANUFACTURER	MODEL	QUANTITY
			HP	RPM	V/PH/HZ				
EXHAUST FAN	800	12	1/25	1550	115/1/60	12	GRAINGER	1HLA2	1
HEATER	650	–	1/30	1600	480/3/60	24	QMARK	MUH0704	1

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Professional Engineer's Name: **THOMAS P ARMSTRONG JR.**
Professional Engineer's No.: 085236
State: NY | Date Signed: 12/7/16 | Project Mgr.: WBP
Designed: NCP | Drawn: NCP | Checked: TPA



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SUB-SLAB DEPRESSURIZATION SYSTEM

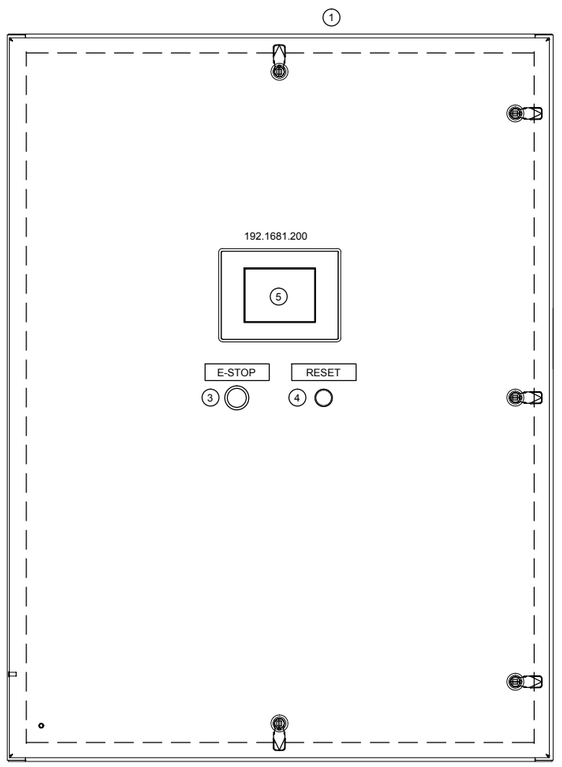
HVAC AND LIGHTING SCHEDULE

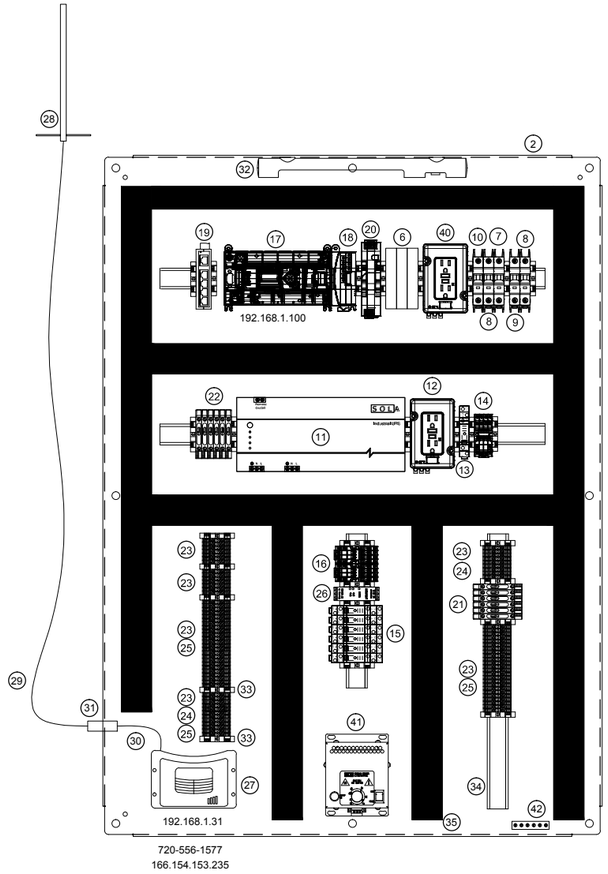
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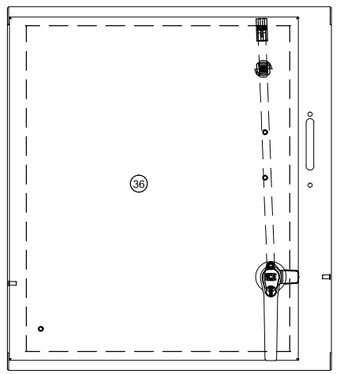
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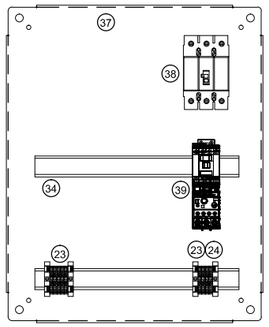
E-2





SSDS MAIN CONTROL PANEL (MCP)





SSDS MOTOR STARTER

TAG	QTY	SUB	DESCRIPTION	MANUFACTURER	CATALOG #
1	1		WALL MOUNT STEEL ENCLOSURE 48X36X12	SCE	SCE-48EL3612LP
2	1		BACK PANEL FOR ENCLOSURE	SCE	SCE-48P36
3	1		RED MUSHROOM HEAD E-STOP TWIST RELEASE	AB	800FP-MT44
		1	22.5MM PB BASE MOUNT, SCREW CONTACT BLOCK, 1 N.C.	AB	800F-BX01
4	1		BLACK, 22 MM, MOMENTARY PUSH BUTTON	AB	800FP-F2PX20
5	1		6" C_MORE COLOR TOUCH PANEL	AUTOMATION DIRECT	EA9-T6CL-4983-DC
6			120 VAC SURGE PROTECTION DEVICE (10A)	AB	4983-DC
7	1		10 AMP MINIATURE CIRCUIT BREAKER (1 POLE, 120 VAC)	AB	1489-M1C100
8	2		8 AMP MINIATURE CIRCUIT BREAKER (1 POLE, 120 VAC)	AB	1489-M1C080
9	1		7 AMP MINIATURE CIRCUIT BREAKER (1 POLE, 120 VAC)	AB	1489-M1C070
10	1		2 AMP MINIATURE CIRCUIT BREAKER (1 POLE, 120 VAC)	AB	1489-M1C020
11	1		UPS, 850 KVA	SOLA	S1K850
		1	MOUNTING BRACKET FOR UPS	SOLA	S1K-PMBRK
12	1		DUAL RECEPTACLE	AB	1492-REC15
13	1		RELAY - 1 POLE, 120 VAC, 16 A CONTACT	AB	700-HK36A1
		1	RELAY SOCKET (5 PIN)	AB	700-HN221
14	1		RELAY - 4 POLE, 120 VAC, 7 A CONTACT	AB	700-HC24A1
		1	RELAY SOCKET (14 PIN)	AB	700-HN104
15	6		RELAY - 1 POLE, 24 VDC, 8 A CONTACT	AB	700-HK36A24
		6	RELAY SOCKET (5 PIN)	AB	700-HN221
16	2		RELAY - 4 POLE, 24VDC, 7 A CONTACT	AB	700-HC24Z24
		2	RELAY SOCKET (14 PIN)	AB	700-HN104
17	1		MICROLOGIX 1400 PLC, (20) 24 VDC IN, 12 OUT, 110 AC PWR	AB	1766-L32BWA
18	1		4 CHANNEL CURRENT/VOLTAGE ANALOG INPUT MODULE	AB	1762-IF4
19	1		5 PORT ETHERNET SWITCH	AB	1783-US5T
20	1		24 VDC POWER SUPPLY (120 W)	AB	1606-XLE120E
21	5		120 VAC FUSE BLOCKS	AB	1492-WFB4250
		5	2 A, 250 V, TIME DELAY 5 X 20 MM FUSES	BUSSMANN	S505-2-R
22	7		24 VDC FUSE BLOCKS	AB	1492-WFB424
		1	5 A, 250 V, TIME DELAY 5 X 20 MM FUSES	BUSSMANN	S506-5-R
		6	2 A, 250 V, TIME DELAY 5 X 20 MM FUSES	BUSSMANN	S506-2-R
23	TBD		IEC TERMINAL BLOCK	AB	1492-J3
24	TBD		IEC GROUND TERMINAL BLOCK	AB	1492-J3G
25	15		IEC TERMINAL BLOCK WITH PLUG IN FUSE	AB	1492-J3P
		9	FUSE PLUG 10-36 V WITH BLOW FUSE INDICATION	AB	1492-FPK224
		5	0.50 A, 250 V, TIME DELAY 5 X 20 MM FUSES	BUSSMANN	S506-500-R
		4	0.25 A, 250 V, TIME DELAY 5 X 20 MM FUSES	BUSSMANN	S506-250-R
		6	FUSE PLUG 60-150 V WITH BLOW FUSE INDICATION	AB	1492-FPK2120
		6	1 A, 250 V, TIME DELAY 5 X 20 MM FUSES	BUSSMANN	S505-1-R
26	1		DUAL CHANNEL, AUTO/MANUAL RESET, 24V AC/DC SAFETY RELAY	AB	440R-N23117
27	1		4G CELLULAR MODEM	SIERRA WIRLESS	GX-450
28	1		OMNI DIRECTIONAL LTE/CELLULAR/PCS COMBO ANTENNA	WILSON ELECTRONICS	
29	1		COAXIAL CABLE - N MALE TO N MALE (20 ft)	TBD	
30	1		COAXIAL CABLE - SMA MALE TO N MALE (2 ft)	TBD	
31	1		RF COAXIAL SURGE PROTECTOR	POLYPHASER	TSX-NFF
32	1		24VDC PANEL LIGHT	AUTOMATION DIRECT	25401-00
	1		CONNECTION CABLE 2 X 16 AWG WITH INPUT CONNECTOR	AUTOMATION DIRECT	244361
33	TBD		END BARRIERS	TBD	
34	TBD		DIN RAIL	TBD	
35	TBD		WIRING DUCT	TBD	
36	1		WALL MOUNT DISCONNECT ENCLOSURE 24X21X8	SCE	SCE-24XEL2108LP
37	1		BACK PANEL FOR ENCLOSURE	SCE	SCE-24P20
38	1		20 A MOLDED CASE CIRCUIT BREAKER, 3 POLE, 25 KA INTERRUPT RATING	AB	140G-G2C3-C20
		1	DISC CABLE/HANDLE, FRAME G.I	AB	140G-G-FCX04
39	1		NON-REVERSING E-COMBO STARTER FOR 4 HP MOTOR WITH 120 VAC COIL	AB	309-AOD-EEE
40	1		DUAL GFCI RECEPTACLE	WEIDMULLER	DRAC GF15
41	1		PANEL HEATER	HOFFMAN	DAH2001A
42	1		GROUND BAR	TBD	

LEGEND

- ▫ DENOTES TERMINAL BLOCK CONNECTION
- — — — DASHED LINES DENOTES WIRING TO FIELD DEVICES
- ▭ DASHED WITH PATTERN DENOTES DEVICES IN REMOTE LOCATIONS

LINE NUMBER DESCRIPTION

0000
WIRING DIAGRAM SHEET NUMBER (1 OR 2 DIGITS) — LINE NUMBER (ALWAYS 2 DIGITS)

WIRE NUMBER DESCRIPTION

00000
WIRING DIAGRAM SHEET NUMBER (1 OR 2 DIGITS) — WIRE NUMBER (ALWAYS 1 DIGIT); LINE NUMBER (ALWAYS 2 DIGITS)

TB TERMINAL BLOCK

RECORD DRAWINGS
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Professional Engineer's Name: **THOMAS P ARMSTRONG JR.**
Professional Engineer's No.: 085236

State	Date Signed	Pro□ect Mgr.
NY		WBP
Designed □□	Drawn □□	C□ec□ed □□
NCP	NCP	TPA

STATE OF NEW YORK · THOMAS PAUL ARMSTRONG, JR. · 085236 · LICENSED PROFESSIONAL ENGINEER · 1/31/17

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ARCADIS OF NEW YORK, INC.

CROSMAN CORPORATION • EAST BLOOMFIELD, NEW YORK
SUB-SLAB DEPRESSURI□ATION SYSTEM

SSDS PANEL LAYOUTS

ARCADIS Pro□ect No.
B0041501.0001.00010

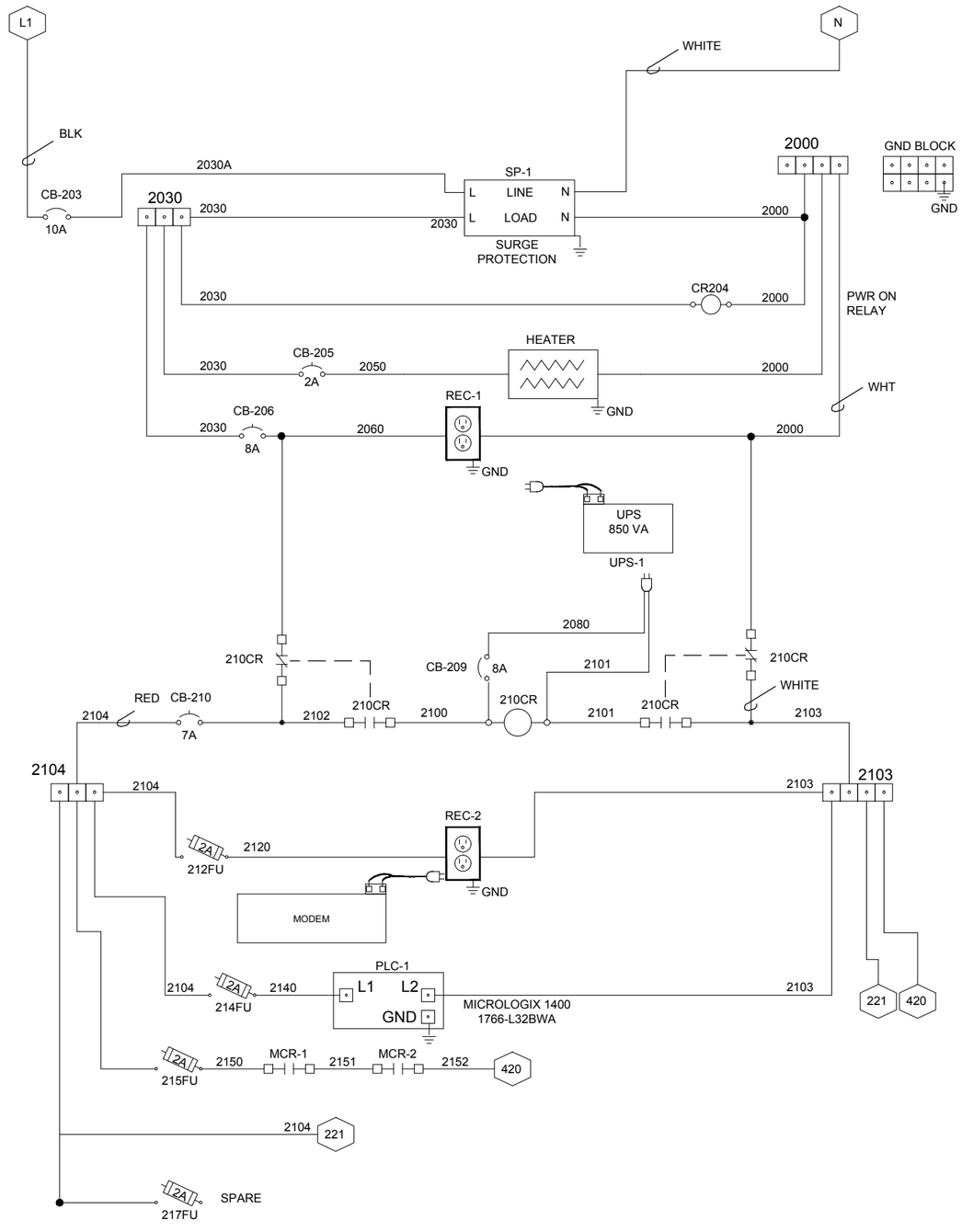
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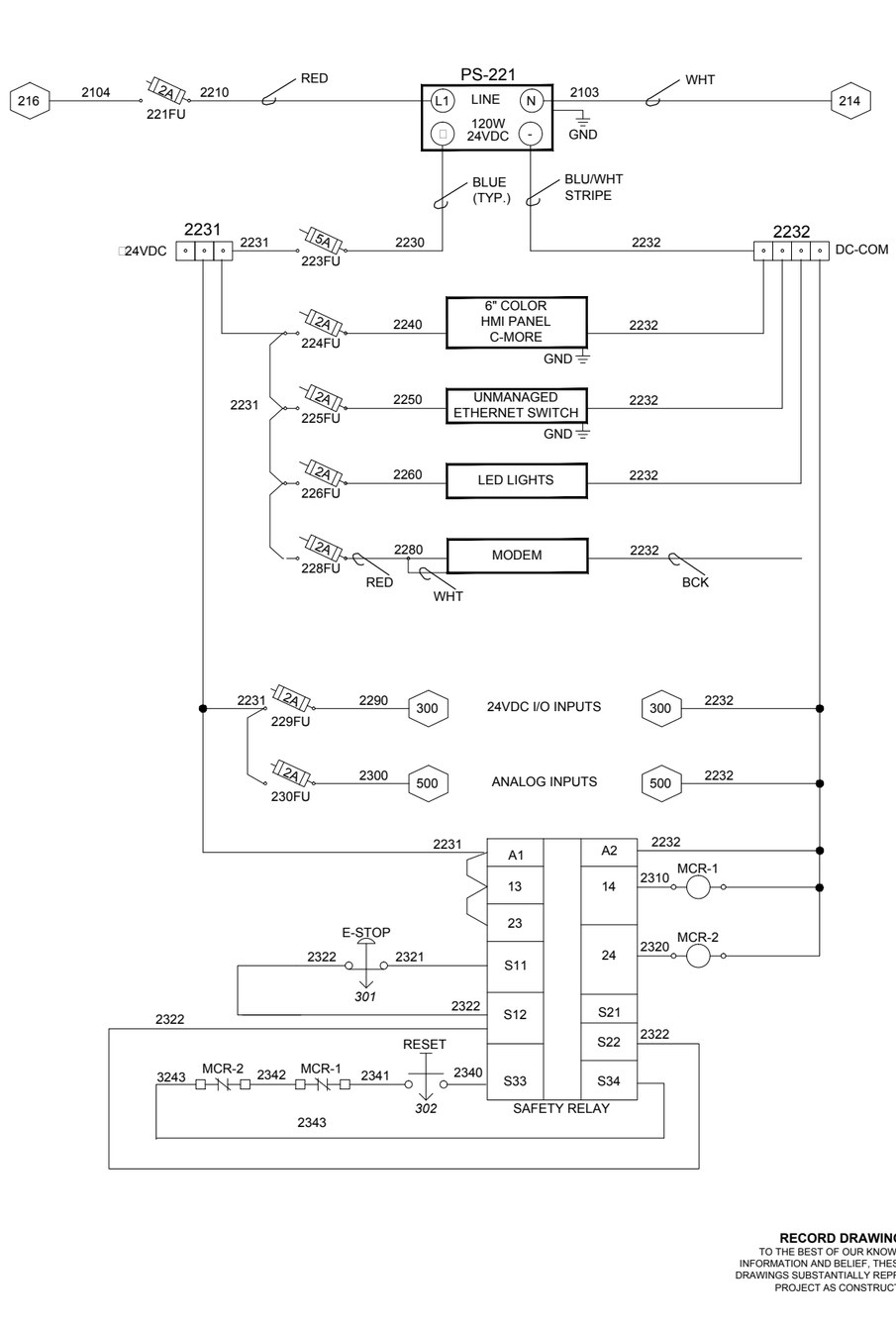
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Tel. 585-385-0090

I-1

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Designed □□	Drawn □□	C□ec□ed □□
NCP	NCP	TPA

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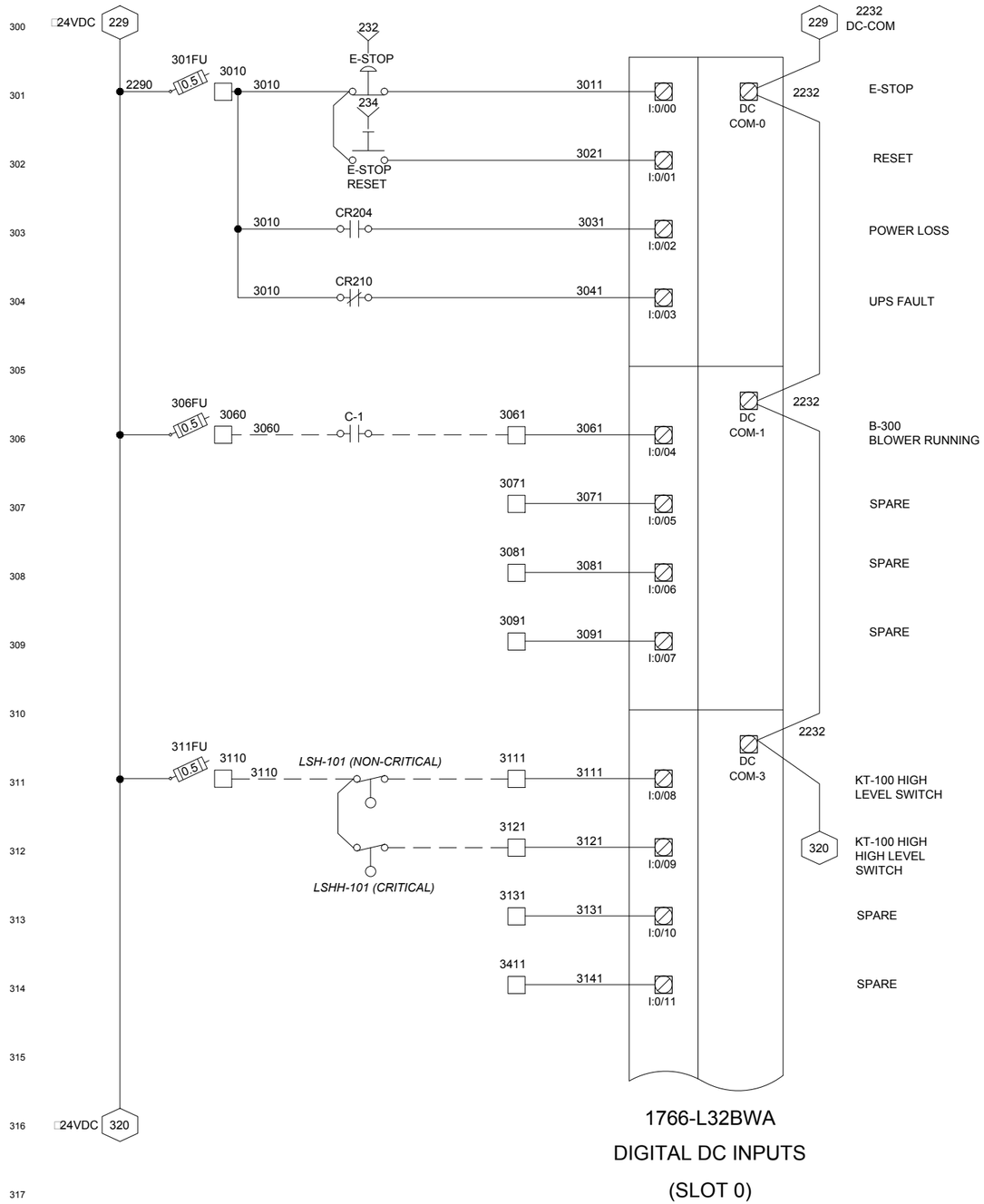
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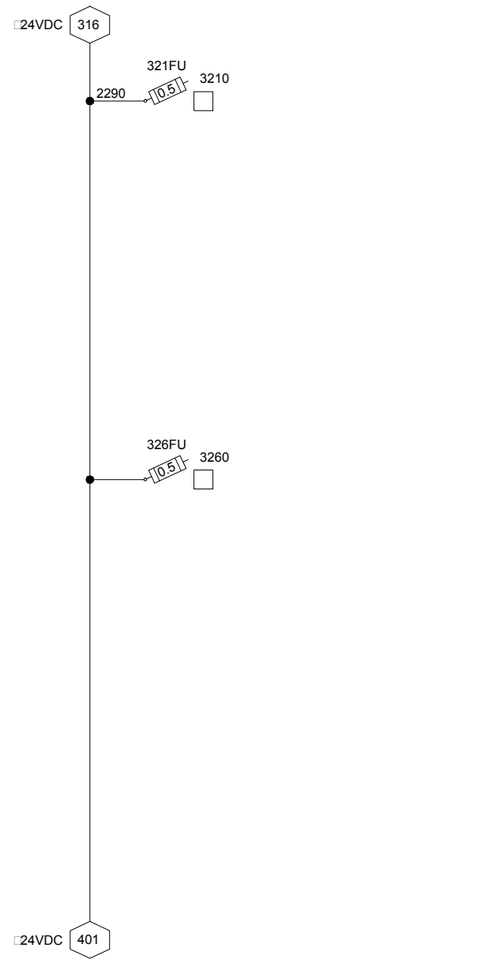
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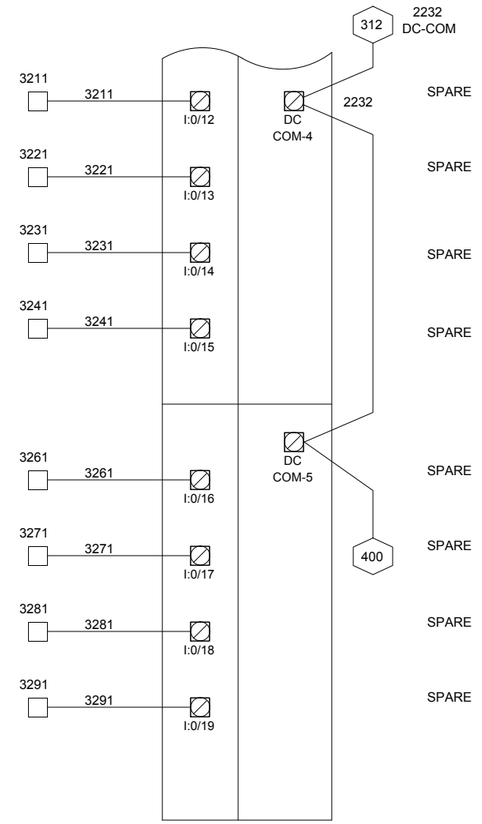


1766-L32BWA

DIGITAL DC INPUTS

(SLOT 0)





1766-L32BWA

DIGITAL DC INPUTS

(SLOT 0)

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Professional Engineer's No.: 085236

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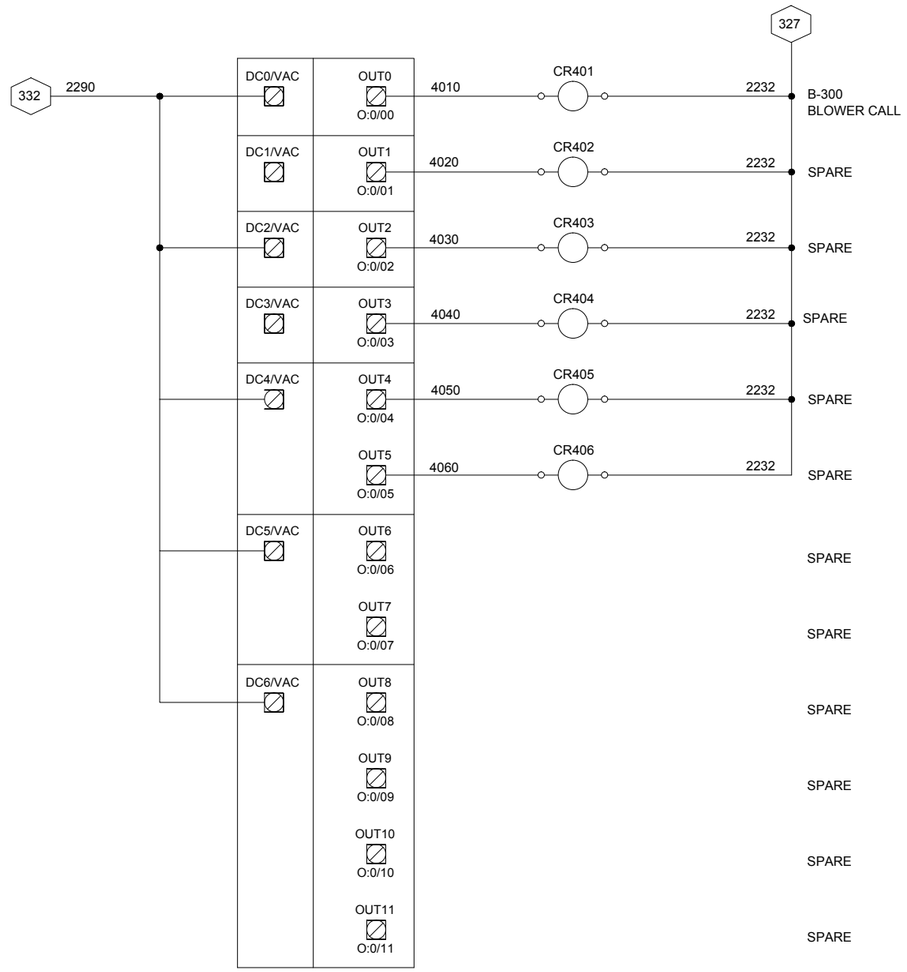
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SSDS MAIN CONTROL PANEL MICROLOGIX DIGITAL INPUTS

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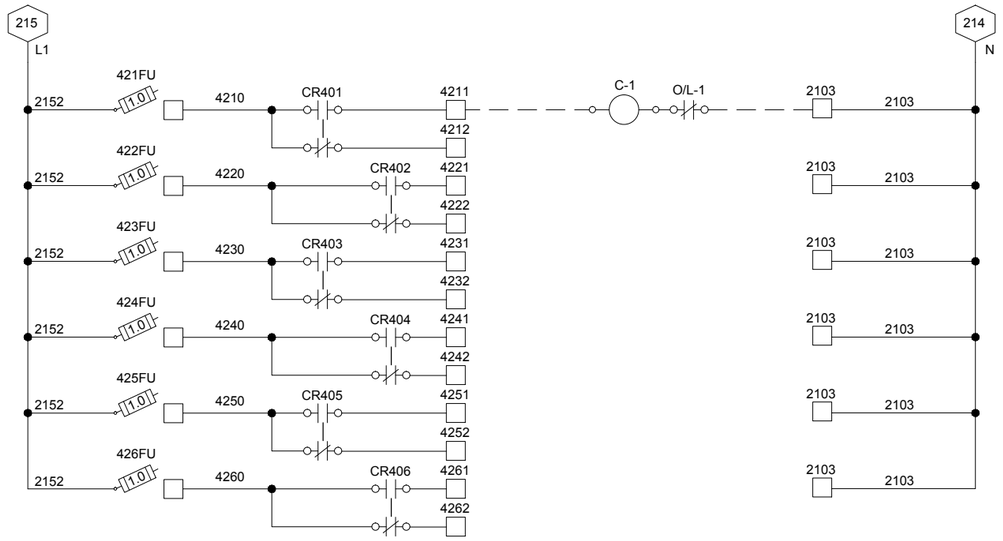
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DIGITAL RELAY OUTPUTS

(SLOT 0)



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Professional Engineer's No.: 085236

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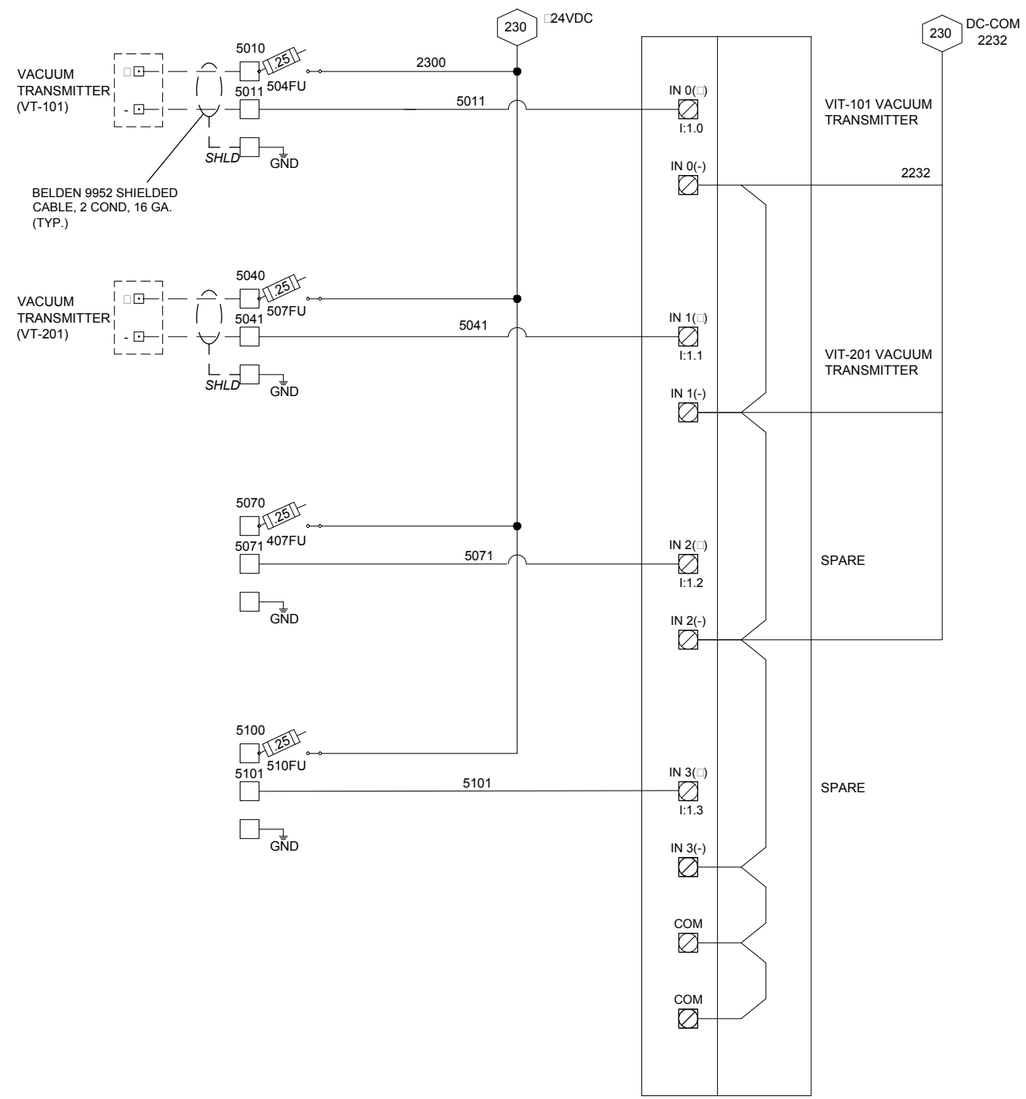
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1762-IF4

ANALOG INPUTS

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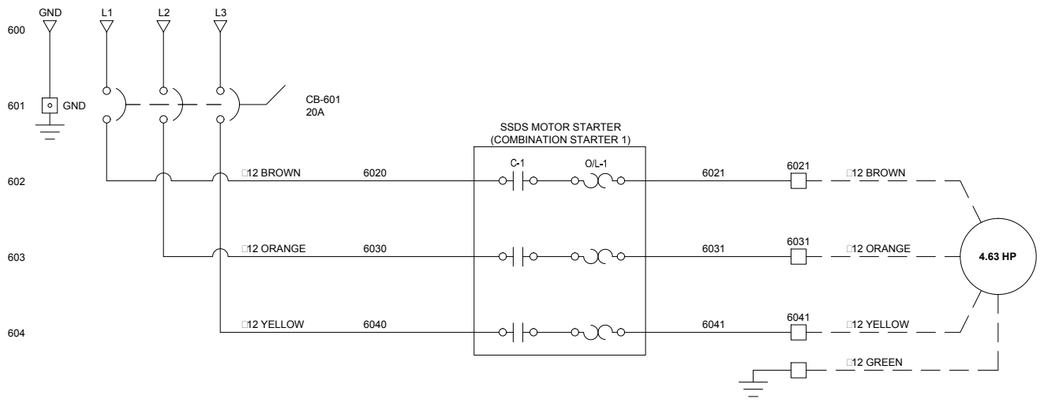
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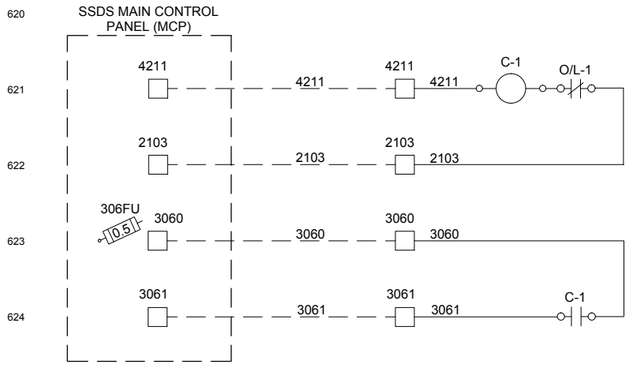
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SSDS MOTOR STARTER WIRING DETAILS

ARCADIS Project No.: B0041501.0001.00010
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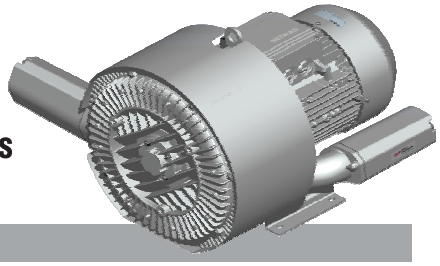
APPENDIX B

Manufacturer's Manuals for Major System Equipment

G-BH1

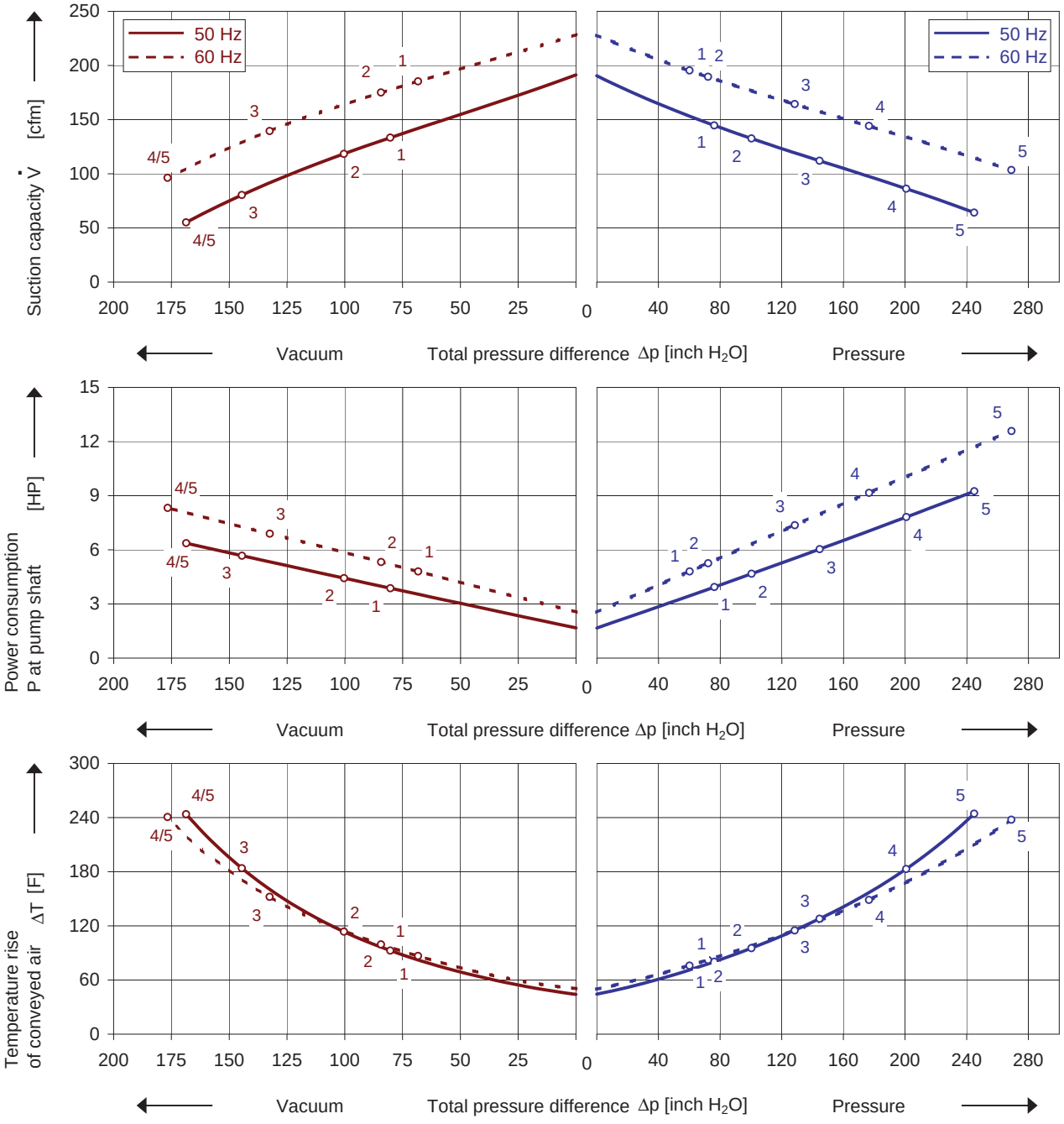
Data sheet 2BH1 610

Side channel blower



Performance curves

Vacuum operation (acfm) | **Pressure operation (scfm)**



The performance curves are based on air at a temperature of 59 F and an atmospheric pressure of 29.91 inch Hg with a tolerance of ± 10 %. The total pressure differences are valid for inlet and ambient temperature up to 77 F. Suction capacity relates to inlet conditions. Pressure capacity relates to atmospheric conditions. For other conditions please get in touch with us.

Every G-BH blower can be used either for vacuum or pressure in continuous operation over the total performance curve range. The motors are available as standard in protection category IP 55 and insulation class F. These blowers are UL and CSA approved.

Selection and ordering data

Type 2BH1 610

No.	Frequency	Rated			Max. differential pressure [2]		Sound pressure level [3]	Weight Approx.	Order No.
		Voltage [1]	Current	Power	Vacuum	Pressure			
	Hz	V	A	HP			dB(A)	ibs	
3~ 50/60 Hz, IP55, Insulation material class F, UL 507 and CSA 22.2 No 113 (certificate number E225239)									
1	50	200-240 Δ / 345-415 Y	9.7 Δ / 5.6 Y	2.95	-80	76	73	95	**2BH1610-7HH16**
	60	220-275 Δ / 380-480 Y	10.3 Δ / 6 Y	3.42	-68	60	75		
2	50	200-240 Δ / 345-415 Y	12.5 Δ / 7.2 Y	4.02	-100	100	73	110	**2BH1610-7HH26**
	60	220-275 Δ / 380-480 Y	12.6 Δ / 7.3 Y	4.63	-84	72	75		
3	50	200-240 Δ / 345-415 Y	17.3 Δ / 10 Y	5.8	-145	145	73	115	**2BH1610-7HH36**
	60	220-275 Δ / 380-480 Y	18.0 Δ / 10.4 Y	6.4	-132	128	75		
4	50	200-240 Δ / 345-415 Y	23.0 Δ / 13.3 Y	7.4	-169	201	73	179	**2BH1610-7HH46**
	60	220-275 Δ / 380-480 Y	23.0 Δ / 13.3 Y	8.4	-177	177	75		
5	50	200-240 Δ / 345-415 Y	29.0 Δ / 16.7 Y	10.1	-169	245	73	190	**2BH1610-7HH56**
	60	220-275 Δ / 380-480 Y	30.0 Δ / 17.3 Y	11.5	-177	269	75		
3~ 50/60 Hz, IP55, Insulation material class F, UL 507 and CSA 22.2 No 113 (certificate number E225239)									
1	50	500 Y	4.5 Y	2.95	-80	76	73	95	**2BH1610-7HC13**
	60	575 Y	4.55 Y	3.42	-68	60	75		
2	50	500 Δ	5.8 Δ	4.02	-100	100	73	110	**2BH1610-7HC25**
	60	575 Δ	6.0 Δ	4.63	-84	72	75		
3	50	500 Δ	7.5 Δ	5.4	-145	145	73	115	**2BH1610-7HC35**
	60	575 Δ	7.6 Δ	6.2	-132	128	75		
4	50	500 Δ	10.5 Δ	7.4	-169	201	73	179	**2BH1610-7HC45**
	60	575 Δ	10.4 Δ	8.4	-177	177	75		
5	50	500 Δ	13.0 Δ	10.1	-169	245	73	190	**2BH1610-7HC55**
	60	575 Δ	13.6 Δ	11.5	-177	269	75		

1) In case of frequency converter operation the standard motor insulation system is suitable for converter input voltages up to 460 V.

2) Relief valves available for limiting differential pressure.

3) Measuring surface sound pressure level acc. to EN ISO 3744, measured with an equivalent unit at a distance of 1 m. The pump is throttled to an average suction pressure, with piping connected, but no relief valves fitted, tolerance ±3 dB (A).

All G-BH match the 2006/42/EC (machinery) and 2006/95/EC (low voltage) directives and the EN 60034-1 norm “Rotating electrical machines”.

The motors comply with EN 60 034-1 / -2 / -30 (IEC 60034) and thermal class F.
For three phase motors tolerances are +/-10% for fixed voltage motors and +/-5% for voltage range motors. Single phase machines are designed with a +/- 5% tolerance.
The frequency tolerance is +/- 2 % maximum.

Motors for other mains

Voltage range		Fixed voltage		VFD	cULus			
50 Hz	**60 Hz**	**50 Hz**	**60 Hz**	**87 Hz**	**60 Hz** Δ	**60 Hz** Y	**2BH1610-7.** □ . □	
3~								
185 - 225 V Δ / 320 - 390 V Y	200 - 240 V Δ / 345 - 415 V Y				•	•	**H**	**1**
200 - 240 V Δ / 345 - 415 V Y	220 - 275 V Δ / 380 - 480 V Y			380 V Δ	•	•	**H**	**6**
345 - 415 V Δ / 600 - 720 V Y	380 - 480 V Δ / 660 - 720 V Y				•		**H**	**7**
		500 V Y	575 V Y			•	**C**	**3**
		500 V Δ	575 V Δ		•		**C**	**5**
3~		**IE2** 3~ [5]						
180 - 240 V Δ / 310 - 415 V Y	200 - 275 V Δ / 345 - 480 V Y	200 V Δ / 345 V Y	230 V Δ / 400 V Y		•	•	**P**	**1**
450 - 550 V Y	520 - 600 V Y	500 V Y	575 V Y			•	**P**	**3**
450 - 550 V Δ	520 - 600 V Δ	500 V Δ	575 V Δ		•		**P**	**5**
200 - 260 V Δ / 350 - 450 V Y	230 - 290 V Δ / 400 - 500 V Y	230 V Δ / 400 V Y	265 V Δ / 460 V Y	400 V Δ	•	•	**P**	**6**
350 - 450 V Δ / 610 - 725 V Y	400 - 500 V Δ / 690 - 725 V Y	400 V Δ / 690 V Y	460 V Δ		•		**P**	**7**

5) Performance can differ if IE2 motors are used. Please refer to corresponding data sheets.

Changes in particular of the quoted performance curve, data and weights may occur without prior notice. The data given do not constitute an obligation from our side to deliver as shown.

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Gardner Denver

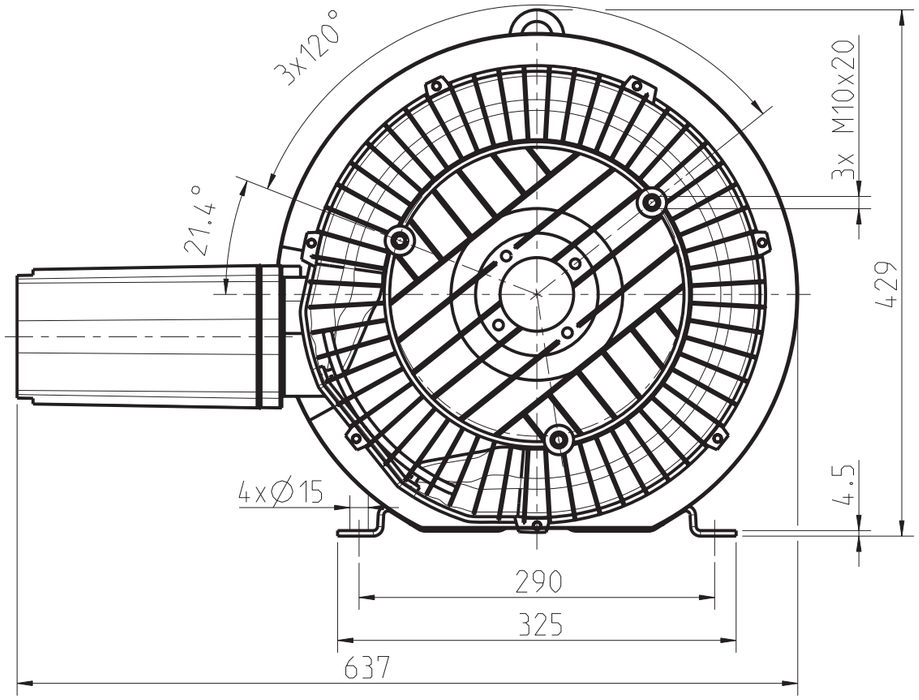
Your Ultimate Source for Vacuum and Pressure

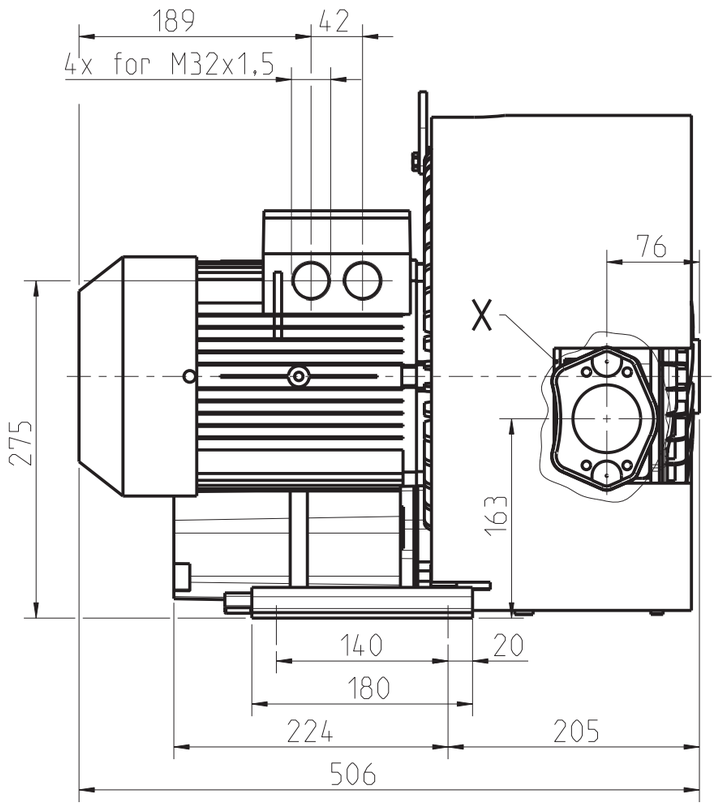
Gardner Denver Deutschland GmbH
Industriestraße 26
97616 Bad Neustadt - Germany
Tel.: +49 9771 6888-0
Fax: +49 9771 6888-4000
www.gd-elmorietschle.com ▪ er.de@gardnerdenver.com

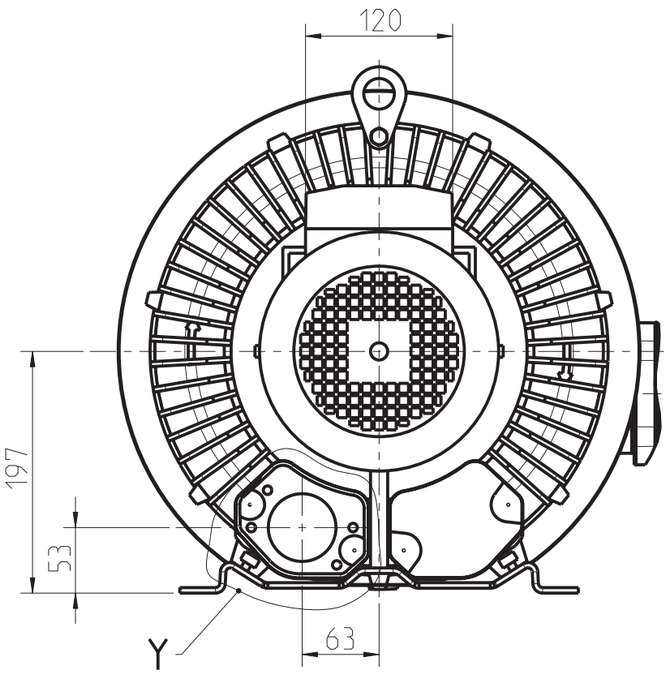
Gardner Denver, Inc.
1800 Gardner Expressway
Quincy, IL 62305
Tel: 217-222-5400
Fax: 217-221-8780

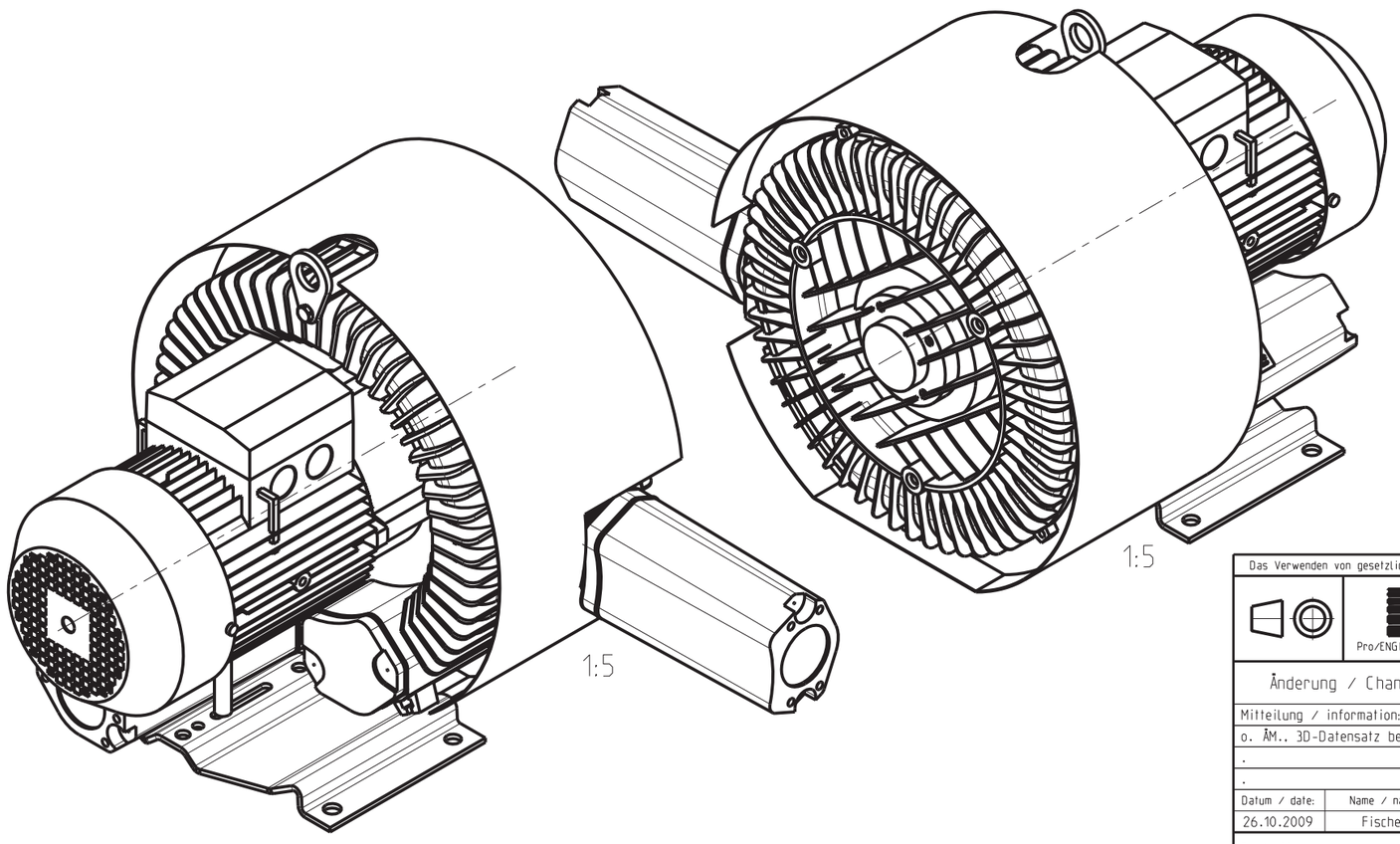
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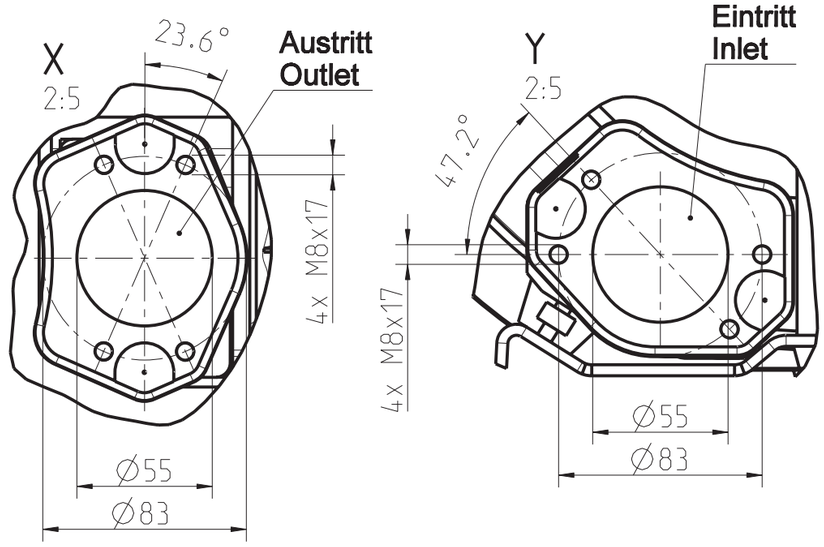
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Pro/ENGINEER Wildfire

Werkstoff / material:	.
Halbzeug / semi-finished part:	.
Beschichtung coating:	.

Änderung / Change management

Mitteilung / information:	
o. ÄM.. 3D-Datensatz berichtigt	
.	
.	

Datum / date:	Name / name:	Geprüft / checked:
26.10.2009	Fischer	/Fis

Ersatz für replacement for: .

Version: 1+

Datum / date:	20.01.2000
Name / name:	Fenn
Geprüft / checked:	Fischer
Abt. / dept.:	R&D D

Gardner Denver
Industriestraße 26
97616 Bad Neustadt a. d. Saale

Maßblatt
Drehstrom mit Standardklemmenkasten

dimension sheet
three-phase with standard terminal box

2BH1610-7H.2.

510_31112_21

f

Masse / mass:	ca. 48 kg
Einheit / unit:	mm
Maßstab / scale:	1:5
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Gardner Denver A3-12-2006, DIN EN ISO 7200-2004

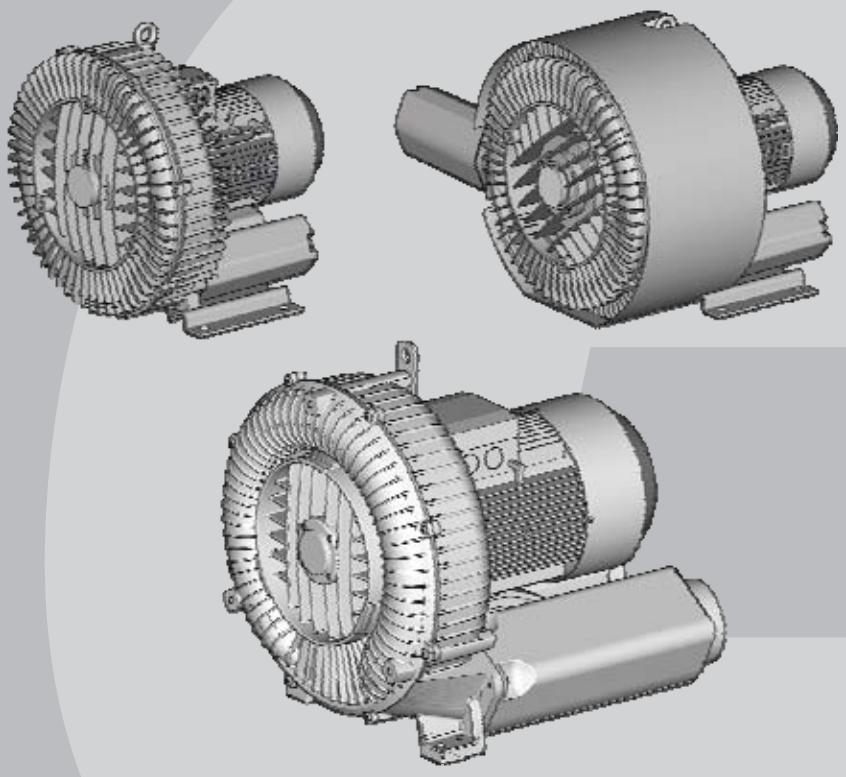
Edition: 09.2011 · 610.44434.40.000

Original operating instructions · English

Operating instructions G-BH1, G-BH9

Elmo Rietschle
A Gardner Denver Product

CE



2BH1 1
2BH1 2
2BH1 3
2BH1 4
2BH1 5
2BH1 6
2BH1 8
2BH1 9
2BH9 23

G-Serie
G-Series
Seitenkanal
Side Channel

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EU declaration of conformity 28
Statement on health safety and on the protection of the environment 29

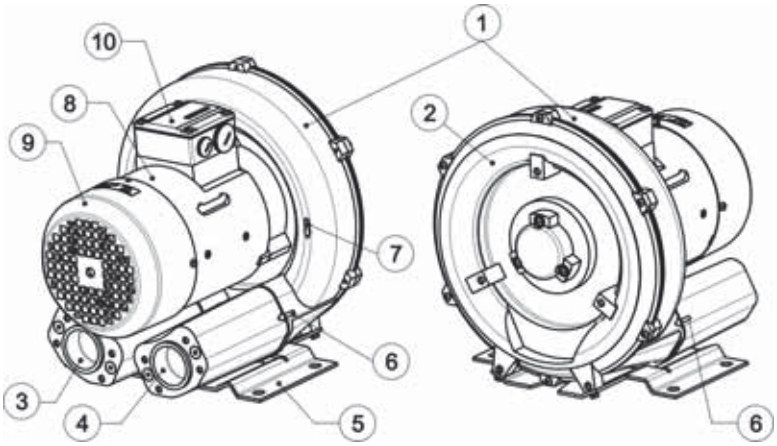


Fig. 1: Design of gas-ring vacuum pump/compressor

1 Vacuum pump/compressor housing
2 Vacuum pump/compressor cover
3 Inlet connection with muffler
4 Discharge connection with muffler
5 Base
6 Arrow indicating delivery direction
7 Arrow indicating direction of rotation
8 Drive motor
9 Fan guard (over external fan)
10 Terminal box

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1 Safety

1.1 Definitions

To point out dangers and important information, the following signal words and symbols are used in these operating instructions:

1.1.1 Safety alert symbol

The **safety alert symbol** ⚠ is located in the safety precautions in the highlighted heading field on the left next to the signal word (DANGER, WARNING, CAUTION).

Safety precautions **with** a safety alert symbol indicate a danger of **injuries**.

Be sure to follow these safety precautions to protect against **injuries or death**!

Safety precautions **without** a safety alert symbol indicate a danger of **damage**.

1.1.2 Signal words

DANGER **WARNING** **CAUTION** **NOTICE** **NOTE**	The **signal words** are located in the safety precautions in the highlighted heading field. They follow a certain hierarchy and indicate (in conjunction with the safety alert symbol, see Chapter 1.1.1) the **seriousness of the danger** and the **type of warning.** See the following explanations:

⚠ DANGER

Danger of injuries.
Indicates an imminently hazardous situation, that **will** result in **death or serious injury** if the corresponding measures are not taken.

⚠ WARNING

Danger of injuries.
Indicates a potentially hazardous situation, that **could** result in **death or serious injury** if the corresponding measures are not taken.

⚠ CAUTION

Danger of injuries.
Indicates a potentially hazardous situation, that may result in **minor or moderate injury** if the corresponding measures are not taken.

CAUTION

Danger of damage.
Indicates a potentially hazardous situation that may result in **property damage** if the corresponding measures are not taken.

NOTICE

Indicates a possible **disadvantage**, i.e. undesirable conditions or consequences can occur if the corresponding measures are not taken.

NOTE

Indicates a possible **advantage** if the corresponding measures are taken; tip.

1.2 General safety precautions

⚠ WARNING

Improper use of the unit can result in serious or even fatal injuries!
These operating instructions

- must have been read completely and understood before beginning any work with or at the pump-motor unit,
- must be strictly observed,
- must be available at the operating location of the pump-motor unit.

⚠ WARNING

Improper use of the unit can result in serious or even fatal injuries!
Only operate the pump-motor unit

- for the purposes indicated under "Intended Use"!
- with the fluids indicated under 'Intended Use'!
- with the values indicated under 'Technical Data'!

⚠ WARNING

Improper use of the unit can result in serious or even fatal injuries!
All work on and with the pump-motor unit (transport, installation, operation, shut-down, maintenance, disposal) may only be carried out by **trained, reliable expert personnel**!

⚠ WARNING

When working on the unit, there is a danger of injury, e.g. in the form of cuts/cutting off, crushing and burns!
During all work on and with the pump-motor unit (transport, installation, operation, shut-down, maintenance, disposal) wear **personal safety equipment (safety helmet, protective gloves, safety shoes)**!

⚠ WARNING

Hair and clothing can be pulled into the unit or caught and wound up moving parts!
Do not wear long, loose hair or wide, loose clothes! Use a hair net!

⚠ DANGER

Electrical danger!
Work on electrical installations may be carried out by trained and authorized electricians only!

⚠ DANGER

Electrical danger!
Before beginning work on the unit or system, the following measures must be carried out:

- Deenergize.
- Secure against being switched on again.
- Determine whether deenergized.
- Ground and short-circuit.
- Cover or block off adjacent energized parts.

⚠ DANGER

Electrical danger!
Do not open the motor terminal box until absence of electricity has been ensured!

⚠ WARNING

Danger due to vacuum and gauge pressure: sudden escape of fluids (skin and eye injuries),
sudden drawing in of hair and clothing!

Danger due to escaping fluid: Burns!
Use mounting elements, connections, lines, fittings and containers with sufficient freedom from leaks and strength for the pressures which occur.

Check the mounting elements, connections, lines, fittings and containers for strength, leaks and firm seating at regular intervals!

⚠ WARNING

Danger from rotating parts (external fan, impeller, shaft):
Cutting/cutting off of extremities, Grasping/winding up of hair and clothing!

Danger due to vacuum and gauge pressure: sudden escape of fluids (skin and eye injuries), sudden drawing in of hair and clothing!

Danger due to escaping fluid: Burns!
Start-up and operation only under the following conditions:

- The pump-motor unit must be completely assembled. When doing so, pay particular attention to the following components:
  - the vacuum pump/compressor cover,
  - the muffler on inlet and discharge connections,
  - the fan guard.
- The pipes/hoses must be connected to inlet and discharge connections.
- Inlet and discharge connections and the connected pipes/hoses may not be closed, clogged or soiled.
- Check the mounting elements, connections of the pipe/hose connections, lines, fittings and containers for strength, leaks and firm seating at regular intervals.

⚠ WARNING

Danger from rotating parts (external fan, impeller, shaft):
Cutting/cutting off of extremities, Grasping/winding up of hair and clothing!

Danger due to vacuum and gauge pressure: sudden escape of fluids (skin and eye injuries), sudden drawing in of hair and clothing!

Danger due to escaping fluid: Burns!
Before beginning work on the pump-motor unit, take the following measures:

- Shut down pump-motor unit and secure against being switched on again.
- Attach a sign on the system controller and on the control elements for the pump-motor unit: "DANGER! Maintenance work on vacuum pump/compressor! Do not switch on!"
- Wait for pump-motor unit to come to a complete stop. Observe run-on time!
- Allow pump-motor unit to cool!
- Shut-off lines. Release pressure.
- Make sure that no vacuum or gauge pressure is present in the lines/tanks to be opened.
- Make sure that no fluids can escape.

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⚠ WARNING

Danger from rotating impeller:
Cutting/cutting of off extremities!
The rotating impeller is accessible with the inlet and discharge connections open!

Do not reach into the unit through open connections!

Do not insert objects into the unit through the openings!

⚠ WARNING

Danger from rotating impeller:
Cutting/cutting of off extremities!
The rotating impeller is accessible with the inlet and discharge connections open!

With free entry and exit of gases, i.e. with direct intake out of or direct feeding into the atmosphere without piping, the following therefore applies:

Provide the inlet and discharge connections of the pump-motor unit either with additional mufflers or with additional piping of a sufficient length to prevent access to the impeller!

⚠ WARNING

Danger of burns from hot surfaces of the pump-motor unit and from hot fluids!
High temperatures of up to approx. 160°C [320°F] can occur on the surface of the pump-motor unit.

Cover the pump-motor unit with a suitable touch protection (e.g. perforated plate cover or wire cover). Do not touch during operation!
Allow to cool after shut-down!

1.3 Residual risks

⚠ WARNING

Danger zone:
Hot surface up to approx. 160°C [320°F].

Hazard:
Possible burns.

Protective measures:
Cover the pump-motor unit with a suitable touch protection (e.g. perforated plate cover or wire cover).

⚠ WARNING

Danger zone:
Fan guard

Hazard:
Long, loose hair can be drawn into external fan through fan guard grate, even with fan guard mounted!

Protective measures:
Wear hair net!

⚠ WARNING

Danger zone:
Missing or defective muffler inlet or discharge connection.

Hazard:
Possible serious hearing damage due to emitted noise.

Protective measures:
Have missing or defective mufflers replaced. Conduct a noise measurement in the system after installing the pump-motor unit. The following measures can be taken from 85 dB(A) and must be taken from 90 dB(A):

- Mark noise area with a warning sign.
- Wear hearing protection.

⚠ WARNING

Danger zone:
Environment of pump-motor unit.

Hazard:
Possible serious hearing damage due to emitted noise.

Protective measures:
Conduct a noise measurement in the system during operation after installing the pump-motor unit.

The following measures can be taken from 85 dB(A) and must be taken from 90 dB(A):

- Mark noise area with a warning sign.
- Wear hearing protection.
- With free entry and exit of gases, i.e. with direct intake out of or direct feeding into the atmosphere without piping, attach an additional muffler.

2 Intended Use

This operating manual

- is intended for side channel compressors of the
  G-BH1 and G-BH9 series, types 2BH1 1 2BH1 2 2BH1 3 2BH1 4 2BH1 5 2BH1 6 2BH1 8 2BH1 9 2BH9 23,
- contains instructions bearing on transport and handling, installation, commissioning, operation, shut-down, storage, servicing and disposal of the G-BH1,G-BH9,
- must be completely read and understood by all operating and servicing personnel before beginning to work with or on the G-BH1, G-BH9,
- must be strictly observed,
- must be available at the site of operation of the G-BH1, G-BH9.

About the operating and servicing personnel of the G-BH1, G-BH9

- These persons must be trained and authorized for the work to be carried out.
- Work on electrical installations may be carried out by trained and authorized electricians only.

The G-BH1,G-BH9

- are pump-motor units for generating vacuum or gauge pressure;
- are used to **extract**, **pump** and **compress the following gases**:
  - Air,
  - Non-flammable, non-aggressive, non-toxic and non-explosive gases or gas-air mixtures.
  - With differing gases/gas-air mixtures, inquire with the Service Department.
- are equipped with one of the following kind of drive motors:
  - 3-phase AC drive motor with a standard or explosion-protected design
  - Single-phase AC drive motor

  These operating instructions apply **only to** pump-motor units with a **standard design**. For an explosion-protected design (EEx e II), see the separate operating instructions.
- are intended for industrial applications,
- are designed for continuous operation. With increased switch-on frequency (6x per hour with equal pauses and operating times) or with increased gas inflow and ambient temperature, the excess temperature limit of the coil and the bearing can be exceeded. Consult the manufacturer when using under such conditions.

When operating the G-BH1, G-BH9 the limits listed in Chapter 3, "Technical Data", Pg. 7 ff. must always be complied with.

Foreseeable Misuse

It is prohibited

- to use the G-BH1, G-BH9 in applications other than industrial applications unless the necessary protection is provided on the system, e.g. guards suitable for children's fingers;
- to use the device in rooms in which explosive gases can occur if the G-BH1, G-BH9 is not expressly intended for this purpose;
- to extract, to deliver and to compress explosive, flammable, corrosive or toxic fluids, unless the G-BH1, G-BH9 is specifically designed for this purpose;
- to operate the G-BH1 with values other than those specified in Chapter 3, "Technical Data", Pg. 7 ff.

Any unauthorized modifications of the G-BH1, G-BH9 are prohibited for safety reasons.

The operator is only permitted to perform the maintenance and service work described in these operating instructions.

Maintenance and servicing work which goes beyond this may only be carried out by companies which have been authorised by the manufacturer (ask the service department for details).

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3 Technical Data

3.1 Mechanical data

Weight

Single-impeller design		
Type	Weight [kg] approx.	Weight [lbs] approx.
2BH1100-7..0.	9	20
2BH1200-7..0.	9	20
2BH1300-7..0.	9	20
2BH1300-7..1.	10	22
2BH1300-7..2.	11	24
2BH1330-7..0.	10	22
2BH1330-7..1.	11	24
2BH1330-7..2.	12	26
2BH1400-7..0.	13	29
2BH1400-7..1.	16	35
2BH1400-7..2.	17	37
2BH1430-7..0.	14	31
2BH1430-7..1.	17	37
2BH1430-7..2.	18	40
2BH1500-7..0.	20	44
2BH1500-7..1.	22	49
2BH1500-7..2.	23	51
2BH1500-7..3.	25	55
2BH1530-7..0.	21	46
2BH1530-7..1.	23	51
2BH1530-7..2.	24	53
2BH1530-7..3.	26	57
2BH1600-7..0.	27	60
2BH1600-7..1.	30	66
2BH1600-7..2.	36	79
2BH1600-7..3.	40	88
2BH1600-7..6.	32	71
2BH1600-7..7.	39	86
2BH1630-7..0.	29	64
2BH1630-7..1.	32	71
2BH1630-7..2.	37	82
2BH1630-7..3.	43	95
2BH1630-7..6.	34	75
2BH1630-7..7.	40	88

Single-impeller design		
Type	Weight [kg] approx.	Weight [lbs] approx.
2BH180.-7..0.	117	258
2BH180.-7..1.	126	278
2BH180.-7..2.	132	291
2BH183.-7..0.	120	265
2BH183.-7..1.	129	284
2BH183.-7..2.	135	298
2BH190.-7..0.	179	395
2BH190.-7..1.	198	437
2BH190.-7..3.	210	463
2BH193.-7..0.	179	395
2BH193.-7..1.	198	437
2BH193.-7..3.	209	463
2BH923..-…P	167	368
2BH923..-…Q	145	320
2BH923..-…H	151	333

Two-impeller design		
Type	Weight [kg] approx.	Weight [lbs] approx.
2BH1310-7..2.	15	33
2BH1410-7..3.	25	55
2BH1410-7..4.	27	60
2BH1510-7..4.	40	88
2BH1510-7..5.	44	97
2BH1610-7..1.	43	95
2BH1610-7..2.	48	106
2BH1610-7..3.	54	119
2BH1610-7..4.	66	146
2BH1610-7..5.	73	161
2BH1610-7..7.	50	110
2BH1610-7..8.	62	137
2BH1640-7..3.	54	119
2BH1640-7..4.	69	152
2BH1640-7..5.	75	165
2BH1640-7..8.	62	137
2BH181.-7..1.	171	377
2BH181.-7..2.	177	390

Two-impeller design		
	Weight	
Type	[kg] approx.	[lbs] approx.
2BH181.-7..3.	203	448
2BH181.-7..4.	215	474
2BH184.-7..2.	177	390
2BH184.-7..3.	203	448
2BH191.-7..1.	274	604
2BH191.-7..2.	288	635
2BH191.-7..3.	299	659
2BH191.-7..4.	309	681
2BH1940-7B.2.	275	606
2BH1940-7B.3.	314	692
2BH1940-7B.4.	324	714
2BH1943-7..2.	330	728
2BH1943-7..3.	339	747
2BH1943-7..4.	349	769

Minimum distances

Minimum distance to fan guard (for sucking in cooling air):

Type	[mm]	[inches]
2BH1 1.. - 2BH1 4	34	1.34
2BH1 5.. - 2BH1 9	53	2.09
2BH923…	52	2.05

Minimum distance to face of vacuum pump/compressor cover:

Type	[mm]	[inches]
2BH1 1.. - 2BH1 5	20	0.79
2BH1 6..	30	1.18
2BH1 8.. - 2BH1 9	40	1.57
2BH923..	52	2.05

Noise level

Measuring-surface sound-pressure level as per EN ISO 3744, measured at a distance of 1 m [3.28 ft] at an operating point of approximately 2/3 of the permissible total pressure difference with the lines connected without a vacuum or pressure relief valve, tolerance ±3 dB (A).

Single-impeller design		
Type	1-m measuring-surface sound pressure level L [dB (A)]	
	50 Hz approx.	60 Hz approx.
2BH1100-7..0.	52	55
2BH1200-7..0.	57	61
2BH1300-7..0.	53	56
2BH1300-7..1.	53	56
2BH1300-7..2.	53	56
2BH1330-7..0.	53	56
2BH1330-7..1.	53	56
2BH1330-7..2.	53	56
2BH1400-7..0.	63	64
2BH1400-7..1.	63	64
2BH1400-7..2.	63	64
2BH1430-7..0.	63	64
2BH1430-7..1.	63	64
2BH1430-7..2.	63	64
2BH1500-7..0.	64	70
2BH1500-7..1.	64	70
2BH1500-7..2.	64	70
2BH1500-7..3.	64	70
2BH1530-7..0.	64	70
2BH1530-7..1.	64	70
2BH1530-7..2.	64	70
2BH1530-7..3.	64	70
2BH1600-7..0.	69	72
2BH1600-7..1.	69	72
2BH1600-7..2.	69	72
2BH1600-7..3.	69	72
2BH1600-7..6.	69	72
2BH1600-7..7.	69	72
2BH1630-7..0.	69	72

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Single-impeller design		
Type	**1-m measuring-surface sound pressure level L [dB (A)]**	
	50 Hz approx.	**60 Hz approx.**
2BH1630-7..1.	69	72
2BH1630-7..2.	69	72
2BH1630-7..3.	69	72
2BH1630-7..6.	69	72
2BH1630-7..7.	69	72
2BH180.-7..0.	70	74
2BH180.-7..1.	70	74
2BH180.-7..2.	70	74
2BH183.-7..0.	70	74
2BH183.-7..1.	70	74
2BH183.-7..2.	70	74
2BH190.-7..0.	74	79
2BH190.-7..1.	74	79
2BH190.-7..3.	74	79
2BH193.-7..0.	75	80
2BH193.-7..1.	75	80
2BH193.-7..3.	75	80
2BH923..	79	81

Two-impeller design		
Type	**1-m measuring-surface sound pressure level L [dB (A)]**	
	50 Hz approx.	**60 Hz approx.**
2BH1310-7..2.	55	61
2BH1410-7..3.	66	69
2BH1410-7..4.	66	69
2BH1510-7..4.	72	74
2BH1510-7..5.	72	74
2BH1610-7..1.	73	76
2BH1610-7..2.	73	76
2BH1610-7..3.	73	76
2BH1610-7..4.	73	76
2BH1610-7..5.	73	76
2BH1610-7..7.	73	76
2BH1610-7..8.	73	76
2BH1640-7..3.	74	78
2BH1640-7..4.	74	78
2BH1640-7..5.	74	78
2BH1640-7..8.	74	---
2BH181.-7..1.	74	---
2BH181.-7..2.	74	78
2BH181.-7..3.	74	78
2BH181.-7..4.	74	78
2BH184.-7..2.	74	78
2BH184.-7..3.	74	78
2BH191.-7..1.	74	84
2BH191.-7..2.	74	84
2BH191.-7..3.	74	84
2BH1940-7B.2.	75	84
2BH1940-7B.3.	75	84
2BH1940-7B.4.	75	84
2BH1943-7..2.	75	84
2BH1943-7..3.	75	84
2BH1943-7..4.	75	84

Sound power level

Sound power level L_W as per EN ISO 3744, tolerance ±3 dB (A).

Two-impeller design		
	Sound power level L_W [dB (A)]	
Type	50 Hz	60 Hz
2BH191.	-	98
2BH1940	-	98
2BH1943	-	99
2BH923..	-	93

Tightening torques for screw connections

The following values apply if no other information is available.

With non-electrical connections, property classes of 8.8 and 8 or higher as per ISO 898-1 are assumed.

	Tightening torques for non-electrical connections	
Thread	[Nm]	[ft lbs]
M4	2.7 - 3.3	1.99 - 4.44
M5	3.6 - 4.4	2.65 - 3.25
M6	7.2 - 8.8	5.31 - 6.5
M8	21.6 - 26.4	15.9 - 19.5
M10	37.8 - 46.2	27.9 - 34.1
M12	63.0 - 77.0	46.5 - 56.8

The following information for electrical connection applies to all terminal board connections with the exception of terminal strips.

	Tightening torques for electrical connections	
Thread	[Nm]	[ft lbs]
M4	0.8 - 1.2	0.59 - 0.89
M5	1.8 - 2.5	1.33 - 1.84

Especially for metal and plastic threaded cable glands and pipe unions, the following values apply:

	Tightening torques for metal threaded glands/unions	
Thread	[Nm]	[ft lbs]
M12x1,5	4 - 6	2.95 - 4.43
M16x1,5	5 - 7.5	3.69 - 5.53
M25x1,5	6 - 9	4.43 - 6.64
M32x1,5	8 - 12	5.9 - 8.85
M40x1,5		

	Tightening torques for plastic threaded glands/unions	
Thread	[Nm]	[ft lbs]
M12x1,5	2 - 3.5	1.48 - 2.58
M16x1,5	3 - 4	2.21 - 2.95
M25x1,5	4 - 5	2.95 - 3.69
M32x1,5	5 - 7	3.69 - 5.16
M40x1,5		

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3.2 Electrical data

See rating plate.

3.3 Operating conditions

Temperatures

Temperature of pumped gases:	max. permissible temperature: +40°C [+104°F] Nominal value: +15°C [+59°F] Pump-motor units for higher fluid temperatures on request.
Ambient temperature:	max. permissible temperature: +40°C [+104°F] min. permissible temperature: -15°C [+5°F] Nominal value: +25°C [+77°F] Ambient temperatures between 25°C [+77°F] and 40°C [+104°F] affect the permissible total pressure difference. At higher temperatures the winding may be damaged and the grease change interval may be shortened.

Pressures

Min. suction pressure:	See rating plate
Max. discharge pressure in compressor mode:	See rating plate

* The total pressure difference, shown on the rating plate, applies only for the following conditions:

- Ambient temperature: 25°C
- Pressure for vacuum operation: 1013 mbar at pressure connection;
- Pressure for compressor operation: 1013 mbar at suction connection;
- Intake temperature (temperature of conveyed gases at suction connection): 15°C
  For ambient temperatures between 25°C and 40°C, the total pressure difference specified on the rating plate must be reduced (at 40°C by 10%).

Consultation with the manufacturer is essential for such operational conditions.

Installation altitude

Max. of 1,000 m [3,280 ft] above sea level.

When installing the pump-motor unit at an altitude of more than 1,000 m [3,280 ft] above sea level, first inquire with the Service department.

4 Transport and Handling

⚠ WARNING

Tipping or falling can lead to crushing, broken bones etc.! Sharp edges can cause cuts!
Wear personal safety equipment (gloves, safety shoes and protective helmet) during transport!

⚠ WARNING

Danger from tipping or falling loads!
Prior to transport and handling make sure that all components are securely assembled and secure or remove all components the fasteners of which have been loosened!

Manual handling:

⚠ WARNING

Danger from lifting heavy loads!
Manual handling of the unit is only permitted within the following limits:

- max. 30 kg [max. 66 lbs] for men
- max. 10 kg [max. 22 lbs] for women
- max. 5 kg [max. 11 lbs] for pregnant women

For the weight of the pump-motor unit, see Chapter 3.1, "Mechanical data", Section "Weight", Pg. 7. For weights above the given values use suitable lifting appliances and handling equipment!

Handling by means of lifting equipment:

⚠ WARNING

Danger from tipping or falling loads!
When transporting with lifting equipment, observe the following basic rules:

- Before each transport, check the tight fit of the eye bolt/lifting attachment, see "Tightening torques for screw connections", p. 10.
- The lifting capacity of lifting equipment and lifting gear must be at least equal to the unit's weight. For the weight of the pump-motor unit, see Chapter 3.1, "Mechanical data", Section "Weight", Pg. 7.
- The pump-motor unit must be secured so that it cannot tip or fall.
- Do not stand or walk under suspended loads!

The transport must be carried out in different ways depending on the type:

- 2BH11., 2BH12., 2BH13., 2BH14., 2BH15. (single-impeller): Manual handling
- 2BH15. (two-impeller), 2BH16., 2BH18., 2BH19., 2BH923…
  Transport with crane, hooked onto eye bolt/lifting attachment (1 attachment point)
- 2BH1943:
  Transport with crane, hooked with lifting belts onto eye bolt and onto the holes in the two feet of the vacuum pump/compressor housing (3 attachment points).

For **transport with a crane**, the pump-motor unit can be hooked into the crane hook as follows:

- directly on the eye bolt/lifting attachment (With 2BH194 the eye bolt and the two foot holes should be used)

or possibly

- with lifting belts.

Eye bolt/lifting attachment:

Types with a weight of up to 30 kg [66 lbs] are **not** equipped with an eye bolt/lifting attachment (2BH11., 2BH12., 2BH13., 2BH14., 2BH15 [single-impeller]).

Types with a weight of more than 30 kg [66 lbs] are equipped with an eye bolt/lifting attachment as **standard** (2BH15. [two-impeller], 2BH16., 2BH18., 2BH19., 2BH9…).

The eye bolt/lifting attachment is mounted on the vacuum pump/compressor housing.

In case of possible removal and remounting of the eye bolt, it must be ensured that the eye level is positioned exactly in the axis direction of the pump-motor unit. Lay shims under the eye bolt if necessary.

The eye bolt/lifting attachment must be firmly tightened.

Loads laterally to the ring level are not permissible. Heavy impact loads during transport must be avoided.

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5 Installation

⚠ WARNING

Improper use of the unit can result in serious or even fatal injuries!

Have you read the safety precautions in Chapter 1, "Safety", Pg. 3 f.?

Otherwise you many not carry out any work with or on the pump-motor unit!

⚠ DANGER

Danger from missing view into area of pump-motor unit!

When operating the control elements without a view into the area of the pump-motor unit, there is a danger that the pump-motor unit will be switched on while other persons are still performing work on it. Extreme injuries are possible!

Provide control elements at a location with a view of the pump-motor unit.

⚠ DANGER

Electrical danger!

The pump-motor unit must be installed so that the electrical device cannot be damaged by external influences!

In particular, the feed pipes must be securely routed, e.g. in cable ducts, in the floor etc.

⚠ WARNING

Danger from balance damage caused by vibration!

Vibrating environments can cause balance damage!

Install the pump-motor unit on a solid foundation or on a solid mounting surface.

Check screw glands/unions for mounting the pump-motor unit on the mounting surface regularly for strength and firm seating.

⚠ WARNING

Danger from crushing due to pump-motor unit tipping over!

Wear personal safety equipment (protective gloves and safety shoes). Handle the unit with the appropriate care. Install the pump-motor unit on a solid foundation or on a solid mounting surface! Check screw glands/unions for mounting the pump-motor unit on the mounting surface regularly for strength.

⚠ WARNING

Danger of fire from flammable substances!

The pump-motor unit must never come into contact with flammable substances.

⚠ WARNING

Danger of burns from hot surfaces of the pump-motor unit and from hot fluids!

High temperatures of up to approx. 160°C [320°F] can occur on the surface of the pump-motor unit.

The pump-motor unit must be installed so that accidental touch of its surface is not possible. Cover the pump-motor unit with a suitable touch protection (e.g. perforated plate cover or wire cover).

⚠ WARNING

Danger of injuries from flying parts!

Select installation so that parts that are thrown out through the grate if the external fan breaks cannot hit persons!

⚠ CAUTION

Danger of tripping and falling!

Make sure the unit does not present a danger of tripping. Lay cables and pipes so that they cannot be reached during operation(recessed in floor, in ducts on the wall etc.).

CAUTION

Danger of overheating due to hot surface of pump-motor unit!

High temperatures can occur on the surface of the pump-motor unit.

Temperature sensitive parts, such as lines or electronic components, may not come into contact with the surface of the pump-motor unit.

The pump-motor unit is ready to connect on delivery. However, if the time from delivery to commissioning of the pump-motor unit exceeds a certain period, the lubrication of the rolling bearings must be renewed.
See Chapter 8.2, "Storage conditions", Section "Lubrication of rolling bearings after longer storage", Pg. 24 for information on this topic.

Carry out the following work to install the pump-motor unit:

- Installation and securing,
- Attachment of the included loose muffler if necessary,
- Attachment of threaded flange or hose flange (available as accessories)
  for the connection of inlet or discharge pipe to the muffler,
- Electrical connection,
- Connection of inlet and discharge connection to the system.

5.1 Installation

⚠ WARNING

For an installation that differs from the following specifications, it is necessary to inquire with the Service Department!

Ambient conditions:

The pump-motor unit is suitable for installation in the following environments:

- In a dusty or damp environment,
- in buildings,
- in the open.
  When properly installed in the open, the pump-motor unit must be protected from exposure to intensive sunlight, e.g. by attaching a protective roof. Otherwise, no special protective devices against the effects of weathering are required.

The drive motors of the pump-motor units have the following design:

- with degree of protection IP55 (see rating plate),
- with tropicalized insulation.

Installation conditions:

The pump-motor unit must be installed as follows:

- on level surfaces,
- at a maximum height of 1000 m [3280 ft] above sea level.
  When installing at an altitude of more than 1,000 m [3,280 ft] above sea level, first inquire with the Service Department.

Minimum distances:

To ensure sufficient cooling of the pump-motor unit, it is absolutely necessary that the required minimum distances to the **fan guard** and to the **face of the vacuum pump/compressor cover** be maintained. see Chapter 3.1, "Mechanical data", Section "Minimum distances", Pg. 8.

The minimum distances to the face of the vacuum pump/compressor cover are especially important when installing on the vacuum pump/compressor cover or near a wall.

CAUTION

To ensure sufficient cooling of the pump-motor unit, also observe the following:

- Ventilation screens and openings must remain clear.
- Discharge air of other units may not be directly sucked in again!

Noise radiation:

To reduce the noise radiation, the following must be observed:

- Do not mount pump-motor unit on noise-conducting or noise-radiating parts (e.g. thin walls or sheet-metal plates).
- Provide pump-motor unit with sound-insulating intermediate layers (e.g. rubber buffers under the base of the pump-motor unit) if necessary.
- Install the pump-motor unit on a stable foundation or on a rigid mounting surface. This provides for smooth, low-vibration running of the pump-motor unit.

Components for reducing noise on the pump-motor unit:

- **Mufflers** (included as standard equipment):
  On delivery the pump-motor units are equipped with attached mufflers as standard. The noise radiation is considerably reduced by the mufflers. See Fig. 2 to Fig. 9, Pg. 18 ff.
- **Additional silencer** (available as an accessory for the 2BH1):
  The additional mufflers enable a further noise reduction. They may only be used with free entry and exit of gases, i.e. with direct intake out of or direct feeding into the atmosphere **without piping**.

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- **Sound protection hood** (available as an accessory for the 2BH1):
  Noise protection hoods are suitable for installation in rooms and in the open. They reduce both the total sound pressure level and tonal components that are perceived as particularly annoying.

Installation variants/axis position:

Basically, when installing the pump-motor unit, the following variants are possible with a different axis position (horizontal or vertical):

- Horizontal installation
- Vertical installation on the vacuum pump/compressor cover ("cover installation")
- Vertical mounting on the wall

Basically, all variants are possible with all type.

Exceptions

- For the 2BH1943, vertical axis mounting on the compressor cover ("cover position") is necessary.
- For the 2BH923, only horizontal axis mounting and vertical axis mounting on the compressor cover are possible.
- For units with condensate water opening, horizontal axis mounting with a foot below is necessary.

Horizontal axis mounting

The foot of the unit has fastening holes.

- Screw the foot of the unit to the base using suitable screws.
  All fastening holes must have screws!

Vertical axis mounting on the compressor cover ("cover position")

For vertical axis mounting on the compressor cover, use spring elements.

Spring elements are available as accessories and come in a set of 3. The upper part has a threaded stud and the lower part a threaded hole.

- fFastening spring elements to the unit:
  Screw threaded studs of the spring elements into the holes on the front side of the compressor cover and tighten.
- Fastening the unit with spring elements to the foundation:
  Select suitable fastening elements for the threaded hole.
  Screw spring elements over the threaded hole into the base or foundation.

Vertical axis mounting on the wall with the compressor cover pointing downward

For vertical axis mounting of the unit on the wall, the unit is fastened using the holes in the foot. The foot of the unit has fastening holes.

- Place the unit with the foot to the wall on a base plate with sufficient load-bearing capability in the mounting position.
- Screw the foot of the unit to the wall using suitable screws.
  All fastening holes must have screws!
- Remove the base plate.

Eye bolt/lifting attachment:

After set-up, the eye bolt/lifting attachment can be removed.

5.2 Electrical connection (motor)

⚠ DANGER

Electrical danger!
Malpractice can result in severe injuries and material damage!

⚠ DANGER

Electrical danger!
The electrical connection may be carried out by trained and authorized electricians only!

⚠ DANGER

Electrical danger!
Before beginning work on the unit or system, the following measures must be carried out:

- Deenergize.
- Secure against being switched on again.
- Determine whether deenergized.
- Ground and short-circuit.
- Cover or block off adjacent energized parts.

CAUTION

Incorrect connection of the motor can lead to serious damage to the unit!

Regulations:

The electrical connection must be carried out as follows:

- according to the applicable national and local laws and regulations,
- according to the applicable system-dependent prescriptions and requirements,
- according to the applicable regulations of the utility company.

Electrical power supply:

Observe the **rating plate**.
It is imperative that the operating conditions correspond to the data given on the rating plate!

Deviations permissible without reduction in performance:

- ±5 % voltage deviation
- ±2 % frequency deviation

Connection to drive-motor terminal box:

Open the required cable entry openings on the terminal box. Here the following two cases are differentiated:

- The cable entry opening is prefabricated and provided with a sealing plug.
- Screw out sealing plug.

OR

- The cable entry opening is closed off with a casting skin (only on pump-motor units with drive-motor axis heights of 100 to 160 in standard design).
- Break out casting skin using a suitable tool. For example, use a metal pin with a corresponding diameter or a chisel and hammer.

CAUTION

When pounding out the casting skin on the cable entry openings in the terminal box, the terminal box or its parts can be damaged (e.g. terminal board, cable connections).

Proceed with suitable caution and precision when doing so! Prevent flash formation!

Mount cable glands on the terminal box. Proceed as follows:

- Select one cable gland in each case which is suitable for the cable diameter.
- Insert this cable gland in the opening of the terminal box.
  Use a reducer if necessary.
- Screw on the cable gland so that no moisture, dirt etc. can penetrate into the terminal box.

Carry out the connection and the arrangement of the jumpers in accordance with the **circuit diagram in the terminal box**.

Connect the protective conductor to the terminal with the following symbol:
 .

The electrical connection must be carried out as follows:

- The electrical connection must be permanently safe.
- There may be no protruding wire ends.
- Clearance between bare live parts and between bare live parts and ground: ≥ 5.5 mm [0.217"] (at a nominal voltage of U_N ≤ 690V).
- For the tightening torques for terminal board connections (except terminal strips), see Chapter 3.1, "Mechanical data", Section "Tightening torques for screw connections", Pg. 10.
- For terminals with clamping straps (e.g. as per DIN 46282), the conductors must be inserted so that approximately the same clamping height results on both sides of the bar. Individual conductors must therefore be bent into a U-shape or connected with a cable lug (DIN 46234).

This also applies to:

- the protective conductor,
- the outer ground conductor.

Both conductors can be recognized from their color (green/yellow).

⚠ DANGER

Electrical danger!
The terminal box must be free from

- foreign bodies,
- dirt,
- humidity.

Terminal box cover and cable entries must be tightly closed so as to make them dustproof and waterproof. Check for tightness at regular intervals.

⚠ DANGER

Electrical danger!
Clearance between bare live parts and between bare live parts and ground:

at least **5.5 mm [0.217"]** (at a nominal voltage of U_N ≤ 690V).

There may be no protruding wire ends!

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For **motor overload protection**:

- Use motor circuit breakers.
- This must be adjusted to the specified nominal current (see rating plate).

⚠ DANGER

Electrical danger!
There is danger of an electrical shock when a defective pump-motor unit is touched!

Mount motor circuit breaker.
Have electrical equipment checked regularly by an electrician.

Interference immunity of drive motor:

For drive motors with integrated sensors, the operator must provide for a sufficient interference immunity itself. Select a suitable sensor signal cable (e.g. with screening, connection as for a motor power-supply cable) and analyzing unit.

Operation with frequency converter:

⚠ WARNING

Pump-motor units with a UL approbation may not be operated on frequency converters in the US without testing by a suitable test agency!

With a power supply by a frequency converter, the following must be observed:

- High-frequency current and voltage harmonics in the motor supply cables can lead to emitted electromagnetic interference. This is dependent on the converter design (type, manufacturer, interference suppression measures).
- Be sure to observe the EMC notes of the converter manufacturer!
- Use screened power supply cables if necessary. For optimal screening, the screen must be conductively connected over a large area to the metal terminal box of the drive motor with a screwed metal gland.
- In the case of drive motors with integrated sensors (e.g. PTC thermistors) interference voltage can occur on the sensor cable depending on the converter type.
- Limit speed:
  see specifications on the rating plate.

5.3 Connecting pipes/hoses (vacuum pump/compressor)

Mufflers:

The pump-motor units are delivered with mufflers (indicated with arrows in the following illustrations) for the inlet and discharge connections as standard equipment.

On delivery the mufflers are already mounted on the following pump-motor units.

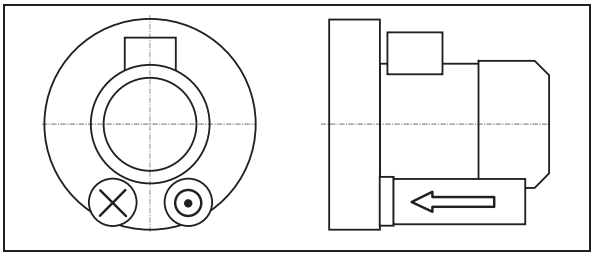


Fig. 2: 2BH1… (single-impeller pump-motor units), 2BH9 23

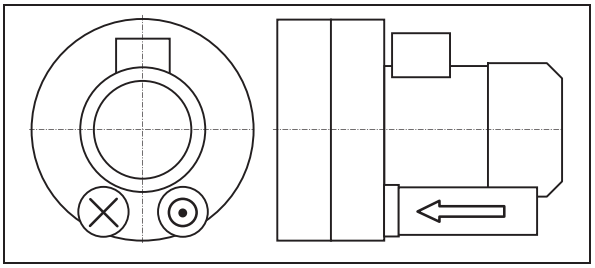


Fig. 3: 2BH1640 (two-impeller pump-motor unit with double-flow design)

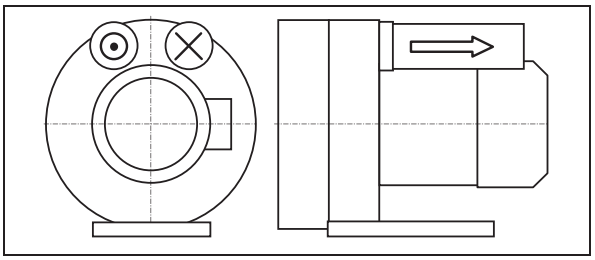


Fig. 4: 2BH1840-7G... (two-impeller pump-motor unit with double-flow design)

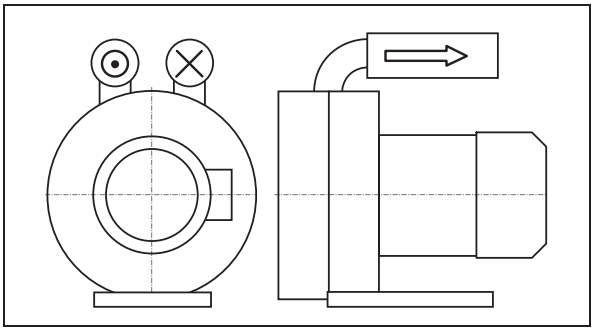


Fig. 5: 2BH1840-7J... (two-impeller pump-motor unit with double-flow design)

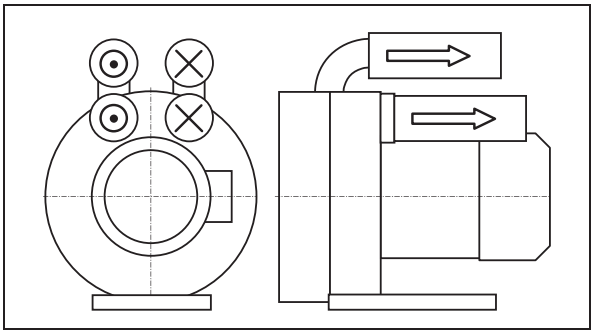


Fig. 6: 2BH1840-7L... (two-impeller pump-motor unit with double-flow design)

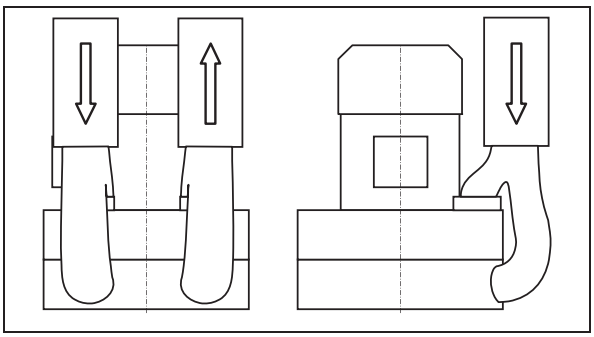


Fig. 7: 2BH1943 (two-impeller pump-motor unit with double-flow design)

On **two-impeller pump-motor units with a two-stage design of the types 2BH1310 to 2BH1910** the discharge-side muffler is included loose for packing-related reasons and must be mounted by the customer.

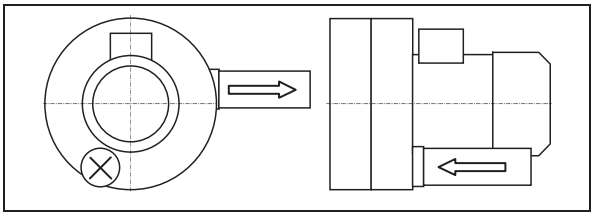


Fig. 8: 2BH1310 ... 2BH1610, 2BH1910 (two-impeller pump-motor units with a two-stage design)

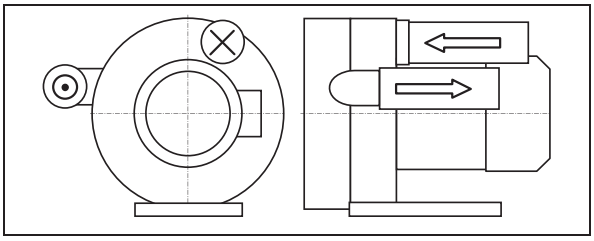


Fig. 9: 2BH1810 (two-impeller pump-motor unit with a two-stage design)

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⚠ WARNING

Danger from rotating impeller:
Cutting/cutting of off extremities!
The rotating impeller is accessible with the inlet and discharge connections open!

With free entry and exit of gases, i.e. with direct intake out of or direct feeding into the atmosphere without piping, the following therefore applies:

Provide the inlet and discharge connections of the pump-motor unit either with additional mufflers or with additional piping of a sufficient length to prevent access to the impeller!

Connections:

To prevent foreign bodies from entering the unit, all connections are sealed off when delivered. Do not remove the sealing plugs until immediately before connecting the pipes/hoses.

The following applies for the arrangement of the pipe/hose connections:

The **pumped gases** are sucked in via the inlet connection (see Chapter 5.3.1, Pg. 19) and discharged via the discharge connection (see Chapter 5.3.2, Pg. 19).

The **shaft rotating direction** is marked with an arrow on the back of the vacuum pump/compressor housing (Fig. 1, Pg. 2, Item 7).

The **delivery direction of the gases** is marked with arrows on both connections (Fig. 1, Pg. 2, Item 6).

⚠ WARNING

Danger from interchanging inlet and pressure line!
Interchanged inlet and pressure lines can lead to damage to the pump-motor unit and the system, and as a result of this to serious injuries!

Make sure that the inlet and pressure line cannot be confused when connecting.

Look for the clear marking with the arrow indicating the delivery direction on the inlet and discharge connections.

⚠ WARNING

Danger due to vacuum and gauge pressure!

Danger due to escaping fluid!

During operation, connected pipes and vessels are vacuumized or pressurized!

Use only mounting elements, connections, lines, fittings and containers with sufficient freedom from leaks and strength for the pressures which occur.

Make sure that the mounting elements and connections are mounted sufficiently firmly and leak-free!

CAUTION

If the pumped gases are passed on on the discharge side in a closed pipe system, then it must be ensured that the pipe system is adapted to the maximum discharge pressure. See Chapter 3.3: "Operating conditions", Section "Pressures", Pg. 11. Connect a pressure relief valve upstream if necessary.

NOTICE

Attach pipes/hoses free of mechanical tensions. Support the weight of the pipes/hoses.

5.3.1 Inlet connection

The inlet connection with the related muffler (Fig. 1, Pg. 2, Item 3) is marked with an arrow pointing into the vacuum pump/compressor. Connect the inlet pipe here. The pumped gases are sucked in via this.
Procedure: see Chapter 5.3.3.

⚠ WARNING

Danger from solid bodies and impurities in the pump-motor unit!
If solid bodies penetrate into the pump-motor unit, blades of the impellers can break and broken pieces can be thrown out.

Install a filter in the inlet pipe.
Replace filter regularly!

5.3.2 Discharge connection

The discharge connection with the related muffler (Fig. 1, Pg. 2, Item 4) is marked with an arrow pointing out of the vacuum pump/compressor. Connect the discharge pipe here. The pumped gases are discharged via this. Procedure: see Chapter 5.3.3.

5.3.3 Procedure when connecting pipes/hoses

Attach the pipes/hoses to the unit as described in the following. The pipes/hoses are connected differently to inlet and discharge connections depending on the muffler design and the type of line (pipe or hose):

- Muffler with inside threads:
  The pipe is screwed directly into the muffler.
- Muffler without inside thread:
  - Screw threaded flange (available as an accessory) onto the muffler.
  - Screw the pipe into the threaded flange.
- Hose connection:
  - for 2BH1 Screw the hose flange (available as an accessory) onto the silencer.
  - Push the hose onto the hose flange and secure it with a hose clamp. See Chapter 3.1, "Mechanical data", Section "Tightening torques for screw connections", Pg. 10 for information on this topic.

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6 Commissioning

⚠ WARNING

Improper use of the unit can result in serious or even fatal injuries!

Have you read the safety precautions in Chapter 1, "Safety", Pg. 3 f.? Otherwise you many not carry out any work with or on the pump-motor unit!

⚠ WARNING

Danger from rotating parts (external fan, impeller, shaft): Cutting/cutting off of extremities, Grasping/winding up of hair and clothing!

Danger due to vacuum and gauge pressure: sudden escape of fluids (skin and eye injuries), sudden drawing in of hair and clothing!

Danger due to escaping fluid: Burns!

Start-up and operation only under the following conditions:

- The pump-motor unit must be completely assembled. When doing so, pay particular attention to the following components:
  - the vacuum pump/compressor cover,
  - the muffler on inlet and discharge connections,
  - the fan guard.
- The pipes/hoses must be connected to inlet and discharge connections.
- Inlet and discharge connections and the connected pipes/hoses may not be closed, clogged or soiled.
- Check the mounting elements, connections of the pipe/hose connections, lines, fittings and containers for strength, leaks and firm seating at regular intervals.

6.1 Preparation

⚠ WARNING

Danger from closed connections!

With closed/soiled intake or discharge connections vacuum or gauge pressure results in the pump-motor unit.

This can overheat and damage the drive motor winding.

Before start-up, make sure that the inlet and discharge connections are not closed, clogged or soiled!

CAUTION

Before starting up again after a longer standstill: Measure the insulation resistance of the motor. With values ≤ 1 kΩ per volt of nominal voltage, the winding is too dry.

Measures before start-up:

- If a shut-off device is installed in the discharge pipe:
  Make sure that the unit is NOT operated with the shut-off device closed.
- Before starting up the pump-motor unit, observe the values specified on the rating plate. Specifications on the drive-motor nominal current apply at a gas entry and ambient temperature of +40° C [104°F].
- Adjust the motor circuit breaker to the drive-motor nominal current.

Check direction of rotation:

- The intended rotating direction of the shaft is marked with arrows on the vacuum pump/compressor housing (Fig. 1, Pg. 2, Item. 7).
- The gas delivery direction is marked with arrows on the inlet and discharge connections (Fig. 1, Pg. 2, Item 6).
- Make sure the pipes/hoses on the inlet and discharge connections are properly connected.
- Switch the pump-motor unit on briefly and then off again.
- Compare the actual rotating direction of the external fan with the intended shaft rotating direction indicated with the arrows shortly before the pump-motor unit comes to a standstill.
- If necessary, reverse the direction of rotation of the motor.

⚠ WARNING

Danger due to rotating parts! Danger due to vacuum and gauge pressure! Danger due to escaping fluid!
Test runs may also only be conducted with the pump-motor unit completely mounted.

⚠ DANGER

Electrical danger!
The electrical connection may be carried out by trained and authorized electricians only!

⚠ DANGER

Electrical danger!
Before beginning work on the unit or system, the following measures must be carried out:

- Deenergize.
- Secure against being switched on again.
- Determine whether deenergized.
- Ground and short-circuit.
- Cover or block off adjacent energized parts.

Check operating speeds:

Observe the operating speed specified on the rating plate. This may not be exceeded, as otherwise the noise radiation, vibration behavior, grease consumption duration and bearing change interval worsen. To prevent damage as a result of higher speeds, it may be necessary to inquire with the Service Department as to the maximum speed.

⚠ WARNING

Danger of hearing damage due to noise radiation!
For the noise emission of the pump-motor unit measured by the manufacturer, see Chapter 3.1, "Mechanical data", Section "Noise level", Pg. 8. However, the actual noise emission during operation is highly dependent on the installation and system conditions. Conduct a noise measurement in the system during operation after installing the pump-motor unit. The following measures can be taken from 85 dB(A) and must be taken from 90 dB(A):

- Mark noise area with a warning sign.
- Wear hearing protection.
- With free entry and exit of gases, i.e. with direct intake out of or direct feeding into the atmosphere without piping, attach an additional muffler.

6.2 Start-up and shut-down

Start-up

- Open shut-off device in intake/discharge pipe.
- Switch on power supply for drive motor.

Shut-down:

- Switch off power supply for drive motor.
- Close shut-off device in intake/discharge pipe.

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7 Operation

⚠ WARNING

Improper use of the unit can result in serious or even fatal injuries!

Have you read the safety precautions in Chapter 1, "Safety", Pg. 3 f.?
Otherwise you many not carry out any work with or on the pump-motor unit!

Also **be sure** to read the safety precautions in Chapter 6, "Commissioning", Pg. 21!

Starting up and shutting down

See Chapter 6, "Commissioning", Sub-Chapter 6.2, "Start-up and shut-down", Pg. 22.

Also be sure to observe the following important notes especially for operation:

⚠ WARNING

Danger of burns from hot surfaces of the pump-motor unit and from hot fluids!

High temperatures of up to approx. 160°C [320°F] can occur on the surface of the pump-motor unit.

Do not touch during operation!
Allow to cool after shut-down!

CAUTION

Danger of overheating due to hot surface of pump-motor unit!

High temperatures of up to approx. 160°C [320°F] can occur on the surface of the pump-motor unit.

Temperature sensitive parts, such as lines or electronic components, may not come into contact with the surface of the pump-motor unit.

CAUTION

Danger of overheating!

During operation the standstill heating may, if installed, **not** be switched on!

CAUTION

Danger of rusting due to collection of condensed water in drive motor area!

On drive motors with closed condensed water openings:
Remove closures occasionally to allow any water which has collected to drain off.

CAUTION

Danger of bearing damage!

Heavy mechanical impacts must be avoided during operating and while at a standstill.

8 Shut-Down and Longer Standstills

8.1 Preparing for shut-down or longer standstill

⚠ WARNING

Improper use of the unit can result in serious or even fatal injuries!
Have you read the safety precautions in Chapter 1, "Safety", Pg. 3 f.?
Otherwise you many not carry out any work with or on the pump-motor unit!

CAUTION

Danger of rusting due to collection of condensed water in drive motor area!
On drive motors with closed condensed water openings:
Remove closures occasionally to allow any water which has collected to drain off.

CAUTION

Danger of bearing damage!
Avoid mechanical shocks during operation and shut-down.

Prior to shut-down or longer standstill, proceed as follows:

- Switch off the pump-motor unit.
- Close shut-off device in inlet and pressure line if installed.
- Disconnect pump-motor unit from power supply.
- Release pressure.
  When doing so, open pipes/hoses slowly and carefully so that the vacuum or gauge pressure in the pump-motor unit can be released.
- Remove pipes/hoses.
- Provide mufflers on inlet and discharge side with sealing plugs.

8.2 Storage conditions

To prevent standstill damage during storage, the environment must provide the following conditions:

- dry,
- dust-free,
- low-vibration (V_{eff} ≤ 2.8 mm/s [0.11"/sec]).
- Ambient temperature:
  min. -30°C [-22°F]
  max. 40°C [+104°F].

CAUTION

Danger of overheating due to high temperature!
When storing in an environment with a temperature of over 40°C [104°F], the winding may be damaged and the grease change interval may be shortened.

Lubrication of rolling bearings after longer storage:

The new pump-motor unit may at first be stored following delivery. If the time from deliver to commissioning exceeds the following periods, the lubrication of the rolling bearings must be renewed:

- Under advantageous storage conditions (as specified above): 4 years.
- Under disadvantageous storage conditions (e.g. high humidity, salty air, sandy or dusty air): 2 years.

In these cases open rolling bearings must be relubricated and closed rolling bearings must be completely replaced. In this case be sure to inquire with the Service Department. In particular, exact information with regard to the procedure and grease type are required.

⚠ WARNING

Improper use of the unit can result in serious or even fatal injuries!
All maintenance work on the pump-motor unit must always be performed by the Service Department!

Maintenance work on the pump-motor unit may only be conducted by the operator itself when the related **maintenance manual** on hand!

Inquire with the Service Department!

Commissioning after longer standstill:

Before recommissioning after a longer standstill, measure the insulation resistance of the drive motor. With values ≤ 1 kΩ per volt of nominal voltage, the winding is too dry.

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9 Servicing

⚠ WARNING

Improper use of the unit can result in serious or even fatal injuries!

Have you read the safety precautions in Chapter 1, "Safety", Pg. 3 f.?

Otherwise you many not carry out any work with or on the pump-motor unit!

⚠ WARNING

Improper use of the unit can result in serious or even fatal injuries!

All maintenance work on the pump-motor unit must always be performed by the Service Department!

Maintenance work on the pump-motor unit may only be conducted by the operator itself when the related **maintenance manual** on hand!

Inquire with the Service Department!

9.1 Emptying/Rinsing/Cleaning

Before any maintenance/servicing work, empty, rinse and clean the outside of the unit.

- Empty unit with air and rinse until all residues have been removed.
- Clean the outside of the unit with compressed air.
  - Wear gloves and protective safety glasses.
  - Secure the surrounding area.
  - Clean the entire surface of the unit and exterior fan with compressed air.

9.2 Repairs/troubleshooting

Fault	Cause	Remedy	Carried out by
Motor does not start; no motor noise.	At least two power supply leads interrupted.	Eliminate interruption by fuses, terminals or power supply cables.	Electrician
Motor does not start; humming noise..	One power supply lead interrupted.	Eliminate interruption by fuses, terminals or power supply cables.	Electrician
	Impeller is jammed.	Open vacuum pump/compressor cover, remove foreign body, clean.	Service*)
		Check or correct impeller gap setting if necessary.	Service
	Impeller defective.	Replace impeller.	Service*)
	Rolling bearing on drive motor side or vacuum pump/compressor side defective.	Replace motor bearing or vacuum pump/compressor bearing.	Service*)
Protective motor switch trips when motor is switched on. Power consumption too high.	Winding short-circuit.	Have winding checked.	Electrician
	Motor overloaded. Throttling does not match specification on rating plate.	Reduce throttling.	Service*)
		Clean filters, mufflers and connection pipes if necessary.	Service*)
	Compressor is jammed.	See fault: "Motor does not start; humming noise." with cause: "Impeller is jammed.".	Service*)

Fault	Cause	Remedy	Carried out by
Pump-motor unit does not generate any or generates insufficient pressure difference.	Leak in system.	Seal leak in the system.	Operator
	Wrong direction of rotation.	Reverse direction of rotation by interchanging two connecting leads.	Electrician
	Incorrect frequency (on pump-motor units with frequency converter).	Correct frequency.	Electrician
	Shaft seal defective.	Replace shaft seal.	Service*)
	Different density of pumped gas.	Take conversion of pressure values into account. Inquire with Service Department.	Service
	Change in blade profile due to soiling.	Clean impeller, check for wear and replace if necessary.	Service*)
Abnormal flow noises.	Flow speed too high.	Clean pipes. Use pipe with larger cross-section if necessary.	Operator
	Muffler soiled.	Clean muffler inserts, check condition and replace if necessary.	Service*)
Abnormal running noise.	Ball bearing lacking grease or defective.	Regrease or replace ball bearing.	Service*)
Compressor leaky.	Seals on muffler defective.	Check muffler seals and replace if necessary.	Service*)
	Seals in motor area defective.	Check motor seals and replace if necessary.	Service

*) Only when the maintenance manual is at hand: rectification by the operator.

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9.3 Service/After-sales service

Our Service is available for work (in particular the installation of spare parts, as well as maintenance and repair work), not described in these operating instruction.

A list of spare parts with an exploded drawing is available on the Internet at www.gd-elmorietschle.com.

Observe the following when **returning** pump-motor unit:

- The pump-motor unit must be delivered complete, i.e. not dismantled.
- The pump-motor unit may not present a danger to the workshop personnel.
  Each pump motor unit on delivery to the workshop must be accompanied with a fully completed "Statement on health safety and on the protection of the environment", Pg. 29.
- The original rating plate of the pump-motor unit must be properly mounted, intact and legible.
  All warranty claims are voided for pump-motor units delivered for a damage expertise without the original rating plate or with a destroyed original rating plate.
- In case of warranty claims, the manufacturer must be informed of the operating conditions, operating duration etc. and additional detailed information provided on request if necessary.

10 Disposal

Have the entire pump-motor unit scrapped by a suitable disposal company. No special measures are required when doing so.
For additional information on disposing of the unit, ask the Service Department.

11 Explosion-Protected Design

An additional set of operating instructions with supplementary or specific information is provided with these pump-motor units.

EU declaration of conformity

Manufacturer:	Gardner Denver Deutschland GmbH Industriestraße 26 97616 Bad Neustadt Germany
Responsible for documentation:	Holger Krause Industriestraße 26 97616 Bad Neustadt Germany
Designation:	G series Side channel blower G-BH1, G-BH9 Types 2BH1 1 2BH1 2 2BH1 3 2BH1 4 2BH1 5 2BH1 6 2BH1 8 2BH1 9 2BH9 23

The side channel blower described above meets the following applicable Community harmonisation legislation:

2004/108/EC*)	Directive 2004/108/EC of the European Parliament and of the Council of 15 December 2004 on the approximation of the laws of the Member States relating to electromagnetic compatibility and repealing Directive 89/336/EEC
2006/42/EC	Directive 2006/42/EC of the European Parliament and of the Council of 17 May 2006 on machinery, and amending Directive 95/16/EC The protection targets of the directive 2006/95/EC have been met

Harmonised standards applied:

EN 1012-1:2010	Compressors and vacuum pumps - Safety requirements - Part 1: Air compressors
EN 1012-2:1996 +A1:2009	Compressors and vacuum pumps - Safety requirements - Part 2: Vacuum pumps
EN ISO 12100:2010	Safety of machinery - General principles for design - Risk assessment and risk reduction
EN 60204-1:2006	Safety of machinery - Electrical equipment of machines Part 1: General requirements

Bad Neustadt, 26.09.2011
(Place and date of issue)
Thomas Kurth, Managing Director
(Name and function)



(Signature)

*) Only applicable for version with frequency converter 2FC

664.44434.40.000

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Gardner Denver

Statement on health safety and on the protection of the environment

- For the safety of our employees and to comply with statutory requirements on handling substances harmful to the health and the environment, this statement must be enclosed, fully completed, with **each** unit/system sent.
- **Without the fully completed statement, repair/disposal is not possible and delays are unavoidable!**
- The statement is to be completed and signed by suitably qualified, authorised personnel at the operating organisation.
- In the case of shipment to Germany, the statement is to be completed in German or English.
- The statement is to be attached to the outside of the packing on shipment.
- If necessary, the carrier is to be informed.

1. **Product designation (type):** .....
2. **Serial number (no. BN):** .....
3. **Reason for sending:** .....
4. **The unit/system**
   - ☐ has **not** come into contact with hazardous substances. There will be **no** hazards for personnel or the environment during repair/disposal. Continue with "6. Legally binding statement"
   - ☐ has come into contact with hazardous substances. Continue with "5. Information on the contamination"
5. **Information on the contamination** (if necessary provide more information on an additional sheet)

   The unit/system was used in the following application:

   .....

   and has come into contact with the following classifiable substances or substances presenting a hazard to health/environment:

Trade name:	Chemical designation:	Hazardous substance class:	Properties (e.g. toxic, inflammable, caustic, radioactive):

   - ☐ The unit/system has been emptied in accordance with the operating instructions, flushed and cleaned externally.
   - ☐ Safety data sheets in accordance with the applicable regulations are enclosed (..... sheet).
   - ☐ The following safety precautions are necessary for handling (e.g. personal protective equipment):

     .....

     .....

6. **Legally binding statement**

   I herewith guarantee that the details specified are true and complete and that I, as signatory, am in a position to judge that this is so.
   We are aware that we are liable to the contractor for any damages arising from incomplete or incorrect specifications. We are obliged to indemnify the contractor against claims for damages by third parties arising from incomplete or incorrect specifications. We are aware that, irrespective of this statement, we are directly liable to third parties - in particular including the contractor's employees tasked with repair/disposal.

Company/institute: .....

Name, position: ..... Phone: .....

Street: ..... Fax: .....

Post code, city: .....

Country: ..... Stamp:

Date, signature: .....

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610.00250.40.905
10.2009
English

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Elmo Rietschle
A Gardner Denver Product

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Gardner Denver

Elmo Rietschle is a brand of Gardner Denver's Industrial Products Group and part of Blower Operations.

Figure # 937

Ductile Iron Wafer Style Butterfly Valve

4"

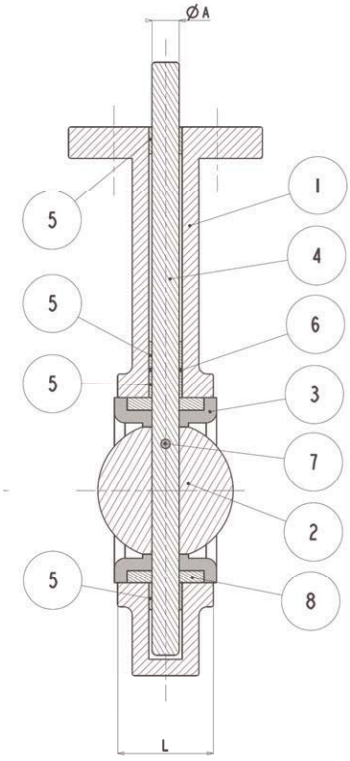


Product Features

- 200 PSI Sizes 2”-12”
- 150 PSI Sizes 14” - UP
- Ductile Iron Body
- Wafer Style Body
- Cartridge Seat
- ISO 5211 Mounting Flange
- MSS-SP-67

Figure Number Breakdown (Example 937DNSL)

Disc Matl.	Seat Matl.	Stem Matl.	Topworks
B = Aluminum Bronze	E = EPDM	M = 316 SS.	L = Lever
D = Ductile Iron w/ Nickel plating	N = Buna N	S = 416 SS.	G = Gear
M = 316 Stainless Steel	------	------	X = Bare Stem



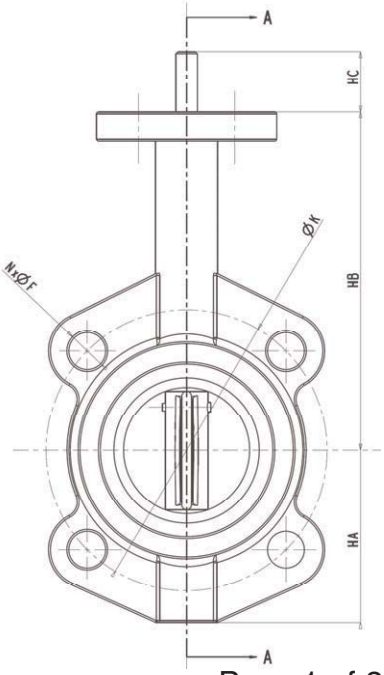
Materials & Specifications

Item	Description	Material
1	Body	Ductile Iron
2	Disc	~~Alum. Bronze~~, Ductile Iron or ~~316 SS.~~
3	Seat	~~Buna or~~ EPDM
4	Stem	416 ~~or 316~~ Stainless Steel
5	Bushings	PTFE
6	O-Ring	NBR
7	Taper Pin	Stainless Steel
8	Seat Support	Plastic

Note: Ductile Iron Disc are electroless Nickel plated

Dimensions, Weights (inches-lbs.) & Valve Data

Size	2”	2-1/2”	3”	4”	5”	6”	8”	10”	12”	14”	16”	18”	20”	24”
HA	2.99	3.5	3.74	4.49	5.0	5.51	6.81	7.99	9.57	10.51	11.73	12.52	13.74	16.14
HB	6.38	6.89	7.13	7.87	8.39	8.86	10.24	11.5	13.27	14.49	15.75	16.61	18.86	22.13
HC	1.26	1.26	1.26	1.26	1.26	1.26	1.77	1.77	1.77	1.77	2.01	2.01	2.52	2.8
L	1.69	1.81	1.81	2.05	2.2	2.2	2.36	2.68	3.07	3.07	4.02	4.49	5.0	6.0
ØK	4.75	5.5	6.0	7.5	8.5	9.5	11.75	14.25	17.0	18.75	21.25	22.75	25.0	29.5
ØF	.75	.75	.75	.75	.88	.88	.88	1.0	1.0	1.12	1.12	1.25	1.25	1.38
ØA	.5	.5	.5	.63	.75	.75	.87	1.13	1.25	1.25	1.31	1.5	1.62	1.99
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Wt. lever	8	9	12	15	20	22	36	46	74	-	-	-	-	-
Wt. Gear	24	25	28	31	36	38	55	65	93	118	177	225	373	538



Seating torques (inch/lbs.)

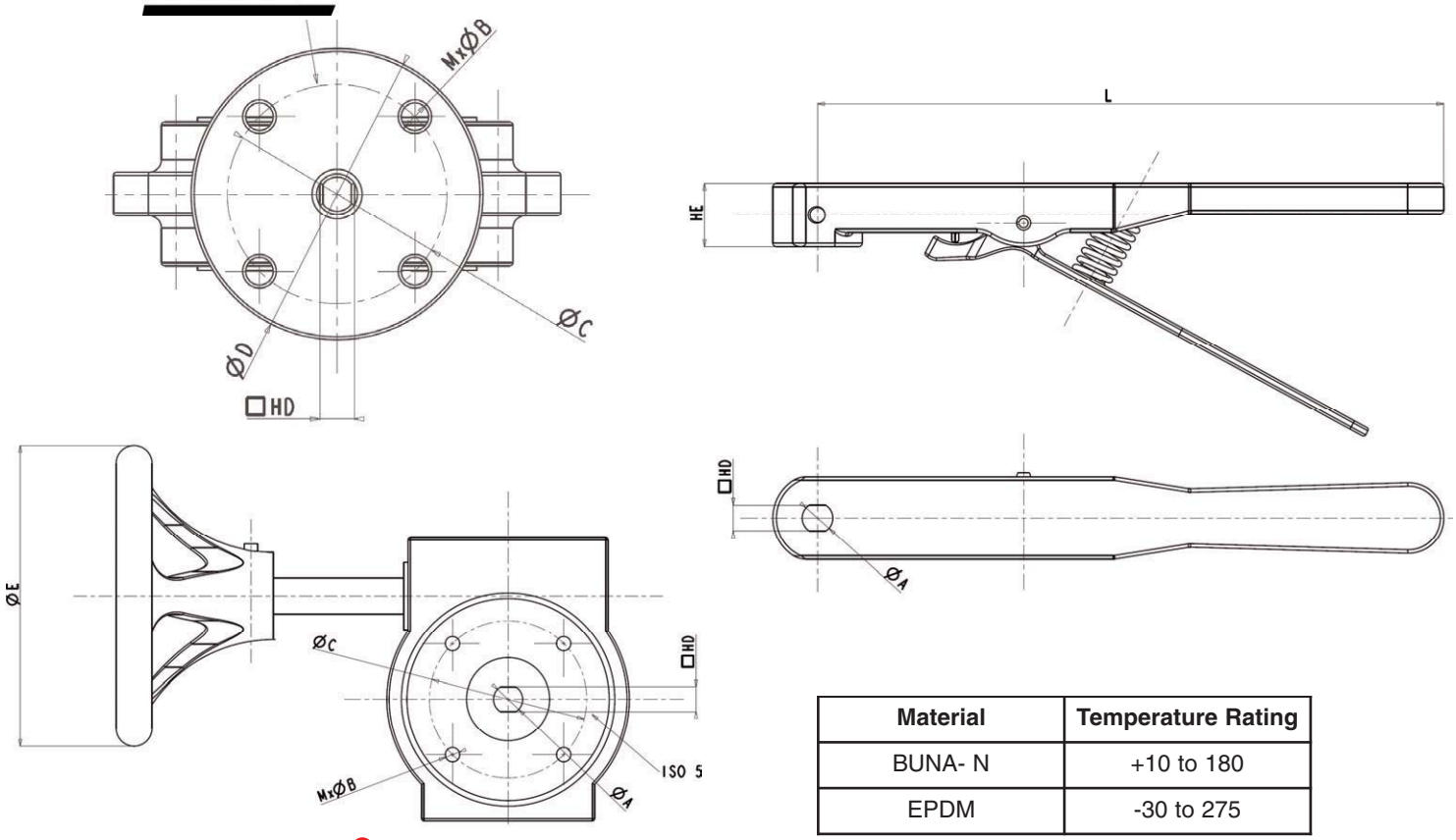
PSI	2”	2-1/2”	3”	4”	5’	6”	8”	10”	12”	14”	16”	18”	20”	24”
50	100	150	207	290	423	599	1060	1671	2568	2640	4260	6287	8360	15427
100	106	163	220	323	481	691	1183	1872	2795	3070	4880	7243	9180	16813
150	111	176	232	357	540	783	1307	2074	3023	3500	5500	8200	10000	18200
200	117	189	244	390	598	875	1430	2275	3250	-	-	-	-	-

All torque values shown are for wet (water and other non-lubricating media) on-off service. For dry services (dry gas, etc.) multiply values by 1.15. For lubed service (clean, non-abrasive lubricating media) multiply values by .85. These values do not include a safety factor. An appropriate safety factor should be used when sizing any actuator.

RED-WHITE VALVE 20600 Regency Lane • Lake Forest, CA 92630
tel: 949.859.1010 • fax: 949.859.7200 • www.redwhitevalveusa.com

Figure # 937

Ductile Iron Wafer Style Butterfly Valve



Material	Temperature Rating
BUNA- N	+10 to 180
EPDM	-30 to 275

Dimensions (inches) of Stem, Lever and Gear Mounting Information

Size	2”	2-1/2”	3”	4”	5”	6”	8”	10”	12”	14”	16”	18”	20”	24”
ØA	.5	.5	.5	.63	.75	.75	.87	1.13	1.25	1.25	1.31	1.5	1.62	1.99
HD	.39	.39	.39	.47	.55	.55	.67	.87	.94	.94	1.06	1.06	1.26	1.42
HE	1.06	1.06	1.06	1.06	1.06	1.06	1.22	1.22	1.22	-	-	-	-	-
L	10.51	10.51	10.51	10.51	10.51	10.51	14.13	14.13	14.13	-	-	-	-	-
E	5.91	5.91	5.91	5.91	5.91	5.91	11.81	11.81	11.81	11.81	11.81	11.81	15.75	15.75
ØC	2.76	2.76	2.76	2.76	2.76	2.76	4.02	4.02	4.92	4.92	6.5	6.5	6.50	10.0
ØD	3.62	3.62	3.62	3.62	3.62	3.62	4.92	4.92	5.91	5.91	8.27	8.27	8.27	11.81
ISO	F07	F07	F07	F07	F07	F07	F10	F10	F12	F12	F16	F16	F16	F25

Cv Values - Valve Sizing (US Gallons/minute at 1PSI drop)

	Degrees Open								
Size	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**
2”	.06	3	7	15	27	44	70	105	115
2-1/2”	.1	6	12	25	45	75	119	178	196
3”	.2	9	18	39	70	116	183	275	302
4”	.3	17	36	78	139	230	364	546	600
5”	.5	29	61	133	237	392	620	930	1022
6”	.8	34	94	153	257	422	706	1154	1320
8”	2	56	154	251	422	693	1158	1892	2165
10”	3	87	238	385	654	1073	1794	2931	3353
12”	4	153	417	681	1145	189	3142	5132	5827
14”	6	183	500	816	1372	2252	3765	6150	7037
16”	8	271	740	1208	2031	3333	5573	9104	10416
18”	11	318	867	1417	2382	3909	6535	10676	12215
20”	14	415	1133	1851	3112	5107	8538	13948	15959
24”	22	543	1482	2421	4069	668	11165	18240	20869

RED-WHITE VALVE 20600 Regency Lane • Lake Forest, CA 92630
tel: 949.859.1010 • fax: 949.859.7200 • www.redwhitevalveusa.com

Activated Carbon Data Sheet

Stags - CV 1100

Applications

VOC Abatement

Odor Control

Air Purification

BTEX Removal

Features / Benefits

High Activity

High Hardness

Low Attrition Rates

High Purity

No Preconditioning Required

Packaging

25 Kg bags

500 Kg bulk bags

Stags

Phone: 713.703.6516

E-mail: info@tetrasolv.com

Stags - CV 1100 is a high activity, coconut based produced via the steam activation process. **Stags - CV 1100** is a high VOC capacity carbon which is excellent for fugitive emissions and odor control. The high hardness and low dust levels makes it very easy to use. **Stags - CV 1100** can be sold separately or part of a turnkey package involving equipment and service.



Specifications

Ball Pan Hardness	99.5
Carbon Tetrachloride Activity	60 min (g/100g)
Iodine Number	1100 mg/g
Apparent Density	0.50-0.52 g/cc
	28 - 30 lbs/ft3
Total Surface Area	1100 m^2/g
Moisture	5% max
Mesh Size +4	less than 5%
Mesh Size –8	less than 5%



CAUTION *Activated carbon can remove oxygen from air under wet or humid conditions. Care should be taken when entering confined spaces where wet activated carbon is present. Use proper breathing apparatus to prevent prolong dust exposure.*

NOTICE *Stags reserve the right to change product specifications without prior notification. The information contained in this datasheet is intended to assist a customer in the evaluation and carbon selection. Stags or any of its affiliations assumes no obligation or liability for the usage of the information in this datasheet. No guarantees or warranties, expressed or implied, are provided and the user must accept full responsibility for performance of carbon based on this data.*

SMALL COMPACT FILTER SILENCERS WITH STANDARD FILTER DESIGN

"FS" Series 1/2" - 3" MPT

APPLICATIONS

Blowers-PD Type	Blowers-Side Channel	Compressor-Piston
Compressor-Screw	Construction\Contractor Industry	Dental
Engines	Hydraulic Breathers - fine filtration	Industrial & Severe Duty
Medical	Pneumatic Conveying Systems	Sparging
Waste Water Aeration	Workshop	

FEATURES & SPECIFICATIONS

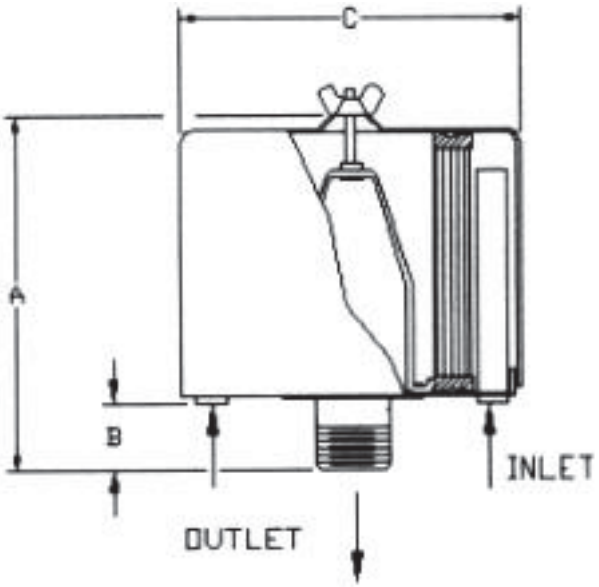
- ;99%+ removal efficiency std: Paper=2 micron, Polyester=5 micron
- Filter change out differential: 10"-15" in. H_2O above initial Delta P
- Interchangeable elements: Polyester, Paper, HEPA
- Pressure drop graphs available upon request
- Tubular silencing design - tube is positioned to maximize attenuation and air flow while minimizing pressure drop
- Durable carbon steel construction with powder coated finish or galvanized steel
- Fully drawn weatherhood - no welds to rust or vibrate apart
- Low pressure drop center bracket and outlet pipe design
- Temp (continuous): min -15° F (-26° C) max 220° F (104° C)
- Typical noise attenuation up to 25 dB's (due to the wide range of applications and machines these units are used on, a single graph is insufficient. Please inquire for your specific requirement)

OPTIONS

1/8" tap holes for differential pressure gauges	Available in *Stainless Steel*	Epoxy coated housings
Hot dipped galvanized housings	Special connections, BSPT/Metric	Various elements available

Line Drawing





***All measurements are shown in standards.**



Add To Order	Model Number	Element Type	Outlet in. NPT or FLG	Connection Style	Dim A in.	Dim B in.	Dim C in.	Rated Flow Piston SCFM	Rated Flow Screw Blower Fan SCFM	Element Parent Flow SCFM	Tube Count	Approx. Weight lbs.
	FS-15-050	Polyester	0.5	MPT	4	1.5	6	10	10	35	1	1.8
	FS-15-075	Polyester	0.75	MPT	4	1.5	6	20	25	35	2	2
	FS-15-100	Polyester	1	MPT	4	1.5	6	25	35	35	3	2.1
	FS-19P-100	Polyester	1	MPT	6.63	1.5	6	35	55	100	3	3
	FS-19P-125	Polyester	1.25	MPT	6.63	1.63	6.1	55	70	100	5	3.3
	FS-19P-150	Polyester	1.5	MPT	6.63	1.5	6	70	85	100	5	3.5
	FS-231P-200	Polyester	2	MPT	12.25	2.25	10	135	135	300	7	14
	FS-31P-200	Polyester	2	MPT	7.25	2.25	10	85	135	195	5	7.8
	FS-231P-250	Polyester	2.5	MPT	12.5	2.5	10	195	195	300	9	14.5
	FS-31P-250	Polyester	2.5	MPT	7.5	2.5	10	100	195	195	5	8.2
	FS-231P-300	Polyester	3	MPT	13	3	10	200	300	300	9	15
	FS-14-050	Paper	0.5	MPT	4	1.5	6	10	10	35	1	1.8
	FS-14-075	Paper	0.75	MPT	4	1.5	6	20	25	35	2	2
	FS-14-100	Paper	1	MPT	4	1.5	6	25	35	35	3	2.1
	FS-18P-100	Paper	1	MPT	6.63	1.5	6	35	55	100	3	3
	FS-18P-125	Paper	1.25	MPT	6.63	1.63	6.1	55	70	100	5	3.3
	FS-18P-150	Paper	1.5	MPT	6.63	1.5	6	70	85	100	5	3.5
	FS-230P-200	Paper	2	MPT	12.25	2.25	10	135	135	300	9	14
	FS-30P-200	Paper	2	MPT	7.25	2.25	10	85	135	195	5	8.2
	FS-230P-250	Paper	2.5	MPT	12.5	2.5	10	195	195	300	9	14.5
	FS-30P-250	Paper	2.5	MPT	7.5	2.5	10	100	195	195	5	8.2
	FS-230P-300	Paper	3	MPT	13	3	10	200	300	300	9	15

Solberg Mfg.
1151 W. Ardmore Ave.·Itasca, IL 60143·(630)773-1363· Fax: (630)773-0727

Test Equipment Depot
1-800-517-8431
99 Washington Street
Melrose, MA 02176
Phone 781-665-1400
Toll Free 1-800-517-8431
Visit us at www.TestEquipmentDepot.com

E-Mon
Energy Monitoring Products

E-Mon D-Mon®
Installation Manual

Class 2000
kWh & kWh/Demand Meter



E-Mon
Energy Monitoring Products

Dear Valued Customer,

We are pleased that you chose to buy one of our products, and want you to be just as pleased with owning it. Before installing your new E-Mon product, please read the information on the following pages carefully.

We believe that you will f nd the E-Mon D-Mon meters easy to install and to use for monitoring and evaluating your electrical usage.

If you have questions, we can handle them quickly and effectively with a telephone call. Please let us try to help you BEFORE you remove your meter. And to help us help you, we ask that you have all relevant information on hand when you call (model or part numbers, nature of diff culty, etc.)

Be sure to forward this manual to the owner after installation is complete, so that they may use it as a reference guide when reading the E-Mon D-Mon meter.

Thank you.

®

Energy Monitoring Products

E-Mon

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* Applies to meters equipped with the Demand option.

1.0 Pre-Installation Information

The E-Mon D-Mon® Class 2000 kWh/Demand meter is a 3-element meter used to monitor electric power usage of individual loads after the utility meter. I**nstallation must only be performed by qualified personnel and in accordance with these instructions and all applicable local and national electrical codes.** E-Mon or its representatives assume no responsibility for damages or injury resulting from the improper installation of this meter.

Meters are supplied in a NEMA 12 steel enclosure appropriate for indoor installation where it will not be affected by the elements, such as moisture and extreme temperatures.

Units designated by the "R" suff x on the model number have an extended environmental operating range and are enclosed in a NEMA 4X enclosure to accommodate outdoor environments.

Verify the input voltage rating and conf guration on the meter label to ensure it is suitable for the intended electrical services. Class 2000 meters labeled for 120/208V service MUST NOT be installed on service feeds of 277/480V and vice versa.

Verify the current sensors are sized suitably for the load to be monitored. Compare the color of the arrows on the current sensors to the chart below to conf rm the correct current sensor is being used.

Sensor Arrow Color Code	Sensor Rating
Brown -	100 Amp
Red -	200 Amp
Y ellow -	400 Amp
Black -	800 Amp
Blue -	1600 Amp
White/Black -	3200 Amp

CAUTION: Internal circuit card components are extremely sensitive to electrostatic discharge. Prior to handling or touching internal circuitry, discharge any static buildup on your person. To discharge yourself, touch a grounded metal object such as conduit or an earth grounded metal enclosure.

WARNING: Use of this instrument, Class 2000, in a manner inconsistent with this manual or not specified by the manufacturer in writing, can cause permanent damage to the unit and/or serious injury to the operator. The protection and safety features provided by this equipment may become impared or otherwise compromised.

NOTE: If any trouble arises during installation or functional verification operations, do not immediately remove unit. Before removing the unit, contact E-Mon's technical support department at (800) 334-3666. E-Mon's technical department will assist you in detailed troubleshooting of the Class 2000 installation.

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1.0 Pre-Installation Information (Continued)

Internal Electronic Assemblies

The unit is comprised of two major subassembly boards, Main Power Board and Display Board. All circuit cards are mounted inside a NEMA 12 (standard) or NEMA 4X (optional) enclosure.



Power Supply Board (Showing MI Conf g.) Display Board

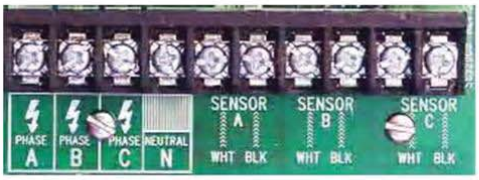
NOTE: Units are supplied in a NEMA 12 metal enclosure suitable for indoor applications only. Units supplied in the optional NEMA 4X f berglass enclosure are suitable for either indoor or outdoor applications, within the def ned specif cations. Refer to Section 12.0 for a def nition of suitable environmental conditions for indoor and outdoor units.

Main Power Board

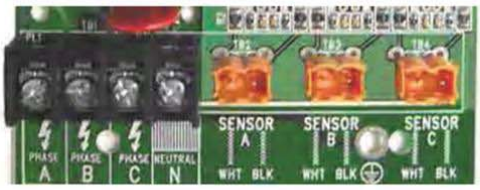
Connections to this board include the MAINS Input Voltage, Current Sensors, external IDR interface and Isolated Pulse Output.

The MAINS input terminals are covered with a protective clear shield for safety purposes. The current sensor assemblies interface to either TB1 (MI conf guration) or to three header connectors, TB2, TB3 and TB4 (MI conf guration). Each header connector input corresponds to an input voltage phase, so care must be taken to ensure each current sensor is connected to the correct input header.

(Standard Conf g.)



(Optional MI Conf g.)



Display Board

The display board connects to the main power board via a f ex-ribbon cable and the board is mounted on the inside of the enclosure door. The display board LCD readout indicates the cumulative kWh (on kWh meters) and instantaneous kW value or cumulative kWh, peak demand and instantaneous kW values (on kWh/ Demand meters). Additionally, errors such as low battery conditions or sensor error conditions are displayed.

2.0 Safety Label Definitions and Information

The Class 2000 meter may contain one or more of the following labels. Operator(s) should familiarize themselves with the meaning of each label to minimize risk.



The presence of this label is a cautionary indicator identifying a danger risk. The manual should be consulted prior to proceeding.



The presence of this label indicates an electrical shock hazard exists in the location or area where the label is placed. Prior to proceeding, the MAINS power must be disconnected and the manual consulted for safety information.

3.0 Precautionary/Safety Information



CAUTION: **Internal circuit card components are extremely sensitive to electrostatic discharge. Be careful not to touch internal circuitry prior to discharging any static buildup on your person. To discharge yourself, touch a grounded metal object such as conduit or an earth-grounded metal enclosure.**



WARNING: High voltages present on main PCB terminal block TB1. Risk of serious injury and/or electrical shock exists. Prior to performing any wiring operations, review all contents of the user manual and de-energize the MAINS power switch. Only qualified personnel should perform installation wiring. Installation wiring must comply with all local and national electrical codes.



WARNING: Failure to ground the enclosure creates a possible shock hazard. Do not operate the Class 2000 meter without a protective earth wire attached securely to the PE terminal screw. After installing protective earth wiring, secure the screw tightly (10 N-m torque.)



WARNING: NEVER open front panel of unit while unit has MAINS power applied. Failure to comply can increase the risk of serious injury and/or electrical shock.

4.0 Meter Installation

4.1 Mounting

STEP 1: Using the appropriate sized mounting hardware, fasten the Class 2000 meter enclosure to the selected mounting surface. The four mounting holes are centered 6.75" H x 4" W. The mounting hole spacing is identical for either the NEMA 12 or NEMA 4X enclosure.

NOTE: Only the NEMA 4X enclosed unit is suitable for outdoor environmental conditions. Units housed in NEMA 12 enclosures must only be installed in indoor environments where it will not be affected by the elements, such as moisture and extreme temperatures.

4.2 Main Power Board Connections

STEP 1: Install a temporary ground for ESD (Electrostatic Discharge) protection. With all circuits de-energized, connect a temporary protective earth ground connection for ESD protection. Prior to performing any unit wiring, be sure to discharge any static on your person.

STEP 2: Install the Class 2000 Protective Earth Ground. Connect an earth ground wire to the Class 2000 protective earth ground terminal screw located on the bottom right side of the main power board. After installing the protective earth ground wire, securely fasten the protective earth ground screw.

WARNING: Failure to attach the protective earth ground wire securely to the enclosure creates a potential shock hazard. Do not operate the Class 2000 meter without a protective earth ground connection securely installed.

STEP 3: Wire Entry

Two openings exist on the unit enclosure, one for 1/2" conduit and one for 3/4" conduit. The 3/4" conduit opening located on the bottom of the enclosure is used to bring in MAINS Power (voltage lines to power meter) and current sensor wiring. The 1/2" conduit opening located on the top of the enclosure is used to interface low voltage signals, such as the IDR interface and isolated pulse output. (Outdoor enclosures equipped with one 3/4" conduit opening on bottom of enclosure only.)

Route the appropriate cabling to and through the respective enclosure opening. The conduit and f ttings interfacing the enclosure entrances must be UL listed and properly sized to the enclosure port diameter, The interfacing f tting must use a gasketed seal ring to interface between the conduit f tting and the enclosure entry point. After installing the conduit f tting and conduit, verify that the conduit f ttings are aligned properly to their respective enclosure entrance ports and tightened securely to prevent moisture entry. VERIFY that each conduit slip nut is securely tightened to its respective conduit f tting.

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4.0 Meter Installation (Continued)

4.2 Main Power Board Connections (Continued)

STEP 3: Wire Entry (continued)

Outdoor applications require the use of the optional NEMA 4X enclosure. The same principles outlined for indoor meter installations as def ned in the aforementioned paragraph carry over and apply to outdoor installations with one exception. This exception is that the conduit and f ttings for outdoor installations require an outdoor material rating.

STEP 4: Unit MAINS Wiring (Voltage Wiring Connections)

Remove the clear shield located over terminal block TB1 on the main power board. This shield can be removed by pressing in on each locking tab located at the top of each standoff. While pressing the tabs inward, lift the shield from the standoffs. Wire each connection to Terminal Block TB1 with stranded wire 14-12 AWG, rated at 600 VAC.

Strip back all wire insulation to expose between 1/4" and 3/8" of the copper conductors. Gently twist each wire to prevent fraying. Insert the conductors into their respective terminal block position and tighten down the terminal block screw to securely fasten the conductor. Terminal block TB1 is clearly labeled PHASE A, PHASE B, PHASE C and NEUTRAL.

Connect the NEUTRAL wire to the appropriate terminal block position.

NOTE: For Delta MAINS input wiring, DO NOT connect the NEUTRAL wire. Remove the terminal block screw for this position.

Connect the AC mains power wires (Phase A, Phase B and Phase C) to their respective positions as labeled on terminal block TB1.

After all conductors are connected to their respective terminal block positions and tightened down, verify that each terminal block screw is securely fastened by gently tugging on each conductor. Verify no conductor wires are frayed or are shorting to adjacent terminal block positions.

STEP 5: External Switch Mechanism/In-Line Fuse Installation

To ensure a safe installation, the Class 2000 meter requires an external switch mechanism, such as a circuit breaker, be installed on the Class 2000 MAINS input wiring. The switch mechanism must be installed in close proximity to the meter and easily reachable for the operator. This device must also be marked as the disconnecting device for the Class 2000 meter.

4.0 Meter Installation (Continued)

4.2 Main Power Board Connections (Continued)

STEP 5: External Switch Mechanism/In-Line Fuse Installation (Continued)

Install 1/10 Amp Slow Activation inline fuses with the suitable voltage rating for each conductor phase at the MAINS input to the meter. The fuses must be labeled to indicate voltage and current rating as well as element characteristics. The fuse element must be slow activating type.

STEP 6: Once the MAINS wiring is complete, replace the clear lexan protective shield over terminal block TB1 and close the enclosure front panel. Secure the enclosure cover using the locking mechanism. Activate the external circuit breaker or equivalent switch to apply AC MAINS power to the unit.

The Class 2000 meter display should turn on and indicate total kWh accumulation reading.

NOTE: The unit display, clock and other critical configuration parameters will be reset once the unit installation and wiring is complete.

STEP 7: Using an AC Voltmeter, verify the input voltage readings are within the limits specif ed below.

NOTE: For 3-Wire systems, the voltages are measured Phase to Phase. On 4-Wire systems the voltages are measured Phase to Neutral.

Meter Input Voltage Conf guration	Nominal Voltage	Limits (+/- 10%)
120/208V, 3 Ph, 4 Wire	120 VAC	108 to 132 VAC
277/480V, 3 Ph, 4 Wire	277 VAC	249 to 305 VAC
240V, 3 Ph, 3 Wire	240 VAC	216 to 264 VAC
480V, 3 Ph, 3 Wire	480 VAC	432 to 528 VAC

STEP 8: Remove power from the unit by de-energizing the external switch.

4.0 Meter Installation (Continued)

4.3 Current Sensor Installation & Wiring

Once the AC voltages have been conf rmed to be within acceptable limits, you are ready to install the current sensors. The MAIN power board contains either a 10-position terminal block (TB1) (standard conf guration) or three header connectors located at the bottom center of the board, TB2, TB3 and TB4 (MI conf guration). If supplied with the TB1 terminal block, the current sensors are connected to the 6 positions on the right side. Both styles are marked with the appropriate phase designation and conductor color. This format must be followed in order for the meter to function correctly.

The Class 2000 meter will be used with one of two basic types of current sensors:

a. Split-Core Current Sensor: This sensor opens so that it can be attached around the circuit conductor being monitored without interrupting power. Unless otherwise specif ed, all Class 2000 meters are supplied with this sensor type.

b. Solid-Core Current Sensor: This sensor does not open and requires the monitored conductor be removed from the circuit to install the current sensor. This type is only supplied when specif ed at time of order.

NOTE: The unit serial label specifies if the unit is set up for split or solid core current sensors.

Both types of current sensors output a 0-2 VAC signal proportional to the current being measured.

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4.0 Meter Installation (Continued)

4.3 Current Sensor Installation & Wiring (Continued)

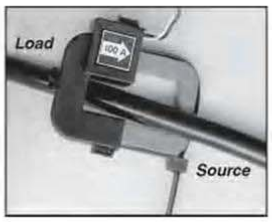
Installing the Split-Core Current Sensor Assembly

STEP 1: Each phase being monitored will require one two-piece current sensor assembly. Therefore, a three-phase meter will require three (3) assemblies. Open the two-piece current sensor assembly by releasing the nylon clamp using a f at head screwdriver.





STEP 2: Reassemble the current sensor assembly around the conductor(s) to be monitored. Ensure the current sensor halves marked "Load" are both facing the load side of the conductor. The colored arrow will be on the source side of the conductor being monitored and MUST be pointed in a clockwise direction around the conductor being monitored. Tighten the nylon clamp to complete the assembly.



IMPORTANT: When looking from the source side of the conductor(s) being monitored, you should see the arrow on the current sensor assembly. The arrow should be pointing in a clockwise direction around the conductor(s) being monitored. If the arrow is not positioned on the source side, inaccurate readings will result.

4.0 Meter Installation (Continued)

4.3 Current Sensor Installation & Wiring (Continued)

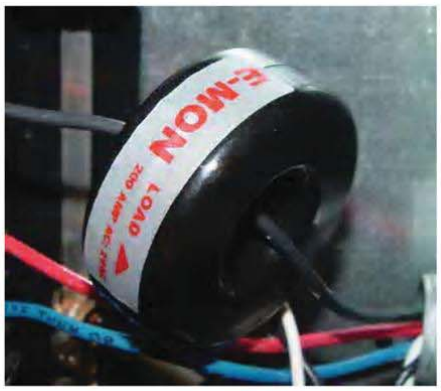
Installing the Solid-Core Current Sensor Assembly

The optional solid-core current sensors can be installed in the same applications as the standard split-core units, however, the conductors that they are monitoring must f rst be disconnected.

NOTE: Under no circumstances is this operation to take place without shutting off the power to the conductor(s) being monitored.

With the power off, disconnect the conductor from its breaker or terminal. Slide the solid-core current sensor over the conductor, making sure that the indicator on the sensor is pointing in the direction of the load. After this is done, reconnect the conductor and verify that it is properly installed.

Run the black and white wires from the solid-core current sensors and install them according to the standard installation diagram. When this is completed, the power to the monitored conductor can be turned back on.



4.0 Meter Installation (Continued)

4.3 Current Sensor Installation & Wiring (Continued)

Current Sensor Wiring

Once all the current sensors are installed on their appropriate phase conductors, you can begin terminating the current sensors on to the Class 2000 main power board.

The current sensor leads can be extended up to 2,000 feet (using #14-22 AWG wire) for remote monitoring applications. Consult your local electrical codes for proper wire sizing (#22 AWG twisted pair wire with a black and white conductor, rated for 600 VAC recommended.)

The current sensor connection points are located on the bottom center of the main power board. If supplied with the terminal block (TB1) (standard conf gura-tion), the current sensors are connected to the 6 positions on the right side.

If your meter is equipped with removable current sensor terminal blocks (MI conf guration), you can f nd the current censor connection points located on the bottom center of the main power board. Three removable plugs exist, one for each current sensor phase input. The header portions of the connectors are labeled TB2, TB3 and TB4. Text silkscreened on each of the connectors instruct you which terminal of the plug is for the white conductor and which terminal is wired to the black conductor. Once each current sensor is wired to its respective plug, insert each plug into the appropriate header.

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4.0 Meter Installation (Continued)

4.4 MAINS Line Voltage & Current Sensor Wiring Diagrams

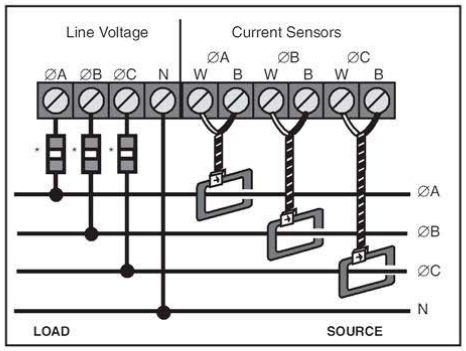
3-Phase, 4-Wire Installation Diagram

Line Voltage Connections: # 14-22 AWG

Sensor Connections: B = Black Lead
W = White Lead

* 1/10 A, 600 VAC inline fuse per conductor. Littlefuse part number KLDR .100.

** Neutral not used in delta system. Remove neutral terminal block screw for Delta systems.



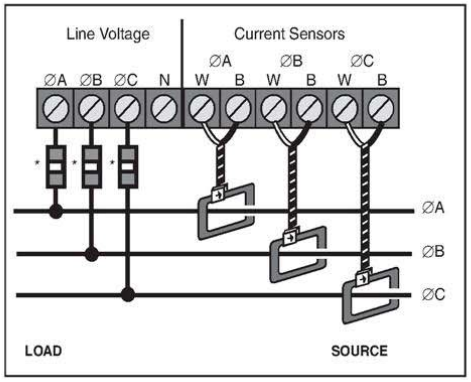
3-Phase, 3-Wire Installation Diagram

Line Voltage Connections: # 14-22 AWG

Sensor Connections: B = Black Lead
W = White Lead

*1/10 A , 600 VAC inline fuse per conductor. Littlefuse part number KLDR .100.

** Neutral not used in delta system. Remove neutral terminal block screw for Delta Systems.

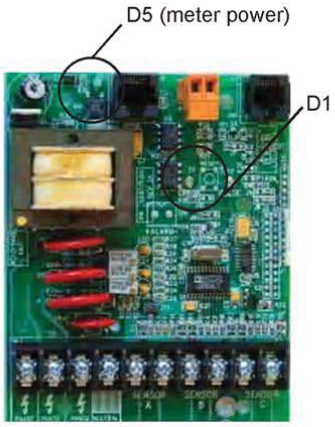


4.0 Meter Installation (Continued)

4.5 Line Voltage/Current Sensor Diagnostics

The three-phase AC MAINS voltage wiring and the current sensor wiring must be connected in the proper phase sequence. If there is a phase sequence error, the display LCD will display a message 'Check Sensor" in the upper right hand corner. Additionally, LED D1, Check Sensor, will illuminate if there is a phasing error.

Verify that the AC MAINS voltage wires are all connected to the correct positions on terminal block TB1. Inspect the MAINS input wiring to verify each conductor is terminated at the correct terminal block position. Using an AC voltmeter, measure the AC voltage for each Phase to Neutral terminal and to the Frame ground point.



(Main Board Standard Conf g. Shown)

Verify each current sensor by running at least 1% of the full scale rated current through the conductor being monitored by each phase. (e.g. 2 amp load required for each phase to perform sensor diagnostic procedures.)

- Verify that the current sensor white and black conductors are installed in the correct header positions.

- Verify the current sensors are installed in the correct direction on the conductor being monitored.

- Verify that the current sensor plugs are terminated in the correct header on the Main power board if meter is equipped with removable ST terminal blocks.

If the error messages still haven't been cleared, measure the AC voltage inputs across the plug terminals of each current sensor, individually. Set the AC volt-meter to the 20 Volt scale. If a reading of zero volts is indicated on the voltmeter, check for an open circuit. An open connection could exist at the plug terminals or at a splicing junction. Also verify a tight connection exists between the core halves.

If error message is still appearing, contact E-Mon technical support at (800) 334-3666 for further assistance.

Final Main Board Checks

Once the phase error has been corrected, the Display LCD "Check Sensor" error should extinguish and the Main Power Board LED D1 should extinguish.

5.0 Monitoring Multiple Loads with One Meter

The Class 2000 meter provides extreme f exibility by allowing additional sets of current sensors to be used in parallel so that multiple load locations can be monitored by one meter. This feature allows a totalized display readout from two or more load circuits.

You may use parallel sensors to monitor specif c breakers from one panel, specif c breakers from more than one panel, two or more complete panels, etc.

When paralleling current sensors, the following rules must be followed for accurate readings:

Rule 1: Current sensors must be installed in complete sets of three, with a maximum of three sensors installed in parallel per phase.

Rule 2: All sensors used in parallel must be of the same amperage rating (i.e. 100 amp, 200 amp, etc.) The rating is determined by the current rating (amperage) of the Class 2000 meter. For example, a 200 amp meter must use extra sets of 200 amp current sensors.

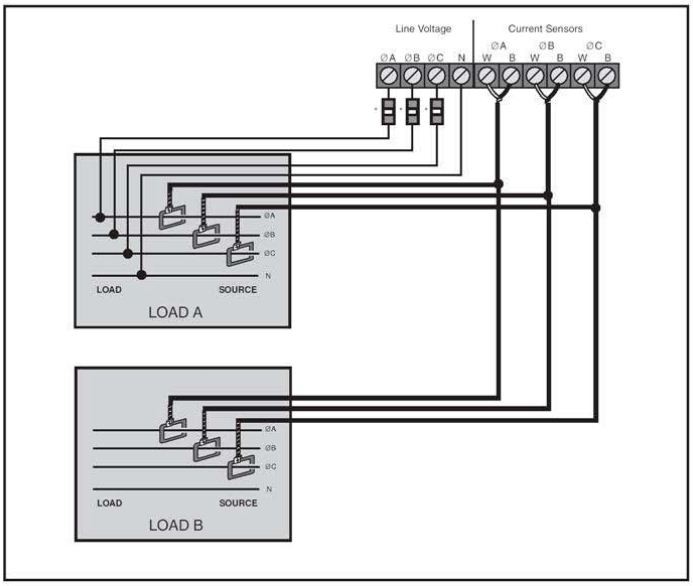
Rule 3: All locations being monitored must have the same power source. A 480 volt meter cannot monitor a 208 volt load nor can a meter monitor two 480 or 208 volt loads if they are from different originating power sources or from different transformers.

Rule 4: The display readings must be multiplied by the number of sets of current sensors installed. E.g. meter reading of 5 kWh with 2 sets of current sensors....5 x 2 = 10 kWh (actual usage.)

NOTE: One set of current sensors equates to three sensors, one per phase. The multiplier only applies when extra sets of current sensors are installed on one meter. Therefore, if you are using only one set of three sensors (one per phase) the multiplier is not required.

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5.0 Monitoring Multiple Loads with One Meter (Continued)



6.0 KWh Meter Features & Functions

6.1 KWh Meter Display Features

Normal Mode (kWh Reading)



The Class 2000 kWh meter display requires no multiplier and shows kilowatt-hours consumed. See section 6.2 for information on calculating cost based on kWh usage.

KW Load Mode (Current Load in kW)



Pressing the "UP" button on the meter display board will switch the display to the Load mode and will show the present load in kW (kilowatts). (Allow 6 seconds for correct reading to stabilize.) This feature is useful to the consumer as it shows the actual load on the meter and can be valuable in showing the effects of large loads-such as air conditioning, electric hot water heaters, and electrical appliances on power consumption. Pressing the "UP" button again returns the meter display to normal mode.

Test Mode

Pressing the "CPU" button on the meter display board will cycle the display through the test mode. The two screens below will be seen.





The f rst screen activates all the digits and icons on the display. This is to verify that all segments on the display are functional.

The second screen will show the amp rating of the meter. The f rst digit (on the left side of the dash) will always be zero on the kWh meter. The four digits on the right side of the dash indicate the amp rating.

Upon completion of the cycling, the meter will return to the normal display mode. When the meter is f rst energized it will automatically cycle through the test screens.

6.0 KWh Meter Features & Functions (Continued)

6.2 How to read the kWh Meter



The Class 2000 kWh meter displays readings in whole numbers, there are no decimals.

To f nd the dollar cost for the power used by the load(s) being monitored, you must f rst f nd out what the cost per kWh is in your area (this cost can be found on your utility electric bill, or call your local utility and ask for their cost per kilo-watt hour.) Simply multiply the cost per kWh by the kWh reading from the E-Mon D-Mon meter. The resultant f gure is the dollar cost for power used by the load(s) being monitored by this meter.

Example:

8-digit display reading	00000250
Cost per kWh from utility	$0.12100

250 x $0.121 = $30.25

NOTE: THE FOLLOWING ONLY APPLIES TO METERS USING MORE THAN ONE SET OF CURRENT SENSORS. For meters using parallel current sensors you must multiply the kWh display reading by the number of sets of current sen-sors installed.

Example:

250 (meter display reading) x 2 (sets of sensors in parallel) = 500 kWh

500 kWh x $0.121 (utility cost per kWh) = $60.50

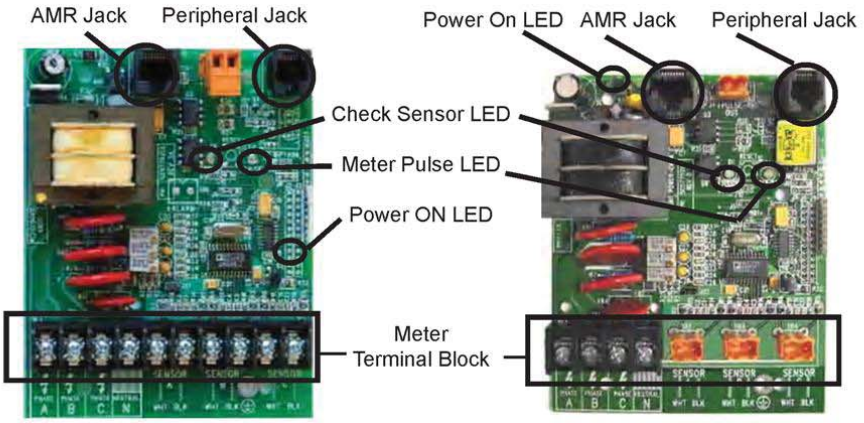
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6.0 KWh Meter Features & Functions (Continued)

6.3 KWh Meter Hardware Functions

AMR Jack	8-pin RJ-45-used to connect kWh meter to the E-Mon Energy automatic meter reading system.
Peripheral Jack	6-pin RJ-11-used to interface with E-Mon meter options such as the P2 Pulser or D/A Converter.
Check Sensor LED	When lit, indicates that the current sensor is backwards or on the incorrect phase.
Meter Pulse LED with	Blinks to show the meter load. Blink rate increases load.
Power On LED	When lit, indicates power to meter is on.
Real-Time Load PB	Press (UP) once and wait 6 seconds to display present load in kW, press again to return to standard kWh display (update is not instantaneous.)
Reset PB	Press (RESET) to reset display to zero.
Display Test PB	Press (CPU) to test display. Shows "88888888" then amp rating of meter.
DIP Switch personnel.	Meter set-up. Used ONLY by E-Mon factory
CPU Active LED	One blink per second indicates normal operation.

Main circuit board located inside meter enclosure

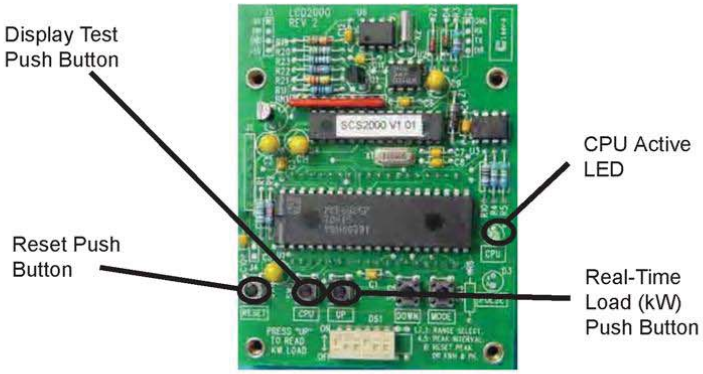


Standard Conf guration MI Conf guration

6.0 KWh Meter Features & Functions (Continued)

6.3 KWh Meter Hardware Functions (Continued)

Circuit board located inside door of meter enclosure.



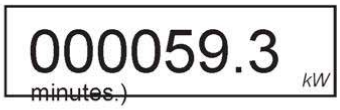
7.0 KWh/Demand Meter Features & Functions (Only applies to meters ordered with the Demand Option)

7.1 KWh/Demand Meter Display Functions

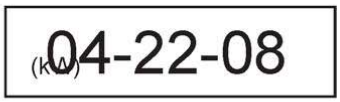
The Class 2000 kWh/Demand meter has a single display window that cycles through the energy data screens. The meter will cycle through four (4) separate screens. The screens are described below.



KWh display shows the amount of energy consumed in kilowatt hours (kWh). Reading is in whole numbers, there are no decimals and the meter requires no multipliers.



KW display shows the electrical Demand in kilowatts (kW). Demand interval is either 15 minutes or 30 minutes. (Default is 15



Date display shows the date of the demand peak.



Time display shows the time of the day that demand peak occurred.

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7.0 KWh/Demand Meter Features & Functions (Only applies to meters ordered with the Demand Option)

7.2 How to Read the kWh/Demand Meter

KWh Reading



The Class 2000 kWh meter displays readings in whole numbers, there are no decimals.

To f nd the dollar cost for the power used by the load(s) being monitored, you must f rst f nd out what the cost per kWh is in your area (this cost can be found on your utility electric bill, or call your local utility and ask for their cost per kilowatt hour.) Simply multiply the cost per kWh by the kWh reading from the E-Mon D-Mon meter. The resultant f gure is the dollar cost for power used by the load(s) being monitored by this meter.

Example:

8-digit display reading 00000250
Cost per kWh from utility $0.12100

250 x $0.121 = $30.25

KW (Demand) Reading



The kW (Demand) reading is the peak usage over a specif ed time period (15 minute standard, 30 minute optional). While kWh costs are interpreted as cents, Kilowatt costs are usually represented in dollars, and interpretation of demand costs are based on your utility's tariff and rate structures. You will need to contact your utility to see how your utility structures their kilowatt demand charges to ensure proper allocation of costs utilizing data from the E-Mon D-Mon meter.

NOTE: THE FOLLOWING ONLY APPLIES TO METERS USING MORE THAN ONE SET OF CURRENT SENSORS. For meters using parallel current sensors you must multiply the kWh display reading by the number of sets of current sensors installed.

Example:

250 (meter display reading) x 2 (sets of sensors in parallel) = 500 kWh

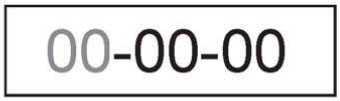
500 kWh x $0.121 (utility cost per kWh) = $60.50

7.0 KWh/Demand Meter Features & Functions (Only applies to meters ordered with the Demand Option)

7.3 KWh/Demand Display Set-Up

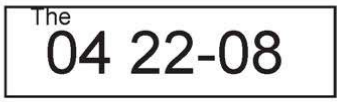
The demand meter display is set-up using the Mode Select, Up and Down buttons located on the meter display board which is mounted on the door inside the meter enclosure. The CPU Reset button may also be utilized for certain functions. (See Section 7.4 for details on button locations.)

STEP 1: Date Setting



Press the Mode Select button and the display screen shown will appear. The date is entered MM-DD-YY. A zero will proceed a single digit entry. Using the Up and Down buttons, enter the correct numbers. After entering the correct number in the f rst set of digits, press the Mode Select button to move to the next set of digits. When completed, pressing the Mode Select button will advance the display to the next screen.

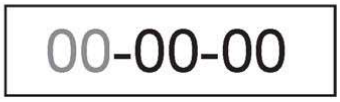
STEP 2: Day of Week and Time Setting



Time shown is Wednesday, 10:08 pm

The f rst section of the next screen calls for the entry of the recent day of the week. Using the Up and Down buttons, enter “1” for Sunday, “2” for Monday, “3” for Tuesday, “4” for Wednesday, “5” for Thursday, “6” for Friday or “7” for Saturday. This is important so the meter can automatically keep track of daylight savings time. Using the Mode Select button, move to the next f eld where the hour is entered through the Up and Down buttons. As the meter uses a 24 hour clock, this number will be from 1 to 24. (eg. 2:00pm=14). The f nal f eld will be the minute display which is also entered by pressing the Up and Down buttons. Again, press the Mode Select button to move to the f nal display screen.

NOTE: When the meter is first energized, or after pressing the CPU Reset button, the display will appear as seen below:

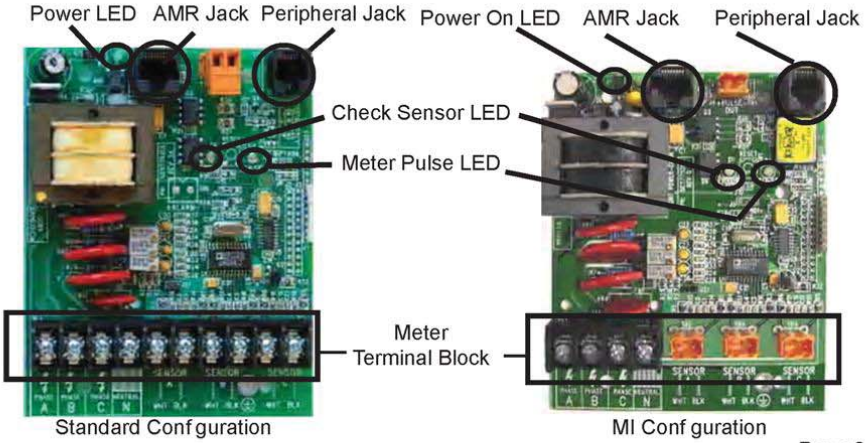


7.0 KWh/Demand Meter Features & Functions (Only applies to meters ordered with the Demand Option)

7.4 KWh/Demand Meter Hardware Functions

AMR Jack	8-pin RJ-45-used to connect kWh meter to the E-Mon Energy automatic meter reading system.
Peripheral Jack	6-pin RJ-11-used to interface with E-Mon meter options such as the P2 Pulser or D/A Converter.
Check Sensor LED	When lit, indicates that the current sensor is backwards or on the incorrect phase.
Meter Pulse LED with	Blinks to show the meter load. Blink rate increases load.
Power On LED	When lit, indicates power to meter is on.
Real-Time Load PB	Press (UP) once and wait 6 seconds to display present load in kW, press again to return to standard kWh display (update is not instantaneous.)
Reset PB	Press (RESET) to reset display to zero.
Display Test PB	Press (CPU) to test display. Shows "88888888" then amp rating of meter.
DIP Switch personnel.	Meter set-up. Used ONLY by E-Mon factory
CPU Active LED	One blink per second indicates normal operation.

Main circuit board located inside meter enclosure



Standard Configuration MI Configuration

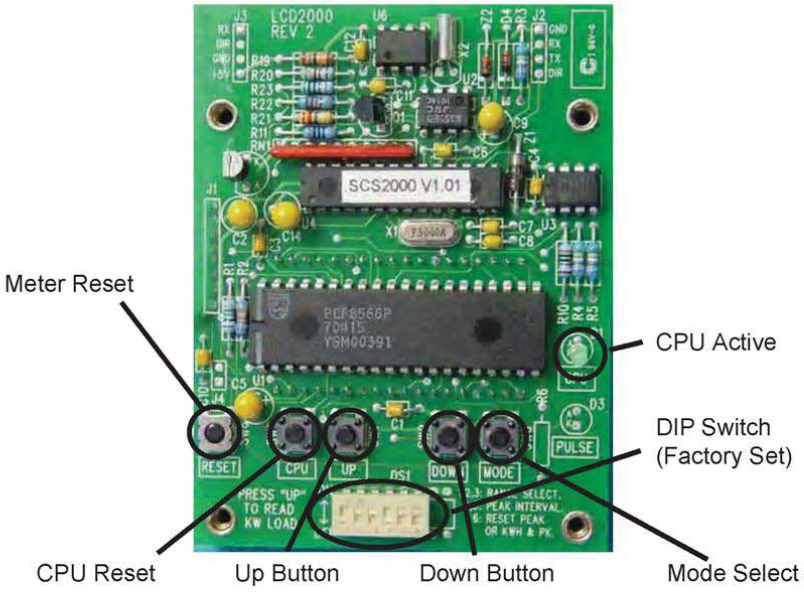
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7.0 KWh/Demand Meter Features & Functions (continued) (Only applies to meters ordered with the Demand Option)

7.4 KWh/Demand Meter Hardware Functions

CPU Active operating.	LED (D1) blinks indicating the CPU is active and
Mode Select	Button used to select adjustment mode when setting up the meter (clock adjust, date adjust, input select.)
Down Button	Used when adjusting time and date for meter display.
Dip Switch	For use by E-Mon factory personnel only.
Up Button	Used when adjusting time and date for meter display.
CPU Reset	Resets the CPU; Used by f eld service personnel.
Meter Reset	All meter display readings reset to zero.

The picture below shows the various hardware points on the KWh/Demand meter display board that are utilized when setting up the meter for operation. The board is located on the inside of the door of the meter and is accessible by opening the enclosure. A padlocking hasp is provided on the meter enclosure to prevent unauthorized access. The functions of these hardware points are outlined above.



8.0 Preventative/Scheduled Maintenance

The Class 2000 kWh/Demand meter is shipped in a calibrated, tested and fully functional condition.

- All potentiometers are sealed. No f eld adjustments are required.

- No preventative or scheduled maintenance is required.

- No cleaning or decontamination procedures are required for this instrument.

9.0 Lithium Battery Replacement Instructions

The Class 2000 kWh/Demand meter has a Lithium Battery Cell, which is used to retain the contents of SRAM and the RTC during power outages. The battery has a life expectancy of greater than 8 years.

Battery Specif cations:	25 Degrees Celsius
Nominal Working Voltage:	3.5 VDC Output
Nominal Current Capacity:	350 mAHr
Cell Chemical: Lithium-Thionyl	Chloride
Operating Temperature Range:	-40 to +95 Degrees Celsius
Manufacturer: Eagle-Picher	
Manufacturer's Part Number:	LTC-3PN-S2

WARNING: Only replace battery with exact manufacturer and manufacturer's part number specified above.



The battery cell is mounted in a socket on the right side of the main power board. Should the battery drop below 2.4 VDC in capacity, the display will illuminate a battery symbol on the left margin indicating a low condition. Additionally, the internal f rmware will set a f ag indicating the low battery condition. Use the following procedure to replace the lithium battery cell.

CAUTION: The battery is not completely discharged, therefore DO NOT short the terminals on the battery with any conductive material.

CAUTION: Internal circuit card components are extremely sensitive to electrostatic discharge. Be careful not to touch internal circuitry prior to discharging any static buildup on your person. To discharge yourself, touch a grounded metal object such as conduit or a metal enclosure exterior.

9.0 Lithium Battery Replacement Instructions (Continued)

STEP 1: Disconnect power from the meter at the unit external circuit breaker.

STEP 2: Remove the battery from its socket and place on a non-conductive surface.

STEP 3: Install new battery into the PCB battery socket.

NOTE: Observe polarity of battery terminals. Be sure to align battery terminal polarities with pcb silkscreen markings. No damage to unit or battery will occur if battery is inadvertently installed in the wrong direction.

STEP 4: Visually inspect new battery to verify that all leads are fully inserted into their respective socket positions.

STEP 5: Dispose of the used battery in accordance with the manufacturers' (Eagle Picher) instructions.

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10.0 Troubleshooting

The Class 2000 kWh/Demand meter is calibrated and tested at the factory before being packaged and shipped. If installed properly and in accordance with these installation instructions, your Class 2000 meter should provide years of trouble-free service. If the meter should not function, the following guide will assist in troubleshooting the installation.

Problem	Procedure to follow
1. Display window is blank.	A. Check wiring to voltage terminals. B. Check circuit breakers or fuses. C. Verify that the power is turned on. D. Test source for correct voltage.
2. Display shows incomplete f gures or numbers other than zeros when power is turned on.	A. Press RESET button located on door inside meter enclosure (5 sec.)
3. Display reading all zeros (00000000)	A. Determine if load is suff cient to update the display. B. Check RESET button to ensure there are no wires or other objects pressing against it when the door is closed. C. Check the current sensors for installation and polarity. D. Be sure the current and voltage inputs have the proper phase relationship. E. Check wiring to voltage terminals. F. Check circuit breaker or fuses. G. Test source for correct voltage.
4. Display reads only a fraction of consumption	A. Check the supply voltage to be sure that it is on continuously 24 hrs/day. B. Check the current sensors for installation and polarity. C. Check sensor wiring to the terminal strip in meter (color coding B & W.)

NOTE: If you still need assistance after performing the above troubleshooting procedures, do not remove the unit. Before removing the unit, contact E-Mon's technical support department at (800) 334-3666, our support experts will assist you in detailed troubleshooting of the meter installation and assist you in getting the unit operating correctly.

11.0 Frequently Asked Questions

Q. When providing line voltage to the meter, can I tap off of the same breaker I am monitoring?

A. Yes, the voltage can be pulled from the same breaker being monitored.

Q. Can the meter's line voltage wires be run in the same conduit as the sensor leads?

A. Yes, there will be no effect on the meter if the sensor leads and line voltage wires are run in the same conduit.

Q. Can the meter communication wires and line voltage wires be run in the same conduit?

A. It is NOT recommended to run these wires together due to noise concerns and their effects on the communications signal integrity. Communication wires can be routed separately using the 1/2" conduit port.

Q. How do I find the cost for kWh and kW to bill my tenants?

A. Your local utility bill should list the cost per kWh and kW. If not, simply call your utility and ask them to provide you with the cost per kWh and kW.

Q. What size wire do I use for the line voltage leads?

A. These wires are normally #14 AWG, but be sure to consult your local electrical codes for proper sizing requirements.

Q. What size wire should I use to extend the current sensor leads?

A. These wires are normally sized at #14-22 AWG, twisted pair arrangement. Consult your local electrical codes for proper sizing requirements.

Q. The load I need to monitor has parallel feeds. How do I install the current sensors for this application?

A. There are two ways you can monitor parallel feeds. One method is to clamp the sensors around all feed wires for each phase (no additional reading multiplier required). The second way to monitor parallel feeds is to clamp the sensor around one of the feed wires for each phase, and when you read the kWh meter the f nal reading must be multiplied by the number of feed wires for each phase.

Q. I have two subpanels I would like to monitor with one meter. These subpanels are fed by different transformers in the building. Can I parallel sensors and monitor both panels with one meter?

A. No. These panels cannot be monitored by one meter because they are different power sources. When you parallel current sensors, all loads must be from the same voltage source.

Q. I have 5 breakers in one subpanel I would like to monitor with one meter. Can this be done without having to parallel current sensors?

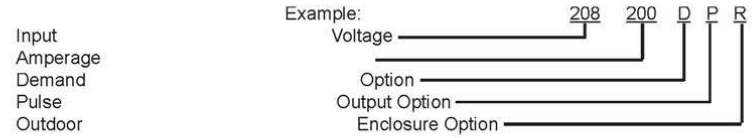
A. Yes. Simply run all the breaker wires through one set of current sensors. Make sure all A phase circuits are run through the A phase sensor, and the same for B & C phases. The meter should be sized by the highest amount of current being monitored by one sensor.

Q. I've gone through the troubleshooting guides and I still can't get my meter to work. What should I do?

A. Before removing the unit, contact E-Mon's technical support department at (800) 334-3666. Our technical support experts will assist you in detailed troubleshooting of the meter installation and assist you in getting the meter functional without having to remove and return the unit.

12.0 Meter Technical Specifications

Ordering Information: Def ne input voltage, current sensor rating (amperage) and options.



Input Voltage Conf guration:		3-Wire (Delta) or 4-Wire (Wye)
MAINS Voltage Input:		Up to 480 VAC RMS Available
Input Power:	6V	A Maximum Rating
Current Sensor Rating:		Up to 3200 Amp RMS AC Available
Power Factor:		.5 leading or lagging
Line Frequency:	50-60	Hz
Metering Accuracy:	Certi	f ed to ANSI C12.16 (+/- 1% from
1%		to 100% of rated load)
Voltage Operating Range:		+/- 10% of rated load
Temperature Range (Standard indoor enclosure):		-20 degrees C to +50 degrees C
Temperature Range: (NEMA 4X outdoor enclosure):		-20 degrees C to +70 degrees C
Relative Humidity Range:		0-95% Non-Condensing
Altitude:	2000	meters maximum
Voltage Overload:		+25% Continuously; +100% for 20 Cycles
Current Sensor Overload:		100% for 1 minute without damaging meter
Pollution Degree:		Degree 2 in accordance with IEC 664
Installation (Overvoltage) Category:		Category III
Measurement Category:	Category	III
Indoor Housing Rating (Standard):		NEMA 12
Outdoor Housing Rating (Optional):		NEMA 4X
Display Readout:	KWh	Accumulated, Peak Demand,
Instantaneous		kWh
Standard Ranges:	4-Wire Wye, 120/208 VAC:	100, 200, 400, 800, 1600 and 3200 Amp
	2 Phase, 120/240 VAC:	100, 200, 400, 800, 1600 and 3200 Amp
	4-Wire Wye, 277/480 VAC:	100, 200, 400, 800, 1600 and 3200 Amp
	3-Wire Delta, 220/240 VAC:	100, 200, 400, 800, 1600 and 3200 Amp
	3-Wire Delta, 480 VAC:	100, 200, 400, 800, 1600 and 3200 Amp

IDR Interface Port:	Cable Specif catons:		UL Listed/Rated Telephone Cord, 6-conductor
300			VAC, stranded conductors, 22-26 AWG.
Input/Output	Voltage:	+5	VDC/18 VAC
Cable	Connector:	RJ-45	male IDC
	Ckt Input Isolation:		5.3K VAC for 1 Minute
Ckt	Output Isolation:	2.5K	VAC

Isolated Pulse/Alarm Outputs (TB5, TB6):		
	Output Voltage Potential:	0 VDC to +5 VDC Logic Levels
	Mating Plug Connector:	Weidmuller PN: 152876
	Signal Isolation Voltage:	5.3K VAC for 1 Minute

Recommended in-Line Fuse:			
Manufacturer:		Littlefuse	
Mfg	Part No.:	KLDR.100	
	Rating:		100mA, Time Delay, 600 VAC Cartridge Fuse

Battery Cell:	Description:		Non-rechargeable cell used for memory
retention.			
Manufacturer:		Eagle-Picher	
Mfg	Part No.:	L	TC-3PN-S2
W	orking Voltage:	3.5	VDC
Current	Capacity:	350mAHr	
Electrolyte:	Lithium		Thionyl Nitrate

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13.0 Meter Limited Warranty

Subject to the exclusions listed below, E-Mon will either repair or replace (at its option) any product that it manufactures and which contains a defect in material or workmanship.

The following exclusions apply:

1. This Limited Warranty is only effective for a period of (5) f ve years following the date of manufacture when installed in accordance with manufacturer's instructions by qualif ed personnel.

2. E-Mon must be notif ed of the defect within ninety (90) days after the defect becomes apparent or known.

3. Buyer's remedies shall be limited to repair or replacement of the product or component which failed to conform to E-mon's express warranty set forth above.

4. Buyer shall be responsible for all freight costs and shall bear all risk of loss or damage to returned goods while in transit.

5. This Limited Warranty does not cover installation, removal, reinstallation, or labor costs, and excludes normal wear and tear. Buyer shall provide labor for the removal of the defective component or item and installation of its replacement at no charge to E-Mon.

6. This Limited Warranty does not cover any product if: (i) a product is altered or modif ed from its original manufactured condition, (ii) any repairs, alterations or other work has been performed by Buyer or others on such item, other than work performed with E-Mon's authorization and according to its approved procedures; (iii) the alleged defect is a result of abuse, misuse, improper maintenance, improper installation, accident or the negligence of any party; (iv) damaged as a result of events beyond E-Mon's control or other force majeure events or (v) used in conjunction with equipment, components, accessories, parts or materials not supplied or approved by E-Mon.

7. This Limited Warranty is limited to the obligation to repair or replace the manufactured product. This is the sole and exclusive remedy for any breach of warranty. IN NO EVENT SHALL E-MON BE LIABLE FOR ANY INDIRECT, INCIDENTAL, SPECIAL, CONSEQUENTIAL OR PUNITIVE DAMAGES (INCLUDING ANY DAMAGE FOR LOST PROFITS) ARISING OUT OF OR IN CONNECTION WITH THE FURNISHING OF PRODUCTS, PARTS OR SERVICES, OR THE PERFORMANCE, USE OF, OR INABILITY TO USE ANY PRODUCTS, PARTS OR SERVICES, SALE OF OR OTHERWISE, WHETHER BASED IN CONTRACT, WARRANTY, TORT, INCLUDING WITHOUT LIMITATION, NEGLIGENCE, OR ANY OTHER LEGAL OR EQUITABLE THEORY.

8. EXCEPT AS EXPRESSLY PROVIDED HEREIN, E-MON MAKES NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED WITH RESPECT TO ANY PRODUCTS, PARTS OR SERVICES PROVIDED BY E-MON INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. PRODUCTS OR COMPONENTS DISTRIBUTED, BUT NOT MANUFACTURED, BY E-MON ARE NOT WARRANTED BY E-MON AND BUYER MUST INSTEAD RELY ON THE REPRESENTATIONS AND WARRANTIES, IF ANY, PROVIDED DIRECTLY TO THE BUYER BY THE MANUFACTURER OF SUCH PRODUCT OR COMPONENT.

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Measurement Accessories

Blower Connection Key
NPT – American National Standard Taper Pipe Thread (Male)
NPSC – American National Standard Straight Pipe Thread for Coupling (Female)
SO – Slip On (Smooth – No Threads)

Air Flow Meter

FEATURES

- Direct reading in SCFM
- Low pressure drop (2-4" typical) across the flow meter
- Non-clogging, low impedance air stream
- Light weight aluminum
- No moving parts
- Large easy-to-read dial
- Accurate within 2% at standard conditions
- Good repeatability
- Available in 2", 3" and 4" sizes
- Factory configured for quick installation
- .048" Allen key supplied for gauge adjustment

OPTIONS

- For 4-20 mA outputs and digital readouts see page G-9
- High temperature version (above 140°F)
- Corrosion-resistant version with Chem-Tough™ or in stainless steel
- FDA-approved Food Tough™ surface conversion
- High pressure version (100 PSI)

BENEFITS

- OPTIMIZE SYSTEM EFFICIENCY
  Measuring the correct air flow can assist you in fine-tuning to your system's optimal efficiency.
- BALANCE MULTI-PIPING SYSTEMS
  When evacuating CFM from more than one pipe, different run lengths or end system impedance can cause one pipe to handle more CFM than the other. With an accurate CFM reading, piping can be balanced by bleeding air in/out or by creating an extra impedance.
- DETECT CHANNELING OR PLUGGING
  For systems in which channeling or plugging can occur, a change in the CFM measured can help indicate the unseen changes in your system.



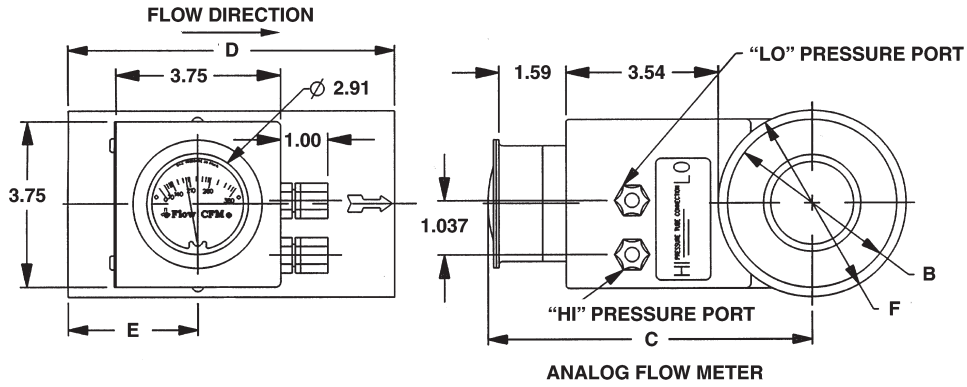
Current Models		Flow Range	B	C	D	E	F
Model	Part #	(SCFM)	Threads	Length	Width		
FM20C030Q	550599	6-30	2" - 11.5 NPSC	7.18"	7.0"	2.0"	3.75"
FM20C045Q	550600	9-45					
FM20C065Q	550601	13-65					
FM20C125Q	550602	25-125			5.6"		
FM20C175Q	550603	35-175					
FM20C225Q	550604	45-225					
FM30C250Q	550605	50-250	3" - 8 NPSC	7.52"	7.4"	2.5"	4.43"
FM30C350Q	550606	70-350					
FM30C475Q	550607	95-475					
FM40C450Q	550608	90-450	4" - 8 NPSC	8.00"	7.7"	2.7"	5.43"
FM40C600Q	550609	120-600					
FM40C850Q	550610	170-850					

Rev. 2/01

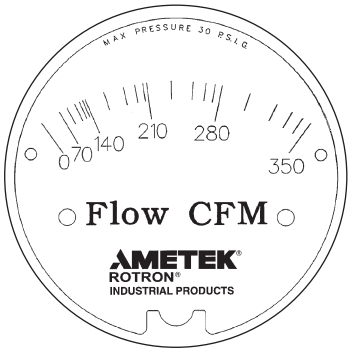
Blower Model Reference Key	
A = SPIRAL	E = DR/EN/CP 656, 6, 623, S7
B = DR/EN/CP 068, 083, 101, 202	F = DR/EN/CP 707, 808, 858, S9, P9 (Inlet Only)
C = DR/EN/CP 303, 312, 313, 353	G = DR/EN/CP 823, S13, P13 (Inlet Only)
D = DR/EN/CP 404, 454, 513, 505, 555, 523	H = DR/EN/CP 909, 979, 1223, 14, S15, P15 (Inlet Only)

Measurement Accessories

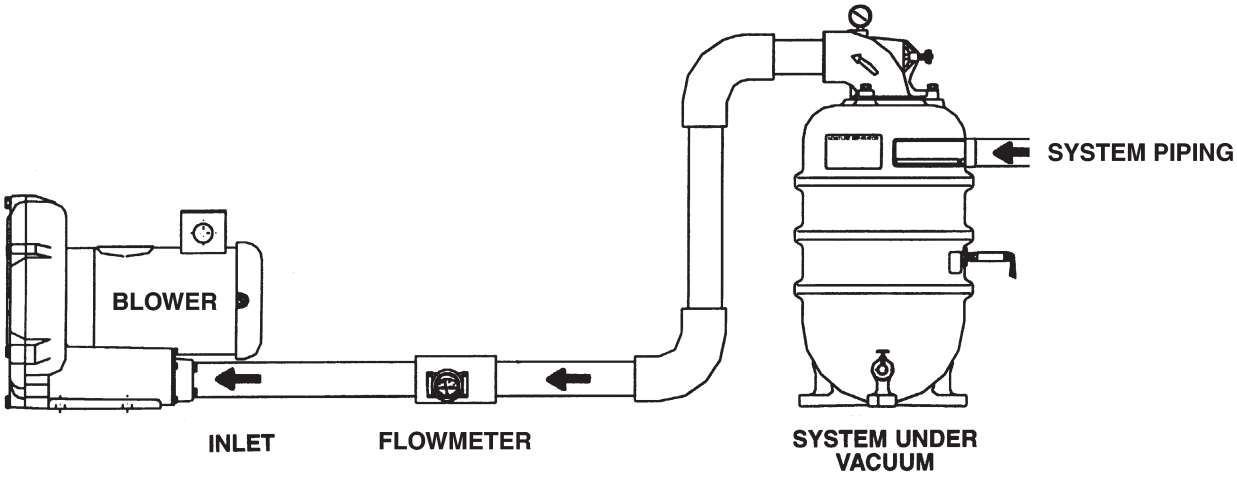
TYPICAL FLOW METER ARRANGEMENT



ANALOG FLOW METER



TYPICAL GAUGE FACE



HIGH TEMPERATURE/PRESSURE CORRECTION

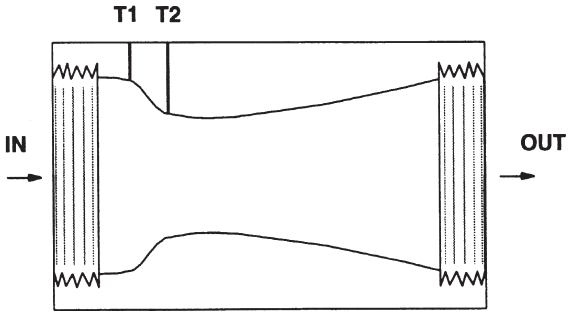
$$SCFM_2 = \frac{SCFM_1}{-\left(\frac{14.7}{Pf_2}\right) \times \left(\frac{530}{Tf_2 + 460}\right)}$$

Pf_2 = Absolute Pressure in PSIA

Tf_2 = Temperature in °F

- Use on inlet to limit need to correct for high pressure or elevated outlet temperature
- Standard model limits = 140°F and 30 PSIG

HOW IT WORKS



Rotron's flow meter is a venturi style design. After air enters the inlet, the pressure is measured in the T1 tap. The second tap, T2, measures the pressure at the throat. The differential between T1 and T2 registers across a special calibrated CFM gauge to provide accurate readings. The throat is then expanded back to the original size to keep pressure loss to under 2-4 IWG.

PRUDEN VENTILATION J&D

J&D Manufacturing

EXTREME AIR

LEADERS IN MOVING THE WORLD'S AIR

ES Shutter Fan With or Without Cord

J&D Manufacturing's ES Shutter Fan is a durable agriculture grade exhaust fan perfect for barn and building peaks, greenhouses, warehouses and more. ES Shutter Fans are available without a cord, or pre-wired with a cord and plug for "No Electrician Required" installation. Fans ship fully assembled out of the box so you're up and running in no time!



No Electrician Required for Corded Models

Features

- Smooth and quiet operation
- Comes totally assembled out of the box
- Models with cord are pre-wired for 115 Volts with 3-prong plug. No electrician required.
- Balanced 3 bladed aluminum prop with a zinc plated steel hub
- Chrome guard allows for easy cleaning and meets OSHA 1910.212(a)(5) requirements to mount at any height on inlet side of fan. (When mounted, shutter side should be 7' above ground.)

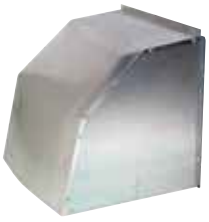


- High efficiency aluminum shutters with tie bar to eliminate shutter flapping and opening on windy days
- Energy efficient, totally enclosed, maintenance free, direct drive high efficiency motors have completely sealed ball bearings, covered by a **Full Two Year Warranty**.

MADE IN U. S. A.

Optional Weather Hood

Shutter Fan Size	Weather Hood
10"	VFT140855
12"	VFT140855
16"	VFT140856
20"	VFT140857
24"	VFT140858
30"	VFT140859



Weather hood for exterior shutter side

Part#	Size	HP	Volt	Amps	HZ	Phs	Spd	CFM @.0" SP	CFM / Watt Hi / Low @.0" SP	CFM @.05" SP	CFM / Watt Hi / Low @.05" SP	RPM Hi / Low	Rough Opening
With Cord													
VES10C	10"	1/8	115	0.8	60	1	3	697	12/9	670	11/9	1,706/1,390	12½" x 12½"
VES12C	12"	1/10	115˜	1.0	60	1	S/Var^	1,846	9/7	1,775	9/7	1,625/600	12½" x 12½"
VES161C	16"	1/10	115˜	1.0	60	1	S/Var^	2,951	12/9	2,810	11/9	1,625/600	16½" x 16½"
VES201C	20"	1/10	115˜	1.0	60	1	S/Var^	3,233	12/10	3,050	12/9	1,625/600	20½" x 20½"
VES20C	20"	1/3	115˜	3.5	60	1	S/Var^	5,077	13/10	4,790	12/10	1,725/600	20½" x 20½"
VES24C	24"	1/2	115˜	4.8	50/60	1	S/Var^	6,487	17/14	6,120	16/12	1,725/600	24½" x 24½"
VES30C	30"	1/2	115˜	5.1	50/60	1	1	7,086	23/18	6,685	21/17	844/600	30½" x 30½"
Without Cord													
VES12	12"	1/10	115/230	1.0/0.5	60	1	S/Var^	1,846	9/7	1,775	9/7	1,625/600	12½" x 12½"
VES161	16"	1/10	115/230	1.0/0.5	60	1	S/Var^	2,951	12/9	2,810	11/9	1,625/600	16½" x 16½"
VES201	20"	1/10	115/230	1.0/0.5	60	1	S/Var^	3,233	12/10	3,050	12/9	1,625/600	20½" x 20½"
VES20	20"	1/3	115/230	3.5/1.7	60	1	S/Var^	5,077	13/10	4,790	12/10	1,725/600	20½" x 20½"
VES24	24"	1/2	115/230	4.8/2.4	50/60	1	S/Var^	6,487	17/14	6,120	16/12	1,725/600	24½" x 24½"
VES30	30"	1/2	115/230	5.1/2.6	50/60	1	1	7,086	13/11	6,685	12/10	844/600	30½" x 30½"
VES303	30"	1/2	230/460	2.6/1.3	50/60	3	1	6,922	13/10	6,530	12/9	825/600	30½" x 30½"

˜ These units come prewired for 115 Volts (electrician may rewire for 230 Volts)

^ Variable speed fans require separate variable speed control to adjust fan speed.

6200 Highway 12, Eau Claire, WI 54701
ph. 800-998-2398 • fax. 888-972-4454

ph. 715-834-1439 • fax. 715-834-3812
www.jdmfg.com • e-mail: jdmfg@jdmfg.com

Product Specifications

CASING: Fabricated of die formed, heavy Gauge steel and finished with two tone, brown and beige, durable powder coated paint. Supply air is drawn through the rear heavy duty expanded steel inlet grill. Heated air is discharged through front adjustable louvers, which are spring loaded for individual adjustment.

ELEMENT: Heavy-duty block fin element design. The multiple tap electric connection design allows field conversion to eight wattage settings at 208/240-Volt single phase or 240/480 Volt, 3 phase. Units are available on special order with a specific wattage/voltage setting.

MOTOR: Motor shall be totally enclosed, permanently lubricated, all angle industrial rated with thermal overload protection.

WIRING: Wiring to terminal block adjacent to incoming knockout in accordance with NEC and local codes.



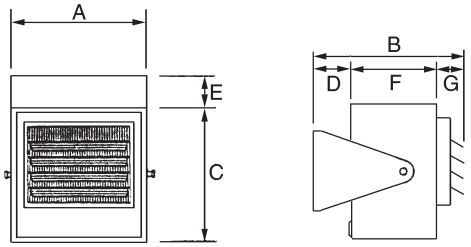
Manufactured in U.S.A.

THERMAL OVERLOAD: All heaters shall be equipped with an automatic reset thermal cutout to shut down the element and motor circuits if unsafe operating temperatures are exceeded.

CONTROLS: The heater shall have a heavy-duty hydraulic thermostat factory installed and wired. All controls and wiring shall be in a large wiring compartment with hinged door for easy access. An optional disconnect switch shall be available for field installation.

MOUNTING: Heaters are standard with a three position-mounting bracket for wall, ceiling or workbench. Heaters can be mounted for horizontal or vertical discharge. Note: Minimum mounting height is 6 feet, and minimum distance from side of heater to nearest wall is 6 inches. Note: Approved for residential applications.

Product Dimensions



A	B	C	D	E	F	G
14”	12-11/16”	14”	1-9/16”	1-9/16”	9”	2-3/4”

Standard Models

UPC# 686334	MODEL	WATTS	BTU's	VOLTS	PHASE	AMPS	TEMP RISE	AIR THROW	CFM	WT. (LBS.)	LIST
707282	HF5605T	5000	17065	240	1	21	57 °F	16'	275	32	772
		4165	14215			17	48 °F				
		3332	11365			14	38 °F				
		2500	8533			10	29 °F				
		3750	12798	208	1	18	43 °F	16'	275	32	
		3123	10659			15	36 °F				
		2500	8553			12	29 °F				
		1874	6396			9	21 °F				
707299	H3H5605T	3750	12799	208	3	10.4	57 °F	16'	375	32	832
		5000	17065	240	3	12	57 °F	16'	275	32	
707305	P3P5605T	5000	17065	480	3	6	57 °F	16'	275	32	
707367	DCS-MT303	Optional Field Installed Disconnect Switch, 30 Amp @ 600Volts									57
For 24V control on single phase models delete "T" suffix											146

Code No. LIT-1927010
Issued February 1, 2009

A19 Series

Remote Bulb Control

Description

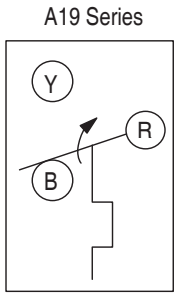
The A19 Series are single-stage temperature controls that incorporate environmentally friendly liquid-filled sensing elements.

Features

- wide temperature ranges available
- constant differential throughout the entire range
- compact enclosure
- fixed or adjustable differential available
- variety of sensing element styles
- unaffected by cross-ambient conditions

Applications

The A19 is suitable for temperature control in heating, ventilating, air conditioning, and refrigeration.



A19 Series
Terminal Arrangement for SPDT



A19ABC-24

Selection Charts

A19 Series Remote Bulb Control[1]

Code Number	Switch Action	Range °F (°C)	Diff F° (C°)	Bulb and Capillary	Bulb Well No. (order separately)	Range Adjuster	Max. Bulb Temp. °F (°C)
Adjustable Differential (Wide Range)							
A19ABA-40C [2]	SPST Open Low	-30 to 100 (-34 to 38)	3 to 12 (1.7 to 6.7)	3/8 in. x 4 in., 6 ft. Cap.	WEL14A-602R	Screwdriver Slot	140 (60)
A19ABC-4C	SPDT	50 to 130 (10 to 55)	3 1/2 to 14 (1.9 to 8)	3/8 in. x 5 in., 8 ft. Cap.	WEL14A-603R	Knob	170 (77)
A19ABC-24C [3]	SPDT	-30 to 100 (-34 to 38)	3 to 12 (1.7 to 6.7)	3/8 in. x 4 in., 8 ft. Cap.	WEL14A-602R	Convertible	140 (60)
A19ABC-36C	SPDT	-30 to 100 (-34 to 38)	3 to 12 (1.7 to 6.7)	3/8 in. x 4 in., 20 ft. Cap.	WEL14A-602R	Convertible	140 (60)
A19ABC-37C	SPDT	-30 to 100 (-34 to 38)	3 to 12 (1.7 to 6.7)	3/8 in. x 4 in., 10 ft. Cap.	WEL14A-602R	Screwdriver slot	140 (60)
A19ABC-74C	SPDT	-30 to 100 (-34 to 38)	3 to 12 (1.7 to 6.7)	3/8 in. x 4 in., 6 ft. Cap.	WEL14A-602R	Screwdriver slot	140 (60)
Fixed Differential							
A19AAF-12C	SPDT	25 to 225 (-4 to 107)	3 1/2 (1.9)	3/8 in. x 3 in., 10 ft. Cap.	WEL14A-602R	Screwdriver slot	275 (135)
Fixed Differential (Case Compensated)							
A19AAC-4C	SPDT	0 to 80 (-18 to 27)	5 (2.8)	3/8 in. x 4 in., 6 ft. Cap.	WEL14A-602R	Screwdriver slot	140 (60)
A19AAD-12C	SPST Open Low	-30 to 50 (-34 to 10)	2 1/2 (1.4)	3/8 in. x 4 in., 7 ft. Cap.	WEL14A-602R	Screwdriver slot	140 (60)
Fixed Differential (Close)							
A19AAD-5C [4]	SPST Open Low	30 to 50 (-1 to 10) (**Bulk Milk Cooler**)	2 1/2 (1.4)	3/8 in. x 2 5/8 in., 6 ft. Cap.	WEL16A-601R	Screwdriver slot	190 (88)
A19AAF-20C	SPDT	-30 to 100 (-34 to 38)	2 1/2 (1.4)	3/8 in. x 4 in., 6 ft. Cap.	WEL14A-602R	Screwdriver slot	140 (60)
A19AAF-21C	SPDT	40 to 90 (4 to 32)	1 1/2 (0.8)	3/8 in. x 5 3/4 in., 6 ft. Cap.	WEL14A-603R	Screwdriver slot	140 (60)
Manual Reset							
A19ACA-14C	SPST Open Low	-30 to 100 (-34 to 38)	Manual Reset	3/8 in. x 4 in. 6 ft .Cap.	WEL14A-602R	Screwdriver slot	140 (60)
A19ACA-15C	SPST Open Low	-30 to 100 (-34 to 38)	Manual Reset	3/8 in. x 4 in. 10 ft. Cap.	WEL14A-602R	Screwdriver slot	140 (60)
A19ADB-1C	SPST Open High	100 to 240 (38 to 116)	Manual Reset	3/8 in. x 3 1/2 in. 6 ft. Cap.	WEL14A-602R	Knob	290 (143)
A19ADN-1C	SPST Open High	100 to 240 (38 to 116)	Manual Reset	3/8 in. x 4 in. 6 ft. Cap.	WEL14A-602R	Screwdriver slot	290 (143)

1. Specify the control model code number, packing nut code number (if required), and bulb well code number (if required).
2. Replaces White-Rodgers 1609-101
3. Replaces White-Rodgers 1609-12, -13; Ranco 010-1408, -1409, - 1410, -1490, 060-110; Honeywell L6018C-1006, L6021A-1005, T675A-1011, -1508, -1516, -1821, T4301A-1008, T6031A-1011, T6031A-1029
4. Case-Compensated

The performance specifications are nominal and conform to acceptable industry standards. For applications at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls, Inc. shall not be liable for damages resulting from misapplication or misuse of its products. © 2009 Johnson Controls, Inc.

Remote Bulb Control (Continued)

Selection Charts (Continued)

Replacement Parts

Code Number	Description
CVR28A-617R	Concealed adjustment cover
CVR28A-618R	Visible scale cover
KNB20A-602R	Replacement Knob Kit

Accessories

A packing nut is available for closed tank application.
Specify the part number **FTG13A-600R**.

Bulb wells (WEL14A Series) are available for liquid immersion applications.
Refer to the selection chart or to *Bulb Wells Catalog Page, LIT-1922135*.

Technical Specifications

Electrical Ratings

Motor Ratings VAC	120	208	240
Wide Range – Adjustable Differential			
AC Full Load A	16.0	9.2	8.0
AC Locked Rotor A	96.0	55.2	48.0
Non-Inductive A [1]	22 A, 120 to 277 VAC		
Pilot Duty – 125 VA, 24 to 600 VAC			
Fixed Differential and Close Differential			
AC Full Load A	6.0	3.4	3.0
AC Locked Rotor A	36.0	20.4	18.0
Non-Inductive A	10 A, 24 to 277 VAC		
Pilot Duty – 125 VA, 24 to 277 VAC			
Case Compensated – Fixed Differential A19AAC-4			
AC Full Load A	16.0	9.2	8.0
AC Locked Rotor A	96.0	55.2	48.0
Non-Inductive A [1]	22 A, 120 to 277 VAC		
Pilot Duty – 125 VA, 24 to 600 VAC			
A19AAD-12			
AC Full Load A	6.0	3.4	3.0
AC Locked Rotor A	36.0	20.4	18.0
Non-Inductive A	10 A, 24 to 277 VAC		
Pilot Duty – 125 VA, 24 to 277 VAC			
Manual Reset			
AC Full Load A	16.0	9.2	8.0
AC Locked Rotor A	96.0	55.2	48.0
Non-Inductive A	16.0	9.2	8.0
Pilot Duty – 125 VA, 24 to 600 VAC			

1. SPST and N.O. contact of SPDT control;
SPDT N.C. contact- 16 amps 120 to 277 VAC

The performance specifications are nominal and conform to acceptable industry standards. For applications at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls, Inc. shall not be liable for damages resulting from misapplication or misuse of its products. © 2009 Johnson Controls, Inc. **www.johnsoncontrols.com**

Inlet Vacuum Filters

"CSL" Series 3" - 6" MPT

APPLICATIONS & EQUIPMENT

- Vacuum Pumps & Systems – P.D., Side Channel, Rotary Vane, Screw, Piston
- Vacuum Packaging Equipment
- Vacuum Furnaces
- Blowers - Side Channel & P.D.
- Intake Suction Filters
- Pneumatic Conveying Systems
- Remote Install for Piston, Screw & Centrifugal Compressors
- Factory Automation Equip
- Ash Handling
- Food Industry
- Paper Processing
- Glass, Ceramic Processing
- Waste Water Treatment
- Woodworking
- Cement
- Bag House Systems
- Envelope Manufacturing
- Medical Industry
- Chemical Processing

FEATURES & SPECIFICATIONS

- **Vacuum level**: Typically $1x10^{-3}$ mmHg ($1.3x10^{-3}$ mbar)
- Polyester: 99%+ removal efficiency standard to 5 micron
- Paper: 99%+ removal efficiency standard to 2 micron
- Heavy duty T bolts for easy maintenance
- Hydrostatically tested to 0.5 bar pressure for vacuum tightness
- Low pressure drop
- Positive engagement O-ring seal system
- **Large** dirt holding capacity and **Easy** field cleaning, especially when mounted horizontally or inverted
- Inlet/outlet 1/4" gauge taps standard
- Rugged all steel construction w/baked gray enamel finish
- Temp (continuous): min -15°F (-26°C) 220°F (max 104°C)
- Filter change out differential: 10" - 15" H_2O over initial delta P
- Pressure drop graphs available upon request

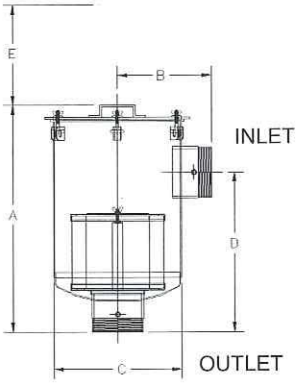
OPTIONS (Inquiries Encouraged)

- Various media
- Larger sizes available
- Straight-Through Configurations
- Available in ***Stainless Steel***
- Epoxy coated housings
- Support brackets
- Special connections
- Activated carbon prefilters to reduce order

CONFIGURATION



DRAWING



Dimension tolerance ± 1/4"

I = Industrial Duty S = Severe Duty E = Extreme Duty

	with Polyester Element	with Paper Element	MPT Inlet & Outlet	DIMENSIONS - inches A	B	C	D	E	Rated Flow SCFM Nominal Rating	Element Rating	Approx. Wt. lbs
I	CSL-235P-300	CSL-234P-300	3"	27 1/8	9	14	18 1/2	10	300	570	47
S	CSL-335P-300	CSL-334P-300	3"	27 1/8	9	14	18 1/2	15	300	800	50
I	CSL-235P-400	CSL-234P-400	4"	27 1/8	9	14	18 1/2	10	520	570	52
S	CSL-335P-400	CSL-334P-400	4"	27 1/8	9	14	18 1/2	15	520	800	55
I	CSL-245P-500	CSL-244P-500	5"	28 1/8	11	18 1/2	19 1/2	10	800	880	82
S	CSL-345P-500	CSL-344P-500	5"	28 1/8	11	18 1/2	19 1/2	15	800	1100	88
I	CSL-275P-600	CSL-274P-600	6"	29 1/8	12	18 1/2	20 1/2	10	1100	1100	95
S	CSL-375P-600	CSL-374P-600	6"	29 1/8	12	18 1/2	20 1/2	15	1100	1500	97

Note: Model offerings and design parameters may change without notice.

1151 Ardmore Ave. • Itasca, IL 60143 USA
Sales/Service: 630.773.1363 • Fax: 630.773.0727
E-mail: sales@solbergmfg.com • Web Site: www.solbergmfg.com

Air Water Separators

Low Vacuum Model

Product Level Control

Product Level Control manufactures a variety of air water separators (AWS), custom-equipped for optimal on-site performance. By offering flexible system designs with a wide range of available product parts and accessories, we meet your individual project goals for the best possible value.



FEATURES

- **Protects vacuum blowers from damage caused by corrosion**
- **Designed and fabricated to meet various air flow rates and holding capacities**
- **Efficient separation of entrained liquids — up to 99.9%**
- **Rust-resistant**
- **Easily installed and serviced**
- **Removable lid for easy cleaning and inspection**
- **Factory wet-tested for reliable system operation**

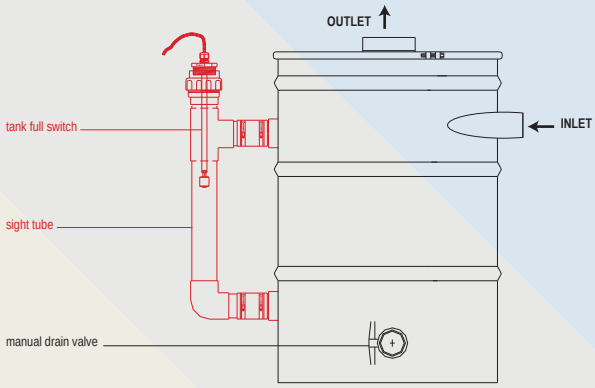
PERFORMANCE*

- System accommodates any air flow
- Models size up to a maximum vacuum rate of 20" Hg
- Vessels size to meet client specifications

* Due to the custom nature of our AWS models, individual specifications can be provided once proper project requirements have been established. Specifications are subject to change without notice.

STANDARD CONSTRUCTION

- Heavy-gauge steel construction
- Custom-sized vessel
- Rust-resistant finish (premium alkyd enamel)
- Corrosion-resistant epoxy phenolic interior lining
- Manual drain valve



PLC PERSONALIZED ORDERING NUMBER

Holding Tank Capacity (nominal gallons)
30-30☐
55-55☐
85-85☐
110-110

Separation Efficiency
S-Standard, cyclonic
C-High efficiency, cyclonic (99% efficient separation of entrained liquids 150+ micron)
M-Extra high efficiency, mist eliminator (99.9% efficient separation of entrained liquids 50+ micron)

Air Flow Rate (number in ICFM or ACFM)

Operational Vacuum (number in inches of Hg Vac)

Optional Accessories
GA-Vacuum gauge
TF-Tank full switch
PC-Pump control level switch
ST-Sight tube
BC-Ball check float valve
LG-Legs

MDXX - WSD __ -XX __ __ - __ -_____

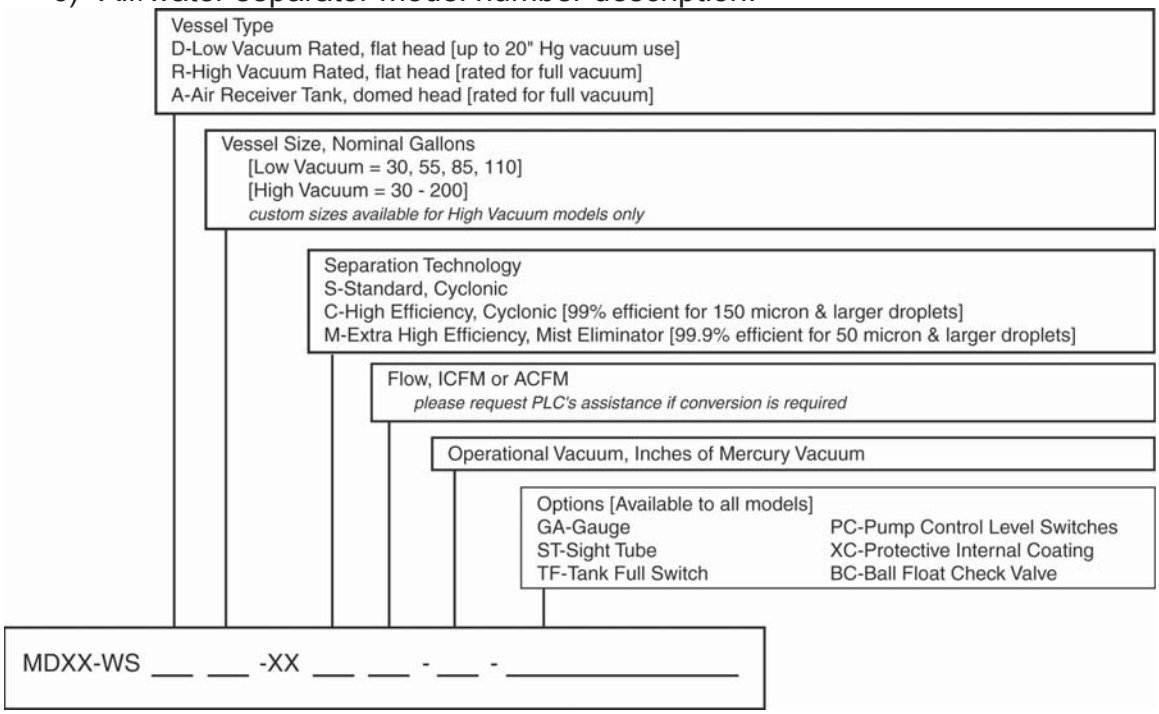
11929 Portland Avenue South | Burnsville, MN 55337 | 952-707-9101 | fax 952-707-1075 | www.productlevel.com | sales@productlevel.com

Air/Water Separator
Operation and Maintenance

SECTION INCLUDES
1.1 Application
1.2 Receiving and Unpacking
1.3 Tools required
1.4 Installation
1.5 Operation
1.6 Maintenance
1.7 Troubleshooting

1.1 APPLICATION

a) Product Level Control's air/water separators are designed to remove water from moisture-laden air streams. Proper selection and sizing of your air/water separator will ensure effective operation and longevity
b) Appurtenances required in addition to an air/water separator include:
   i) High water level switch. The high level switch will shut down the airflow when the separator becomes full of water.
   ii) Vacuum relief valve. The vacuum relief valve protects the separator from over pressurization.
   iii) Inline filter. The inline filter protects downstream equipment from foreign particles.
c) Air/water separator model number description:



1.2 RECEIVING AND UNPACKING

a) Upon receiving the unit, inspect carefully for any damage that may have occurred during shipment.
b) Shipping damage claims must be filed with the carrier at time of delivery.

1.3 TOOLS REQUIRED

i) No special tools are required to install the unit. Some separators can be heavy. Make sure you have appropriate equipment to place the separator in position.

1.4 INSTALLATION

a) Secure separator to floor. Separator must be mounted vertically and secured to prevent movement during operation.
b) Connect inlet and discharge piping to the separator. Inlet is horizontal while the outlet is on top. Use flexible couplings to avoid transferring vibration and stress to separator. Inlet and discharge piping must be secured such that the separator does not support the weight of the piping. Note: Keep in mind the weight of the pipe and its contents (air and water) when installing pipe supports.
c) Install water level switch (es). This switch is either installed in a sight tube or directly through the wall of the separator. Install and wire switch according to manufacturer's instructions and local codes. Typically this switch is wired to a control panel to control either a transfer pump or shut the system down when the separator becomes full of water.
d) Install and adjust vacuum relief valve according to manufacturer's instructions. Set the vacuum relief valve at the lowest of the following values: maximum vacuum rating of the vacuum blower, or maximum vacuum that can be applied to the separator. For separator models MDXX-WSR and MDXX-WSA, the vacuum relief valve can be set at full vacuum, or 28" mercury vacuum. For separator models MDXX-WSD (drum type), set the vacuum relief valve at 20" mercury vacuum. Note these are the maximum vacuum levels the separators can handle.
e) In cold climates, prevent the separator from freezing. Catastrophic failures can occur if water in the separator or water in transmission piping freezes.

1.5 OPERATION

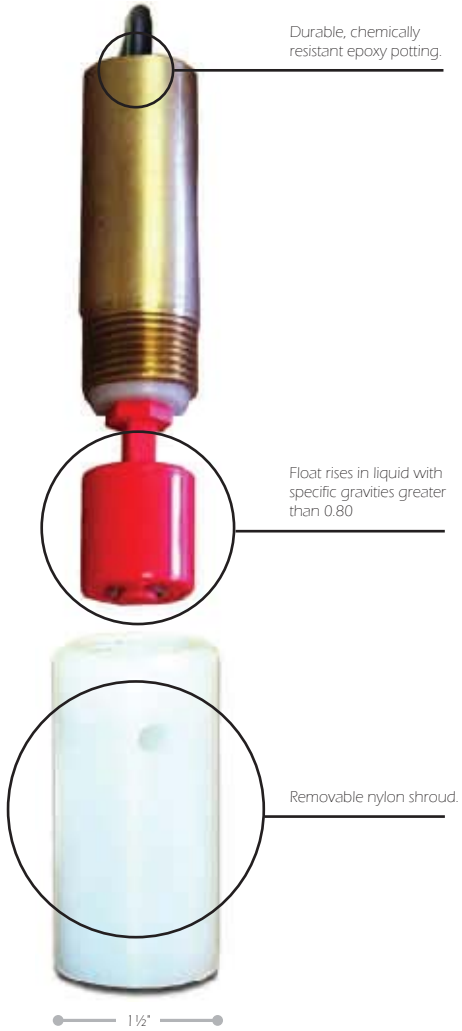
a) Moisture-laden air enters the air/water separator through the horizontal inlet. After entering the separator, tangential forces created by cyclonic motion remove free moisture contained in the air stream. This separated moisture falls to the bottom of the separator as a liquid due to gravity. Air continues to swirl around the separator until it reaches the discharge at the top.
b) Manually drain the separator by opening the drain valve. It may be necessary to turn off the vacuum blower in order to allow the water to drain from the separator. This water may be considered hazardous waste. Be sure to wear appropriate safety clothing and follow proper procedures for disposal. Some locations require this water to be treated before discharge.

c) For systems with automatic water pump out: Water level switches will automatically operate the water transfer pump to empty the separator. Be sure the transfer pump is primed before operation. Also consult the transfer pump's literature for specific operating instructions. As stated above, this water may be hazardous. Follow above guidelines for disposal.

1.6 MAINTENANCE

a) Product Level Control's air/water separators require minimal maintenance.
b) Gain access to the interior of the separator through the removable lid or the clean out port. Lids are removed by removing the bolt and band at the top of the separator, remove discharge piping, and then remove the lid while being careful to prevent damage to the gasket. When reinstalling the lid, carefully place the gasket, ring, and tighten the bolt until the ends of the ring are ¼" apart. White tightening the bolt, tap the band horizontally with a hammer on the side opposite the bolt. If lid leaks, bolt may be tightened slightly more and silicone can be applied to gasket.
c) Periodically, a layer of sludge may form on the bottom of the separator. Remove the top lid of the separator and remove the sludge with water. Remember this sludge may be considered hazardous so be sure to wear appropriate safety clothing. If the separator does not contain a removable lid, gain access through the clean out port located on the side of the separator and remove the sludge as indicated above.
d) If your separator contains a high efficiency demister, periodically check the pressure drop across the separator. If the pressure drop increases to an unacceptable value, or when the separator's performance decreases, remove the demister and clean with an appropriate solution. Do not unwrap the demister. If the demister is unwrapped and then rewrapped, performance will be sacrificed.
e) Periodically, consult the maintenance instructions for the vacuum relief valve. Also, verify the vacuum setting in order to protect the separator.

Product Level Control



Product Level Control manufactures our own line of treatment sensors, custom-equipped for optimal on-site performance. By offering flexible product designs with a wide range of available options, we meet your individual project goals for the best possible value.

FEATURES

- **Constructed to meet client specifications**
- **Easily changed between Normally Open (NO) and Normally Closed (NC) — simply remove the E-clip and invert the float**
- **Various materials of construction allow for chemical resistance to contaminants**
- **Delivered fully assembled**
- **1-year warranty**

ELECTRICAL SPECIFICATIONS

- Maximum contact ratings:
  0.080 Amp, 120V, 60 Hz Resistive
  0.040 Amp, 240V, 60 Hz Resistive
  3.36 VA, 240V, 60 Hz Pilot Study
  1 Amp Max @ 24 VDC Resistive
- Single pole, single throw switch (SPST)
- 18/2 stranded copper conductors

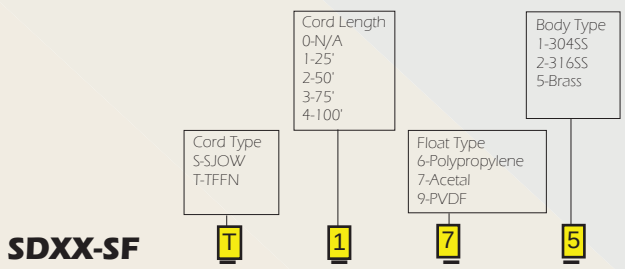
MECHANICAL SPECIFICATIONS

- Maximum pressure rating of 100 PSI @ 20°C
- Maximum temperature rating of 100°C
- Minimum specific gravity rating of 0.8☐
- Operable at angles up to 30° from vertical
- Length equals 6.5"
- Diameter equals 0.5"

PROCESS OF OPERATION

Operating as a vertically-orientated level switch, a single float unit is used with a total fluid system to detect the presence of liquid in a recovery well or tank. When liquid is present, the float rises. Simply secure the sensor in a well or tank by restraining the power cord.

PLC PERSONALIZED ORDERING NUMBER



High-quality pressure transmitter for general industrial applications
Model S-10

for further approvals see page 4

Applications

- Machine building
- Hydraulics and pneumatics
- Pumps
- Chemical industry

Special features

- Measuring ranges from 0 ... 5 to 0 ... 15,000 psi (0 ... 0.1 to 0 ... 1,000 bar)
- Non-linearity 0.2 % of span (BFSL)
- Output signals 4 ... 20 mA, DC 0 ... 10 V, DC 0 ... 5 V and others
- Electrical connections: Angular connector form A, circular connector M12 x 1, various cable outlets and others
- Zero point and span adjustable via internal potentiometer



Pressure transmitter model S-10

Description

The model S-10 pressure transmitter for general industrial applications is the ideal solution for customers with demanding measuring requirements. It features a very good accuracy, a robust design and an exceptional number of variants, meaning it can be suited to the widest range of applications.

Versatile
The model S-10 offers continuous measuring ranges between 0 ... 5 and 0 ... 15,000 psi (0 ... 0.1 and 0 ... 1,000 bar) in all the major units. These measuring ranges can be combined in almost any way with all the standard industry output signals, the most common international process connections and a wide number of electrical connections.

Furthermore, it offers numerous options, such as different accuracy classes, extended temperature ranges and customer-specific pin assignments.

High quality
The robust design turns the model S-10 into a very high quality product, which even the most adverse environmental conditions cannot affect. Whether with the lowest temperatures when used outdoors, with extreme shock and vibration in machine building or with aggressive media in the chemical industry, this transmitter can meet all requirements.

Availability
All variants described in this data sheet are available on very short lead times. For particularly urgent demands, there is a sizeable stock available.

Data sheets showing similar products:
Ex pressure transmitter; model IS-2x; see data sheet PE 81.50
Pressure transmitter for general industrial applications; model A-10; see data sheet PE 81.60
OEM pressure transmitter for general industrial applications; model O-10; see data sheet PE 81.65
Flush pressure transmitter for viscous and solids-containing media; model S-11; see data sheet PE 81.02

WIKA
Part of your business

Measuring ranges

Relative pressure								
bar	**Measuring range**	**0 ... 0.1**	**0 ... 0.16**	**0 ... 0.25**	**0 ... 0.4**	**0 ... 0.6**	**0 ... 1**	**0 ... 1.6**
	Overpressure limit	1	1.5	2	2	4	5	10
	Measuring range	**0 ... 2.5**	**0 ... 4**	**0 ... 6**	**0 ... 10**	**0 ... 16**	**0 ... 25**	**0 ... 40**
	Overpressure limit	10	17	35	35	80	50	80
	Measuring range	**0 ... 60**	**0 ... 100**	**0 ... 160**	**0 ... 250**	**0 ... 400**	**0 ... 600**	**0 ... 1,000**
	Overpressure limit	120	200	320	500	800	1,200	1,500
psi	**Measuring range**	**0 ... 5**	**0 ... 10**	**0 ... 15**	**0 ... 20**	**0 ... 25**	**0 ... 30**	**0 ... 50**
	Overpressure limit	29	29	72.5	145	145	145	240
	Measuring range	**0 ... 60**	**0 ... 100**	**0 ... 150**	**0 ... 160**	**0 ... 170**	**0 ... 200**	**0 ... 250**
	Overpressure limit	240	500	500	1,160	1,160	1,160	1,160
	Measuring range	**0 ... 300**	**0 ... 400**	**0 ... 500**	**0 ... 600**	**0 ... 750**	**0 ... 800**	**0 ... 1,000**
	Overpressure limit	1,160	1,160	1,160	1,160	1,740	1,740	1,740
	Measuring range	**0 ... 1,500**	**0 ... 1,600**	**0 ... 2,000**	**0 ... 3,000**	**0 ... 4,000**	**0 ... 5,000**	**0 ... 6,000**
	Overpressure limit	2,900	4,600	4,600	7,200	7,200	11,600	11,600
	Measuring range	**0 ... 7,500**	**0 ... 8,000**	**0 ... 10,000**	**0 ... 15,000**			
	Overpressure limit	17,400	17,400	17,400	21,700			

Absolute pressure								
bar	**Measuring range**	**0 ... 0.25**	**0 ... 0.4**	**0 ... 0.6**	**0 ... 1**	**0 ... 1.6**	**0 ... 2.5**	**0 ... 4**
	Overpressure limit	2	2	4	5	10	10	17
	Measuring range	**0 ... 6**	**0 ... 10**	**0 ... 16**	**0 ... 25**	**0.8 ... 1.2**		
	Overpressure limit	35	35	80	80	5		
psi	**Measuring range**	**0 ... 15**	**0 ... 25**	**0 ... 50**	**0 ... 100**	**0 ... 250**		
	Overpressure limit	72.5	145	240	500	1,160		

Vacuum and +/- measuring range						
bar	**Measuring range**	**-0.6 ... 0**	**-0.4 ... 0**	**-0.25 ... 0**	**-0.16 ... 0**	**-0.1 ... 0**
	Overpressure limit	4	2	2	1.5	1
	Measuring range	**-1 ... 0**	**-1 ... +0.6**	**-1 ... +1.5**	**-1 ... +3**	**-1 ... +5**
	Overpressure limit	5	10	10	17	35
	Measuring range	**-1 ... +9**	**-1 ... +15**	**-1 ... +24**		
	Overpressure limit	35	80	50		
psi	**Measuring range**	**- 15 inHg ... 0**	**-30 inHg ... 0**	**-30 inHg ... +15**	**-30 inHg ... +30**	**-30 inHg ... +60**
	Overpressure limit	72.5	72.5	145	240	240
	Measuring range	**-30 inHg ... +100**	**-30 inHg ... +160**	**-30 inHg ... +200**	**-30 inHg ... +300**	
	Overpressure limit	500	1,160	1,160	1,160	

The given measuring ranges are also available in kg/cm² and MPa.
Burst pressures on request

Vacuum tightness
Yes

Output signals

Signal type	Signal
Current (2-wire)	4 ... 20 mA 20 ... 4 mA
Current (3-wire)	0 ... 20 mA
Voltage (3-wire)	DC 0 ... 10 V DC 0 ... 5 V DC 1 ... 5 V DC 0.5 ... 4.5 V ratiometric

Other output signals on request.

Load in Ω

- Current output (2-wire):
  ≤ (power supply - 10 V) / 0.02 A
- Current output (3-wire):
  ≤ (power supply - 3 V) / 0.02 A
- Voltage output (3-wire):
  > maximum output signal / 1 mA

Voltage supply

Power supply

The power supply depends on the selected output signal

- 4 ... 20 mA: DC 10 ...30 V
- 20 ... 4 mA: DC 10 ...30 V
- 0 ... 20 mA: DC 10 ...30 V
- DC 0 ... 5 V: DC 10 ...30 V
- DC 1 ... 5 V: DC 10 ...30 V
- DC 0 ... 10 V: DC 14 ... 30 V
- DC 0.5 ... 4.5 V ratiometric: DC 4.5 ...5.5 V

Reference conditions (per IEC 61298-1)

Temperature
59 ... 77 °F (15 ... 25 °C)

Atmospheric pressure
12.5 ... 15.4 psi (860 ... 1,060 mbar)

Humidity
45 ... 75 % relative

Power supply
DC 24 V

Mounting position
Calibrated in vertical mounting position with pressure connection facing downwards.

Accuracy specifications

Non-linearity (per IEC 61298-2)
≤ ± 0.2 % of span BFSL

Non-repeatability
≤ ±0.1 % of span

Accuracy at reference conditions
Including non-linearity, hysteresis, zero offset and end value deviation (corresponds to measured error per IEC 61298-2).

Accuracy	
Standard	≤ ±0.50 % of span
Option	≤ ±0.25 % of span [1]

1) Only for measuring ranges ≥ 0.25 bar

Adjustability of zero point and span
Adjustment is made using potentiometers inside the instrument.

- Zero point: ± 5 %
- Span: ± 5 %

Temperature error at 32 ... 176 °F (0 ... 80 °C)

- Mean temperature coefficient of zero point:
  - Measuring ranges ≤ 0.25 bar: ≤ 0.4 % of span/10 K
  - Measuring ranges > 0.25 bar: ≤ 0.2 % of span/10 K
- Mean temperature coefficient of span:
  ≤ 0.2 % of span/10 K

Long-term stability at reference conditions
≤ ±0.2 % of span/year

Time response

Settling time

- ≤ 1 ms
- ≤ 2 ms for output signal DC 0.5…4.5 V ratiometric and measuring ranges < 400 mbar, 10 psi

Operating conditions

Ingress protection (per IEC 60529)
For ingress protections see "Electrical connections"
The stated ingress protection only applies when plugged in using mating connectors that have the appropriate ingress protection

Vibration resistance (per IEC 60068-2-6)
20 g

Shock resistance (per IEC 60068-2-27)
1,000 g (mechanical)

Temperatures

Permissible temperature ranges		
	Standard	Option
Medium	-22 ... 212 °F(-30 ... +100 °C)	-40 ... 257 °F(-40 ... +125 °C)
Ambient	-4 ... 176 °F(-20 ... +80 °C)	-4 ... 176 °F(-20 ... +80 °C)
Storage	-40 ... 212 °F(-40 ... +100 °C)	-40 ... 212 °F(-40 ... +100 °C)

Materials

Wetted parts
Stainless steel

Non-wetted parts
- Case: Stainless steel
- Internal pressure transmission medium: Synthetic oil
- Clamping nut: PA
- Angular connector: PA
- O-rings at the clamping nut: NBR
- Flat gasket: VMQ

Instruments with a measuring range of > 25 bar relative do not contain any pressure transmission medium (dry measuring cell).

Process connections

Standard	Thread size
EN 837	G ¼ B
	G ½ B
DIN 3852-E	G ¼ A [1]
-	G ¼ female
ANSI/ASME B1.20.1	¼ NPT
	½ NPT
SAE J514 E	7/16-20 UNF with 74° taper
-	M20 x 1.5
-	G ½ male / G ¼ female
ISO 7	R ¼

1) Maximum overpressure limit 600 bar

Other process connections on request

Approvals, directives and certificates

Approvals
- CSA
- GOST

For further approvals see www.wika.com

CE conformity
- EMC directive 2004/108/EC, EN 61326 emission (group 1, class B) and interference immunity (industrial application)
- Pressure equipment directive 97/23/EC

Electrical connections

Available connections

Electrical connection	Ingress protection	Wire cross-section	Cable diameter	Cable lengths
Angular connector DIN 175301-803 A	IP 65	max. 1.5 mm²	6 ... 8 mm	-
Angular connector DIN 175301-803 with ½ NPT	IP 65	max. 1.5 mm²	-	-
Circular connector M12 x 1 (4-pin)	IP 67	-	-	-
Bayonet connector (6-pin)	IP 67	-	-	-
½ NPT conduit male, with cable outlet	IP 67	3 x 0.5 mm²	6.8 mm	1.5 m, 3 m, 5 m, 10 m, 5 ft, 10 ft, 20 ft, 30 ft, others on request
Cable outlet				
■ Standard	IP 67	3 x 0.5 mm²	6.8 mm	1.5 m, 3 m, 5 m, 10 m, 5 ft, 10 ft, 20 ft, 30 ft, others on request
■ not adjustable	IP 68	3 x 0.5 mm²	6.8 mm	1.5 m, 3 m, 5 m, 10 m, 5 ft, 10 ft, 20 ft, 30 ft, others on request
■ adjustable	IP 68	3 x 0.5 mm²	6.8 mm	1.5 m, 3 m, 5 m, 10 m, 5 ft, 10 ft, 20 ft, 30 ft, others on request

Short-circuit resistance
S_+ vs. U-

Reverse polarity protection
U_+ vs. U-

Overvoltage protection
DC 36 V

Insulation voltage
DC 500 V

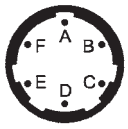
Connection diagrams

Angular connector DIN 175301-803 A



	2-wire	3-wire
U_+	1	1
U-	2	2
S_+	-	3

Bayonet connector (6-pin)



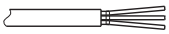
	2-wire	3-wire
U_+	A	A
U-	B	B
S_+	-	C

Angular connector DIN 175301-803 with ½ NPT



	2-wire	3-wire
U_+	1	1
U-	2	2
S_+	-	3

½ NPT conduit male, with cable outlet



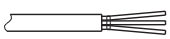
	2-wire	3-wire
U_+	red	red
U-	black	black
S_+	-	brown

Circular connector M12 x 1 (4-pin)



	2-wire	3-wire
U_+	1	1
U-	3	3
S_+	-	4

Cable outlets

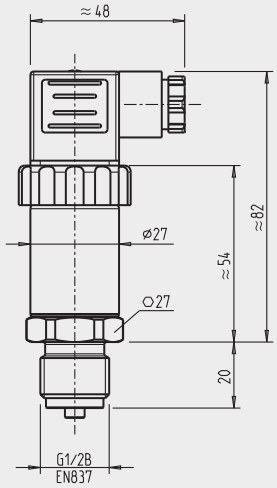


	2-wire	3-wire
U_+	brown	brown
U-	green	green
S_+	-	white
Shield	grey	grey

Dimensions in mm

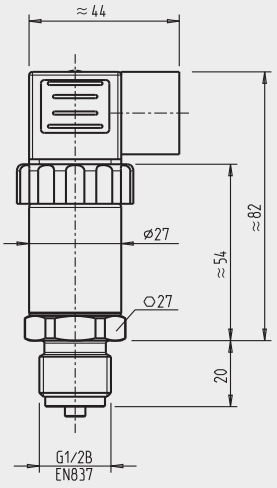
Pressure transmitter model S-10

with angular connector DIN 175301-803 A



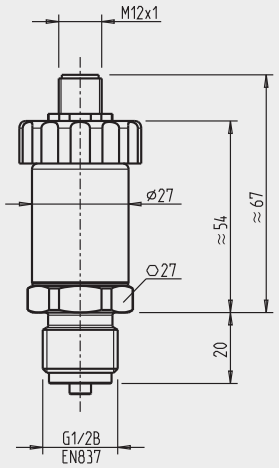
Weight: approx. 0.2 kg

with angular connector DIN 175301-803 with ½ NPT



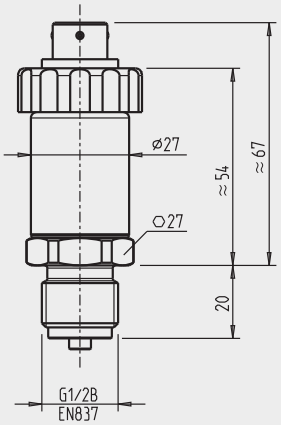
Weight: approx. 0.2 kg

with circular connector M12 x 1 (4-pin)



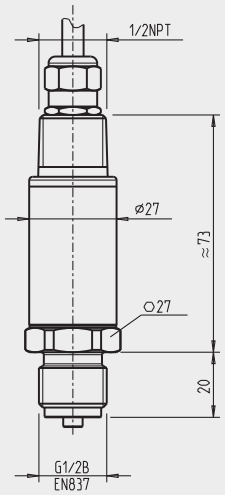
Weight: approx. 0.2 kg

with bayonet connector (6-pin)



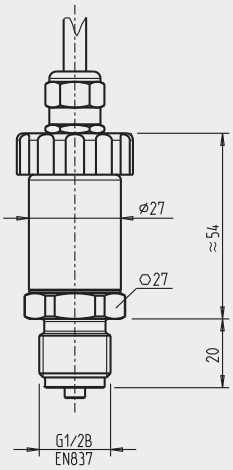
Weight: approx. 0.2 kg

with ½ NPT conduit male, with cable outlet



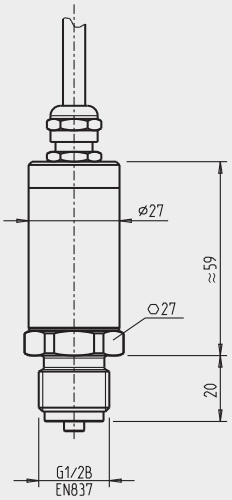
Weight: approx. 0.2 kg

with cable outlet, standard



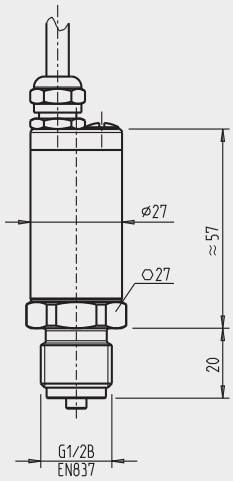
Weight: approx. 0.2 kg

with cable outlet, not adjustable



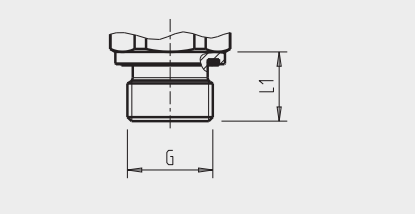
Weight: approx. 0.2 kg

with cable outlet, adjustable

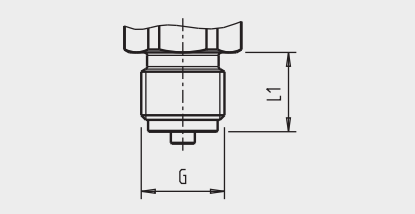


Weight: approx. 0.2 kg

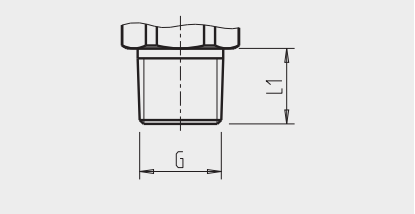
Process connections



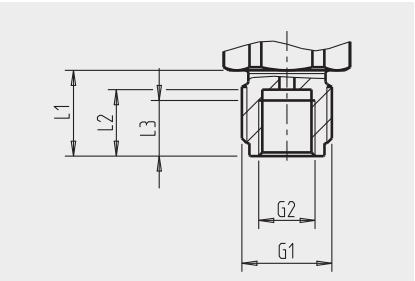
G	L1
G ¼ A	12



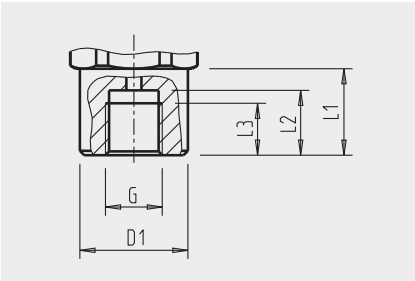
G	L1
G ¼ B	13
G ½ B	20
M20 x 1.5	20



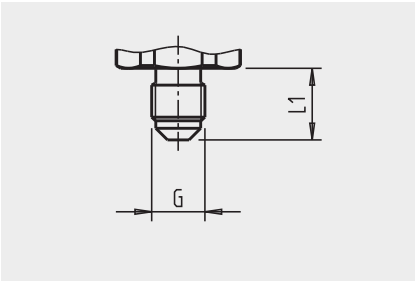
G	L1
¼ NPT	13
½ NPT	19
R ¼	13



G1	G2	L1	L2	L3
G ½ B	G ¼	20	15.5	13



G	D1	L1	L2	L3
G ¼ female	25	20	15	12



G	L1
7/16-20 UNF with 74° taper	15

For information on tapped holes and welding sockets, see Technical Information IN 00.14 at www.wika.com.

Accessories and spare parts

Mating connector

Description	Order number		
	without cable	with 2 m cable	with 5 m cable
Angular connector DIN 175301-803 A			
■ with cable gland, metric	11427567	11225793	11250186
■ with cable gland, conduit	11022485	-	-
Circular connector M12 x 1 (4-pin)			
■ straight	2421262	11250780	11250259
■ angled	2421270	11250798	11250232

Sealings for mating connectors

Mating connector	Order number
Angular connector DIN 175301-803 A	1576240

Sealings for process connection

Thread size	Order number			
	Cu	Stainless steel	NBR	FKM
G ¼ B EN 837	11250810	11250844	-	-
G ½ B EN 837	11250861	11251042	-	-
G ¼ A DIN 3852-E	-	-	1537857	1576534
M20 x 1.5	11250861	11251042	-	-

Ordering information

Model / Measuring range / Output signal / Accuracy / Electrical connection / Medium temperature / Process connection

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We reserve the right to make modifications to the specifications and materials.

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MM/YYYY based on 07/2012 GB

Models 215V and 337

Model 215V is Non-code Vacuum and Model 337 is ASME Section VIII, Air/Gas Vacuum, 'UV' National Board Certified, Safety Valves

KUNKLE

Features

- **Large nozzle design** provides high capacity.
- **Flat bronze valve seats are lapped** for optimum performance.
- **Warn ring offers easy adjustability** for precise opening with minimum pre-open or simmer and exact blowdown control.
- **Pivot between disc and spring** corrects misalignment and compensates for spring side thrust.

Model Descriptions

- **Model 337 has 'pull-ring' lift device** for easy manual testing.
- **Every valve is 100% tested/inspected** for pressure setting, blowdown and leakage.
- **All adjustments are factory sealed** to prevent tampering or disassembly.

Option

- SS trim. (nozzle and disc) (Variation 03)

Applications

- Protection of low to medium pressure high volume blowers, compressors and pneumatic conveying systems.
- Bulk hauling trailers/equipment.
- Light gauge tanks.
- Protection of high volume vacuum pumps and conveying systems.



Vacuum Limits

Model 215V:
2-inch HG
to 29-inch HG
[67.7 to 982 mbarg]
-20° to 406°F [-29° to 208°C]

Pressure and Temperature Limits

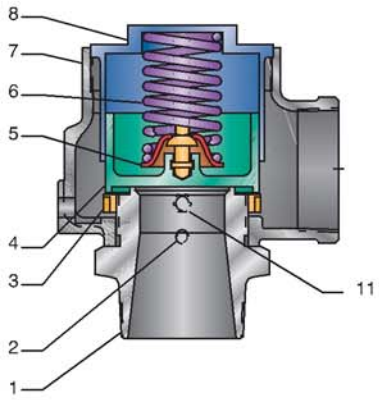
Model 337:
1 to 60 psig [0.07 to 4.1 barg]
-20° to 406°F [-29° to 208°C]

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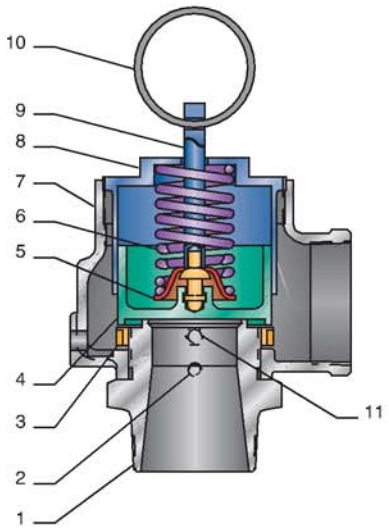
KUKMC-0383-US-0207

Models 215V and 337

Parts and Materials



Model 215V



Model 337

Models 215V and 337

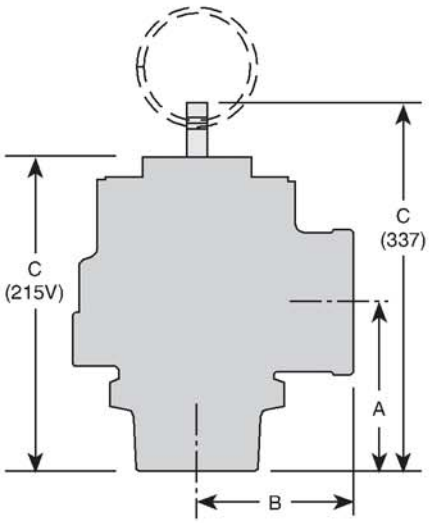
No.	Part Name	215V	337
1	Nozzle[1]	Bronze, SB62	Bronze, SB62
2	Set Screw	Steel A108-1018 Brass Plated	Steel A108-1018 Brass Plated
3	Regulator Ring	Bronze B584 Alloy 84400	Bronze B584-C84400
4	Disc[1]	Bronze B584 Alloy 84400	Bronze B584-C84400
5	Spring Step	Steel A-109 Coated[3]	Steel A109 Coated[3]
6	Spring	SS, A313 TY 302	SS A313-302
7	Body	Cast Iron, Zinc Plated, B633	Iron A-126, CL A or B
8	Compression Screw	Bronze, B-584 Alloy 84400	Bronze, B584-C84400
9	Stem[2]	N/A	Brass B16
10	Lift Ring[2]	N/A	SS A313-302
11	Regulator Ring Set Screw	N/A	Brass B16

Notes

1. Disc and nozzle available in SSA-479 TY 316.
2. Stem and lift ring available on Model 337 only.
3. Corrosion preventative coating.

Specifications

Size Inlet and Outlet	Dimensions, in [mm] A	B	C 215V	C 337	Weight lb [kg]
2" [50.8 mm]	3 1/4 [82.5]	3 [76.2]	6 1/2 [165.1]	7 [177.8]	8 [3.6]
2 1/2" [63.5 mm]	3 3/4 [95.2]	3 1/2 [88.9]	7 5/8 [194.6]	8 [203.2]	12 [5.4]
3" [76.2 mm]	4 1/4 [107.9]	4 [101.6]	8 1/2 [215.9]	9 [228.6]	20 [4.1]



Model 337

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Models 215V and 337

Model 215V

Non-code Vacuum Air (SCFM) - Flow Coefficient			
Relief Set (in, HG)	Valve Inlet and Outlet Size		
	2" Orifice Area, in^2 1.84	2½" Orifice Area, in^2 2.79	3" Orifice Area, in^2 4.04
2	229	347	503
5	338	512	742
10	415	630	912
15	426	646	936
20	426	646	936

Non-code Vacuum Air [Metric, Nm^3/h]			
Relief Set [mbarg]	Valve Inlet and Outlet Size		
	5.08 cm Orifice Area [11.86 cm^2]	6.35 cm Orifice Area [17.97 cm^2]	7.62 cm Orifice Area [26.05 cm^2]
50	328	498	722
100	450	682	988
150	533	807	1170
200	593	899	1303
250	638	966	1400
300	669	1014	1470
350	690	1046	1516
400	701	1062	1540
450	704	1067	1546
500	704	1067	1546
550	704	1067	1546
600	704	1067	1546
650	704	1067	1546
700	704	1067	1546
750	704	1067	1546

Model 337

Non-code[1] and ASME Section VIII Air (English, SCFM)			
Set Pressure (psig)	Valve Inlet and Outlet Size		
	2"	2½"	3"
1	240	364	527
5	531	805	1166
10	741	1124	1628
15	948	1436	2081
20	1092	1656	2399
25	1237	1875	2718
30	1382	2095	3036
35	1542	2337	3386
40	1701	2578	3736
45	1860	2820	4086
50	2020	3061	4436
55	2179	3303	4786
60	2338	3544	5136

Note

1. No code stamp or 'NB' on nameplate below 15 psig set.

Non-code[1] and ASME Section VIII Air [Metric, Nm^3/h]			
Set Pressure [barg]	Valve Inlet and Outlet Size		
	50 mm	63 mm	80 mm
0.5	1049	1589	2303
1.0	1457	2208	3200
1.5	1888	2861	4147
2.0	2235	3387	4910
2.5	2613	3959	5739
3.0	2995	4538	6579
3.5	3377	5117	7418
4.0	3760	5696	8258

Note

1. No code stamp or 'NB' on nameplate below 1.1 barg set.

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Models 215V and 337

Model Number/Order Guide

Model Number Position	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Example	2	1	5	V	—	H	0	1	A	Q	E	0	0	5	0

Model
215V
0337

Inlet Size
H - 2-inch [50.8 mm]
J - 2½-inch [63.5 mm]
K - 3-inch [76.2 mm]

Variation (01 through 99)
01 - Bronze Disc and Nozzle
03 - SS Disc and Nozzle
60 - BSP Connections

Design Revision
Indicates non-interchangeable revision. Current Design is at Revision 'A'

Valve Service
K - Air ASME Section VIII (Model 337 only)
Q - Vacuum (Model 215V only)
N - Non-code Air/Gas (Model 337 only)

Spring Material
E - SS Type 316
M - SS (26 psi thru 60 psi set) Type 17-7

Set Pressure
Model 337, 1 psig [0.7 barg] (0001) through 60 psig [4.1 barg] (0060)
Model 215V, 2-inch HG [68 mbarg] (0002) through 29-inch HG [982 mbarg] (0029) vacuum

Facility Phone: 828-669-3700

tyco / Valves & Controls

www.kunklevalve.com

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ABSORPTIVE SILENCERS
Air Intake and Exhaust "SLCR" Series 1/2" - 4"

APPLICATIONS

- ☐ Blowers-Centrifugal
- ☐ Blowers-Regenerative
- ☐ Blowers-Side Channel
- ☐ Compressors-Air
- ☐ Vacuum Lifters
- ☐ Vacuum Pumps & Systems

FEATURES & SPECIFICATIONS

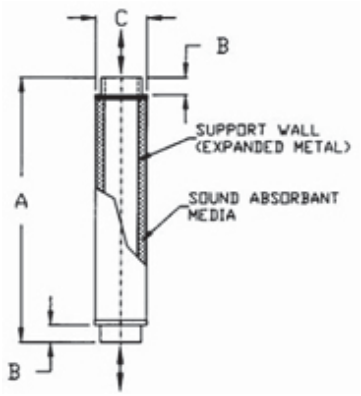
- ☐ Durable inline carbon steel construction with baked enamel finish
- ☐ Layered sound absorbant media
- ☐ Pressure drop graphs available upon request
- ☐ Inlet or discharge applications with max temperature 212° F (100° C)
- ☐ Minimal pressure drop because it does not rely on internal baffles, tubes, or other restrictive devices
- ☐ Reduces high frequency noise up to 30 decibels (Due to the wide range of applications and machines these units are used on, please inquire for your specific application.)

OPTIONS

- ☐ Flange Adapters
- ☐ Larger sizes available
- ☐ NPT connections

Line Drawing





***All measurements are shown in standards.**

Typical Lead Times:	
■	Normally in stock
■	1 - 2 weeks
■	5 - 7 weeks
■	3 - 4 weeks
■	8 + weeks

Add To Order	Model Number	Inlet in. NPT or FLG	Outlet in. NPT or FLG	Connection Style	Dim A in.	Dim B in.	Dim C in.	Parent Flow SCFM	Approx. Weight lbs.	CAD
■	SLCRT050	0.5	0.5	MPT	14.5	2	2.5	25	2	CAD
■	SLCRT075	0.75	0.75	MPT	14.5	2	2.5	35	2	CAD
■	SLCR100	1	1	FPT	12	0.69	2.5	42	2	CAD
■	SLCRT100	1	1	MPT	14.5	2	2.5	42	2	CAD
■	SLCR125	1.25	1.25	FPT	12	0.69	2.5	55	2	CAD
■	SLCRT125	1.25	1.25	MPT	14.5	2	2.5	55	2	CAD
■	SLCR150	1.5	1.5	FPT	12	0.69	3.12	155	3	CAD
■	SLCRT150	1.5	1.5	MPT	14	1.75	3.12	155	3	CAD
■	SLCR200	2	2	FPT	15.75	0.69	3.63	270	4	CAD
■	SLCRT200	2	2	MPT	18.5	2.12	3.63	270	4	CAD
■	SLCR250	2.5	2.5	FPT	21	1.5	4.63	385	8	CAD
■	SLCRT250	2.5	2.5	MPT	23.68	2.63	4.63	385	8	CAD
■	SLCR300	3	3	FPT	26	1.56	5.12	575	10	CAD
■	SLCRT300	3	3	MPT	28	2.63	5.12	575	10	CAD
■	SLCR400	4	4	FPT	23.88	1.69	10	575	26	CAD
■	SLCRT400	4	4	MPT	29.31	4	10	575	26	CAD

Solberg Mfg.
1151 W. Ardmore Ave.·Itasca, IL 60143·(630)773-1363· Fax: (630)773-0727

RevNo	Revision note	Date	Signature	Checked
-	-	-	-	-

NOZZLE SCHEDULE

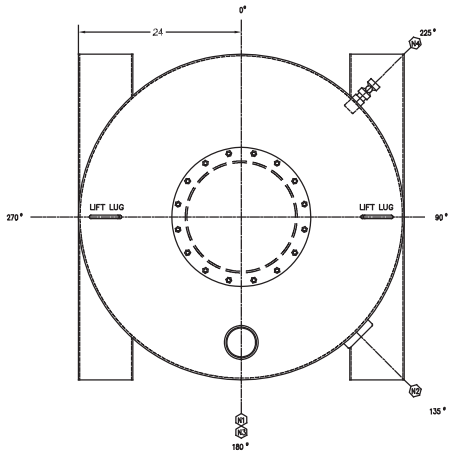
ID	Description	Service
N1	18" Round Manway with 1/4' Cover	Clean out Access
N2	4" 3000# Thd Cplg (SA-105)	Process Inlet
N3	4" 3000# Thd Cplg (SA-105)	Process Effluent
N4	1" 3000# Thd Cplg (SA-105)	Vessel Drain with 1" Ball Valve (Brz/SS/TFE)
N5		
N6		
N7		

COATINGS SCHEDULE

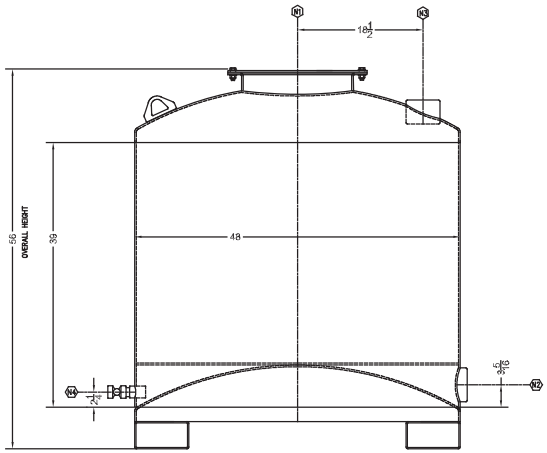
Surface	Surface Preparation	Product Specification
Internal – 1	SSPC-SP6	CArboline Carboguard 635 6-10 mils DFT per Coat
Internal – 2	Inspect	n/a
External – 1	SSPC-SP6	CArboline Carboguard 635 6-10 mils DFT per Coat
External – 2	n/a	Carboline Carbothane 8845 3-5 mils DFT (Blue)
External – 3	n/a	n/a

NOTES

Item	Details
Construction	Non-Code Design Pressure: 10 PSIG @ 140 DEG F.
Mtrls Vessel	Shell: SA-36 Heads: SA-36 Pipe: SA-53 (see nozzle detail for others)
Mtrls Interls	Perforated False Floor: SS Gaskets: Buna-N
n/a	n/a
QTY	TBD
Media	TBD



PLAN VIEW
TRUE ORIENTATION



ELEVATION VIEW
NOT TRUE ORIENTATION

Designed by	Approved by	Customer	Job Number	Date	Scale/Unit
D. Shreves	E. Patterson	Product Level Control	4645HS	April 18, 2016	NTS / Inch

tetraSOLV FILTRATION
1624 ABRAHAM DRIVE
ANDERSON, INDIANA 46013
Ph: (765) 643-3941
Fx: (765) 643-3949

VFV-1000-SD48

Drawing# V48-1000

Tetrasolv Filtration

PRODUCT DATA SHEET
VFV SERIES FILTERS
MODEL VFV-1000

GENERAL DESCRIPTION

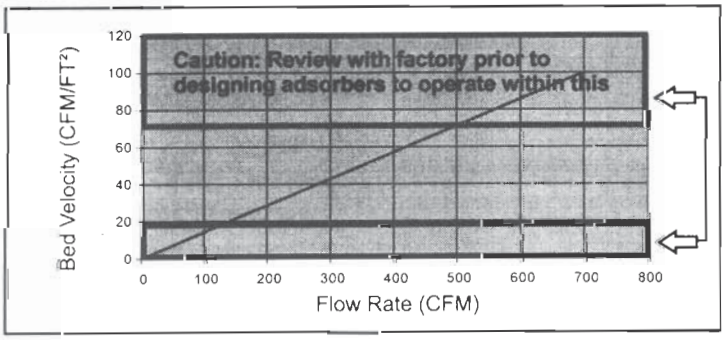
The VFV-1000 filter is a media filter vessel designed to treat vapor streams. While the typical design application is a activated carbon adsorbtion unit, the filter can easily accommodate many medias. The sturdy construction makes these filter vessels ideal for long term treatment units. Some applications include:

- Soil Vapor Extraction Treatment
- Air Stripper Off Gas Treatment
- Odor Removal System
- Storage Tank Purge Vapor Treatment
- Pilot Study
- Industrial Process Treatment

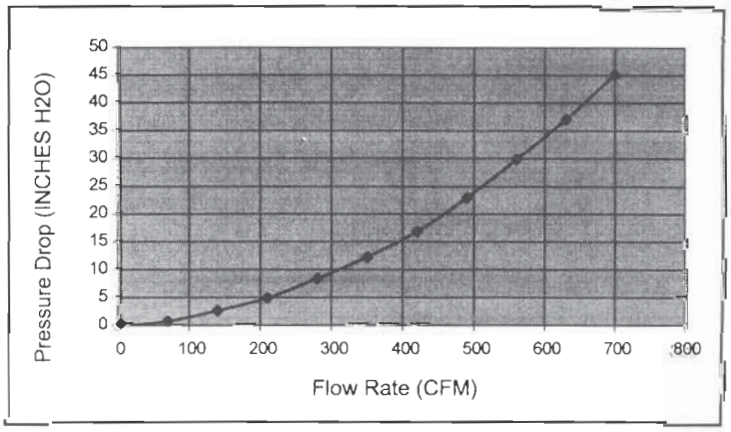
VFV-1000 STANDARD SPECIFICATIONS

Specification	Specification Value	Options
Materials (Vessel)	Carbon Steel	Stainless Steel, HDPE
Materials (Internal Piping)	SCH 40 PVC (Optional False Floor)	Polypropylene, CPVC, 304SS, 316SS
Materials (Collector Nozzles)	SCH 40 PVC	304SS, 316SS, Polypropylene
Internal Coating	Polyamide Epoxy Resin	Vinyl Ester, PVC
External Coating	Urethane Enamel	Any available coating
Maximum Pressure / Vacuum	10 PSIG / 20" HG	Specials Designs Available
Maximum Temperature	140° F (Limited by coating and PVC Internals)	Up to 450° F
Cross Sectional Bed Area	7 FT^2	NA
Bed Depth	5 FT (Using 1000 Lbs. 4*10 GAC)	Dependent upon supplied media
Bed Volume	35 FT^3 (Using 1000 Lbs. 4*10 GAC)	NA

BED VELOCITY GRAPH
(Line Indicates Flow to Velocity Relationship)



PRESSURE DROP GRAPH
(As Filled - 4x10 GAC)



Rev. 10/17/2000

1200 E. 26th Street · Anderson, Indiana 46016
Phn: 765-643-3941 Fax: 765-643-3949 Email: info@tetrasolv.com

Operation & Maintenance Manual

VFD ● VFV ● VF ● VR SERIES

Tetrasolv Filtration Vapor Filters

Liquid & Vapor Filtration
Remedial • Industrial • Municipal

CONTENTS

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2.0 Safety Considerations 1
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3.1 Shipment 2
3.2 Unloading 2
3.3 Inspection 2
3.4 Set Up 3
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4.1 Modes of Operation 3
4.2 Monitoring 3
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1.0 GENERAL DESCRIPTION

The liquid series filters utilize fixed bed filtration to treat vapor. The filters employ a variety of medias to remove or catalyze contaminants. Flow through the filter may be either up flow or down flow depending upon the media supplied and the operation parameters. Generally inlet and outlet locations are indicated on the filter and or the filter drawings.

The most common application utilizes activated carbon as the adsorption media. Typically vapor which contains low levels of organic contaminants flows upward through the column of activated carbon where the larger organic molecules adhere to the porous structure of the activated carbon granules. This adsorption begins at the bottom of the “bed” and continues upward as the original adsorptive area becomes saturated.

Complete saturation of the carbon is dependent upon many factors such as contaminant levels, temperature, compounds being adsorbed, humidity, etc. Typically a carbon isotherm has been run on the influent stream to determine the expected rate of consumption of the activated carbon media. When monitoring has determined discharge air no longer meets discharge requirements the carbon will have to be removed and replaced ***(refer to section 5.0)***.

2.0 SAFETY CONSIDERATIONS

It is important that the entire O&M manual be read prior to set up and operation of the carbon system. If you have any questions please contact Tetrasolv Filtration at the number listed below or support@tetrasolv.com.

- ***WARNING: Where system pressure may exceed design pressure we strongly recommend the use of a relief device. Exceeding the maximum pressure of the filter could result in catastrophic failure***

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of the vessel.

- Always adhere to “lockout/tagout” procedures when servicing the system.

- Wear appropriate safety equipment when operating system.

♦ ***WARNING: Wet or dry activated carbon preferentially removes oxygen from air. In closed or partially closed containers, oxygen depletion may reach hazardous levels. If workers must enter a container containing carbon, appropriate sampling and work procedures should be followed for potentially low-oxygen spaces - including all applicable federal and state requirements.***

♦ ***WARNING: High concentrations of certain compounds such as BETX and low concentrations such as ketones, aldehydes, organic acids and sulphur may cause severe temperature rises.***

- Understand the potential hazards of the stream being treated by the system. The activated carbon may contain higher concentrations of the contaminants being adsorbed than is in the influent stream. In addition the carbon may be considered hazardous material and therefore may require specific handling precautions unknown to Tetrasolv Filtration.

3.0 INSTALLATION

3.1 Shipment

Typically filters are shipped with media installed. However, in certain instances media is shipped to the site to be installed after installation. In very large systems it may be advisable to not install the media until adsorbers have been placed into final position and secured.

3.2 Unloading

Refer to the product data sheet for weight information for appropriate sizing information for the equipment to be used.

All components should be lifted either by crane or forklift as designated by the model.

♦ ***WARNING: Failure to follow the procedures outlined below can result in catastrophic damage to the system.***

Crane Lift - If a crane lift is to be used we recommend the following method. A “spreader” equaling 75% of the distance between the opposing lifting eyes on each adsorber should be used to insure proper lifting force direction. Attach an appropriately sized spreader beam and lifting cables to each lift eye of the component. The use of an experienced crane operator and quality equipment is highly recommended.

Fork-Lift - When using a forklift we recommend that the fork tubes on the filter be used or a pallet if the unit was shipped on a pallet.

3.3 Inspection

Perform the following inspections after un-loading the system. Note any discrepancies and contact TetraSolv immediately.

- Check the vessel exterior for damage which may have occurred during shipment. Inspect the support structures and piping support for damage.

- Inspect the piping system for damage. Insure the valves operate properly. Check installed instruments and instrument installation points for damage.

- If the filters are shipped without carbon visually inspect the interior of the vessel for damaged internals.

- Inspect the carbon discharge, drain and vent valves for damage

3.4 Set Up

The filter should be placed on a level concrete pad of appropriate thickness to support the system at it’s maximum operational weight. The filter should be secured to the pad using appropriately sized anchor bolts.

Connect the site piping to the filter inlet and outlet connection points. It is important that all piping connected to the filter should be self supported. We also recommend in hard pipe installation that a flexible joint be used to further insulate the filter from vibration and stress.

Connect any gauges and instrumentation shipped

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loose with the system.

The outlet piping if connected to a stack or vent should be designed to prevent the introduction of water or debris into the adsorber piping. Discharge piping should be sized equal to or greater than the diameter of the system piping or back pressure could occur creating excess pressure drop on the system.

Flowrates greater than 60 cfm / sq ft can produce bed fluidization in vapor phase filters. When this occurs carbon granules can be lifted and propelled out of the carbon bed in up-flow applications. In extreme cases large amounts of carbon can be expelled. If the system will be operating near or greater than the amount stated above please contact Tetrasolv for recommendations.

Carbon filters can be manifold in parallel operation for higher flowrates. Series operation is the preferred method of operation as it provides for the greatest degree of bed utilization.

Vapor conditions such as high humidity and high temperature (> 125º F) can cause inefficient adsorbtion to occur. If these conditions exist contact Tetrasolv for support. Also, any free water or product and debris should be eliminated with a knockout filter prior to the vapor stream entering the system. Many other vapor issues may effect Adsorber operation and we therefore recommend you discuss your specific installation with a representative.

4.0 OPERATION

4.1 Modes of Operation

With certain applications (2) filters in series flow are utilized. Listed below are typical operational modes.

- Shutdown - Both filters completely off-line and isolated.
- Series Flow - Influent enters primary filter and exits through secondary adsorber (this is the preferred method of operation)
- Isolation Flow - Only one filter is receiving influent. This mode is typically used when the operator is maintaining the off-line filter.
- Parallel Flow - Both filters are receiving the influent as the primary. Flow is split equally between the filters. This mode is used when higher flow rates need to be achieved and contact times are not critical.

4.3 Monitoring

Adsorber units only require periodic monitoring if properly installed. The following items may be monitored:

Pressure: Check inlet and outlet pressure. Increase in pressure differential may indicate media breakdown or presence of high moisture. Rapid increase in pressure drop could indicate adsorber failure.

Samples: Inlet and outlet sample points if provided for vapor analysis to determine system performance.

5.0 ADSORBER SERVICING

The Adsorber may be serviced on-site using a vacuum removal method. Prior to servicing the unit should be closed off from influent and effluent lines and any electrical devices or connections should be tagged off.

After removal of the spent carbon is complete, it is recommended that the inside of the Adsorber be checked thoroughly and any minor maintenance conducted.

5.1 Carbon Loading - Bulk Bag

- ***WARNING - Dry activated carbon generates considerable dust. While activated carbon poses no health risk the dust can cause respiratory irritation and occasional skin rash. Therefore we recommended the use of proper clothing and dust mask during filling operation.***

Hoist the bag over the manway and untie the outer bag exposing the inner chute. Untie the inner chute while clasping it shut. Remain holding the chute and carefully lower the chute into the manway. Un-clasp the chute and allow the carbon to discharge from the sack. The carbon should flow out very quickly and completely. When finished shake the bag and invert the chute into the bag.

If at any time you wish to stop the flow of carbon simply re-grasp the chute up high and cinch. Re-tie the bag.

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5.2 Carbon Loading - Vacuum Method

In this method dry-activated carbon will be loaded into to the adsorbers using a vacuum rig. To add the carbon to the filters use the following method:

WARNING: Due to the low vacuum rating of the VF series adsorbers (< 60" H_20) only experienced change-out personnel should attempt this method of re-filling. Exceeding the recommend vacuum rating could lead to failure of the superstructure of the vessel.

1. Connect a 3" vacuum source to the auxiliary connection of the adsorber to be filled.

2. Install a 16" bolted transfer lid onto the manway opening of the adsorber to be filled.

3. Turn on the vacuum and check for good flow of air through the adsorber. Connect the fill line to the transfer lid and lead enough hose to reach the fresh carbon source (Note: This should be as short of a distance as possible).

4. Begin vacuuming carbon into the adsorber. It is important to note that the loading method is actually conveying and not true vacuum. The hose should contain 1/3 air with the carbon. Closely view the adsorber being filled. If the adsorber is collasping in excessively take less carbon and more air. This is something from experience and cannot be adequately explained here.

5. When transfer is complete the transfer lid should be removed and the carbon in the adsorber should be leveled out to insure even pressure drop across the bed.

6. Close the manway and turn the adsorber back on.

> ***Note: When the system if first started up small amounts of fines may be present in the discharge stream. This is normal and should discontinue within a short period of time.***

6.0 MAINTENANCE

6.1 Extended Shutdown

If the system is to be shutdown for extended period of time it is recommended that the valve be placed in shutdown mode and the system water drain valve be left open.

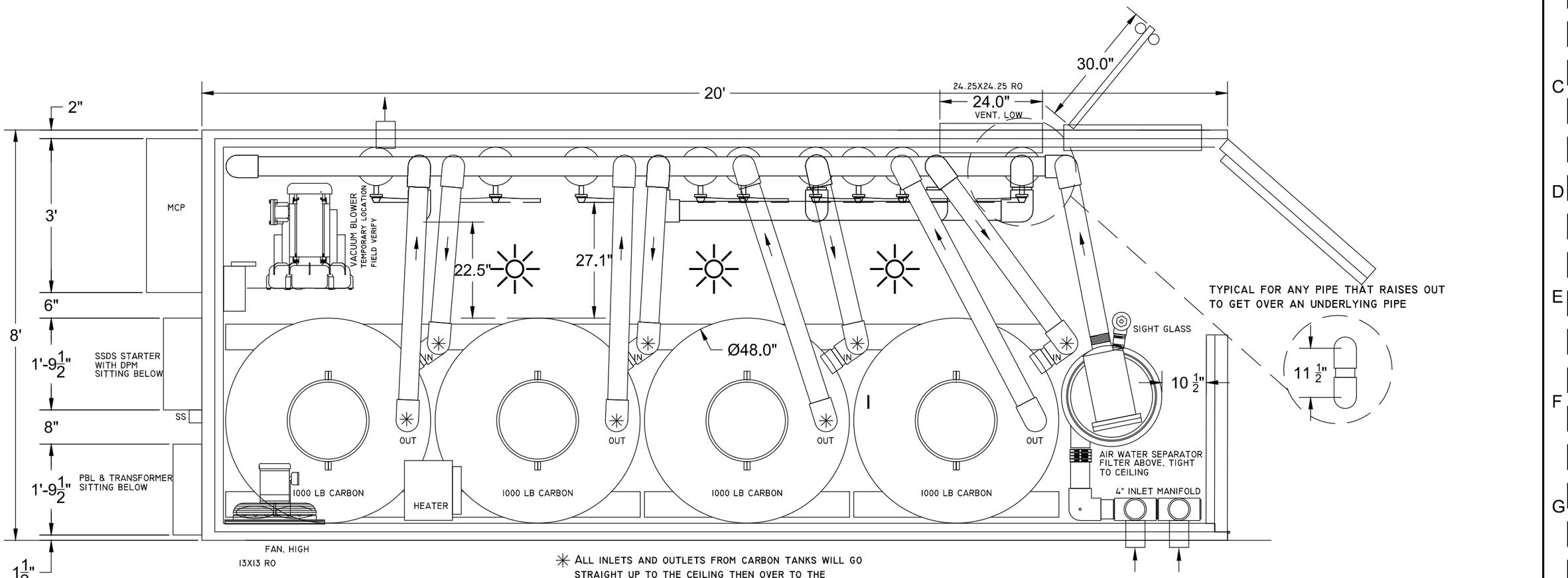
Monitor the system closely after extended shutdown for signs of potential problems such as interior manifold failure or leaking valves and gaskets.

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APPENDIX C

Equipment Layout, Panelboard Layout, Breaker Schedule, and Parts List

REVISIONS			
Rev	Date	By	Description
0			
1			
2			
3			
4			



✳ ALL INLETS AND OUTLETS FROM CARBON TANKS WILL GO STRAIGHT UP TO THE CEILING THEN OVER TO THE MANIFOLD. THIS WILL ALLOW FOR WALKING UNDERNEATH. FIELD VERIFY THE HEIGHT UP AND THE ANGLE OVER TO THE MANIFOLD.

PRODUCT LEVEL CONTROL, INC.

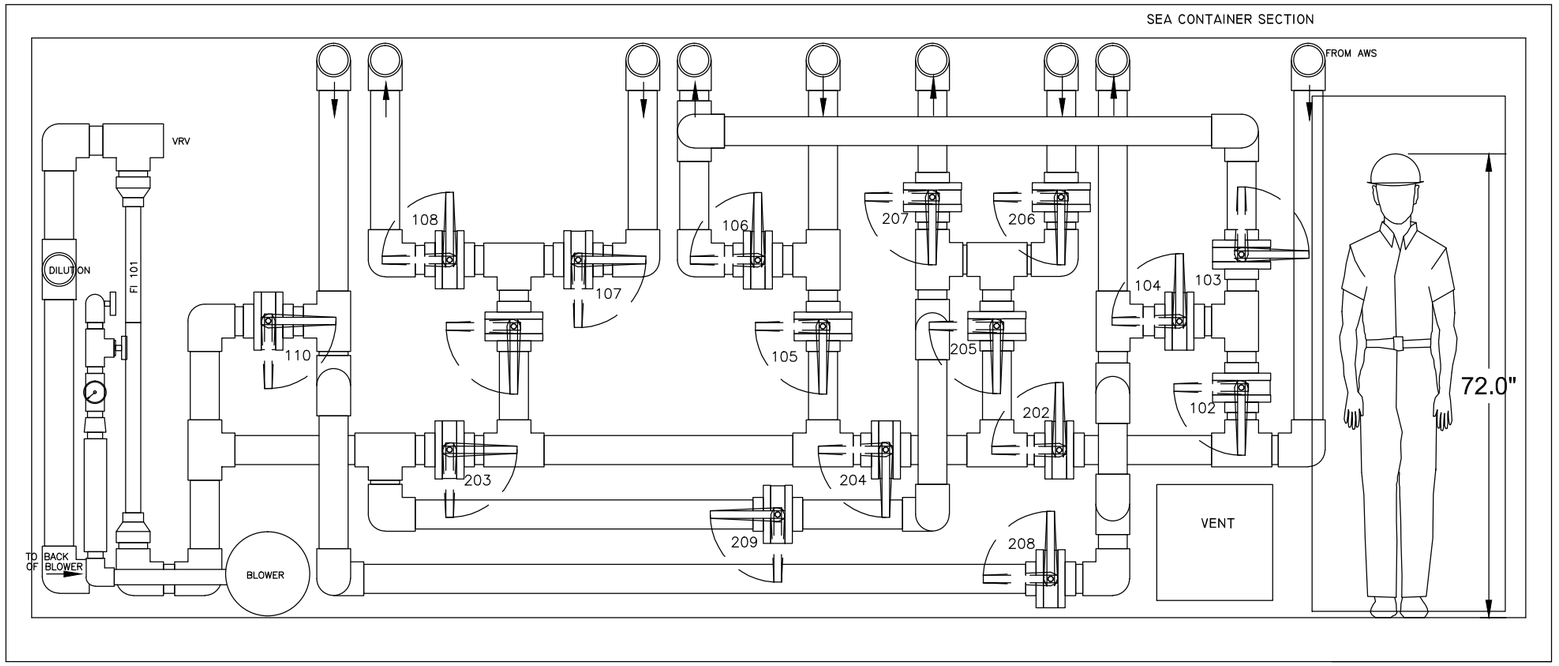
ENVIRONMENTAL EQUIPMENT & CONTROLS

11929 Portland Ave S.
Burnsville, MN 55377

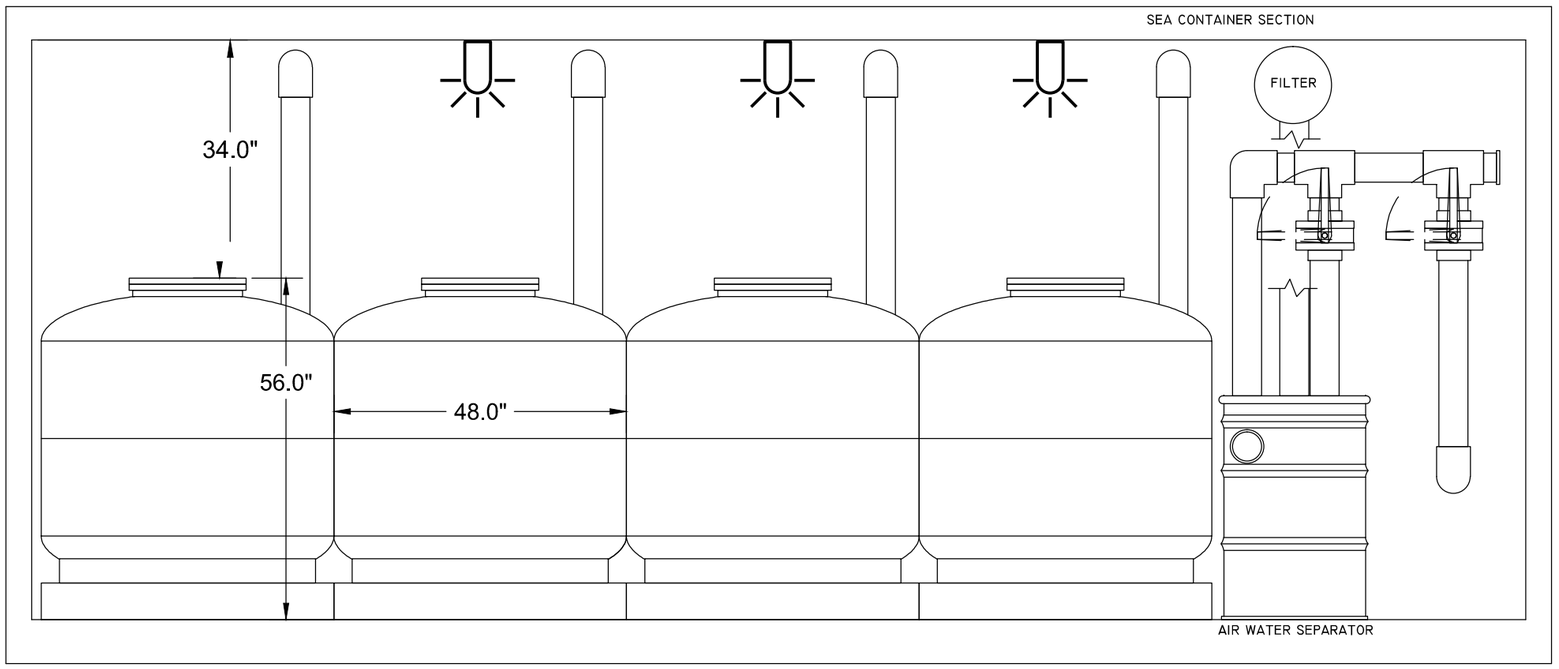
Phone: 952-707-9101
Fax: 952-707-1075

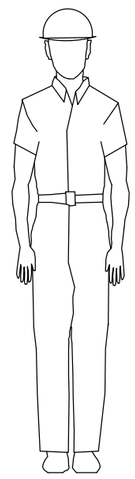
Customer	ARCADIS
Site Reference	CROSSMAN
Cust. No.	PLC Job No. 16-020
Tolerance ±0.5"	Rev. 0
Drawing No.	PLAN
Sheet No. Sheet 1 of 1	Scale 1/2"=1'-0" (11" x 17")
Drawn By FOX-1	Drawn Date 2016-06-15
Title	PLAN

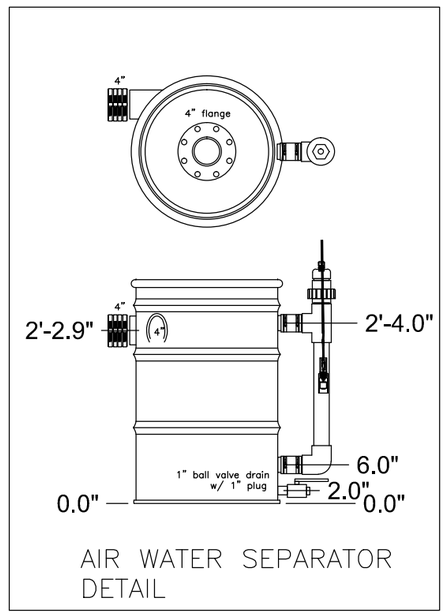
REVISIONS			
Rev	Date	By	Description
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1			
2			
3			
4			



SEA CONTAINER SECTION







AIR WATER SEPARATOR DETAIL

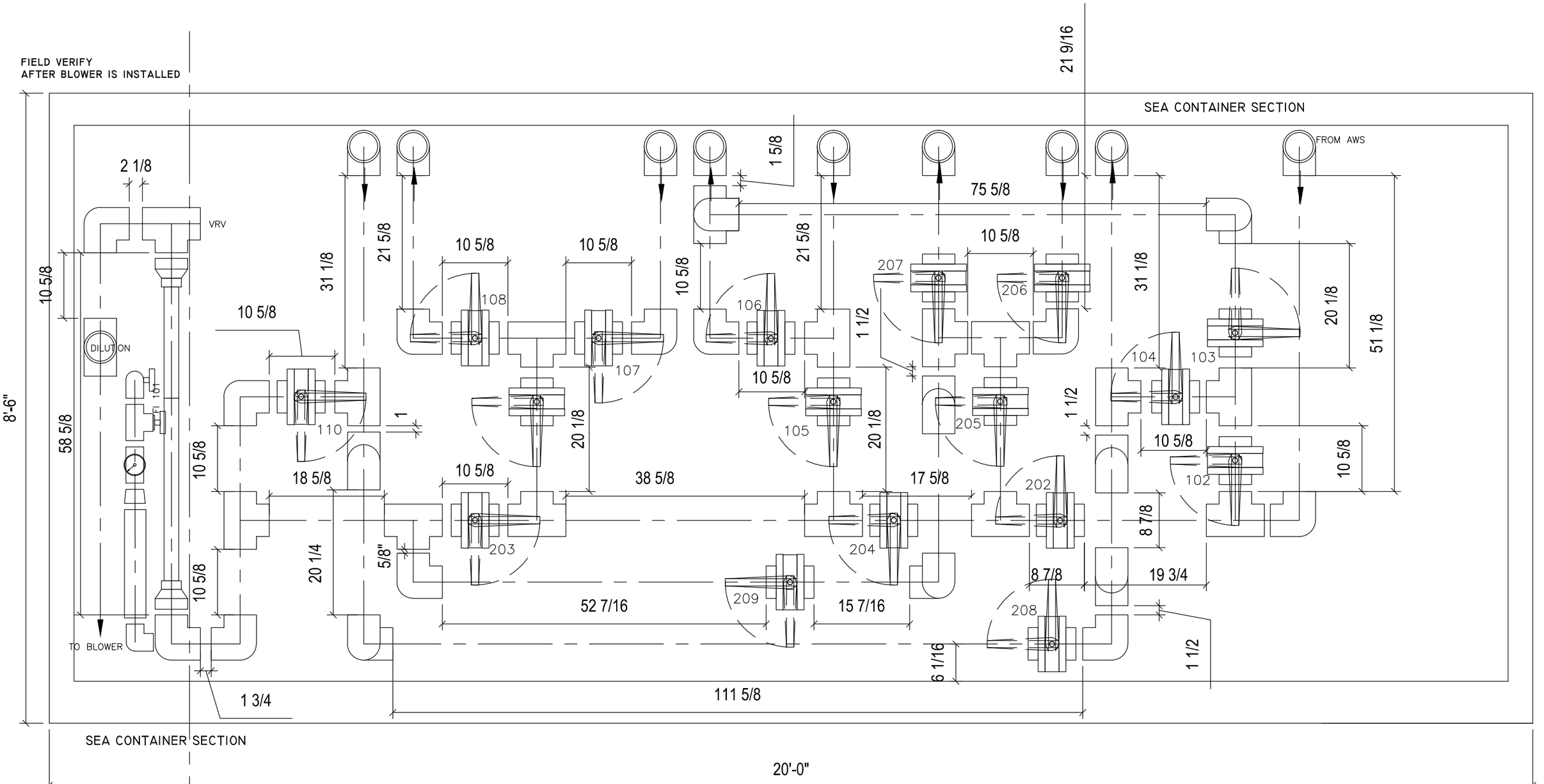
PRODUCT LEVEL CONTROL, INC.

ENVIRONMENTAL EQUIPMENT & CONTROLS

11929 Portland Ave S.
Burnsville, MN 55377

Phone: 952-707-9101
Fax: 952-707-1075

Customer	ARCADIS
Site Reference	CROSSMAN
Cust. No.	PLC Job No. 16-020
Tolerance ±0.5"	Rev. 0
Drawing No.	CROSS SECTIONS
Sheet No. Sheet 1 of 1	Scale 1/2"=1'-0" (11" x 17")
Drawn By FOX-1	Drawn Date 2016-06-15
Title	CROSS SECTIONS



SCALE = 3/4" = 1'-0"

REVISIONS			
Rev	Date	By	Description
0			
1			
2			
3			
4			

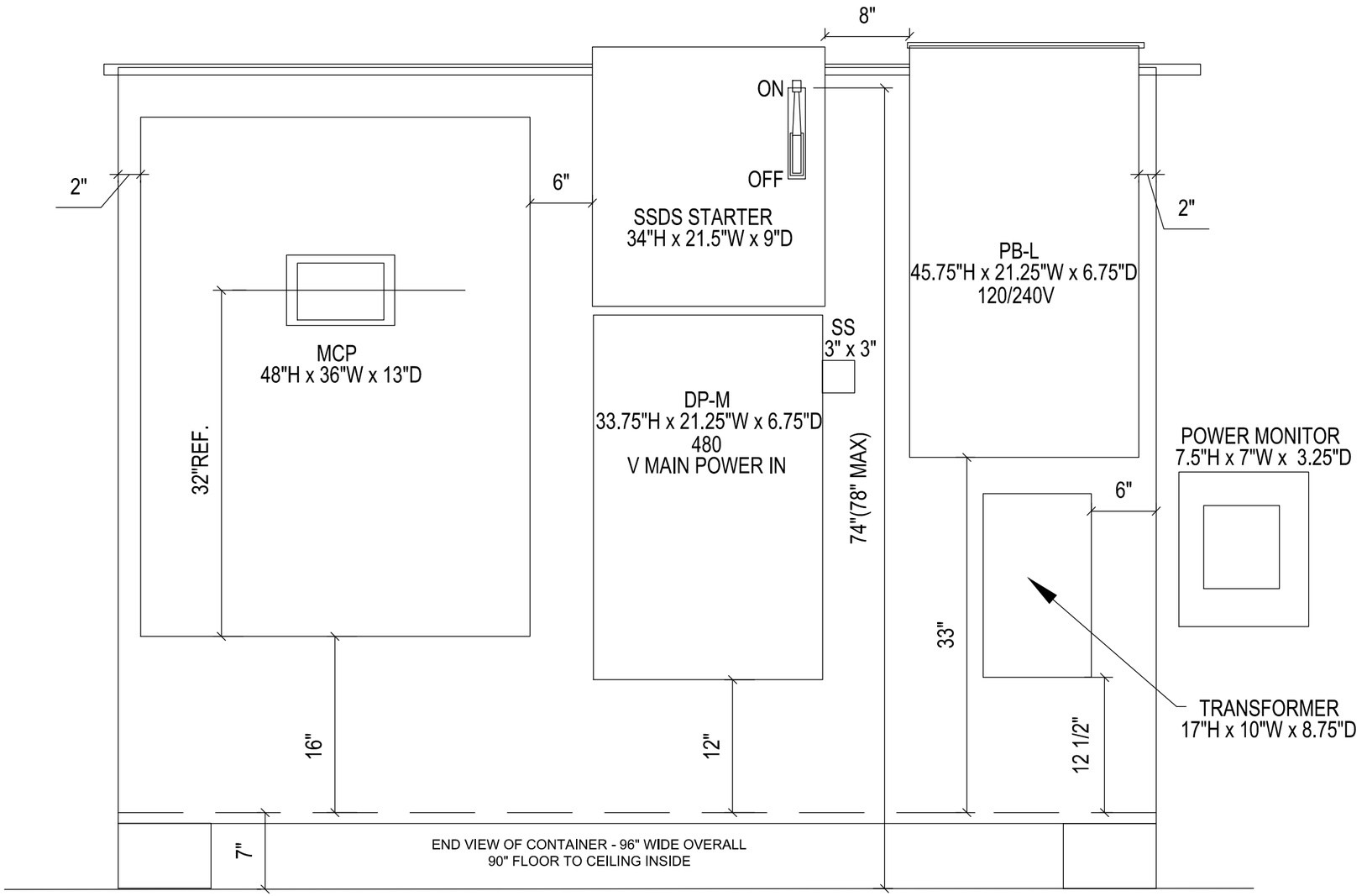
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Burnsville, MN 55377

Phone: 952-707-9101
Fax: 952-707-1075

Customer	ARCADIS
Site Reference	CROSSMAN
Cust. No.	PLC Job No. 16-020
Tolerance ±0.5"	Rev. 0
Drawing No.	PIPING LAYOUT
Sheet No. Sheet 1 of 1	Scale 3/4"=1'-0" (11" x 17")
Drawn By FOX-1	Drawn Date 2016-06-15
Title	PIPING LAYOUT



REVISIONS			
Rev	Date	By	Description
0			
1			
2			
3			
4			

PRODUCT LEVEL CONTROL, INC.
ENVIRONMENTAL EQUIPMENT & CONTROLS
11929 Portland Ave S.
Burnsville, MN 55377
Phone: 952-707-9101
Fax: 952-707-1075

Customer	ARCADIS
Site Reference	CROSSMAN
Cust. No.	PLC Job No. 16-020
Tolerance ±0.5"	Rev. 0
Drawing No.	PANEL LAYOUT
Sheet No. Sheet 1 of 1	Scale 1"=1'-0" (11" x 17")
Drawn By FOX-1	Drawn Date 2016-06-15
Title	PANEL LAYOUT

ARCADIS - CROSMAN
PANELBOARD DP-M
BREAKER SCHEDULE

Model: SquareD NF with MH50WP Enclosure
Type: 3R/5/12, 30 Circuit, Surface Mount, Service Entrance Rated

DIRECTORY	KVA LOAD A	KVA LOAD B	KVA LOAD C	CIRCUIT	CB AMPS	PHASE	CB AMPS	CIRCUIT	KVA LOAD A	KVA LOAD B	KVA LOAD C	DIRECTORY
SPARE				1		A		2				
				3	**20/3**	B	**20/3**	4	0	0	0	METER
				5		C		6				
SSDS BLOWER	2			7		A		8				
		2		9	**20/3**	B	**20/3**	10				SPARE
			2	11		C		12				
HEATER 7.5kW	2.5			13		A		14				
		2.5		15	**20/3**	B		16				BLANK
			2.5	17		C		18				
TRANSFORMER	5			19	**30/2**	A		20				
		5		21		B		22				BLANK
				23		C		24				
MAIN BREAKER				25		A		26				
				27	**60/3**	B	**30/3**	28	0	0	0	SPD
				29		C		30				
SUBTOTAL	9.5	9.5	4.5						0	0	0	SUBTOTAL
SYSTEM: 480Y/277 VAC, 3 PH, 4 WIRE									9.5	9.5	4.5	TOTAL / PHASE
MAIN BREAKER: EDB 60A/3 POLE									23.5			**TOTAL KVA**
BRANCH CIRCUITS: EDB 20A/3 POLE, 30A/2 POLE												
SCCR: 18kA @ 480VAC, FULLY RATED												

ARCADIS - CROSMAN
PANEL BOARD PB-L
BREAKER SCHEDULE

Model: Schneider Electric NQ30L2 with MH44WP enclosure
Type: 3R/5/12, 30 Circuit, Surface Mount

DIRECTORY	KVA LOAD A	KVA LOAD B	CIRCUIT	CB AMPS	PHASE	CB AMPS	CIRCUIT	KVA LOAD A	KVA LOAD B	DIRECTORY
MCP	1.9		1	**20/1**	A	**20/1**	2	1.5		Heat Trace GFI
Receptacles		1.9	3	**20/1**	B	**20/1**	4		1.5	Heat Trace GFI
Spare			5	**20/1**	A	**20/1**	6	0.2		Ex Fan 0.1 Hp
Interior Lights		1.2	7	**20/1**	B	**20/1**	8			Spare
Spare			9	**20/1**	A		10			
			11		B		12			
			13		A		14			
			15		B		16			
			17		A		18			
			19		B		20			
			21		A		22			
			23		B		24			
			25		A		26			
			27		B		28			
			29		A		30			
SUBTOTAL	1.9	3.1						1.7	1.5	SUBTOTAL
VOLTAGE: 120/240 VAC PHASE: 1 WIRE: 3								3.6	4.6	TOTAL / PHASE
MAIN BREAKER: HD 50A/2P								8.2		**TOTAL KVA**
BRANCH CIRCUITS: QOB 20A/1P, 20A/1P EPD										
SCCR: 10kA FULLY RATED										

Reference	Qty	Units	Description	Material	Part Number
BLOWER, VACUUM SYSTEM					
B-300	1	each	RIETSCHLE MODEL 2BH1610-7HH26-Z 26 SIDE CHANEL BLOWER		
AF-100	1	each	SOLBERG-CSL-235P-300 FILTER, AIR, INLINE, 3" MNPT-300 ACFM	STEEL/POLY ESTER	SOLBERG-CSL-235P-300
V-111	1	each	VALVE, BALL, FNPT, 2" FULL PORT, 600 NSWOG 150 WSP, 0-400°F	BRASS/TFE	MATCO-759T08
AFS-100	1	each	SOLBERG-FS-31P-200 FILTER, AIR, INLET SILENCER, DILUTION FILTER SILENCER, 2" MNPT-135 SCFM	STEEL/POLY ESTER	SOLBERG-FS-31P-200
S-400	1	each	SILENCER, ABSORPTIVE TYPE, MINIMAL PRESSURE DROP, REDUCES HIGH FREQUENCY NOISE UP TO 30dBA, LAYERED SOUND ABSORBENT MEDIA, INLET OR DISCHARGE APPLICATION, UP TO 212F, 15 PSIG, 2 1/2" MNPT I/O, 23.7" LONG, RATED FOR 385 SCFM, 15 PSIG	STEEL/ABSO RBENT MEDIA	SOLBERG-SLCRT250
V-112	1	each	VACUUM RELIEF VALVE, 2" FNPT, 2/229, 5/338, 10/415, 15/426, 20/426 ("HG/SCFM RATING) RATED FOR SERVICE UP TO 29"HG	BRONZE, CAST	KUNKLE-215V-H01AQEXXXX (SET VACUUM, xx INCH Hg)
V-301	1	each	PRESSURE RELIEF VALVE, 2" MNPT, 1/240, 5/531, 10/741, 15/948, 20/1092, 50/2020 (PSIG/SCFM RATING) RATED FOR SERVICE UP TO 60 PSIG, 406°F MAX, WITH LIFT RING	BRONZE, SS, IRON	KUNKLE-0337-H01ANEXXXX (SET PRESURE, xx PSIG)
FI-101	1	each	ROTRON-FM20C225Q VENTURI FLOWMETER, 2" FPT, 45-225 SCFM	ALUMINUM	ROTRON-FM20C225Q-550604
V102-107	7	each	GAUGE, VACUUM, 0-100" WC 2 1/2" DIAL 1/4" MNPT CBM -20-180°F		PIC
	8	each	Miniature Chrome-Plated Brass Ball Valve Wedge Handle, 1/8" NPT Male X 1/8" NPT Female	BRASS	4912K71
SP	8	each	1/4" MNPT BARBED SAMPLE PORT	BRASS	4793K2
PI-301	1	each	GAUGE, PRESSURE, 0-60" WC 2 1/2" DIAL 1/4" MNPT CBM -20-180°F		PIC
TI-102, 301	2	each	THERMOMETER, 20-240°F 3" DIAL 2 1/2" STEM 1/2" MNPT CBM	300 SS	TRERICE-B831X0205
	1	each	4" PVC EXHAUST STACK		
KT-100	1	each	60 GALLON VESSEL WITH MANUAL DRAIN VALVE, 29" Hg MAX	.25 & 10 GA STEEL	PLC-MDXX-WSR60-XXS
LEVEL SWITCHES	1	each	TWO-LEVEL FLOAT SYSTEM (EACH FLOAT HAS ITS OWN SWITCH THAT CAN BE ADJUSTED) ALL INSIDE A CLEAR PVC SITE TUBE		
V-102, 201	2	each	VALVE, BUTTERFLY, WAFER TYPE, LOCKABLE LEVER HANDLE, 4", 200 NSWOG	CAST/ALBRO NZE/EPDM	MILWAUKEE-4CW223E
V-101-201	3	each	GAUGE, VACUUM, 0-100" WC 2 1/2" DIAL 1/4" MNPT CBM -20-180°F		PIC
VI	2	each	Miniature Chrome-Plated Brass Ball Valve Wedge Handle, 1/8" NPT Male X 1/8" NPT Female	BRASS	4912K71
SP	2	each	1/4" MNPT BARBED SAMPLE PORT	BRASS	4793K2
VT	2	each	WIKA VACUUM TRANSMITTER, 2 WIRE 4-20 mA OUTPUT, M12X1 4 PIN CONNECTION CABLE, -0.25 … 0 BAR VACUUM RANGE, STANDARD 0.50% OF SPAN ACCURACY, 10-30 VDC SUPPLY, 1/4" NPT PROCESS CONNECTION,		WIKS S-10
VT	2	each	M12 cable for quick-disconnect sensors, 12mm right-angle female plug, 4-pole, 7 meter length, gray PVC outer jacket		CD12M-0B-070-C1
BUILDING					
BUILDING	1	each	20' SEA CONTAINER, DRY FREIGHT, EXTERIOR DIMENSIONS: 8' W X 8'-6" H X 19'-10 1/2" L, INTERIOR DIMENSIONS: 7'-8 1/2" W X 7'-9 7/8" H X 19'-4 1/4" L, REAR FULL 7'-8 1/2" W X 7'-5 5/8" T DOOR WITH CAMS AND KEEPERS, 67200 LB GROSS, 4755 LB TARE, 62445 LB CAPACITY, HIGH TENSILE STEEL, HARDWOOD FLOOR, NEW CONTAINER OR ONE TRIP	STEEL	
BUILDING	1	each	INSULATION AND INTERIOR FINISH KIT FOR 20' SEA CONTAINER, R 7.5 EXTRUDED POLYSTYRENE INSULATION, 7/16" OSB		PLC-20' SEA CONTAINER INSULATE AND OSB
BUILDING	1		INSULATE THE UNDER SIDE OF THE SEA CONTAINER		
DOOR	1	each	Mastercraft P-1 32" x 80" Flush Steel Prehung Exterior Door - Left Outswing: When pulling the door toward you, the knob is on the left side, Primed and ready to finish, Prehung with 4-9/16" primed wood and high performance weatherstrip, Energy-saving, foam-in-place polyurethane core, Outswing, adjustable, aluminum sill, Double bored and prepped for deadbolt, Rough Opening: 34-1/4" W x 82" H	___/ ___	Menards® SKU: 4141198
DOOR KNOB	1	each	DOORKNOB AND DEADBOLT KIT		KEYED THE SAME 219-6069 DEXTER KEY #33486
DOOR KNOB	1	each	DOOR KEY		DEXTER KEY #33486
DOOR	1	each	Gate Hook With Staple		225-0735
LIGHTS	2	each	Ceiling Mount Metallic Weatherproof Utility Light Kit, Electric Lampholder, Clear Glass Globe, Heavy Duty, Die-Cast Aluminum, Suitable for Wet Locations, Surface Mounted or Mounted to a Junction Box, Listed for Through Branch Wiring, Max Lamp Size 150 Watts, 120VAC, Incandescent Bulb Only		365-2830, CARLON-MCL150C
EXHAUST FAN	1	each	EXHAUST FAN, 12"		JDMFG-VES12C
VENT	1	each	Heavy Duty Fixed-Blade Wall Louver, Drop-in, Extruded Aluminum, 24" Wide x 24" High Opening	AL	2100K252
EXHAUST FAN	1	each	LINE VOLTAGE HEATING OR COOLING INDUSTRIAL THERMOSTAT, 8' REMOTE BULB, -30 TO +100°F, SPDT, 120-277VAC 22AMPS, NEMA 1		McMASTER-1846K26, Johnson Controls A19ABC-24C
HEATER WITH STAT	1	each	17,100 BTU CEILING MOUNT HEATER FORCED AIR 5000 WATTS 3 PHASE 480 VOLT 6.1 AMPS, WITH STAT	3239025	TPI P3P5605T - 5000W 480V 3 PH, B45465, WITH STAT
CARBON					
CARBON	4	each	TETRASOLV MODEL VFV-1000- SD 48 48" DIA BY 59" TALL 4" NPT PORTS WITH 18" TOP MANWAY CW WITH 1000 LBS VIRGIN CARBON		MODEL VFV-1000- SD 48 DRAWINGS TO BE APPROVED BY PLC
VALVES	20	each	Cast Iron Butterfly Valve 4" Pipe, Wafer Style, Lever Handle, EPDM Seat	DUCTILE IRON, EPDM	RED-WHITE FIGURE NO. 937DESL-4"

APPENDIX D

System OMM Logs

System Monitoring Log
Sub-Slab Depressurization System
Crosman Corporation, East Bloomfield, New York

ARCADIS Design & Consultancy for natural and built assets

Date: _____ **Time:** _____ **Technician:** _____

SYSTEM STATUS

	YES	NO	Notes
Is blower running?	☐	☐	
Is virtual hand-off-auto switch in the "auto" position?	☐	☐	
Are electrical panel doors securely closed?	☐	☐	

List any active alarms including date/time of occurrence: _____

Record electric meter reading (kWh) _____ Record blower runtime (hours) _____

SYSTEM PARAMETERS

SDS-1 applied vacuum (in w.c.) (*VI-001*) _____
SDS-1 header vacuum (in w.c.) (*VI-101*) _____
(transmitter VT-101) _____
SDS-2 applied vacuum (in w.c.) (*VI-002*) _____
SDS-2 header vacuum (in w.c.) (*VI-201*) _____
(transmitter VT-201) _____
Knockout tank level *(inches in site gauge)* _____
Influent temperature *(TI-102)* _____
Influent flow rate *(FI-101)* _____
SDS-1 Air Velocity (fpm) _____
SDS-2 Air Velocity (fpm) _____

Post-air filter/pre-VPGAC-101 vacuum (in w.c.) *(VI-102)* _____
Pre-VPGAC-101 vacuum (in w.c.) *(VI-103)* _____
Pre-VPGAC-102 vacuum (in w.c.) *(VI-104)* _____
Pre-VPGAC-103 vacuum (in w.c.) *(VI-105)* _____
Pre-VPGAC-104 vacuum (in w.c.) *(VI-106)* _____
Post-VPGAC-104/pre-dilution vacuum *(VI-107)* _____
Post-dilution/pre-blower vacuum *(VI-108)* _____
Post-blower pressure (in w.c.) *(PI-301)* _____
Post-blower temperature (°F) *(TI-301)* _____

System Valve Positions

	OPENED	CLOSED
SDS-1 extraction point valve V-001	☐	☐
SDS-2 extraction point valve V-002	☐	☐
SDS-1 header valve V-101	☐	☐
SDS-2 header valve V-201	☐	☐
Dilution valve V-119	☐	☐
Vacuum relief valve V-120	☐	☐
Pressure relief valve V-301	☐	☐

	OPENED	CLOSED
V-102	☐	☐
V-103	☐	☐
V-104	☐	☐
V-105	☐	☐
V-106	☐	☐
V-107	☐	☐
V-108	☐	☐
V-109	☐	☐
V-110	☐	☐

	OPENED	CLOSED
V-111	☐	☐
V-112	☐	☐
V-113	☐	☐
V-114	☐	☐
V-115	☐	☐
V-116	☐	☐
V-117	☐	☐
V-118	☐	☐

GENERAL

Are there any unusual noises, vibrations or odors detected at the system? _____

Inspect all fittings, piping, relief valves and sample ports for leaks. Note any observations: _____

Was enclosure secure upon arrival? (Y/N) _____

Other notes: _____

Monthly OMM Checklist
Sub-Slab Depressurization System
Crosman Corporation, East Bloomfield, New York

ARCADIS Design & Consultancy for natural and built assets

Date: _____ **Time:** _____ **Technician:** _____

Task	Frequency	Conducted (Y/N)	Notes
Complete System Monitoring Log	Monthly		
Complete Performance Monitoring Log	Monthly		
Complete Alarm Response Log	As Needed		
Conduct Instantaneous Sub-Slab Differential Pressure Monitoring	See Table 4		
Conduct 24-Hour Continuous Differential Pressure Monitoring	See Table 4		
Conduct System Vapor sampling	See Table 5		
Blower Inspection	Monthly		
Knockout Tank Liquid Level Check and/or Draining (1)	Monthly		
Condensation Check (1)	Monthly		
In-Line Air Filter Element Inspection and/or Replacement (2)(3)	Monthly		
Dilution Line Air Filter Element Inspection and/or Replacement	Monthly		
Extraction Point Riser Inspection	Monthly		
Discharge Stack Inspection	Monthly		
Knockout Tank Liquid Level Switches Test(4)(5)	Annual		
Vacuum Transmitters Test (4)(6)	Annual		
Vacuum Relief Valve Test (should open at 80 in w.c. vacuum)	Annual		
Alarm Notification Test	Annual		
VPGAC Changeout	Annual		
Blower Voltage and Current Check (3)	As Needed		

Notes:

1) Condensation shall be containerized and disposed of in coordination with Crosman Corporation's procedures.
2) System shall be shutdown prior to performing.
3) Lockout/tagout and work on energized equipment shall be conducted in accordance with Arcadis Safety Program.
4) Will cause system shutdown.
5) Knockout tank shall be filled with water using lower drain port.
6) Vacuum transmitters VT-101 and VT-201 shall read between +/- 5% of vacuum gauges VI-101 and VI-201, respectively.

Performance Monitoring Log
Sub-Slab Depressurization System
Crosman Corporation, East Bloomfield, New York

ARCADIS Design & Consultancy for natural and built assets

Date: _____ **Time:** _____ **Technician:** _____

System Status

	YES	NO	Notes
Is blower running?			
Was monthly OM&M Log Sheet completed?			
Was instantaneous sub-slab differential pressure monitoring conducted?			
Was air sampling conducted?			
Was 24-hour continous differential pressure monitoring conducted?			
Indicate indoor air temperature (°F):			

Sub-Slab Differential Pressure Monitoring

Vacuum Monitoring Point	Instantaneous Differential Pressure (in w.c.) [*use negative sign to indicate vacuum*]	24-Hour Continuous Monitoring Conducted (Y/N)
VMP-1		
VMP-2		
VMP-3		
VMP-4		
VMP-5		
VMP-6		
VMP-7		
VMP-8		
VMP-9		
VMP-10		
VMP-11		
VMP-12		

System Vapor Sampling

Sample Location	Sample Collected (Y/N)	Time	Grab or Integrated Sample?	Canister Vacuum (inHg)		PID Measurement
				Start	Finish	

Alarm Response Log
Sub-Slab Depressurization System
Crosman Corporation, East Bloomfield, New York

ARCADIS Design & Consultancy for natural and built assets

Date: _____ **Time:** _____ **Technician:** _____

Alarm Condition:

_____

_____

_____

Cause of Alarm:

_____

_____

_____

Corrective Action:

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

APPENDIX E

Standard Operating Procedures

SOP Author:	Arcadis
SOP #:	SSDS SOP-01
Revision #:	1
Date Implemented:	July 2016
Approval:	

Crosman Corporation – SSD System Vapor Sampling

Description

This SOP is to be used when performing vapor sampling of the SSD system.

Abbreviations

KT	Knockout Tank
LSH	Level Switch High
PI	Pressure Indicator
PS	Pressure Switch
SOP	Standard Operating Procedure
SP	Sample Port
SSDS	Sub-Slab Depressurization System
VI	Vacuum Indicator
VT	Vacuum Transmitter

System Sampling

1. System sampling locations and frequency shall be in accordance with Table 6 in the OM&M Plan.

2. Grab samples will be collected directly from the sample ports. Sample locations are shown on Drawing M-1. Samples should be analyzed using USEPA Method TO-15 and submitted to the approved testing laboratory.

3. At each sampling port location the threaded male ¼" plug will have to be removed and replaced with a clean brass or stainless steel ¼" male NPT x 3/16" barb fitting. The barbed fitting shall be cleaned in accordance with the site-specific Field Sampling Plan / Quality Assurance Assessment Program.



Photo 1: SDS-1 Sampling Location



Photo 2: Particulate Filter

4. Obtain the lab-provided 1-liter Summa canister. Make sure that the canister valve is 100% closed (i.e, turned clockwise, hand-tight).

5. Note that the Summa canisters are under vacuum. As soon as the canister valve is opened a sample is being collected.

6. Use a wrench to tighten/loosen lab-provided threaded Swagelok fittings. Be sure not to overtighten fittings (each joint contains compression fitting).

7. Remove the threaded cap from the canister. Attach the lab-provided vacuum gauge. If the gauge fitting contains a tee fitting then attach the threaded cap to the tee fitting so the

Crosman Corporation – SSD System Vapor Sampling

SOP Author:	Arcadis
SOP #:	SSDS SOP-01
Revision #:	1
Date Implemented:	July 2016
Approval:	

gauge is not open to atmosphere. Open the canister valve a ½ turn. Record the vacuum reading.

8. The initial vacuum reading should be around 30 inches of mercury. If the vacuum is less than 28 inches of mercury then contact the laboratory to confirm the canister may be used.

9. Close the canister valve 100% (i.e., turn clockwise). Remove the vacuum gauge.

10. Attach the lab-provided particulate filter.

11. Attach the lab-provided compression fitting to the end of the particulate filter.



Photo 3: Top of Summa Canister, Removing Cap

12. Obtain a short section of lab-provided Teflon tubing (1/4" OD x 3/16" ID). Connect one end of the tubing to the compression fitting on the Summa canister and the other end to the barbed fitting on the sample port. Use a hose clamp to tighten the tubing onto the barb. Be sure not to overtighten the hose clamp.

13. If the sample port has an inline valve, then open the valve 100%.

14. To collect the sample, open the Summa canister valve a ½ turn (turn counter-clockwise). Sufficient sample volume should be collected after 1 minute.

15. After 1 minute close the canister valve 100% and remove the particulate filter. Attach the lab-provided vacuum gauge. If the gauge fitting contains a tee fitting then attach a threaded cap to the tee fitting so the gauge is not open to atmosphere. Open the canister valve a ½ turn and record the vacuum reading.

16. The vacuum reading should be less than 5 inches of mercury. If the vapor stream being sampled is under vacuum then the canister vacuum at the conclusion of the sampling may read approximately the vacuum of the vapor stream. If the vapor stream being sampled is under pressure then the canister vacuum at the conclusion of the sampling may read approximately 0 inches of mercury. If the vacuum reading is greater than 5 inches of mercury, then additional sample volume is required.

17. If the canister vacuum is between 0 and 5 inches of mercury, then sampling is complete. Close the canister valve 100%, disconnect the vacuum gauge and attach the threaded cap. Remove the barbed fitting from the sample port and thread the male ¼" plug.

SOP Author:	Arcadis
SOP #:	SSDS SOP-02
Revision #:	1
Date Implemented:	July 2016
Approval:	

Crosman Corporation
Sub-Slab Continuous Monitoring

Description

This SOP is to be used when performing sub-slab continuous monitoring.

Abbreviations

KT	Knockout Tank
LSH	Level Switch High
PI	Pressure Indicator
PS	Pressure Switch
SOP	Standard Operating Procedure
SP	Sample Port
SSDS	Sub-Slab Depressurization System
VI	Vacuum Indicator
VT	Vacuum Transmitter

Sub Slab Continuous Monitoring

1. 24-hour continuous sub-slab differential pressure monitoring is to be conducted at the locations and frequencies in accordance with Table 5 in the OM&M Plan.

2. The OmniGuard 4 differential pressure recorder is a micromanometer with data logging capabilities. This device or an equivalent will be used and set to record continuous pressure differential readings.

Instructions for Installing Continuous Monitoring and Data Logging Devices

1. Plug unit into extension cord or connect to portable battery and power on by pushing the "POWER ON/OFF" key (See Figure 1, #1).

2. Set the upper and lower alarm limits as follows:
   a. Press the "MENU" (See Figure 1, #2) button to view the main menu.
   b. Scroll to the "ALARM SETPOINTS" option using the up and down arrow keys (Figure 1, #3) and press the "SELECT" (Figure 1, #4) button.
   c. Use the up and down arrow keys (Figure 1, #3) to change the Alarm 1 set point. Note that you can only change the values in increments of 0.005 inches of water column. Set the Alarm 1 set point to -0.245 inches of water column. Once the alarm is at the appropriate value, press the right arrow key (Figure 1, #5) to move to the Alarm 2.
   d. Set the Alarm 2 set point using the up and down arrow keys (Figure 1, #3). The Alarm 2 set point should be set to -0.005 inches of water column. Once the appropriate value is selected, press the "SAVE" (Figure 1, #6) key to return to the main menu.

3. Set the print/log rates as follows:
   a. Scroll through the menu using the up and down arrow keys (Figure 1, #3) until the "PRINT/LOG RATES" is highlighted. Press the "SELECT" (Figure 1, #4) button.
   b. Use the up and down arrow keys (Figure 1, #3) to change the "NORMAL RATE". Set the "NORMAL RATE" to 5 minutes. Once the 5 minute option is highlighted, press the right arrow key (Figure 1, #5) to move to the "ALARM RATE".
   c. Use the up and down arrow keys (Figure 1, #3) to change the "ALARM RATE". Set the "ALARM RATE" to 120 seconds (2 minutes). Once the appropriate value is highlighted, press the "SAVE" (Figure 1, #6) key to return to the main menu.

4. Set the response rate as follows:
   a. Scroll through the main menu using the up and down arrow keys (Figure 1, #3) until the "RESPONSE RATE" option is highlighted. Press the "SELECT" button (Figure 1, #4).
   b. Use the up and down arrow keys (Figure 1, #3) to scroll to the appropriate

Crosman Corporation
Sub-Slab Continuous Monitoring

rate. The "RESPONSE RATE" should be set to "SLOW". Once the "SLOW" option is highlighted, press the "SAVE" (Figure 1, #6) key to return to the main menu. Document what the response rate was set to on the system parameter form.

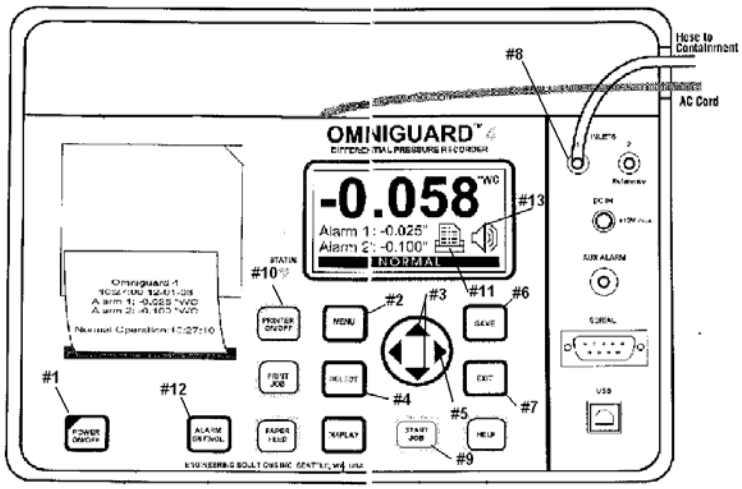


Figure 1: Schematic of OmniGuard 4

5. Press the "EXIT" (Figure 1, #7) button on the data logger to return to the main screen.

6. Connect one end of the tubing to "Inlet 1" (Figure 1, #8) on the data logger, and connect the other end to the monitoring point.

7. Start the data logging as follows:
   a. Press the "START JOB" (Figure 1, #9) key on the data logger.
   b. Enter the name of the location where the data logger is being installed using the up and down arrow keys (Figure 1, #3). Once the name is complete, press the "SAVE" (Figure 1, #6) button. This will start the current data logging job.

8. Turn off the printing option on the data logger as follows:
   a. Press the "PRINTER ON/OFF" button (Figure 1, #10) on the data logger. Confirm that the printer is off by checking the printer symbol on the main screen (Figure 1, #11); it should have an X through it. If it does not, press the "PRINTER ON/OFF" (Figure 1, #10) key until there is an X through the symbol.

9. Turn off the audible alarm as follows:
   a. Press the "ALARM SILENCE" (Figure 1, #12) key on the data logger. Confirm that the audible alarm is off by checking the sound symbol on the main screen (Figure 1, #13); it should have an X through it. If it does not, press the "ALARM SILENCE" (Figure 1, #12) key until there is an X through the symbol.

10. Ensure that the instrument is recording:
    a. The green light will stop flashing and the status display will change from "WAITING FOR PRESSURE" to NORMAL OP".
    b. Note that the instrument will not begin recording until the measured value is between the two alarm set points. If a pressure is not displayed on the main screen, use a portable micromanometer with a measurable pressure range greater than the OmniGuard 4 to determine if the pressure is above or below the alarm set points.

Downloading the Data

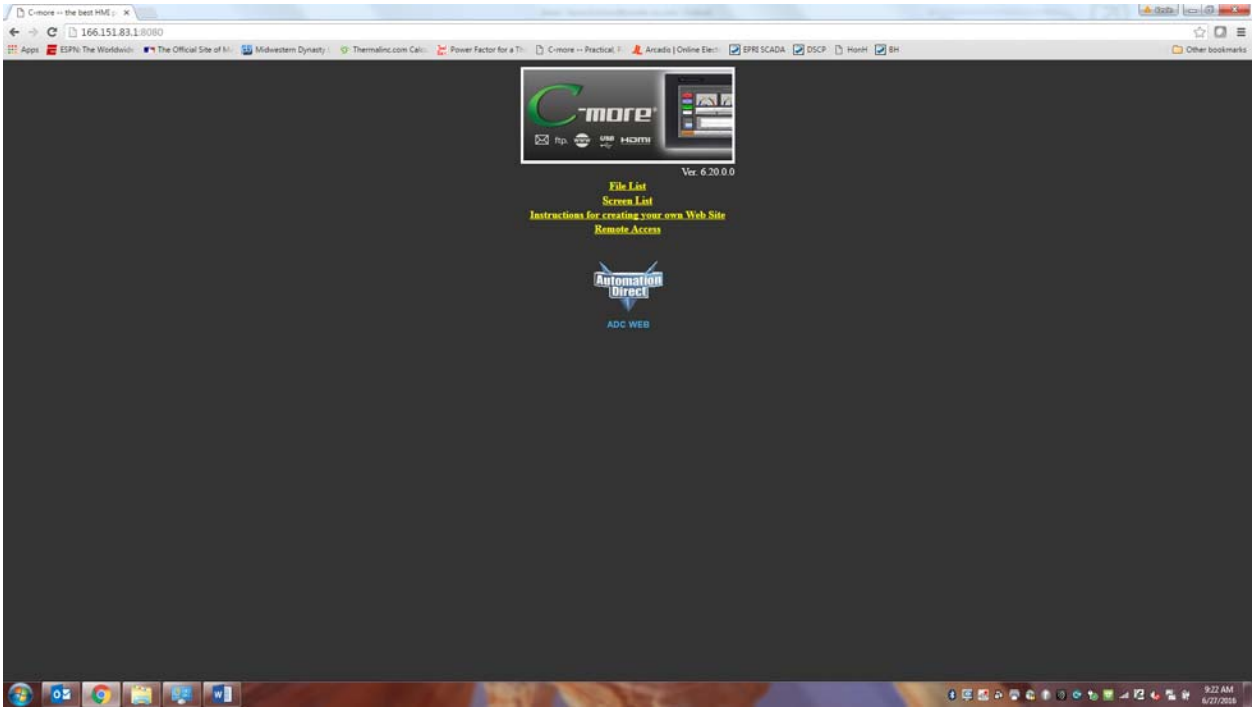
After installing the necessary communication software (OmniGuard Communication Software) on a computer, the data may be downloaded.

If the OmniGuard unit will be moved to a different location for downloading of the data, the unit may be turned off using the "POWER ON/OFF" button. To communicate with the OmniGuard, the OmniGuard will need to be turned on and connected to your computer using one of the cables provided. After the desired files are downloaded from the OmniGuard, make sure that the files are named correctly and provide to the GE Project Manager.

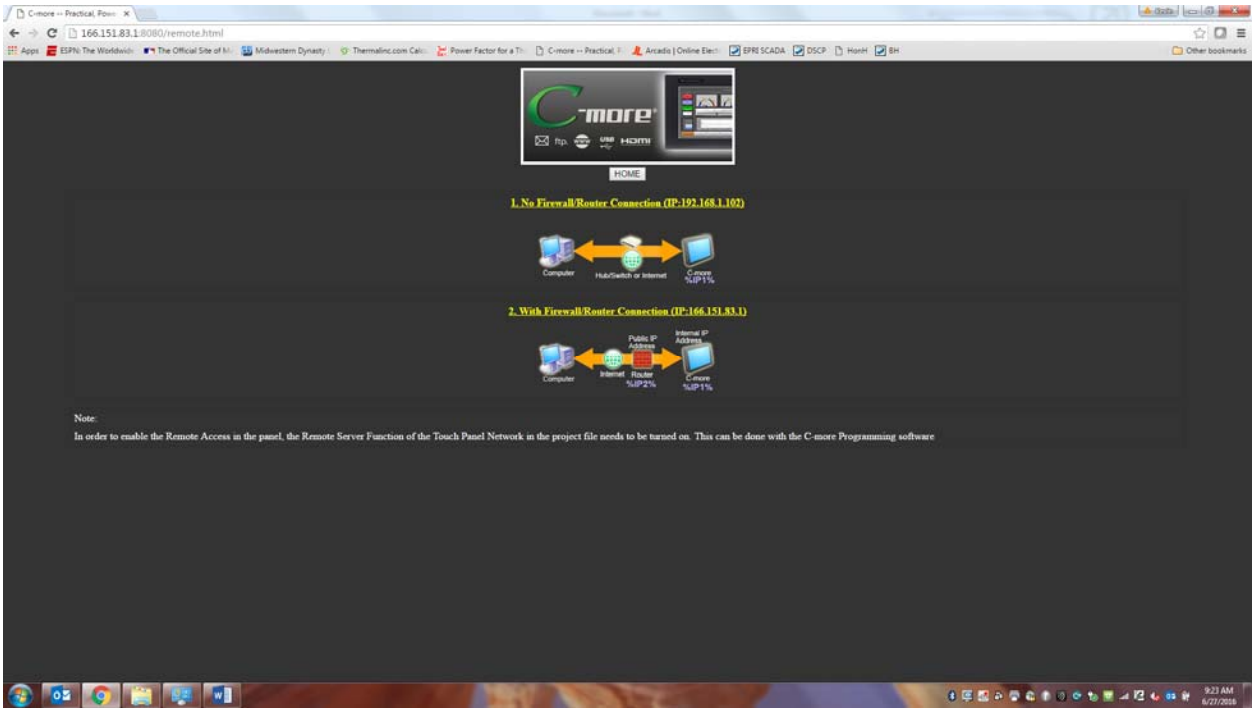
Crosman Corporation
Remote Access Instructions
SSDS SOP-03

Step 1: If ARCADIS employee, then disable unified agent software in task bar

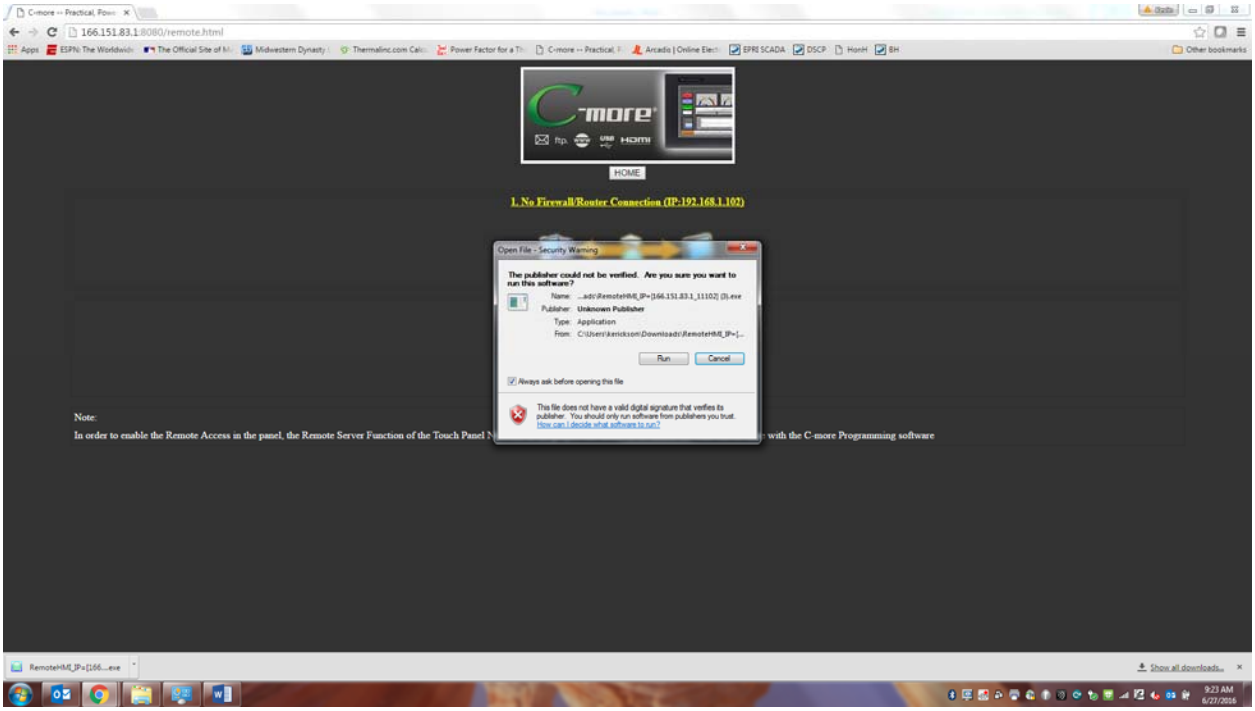
Step 2: Open a web browser and type in the following to the address bar: 166.154.153.235:8080



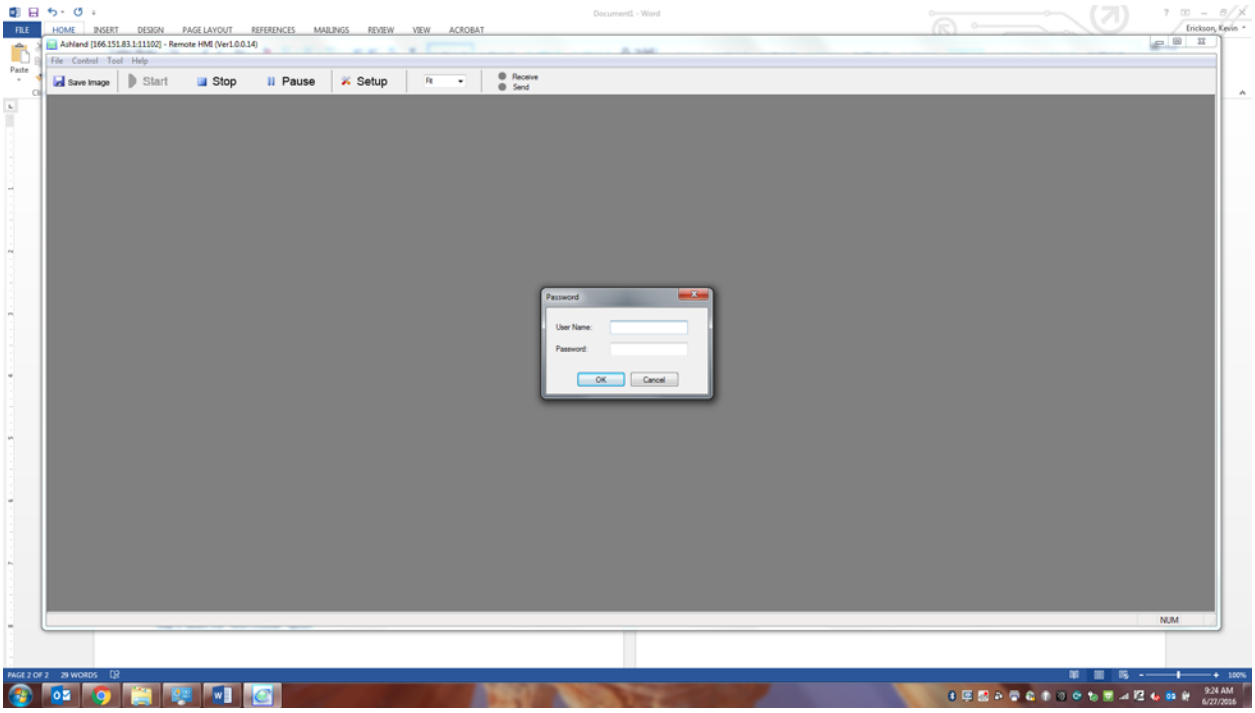
Step 2: Select the “Remote Access” option



Step 3: Select the “With Firewall” option



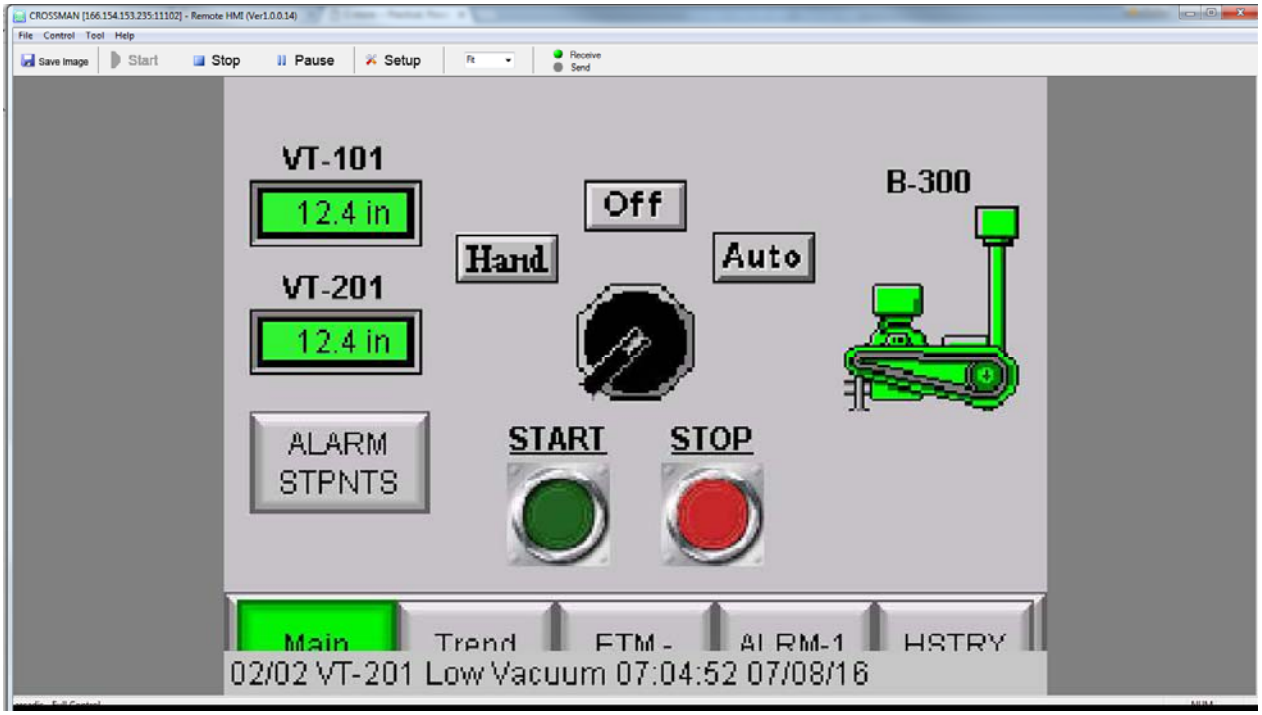
Step 5: A file will download, open if it doesn’t open automatically, and select “Run”



Step 6: Log in credentials are prompted for, use the below:

User Name: arcadis

Password: 5alamander



Step 7: Control system as if in front of the screen

Arcadis U.S., Inc.

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Appendix I

Quality Assurance Project Plan

ARCADIS Design & Consultancy for natural and built assets

QUALITY ASSURANCE PROJECT PLAN

Crosman Corporation Site
East Bloomfield, New York

Prepared for:
Crosman Corporation and
New Coleman Holdings, Inc.

February 2017

QUALITY ASSURANCE PROJECT PLAN

Crosman Corporation Site
East Bloomfield, New York

Prepared for:

Crosman Corporation and
New Coleman Holdings, Inc.

Prepared by:

Arcadis of New York, Inc.

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Our Ref.:

B0041501.0001

Date:

February 2017

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ATTACHMENT

1 Sample Chain of Custody Form

ACRONYMS AND ABBREVIATIONS

Arcadis	Arcadis of New York, Inc.
ASP	Analytical Services Protocol
CLP	Contract Laboratory Program
DQO	data quality objective
EDD	electronic data deliverable
FSP	Field Sampling Plan
MS/MSD	matrix spike/matrix spike duplicate
NYSDEC	New York State Department of Environmental Conservation
OMM	operation, maintenance, and monitoring
ORP	oxidation-reduction potential
OSHA	Occupational Safety and Health Administration
QA/QC	quality assurance/quality control
QAPP	Quality Assurance Project Plan
RPD	relative percent difference
SDG	sample delivery group
SMP	Site Management Plan
Site	Crosman Corporation Site located in East Bloomfield, New York
TCE	trichloroethene
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound

1 INTRODUCTION

This Quality Assurance Project Plan (QAPP) was prepared to support the Site Management Plan (SMP). This QAPP details planning processes for collecting data at the Crosman Corporation Site located in East Bloomfield, New York (Site) and describes implementation of quality assurance (QA) and quality control (QC) activities developed for this program. Objectives of this QAPP are to generate project data that are technically valid, legally defensible, and useful in meeting project goals. This QAPP can be used as a guide for field personnel performing activities at the Site where the SMP requires water or air sampling.

This QAPP was prepared in a manner consistent with the following reference and guidance documents:

- United States Environmental Protection Agency (USEPA). Methods for Chemical Analysis of Water and Wastes. USEPA/600/4-79/020. EMSL-Cincinnati. 1983.
- USEPA. Test Methods for Evaluating Solid Waste, SW-846 (USEPA 1996, and subsequent method revisions).
- USEPA. Compendium of Methods for the Determination of Toxic Organic Compounds in Air. USEPA/625/R-96/010b. January 1999.
- USEPA. 2001. EPA Requirements for QA Project Plans for Environmental Operations. EPA-QA/R-5. Office of Environmental Information. March 2001.
- USEPA. 2002. Guidance for QA Project Plans. EPA-QA/G-5. Office of Environmental Information. December 2002.
- National Enforcement Investigations Center Policies and Procedures Manual (USEPA 1991).
- Standard Methods for the Examination of Water and Wastewater, 22nd Edition. 2012.

2 PROJECT ORGANIZATION AND RESPONSIBILITIES

2.1 Project Organization

Sampling work utilizing this QAPP as guidance will require integration of personnel from the organizations identified below, collectively referred to as the project team. A description of the responsibilities of each member of the project team is presented in Section 2.2.

Title	Company/Organization	Name	Phone Number
Project Manager	Arcadis	Aaron Richardson	585.662.4024
Project Manager	Crosman Corporation	Gina Thomas	585.657.3120
NYSDEC Project Manager	NYSDEC	Todd Caffoe	585.226.5350

Notes:
NYSDEC = New York State Department of Environmental Conservation

2.1.1 Analytical Laboratory Services and Subcontractors

The analytical services laboratory and contractors performing sampling activities will be determined prior to initiation of field work.

2.1.2 Quality Assurance Staff

Client or contractors conducting sampling work will identify QA personnel. In addition, the following Arcadis of New York, Inc. (Arcadis) individual has been assigned as QA Manager for sampling activities at the site:

Title	Company/Organization	Name	Phone Number
QA Manager	Arcadis	Aaron Richardson	585.662.4024

2.2 Team Member Responsibilities

This section presents the responsibilities and duties of project team members.

2.2.1 New York State Department of Environmental Conservation

NYSDEC Project Manager

1. Confirms all requirements of the SMP, QAPP, and Field Sampling Plan (FSP) are followed for all operation, maintenance, and monitoring (OMM) activities and/or proposed work.
2. Reviews results, reports, and all documents.
3. Overall understanding of nature and extent of impacts remaining at the Site.
4. Provides review and approval of work plans and reports.

2.2.2 Arcadis

Arcadis Project Manager/Field Personnel

1. Management and coordination of all aspects of the project with an attention on adhering to the requirements of the SMP, QAPP, and FSP.
2. Communicates/notifies project team regarding proposed work to be conducted within impacted areas.
3. Confirms all the requirements of the SMP, QAPP, and FSP are followed for all OMM and/or proposed work.
4. Oversight of required media sampling.
5. Oversight of field analysis and collection of QA samples.
6. Reduction of field data calibration and maintenance.
7. Reviews field instrumentation, maintenance, and calibration to maintain quality data.
8. Prepares draft reports and other key documents.
9. Maintains field files of notebooks, logs, and calculations.
10. Coordinates field and laboratory schedules.
11. Performs field procedures associated with tasks and subtasks presented in the SMP.
12. Performs field analyses and collects QA samples.
13. Maintains sample custody.
14. Prepares field records and logs.
15. Calibrates, operates, and maintains field equipment.
16. Reduces field data.

QA Manager

1. Reviews laboratory data packages.
2. Oversees and interfaces with analytical laboratories.

3. Coordinates field QA/QC activities with Task Managers, including audits of field activities, concentrating on field analytical measurements and practices to meet data quality objectives (DQOs).
4. Reviews field reports.
5. Reviews audit reports.
6. Prepares a QA/QC report that includes an evaluation of field and laboratory data and data validation reports.

2.2.3 Laboratory Subcontractor (To Be Determined)

General responsibilities and duties include:

1. Performing sample analyses.
2. Supplying sample containers and shipping cartons.
3. Maintaining laboratory custody of samples.
4. Strictly adheres to laboratory protocols.

Laboratory Project Manager

1. Serves as primary communication link between Arcadis and laboratory staff.
2. Monitors workloads and confirm availability of resources.
3. Oversees preparation of analytical reports.
4. Supervises in-house chain of custody.

Quality Assurance Officer

1. Supervises technical staff in QA/QC procedures.
2. Conducts audits of all laboratory activities.

2.2.4 Data Validator

Provides independent data review and validation of analytical data; provides documentation of results.

3 PROJECT BACKGROUND

This section summarizes background information for the Site. Additional information can be found in the SMP.

The Site is located in the Town of East Bloomfield, Ontario County, New York. The original building at the Site was constructed and operations initiated in 1966 with subsequent building expansions in 1969, 1983, and 1985. Operations in the building have involved manufacture of airguns, BBs, pellets, zinc-plated carbon dioxide cartridges, and rangefinders. During past operations, steel, brass, aluminum, plastic, and wood were received in bar and round stock; machined; cleaned with a degreasing agent; and finished by black oxidizing, painting, or staining. As a result, past manufacturing processes conducted at the plant have generated the following waste streams: spent trichloroethene (TCE), oil, petroleum naphtha, paint and stain solvents, Freon, and non-hazardous iron hydroxide sludge.

By phasing out certain processes and/or chemicals (i.e., TCE), many of these waste streams, including spent TCE, are no longer generated at the Site. Previous investigations at the Site identified TCE in soil and groundwater as the contaminant of concern. The TCE is believed to have been primarily an artifact of inadvertent releases from the east side TCE storage tank that has since been removed. As a result, the remedy for the Site included, among other activities, the installation and operation of a soil vapor extraction system at the east end of the plant that removed TCE contamination from soil and groundwater at the source area to the extent feasible. Long-term groundwater monitoring has shown that pumping well PW-1 at the northern end of the Site continues to be effective in maintaining hydraulic control of the contaminant plume, preventing TCE-containing groundwater from migrating offsite.

4 QUALITY OBJECTIVES AND CRITERIA FOR MEASUREMENT DATA

DQOs are qualitative and quantitative statements that specify quality of the data required to support decisions made during site-related activities and are based on end uses of data to be collected. Preliminary DQOs were identified to confirm that data generated during field activities will be of adequate quality and sufficient quantity to form a sound basis for decision making relative to the above objectives. DQOs have been specified for each data collection activity.

A DQO summary for field sampling efforts is presented below. The summary consists of stated DQOs relative to data uses, data types, data quantity, sampling and analytical methods, and data measurement performance criteria.

Three data categories have been defined to address various analytical data uses and the associated QA/QC effort and methods required to achieve the desired levels of quality. These categories are:

- Screening Data: Screening data affords a quick assessment of site characteristics or conditions. This objective for data quality is applicable to data collection activities that involve rapid, non-rigorous methods of analysis and QA. This objective is generally applied to physical and/or chemical properties of samples, degree of contamination relative to concentration differences, and preliminary health and safety assessment.
- Screening Data with Definitive Confirmation: Screening data allows rapid identification and quantitation, although the quantitation can be relatively imprecise. This objective for data quality is available for data collection activities that require qualitative and/or quantitative verification of a select portion of sample findings (10% or more). This objective can also be used to verify less rigorous laboratory-based methods.
- Definitive Data: Definitive data are generated using analytical methods, such as approved USEPA reference methods. Data are analyte-specific, with confirmation of analyte identity and concentration. Methods produce raw data (e.g., chromatograms, spectra, digital values) in the form of paper printouts or computer-generated electronic files.

For this project, three levels of data reporting have been defined. They are as follows:

- Level 1 – Minimal Reporting: Minimal or “results only” reporting is used for analyses that, either due to their nature (i.e., field monitoring) or the intended data use (i.e., preliminary screening), do not generate or require extensive supporting documentation.
- Level 2 – Modified Reporting: Modified reporting is used for analyses that are performed following standard USEPA-approved methods and QA/QC protocols and that, based on the intended data use, require some supporting documentation but not, however, full “Contract Laboratory Program-type” (CLP-type) reporting.
- Level 3 – Full Reporting: Full “CLP-type” reporting is used for those analyses that, based on intended data use, require full documentation. This reporting level would include Analytical Services Protocol (ASP) Superfund and Category B reporting.

The analytical methods to be used during intrusive soil and/or groundwater sampling activities will be USEPA SW-846 methods with NYSDEC ASP Revision 2000, QA/QC requirements, and Category B reporting deliverables, where required.

4.1 Data Quality Objectives for Groundwater

Groundwater and retention pond effluent samples will be collected as part of field activities associated with the SMP. Groundwater samples will be analyzed on a semi-annual (twice per year) basis for:

- Volatile Organic Compounds (VOCs) by USEPA SW-846 Method 8260.

Retention pond effluent samples will be analyzed on a monthly basis for:

- TCE by USEPA Method 624.

Retention pond effluent samples will be analyzed on a semi-annual (twice per year) basis for:

- Total Toxic Organics USEPA Method 624
- Total Cyanide by Standard Method SM19 4500CN E

Table 1 presents the parameters to be analyzed under each of the methods described above with the laboratory quantitation limits. In addition, during collection of groundwater samples, the following data may be collected; water-level information and water quality field parameters, including pH, oxidation-reduction potential (ORP), turbidity, temperature, conductivity, and dissolved oxygen.

Groundwater level measurement procedures, groundwater sampling procedures, and pond effluent sampling procedures are provided in the FSP.

4.2 Data Quality Objectives for Air

Air samples will be collected at multiple points from the sub-slab depressurization system and associated piping, as well as from ambient indoor air. When collected, air samples will be analyzed for:

- VOCs by USEPA Method TO-15

Table 1 presents the parameters to be analyzed under each of the methods described above with the laboratory quantitation limits.

5 SPECIAL TRAINING REQUIREMENTS/CERTIFICATION

Compliant with the Occupational Safety and Health Administration's (OSHA's) final rule, Hazardous Waste Operations and Emergency Response, 29 Code of Federal Regulations Part 1910.120(e), all personnel performing work in potentially impacted areas will have completed the requirements for OSHA 40-hour Hazardous Waste Operations and Emergency Response training. Persons in field supervisory positions will have also completed the additional OSHA 8-hour Supervisory Training.

6 DOCUMENTATION AND RECORDS

6.1 General

Samples of the various media may be collected, as described in the SMP. Detailed descriptions of documentation and reporting requirements are presented below.

6.2 Field Documentation

Field personnel will provide comprehensive documentation covering all aspects of field sampling, field analysis, and sample chain of custody. This documentation constitutes a record that allows reconstruction of all field events to aid in the data review and interpretation process. All documents, records, and information relating to the performance of the field work will be retained in the project file.

The various forms of documentation to be maintained throughout the action include:

- Daily Production Documentation – A field notebook consisting of a waterproof, bound notebook that will contain a record of all activities performed at the Site.
- Sampling Information – Detailed notes will be made as to the exact site of sampling, physical observations, and weather conditions (as appropriate).
- Sample Chain of Custody – Chain of custody forms will provide the record of responsibility for sample collection, transport, and submittal to the laboratory. Chain of custody forms will be filled out at each sampling site, at a group of sampling sites, or at the end of each day of sampling by Arcadis field personnel designated to be responsible for sample custody. In the event that samples are relinquished by the designated sampling person to other sampling or field personnel, the chain of custody form will be signed and dated by the appropriate personnel to document sample transfer. The original chain of custody form will accompany the samples to the laboratory, and copies will be forwarded to the project files. A sample chain of custody form is included in Attachment 1.
- Field Equipment, Calibration, and Maintenance Logs – To document calibration and maintenance of field instrumentation, calibration and maintenance logs will be maintained for each piece of field equipment that is not factory calibrated.

6.3 Laboratory Documentation

6.3.1 Laboratory Project Files

The laboratory will establish a file for all pertinent data. The file will include all correspondence, faxed information, phone logs, and chain of custody forms. The laboratory will retain all project files and data packages for 5 years.

6.3.2 Laboratory Logbooks

Workbooks, bench sheets, instrument logbooks, and instrument printouts will be used to trace the history of samples through the analytical process and document and relate important aspects of the work, including the associated QCs. As such, all logbooks, bench sheets, instrument logs, and instrument printouts will be part of the permanent record of the laboratory.

Each page or entry will be dated and initialed by the analyst at the time of entry. Errors in entry will be crossed out in indelible ink with a single stroke, corrected without the use of whiteout or by obliterating or writing directly over the erroneous entry, and initialed and dated by the individual making the correction. Pages of logbooks that are not used will be completed by lining out unused portions.

Information regarding the sample, analytical procedures performed, and the results of the testing will be recorded on laboratory forms or personal notebook pages by the analyst. These notes will be dated and will also identify the analyst, instrument used, and instrument conditions.

Laboratory notebooks will be periodically reviewed by the laboratory group leaders for accuracy, completeness, and compliance to this QAPP. All entries and calculations will be verified by the laboratory group leader. If all entries on the pages are correct, then the laboratory group leader will initial and date the pages. Corrective action will be taken for incorrect entries before the laboratory group leader signs.

6.3.3 Computer Tape and Hard Copy Storage

All electronic files will be maintained on CD-ROM for 5 years; hard copy data packages will be maintained in files for 5 years.

6.4 Field Data Reporting

6.4.1 Field Data Reporting

Information collected in the field through visual observation, manual measurement, and/or field instrumentation will be recorded in field notebooks or data sheets and/or on forms. Such data will be reviewed by the appropriate Task Manager for adherence to the work plan and for consistency. Concerns identified as a result of this review will be discussed with the field personnel, corrected if possible, and, as necessary, incorporated into the data evaluation process.

Where appropriate, field data forms and calculations will be processed and included in appendices to a Site Report (when generated). The original field logs, documents, and data reductions will be kept in the project file.

6.4.2 Laboratory Data Reporting

The laboratory is responsible for preparing ASP Category B data packages for VOC data, reduced data packages and case narratives may be acceptable for all other analyses.

All data reports for all parameters will include, at a minimum, the following items:

Narrative – Summary of activities that took place during the course of sample analysis, including the following information:

- Laboratory name and address
- Date of sample receipt
- Cross-reference of laboratory identification number to consultant's sample identification
- Analytical methods used
- Deviations from specified protocol
- Corrective actions taken

Included with the narrative will be any sample handling documents, including field and internal chain of custody forms, air bills, and shipping tags.

Analytical Results – Reported according to analysis type, including the following information, as acceptable:

- Sample ID
- Laboratory ID
- Date of collection
- Date of receipt
- Date of extraction
- Date of analysis
- Detection limits

Sample results on the report forms will be collected for dilutions. Unless otherwise specified, results will be reported uncorrected for blank contamination.

Data for volatile analyses will be expanded to include all supporting documentation necessary to provide a Category B package. This additional documentation will include, but is not limited to, all raw data required to recalculate any result, including printouts, chromatograms, and quantitation reports. The report also will include standards used in calibration and calculation of analytical results; sample extraction, digestion, and other preparation logs; standard preparation logs; instrument run logs; and moisture content calculations.

6.5 Project File

Project documentation will be placed in project files for document management. Project files typically consist of the following components:

1. Agreements/Proposals (filed chronologically)
2. Change Orders/Purchase Orders (filed chronologically)
3. Invoices (filed chronologically)

4. Project Management (filed by topic)
5. Correspondence (filed chronologically)
6. Notes and Data (filed by topic)
7. Public Relations Information (filed by topic)
8. Regulatory Documents (filed chronologically)
9. Marketing Documents (filed chronologically)
10. Final Reports/Presentations (filed chronologically)
11. Draft Reports/Presentations (filed chronologically)
12. Documents Prepared by Others (filed chronologically)

Final reports (including QA Reports) are filed in a designated folder within the project file. Analytical laboratory documentation (when received) and field data will also be filed in a designated folder within the project file. Filed materials may be removed and signed out by authorized personnel on a temporary basis only. Electronic storage of reports in a client folder is also acceptable.

7 SAMPLING PROCESS DESIGN

Information regarding sampling rationale and associated sampling locations can be found in the SMP.

8 SAMPLING METHOD REQUIREMENTS

Groundwater, pond effluent, and air samples will be collected, as necessary, as described in the SMP. Sampling procedures and method requirements are included in the FSP.

9 SAMPLE HANDLING AND CUSTODY REQUIREMENTS

9.1 Sample Containers and Preservation

Appropriate sample containers, preservation methods, and laboratory holding times for the samples are shown in Table 3.

The analytical laboratory will supply appropriate sample containers and preservatives, as necessary. Bottles will be purchased (new) and pre-cleaned to USEPA Office of Solid Waste and Emergency Response Directive 9240.05A requirements. Field personnel will be responsible for properly labeling containers and preserving samples (as appropriate).

9.2 Packing, Handling, and Shipping Requirements

Sample packaging and shipment procedures are designed to confirm samples will arrive at the laboratory, with the chain of custody intact.

Samples will be packaged for shipment as outlined below:

- Confirm all sample containers have sample labels securely affixed to the container with clear packing tape.
- Check the caps on the sample containers to confirm that they are properly sealed.
- Wrap the sample container cap with clear packing tape to prevent it from becoming loose.
- Complete the chain of custody form with required sampling information and confirm that the recorded information matches the sample labels. (Note: If the designated sampler relinquishes the samples to other sampling or field personnel for packing or other purposes, the sampler will complete the chain of custody prior to this transfer. The appropriate personnel will sign and date the chain of custody form to document the sample custody transfer.)
- Using duct tape, secure the outside drain plug at the bottom of the cooler.
- Wrap sample containers in bubble wrap or other cushioning material.
- Place 1 to 2 inches of cushioning material at the bottom of the cooler.
- Ice layer.
- Place the sealed sample containers into the cooler.
- Place ice in plastic bags and seal. Place loosely in the cooler.
- Fill remaining space in cooler with cushioning material.
- Place chain of custody forms in a plastic bag and seal. Tape forms to the inside of the cooler lid.
- Close lid of cooler, lock, and secure with duct tape.
- Wrap strapping tape around both ends of cooler at least twice.

- Mark cooler on outside with the following information: shipping address, return address, “Fragile” labels, and arrows indicating “this side up.” Cover the labels with clear plastic tape. Place a signed custody seal over the cooler lid.

All samples will be packaged by field personnel and transported as low-concentration environmental samples. Samples will be hand-delivered or delivered by an express carrier within 48 hours of the time of collection. All shipments will be accompanied by the chain of custody form identifying the contents. The original form will accompany the shipment; copies will be retained by the sampler for the sampling office records. If samples are sent by common carrier, a bill of lading should be used. Receipts or bills of lading will be retained as part of the permanent project documentation. Commercial carriers are not required to sign off on the chain of custody form, as long as the forms are sealed inside the sample cooler and the custody seals remain intact.

Sample custody seals and packing materials for filled sample containers will be provided by the analytical laboratory. The filled, labeled, and sealed containers will be placed in a cooler on ice and carefully packed to eliminate the possibility of container breakage.

Procedures for packing, handling, and shipping environmental samples are included in the FSP.

9.3 Field Custody Procedures

The objective of field sample custody is to confirm that samples are not tampered with from the time of sample collection through the time of transport to the analytical laboratory. Persons will have “custody of samples” when samples are in their physical possession, in their view after being in their possession, or in physical possession and secured so they cannot be tampered with. In addition, when samples are secured in a restricted area accessible only to authorized personnel, they will be deemed to be in the custody of such authorized personnel.

Field custody documentation consists of both field logbooks and field chain of custody forms.

9.3.1 Field Logbooks

Field logbooks will provide the means of recording data collecting activities performed. As such, entries will be described in as much detail as possible so that persons going to the site could reconstruct a particular situation without reliance on memory.

Field logbooks will be bound field survey books or notebooks. Logbooks will be assigned to field personnel, but will be stored in a secure location when not in use. Each logbook will be identified by the project-specific document number. The title page of each logbook will contain the following:

- Person to whom the logbook is assigned
- Logbook number
- Project name
- Project start date
- End date

Entries into the logbook will contain a variety of information. At the beginning of each entry, the date, start time, weather, names of all sampling team members present, level of personal protection being used, and the signature of the person making the entry will be entered. The names of visitors to the site, field sampling or investigation team personnel, and the purpose of their visit will also be recorded in the field logbook.

Measurements made and samples collected will be recorded. All entries will be made in ink, and no erasures will be made. If an incorrect entry is made, the information will be crossed out with a single strike mark. Whenever a sample is collected or a measurement is made, a detailed description of the location of the station will be recorded. The number of the photographs taken of the station, if any, will also be noted. All equipment used to make measurements will be identified, as well as with the date of calibration.

Samples will be collected following sampling procedures documented in the FSP. Equipment used to collect samples will be noted, as well as with the time of sampling, sample description, volume, and number of containers. Sample identification numbers will be assigned prior to sample collection. Field duplicate samples, which will receive an entirely separate sample identification number, will be noted under sample description.

9.3.2 Sample Labeling

Preprinted sample labels will be affixed to sample bottles prior to delivery at the sampling site. The following information is required in each sample label:

- Project
- Date collected
- Time collected
- Location
- Sampler
- Analysis to be performed
- Preservative
- Sample number

9.3.3 Field Chain of Custody Forms

Completed chain of custody forms will be required for all samples to be analyzed. Chain of custody forms will be initiated by the sampling crew in the field. The chain of custody forms will contain the sample's unique identification number, sample date and time, sample description, sample type, preservation (if any), and analyses required. The original chain of custody form will accompany the samples to the laboratory. Copies of the chain of custody will be made prior to shipment (or multiple copy forms used) for field documentation. The chain of custody forms will remain with the samples at all times. The samples and signed chain of custody forms will remain in the possession of the sampling crew until the samples are delivered to the express carrier (e.g., FedEx) or hand delivered to a mobile or permanent laboratory or placed in secure storage.

Sample labels will be completed for each sample using waterproof ink, unless prohibited by weather conditions. The labels will include sample information, such as sample number and location, type of sample, date and time of sampling, sampler's name or initials, preservation, and analyses to be performed. The completed sample labels will be affixed to each sample bottle and covered with clear tape.

Whenever samples are collocated with a source or government agency, a separate sample receipt will be prepared for those samples and marked to indicate with whom the samples are being collocated. The person relinquishing the samples to the facility or agency should request the representative's signature, acknowledging sample receipt. If the representative is unavailable or refuses, this is noted in the "Received By" space.

9.4 Laboratory Procedures

9.4.1 General

Upon sample receipt, laboratory personnel will be responsible for sample custody. A field chain of custody form will accompany all samples requiring laboratory analysis. Samples will be kept secured in the laboratory until all stages of analysis are complete. All laboratory personnel having samples in their custody will be responsible for maintaining sample integrity.

9.4.2 Sample Receipt and Storage

Upon sample receipt, the laboratory sample custodian will verify the package seal, open the package, verify sample integrity, and compare contents against the field chain of custody. If a sample container is broken, the sample is in an inappropriate container, has not been preserved by appropriate means, or if there is a discrepancy between the chain of custody and the sample shipment, Arcadis will be notified. The laboratory sample custodian will then log the samples in, assign a unique laboratory identification number to each, and label the sample bottle with the laboratory identification number. The project name, field sample code, date sampled, date received, analysis required, storage location and date, and action for final disposition will be recorded in the laboratory information management system. If the sample container is broken, the sample is in an inappropriate container, or has not been preserved by appropriate means, Arcadis will be notified.

9.4.3 Sample Chain of Custody and Documentation

Laboratory chain of custody and documentation will follow procedures consistent with Exhibit F of the NYSDEC ASP 2005.

9.4.4 Sample Analysis

Analysis of an acceptable sample will be initiated by worksheets that contain all pertinent information for analysis. The analyst will sign and date the laboratory chain of custody form when removing the samples from storage.

Samples will be organized into sample delivery groups (SDGs) by the laboratory. An SDG may contain up to 20 field samples (field duplicates, trip blanks, and rinse blanks are considered field samples for the purposes of SDG assignment). All field samples assigned to a single SDG will be received by the laboratory over a maximum of 7 calendar days, and must be processed through the laboratory (preparation, analysis, and reporting) as a group. Every SDG must include a minimum of one site-specific matrix/matrix spike duplicate (MS/MSD) pair, which will be received by the laboratory at the start of the SDG assignment.

Each SDG will be self-contained for all required QC samples. All parameters within an SDG will be extracted and analyzed together in the laboratory. At no time will the laboratory be allowed to run any sample (including QC samples) at an earlier or later time than the rest of the SDG. These rules for analysis will confirm that the QC samples for an SDG are applicable to the field samples of the same SDG and that the best possible comparisons can be made.

9.4.5 Sample Storage Following Analysis

The remaining samples will be maintained by the laboratory for 1 month after the final report is delivered to Arcadis. After this period, the samples will be disposed in accordance with applicable rules and regulations.

10 ANALYTICAL PROCEDURES

10.1 Field Analytical Procedures

Field analytical procedures may include the measurement of pH, ORP, turbidity, temperature, conductivity, dissolved oxygen, groundwater levels, and volatile organic vapors. Specific field measurement protocols are provided in the FSP.

10.2 Laboratory Analytical Procedures

Laboratory analytical requirements presented in the subsections below include a general summary of requirements, specifics related to each sample medium that may be analyzed, and details of the methods to be used for this project.

10.2.1 General

The following tables summarize general analytical requirements:

Table	Title
Table 1	Parameters, Methods, and Quantitation Limits
Table 2	Environmental and Quality Control Sample Analyses
Table 3	Sample Containers, Preservation Methods, and Holding Times Requirements

10.2.2 Sample Metrics

Analyses will be performed following methods listed in Table 2. Results will be reported in units presented in Table 1.

10.2.3 Analytical Requirements

The primary sources to describe analytical methods used during OMM or field sampling are provided in USEPA SW-846 Test Methods for Evaluating Solid Waste; USEPA Methods for Determination of Toxic Organic Compounds in Air; and USEPA Methods for Chemical Analysis of Water and Waste with NYSDEC ASP 2005 Revision, QA/QC, and reporting deliverables requirements. Detailed information regarding QC procedures, including MS/MSDs, MS blanks, and surrogate recoveries is provided in NYSDEC, ASP 2005 Revision, Exhibit E.

11 QUALITY CONTROL REQUIREMENTS

11.1 Quality Assurance Indicators

The overall QA objective for this QAPP is to develop and implement procedures for sampling, chain of custody, laboratory analysis, instrument calibration, data reduction and reporting, internal QC, audits, preventive maintenance, and corrective action such that valid data will be generated. These procedures are presented or referenced in the following sections of this QAPP. Specific QC checks are discussed in Section 11.2.

QA indicators are generally defined in terms of five parameters:

1. Representativeness
2. Comparability
3. Completeness
4. Precision
5. Accuracy

Each parameter is defined below. Specific objectives for the site actions are set forth in other sections of this QAPP, as referenced below.

11.1.1 Representativeness

Representativeness is the degree to which sampling data accurately and precisely represent site conditions, and is dependent on sampling and analytical variability. Field sampling activities have been designed to assess the presence of the constituents at the time of sampling. The FSP and this QAPP present field sampling methodologies and laboratory analytical methodologies. The use of prescribed field and laboratory analytical methods with associated holding times and preservation requirements are intended to provide representative data.

11.1.2 Comparability

Comparability is the degree of confidence with which one dataset can be compared to another. Comparability between field investigation data, to the extent possible, with existing data will be maintained through consistent sampling and analytical methodology set forth in the FSP and this QAPP, aforementioned regulatory guidance analytical methods with NYSDEC ASP Revision 2005 QA/QC requirements and Category B reporting deliverables, and through use of QA/QC procedures and appropriately trained personnel.

11.1.3 Completeness

Completeness is defined as a measure of the amount of valid data obtained from an event and/or investigation compared to the amount that was expected to be obtained under normal conditions. This will be determined on assessment of the analytical results, as discussed in Section 11.6.

11.1.4 Precision

Precision is the measure of reproducibility of sample results. The goal is to maintain a level of analytical precision consistent with the project objectives. To maximize precision, sampling and analytical procedures will be followed. Checks for analytical precision will include the analysis of MSDs, laboratory duplicates, and field duplicates. Checks for field measurement precision will include obtaining duplicate field measurements. Further discussion of precision QC checks is provided in Section 11.4.

11.1.5 Accuracy

Accuracy is the deviation of a measurement from the true value of a known standard. Both field and analytical accuracy will be monitored through initial and continuing calibration of instruments. In addition, internal standards, MS, blank spikes, and surrogates (system monitoring compounds) will be used to assess the accuracy of the laboratory analytical data. Further discussion of these QC samples is provided in Section 11.5.

11.2 Field Quality Control Checks

11.2.1 Field Measurements

To verify the quality of data using field instrumentation, duplicate measurements will be obtained and reported for all field analytical measurements.

11.2.2 Sample Containers

Certified, clean sample containers in accordance with Exhibit I of the NYSDEC ASP Revision 2005 (Eagle Picher pre-cleaned containers or equivalent) will be supplied by the laboratory.

11.2.3 Field Duplicates

Field duplicates may be collected for groundwater to check reproducibility of sampling methods. Field duplicates will be prepared as discussed in the FSP. In general and when required, groundwater and air sample duplicates will be analyzed at a 5% frequency (every 20 samples). Table 2 provides an estimated number of field duplicates for each applicable parameter and matrix.

11.2.4 Trip Blanks

Trip blanks will be used to assess whether site samples have been exposed to non-site-related volatile constituents during storage and transport. Trip blanks will be analyzed at a frequency of once per day, per cooler containing groundwater samples to be analyzed for VOCs. A trip blank will consist of a container filled with analyte-free water (supplied by the laboratory) that remains unopened with field samples throughout the sampling event. Trip blanks will only be analyzed for aqueous VOCs. Table 2 provides an estimated number of trip blanks collected for each matrix and parameter during the investigation activities.

11.3 Analytical Laboratory Quality Control Checks

Internal QC procedures are specified in the analytical methods. These specifications include the types of QC checks required (method blanks, reagent/preparation blanks, MS/MSDs, calibration standards, internal standards, surrogate standards, the specific calibration check standards, laboratory duplicate/replicate analysis), compounds and concentrations to be used, and the QC acceptance criteria.

11.3.1 Method Blanks

Method blanks will serve as a measure of contamination attributable to a variety of sources, including glassware, reagents, and instrumentation. The method blank will be initiated at the beginning of an analytical procedure and is carried through the entire process.

11.3.2 Matrix Spike/Matrix Spike Duplicates

The MS will serve as a measure of method accuracy in a given matrix. The MS and the MSDs together will serve as a measure of method precision.

11.3.3 Surrogate Spikes

Surrogate spikes are organic compounds that have similar properties to those being tested. They will serve as indicators of method performance and accuracy in organic analyses.

11.3.4 Laboratory Duplicates

Laboratory duplicates will serve to measure method precision in inorganic and supplemental analyses.

11.3.5 Calibration Standards

Calibration check standards analyzed within a particular analytical series provide insight regarding the instruments' stability. A calibration check standard will be analyzed at the beginning and end of an analytical series, or periodically throughout a series containing a large number of samples.

In general, calibration check standards will be analyzed after every 12 hours or more frequently, as specified in the applicable analytical method. In analyses where internal standards are used, a calibration check standard will only be analyzed in the beginning of an analytical series. If results of the calibration check standard exceed specified tolerances, then all samples analyzed since the last acceptable calibration check standard will be reanalyzed.

Laboratory instrument calibration standards will be selected utilizing guidance provided in the analytical methods, as summarized in Section 13.

11.3.6 Internal Standards

Internal standard areas and retention times will be monitored for organic analyses performed by gas chromatograph/mass spectrometer methods. Method-specified internal standard compounds will be spiked into all field samples, calibration standards, and QC samples after preparation and prior to

analysis. If internal standard areas in one or more samples exceed the specified tolerances, then cause will be investigated, the instrument will be recalibrated, if necessary, and all affected samples will be reanalyzed.

The acceptability of internal standard performance will be determined using the guidance provided within the analytical methods.

11.3.7 Reference Standards/Control Samples

Reference standards are standards of known concentration and independent in origin from the calibration standards. The intent of reference standard analysis is to provide insight into analytical proficiency within an analytical series. This includes preparation of calibration standards, validity of calibration, sample preparation, instrument setup, and premises inherent in quantitation. Reference standards will be analyzed at frequencies specified within the analytical methods.

11.4 Data Precision Assessment Procedures

Field precision is difficult to measure because of temporal variations in field parameters. However, precision will be controlled through use of experienced field personnel, properly calibrated meters, and duplicate field measurements. Field duplicates will be used to assess precision for the entire measurement system, including sampling, handling, shipping, storage, preparation, and analysis.

Laboratory data precision for organic analyses will be monitored through the use of MSDs, laboratory duplicate, and field duplicates as identified in Table 2.

The precision of data will be measured by calculation of the relative percent differences (RPDs) of duplicate sample sets.

The RPD can be calculated by the following equation:

$$RPD = \frac{(A-B)}{(A+B)/2} \times 100$$

Where:

A = Analytical result from one of two duplicate measurements

B = Analytical result from the second measurement

Precision objectives for MSD and laboratory duplicate analyses are identified in the NYSDEC ASP Revision 2005.

11.5 Data Accuracy Assessment Procedures

Accuracy of field measurements will be controlled by experienced field personnel, properly calibrated field meters, and adherence to established protocols. Accuracy of field meters will be assessed by review of calibration and maintenance logs.

Laboratory accuracy will be assessed via use of MS, surrogate spikes, and internal standards. Where available and appropriate, QA performance standards will be analyzed periodically to assess laboratory accuracy. Accuracy will be calculated as a percent recovery as follows:

$$\text{Accuracy} = \frac{A-X}{B} \times 100$$

Where:

A = Value measured in spiked sample or standard

X = Value measured in original sample

B = True value of amount added to sample or true value of standard

This formula is derived under the assumption of constant accuracy over original and spiked measurements. If any accuracy calculated by this formula is outside of acceptable levels, data will be evaluated to determine whether the deviation represents unacceptable accuracy, or variable, but acceptable accuracy. Accuracy objectives for MS recoveries and surrogate recovery objectives are identified in the NYSDEC ASP, 2005 Revision.

11.6 Data Completeness Assessment Procedures

Completeness of a field or laboratory data set will be calculated by comparing the number of samples collected or analyzed to the proposed number.

$$\text{Completeness} = \frac{\text{No. Valid Samples Collected or Analyzed}}{\text{No. Proposed Samples Collected or Analyzed}} \times 100$$

As general guidelines, overall project completeness is expected to be at least 90%. Assessment of completeness will require professional judgment to determine data usability for intended purposes.

12 INSTRUMENT/EQUIPMENT TESTING, INSPECTION AND MAINTENANCE REQUIREMENTS

Preventive maintenance schedules have been developed for both field and laboratory instruments. A summary of maintenance activities to be performed is presented below.

12.1 Field Instruments and Equipment

Prior to any field sampling, each piece of field equipment will be inspected to confirm that it is operational. If the equipment is not operational, it must be serviced prior to use. All meters that require charging or batteries will be fully charged or have fresh batteries. If instrument servicing is required, it is the responsibility of the field Task Manager to follow the maintenance schedule and arrange for prompt service.

Field instrumentation that may be used during field activities includes meters to measure pH, ORP, turbidity, temperature, conductivity, dissolved oxygen, groundwater levels, and VOCs. Field equipment also includes sampling devices for groundwater. A logbook will be kept for each field instrument. Each logbook contains records of operation, maintenance, calibration, and any problems and repairs. The field Task Manager will review calibration and maintenance logs.

Field equipment returned from a site will be inspected to confirm it is in working order. This inspection will be recorded in the logbook or field notebooks as appropriate. It will also be the obligation of the last user to record any equipment problems in the logbook.

12.2 Laboratory Instruments and Equipment

12.2.1 General

Only qualified personnel will service instruments and equipment. Repairs, adjustments, and calibrations are documented in the appropriate logbook or data sheet.

12.2.2 Instrument Maintenance

Preventive maintenance of laboratory equipment will follow the guidelines recommended by the manufacturer. A malfunctioning instrument will be repaired by in-house staff or through a service call by the manufacturer, as appropriate.

The laboratory will maintain a sufficient supply of spare parts for its instruments to minimize downtime. Whenever possible, backup instrumentation will be retained.

Whenever practical, analytical equipment will be maintained under a service contract. The contract allows for preventative system maintenance and repair on an “as-needed” basis. The laboratory has sufficiently trained staff to allow for the day-to-day maintenance of equipment.

12.2.3 Equipment Monitoring

On a daily basis, the operation of balances, incubators, ovens, refrigerators, and water purification systems will be checked and documented. Any discrepancies will be immediately reported to the appropriate laboratory personnel for resolution.

13 INSTRUMENT CALIBRATION AND FREQUENCY

13.1 Field Equipment Calibration Procedures and Frequency

Specific procedures for performing and documenting calibration and maintenance for the equipment measuring conductivity, temperature, pH, groundwater levels, and VOCs are provided in the FSP. Calibration checks will be performed daily when measuring pH, ORP, turbidity, temperature, conductivity, and dissolved oxygen. Field equipment operation, calibration, and maintenance procedures are provided in the FSP.

13.2 Laboratory Equipment Calibration Procedures and Frequency

Instrument calibration will follow the specifications provided by the instrument manufacturer or specific analytical method used.

14 INSPECTION/ACCEPTANCE REQUIREMENTS FOR SUPPLIES AND CONSUMABLES

The laboratory will inspect/test all supplies and consumables prior to use with samples. Documentation will be maintained for all associated testing and analyses.

15 DATA MANAGEMENT

The purpose of data management is to confirm that all necessary data are accurate and readily accessible to meet the analytical and reporting objectives of the project. Field activities will generate a large number of samples and analytes. From the large amount of resulting data, the need arises for a structured, comprehensive, and efficient program for management of data.

The data management program established for the Site includes field documentation and sample QA/QC procedures, methods for tracking and managing the data, and a system for filing all site-related information. More specifically, data management procedures will be employed to efficiently process information collected such that data are readily accessible and accurate. These procedures are described in detail in the following subsection.

The data management plan has five elements:

1. Sample Designation System
2. Field Activities
3. Sample Tracking and Management
4. Data Management System
5. Document Control and Inventory

15.1 Sample Designation System

A concise and easily understandable sample designation system is an important part of the project sampling activities. It provides a unique sample number that will facilitate both sample tracking and easy resampling of select locations to evaluate data gaps, if necessary. The sample designation system to be employed during sampling activities will be consistent, yet flexible enough to accommodate unforeseen sampling events or conditions. A combination of letters and numbers will be used to yield a unique sample number for each field sample collected.

15.2 Field Activities

OMM activities designed to gather information necessary to make decisions require consistent documentation and accurate record keeping. During site activities, standardized procedures will be used for documentation of field activities, data security, and QA. These procedures are described in further detail in the following subsections.

15.2.1 Field Documentation

Complete and accurate record keeping is a critical component of field activities. When interpreting analytical results and identifying data trends, investigators realize field notes are an important part of the review and validation process. To confirm all aspects of the field investigation are thoroughly documented, several different information records, each with its own specific reporting requirements, will be maintained, including:

- Field logs
- Instrument calibration records
- Chain of custody forms

A description of each of these types of field documentation is provided below.

Field Logs

Personnel performing the field activities will keep field logs that detail all observations and measurements made during field activities. Data will be recorded directly into site-dedicated, bound notebooks, with each entry dated and signed. To confirm at any future date that notebook pages are not missing, each page will be sequentially numbered. Erroneous entries will be corrected by crossing out the original entry, initialing it, and then documenting the proper information.

Instrument Calibration Records

As part of data QA procedures, field monitoring and detection equipment will be routinely calibrated. Instrument calibration confirms that equipment used is of the proper type, range, accuracy, and precision to provide data compatible with the specified requirements and desired results. Calibration procedures for the various types of field instrumentation are described in Section 12.1. To demonstrate that established calibration procedures have been followed, calibration records will be prepared and maintained to include, as appropriate, the following:

- Calibration date and time
- Type and identification number of equipment
- Calibration frequency and acceptable tolerances
- Identification of individual(s) performing calibration
- Reference standards used
- Calibration data
- Information on calibration success or failure

The calibration record will serve as a written account of monitoring or detection equipment QA. All erratic behavior or failures of field equipment will be subsequently recorded in the calibration log.

Chain of Custody Forms

Chain of custody forms are used as a means of documenting and tracking sample possession from time of collection to the time of disposal. A chain of custody form will accompany each field sample collected, and one copy of the form will be filed in the field office. Field personnel will be briefed on the proper use of the chain of custody procedure. A more thorough description of the chain of custody forms is located in the Standard Operating Procedures.

15.2.2 Data Security

Measures will be taken during the field investigation to confirm that samples and records are not lost, damaged, or altered. When not in use, all field notebooks will be stored at the field office in a locked, fireproof cabinet. Access to these files will be limited to field personnel who utilize them.

15.3 Sample Management and Training

A record of all field documentation, as well as analytical and QA/QC results, will be maintained to confirm the validity of data used in the site analysis. To effectively execute such documentation, carefully constructed sample tracking and data management procedures will be used throughout the sampling program.

Sample tracking will begin with the completion of chain of custody forms, as described in Section 9.4.3. On a daily basis, the completed chain of custody forms associated with samples collected that day will be faxed from the project office to the QA Manager. Copies of all completed chain of custody forms will be maintained in the field office. On the following day, the QA Manager will telephone the laboratory to verify receipt of samples.

When analytical data are received from the laboratory, the QA Manager will review the incoming analytical data packages against the information on the chains of custody to confirm that the correct analyses were performed for each sample and that results for all samples submitted for analysis were received. Any discrepancies noted will be promptly followed-up by the QA Manager.

15.4 Data Management System

In addition to the sample tracking system, a data management system may be implemented. The central focus of the data management system will be the development of a personal computer-based project database. The project database, to be maintained by the Database Administrator, will combine pertinent geographical, field, and analytical data.

15.4.1 Computer Hardware

If required, the database will be constructed on Pentium®-based personal computer work stations connected through a network server (or similar). The network will provide access to various hardware peripherals, such as, but not limited to, printers, backup storage devices, image scanners, and modems. Computer hardware will be maintained to industrial and corporate standards.

15.4.2 Field Observations

An important part of the information that will ultimately reside in the data management system for use during the project will originate in the observations that are recorded in the field.

Following each sampling event, a data entry may be prepared by the field personnel who performed the sampling activities. The purpose of the data entry is to present a summary and a record of the sampling event. Topics to be discussed include locations sampled, sampling methodologies used, QA/QC

procedures, blind duplicate and MS/MSD sample identification numbers, equipment decontamination procedures, personnel involved in the activity, and any other noteworthy events that occurred.

Tables are typically attached to the data entry, as required, and are used to summarize measurements that were recorded in the field books. It is anticipated that these tables will be developed using a personal computer spreadsheet program to reduce possible transcription error and to facilitate the transfer of information to the data management system.

Status memos, if required, are valuable tools to keep project personnel informed on the details of the field activities and are also invaluable during the development of the final report. Each status memo will be reviewed for accuracy and completeness by the respective sampling activity manager. Following the approval and finalization of each memo, the status memo will be used to transfer field observations into the data management system.

All pertinent field data will be manually entered into the appropriate database tables from the chain of custody forms and field notebooks.

15.4.3 Analytical Results

Analytical results provided by the laboratory will be available in both a digital and a hard copy format. Upon receipt of each analytical package, the original chain of custody form will be placed in the project files. The data packages will be examined to confirm that the correct analyses were performed for each sample submitted and that all of the analyses requested on the chain of custody form were performed. If discrepancies are noted, the laboratory will be notified and will promptly resolve any issues.

Where appropriate, the data packages will be validated in accordance with the procedures presented in Section 18. Any data that does not meet the specified standards will be flagged pending resolution of the issue. The flag will not be removed from the data until the issue associated with the sample results is resolved. Although flags may remain for certain data, the use of that data may not necessarily be restricted.

Following completion of the data validation (if necessary), the digital files of analytical data will be processed to populate the appropriate database tables. Specific fields include:

- Sample identification number
- Date sampled
- Date analyzed
- Parameter name
- Analytical result
- Units
- Detection limit
- Qualifier(s)

The individual electronic data deliverables (EDDs) supplied by the laboratory in a Microsoft Excel worksheet, will be loaded into the appropriate database table. Any analytical data that cannot be provided by the laboratory in electronic format will be entered manually.

After entry into the database, the EDD data will be compared to the field information previously entered into the database to confirm that all requested analytical data have been received.

15.4.4 Data Analysis and Reporting

The database management system will have several functions to facilitate review and analysis of the data. Data entry screens will be developed to assist in the keypunching of field observations. Routines will also be developed to permit the user to scan analytical data from a given site for a given media.

A valuable function of the data management system will be generation of tables of analytical results from the project databases. The capability of the data management system to directly produce tables reduces the redundant manual entry of analytical results during report preparation and precludes transcription errors that may occur otherwise. Tables of analytical data will be produced as part of data interpretation tasks and the reporting of data.

Another function of the data management system will be to create digital files of analytical results and qualifiers suitable for transfer to mapping/presentation software. This routine greatly reduces the redundant keypunching of analytical results and facilitates the efficient production of interpretative and presentation graphics.

15.5 Document Control and Inventory

Arcadis maintains project files in its Fairport, New York office. Each client project is assigned a file/job number. Each file is then broken down into the following sub-files:

1. Agreements/Proposals
2. Change Orders/Purchase Orders
3. Invoices
4. Project Management
5. Correspondence
6. Notes and Data
7. Public Relations Information
8. Regulatory Documents
9. Marketing Documents
10. Final Reports/Presentations
11. Draft Reports/Presentations
12. Documents Prepared by Others

Originals, when possible, are placed in these central files.

16 ASSESSMENT AND RESPONSE ACTIONS

Performance and systems audits will be completed in the field and the laboratory, as described below.

16.1 Field Audits

The following field performance and systems audits will be completed.

16.1.1 Performance Audits

The Task Manager will monitor field performance, as appropriate. Field performance summaries will contain field measurements and field meter calibrations to verify that measurements are taken according to established protocols. The project QA Manager will review all field reports and communicate concerns to the Project Manager and/or Task Managers, as appropriate. In addition, the QA Manager will review the trip blank data to identify potential deficiencies in field sampling and cleaning procedures.

16.1.2 Internal Systems Audits

A field internal systems audit is a qualitative evaluation of all components of field QA/QC. The systems audit compares scheduled QA/QC activities from this document with actual QA/QC activities completed. The appropriate QA Manager will periodically confirm that work is being performed consistent with the SMP, FSP, and Health and Safety Plan.

16.2 Laboratory Audits

The laboratory will perform internal audits consistent with NYSDEC ASP, 2005 Revision, Exhibit E.

In addition to the laboratory's internal audits and participation in state and federal certification programs, the laboratory sections at the laboratory are audited by representatives of the regulatory agency issuing certification. Audits are usually conducted on an annual basis and focus on laboratory conformance to the specific program protocols for which the laboratory is seeking certification. The auditor reviews sample handling and tracking documentation, analytical methodologies, analytical supportive documentation, and final reports. The audit findings are formally documented and submitted to the laboratory for corrective action, if necessary.

Crosman Corporation and New Coleman Holdings, Inc. reserves the right to conduct an onsite audit of the laboratory prior to the start of analyses for the project. Additional audits may be performed during the course of the project, as deemed necessary.

16.3 Corrective Action

Corrective actions are required when field or analytical data are not within the objectives specified in this QAPP or the FSP. Corrective actions include procedures to promptly investigate, document, evaluate, and correct data collection and/or analytical procedures. Field and laboratory corrective action procedures are described below.

16.3.1 Field Procedures

When conducting field work, if a condition is noted that would have an adverse effect on data quality, corrective action will be taken so as not to repeat this condition. Condition identification, cause, and corrective action implemented will be documented on a Corrective Action Report Form and reported to the appropriate Project Manager and Task Manager.

Examples of situations that would require corrective actions are provided below:

1. Protocols, as defined by this QAPP or the FSP have not been followed
2. Equipment is not in proper working order or properly calibrated
3. QC requirements have not been met
4. Issues resulting from performance or systems audits

Project personnel will continuously monitor ongoing work performance in the normal course of daily responsibilities.

16.3.2 Laboratory Procedures

In the laboratory, when a condition is noted to have an adverse effect on data quality, corrective action will be taken so as not to repeat this condition. Condition identification, cause, and corrective action to be taken will be documented and reported to the appropriate Project Manager and Task Manager.

Corrective action may be initiated, at a minimum, under the following conditions:

1. Specific laboratory analytical protocols have not been followed
2. Pre-determined data acceptance standards are not obtained
3. Equipment is not in proper working order or calibrated
4. Sample and test results are not completely traceable
5. QC requirements have not been met
6. Issues resulting from performance or systems audits

Laboratory personnel will continuously monitor ongoing work performance in the normal course of daily responsibilities.

17 REPORTS TO MANAGEMENT

17.1 Internal Reporting

The analytical laboratory will submit analytical reports to the Contractor for review. If required, the Contractor, or Arcadis will, in turn, submit the reports to the data validator for review. The QA Manager will incorporate results of the data validation reports (if required) and assessments of data usability into a summary report (if required) that will be submitted to the Project Manager. If required, this summary report will be filed in the project file and will include the following:

1. Assessment of data accuracy, precision, and completeness for both field and laboratory data
2. Results of the performance and systems audits
3. Significant QA/QC problems, solutions, corrections, and potential consequences
4. Analytical data validation report

17.2 Reporting

Upon sample transport to the laboratory, a copy of the chain of custody will be forwarded to Crosman Corporation, if requested. Upon receipt of the data package from the laboratory, the QA Manager will determine if the data package has met the required DQOs. The analytical data package will be incorporated into required reports.

18 DATA REVIEW, VALIDATION, AND VERIFICATION

After field and laboratory data are obtained, these data may be subject to:

1. Validation of the data
2. Reduction or manipulation of the data mathematically or otherwise into meaningful and useful forms
3. Organization, interpretation, and reporting of the data

18.1 Field Data Reduction, Validation, and Reporting

18.1.1 Field Data Reduction

Information that is collected in the field through visual observation, manual measurement, and/or field instrumentation will be recorded in field notebooks, log sheets, and/or other appropriate forms. Such data will be reviewed by the appropriate Task Manager for adherence to the work plan and consistency of data. Any concerns identified as a result of this review will be discussed with the field personnel, corrected if possible, and, as necessary, incorporated into the data evaluation process.

18.1.2 Field Data Validation

Field data calculations, transfers, and interpretations will be conducted by the field personnel and reviewed for accuracy by the appropriate Task Manager and the QA Manager. Task Managers will recalculate at least 5% of all data reductions. Field documentation and data reduction prepared by field personnel will be reviewed by the QA Manager. All logs and documents will be checked for:

1. General completeness
2. Readability
3. Usage of appropriate procedures
4. Appropriate instrument calibration and maintenance
5. Reasonableness in comparison to present and past data collected
6. Correct sample locations
7. Correct calculations and interpretations

18.1.3 Field Data Reporting

Where appropriate, field data forms and calculations will be processed and included in appendices to the reports. The original field logs, documents, and data reductions will be kept in the project file.

18.2 Laboratory Data Reduction, Review, and Reporting

18.2.1 Laboratory Data Reduction

Laboratory analytical data will be directly transferred from the instrument to the computer or the data reporting form (as applicable). Calculation of sample concentrations will be performed using the appropriate regression analysis program, response factors, and dilution factors (where applicable).

18.2.2 Laboratory Data Review

All data will be subject to multi-level review by the laboratory. The group leader will review all data reports prior to release for final data report generation, and the laboratory director will review a cross section of the final data reports. All final data reports are reviewed by the laboratory QA Manager prior to shipment.

If discrepancies or deficiencies exist in the analytical results, then corrective action will be taken, as discussed in Section 15. Deficiencies discovered as a result of internal data review, as well as the corrective actions to be used to rectify the situation, will be documented on a Corrective Action Form. This form will be submitted to the Project Manager.

19 VALIDATION AND VERIFICATION METHODS

Data validation entails a review of the QC data and the raw data to verify that the laboratory was operating within required limits, the analytical results are correctly transcribed from the instrument, and which, if any, environmental samples are related to any out-of-control QC samples. The objective of data validation is to identify any questionable or invalid laboratory measurements.

If required, data validation will consist of data screening, checking, reviewing, editing, and interpreting to document analytical data quality and determine if the quality is sufficient to meet the DQOs. The data validation will also include a review of completeness and compliance, including the elements provided in Table 4.

The data validator will use the most recent versions of the USEPA functional guidelines for data validation with NYSDEC ASP 2005 Revision, QA/QC and reporting deliverables requirements available at the time of project initiation and for the entire duration of the project, as guidance, where appropriate.

The data validator will verify reduction of laboratory measurements and laboratory reporting of analytical parameters are in accordance with the procedures specified for each analytical method (i.e., perform laboratory calculations in accordance with the method-specific procedure).

If required, upon receipt of the laboratory data, the following reduction, validation, and reporting scheme will be executed by the data validator:

1. Laboratory data will be screened to confirm that the necessary QC procedures (e.g., detection limit verification, initial calibration, continuing calibration, duplicates, spikes, blanks) have been performed. QC information not included or of insufficient frequency will be identified in the validation report, including a discussion of the implications.
2. QC supporting information will subsequently be screened to identify QC data outside established control limits. If out-of-control data are discovered, documentation of appropriate corrective action will be reviewed. Out-of-control data without appropriate corrective action will result in designation of the affected data as qualified or rejected, as appropriate.

   It should be noted that the existence of qualified results does not automatically invalidate data. This point is repeatedly emphasized in the USEPA functional guidelines for data validation and is inherently acknowledged by the very existence of the data validation/flagging guidelines. The goal to produce the best possible data does not necessarily mean producing data without QC qualifiers. Qualified data can provide useful information.

Resolution of any issues regarding laboratory performance or deliverables will be handled between the data validator, laboratory Project Manager, and the Contractor's Project Manager.

Upon completion of the data validation (if required), a data usability summary report addressing the following topics will be prepared.

1. Assessment of the data package
2. Description of any protocol deviations
3. Failures to reconcile reported and/or raw data

4. Assessment of any compromised data
5. Laboratory case narrative
6. Overall appraisal of the analytical data
7. Table of site name, sample quantities, data submitted to the laboratory, year of protocol used, matrix, and fractions analyzed

20 RECONCILIATION WITH USER REQUIREMENTS

Data results will be examined to determine the performance that was achieved for each data usability criteria. The performance will then be compared with the project objectives. Of particular note, will be samples at or near action levels. All deviations from objectives will be noted. Additional action may be warranted when performance does not meet performance objectives for critical data. Action options may include any or all of the following:

- Retrieval of missing information
- Request for additional explanation or clarification
- Reanalysis of sample from extract (when appropriate)
- Recalculation or reinterpretation of results by the laboratory

These actions may improve the data quality, reduce uncertainty, and may eliminate the need to qualify or reject data.

If these actions do not improve the data quality to an acceptable level, the following actions may be taken:

- Extrapolation of missing data from existing data points
- Use of historical data
- Evaluation of the critical/noncritical nature of the sample

If the data gap cannot be resolved by these actions, an evaluation of the data bias and potential for false negatives and positives can be performed. If the resultant uncertainty level is unacceptable, then the following action must be taken:

- Additional sample collection and analysis

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TABLES

Table 1
Parameter, Methods, and Quantitation Limits

Quality Assurance Project Plan
Crosman Corporation
Crosman Corporation Site

Parameter	Quantitation Limit[1]
Volatile Organics Method 8260	**Water (µg/L)**
1,1,1-Trichloroethane	1
1,1,2,2-Tetrachloroethane	1
1,1,2-Trichloroethane	1
1,1,2-Trichloro-1,2,2-trifluoroethane	1
1,1-Dichloroethane	1
1,1-Dichloroethene	1
1,2,4-Trichlorobenzene	1
1,2-Dibromo-3-Chloropropane	1
1,2-Dibromoethane	1
1,2-Dichlorobenzene	1
1,2-Dichloroethane	1
1,2-Dichloropropane	1
1,3-Dichlorobenzene	1
1,4-Dichlorobenzene	1
2-Hexanone	5
2-Butanone (MEK)	10
4-Methyl-2-pentanone (MIBK)	5
Acetone	10
Benzene	1
Bromodichloromethane	1
Bromoform	1
Bromomethane	1
Carbon disulfide	1
Carbon tetrachloride	1
Chlorobenzene	1
Dibromochloromethane	1
Chloroethane	1
Chloroform	1
Chloromethane	1
cis-1,2-Dichloroethene	1
cis-1,3-Dichloropropene	1
Cyclohexane	1
Dichlorodifluoromethane	1
Ethylbenzene	1
Isopropylbenzene	1
Methyl acetate	2.5
Methyl tert-butyl ether	1
Methylcyclohexane	1
Methylene Chloride	1
Styrene	1
Tetrachloroethene	1
Toluene	1
trans-1,2-Dichloroethene	1
trans-1,3-Dichloropropene	1
Trichloroethene	1
Trichlorofluoromethane	1
Vinyl chloride	1
Xylenes, Total	2

Table 1
Parameter, Methods, and Quantitation Limits

Quality Assurance Project Plan
Crosman Corporation
Crosman Corporation Site

Parameter	Quantitation Limit[1]
Volatile Organics Method 624	**Water (µg/L)**
Trichloroethylene	1
Total Toxic Organics Method 624	**Water (µg/L)**
Acrolein	10
Acrylonitrile	5
Benzene	1
Bromodichloromethane	1
Bromoform	1
Bromomethane	1
Carbon Tetrachloride	1
Chlorobenzene	1
Chlorodibromomethane	1
Chloroethane	1
2-Chloroethylvinyl Ether	2
Chloroform	1
Chloromethane	1
1,2-Dichlorobenzene	1
1,3-Dichlorobenzene	1
1,4-Dichlorobenzene	1
Dichlorodifluoromethane	1
1,1-Dichloroethane	1
1,2-Dichloroethane	1
1,1-Dichloroethene	1
cis-1,2-Dichloroethene	1
trans-1,2-Dichloroethene	1
1,2-Dichloropropane	1
cis-1,3-Dichloropropene	1
trans-1,3-Dichloropropene	1
1,3-Dichloropropene, Total	2
Ethylbenzene	1
Methylene Chloride	1
Styrene	1
1,1,2,2-Tetrachloroethane	1
Tetrachloroethene	1
Toluene	1
Total Xylenes	3
1,1,1-Trichloroethane	1
1,1,2-Trichloroethane	1
Trichloroethene	1
Trichlorofluoromethane	1
Vinyl Chloride	1
Supplemental Parameters	**Water (µg/L)**
Total Cyanide	NA
Volatile Organics Method TO-15	**Air (µg/m3)**
1,1,1-Trichloroethane	0.2
1,1,2,2-Tetrachloroethane	0.2
1,1,2-trichloro-1,2,2-trifluoroethane	0.2

Table 1
Parameter, Methods, and Quantitation Limits

Quality Assurance Project Plan
Crosman Corporation
Crosman Corporation Site

Parameter	Quantitation Limit[1]
1,1,2-Trichloroethane	0.2
1,1-Dichloroethane	0.2
1,1-Dichloroethene	0.2
1,2,4-Trichlorobenzene	1
1,2,4-Trimethylbenzene	0.2
1,2-Dibromoethane	0.2
1,2-Dichlorobenzene	0.2
1,2-Dichloroethane	0.2
1,2-Dichloroethene (total)	0.2
1,2-Dichloropropane	0.2
1,2-Dichlorotetrafluoroethane	0.2
1,3,5-Trimethylbenzene	0.2
1,3-Butadiene	0.2
1,3-Dichlorobenzene	0.2
4-Ethyltoluene	0.4
Acetone	0.5
Benzene	0.2
Bromodichloromethane	--
Bromoethane	0.2
Bromoform	0.2
Bromomethane	0.2
Carbon Disulfide	0.5
Carbon Tetrachloride	0.2
Chlorobenzene	0.2
Chloroethane	0.2
Chloroform	0.2
Chloromethane	0.5
cis-1,2-Dichloroethene	0.2
cis-1,3-Dichloropropene	0.2
Cyclohexane	0.5
Dibromochloromethane	0.2
Dichlorodifluoromethane	0.2
Ethylbenzene	0.2
Hexachlorobutadiene	1
m,p-Xylenes	0.2
Methyl tert-butyl ether	1
Methylene Chloride	0.5
Naphthalene	0.5
N-Heptane	--
N-Hexane	--
o-Xylene	0.5
Styrene	0.2
Tetrachloroethene	0.2
Tetrahydrofuran	--
Toluene	0.2
trans-1,2-Dichloroethene	0.2
trans-1,3-Dichloropropene	0.2
Trichloroethene	0.2
Trichlorofluoromethane	0.2
Vinyl Chloride	0.2
Xylenes (total)	0.2

Table 1
Parameter, Methods, and Quantitation Limits

Quality Assurance Project Plan
Crosman Corporation
Crosman Corporation Site

Notes:
[1] Specific quantitation limits are highly matrix dependent. The quantitation limits listed are for guidance and may not always be achievable due to matrix interference.
µg/L = micrograms per liter
µg/m^3 = micrograms per cubic meter

Table 2
Environmental and Quality Control Analyses

Quality Assurance Project Plan
Crossman Corporation
Crossman Corporation Site

Environmental Sample Matrix/ Laboratory Parameters	Field QC Analyses					Laboratory QC Analyses[1,2]	
	Trip Blank	Field Duplicate	Rinse Blank[3]	MS	MSD	MSB	Lab Duplicate
Groundwater							
Volatile Organics Method 8260	1/cooler	0/20	0/20	0/20	0/20	1/20	--
Pond Effluent							
Trichloroethylene (TCE) Method 624	1/cooler	0/20	0/20	0/20	0/20	1/20	--
Total Toxic Organics (TTO) Method 624	1/cooler	0/20	0/20	0/20	0/20	1/20	--
Air							
Volatile Organics Method TO-15	--	1/20	0/20	0/20	0/20	0/20	--

Notes:
[1] The number of laboratory QC analyses is based on the frequencies given for the number of environmental samples estimated, not including field QC analyses (i.e., rinse and trip blanks).
[2] Laboratory QC analyses are listed only for those parameters that must be performed on site samples. The laboratory is required to analyze QC samples for the remaining parameters at the frequency listed in the associated analytical method.
[3] Rinse blank samples will be collected only when not dedicated sampling devices are used. Rinse blanks will be collected at a frequency of one per day of use or one per 20 samples, whichever is less.
QC = quality control
MS = matrix spike
MSB = matrix spike blank
MSD = matrix spike duplicate

Table 3
Sample Containers, Preservation, and Holding Times Requirements

Quality Assurance Project Plan
Crosman Corporation
Crosman Corporation Site

Parameter	Container	Preservation	Maximum Holding Time from VTSR
Groundwater Samples			
Volatile Organics	(3) 40-mL Teflon®-lined septa (glass)	Cool 4ºC HCl to pH <2	7 days (unpreserved) 10 days (preserved)
Pond Effluent			
Trichloroethylene (TCE)	(2) 40-mL Teflon®-lined septa (glass)	Cool 4ºC	7 days (unpreserved)
Total Toxic Organics (TTO)	(2) 40-mL Teflon®-lined septa (glass)	Cool 4ºC	7 days (unpreserved)
Air			
Volatile Organics	(1) 6-L Stainless Steel Summa Canister	None	30 days

Notes:
mL = milliliters
L = liter
^{o}C = degrees Celsius
HCL = hydrochloric acid

Table 4
Data Validation Checklist – Laboratory Analytical Data

Quality Assurance Project Plan
Crossman Corporation
Crossman Corporation Site

REVIEW FOR COMPLETENESS	
1.	Chain of custody forms included.
2.	Sample preparation and analysis summary tables included.
3.	Quality assurance/quality control (QA/QC) summaries of analytical data included.
4.	Relevant calibration data included with analytical data.
5.	Instrument and method performance data included.
6.	Method detection limits documented.
7.	Data report forms of examples for calculations of concentrations.
8.	Raw data used in identification and quantification of the analysis required.
REVIEW OF COMPLIANCE	
1.	Data package completed.
2.	Quality Assurance Project Plan requirements for data met.
3.	QA/QC criteria met.
4.	Instrument type and calibration procedures met.
5.	Initial and continuing calibration met.
6.	Data reporting forms completed.
7.	Problems and corrective actions documented.

FIGURES

ATTACHMENT 1

Sample Chain of Custody Form

ARCADIS

ID#:

CHAIN OF CUSTODY & LABORATORY ANALYSIS REQUEST FORM

Page ___ of ___

Lab Work Order #

Send Results to:

Contact & Company Name: | Telephone:

Address: | Fax:

City | State | Zip | E-mail Address:

Project Name/Location (City, State): | Project #:

Sampler's Printed Name: | Sampler's Signature:

Preservative							
Filtered (✓)							
# of Containers							
Container Information							

PARAMETER ANALYSIS & METHOD

Keys

Preservation Key:
A. H_2SO_4
B. HCL
C. HNO_3
D. NaOH
E. None
F. Other: _____
G. Other: _____
H. Other: _____

Container Information Key:
1. 40 ml Vial
2. 1 L Amber
3. 250 ml Plastic
4. 500 ml Plastic
5. Encore
6. 2 oz. Glass
7. 4 oz. Glass
8. 8 oz. Glass
9. Other: _____
10. Other: _____

Matrix Key:
SO - Soil | SE - Sediment | NL - NAPL/Oil
W - Water | SL - Sludge | SW - Sample Wipe
T - Tissue | A - Air | Other: _____

Sample ID	Collection Date	Collection Time	Type (✓) Comp	Type (✓) Grab	Matrix	REMARKS

Special Instructions/Comments:

☐ **Special QA/QC Instructions(✓):**

Laboratory Information and Receipt		Relinquished By	Received By	Relinquished By	Laboratory Received By
Lab Name:	Cooler Custody Seal (✓)	Printed Name:	Printed Name:	Printed Name:	Printed Name:
☐ Cooler packed with ice (✓)	☐ Intact ☐ Not Intact	Signature:	Signature:	Signature:	Signature:
Specify Turnaround Requirements:	Sample Receipt:	Firm:	Firm/Courier:	Firm/Courier:	Firm:
Shipping Tracking #:	Condition/Cooler Temp: _____	Date/Time:	Date/Time:	Date/Time:	Date/Time:

Distribution: **WHITE – Laboratory returns with results** **YELLOW – Lab copy** **PINK – Retained by Arcadis**

Arcadis of New York, Inc.

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Fairport, New York 14450

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Appendix J

Site Management Plan Forms

Crosman Corporation - East Bloomfield, New York **GROUNDWATER MONITORING PROGRAM**

Site *Event*

GROUNDWATER SAMPLING LOG

Sampling Personnel: **Well ID.**
Job Number: **Date:**
Weather: **Time In:** **Time Out:**

WELL INFORMATION *(record from top of inner casing at minimum)*

		TIC	TOC	BGS
Well Depth	(feet)			
Water Table Depth	(feet)			

check where appropriate

Well Type: Flushmount ☐ Stick-Up ☐
Well Locked: Yes ☐ No ☐
Measuring Point Marked: Yes ☐ No ☐
Well Diameter: 1" ☐ 2" ☐ 4" ☐

WELL WATER INFORMATION

Length of Water Column:	(feet)	0
Volume of Water in Well:	(gal)	0
Pumping Rate of Pump:	(mL/min)	
Pumping Rate of Pump:	(GPM)	
Minutes of Pumping:		
Total Volume Removed:	(gal)	

Conversion Factors

gallons per feet	1" ID	2" ID	4" ID	6" ID
of water column:	0.094	0.16	0.66	1.5

1 gal = 3.785 L =3785 mL = 0.1337 cubic ft.

SAMPLING INFORMATION

Analyses:
TCL VOCs (40 ml vials) ☐
TAL Metals (500 mL poly) ☐
☐
☐
☐

Sample ID:
Sample Time:
MS/MSD: Yes ☐ No ☐
Duplicate: Yes ☐ No ☐

Total Bottles: _____

EVACUATION INFORMATION

Evacuation Method: Bailer ☐ Grundfos Pump ☐ Peristaltic ☐ _____
Tubing Used: Dedicated ☐ Deconned ☐ Type _____
Sampling Method Bailer ☐ Grunfos Pump ☐ Other Pump ☐ _____
Did well go dry? Yes ☐ No ☐

Water Quality Meter Type: _____

Time / Parameter	1 Initial	2	3	4	5	6	7	8	9
Volume Purged (gal)									
Depth to Water (ft. TIC)									
Temp (oC)									
DO (mg/L)									
Conductance (mS/cm)									
pH									
ORP (mV)									
Turbidity									

Time / Parameter	10	11	12	13	14	15	16	17	18
Volume Purged (gal)									
Depth to Water (ft. TIC)									
Temp (oC)									
DO (mg/L)									
Conductance (mS/cm)									
pH									
ORP (mV)									
Turbidity									

SAMPLE DESTINATION

Laboratory: _____ Sample was ☐ shipped day of sampling Chain of Custody Signed By:
Shipped Via: ☐ Federal Express Other: _____ ☐ sent on _____ _____

Site Inspection Form
Site Management Plan
Crosman Corporation, East Bloomfield, New York

ARCADIS Design & Consultancy for natural and built assets

Date: _____ **Time:** _____ **Personnel:** _____

Compliance with Institutional Controls	**Conducted (Y/N)**	**Notes**
Is the site being utilized for uses other than General Industrial Use?		
Is the site operating in compliance with the Deed Restriction?		
Performance of the Engineering Controls		
Is the SSDS operating?		
Have SSDS monitoring sampling been conducted, per the SMP?		
Any reported issues with the SSDS operation?		
Is production well PW-1 operating?		
Has groundwater monitoring been conducted, per the SMP?		
Any reported issues with production well PW-1?		
Green Remediation Evaluation		
Are energy conservation controls being implemented?		
Has any solid waste been generated?		
Is off-site waste transportation required?		
Have water and/or land usage requirements changed?		
Are any ecosystems being distrubed by the remedial activities?		

Notes:

APPENDIX H

SITE MANAGEMENT FORMS

Summary of Green Remediation Metrics for Site Management

Site Name: _____ Site Code: _____
Address: _____ City: _____
State: _____ Zip Code: _____ County: _____

Initial Report Period (Start Date of period covered by the Initial Report submittal)
Start Date: _____

Current Reporting Period
Reporting Period From: _____ To: _____

Contact Information
Preparer's Name: _____ Phone No.: _____
Preparer's Affiliation: _____

I. Energy Usage: Quantify the amount of energy used directly onsite and the portion of that derived from renewable energy sources.

	Current Reporting Period	**Total to Date**
Fuel Type 1 (e.g., natural gas (cf))		
Fuel Type 2 (e.g., fuel oil, propane [gals])		
Electricity (kWh)		
Of that Electric usage, provide quantity:		
Derived from renewable sources (e.g., solar, wind)		
Other energy sources (e.g., geothermal, solar thermal [Btu])		

Provide a description of all energy usage reduction programs for the site in the space provided on Page 3.

II. Solid Waste Generation: Quantify the management of solid waste generated onsite.

	Current Reporting Period (tons)	**Total to Date (tons)**
Total waste generated on-site		
OM&M generated waste		
Of that total amount, provide quantity:		
Transported offsite to landfills		
Transported offsite to other disposal facilities		
Transported offsite for recycling/reuse		

Reused onsite		

Provide a description of any implemented waste reduction programs for the site in the space provided on Page 3.

III. Transportation/Shipping: Quantify the distances travelled for delivery of supplies, shipping of laboratory samples, and the removal of waste.

	Current Reporting Period (miles)	**Total to Date (miles)**
Standby Engineer/Contractor		
Laboratory Courier/Delivery Service		
Waste Removal/Hauling		

Provide a description of all mileage reduction programs for the site in the space provided on Page 3. Include specifically any local vendor/services utilized that are within 50 miles of the site.

IV. Water Usage: Quantify the volume of water used on-site from various sources.

	Current Reporting Period (gallons)	**Total to Date (gallons)**
Total quantity of water used on-site		
Of that total amount, provide quantity:		
Public potable water supply usage		
Surface water usage		
On-site groundwater usage		
Collected or diverted storm water usage		

Provide a description of any implemented water consumption reduction programs for the site in the space provided on Page 3.

V. Land Use and Ecosystems: Quantify the amount of land and/or ecosystems disturbed and the area of land and/or ecosystems restored to a pre-development condition (i.e. Green Infrastructure).

	Current Reporting Period (acres)	**Total to Date (acres)**
Land disturbed		
Land restored		

Provide a description of any implemented land restoration/green infrastructure programs for the site in the space provided on Page 3.

Description of green remediation programs reported above (Attach additional sheets if needed)
Energy Usage:
Waste Generation:
Transportation/Shipping:
Water usage:
Land Use and Ecosystems:
Other:

CERTIFICATION BY CONTRACTOR
I, _____ (**Name**) do hereby certify that I am _____ (**Title**) of the Company/Corporation herein referenced and contractor for the work described in the foregoing application for payment. According to my knowledge and belief, all items and amounts shown on the face of this application for payment are correct, all work has been performed and/or materials supplied, the foregoing is a true and correct statement of the contract account up to and including that last day of the period covered by this application. _____ **Date** **Contractor**

Appendix K

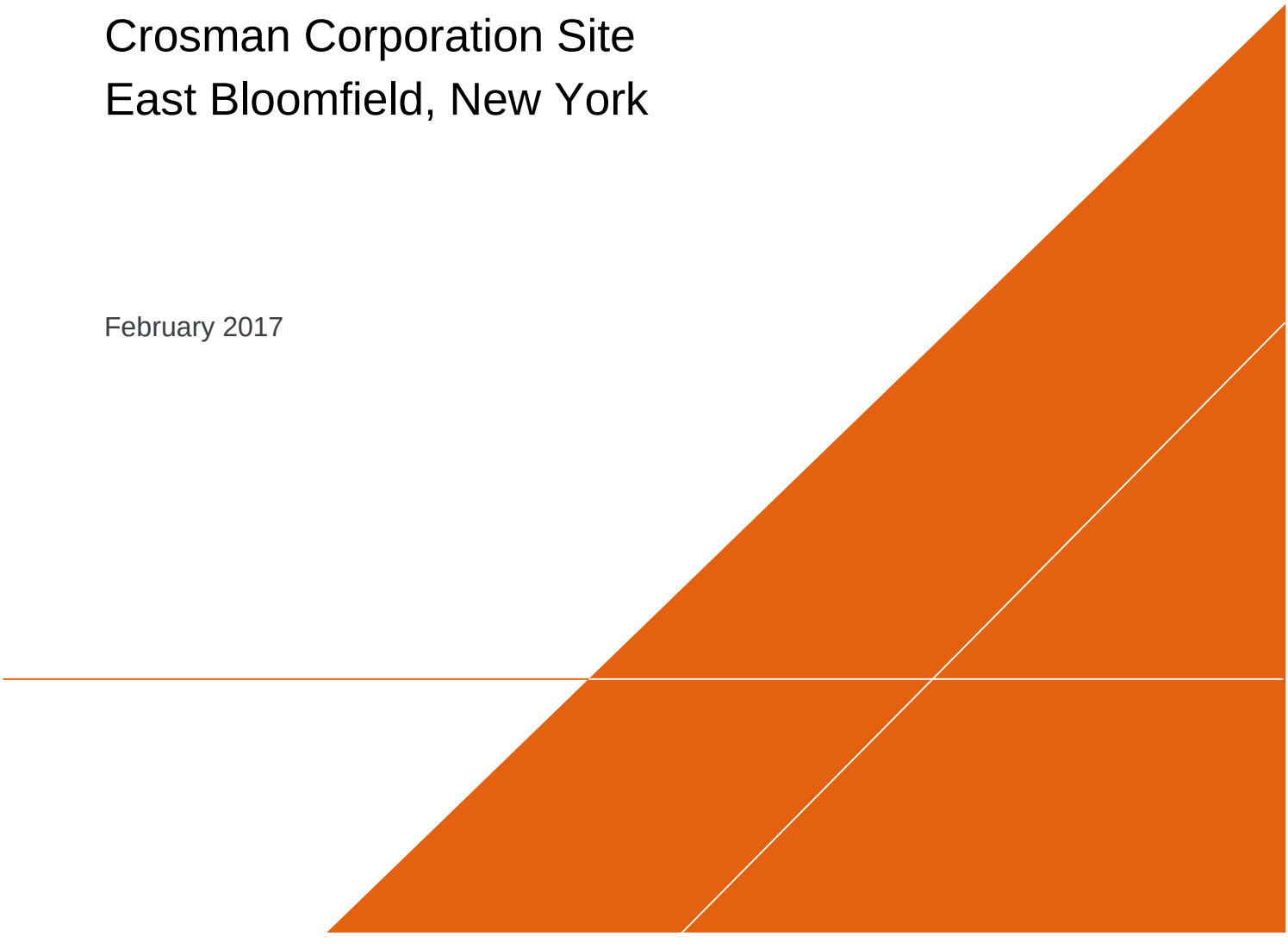
Field Sampling Plan

ARCADIS Design & Consultancy for natural and built assets

FIELD SAMPLING PLAN

Site Management Plan
Crosman Corporation Site
East Bloomfield, New York

February 2017



FIELD SAMPLING PLAN

Site Management Plan

Prepared for:

Crosman Corporation and New Coleman Holdings, Inc.

Prepared by:

Arcadis of New York, Inc.

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Our Ref.:

B0041501.0001

Date:

February 2017

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ATTACHMENTS

A Sample Chain of Custody
B Standard Operating Procedures
C Field Sampling Logs
D Calibration Log Sheets

1 INTRODUCTION

1.1 General

This *Field Sampling Plan* (FSP) supports the *Site Management Plan* (SMP) prepared by Arcadis of New York, Inc. (Arcadis) for the Crosman Corporation (Crosman) Site located in East Bloomfield, New York (site).

This FSP addresses field procedures and sample collection methods to be used during implementation of SMP field activities. This FSP should be used in conjunction with the SMP or other task-specific work plans, the *Quality Assurance Project Plan* (QAPP), and an approved *Health and Safety Plan* (HASP). The QAPP (included as **Appendix G** of the SMP) presents the quality assurance/quality control procedures to be used during field activities described in the SMP, as well as a description of general field and laboratory procedures.

1.2 Project Objectives

The purpose of the FSP is to describe field procedures and sample collection methods to be used during implementation of SMP field activities.

1.3 Overview of Investigation Field Activities

The following activities may be conducted at the site:

- Measurement of fluid levels
- Groundwater sampling
- Pond effluent sampling
- Sub-slab depressurization system (SSDS) air sampling
- Sub-slab air sampling from monitoring points and paired indoor air sampling

Sampling locations and the rationale for each field sampling activity are described in the SMP, or other site-specific work plans, and therefore, are not further described in this FSP.

A site location map and a figure with sampling locations have been prepared for the site; these figures are presented in the SMP.

This FSP represents a generic reference document to be used by personnel conducting activities described in the SMP. It is their responsibility to review the FSP to verify that required field activities are included, to verify that the FSP contains the “best practices” approach to conducting field activities, and to verify that the guidance provided is consistent with the New York State Department of Environmental Conservation’s (NYSDEC’s) requirements. This FSP does not provide safety guidance or reference to either state or federal safety requirements; it is the responsibility of those conducting the work to prepare a site- and task-specific HASP and to modify this FSP to meet safety requirements, guidelines, or

regulations, as required. Neither Crosman nor Arcadis assumes responsibility or liability for work conducted by others at the site utilizing this FSP.

2 FIELD ACTIVITIES

2.1 General Field Guidelines

The following is a general list of equipment necessary for sample collection:

- Dedicated and/or disposable bailers (water samples)
- Dedicated and/or disposable syringes and tubing (air samples)
- Appropriate sample containers provided by the laboratory (kept closed and in laboratory-supplied coolers until the samples are collected); pre-preserved sample containers (as required) for aqueous samples.
- Chain of custody record forms
- Logbook, field sampling records, and indelible ink pens and markers
- Digital camera
- Shipping labels and forms
- Knife
- Packing/shipping material for sample bottles
- Clear plastic tape
- Duct tape
- Re-closable plastic bags
- Nitrile gloves
- Portable field instruments; multi-parameter chemical detector (lower explosive limit [LEL], oxygen, organic vapors), water quality parameter meter (conductivity, dissolved oxygen [DO], pH, turbidity, oxidation-reduction potential [ORP]), and water-level meter

Field logbooks will be maintained by the field team leader and other team members to provide a daily record of significant events, observations, and measurements during the field investigation.

Information pertinent to the field investigation and/or sampling activities will also be recorded in the logbooks. The books will be bound with consecutively numbered pages. Entries in the logbook will include, at a minimum, the following information:

- Name of author, date of entry, and physical/environmental conditions during field activity
- Purpose of sampling activity
- Location of sampling activity
- Name of field crew members
- Name of any site visitors

- Sample media (e.g., groundwater, air)
- Sample collection method
- Number and volume of sample(s) taken
- Description of sampling point(s)
- Volume of groundwater removed before sampling (where appropriate)
- Preservatives used
- Date and time of collection
- Sample identification number(s)
- Field observations
- Any field measurements made, such as, but not limited to, pH, temperature, conductivity, and water level

All original data recorded in field logbooks and chain of custody records will be written with indelible ink. If an error is made on an original document assigned to one individual, that individual will make all corrections simply by crossing a single line through the error and entering the correct information. The erroneous information will not be erased. Any subsequent error discovered on an original document will be corrected by the person who made the entry. All subsequent corrections will be initialed and dated.

2.2 Sample Labeling, Packing, and Shipping

Each sample will be given a unique identification, which references the sample location. With this type of identification, no two samples will have the same label.

Samples will be promptly labeled upon collection with the following information:

- Project number and site
- Unique sample identification
- Analysis required
- Date and time sampled
- Sample type (composite or grab)
- Preservative, if applicable

Clear tape will be secured over the sample label and the chain of custody will be initiated. A sample chain of custody form is included on **Attachment A**.

Appropriate sample containers, preservation methods, and laboratory holding times for each sample type will be applied as identified in the QAPP.

If samples requiring preservation are to be shipped by commercial carrier (e.g., FedEx), sample bottles/jars will be packed in coolers containing the following:

- Drain plug (if present) that has been sealed with duct tape
- 1 to 2 inches of bubble wrap on the bottom of the cooler
- Ice packaged in re-sealable plastic bags
- Sufficient bubble wrap to fill in the remaining area
- Completed chain of custody in a re-sealable plastic bag, taped in place on the inside cover of the cooler

The cooler will then be sealed with tape. Appropriate shipping labels, such as "this-end-up" and "fragile" stickers will be affixed to the cooler.

All samples will be hand delivered or delivered by an express carrier within 48 hours of sample collection. The express carrier will not be required to sign the chain of custody form; however, the shipping receipt should be retained by the sampler and forwarded to the project files.

2.3 Equipment Decontamination

It is anticipated that all sampling equipment will be dedicated for disposable, and therefore, will not require decontamination. The following decontamination procedures are provided if sampling equipment is reused and requires decontamination.

Prior to collecting samples to be submitted for chemical analysis, all non-dedicated or non-disposable equipment, if any, will be washed with potable water and a detergent (such as Alconox®). Decontamination may take place at the sampling location as long as all liquids are contained. The sampling equipment will then be rinsed with potable water, followed by a 10% “pesticide-grade” methanol rinse, and finally a distilled water rinse. When sampling for inorganic constituents (if required) in an aqueous phase, an additional rinse step will be added prior to the methanol rinse. The rinse step will entail a rinse with a 10% “ultra-pure-grade” nitric acid followed by a distilled water rinse. Between rinses, equipment will be placed on polyethylene sheets or aluminum foil, if necessary. At no time will washed equipment be placed directly on the ground. Equipment will be either used immediately or wrapped in plastic or aluminum foil for storage or transportation from the designated decontamination area to the sampling location.

2.4 Measurement of Fluid Levels

Fluid levels will be measured using an electronic fluid-level indicator (sounder), steel tape, pressure transducer, or stream gauge at established reference points (e.g., top of casing, stream gauge). When one round of water levels is taken to generate water-elevation data, the water levels will be taken consecutively at one time prior to sampling or other activities.

The following materials will be available, as required:

- Appropriate health and safety equipment, as specified in the applicable HASP
- Laboratory-type soap (Alconox or equivalent)
- Electronic water-level indicator (sounder) or pressure transducer

- Organic vapor meter (photoionization detector [PID])
- Analyte-free water
- Indelible ink pen

The following procedures will be used to obtain fluid levels:

1. Identify site and well number in field logbook, as well as the date, time, personnel, and weather conditions using indelible ink. Use safety equipment, as specified in the applicable HASP. Clean the water-level indicator in accordance with Section 2.3.
2. Unlock and open well cover while standing upwind from the well. Record PID reading in well headspace.
3. Locate a measuring reference point on the well casing. If one is not found, create a reference point by notching the inner casing or marking with paint or permanent marker. All down-hole measurements will be taken from one reference point. Document the creation of any new reference point or alteration of the existing reference point.
4. Measure to the nearest 0.01 foot and record the height of the inner and outer casing from reference point to ground level.
5. Lower the water-level indicator probe down the well. Take depth measurements of water and bottom. Double-check all measurements and record depths to the nearest 0.01 foot.
6. Clean the instrument(s), as specified in Section 2.3.
7. Compare depth of the well to previous records.
8. Lock the well when all activities are completed.

2.5 Bailer Sampling Procedures for Monitoring Wells

This protocol describes procedures to be used to collect groundwater samples. For newly installed wells, no sampling will be completed until well development has been performed. During precipitation events, groundwater sampling will be discontinued until precipitation ceases.

Additional materials and procedures for consideration are provided in the Water Level Measurement Standard Operating Procedure (SOP) included in **Attachment B**.

The following materials, as required, will be available during groundwater sampling:

- Dedicated or disposable bailer
- PID
- Appropriate health and safety equipment, as specified in the HASP
- Plastic sheeting (for each sampling location)
- New disposable polypropylene rope (if using disposable bailers)
- Buckets to measure purge water

- Water-level probe
- Water quality parameter meter (to measure conductivity, temperature, pH, DO, ORP, and turbidity)
- Appropriate water sample containers
- Appropriate blanks (trip blank supplied by the laboratory)
- Appropriate transport containers (coolers) with ice and appropriate labeling, packing, and shipping materials
- Groundwater sampling logs
- Chain of custody forms
- Indelible ink pens
- Site map with well locations and groundwater contour maps
- Keys to wells

Procedures for collecting groundwater samples from monitoring wells are presented below:

1. Review materials checklist to confirm appropriate equipment has been acquired.
2. Identify site and well to be sampled on sampling log sheets, including date, arrival time, and weather conditions. Identify personnel and equipment used and other pertinent data requested on the Field Sampling Logs (**Attachment C**).
3. Label all sample containers using an appropriate label.
4. Use safety equipment, as required in the applicable HASP.
5. Place plastic sheeting adjacent to the well to use as a clean work area.
6. Establish background reading with the PID and record the reading on the field log.
7. Remove lock from the well; if rusted or broken, replace with a new keyed-alike lock.
8. Open well cover while standing upwind of well. Remove well cap and place on plastic sheeting. Insert PID probe in the breathing zone above well casing following instructions in the applicable HASP.
9. Set out on plastic sheeting the dedicated or disposable sampling device and meters.
10. Prior to sampling, measure depth to groundwater and bottom in the well as described in Section 2.4. (Note: water levels will be measured at all wells prior to initiating a sampling event). Calculate the volume of water in the well.
11. After groundwater depths are measured, groundwater will be purged from the well.
12. Lower the bailer slowly into the well to a depth corresponding to the center of the saturated screen section of the well.
13. Retrieve the bailer.

14. Measure water quality parameters (e.g., turbidity, temperature, specific conductance, pH, DO, and ORP) initially and after every well volume. Note physical appearance of the water.
15. After purging three well volumes, obtain the groundwater sample needed for analysis directly from the bailer in the appropriate container and tightly screw on the caps.
16. Fill in the sample containers and cover the labels with clear packing tape to secure the label onto the containers.
17. Secure with packing material and store at 4 degrees Celsius (°C) on wet ice in an insulated transport container provided by the laboratory.
18. Record the time sampling procedures were completed on the field logs.
19. Place all disposable sampling materials (plastic sheeting, disposable bailers, and health and safety equipment) in a garbage bag for disposal in a standard waste stream. Go to the next well and repeat Steps 1 through Step 19 until all wells are sampled.
20. Complete the procedures for packaging, shipping, and handling with associated chain of custody forms (Section 2.2).

Additional materials and procedures for consideration are provided in the Standard Groundwater Sampling for Monitoring Wells SOP included in **Attachment B**.

2.6 Pond Effluent Sampling

This protocol describes procedures to be used to collect water effluent samples from the onsite retention pond. Effluent water discharges the pond by way of a V-notch weir.

The following materials, as required, will be available during pond effluent sampling:

- Appropriate health and safety equipment, as specified in the applicable HASP
- Digital camera
- Waterproof ruler
- Appropriate water sample containers
- Appropriate blanks (trip blank supplied by the laboratory)
- Appropriate transport containers (coolers) with ice and appropriate labeling, packing, and shipping materials
- Groundwater sampling logs
- Chain of custody forms
- Indelible ink pens
- Coolers with ice
- Field logbook

Procedures for collecting pond effluent samples are presented below:

1. Identify sample location by removing access lid.
2. Measure the height of water above the V-notch in the weir. Record this measurement in the field logbook for later calculation.
3. Label all sample containers using an appropriate label.
4. Fill laboratory-provided glassware.
5. Secure with packing material and store at 4 °C on wet ice in an insulated transport container provided by the laboratory.
6. Record the time sampling procedures were completed on the field logs.
7. Place all disposable sampling materials (health and safety equipment) in a garbage bag for disposal in a standard waste stream.
8. Complete the procedures for packaging, shipping, and handling with associated chain of custody forms (Section 2.2).

Additional materials and procedures for consideration are provided in the Discharge Grab Sampling SOP included in **Attachment B**.

2.7 Air Sampling

This protocol describes procedures to be used to collect air samples from the SSDS, as well as soil vapor and indoor air samples. Samples may be collected from the influent stream, effluent stream, at points between granular-activated carbon vessels, as well as at extraction points (including both sub-slab and indoor air).

Care must be taken to minimize the potential for introduction of source pollutants or biological debris. Sampling personnel should not handle hazardous substances (such as gasoline), permanent marking pens, wear/apply fragrances, smoke cigarettes/cigars before and/or during the sampling event.

Sample integrity is maintained if some vacuum is present in the canister, but sample integrity can be compromised if the event is extended to the point that the canister reaches atmospheric pressure. The treatment system will be operational for a minimum of 1 hour before collection of any samples from the system.

The following materials, as required, will be available during air sampling events:

- Dedicated or disposable Teflon® or Teflon®-lined low-density polyethylene tubing
- 1 liter or 6-liter steel SUMMA® canister (laboratory-supplied, batch certified)
- ¼ inch stainless steel Swagelok™ fittings for canister
- Vacuum gauge capable of measuring -30-inches of mercury
- MiniRAE™ PID
- Knife and tubing cutter
- Appropriately sized open-end wrench

- Digital camera
- Chain-of-custody form and sample label tags
- Field logbook
- Sample collection log
- Hearing protection, eye protection, and hand and heat protective personal protective equipment (PPE)

Procedures for performing SSDS air sampling are presented below:

1. Identify the proposed sample location in the field logbook and sampling log sheets (**Attachment C**), as well as with other appropriate system information (pressures, temperatures, valve positions).
2. Use PPE (as required by the applicable HASP).
3. Remove SUMMA® canister from box, connect the pressure gauge and sample valve. Check the vacuum gauge is zeroed properly. Connect the vacuum gauge, open canister valve slightly and observe vacuum. Vacuum should be the same value supplied by the laboratory (approximately -29-inches mercury). Verify canister identification.
4. For timed sample collection, attach flow regulator (required for paired Extraction Point and Indoor Air samples).
5. Attach tubing to SUMMA® canister inlet.
6. Connect tubing to system sample port.
7. With SUMMA® canister valve closed, open sample port valve on system/extraction point. The system will remove all air in the sample train.
8. System Sampling (influent, effluent, mid-points): Open regulator valve on SUMMA® canister. Collect sample for approximately 5 to 10 seconds. Close canister valve and ensure canister vacuum is between 0 to -5-inches of mercury. If canister vacuum is above -5-inches of mercury, open valve for a short period of time and recheck canister pressure. Repeat until canister vacuum registers between 0 and -5-inches of mercury.
9. Extraction Point and Indoor Air Sampling: Open valve on SUMMA® canister. Collect sample for the duration indicated on the flow regulator. Begin checking the pressure prior to the full duration indicated on the flow regulator. Stop sample collection (i.e., close valve on SUMMA® canister) after the time indicated on the flow regulator has passed, or once the vacuum on the canister reaches -6 inches of mercury, whichever occurs first.
10. Repeat Steps 1 through 8 for all other sampling locations.
11. Label all sample tags with 1) site, 2) project number, 3) location number, 4) sample interval, 5) date, 6) time of core collection, and 7) names of sampling personnel. Complete sampling log and chain of custody.
12. Package canister and flow controller in shipping container for return shipment to the laboratory. The SUMMA® canister does not require any preservation methods for shipment.

13. Seal shipping container by affixing custody seal. Keep all samples away from constituents that may impact results (e.g., vehicle exhaust, contaminated media). Ship samples.

Additional materials and procedures for consideration are provided in the Soil Vapor Extraction and Treatment System Sampling SOP included in **Attachment B**.

3 FIELD INSTRUMENTS

All field-screening equipment will be calibrated immediately prior to each day's use and more frequently, if required. The calibration procedures will conform to the manufacturer's standard instructions. Records of all instrument calibration will be maintained by the field personnel. Copies of all instrument manuals will be maintained onsite by the field personnel.

3.1 Portable Photoionization Detector

The PID will be a MiniRAE (or equivalent), equipped with a 10.6-electron volt (eV) lamp. The MiniRae is capable of ionizing and detecting compounds with an ionization potential of less than 10.6 eV. This accounts for up to 73% of the volatile organic compounds on the Target Compound List. Calibration will be performed according to the manufacturer’s procedures and recorded on the calibration log sheet in **Attachment D**.

3.2 Multi-Parameter Chemical Detector

The multi-parameter chemical detector will be a MulitRAE (or equivalent) equipped with sensors to measure at minimum LEL and oxygen.

3.3 pH Meter

The pH meter will be calibrated at the start of each day of use and after very high or low readings, as required by this FSP. National Institute of Standards and Technology traceable standard buffer solutions that bracket the expected pH range will be used. The standards will most likely be a pH of 7.0 and 10.0 standard units. The pH calibration and slope knobs will be used to set the meter to display the value of the standard being checked. The calibration data will be recorded in field logbooks. Calibration will be performed according to the manufacturer’s procedures and recorded on the calibration log sheet in **Attachment D**.

3.4 Specific Conductivity Meter

Calibration checks using the appropriate conductivity standard for the meter will be performed at the start of each day of use and after very high or low readings, as required by this FSP. Readings must be within 5% to be acceptable. The thermometer of the meter will be calibrated against the field laboratory thermometer on a weekly basis. Calibration will be performed according to the manufacturer’s procedures and recorded on the calibration log sheet in **Attachment D**.

3.5 Dissolved Oxygen Meter

The DO meter will be calibrated and the condition of the DO sensor will be checked at the start of each day of use. Calibration and maintenance of the DO meter will be conducted in accordance with the manufacturer’s specifications. The calibration data will be recorded in field logbooks. Calibration will be performed according to the manufacturer’s procedures and recorded on the calibration log sheet in **Attachment D**.

3.6 Water-Level Meter

The water-level meter will be checked once to a standard to assess if the meter has been correctly calibrated by the manufacturer or vendor. If the markers are incorrect, the meter will be sent back to the manufacturer or vendor.

3.7 Turbidity Meter

The turbidity meter will be calibrated daily prior to use. Calibration and maintenance will be conducted in accordance with the manufacturer's specifications. Calibration and maintenance information will be recorded in the field logbook. Calibration will be performed according to the manufacturer's procedures and recorded on the calibration log sheet in **Attachment D**.

3.8 Oxidation-Reduction Potential Meter

The ORP meter will be calibrated at the start of each day of use. Calibration and maintenance of the ORP meter will be conducted in accordance with the manufacturer's specifications. The calibration data will be recorded in the field logbook. Calibration will be performed according to the manufacturer's procedures and recorded on the calibration log sheet in **Attachment D**.

ATTACHMENT A

Sample Chain of Custody

ARCADIS

ID#:

CHAIN OF CUSTODY & LABORATORY ANALYSIS REQUEST FORM

Page ___ of ___

Lab Work Order #

Send Results to:

Contact & Company Name: | Telephone:

Address: | Fax:

City | State | Zip | E-mail Address:

Project Name/Location (City, State): | Project #:

Sampler's Printed Name: | Sampler's Signature:

Preservative							
Filtered (✓)							
# of Containers							
Container Information							

PARAMETER ANALYSIS & METHOD

Keys

Preservation Key:
A. H_2SO_4
B. HCL
C. HNO_3
D. NaOH
E. None
F. Other: _____
G. Other: _____
H. Other: _____

Container Information Key:
1. 40 ml Vial
2. 1 L Amber
3. 250 ml Plastic
4. 500 ml Plastic
5. Encore
6. 2 oz. Glass
7. 4 oz. Glass
8. 8 oz. Glass
9. Other: _____
10. Other: _____

Matrix Key:
SO - Soil | SE - Sediment | NL - NAPL/Oil
W - Water | SL - Sludge | SW - Sample Wipe
T - Tissue | A - Air | Other: _____

Sample ID	Collection Date	Collection Time	Type (✓) Comp	Type (✓) Grab	Matrix	REMARKS

Special Instructions/Comments:

☐ **Special QA/QC Instructions(✓):**

Laboratory Information and Receipt		Relinquished By	Received By	Relinquished By	Laboratory Received By
Lab Name:	Cooler Custody Seal (✓)	Printed Name:	Printed Name:	Printed Name:	Printed Name:
☐ Cooler packed with ice (✓)	☐ Intact ☐ Not Intact	Signature:	Signature:	Signature:	Signature:
Specify Turnaround Requirements:	Sample Receipt:	Firm:	Firm/Courier:	Firm/Courier:	Firm:
Shipping Tracking #:	Condition/Cooler Temp: _____	Date/Time:	Date/Time:	Date/Time:	Date/Time:

Distribution: **WHITE – Laboratory returns with results** **YELLOW – Lab copy** **PINK – Retained by Arcadis**

ATTACHMENT B

Standard Operating Procedures

ARCADIS
Infrastructure, environment, facilities

Imagine the result

Water Level Measurement

Rev. #: 2

Rev Date: February 24, 2011

Approval Signatures

Prepared by:  Date: 02/24/2011

Reviewed by:  Date: 02/24/2011

(Technical Expert)

I. Scope and Application

The objective of this Standard Operating Procedure (SOP) is to describe procedures to measure and record groundwater and surface-water elevations. Water levels may be measured using an electronic water-level probe, oil-water level indicator, or a pressure transducer from established reference points (e.g. top of casing). Reference points will be surveyed to evaluate fluid elevations relative to mean sea level (msl). This SOP describes the equipment, field procedures, materials, and documentation procedures to measure and record groundwater and surface-water elevations using the aforementioned equipment.

This is a standard (i.e., typically applicable) operating procedure which may be varied or changed as required, dependent upon site conditions, equipment limitations, or limitations imposed by the procedure. The ultimate procedure employed will be documented in the project work plans or reports.

II. Personnel Qualifications

ARCADIS field sampling personnel will have current health and safety training including 40-hour HAZWOPER training, site supervisor training, site-specific training, first aid, and CPR, as needed. In addition, ARCADIS field sampling personnel will be versed in the relevant SOPs and posses the required skills and experience necessary to successfully complete the desired field work.

III. Equipment List

The following materials, as required, shall be available during water level measurements:

- Appropriate personal protective equipment as specified in the Site Health and Safety Plan
- Equipment decontamination supplies
- Electronic water-level indicator
- Electronic oil-water level indicator
- Mini-Troll® or Troll® pressure transducer
- In-Situ™ data logger

- Laptop computer with the Win-Situ software package installed
- Photoionization detector (PID) and/or organic vapor analyzer
- Non-phosphate laboratory soap (Alconox or equivalent)
- Deionized/distilled water
- 150-foot measuring tape
- Solvent (methanol/acetone) rinse
- Portable containers
- Hacksaw
- Pliers
- Plastic sheeting
- “Write-in-the-Rain” Field logbook and or PDA (Personal Digital Assistant)
- Indelible ink pen.

IV. Cautions

Electronic water-level probes and oil-water interface probes can sometimes produce false-positive readings. For example, if the inside surface of the well has condensation above the water level, then an electronic water-level probe may produce a signal by contacting the side of the well rather than the true water level in the well. To produce reliable data, the electronic water level probe and/or interface probe should be raised and lowered several times at the approximate depth where the instrument produces a tone indicating a fluid interface to verify consistent, repeatable results.

The graduated tape or cable with depth markings is designed to indicate the depth of the electronic sensor that detects the fluid interface, but not the depth of the bottom of the instrument. When using these devices to measure the total well depth, the additional length of the instrument below the electronic sensor must be added to the apparent well depth reading, as observed on the tape or cable of the instrument, to obtain the true total depth of the well. If the depth markings on the tape or cable are

worn or otherwise difficult to read, extra care must be taken in obtaining the depth readings.

V. Health and Safety Considerations

The HASP will be followed, as appropriate, to ensure the safety of field personnel. Access to wells may expose field personnel to hazardous materials such as contaminated groundwater or oil. Other potential hazards include stinging insects that may inhabit well heads, other biologic hazards, and potentially the use of sharp cutting tools (scissors, knife). Appropriate personal protective equipment (PPE) will be worn during these activities. Field personnel will thoroughly review client-specific health and safety requirements, which may preclude the use of fixed/folding-blade knives.

VI. Procedure

Electronic Water-Level Indicators and Oil-Water Indicators

Calibration procedures and groundwater level measurement procedures for electronic water-level indicators and oil-water indicators are described in the sections below.

Calibration Procedures

The indicator probe will be tested to verify that the meter has been correctly calibrated by the manufacturer. The following steps will be used to verify the accuracy of the indicator:

1. Measure the lengths between each increment marker on the indicator with a measuring tape. The appropriate length of indicator measuring tape, suitable to cover the depth range for the wells of interest, will be checked for accuracy.

2. If the indicator measuring tape is inaccurate, the probe will be sent back to the manufacturer.

3. Equipment calibration will be recorded in the field logbook and/or PDA.

Groundwater Level Measurement Procedures

A detailed procedure for obtaining water elevations will be as follows:

1. Identify site and monitoring well number in field notebook along with date, time, personnel and weather conditions using indelible ink.

2. Use safety equipment as specified in the Health and Safety Plan.

3. Decontaminate the indicator probe and tape in accordance with the appropriate cleaning procedures.

4. Place clean plastic sheeting on the ground next to the well.

5. Unlock and open the monitoring well cover while standing upwind from the well.

6. Measure the volatile organics present in the monitoring well head space with a PID and record the PID reading in the field logbook.

7. Allow the water level in the well to equilibrate with atmospheric pressure for a few minutes. Locate a measuring reference point on the monitoring well casing. If one is not found, create a reference point by notching the highest point on the inner casing (or outer if an inner casing is not present) with a hacksaw. All downhole measurements will be taken from the reference point. Document the creation of any new reference point or alteration of the existing reference point.

8. Measure to the nearest 0.01 foot and record the height of the inner and outer casing from reference point to ground level.

9. Slowly lower the level indicator probe until it touches the bottom of the well. Record the total depth of the well from the top of the inner casing (or outer casing if inner casing is not present). Measure depth to water level as the probe is drawn back up through the water column. If used to measure the level of surface water, slowly lower from the surveyed reference point, as appropriate. Double check all measurements and record depths to the nearest 0.01 foot.

10. Decontaminate the instrument using appropriate cleaning procedures.

11. Lock the well when all activities are completed.

Pressure Transducers

The detailed procedure for obtaining water elevations using a Mini-Troll® or Troll® pressure transducer with an In-Situ™ data logger and the Win-Situ software package will be as follows:

<u>Setup Procedures</u>

1. Connect the Mini-Troll® or Troll® transducer to a laptop computer serial port.

2. Open the Win-Situ software package on the laptop computer.

3. Verify that the Win-Situ software recognizes the transducer.

4. Synchronize the clock on the laptop computer with that of the transducer.

5. Add a test to the transducer and input the specifications of the test (e.g., frequency of data collection, start data collection).

6. Disconnect the transducer from the laptop computer, and prepare the transducer for field deployment.

Field Procedures

1. Decontaminate all equipment entering the monitoring well using appropriate cleaning procedures.

2. Connect transducer to laptop computer, and start the Win-Situ program.

3. Lower the transducer gently below the water table or surface-water level.

4. Take a water level reading from the transducer using the Win-Situ software package. Lift the transducer approximately 1-foot, and verify the transducer response on the Win-Situ program (i.e. depth to water should be 1-foot less).

5. Upon verification, set the transducer to the desired depth. Position the instrument below the lowest anticipated water level, but not so low that its range will be exceeded at the highest anticipated water level. The maximum operating depth below water is equal to 2.31 feet times the psi rating of the transducer (e.g., 23.1 feet for a 10 psi transducer).

6. Secure the cable at the well head or fixed object adjacent to surface-water body to prevent drift and movement.

7. Obtain a manual water-level reading using the procedure noted above, and record the measurement in the field notebook or PDA.

8. Set reference point (e.g. depth to water, groundwater elevation) and input it into the Win-Situ software package.

9. Periodically download data and collect additional manual depth-to-water measurements using the same water-level or oil-water indicator probe used during the equipment setup to verify the accuracy of the transducer.

VII. Waste Management

Decontamination fluids, PPE, and other disposable equipment will be properly stored on site in labeled containers and disposed of properly. Be certain that waste containers are properly labeled and documented in the field log book. Review appropriate waste management SOPs, which may be state- or client-specific.

VIII. Data Recording and Management

Groundwater level measurements should be documented in the field logbook and/or PDA. The following information will be documented in the field logbook:

- Sample identification
- Measurement time
- Total well depth
- Depth to water

Groundwater elevations recorded using a Mini-Troll® or Troll® pressure transducer with an In-Situ™ data logger and the Win-Situ software package will be downloaded and stored in the central project file.

IX. Quality Assurance

As described in the detailed procedure, the electronic water-level meter and/or oil-water interface probe will be calibrated prior to use versus an engineer's rule to ensure accurate length demarcations on the tape or cable. Fluid interface measurements will be verified by gently raising and lowering the instrument through each interface to confirm repeatable results.

X. References

No literature references are required for this SOP.

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Standard Groundwater Sampling for Monitoring Wells

Rev. #: 1

Rev Date: July 16, 2008

Approval Signatures

Prepared by: _____ Date: 7/16/08

Reviewed by: _____ Date: 7/16/08
(Technical Expert)

I. Scope and Application

This Standard Operating Procedure (SOP) describes the procedures to be used to collect groundwater samples using traditional purging and sampling techniques. For low-flow purging techniques, please refer to the Low Flow Purging SOP. Monitoring wells must be developed after installation at least 1 week prior to groundwater sample collection. Monitoring wells will not be sampled until the well has been developed. During precipitation events, groundwater sampling will be discontinued until precipitation ceases or a cover has been erected over the sampling area and monitoring well.

Both filtered and unfiltered groundwater samples may be collected using this SOP. Filtered samples may be obtained using a 1.0-, 0.45-, or 0.1-micron disposable filter.

II. Personnel Qualifications

ARCADIS personnel directing, supervising, or leading groundwater sample collection activities should have a minimum of 2 years of previous groundwater sampling experience. Field employees with less than 6 months of experience should be accompanied by a supervisor (as described above) to ensure that proper sample collection techniques are employed.

III. Equipment List

The following materials shall be available, as required, during groundwater sampling:

- site plan of monitoring well locations and site Field Sampling Plan (FSP);
- appropriate health and safety equipment, as specified in the site Health and Safety Plan (HASP);
- photoionization detector (PID) or flame ionization detector (FID), as needed, in accordance with the HASP;
- monitoring well construction logs or tables and historical water level information, if available;
- dedicated plastic sheeting or other clean surface to prevent sample contact with the ground;
- if bailers are to be used in sampling:

  - appropriate dedicated bottom-loading, bottom-emptying bailers (i.e., polyvinyl chloride [PVC], Teflon, or stainless steel);
  - polypropylene rope;
- if submersible pumps are to be used in sampling:
  - dedicated tubing and other equipment necessary for purging;
  - generator or battery for operation of pumps, if required;
  - a pump selected in accordance with the FSP or Work Plan (parameter-specific [e.g., submersible, bladder, peristaltic]);
- graduated buckets to measure purge water;
- water-level or oil/water interface probe, in accordance with the FSP or Work Plan;
- conductivity/temperature/pH meter;
- down-hole dissolved oxygen meter, oxidation reduction potential meter, and/or turbidity meter, if specified in the FSP;
- water sample containers appropriate for the analytical method(s) with preservative, as needed (parameter-specific);
- filter, as needed, in accordance with the analytical method and parameter;
- appropriate blanks (trip blank supplied by the laboratory), as specified in the FSP;
- Ziploc-type freezer bags for use as ice containers;
- appropriate transport containers (coolers) with ice and appropriate labeling, packing, and shipping materials;
- appropriate groundwater sampling log (example attached);
- chain-of-custody forms;
- site map with well locations and groundwater contour maps;

- keys to wells and contingent bolt cutters for rusted locks and replacement keyed-alike locks; and

- drums or other containers for purge water, as specified by the site investigation derived waste (IDW) management plan.

IV. Cautions

If heavy precipitation occurs and no cover over the sampling area and monitoring well can be erected, sampling must be discontinued until adequate cover is provided. Rain water could contaminate groundwater samples.

Remember that field logs and some forms are considered to be legal documents. All field logs and forms should therefore be filled out in indelible ink.

It may be necessary to field filter some parameters (e.g., metals) prior to collection, depending on preservation, analytical method, and project quality objectives.

Check monitoring well logs for use of bentonite pellets. Make note of potential use of bentonite pellets on the groundwater sampling log. Coated bentonite pellets have been found to contaminate monitoring wells with elevated levels of acetone.

Store and/or stage empty and full sample containers and coolers out of direct sunlight.

To mitigate potential cross-contamination, groundwater samples are to be collected in a pre-determined order from least impacted to more impacted based on previous analytical data. If no analytical data are available, samples are to be collected in the following order:

1. First sample the upgradient well(s).

2. Next, sample the well located furthest downgradient of the interpreted or known source.

3. The remaining wells should be progressively sampled in order from downgradient to upgradient, such that the wells closest to the interpreted or known source are sampled last.

Be careful not to over-tighten lids with Teflon liners or septa (e.g., 40 mL vials). Over-tightening can impair the integrity of the seal.

V. Health and Safety Considerations

If thunder or lighting is present, discontinue sampling until 30 minutes have passed after the last occurrence of thunder or lighting.

VI. Procedure

The procedures to sample monitoring wells will be as follows:

1. Don safety equipment, as required in the HASP. Depending on site-specific security and safety considerations, this often must be done prior to entering the work area.

2. Review equipment list (Section III above) to confirm that the appropriate equipment has been acquired.

3. Record site and monitoring well identification on the groundwater sampling log, along with date, arrival time, and weather conditions. Also identify the personnel present, equipment utilized, and other relevant data requested on the log.

4. Label all sample containers with indelible ink.

5. Place plastic sheeting adjacent to the well for use as a clean work area, if conditions allow. Otherwise, prevent sampling equipment from contacting the ground or other surface that could compromise sample integrity.

6. Remove lock from well and if rusted or broken, replace with a new brass keyed-alike lock.

7. Unlock and open the well cover while standing upwind of the well. Remove well cap and place on the plastic sheeting.

8. Set the sampling device,meters, and other sampling equipment on the plastic sheeting. If a dedicated sampling device stored in the well is to be used, this may also be set temporarily on the plastic sheeting, for convenience. However, if a dedicated sampling device is stored below the water table, removing it may compromise water-level data, so water level measurements should be taken prior to removing the device.

9. Obtain a water-level depth and bottom-of-well depth using an electric well probe and record on the groundwater sampling log using indelible ink. Clean the probe(s) after each use in accord with the FSP or the equipment

decontamination SOP.

Note: Water levels may be measured at all wells prior to initiating any sampling activities, depending on FSP requirements.

10. Calculate the number of gallons of water in the well using the length of water column (in feet). Record the well volume on the groundwater sampling log using indelible ink.

11. Remove the required purge volume of water from the well (measure purge water volume in measuring buckets). The required purge volume will be three to five well volumes (the water column in the well screen and casing) unless the well runs dry, in which case, the water that comes into the well will be sampled (USEPA, 1996). In any case, the pumping rate will be decreased during sampling to limit the potential for volatilization of organics potentially present in the groundwater.

12. Field parameter measurements will be periodically collected in accord with FSP specifications. The typical time intervals of field parameter measurement are (1) after each well volume removed, and (2) before sampling. If the field parameters are being measured above-ground (rather than with a downhole probe), then the final pre-sampling parameter measurement should be collected at the reduced flow rate to be used during sampling. The physical appearance of the purged water should be noted on the groundwater sampling log. In addition, water level measurements should be collected and recorded to verify that the well purging is in accord with the guidelines set forth in the previous step.

13. Unless otherwise specified by the applicable regulatory agencies, all purge water will be contained. Contained purge water will be managed in accordance with the FSP or Work Plan. If historical concentrations in the well are less than federal or state regulated concentrations appropriate for current land use, *and permission has been granted by the oversight regulatory agency* to dispose of clean purge water on the ground next to the well(s), then purge water will be allowed to infiltrate into the ground surface downgradient from the monitoring well after the well is sampled.

14. After the appropriate purge volume of groundwater in the well has been removed, or if the well has been bailed dry and allowed to recover, obtain the groundwater sample needed for analysis with the dedicated bailer or from the dedicated sampling tubing, pour the groundwater directly from the sampling device into the appropriate container in the order of volatilization sensitivity of

the parameters sampled, and tightly screw on the cap (snug, but not too tight). The suggested order for sample parameter collection, based on volatilization sensitivity, is presented below:

a. volatile organic compounds (VOCs);

b. semi-volatile organic compounds (SVOCs);

c. polychlorinated biphenyls (PCBs)/pesticides;

d. metals; and

e. wet chemistry.

15. When sampling for volatiles, water samples will be collected directly from the bailer or dedicated tubing into 40 mL vials with Teflon-lined septa.

16. For other analytical samples, sample containers for each analyte type should be filled in the order specified by the FSP. If a bailer is used, then the sample for dissolved metals and/or filtered PCBs should either be placed directly from the bailer into a pressure filter apparatus or pumped directly from the bailer with a peristaltic pump, through an in-line filter, into the pre-preserved sample bottle. If dedicated sample tubing is used, then the filter should be installed in-line just prior to filtered sample collection.

17. If sampling for total and filtered metals and/or PCBs, a filtered and unfiltered sample will be collected. Sample filtration for the filtered sample will be performed in the field utilizing a pump prior to preservation. Attach (clamp) a new 1.0-, 0.45-, or 0.1-micron filter to the discharge tubing of the pump (note the filter flow direction). Turn the pump on and allow 100 mL (or manufacturer recommended amount) of fluid through the filter before sample collection. Dispense the filtered liquid directly into the laboratory sample bottles. If bailers are used for purging and sampling, a proper volume of purge water will be placed in a disposable or decontaminated polyethylene container and pumped through the filter and into the sample container using a peristaltic pump.

18. Place the custody seal around the cap and the sampler container, if required. Note the time on the sample label. Secure with packing material and maintain at approximately 4°C on wet ice contained in double Ziploc-type freezer bags during storage in an insulated, durable transport container.

19. Replace the well cap and lock well, or install a new lock if needed.

20. Record the time sampling procedures were completed on the appropriate field logs (using indelible ink).

21. Complete the procedures for chain-of-custody, handling, packing, and shipping. Chain-of-custody forms should be filled out and checked against the labels on the sample containers progressively after each sample is collected.

22. Place all disposable sampling materials (such as plastic sheeting, disposable tubing or bailers, and health and safety equipment) in appropriate containers.

23. If new locks were installed, forward copies of the keys to the client Project Manager (PM) and ARCADIS PM at the end of the sampling activities.

VII. Waste Management

Purge water will be managed as specified in the FSP or Work Plan, and according to state and/or federal requirements. Personal protective equipment (PPE) and decontaminated fluids will be contained separately and staged at the sampling location. Containers must be labeled at the time of collection. Labels will include date, location(s), site name, city, state, and description of matrix contained (e.g., soil, groundwater, PPE). General guidelines for IDW management are set forth in a separate IDW management SOP.

VIII. Data Recording and Management

Initial field logs and chain-of-custody records will be transmitted to the ARCADIS PM at the end of each day unless otherwise directed by the PM. The groundwater team leader retains copies of the groundwater sampling logs. All field data should be recorded in indelible ink.

IX. Quality Assurance

Field-derived quality assurance blanks will be collected as specified in the FSP, depending on the project quality objectives. Typically, field rinse blanks will be collected when non-dedicated equipment is used during groundwater sampling. Field rinse blanks will be used to confirm that decontamination procedures are sufficient and samples are representative of site conditions. Trip blanks for VOCs, which aid in the detection of contaminates from other media, sources, or the container itself, will be kept with the coolers and the sample containers throughout the sampling activities.

X. References

USEPA. 1986. RCRA Groundwater Monitoring Technical Enforcement Guidance Document (September 1986).

USEPA. 1991. Handbook Groundwater, Volume ii Methodology, Office of Research and Development, Washington, DC. USEPN62S, /6-90/016b (July, 1991).

U.S. Geological Survey (USGS). 1977. National Handbook of Recommended Methods for Water-Data Acquisition: USGS Office of Water Data Coordination. Reston, Virginia.

Discharge Grab Sampling
Standard Operating Procedure

Rev. 1

October 23, 2015

Printed copies of this procedure are uncontrolled

Approval Signatures

Prepared by: _____ Date: October 23, 2015
JoAnne Lonzanida
Civil Engineer II

Reviewed by: _____ Date: October 23, 2015
Lucas Cullen, Certified Project Manager
(Technical Expert)

I. Scope and Application

This Standard Operating Procedure (SOP) provides general guidance, material needs, and methodology for collection discharge grab water samples (including tanks, trenches, sumps, manholes, pipes and other wastewater discharges) for chemical analysis. SOP 1510814 Stormwater Sampling describes collecting composite samples. This SOP does not address field parameter measurements (e.g., temperature, pH, etc.) sample preservation, sample packaging, chain-of-custody, laboratory analysis or confined space sampling. This SOP is to be used in conjunction with any federal, state, local and/or other agencies sampling procedures. Additionally, Health and Safety Plan (HASP) procedures should be reviewed and followed including air monitoring, as appropriate.

II. Personnel Qualifications

Field sampling personnel will have current health and safety training, including site-specific training. In addition, field sampling personnel will be versed in the relevant SOPs and possess the required skills, training, field observation documentation, and experience necessary to successfully complete the field work

III. Equipment List

The following materials shall be available, as required, during sampling:

- Field log book
- Chain-of-custody and security seals
- Clean sample containers (include an extra set) and preservatives
- Sample labels
- Field parameter instruments (such as water quality instruments)
- Cooler
- Resealable plastic bags for ice and sample sets
- Ice
- Paper towels
- Nitrile gloves

- Clean 5-gallon buckets with lids
- Plastic sheeting
- Appropriate dedicated bottom-loading, bottom emptying Teflon® bailers
- Polypropylene rope
- Wrench, socket, manhole cover hook or magnetic manhole cover remover for access
- Swing sampler device
- Site access tools (shovel and brush removal tools, manhole hook and sledge hammer)

IV. Procedure

The procedure for sampling from a discharge point is as follows:

1) Review all associated discharge permits and any referenced procedures or ordinances.

2) The field crew will don and maintain appropriate personal protective equipment (PPE). Gloves will be changed frequently and with each change of sampling location and/or task.

3) If available, look for the sample tap installed at the location to be sampled. Otherwise, access the outfall.

4) Place plastic sheeting adjacent to the sample location for use as a clean work area, if conditions allow. Otherwise, prevent sampling equipment from contacting the ground or other surface that could compromise sample integrity.

5) Set the sampling device, meters and other sampling equipment on the plastic sheeting.

6) Label all sample containers with inedible ink and place transparent tape over label to prevent smearing.

7) If available, turn on the sampling location tap and run the water for at least 30 seconds or, if appropriate, until the well pump cycles on. The time required will vary depending on the sampling location.

Purged water will be collected in 5-gallon buckets with lids or similarly appropriate containers.

8) If a sample tap is not available, collect samples using a dedicated bailer or swing sampler device with attached sample container (as appropriate) at the outfall. Place the sampler under the outfall and fill the sampler.

9) When collecting multiple parameter samples fill the containers in the following order:

1. Volatile organic compounds (VOCs)
2. Semivolatile organic compounds (SVOCs)
3. Pesticides
4. Polychlorinated biphenyls (PCBs)
5. Herbicides
6. Metals
7. Mercury
8. Alkalinity, biological oxygen demand (BOD), total suspended solids (TSS), total dissolved solids (TDS), chloride, and fluoride
9. Others

10) Fill the VOC vials completely (i.e. no headspace) directly from the tap. If a sample tap is not available, place the bailer or swing sampler device with attached sample container into the water at the targeted sampling location. If using a bailer, once completely filled, pour the water directly from the sampling device into the appropriate container. If using a swing sampler with attached container, position the swing sampler with attached sample such that the Assistant can remove the sample bottle. Fill the vial until a meniscus forms at the bottle opening. Place the cap on the vial and screw it on. Invert the bottle and check for air bubbles. If bubbles are present remove the cap and add more sample. Replace the cap and re-inspect the vial for bubbles.

11) Fill the remaining sample containers to the shoulder. Close and label the container with the appropriate information.

12) Samples should be placed into a cooler containing ice immediately after collection.

13) Ship the samples to the laboratory per project requirements.

14) Place all disposable sampling materials (such as plastic sheeting and health and safety equipment) in appropriate containers.

The procedure for sampling from a manhole, sump, trench, or equivalent is as follows:

1) Review all associated discharge permits and any referenced procedures or ordinances.

2) The field crew will don and maintain appropriate personal protective equipment (PPE). Gloves will be changed frequently and with each change of sampling location and/or task.

3) Identify the location to be sampled and gain access using a wrench, socket, manhole cover hook, or magnetic manhole cover remover, as appropriate.

4) Place plastic sheeting adjacent to the sample location for use as a clean work area, if conditions allow. Otherwise, prevent sampling equipment from contacting the ground or other surface that could compromise sample integrity.

5) Set the sampling device, meters and other sampling equipment on the plastic sheeting.

6) Label all sample containers with inedible ink and place transparent tape over label to prevent smearing.

7) Collect samples using a dedicated bailer or swing sampler device with attached sample container (as appropriate). Lower the sampler into the water. Collect the sample just below the surface of the water. If the water is flowing, place the opening of the sampler in the downstream direction to minimize the collection of debris in the sampler.

8) When collecting multiple parameter samples fill the containers in the following order:

10. Volatile organic compounds (VOCs)
11. Semivolatile organic compounds (SVOCs)
12. Pesticides
13. Polychlorinated biphenyls (PCBs)
14. Herbicides
15. Metals

16. Mercury
17. Alkalinity, biological oxygen demand (BOD), total suspended solids (TSS), total dissolved solids (TDS), chloride, and fluoride
18. Others

9) Fill the VOC vials completely (i.e. no headspace) directly from the tap. If a sample tap is not available, place the bailer or swing sampler device with attached sample container into the water at the targeted sampling location. If using a bailer, once completely filled, pour the water directly from the sampling device into the appropriate container. If using a swing sampler with attached container, position the swing sampler with attached sample such that the Assistant can remove the sample bottle. Fill the vial until a meniscus forms at the bottle opening. Place the cap on the vial and screw it on. Invert the bottle and check for air bubbles. If bubbles are present remove the cap and add more sample. Replace the cap and re-inspect the vial for bubbles.

10) Fill the remaining sample containers to the shoulder. Close and label the container with the appropriate information.

11) Samples should be placed into a cooler containing ice immediately after collection.

12) Ship the samples to the laboratory per project requirements.

13) Place all disposable sampling materials (such as plastic sheeting and health and safety equipment) in appropriate containers.

V. Waste Management

Waste generated during this sample collection task will be purged water resulting from collecting the sample and a small volume of solid waste (e.g., spent PPE and disposable sampling equipment). The purge water and solid waste will be placed in designated containers.

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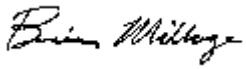
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SOP: Soil Vapor Extraction and Treatment System Sampling

Rev. #: 1

Rev Date: February 19, 2010

Approval Signatures

Prepared by:  Date: February 19, 2010

Brian Millage
Staff Scientist

Reviewed by:  Date: February 19, 2010

Chris Lutes
Technical Review

Reviewed by: _____ Date: February 19, 2010

Quentin Moore
Project Engineer/ Certified Project Manager

I. Scope and Application

This standard operating procedure (SOP) describes the procedures to collect treatment system air samples using a 6-liter, stainless steel SUMMA® canister. The presence of volatile organic compounds (VOCs) will be analyzed by United States Environmental Protection Agency (USEPA) Method TO-14A (TO-14A) and USEPA Method 25C (25C) for total gaseous non-methane organic compounds (TGNMO) to satisfy permit conditions and provide baseline data for destruction efficiency calculations. In addition, all vapor samples collected quarterly will be submitted to the laboratory for the analysis of oxygen, carbon monoxide, carbon dioxide and methane in accordance with the American Society for Testing and Materials (ASTM) method D1946.

Sample collection discussed in this SOP is consistent with the standard TO-14A collection method. Both the TO-14A and 25C analysis will be performed from the same canister. The following sections list the necessary equipment and detailed instructions for collecting the treatment system samples.

II. Personnel Qualifications

ARCADIS field sampling personnel will have current health and safety training, including 40-hour HAZWOPER training, DOT/IATA Hazardous Materials training, site supervisor training, site-specific training, first aid, and cardiopulmonary resuscitation (CPR), as needed. ARCADIS field sampling personnel will be well versed in the relevant SOPs and possess the required skills and experience necessary to successfully complete the desired field work. ARCADIS personnel responsible for leading treatment system air sample collection activities must have previous treatment system air sampling experience or be cross-trained by experienced personnel.

III. Equipment List

The equipment required for ambient air sample collection is presented below:

- 6-liter, stainless steel SUMMA® canisters (LAB SUPPLIED - order at least one extra if feasible);
- ¼" stainless steel Swagelok™ fittings for canisters
- Vacuum gauge capable of -30" Hg;
- ¼" Teflon tubing, tees and 3-way valves to purge sample train

- Peristaltic purge pump with required silicon tubing;
- MultiRAE^{TM} Plus PID or equivalent (calibrated);
- Non fixed-open-blade-knife (FOBK) cutting tool for tubing;
- Appropriate-sized open-end wrench and kneeling pad;
- Chain-of-custody (COC) form and sample label tags;
- Field notebook, pens and camera;
- Sample collection log;
- Table or adequate surface to place and secure canisters
- Safety gear including eye, hand and heat protective PPE

IV. Cautions

Care must be taken to minimize the potential for introducing interferences during the sampling event such as any source pollutants or biological debris. Care must also be taken to keep the canister secured in place while collecting the sample. Sampling personnel should not handle hazardous substances (such as gasoline), permanent marking pens, wear/apply fragrances, or smoke cigarettes/cigars before and/or during the sampling event.

Sample integrity is maintained if some vacuum is present in the canister, but sample integrity can be compromised if the event is extended to the point that the canister reaches atmospheric pressure. The treatment system will be operational for a minimum of one hour before the collection of any treatment system samples.

A Shipping Determination must be performed, by DOT-trained personnel, for all environmental and geotechnical samples that are to be shipped, as well as some types of environmental equipment/supplies that are transported. Use laboratory courier to transport samples if there is any doubt regarding shipping methods.

V. Health and Safety Considerations

Field sampling equipment must be carefully handled to minimize the potential for injury and the spread of hazardous substances. Plan safe access routes if sampling points are near powered, heated or elevated equipment. Use a spotter when necessary.

VI. Sampling Procedure

SUMMA® Canister Sampling Train Setup

- The canister valve assembly can be directly leak tested by connecting the pressure gauge and sampling valve directly to the sample tank. Remove the brass dust cap from the SUMMA® canister. Check that the vacuum gauge is zeroed properly. Connect the vacuum gauge, open canister valve slightly and observe vacuum. The vacuum should be the same as the reported value supplied by the laboratory, approximately -29" Hg. Verify canister Identification, record results and allow the canister to sit for one minute. The leak check for the tank is acceptable if no vacuum change is noted. If the canister leaks, notify the laboratory and remove the canister from use.

- Prepare sampling equipment and sample train assembly on plastic sheeting or table to limit potential debris from entering the sample train or equipment.

- To incorporate the canister as part of the sample train, remove vacuum gauge and install a barb to the SUMMA® canister with the appropriate wrench. Tighten with fingers first, then gently with the wrench.

- Using Teflon tubing, place a 3-way valve in line from the sample port (source gas) to the canister and tubing from the remaining barb to a peristaltic purge pump. Install a tee downstream of the purge pump for PID screening and attach a length of tubing to the remaining barb open to the atmosphere for discharge gas. For safety, keep this length of tubing away from the breathing zone or from powered equipment.

- With the sample train now in place, evacuate using the peristaltic pump with the three-way valve initially open and purge an adequate length of time to assure source vapors fill the sample train. Log the PID readings. Note the condition of the gas stream for the presence of moisture or other matter. (Note: At no time should droplets be permitted to enter the sample canister).

- Once adequate purge has been achieved, close the three-way valve and stop the purge pump. The three-way valve should now be closed to the peristaltic pump and open towards the SUMMA® canister for sample collection.

Sample Collection

- With the sample port valve still open, and 3-way valve properly aligned, gently open the SUMMA® canister valve. Record in the field notebook the time sampling began and note conditions.

- Take photographs of the SUMMA® canister, sample location and surrounding area, as appropriate.

- Close the canister valve when the canister vacuum reaches approximately 5 inches of Hg (leaving some vacuum in the canister provides a way to verify if the canister leaks before it reaches the laboratory) or when the desired sample collection time has elapsed. Verify end vacuum reading and record on the appropriate form.

- Close the sample port valve and carefully disconnect the sample train assembly and purge PID of residual source gas.

VII. Sample Handling, Packing and Shipping

- Record the date and local time (24-hour basis) of valve closing in the field notebook, sample collection log, and COC form.

- Complete the appropriate forms and sample labels as directed by the laboratory (e.g., affix card with string), complete COC forms and place requisite copies in shipping container.

- Package the canister (and flow controller if supplied by the laboratory) in the shipping container for return shipment to the laboratory. The SUMMA® canister does not require any preservation methods for shipment.

- Seal shipping container by affixing custody seal to container closure. Keep trip blank with collected samples until laboratory courier arrives. Keep all samples away from objects that may impact results (i.e. car exhaust, contaminated media).

VIII. Waste Management

No specific waste management procedures are required. Properly dispose of used materials in a sealed plastic bag managed as Non-hazardous waste.

IX. Data Recording and Management

Measurements will be recorded in the field notebook at the time of measurement, with notations of project name, sample date, sample start and finish times, sample location (e.g., GPS coordinates if available), canister serial number and initial and final vacuum reading. Field sampling logs and COC records will be transmitted to the Project Manager.

X. Quality Assurance

Soil gas vapor sample analysis will be performed using USEPA Method TO-14A and USEPA Method 25C. The TO-14A method uses a quadrupole or ion-trap GC/MS with a capillary column to provide optimum detection limits. The GC/MS system requires a 1-liter gas sample (which can easily be recovered from a 6-liter canister) to provide a 0.5 ppbv detection limit. The 6-liter canister also provides several additional 1-liter samples in case subsequent re-analyses or dilutions are required. This system also offers the advantage of the GC/MS detector, which confirms the identity of detected compounds by evaluating their mass spectra in either the SCAN or SIM mode.

The Method 25C analysis for total non-methane organic compounds requires less than 1-liter volume for analysis. Both the TO-14A and 25C analysis can be performed from the same canister. Oxygen, carbon monoxide, carbon dioxide and methane fixed gases are analyzed in accordance with the American Society for Testing and Materials (ASTM) method D1946.

XI. Limitations

Please reference the documentation specific to the job site, including the permit conditions, to assure that the method testing is suitable for testing requirements and project target goals.

XII. References

Center for Environmental Research Information Office of Research and Development, *Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air - Second Edition, Compendium Method TO-14A Determination of Volatile Organic Compounds (VOCs) In Ambient Air Using Specially Prepared Canisters with Subsequent Analysis By Gas Chromatography*, U.S. Environmental Protection Agency, Cincinnati, OH 45268. January 1999.

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Soil Gas Sampling Using Single or Nested Ports

SOP # 428199

Rev. #: 4

Rev Date: July 9, 2010

Approval Signatures

Prepared by: _____ Date: 07/09/2010
Mitch Wacksman and Andrew Gutherz

Approved by: _____ Date: 07/09/2010
Christopher Lutes and Nadine Weinberg

I. Scope and Application

This document describes the procedures for installing semi-permanent or permanent single or nested soil-gas ports and collecting soil-gas samples. Nested soil-gas ports allow for the generation of discrete data as a function of depth and time. Samples are collected for the analysis of volatile organic compounds (VOCs) by United States Environmental Protection Agency (USEPA) Method TO-15 (TO-15). Method TO-15 uses a 1-liter, 3-liter of 6-liter SUMMA® passivated stainless steel canister. An evacuated SUMMA canister (less than 28 inches of mercury [Hg]) will provide a recoverable whole-gas sample of approximately 5 liters when allowed to fill to a vacuum of 6 inches of Hg. The whole-air sample is then analyzed for VOCs using a quadrupole or ion-trap gas chromatograph/mass spectrometer (GS/MS) system to provide compound detection limits of 0.5 parts per billion volume (ppbv). Optionally, the whole air sample can also be analyzed for permanent gasses such as oxygen and carbon dioxide.

The following sections list the necessary equipment and provide detailed instructions for the installation of semi-permanent or permanent single or nested soil-gas ports (using direct-push technology or a hollow stem auger) and the collection of soil-gas samples for VOC analysis.

II. Personnel Qualifications

ARCADIS field sampling personnel will have current health and safety training, including 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training. Site supervisor training, site-specific training, first-aid, and cardiopulmonary resuscitation (CPR), may be appropriate at some sites. ARCADIS field sampling personnel will be well versed in the relevant standard operating procedures (SOPs) and possess the required skills and experience necessary to successfully complete the desired field work. ARCADIS personnel responsible for leading soil-gas sample collection activities must have previous soil-gas sampling experience.

III. Health and Safety Considerations

All sampling personnel should review the appropriate health and safety plan (HASP) and job loss analysis (JLA) prior to beginning work to be aware of all potential hazards associated with the job site and the specific installation. Field sampling equipment must be carefully handled to minimize the potential for injury and the spread of hazardous substances. For vapor port installation, drilling with a direct-push drilling rig

or hollow stem auger rig should be done only by personnel with prior experience using such of equipment.

IV. Equipment List

The equipment required to install single or nested soil vapor ports is presented below:

- Appropriate personal protective equipment (PPE ; as required by the HASP and JLA);
- Appropriate drill rig to reach necessary sample depth (hollow stem auger, direct-push rig, etc)
    - Hollow stem auger rig with interconnecting augers. The inner diameter of typical augers ranges from 2.25-inches to 7.75-inches; the auger size should be chosen should be large enough to accommodate the number of nested ports that will be installed inside the boring.
    - Direct-push rig (e.g., -Geoprobe) equipped with interconnecting 4-foot lengths of steel drive rods (2.25-inch-diameter, or 3.25-inch diameter depending on the number of ports to be installed).
- 1/4-inch outside diameter (OD) x 1/8-inch inside diameter (ID) tubing (Teflon, Teflon lined, or nylon). Note that Nylaflow tubing has a somewhat higher background level of BTEX and much poorer recovery of trichlorobenzene and naphthalene then Teflon, so it should not be used on site where these compounds are a concern (Hayes, 2006)
- Stainless steel sample screens with sacrificial point (one per sample depth to weight sample screen, available from Geoprobe). Typically 6” long for sized for 1/4-inch OD tubing.
- Stainless steel, or Teflon ball valve or needle valve (one per sample depth to match sample tubing) for sample line termination.
- Commercially available clean sand filter pack or glass beads having a grain size larger than 0.0057-inch (pore diameter of screen)

- Granular and powdered bentonite (Benseal®, Volclay® Crumbles, or equivalent)
- Down hole measuring device
- Distilled or Deionized water for hydration of bentonite
- Plastic or aluminum tags for permanently labeling port with sample depth, and port identification number. It is no recommended to write on or affix adhesive tape to tubing as these methods fail over time.
- Well cover for permanent installation, This should be a traffic rated road box for exterior installations or an appropriate clean-out cover for interior installations.
- Photoionization Detector (PID) (with a lamp of 11.7 eV).

The equipment required for soil-gas sample collection from single or nested ports is presented below:

- 1,3, or 6 – liter stainless steel SUMMA® canisters (order at least one extra, if feasible) (batch certified canisters or individual certified canisters as required by the project)
- Flow controllers with in-line particulate filters and vacuum gauges; flow controllers are pre-calibrated to specified sample duration (e.g., 30 minutes, 8 hours, 24 hours) or flow rate (e.g., 200 milliliters per minute [mL/min]); confirm with the laboratory that the flow controller comes with an in-line particulate filter and pressure gauge (order at least one extra, if feasible). Flow rate should be selected based on expected soil type (see below)
- Decontaminated stainless steel1/4-inch Swagelok (or equivalent) fittings (e.g., nuts, ferrules and backers)
- Decontaminated stainless steel Swagelok or comparable “T” fitting and needle valve for isolation of purge pump.
- Stainless steel or brass “T” fitting (if collecting duplicate [i.e., split] samples). Swage-lok or comparable

- Portable vacuum pump capable of producing very low flow rates (e.g., 100 to 200 mL/min) with vacuum gauge. Purging flow rate should also be selected based on expected soil type (see below).
- Rotameter or an electric flow sensor if vacuum pump does not have an accurate flow gauge (Bios DryCal or equivalent).
- Tracer gas testing supplies if applicable (refer to tracer SOP)
- Photoionization Detector (PID) (with a lamp of 11.7 eV)
- Appropriate-sized open-end wrench (typically 9/16-inch, 1/2-inch, and 3/4-inch)
- Down hole measuring device (e.g., water level probe, tape measure)
- Portable weather meter, if appropriate
- Chain-of-custody (COC) forms
- Sample collection logs (attached)
- Field Book

V. Cautions

The following cautions and field tips should be reviewed and considered prior to installing or collecting a single or nested soil-gas sample.

- When drilling to install sampling ports , be mindful of utilities that may be in the area. Follow ARCADIS utility location procedure. If the driller is concerned about a particular location, consult the project manager about moving it to another location. Do not hesitate to use Stop Work Authority; if something doesn't seem right stop and remedy the situation.
- Sampling personnel should not handle hazardous substances (such as gasoline), permanent marking pens (sharpies), wear/apply fragrances, or smoke cigarettes/cigars before and/or during the sampling event.

- Ensure that the flow controller is pre-calibrated to the proper sample collection duration (confirm with laboratory). Sample integrity can be compromised if sample collection is extended to the point that the canister reaches atmospheric pressure. Sample integrity is maintained if sample collection is terminated prior to the target duration and a measurable vacuum (e.g., 3-7–inches Hg) remains in the canister when sample collection is terminated. Do not let sample canister reach atmospheric pressure (e.g., 0-inches Hg).

- Care should be taken to ensure that nested ports are installed at the target sample depths within the sand filer pack.. Sampling personnel should work closely with the driller to accomplish this.

- When introducing granular bentonite to the boring, the material should be introduced slowly and hydrated properly. Consult the bentonite manufacturer's instructions on the bag to determine the proper amount of to be used. When hydrated properly bentonite forms a thick clay mass that remains moist. The hydration step is crucial in the installation process and if not done properly the integrity of the bentonite seal can be compromised.

- Using prehydrated bentonite is best and should be discussed with drilling subcontractor.

- The purge flow rate of 100 ml/min should be suitable for a variety of silt and sand conditions but will not be achievable in some clays without excessive vacuum. Thus lower flow rates may be necessary in clay. A low vacuum (<10" of mercury) should be maintained. Record the measured flow rate and vacuum pressure during sample collection.

  The cutoff value for vacuum differs in the literature from 10" of water column (ITRC 2007) to 136" of water column or 10" of mercury (http://www.dtsc.ca.gov/lawsregspolicies/policies/SiteCleanup/upload/SMBR_ADV_activesoilgasinvst.pdf). A detailed discussion of the achievable flow rates in various permeability materials can be found in Nicholson 2007. Related issues of contaminant partitioning are summarized in ASTM D5314-92. Passive sampling approaches can be considered as an alternative for clay soils although most passive methods for soil gas do not yield a quantitative concentration in soil gas.

- It is important to record the canister pressure, start and stop times and ID on a proper field sampling form. You should observe and record the

time/pressure at a mid-point in the sample duration. It is a good practice to lightly tap the pressure gauge with your finger before reading it to make sure it isn't stuck.

- Ensure that there is still measureable vacuum in the SUMMA® after sampling. Sometimes the gauges sent from labs have offset errors, or they stick.

- When sampling carefully consider elevation. If your site is over 2,000' above sea level or the difference in elevation between your site and your lab is more than 2,000' then pressure effects will be significant. If you take your samples at a high elevation they will contain less air for a given ending pressure reading. High elevation samples analyzed at low elevation will result in more dilution at the lab, which could affect reporting limits. Conversely low elevation samples when received at high elevation may appear to not have much vacuum left in them. http://www.uigi.com/Atmos_pressure.html.

- If possible, have equipment shipped a two or three days before the sampling date so that all materials can be checked. Order replacements if needed.

- Requesting extra canisters from the laboratory should also be considered to ensure that you have enough equipment on site in case of an equipment failure.

- Soil-gas sampling should not proceed within 5 days following a significant rain event (1/2-inch of rainfall or more). Exceptions to this requirement may be appropriate depending on site climatic conditions, soil gas point depth and soil drainage characteristics. However since this requirement is frequently contained in regulatory documents, any exception to this requirement must be discussed with client and/or regulatory representatives. ITRC (2007) discussed the conditions when this requirement may not be necessary: "*Infiltration from rainfall can potentially impact soil gas concentrations by displacing the soil gas, dissolving VOCs, and by creating a "cap" above the soil gas. In many settings, infiltration from large storms penetrates into only the uppermost vadose zone. In general, soil gas samples collected at depths greater than about 3–5 feet bgs or under foundations or areas with surface cover are unlikely to be significantly affected. Soil gas samples collected closer to the surface (<3 feet) with no surface cover may be affected. If the moisture has penetrated to the*

sampling zone, it typically can be recognized by difficulty in collecting soil gas samples. "

VI. Procedure

Single or Nested Soil-Gas Monitoring Point Installation

The procedure used to install semi-permanent or permanent single or nested soil-gas ports will vary based upon the method of boring installation. In most situations a temporary well casing well need to be installed to keep the down hole formation from collapsing during port installation. The following steps will detail installing nested soil-gas ports through a temporary well casing.

If the nested ports will be installed at shallow depths, or the formation is thought to be stable enough to not collapse, a temporary well casing may not be necessary to facilitate the installation of the sample ports. Either way, the steps for installing the sample ports are nearly identical. These following steps should be discussed with the drilling subcontractor and altered based on the methods chosen for a given project.

1. Advance boring to bottom of deepest sampling interval and install a temporary well casing. Care should be taken to ensure that the terminal depth of the boring does not reach groundwater or the capillary fringe. Soil-gas probes should not be installed in groundwater or the capillary fringe. Moisture conditions and/or other observations (such as depth to water in nearby monitoring wells) should be recorded on the soil-gas collection log, as indicated.

2. Cut a length of 1/4-inch tubing slightly longer (e.g., 4 to 5 feet) than the collection depth. Attach a stainless steel sample screen and sacrificial point to the tubing and lower the screen and attached tubing through the boring.

3. Assure that the sample screen has reached the bottom of the boring and record this depth.

4. Begin simultaneously filling in the area around the sample screen with sand filter pack and retracting the temporary well casing. The casing should be lowered back down onto the sand every few inches to compact the sand around the screen. Sand should be introduced 3-inches below the screen, to cover the 6-inch sample screen and extend 3-inches inches above the screen for a total of 12 inches of sand. Closely monitor the amount of sand added to the borehole with a tape measure or water level probe.

5. With the proper sand pack in place begin slowly introducing 6-inches of dry granular bentonite into the boring. This dry Bentonite will prevent water from entering the sand filter pack during hydration.

6. A slurry of hydrated bentonite should be placed above the dry granular bentonite to the next sample depth (for nested ports) or to the ground surface (for single ports).

7. Properly label the sample tubing with a permanent label to designate the sample number and screen depth.

8. Affix a Swagelok fitting and valve to the end of the tubing.

9. Add an inch or two of dry granular Bentonite over the bentonite slurry prior to installing the subsequent sand filter pack and screen.

10. Repeat steps 2-8 until all the sample depths are installed.

11. With all semi-permanent or permanent single or nested ports installed and labeled, a well cover may be installed.

    a. For permanent installations, the well cover should be rated for whatever type of traffic it may encounter in the future. For interior installations a brass clean-out cover available from a plumbing supply store may provide adequate protection. For exterior installations in high traffic areas a heavy duty groundwater well cover may be appropriate.

    b. For a semi-permanent installation, a well cover is generally not necessary as the tubing will be removed within several days.

12. All soil-gas points should be allowed to sit and equilibrate for a minimum of 24-hours before proceeding to soil-gas sample collection.

Soil-Gas Sample Collection

The following steps should be used to collect a soil-gas sample from each of the single or nested probes installed using the above procedure.

1. Record the following information on the sample log, if appropriate (contact the local airport or other suitable information source [e.g., site-specific measurements, weatherunderground.com] to obtain the information):

    a. wind speed and direction;

    b. ambient temperature;

    c. barometric pressure; and

    d. relative humidity.

2. Assemble the sample train by removing the cap from the SUMMA canister and connecting the Swagelok T-fitting to the can using a short length of 1/4-inch OD Teflon tubing. The flow controller with in-line particulate filter and vacuum gauge is then attached to the T-fitting. The Swagelok (or similar) two-way valve is connected to the free end of the T-fitting using a short length of ¼-inch OD Teflon tubing (precleaned stainless steel tubing could also be used)..

3. When collecting duplicate or other quality assurance/quality control (QA/QC) samples as required by applicable regulations and guidance, couple two SUMMA canisters using stainless steel Swagelok duplicate sample T-fitting supplied by the laboratory. Attach flow controller with in-line particulate filter and vacuum gauge to duplicate sample T-fitting provided by the laboratory.

4. Attach Teflon sample tubing to the flow controller using Swagelok fittings.

5. Remove the flush Swagelok cap from the sample port and install a Swagelok nut, ferrules, and sample tubing into the sub-slab port.

6. Connect the two-way valve and the portable purge pump using a length of Teflon sample tubing.

7. Record on the sample log and COC form the flow controller number with the appropriate SUMMA® canister number.

    a. Perform a leak-down-test by replacing the nut which secures sample tubing with the cap from the canister or closing the valve on the sample port. This will create a closed system. Open the canister

valve and quickly close it; the vacuum should increase approaching 30" Hg. If there are no leaks in the system this vacuum should be held. If vacuum holds proceed with sample collection; if not attempt to rectify the situation by tightening fittings.

8. The seal around the soil-gas sampling port and the numerous connections comprising the sampling train will be evaluated for leaks using helium as a tracer gas. The helium tracer gas will be administered according to the methods established in the appropriate guidance documents and SOP: Administering Tracer Gas.

9. Open the two-way valve and purge the soil-gas sampling port and tubing with the portable sampling pump. Purge approximately three volumes of air from the soil-gas sampling port and sampling line using a flow rate of 200 mL/min. Purge volume is calculated by the following equation "purge volume = 3 x Pi x inner radius of tubing^2 x length of tubing. Purge air should be vented away from personnel and sampling equipment, a length of tubing or Tedlar bag can be used for this purpose. Measure organic vapor levels and tracer gas within the Tedlar bag, as appropriate.

10. Close the two-way valve to isolate the purge pump.

11. Open the SUMMA® canister valve to initiate sample collection. Record on the sample log (attached) the time sampling began and the canister pressure.

If the initial vacuum pressure registers less than -25 inches of Hg, then the SUMMA® canister is not appropriate for use and another canister should be used.

12. Take a photograph of the SUMMA® canister and surrounding area unless prohibited by the property owner.

13. Check the SUMMA canister pressure approximately half way through the sample duration and note progress on sample logs.

14. Steps 2-10 should be repeated for each of the nested soil-gas ports; samples can be collected concurrently.

Termination of Sample Collection

1. Arrive at the SUMMA® canister location at least 1-2 hours prior to the end of the required sampling interval (e.g., 8, 24-hours)..

2. Record the final vacuum pressure. Stop collecting the sample by closing the SUMMA® canister valves. The canister should have a minimum amount of vacuum (approximately 6 inches of Hg or slightly greater).

3. Record the date and time of valve closing on the sample log and COC form.

4. Close the valve on the nested soil-gas sample tubing or replace Swagelok cap.

5. Once all the nested samples have been collected, be sure the well cover (if applicable) is properly re-installed and secured.

6. Remove the particulate filters and flow controllers from the SUMMA® canisters, re-install the brass plugs on the canister fittings, and tighten with the appropriate wrench.

7. Package the canisters and flow controllers in the shipping container supplied by the laboratory for return shipment to the laboratory. The SUMMA® canisters should not be preserved with ice or refrigeration during shipment.

8. Complete the appropriate forms and sample labels as directed by the laboratory (e.g., affix card with a string).

9. Complete the COC form and place the requisite copies in a shipping container. Close the shipping container and affix a custody seal to the container closure. Ship the container to the laboratory via overnight carrier (e.g., Federal Express) for analysis.

VII. Soil-Gas Monitoring Point Abandonment

If the single or nested soil-gas ports were installed in a semi-permanent manner, and the soil-gas samples have been collected, the soil-gas monitoring points will be abandoned by pulling up the sample tubing. Since the boring is filled with bentonite and sand, no additional abandonment steps are necessary. Ensure that the boring location and surrounding area are returned to as close to their original appearance as possible.

VIII. Waste Management

The waste materials generated by these activities should be minimal. Personal protective equipment, such as gloves and other disposable equipment (i.e., tubing) should be collected by field personnel for proper disposal. Any soils brought up from the borehole should be disposed of in a manner consistent with the project workplan.

IX. Data Recording and Management

Measurements will be recorded on the sample log at the time of measurement with notations of the project name, sample date, sample start and finish time, sample location (e.g., GPS coordinates, distance from permanent structure), canister serial number, flow controller serial number, initial vacuum reading, and final pressure reading. Field sampling logs and COC records will be transmitted to the Project Manager.

X. Quality Assurance

Duplicate samples should be collected in the field as a quality assurance step. Generally, duplicates are taken of 10% of samples, but project specific requirements should take precedence.

Soil-gas sample analysis will generally be performed using USEPA TO-15 methodology or a project specific constituent list. Method TO-15 uses a quadrupole or ion-trap GC/MS with a capillary column to provide optimum detection limits (typically 0.5-ppbv for most VOCs). A trip blank sample will accompany each shipment of soil-gas samples to the laboratory for analysis. Trip blanks assess potential sample contamination resulting from the transportation and storing of samples.

Duplicate soil gas samples should be collected via a split sample train, allowing the primary and duplicate sample to be collected from the soil-gas probe simultaneously.

XI. References

ASTM – “Standard Guide for Soil Gas Monitoring in the Vadose Zone”, D5314-92.

ITRC “Vapor Intrusion Pathway: A Practical Guide”, January 2007, Appendix F: “regulators Checklist for Reviewing Soil Gas Data”

New York State Department of Health (NYSDOH). 2005. DRAFT "Guidance for Evaluating Soil Vapor Intrusion in the State of New York" February 23, 2005.

Nicholson, P, D. Bertrand and T. McAlary. "Soil Gas Sampling in Low-Permeability Materials" Presented at AWMA Specialty Conference on Vapor Intrusion, Providence RI, Sept 200

Hayes, H. C., D. J. Benton and N. Khan "Impact of Sampling Media on Soil Gas Measurements" Presented with short paper at AWMA Vapor Intrusion Conference, January2006, Philadelphia, PA.

Sub-slab Soil Vapor Sample Collection Log

		Sample ID:	
Client:		**Boring Equipment:**	
Project:		**Sealant:**	
Location:		**Tubing Information:**	
Project #:		**Miscellaneous Equipment:**	
Samplers:		**Subcontractor:**	
`		**Equipment:**	
Sampling Depth:		**Moisture Content of Sampling Zone):**	
Time and Date of Installation:		**Approximate Purge Volume:**	

Instrument Readings:

Date	Time	Canister Vacuum (a) (inches of Hg)	Temperature (°F)	Relative Humidity (%)	Air Speed (mph)	Barometric Pressure (inches of Hg)	PID (ppb)

(a) Record canister information at a minimum at the beginning and end of sampling

SUMMA Canister Information:

Size (circle one):	**1 L 6 L**
Canister ID:	
Flow Controller ID:	
Notes:	

Tracer Test Information (if applicable):

Initial Helium Shroud:	
Final Helium Shroud:	
Tracer Test Passed:	**Yes No**
Notes:	

General Observations/Notes:

Approximating One-Well Volume (for purging):

When using 1¼-inch "Dummy Point" and a 6-inch sampling interval, the sampling space will have a volume of approximately 150 mL. Each foot of ¼-inch tubing will have a volume of approximately 10 mL.

ATTACHMENT C

Field Sampling Log Sheets

ARCADIS
Infrastructure, environment, facilities

Water Sampling Log

Project _____ Project No. _____

Site Location _____ Date _____

Well No. _____ Replicate No. _____ Weather _____

Sampling Personnel _____ Sampling Time: Begin _____ End _____

Purge Data

Measuring Point (describe) _____

Sounded Well Depth (ft bmp) _____

Depth to Water (ft bmp) _____

Depth to Packer (ft bmp) _____

Water Column in Well (ft) _____

Casing Diameter _____

Gallons in Well _____

Gallons Purged

Prior to Sampling _____

Pump Intake

Setting (ft bmp) _____

Packer Pressure (psi) _____

Pumping Rate (gpm) _____

Evacuation Method _____

Sampling Method _____

Purge Time Begin _____ End _____

Field Parameters

Color _____

Odor _____

Appearance _____

	I	1V	2V	3V
pH (s.u.)				
Conductivity (mS/cm) or (µmhos/cm) [1)]				
Temperature (°C)				
DO (mg/L)				
ORP (mV)				
Turbidity (NTU)				
Time				
DTW (ft bmp)				

Remarks: _____

Parameter	Container	No.	Preservative

PID Reading _____

Well Casing Volumes

Gal./Ft.				
	$1^{1/4}$" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	$1^{1/2}$" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

1) Circle one unit type

Soil Gas Sample Collection Log

ARCADIS Design & Consultancy for natural and built assets

Sample ID:

Client:		**Date/Day:**	/ /
Project:		**Weather:**	
Location:		**Temperature:**	
Project #:		**Wind Speed/Direction:**	(ft/min) (mph)
Samplers:		**Subcontractor:**	
Logged By:		**Equipment:**	
Background PID Ambient Air Reading:	ppb	**Moisture Content of Sampling Zone (circle one):**	Dry / Moist
Sampling Depth:			
Probe (circle one):	Permanent / Temporary	**Approximate Volume of Sampling Train::**	____ mL= (___' of ____" ID tubing)
Time of Collection:	Start: Finish:	**Approximate Purge Volume:**	_____ mL= [(____) * (3v)]

Nearby Groundwater Monitoring Wells/Water Levels:

Well ID	Depth to Groundwater (feet)

SUMMA Canister Information

Size (circle one): 1 L 3 L 6 L Other: ___L

Canister ID: _____

Flow Controller ID: _____

Tracer Gas Information (if applicable)

Tracer Gas: _____

Canister Pressure (inches Hg):		
Reported By Laboratory	**Measured Prior to Sample Collection**	**Measured Following Sample Collection**
-	Analog: - / Digital: -	Analog: - / Digital: -

Tracer Gas Concentration (if applicable):				
Measured from Soil Vapor Tubing		**Measured in 'Concentrated' Area**		
Post Purge	**Post Sample**	**Prior to Purging**	**Post Purging**	**Post Sampling**
ppm	ppm	%	%	%

General Observations/Notes:

Photo ID:	ppb reading on the PID following sample
Analog reading (-) after ( ) hrs.	Collected from soil vapor tubing.
Analog reading (-) after ( ) hrs.	
Differential Pressure:	

Approximating One-Well Volume (for purging temporary points):
Each foot of ¼-inch tubing will have a volume of approximately 10 mL.

Soil Gas Sample Collection Log

ARCADIS Design & Consultancy for natural and built assets

Sample ID: / DUP-

Client:		**Date/Day:**	/ /
Project:		**Weather:**	
Location:		**Temperature:**	
Project #:		**Wind Speed/Direction:**	(ft/min) (mph)
Samplers:		**Subcontractor:**	
Logged By:		**Equipment:**	
Background PID Ambient Air Reading:	ppb	**Moisture Content of Sampling Zone (circle one):**	Dry / Moist
Sampling Depth:			
Probe (circle one):	Permanent / Temporary	**Approximate Volume of Sampling Train::**	____ mL= (___' of ____" ID tubing)
Time of Collection:	Start: Finish:	**Approximate Purge Volume:**	_____ mL= [(____) * (3v)]

Nearby Groundwater Monitoring Wells/Water Levels:

Well ID	Depth to Groundwater (feet)

SUMMA Canister Information

Size (circle one): 1 L 3 L 6 L Other: ___L

Sample / DUP

Canister ID: _____ / _____

Flow Controller ID: _____ / _____

Tracer Gas Information (if applicable)

Tracer Gas: _____

Canister Pressure (inches Hg):

Reported By Laboratory		Measured Prior to Sample Collection		Measured Following Sample Collection	
(Sample)	(DUP)	(Sample)	(DUP)	(Sample)	(DUP)
		Analog: -	Analog: -	Analog: -	Analog: -
-	-	Digital: -	Digital: -	Digital: -	Digital: -

Tracer Gas Concentration (if applicable):

Measured from Soil Vapor Tubing		Measured in 'Concentrated' Area		
Post Purge	**Post Sample**	**Prior to Purging**	**Post Purging**	**Post Sampling**
ppm	ppm	%	%	%

General Observations/Notes:

Photo ID:	ppb reading on the PID following sample
Analog reading (-) after ( ) hrs.	Collected from soil vapor tubing.
Analog reading (-) after ( ) hrs.	
Differential Pressure:	

Approximating One-Well Volume (for purging temporary points):
Each foot of ¼-inch tubing will have a volume of approximately 10 mL.

ATTACHMENT D

Calibration Log

ARCADIS

INSTRUMENT CALIBRATION FORM

Project _____

Project No. _____

Site Location _____

Date _____

Time _____

Prepared by _____

☐ Ph Cond Tempmeter Model Oakton 300 Services Serial 121686	☐ Turbidity Meter Model 2020 Lamotte Serial 3597-3502	☐ D.O. Meter Model #55/25 FT Serial 00H0611	☐ ORP Meter Model 00702-70 Serial 55386
☐ Multiprobe Model YSI 600 XL Serial 02J0183A1	☐ Turbidity Meter Model 2020 Lamotte Serial	☐ D.O. Meter Model Serial	☐ ORP Meter Model Serial
☐ PID Model Photovac 2020 Serial ED HF 358	☐ PID Model Photovac 2020 Serial	☐ pH Cond Temp Model Oakton 300 Series Serial 197765	☐ Rental Model Serial

Check appropriate box for equipment calibrated. If two similar items are calibrated, please note two checks under calibration successful

Parameter PID (ppmv)	**Value**	**Calibration Successful**
Zero		
Span		

ph (si Units)	**Value**	**Calibration Successful**
4.00		
7.00		
10.00		

Conductivity (umhos)	**Value**	**Calibration Successful**
84 umhos		
1413 uhmos		
Other		

Turbidity (NTU)	**Value**	**Calibration Successful**
1.0 NTU		
10 NTU		
40 NTU		
Other		

Parameter D.O.	**Calibration Successful**
100% Saturated Air	
Barometer Adjustment	
Elevation Adjustment	

*** ORP (Mv)**	**Calibration Successful**
Hydroquinone (240) (Black)	
Zobel Solution (237) (yellow)	
Temperature Based Chart Calibration	
* Adjusted	

*** No adjustment on some meters just a probe check, others are adjustable**

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Appendix L

Remedial System Optimization Report

APPENDIX L

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REMEDIAL SYSTEM OPTIMIZATION FOR CROSMAN CORPORATION

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Appendix M

Responsibilities of Owner and Remedial Party

APPENDIX M

RESPONSIBILITIES of

OWNER and REMEDIAL PARTY

Responsibilities

The responsibilities for implementing the Site Management Plan ("SMP") for the Crosman Corporation site (the "site"), number 835012, are divided between the site owner(s) and a Remedial Party, as defined below. The owner is currently listed as:

Crosman Corporation

7629 Route 5 and 20

East Bloomfield, New York 14469 (the "owner").

Solely for the purposes of this document and based upon the facts related to a particular site and the remedial program being carried out, the term Remedial Party ("RP") refers to any of the following: certificate of completion holder, volunteer, applicant, responsible party, and, in the event the New York State Department of Environmental Conservation ("NYSDEC") is carrying out remediation or site management, the NYSDEC and/or an agent acting on its behalf. The RP is:

New Coleman Holdings, Inc.

35 East 62nd Street

New York, New York 10065

and

Crosman Corporation

7629 Route 5 and 20

East Bloomfield, New York 14469

Nothing on this page shall supersede the provisions of the Declaration of Covenants and Restrictions ("Deed Restriction"), Consent Order or other legally binding document that affects rights and obligations relating to the site.

Site Owner's Responsibilities:

1) The owner shall follow the provisions of the SMP as they relate to future construction and excavation at the site.
2) In accordance with a periodic time frame determined by the NYSDEC, the owner shall periodically certify to the RP, in writing, that all Institutional Controls set forth in the

Deed Restriction remain in place and continue to be complied with. The owner shall provide that written certification to the RP, upon the RP's request, in order to allow the RP to include the certification in the site's Periodic Review Report (PRR) certification to the NYSDEC.

3) In the event the site is delisted, the owner remains bound by the Deed Restriction and shall submit, upon request by the NYSDEC, a written certification that the Deed Restriction is still in place and has been complied with.
4) The owner shall grant access to the site to the RP and the NYSDEC and its agents for the purposes of performing activities required under the SMP and assuring compliance with the SMP.
5) The owner is responsible for assuring the security of the remedial components located on its property to the best of its ability. In the event that damage to the remedial components or vandalism is evident, the owner shall notify the site's RP and the NYSDEC in accordance with the timeframes indicated in Section 1.3-Notifications.
6) In the event some action or inaction by the owner adversely impacts the site, the owner must notify the site's RP and the NYSDEC in accordance with the time frame indicated in Section 1.3- Notifications and (ii) coordinate the performance of necessary corrective actions with the RP.
7) The owner must notify the RP and the NYSDEC of any change in ownership of the site property (identifying the tax map numbers in any correspondence) and provide contact information for the new owner of the site property. 6 NYCRR Part contains notification requirements applicable to any construction or activity changes and changes in ownership. Among the notification requirements is the following applicable to a change of use: (A) Sixty days prior written notification must be made to the NYSDEC; (B) Notification is to be submitted to the NYSDEC Division of Environmental Remediation's Site Control Section; (C) Notification requirements for a change in use are detailed in Section 2.4 of the SMP; and (D) A 60-Day Advance Notification Form and Instructions are found at http://www.dec.ny.gov/chemical/76250.html.
8) Although there is no written commitment to do so, Crosman has expressed a present intention to continue operating production well PW-1 as part of the manufacturing activities at its facility, a willingness to ascertain the average rate of usage (in gallons

per day) of water from production well PW-1 each month and then provide that information to the RP's environmental consultant along with copies of the SPDES monitoring reports for the discharge from the non-contact cooling water pond. In addition, Crosman has expressed a present intention to within reason pay for the electricity used to operate the SSDS. The RP remains ultimately responsible for maintaining the engineering controls.

9) Until such time as the NYSDEC deems the vapor mitigation system unnecessary, the owner has expressed a present intention to observe the operation of the SSDS, pay within reason for the utilities for the system's operation, and report any maintenance issues to the RP's environmental consultant and the NYSDEC.
10) In accordance with the tenant notification law, within 15 days of receipt, the owner must supply a copy of any vapor intrusion data, that is produced with respect to structures and that exceeds NYSDOH or OSHA guidelines on the site, whether produced by the NYSDEC, RP, or owner, to the tenants on the property. The owner must otherwise comply with the tenant and occupant notification provisions of Environmental Conservation Law Article 27, Title 24.

Remedial Party Responsibilities

1) The RP must ensure that the SMP's provisions regarding any construction and/or excavation undertaken at the site which disturbs remaining contamination.
2) The RP shall report to the NYSDEC all activities required for remediation, operation, maintenance, monitoring, and reporting. Such reporting includes, but is not limited to, periodic review reports and certifications, electronic data deliverables, corrective action work plans and reports, and updated SMPs.
3) Before accessing the site property to undertake a specific activity, the RP shall provide the owner advance notification that shall include an explanation of the work expected to be completed. The RP shall provide to (i) the owner, upon the owner's request, (ii) the NYSDEC, and (iii) other entities, if required by the SMP, a copy of any data generated during the site visit and/or any final report produced.
4) If the NYSDEC determines that an update of the SMP is necessary, the RP shall update the SMP and obtain final approval from the NYSDEC. Within 5 business days after NYSDEC approval, the RP shall submit a copy of the approved SMP to the owner(s).

5) The RP shall notify the NYSDEC and the owner of any changes in RP ownership and/or control and of any changes in the party/entity responsible for the operation, maintenance, and monitoring of and reporting with respect to any remedial system (Engineering Controls). The RP shall provide contact information for the new party/entity. Such activity constitutes a Change of Use pursuant to 375-1.11(d) and requires 60-days prior notice to the NYSDEC. A 60-Day Advance Notification Form and Instructions are found at http://www.dec.ny.gov/chemical/76250.html .
6) The RP shall notify the NYSDEC of any damage to or modification of the systems as required under Section 1.3- Notifications of the SMP.
7) The RP is responsible for the proper maintenance of any installed vapor intrusion mitigation systems associated with the site, as required in Section 5.3 or Appendix F (Operation , Monitoring and Maintenance Manual) of the SMP.
8) Prior to a change in use that impacts the remedial system or requirements and/or responsibilities for implementing the SMP, the RP shall submit to the NYSDEC for approval an amended SMP.
9) Any change in use, change in ownership, change in site classification (*e.g.*, delisting), reduction or expansion of remediation, and other significant changes related to the site may result in a change in responsibilities and, therefore, necessitate an update to the SMP and/or updated legal documents. The RP shall contact the Department to discuss the need to update such documents.

Change in RP ownership and/or control and/or site ownership does not affect the RP's obligations with respect to the site unless a legally binding document executed by the NYSDEC releases the RP of its obligations.

Future site owners and RPs and their successors and assigns are required to carry out the activities set forth above.