# APPENDIX B
# EQUIPMENT MANUALS

SPPD PROPERTY LANDFILL GAS COLLECTION AND CONTROL SYSTEM
OPERATION, MAINTENANCE, AND MONITORING PLAN
South Park Landfill Site
Seattle, Washington

Farallon PN: 408-002

# The New York Blower Company

Fan-to-Size
Fan Selection Data

| | |
|---|---|
| Project: | |
| Location: | |
| Contact: | |

## Fan Design

| | | | |
|---|---|---|---|
| Product: | Pressure Blower | Arrangement: | 1 |
| Size/Model: | 2606A | Drive type: | Belt |
| Wheel Type: | Aluminum | | |
| Wheel Material: | Aluminum | | |
| Wheel Width: | 100.0 % | Wheel Diameter: | 100.0 % |

## Operating Conditions

| | | | |
|---|---|---|---|
| Volume Flow Rate: | 600 CFM | Fan Speed: | 3500 rpm |
| Fan Static Pressure: | 44.4 in wg | Fan Input Power: | 8.41 bhp |
| Outlet Velocity: | 3061 ft/min | VP/SP ratio: | 0.0112 |
| Altitude (above mean sea level): | 0 ft | Operating Temperature: | 70 Deg F |
| Operating Inlet Airstream Density: | 0.0640 lb/ft3 | | |
| Static Efficiency: | 49.82% | Mechanical Efficiency: | 50.38% |
| Maximum Operating Temperature: | 70 Deg F | Maximum Safe Operating Speed: | 3800 rpm |

## Sound Power Level Ratings Levels expressed in dB (power levels reference 10^(-12) watts)

| **Center Frequency (Hz):** | **63** | **125** | **250** | **500** | **1000** | **2000** | **4000** | **8000** | |
|---|---|---|---|---|---|---|---|---|---|
| **Octave Bands:** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **Overall** |
| Total Fan Power Levels*: | 87. | 94. | 101. | 104. | 102. | 96. | 92. | 82. | 107.9 |
| Inlet Power Levels**: | 84. | 91. | 98. | 101. | 99. | 93. | 89. | 79. | 104.9 |
| Outlet Power Levels**: | 84. | 91. | 98. | 101. | 99. | 93. | 89. | 79. | 104.9 |

*As corrected for point of operation (location on fan curve)
**Unsilenced Inlet and Outlet power ratings are 3 dB lower than total fan power levels under the assumption that "half" of the sound power can be attributed to each opening. Silenced power ratings include this 3 dB reduction as well as the silencer attenuation.

**Estimated Sound Pressure Levels** Expressed in dB (pressure levels reference $2x10^{-7}$ microbar)

Directivity/Reflection Factor (Q) is 1, spherical radiation; Distance is 5 ft.; A-weighting is in use.

The estimated sound pressure level outside the fan due to an open inlet OR outlet is 88.3 dBA at 5.0 feet. The estimated sound pressure level outside the fan when BOTH inlet and outlet are ducted is 76.3 dBA at 5.0 feet (Housing Radiated Noise).

Your Representative:
Baxter Air Engineering
12625 NE Woodinville Dr
Woodinville, WA 98072-8206
USA
Phone: 425-486-6666
Fax: 425-486-8260
E-Mail: da

The New York Blower Company certifies that the Pressure Blower fan is licensed to bear the AMCA Air Performance Seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 211 and comply with the requirements of the AMCA Certified Ratings program.

AMCA Licensed for Air Performance without Appurtenances (Accessories). Power (bhp) excludes drives.

Performance certified is for installation type: B - free inlet, ducted outlet.

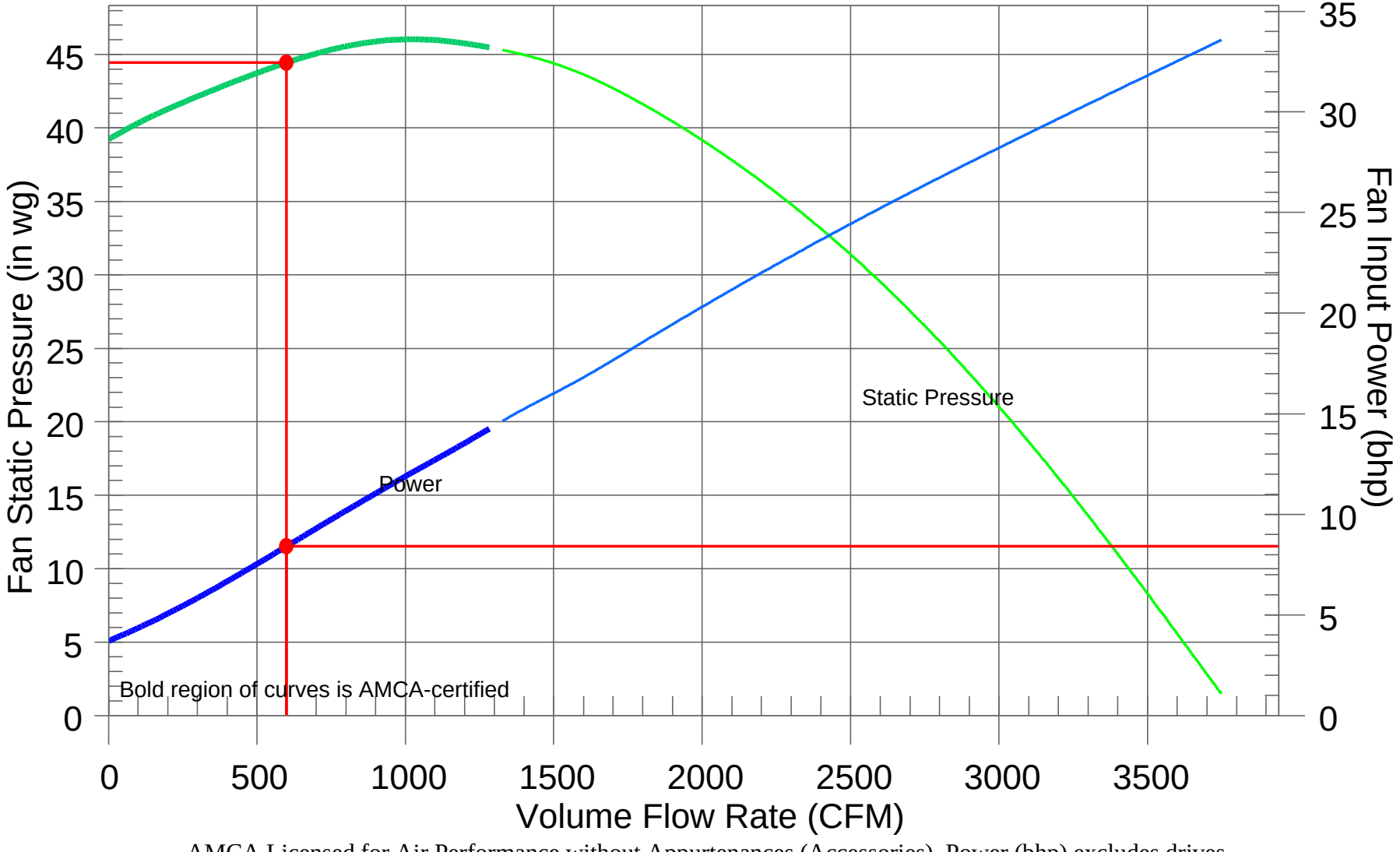
# The New York Blower Company

Fan-to-Size

Pressure Blower
2606 Aluminum
Arr.: 1

Volume Flow Rate: 600 CFM
Fan Static Press.: 44.4 in wg
Speed: 3500 rpm
Power: 8.41 bhp

Temp.: 70 Deg F
Altitude: 0 ft
Density: 0.0640 lb/ft3
Outlet Velocity: 3061 ft/min

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Phone: 425-486-6666

[v1.83.300-R -- ] Date Printed: 7/1/2014

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Fan-to-Size
Fan Selection Data

| | |
|---|---|
| Project: | |
| Location: | |
| Contact: | |

### Fan Design

| | | | |
|---|---|---|---|
| Product: | Pressure Blower | Arrangement: | 1 |
| Size/Model: | 2606A | Drive type: | Belt |
| Wheel Type: | Aluminum | | |
| Wheel Material: | Aluminum | | |
| Wheel Width: | 100.0 % | Wheel Diameter: | 100.0 % |

### Operating Conditions

| | | | |
|---|---|---|---|
| Volume Flow Rate: | 600 CFM | Fan Speed: | 3150 rpm |
| Fan Static Pressure: | 36.3 in wg | Fan Input Power: | 6.56 bhp |
| Outlet Velocity: | 3061 ft/min | VP/SP ratio: | 0.0137 |
| Altitude (above mean sea level): | 0 ft | Operating Temperature: | 70 Deg F |
| Operating Inlet Airstream Density: | 0.0640 lb/ft3 | | |
| Static Efficiency: | 52.21% | Mechanical Efficiency: | 52.93% |
| Maximum Operating Temperature: | 70 Deg F | Maximum Safe Operating Speed: | 3800 rpm |

### Sound Power Level Ratings Levels expressed in dB (power levels reference 10^(-12) watts)

| **Center Frequency (Hz):** | **63** | **125** | **250** | **500** | **1000** | **2000** | **4000** | **8000** | |
|---|---|---|---|---|---|---|---|---|---|
| **Octave Bands:** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **Overall** |
| Total Fan Power Levels*: | 86.4 | 91.7 | 98.1 | 101.7 | 99.3 | 93.5 | 89.7 | 80.6 | 105.5 |
| Inlet Power Levels**: | 83.4 | 88.7 | 95.1 | 98.7 | 96.3 | 90.5 | 86.7 | 77.6 | 102.5 |
| Outlet Power Levels**: | 83.4 | 88.7 | 95.1 | 98.7 | 96.3 | 90.5 | 86.7 | 77.6 | 102.5 |

*As corrected for point of operation (location on fan curve)
**Unsilenced Inlet and Outlet power ratings are 3 dB lower than total fan power levels under the assumption that "half" of the sound power can be attributed to each opening. Silenced power ratings include this 3 dB reduction as well as the silencer attenuation.

**Estimated Sound Pressure Levels** Expressed in dB (pressure levels reference $2x10^{-7}$ microbar)

Directivity/Reflection Factor (Q) is 1, spherical radiation; Distance is 5 ft.; A-weighting is in use.

The estimated sound pressure level outside the fan due to an open inlet OR outlet is 85.8 dBA at 5.0 feet. The estimated sound pressure level outside the fan when BOTH inlet and outlet are ducted is 73.8 dBA at 5.0 feet (Housing Radiated Noise).

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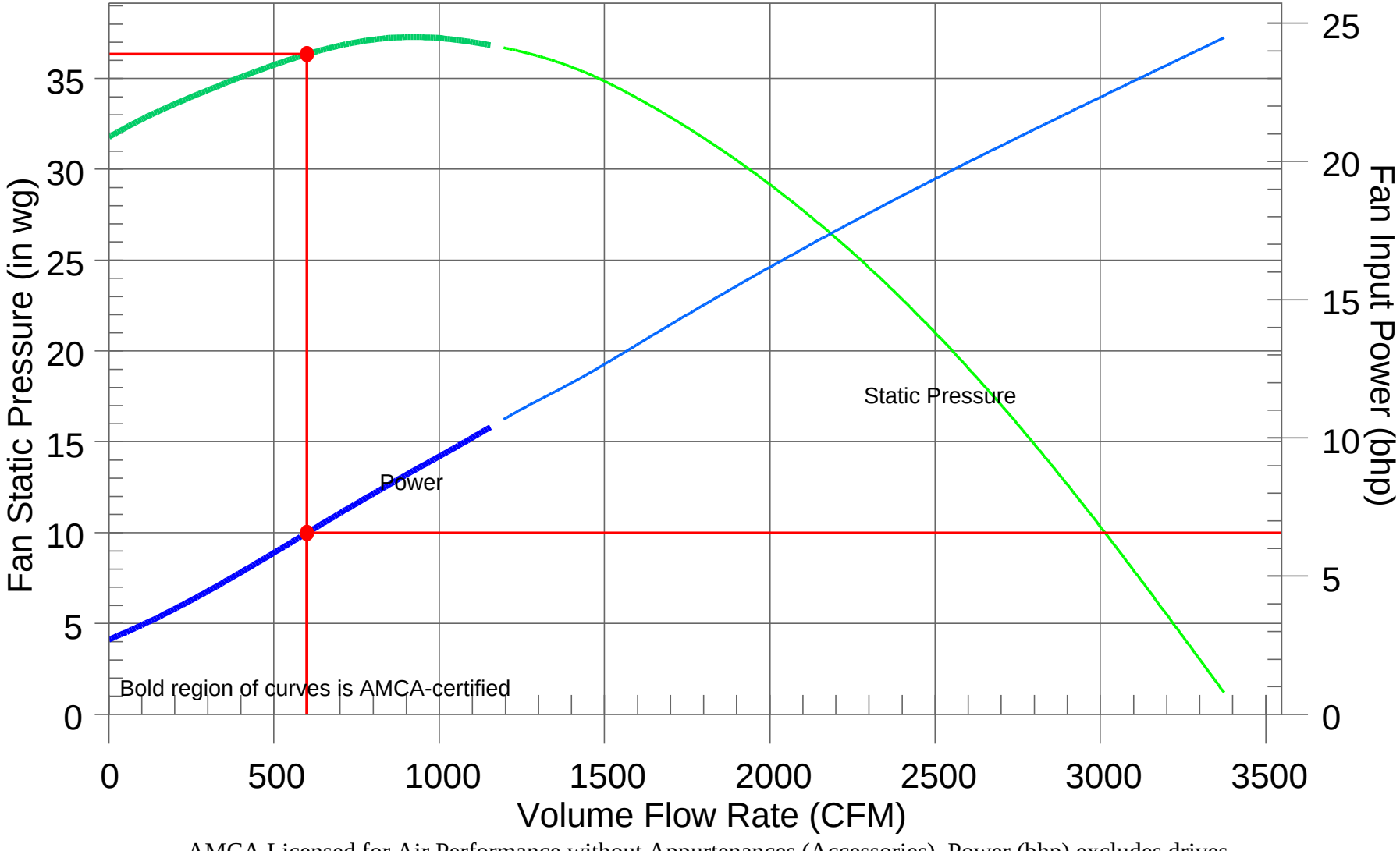
Fan-to-Size

Pressure Blower
2606 Aluminum
Arr.: 1

Volume Flow Rate: 600 CFM
Fan Static Press.: 36.3 in wg
Speed: 3150 rpm
Power: 6.56 bhp

Temp.: 70 Deg F
Altitude: 0 ft
Density: 0.0640 lb/ft3
Outlet Velocity: 3061 ft/min

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Fan-to-Size
Fan Selection Data

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| Size/Model: | 2606A | Drive type: | Belt |
| Wheel Type: | Aluminum | | |
| Wheel Material: | Aluminum | | |
| Wheel Width: | 100.0 % | Wheel Diameter: | 100.0 % |

## Operating Conditions

| | | | |
|---|---|---|---|
| Volume Flow Rate: | 600 CFM | Fan Speed: | 3500 rpm |
| Fan Static Pressure: | 44.4 in wg | Fan Input Power: | 8.41 bhp |
| Outlet Velocity: | 3061 ft/min | VP/SP ratio: | 0.0112 |
| Altitude (above mean sea level): | 0 ft | Operating Temperature: | 70 Deg F |
| Operating Inlet Airstream Density: | 0.0640 lb/ft3 | | |
| Static Efficiency: | 49.82% | Mechanical Efficiency: | 50.38% |
| Maximum Operating Temperature: | 70 Deg F | Maximum Safe Operating Speed: | 3800 rpm |

## Sound Power Level Ratings Levels expressed in dB (power levels reference 10^(-12) watts)

| **Center Frequency (Hz):** | **63** | **125** | **250** | **500** | **1000** | **2000** | **4000** | **8000** | |
|---|---|---|---|---|---|---|---|---|---|
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# The New York Blower Company

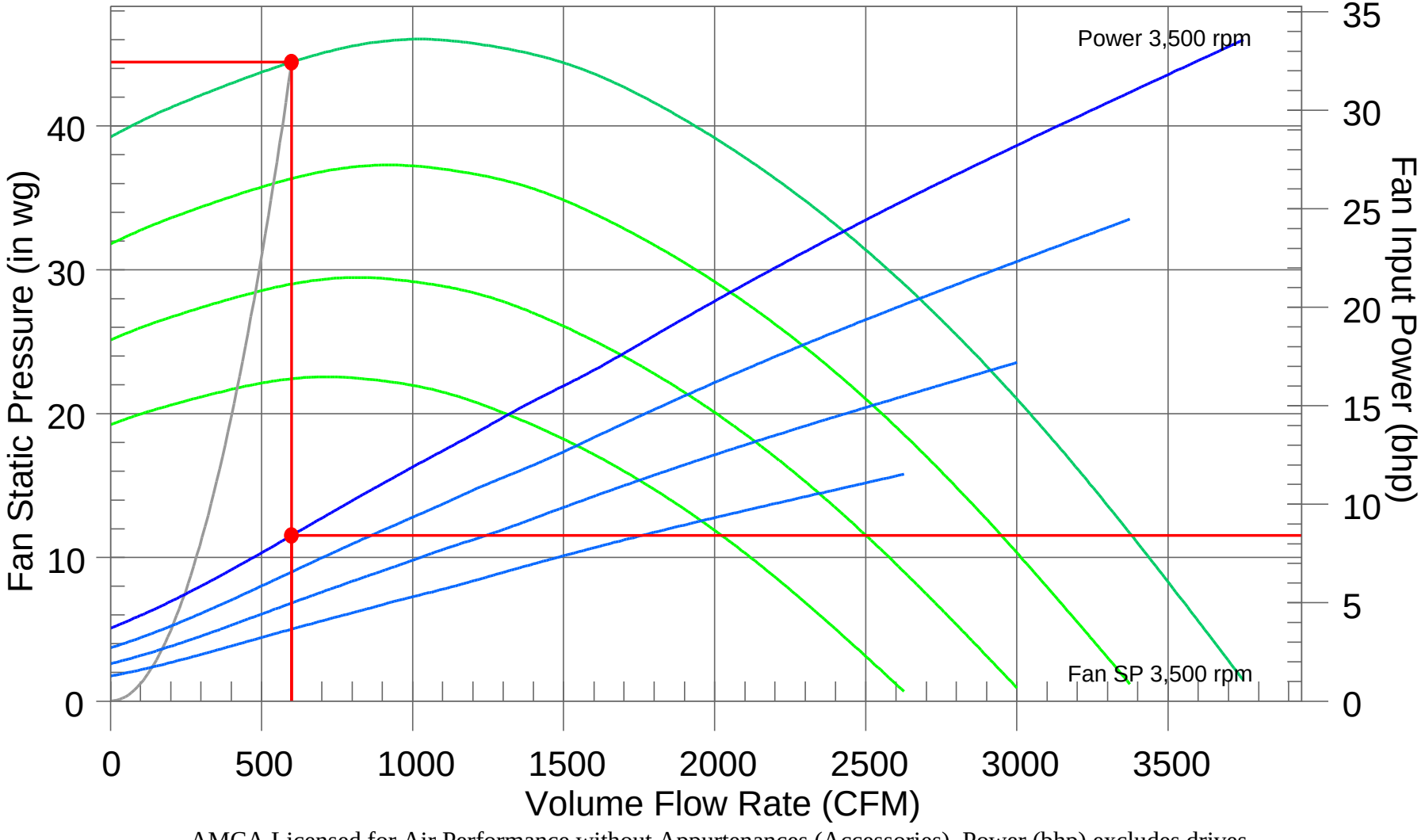
Fan-to-Size

Pressure Blower
2606 Aluminum
Arr.: 1

Volume Flow Rate: 600 CFM
Fan Static Press.: 44.4 in wg
Speed: 3500 rpm
Power: 8.41 bhp

Temp.: 70 Deg F
Altitude: 0 ft
Density: 0.0640 lb/ft3
Outlet Velocity: 3061 ft/min

Fan Speeds shown in addition to the base curve (3500 RPM): 3150 RPM; 2800 RPM; 2450 RPM

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BALDOR
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# Product Information Packet

# EM3771T

## 10HP,3490RPM,3PH,60HZ,215T,0729M,TEFC,F1

## Part Detail

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Revision:** | C | **Status:** | PRD/A | **Change #:** | | **Proprietary:** | No |
| **Type:** | AC | **Prod. Type:** | 0729M | **Elec. Spec:** | 07WGY855 | **CD Diagram:** | CD0005 |
| **Enclosure:** | TEFC | **Mfg Plant:** | | **Mech. Spec:** | 07H002 | **Layout:** | 07LYH002 |
| **Frame:** | 215T | **Mounting:** | F1 | **Poles:** | 02 | **Created Date:** | 12-17-2011 |
| **Base:** | RG | **Rotation:** | R | **Insulation:** | F | **Eff. Date:** | 08-15-2013 |
| **Leads:** | 9#14 | | | | | **Replaced By:** | |
| **Literature:** | | **Elec. Diagram:** | | | | | |

## Nameplate NP1259L

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **CAT.NO.** | EM3771T | | | | | | |
| **SPEC.** | 07H002Y855G1 | | | | | | |
| **HP** | 10 | | | | | | |
| **VOLTS** | 230/460 | | | | | | |
| **AMP** | 23.6/11.8 | | | | | | |
| **RPM** | 3490 | | | | | | |
| **FRAME** | 215T | **HZ** | 60 | **PH** | 3 | | |
| **SER.F.** | 1.15 | **CODE** | G | **DES** | B | **CL** | F |
| **NEMA-NOM-EFF** | 90.2 | **PF** | 87 | | | | |
| **RATING** | 40C AMB-CONT | | | | | | |
| **CC** | 010A | **USABLE AT 208V** | | | | | |
| **DE** | 6307 | **ODE** | 6206 | | | | |
| **ENCL** | TEFC | **SN** | | | | | |
| | | | | | | | |

## Parts List

| Part Number | Description | Quantity |
|---|---|---|
| SA235959 | SA 07H002Y855G1 | 1.000 EA |
| RA222912 | RA 07H002Y855G1 | 1.000 EA |
| 36FN3000C02 | EXFN, PLASTIC, 5.25 OD, 1.175 ID | 1.000 EA |
| S/P107-000-001 | SUPER E PROC'S-FS & WS PLTS-POLYREX EM G | 1.000 EA |
| HW3201A05 | 3/8-16 EYEBOLT | 1.000 EA |
| 09CB3002SP | CB W/1.38 LEAD HOLE FOR 37, 39, 307 & 30 | 1.000 EA |
| 09GS1000SP | GASKET-CONDUIT BOX, 1/16 THICK LEXIDE | 1.000 EA |
| 51XW2520A12 | .25-20 X .75, TAPTITE II, HEX WSHR SLTD | 2.000 EA |
| WD1000B17 | T&B CX35TN TERMINAL | 1.000 EA |
| 11XW1032G06 | 10-32 X .38, TAPTITE II, HEX WSHR SLTD U | 1.000 EA |
| 37EP1100A41 | FR ENDPLATE MACH FOR GREASER & RELIEF | 1.000 EA |
| HW4500A17 | 317400 ALEMITE GREASE RELIEF | 1.000 EA |
| HW4500A01 | 1641B(ALEMITE)400 UNIV, GREASE FITT | 1.000 EA |
| HW5100A06 | W2420-025 WVY WSHR (WB) | 1.000 EA |
| 37EP1101A22 | PU ENDPLATE, MACH | 1.000 EA |
| HW4500A17 | 317400 ALEMITE GREASE RELIEF | 1.000 EA |
| HW4500A01 | 1641B(ALEMITE)400 UNIV, GREASE FITT | 1.000 EA |
| XY3118A12 | 5/16-18 HEX NUT DIRECTIONAL SERRATION | 4.000 EA |
| 07FH4007SP | IEC FH W/GRSR, NOTCH @ 6:00 & 3 FAN CVR | 1.000 EA |
| 51XW1032A06 | 10-32 X .38, TAPTITE II, HEX WSHR SLTD S | 3.000 EA |
| 09CB3501SP | CONDUIT BOX LID FOR 09CB3001 & 09CB3002 | 1.000 EA |
| 09GS1013SP | 09 GS FOR 09CB3501 LID - LEXIDE | 1.000 EA |
| 51XW2520A12 | .25-20 X .75, TAPTITE II, HEX WSHR SLTD | 2.000 EA |
| HW2501F21 | KEY, 5/16 SQ X 2.375 | 1.000 EA |

## Parts List (continued)

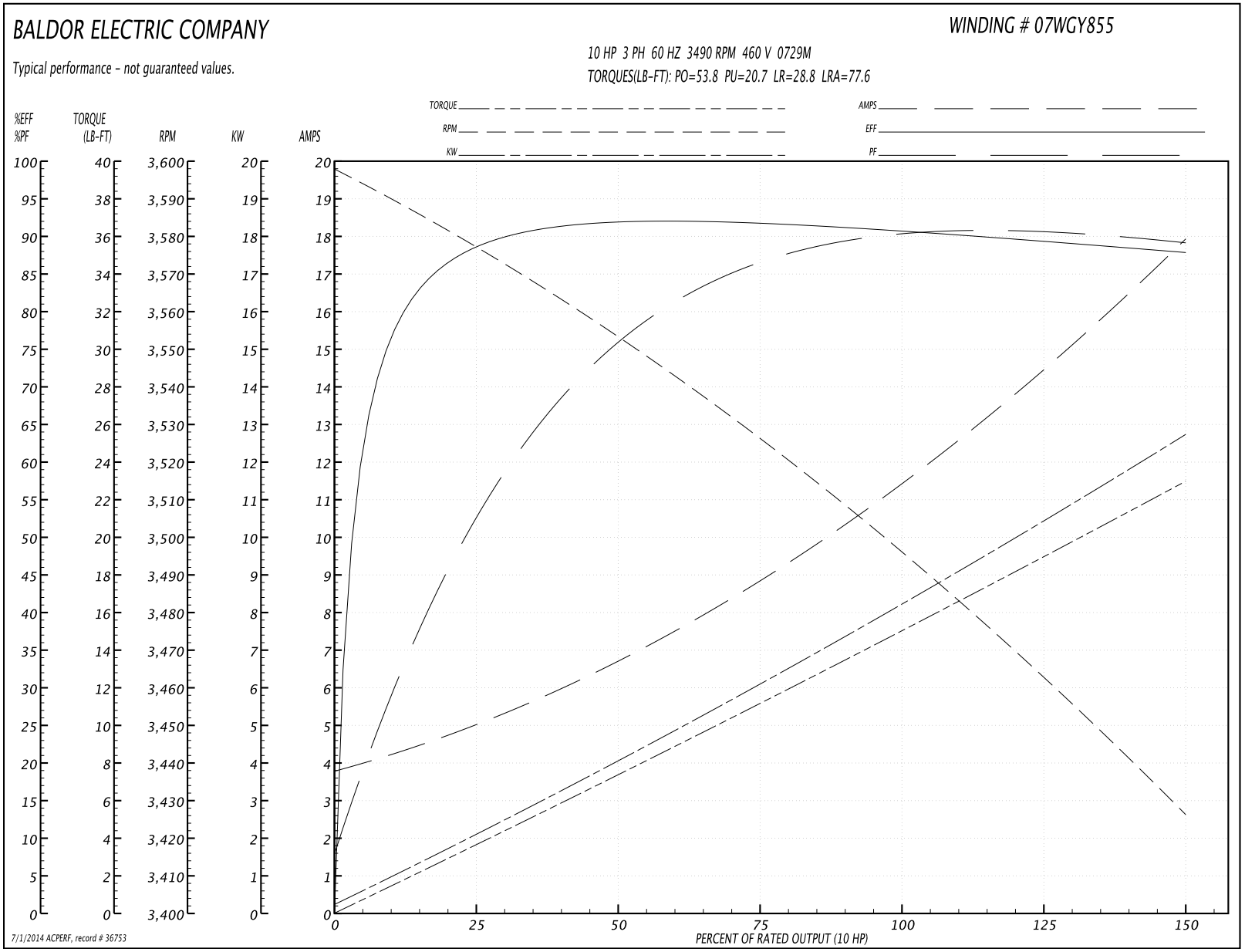
| Part Number | Description | Quantity |
|---|---|---|
| HA7000A02 | KEY RETAINER RING, 1 1/8 DIA, 1 3/8 DIA | 1.000 EA |
| LB1115N | LABEL,LIFTING DEVICE (ON ROLLS) | 1.000 EA |
| 85XU0407S04 | 4X1/4 U DRIVE PIN STAINLESS | 2.000 EA |
| MJ1000A75 | GREASE, POLYREX EM EXXON (USe 4824-15A) | 0.050 LB |
| HA3104A32 | THRUBOLT- 5/16-18 X12.750 | 4.000 EA |
| 51XB1214A20 | 12-14X1.25 HXWSSLD SERTYB | 1.000 EA |
| MG1000Y03 | MUNSELL 2.53Y 6.70/ 4.60, GLOSS 20, | 0.036 GA |
| LB1125C02 | SUPER-E (STOCK CTN LABEL SUPER-E WITH FL | 1.000 EA |
| LC0005E01 | CONN.DIA./WARNING LABEL (LC0005/LB1119) | 1.000 EA |
| NP1259L | ALUM SUPER-E UL CSA-EEV CC NEMA PREMIUM | 1.000 EA |
| 07PA1011 | PKG GRP, 07 CAST IRON PK1181 | 1.000 EA |
| LB1506 | LABEL "AMERICAN MADE" 1.50 X 1.00 | 1.000 EA |
| MN416A01 | TAG-INSTAL-MAINT no wire. (100/bx) 8/12 | 1.000 EA |

## Accessories

| Part Number | Description | Multiplier |
|---|---|---|
| 37-1304 | C FACE KIT | A8 |

| Performance Data at 460V, 60Hz, 10.0HP (Typical performance - Not guaranteed values) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **General Characteristics** | | | | | | | |
| **Full Load Torque:** | 15.1 LB-FT | | | **Start Configuration:** | | DOL | |
| **No-Load Current:** | 4.0 Amps | | | **Break-Down Torque:** | | 53.8 LB-FT | |
| **Line-line Res. @ 25°C.:** | 1.0281 Ohms A Ph / 0.0 Ohms B Ph | | | **Pull-Up Torque:** | | 20.7 LB-FT | |
| **Temp. Rise @ Rated Load:** | 61 C | | | **Locked-Rotor Torque:** | | 28.8 LB-FT | |
| **Temp. Rise @ S.F. Load:** | 77 C | | | **Starting Current:** | | 77.6 Amps | |
| **Load Characteristics** | | | | | | | |
| **% of Rated Load** | **25** | **50** | **75** | **100** | **125** | **150** | **S.F.** |
| **Power Factor:** | 57.0 | 77.0 | 86.0 | 89.0 | 90.0 | 90.0 | 90.0 |
| **Efficiency:** | 88.1 | 91.5 | 91.7 | 90.8 | 89.4 | 87.7 | 90.0 |
| **Speed:** | 3576.4 | 3552.0 | 3526.4 | 3496.4 | 3463.3 | 3425.3 | 3477.0 |
| **Line Amperes:** | 4.73 | 6.58 | 8.97 | 11.6 | 14.6 | 17.8 | 13.4 |

Performance Graph at 460V, 60Hz, 10.0HP Typical performance - Not guaranteed values



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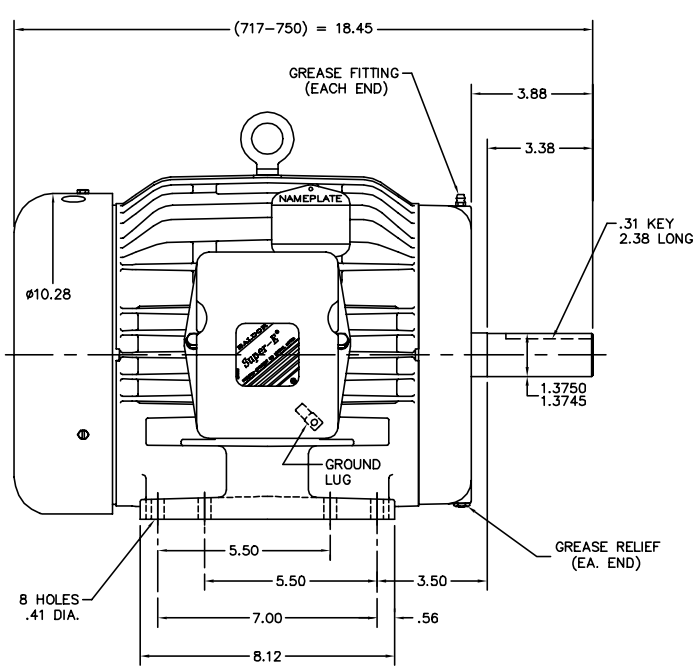
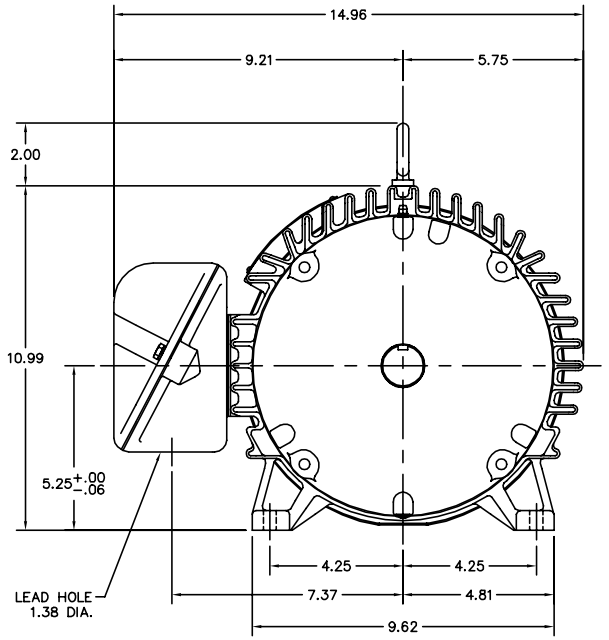



CUSTOMER IS RESPONSIBLE FOR DETERMINING THAT MOTOR PERFORMANCE IS SUITABLE IN THE APPLICATION.

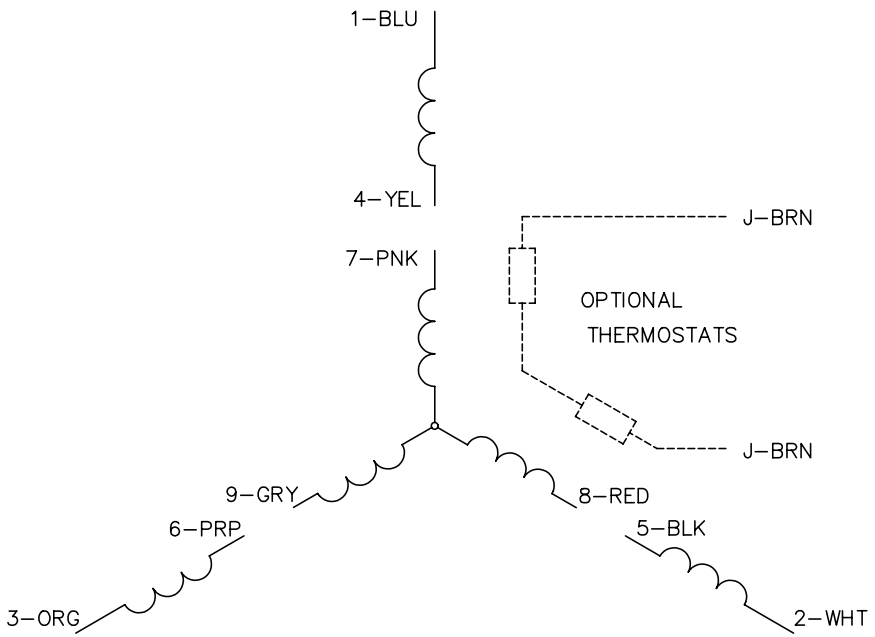
| | | | |
|---|---|---|---|
| REV. DESC: OMITTED LB1098 | | | |
| REV. LTR: N | BY: SSS | REVISED: 09:30:19 04/16/2001 | TDR: 237216 |
| FILE: AAA00016291 | | | REF: 07LYH002 |
| MTL: – | | | |

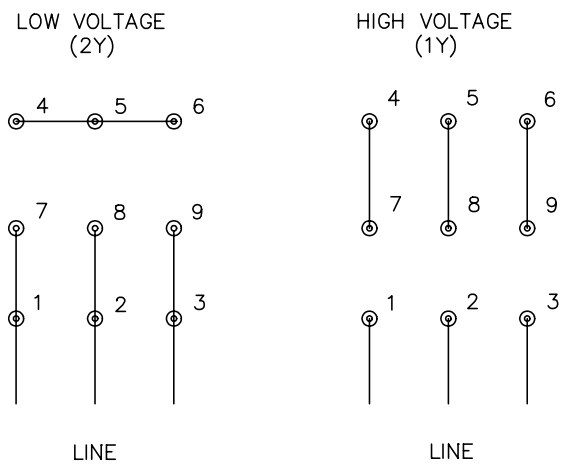
BALDOR ELECTRIC Co.

HORZ TEFC 307M 213–5T (SUPER–E)

07LYH002

CD0005




NOTES:

1. INTERCHANGE ANY TWO LINE LEADS TO REVERSE ROTATION.
2. OPTIONAL THERMOSTATS ARE PROVIDED WHEN SPECIFIED.
3. ACTUAL NUMBER OF INTERNAL PARALLEL CIRCUITS MAY BE A MULTIPLE OF THOSE SHOWN ABOVE.
4. LEAD COLORS ARE OPTIONAL. LEADS MUST ALWAYS BE NUMBERED AS SHOWN.

CD0005

| | | | |
|---|---|---|---|
| REV. DESC: REVISE TO SHOW OPTIONAL COLORS | | | BALDOR ELECTRIC Co. |
| REV. LTR: E | BY: JLP | REVISED: 01/19/99 10:15 | TDR: 0171435 |
| CD0005 | | FILE: AAA00005140 | MDL: – |
| | | MTL: – | 3PH, DV, 9 LEADS |

## AC & DC Motor Installation & Maintenance Instructions

### Handling

The weight of the motor and shipping container will vary. Use correct material handling equipment to avoid injury.

### Receiving

Inspect the motor for damage before accepting it. The Motor shaft should rotate freely with no rubs. Report any damage immediately to the commercial carrier that delivered your motor.

### Safety Notice

Only qualified personnel trained in the safe installation and operation of this equipment should install this motor. When improperly installed or used, rotating equipment can cause serious or fatal injury. Equipment must be installed in accordance with the National Electrical Code (NEC), local codes and NEMA MG2 Safety Standards for Construction and Guide for Selection, Installation and Use of Electric Motors and Generators. Observe the following guidelines:

1. When eyebolts are provided, they must be fully tightened and are intended to lift the motor and its included accessories only.
2. Ground the motor according to NEC and local codes.
3. Provide a permanent guard to prevent accidental contact of body parts or clothing with rotating or moving parts or burns if motor is hot.
4. Shaft key must be secured before starting motor.
5. Do not apply power to the motor until the motor is securely mounted by its mounting holes.
6. This motor must only be connected to the proper line voltage, line frequency and load size.
7. If a motor mounted brake is installed, provide proper safeguards for personnel in case of brake failure.
8. Disconnect all power services and stop the motor before servicing.
9. For single phase motors, discharge the start and/or run capacitors before servicing.
10. Do not by-pass or render inoperative any safety device.
11. When using AC motors with frequency inverters, be certain that the Maximum Speed rating (on nameplate) is not exceeded.
12. Mounting bolts should be high tensile steel. Be sure to use a suitable locking device on each bolt (spring washer or thread lock compound).

### Motor Enclosure

ODP, Open drip proof motors are intended for use in clean, dry locations with adequate supply of cooling air. These motors should not be used in the presence of flammable or combustible materials. Open motors can emit flame and/or molten metal in the event of insulation failure.

TEFC, totally enclosed motors are intended for use where moisture, dirt and/or corrosive materials are present in indoor and outdoor locations. Explosion proof motors, as indicated by the Underwriters Laboratories, Inc. label are intended for use in hazardous areas as specified by the NEC.

### Mounting

Foot mounted machines should be mounted to a rigid foundation to prevent excessive vibration. Shims may be used if location is uneven.

Flange mounted machines should be properly seated and aligned. Note: If improper rotation direction is detrimental to the load, check rotation direction prior to coupling the load to the motor shaft.

For V-belt drive, mount the sheave pulley close to the motor housing. Allow clearance for end to end movement of the motor shaft. Do not overtighten belts as this may cause premature bearing failure or shaft breakage.

Direct coupled machines should be carefully aligned and the shaft should rotate freely without binding.

### Wiring

Connect the motor as shown in the connection diagram. The wiring, fusing and grounding must comply with the National Electrical Code and local codes. When the motor is connected to the load for proper direction of rotation and started, it should start quickly and run smoothly. If not, stop the motor immediately and determine the cause.

Possible causes are: low voltage at the motor, motor connections are not correct or the load is too heavy. Check the motor current after a few minutes of operation and compare the measured current with the nameplate rating.

**Lubrication**

This is a ball bearing motor. The bearings have been lubricated at the factory. Motors that do not have regrease capability are factory lubricated for the normal life of the bearings.

**Relubrication Intervals** (For motors with rearease capability)

New motors that have been stored for a year or more should be relubricated. Lubrication is also recommended at these intervals:

**Relubrication Intervals**

| NEMA (IEC) Frame Size | Rated Speed (RPM) | | | |
|---|---|---|---|---|
| | 3600 | 1800 | 1200 | 900 |
| Up to 210 incl. (132) | 5500Hrs. | 12000Hrs. | 18000Hrs. | 22000Hrs. |
| Over 210 to 280 incl. (180) | 3600Hrs. | 9500Hrs. | 15000Hrs. | 18000Hrs. |
| Over 280 to 360 incl. (225) | *2200Hrs. | 7400Hrs. | 12000Hrs. | 15000Hrs. |
| Over 360 to 5000 incl.(300) | *2200Hrs. | 3500Hrs. | 7400Hrs. | 10500Hrs. |

* Lubrication interval for 6313 or 6314 bearings that are used in 360 through 5000 frame, 2 pole motors. If roller bearings are used, bearings must be lubricated more frequently, divide the interval by 2.

**Lubricant**

Baldor motors are pregreased, normally with Polyrex EM (Exxon Mobil). If other greases are preferred, check with a local Baldor Service Center for recommendations.

**Procedure**

Clean the grease fitting (or area around grease hole, if equipped with slotted grease screws). If motor has a purge plug, remove it. Motors can be regreased while stopped (at less than 80°C) or running.

Apply grease gun to fitting (or grease hole). Too much grease or injecting grease to quickly can cause premature bearing failure. Slowly apply the recommended amount of grease, taking 1 minute or so to apply. Operate motor for 20 minutes, then reinstall purge plug if previously removed.

**Caution: Keep grease clean. Mixing dissimilar grease is not recommended.**

**Amount of Grease to Add**

| Frame Size NEMA (IEC) | Weight of grease to add ounce (gram) | Volume of grease to add | |
|---|---|---|---|
| | | inches$^3$ | teaspoon |
| Up to 210 incl. (132) | 0.30 (8.4) | 0.6 | 2.0 |
| Over 210 to 280 incl. (180) | 0.61 (17.4) | 1.2 | 3.9 |
| Over 280 to 360 incl. (225) | 0.81 (23.1) | 1.5 | 5.2 |
| Over 360 to 5000 incl.(300) | 2.12(60.0) | 4.1 | 13.4 |

**Maintenance Interval for Motors with Baldor Shaft Grounding Brush**

Baldor shaft grounding motors are designed for long life, but do require periodic replacement. Recommended interval for changing the brush assembly on all frame sizes:

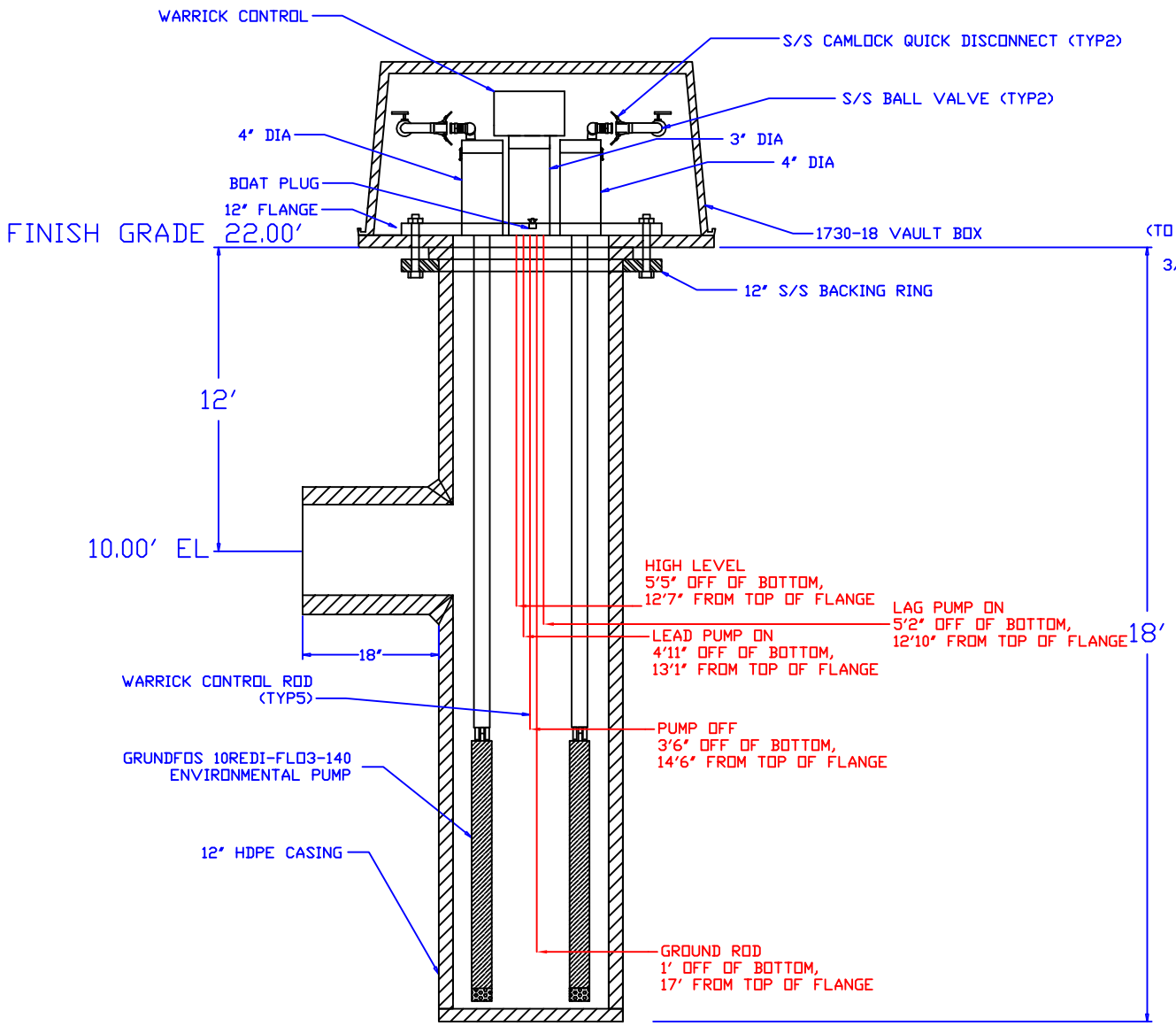
**Replacement Intervals**

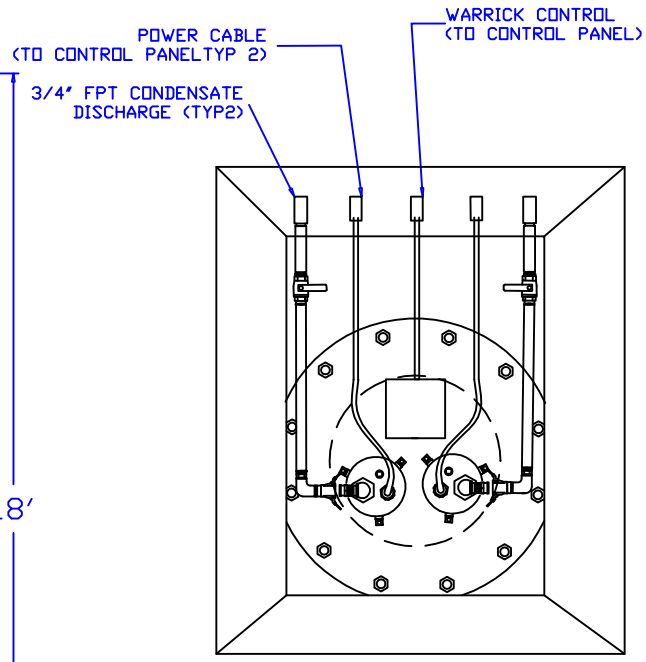
| Rated speed (RPM) | | | |
|---|---|---|---|
| 3600 | 1800 | 1200 | 900 |
| 22,000Hrs. | 44,000Hrs. | 66,000Hrs. | 88,000Hrs. |

*LB5001-0914*

BALDOR
A MEMBER OF THE ABB GROUP

P.O. Box 2400
Fort Smith, AR 72902-2400 USA
(479) 646-4711

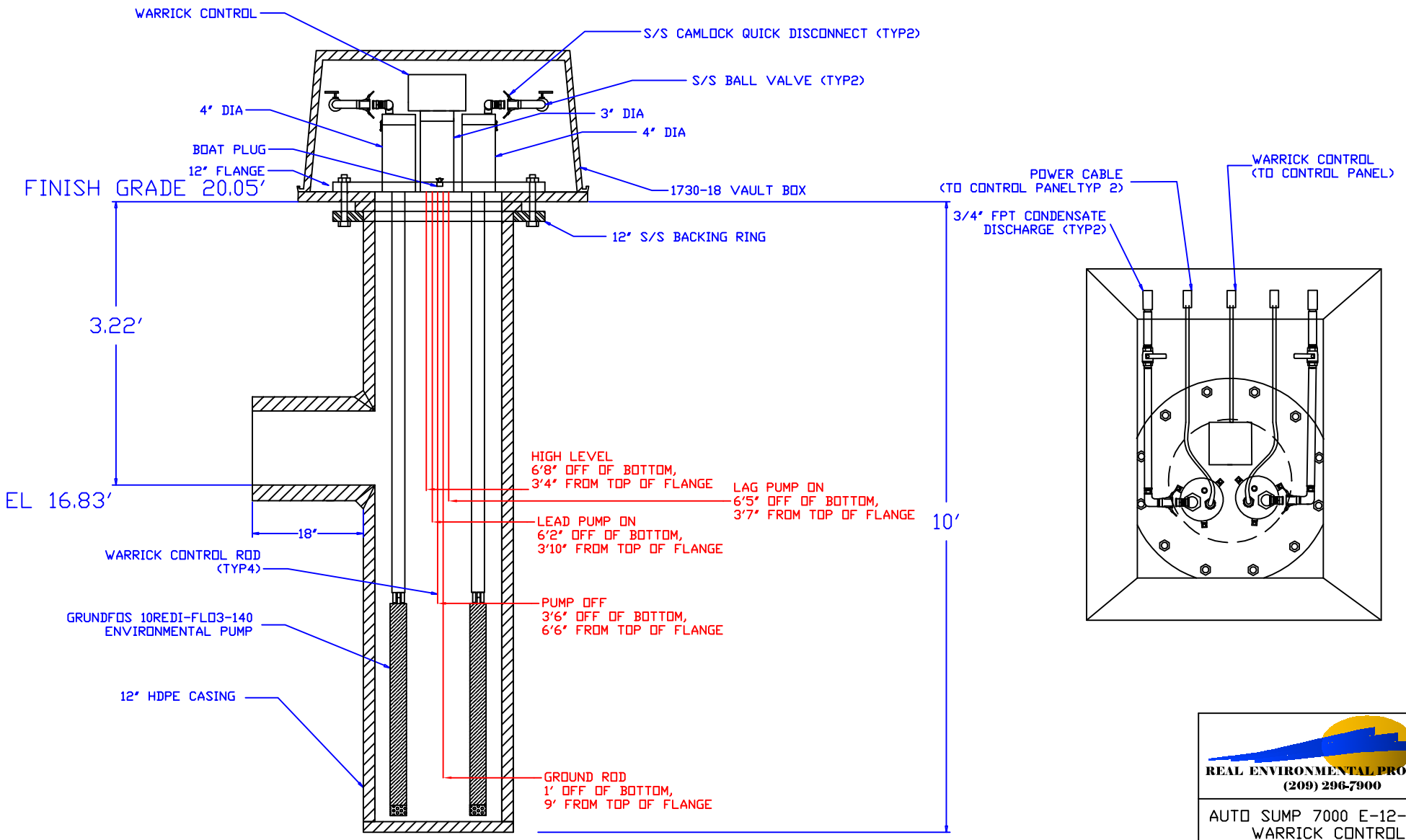



REAL ENVIRONMENTAL PRODUCTS
(209) 296-7900

AUTO SUMP 7000 E-12-DUAL
WARRICK CONTROL
SUMP #1 12"INLET

| NTS | 08/01/14 | 70704-P |
|---|---|---|
| | DRAWN BY: C. NEWMAN | |

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AUTO SUMP 7000 E-12-DUAL
WARRICK CONTROL
SUMP #2 6" INLET

| NTS | 08/01/14 | 70704-P |
|---|---|---|
| | DRAWN BY: C. NEWMAN | |

# POSITIVE DISPLACEMENT METER INSTALLATION INSTRUCTIONS

The installation instructions detailed below are consistent with recommendations by the American Water Works Association in AWWA Manual M6, Water Meters-Selection, Installation, Testing, and Maintenance.

## WE RECOMMEND IN THE DESIGN OF THE INSTALLATION:

1. The installation should include a high quality, low pressure loss shutoff valve upstream of the meter to prevent water damage to the customer property when service is required, a downstream shutoff valve is likewise recommended.

2. The meter should be installed in a horizontal plane, with the register upright, in a location accessible for reading, service and inspection.

3. The installation should be leak-tight, with properly sized gaskets. When meter connections are ordered from Master Meter, gaskets are provided. Appropriate gaskets and couplings also are available from a qualified waterworks distributor. Whenever a meter is pulled from the line, discard and replace the old gaskets.

4. Although AWWA opposes the grounding of electrical systems to potable water delivery lines, such practices do exist. To prevent accidental harm to service personnel, make certain that an electrical grounding strap is installed around the meter.

## AT THE TIME OF INSTALLATION:

1. Thoroughly flush the service line upstream of the meter to remove dirt and debris.

2. Remove meter spud thread protectors. Note: To protect the meter spud threads, store the meter with the thread protectors in place.

3. Set the meter in the line. Arrows on the side of the meter and above the outlet spud indicate the direction of flow.

4. Do not over-tighten connections; tighten only as required to seal. Do not use pipe sealant or Teflon tape on meter threads.

5. With upstream shutoff valve only: Open the shutoff valve slowly, to remove air from meter and service line. Open a consumer faucet slowly to allow entrapped air to escape. Close the customer Faucet.

5.1. With upstream and downstream shutoff valves installed:

A. To test the installation for leaks: Close the outlet (downstream) shutoff valve. Open the inlet (upstream) shutoff slowly until the meter is full of water.

B. Open the outlet (downstream) valve slowly until air is out of the meter and service line. Open a customer faucet slowly to allow entrapped air to escape. Close the customer faucet.

6. When installing meters equipped with electronic registers that require connections to external devices, please refer to installation instructions or diagrams provided by Master Meter.

Real Environmental Products

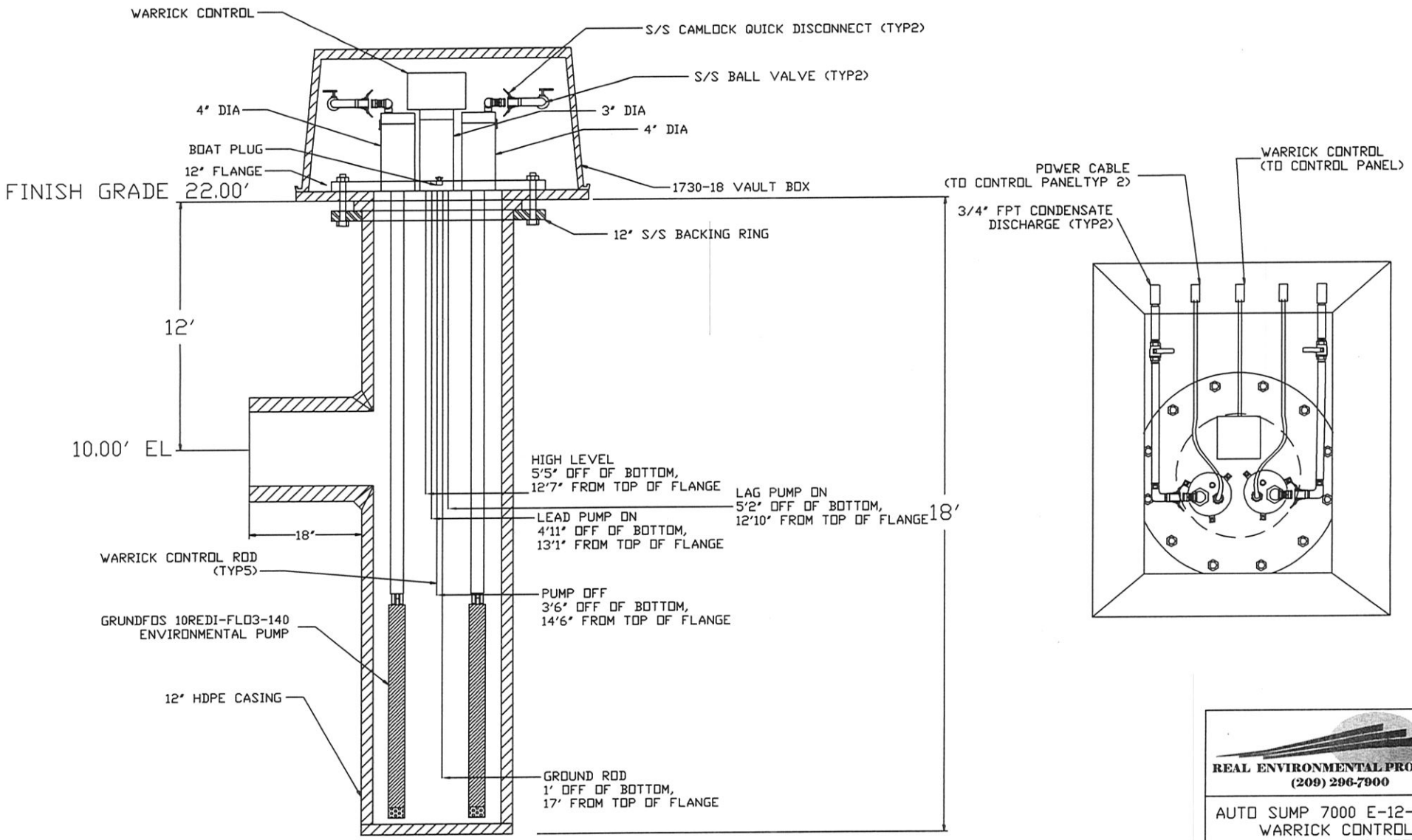
# AUTO SUMP
# 7000-E-12-DUAL

# O & M MANUAL
## 70704-P

# SIMPLICITY
# The Key to lower O & M Costs


**Real Environmental Products**

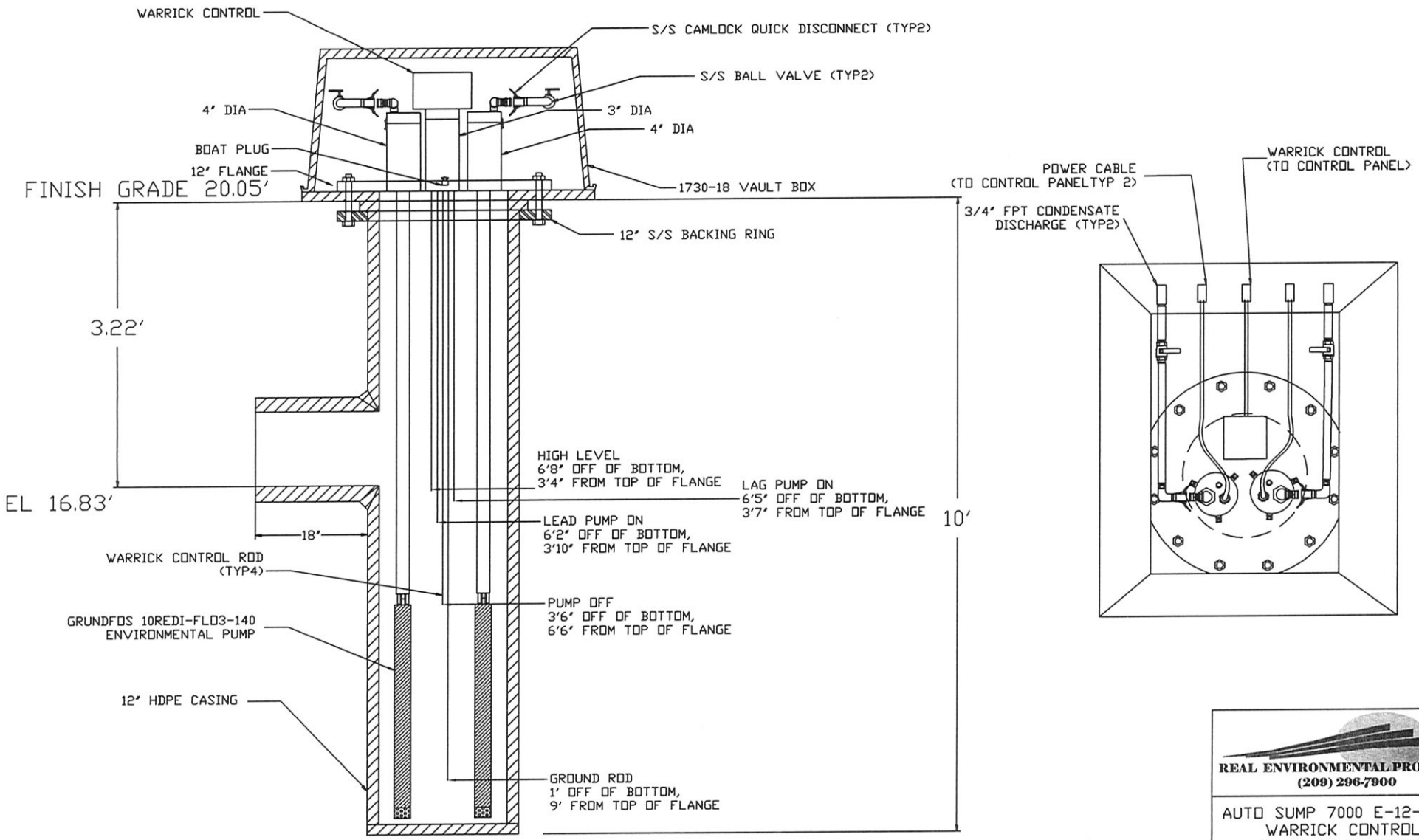
**19881 Hwy 88, Suite 3**
**Pine Grove, CA 95665**
**Ph: 209.296.7900**
**Fax: 209.296.7944**
**www.realenvprod.com**




REAL ENVIRONMENTAL PRODUCTS
(209) 296-7900

AUTO SUMP 7000 E-12-DUAL
WARRICK CONTROL
SUMP #1 12"INLET

| NTS | 08/01/14 | 70704-P |
|---|---|---|
| | DRAWN BY: C. NEWMAN | |

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AUTO SUMP 7000 E-12-DUAL
WARRICK CONTROL
SUMP #2 6' INLET

| NTS | 08/01/14 | 70704-P |
|---|---|---|
| | DRAWN BY: C. NEWMAN | |

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# Specifications

**Vault:**
All operating components of the condensate pump and control assembly are located in a polyethylene vault that is integrally mounted on top of condensate liquid sump.

Service connections, including the liquid discharge, power cable, and warrick control inlet are bulkhead mounted on a common wall of the vault.

**Connections:**
The AUTO-SUMP 7000-E has the following sizes and types:

| Service | Size Connections | Furnished |
|---|---|---|
| Condensate Liquid Discharge | ¾" - inch | FIPT |

No PVC Pipe is used in the Auto-Sump assembly

**Liquid Pump:**
An electric submersible Redi-Flo3 pump, manufactured by Grundfos Pumps Corporation U.S.A. is used to transfer liquids from the sump.

Environmental materials of construction used in pump.

**Level Control:**
Warrick Series 3G and Level Probes, manufactured by Gems Senors & Controls.

**Bolts:**
All bolts, nuts, and washers in contact with LFG are stainless steel.

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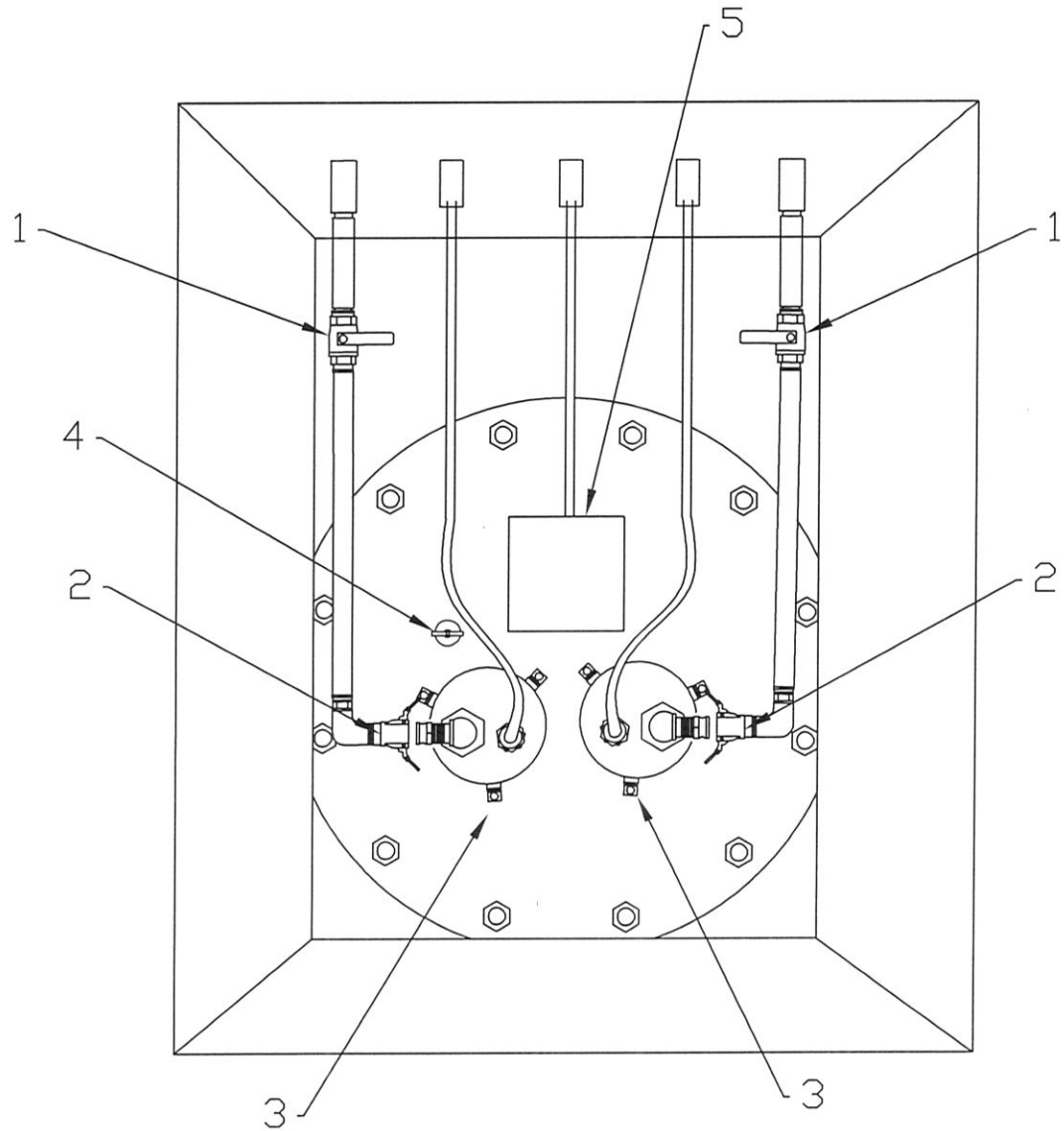
*Web Site: www.realenvprod.com*

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AREIAL VIEW PARTS

| NTS | 08/01/14 | 70704-P |
|---|---|---|
| | DRAWN BY: C. NEWMAN | |

Real Environmental Products

# Auto Sump 7000 Description

1. Condensate Discharge Stainless Steel Ball Valve
2. Stainless Steel Camlock Quick Disconnect (Condensate Discharge).
3. Stainless Steel Locking Latch ( Typ. 3)
4. Drain Plug.
5. Warrick Control Box.

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*Web Site: www.realenvprod.com*

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# Pump Removal

| | |
|---|---|
| 1. | Disconnect Power Source (Lock out Tag Out.) |
| 2. | Turn the Condensate Discharge valve to the off position See #1 Fig. 1 |
| 3. | Turn the Sump Balance valve to the off position See#2 Fig. 1 |
| 4. | Release the S/S Camlock Quick Disconnect (Condensate Discharge) See #3 Fig. 1 |
| 5. | Release the 3 draw latches from the Isolation Well REP Quick Cap. See #4 Fig. 1 |
| 6. | Carefully Pull the REP Quick Cap off the Isolation Well, and Pull the Pump from the Isolation Well See #6 Fig. 1 |

## Reinstallation of Pump

| | |
|---|---|
| 1. | Follow Steps 6. –1. |

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*Web Site: www.realenvprod.com*

Real Environmental Products

# WARNING

## EQUIPMENT TO BE INSTALLED BY QUALIFIED ELECTRICIAN FAMILIAR WITH HAZARDOUS LOCATION WIRING

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*Web Site: www.realenvprod.com*

Real Environmental Products

# NOTICE:

All electrical, liquid, control and air service connections must be engaged for proper system operation. Connections should only be made by persons experienced with landfill gas/liquid systems.

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*Web Site: www.realenvprod.com*

# REP Warranty

Real Environmental Products (REP) warrants its products to be free of defects in materials and workmanship and conform to a reasonable description of the product. This warranty is applicable only to the original purchaser of its products and is subject to the limitations and conditions provided below. Any failure of the products to conform to this warranty will be remedied by REP in the manner described herein.

Listed below are limitations, conditions, and duration of this warranty.

- All warranty durations are calculated from the original date of purchase.
- The GCS Series 8000 Gas/Condensate Separator is warranted for 2 years.
- The Auto Sump Series 7000 is warranted for 3 years providing standard pneumatic pumping device is utilized. Electric sumps are warranted for 1 year. Control devices, control device mounting, tubing, liquid contacting supplies, flow totalization equipment, and surface air supply hose are warranted for 1 year. Pumps will also be covered based on manufacturers 5year warranty.
- Series 3000 Well Heads are warranted for 3 years.
- Infa-Just Pipe Supports are warranted for 5 years.
- Series 5000 Lo Point Tees are warranted for 1 year.
- Separately sold parts and spare parts kits are warranted for 90 days and are subject to OEM warranty. REP will give reasonable assistance to buyer in obtaining whatever adjustment is reasonable from OEM warranty.
- REP will only warrant that the supplied gas or liquid contacting materials will conform to published REP specifications and generally accepted standards for that particular material.
- Warranty duration on custom fabrication shall be as specified.
- Repairs performed by REP are warranted for 90 days or for the full term of the warranty whichever is longer.

Buyer must notify REP in writing within the applicable warranty period of any defects to be eligible for a warranty claim REP will at its option as soon as reasonably possible, replace or repair any such product without charge to buyer, however, no allegedly defective product shall be returned to REP without its consent. REP's sole responsibility shall be at its option to repair, replace, or to refund the purchase price of the defective product at no charge to the Buyer.

It is understood and agreed that REP shall in no event be liable for incidental or consequential damages resulting from its breach of any of the terms of this agreement, nor for special damages, nor for improper selection of any product described or referred to for a particular application.

The following conditions shall render this warranty void:

- Abuse or operation in any manner outside the recommended procedures.
- Use and applications other than intended use.
- Unauthorized disassembly of products or components.
- Exposure to chemical or physical environment beyond the designated limits of material and construction. It shall be the buyer's responsibility to select materials to fit its own application.
- Repairs or modifications by persons other than REP's service personnel unless such repair by others is made with written consent of REP.

If any product covered hereby is actually defective within the terms of this warranty purchaser must contact REP for determination of warranty coverage. If the return of a component is determined to be necessary, REP will authorize the return of the component, at owner's expense. If the product proves not to be defective within the terms of this warranty, then all costs and expenses in connection with the processing of the purchaser's claim and all costs for repair, parts and labor as authorized by owner hereunder shall be borne by the purchaser.

The original purchaser's sole responsibility in the instance of a warranty claim shall be to notify REP of the defect, malfunction, or other manner in which the terms of the warranty are believed to be violated. You may secure performance of obligations hereunder by contacting REP.

1. Identify the product involved (by model or serial number or other sufficient description that will allow REP to determine which product is defective.)
2. Specifying where, when, and from whom the products were purchased.
3. Describing the nature of the defect or malfunction covered by this warranty.
4. Sending the malfunctioning component, after authorization by REP to:

**Real Environmental Products**
**19605 Berry St Bldg B Unit A**
**Pine Grove, CA 95665**

**Telephone: 209-296-7900**
**Fax: 209-296-7944**

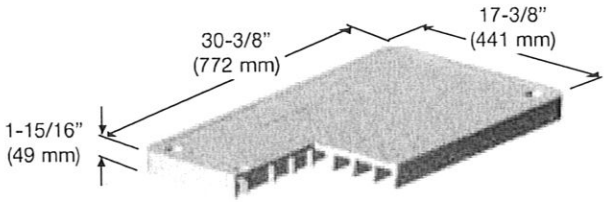
CARSON INDUSTRIES LLC
SPECIFIED AND PREFERRED WORLDWIDE

**Glendora, California**
Toll-Free: 800.735.5566
Phone: 909.592.6272
Fax: 909.592.7971

**Roscommon, Ireland**
Phone: 35.39.03.25922
Fax: 35.39.03.25921

# L Series 1730-18

## Light Duty




**Flush Cover**
Material: HDPE
Weight: 10.0 lbs.
Model: 1730-3B
*Option: ABS*

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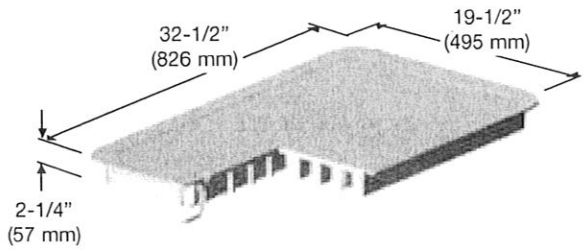


**T-Cover**
Material: HDPE
Weight: 10.0 lbs.
Model: 1730-4B Bolt Down
1730-4L Captive L-Bolt Lock

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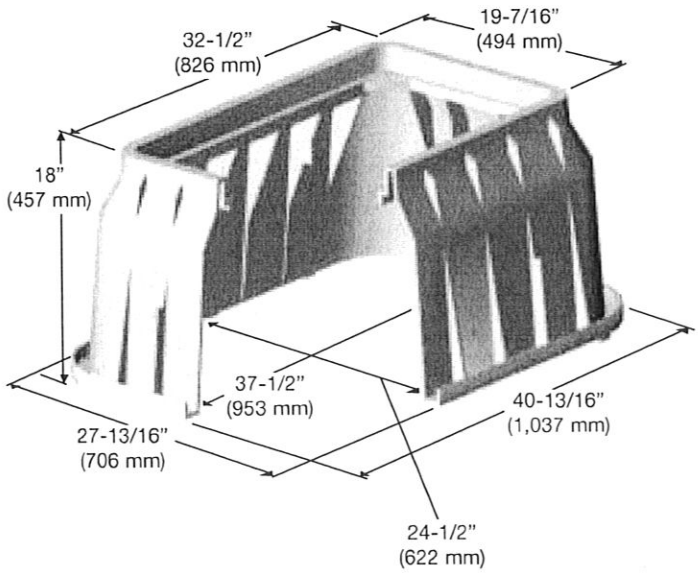



**Body**
Material: HDPE
Weight: 26.0 lbs.
Model: 1730-18

**Colors Available**
Green, Gray or Black

Note: For use in non-vehicular traffic situations only. We do not recommend installation in concrete or asphalt. Weights and dimensions may vary slightly.

Revision Date 4/2003

# L Series 1730-18

## Light Duty


**Carson Industries, LLC**

**Glendora, California**
Toll-Free: 800.735.5566
Phone: 909.592.6272
Fax: 909.592.7971

**Roscommon, Ireland**
Phone: 35.39.03.25922
Fax: 35.39.03.25921


### Static Vertical Load Rating
*(Design Load; Test Load)*

- ASTM C857 – A-0.3, 300 lbf/ft$^2$; Report Ultimate
- SCTE – Light Duty, Pedestrian; 3,000 lbf

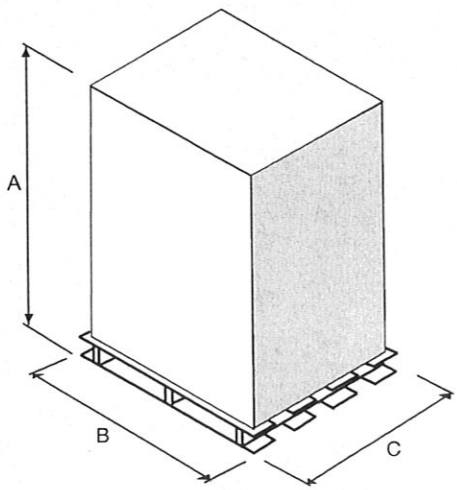
### Shipping Configuration

- Unit, 16 assemblies, = 92.5 cu. ft., 717.0 lbs.

| Material Property | ASTM Test Method | Typical Value[1] |
|---|---|---|
| Type, Class, Category | D 1248 | III, A, 3 |
| Density, g/cm$^3$ | D 1505 | 0.950 min., not to exceed 0.965 |
| Tensile Strength, at break, psi | D 638 | 3,000 to 4,400 |
| Elongation, at break, % | D 638 | 400 |
| Tensile Impact, ft-lb/in$^2$ | D 1822 | 27 |
| Flexural Modulus, psi | D 790 | 120,000 min., not to exceed 240,000 |
| Low Temperature Brittleness, F50, at °C | D 746 | <-76 |
| Hardness, Shore D | D 2240 | 66 |
| Deflection Temperature, at 66 psi, °F | D 648 | 150° min., not to exceed 200° |
| Electrical Dielectric Strength, V/mil | D 149 | 400 min., not to exceed 600 |
| **Molded Product[2]** | | |
| Chemical Resistance | D 543 | Very Resistant |
| Water Absorption | D 570 | Less than 1% weight change |

*[1]The values listed for physical property measurements are nominal values only. Certain physical property measurements are subject to variations consistent with the test methods and are within a generally accepted range for such values.*
*[2]Test reports available on request.*

### Shipping Information




**UNIT**

| Dim. | Description | Value |
|---|---|---|
| A | Height | 80" |
| B | Length | 40" |
| C | Width | 48" |

**Units:** 16 per pallet
**Weight:** 616 lbs. per pallet

**FLUSH COVER**

| Dim. | Description | Value |
|---|---|---|
| A | Height | 66" |
| B | Length | 40" |
| C | Width | 48" |

**Units:** 120 per pallet
**Weight:** 1,240 lbs. per pallet

**T-COVER**

| Dim. | Description | Value |
|---|---|---|
| A | Height | 73" |
| B | Length | 40" |
| C | Width | 48" |

**Units:** 120 per pallet
**Weight:** 1,240 lbs. per pallet

**BODY**

| Dim. | Description | Value |
|---|---|---|
| A | Height | 80" |
| B | Length | 40" |
| C | Width | 48" |

**Units:** 16 per pallet
**Weight:** 456 lbs. per pallet

Note: For use in non-vehicular traffic situations only. We do not recommend installation in concrete or asphalt. Weights and dimensions may vary slightly.

geotech

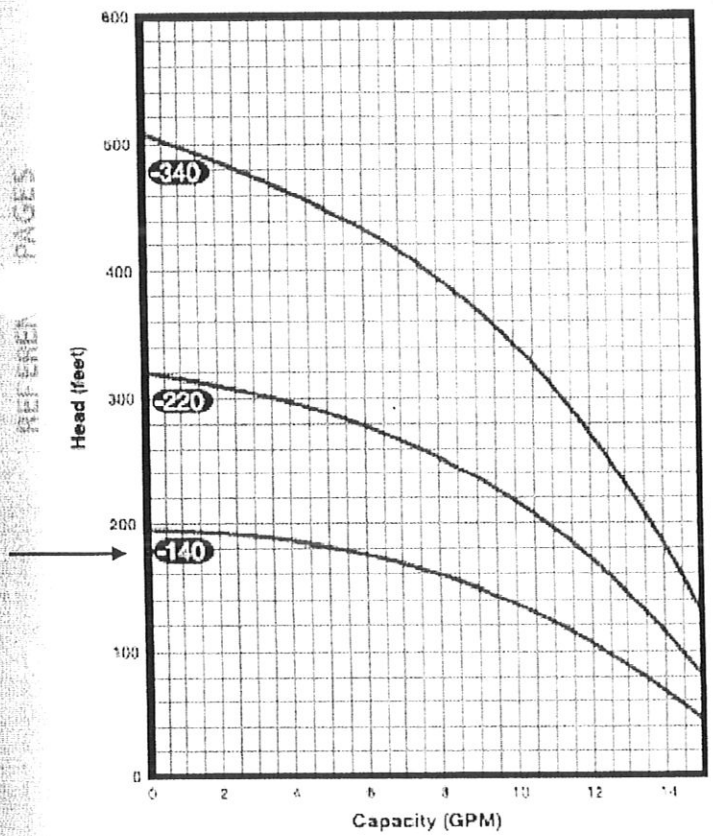
# Grundfos Redi-Flo3™ 10gpm Technical Data

## SPECIFICATIONS

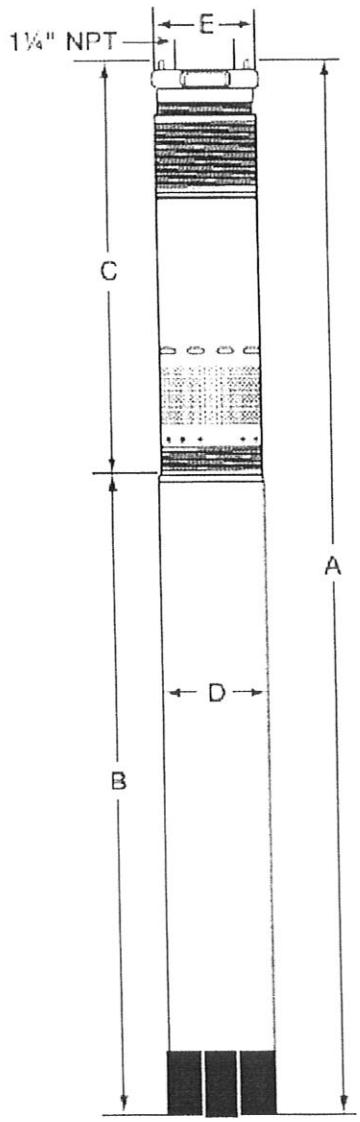
| Model Number | HP | Size | Discharge Size | Dimensions in Inches A | B | C | D | E | Approximate Ship Wt. (pounds) |
|---|---|---|---|---|---|---|---|---|---|
| 10Redi-Flo3-140 | ½A | 3" | 1 ¼" NPT | 30.4 | 19.5 | 10.6 | 2.6 | 2.9 | 12 |
| 10Redi-Flo3-220 | ¾B | 3" | 1 ¼" NPT | 33.6 | 19.5 | 13.7 | 2.6 | 2.9 | 12 |
| 10Redi-Flo3-340 | 1 ½C | 3" | 1 ¼" NPT | 38.2 | 21.3 | 16.0 | 2.6 | 2.9 | 16 |

**Note:** Weights include pump ends with motors

## PERFORMANCE

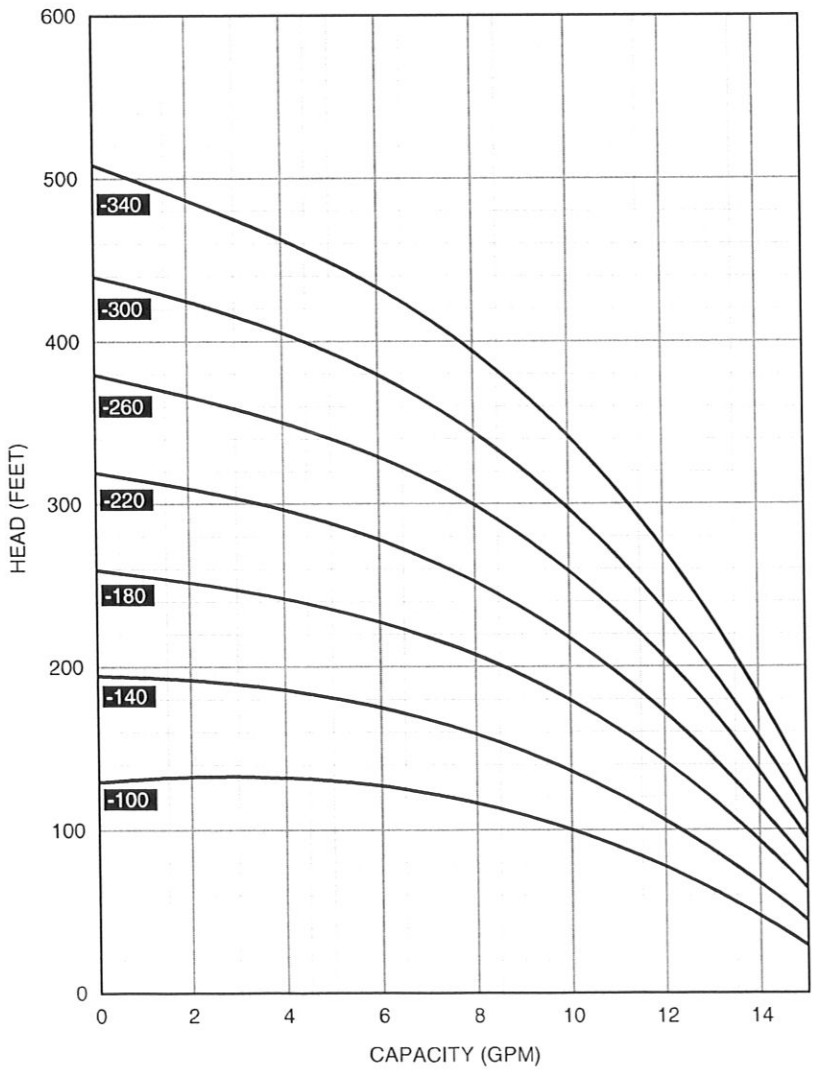


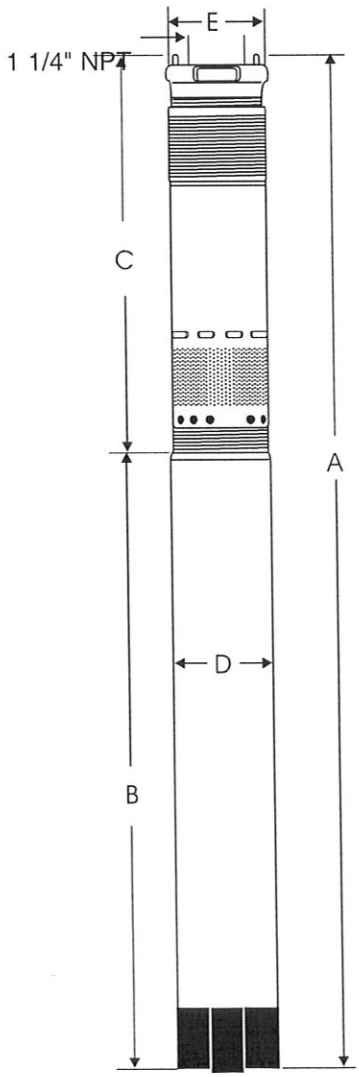

## DIMENSIONS
Inches (mm)



| Model # | HP | Size | Disch. Size | Dimensions in Inches | | | | | Approx. Ship Wt. |
|---|---|---|---|---|---|---|---|---|---|
| | | | | A | B | C | D | E | (pounds) |
| 10Redi-Flo3-100 | 1/3A | 3" | 1 1/4" NPT | 30.4 | 19.8 | 10.6 | 2.6 | 2.9 | 12 |
| 10Redi-Flo3-140 | 1/2A | 3" | 1 1/4" NPT | 30.4 | 19.8 | 10.6 | 2.6 | 2.9 | 12 |
| 10Redi-Flo3-180 | 1/2B | 3" | 1 1/4" NPT | 31.5 | 19.8 | 11.6 | 2.6 | 2.9 | 13 |
| 10Redi-Flo3-220 | 3/4B | 3" | 1 1/4" NPT | 33.6 | 19.8 | 13.7 | 2.6 | 2.9 | 13 |
| 10Redi-Flo3-260 | 1C | 3" | 1 1/4" NPT | 35.0 | 21.3 | 13.7 | 2.6 | 2.9 | 16 |
| 10Redi-Flo3-300 | 1C | 3" | 1 1/4" NPT | 36.1 | 21.3 | 14.8 | 2.6 | 2.9 | 16 |
| 10Redi-Flo3-340 | 1 1/2C | 3" | 1 1/4" NPT | 38.2 | 21.3 | 16.9 | 2.6 | 2.9 | 16 |

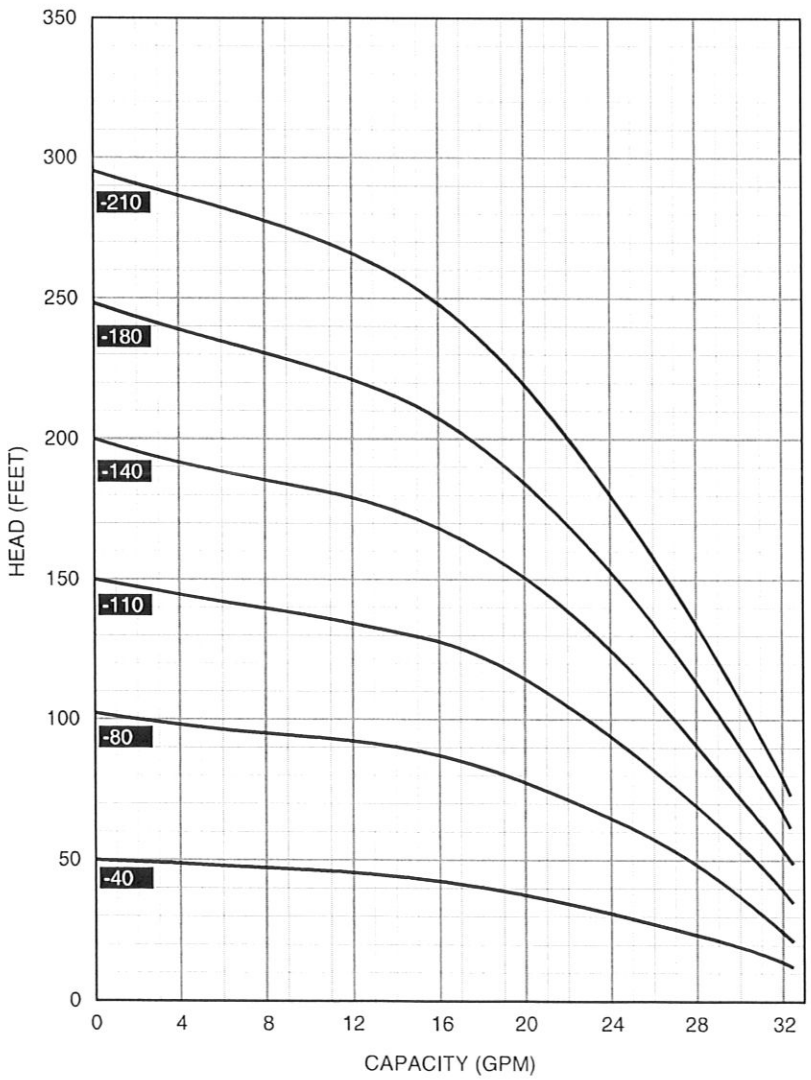
Note: Weights include pump ends with motors

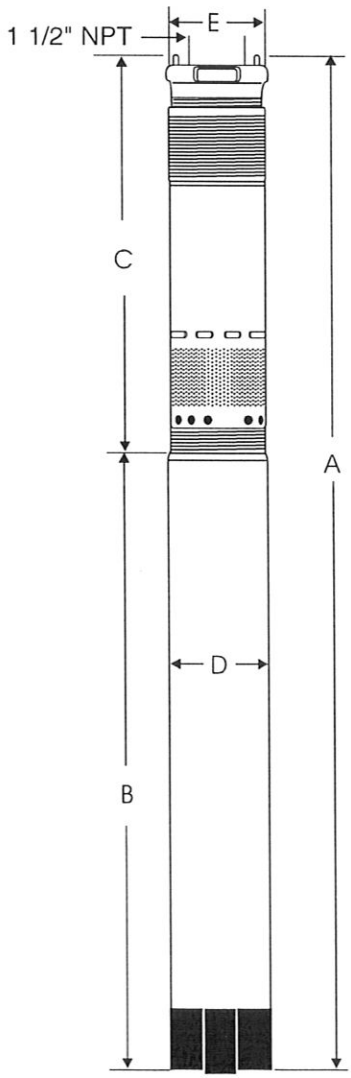


| Model # | HP | Size | Disch. Size | Dimensions in Inches | | | | | Approx. Ship Wt. |
|---|---|---|---|---|---|---|---|---|---|
| | | | | A | B | C | D | E | (pounds) |
| 22Redi-Flo3-40 | 1/3A | 3" | 1 1/2" NPT | 30.4 | 19.8 | 10.6 | 2.6 | 2.9 | 12 |
| 22Redi-Flo3-80 | 1/2A | 3" | 1 1/2" NPT | 30.4 | 19.8 | 10.6 | 2.6 | 2.9 | 12 |
| 22Redi-Flo3-110 | 1/2B | 3" | 1 1/2" NPT | 31.5 | 19.8 | 11.6 | 2.6 | 2.9 | 13 |
| 22Redi-Flo3-140 | 3/4B | 3" | 1 1/2" NPT | 33.6 | 19.8 | 13.7 | 2.6 | 2.9 | 13 |
| 22Redi-Flo3-180 | 1C | 3" | 1 1/2" NPT | 38.2 | 21.3 | 16.9 | 2.6 | 2.9 | 16 |
| 22Redi-Flo3-210 | 1 1/2C | 3" | 1 1/2" NPT | 38.2 | 21.3 | 16.9 | 2.6 | 2.9 | 16 |

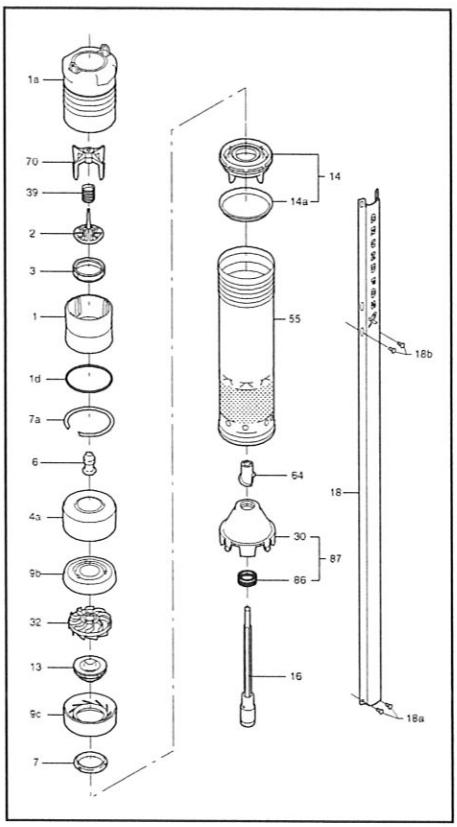
Note: Weights include pump ends with motors



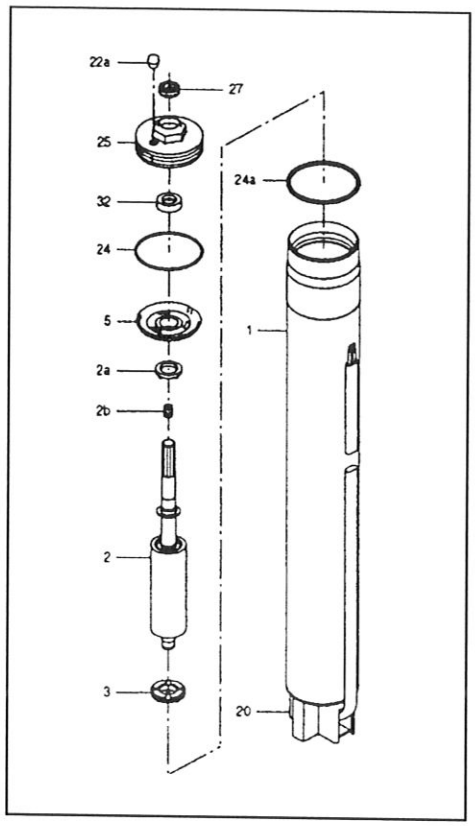
## MATERIAL SPECIFICATION – REDI-FLO3 PUMP END

| Pos. | Component | Material | DIN W. Nr. | AISI |
|---|---|---|---|---|
| 1 | Valve Casing | PVDF | | |
| 1a | Discharge Chamber | Stainless Steel | 1.4401 | 316 |
| 1d | O-Ring | FPM Rubber | | |
| 2 | Valve Cone | PVDF | | |
| 3 | Valve Seat | FPM Rubber | | |
| 9b | Top Chamber | PVDF | | |
| 4a | Empty Chamber | PVDF | | |
| 6 | Top Bearing | FPM Rubber | | |
| 7 | Neck Ring | PVDF | | |
| 7a | Lock Ring | Stainless Steel | 1.4401 | 316 |
| 32 | Guide Vanes | PVDF | | |
| 9c | Bottom Chamber | PVDF | | |
| 13 | Impeller w/ tungsten carbide bearing | PVDF | | |
| 14 | Suction Interconnector | PVDF | | |
| 14a | Ring | Stainless Steel | 1.4401 | 316 |
| 16 | Shaft w/ coupling | Stainless Steel<br>Sintered Steel | 1.4401 | 316 |
| 18 | Cable Guard | Stainless Steel | 1.4401 | 316 |
| 18a-b | Cable Guard Screws | Stainless Steel | 1.4401 | 316 |
| 30 | Pressure Equalization Cone | PVDF | | |
| 39 | Valve Spring | Stainless Steel | 1.4406 | 316LN |
| 55 | Pump Sleeve | Stainless Steel | 1.4401 | 316 |
| 70 | Valve Guide | PVDF | | |
| 64 | Priming Screw | PVDF | | |
| 86 | Lip Seal Ring | FPM Rubber | | |



## MATERIAL SPECIFICATION – REDI-FLO3 PUMP MOTOR

| Pos. | Component | Material | DIN W. Nr. | AISI |
|---|---|---|---|---|
| 1 | Stator | Stainless Steel | 1.4401 | 316 |
| 2 | Rotor | Stainless Steel | 1.4401 | 316 |
| 2a | Stop Ring | PP | | |
| 2b | Filter | Polyester | | |
| 3 | Thrust Bearing | Carbon | | |
| 5 | Radial Bearing | Ceramic/ tungsten carbide | | |
| 20 | Motor Cable w/ plug | Tefzel | | |
| | | PVDF | | |
| 22a | Filling Plug | FPM Rubber | | |
| 24 | O-Ring | FPM Rubber | | |
| 24a | O-Ring | FPM Rubber | | |
| 25 | Top Cover | PPS | | |
| 27 | Filter | Polyester | | |
| 32 | Shaft Seal | FPM Rubber | | |
| | Motor Liquid | SML-2 | | |



geotech

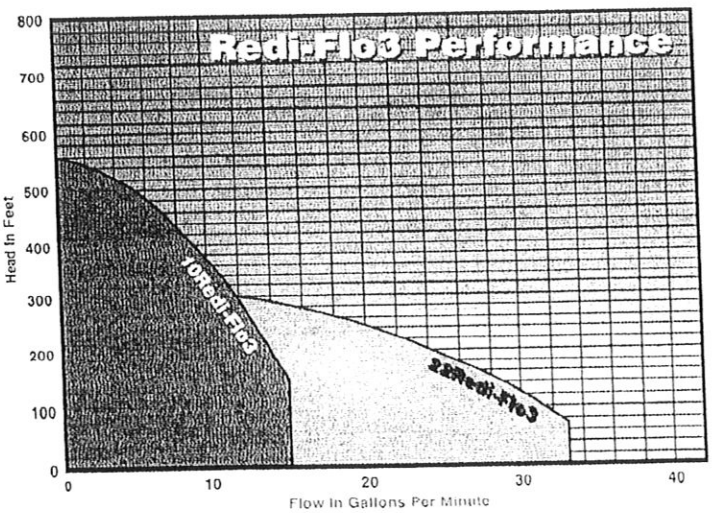
# Environmental Pumps

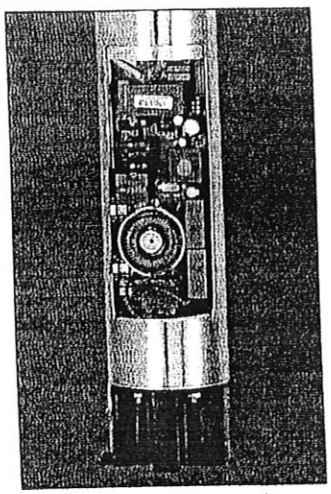
## *Grundfos Redi-Flo3 Electrical Submersible Pump*

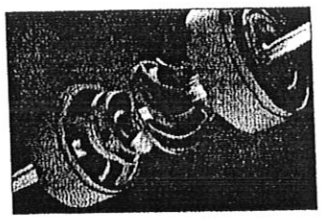
**The Grundfos Redi-Flo3 Electrical Submersible Pump is ideal for the removal of polluted groundwater. Users have the capability to change the pump performance while the pump is installed in the well. Typical applications include: environmental remediation, leachate extraction, total fluids recovery, tank-to-tank transfer, and sampling. Systems are available for your portable or dedicated pumping needs.**

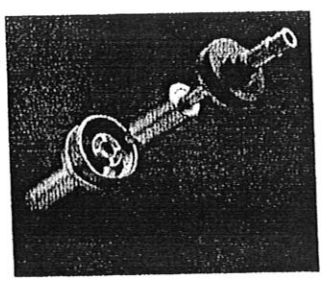
### FEATURES

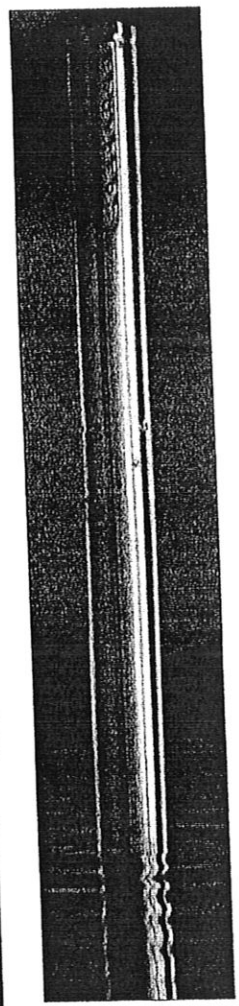
- **Advanced Electronics**
  Permanent-magnet motors, and Grundfos' own micro-frequency converter offer the capability to control and communicate with the pump to monitor performance and set operating parameters.
- **Permanent-Soft Start System**
  The motor has a soft-start system which allows the pump to start with gradually increasing speed and with the highest possible starting torque.
- **Rugged Design**
  The pump uses "floating" impellers. Each impeller has its own tungsten carbide/ceramic bearing. This design and the environmentally tough 316 stainless steel and PVDF construction provide excellent wear resistance and solids handling capability.
- **Permanent-Magnet Motor**
  The motor is protected against: dry-run, overvoltage, undervoltage, overload, overtemperature, virtually eliminating down time.
- **Reliable Check Valves**
  Reliable built-in spring loaded check valves let you operate the pump in a position from vertical to horizontal.





Advanced Electronics


Wear Resistant Bearings


Permanent Magnet Motor


Grundfos Redi-Flo3


CALL GEOTECH TODAY (800) 833-7958

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(303) 320-4764 • (800) 833-7958 • FAX (303) 322-7242
email: sales@geotechenv.com website: www.geotechenv.com

geotech

# Environmental Pumps

## *Grundfos Redi-Flo3 Electrical Submersible Pump*

### SPECIFICATIONS

**General**

| | |
|---|---|
| Borehole diameter | Minimum 3 in. (76 mm) |
| Installation depth | Maximum 500 ft./150 m below water table |
| Media temperature | 86° F/30° C at no flow past motor/ 104° F/40°C at over 15 m/sec. flow past motor |
| Noise level | < 70 dB (A) |
| Radio noise | Complies with the EMC directive (89/336/EEC) |
| Power factor | Cos phi = 1 |
| Ground fault circuit breaker | HPFI |
| Material | Stainless Steel complying with DIN W.-Nr 1.4401 (AISI 316). PVDF and FPM rubber |

**Electric**

| | |
|---|---|
| Supply voltage | 1x200-240V, 50/60Hz<br>1x100-115V, 50/60Hz |
| Operation via generator | The generator output must be equal to the motor p1(KW) +10% |
| Starting current | The motor starting current is equal to the highest value stated on the motor nameplate |
| Starting | Soft-start |
| Run-up time | Maximum 2 seconds |
| Motor protection | The motor is protected against: dry-run, overvoltage, undervoltage, overload, over temperature |
| Power factor | PF = 1 |
| Service factor | 0.33-0.50A(Hp)-1.75 at 115V/230V<br>0-50-0.75B(Hp)-1.4 at 230V<br>1.0-1.5C(Hp)-1.15 at 230V |
| Motor Cable | 3 Wire, Tefzel Cable Kit (Santoprene® available) |
| Motor Liquid | Type SML2 |
| pH Values | 2-13 |
| Liquid Temperature | The temperature of the pumped liquid should not exceed 104°F |

**Note: If liquids with a viscosity higher than that of water are to be pumped, please contact Geotech Environmental Equipment, Inc.**

| | |
|---|---|
| Minimum Ambient Temperature: | -4°F |
| Maximum Ambient Temperature: | +140°F |

**Piping Connection**

| | |
|---|---|
| Discharge port | 10 Redi-Flo3 - 1¼ in. NPT; 22 Redi-Flo3 - 1½ in. NPT |

| ELECTRIC | |
|---|---|
| **Supply Voltage:** | 1x200-240V +6%/-10%, 50/60 Hz, PE<br>1x100-115V |
| **Operation via Generator:** | As a minimum, the generator output must be equal to the motor P1[KW] +10% |
| **Starting Current:** | The motor starting current is equal to the highest value stated on the motor nameplate |
| **Starting:** | Soft-start |
| **Run-up Time:** | Maximum: 2 seconds |
| **Motor Protection:** | The motor is protected against:<br>Dry running, overvoltage, undervoltage, overload, overtemperature |
| **Power Factor:** | PF=1 |
| **Service Factor:** | 0.33-0.50A[Hp]-1.75 at 115V/230V<br>0.50-0.75B[Hp]-1.4 at 230V<br>1.0-1.5C[Hp]-1.15 at 230V |
| **Motor Cable:** | 3 Wire, Tefzel Cable Kit |
| **Motor Liquid:** | Type SML 2 |
| **pH Values:** | 2-13 |
| **Liquid Temperature:** | The temperature of the pumped liquid should not exceed 104ºF. |
| **Note: If liquids with a viscosity higher than that of water are to be pumped, please contact GRUNDFOS** | |
| **Minimum Ambient Temperature:** | -4° F |
| **Maximum Ambient Temperature:** | +140° F |
| **Frost Protection:** | If the pump is to be stored after use, it must be stored in a frost-free location or it must be ensured that the motor liquid is frost-proof. Otherwise motor must be stored without being filled with motor liquid. |
| **OPERATING CONDITIONS** | |
| **Minimum Ambient Fluid Temperature:** | -4° F |
| **Maximum Ambient Fluid Temperature:** | +104° F |
| **APPROXIMATE DIMENSIONS AND WEIGHT** | |
| **Motor Dimensions (MSE - NE 3):** | |
| 0.33-0.50A[Hp] | 20.9" length x 2.68" diameter |
| 0.50-0.75B[Hp] | 20.9" length x 2.68" diameter |
| 1.0-1.5C[Hp] | 22.3" length x 2.68" diameter |
| Pump Diameter, incl. cable guard: | 2.91" |
| **Motor Weights (MSE - NE 3):** | |
| 0.33-0.50A[Hp] | 6.0 lbs |
| 0.50-0.75B[Hp] | 7.1 lbs |
| 1.0-1.5C[Hp] | 8.2 lb |
| **Pump End Dimensions:** | |
| Pump Diameter: | 2.68" |
| Pump Diameter, incl. cable guard: | 2.91" |
| **Pump End Dimensions (min. and max.):** | |
| 10 Redi-Flo3 | 10.6" to 16.9" |
| 22 Redi-Flo3 | 10.6" to 16.9" |
| **Pump End Weights (min. and max.):** | |
| All | 2.2 lbs to 3.5 lbs |
| **Well Diameter (minimum):** | 3" |
| **Installation Depth (maximum):** | 500 feet, below static water level |

# Features and Benefits

### Redi-Flo3 Submersible Pumps

Redi-Flo3 pumps are suitable for both continuous and intermittent operation for a variety of environmental applications including:

- Remediation
- Pollution Recovery
- Leachate Recovery
- Dewatering
- Tank Applications

### Redi-Flo3 pumps offer the following features:

- Dry-Run Protection
- High Efficiency Pump End and Motor
- High Starting Torque
- Protection Against Up-Thrust
- Soft-Start
- Over- and Under-Voltage Protection
- Overload Protection
- Over-temperature Protection
- Variable Speed
- Electronic Control and Communication

Redi-Flo3 pumps incorporate a totally new motor design. With the use of permanent-magnet technology within the motor, Redi-Flo3 pumps deliver unmatched performance. The combination of permanent-magnet motors and Grundfos' own micro frequency converter, we are now able to communicate with the pump in ways never before possible. Just a few of the features that come out of this combination are constant level control, soft-start and integrated dry-run protection. These are just a few of the many features that Redi-Flo3 pumps can offer.

Redi-Flo3 pumps use the Grundfos "Smart Motor". This permanent-magnet motor is single phase input and with a 2-wire design makes installation easy. The combination of integrated microelectronics in the pump with the optional CU300 status box and R100 at the surface allows communication with the pump through standard electrical motor power leads. No additional wires are required. This feature allows the direct use of multiple sensors, digital input and relays without adding extra control electronics and costs.

The surface CU300 status box allows communication with the "Smart Motor" through the R100 infrared remote control unit or via the CU300 PC Software Tool. This gives you the ability to monitor and setup or change your pumping system to meet the specific needs of your application.

The Redi-Flo3 can operate without the status control box much like a traditional submersible electric pump. Some communication and program functions will not be available in this configuration, but the internal motor protection features are still active.

### Pump and Motor Range

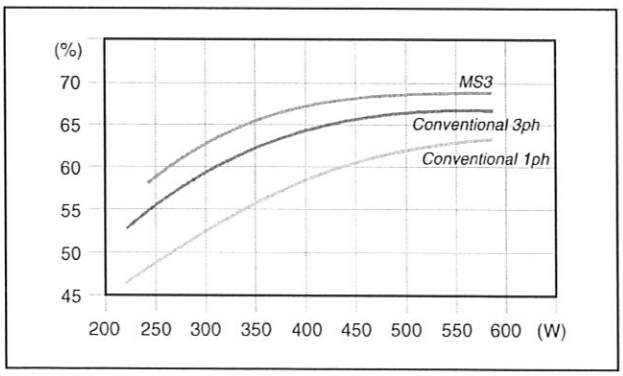
| Product | Description |
|---|---|
| Redi-Flo3 Pump End | 10, 22, GPM |
| MSE3NE Motor | Single Phase 1/3 - 1.5 Hp |

### Dry-Run Protection

The Redi-Flo3 incorporates integrated Dry-Run protection. When the fluid level falls below the inlet of the pump, the pump automatically shuts off. After a programmable period of time, the pump automatically starts up again.

### High Motor Efficiency

Redi-Flo3 motors are based on a permanent magnet rotor, which produce high efficiency within a wide load range. The high and flat efficiency curve of the Permanent-Magnet (PM) motor allows for coverage of a wide power range with the same motor as compared to conventional submersible AC motors. For Redi-Flo3 pumps, this means only three motors to cover the horsepower range from 1/3 to 1.5Hp.

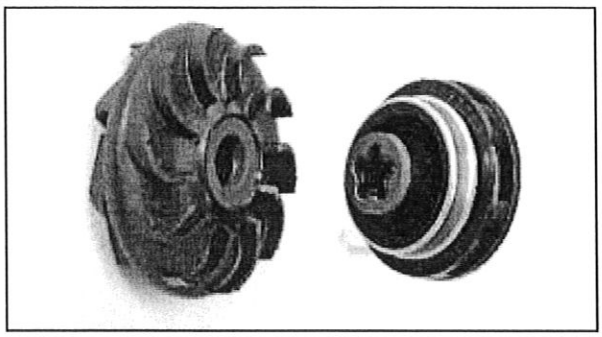



### High Pump Efficiency

The pump end components are made from Polyvinylidene Fluoride (PVDF). The pumps are designed to deliver at peak efficiency levels. Because of high pump efficiencies, overall power consumption will be reduced.

### Wear Resistance

Redi-Flo3 pump design uses "floating" impellers. Each impeller has its own tungsten carbide/ceramic bearing. This design and the environmental quality of materials make this pump an excellent choice for environmental application projects.



### Protection Against Up-Thrust

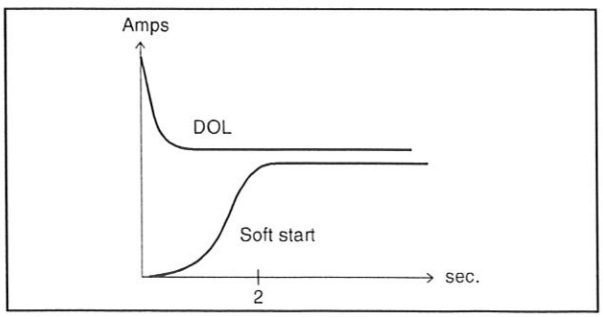
During start-up many pumps start in an up-thrust condition. To prevent damage caused by up-thrust, a top bearing has been placed in the motor to protect both the pump and the motor against up-thrust.

### Soft-Start

Redi-Flo3 have a soft-start feature possible because of the integrated electronics. Soft-start reduces the starting current and gives the pump a smooth and steady acceleration.

### High Starting Torque

Because of the permanent-magnet motor, the Redi-Flo3 pumps have excellent starting capabilities. The high locked rotor torque produced by the PM motor provides a starting torque that is 1.5 times greater than conventional submersible pump motors. Even if the voltage is low, the PM motor will still maintain a high starting torque.




### Overvoltage and Undervoltage Protection

Overvoltage and undervoltage may occur at any time, especially if you have an unstable voltage supply. The integrated protection in the Redi-Flo3 motor protects itself when voltage falls outside of permissible voltage range. The 230V pump motor will cut out if voltage falls below 150V or above 280V. The motor will automatically start when the voltage is within the permissible range. It is not necessary to have additional voltage protection.

### Overload Protection

When the pump load rises above the maximum amp level, the motor will automatically compensate and reduce the speed to maintain its maximum amp level. If the speed drops to 65% of the nominal speed, the motor will shut off.

### Overtemperature Protection

Permanent-magnet motors emit very little heat because of their high efficiency. Redi-Flo3 motors are designed with an internal circulation system to effectively cool all the internal components.

As extra protection, the electronic unit also has a built-in temperature sensor. When the temperature rises too high, the motor will automatically shut-off; when the temperature drops the motor will automatically restart.

### Variable Speed

The Redi-Flo3 "Smart" motor enables continuous variable speed control within 30%-100% (3,000-10,700 rpm). The pump can be set to operate at any duty point in the range between 30% and 100% of the pumps performance curve. The pump can be adapted to any specific requirement. The variable speed control requires the status box and R100 or potentiometer.

### Installation

Redi-Flo3 pumps can be installed vertically or horizontally (Note: the pump must not fall below the horizontal level in relation to the motor). For horizontal installations, a flow sleeve is recommended to ensure sufficient flow past the motor to provide proper cooling and prevent the unit from being buried in sand or silt.

Gems Sensors & Controls

Warrick Fittings and Probes

# Series 3G

Series 3G Corrosion Resistant Fitting

Part No. 3G5H3

*Image is of similar product*

| | |
|---|---|
| **Model** | 3G |
| **Number of Probes** | 5 |
| **Body Material** | PVC |
| **Probe Length** | N/A |
| **Mounting** | 3" NPT |
| **Gauge Tappings** | N/A |
| **Tricock Tappings** | N/A |
| **Probe Type** | 3W, 3Y |
| **Probe Material** | N/A |
| **Sheathing Material** | N/A |
| **Pressure Rating** | 0 psig @ 150 F |
| **Maximum Temperature (°F)** | N/A |
| **Minimum Qty (per Release)** | 1 |
| **Weight (Lbs)** | 2 |

## Options

Gems Sensors & Controls

Warrick Fittings and Probes

# Series 3R_3T

Tapered Probes

Part No. 3T4C4

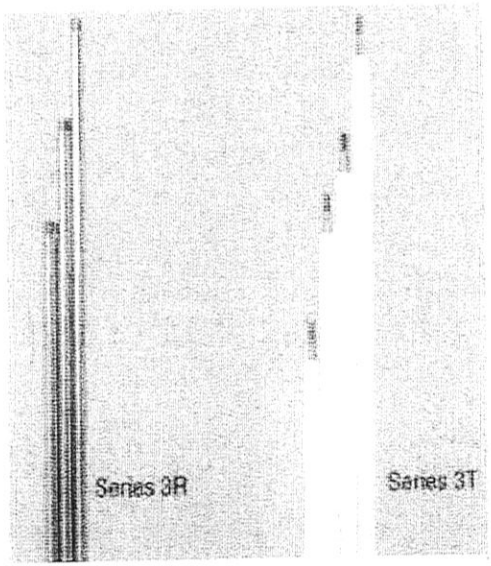
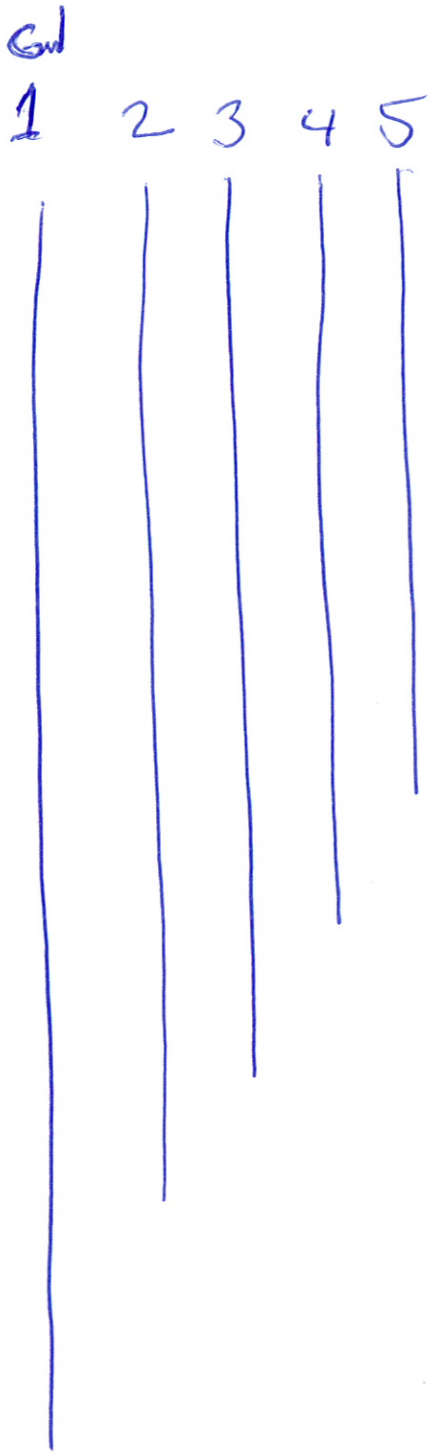



*Image is of similar product*

| | |
|---|---|
| **Model** | 3T |
| **Number of Probes** | 1 |
| **Body Material** | N/A |
| **Probe Length** | 4 feet |
| **Mounting** | Tapered #6-32 UNC |
| **Gauge Tappings** | N/A |
| **Tricock Tappings** | N/A |
| **Probe Type** | N/A |
| **Probe Material** | 316 Stainless Steel |
| **Sheathing Material** | PVC |
| **Pressure Rating** | N/A |
| **Maximum Temperature (°F)** | 200 |
| **Minimum Qty (per Release)** | 1 |
| **Weight (Lbs)** | 2 |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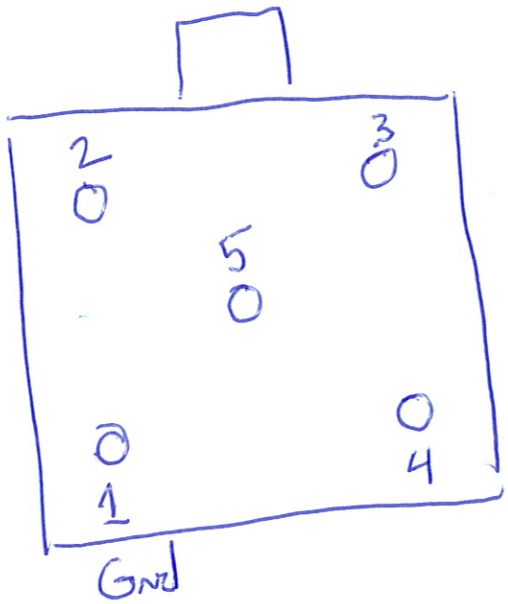
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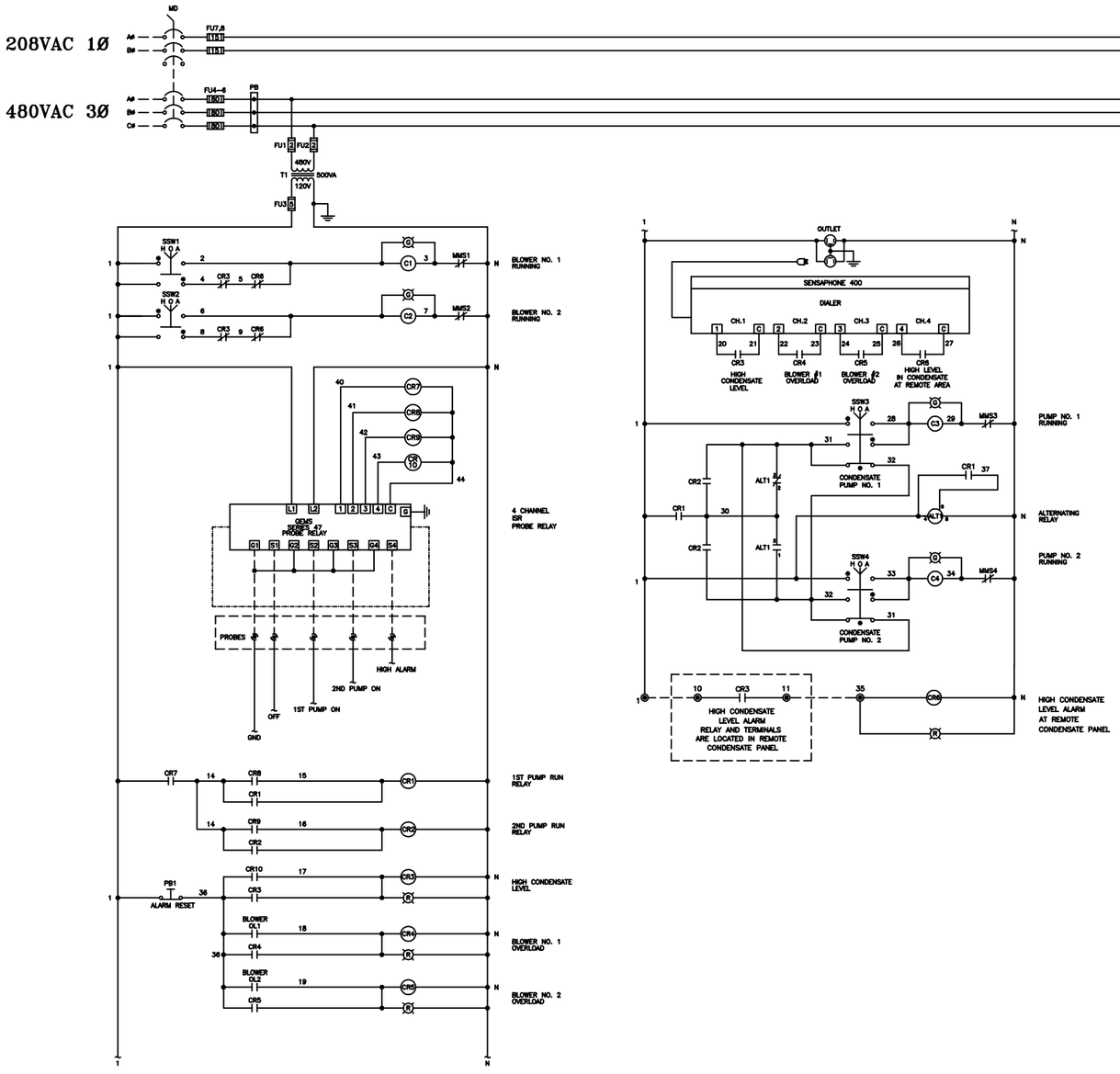
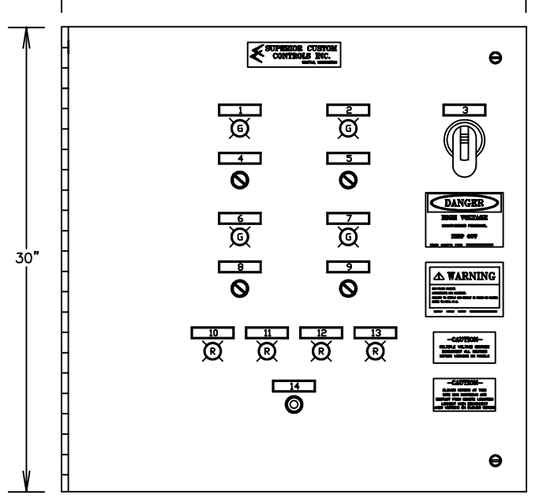



## LIST OF MATERIALS

| ITEM | QTY | DESCRIPTION | | | MFGR. |
|---|---|---|---|---|---|
| | 1 | ENCLOSURE | 30X30 | CSD30308 | HOFFMAN |
| | 1 | PAN | | CP3030 | HOFFMAN |
| | 1 | FOOT KIT | | CMFK | HOFFMAN |
| MD | 1 | MAIN DISCONNECT | 80A | OT80F3 | ABB |
| | 1 | HANDLE | | OHB65J6 | ABB |
| | 1 | SHAFT | | OXP6X210 | ABB |
| FU1,2 | 2 | PRIMARY FUSES | 2A | FNQR-2 | BUSS |
| FU3 | 1 | SECONDARY FUSE | 5A | FNM-5 | BUSS |
| FU4-6 | 3 | FUSES | 80A | LPJ80SP | BUSS |
| FU1-3 | 1 | FUSE BLOCK | 3P | BC6033PQ | BUSS |
| FU4-6 | 1 | FUSE BLOCK | 3P | J60100-3CR | BUSS |
| MMS1,2 | 2 | MANUAL MOTOR STARTERS | 14A | GV2P16 | SQUARE D |
| C1,2 | 2 | CONTACTORS | 18A | LC1D18G7 | SQUARE D |
| | 2 | AUXILARY CONTACTS | | GVAN11 | SQUARE D |
| SSW1,2 | 2 | HOA SWITCHES | 3 POS. | HW1S-3TF20 | IDEC |
| | 2 | INDICATOR LIGHTS | GREEN | HW1P-1FQD-G-120V | IDEC |
| DIALER | 1 | AUTODIALER | | SENSAPHONE 400 + BAT5 | SENSAPHONE |
| | 3 | INDICATOR LIGHTS | RED | HW1P-1FQD-R-120V | IDEC |
| T1 | 1 | TRANSFORMER | 500VA | PH500MQMJ | HAMMOND |
| ◉ | 20 | TERMINALS | 50A | 3044131 | PHOENIX |
| PR1 | 1 | PROBE RELAY | 4 CH. | 47X1B0A4 | GEMS |
| PB | 1 | POWER BLOCK | | 1423570 | MARATHON |
| CR4,5 | 2 | CONTROL RELAYS | 3P | RH3B-ULAC120V | IDEC |
| | 3 | RELAY BASES | | SR3B-05 | IDEC |
| OUTLET | 1 | DUPLEX RECEPTACLE | | 7599-I | LEVITON |
| PB1 | 1 | PUSH BUTTON | | HW1B-M1-F11-B | IDEC |
| ALT1 | 1 | ALTERNATING RELAY | | ARA120ADA | DIVERSIFIED |
| | 1 | SOCKET | | SR2P-06 | IDEC |
| | 1 | END PLATE | | 3047028 | PHOENIX |
| | 2 | END CLAMPS | | 0800886 | PHOENIX |
| CR7-10 | 4 | CONTROL RELAYS | 1P | PLC-RSC-120UC/21 | PHOENIX |

## CONDENSOR CONTROL DEVICES

| ITEM | QTY | DESCRIPTION | | | MFGR. |
|---|---|---|---|---|---|
| FU7,8 | 2 | FUSES | 15A | LPCC-15 | BUSS |
| FU7,8 | 1 | FUSE BLOCK | 2P | BC6032PQ | BUSS |
| MMS3,4 | 2 | MANUAL MOTOR STARTERS | 4-6A | GV2P10 | SQUARE D |
| C3,4 | 2 | CONTACTORS | 9A | LC1D09G7 | SQUARE D |
| | 2 | AUXILARY CONTACTS | | GVAN11 | SQUARE D |
| SSW3,4 | 2 | HOA SWITCHES | 3 POS. | HW1S-3TF20 | IDEC |
| | 2 | INDICATOR LIGHTS | GREEN | HW1P-1FQD-G-120V | IDEC |
| | 1 | INDICATOR LIGHT | RED | HW1P-1FQD-R-120V | IDEC |
| CR1,2,6 | 3 | CONTROL RELAY | 3P | RH3B-ULAC120V | IDEC |
| | 3 | RELAY BASE | | SR3B-05 | IDEC |
| CR3 | 1 | CONTROL RELAY | 4P | RH4B-ULAC120V | IDEC |
| | 1 | RELAY BASE | | SR4B-05 | IDEC |




NAMEPLATE SCHEDULE–

1– BLOWER NO. 1 RUNNING
2– BLOWER NO. 2 RUNNING
3– MAIN DISCONNECT
4– BLOWER NO. 1 CONTROL HAND OFF AUTO
5– BLOWER NO. 2 CONTROL HAND OFF AUTO
6– PUMP NO. 1 RUNNING
7– PUMP NO. 2 RUNNING
8– PUMP NO. 1 CONTROL HAND OFF AUTO
9– PUMP NO. 2 CONTROL HAND OFF AUTO
10– LOCAL HIGH CONDENSATE LEVEL
11– BLOWER NO. 1 OVERLOAD
12– BLOWER NO. 2 OVERLOAD
13– REMOTE HIGH CONDENSATE LEVEL
14– ALARM RESET



AS-BUILT

NOTES
- NOT SUPPLIED BY SUPERIOR CUSTOM CONTROLS.
- DENOTES TERMINALS INTERNAL TO PANEL.
- DENOTES INTRINSICALLY SAFE TERMINAL
- DENOTES WIRING EXTERNAL TO PANEL.
- DENOTES WIRING INTERNAL TO PANEL.

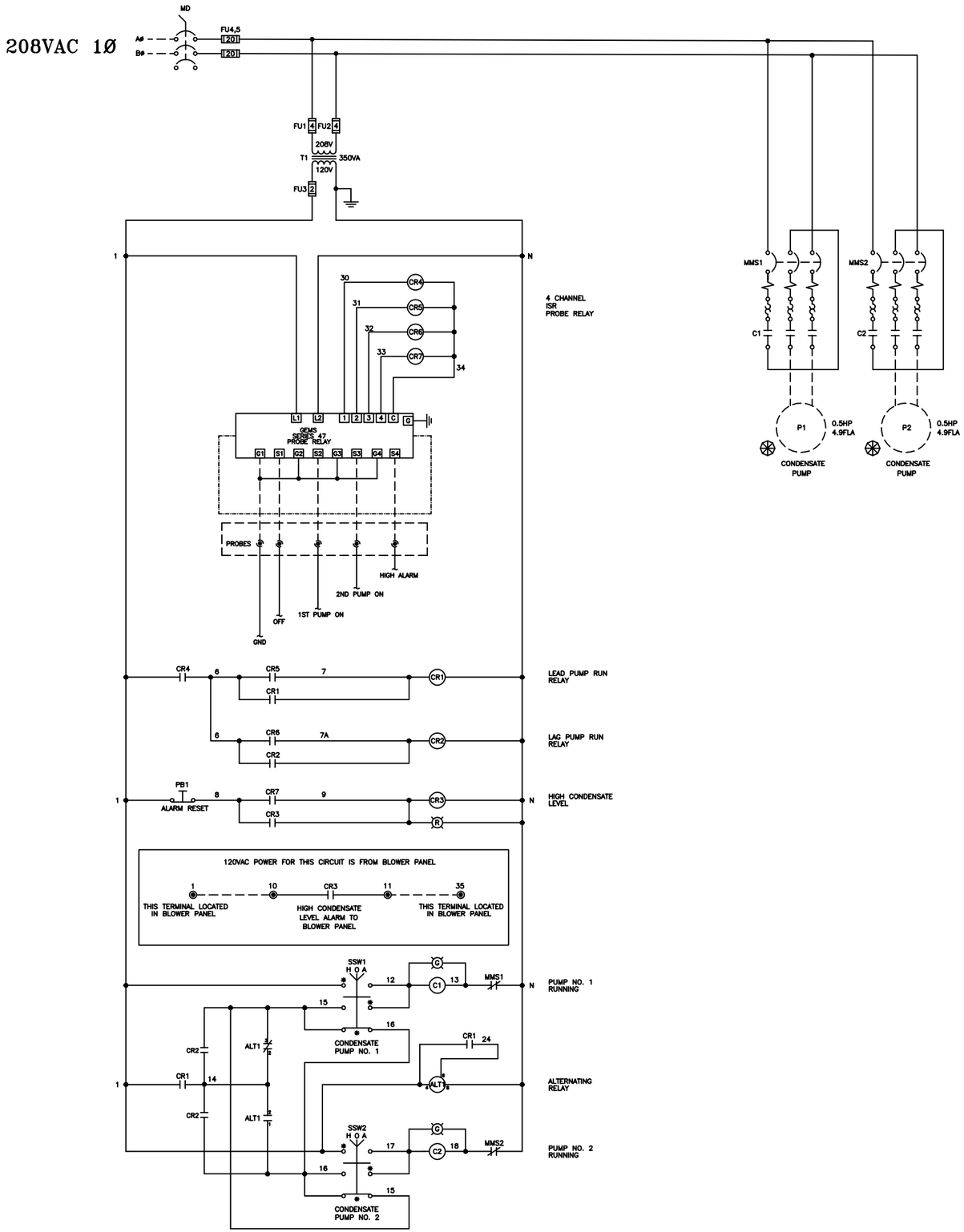
DENOTES COMPONENTS AND CIRCUITRY ARE LOCATED INSIDE AN INTRINSICALLY SAFE AREA

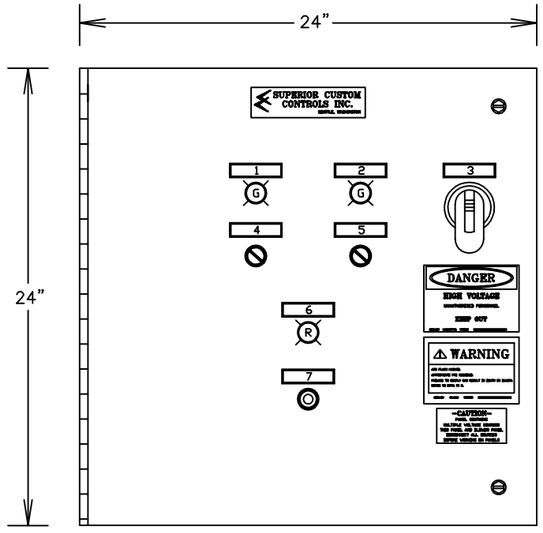
GLACIER ENVIRONMENTAL

SUPERIOR CUSTOM CONTROLS
12544 27th AVE. N.E. SEATTLE, WA 98125

| | | |
|---|---|---|
| SCALE: NONE | PREV. REV: 21JUL2014 | DRAWN BY: WR |
| DATE: 24NOV2014 | PAGE: 1 OF 2 | REVISED: 11NOV2014 |

SOUTH PARK LANDFILL
BLOWER PANEL
SCHEMATIC DIAGRAM AND DOOR LAYOUT
DRAWING: 3817-1




## LIST OF MATERIALS

| ITEM | QTY | DESCRIPTION | | | MFGR. |
|---|---|---|---|---|---|
| | 1 | ENCLOSURE | 24X24 | CSD24248 | HOFFMAN |
| | 1 | PAN | | CP2424 | HOFFMAN |
| | 1 | FOOT KIT | | CMFK | HOFFMAN |
| MD | 1 | MAIN DISCONNECT | 25A | OT25F3 | ABB |
| | 1 | HANDLE | | OHB65J6 | ABB |
| | 1 | SHAFT | | OXP6X210 | ABB |
| FU1,2 | 2 | PRIMARY FUSES | 4A | FNQR-4 | BUSS |
| FU3 | 1 | SECONDARY FUSE | 2A | FNM-2 | BUSS |
| FU4,5 | 2 | FUSES | 20A | LPCC-20 | BUSS |
| FU1-3 | 1 | FUSE BLOCK | 3P | BC6033PQ | BUSS |
| FU4,5 | 1 | FUSE BLOCK | 2P | BC6032PQ | BUSS |
| MMS1,2 | 2 | MANUAL MOTOR STARTERS | 10A | GV2P10 | SQUARE D |
| C1,2 | 2 | CONTACTORS | 9A | LC1D09G7 | SQUARE D |
| | 2 | AUXILARY CONTACTS | | GVAN11 | SQUARE D |
| SSW1,2 | 2 | HOA SWITCHES | 3 POS. | HW1S-3TF20 | IDEC |
| | 2 | INDICATOR LIGHTS | GREEN | HW1P-1FQD-G-120V | IDEC |
| | 1 | INDICATOR LIGHT | RED | HW1P-1FQD-R-120V | IDEC |
| T1 | 1 | TRANSFORMER | 350VA | PH350MLJ | HAMMOND |
| ◉ | 15 | TERMINALS | 50A | 3044131 | PHOENIX |
| PR1 | 1 | PROBE RELAY | 4 CH. | 47X1B0A4 | GEMS |
| PB | 1 | POWER BLOCK | | 1423570 | MARATHON |
| CR1-3 | 3 | CONTROL RELAYS | 3P | RH3B-ULAC120V | IDEC |
| | 2 | RELAY BASES | | SR3B-05 | IDEC |
| CR4-7 | 4 | CONTROL RELAYS | 1P | PLC-RSC-120UC/21 | PHOENIX |
| PB1 | 1 | PUSH BUTTON | | HW1B-M1-F11-B | IDEC |
| ALT1 | 1 | ALTERNATING RELAY | | ARA120ADA | DIVERSIFIED |
| | 1 | SOCKET | | SR2P-06 | IDEC |
| | 1 | END PLATE | | 3047028 | PHOENIX |
| | 2 | END CLAMPS | | 0800886 | PHOENIX |

### NAMEPLATE SCHEDULE-

1- PUMP NO. 1 RUNNING
2- PUMP NO. 2 RUNNING
3- MAIN DISCONNECT
4- PUMP NO. 1 CONTROL
HAND OFF AUTO
5- PUMP NO. 2 CONTROL
HAND OFF AUTO
6- HIGH CONDENSATE LEVEL
7- ALARM RESET

AS-BUILT

### NOTES

- ⊛ NOT SUPPLIED BY SUPERIOR CUSTOM CONTROLS.
- ◉ DENOTES TERMINALS INTERNAL TO PANEL.
- ⊗ DENOTES INTRINSICALLY SAFE TERMINAL
- — DENOTES WIRING EXTERNAL TO PANEL.
- — DENOTES WIRING INTERNAL TO PANEL.

DENOTES COMPONENTS AND CIRCUITRY ARE LOCATED INSIDE AN INTRINSICALLY SAFE AREA



GLACIER ENVIRONMENTAL

SUPERIOR CUSTOM CONTROLS
12544 27th AVE. N.E. SEATTLE, WA 98125

| | | |
|---|---|---|
| SCALE: NONE | PREV. REV: 21JUL2014 | DRAWN BY: WR |
| DATE: 24NOV2014 | PAGE: 2 OF 2 | REVISED: 18AUG2014 |

SOUTH PARK LANDFILL
CONDENSATE PANEL

SCHEMATIC DIAGRAM AND DOOR LAYOUT | DRAWING: 3817-2

# CARTRIDGE FILTERS AND FILTER-SILENCERS

## FOR BLOWERS, COMPRESSORS, AND ENGINES


## Outstanding Features

- **Weatherhoods for CCF and CCS sizes 2½ in. through 5 in. are rugged blue ABS composite material that may be painted. All other components are carbon steel construction with a high-quality semi-gloss enamel finish.**
- **Unique design options, combined with the latest manufacturing techniques, ensure optimum performance and long life even under demanding conditions.**
- **Choice of filter only or filter-silencer.**
- **Female pipe thread connections are standard for pipe sizes ½ in. through 3½ in. and optional for pipe sizes 4 in. and 5 in.**
- **Removable lightweight weatherhood (CCS and CCF) or removable top plate (CS and CF) for easy access to the filter element.**
- **Interchangeable element options for desired filtration characteristics in the same housing.**
- **Filter restriction gauges are optional for all units.**

## Advanced Design and Testing

- **Our extensive in-house engineering, manufacturing, and testing facilities ensure optimized process, mechanical, and acoustic performance for your application.**

Universal Silencer's cartridge filters and filter-silencers offer high-performance filtration and silencing in a convenient, economical cartridge configuration. Choose from four standard models for pipe sizes ranging from ½ in. to 16 in. and for flow capacities ranging from 15 to 7700 CFM. Three types of filter element media — pleated paper, pleated felt, or wire mesh — are available to suit your application.

The CCF and CF series filters are high-quality air filters without a silencing section. The CCF has a removable weatherhood, and the CF has a removable top plate. Our CCS and CS intake filter-silencers have a built-in silencing section. The CCS features a removable weatherhood, and the CS has a removable top plate for easy access to the filter element.

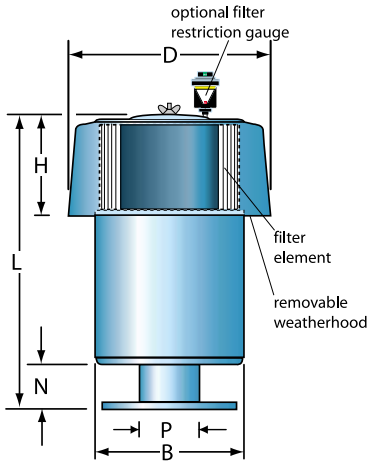
UNIVERSAL
Acoustic & Emission Technologies

# SPECIFICATIONS

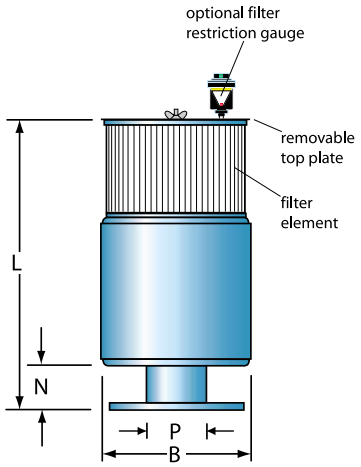
## CCS and CS Filter-Silencers

### Noise Attenuation, CCS and CS Filter-Silencers

| Octave Band Center Frequency, Hz | 63 | 125 | 250 | 500 | 1 k | 2 k | 4 k | 8 k |
|---|---|---|---|---|---|---|---|---|
| Attenuation, dB | 5 | 8 | 10 | 12 | 14 | 14 | 14 | 14 |

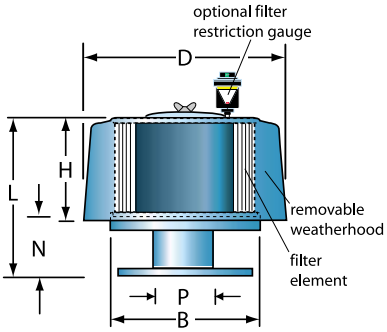



CCS Series (with weatherhood)

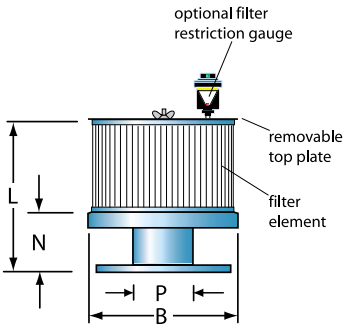



CS Series (with top plate)

## CCF and CF Filters




CCF Series (with weatherhood)




CF Series (with top plate)

### DIMENSIONS AND WEIGHTS

| P (size) | Rated Flow Capacity (CFM) | D | H | B | N | | | | L | | | | Approximate Weight with Paper Elements | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | CCF | CCS | CF | CS | CCF | CCS | CF | CS | CCF | CCS | CF | CS |
| ½ | 15 | 8.00 | 3.13 | 6.00 | Use | — | Use | — | Use | 6.50 | Use | 6.50 | Use | 7 | Use | 7 |
| ¾ | 22 | 8.00 | 3.13 | 6.00 | CCS | — | CS | — | CCS | 6.50 | CS | 6.50 | CCS | 7 | CS | 7 |
| 1 | 35 | 8.00 | 3.13 | 6.00 | Series. | — | Series. | — | Series. | 6.50 | Series. | 6.50 | Series. | 7 | Series. | 7 |
| 1¼ | 60 | 9.00 | 3.50 | 6.50 | — | — | — | — | 3.50 | 7.88 | 3.50 | 7.88 | 9 | 10 | 5 | 9 |
| 1½ | 75 | 9.00 | 3.50 | 6.50 | — | — | — | — | 3.50 | 7.88 | 3.50 | 7.88 | 9 | 10 | 5 | 9 |
| 2 | 120 | 9.00 | 3.50 | 6.50 | — | — | — | — | 3.50 | 7.88 | 3.50 | 7.88 | 8 | 10 | 5 | 8 |
| 2½ | 190 | 13.44 | 6.75 | 10.00 | 1.00 | 1.00 | 1.00 | 1.00 | 7.50 | 17.69 | 7.13 | 17.31 | 11 | 19 | 10 | 18 |
| 3 | 275 | 13.44 | 6.75 | 10.00 | 1.00 | 1.00 | 1.00 | 1.00 | 7.50 | 17.69 | 7.13 | 17.31 | 10 | 18 | 9 | 17 |
| 3½ | 375 | 13.44 | 6.75 | 10.00 | 1.13 | 1.13 | 1.13 | 1.13 | 7.63 | 17.69 | 7.25 | 17.31 | 13 | 2012 | 19 | |
| 4 (NPT) | 500 | 13.44 | 6.75 | 10.00 | 1.13 | 1.13 | 1.13 | 1.13 | 7.63 | 17.69 | 7.25 | 17.31 | 12 | 19 | 11 | 18 |
| 4 (flanged) | 500 | 13.44 | 6.75 | 10.00 | 4.00 | 3.00 | 4.00 | 3.00 | 10.50 | 19.63 | 10.13 | 19.25 | 14 | 21 | 13 | 20 |
| 5 (NPT) | 750 | 13.44 | 6.75 | 10.00 | 1.81 | 1.81 | 1.81 | 1.81 | 8.38 | 18.25 | 8.00 | 17.88 | 12 | 19 | 11 | 18 |
| 5 (flanged) | 750 | 13.44 | 6.75 | 10.00 | 4.00 | 3.00 | 4.00 | 3.00 | 10.50 | 19.56 | 10.13 | 19.13 | 16 | 23 | 15 | 22 |
| 6 | 1100 | 18.00 | 9.50 | 14.00 | 4.00 | 3.00 | 4.00 | 3.00 | 13.31 | 25.25 | 12.75 | 24.75 | 31 | 43 | 23 | 35 |
| 8 | 2200 | 18.00 | 18.00 | 14.00 | 4.00 | 3.00 | 4.00 | 3.00 | 21.88 | 33.88 | 21.38 | 33.38 | 43 | 56 | 30 | 43 |
| 10 | 3000 | 24.00 | 11.50 | 18.00 | 4.00 | 3.00 | 4.00 | 3.00 | 15.38 | 29.25 | 14.19 | 28.13 | 52 | 83 | 41 | 67 |
| 12 | 4300 | 24.00 | 11.50 | 18.00 | 4.00 | 3.00 | 4.00 | 3.00 | 15.38 | 29.25 | 14.19 | 28.13 | 64 | 91 | 48 | 75 |
| 14 | 5900 | 30.00 | 15.44 | 24.00 | 4.00 | 3.00 | 4.00 | 3.00 | 19.38 | 36.25 | 18.25 | 35.06 | 97 | 143 | 75 | 121 |
| 16 | 7700 | 30.00 | 15.44 | 24.00 | 4.00 | 3.00 | 4.00 | 3.00 | 19.38 | 36.25 | 18.25 | 35.06 | 101 | 145 | 79 | 123 |

- **All models have a 1/8-in. FNPT tap for installation of a gauge or manometer to monitor pressure drop.**
- **Sizes ½ in. through 3½ in. are standard with female pipe thread connection (FNPT).**
- **Sizes 4 in. and 5 in. are available with female threads or flanges. Please specify "threaded" or "flanged" when you order 4 in. and 5 in. sizes.**
- **Sizes 6 in. through 16 in. are standard with 150# ANSI drilled plate flanges.**
- **Rated capacity is based upon exit velocity of approximately 5500 ft/min. If pressure drop allowance permits, capacity may be increased by as much as 50%.**

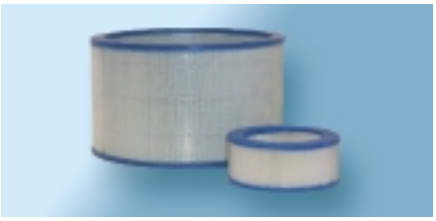
### PRESSURE DROP, CLEAN, ALL MODELS

| Percentage of Rated Flow | 50 | 75 | 100 | 125 | 150 |
|---|---|---|---|---|---|
| Pressure Drop, Inches $H_2O$ | 0.7 | 1.6 | 2.8 | 4.4 | 6.3 |

# FILTER ELEMENTS

Three types of filter elements are available for Universal's cartridge filters and filter-silencers. The pleated paper elements provide the highest efficiency and are considered standard. Pleated felt and wire mesh elements are available for less demanding service, with respect to efficiency. The three types of elements are completely interchangeable and will fit the CCS, CS, CF, or CCF filter housings.

**SERVICE INTERVALS:** Paper and felt elements are typically cleaned or replaced when the air flow resistance has increased by 4 inches of water over the initial clean resistance. The maximum restriction recommended across the filter elements is 20 inches of water, but this value may be greater than the equipment can tolerate for best efficiency. The wire mesh elements should be cleaned when they are visibly dirty and re-treated with Universal Oil-Free Adhesive or motor oil. Resistance is typically not a good indicator for cleaning wire mesh elements; a periodic cleaning schedule is recommended.



## Pleated Paper Element

**SPECIFICATIONS:**

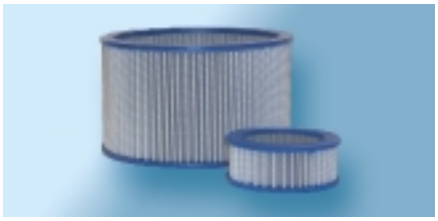
- **High-quality industrial grade filter paper—pleated and oven-cured during production.**
- **Oven-cured plastisol end caps with molded sealing beads (larger elements for pipe sizes (P) 10 in., 12 in., 14 in., and 16 in. have metal end caps and closed-cell rubber gaskets).**
- **Media efficiency: 99.5% on 2 microns; 97% on 1 micron.**
- **Maximum operating temperature: 200° F for units with ½ in. through 16 in. pipe sizes.**

**SERVICE INSTRUCTIONS:**

Because of the low cost of the paper element, it is generally treated as a consumable and replaced when dirty. However, depending upon customer preference, the paper element may be cleaned with compressed air and reused.

**Compressed Air Cleaning:**

Carefully direct compressed air (100 PSI maximum) through the dry element, opposite the normal direction of flow. After cleaning, inspect carefully for holes or cracks. If damaged, replace element.



## Pleated Felt Element

**SPECIFICATIONS:**

- **Durable polyester felt media — pleated.**
- **Oven-cured plastisol end caps with molded sealing beads (larger elements for pipe sizes (P) 10 in., 12 in., 14 in., and 16 in. have metal end caps with closed cell rubber gaskets).**
- **Media efficiency: 99% on 10 microns.**
- **Maximum operating temperature: 200° F for units with ½ in. through 8 in. pipe sizes.**

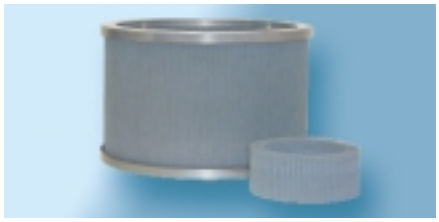
  **250° F for units with 10 in. through 16 in. pipe sizes using elements with metal end caps.**

**SERVICE INSTRUCTIONS:**

Pleated felt elements may be cleaned with compressed air (as described for paper elements) or water and reused.

**Water Cleaning:**

Rap gently to dislodge accumulated dirt, soak thoroughly approximately 15 minutes in warm water and mild detergent. Rinse thoroughly under low-pressure water. Air dry—do not dry with compressed air. After cleaning, inspect carefully for holes or cracks. If damaged, replace element.



## Wire Mesh Element

**SPECIFICATIONS:**

- **Galvanized wire-mesh media—corrugated construction.**
- **Larger elements for pipe sizes (P) 6 in., 8 in., 10 in., 12 in., 14 in., and 16 in. have metal end caps.**
- **For best efficiency, wire mesh elements must be treated with oil or oil-free adhesive.**
- **May be cleaned and reused indefinitely.**
- **Wire mesh elements are considered "roughing" filters and are not recommended for applications that require efficient filtration of fine particles.**
- **Approximate efficiency: 93% on 10 microns. Efficiency will vary with element oil or adhesive coverage.**
- **Maximum operating temperature: 200° F for ½ in. through 16 in. with oil-free adhesive (the flash point for oil-free adhesive is 235° F).**

  **300° F for ½ in. through 16 in. without oil-free adhesive. Filter efficiency is much lower without oil-free adhesive on the filter. Higher temperatures can be used with uncoated ½ in. through 5 in. filter elements without end caps.**

**SERVICE INSTRUCTIONS:**

New elements are delivered pre-treated with Universal Silencer's oil-free adhesive. See the back page for details. For best efficiency, wire mesh elements must be re-treated after each cleaning. Spray the element on both sides with Universal Oil-Free Adhesive, P/N 81-0323, following the directions on the container. For oil treatment, dip the element in SAE 30-50 motor oil and drain thoroughly before using.

To clean wire mesh elements, wash in solvent or warm water and detergent in a container large enough for complete immersion of element. Rinse completely, drain, and either air dry or use compressed air. After cleaning and drying, re-treat the element with oil-free adhesive or oil as described.

| | Replacement Element Part No. | | |
|---|---|---|---|
| P (nom.) | Paper | Felt | Wire |
| 1/2 | 81-0470 | 81-1202 | 81-1035 |
| 3/4 | 81-0470 | 81-1202 | 81-1035 |
| 1 | 81-0470 | 81-1202 | 81-1035 |
| 1 1/4 | 81-0471 | 81-1203 | 81-1036 |
| 1 1/2 | 81-0471 | 81-1203 | 81-1036 |
| 2 | 81-0471 | 81-1203 | 81-1036 |
| 2 1/2 | 81-1063, 81-0472 (old) | 81-1205, 81-1204 (old) | 81-1038, 81-1037 (old) |
| 3 | 81-1063, 81-0472 (old) | 81-1205, 81-1204 (old) | 81-1038, 81-1037 (old) |
| 3 1/2 | 81-1063 | 81-1205 | 81-1038 |
| 4 | 81-1063 | 81-1205 | 81-1038 |
| 5 | 81-1063, 81-0474 (old) | 81-1205, 81-1206 (old) | 81-1038, 81-1039 (old) |
| 6 | 81-0475 | 81-1207 | 81-1040 |
| 8 | (2) 81-0475 | (2) 81-1207 | (2) 81-1040, (1) 81-1199 (old) |
| 10 | 81-1163 | 81-1209 | 81-1200 |
| 12 | 81-1163 | 81-1209 | 81-1200 |
| 14 | 81-1164 | 81-1210 | 81-1201 |
| 16 | 81-1164 | 81-1210 | 81-1201 |

UNIVERSAL

Our corporate headquarters are located in Stoughton, Wisconsin, just southeast of Madison, the state capital. This new building houses administration, sales, and engineering departments.

Manufacturing facilities are in Muscoda (above), 75 miles west of Stoughton, and Montello (below), 70 miles north.

Our products have been used to protect, quiet, and optimize the performance of industrial equipment for 50 years. We maintain a fully equipped testing facility to qualify filters and silencers. We are an ISO 9001 registered firm and ASME Code certified.

*Keeping industrial equipment clean and quiet.*

# Cartridge Air Filters and Filter-Silencers

## AIR FILTER RESTRICTION GAUGE

Universal's Filter Restriction Gauge provides a convenient, accurate means of monitoring filter pressure drop as the filter element becomes increasingly loaded with dirt. Cartridge filters and filter-silencers are standard with threaded connections for direct mounting of the gauge. See product bulletin 81-1234 for a complete description.

## OIL-FREE ADHESIVE FOR WIRE MESH ELEMENTS

This is an oil-free product developed for use on viscous impingement filters. It is a substitute for applications that do not permit oil wetting of the filter elements, such as oil-free compressors. Universal oil-free filter adhesive is available in 16-ounce aerosol spray cans, packaged 6 cans per case. Order by part number 81-0323.

**Contact us for more information about our complete line of industrial silencers, air filters, and filter-silencers:**

- **Air filters and filter-silencers, catalog 241-A**
- **CB compact blower silencers, catalog 255-A**
- **CBF/CBFI compact blower filter-silencers, catalog 261-A**
- **Air filter restriction gauge, catalog 81-1234**
- **Reciprocating engine silencers and filters, catalog 246-A**
- **Rotary positive blower silencers, catalog 244-D**
- **Absorptive silencers, catalog 245-B**
- **Vent and blowdown silencers, catalog 243-C**
- **Compressor silencers and filters, information provided by application**
- **Vacuum pump separator silencers, catalog 222-B**
- **Industrial fan silencers, catalog 249-A, 249-D**
- **Steam ejectors, pressure reduction valves, and other special applications**
- **Gas turbine silencers and filters, catalog B-249-A**
- **Acousti-Tube® Silencers, catalog 260**
- **Acousti-Tube® Silencer Series, technical bulletin 94-1315**
- **StrataClean™ barrier air filter systems, catalog 268**
- **StrataClean™ Pulse air filter systems, catalog 269**

UNIVERSAL
Acoustic & Emission Technologies
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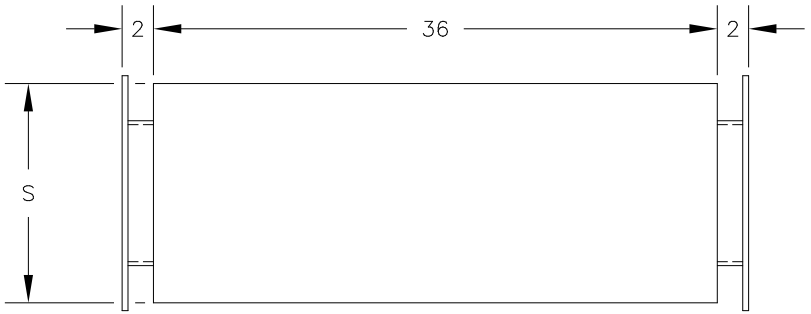
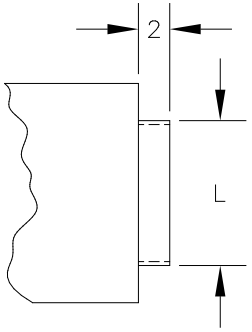
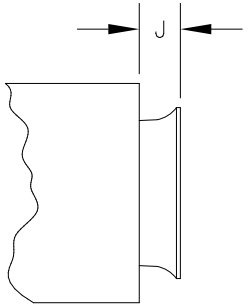



FLANGED




PLAIN PIPE




VENTURI

MOUNTING CODE

A-FLANGES–BOTH ENDS.
B-PLAIN PIPE–BOTH ENDS.
C-ONE END FLANGED & ONE END PLAIN PIPE.
⊕D-ONE END FLANGED & ONE VENTURI END.
⊕E-ONE END PLAIN PIPE & ONE VENTURI END.

⊕ NOT AVAILIABLE ON SIZE 4.

TOLERANCE: ±1/8

| SIZE | J | L (O.D.) | S (DIA.) | FLANGE DIMENSION | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | I.D. | O.D. | BOLT CIRCLE | HOLES NO. | HOLES DIA. |
| 4 | —— | 4 1/2 | 14 | 4 | 9 | 7 1/2 | 8 | 3/4 |
| 6 | 2 5/8 | 6 5/8 | 14 | 6 | 11 | 9 1/2 | 8 | 7/8 |
| 8 | 2 5/8 | 8 5/8 | 14 | 8 | 13 1/2 | 11 3/4 | 8 | 7/8 |
| 10 | 2 5/8 | 10 3/4 | 20 | 10 | 16 | 14 1/4 | 12 | 1 |
| 12 | 3 5/8 | 12 3/4 | 20 | 12 | 19 | 17 | 12 | 1 |

FAN SILENCERS ARE OF HEAVY WELDED STEEL CONSTRUCTION FILLED WITH HIGH DENSITY ACOUTSICAL ABSORPTION MATERIAL.

MAXIMUM TEMPERATURE: 800°F

DIMENSIONS SHOULD NOT BE USED FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.

CERTIFIED DRAWING | FORM NO. H–4J

DATE _____ CERTIFIED _____ CONTROL NO. _____
CUSTOMER'S NO. _____
TAG _____

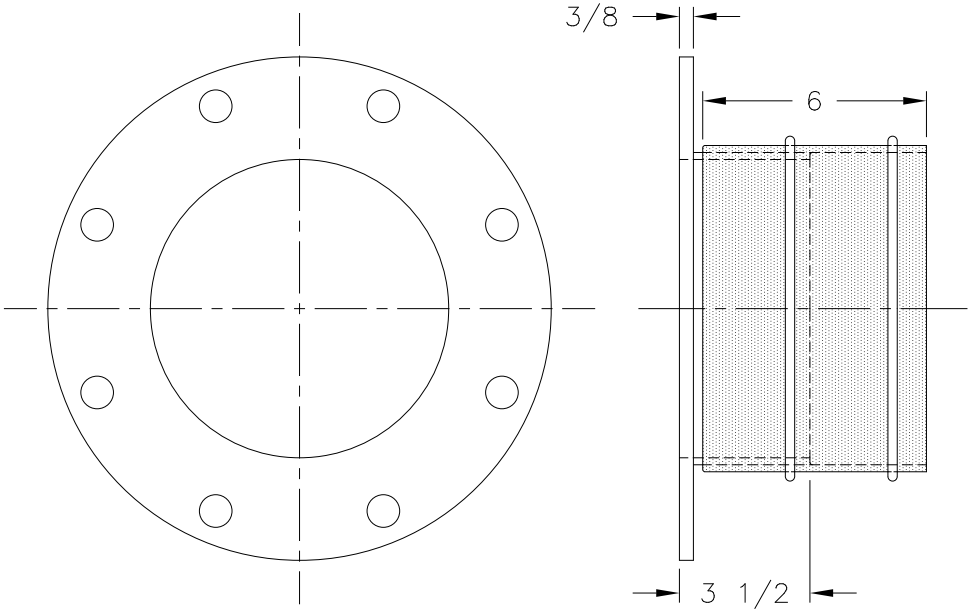
| SIZE | QTY. | MTG. CODE |
|---|---|---|
| | | |
| | | |

nyb The New York Blower Company
7660 Quincy Street
Willowbrook, IL. 60521

# FAN SILENCER FOR PRESSURE BLOWERS

DRAWING NUMBER

FILE _____ DWG. _____




FLANGE FITS ANSI 150 PIPE FLANGES.

FLEXIBLE NEOPRENE SLEEVE HELD ON STUB PIPE AND STANDARD 4, 6, 8, 10, OR 12 INCH PIPE OF SYSTEM WITH WORM DRIVE ADJUSTABLE HOSE CLAMPS.

SLEEVE DIMENSIONS

| SIZE | I.D. |
|---|---|
| 4 | 4 1/2 |
| 6 | 6 5/8 |
| 8 | 8 5/8 |
| 10 | 10 3/4 |
| 12 | 12 3/4 |

FLANGE DIMENSIONS

| SIZE | I.D. | B.C. | O.D. | HOLES NO. & SIZE |
|---|---|---|---|---|
| 4 | 4 | 7 1/2 | 9 | 8 – 3/4 |
| 6 | 6 | 9 1/2 | 11 | 8 – 7/8 |
| 8 | 8 | 11 3/4 | 13 1/2 | 8 – 7/8 |
| 10 | 10 | 14 1/4 | 16 | 12 – 1 |
| 12 | 12 | 17 | 19 | 12 – 1 |

TOLERANCE: ±1/8"

CERTIFIED DRAWING | FORM NO. B–6 L

DIMENSIONS SHOULD NOT BE USED FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.

DATE _____ CERTIFIED _____ CONTROL NO. _____

CUSTOMER'S NO. _____

TAG _____

| SIZE | FAN SIZE | QTY. |
|---|---|---|
| | | |
| | | |

nyb The New York Blower Company
7660 Quincy Street
Willowbrook, IL. 60521

# FLEXIBLE CONNECTOR FOR PRESSURE BLOWERS

DRAWING NUMBER

FILE _____ DWG. _____

ENERGY AND COMFORT

Indoor Air Quality

# VELOCICALC® Plus Air Velocity Meter

Models 8384/8384A/8385/
8385A/8386/8386A


Operation and Service Manual

1980321, Revision J
July 2010

TRUST. SCIENCE. INNOVATION.

**Address**
TSI Incorporated / 500 Cardigan Road / Shoreview, MN 55126 / USA

**Fax No.**
(651) 490-3824

**LIMITATION OF WARRANTY AND LIABILITY** (effective July 2000)

Seller warrants the goods sold hereunder, under normal use and service as described in the operator's manual, shall be free from defects in workmanship and material for twenty-four (24) months, or the length of time specified in the operator's manual, from the date of shipment to the customer. This warranty period is inclusive of any statutory warranty. This limited warranty is subject to the following exclusions:

a. Hot-wire or hot-film sensors used with research anemometers, and certain other components when indicated in specifications, are warranted for 90 days from the date of shipment.
b. Parts repaired or replaced as a result of repair services are warranted to be free from defects in workmanship and material, under normal use, for 90 days from the date of shipment.
c. Seller does not provide any warranty on finished goods manufactured by others or on any fuses, batteries or other consumable materials. Only the original manufacturer's warranty applies.
d. Unless specifically authorized in a separate writing by Seller, Seller makes no warranty with respect to, and shall have no liability in connection with, goods which are incorporated into other products or equipment, or which are modified by any person other than Seller.

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TO THE EXTENT PERMITTED BY LAW, THE EXCLUSIVE REMEDY OF THE USER OR BUYER, AND THE LIMIT OF SELLER'S LIABILITY FOR ANY AND ALL LOSSES, INJURIES, OR DAMAGES CONCERNING THE GOODS (INCLUDING CLAIMS BASED ON CONTRACT, NEGLIGENCE, TORT, STRICT LIABILITY OR OTHERWISE) SHALL BE THE RETURN OF GOODS TO SELLER AND THE REFUND OF THE PURCHASE PRICE, OR, AT THE OPTION OF SELLER, THE REPAIR OR REPLACEMENT OF THE GOODS. IN NO EVENT SHALL SELLER BE LIABLE FOR ANY SPECIAL, CONSEQUENTIAL OR INCIDENTAL DAMAGES. SELLER SHALL NOT BE RESPONSIBLE FOR INSTALLATION, DISMANTLING OR REINSTALLATION COSTS OR CHARGES. No Action, regardless of form, may be brought against Seller more than 12 months after a cause of action has accrued. The goods returned under warranty to Seller's factory shall be at Buyer's risk of loss, and will be returned, if at all, at Seller's risk of loss.

Buyer and all users are deemed to have accepted this LIMITATION OF WARRANTY AND LIABILITY, which contains the complete and exclusive limited warranty of Seller. This LIMITATION OF WARRANTY AND LIABILITY may not be amended, modified or its terms waived, except by writing signed by an Officer of Seller.

**Service Policy**

Knowing that inoperative or defective instruments are as detrimental to TSI as they are to our customers, our service policy is designed to give prompt attention to any problems. If any malfunction is discovered, please contact your nearest sales office or representative, or call TSI's Customer Service department at (800) 874-2811 (USA) and 1 (651) 490-2811 (International).

# CONTENTS

## Chapters

Chapter 1

# Unpacking and Parts Identification

Carefully unpack the instrument and accessories from the shipping container. Check the individual parts against the list of components in Table 1-1. If anything is missing or damaged, notify TSI immediately.

**Table 1-1: List of Components**

| Qty | Item Description | Part / Model |
|---|---|---|
| 1 | Model 8384 VELOCICALC Plus or | 8384 |
| | Model 8384A VELOCICALC Plus (articulating probe) or | 8384A |
| | Model 8385 VELOCICALC Plus or | 8385 |
| | Model 8385A VELOCICALC Plus (articulating probe) or | 8385A |
| | Model 8386 VELOCICALC Plus or | 8386 |
| | Model 8386A VELOCICALC Plus (articulating probe) | 8386A |
| 1 | Carrying Case | 1319156 |
| 4 | AA Alkaline Batteries | 1208013 |
| 1 | AC Adapter (optional)<br>120 V, NEMA-5, 60 Hz, or<br>230 V, European, CEE 7/16, 50 Hz or<br>230 V, Great Britain, 50 Hz, or<br>240 V, Australian, 50 Hz | <br>2613033<br>2613078<br>800169<br>2613106 |
| 1 | Operation and Service Manual | 1980321 |
| 1 | Static Pressure Tip | 3002017 |
| 1 | Pitot Tube (optional) | 3002018 |
| 8 ft. | Rubber Tubing | 801039 |
| 1 | Interface Cable (Instrument to Computer) | 8940 |
| 1 | Downloading Software | 800832 |

## Parts Identification

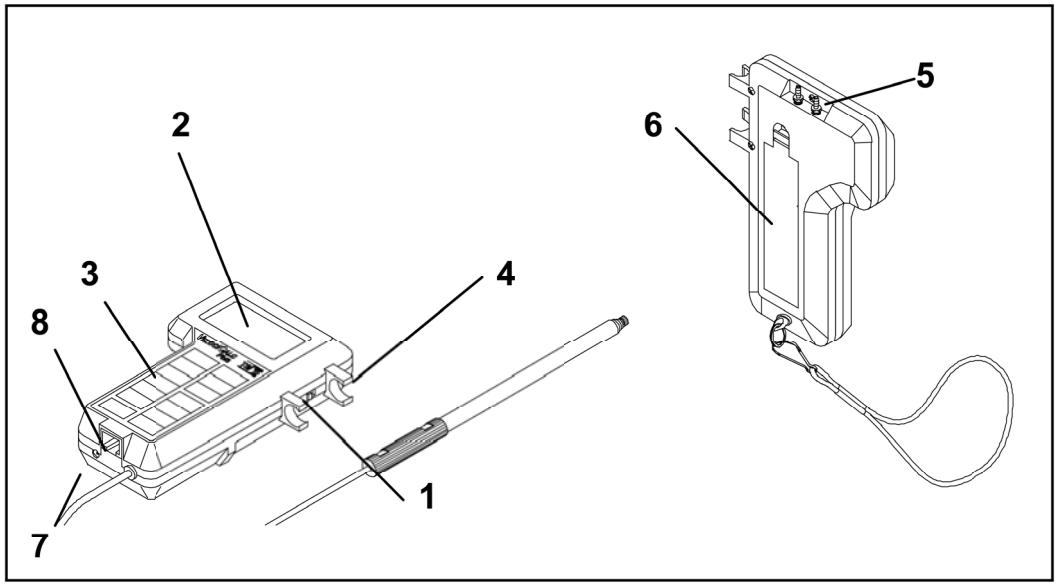



**Figure 1-1: VELOCICALC Plus**

1. Backlight Switch
2. Display
3. Keypad
4. Probe Mounting Clips
5. Pressure Measurement Ports
6. Battery Access Cover
7. AC Adapter port
8. Printer Output / Communications Port

Chapter 2

# Setting-up

## Supplying Power to the VELOCICALC Plus

The VELOCICALC Plus can be powered in one of two ways: four size AA batteries or the optional AC adapter.

### Installing the Batteries

Insert four AA batteries as indicated by the diagram located on the inside of the battery compartment. The VELOCICALC Plus is designed to operate with either alkaline or NiCd rechargeable batteries. Battery life will be shorter if NiCd batteries are used. Carbon-zinc batteries are not recommended because of the danger of battery acid leakage.

**Table 2-1 Typical Battery Life at 20°C**

| Air Velocity (ft/min) | Air Velocity (m/s) | Alkaline (hrs) |
|---|---|---|
| 100 | 0.5 | >8.0 |
| 5000 | 25.0 | 5.0 |

### Using the Optional AC Adapter

When using the AC adapter, the batteries (if installed) will be bypassed. The AC adapter is not a battery charger. Be sure to provide the correct voltage and frequency which is marked on the back of the AC adapter.

## Selecting the Display Units

The VELOCICALC Plus is capable of displaying the measured values in several different measurement units. To change the display units on your VELOCICALC Plus, refer to Appendix B, DIP Switch Settings.

## Using the Telescoping Probe

The telescoping probe contains the velocity, temperature, and humidity sensors (humidity sensor, Models 8386 and 8386A only). When using the probe, make sure the sensor window is fully exposed and the orientation dimple is facing upstream. ***NOTE**: For temperature and humidity measurements, make sure that at least 3 inches (7.5 cm) of the probe is in the flow to allow the temperature and humidity sensors to be in the air stream.*

### Extending the Probe

To extend the probe, hold the handle in one hand while pulling on the probe tip with the other hand. Do not hold the cable while extending the probe as this prevents the probe from moving.

### Retracting the Probe

To retract the probe, hold the handle in one hand while pushing on the probe tip with the other hand. If you feel the probe antenna binding, pull gently on the probe cable until the smallest antenna section is retracted. Collapse the rest of the antenna by pressing the probe tip.

### Articulating Probe (Models 8384A/8385A/8386A Only)

The articulating probe has the ability to bend at a 90° angle for those hard to reach places. To bend the probe, loosen the knurled nut on the joint, bend the probe, and tighten the nut. To straighten the probe, loosen the nut, straighten the probe, and tighten the nut.

## Changing the Real-Time Clock

The VELOCICALC Plus has an internal real-time clock that keeps track of the time of day (the format is HH.MM where HH is the hour in 24-hour format and MM is minutes) and the date. It is very important to set the time and date correctly, otherwise date and time stamping of recorded data will not be correct. This information has been set to Central Time at the factory before shipping.

To change the time and date, press and hold both ▲ and ▼ keys during the power-up sequence when the time is displayed. Release the keys when the VELOCICALC Plus beeps twice. You will have an opportunity to view and/or change the hours, minutes, year, month, and day of month in sequence. Use the up and down arrow keys (▲▼) to change any settings. Use the ENTER key to store each setting and advance to the next one.

## Changing the Baud Rate

The VELOCICALC Plus has a variable baud rate that is used when downloading or printing data from the instrument. By changing the baud rate to a higher rate, the data will be downloaded faster. ***NOTE**: The baud rate must be equal to that of your computer or printer.*

The instrument baud rate is displayed during the initial power up sequence. To change the baud rate, press and hold both ▲ and ▼ keys during the power-up sequence while the baud rate is displayed. Release the keys when the VELOCICALC Plus beeps twice. Use the ▲ and ▼ keys to scroll through the available values of 1200, 2400, 4800, 9600, and 19200. Press ENTER to set the value that is displayed.

## Connecting the Optional Portable Printer

To connect the printer to the VELOCICALC Plus, locate the Printer Interface Cable (supplied with the optional printer) and connect the 9-pin end labeled "PRINTER" to the printer and the other end to the data port of the VELOCICALC Plus. The printer must be set to the same baud rate as the VELOCICALC Plus. See *Changing the Baud Rate* section for details on how to change the baud rate for the VELOCICALC Plus. To change the baud rate of the printer, please refer to that operation and service manual. Always turn the VELOCICALC Plus on ***before*** the printer. If the printer prints question marks (??????), asterisks (******), or random characters, reset it by turning it off and then on again. If necessary, refer to the *Portable Printer Manual.*

## Connecting to a Computer

Use the Computer Interface Cable provided with the VELOCICALC Plus to connect the instrument to a computer for downloading stored data or for remote polling. Connect the 9-pin end labeled "COMPUTER" to the computer COM port and the other end to the data port of the VELOCICALC Plus. A 9-pin to 25-pin adapter will be required if your computer has a 25-pin serial port connector.

For more information on how to download stored data see Chapter 3 section titled *Downloading Data to a Computer*. For polling instructions, see Chapter 3 section titled *Data Acquisition (Polling)*.

**Caution:** This symbol is used to indicate that the data port of the VELOCICALC Plus is **not** intended for connection to a public telecommunications network. Connect the data port only to another RS232 port.

Chapter 3

# Operation

## Keypad Functions

When pressing the keys on the front panel, the VELOCICALC Plus will beep to confirm the function. If you press a key and the VELOCICALC Plus does not beep, then the VELOCICALC Plus does not allow that function during the selected mode.

## Common Terms

In this manual there are several terms that are used in different places. The following is a brief explanation of the meanings of those terms.

**Sample**: Consists of all of the measurement parameters stored at the same time (a more detailed explanation is found in the *Setting Data Storage Options* section of this chapter). The maximum number of samples is 1394.

**Test ID**: A group of samples. A test ID can contain one sample or up to 1394 samples. The statistics (average, minimum, maximum, and count) are calculated for each test ID. The maximum number of test IDs is 275.

**Time Constant**: The time constant is an averaging period. It is used to dampen the display. If you are experiencing fluctuating flows, a longer time constant will slow down those fluctuations. The display will update every second, but the displayed reading will be the average over the last time constant period. For example, if the time constant is 10 seconds, the display will update every second, but the displayed reading will be the average from the last 10 seconds. This is also referred to as a "moving average".

**Logging Interval**: The logging interval is a frequency period that the instrument will log readings. For example, if the logging interval is set to 30 minutes, readings will be taken and recorded every 30 minutes.

## ON/OFF Key

Press to turn the VELOCICALC Plus on and off. During the power up sequence the display will show the following: all characters, % battery life, % log (memory available), baud rate, time (HH:MM), entered barometric pressure, entered temperature, and then velocity readings.

### Arrow (▲▼) Keys

Press to scroll through choices while setting a parameter.

### ENTER Key

Press to accept a value or condition.

### Backlight Switch

Slide the switch in the upward position to turn on the backlight. The backlight switch is marked in the international symbols '|' for on and 'O' for off. The backlight will remain on until switched off.

### VELOCITY/FLOWRATE Key

Press to toggle back and forth between displaying velocity and flow rate. In flow rate mode, there are 3 options: flow rate from velocity and area, flow rate from velocity and a horn, and flow rate from pressure and a K factor. These are indicated by circle, rectangle, horn symbol and pressure units. Use ▲▼ keys to scroll through and select the desired symbol, then press ENTER to accept the choice. To change the flow rate mode, press either the ▲ or ▼ key while displaying flow rate, use the ▲▼ keys to make your selection, then press ENTER to accept the choice. The test ID will automatically increment to the next test ID if flow data has previously been stored in the current test ID.

- **If circle is chosen:**
  SIZE will flash on display. Use ▲▼ keys to select size (diameter), then press ENTER to accept the choice and return to measuring.

- **If rectangle is chosen:**
  X SIZE will flash on display. Use ▲▼ keys to select the x-size of the duct, then press ENTER to accept the choice and advance to the next dimension. Y SIZE will flash on display. Use ▲▼ keys to select the y-size of the duct, then press ENTER to accept the choice and return to measuring.

- **If horn symbol is chosen:**
  Use ▲▼ to scroll through horn numbers shown on the display (100, 300, 600, 1200) and $K_f$ symbol, then press ENTER to accept the choice. ***NOTE:*** *The horn numbers are the models of the horns. For example, 100 refers to a horn model number AM 100. Only horns with Model numbers as follows can be used with this function: AM 100, AM 300, AM 600 and AM 1200.* If a horn model number is chosen, the instrument will return to measuring mode and use a preprogrammed curve to calculate flow rate from velocity. If $K_f$ is chosen, the K factor choices will be shown in the following order: last 5 values used, then a

new value which can be adjusted from 0.01 to 999.9. Use the ▲▼ to scroll through the $K_f$ choices, then press ENTER to accept the choice. ***NOTE:*** *This measurement can only be made with the thermal anemometer sensor, not the Pitot tube.*

- **If pressure units (in $H_2O$, mm Hg, Pa, hPa, or mm $H_2O$) are chosen:** Use ▲▼ keys to select the K factor, then press ENTER to accept the choice. The K factor choices will be shown in the following order: last 5 values used, then a new value which can be adjusted from 0.01 to 999.9. You can zero the pressure while in flow rate from pressure mode by pressing and holding the pressure key for three seconds. The unit will double beep to confirm that the pressure has been zeroed. ***NOTE:*** *This measurement method is intended for use with diffusers with pressure taps and a manufacturer-supplied K factor.*

When measuring velocity or flow rate, and the measurement type is changed, the next time the VELOCITY/FLOWRATE key is pressed, the last measurement used will be displayed. For example, if you were measuring flow rate, switched to measuring humidity, and then back to VELOCITY/FLOWRATE, the VELOCICALC Plus will go back to displaying flow rate. If you were measuring velocity, then humidity, and returned to VELOCITY/FLOWRATE, the instrument will return to velocity.

### PRESSURE (zero) Key (Models 8385/8385A/8386/8386A Only)

Press and release to display pressure. Press and hold for three seconds to zero the pressure reading. The unit will double beep to confirm that the pressure has been zeroed. ***NOTE:*** *Make sure that all tubing is disconnected or open to ambient conditions before zeroing.*

### TEMPERATURE Key

Press and release to display temperature on the large digits instead of showing it on the small digits. Temperature is usually displayed on the small digits when other measurement types are on the large digits.

***NOTE****: For temperature and humidity measurements, make sure that at least 3 inches (7.5 cm) of the probe is in the flow to allow the temperature and humidity sensors to be in the air stream.*

### HUMIDITY Key (Model 8386/8386A Only)

Press to toggle between displaying % relative humidity, dew point temperature, and wet bulb temperature on the large digits. (The first time that the button is pushed it will display the last measurement type that was displayed.) ***NOTE:*** *To display accurate wet bulb temperature, the correct barometric pressure must be entered. See Actual/Standard Key section for details on setting the barometric pressure.* ***NOTE:*** *For temperature and humidity measurements, make sure that at least 3 inches (7.5 cm) of the probe is in the flow to allow the temperature and humidity sensors to be in the air stream.*

### THERMAL/PITOT Key (Models 8385/8385A/8386/8386A Only)

Press to toggle back and forth between measuring velocity or flow rate with the thermal anemometer sensor or with a Pitot tube attached to the pressure ports. ***NOTE:*** *If this key is pressed while displaying anything other than velocity or flowrate, it will have no effect on the readings.*

### ACTUAL/STANDARD Key

Press to toggle between displaying actual and standard velocity or flow rate. Press and hold to view, enter, or change ambient conditions. When the key is pressed and held, the pressure units will flash and the last barometric pressure entered will be displayed. Use the ▲▼ keys to change the barometric pressure and press ENTER to accept it. Then the temperature units will flash and the last temperature entered will be displayed. Use the ▲▼ keys to change the temperature and press ENTER to accept it and return to measuring mode. The ranges that can be entered are as follows: Pressure: 15 to 40 in. Hg (381 to 1016 mm Hg), 29.92 in. Hg (760 mm Hg) is default; Temperature: -80 to 400°F (-62 to 204°C), 70°F (21.1°C) is default. ***NOTE****: When obtaining wet bulb temperature or heat flow readings, the correct barometric pressure must be entered. Both the barometric pressure and temperature need to be entered when measuring the following: 1) actual velocity (or flow rate) with either the thermal anemometer or the Pitot tube, or 2) standard velocity (or flow rate) with a Pitot tube.*

### SAMPLE INTERVAL Key

The SAMPLE INTERVAL key is used to set the time constant and logging intervals. Press to display current time constant. Use ▲▼ to scroll through the time constant choices, which are 1 s, 2 s, 5 s, 10 s, 15 s, 20 s, and LOG symbol, then press ENTER to accept the choice. If LOG was chosen, the first logging interval choice will be displayed. Use ▲▼ to scroll through the logging interval choices, which are 2 s, 5 s, 10 s, 15 s, 20 s, 30 s, 1 min, 2 min, 5 min, 10 min, 15 min, 20 min, 30 min, 60 min, and OFF. Press ENTER to accept choice and return to measuring mode. If a logging interval is chosen that is shorter than the time constant, the time constant will be shortened to be equal to the logging interval.

***NOTE:*** *To operate the instrument in discrete data logging (or single point) mode, the logging interval must be set to OFF. To operate the instrument in continuous data logging mode, the logging interval must be set to something* ***other than*** *OFF.*

## SAMPLE (options) Key

### Discrete Data Logging (Single Point Measurements)

The instrument must first be in discrete data logging mode. See *SAMPLE INTERVAL Key* section for more details. Press the SAMPLE key to take a sample. The sample that gets stored is the measurement types that were chosen in sample options (see *Setting Data Storage Options* for more details) and the measurement type that is on the large digits. While the sample is being taken, the small digits will read the sample number, the COUNT indicator will be lit, and the SAMPLE indicator will flash during the length of the sample. The sample will last until the length of a time constant has passed. Then the VELOCICALC Plus will display the sample number and the value that was recorded.

### Continuous Data Logging (Multiple Readings Over Time)

The instrument must first be in continuous data logging mode. See *SAMPLE INTERVAL Key* section for more details. Press the SAMPLE key to start a sample. The parameters that are stored are those that were turned on in the options menu as well as that on the large digits. Samples will be taken at intervals that were set in the SAMPLE INTERVAL menu (see the *SAMPLE INTERVAL Key* section for more details). The display will light LOG while samples are being taken and SAMPLE will light as the data is stored. Press the SAMPLE key again to stop the sample. The display will then scroll through the following: number of samples stored, test ID number and average of the measurements that were stored. To review this data and/or individual data points, please see *STATISTICS (review data) Key* section.

### Setting Data Storage Options

In this section the terms “On” and “AUtO” are referred to. The following brief explanations may help to understand what function is being performed. “On” means that measurement type will log whenever the SAMPLE key is pressed. “AUtO” means that measurement type will automatically log if it is needed to calculate the measurement type on the large digits when the SAMPLE key is pressed.

For example, if dew point is being displayed on the large display digits and SAMPLE is pressed, then dew point, humidity, and temperature will all be stored automatically because dew point is calculated using

humidity and temperature. Table 3.1 shows what measurements are stored automatically when a specific measurement type is on the display.

**Table 3.1: Measurement Types Stored When SAMPLE is Pressed**

| Displayed Measurement Type | Measurement Types Automatically Stored |
|---|---|
| Thermal Velocity | Velocity |
| Pitot Velocity | Velocity, Pressure |
| Temperature | Temperature |
| Pressure | Pressure |
| Humidity | Humidity |
| Wetbulb | Humidity, Temperature, Wetbulb |
| Dew point | Humidity, Temperature, Dew point |
| Heat flow | Heat flow, Humidity, Temperature (Flow rate is needed, but must be stored separately) |
| Flow rate from duct size and shape | Velocity, Flow rate, Pressure if velocity is from Pitot |
| Flow rate from a horn | Velocity, Flow rate |
| Flow rate from Pressure | Pressure, Flow rate |

Press and hold the SAMPLE key to view, enter, or change data storage options. “SET” lights up on the small display. The velocity units light up, and the large display says “On” or “AUtO”, depending on how it was set previously. Use ▲▼ to toggle between on and auto, then press ENTER to accept setting and advance to next parameter. The flow rate units light up, and lower display says “On” or “AUtO”, depending on how it was set previously. Use ▲▼ to toggle between on and off, then press ENTER to accept setting and advance to next measurement. This pattern will continue through the following measurements: differential pressure, temperature, relative humidity, dew point temperature, and wet bulb temperature. Follow the same instructions as set forth above for each parameter. Once all the measurement parameters have been displayed, the instrument will return to measurement mode.

### NEXT TEST (clear) Key

Press to advance to the next test ID. If the current test ID does not have anything stored, it will not advance to the next test ID. To clear the last sample, press and hold the key and the display will begin a countdown from 5 to 0. Release the key at any time during the countdown before zero is displayed. To clear all memory, keep holding key during the countdown. Release the key when 0 is displayed. The display will flash 'CLEAR LOG'. ***NOTE:*** *Only the last sample recorded can be cleared without clearing the entire memory. You cannot go back to a previous test ID and clear a single reading. Also, you cannot add data to a previous test ID.* Sample clear does not work in continuous data logging mode.

### STATISTICS (review data) Key

The STATISTICS key has two purposes. One is to view the statistics for the currently displayed parameter and the other is review data for a particular test ID.

#### To View Statistics

Press STATISTICS to view statistics for the parameter currently shown on the large digits. The count will be shown on the small digits and the test ID on the large digits. Count will stay on the small digits and the large digits will change to displaying average. Press STATISTICS again (before the average disappears from the display) to proceed to maximum and again to display minimum.

#### To Review Data

Press and hold STATISTICS. The VELOCICALC Plus will beep twice, release the key and the test ID number will be displayed on the small digits and the TEST ID symbol will light up. Use ▲▼ to select the desired test ID. Press ENTER to accept the test ID number. Use ▲▼ to select and view average, maximum, minimum, count, and individual sample numbers with values for the selected test ID. The samples will be displayed in the order that they were taken, from the first sample of that test ID to the last. To view a different test ID, press STATISTICS again to return to test ID on small digits and nothing on large digits. Use ▲▼ to choose a new test ID, then press ENTER to accept the choice and continue as above to review the data. To review data of a different measurement type, press the desired measurement type button while AVG, MAX, MIN, COUNT or sample is being displayed. If there is no data for that measurement type, "----" will be displayed. Press another measurement type key to view more data or press ENTER to return to measuring mode.

### HEAT FLOW Key (Model 8386/8386A Only)

In order for the VELOCICALC Plus to calculate heat flow, the flow rate, temperature, and humidity need to be recorded at one location before the heating (or cooling) source and one location after the source. The data at these locations must be stored in two sequential test IDs. The first test ID is used as reference for calculating heat flow in the second test ID. To store the required data for heat flow calculations, proceed as outlined below.

1. Make sure that the correct barometric pressure is entered in the instrument or the obtained readings will be incorrect. If flow is being measured from a Pitot tube, make sure the correct flow temperature is also entered. The flow rate displayed must be is STANDARD flow, not ACTUAL flow, or the "nO rEF" message will appear on the display. This message indicates that there is missing or incorrect reference data for calculating heat flow. (See *ACTUAL/STANDARD Key* section for details on setting these parameters.)
2. Make sure the instrument is in discrete (or single point) sampling mode. (See *SAMPLE INTERVAL Key* and *SAMPLE (options) Key* sections for details on how to be in discrete sampling mode.)
3. Press NEXT TEST to start a new test ID.
4. Press VELOCITY/FLOWRATE key to display flowrate.
5. Press SAMPLE key and store multiple readings at the first (reference) location. Taking several samples in the traverse of the duct provides accurate average readings.
6. Press TEMPERATURE key.
7. Press SAMPLE to record the temperature readings.
8. Press HUMIDITY key to display relative humidity (% RH).
9. Press SAMPLE to record the relative humidity.
10. Press NEXT TEST key to advance to the next test ID. Move probe to the second location. (Make sure that at least 3 inches (7.5 cm) of the probe are in the flow to allow the temperature and humidity sensors to be in the air stream.)
11. Press HEAT FLOW key to get instantaneous readings of sensible heat flow. Press key three more times to display latent heat flow, total heat flow, and sensible heat factor.
12. Press SAMPLE key to store readings at second location.

To record readings of heat flow over time, proceed as above with steps 1-11 and then follow the steps below.

1. Change from discrete to continuous data logging (See *SAMPLE INTERVAL Key* and *SAMPLE (options) Key* sections for details on how to change to continuous sampling mode).
2. Press SAMPLE to start a sample. This will automatically log data that is required.
3. Press SAMPLE to stop the sample.

This will allow you to record data over time which, when downloaded to a computer, can be graphed.

### Printing Data Using the Portable Printer

The following will be printed as long as a printer is connected. When viewing statistics, the statistics shown on the display for the current test ID will be printed automatically when the STATISTICS key is pressed. When reviewing data, nothing will print. When taking a sample, the reading will be printed automatically each time the SAMPLE key is pressed.

To print everything in memory, press and hold the ENTER key. This will initiate a countdown from 5 to 0. When the display shows zero, release the key and everything in memory will print to the printer. The display will read "Send dAtA" while dumping the memory. If you release the key at any time other than 0 during the countdown, nothing will print. To stop printing at any time, turn the VELOCICALC Plus off. ***NOTE:*** *In order to print, the baud rate on the VELOCICALC Plus must be set to the same as the printer (default is 1200).*

### Downloading Data to a Computer

"LOGDAT" is a windows-based program from TSI designed to download the data stored in the memory of the VELOCICALC Plus to a computer. This data includes the test ID, measurement, unit of measure, flow area, and sample interval. This data is date and time stamped. In addition, the statistics for each test ID are provided. The file containing the downloaded data is sorted and tab delimited to allow it to be imported into a spreadsheet for further data analysis.

To install LogDat software, run the SETUP.EXE file on the LogDat distribution disc. Once you open the program, it is self-directing and provides all the necessary instructions for downloading data.

To download data from the VELOCICALC Plus, connect the supplied computer interface cable to the VELOCICALC Plus and to a computer serial port. Any serial port from COM1 to COM4 can be used.

## Data Acquisition (Polling)

The VELOCICALC Plus is designed to allow you to perform polling through the use of a computer. To do this your computer must be hooked up and in terminal mode and the baud rate for the computer and the VELOCICALC Plus must be set to the same value. For details on viewing or changing the baud rate see *Changing the Baud Rate* section in Chapter 2. You must then send an upper case V to the instrument. The values that are sent back to the computer are for those measurement types that are turned "on" in "Sample Options" menu. See *Setting Data Storage Options* and *SAMPLE INTERVAL Key* sections earlier in this chapter for more details.

You must write their own routine (program) to obtain information at specific intervals from the VELOCICALC Plus. The meter will only print information when the SAMPLE button is pressed.

**Caution:** This symbol is used to indicate that the data port of the VELOCICALC Plus is **not** intended for connection to a public telecommunications network. Connect the data port only to another RS232 port.

Chapter 4

# Maintenance

The VELOCICALC Plus requires very little maintenance to keep it performing well.

## Recalibration

To maintain a high degree of accuracy in your measurements, we recommend that you return your VELOCICALC Plus to TSI for annual recalibration. For a reasonable fee, we will quickly recalibrate the unit and return it to you in "as new" working condition; it is especially important in applications where strict calibration records must be maintained. Please contact one of TSI's offices or your local distributor to make service arrangements and to receive a Return Material Authorization (RMA) number. To fill out an online RMA form, visit TSI's website at http://rma.tsi.com.

**U.S. & International**
TSI Incorporated
500 Cardigan Road
Shoreview MN 55126-3996
Tel: (800) 874-2811
(651) 490-2811
Fax: (651) 490-3824

## Cases

If the instrument case or storage case needs cleaning, wipe it off with a soft cloth and isopropyl alcohol or a mild detergent. Never immerse the VELOCICALC Plus. If the enclosure of the VELOCICALC Plus or the AC adapter becomes broken, it must be replaced immediately to prevent access to hazardous voltage.

## Storage

When storing the VELOCICALC Plus for more than one month, removing the batteries is recommended. This prevents damage due to battery leakage.

Chapter 5

# Troubleshooting

Table 5-1 lists the symptoms, possible causes, and recommended solutions for common problems encountered with the VELOCICALC Plus. If your symptom is not listed, or if none of the solutions solves your problem, please contact TSI.

**Table 5-1: Troubleshooting the VELOCICALC Plus**

| Symptom | Possible Causes | Corrective Action |
|---|---|---|
| No display | Unit not switched on | Switch the unit on |
| | Low or dead batteries | Replace the batteries or plug in the AC adapter |
| | Dirty battery contacts | Clean the battery contacts |
| Display reads "LO" | Low battery charge | Replace or recharge batteries |
| | Wrong AC adapter | Replace with the correct AC adapter |
| | Low AC line voltage | Correct the AC line voltage or use batteries |
| | Dirty battery contacts | Clean the battery contacts |
| Display reads "CAL" | The VELOCICALC Plus has detected an internal fault | Return to factory for service |
| Display reads "OVER" | The velocity, pressure or temperature is too high | Use an alternate method |
| | Sensible heat factor is less than -1.5 or greater than +1.5 | Take heat flow data again |
| Velocity reading fluctuates badly | The flow is fluctuating | Reposition the probe in a less turbulent section of the flow or use a longer time constant |
| Display reads "Err 6" | Low lithium battery | Return to TSI for replacement. |
| Display reads "Err 5" | Datalogging RAM is inoperable | Return to TSI for service |
| "nO rEF" is displayed | Not enough data has been taken to calculate heat flow | Refer to *Heat Flow* section of Chapter 3 to see what data is required |

| WARNING! |
| --- |
| Remove the probe from excessive temperature immediately: excessive heat can damage the sensor. Operating temperature limits can be found in Appendix A (Specifications). The pressure sensor is protected from damage up to 7 psi (48 kPa or 360 mmHg). At higher pressure it can burst! |

# Appendix A

## Specifications

Specifications are subject to change without notice.

**Velocity From Thermal Sensor (all models):**

Range: 0 to 9999 ft/min (0 to 50 m/s)
Accuracy [1&2]: ±3% of reading or ±3 ft/min (±0.015 m/s), whichever is greater
Resolution: 1 ft/min (0.01 m/s)

**Velocity From a Pitot Tube (Models 8385/8385A/8386/8386A):**

Range [3]: 250 to 15500 ft/min (1.27 to 78.7 m/s)
Accuracy [4]: ±1.5% at 2000 ft/min (10.16 m/s)
Resolution: 1 ft/min (0.1 m/s)

**Volumetric Flowrate (all models):**

Range: Actual range is a function of actual velocity, pressure, duct size, and K factor

**Temperature (Models 8384/8384A/8385/8385A):**

Range: 0 to 200°F (–17.8 to 93.3°C)
Accuracy [5]: ±0.5°F (±0.3°C)
Resolution: 0.1°F (0.1°C)

**Temperature (Models 8386/8386A):**

Range: 14 to 140°F (-10 to 60°C)
Accuracy [5]: ±0.5°F (±0.3°C)
Resolution: 0.1°F (0.1°C)

**Instrument Temperature Range (Models 8384/8384A/8385/8385A)**

Operating (Electronics): 40 to 113°F (5 to 45°C)
Operating (Probe): 0 to 200°F (-17.8 to 93.3°C)
Storage: -4 to 140°F (-20 to 60°C)

**Instrument Temperature Range (Models 8386/8386A)**

Operating (Electronics): 40 to 113°F (5 to 45°C)
Operating (Probe): 14 to 140°F (-10 to 60°C)
Storage: -4 to 140°F (-20 to 60°C)

**Instrument Operating Conditions:**
Altitude up to 4000 meters
Relative humidity up to 80% RH, non-condensing
Pollution degree 1 in accordance with IEC 664
Transient over voltage category II

**Relative Humidity (Models 8386/8386A):**
Range: 0 to 95% RH
Accuracy [6]: ±3% RH
Resolution: 0.1% RH

**Wet Bulb Temperature (Models 8386/8386A)**
Range: 40 to 140°F (5 to 60°C)
Resolution: 0.1°F (0.1°C)

**Dew point (Model 8386/8386A):**
Range: 5 to 120°F (-15 to 49°C)
Resolution: 0.1°F (0.1°C)

**Heat Flow (Models 8386/8386A):**

| | |
|---|---|
| Range: | Function of velocity, temperature, humidity, and barometric pressure |
| Measurements available: | Sensible heat flow, latent heat flow, total heat flow and sensible heat factor |
| Units measured: | BTU/hr, kW |

**Static / Differential Pressure (Models 8385/8385A/8386/8386A):**
Range [7]: -5 to +15 in. $H_2O$ (-9.3 to +28.0 mm Hg, -1245 to +3735 Pa)
Accuracy: ±1% of reading ±0.005 in. $H_2O$ (±1 Pa, ±0.01 mm Hg)
±0.02%/°F (±0.03%/°C)
Resolution: 0.001 in. $H_2O$ (1 Pa, 0.01 mm Hg)

**Duct Size (all models):**
Range: 1 to 250 inches in increments of 0.1 inches (1 to 635 cm in increments of 0.1 cm)

**Data Storage Capabilities (all models):**
Range: Up to 1394 samples and 275 test IDs (one sample can contain all eleven measurement types)

**Logging Interval (all models):**
Intervals: 2 sec, 5 sec, 10 sec, 20 sec, 30 sec, 60 sec, 2 min, 5 min, 10 min, 20 min, 30 min, 60 min

**Time Constant (all models):**
Intervals: 1 sec, 2 sec, 5 sec, 10 sec, 15 sec, 20 sec

**Response Time (all models):**
Velocity: 200 msec
Temperature: 2 minutes (to 66% of final value)
Pressure: 0.1 msec
Humidity: < 1 minute (to 66% of final value)

**External Meter Dimensions (all models):**
4.2 in. × 7.2 in. × 1.5 in. (10.7 cm × 18.3 cm × 3.8 cm)

**Meter Probe Dimensions (all models):**
Probe Length: 40 inches (101.6 cm)
Probe Diameter of Tip: 0.276 inches (7.01 mm)
Probe Diameter of Base: 0.395 inches (10.03 mm)

**Articulating Probe Dimensions (Models 8384A/8385A/8386A):**
Articulating Section Length: 6.4 inches (16.26 cm)
Diameter of Articulating Knuckle: 0.372 inches (9.44 mm)

**Meter Weight (all models):**
Weight With Batteries: 1.2 lbs (0.54 kg)

**Meter Display Dimensions (all models):**
Primary Display: 4-digit LCD, 0.6 inches (15 mm) digit height
Secondary Display: 3.5-digit LCD, 0.3 inches (8 mm) digit height

**Power Requirements (all models):**
Four AA-size batteries (included) or AC adapter (optional) 7.2 VDC, 300 mA, 4-18 watts (input voltage and frequency vary depending on which adapter is used)

1 Temperature compensated over an air temperature range of 40 to 150°F (5 to 65°C).

2 The accuracy statement of ±3.0% of reading or ±3 ft/min (±0.015 m/s), whichever is greater, begins at 30 ft/min through 9999 ft/min (0.15 m/s through 50 m/s).

3 Pressure velocity measurements are not recommended below 1000 ft/min (5 m/s) and are best suited to velocities over 2000 ft/min. Range can vary depending on barometric pressure.

4 Accuracy is a function of converting pressure to velocity. Conversion accuracy improves when actual pressure values increase.

5 Accuracy with instrument case at 77°F (25°C), add uncertainty of 0.05°F/°F (0.03°C/°C) for change in instrument temperature.

6 Accuracy with probe at 77°F (25°C). Add uncertainty of 0.1% RH/°F (0.2% RH/°C) for change in probe temperature. Includes 1% hysteresis.

7 Overpressure range = 7 psi (190 in. $H_2O$, 360 mmHg, 48 kPa).

# Appendix B

## DIP Switch Settings

To access the DIP switched, remove the batteries from the battery compartment. On the inside of the battery compartment, there is a window with eight DIP switches (see Fig. B-1). The table below shows the functions for each switch.

**Caution:** Make certain that power is turned off before changing the DIP switch settings.

| Switch | Function | Settings |
|---|---|---|
| 1 | Temperature | OFF: Degrees Fahrenheit (°F)<br>ON: Degrees Celsius (°C) |
| 2 | Heat Flow | OFF: BTU/hr<br>ON: kW |
| 3, 4 | Velocity / Flow rate | 3 ON, 4 OFF: m/s, l/s<br>3 OFF, 4 ON: m/s, $m^3$/hr<br>3 OFF, 4 OFF: ft/min, $ft^3$/min<br>3 ON, 4 ON: m/s, $m^3$/min |
| 5, 6 | Pressure | 5 OFF, 6 ON: Pa<br>5 ON, 6 ON: hPa<br>5 ON, 6 OFF: mm Hg<br>5 OFF, 6 OFF, if velocity is ft/min: in. $H_2O$<br>5 OFF, 6 OFF, if velocity is m/s: mm $H_2O$ |
| 7 | User cal. adjust | OFF: Normal<br>ON: User calibration adjust mode |
| 8 | Data format | OFF: Decimals; DD:MM:YY<br>ON: Commas; MM:DD:YY |

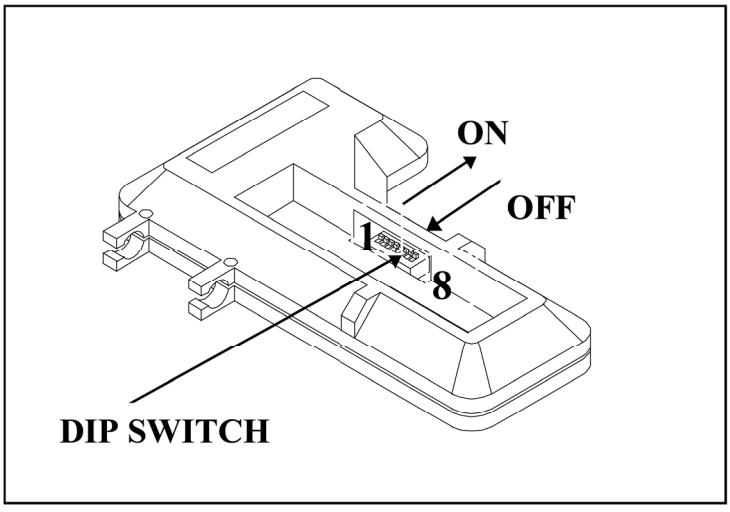



**Figure B-1: DIP Switch Location**

**TSI Incorporated** – 500 Cardigan Road, Shoreview, MN 55126 U.S.A

| | | | |
|---|---|---|---|
| **USA** | **Tel:** +1 800 874 2811 | **E-mail:** answers@tsi.com | **Website:** www.tsi.com |
| **UK** | **Tel:** +44 149 4 459200 | **E-mail:** tsiuk@tsi.com | **Website:** www.tsiinc.co.uk |
| **France** | **Tel:** +33 491 11 87 64 | **E-mail:** tsifrance@tsi.com | **Website:** www.tsiinc.fr |
| **Germany** | **Tel:** +49 241 523030 | **E-mail:** tsigmbh@tsi.com | **Website:** www.tsiinc.de |
| **India** | **Tel:** +91 80 41132470 | **E-mail:** tsi-india@tsi.com | |
| **China** | **Tel:** +86 10 8260 1595 | **E-mail:** tsibeijing@tsi.com | |
| **Singapore** | **Tel:** +65 6595 6388 | **E-mail:** tsi-singapore@tsi.com | |


Contact your local TSI Distributor or visit our website **www.tsi.com** for more detailed specifications.

P/N 1980321 Rev. J  Printed in U.S.A

**Parts Contact Information:**

*Dilution air inlet filter element-*

Universal Acoustic & Emission Technologies
(608) 873-4272
Part No. 81-1205 (qty. 2)

*Control panel fuse-*

Grainger, Inc.
(800) 472-4643
2 amp fuse Grainger Part No. 6F114 (qty. 2)
4 amp fuse Grainger Part No. 6F117 (qty. 2)
5 amp fuse Grainger Part No. 4XC12 (qty. 2)
20 amp fuse Grainger Part No. 1CX53 (qty. 2)
80 amp fuse Grainger Part No. 4XF41 (qty. 2)

**Component Contact Information:**

*Condensate Pump and Sump System-*

Real Environmental Products
(209) 296-7900

*LFG Blower-*

Baxter Air Engineering
(425) 486-6666

*Control Panels-*

Superior Custom Controls
(206) 362-8866

*Permit Compliance Agencies-*

King County Industrial Waste (condensate discharge)
(206) 477-5300

Puget Sound Clean Air Agency (air discharge)
(206) 343-8800

# APPENDIX C
# REGULATORY PERMITTING DOCUMENTS

SPPD PROPERTY LANDFILL GAS COLLECTION AND CONTROL SYSTEM
OPERATION, MAINTENANCE, AND MONITORING PLAN
South Park Landfill Site
Seattle, Washington

Farallon PN: 408-002

FARALLON CONSULTING

Washington
Issaquah | Bellingham | Seattle

Oregon
Portland | Bend | Baker City

California
Oakland | Sacramento | Irvine

# T E C H N I C A L  M E M O R A N D U M

**TO:** Claude Williams, P.E. – Puget Sound Clean Air Agency

**cc:** Rob Howie – South Park Property Development, L.L.C.

**FROM:** Thaddeus J. Cline, P.E., L.G., L.H.G., Principal Civil Engineer/Hydrogeologist
Andrew E. Vining, P.E., Project Engineer
Clyde N. Moore, P.E., Senior Project Engineer

**DATE:** January 20, 2016

**RE:** **LANDFILL GAS CONTROL SYSTEM EMISSIONS SAMPLING**
**SPPD PROPERTY**
**SOUTH PARK LANDFILL SITE**
**SEATTLE, WASHINGTON**
**FARALLON PN: 408-002**

Farallon Consulting, L.L.C. (Farallon) has prepared this Technical Memorandum to document the results of emissions sampling from an actively operated landfill gas (LFG) control system installed by South Park Property Development, L.L.C. (SPPD) as part of development of a 19.4-acre portion of the closed 39-acre South Park Landfill in Seattle, Washington (King County Tax Parcel No. 3224049005) (herein referred to as the SPPD Property).

A cleanup interim action was conducted under terms of an amendment to Agreed Order No. 6706 (Agreed Order) and the Washington State Model Toxics Control Act Cleanup Regulation (MTCA), as established in Chapter 173-340 of the Washington Administrative Code (WAC 173-340), specifically Section 430 of WAC 173-340 (Interim Action). The Agreed Order amendment was executed by Seattle Public Utilities, SPPD, and the Washington State Department of Ecology (Ecology) with an effective date of June 6, 2013. The Interim Action was conducted to reduce threats to human health or the environment by eliminating or substantially reducing one or more pathways for exposure to hazardous substances in the subsurface of the SPPD Property. The Interim Action consisted of construction and maintenance of a landfill cap; installation, operation, and monitoring of the LFG control system; and implementation of surface water and institutional controls.

The Interim Action was conducted in advance of cleanup of the South Park Landfill Site, which is defined as the area where hazardous substances deposited, disposed of, or placed at the South

Park Landfill have come to be located. SPPD and the City of Seattle were identified by Ecology as potentially liable persons (PLPs) for the South Park Landfill Site. The PLPs submitted a draft Cleanup Action Plan for the South Park Landfill Site to Ecology on November 20, 2015, which identified cleanup standards for soil, groundwater, and air; and specified LFG control requirements.

The SPPD Property LFG control system was installed between June and December 2014 and operation commenced on December 17, 2014. The LFG control system was designed to capture LFG generated by mixed municipal solid waste disposed of at the SPPD Property from approximately 1938 through the 1950s. The LFG control system extracts LFG from a system of 77 horizontal and vertical LFG collectors with a 10-horsepower blower. No equipment currently is installed to treat system emissions. The design flow rate of the LFG control system was up to about 5 standard cubic feet per minute (scfm) per collector to capture and control the estimated methane generation rate at the SPPD Property. Based on computer modeling, the methane generation rate was estimated to be 15 scfm in 2014, diminishing to about 6 scfm in 2034. Attachment A provides an as-built plan of the current LFG control system.

The LFG control system has been in a start-up phase for an extended period. System start-up included iterative field events to adjust flows for balanced long-term operations and to monitor system responses. System adjustments since initiating operations in December 2014 have been to generally reduce extraction rates at each of the LFG collectors to considerably below design flow rates to achieve safe steady-state operations. The system recently was retrofitted for intermittent operation to further reduce extraction rates. The system currently is operating intermittently with a 1.1-hour blower-on cycle at 14 scfm and a 1.9-hour blower-off cycle that occurs eight times per day and equates to approximately 5 scfm over 24 hours. The system continues to require frequent monitoring and adjustment; however, start-up is considered to be complete.

The operational status of the LFG control system was discussed with the Puget Sound Clean Air Agency (PSCAA) in a telephone conversation on November 12, 2015. Based on this conversation, SPPD and Farallon sampled system emissions on December 9, 2015 to evaluate the need for emissions treatment. Emissions samples were collected from a sampling port upstream of the blower, the system air dilution valve, and the discharge stack, and are representative of undiluted LFG direct from the well field. LFG control system emissions are diluted prior to discharge using an air dilution valve to reduce methane concentrations emitted at the discharge stack. The emissions samples were collected during the early part of the 1.1-hour extraction cycle when the system was operating under a well field flow rate of 14 scfm. Following dilution, the emissions stack discharge flow rate was approximately 100 scfm. The emissions samples were collected in a 2.5-liter Summa canister and Tedlar bag for analysis for constituents of potential concern to PSCAA for the LFG control system as discussed during the November 12, 2015 telephone conversation: volatile organic constituents by U.S. Environmental Protection Agency Method TO-15 and sulfur compounds by ASTM Method DD504.

Analytical results are provided in Table 1. Laboratory analytical results are provided in Attachment B. The following constituents were detected in the emissions samples:

- 2,2,4-Trimethylpentane;
- Benzene;
- Cyclohexane;
- Dichlorodifluoromethane;
- Freon 114;
- Hexane extractable material (fats, oils, greases);
- n-Heptane;
- Trichlorofluoromethane;
- Vinyl chloride; and
- Dimethyl sulfide.

Other constituents tested for were not detected at concentrations exceeding laboratory reporting limits (Table 1).

Concentrations of detected constituents were compared to criteria in WAC 173-460-150 (Controls for New Sources of Toxic Air Pollutants, Table of ASIL [Acceptable Source Impact Level], SQER [Small Quantity Emission Rate], and De Minimis Emission Values). Concentrations of detected constituents were also compared to criteria in PSCAA Regulation I, Section 6.03 (Notice of Construction) (c) (Exemptions) (94) (Soil and Groundwater Remediation Projects) for exemptions to Notice of Construction Applications and Orders of Approval for new sources for soil and remediation projects.

Of the detected constituents listed above, only benzene, cyclohexane, hexane, and vinyl chloride are listed in WAC 173-460-150. For comparison to criteria in WAC 173-460-150, concentrations of benzene, cyclohexane, hexane, and vinyl chloride detected in the emissions samples were converted to mass loading rates and compared to Small Quantity Emission Rates for the averaging period in WAC 173-460-150. Mass loading rates were calculated based on a well field flow rate of 14 scfm at the time of emissions sampling and active during eight timer-controlled 1.1-hour cycles in 24 hours. Calculated mass loading rates for benzene, cyclohexane, hexane, and vinyl chloride detected in the air sample collected from the emissions stack were considerably less than Small Quantity Emission Rate thresholds (Table 1).

Calculated mass loading rates were also below criteria in PSCAA Regulation I for air emissions from soil and groundwater remediation projects, allowing for exemption from Notice of Construction Application and Order of Approvals for emissions from this LFG control system.

Based on the results of sampling of emissions from the LFG control system, Farallon concludes that emissions treatment is not necessary and that a Notice of Construction Application is not required. Please notify Farallon of PSCAA's concurrence with these conclusions or contact us to discuss.

Attachments: Table 1, *Landfill Gas Control System Emissions – Analytical Results Summary*
Attachment A, LFG Control System As-Built Plan
Attachment B, Laboratory Analytical Reports

TJC/AEV/CNM:bw

# TABLE

LANDFILL GAS CONTROL SYSTEM EMISSIONS SAMPLING
SPPD Property
South Park Landfill Site
Seattle, Washington

Farallon PN: 408-002

# Table 1
# Landfill Gas Control System Emissions – Analytical Results Summary
# SPPD Property
# South Park Landfill Site
# Seattle, Washington
# Farallon PN: 408-002

| Sample Identification<br>Sample Location<br>Sample Date | LFG-120915<br>Undiluted Well Field Inflow<br>12/9/2015 | Calculated Annual Mass Loading for Detected Analyte (pounds per year) | WAC 173-460-150 Small Quantity Emission Rate Criterion for Detected Analyte (pounds per year) |
|---|---|---|---|
| **Analyte** | **Analytical Results (micrograms per cubic meter)** | | |
| **Method: EPA TO-15[1]** | | | |
| 1,1,1-Trichloroethane | < 4.2 | - | - |
| 1,1,2,2-Tetrachloroethane | < 5.3 | - | - |
| 1,1,2-Trichloroethane | < 4.2 | - | - |
| 1,1-Dichloroethane | < 3.1 | - | - |
| 1,1-Dichloroethene | < 3.1 | - | - |
| 1,2,4-Trichlorobenzene | < 23 | - | - |
| 1,2,4-Trimethylbenzene | < 3.8 | - | - |
| 1,2-Dibromoethane | < 6.0 | - | - |
| 1,2-Dichlorobenzene | < 4.6 | - | - |
| 1,2-Dichloroethane | < 3.1 | - | - |
| 1,2-Dichloropropane | < 3.6 | - | - |
| 1,3,5-Trimethylbenzene | < 3.8 | - | - |
| 1,3-Butadiene | < 1.7 | - | - |
| 1,3-Dichlorobenzene | < 4.6 | - | - |
| 1,4-Dichlorobenzene | < 4.6 | - | - |
| 1,4-Dioxane | < 11 | - | - |
| 2,2,4-Trimethylpentane | 22 | 0.0037 | N/A |
| 2-Butanone (Methyl ethyl ketone) | < 9.1 | - | - |
| 2-Hexanone | < 13 | - | - |
| 2-Propanol | < 7.6 | - | - |
| 3-Chloropropene | < 9.7 | - | - |
| 4-ethyltoluene | < 3.8 | - | - |
| 4-Methyl-2-Pentanone (MIBK) | < 3.2 | - | - |
| Acetone | < 18 | - | - |
| Benzene | 2.9 | 0.00049 | 6.62 |
| Benzyl Chloride | < 4.0 | - | - |
| Bromodichloromethane | < 5.2 | - | - |
| Bromoform | < 8.0 | - | - |
| Bromomethane | < 30 | - | - |
| Carbon Disulfide | < 9.6 | - | - |
| Carbon Tetrachloride | < 4.9 | - | - |
| Chlorobenzene | < 3.6 | - | - |
| Chloroethane | < 8.2 | - | - |
| Chloroform | < 3.8 | - | - |
| Chloromethane | < 16 | - | - |
| cis-1,2-Dichloroethene | < 3.1 | - | - |
| cis-1,3-Dichloropropene | < 3.5 | - | - |
| Cyclohexane | 10 | 0.0017 | 288,182 [3] |
| Dibromochloromethane | < 6.6 | - | - |
| Dichlorodifluoromethane | 5.6 | 0.00094 | N/A |
| Ethanol | < 5.8 | - | - |
| Ethylbenzene | < 3.4 | - | - |
| Freon 113 | < 5.9 | - | - |

# Table 1
# Landfill Gas Control System Emissions – Analytical Results Summary
# SPPD Property
# South Park Landfill Site
# Seattle, Washington
# Farallon PN: 408-002

| Sample Identification<br>Sample Location<br>Sample Date | LFG-120915<br>Undiluted Well Field Inflow<br>12/9/2015 | Calculated Annual Mass Loading for Detected Analyte (pounds per year) | WAC 173-460-150 Small Quantity Emission Rate Criterion for Detected Analyte (pounds per year) |
|---|---|---|---|
| **Analyte** | **Analytical Results (micrograms per cubic meter)** | | |
| **Method: EPA TO-15[1] (continued)** | | | |
| Freon 114 | 12 | 0.0020 | N/A |
| Hexachlorobutadiene | < 33 | - | - |
| Hexane Extractable Material (Fats, Oils, Greases) | 36 | 0.0061 | 33,603 [4] |
| Isopropylbenzene | < 3.8 | - | - |
| m,p-Xylene | < 3.4 | - | - |
| Methyl tertiary butyl ether | < 2.8 | - | - |
| Methylene Chloride | < 27 | - | - |
| n-Heptane | 5.8 | 0.00098 | N/A |
| n-Propylbenzene | < 3.8 | - | - |
| o-Xylene | < 3.4 | - | - |
| Styrene | < 3.3 | - | - |
| Tetrachloroethene | < 5.2 | - | - |
| Tetrahydrofuran | < 2.3 | - | - |
| Toluene | < 2.9 | - | - |
| trans-1,2-Dichloroethene | < 3.1 | - | - |
| trans-1,3-Dichloropropene | < 3.5 | - | - |
| Trichloroethene | < 4.2 | - | - |
| Trichlorofluoromethane | 5.0 | 0.00084 | N/A |
| Vinyl Chloride | 3.7 | 0.00062 | 2.46 |
| **Method: ASTM D-5504[2]** | | | |
| 2,5-Dimethylthiophene | < 18.35 | - | - |
| 2-Ethylthiophene | < 18.35 | - | - |
| 3-Methylthiophene | < 16.06 | - | - |
| Carbon Disulfide | < 62.28 | - | - |
| Carbonyl Sulfide | < 9.83 | - | - |
| Diethyl Disulfide | < 20.01 | - | - |
| Diethyl Sulfide | < 14.76 | - | - |
| Dimethyl Disulfide | < 15.41 | - | - |
| Dimethyl Sulfide | 27.95 | 0.0047 | N/A |
| Ethyl Mercaptan | < 10.16 | - | - |
| Ethyl Methyl Sulfide | < 12.46 | - | - |
| Hydrogen Sulfide | < 5.58 | - | - |
| Isobutyl Mercaptan | < 14.76 | - | - |
| Isopropyl Mercaptan | < 12.46 | - | - |
| Methyl Mercaptan | < 7.87 | - | - |
| n-Butyl Mercaptan | < 14.76 | - | - |
| n-Propyl Mercaptan | < 12.46 | - | - |
| tert-Butyl Mercaptan | < 14.76 | - | - |
| Tetrahydrothiophene | < 14.42 | - | - |
| Thiophene | < 13.77 | - | - |

NOTES:

< denotes analyte not detected at or exceeding the reporting limit listed.

"-" = data not presented for non-detect analytes.

[1]Analyzed by U.S. Environmental Protection Agency Method TO-15.

[2]Analyzed by ASTM Method D-5504.

[3]789 pounds in a 24-hour period criterion multiplied by 365.25 days per year.

[4]92 pounds in a 24-hour period criterion multiplied by 365.25 days per year.

EPA = U.S. Environmental Protection Agency

LFG = landfill gas

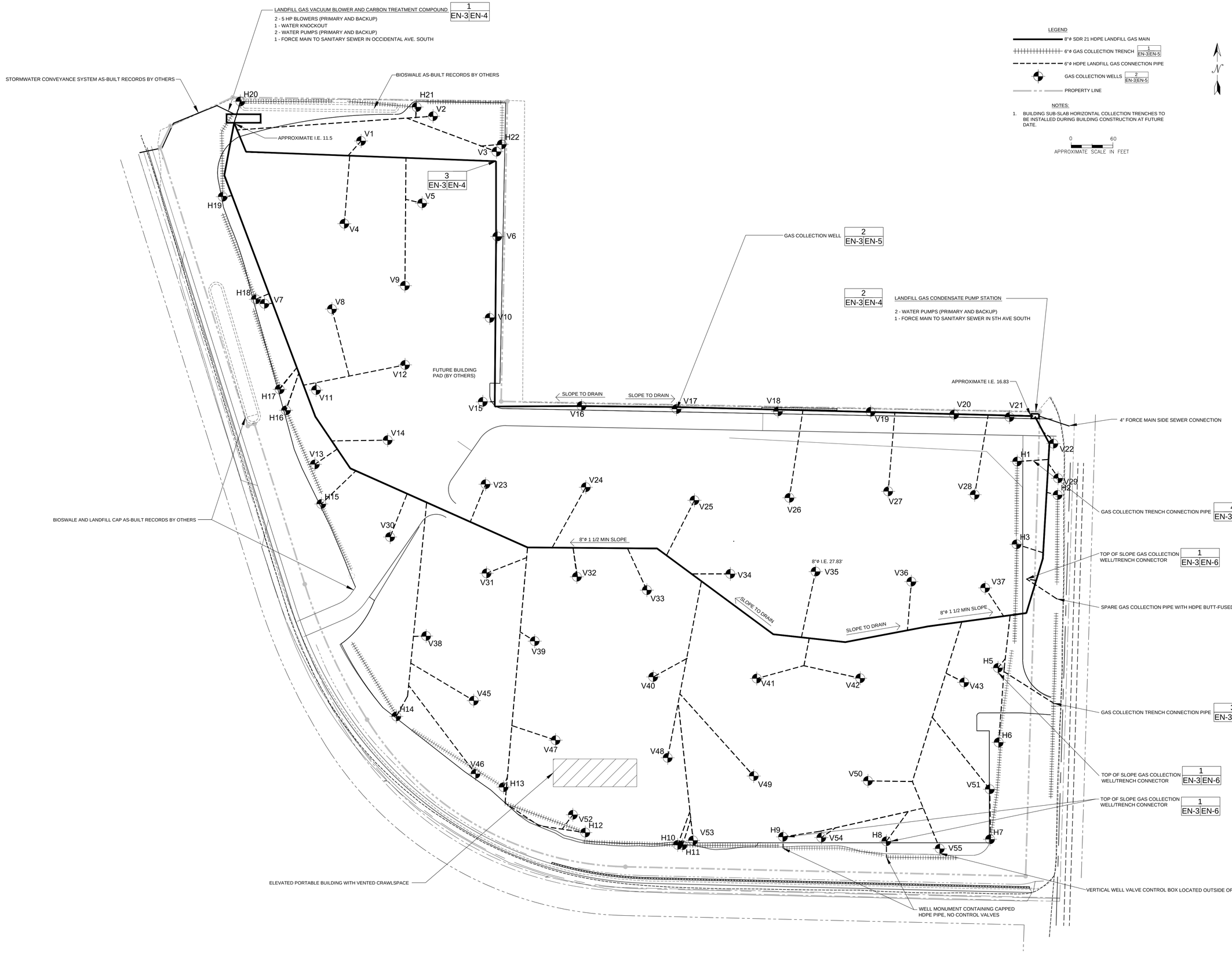
N/A = not available

WAC = Washington Administrative Code

**ATTACHMENT A**
**LFG CONTROL SYSTEM AS-BUILT PLAN**

LANDFILL GAS CONTROL SYSTEM EMISSIONS SAMPLING
SPPD Property
South Park Landfill Site
Seattle, Washington

Farallon PN: 408-002




6/23/15 AS-BUILT

PREPARED BY
FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

SOUTH PARK DEVELOPMENT
PROPERTY DEVELOPMENT
8249 5TH AVENUE SOUTH
SEATTLE, WA

First Student

# LFG SYSTEM PLAN

| | |
|---|---|
| DRAWN | AEV / DW |
| CHECKED | DAVID E. JOHNSON |
| DATE | 6/23/15 |
| SCALE | AS NOTED |
| JOB NUMBER | 408-002 |

EN-3

# ATTACHMENT B
# LABORATORY ANALYTICAL REPORTS

LANDFILL GAS CONTROL SYSTEM EMISSIONS SAMPLING
SPPD Property
South Park Landfill Site
Seattle, Washington

Farallon PN: 408-002

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12/22/2015
Mr. Andrew Vining
Farallon Consulting, LLC
975 Fifth Avenue NW

Issaquah WA 98027-3333

Project Name: SPPD
Project #: 408-002
Workorder #: 1512183A

Dear Mr. Andrew Vining

The following report includes the data for the above referenced project for sample(s) received on 12/10/2015 at Air Toxics Ltd.

The data and associated QC analyzed by TO-15 are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Eurofins Air Toxics Inc. for your air analysis needs. Eurofins Air Toxics Inc. is committed to providing accurate data of the highest quality. Please feel free the Project Manager: Kelly Buettner at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Kelly Buettner

Project Manager

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# WORK ORDER #: 1512183A

Work Order Summary

| | | | |
|---|---|---|---|
| **CLIENT:** | Mr. Andrew Vining<br>Farallon Consulting, LLC<br>975 Fifth Avenue NW<br>Issaquah, WA 98027-3333 | **BILL TO:** | Mr. Andrew Vining<br>Farallon Consulting, LLC<br>975 Fifth Avenue NW<br>Issaquah, WA 98027-3333 |
| **PHONE:** | 425-427-0061 | **P.O. #** | |
| **FAX:** | 425-427-0067 | **PROJECT #** | 408-002 SPPD |
| **DATE RECEIVED:** | 12/10/2015 | **CONTACT:** | Kelly Buettner |
| **DATE COMPLETED:** | 12/22/2015 | | |

| FRACTION # | NAME | TEST | RECEIPT VAC./PRES. | FINAL PRESSURE |
|---|---|---|---|---|
| 01A | LFG_120915 | TO-15 | 4.3 "Hg | 4.8 psi |
| 02A | Lab Blank | TO-15 | NA | NA |
| 03A | CCV | TO-15 | NA | NA |
| 04A | LCS | TO-15 | NA | NA |
| 04AA | LCSD | TO-15 | NA | NA |

CERTIFIED BY: Heidi Mayo DATE: 12/22/15

Technical Director

Certification numbers: AZ Licensure AZ0775, NJ NELAP - CA016, NY NELAP - 11291,
TX NELAP - T104704343-14-7, UT NELAP CA009332014-5, VA NELAP - 460197, WA NELAP - C935
Name of Accreditation Body: NELAP/ORELAP (Oregon Environmental Laboratory Accreditation Program)
Accreditation number: CA300005, Effective date: 10/18/2014, Expiration date: 10/17/2015.
Eurofins Air Toxics Inc.. certifies that the test results contained in this report meet all requirements of the NELAC standards



180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 9563
(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

**LABORATORY NARRATIVE**
**EPA Method TO-15**
**Farallon Consulting, LLC**
**Workorder# 1512183A**

One 6 Liter Summa Canister (SIM Certified Calscience) sample was received on December 10, 2015. The laboratory performed analysis via EPA Method TO-15 using GC/MS in the full scan mode.

This workorder was independently validated prior to submittal using 'USEPA National Functional Guidelines' as generally applied to the analysis of volatile organic compounds in air. A rules-based, logic driven, independent validation engine was employed to assess completeness, evaluate pass/fail of relevant project quality control requirements and verification of all quantified amounts.

## Receiving Notes

There were no receiving discrepancies.

## Analytical Notes

There were no analytical discrepancies.

## Definition of Data Qualifying Flags

Eight qualifiers may have been used on the data analysis sheets and indicates as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).

J - Estimated value.

E - Exceeds instrument calibration range.

S - Saturated peak.

Q - Exceeds quality control limits.

U - Compound analyzed for but not detected above the reporting limit, LOD, or MDL value. See data page for project specific U-flag definition.

UJ- Non-detected compound associated with low bias in the CCV

N - The identification is based on presumptive evidence.

File extensions may have been used on the data analysis sheets and indicates as follows:

a-File was requantified

b-File was quantified by a second column and detector

r1-File was requantified for the purpose of reissue

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# Summary of Detected Compounds
# EPA METHOD TO-15 GC/MS FULL SCAN

**Client Sample ID: LFG_120915**

**Lab ID#: 1512183A-01A**

| Compound | Rpt. Limit (ppbv) | Amount (ppbv) | Rpt. Limit (ug/m3) | Amount (ug/m3) |
|---|---|---|---|---|
| Freon 12 | 0.78 | 1.1 | 3.8 | 5.6 |
| Freon 114 | 0.78 | 1.7 | 5.4 | 12 |
| Vinyl Chloride | 0.78 | 1.4 | 2.0 | 3.7 |
| Freon 11 | 0.78 | 0.90 | 4.4 | 5.0 |
| Hexane | 0.78 | 10 | 2.7 | 36 |
| Cyclohexane | 0.78 | 3.0 | 2.7 | 10 |
| 2,2,4-Trimethylpentane | 0.78 | 4.7 | 3.6 | 22 |
| Benzene | 0.78 | 0.90 | 2.5 | 2.9 |
| Heptane | 0.78 | 1.4 | 3.2 | 5.8 |

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**Client Sample ID: LFG_120915**

**Lab ID#: 1512183A-01A**

**EPA METHOD TO-15 GC/MS FULL SCAN**

| | | | |
|---|---|---|---|
| **File Name:** | **17122014** | **Date of Collection: 12/9/15** | |
| **Dil. Factor:** | **1.55** | **Date of Analysis: 12/20/15 04:06 PM** | |

| Compound | Rpt. Limit (ppbv) | Amount (ppbv) | Rpt. Limit (ug/m3) | Amount (ug/m3) |
|---|---|---|---|---|
| Freon 12 | 0.78 | 1.1 | 3.8 | 5.6 |
| Freon 114 | 0.78 | 1.7 | 5.4 | 12 |
| Chloromethane | 7.8 | Not Detected | 16 | Not Detected |
| Vinyl Chloride | 0.78 | 1.4 | 2.0 | 3.7 |
| 1,3-Butadiene | 0.78 | Not Detected | 1.7 | Not Detected |
| Bromomethane | 7.8 | Not Detected | 30 | Not Detected |
| Chloroethane | 3.1 | Not Detected | 8.2 | Not Detected |
| Freon 11 | 0.78 | 0.90 | 4.4 | 5.0 |
| Ethanol | 3.1 | Not Detected | 5.8 | Not Detected |
| Freon 113 | 0.78 | Not Detected | 5.9 | Not Detected |
| 1,1-Dichloroethene | 0.78 | Not Detected | 3.1 | Not Detected |
| Acetone | 7.8 | Not Detected | 18 | Not Detected |
| 2-Propanol | 3.1 | Not Detected | 7.6 | Not Detected |
| Carbon Disulfide | 3.1 | Not Detected | 9.6 | Not Detected |
| 3-Chloropropene | 3.1 | Not Detected | 9.7 | Not Detected |
| Methylene Chloride | 7.8 | Not Detected | 27 | Not Detected |
| Methyl tert-butyl ether | 0.78 | Not Detected | 2.8 | Not Detected |
| trans-1,2-Dichloroethene | 0.78 | Not Detected | 3.1 | Not Detected |
| Hexane | 0.78 | 10 | 2.7 | 36 |
| 1,1-Dichloroethane | 0.78 | Not Detected | 3.1 | Not Detected |
| 2-Butanone (Methyl Ethyl Ketone) | 3.1 | Not Detected | 9.1 | Not Detected |
| cis-1,2-Dichloroethene | 0.78 | Not Detected | 3.1 | Not Detected |
| Tetrahydrofuran | 0.78 | Not Detected | 2.3 | Not Detected |
| Chloroform | 0.78 | Not Detected | 3.8 | Not Detected |
| 1,1,1-Trichloroethane | 0.78 | Not Detected | 4.2 | Not Detected |
| Cyclohexane | 0.78 | 3.0 | 2.7 | 10 |
| Carbon Tetrachloride | 0.78 | Not Detected | 4.9 | Not Detected |
| 2,2,4-Trimethylpentane | 0.78 | 4.7 | 3.6 | 22 |
| Benzene | 0.78 | 0.90 | 2.5 | 2.9 |
| 1,2-Dichloroethane | 0.78 | Not Detected | 3.1 | Not Detected |
| Heptane | 0.78 | 1.4 | 3.2 | 5.8 |
| Trichloroethene | 0.78 | Not Detected | 4.2 | Not Detected |
| 1,2-Dichloropropane | 0.78 | Not Detected | 3.6 | Not Detected |
| 1,4-Dioxane | 3.1 | Not Detected | 11 | Not Detected |
| Bromodichloromethane | 0.78 | Not Detected | 5.2 | Not Detected |
| cis-1,3-Dichloropropene | 0.78 | Not Detected | 3.5 | Not Detected |
| 4-Methyl-2-pentanone | 0.78 | Not Detected | 3.2 | Not Detected |
| Toluene | 0.78 | Not Detected | 2.9 | Not Detected |
| trans-1,3-Dichloropropene | 0.78 | Not Detected | 3.5 | Not Detected |
| 1,1,2-Trichloroethane | 0.78 | Not Detected | 4.2 | Not Detected |
| Tetrachloroethene | 0.78 | Not Detected | 5.2 | Not Detected |
| 2-Hexanone | 3.1 | Not Detected | 13 | Not Detected |

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**Client Sample ID: LFG_120915**

**Lab ID#: 1512183A-01A**

**EPA METHOD TO-15 GC/MS FULL SCAN**

| | | | |
|---|---|---|---|
| **File Name:** | **17122014** | **Date of Collection:** | **12/9/15** |
| **Dil. Factor:** | **1.55** | **Date of Analysis:** | **12/20/15 04:06 PM** |

| Compound | Rpt. Limit (ppbv) | Amount (ppbv) | Rpt. Limit (ug/m3) | Amount (ug/m3) |
|---|---|---|---|---|
| Dibromochloromethane | 0.78 | Not Detected | 6.6 | Not Detected |
| 1,2-Dibromoethane (EDB) | 0.78 | Not Detected | 6.0 | Not Detected |
| Chlorobenzene | 0.78 | Not Detected | 3.6 | Not Detected |
| Ethyl Benzene | 0.78 | Not Detected | 3.4 | Not Detected |
| m,p-Xylene | 0.78 | Not Detected | 3.4 | Not Detected |
| o-Xylene | 0.78 | Not Detected | 3.4 | Not Detected |
| Styrene | 0.78 | Not Detected | 3.3 | Not Detected |
| Bromoform | 0.78 | Not Detected | 8.0 | Not Detected |
| Cumene | 0.78 | Not Detected | 3.8 | Not Detected |
| 1,1,2,2-Tetrachloroethane | 0.78 | Not Detected | 5.3 | Not Detected |
| Propylbenzene | 0.78 | Not Detected | 3.8 | Not Detected |
| 4-Ethyltoluene | 0.78 | Not Detected | 3.8 | Not Detected |
| 1,3,5-Trimethylbenzene | 0.78 | Not Detected | 3.8 | Not Detected |
| 1,2,4-Trimethylbenzene | 0.78 | Not Detected | 3.8 | Not Detected |
| 1,3-Dichlorobenzene | 0.78 | Not Detected | 4.6 | Not Detected |
| 1,4-Dichlorobenzene | 0.78 | Not Detected | 4.6 | Not Detected |
| alpha-Chlorotoluene | 0.78 | Not Detected | 4.0 | Not Detected |
| 1,2-Dichlorobenzene | 0.78 | Not Detected | 4.6 | Not Detected |
| 1,2,4-Trichlorobenzene | 3.1 | Not Detected | 23 | Not Detected |
| Hexachlorobutadiene | 3.1 | Not Detected | 33 | Not Detected |

**Container Type: 6 Liter Summa Canister (SIM Certified Calscience)**

| Surrogates | %Recovery | Method Limits |
|---|---|---|
| Toluene-d8 | 103 | 70-130 |
| 1,2-Dichloroethane-d4 | 91 | 70-130 |
| 4-Bromofluorobenzene | 108 | 70-130 |

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**Client Sample ID: Lab Blank**

**Lab ID#: 1512183A-02A**

**EPA METHOD TO-15 GC/MS FULL SCAN**

| | | | |
|---|---|---|---|
| **File Name:** | **17122006** | **Date of Collection: NA** | |
| **Dil. Factor:** | **1.00** | **Date of Analysis: 12/20/15 10:51 AM** | |

| Compound | Rpt. Limit (ppbv) | Amount (ppbv) | Rpt. Limit (ug/m3) | Amount (ug/m3) |
|---|---|---|---|---|
| Freon 12 | 0.50 | Not Detected | 2.5 | Not Detected |
| Freon 114 | 0.50 | Not Detected | 3.5 | Not Detected |
| Chloromethane | 5.0 | Not Detected | 10 | Not Detected |
| Vinyl Chloride | 0.50 | Not Detected | 1.3 | Not Detected |
| 1,3-Butadiene | 0.50 | Not Detected | 1.1 | Not Detected |
| Bromomethane | 5.0 | Not Detected | 19 | Not Detected |
| Chloroethane | 2.0 | Not Detected | 5.3 | Not Detected |
| Freon 11 | 0.50 | Not Detected | 2.8 | Not Detected |
| Ethanol | 2.0 | Not Detected | 3.8 | Not Detected |
| Freon 113 | 0.50 | Not Detected | 3.8 | Not Detected |
| 1,1-Dichloroethene | 0.50 | Not Detected | 2.0 | Not Detected |
| Acetone | 5.0 | Not Detected | 12 | Not Detected |
| 2-Propanol | 2.0 | Not Detected | 4.9 | Not Detected |
| Carbon Disulfide | 2.0 | Not Detected | 6.2 | Not Detected |
| 3-Chloropropene | 2.0 | Not Detected | 6.3 | Not Detected |
| Methylene Chloride | 5.0 | Not Detected | 17 | Not Detected |
| Methyl tert-butyl ether | 0.50 | Not Detected | 1.8 | Not Detected |
| trans-1,2-Dichloroethene | 0.50 | Not Detected | 2.0 | Not Detected |
| Hexane | 0.50 | Not Detected | 1.8 | Not Detected |
| 1,1-Dichloroethane | 0.50 | Not Detected | 2.0 | Not Detected |
| 2-Butanone (Methyl Ethyl Ketone) | 2.0 | Not Detected | 5.9 | Not Detected |
| cis-1,2-Dichloroethene | 0.50 | Not Detected | 2.0 | Not Detected |
| Tetrahydrofuran | 0.50 | Not Detected | 1.5 | Not Detected |
| Chloroform | 0.50 | Not Detected | 2.4 | Not Detected |
| 1,1,1-Trichloroethane | 0.50 | Not Detected | 2.7 | Not Detected |
| Cyclohexane | 0.50 | Not Detected | 1.7 | Not Detected |
| Carbon Tetrachloride | 0.50 | Not Detected | 3.1 | Not Detected |
| 2,2,4-Trimethylpentane | 0.50 | Not Detected | 2.3 | Not Detected |
| Benzene | 0.50 | Not Detected | 1.6 | Not Detected |
| 1,2-Dichloroethane | 0.50 | Not Detected | 2.0 | Not Detected |
| Heptane | 0.50 | Not Detected | 2.0 | Not Detected |
| Trichloroethene | 0.50 | Not Detected | 2.7 | Not Detected |
| 1,2-Dichloropropane | 0.50 | Not Detected | 2.3 | Not Detected |
| 1,4-Dioxane | 2.0 | Not Detected | 7.2 | Not Detected |
| Bromodichloromethane | 0.50 | Not Detected | 3.4 | Not Detected |
| cis-1,3-Dichloropropene | 0.50 | Not Detected | 2.3 | Not Detected |
| 4-Methyl-2-pentanone | 0.50 | Not Detected | 2.0 | Not Detected |
| Toluene | 0.50 | Not Detected | 1.9 | Not Detected |
| trans-1,3-Dichloropropene | 0.50 | Not Detected | 2.3 | Not Detected |
| 1,1,2-Trichloroethane | 0.50 | Not Detected | 2.7 | Not Detected |
| Tetrachloroethene | 0.50 | Not Detected | 3.4 | Not Detected |
| 2-Hexanone | 2.0 | Not Detected | 8.2 | Not Detected |

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**Client Sample ID: Lab Blank**

**Lab ID#: 1512183A-02A**

**EPA METHOD TO-15 GC/MS FULL SCAN**

| | | | |
|---|---|---|---|
| **File Name:** | **17122006** | **Date of Collection: NA** | |
| **Dil. Factor:** | **1.00** | **Date of Analysis: 12/20/15 10:51 AM** | |

| Compound | Rpt. Limit (ppbv) | Amount (ppbv) | Rpt. Limit (ug/m3) | Amount (ug/m3) |
|---|---|---|---|---|
| Dibromochloromethane | 0.50 | Not Detected | 4.2 | Not Detected |
| 1,2-Dibromoethane (EDB) | 0.50 | Not Detected | 3.8 | Not Detected |
| Chlorobenzene | 0.50 | Not Detected | 2.3 | Not Detected |
| Ethyl Benzene | 0.50 | Not Detected | 2.2 | Not Detected |
| m,p-Xylene | 0.50 | Not Detected | 2.2 | Not Detected |
| o-Xylene | 0.50 | Not Detected | 2.2 | Not Detected |
| Styrene | 0.50 | Not Detected | 2.1 | Not Detected |
| Bromoform | 0.50 | Not Detected | 5.2 | Not Detected |
| Cumene | 0.50 | Not Detected | 2.4 | Not Detected |
| 1,1,2,2-Tetrachloroethane | 0.50 | Not Detected | 3.4 | Not Detected |
| Propylbenzene | 0.50 | Not Detected | 2.4 | Not Detected |
| 4-Ethyltoluene | 0.50 | Not Detected | 2.4 | Not Detected |
| 1,3,5-Trimethylbenzene | 0.50 | Not Detected | 2.4 | Not Detected |
| 1,2,4-Trimethylbenzene | 0.50 | Not Detected | 2.4 | Not Detected |
| 1,3-Dichlorobenzene | 0.50 | Not Detected | 3.0 | Not Detected |
| 1,4-Dichlorobenzene | 0.50 | Not Detected | 3.0 | Not Detected |
| alpha-Chlorotoluene | 0.50 | Not Detected | 2.6 | Not Detected |
| 1,2-Dichlorobenzene | 0.50 | Not Detected | 3.0 | Not Detected |
| 1,2,4-Trichlorobenzene | 2.0 | Not Detected | 15 | Not Detected |
| Hexachlorobutadiene | 2.0 | Not Detected | 21 | Not Detected |

**Container Type: NA - Not Applicable**

| Surrogates | %Recovery | Method Limits |
|---|---|---|
| Toluene-d8 | 98 | 70-130 |
| 1,2-Dichloroethane-d4 | 90 | 70-130 |
| 4-Bromofluorobenzene | 93 | 70-130 |

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**Client Sample ID: CCV**

**Lab ID#: 1512183A-03A**

**EPA METHOD TO-15 GC/MS FULL SCAN**

| | | | |
|---|---|---|---|
| **File Name:** | **17122002** | **Date of Collection: NA** | |
| **Dil. Factor:** | **1.00** | **Date of Analysis: 12/20/15 08:46 AM** | |

| Compound | %Recovery |
|---|---|
| Freon 12 | 85 |
| Freon 114 | 93 |
| Chloromethane | 78 |
| Vinyl Chloride | 78 |
| 1,3-Butadiene | 76 |
| Bromomethane | 83 |
| Chloroethane | 82 |
| Freon 11 | 84 |
| Ethanol | 76 |
| Freon 113 | 91 |
| 1,1-Dichloroethene | 83 |
| Acetone | 78 |
| 2-Propanol | 76 |
| Carbon Disulfide | 85 |
| 3-Chloropropene | 84 |
| Methylene Chloride | 80 |
| Methyl tert-butyl ether | 84 |
| trans-1,2-Dichloroethene | 93 |
| Hexane | 86 |
| 1,1-Dichloroethane | 81 |
| 2-Butanone (Methyl Ethyl Ketone) | 86 |
| cis-1,2-Dichloroethene | 90 |
| Tetrahydrofuran | 81 |
| Chloroform | 82 |
| 1,1,1-Trichloroethane | 84 |
| Cyclohexane | 94 |
| Carbon Tetrachloride | 85 |
| 2,2,4-Trimethylpentane | 89 |
| Benzene | 88 |
| 1,2-Dichloroethane | 79 |
| Heptane | 99 |
| Trichloroethene | 101 |
| 1,2-Dichloropropane | 84 |
| 1,4-Dioxane | 92 |
| Bromodichloromethane | 83 |
| cis-1,3-Dichloropropene | 89 |
| 4-Methyl-2-pentanone | 95 |
| Toluene | 96 |
| trans-1,3-Dichloropropene | 91 |
| 1,1,2-Trichloroethane | 92 |
| Tetrachloroethene | 98 |
| 2-Hexanone | 96 |

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**Client Sample ID: CCV**

**Lab ID#: 1512183A-03A**

**EPA METHOD TO-15 GC/MS FULL SCAN**

| | | | |
|---|---|---|---|
| **File Name:** | **17122002** | **Date of Collection: NA** | |
| **Dil. Factor:** | **1.00** | **Date of Analysis: 12/20/15 08:46 AM** | |

| Compound | %Recovery |
|---|---|
| Dibromochloromethane | 92 |
| 1,2-Dibromoethane (EDB) | 95 |
| Chlorobenzene | 96 |
| Ethyl Benzene | 105 |
| m,p-Xylene | 112 |
| o-Xylene | 109 |
| Styrene | 116 |
| Bromoform | 100 |
| Cumene | 113 |
| 1,1,2,2-Tetrachloroethane | 80 |
| Propylbenzene | 103 |
| 4-Ethyltoluene | 108 |
| 1,3,5-Trimethylbenzene | 116 |
| 1,2,4-Trimethylbenzene | 106 |
| 1,3-Dichlorobenzene | 106 |
| 1,4-Dichlorobenzene | 106 |
| alpha-Chlorotoluene | 102 |
| 1,2-Dichlorobenzene | 106 |
| 1,2,4-Trichlorobenzene | 90 |
| Hexachlorobutadiene | 102 |

**Container Type: NA - Not Applicable**

| Surrogates | %Recovery | Method Limits |
|---|---|---|
| Toluene-d8 | 104 | 70-130 |
| 1,2-Dichloroethane-d4 | 92 | 70-130 |
| 4-Bromofluorobenzene | 108 | 70-130 |

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**Client Sample ID: LCS**

**Lab ID#: 1512183A-04A**

**EPA METHOD TO-15 GC/MS FULL SCAN**

| | | | |
|---|---|---|---|
| **File Name:** | **17122003** | **Date of Collection: NA** | |
| **Dil. Factor:** | **1.00** | **Date of Analysis: 12/20/15 09:12 AM** | |

| Compound | %Recovery | Method Limits |
|---|---|---|
| Freon 12 | 89 | 70-130 |
| Freon 114 | 103 | 70-130 |
| Chloromethane | 87 | 70-130 |
| Vinyl Chloride | 87 | 70-130 |
| 1,3-Butadiene | 83 | 70-130 |
| Bromomethane | 87 | 70-130 |
| Chloroethane | 89 | 70-130 |
| Freon 11 | 92 | 70-130 |
| Ethanol | 82 | 70-130 |
| Freon 113 | 96 | 70-130 |
| 1,1-Dichloroethene | 90 | 70-130 |
| Acetone | 82 | 70-130 |
| 2-Propanol | 83 | 70-130 |
| Carbon Disulfide | 78 | 70-130 |
| 3-Chloropropene | 84 | 70-130 |
| Methylene Chloride | 84 | 70-130 |
| Methyl tert-butyl ether | 85 | 70-130 |
| trans-1,2-Dichloroethene | 98 | 70-130 |
| Hexane | 92 | 70-130 |
| 1,1-Dichloroethane | 84 | 70-130 |
| 2-Butanone (Methyl Ethyl Ketone) | 92 | 70-130 |
| cis-1,2-Dichloroethene | 92 | 70-130 |
| Tetrahydrofuran | 84 | 70-130 |
| Chloroform | 85 | 70-130 |
| 1,1,1-Trichloroethane | 88 | 70-130 |
| Cyclohexane | 100 | 70-130 |
| Carbon Tetrachloride | 88 | 70-130 |
| 2,2,4-Trimethylpentane | 99 | 70-130 |
| Benzene | 90 | 70-130 |
| 1,2-Dichloroethane | 78 | 70-130 |
| Heptane | 97 | 70-130 |
| Trichloroethene | 106 | 70-130 |
| 1,2-Dichloropropane | 87 | 70-130 |
| 1,4-Dioxane | 97 | 70-130 |
| Bromodichloromethane | 85 | 70-130 |
| cis-1,3-Dichloropropene | 86 | 70-130 |
| 4-Methyl-2-pentanone | 98 | 70-130 |
| Toluene | 97 | 70-130 |
| trans-1,3-Dichloropropene | 93 | 70-130 |
| 1,1,2-Trichloroethane | 93 | 70-130 |
| Tetrachloroethene | 98 | 70-130 |
| 2-Hexanone | 104 | 70-130 |

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**Client Sample ID: LCS**

**Lab ID#: 1512183A-04A**

**EPA METHOD TO-15 GC/MS FULL SCAN**

| | | | |
|---|---|---|---|
| **File Name:** | **17122003** | **Date of Collection: NA** | |
| **Dil. Factor:** | **1.00** | **Date of Analysis: 12/20/15 09:12 AM** | |

| Compound | %Recovery | Method Limits |
|---|---|---|
| Dibromochloromethane | 94 | 70-130 |
| 1,2-Dibromoethane (EDB) | 98 | 70-130 |
| Chlorobenzene | 97 | 70-130 |
| Ethyl Benzene | 108 | 70-130 |
| m,p-Xylene | 115 | 70-130 |
| o-Xylene | 111 | 70-130 |
| Styrene | 114 | 70-130 |
| Bromoform | 104 | 70-130 |
| Cumene | 115 | 70-130 |
| 1,1,2,2-Tetrachloroethane | 77 | 70-130 |
| Propylbenzene | 108 | 70-130 |
| 4-Ethyltoluene | 112 | 70-130 |
| 1,3,5-Trimethylbenzene | 120 | 70-130 |
| 1,2,4-Trimethylbenzene | 112 | 70-130 |
| 1,3-Dichlorobenzene | 106 | 70-130 |
| 1,4-Dichlorobenzene | 109 | 70-130 |
| alpha-Chlorotoluene | 108 | 70-130 |
| 1,2-Dichlorobenzene | 106 | 70-130 |
| 1,2,4-Trichlorobenzene | 99 | 70-130 |
| Hexachlorobutadiene | 105 | 70-130 |

**Container Type: NA - Not Applicable**

| Surrogates | %Recovery | Method Limits |
|---|---|---|
| Toluene-d8 | 103 | 70-130 |
| 1,2-Dichloroethane-d4 | 81 | 70-130 |
| 4-Bromofluorobenzene | 104 | 70-130 |

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**Client Sample ID: LCSD**

**Lab ID#: 1512183A-04AA**

**EPA METHOD TO-15 GC/MS FULL SCAN**

| | | | |
|---|---|---|---|
| **File Name:** | **17122004** | **Date of Collection: NA** | |
| **Dil. Factor:** | **1.00** | **Date of Analysis: 12/20/15 09:37 AM** | |

| Compound | %Recovery | Method Limits |
|---|---|---|
| Freon 12 | 88 | 70-130 |
| Freon 114 | 101 | 70-130 |
| Chloromethane | 86 | 70-130 |
| Vinyl Chloride | 87 | 70-130 |
| 1,3-Butadiene | 80 | 70-130 |
| Bromomethane | 86 | 70-130 |
| Chloroethane | 88 | 70-130 |
| Freon 11 | 89 | 70-130 |
| Ethanol | 80 | 70-130 |
| Freon 113 | 96 | 70-130 |
| 1,1-Dichloroethene | 88 | 70-130 |
| Acetone | 81 | 70-130 |
| 2-Propanol | 79 | 70-130 |
| Carbon Disulfide | 78 | 70-130 |
| 3-Chloropropene | 84 | 70-130 |
| Methylene Chloride | 80 | 70-130 |
| Methyl tert-butyl ether | 85 | 70-130 |
| trans-1,2-Dichloroethene | 97 | 70-130 |
| Hexane | 91 | 70-130 |
| 1,1-Dichloroethane | 82 | 70-130 |
| 2-Butanone (Methyl Ethyl Ketone) | 90 | 70-130 |
| cis-1,2-Dichloroethene | 91 | 70-130 |
| Tetrahydrofuran | 83 | 70-130 |
| Chloroform | 84 | 70-130 |
| 1,1,1-Trichloroethane | 86 | 70-130 |
| Cyclohexane | 99 | 70-130 |
| Carbon Tetrachloride | 85 | 70-130 |
| 2,2,4-Trimethylpentane | 99 | 70-130 |
| Benzene | 88 | 70-130 |
| 1,2-Dichloroethane | 75 | 70-130 |
| Heptane | 96 | 70-130 |
| Trichloroethene | 105 | 70-130 |
| 1,2-Dichloropropane | 84 | 70-130 |
| 1,4-Dioxane | 97 | 70-130 |
| Bromodichloromethane | 85 | 70-130 |
| cis-1,3-Dichloropropene | 85 | 70-130 |
| 4-Methyl-2-pentanone | 98 | 70-130 |
| Toluene | 95 | 70-130 |
| trans-1,3-Dichloropropene | 92 | 70-130 |
| 1,1,2-Trichloroethane | 91 | 70-130 |
| Tetrachloroethene | 96 | 70-130 |
| 2-Hexanone | 101 | 70-130 |

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**Client Sample ID: LCSD**

**Lab ID#: 1512183A-04AA**

**EPA METHOD TO-15 GC/MS FULL SCAN**

| | | | |
|---|---|---|---|
| **File Name:** | **17122004** | **Date of Collection: NA** | |
| **Dil. Factor:** | **1.00** | **Date of Analysis: 12/20/15 09:37 AM** | |

| Compound | %Recovery | Method Limits |
|---|---|---|
| Dibromochloromethane | 91 | 70-130 |
| 1,2-Dibromoethane (EDB) | 96 | 70-130 |
| Chlorobenzene | 96 | 70-130 |
| Ethyl Benzene | 107 | 70-130 |
| m,p-Xylene | 113 | 70-130 |
| o-Xylene | 111 | 70-130 |
| Styrene | 113 | 70-130 |
| Bromoform | 102 | 70-130 |
| Cumene | 115 | 70-130 |
| 1,1,2,2-Tetrachloroethane | 76 | 70-130 |
| Propylbenzene | 108 | 70-130 |
| 4-Ethyltoluene | 113 | 70-130 |
| 1,3,5-Trimethylbenzene | 116 | 70-130 |
| 1,2,4-Trimethylbenzene | 113 | 70-130 |
| 1,3-Dichlorobenzene | 105 | 70-130 |
| 1,4-Dichlorobenzene | 107 | 70-130 |
| alpha-Chlorotoluene | 107 | 70-130 |
| 1,2-Dichlorobenzene | 105 | 70-130 |
| 1,2,4-Trichlorobenzene | 105 | 70-130 |
| Hexachlorobutadiene | 109 | 70-130 |

**Container Type: NA - Not Applicable**

| Surrogates | %Recovery | Method Limits |
|---|---|---|
| Toluene-d8 | 101 | 70-130 |
| 1,2-Dichloroethane-d4 | 92 | 70-130 |
| 4-Bromofluorobenzene | 108 | 70-130 |

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12/17/2015
Mr. Andrew Vining
Farallon Consulting, LLC
975 Fifth Avenue NW

Issaquah WA 98027-3333

Project Name: SPPD
Project #: 408-002
Workorder #: 1512183B

Dear Mr. Andrew Vining

The following report includes the data for the above referenced project for sample(s) received on 12/10/2015 at Air Toxics Ltd.

The data and associated QC analyzed by ASTM D-5504 are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Eurofins Air Toxics Inc. for your air analysis needs. Eurofins Air Toxics Inc. is committed to providing accurate data of the highest quality. Please feel free the Project Manager: Kelly Buettner at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Kelly Buettner

Project Manager

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# WORK ORDER #: 1512183B

Work Order Summary

| | | | |
|---|---|---|---|
| **CLIENT:** | Mr. Andrew Vining<br>Farallon Consulting, LLC<br>975 Fifth Avenue NW<br>Issaquah, WA 98027-3333 | **BILL TO:** | Mr. Andrew Vining<br>Farallon Consulting, LLC<br>975 Fifth Avenue NW<br>Issaquah, WA 98027-3333 |
| **PHONE:** | 425-427-0061 | **P.O. #** | |
| **FAX:** | 425-427-0067 | **PROJECT #** | 408-002 SPPD |
| **DATE RECEIVED:** | 12/10/2015 | **CONTACT:** | Kelly Buettner |
| **DATE COMPLETED:** | 12/17/2015 | | |

| FRACTION # | NAME | TEST | RECEIPT VAC./PRES. | FINAL PRESSURE |
|---|---|---|---|---|
| 02A | LFG_120915 | ASTM D-5504 | Tedlar Bag | Tedlar Bag |
| 03A | Lab Blank | ASTM D-5504 | NA | NA |
| 04A | LCS | ASTM D-5504 | NA | NA |
| 04AA | LCSD | ASTM D-5504 | NA | NA |

CERTIFIED BY: Heidi Mayo DATE: 12/17/15

Technical Director

Certification numbers: AZ Licensure AZ0775, NJ NELAP - CA016, NY NELAP - 11291,
TX NELAP - T104704343-14-7, UT NELAP CA009332014-5, VA NELAP - 460197, WA NELAP - C935
Name of Accreditation Body: NELAP/ORELAP (Oregon Environmental Laboratory Accreditation Program)
Accreditation number: CA300005, Effective date: 10/18/2014, Expiration date: 10/17/2015.
Eurofins Air Toxics Inc.. certifies that the test results contained in this report meet all requirements of the NELAC standards



180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 9563
(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

**LABORATORY NARRATIVE**
**ASTM D-5504**
**Farallon Consulting, LLC**
**Workorder# 1512183B**

One 1 Liter Tedlar Bag sample was received on December 10, 2015. The laboratory performed the analysis of sulfur compounds via ASTM D-5504 using GC/SCD. The method involves direct injection of the air sample into the GC via a fixed 2.0 mL sampling loop. See the data sheets for the reporting limits for each compound.

Method modifications taken to run these samples include:

| ***Requirement*** | ***ASTM D5504-12*** | ***ATL Modifications*** |
|---|---|---|
| Sulfur Standards | Use compressed gases and permeation devices to generate calibration standards. | Compressed gases are used for H2S, COS, and Methyl Mercaptan. Other sulfur compounds are blended in vapor using methanolic stock standards. |

**Receiving Notes**

There were no receiving discrepancies.

**Analytical Notes**

There were no analytical discrepancies.

**Definition of Data Qualifying Flags**

Seven qualifiers may have been used on the data analysis sheets and indicate as follows:
B - Compound present in laboratory blank greater than reporting limit.
J - Estimated value.
E - Exceeds instrument calibration range.
S - Saturated peak.
Q - Exceeds quality control limits.
U - Compound analyzed for but not detected above the detection limit.
M - Reported value may be biased due to apparent matrix interferences.
File extensions may have been used on the data analysis sheets and indicates as follows:
a-File was requantified
b-File was quantified by a second column and detector
r1-File was requantified for the purpose of reissue

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# Summary of Detected Compounds
# SULFUR GASES BY ASTM D-5504 GC/SCD

**Client Sample ID: LFG_120915**

**Lab ID#: 1512183B-02A**

| Compound | Rpt. Limit (ppbv) | Amount (ppbv) |
|---|---|---|
| Dimethyl Sulfide | 4.0 | 11 |

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**Client Sample ID: LFG_120915**

**Lab ID#: 1512183B-02A**

**SULFUR GASES BY ASTM D-5504 GC/SCD**

| | | | |
|---|---|---|---|
| **File Name:** | **k121006** | **Date of Collection:** | **12/9/15 3:20:00 PM** |
| **Dil. Factor:** | **1.00** | **Date of Analysis:** | **12/10/15 12:39 PM** |

| Compound | Rpt. Limit (ppbv) | Amount (ppbv) |
|---|---|---|
| Hydrogen Sulfide | 4.0 | Not Detected |
| Carbonyl Sulfide | 4.0 | Not Detected |
| Methyl Mercaptan | 4.0 | Not Detected |
| Ethyl Mercaptan | 4.0 | Not Detected |
| Dimethyl Sulfide | 4.0 | 11 |
| Carbon Disulfide | 20 | Not Detected |
| Isopropyl Mercaptan | 4.0 | Not Detected |
| tert-Butyl Mercaptan | 4.0 | Not Detected |
| n-Propyl Mercaptan | 4.0 | Not Detected |
| Ethyl Methyl Sulfide | 4.0 | Not Detected |
| Thiophene | 4.0 | Not Detected |
| Isobutyl Mercaptan | 4.0 | Not Detected |
| Diethyl Sulfide | 4.0 | Not Detected |
| n-Butyl Mercaptan | 4.0 | Not Detected |
| Dimethyl Disulfide | 4.0 | Not Detected |
| 3-Methylthiophene | 4.0 | Not Detected |
| Tetrahydrothiophene | 4.0 | Not Detected |
| 2-Ethylthiophene | 4.0 | Not Detected |
| 2,5-Dimethylthiophene | 4.0 | Not Detected |
| Diethyl Disulfide | 4.0 | Not Detected |

**Container Type: 1 Liter Tedlar Bag**

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**Client Sample ID: Lab Blank**

**Lab ID#: 1512183B-03A**

**SULFUR GASES BY ASTM D-5504 GC/SCD**

| | | | |
|---|---|---|---|
| **File Name:** | **k121004** | **Date of Collection: NA** | |
| **Dil. Factor:** | **1.00** | **Date of Analysis: 12/10/15 09:54 AM** | |

| Compound | Rpt. Limit (ppbv) | Amount (ppbv) |
|---|---|---|
| Hydrogen Sulfide | 4.0 | Not Detected |
| Carbonyl Sulfide | 4.0 | Not Detected |
| Methyl Mercaptan | 4.0 | Not Detected |
| Ethyl Mercaptan | 4.0 | Not Detected |
| Dimethyl Sulfide | 4.0 | Not Detected |
| Carbon Disulfide | 20 | Not Detected |
| Isopropyl Mercaptan | 4.0 | Not Detected |
| tert-Butyl Mercaptan | 4.0 | Not Detected |
| n-Propyl Mercaptan | 4.0 | Not Detected |
| Ethyl Methyl Sulfide | 4.0 | Not Detected |
| Thiophene | 4.0 | Not Detected |
| Isobutyl Mercaptan | 4.0 | Not Detected |
| Diethyl Sulfide | 4.0 | Not Detected |
| n-Butyl Mercaptan | 4.0 | Not Detected |
| Dimethyl Disulfide | 4.0 | Not Detected |
| 3-Methylthiophene | 4.0 | Not Detected |
| Tetrahydrothiophene | 4.0 | Not Detected |
| 2-Ethylthiophene | 4.0 | Not Detected |
| 2,5-Dimethylthiophene | 4.0 | Not Detected |
| Diethyl Disulfide | 4.0 | Not Detected |

**Container Type: NA - Not Applicable**

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**Client Sample ID: LCS**

**Lab ID#: 1512183B-04A**

**SULFUR GASES BY ASTM D-5504 GC/SCD**

| | | | |
|---|---|---|---|
| **File Name:** | **k121002** | **Date of Collection: NA** | |
| **Dil. Factor:** | **1.00** | **Date of Analysis: 12/10/15 09:07 AM** | |

| Compound | %Recovery | Method Limits |
|---|---|---|
| Hydrogen Sulfide | 90 | 70-130 |
| Carbonyl Sulfide | 87 | 70-130 |
| Methyl Mercaptan | 91 | 70-130 |
| Ethyl Mercaptan | 99 | 70-130 |
| Dimethyl Sulfide | 104 | 70-130 |
| Carbon Disulfide | 104 | 70-130 |
| Isopropyl Mercaptan | 100 | 70-130 |
| tert-Butyl Mercaptan | 102 | 70-130 |
| n-Propyl Mercaptan | 102 | 70-130 |
| Ethyl Methyl Sulfide | 95 | 70-130 |
| Thiophene | 99 | 70-130 |
| Isobutyl Mercaptan | 99 | 70-130 |
| Diethyl Sulfide | 102 | 70-130 |
| n-Butyl Mercaptan | 101 | 70-130 |
| Dimethyl Disulfide | 97 | 70-130 |
| 3-Methylthiophene | 93 | 70-130 |
| Tetrahydrothiophene | 103 | 70-130 |
| 2-Ethylthiophene | 102 | 70-130 |
| 2,5-Dimethylthiophene | 88 | 70-130 |
| Diethyl Disulfide | 98 | 70-130 |

**Container Type: NA - Not Applicable**

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**Client Sample ID: LCSD**

**Lab ID#: 1512183B-04AA**

**SULFUR GASES BY ASTM D-5504 GC/SCD**

| | | | |
|---|---|---|---|
| **File Name:** | **k121003** | **Date of Collection: NA** | |
| **Dil. Factor:** | **1.00** | **Date of Analysis: 12/10/15 09:31 AM** | |

| Compound | %Recovery | Method Limits |
|---|---|---|
| Hydrogen Sulfide | 94 | 70-130 |
| Carbonyl Sulfide | 88 | 70-130 |
| Methyl Mercaptan | 92 | 70-130 |
| Ethyl Mercaptan | 106 | 70-130 |
| Dimethyl Sulfide | 106 | 70-130 |
| Carbon Disulfide | 105 | 70-130 |
| Isopropyl Mercaptan | 103 | 70-130 |
| tert-Butyl Mercaptan | 106 | 70-130 |
| n-Propyl Mercaptan | 108 | 70-130 |
| Ethyl Methyl Sulfide | 104 | 70-130 |
| Thiophene | 101 | 70-130 |
| Isobutyl Mercaptan | 103 | 70-130 |
| Diethyl Sulfide | 103 | 70-130 |
| n-Butyl Mercaptan | 106 | 70-130 |
| Dimethyl Disulfide | 94 | 70-130 |
| 3-Methylthiophene | 92 | 70-130 |
| Tetrahydrothiophene | 101 | 70-130 |
| 2-Ethylthiophene | 102 | 70-130 |
| 2,5-Dimethylthiophene | 86 | 70-130 |
| Diethyl Disulfide | 93 | 70-130 |

**Container Type: NA - Not Applicable**

## David Johnson

**From:** Haberman, Dave
**Sent:** Wednesday, April 01, 2015 9:33 AM
**To:** Howie Robert (rhowie@seaconllc.com)
**Cc:** Heinz, Dana; Painter, Kristin
**Subject:** No Control Document Required to Discharge to the Sanitary Sewer from South Park Property Development LLC, Reference Number 400185-01, Effective April 1, 2015

No Control Document Required to Discharge to the Sanitary Sewer from South Park Property Development LLC, Reference Number 400185-01, Effective April 1, 2015

Dear Mr. Howie,

The King County Industrial Waste Program (KCIW) has reviewed the Industrial Waste Program Survey, concerning whether your facility is in need of an authorization to discharge wastewater from your operation at South Park Property Development LLC, located at 8249 5th Avenue S., Seattle, to the sanitary sewer.

It is my understanding from the survey and our conversation April 1, 2015 that the property is paved and used for parking but underneath the asphalt is an underground negative pressure system designed to capture gas from an old landfill. This system generates less than a gallon of condensate a day which is discharged to the sanitary sewer system. In addition, the condensate has been tested and meets the King County local discharge limits.

KCIW has determined that, based on the information provided and the processes occurring at your facility, at this time you do not need a permit or other written authorization to discharge your wastewater to the King County sanitary sewer system, in accordance with King County Code 28.84.060 (found at: www.kingcounty.gov/council/legislation/kc_code.aspx).

As a discharger of industrial wastewater you are required to meet discharge limitations as detailed in King County Code and King County Local Discharge Limits (found at: www.kingcounty.gov/environment/wastewater/IndustrialWaste/Limits.aspx).

If you propose to change the type or quantities of substances discharged, you must contact KCIW at least 60 days before making these changes.

If you have any questions about this determination, or other questions about your wastewater discharge, please call me at 206-477-5465. You may also wish to visit our program's Internet pages at: www.kingcounty.gov/industrialwaste.

Thank you for helping support our mission to protect public health and enhance the environment.

Sincerely,

Dave Haberman
Compliance Investigator
King County Industrial Waste Program

Phone 206-477-5465
Fax 206-263-3001

*It’s okay to be confused sometimes because it eventually leads to clarity and with that comes understanding and growth. - Hab*

# APPENDIX D
# FIELD FORMS

SPPD PROPERTY LANDFILL GAS COLLECTION AND CONTROL SYSTEM
OPERATION, MAINTENANCE, AND MONITORING PLAN
South Park Landfill Site
Seattle, Washington

Farallon PN: 408-002

**Appendix D Field Form**
**Landfill Gas Collection and Control System Operation, Maintenance, and Monitoring Plan**
**South Park Landfill Site**
**Seattle, Washington**
**Farallon PN: 408-002**

Date:

Weather Conditions: Ambient Temperature:

| Northwestern Equipment Area | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Stabilized Gas Readings | | | | | | | | | Calculated Values | | |
| | CH4 | CO2 | O2 | Balance Gas | CO | H2S | Static Pressure | Temp. | Velocity | Flowrate | Residual Nitrogen | |
| | % Vol. | % Vol. | % Vol. | % Vol. | ppm | ppm | IOW | | ft/min | SCFM | % Vol. | |
| System Influent | | | | | | | | | | | | |
| Blower Influent | - | - | - | - | - | - | | - | | | | |
| Discharge Stack | | | | | | | | | | | | |
| Dilution Air Inlet | - | - | - | - | - | - | | - | | | | |

| | Running Amperage | Total Run Time (Hr.) | | | |
|---|---|---|---|---|---|
| Blower #1 | | | | | |
| Blower #2 | | | | | |
| Condensate Pump | | | Condensate Discharge Meter Reading | | |
| **Northeastern Equipment Area** | | | | | |

Condensate Pump Running Amps Condensate Discharge Meter Reading

**Appendix D Field Form**
**Landfill Gas Collection and Control System Operation, Maintenance, and Monitoring Plan**
**South Park Landfill Site**
**Seattle, Washington**
**Farallon PN: 408-002**

| Monitoring and Control Assembly | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Stabilized Gas Readings | | | | | | | | | | Calculated Values | |
| Well ID | Time | CH4 % Vol. | CO2 % Vol. | O2 % Vol. | Balance Gas % Vol. | CO ppm | H2S ppm | Barometric Pressure In Hg | Static Pressure IOW | Temp. | Velocity ft/min | Flowrate SCFM | Residual Nitrogen % Vol. |
| V1 | | | | | | | | | | | | | |
| V2 | | | | | | | | | | | | | |
| V3 | | | | | | | | | | | | | |
| V4 | | | | | | | | | | | | | |
| V5 | | | | | | | | | | | | | |
| V6 | | | | | | | | | | | | | |
| V7 | | | | | | | | | | | | | |
| V8 | | | | | | | | | | | | | |
| V9 | | | | | | | | | | | | | |
| V10 | | | | | | | | | | | | | |
| V11 | | | | | | | | | | | | | |
| V12 | | | | | | | | | | | | | |
| V13 | | | | | | | | | | | | | |
| V14 | | | | | | | | | | | | | |
| V15 | | | | | | | | | | | | | |
| V16 | | | | | | | | | | | | | |
| V17 | | | | | | | | | | | | | |
| V18 | | | | | | | | | | | | | |

**Appendix D Field Form**
**Landfill Gas Collection and Control System Operation, Maintenance, and Monitoring Plan**
**South Park Landfill Site**
**Seattle, Washington**
**Farallon PN: 408-002**

| Monitoring and Control Assembly | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Stabilized Gas Readings | | | | | | | | | | Calculated Values | |
| Well ID | Time | CH4 % Vol. | CO2 % Vol. | O2 % Vol. | Balance Gas % Vol. | CO ppm | H2S ppm | Barometric Pressure In Hg | Static Pressure IOW | Temp. | Velocity ft/min | Flowrate SCFM | Residual Nitrogen % Vol. |
| V19 | | | | | | | | | | | | | |
| V20 | | | | | | | | | | | | | |
| V21 | | | | | | | | | | | | | |
| V22 | | | | | | | | | | | | | |
| V23 | | | | | | | | | | | | | |
| V24 | | | | | | | | | | | | | |
| V25 | | | | | | | | | | | | | |
| V26 | | | | | | | | | | | | | |
| V27 | | | | | | | | | | | | | |
| V28 | | | | | | | | | | | | | |
| V29 | | | | | | | | | | | | | |
| V30 | | | | | | | | | | | | | |
| V31 | | | | | | | | | | | | | |
| V32 | | | | | | | | | | | | | |
| V33 | | | | | | | | | | | | | |
| V34 | | | | | | | | | | | | | |
| V35 | | | | | | | | | | | | | |
| V36 | | | | | | | | | | | | | |

**Appendix D Field Form**
**Landfill Gas Collection and Control System Operation, Maintenance, and Monitoring Plan**
**South Park Landfill Site**
**Seattle, Washington**
**Farallon PN: 408-002**

| Monitoring and Control Assembly | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Stabilized Gas Readings | | | | | | | | | | Calculated Values | |
| Well ID | Time | CH4 % Vol. | CO2 % Vol. | O2 % Vol. | Balance Gas % Vol. | CO ppm | H2S ppm | Barometric Pressure In Hg | Static Pressure IOW | Temp. | Velocity ft/min | Flowrate SCFM | Residual Nitrogen % Vol. |
| V37 | | | | | | | | | | | | | |
| V38 | | | | | | | | | | | | | |
| V39 | | | | | | | | | | | | | |
| V40 | | | | | | | | | | | | | |
| V41 | | | | | | | | | | | | | |
| V42 | | | | | | | | | | | | | |
| V43 | | | | | | | | | | | | | |
| V45 | | | | | | | | | | | | | |
| V46 | | | | | | | | | | | | | |
| V47 | | | | | | | | | | | | | |
| V48 | | | | | | | | | | | | | |
| V49 | | | | | | | | | | | | | |
| V50 | | | | | | | | | | | | | |
| V51 | | | | | | | | | | | | | |
| V52 | | | | | | | | | | | | | |
| V53 | | | | | | | | | | | | | |
| V54 | | | | | | | | | | | | | |
| H1 | | | | | | | | | | | | | |

**Appendix D Field Form**
**Landfill Gas Collection and Control System Operation, Maintenance, and Monitoring Plan**
**South Park Landfill Site**
**Seattle, Washington**
**Farallon PN: 408-002**

| Monitoring and Control Assembly | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Stabilized Gas Readings | | | | | | | | | | Calculated Values | |
| Well ID | Time | CH4 % Vol. | CO2 % Vol. | O2 % Vol. | Balance Gas % Vol. | CO ppm | H2S ppm | Barometric Pressure In Hg | Static Pressure IOW | Temp. | Velocity ft/min | Flowrate SCFM | Residual Nitrogen % Vol. |
| H2 | | | | | | | | | | | | | |
| H3 | | | | | | | | | | | | | |
| H5 | | | | | | | | | | | | | |
| H6 | | | | | | | | | | | | | |
| H7 | | | | | | | | | | | | | |
| H8 | | | | | | | | | | | | | |
| H9 | | | | | | | | | | | | | |
| H10 | | | | | | | | | | | | | |
| H11 | | | | | | | | | | | | | |
| H12 | | | | | | | | | | | | | |
| H13 | | | | | | | | | | | | | |
| H14 | | | | | | | | | | | | | |
| H15 | | | | | | | | | | | | | |
| H16 | | | | | | | | | | | | | |
| H17 | | | | | | | | | | | | | |

**Appendix D Field Form**
**Landfill Gas Collection and Control System Operation, Maintenance, and Monitoring Plan**
**South Park Landfill Site**
**Seattle, Washington**
**Farallon PN: 408-002**

| Monitoring and Control Assembly | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Stabilized Gas Readings | | | | | | | | | | Calculated Values | |
| Well ID | Time | CH4 % Vol. | CO2 % Vol. | O2 % Vol. | Balance Gas % Vol. | CO ppm | H2S ppm | Barometric Pressure In Hg | Static Pressure IOW | Temp. | Velocity ft/min | Flowrate SCFM | Residual Nitrogen % Vol. |
| H18 | | | | | | | | | | | | | |
| H19 | | | | | | | | | | | | | |
| H20 | | | | | | | | | | | | | |
| H21 | | | | | | | | | | | | | |
| H22 | | | | | | | | | | | | | |

NOTES:

Residual nitrogen can be calculated by entering the collected field data into the monitoring data Excel spreadsheet or by using the following calculation: RN = Balance Gas - (3.76 x O2) where RN is residual nitrogen in % by volume, balance gas is in % by volume, and O2 is in % by volume.

Using a hot wire anemometer or equivalent air velocity measurement instrument, the flow rate can be calculated by entering the collected field data into the monitoring data Excel spreadsheet or by using the following calculation: SCFM = V x (D / 144) where V is the velocity in feet per minute, and D is the inside diameter of the pipe in inches.

# APPENDIX E
# FARALLON HEALTH AND SAFTETY PLAN

SPPD PROPERTY LANDFILL GAS COLLECTION AND CONTROL SYSTEM
OPERATION, MAINTENANCE, AND MONITORING PLAN
South Park Landfill Site
Seattle, Washington

Farallon PN: 408-002

FARALLON CONSULTING

Washington
Issaquah | Bellingham | Seattle

Oregon
Portland | Bend | Baker City

California
Oakland | Sacramento | Irvine

# HEALTH AND SAFETY PLAN

## INTERIM ACTION COMPLIANCE MONITORING
## SOUTH PARK LANDFILL SITE
## SEATTLE, WASHINGTON

**Submitted by:**
**Farallon Consulting, L.L.C.**
**975 5th Avenue Northwest**
**Issaquah, Washington 98027**

**Farallon PN: 408-002**

**For:**
**South Park Property Development, L.L.C.**
**165 Northeast Juniper Street, Suite 100**
**Issaquah, Washington 98027**

May 2016

# HEALTH AND SAFETY PLAN
# REVIEW AND APPROVAL

**Client**: South Park Property Development
**Facility Name**: South Park Landfill Site
**Type of Work**: Interim Action Compliance Monitoring
**Project Number**: 408-002
**Start Date**: May 2016
**End Date**: November 2016

**Plan Expiration Date**: November 2016 (Last day of expected field work or no longer than 6 months)

**APPROVED BY:**

Thaddeus Cline
Project Manager

*Signature*

May 4, 2016
*Date*

Joe Rounds
Health and Safety Coordinator

*Signature*

May 4, 2016
*Date*

Clifford T. Schmitt
Principal-in-Charge

*Signature*

May 4, 2016
*Date*

This Health and Safety Plan (HASP) was written for the use of Farallon Consulting, L.L.C. (Farallon) and its employees. It may be used also by trained and experienced Farallon subcontractors as a guidance document. However, Farallon does not guarantee the health or safety of any person entering this site.

Due to the potentially hazardous nature of the site and the activities occurring thereon, it is not possible to discover, evaluate, or provide protection for all possible hazards that may be encountered. Strict adherence to the health and safety guidelines set forth herein will reduce, but does not eliminate, the potential for injury. The health and safety guidelines in this HASP were prepared specifically for this site, its conditions, purposes, dates of field work, and personnel, and must be amended if conditions change.

Farallon claims no responsibility for the use of this HASP by others. This HASP will provide useful information to subcontractors and will assist them in developing their own HASP, but it should not be construed as a substitute for their own HASP. Subcontractors should sign this HASP (see Attachment 1, *Health and Safety Plan Acknowledgment and Agreement Form*) as an acknowledgement of hazard information and as notice that this HASP does not satisfy their requirement to develop their own HASP.

# CONTENTS

# ATTACHMENTS

# 1.0 SCOPE OF WORK

This Health and Safety Plan (HASP) was prepared for the use of Farallon Consulting, L.L.C. (Farallon) personnel while performing the following tasks in accordance with the *Interim Action Compliance Monitoring Plan, Appendix C of the Interim Action Work Plan, South Park Landfill Site, Seattle, Washington* dated February 22, 2013, prepared by Farallon (Plan) for the South Park Landfill Site located in the South Park neighborhood less than 5 miles south of downtown Seattle, Washington (herein referred to as the Site). Specific details regarding each field activity are presented in the Plan. Field activities at the Site are outlined below.

Operations and Maintenance

Landfill Cap:

- Annual Inspections
- Periodic Repairs

Landfill Gas Controls:

- System Start-up, Testing, and Optimization
- Operations and Maintenance

Monitoring

Landfill Gas Probes:

- Perimeter Performance – Monitoring perimeter landfill gas probes during construction of the landfill;
- Optimization – Monitoring perimeter landfill gas probes during the adjustment to the landfill gas control system valving; and
- Future Interim Action Area Buildings Confirmation – Monitoring indoor air quality in future buildings constructed in the Interim Action Area.

Work entails tasks on a fenced and paved industrial property and, on occasion, in adjacent rights-of-way. The landfill cap consists of an asphaltic concrete cap over the majority of the Site and a low-permeability membrane cap around the sloped periphery of the Site. Landfill cap annual inspections entails walking the Site and being mindful of tenant vehicle activity. Periodic repairs of the landfill cap may include patching asphalt or membrane surfaces possibly with use of heavy equipment and special tools and products.

Operation and maintenance of landfill gas controls entails monitoring conditions in landfill gas collectors and compliance monitoring landfill gas probes, which are accessed via flush-mount and above-grade monuments and use of a landfill gas monitoring device known as a Landtec GEM-2000. Specialized tools and gauges may also be used. Adjustment of machinery within the

treatment compound or at leachate collection sumps will sometimes be required by appropriately trained personnel aware of hazards of the blower system and high-voltage electricity.

The tasks will be conducted in a manner consistent with the methods and assumptions outlined in the Plan and related appendices.

# 2.0 BACKGROUND INFORMATION

Farallon has prepared this HASP to be implemented during field activities conducted according to the Plan for the Site. This HASP was prepared as Attachment A of the Plan. The Plan describes compliance monitoring that will be performed in conjunction with the Interim Action to be conducted on a portion of the South Park Landfill (Interim Action). The South Park Landfill is located in the South Park neighborhood less than 5 miles south of downtown Seattle, Washington. The South Park Landfill covers an area of approximately 39 acres, of which nearly half is currently developed. Figure 1 of the Plan shows the general vicinity around the South Park Landfill, and Figure 2 of the Plan shows the approximate boundaries of the South Park Landfill. Sections 1 and 2 of the Plan describe the Interim Acton area and summarize the project scope and Interim Action components, which include capping the landfill surface, controlling landfill gas, and constructing a stormwater collection and conveyance system.

The sampling and analysis procedures that will be used are described in the Compliance Monitoring Sampling and Analysis Plan provided in Attachment B of the Plan. The primary objective of the HASP is to ensure the safety of Farallon personnel during the field monitoring tasks.

# 3.0 DRUG AND ALCOHOL POLICY

It is Farallon's policy to maintain a drug-free workplace. Farallon has a responsibility to all of its staff members to provide a safe and inoffensive work environment, and a responsibility to its clients to provide accurate and consistent service. For these reasons, Farallon prohibits the following behavior by staff members in the field:

- Use of tobacco in any form by any person at any time in sensitive or hazardous areas that may pose a health and safety or environmental risk. The Site Health and Safety Officer (SHSO) may designate an area away from hazards that is safe for tobacco use.
- Possession or consumption of alcohol and/or marijuana, or being under the influence of alcohol and/or marijuana during field activities.
- Abuse of prescription and/or over-the-counter drugs in such a manner as to negatively impact performance or field safety.
- Possession, use, sale, or being under the influence of illicit drugs while in the field or during any work hours.

Violation of any of the above codes of conduct is grounds for immediate removal from the project Site and discipline in accordance with Farallon company policy. If an incident occurs as a result of an employee's actions, drug and alcohol testing will be performed in accordance with Farallon company policy.

# 4.0 WEAPONS POLICY

Farallon employees, contractors, subcontractors, and their employees working at the Site are to ensure that they do not bring weapons onto the work site. Weapons include but are not limited to guns, knives, and explosives. Tools that are used during the course of field events, including but not limited to box knives, are exempt from this weapons policy. All vehicles and persons can be subjected to search while working at the property.

Failure to comply with the weapons policy can result in disciplinary action for the individual(s) involved in accordance with Farallon company policy.

# 5.0 INCIDENT PREPAREDNESS AND RESPONSE

Farallon employees and subcontractors working at the Site must be prepared to respond appropriately to an incident involving injury, illness, death, spills, or utility breaches. This section outlines the degree of preparedness required for employees at a work site, and describes the actions to be taken in the event of a health and safety incident.

## 5.1 HEALTH AND SAFETY PREPAREDNESS

All individuals working at the Site are required to be familiar with the contents of this HASP. Additionally, the items on the following health and safety preparedness list should be reviewed prior to the commencement of work and during daily health and safety meetings:

- The directions to the hospital (provided in Attachment 2);
- The locations of first aid kits, personal eye washes, and fire extinguishers (located in Site vehicles);
- The locations of the keys to Site vehicles; and
- Hand sign language providing for the immediate stoppage of work (such as a horizontal hand movement in front of the neck).

Additional topics for daily health and safety meetings are included in Attachment 3, Potential Topics for Daily Health and Safety Meeting. Participation in daily health and safety meetings should be documented in Attachment 4, Daily Health and Safety Briefing Log.

## 5.2 INJURY OR ILLNESS

If an injury or illness occurs, the following actions should be taken, regardless of the severity of the injury or illness:

- Stop work.
- Determine whether emergency response staff (e.g., fire, ambulance) are necessary. If so, dial 911 on a cell phone or the closest available telephone. Describe the location of the injured person and provide other details as requested. If an individual requires non-emergency medical care at a hospital, follow the directions to the nearest hospital, which are provided in Attachment 2. IF EMERGENCY MEDICAL CARE IS NEEDED, CALL 911.
- Administer first aid to the individual immediately, using the first aid kit provided in the Site vehicle. Use the bloodborne pathogens kit and personal eyewash, as needed.
- Notify the SHSO immediately. The SHSO is responsible for preparing and submitting an Incident Report form to Farallon's Health and Safety Coordinator (HSC) within 24 hours of the incident, and for notifying the employee's supervisor and the Principal-in-Charge. The Incident Report form is provided in Attachment 5.

- ***All incidents must be reported to the HSC within 24 hours; however, the actual investigation need not be completed within 24 hours***. **A telephone message that includes the date, time, and general incident circumstances should be left at one of the following numbers if the HSC cannot be reached directly**:
  - HSC work phone: (425) 295-0800
  - HSC cell phone: (206) 484-2748
  - If the HSC cannot be located, contact the Principal-in-Charge
- The SHSO will assume responsibility during a medical emergency until emergency response personnel arrive at the Site.

## 5.3 REPORTING PROCEDURES FOR MINOR CUTS, SCRATCHES, BRUISES, ETC.

Every occupational illness or injury is to be reported immediately by the employee to the SHSO. The SHSO is to complete the Incident Report form provided in Attachment 5, and report the incident to the HSC.

## 5.4 NEAR MISSES

A near miss is defined as an incident in which no personal injury is sustained and no property damage is incurred, but in which injury and/or property damage could have occurred under slightly different timing or location.

In the event of a near miss, the following actions are to be taken:

- Stop work if there is immediate danger of injury or property damage;
- Report the near miss to the SHSO as soon as practicable;
- Resume work upon satisfactory resolution of the near-miss condition, if work was stopped, and document the corrective action(s) taken by the SHSO; and
- Complete and submit the Near Miss Report form in Attachment 6 to the HSC within 2 business days.

## 5.5 MEDICAL INCIDENTS NOT REQUIRING AMBULANCE SERVICE

Medical incidents not requiring ambulance services include injuries and conditions such as minor lacerations and sprains. In the event of an injury, an illness, or a condition that does not require ambulance service, the following actions are to be taken:

- Stop work.
- Administer first aid as necessary to stabilize the individual for transport to the hospital.

- The SHSO is to facilitate prompt transportation of the individual to the hospital. Directions to the nearest hospital are provided in Attachment 2.
- A representative of Farallon or the subcontractor is to drive the individual to the medical facility and remain at the facility until the individual is able to return to the work site, or arrangements for further care have been established.
- If the driver is not familiar with the route to the hospital, a second person who is familiar with the route is to accompany the driver and the injured employee to the hospital.
- If it is necessary for the SHSO to accompany the injured employee to a medical facility, provisions must be made for another employee who is trained and certified in first aid to act as the temporary SHSO before work at the work site can resume.
- If the injured employee is able to return to the work site the same day, he/she is to bring a statement from the doctor that provides the following information:
  - Date of incident
  - Employee's name
  - Diagnosis
  - Date he/she is able to return to work, and whether regular or light duty
  - Date he/she is to return to the doctor for a follow-up appointment, if necessary
  - Signature and address of doctor
- The SHSO is to complete the Incident Report form provided in Attachment 5, and report the incident to the HSC.
- If the injured employee is unable to return to the work site the same day, the employee who transported him/her should bring the statement from the doctor back to the work site. The information on this statement should be reported to the HSC immediately.

## 5.6 EMERGENCY CASES REQUIRING AMBULANCE SERVICE

In the event of an injury or illness that requires emergency response and transport to a hospital by ambulance the following actions should be taken:

- **Dial 911** to request ambulance service;
- Notify the SHSO;
- Administer first aid until the ambulance service arrives;
- One designated company representative should accompany the injured employee to the medical facility and remain there until final diagnosis, treatment plan, and other relevant information has been obtained; and

- The SHSO is to complete the Incident Report form provided in Attachment 5, and report the incident to the HSC immediately.

## 5.7 EMPLOYEE DEATH, OR HOSPITALIZATION OF THREE OR MORE EMPLOYEES

The procedures outlined in Section 6.2 should be followed in the event of an employee injury or illness. If an employee fatality occurs, the HSC, local emergency personnel, and the coroner must be notified **immediately**. **The HSC will initiate the required State of Washington Department of Labor and Industries and Occupational Safety and Health Administration (OSHA) notifications within 8 hours of a fatality or the hospitalization of three or more employees.**

## 5.8 RESPONSE TO SPILLS OR UTILITY BREACHES

The location of underground utilities (e.g., product, sewer, telephone, fiber optic) and facilities (e.g., underground storage tanks, septic tanks, utility vaults) is to be noted prior to commencement of intrusive subsurface work activities. Use the public and private locate services as required and complete the Utility Clearance Log (Attachment 7). If a utility line or tank is breached or a spill or release occurs, the event is to be documented on the Incident Report form provided in Attachment 5 as soon as possible. The date, time, name of the person(s) involved, actions taken, and discussions with other affected parties are to be included. The SHSO, Project Manager (PM), and client are to be notified immediately. The PM is to notify the regulatory authority and/or utility company, as necessary.

In the event of a spill or release, the following actions should be taken:

- Stay upwind of the spill or release.
- Don appropriate personal protective equipment (PPE).
- Turn off equipment and other sources of ignition.
- Turn off pumps and shut valves to stop the flow or leak.
- Plug the leak or collect drippings, if possible.
- Use sorbent pads to collect the product and impede its flow, if possible.
- Dial 911 or telephone the local fire department immediately if a fire or another emergency situation develops.
- Inform the Farallon PM of the situation.
- Determine whether the client would like Farallon to repair the damage or would rather use an emergency repair contractor.

- Advise the client of spill discharge notification requirements, and establish who will complete and submit the required forms. ***Do not report or submit information to an agency without the client's consent.*** Document each interaction with the client and regulators, and note in writing names, titles, authorizations, refusals, decisions, and commitments to any action.
- Do not transport or approve transportation of contaminated soils or product until proper manifests have been completed and approved. Be aware that soil and/or product may meet criteria for hazardous waste.
- Do not sign manifests as a generator of wastes. Contact the PM to discuss waste transportation.

## 5.9 NOTIFICATIONS

A spill or release requires completion of an Incident Report form (provided in Attachment 5) per Farallon's Health and Safety program. **The PM must involve the client and/or generator in the incident reporting process. The client and/or generator is under obligation to report the incident to the appropriate government agency(ies). If the spill extends into waterways, the Coast Guard and the National Response Center must be notified immediately by the client or with client permission (1-800-424-8802).**

## 5.10 SHUTOFF VALVES AND/OR SWITCHES FOR UTILITIES AND PRODUCTS

Before starting work, locate and list below the location of utility and product line shutoff valves and switches on the work site. Review the location of shutoff valves and switches with field personnel before beginning work.

The shutoff valves and/or switches for electrical, natural gas, gasoline, water lines, etc.:

Will be located in the field before work commences, as applicable.

# 6.0 EMERGENCY RESPONSE AND EVACUATION PLAN

Farallon personnel and subcontractors working on the Site are to be aware of Site-specific emergency and evacuation procedures, including alarm systems and evacuation plans and routes. If an incident occurs that requires emergency response, such as a fire or spill, **CALL 911 and request assistance**. Farallon staff, subcontractors, and/or others working in an area where an emergency occurs are to evacuate to a safe location away from the incident area, preferably upwind, and take attendance.

**For this project, the emergency evacuation gathering location is the northeastern entrance of the Site on 5th Avenue South.**

If the emergency causes the route to be obstructed, Farallon personnel and subcontractors are to move to an open area upwind of the hazard area, and remain there until instructed by emergency response personnel (e.g., police, fire, ambulance personnel, paramedics) to do otherwise.

Subcontractors have the responsibility to account for their own employees and provide requested information to emergency response personnel immediately upon request. Farallon staff, subcontractors, and/or contractors may not reenter the scene of the emergency without specific approval from emergency response personnel.

# 7.0 LOCAL EMERGENCY CONTACT NAMES AND TELEPHONE NUMBERS

Local emergency response personnel can be contacted at the following numbers. Directions and a map to the hospital are included in Attachment 2.

| Emergency Contact | Name and Location | Telephone No. |
|---|---|---|
| **Hospital** | Harborview Medical Center<br>325 9th Avenue<br>Seattle, Washington 98104-2420 | **911**<br>or<br>(206) 744-5100 |
| **Police** | Seattle Police Department<br>2300 Southwest Webster Street<br>Seattle, Washington | **911**<br>or<br>(206) 733-9800 |
| **Fire** | Seattle Fire Department<br>800 South Cloverdale Street<br>Seattle, Washington | **911**<br>or<br>(206) 386-1400 |
| **National Response Center** | | **1-800-424-8802** |
| **Washington State Department of Ecology** | | **(360) 407-6300** |
| **Poison Control** | | **1-800-424-5555** |

# 8.0 PROJECT PERSONNEL AND RELEVANT INFORMATION

The following section provides contact information for the project and the HSC and client-specific health and safety requirements. Farallon field personnel training and medical surveillance dates are included in Attachment 8.

## 8.1 PROJECT PERSONNEL CONTACT INFORMATION

Questions about this project that are posed by neighbors, the press, or other interested parties should be directed to the Principal-in-Charge at Farallon: (425) 295-0800.

| Personnel Title<br>Personnel Name<br>Personnel Contact Information | General Project Responsibilities |
|---|---|
| **Health and Safety Coordinator**<br>Joe Rounds<br>Office: (425) 295-0800<br>Cell: (206) 484-2748 | Provide support in implementing HASP. Provide immediate support upon notice of any incident. |
| **Principal-in-Charge**<br>Clifford Schmitt<br>Office: (425) 295-0800<br>Cell: (425) 765-3365 | Provide immediate support upon notice of any incident. |
| **Project Manager**<br>Thaddeus Cline<br>Office: (425) 295-0800<br>Cell: (425) 271-4122 | Provide immediate support upon notice of any incident. |
| **Client Contact**<br>Robert Howie<br>Office: (425) 837-9720 | Provide known analytical data from work performed by others. Provide notice of Site hazards. Provide access to Site. Provide information regarding available emergency supplies at the Site. |

# 9.0 POTENTIAL AIRBORNE CONTAMINANTS

The potential airborne contaminants of concern in the immediate vicinity at the Site are listed in the table on the following page. The table should be reviewed, and any questions directed to the SHSO. The air monitoring table and forms are included in Attachment 10.

| POTENTIAL AIRBORNE CHEMICALS ON SITE FOR THIS PROJECT<br>REVIEW THIS TABLE AND CONTACT THE SHSO WITH ANY QUESTION | | | | | | |
|---|---|---|---|---|---|---|
| **Chemical (or Class)** | **OSHA PEL ACGIH TLV** | **Other Pertinent Limits** | **Properties** | **Routes of Exposure or Irritation** | **Acute Health Effects** | **Chronic Health Effects/ Target Organs** |
| Polychlorinated biphenyls (PCBs) | PEL 0.5 - 1 mg/m$^3$<br>TLV 0.5 - 1 mg/m$^3$, depending on the species. | NIOSH REL - 0.001 mg/m$^3$<br>NIOSH considers this material to be a carcinogen.<br>IDLH - 5 mg/m$^3$ | Pale or dark yellow odorless liquid. | Inhalation; dermal; ingestion. Skin absorption is a significant mode of exposure. | Irritation to eyes, skin, respiratory tract; chloroacne. | May cause reproductive, CNS, CVS, skin, eye, liver effects; cancer (leukemia). |
| Toluene | PEL - 200 ppm<br>TLV - 50 ppm | NIOSH REL = 100 ppm TWA; 150 ppm STEL<br>ILDH = 500 ppm | Sweet, pungent, benzene-like odor. | Eye contact. | Skin (dermatitis); eye, respiratory tract irritant; headache; dizziness; weakness; fatigue. | CNS; liver; kidneys; skin. |
| Benzene | PEL - 1 ppm<br>TLV 0.5 ppm (skin) | PEL STEL - 5 ppm<br>IDLH=500 ppm | Characteristic benzene odor. | Inhalation; dermal; ingestion; eye contact. | Skin (dermatitis); eye, respiratory tract irritant; headache; dizziness; nausea. | Carcinogen; CNS; eye damage; bone marrow; blood; skin; leukemia. |
| Xylenes | PEL - 100 ppm<br>TLV - 100 ppm | TLV STEL - 500 ppm<br>NIOSH REL - 100 ppm<br>NIOSH REL STEL - 100 ppm<br>IDLH - 900 ppm | Aromatic odor. | Inhalation; dermal; ingestion; eye contact. | Throat and skin irritant (dermatitis); headache; nausea; drowsiness; fatigue. | CNS; liver; kidneys; skin; gastrointestinal damage; eye damage. |

| POTENTIAL AIRBORNE CHEMICALS ON SITE FOR THIS PROJECT<br>REVIEW THIS TABLE AND CONTACT THE SHSO WITH ANY QUESTION | | | | | | |
|---|---|---|---|---|---|---|
| **Chemical (or Class)** | **OSHA PEL ACGIH TLV** | **Other Pertinent Limits** | **Properties** | **Routes of Exposure or Irritation** | **Acute Health Effects** | **Chronic Health Effects/ Target Organs** |
| Ethylbenzene | PEL - 100 ppm<br>TLV - 100 ppm | PEL STEL - 125 ppm<br>TLV STEL - 125 ppm<br>NIOSH REL - 100 ppm<br>REL STEL - 125 ppm<br>IDLH - 800 ppm | Pungent, aromatic odor. | Inhalation; dermal; ingestion; eye contact. | Skin, eye, mucous membrane irritant; headache; dizziness; drowsiness. | Eyes; respiratory tract; skin; CNS; blood; kidneys; liver. |
| Lead | PEL - 0.05 $mg/m^3$<br>TLV - 0.05 $mg/m^3$ | IDLH - 100 $mg/m^3$ | A heavy, flexible, soft, gray solid. | Inhalation; dermal; ingestion; eye contact. | Lassitude (weakness, exhaustion); abdominal pain; gingival lead line; tremor; irritation to eyes; hypotension. | Insomnia; facial pallor; anorexia; weight loss; malnutrition; constipation; colic; anemia; paralysis: wrist, ankles; encephalopathy; kidney disease; potential for damage to eyes, gastrointestinal tract, CNS, kidneys, blood, gingival tissue. |
| Trichloroethene (trichloroethylene) | PEL - 100 ppm<br>TLV - 50 ppm | PEL Ceiling - 200 ppm<br>NIOSH considers trichloroethylene to be a carcinogen. | Colorless liquid (unless dyed blue) with a chloroform-like odor. | Inhalation; dermal; ingestion; eye contact. | Irritation to eyes, skin; headache; vertigo (an illusion of movement); visual disturbance; fatigue; giddiness; tremor; somnolence (sleepiness, unnatural drowsiness); nausea; vomiting; dermatitis. | Cardiac arrhythmias; paresthesia; liver injury; potential occupational carcinogen of liver, kidney. |

| POTENTIAL AIRBORNE CHEMICALS ON SITE FOR THIS PROJECT<br>REVIEW THIS TABLE AND CONTACT THE SHSO WITH ANY QUESTION | | | | | | |
|---|---|---|---|---|---|---|
| **Chemical (or Class)** | **OSHA PEL ACGIH TLV** | **Other Pertinent Limits** | **Properties** | **Routes of Exposure or Irritation** | **Acute Health Effects** | **Chronic Health Effects/ Target Organs** |
| Tetrachloroethene (perchloroethylene) | PEL - 100 ppm<br>TLV - 25 ppm | PEL Ceiling - 200 ppm<br>TLV STEL - 100 ppm<br>IDLH - 150 ppm<br>NIOSH considers this compound to be a carcinogen. | Colorless liquid with a mild, chloroform-like odor. | Inhalation; skin absorption; ingestion; eye contact. | Irritation to eyes, skin, nose, throat, respiratory system; nausea; flushed face, neck; vertigo (an illusion of movement); dizziness; lack of coordination; headache; skin erythema (redness). | Somnolence (sleepiness, unnatural drowsiness); liver damage; potential occupational liver carcinogen. **Target Organs:** Eyes, skin, respiratory system, liver, kidneys, CNS. |
| Methane | TLV - 1,000 ppm simple asphyxiate | LEL – 5 percent | Colorless, odorless gas; can be liquid. | Inhalation, dermal. | Headaches, ringing in ears, dizziness, drowsiness, unconsciousness, nausea, vomiting, depression of senses frostbite (from liquid form). | Lungs, skin. |
| Carbon dioxide | PEL - 5,000 ppm<br>TLV - 5,000 ppm | NIOSH REL - 5,000 ppm<br>IDLH - 40,000 ppm | Colorless, odorless gas; can be liquid or solid | Inhalation, dermal, eyes. | Headaches, dizziness, restlessness, paresthesia, dyspnea, sweating, malaise, increased heart rate, elevated blood pressure, pulse pressure, coma, asphyxia, convulsions, frostbite (dry ice). | Lungs, skin, CNS, eyes. |
| Arsenic | PEL – 0.01 $mg/m^3$ | Level for Respiration Use: 0.005 $mg/m^3$<br>Level for Work Stoppage: 1/2 IDLH – 2.5 $mg/m^3$ | Properties vary | Inhalation; dermal; ingestion. Inhalation and ingestion are a significant mode of exposure. | Irritation to eyes, skin, nose; cough; dizziness; nausea | Liver; kidney; gastrointestinal damage; skin; lungs; potential carcinoma |

| POTENTIAL AIRBORNE CHEMICALS ON SITE FOR THIS PROJECT<br>REVIEW THIS TABLE AND CONTACT THE SHSO WITH ANY QUESTION | | | | | | |
|---|---|---|---|---|---|---|
| **Chemical (or Class)** | **OSHA PEL ACGIH TLV** | **Other Pertinent Limits** | **Properties** | **Routes of Exposure or Irritation** | **Acute Health Effects** | **Chronic Health Effects/ Target Organs** |
| Vinyl chloride | PEL - 1 ppm<br>TLV - 1 ppm | NIOSH considers this material to be a carcinogen. | Liquid with a pleasant odor at high concentrations. | Inhalation; dermal; eye contact. | Weakness; abdominal pain; pallor or cyanosis of extremities; liquid frostbite. | Gastrointestinal bleeding; enlarged liver; potential occupational liver carcinogen; damage to CNS, blood, respiratory system, lymphatic system. |

NOTES:
ACGIH = American Conference of Governmental Industrial Hygienists
AIHA = American Industrial Hygiene Association
AIHA WEEL = AIHA-set workplace environmental exposure limits
C = ceiling limit
CNS = central nervous system
CVS = cardiovascular system
IDLH = immediately dangerous to life or health
$mg/m^3$ = milligrams per cubic meter
NIOSH = National Institute for Occupation Safety and Health
OSHA = Occupation Safety and Health Administration
PEL = permissible exposure limit
ppm = parts per million
RBC = red blood cells
REL = recommended exposure limit set by NIOSH
Skin = skin absorption
STEL = short-term exposure limit
TLV = threshold limit value set by ACGIH
TWA = time-weighted average

# 10.0 POTENTIAL SITE HAZARDS AND APPROPRIATE PRECAUTIONS

Activities listed may be associated with work performed by others. The information contained in this section is for the use of Farallon personnel and not intended for use by others. The following tables list potential hazards and appropriate precautions associated with planned field work.

## 10.1 LANDFILL GAS CONTROL SYSTEM OPERATION AND MAINTENANCE

| Job Steps | Personal Protective Equipment | Potential Hazard | Critical Actions |
|---|---|---|---|
| Mobilize with proper equipment/supplies for Operations and Maintenance (O&M). | Safety glasses or goggles, hard hat, steel-toed and -shank boots, hearing protection, gloves. | Vehicle accident.<br>Lifting hazards.<br>Delay or improper performance of work due to improper equipment on Site. | • Follow safe driving procedures.<br>• Employ safe lifting procedures.<br>• Make sure subcontractors are aware of their responsibilities for labor, equipment, and supplies.<br>• Review HASP and permit conditions and gather necessary PPE. |
| Set up necessary traffic control. | Safety glasses or goggles, hard hat, steel-toed and -shank boots, hearing protection, gloves. | Struck by vehicle during placement.<br>Vehicle accident as a result of improper traffic control equipment placement. | • Use buddy system for placing traffic control, if necessary. Reference traffic control plan section of HASP (may include specific requirements based on permits). |

| Job Steps | Personal Protective Equipment | Potential Hazard | Critical Actions |
|---|---|---|---|
| Unload and set up test equipment. | Safety glasses or goggles, hard hat, steel-toed and -shank boots, hearing protection, gloves. | Struck by vehicle.<br>Trip hazards.<br>Accident when maneuvering equipment.<br>Lifting hazard.<br>Electrical hazard.<br>Adverse impacts to station sales. | • Place equipment away from pump islands or other high traffic areas.<br>• Store hoses and electrical cords neatly and protect with traffic control equipment (e.g., cones, barricades).<br>• Provide hand signals and guidance to driver, as needed, when placing testing equipment trailers or other large equipment.<br>• Visually inspect equipment (e.g., fire extinguisher on board/available on the Site, no damaged hoses or electrical lines, pressurized hoses secured with whip-checks or adequate substitute, all vapor and/or water hoses firmly connected, equipment grounded).<br>• Use proper lifting techniques.<br>• Use ground fault interrupter circuit (GFIC) on generators or other electrical equipment.<br>• Inspect cords. |
| Set up exclusion zone(s) and work station. | Safety glasses or goggles, hard hat, steel-toed and -shank boots, hearing protection, gloves. | Struck by vehicle during setup.<br>Slip/fall hazards. | • Implement exclusion zone setup instructions of HASP.<br>• Set up work station with clear walking paths to all testing locations.<br>• Face oncoming traffic. |
| Gauge water levels and product thickness (where applicable). | Safety glasses or goggles, hard hat, steel-toed and -shank boots, hearing protection, gloves. | Back strain, inhalation, or dermal exposure to chemical hazards.<br>Repetitive motion.<br>Eye injury from back pressure in wells.<br>Traffic hazards. | • Wear any additional PPE and initiate air quality monitoring in accordance with HASP.<br>• Maintain safe distance from wellheads.<br>• Bend at knees, rather than waist.<br>• Decontaminate equipment between measurements.<br>• Face oncoming traffic. |

| Job Steps | Personal Protective Equipment | Potential Hazard | Critical Actions |
|---|---|---|---|
| Commence performing O&M. | Safety glasses or goggles, hard hat, steel-toed and -shank boots, hearing protection, gloves. | Explosion or fire.<br>Trip hazards.<br>Unauthorized release of contaminants.<br>Eye injury from pressurized air or shrapnel from burst piping.<br>Burn from heated piping or motors.<br>Clothing caught on turning vanes on compressor and shaft.<br>Exposure to contaminants (e.g., inhalation, dermal contact).<br>Noise.<br>Electrical hazards. | • Follow equipment-specific operation instructions.<br>• Ensure that connections with barbed fittings on pressure gauges are secure.<br>• Be conscious of amount of torque placed on polyvinyl chloride (PVC) connections to avoid breaking.<br>• Monitor pressure conditions; do not exceed pressure ratings for any component involved.<br>• Watch proximity to heated piping and contact with mufflers, motors, manifolds.<br>• Monitor influent vapor and oxygen concentrations, if applicable.<br>• Keep work area tidy and free of loose equipment.<br>• Monitor treatment system and collect data to ensure discharge is within permit parameters and capacity of any storage containers (e.g., concentrations, flow rates).<br>• Wear PPE in accordance with HASP (including ear protection, as necessary).<br>• Ensure lockout/tagout of all electrical equipment that may be handled.<br>• Use GIFC.<br>• Inspect cords. |

| Job Steps | Personal Protective Equipment | Potential Hazard | Critical Actions |
|---|---|---|---|
| Shut down system (if necessary). | Safety glasses or goggles, hard hat, steel-toed and -shank boots, hearing protection, gloves. | Unauthorized release of contaminants from back pressure.<br>Eye injury from pressurized air or shrapnel from burst piping.<br>Burn from heated piping or motors.<br>Exposure to contaminants (e.g., inhalation, dermal contact). | |
| Collect samples in accordance with sampling plan. | Safety glasses or goggles, hard hat, steel-toed and -shank boots, hearing protection, gloves. | Cross-contamination, improper sample labeling or storage, exposure to Site contaminants.<br>Repetitive motion.<br>Cuts from colorimetric tubes.<br>Body position. | • Label samples in accordance with sampling plan. Keep samples stored in proper containers, at correct temperature, and away from work area.<br>• Perform air monitoring and wear proper PPE. |
| Store waste (e.g., water, carbon canisters) in accordance with Site-specific requirements. | Safety glasses or goggles, hard hat, steel-toed and -shank boots, hearing protection, gloves | Back strain.<br>Traffic hazard.<br>Improper storage or disposal.<br>If disposing through on-Site treatment system, damage or injury from improper use of equipment. | • Use proper equipment to transport waste containers (e.g., pumps, drum dollies).<br>• Have proper storage containment and labeling available on the Site. Place materials in isolated location away from traffic and other Site functions.<br>• Label waste.<br>• Coordinate proper disposal off the Site (where applicable).<br>• Review instructions for use of on-Site treatment systems. |

| Job Steps | Personal Protective Equipment | Potential Hazard | Critical Actions |
|---|---|---|---|
| Clean the Site; demobilize. | Safety glasses or goggles, hard hat, steel-toed and -shank boots, hearing protection, gloves. | Traffic hazard.<br>Lifting hazards.<br>Safety hazard left on the Site. | • Use buddy system, as necessary, to remove traffic control.<br>• Use proper lifting techniques.<br>• Leave the Site clean of refuse and debris.<br>• Notify station personnel of departure and location of any stored waste. |

## 10.2 LANDFILL GAS PROBE MONITORING

| Job Steps | Personal Protective Equipment (PPE) | Potential Hazards | Critical Actions |
|---|---|---|---|
| Mobilize with equipment/supplies suitable for landfill gas probe monitoring. | Reflective vest, steel-toe and -shank shoes, hard hat, safety glasses with side shields, and work or nitrile gloves. | Vehicle accident.<br>Lifting hazards.<br>Delay or improper performance of work due to improper equipment on site. | • Begin each work day with tailgate safety meeting.<br>• Follow safe driving procedures.<br>• Employ safe lifting procedures.<br>• Verify that subcontractors are aware of their responsibilities for labor, equipment, and supplies.<br>• Review permit conditions. |
| Collect samples from monitoring probe in accordance with sampling plan. | Reflective vest, steel-toe and -shank shoes, hard hat, safety glasses with side shields, work gloves.<br>Respirator with organic vapor cartridges, chemical-resistant gloves, chemical-resistant apron as required. | Back strain.<br>Heat or cold.<br>Eye injury.<br>Noise.<br>Exposure to chemical hazards.<br>Trip or fall.<br>Equipment failure. | • Stand clear of operating equipment.<br>• Setup GEM 2000 properly to monitoring point.<br>• Use correct lifting techniques.<br>• Monitor air quality in accordance with the air monitoring protocol presented in **Attachment 9**.<br>• Keep work area clear of tripping or slipping hazards. |

| Job Steps | Personal Protective Equipment (PPE) | Potential Hazards | Critical Actions |
|---|---|---|---|
| Collect samples from manhole in accordance with sampling plan. | Reflective vest, steel-toe and -shank shoes, hard hat, safety glasses with side shields, work gloves.<br>Respirator with organic vapor cartridges, chemical-resistant gloves, chemical-resistant apron as required. | Back strain.<br>Heat or cold.<br>Eye injury.<br>Noise.<br>Exposure to chemical hazards.<br>Trip or fall.<br>Equipment failure. | • Proper removal of manhole cover to allow access for monitoring.<br>• Stand clear of operating equipment.<br>• Setup GEM 2000 properly to monitoring point.<br>• Use correct lifting techniques.<br>• Monitor air quality in accordance with the air monitoring protocol presented in **Attachment 9**.<br>• Keep work area clear of tripping or slipping hazards. |
| Clean site; demobilize. | Reflective vest, steel-toe and -shank shoes, hard hat, safety glasses with side shields, ear plugs or ear muffs, work gloves.<br>Respirator with organic vapor cartridges, chemical-resistant gloves, chemical-resistant apron as required. | Traffic.<br>Lifting hazards. | • Use buddy system to remove traffic control, as necessary.<br>• Leave site clear of refuse and debris. Clearly mark or barricade any borings that need topping off or curing at a later time. Notify site personnel of departure, final well locations, and any cuttings and/or purge water left onsite.<br>• Use proper lifting techniques. |
| Package and deliver samples to laboratory. | | Back strain.<br>Traffic accidents. | • Handle and pack sample canisters carefully (e.g., bubble wrap bags).<br>• Use proper lifting techniques.<br>• Apply safe driving practices. |
| Typical work. | Steel-toe and -shank shoes, hard hat, safety glasses with side shields, hearing protection, reflective safety vest, leather gloves for non-chemical aspects of work.<br>Chemical-resistant gloves and apron if chemical exposure is suspected. | Weather-related incidents: automobile accidents, slips, or falls. | • Check weather reports daily. Project visits are not to be performed during inclement weather. Sampling may be performed during light rain mist. Wear raincoats.<br>• Drive at speed limit or less, as needed, to keep a safe distance from vehicle in front. Avoid short stops. |

| Job Steps | Personal Protective Equipment (PPE) | Potential Hazards | Critical Actions |
|---|---|---|---|
| Typical work. | | Cold stress. | • For temperatures below 40 degrees (°) Fahrenheit (F), adequate insulating clothing must be worn. If the temperature is below 20°F, workers will be allowed to enter a heated shelter at regular intervals. Warm, sweet drinks should be available. Coffee intake should be limited.<br>• No one should begin work or return to work from a heated shelter with wet clothes. Workers should be aware of signs of cold stress, such as heavy shivering, pain in fingers or toes, drowsiness, or irritability. Onset of any of these signs is an indication that immediate return to a heated shelter is needed.<br>• Refer to ACGIH TLV Booklet for section on Cold Stress. |
| Typical work. | | Heat stress. | • Discuss health effects and symptoms during daily health and safety meetings.<br>• Drink water regularly (at least one cup every 20 to 30 minutes, depending upon level of effort and the PPE worn).<br>• Refer to ACGIH TLV booklet for heat stress guidance, especially regarding PPE, type of work, and frequency of breaks.<br>• Breaks should be taken in an area cooler than the work area.<br>• Monitor temperature and relative humidity using Wet Bulb Globe Temperature (WBGT) meter. |

| Job Steps | Personal Protective Equipment (PPE) | Potential Hazards | Critical Actions |
|---|---|---|---|
| No eating, drinking, or smoking on site.<br>No contact lenses to be worn on site.<br>No facial hair that would interfere with respirator fit. | | | |
| A safety meeting is to be held every day, even if only one person is working on the project on a given day. | | | • Topics are to always include the work scheduled for the day and restatement of hazards and the means to avoid them. Other topics may include sampling in general, and advances in technology and how they may be applied to the project. Use the *Daily Health and Safety Briefing Log* in **Attachment 4** to log the topics discussed. |

## 11.0 WASTE CHARACTERISTICS

Waste anticipated to be generated on the Site:

Type(s): ☒ Liquid ☐ Solid ☐ Sludge ☐ Other (fill-in)

The approximate volume for each anticipated waste stream:

Waste: Purge and Decontamination Water Approximate Volume: N/A

Waste: (fill-in) Approximate Volume: (fill-in)

Waste: (fill-in) Approximate Volume: (fill-in)

Characteristics**:**

☐ Corrosive ☐ Flammable/Ignitable ☐ Radioactive ☒ Toxic

☐ Reactive ☐ Unknown ☐ Other *(specify)* (fill-in)

# 12.0 TRAFFIC CONTROL

Work on the Site will be conducted in areas of uncontrolled traffic access. Traffic control/warning devices will be placed around the work area to prevent undesirable interface between pedestrian and automotive traffic and project workers and equipment. These devices may include:

- Cones;
- Tubular markers;
- Barricades;
- Temporary fencing; and
- Barricade tape.

The traffic control/warning devices will be placed around the work in such a way that traffic access is inhibited (i.e., place cones less than 8 feet apart so cars cannot easily drive through work area without moving a cone). Barricade tape or temporary fencing will be used to inhibit access to the work area in locations where pedestrians will be encountered.

# ATTACHMENT 1
# HEALTH AND SAFETY PLAN ACKNOWLEDGEMENT AND AGREEMENT FORM

HEALTH AND SAFETY PLAN
Interim Action Compliance Monitoring
South Park Landfill Site
Seattle, Washington

Farallon PN: 408-002

# HEALTH AND SAFETY PLAN ACKNOWLEDGMENT AND AGREEMENT FORM

***(All Farallon and subcontractor personnel must sign on a daily basis.)***

This Health and Safety Plan (HASP) has been developed for the purpose of informing Farallon employees of the hazards they are likely to encounter on the project site, and the precautions they should take to avoid those hazards. Subcontractors and other parties at the site must develop their own HASP to address the hazards faced by their own employees. Farallon will make a copy of this HASP available to subcontractors and other interested parties to fully disclose hazards we may be aware of, and to satisfy Farallon's responsibilities under the Occupational Safety and Health Administration (OSHA) Hazard Communication standard. Similarly, subcontractors and others on site are required to inform Farallon of any hazards they are aware of or that their work on site might possibly pose to Farallon employees, including but not limited to Material Safety Data Sheets for chemicals brought on site. This plan should NOT be understood by contractors to provide information pertaining to all of the hazards that a contractor's employees may be exposed to as a result of their work.

All parties conducting site activities are required to coordinate their activities and practices with the project Site Health and Safety Officer (SHSO). Your signature below affirms that you have read and understand the hazards discussed in this HASP, and that you understand that subcontractors and other parties working on site must develop their own HASP for their employees. Your signature also affirms that you understand that you could be prohibited by the SHSO or other Farallon personnel from working on this project for not complying with any aspect of this HASP. The SHSO will be noted on the sheet below on a daily basis.

| HEALTH AND SAFETY PLAN ACKNOWLEDGMENT AND AGREEMENT FORM | | | | | |
|---|---|---|---|---|---|
| **Check for SHSO** | **Name** | **Title** | **Signature** | **Company** | **Date** |
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| HEALTH AND SAFETY PLAN ACKNOWLEDGMENT AND AGREEMENT FORM | | | | | |
|---|---|---|---|---|---|
| **Check for SHSO** | **Name** | **Title** | **Signature** | **Company** | **Date** |
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# ATTACHMENT 2
# DIRECTIONS TO HOSPITAL

HEALTH AND SAFETY PLAN
Interim Action Compliance Monitoring
South Park Landfill Site
Seattle, Washington

Farallon PN: 408-002

MAPQUEST.

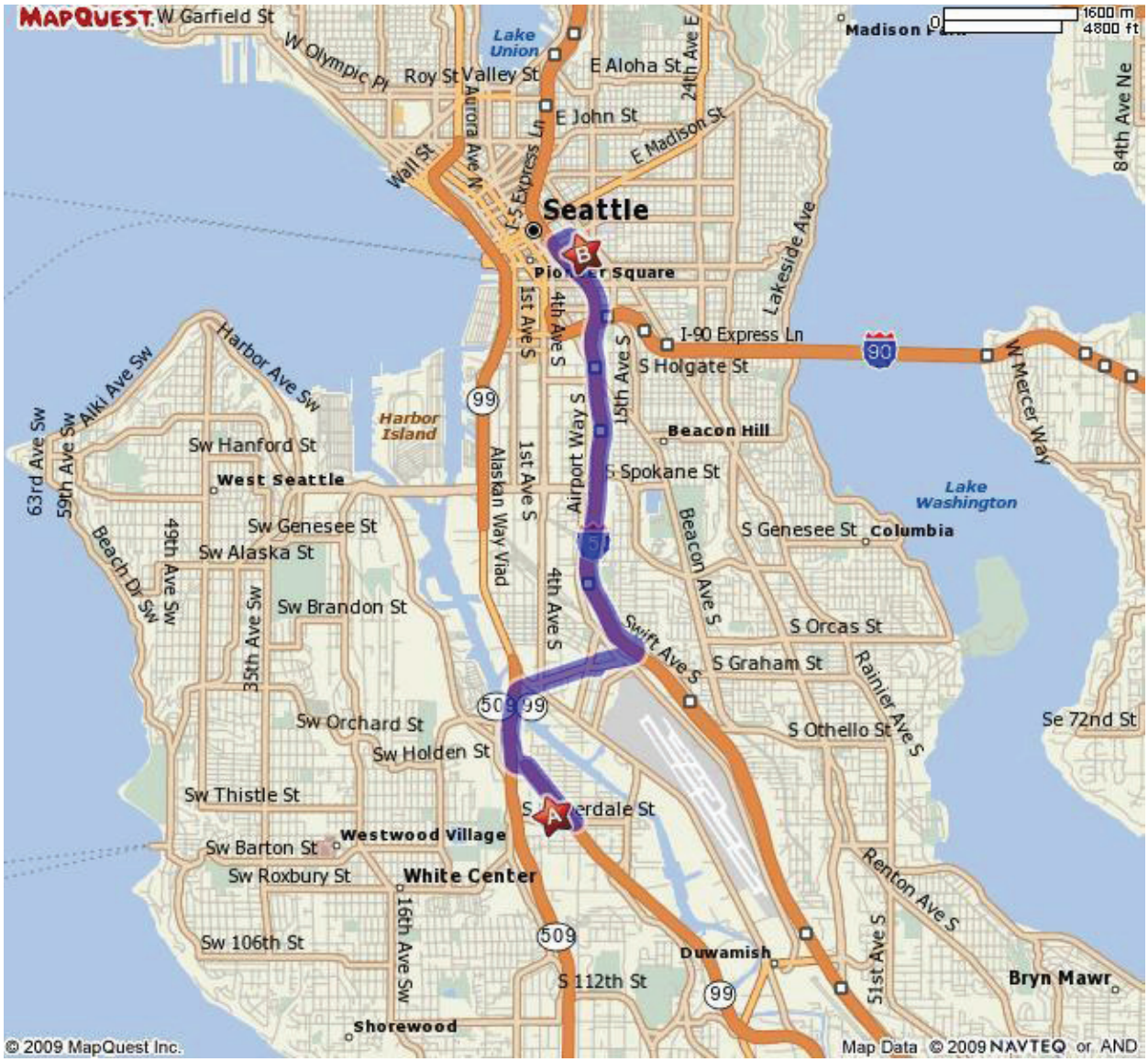
Total Travel Estimates: 12 minutes / 7.07 miles

**A: 5th Ave S & S Sullivan St, Seattle, WA 98108**

| | | |
|---|---|---|
| 1: | Start out going **SOUTH** on **5TH AVE S** toward **S SULLIVAN ST**. | 0.1 mi |
| 2: | Turn **LEFT** onto **S CLOVERDALE ST**. | 0.2 mi |
| 3: | Merge onto **WA-99 N** via the ramp on the **LEFT**. | 0.7 mi |
| 4: | Merge onto **WA-509 N/WA-99 N/1ST AVE BRIDGE S** toward **SEATTLE**. | 0.7 mi |
| 5: | Take the **MICHIGAN ST** exit toward **I-5**. | 0.2 mi |
| 6: | Keep **LEFT** at the fork to go on **S MICHIGAN ST**. | 0.5 mi |
| 7: | **S MICHIGAN ST** becomes **S BAILEY ST**. | 0.1 mi |
| 8: | Merge onto **I-5 N** via the ramp on the **LEFT** toward **VANCOUVER BC**. | 3.1 mi |
| 9: | Take the **DEARBORN ST/JAMES ST** exit, **EXIT 164A**, toward **MADISON ST**. | 1.0 mi |
| 10: | Take the **JAMES ST** exit. | 0.3 mi |
| 11: | Turn **RIGHT** onto **JAMES ST**. | 0.1 mi |
| 12: | Turn **RIGHT** onto **9TH AVE**. | 0.2 mi |
| 13: | **325 9TH AVE # 1C18** is on the **RIGHT**. | 0.0 mi |

**B: Harborview Medical Ctr: 325 9th Ave # 1C18, Seattle, WA 98104, (206) 744-5100**

Total Travel Estimates: **12 minutes / 7.07 miles**


MAPQUEST
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Lake Union
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84th Ave Ne
Wall St
Aurora Ave N
SR 99
Seattle
Pioneer Square
Lakeside Ave
1st Ave S
4th Ave S
I-90 Express Ln
S Holgate St
15th Ave S
90
W Mercer Way
Harbor Ave Sw
Alki Ave Sw
63rd Ave Sw
59th Ave Sw
Harbor Island
99
Beacon Hill
Sw Hanford St
West Seattle
Alaskan Way Viad
Airport Way S
S Spokane St
Lake Washington
Sw Genesee St
S Genesee St
Columbia
Beach Dr Sw
49th Ave Sw
Sw Alaska St
5
Beacon Ave S
Sw Brandon St
35th Ave Sw
S Orcas St
Swift Ave S
S Graham St
Rainier Ave S
509
99
Sw Orchard St
Sw Holden St
S Othello St
Se 72nd St
Sw Thistle St
Westwood Village
Sw Barton St
Sw Roxbury St
White Center
Renton Ave S
16th Ave Sw
Sw 106th St
509
Duwamish
S 112th St
99
51st Ave S
Bryn Mawr
Shorewood
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# ATTACHMENT 3
# POTENTIAL TOPICS FOR DAILY HEALTH AND SAFETY MEETING

HEALTH AND SAFETY PLAN
Interim Action Compliance Monitoring
South Park Landfill Site
Seattle, Washington

Farallon PN: 408-002

## POTENTIAL TOPICS FOR DAILY HEALTH AND SAFETY MEETING

- ☐ Emergency response plan, emergency vehicle (full of fuel) and muster point
- ☐ Route to medical aid (hospital or other facility)
- ☐ Work hours. Is night work planned?
- ☐ Hand signals around heavy equipment
- ☐ Traffic control
- ☐ Pertinent legislation and regulations
- ☐ Above- and below-ground utilities (energized or de-energized)
- ☐ Material Safety Data Sheets
- ☐ Reporting an incident: to whom, what, why, and when to report
- ☐ Fire extinguisher and first aid kit locations
- ☐ Excavations, trenching, sloping, and shoring
- ☐ Personal protective equipment and training
- ☐ Safety equipment and training
- ☐ Emergency telephone location(s) and telephone numbers (in addition to 911)
- ☐ Eye wash stations and washroom locations
- ☐ Energy lock-out/tag-out procedures. Location of "kill switches," etc.
- ☐ Weather restrictions
- ☐ Site security. Site hazards. Is special waste present?
- ☐ Traffic and people movement
- ☐ Working around machinery (both static and mobile)
- ☐ Sources of ignition, static electricity, etc.
- ☐ Stings, bites, large animals, and other nature-related injuries and conditions
- ☐ Working above grade
- ☐ Working at isolated sites
- ☐ Decontamination procedures (for both personnel and equipment)
- ☐ How to prevent falls, trips, sprains, and lifting injuries
- ☐ Right to refuse unsafe work
- ☐ Adjacent property issues (e.g., residence, business, school, daycare center)

# ATTACHMENT 4
# DAILY HEALTH AND SAFETY BRIEFING LOG

HEALTH AND SAFETY PLAN
Interim Action Compliance Monitoring
South Park Landfill Site
Seattle, Washington

Farallon PN: 408-002

# DAILY HEALTH AND SAFETY BRIEFING LOG

| PROJECT INFORMATION | |
|---|---|
| Farallon PN: | Project Name: |
| Site Address: | City/State: |
| **MEETING INFORMATION** | |
| Conducted By: | Weather: |
| Major Job Task: | Date: |

**DAILY EQUIPMENT CHECKLIST**

| | | |
|---|---|---|
| ☐ Site Check In | ☐ First Aid Kit Location(s) | ☐ Ear Plugs (if required) |
| ☐ Proper ID/Safety Credentials | ☐ Fire Extinguisher Location(s) | ☐ Hand Protection (if required) |
| ☐ Hard Hat | ☐ Eye Wash Station | ☐ Face Shield (if required) |
| ☐ Safety Glasses | ☐ Traffic Control (if needed) | ☐ Respirator (if required) |
| ☐ Orange Reflective Vest (H or X back BNSF) | | ☐ _____ |
| ☐ Safety Toe Boots (lace up and leather BNSF) | | ☐ _____ |

| HEALTH AND SAFETY BRIEFING | |
|---|---|
| ☐ Head Count (No. of employees: ) | ☐ Excavation Safety (if applicable) |
| ☐ Emergency Response | ☐ Health Hazards |
| ☐ Who will...? (provide names below)<br>Call 911:<br>Alternate to call 911:<br>Provide First Aid/CPR: | ☐ Environmental Hazards |
| | ☐ Physical Hazards |
| | ☐ Slips, Trips and Falls |
| | ☐ Utility Locates |
| ☐ Emergency Exits/ Rally Points/Hospital Route | ☐ Near Miss Reporting (reminder to look) |
| ☐ Site Security and Exclusion Zone | ☐ Incident Reporting (procedures and forms) |
| ☐ Vehicle/Equipment-Specific Safety Practices | ☐ Traffic Control |
| ☐ Stop Work Authority | ☐ HASP Reviewed and Signed |

| SITE-SPECIFIC HEALTH AND SAFETY ISSUES DISCUSSED |
|---|
| 1) |
| 2) |
| 3) |
| 4) |
| 5) |

**DAILY HEALTH AND SAFETY BRIEFING ATTENDEES**

| NAME | COMPANY | SIGNATURE |
|---|---|---|
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# ATTACHMENT 5
# INCIDENT REPORT FORM

HEALTH AND SAFETY PLAN
Interim Action Compliance Monitoring
South Park Landfill Site
Seattle, Washington

Farallon PN: 408-002

FARALLON CONSULTING

# Accidental Injury, Occupational Illness, or Workplace Incident
# INCIDENT REPORT

| INCIDENT TYPE | | | | INCIDENT DATE: |
|---|---|---|---|---|
| ☐ FATALITY | ☐ INDUSTRIAL NON-RECORDABLE | ☐ SPILL/LEAK | ☐ GENERAL LIABILITY | |
| ☐ LOST WORKDAY | ☐ NON-INDUSTRIAL | ☐ PRODUCT INTEGRITY | ☐ CRIMINAL ACTIVITY | |
| ☐ LW RESTRICTED DUTY | ☐ OFF-THE-JOB INJURY | ☐ EQUIPMENT | ☐ NOTICE OF VIOLATION | |
| ☐ OSHA MEDICAL OR ILLNESS W/O LW | ☐ MVA | ☐ BUSINESS INTERRUPTION | ☐ OTHER | |
| ☐ FIRST AID | ☐ FIRE | **(TO BE COMPLETED BY HEALTH AND SAFETY COORDINATOR)** | | |

This report must be completed by the employee or Health and Safety Coordinator immediately upon learning of the incident. The completed report must be reviewed and signed by a Principal, within 24 hours of the incident, even if employee is not available to review and sign. Employee or employee's doctor must submit a copy of the doctor's report to Gerald Portele within 24 hours of the initial exam and any subsequent exams. After hours or weekends, please call Joe Rounds, Mobile (206) 484-2748.

## EMPLOYEE INFO

| LAST NAME: | FIRST NAME AND MIDDLE INITIAL: | TITLE: | TIME OF EVENT OR EXPOSURE: ☐ AM ☐ PM |
|---|---|---|---|
| EMPLOYMENT STATUS: ☐ FULL-TIME ☐ PART-TIME ☐ HOURLY-AS-NEEDED | | HOW LONG? | |
| DATE OF INJURY OR ONSET OF ILLNESS (MM/DD/YYYY) | | | |

## INJURY OR ILLNESS INFO

EXACT LOCATION OF INCIDENT (ADDRESS, GEOGRAPHICAL LOCATION, FLOOR, BUILDING, ETC.):

COUNTY: | ON EMPLOYER'S PREMISES? ☐ YES ☐ NO

COMPLETE DESCRIPTION OF INCIDENT, INCLUDE SPECIFIC ACTIVITY DURING INCIDENT (LIFTING, PUSHING, WALKING, ETC.):

DESCRIBE THE EQUIPMENT, MATERIALS, OR CHEMICALS THAT DIRECTLY HARMED THE PARTY (E.G., THE MACHINE EMPLOYEE STRUCK AGAINST OR WHICH STRUCK EMPLOYEE; THE VAPOR INHALED OR MATERIAL SWALLOWED; WHAT THE EMPLOYEE WAS LIFTING, PULLING, ETC.):

DESCRIBE THE SPECIFIC INJURY OR ILLNESS (E.G., CUT, STRAIN, FRACTURE, SKIN RASH, ETC.):

BODY PART(S) AFFECTED (E.G., BACK, LEFT WRIST, RIGHT EYE, ETC.):

DATE EMPLOYER NOTIFIED: | TO WHOM REPORTED:

## MEDICAL PROVIDER (HOSPITAL, DOCTOR, CLINIC, ETC.) INFO

NAME AND ADDRESS OF HEALTH CARE PROVIDER: | PHONE NO.:

TREATED IN EMERGENCY ROOM: ☐ YES ☐ NO | HOSPITALIZED OVERNIGHT AS INPATIENT: ☐ YES ☐ NO

| INJURY/ILLNESS SEVERITY | TIME LOSS (Check all that apply) | WORKDAY PHASE |
|---|---|---|
| ☐ NO TREATMENT REQUIRED<br>☐ FIRST AID ONLY<br>☐ MEDICAL TREATMENT<br>☐ FATALITY, ENTER DATE: | ☐ RETURN TO WORK THE NEXT DAY<br>☐ NO TIME LOSS<br>☐ RESTRICTED ACTIVITY<br>BEGIN DATE:<br>RETURN DATE:<br>☐ LOST WORKDAY, NOT AT WORK<br>BEGIN DATE:<br>RETURN DATE: | ☐ PERFORM NORMAL WORK DUTIES<br>☐ MEAL PERIOD<br>☐ REST PERIOD<br>☐ ENTERING/LEAVING<br>☐ CHRONIC EXPOSURE<br>☐ OTHER, SPECIFY: |

| **MOTOR VEHICLE ACCIDENT (MVA)** | | | | PROFESSIONAL DRIVER? | ☐ YES ☐ NO | |
|---|---|---|---|---|---|---|
| TOTAL YEARS DRIVING: | COMPANY VEHICLE?<br>☐ YES ☐ NO | | VEHICLE TYPE: | | | |
| NO. OF VEHICLES TOWED | | NO. OF INJURIES: | | NO. OF FATALITIES: | | |
| **THIRD-PARTY INCIDENTS** | | | | | | |
| NAME OF OWNER | | ADDRESS | | PHONE NO.: | | |
| DESCRIPTION OF DAMAGE: | | | | | | |
| INSURANCE INFORMATION: | | | | | | |
| WITNESS NAME | | ADDRESS | | PHONE NO.: | | |
| WITNESS NAME | | ADDRESS | | PHONE NO.: | | |

| **REVIEWED BY** | | | |
|---|---|---|---|
| NAME (PRINT) | SIGNATURE | TITLE | DATE |
| | | | |
| | | | |
| | | | |

| **ADDITIONAL INFORMATION** (USE SPACE BELOW FOR ADDITIONAL INFROMATION AS NECESSARY TO COMPLETE THIS FORM.) | | | |
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# ATTACHMENT 6
# SAFETY OBSERVATION AND NEAR MISS REPORT

HEALTH AND SAFETY PLAN
Interim Action Compliance Monitoring
South Park Landfill Site
Seattle, Washington

Farallon PN: 408-002

# SAFETY OBSERVATION AND NEAR MISS REPORT

This report is to be filled out by any employee involved in or witnessing a near miss, or making a safety observation. A near miss is an incident that did not result in any personal injury, property damage, or production interruption, but could have under slightly different circumstances. A safety observation is witnessing any activity that places a person or property at risk of injury, accident, or damage. These are very important indicators of potentially harmful future accidents, and provide valuable insights to preventing personal injury and/or property damage.

| **PROJECT INFORMATION** | |
|---|---|
| Farallon PN: | Project Name: |
| Site Address: | City/State: |
| **INCIDENT INFORMATION** | |
| Date: | Time: ☐ AM ☐ PM |
| Exact Location: | |
| Description of Incident or Potential Hazard: | |
| Corrective Action Taken: | |
| Lessons Learned: | |

Employee Signature _____ Date: _____

Printed Name _____

Supervisor Signature _____ Date: _____

Printed Name _____

# ATTACHMENT 7
# UTILITY CLEARANCE LOGS

HEALTH AND SAFETY PLAN
Interim Action Compliance Monitoring
South Park Landfill Site
Seattle, Washington

Farallon PN: 408-002

# UTILITY CLEARANCE LOG

**Project Name**: _____ **Project Number:** _____

**Location**: _____ **Date of Work:** _____

**Instructions**. This log must be completed by a Farallon staff member **before** any Farallon-directed excavation (e.g., test pit excavation) or drilling operation.

**DRILLING OR EXCAVATION WORK MAY NOT COMMENCE UNTIL UTILITY LOCATES HAVE BEEN COMPLETED (see the One-Call Utility Locate Request Procedure on the following page)**

Farallon is responsible for having underground utilities and structures located and marked when drilling or directing test pit excavation operations. Any drilling or excavation within 2 feet of a marked utility must be done with hand tools.

Owners of underground utilities are required by law to mark underground facilities on public and private property. Owners of underground utilities are **not required** to mark existing service laterals or appurtenances. Utility owners in Washington are required to subscribe to the One-Call service.

Private utility locate services must be hired to locate service laterals and other buried utilities (e.g., on-Site electric distribution lines, irrigation pipes) on private property.

Re-mark after 10 days or maintain as appropriate.

## Utility Locate Checklist

☐ Attach map showing drilling and/or excavation sites and known utilities

☐ Attach copy of One-Call Utility Notification Ticket (http://www.searchandstatus.com/)

One-Call Utility Notification Ticket Number: _____

☐ Attach copy of Side Sewer Card (available for City of Seattle; check municipality for availability)

☐ Attach copy of Private Locate Receipt

☐ Photograph all excavation and/or drilling locations and download to project file

☐ Review utilities with Site Contact:

Name: _____ Phone: _____

## Utilities and Structures

| Utility Type | Utility Name | Public Utilities Marked (Y/N) | Private Utilities/Laterals Marked (Y/N) | Marking Method (flags, wooden stakes, paint on pavement, etc.) |
|---|---|---|---|---|
| Petroleum product | | | | |
| Natural gas line | | | | |
| Water line | | | | |
| Sewer line | | | | |
| Storm drain | | | | |
| Telephone cable | | | | |
| Electric power line | | | | |
| Product tank | | | | |
| Septic tank/drain field | | | | |
| Other | | | | |
| | | | | |

Farallon Consulting, L.L.C.

Field Team Leader: _____ Date: _____

| *Electric* = **RED** | *Gas-Oil-Steam* = **YELLOW** | *Comm-CATV* = **ORANGE** | *Water* = **BLUE/PURPLE** | *Sewer* = **GREEN** | *Temp Survey* = **PINK** |
|---|---|---|---|---|---|

# ONE-CALL UTILITY LOCATE REQUEST PROCEDURE

## THE ONE-CALL UTILITY NOTIFICATION CENTER REQUIRES 48 HOURS NOTICE TO MARK UTILITIES BEFORE YOU CAN DIG OR DRILL

Washington: 1-800-424-5555
Oregon: 1-800-332-2344

Washington state law states that "before commencing **any** excavation," the excavator or driller must provide notice to all owners of underground utilities by use of the One-Call locator service, and that the excavator or driller shall not dig or drill until all known utilities are marked. To fully comply with the law, you **must** take the following steps:

1. **Call before you dig or drill:** Notify the One-Call Utility Notification Center (OCUNC) a minimum of 48 hours (2 full business days) before digging or drilling. Provide the following **required** information:
    a. Your name and phone number, company name and mailing address, and Farallon Account Number 25999.
    b. The type of work being done.
    c. Who the work is being done for.
    d. The county and city where the work is being done.
    e. The address or street where the work is being done.
    f. Marking Instructions: "Generally locate entire site including rights-of-way and easements."

    Provide the following information if applicable or requested:

    a. The name and phone number of an alternate contact person.
    b. If the work is being done within 10 feet of any overhead power lines.
    c. The nearest cross street.
    d. The distance and direction of the work site from the intersection.
    e. Township, range, section, and quarter section of the work site.
2. **Record the utilities that will be notified:** OCUNC will tell you the utilities that are on or adjacent to the work site, based on their database. Record the name(s) of the utility on the reverse side of this form.
3. **After the 48-hour waiting period, confirm that the utility locations have been marked:** Before digging or drilling, walk the work site and confirm that the utility companies have marked the utility locations in the field.
4. **If a locate appears to be missing:** If a utility locate appears to be missing and the utility company has not notified you that there are no utilities in the area, call OCUNC and:
    **a. Provide the OCUNC locate number.**
    **b. Clearly state which utility has not been marked. The call is being recorded.**
    **c. Ask for a contact person at that utility.**
    **d. Call the contact person for the missing utility locate:** Determine why there is no utility locate in the field.

| *Electric =* **RED** | *Gas-Oil-Steam =* **YELLOW** | *Comm-CATV =* **ORANGE** | *Water =* **BLUE/PURPLE** | *Sewer =* **GREEN** | *Temp Survey =* **PINK** |
|---|---|---|---|---|---|

e. **Record the reason(s) for the missing locate(s):** There are valid reasons that locates do not appear in the field (e.g., there are no utilities located on the work site or the utility has been abandoned). However, IF THEY ARE LATE, **YOU MUST WAIT** TO DRILL OR DIG. If the utility fails to mark a locate within the required 48 hours (2 full business days), the utility is liable for delay costs.

5. **Hand dig within 2 feet of a marked utility:** When digging or drilling within 2 feet of any marked utility, the utility must be exposed first by using hand tools.

6. **Record reason(s) for missing locate(s)**: There may be reasons that locates do not appear in the field (e.g., no utilities are located on the site, utility has been abandoned). Record the reason given. IF THEY ARE LATE – YOU WAIT TO DRILL OR DIG. If the utility failed to mark within the required two days, they are liable for delay costs.

| *Electric* = **RED** | *Gas-Oil-Steam* = **YELLOW** | *Comm-CATV* = **ORANGE** | *Water* = **BLUE/PURPLE** | *Sewer* = **GREEN** | *Temp Survey* = **PINK** |
|---|---|---|---|---|---|

**FARALLON CONSULTING, L.L.C.**
975 5th Avenue Northwest
Issaquah, Washington
98027

**TELEPHONE CONVERSATION**
**Date:** _____ **Time:** _____
**Project Name:** _____
**Job No.:** _____
**Phone No.:** **1-800-424-5555 WA, 1-800-332-2344**
**OR** _____
**Prepared By/Initials:** _____
**Call:** ☐ **Placed** ☐ **Received**

**Contact/Title:** _____

**Agency/Region: One-Call Utility Notification Center**

**PROJECT:** _____

**1. Your name and the Farallon Account No. #25999:** _____

**2. What is the type of work being conducted (e.g., environmental drilling, test pit excavation) ?**

_____

**3. Who is the property owner?** _____

**4. County and city were work is being done?** _____

**5. Address or street where work is taking place?** _____

_____

6. Nearest cross street? _____

7. Distance and direction of the work site from the intersection? _____

**8. Marking Instructions (generally locate on entire Site, including rights-of-way and easements):** _____

_____

_____

9. What time and date will the locate be completed? _____

10. Utility Locate Request Number? _____

11. Utilities that will be notified? _____

_____

12. Any Overhead Concerns? _____

_____

_____

**cc:**_____ **Page**_____ **of**_____

**Note: Bold indicates required information.**

# ATTACHMENT 8
# FARALLON FIELD PERSONNEL TRAINING DATES

HEALTH AND SAFETY PLAN
Interim Action Compliance Monitoring
South Park Landfill Site
Seattle, Washington

Farallon PN: 408-002

# Health and Safety
# Certifications and Training

| Name | Medical Monitoring | | Annual/Bi-Annual | Resp. Clearance | Respirator Fit Test | CPR | First Aid | Expiration Dates | | GHS Training | 8 Hour Supervisor | 40 Hour Training Taken (Initial) | 8 Hour Refresher |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Date of Last Exam | Next Exam Due | | | | | | BNSF E-Railsafe (Bi-annual) | BNSF Contractor Orientation (Annual) | | | | |
| Aguilar, Daniel | 04/01/16 | 04/01/18 | | | | | | | 4/15/17 | | | 04/08/16 | |
| Bailey, Amber | 12/21/15 | 12/20/17 | B | 11/25/13 | | 10/16/14 | 10/16/14 | 10/07/17 | 11/16/16 | | | 11/22/13 | 01/18/16 |
| Bowser, Matthew | 06/11/15 | 06/10/17 | B | 06/11/15 | | 12/28/15 | 12/28/15 | 06/22/17 | 06/11/16 | | | 06/11/15 | 01/18/16 |
| Burns, Anastasia | 03/19/16 | 03/19/18 | | | | | | | 04/13/17 | | | 09/15/14 | 08/31/16 |
| Dlubac, Katherine | 03/13/15 | 03/12/17 | B | 03/13/15 | | 04/24/15 | 04/24/15 | | | | | 02/20/15 | 01/18/16 |
| Fisco, Gavin | 07/15/14 | 07/14/16 | B | 07/15/14 | 06/06/14 | 10/16/14 | 10/16/14 | | | | 12/12/14 | 05/04/07 | 01/18/16 |
| Garvin, Paul | 03/10/16 | 03/10/18 | B | 02/18/14 | | 02/09/15 | 02/09/15 | 11/20/17 | **expired** | | | 06/22/12 | 02/02/15 |
| Hamlin, Jeff | | | | | | | | 06/05/17 | 11/17/16 | | | | |
| Hudspeth, Amber | 04/08/16 | 04/08/18 | | | | | | | | | | | 01/18/16 |
| Johnson, David | 05/07/14 | 05/06/16 | B | 05/07/14 | 03/06/12 | 10/16/14 | | 06/14/17 | 11/25/16 | | 11/24/14 | 06/06/11 | 01/18/16 |
| Kayhan, Dincer | 03/05/14 | 03/04/16 | B | 03/06/14 | 2/14/12012 | 10/16/14 | 10/16/14 | 03/09/18 | 01/11/16 | | | 03/02/12 | 01/18/16 |
| Kerr, Jared | 06/09/14 | 06/08/16 | B | 06/09/14 | | 10/16/14 | 10/16/14 | 02/26/17 | 03/03/17 | | | 06/27/14 | 01/18/16 |
| Luiten, Russell | 10/20/15 | 10/19/17 | B | 04/02/13 | | 10/16/14 | 10/16/14 | 11/23/17 | 10/15/16 | | | 6/2012? | 01/18/16 |
| Mapson, Eric | 08/18/15 | 08/17/17 | B | | | 08/06/15 | 08/06/15 | | | | | 04/08/10 | 01/18/16 |
| Nichols, Allison | NA | NA | NA | NA | | | | | | | | 05/20/15 | |
| Ostrom, Ryan | 12/15/15 | 12/14/17 | B | 12/13/13 | 02/12/15 | 10/16/14 | 10/16/14 | 10/07/17 | **expired** | | | 05/09/13 | 01/18/16 |
| Raven, Dan | | | | | | | | | | | | 07/17/15 | 01/18/16 |
| Scott, Ken | 01/26/16 | 01/25/18 | B | 02/13/14 | 04/28/15 | 02/05/15 | 02/05/15 | 10/08/17 | 04/12/17 | | 02/17/05 | 09/01/95 | 01/18/16 |
| Vining, Andrew | 03/10/16 | 03/10/18 | B | 03/06/14 | 02/12/15 | 10/16/14 | 10/16/14 | 03/09/18 | 06/11/16 | 11/18/13 | 11/24/14 | 02/07/12 | 01/18/16 |

# ATTACHMENT 9
# AIR MONITORING TABLE AND FORMS

HEALTH AND SAFETY PLAN
Interim Action Compliance Monitoring
South Park Landfill Site
Seattle, Washington

Farallon PN: 408-002

# ACTION LEVEL TABLE FOR AIR MONITORING

The Air Monitoring table (following page) presents protocol for monitoring ambient air for constituents of concern and other parameters that may affect worker safety. Please note the following with respect to use of this table:

- The Level for Respirator Use indicates the concentration at which a respirator must be donned. It does not require that the job stop. The respirator is a piece of equipment that is to be used while determining why a concentration has reached that level. Implement engineering controls such as water mist, spray foam, plastic cover, etc. to reduce the concentration.
- The Level for Work Stoppage indicates the concentration at which work on the job must stop. Determine why a concentration has reached that level, and how it can be decreased. Site evacuation is not necessary at this level. Stopping work does not imply that the concentration level will decrease. Implement engineering controls to reduce the concentration; resume work when it is safe to do so.
- These values can be modified under particular Site conditions and with specific knowledge of the contaminant(s). Should such conditions arise, contact Farallon's Health and Safety Officer at (425) 295-0800.

## AIR MONITORING

| Chemical (or Class) | Monitoring Equipment | Task | Monitoring Frequency and Location | Level for Respirator Use | Level for Work Stoppage |
|---|---|---|---|---|---|
| Volatile Organic Vapors | Flame ionization detector (FID)/photoionization detector (PID) as appropriate for chemicals of concern. Read manual to determine.<br><br>Draeger Tube for vinyl chloride (Model 1/a; Part Number 67 28031).<br><br>Draeger Tube for benzene (Model 0.5/a). | From start of mobilization to completion and demobilization. | Sampling should be continuous during the project while disturbing potentially contaminated soil, uncovering and/or removing tanks and piping, or drilling —at least every 15 minutes in the breathing zone.<br><br>Sample at the exclusion zone boundaries every 30 minutes. Continuously sample during each soil and groundwater sampling interval. If 10 parts per million (ppm) in breathing zone, collect a Draeger Tube for benzene and/or vinyl chloride (depending upon contaminants of concern). | 20 ppm above background sustained in breathing zone for 2 minutes, and no benzene and/or vinyl chloride tube discoloration. If a color change appears on the tube for benzene or vinyl chloride at 10 ppm on FID/PID, don respirator.<br><br>If no Draeger Tube is available, the level for respirator use is to be 5 ppm. | 50 ppm above background in breathing zone and no vinyl chloride or benzene tube discoloration. Stop work if tube indicates > 1 ppm for benzene or vinyl chloride.<br><br>If no Draeger Tube is available, stop work at 25 ppm. |

# AIR MONITORING EQUIPMENT CALIBRATION/CHECK LOG

| Date | Instrument/ Model No. | Serial No. | Battery Check OK? | Zero Adjust OK? | Calibration Gas (ppm) | Reading (ppm) | Leak Check | Performed By | Comments |
|---|---|---|---|---|---|---|---|---|---|
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# AIR MONITORING LOG

| Date | Time | Location | Source/Area/ Breathing Zone | Instrument | Concentration/Units | Sampled by |
|---|---|---|---|---|---|---|
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