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OPERATION AND MAINTENANCE PLAN

HOT WATER FLUSHING SYSTEM
SKYKOMISH SCHOOL
BNSF FORMER MAINTENANCE AND FUELING FACILITY
SKYKOMISH, WASHINGTON
CONSENT DECREE NO. 07-2-33672-9 SEA

Submitted by:
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For:

BNSF RAILWAY

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November 10, 2016

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1.0 INTRODUCTION

This Operation and Maintenance (O&M) Plan has been prepared for the hot water flushing (HWF), cold water flushing (CWF), ambient water flushing, soil vapor extraction (SVE), and subslab depressurization (SSD) remediation system at the Skykomish School (School) for the BNSF Railway Company (BNSF) as part of the remedial action underway at the BNSF Former Maintenance and Fueling Facility in Skykomish, Washington (herein referred to as the Site). Soil and groundwater beneath the School will be treated by thermal flushing with the treatment goal of removing separate-phase mobile liquid petroleum components and/or nonaqueous-phase liquid (NAPL) to the extent technically possible.

The location of the remediation activities defined as the HWF System at the School are shown on Figure 1. The School Site is defined as the area beneath and adjacent to all sides of the School building within the sheet pile barrier wall, as shown on Figure 1. School Site remediation activities are being conducted in accordance with the *Cleanup Action Plan for BNSF Former Maintenance and Fueling Facility, Skykomish, Washington* dated October 18, 2007, prepared by the Washington State Department of Ecology (Ecology) (2007) (CAP). The remediation activities were approved by Ecology and undertaken by BNSF pursuant to Consent Decree No. 07-2-33672-9 SEA between BNSF and Ecology, and are part of an integrated and comprehensive remedial action for the Site. The overall cleanup approach for the Site is described in the Master Engineering Design Report (The RETEC Group, Inc. 2008). The selected cleanup action was designed by Farallon Consulting, L.L.C. (Farallon) and TriHydro Corporation (TriHydro) and is described in the Hot Water Flushing Design Report dated June 6, 2011, prepared by Farallon and Aquifer Solutions Inc. (2011), and the Technical Specifications – Skykomish School HWF Remediation dated January 16, 2015, prepared by Farallon (2015a) (2015 CPS).

The purpose of this O&M Plan is to describe anticipated normal operating procedures for the remediation system, and to assist operators with recurring system O&M events. This O&M Plan presents the intent, material components, O&M requirements, and equipment operating conditions and schedule. This O&M plan has been revised based on comments received from Ecology on September 19, 2016, on the draft version submitted on September 1, 2016. The comments received and the responses to the comments are presented in Appendix A, Response to Comments.

1.1 PROJECT CONTACT INFORMATION

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2.0 CLEANUP GOALS

The objective of treatment as described in the Second Amendment to Consent Decree No. 07-2-33672-9 SEA is "to reduce the amount of petroleum beneath the school to the extent technically possible, with the treatment goal of removing separate phase mobile or volatile liquid petroleum components or nonaqueous phase liquid (NAPL)." This objective will be accomplished by creating a closed-loop subsurface groundwater recirculation system and heating the groundwater to reduce NAPL viscosity, thereby mobilizing the NAPL for recovery via a groundwater extraction system. If present, volatile petroleum constituents will be recovered via an SVE system. The HWF treatment area consists of the School Site, which includes the School building footprint plus approximately 20 feet in all directions, extending to the sheet pile wall and areas previously excavated to Sixth Street to the east, Railroad Avenue to the south, the Schoolyard to the west, and the Teacherage to the north, as shown on Figure 1.

2.1 DESIGN QUALITY OBJECTIVES

Design quality objectives (DQOs) serve to identify the specific design objectives in terms of requirements for functionality, reliability, performance, interchangeability, safety/security, and operations monitoring. They are used to guide the design implementation process by identifying the relevant system requirements to ensure that all elements of the design are addressed. DQOs were identified for these categories for the overall remedy, and for each major subsystem and the components of these subsystems.

The functional objective of the overall HWF treatment system is to meet the cleanup objective for the School Site to reduce the amount of petroleum beneath the School Site to the extent technically possible, with the goal of removing separate-phase mobile or volatile petroleum components or NAPL. To achieve this objective, the HWF treatment system has been constructed at the School Site consisting of the following major subsystems:

- Groundwater Recirculation and NAPL Recovery;
- Subsurface Heating;
- SVE/SSD; and
- Subsurface Sheet Pile Barrier.

The key functional, performance, and monitoring objectives for the major subsystems that compose the HWF remedy, as presented in the DQOs, are discussed below.

Groundwater Recirculation and NAPL Recovery. This major subsystem will provide a gradient toward the eastern side of the School Site for NAPL recovery along Sixth Street and at the southeastern and northeastern corners of the School Site. The groundwater recirculation system also provides the driving force for heat transport throughout the treatment zone. Monitoring will include measurements of water levels, drawdown and mounding, and NAPL recovery.

Subsurface Heating. The subsurface heating subsystem heats the subsurface to reduce NAPL viscosity, reduce NAPL residual saturation, and enhance removal of separate-phase mobile petroleum and NAPL. Specific performance objectives include reaching elevated operational temperatures rapidly during summer operational periods, recycling heat in extracted groundwater to control and maintain heated-area temperatures, and removing heat to rapidly cool the subsurface. Monitoring will include recording subsurface temperatures in the groundwater zone and recording temperatures of the slab floor of the School building.

SVE/SSD. The SVE/SSD subsystem will remove volatile petroleum constituents and prevent vapor intrusion into occupied space or outdoors by maintaining a negative soil vapor pressure in the subsurface. Vapor barriers also are used indoors and outdoors in areas not covered by hard surfaces such as in crawlspace areas beneath the north- and east-entry steps. The size of the SVE system is sufficient to enable heat removal from directly beneath the School building slab, maintaining reasonably comfortable conditions in the School building. Monitoring includes pressure differential monitoring from beneath the floor slab of the School building and the atmosphere, and SVE off-gas monitoring. Indoor air monitoring is also performed during treatment. The SVE/SSD subsystem is designed for an average flow rate of 500 standard cubic feet per minute (scfm) and to achieve measurable vacuum beneath the subslab at all times with an average vacuum differential of 0.025 inch of water column. Subslab void spaces under the School building floor and inconsistencies in soil profile beneath the School result in variations of differential-pressure measurements between monitoring points.

Subsurface Sheet Pile Barrier. The sheet pile barrier subsystem provides hydraulic control to prevent migration of contaminated groundwater or NAPL. The sheet pile barrier extends around the complete footprint of the School Site and ties into the existing mechanically stabilized earth wall installed at the northern end of the School Site in 2006. The subsurface barrier also ties vertically into an existing silt layer at approximately 15 feet below ground surface. Monitoring will include installation of piezometers to enable measurement of groundwater levels on both sides of the barrier to evaluate water balance and groundwater flow hydraulics.

3.0 TREATMENT COMPONENTS AND OPERATING PERIODS

3.1 INJECTION AND RECOVERY SYSTEM

The system is designed to operate in several operating modes, including HWF, CWF, and ambient water flushing. The primary differences between these modes is the temperature of the water, and the equipment specific to each mode of operation, described in the sections below.

The injection and recovery system is common to all modes of system operation. The recovery system consists of a groundwater interceptor trench installed along the eastern boundary of the School Site to capture groundwater and floating oil. Ten extraction wells were installed in the interceptor trench, with a groundwater recovery pump and an oil skimmer installed in each extraction well. Recovery and injection system as-built conditions are shown on Figure 2.

The oil skimmer is a belt skimmer that uses an absorbent belt loop and a squeegee bar to absorb floating oil, bring it to the surface, and wring it into a dedicated tank. This tank is periodically pumped by the Operator, who is notified by the control system when the tank is full and needs to be emptied.

The groundwater recovery pumps operate in concert with one another to maintain a user-established water level in the groundwater interceptor trench. The total pumping rate from the interceptor trench is expected to range from 40 to 60 gallons per minute.

The injection system consists of 25 injection wells, 8 of which are installed in the subsurface beneath the School building. Injection wells serve to introduce treated water into the subsurface, where it will flow to the interceptor trench, mobilizing oil trapped in soil and carrying it to the interceptor trench, where the skimmers remove the floating oil. A network of 20 monitoring wells equipped with automatic water-level sensors enables monitoring of groundwater levels beneath the School Site. These data are used to adjust the flow rate at each injection well to “fine-tune” the injection so oil-recovery is optimized. A copy of the Ecology Rule-Authorized Underground Injection Control Registration is provided in Appendix B.

3.1.1 Hot Water Flushing System

In HWF mode, the water is heated up to between 140 and 150 degrees Fahrenheit (°F) using a boiler prior to injection in the injection wells. The hot water reduces the viscosity of the trapped oil, allowing it to flow with the circulating groundwater. A network of groundwater temperature probes at the School Site enables monitoring of groundwater temperatures beneath the School Site; this information is used to fine-tune the temperature of groundwater under the School Site to optimize oil collection. The boiler is a fuel-oil-fired unit. A fuel tank was placed in the treatment compound to supply the boiler, and requires refilling approximately two to three times per week during HWF operations. Secondary fuel containment is provided for the boiler and fuel tank during HWF operations. The general layout of the HWF treatment compound is shown on Figure 3.

3.1.2 Cold Water Flushing

CWF follows HWF, and is used to cool the subsurface of the School Site prior to the start of and during the first few weeks of the school year. In this mode of operation, the boiler is replaced with an electric-powered chiller, which chills the water to a temperature ranging between 45 and 60°F prior to injection. CWF begins approximately 3 weeks before school begins in August to allow ample time for the return of subsurface temperatures to normal ranges. CWF may continue for several weeks into September if needed while school is in session.

3.1.3 Ambient Water Flushing

Ambient water flushing involves flushing without heating (boiler operation) or cooling (chiller operation). This mode of operation is expected prior to the start of HWF operations, and after CWF when groundwater temperatures have returned to normal ranges between 40 and 60°F. Although heating is not involved and oil viscosity will return to ambient levels, this mode of operation also will recover oil. The time frame for use of ambient water flushing is September through November, and again from February through June, following shutdown during the winter.

3.1.4 Seasonal Shutdown

The system will likely not be operated during the winter because of the potential for freezing, and flooding of extraction well components by seasonally high groundwater levels. As part of the winter shutdown, equipment will be removed from the groundwater extraction wells. Additional winter shutdown activities include draining of water conveyance lines and treatment system tanks, and insulating exposed pipes and vessels.

3.2 WATER TREATMENT SYSTEM

The water treatment system consists of a chemical sequestering system for conditioning of the water, an oil-water separator for removal of residual oil, bag filters for suspended solids removal, and activated carbon treatment for removal of dissolved organic constituents. The flow rate through the system is 40 to 60 gallons per minute (gpm).

3.3 SOIL VAPOR EXTRACTION/SUBSLAB DEPRESSURIZATION SYSTEM

The SVE system consists of six SVE wells installed beneath the School building for the removal of soil vapors, nine air inlet wells installed outside the School building foundation to allow fresh air to enter soil beneath the School building slab, and a vacuum blower connected to the six SVE wells. In addition to the six SVE wells, a horizontal SVE extraction well was installed beneath the main corridor of the School building basement as an additional means of extracting vapors beneath the School building slab foundation, if necessary. Entrained water in recovered vapors is removed by an air-water separator, and the soil vapors are treated using activated carbon prior to discharge to the atmosphere.

The SVE system depressurizes (creates a vacuum) in the soil beneath the School building slab foundation, preventing vapors from entering the School building through the foundation. A series of subslab differential pressure gauges will allow fine-tuning of the system.

3.4 SYSTEM MONITORING AND OPERATIONAL ALERTS

Numerous devices automatically monitor groundwater level, groundwater temperature, the subslab vacuum, and air quality in several rooms of the School building. These devices automatically feed data into the control system. System operators can access these data both on the Site and via the web-based real-time monitoring system. Skykomish School District staff will be provided access to the web-based monitoring data. Operational alerts are built in to the controls, and notify operators if operating parameters are outside normal ranges. An alert of a shutdown condition triggers system shutdown. Shutdown conditions include high groundwater levels beneath the School building, release of any water inside treatment system enclosures, and clogging of various system filters. A detailed list of operation alerts and notifications is provided in Section 6, Reporting and Notification.

3.5 VENTILATION AND AIR CONDITIONING SYSTEM

The purpose of the temporary heating, ventilation, and air conditioning (HVAC) system is to mitigate the impacts of the soil remediation process taking place under the School building using 140°F hot water injection during the summer school break, and the remaining residual thermal warming affects occurring during the start of the fall school session. Temporary HVAC systems provided for this project were established under Chapter 7 of the 2011 American Society of Heating, Refrigerating and Air-Conditioning Engineers Applications Handbook for Educational Facilities.

3.5.1 Summer Ventilation

It is assumed that the ground floor of the building generally will be mostly unoccupied during the summer break, with the exception of toilet room usage by staff, and occasional cooking and maintenance activities conducted by Skykomish School District personnel. Hot water injection activities will start at the beginning of the summer, coincident with the school calendar. During this process, the ground floor School building slab temperature may increase up to a maximum temperature of 84°F, limited by the SVE system. Hotter localized slab areas near injection wells are possible. In areas exceeding a temperature of 80°F, temperatures will be reduced by increasing SVE flows proximate to the area or by providing temporary insulation measures.

The summer HVAC system will accomplish the following:

- Limit ground floor space temperatures to within 10°F of ambient (or 80°F, whichever is greater);
- Provide significant dilution ventilation on the ground floor as a secondary line of defense against volatile organic compound (VOC) accumulation on that floor (SVE system is primary line of defense);
- Provide directional air flow from Level 1 down to the ground floor to help reduce rising heat or potential VOC transfer;

- Reduce impact of elevated ground floor slab temperatures on Level 1 and Level 2 floor space temperatures; and
- Prevent excessive ventilation cooling of Level 1 and Level 2 floors on cool days.

To accomplish the above goals, it is anticipated that the ground floor will require approximately 1.5 to 2 cubic feet per minute per square foot of ventilation (9 to 12 air changes per hour), which will be accomplished using a combination of temporary supply and exhaust fans. The system will be configured to maintain negative directional airflow to the ground floor from the outside, and from floors Level 1 and Level 2 above. The general concept for accomplishing this goal is shown on drawing M-101 in Appendix C, and summarized below:

- Perimeter rooms will use exhaust fans combined with operable windows for air intakes to provide a negative directional airflow into each room.
- Ventilation supply fans will provide ventilation to ground floor interior spaces and hallways using temporary flexible distribution ductwork routed through the existing wood shop and other door entrances. Air from interior rooms will be transferred back to and exhausted from the wood shop and via transfer air to other perimeter rooms at a rate higher than that supplied to keep the overall ground floor airflow balance significantly negative.
- Temporary exhaust fans will be installed in toilet rooms throughout the ground floor to draw large amounts of exhaust air from the hallway via transom windows.
- The existing girls' locker room exhaust system will be operated to maintain negative airflow through the space. The exhaust fan for this system currently is not working, but will be repaired to functional condition for this project.
- Selective Level 1 and/or Level 2 windows will be opened to provide directional airflow from upper floors down to the ground floor.
- Security measures will be implemented to protect fixed air openings.
- Confined areas under stairwells will be ventilated using push/pull window style transfer fans installed in the access openings.

Exact slab temperatures during the summer will vary from normal soil temperatures at system start-up to a worst-case temperature of 84°F, although the worst-case temperature may be less than 84°F. Because of these multiple variables, the summer ventilation system will be capable of operating at lower airflow rates at times to prevent excessive ventilation cooling of Level 1 and Level 2 when ambient temperatures are below 70°F. This will be accomplished by manually adjusting the airflow balance on the ground floor to be closer to neutral (i.e., turning an exhaust fan off in areas with multiple fans, or increasing the airflow rate on the supply side). In addition, windows on Level 1 and Level 1 can be closed.

3.5.2 Fall Cool Down – Ventilation and Air Conditioning

In the fall (coincident with the school calendar), the soil flushing injection system will be switched from a hot water heating mode to a cold water cooling mode. During this time, the SVE system

will continue to exhaust heat from below the ground floor slab. This combined effect significantly decreases the ground floor slab temperature prior to the start of the fall school year/ground floor occupancy. Therefore, it is likely that little or no temporary ventilation or mechanical cooling will be required during the school year to counteract thermal impacts from the remediation process. However, a temporary mechanical cooling and ventilation system will be provided as a backup plan to maintain acceptable space temperatures on the ground floor should soil temperatures still be elevated when the school year starts. The temporary system design requirements are summarized below:

- An 84°F initial maximum ground floor slab temperature;
- A maximum indoor temperature of 75°F for classrooms, the cafeteria, and offices on an 83°F ambient day;
- A temperature ventilation-cooled to within 10° above ambient or 80°F (whichever is greater) for the remainder of occupied areas on the ground floor;
- No spaces in the building cooled to below 70°F; and
- HVAC equipment and systems will be required to comply with Section 110 of Chapter 246-366 of the Washington State Administrative Code regarding allowable sound levels in classrooms.

The plan for accomplishing the above is shown on drawing M-102 in Appendix C. Portions of the ventilation fan systems installed for summer operation will continue to be used for fall operation where appropriate. Provisions for mechanical cooling are anticipated to be needed until the point when the slab temperature and its residual heat impact on the School building are reduced. Because of the acoustical requirements for classrooms cited above, mechanical cooling equipment will be located outdoors away from windows, and supply/return air-ducted to interior spaces.

4.0 EQUIPMENT, OPERATION, AND MAINTENANCE

4.1 EQUIPMENT LAYOUT AND TREATMENT CONFIGURATIONS

The equipment layout and treatment configurations general accordance with the 2015 CPS. Any modifications to the 2015 CPS will be documented in the 2016 As-Built Completion Report. Annual updates to the O&M Plan will be prepared, as needed.

An as-built of the School Site equipment installed during 2015 construction is shown on Figure 2, and on the As-Built Survey in Appendix D. The equipment layout for the treatment compound is shown on Figure 3.

4.2 EQUIPMENT ON SCHOOL SITE

4.2.1 Equipment

The following major components of the HWF system are located at the School Site:

- Recovery Well Vaults
  - Goulds Self-Priming ¾-Horsepower Centrifugal Irrigator Water Pumps
  - Abanaki Oil Skimmer
- Injection Well Vaults
  - Battery-Powered Flowmeter Model GPIG2S05N09GMA
  - Leak Detection Conductive Level Switch
- Groundwater Monitoring Wells
  - Pressure and Temperature Submersible Sensor Model AST45PT
  - Levelogger Junior Edge Model 3001
- Compliance Monitoring Equipment
  - RAEGuard 2 Photoionization Detector
  - Ashcroft Model CXLdp Differential Pressure Transmitter
  - LogTag HAXO-8 Humidity and Temperature Recorder thermometers
  - General IRT-206 Infrared Thermometer

Equipment information sheets are provided in Appendix E. A summary of the equipment operating conditions and maintenance tasks is provided in Table 1.

4.2.2 Extraction Pumps

The Goulds Water Technology GT073 pump is a ¾-horsepower single-stage self-priming centrifugal pump for HVAC systems and general water transfer. The casing is of cast iron

construction with tapped openings provided for vacuum gauge and casing drain. Impellers are enclosed design, glass-filled NorylTM, threaded directly on the motor shaft. Standard motors are National Electrical Manufacturers Association (NEMA)-standard, 3500 revolutions per minute, open drip proof enclosure.

Operation and Maintenance: The extraction pumps are operated using a variable frequency drive to enable the operator to slow down and speed up the pump operation. The control logic for extraction pump operations is based on groundwater levels inside the trench as measured by groundwater monitoring wells GWM-1 and GWM-2, as shown in Figure 4.

The operator has the option of operating the extraction pumps in manual or auto modes. Operating the system in auto mode allows the operator to set a target groundwater elevation to be maintained in the recovery trench, as measured by groundwater monitoring wells GWM-1 and GWM-2. The extraction pumps will slow down or speed up to maintain the target groundwater elevation in the trench. Target groundwater elevations range between 915 to 918 feet mean sea level, depending on seasonal groundwater conditions.

Operating the extraction pumps in manual mode allows the operator to set the speed of individual pumps. System shut-down alarms defined on plan sheet P-108 will shut down the extraction pumps whether operating in manual or auto mode. Manual pump speeds range between 45 and 60 hertz (Hz) depending on the number of pumps online and seasonal groundwater conditions.

The extraction pumps discharge to a common header pipe, which can result in buildup of static pressures at extraction pumps located nearest the treatment compound (i.e., RW-1, RW-2, etc.). To balance the system pressure across the trench, valves at the outlet of each extraction pump can be partially closed to help balance the operating pressure.

During annual system start-up and seasonally low groundwater conditions, extraction wells may experience lower well recharge rates. Lower well recharge rates can result in pumping wells dry and/or extraction pump cavitation, which can damage internal pump equipment. To maximize well recharge rates, extraction wells will be cleaned and/or redeveloped as needed annually to remove buildup of scale and biological growth.

4.2.3 Oil Skimmers

Abanaki's PetroXtractor PX-B is an oil skimmer specially designed to remove hydrocarbons from groundwater via existing monitoring or remediation wells. The oil skimmers require very little maintenance, set up easily, and have low power requirements. Each groundwater remediation oil skimmer package includes a PetroXtractor oil skimmer and an oil transfer system. The main components of the oil skimmer are an oil-attracting belt, an electric motor, belt wipers, and a discharge trough. The major components of the oil transfer system are a pump, an electric motor, and an oil-collection tank.

Operation and Maintenance: Each oil skimmer has a dedicated control panel located inside the extraction well vault. The control panel allows the operator to operate the oil skimmer in auto or manual mode. If NAPL is present in a recovery well, the oil skimmer should be set to auto mode.

In auto mode, the oil skimmer will operate based on a timer setting. The timer is located inside the panel and can be adjusted by the operator. Typical auto mode settings will operate the oil skimmer for 6 minutes every 24 hours. Skimmer operating cycles range between 6 minutes every 24 hours to 6 minutes every 8 hours depending on the presence and recharge of NAPL in the extraction well.

Each extraction well has a dedicated oil storage tank to store water-oil mixture removed from the well by the skimmer belt. Each inch of water-oil mixture measured in the storage tank represents 1 gallon of stored volume. Once the volume of water-oil mixture reaches 8 gallons, the high-level switch in the alarm will trigger and shut off the skimmer. Skimmer tanks are checked at regular intervals, and the oil typically is pumped out before the high-level alarm is triggered.

4.2.4 Recovery Well Instrumentation

Each recovery well vault will include a temperature indicator and transmitter, a flow meter and transmitter, and an oil skimmer tank high-level alarm. The model description of each of the recovery well instruments is provided below:

- ProSense Temperature Transmitter Model TTD25N
- DuraChoice Adjustable Industrial BiMetal Thermometer Model TA5D
- Abanaki Polypro Float Switch Model E21G
- Seametrics Plastic-Bodied electromagnetic flow meter Model WMP101

Recovery well vaults will be inspected daily during HWF operations to ensure that the equipment is functioning correctly.

4.2.5 Injection Well Instrumentation

Each injection well vault will include a pressure gauge, flow meter, and leak detection conductive level switch. Below is the model description of each of the injection well instruments:

- FLOMEC Stainless Steel Industrial Flow Meter Model G2S05N09GMA
- DuraChoice Stainless Steel Oil Filled Pressure Gauge Model PS254L
- Gems Buna N Float Single Point Level Switch Model LS1700

Injection well vaults are inspected weekly during HWF operations to ensure equipment is functioning correctly.

Pressures at the injection well range between 0 and 5 pounds per square inch (psi).

Operation and Maintenance: FLOMEC Stainless Steel Industrial Flow Meters must be cleaned out periodically to remove debris that may build up on the internal impellor. Flow rates at each injection well vary depending on subsurface conditions and operating balance settings defined by the Engineer. Flow rates typically range between 0 and 4 gpm.

4.2.6 Groundwater Monitoring Well Instrumentation

Groundwater level and temperature will be measured continuously in 21 groundwater monitoring wells located at and adjacent to the School Site. All exterior groundwater wells are monitored using the Levelogger Junior Edge Model 3001 datalogger. Temperature and groundwater measurements will be recorded at these wells each hour. Data from these leveloggers may be uploaded periodically using the Solinst Levelloader. All interior wells are equipped with Submersible Pressure and Temperature Sensors Model AST45PT, which provide temperature and water level data to the programmable logic controller (PLC) via a 4-20 mA signal.

Operation and Maintenance: Leveloggers are calibrated as needed by the operator using the Solinst Levelloader.

4.2.7 Compliance Monitoring Equipment

4.2.7.1 Photoionization Detectors

VOCs are measured continuously inside the School building using three RAEGuard 2 fixed photoionization detector (PIDs). The RAEGuard 2 provides data to the PLC via a 4-20 mA signal. The RAEGuard 2 PIDs include a graphic display and light-emitting diode (LED) light status indicator for fault and alarm conditions. The PID in conjunction with the PLC will notify personnel of action level conditions described in the Hot Water Flushing Air, Noise, and Odor Monitoring Plan, 2015 to 2019 dated February 10, 2015, prepared by EMB Consulting (2015 ANO Plan).

Operation and Maintenance: PIDs are checked weekly and calibrated if needed using 100 parts per million (ppm) isobutylene calibration gas. PIDs are serviced as needed by a certified RAE Systems Technician. During periods of servicing, a temporary handheld RAE PID is used, which will create a data log every minute and provide audible alarms.

4.2.7.2 Floor Subslab to Indoor Air Pressure Monitoring Equipment

Subslab differential pressures are monitored with Ashcroft Model CXLdp Differential Pressure Transmitter in six locations throughout the first floor of the School building. The differential pressure transmitters have a unidirectional range of 0 to 5 inches water column. The pressure transmitters provide floor subslab to indoor air pressure differential data to the PLC via a 4-20 mA signal.

Operation and Maintenance: Each pressure transmitter contains a calibration screw used to zero the transmitter. The transmitter should read zero differential pressure when both ports are exposed to ambient (room) pressure conditions. Pressure transmitters are calibrated using a high-accuracy Infiltec DM1 Micro-Manometer.

4.2.7.3 Interior Floor Temperature Monitoring Equipment

Interior floor temperature is measured weekly using a General IRT-206 Infrared Thermometer. The IRT-206 is a manually operated industrial-grade thermometer with a temperature range of -40.0 to 185ºF.

4.2.7.4 Interior Room Temperature Monitoring Equipment

Interior room temperatures are monitored with LogTag HAXO-8 Humidity and Temperature Recorder thermometers located in all occupied rooms of the first floor. The HAXO-8 thermometer measures temperatures -40.0 to 185°F and humidity 0 to 100 percent Relative Humidity. The HAXO-8 can log temperatures hourly, with custom alarms and LED indicators programmed to signal action-level conditions.

4.3 EQUIPMENT AT TREATMENT COMPOUND

4.3.1 SVE Equipment

The following major components of the SVE system are located at the treatment compound:

- Air to Air Heat Exchanger
  - Xchanger Air to Air Heat Exchanger Model AA-1000
- Moisture Separation Equipment
  - FLOMEC Battery Powered Flowmeter Model GPIG2S05N09GMA
  - Leak Detection Conductive Level Switch
- Blower
  - AirTech 19.44 HP Regenerative Blower Model 3BA1900-7AT16
  - Kunkle Vacuum Relief Valve Model 337
- Vapor-Phase Carbon Vessels
  - Siemens 1,000-pound Vapor-Phase Carbon Adsorbers Model FB1000 (two each)

4.3.1.1 Condensate Diaphragm Pump

A timer-operated diaphragm pump removes condensate water from the SVE condensate sumps and discharges it to the moisture separator. The Flojet 4000 diaphragm pump delivers flows up to 5 gpm, and includes a built-in pressure switch for automated starts and stops. The 115-volt pump is self-priming, and can be operated dry without incurring damage.

Operation and Maintenance: Condensate water is pumped to the moister separator and then transferred to the oil-water separator for treatment and reinjection. During summer operation in HWF mode, the system typically produces 15 to 30 gallons of condensate each week. SVE system sumps should be checked weekly for condensate accumulation and manually pumped from sump as necessary.

4.3.1.2 Air to Air Heat Exchanger (HTX-301)

Xchanger AA Series heat exchangers cool low-pressure gas streams with ambient air. These compact air-cooled units feature a TEFC 230/460 VAC, a three-phase motor, a

heavy-duty cooling fan, and an Occupational Safety and Health Administration (OSHA)-approved fan guard.

4.3.1.3 Moisture Separator (V-301)

The VLS-100 Moisture Separator from H2K Technologies, Inc. separates entrained water from the air stream. As the water/air mixture flows into the all-welded steel knockout tank, the water falls out and accumulates in the tank while the air passes through. Accumulated water in the tank is pumped through the water treatment system by a transfer pump.

Operation and Maintenance: During summer operation in HWF mode, the system typically produces 15 to 30 gallons of condensate each week. The moisture separator should be checked weekly for condensate accumulation to confirm that the moisture separator float switch is operational.

4.3.1.4 Blower (B-301)

The Airtech Vacuum/Pressure Regenerative Blower (3BA1900) provides vacuum to the wells and comprises a blower motor and a blower fan. The blower is capable of providing a maximum total vacuum of 108 inches of water column to the system.

Operation and Maintenance: The blower typically is operated at full speed, or at 60 Hz. Depending on groundwater conditions and valve settings at the SVE manifold, the system operating vacuum and blower current will vary. System flows range between 450 and 550 scfm and system vacuums range between 35 and 70 inches per water column. Blower current ranges between 14 and 20 amps. The blower should be serviced according to manufacturer recommendations.

4.3.1.5 Flow Meters

GPI TM Water Meters meet Schedule 80 polyvinyl chloride specifications, and come standard with a low-profile display that indicates batch, cumulative totals, and rate of flow. The flow meters are designed for use in water applications; the TM100 model offers flow rates ranging from 5 to 50 gpm.

Operation and Maintenance: Typical flow rates to each injection zone header pipe range between 5 and 25 gpm. Flow meters should be cleaned annually and serviced according to manufacturer recommendations.

4.3.1.6 Pressure-Relief Valve (RV-302)

The Kunkle Model 337 pressure-relief valve provides protection of low- to medium-pressure high-volume blowers. Pressure limits are 1 to 60 pounds per square inch gauge. Temperature limits are -20 to 406°F.

Operation and Maintenance: The pressure relief valve is factory set to 15 psi. The pressure relief valve should be tested annually to ensure functionality prior to operation in HWF mode.

4.3.1.7 Vapor-Phase Carbon Vessels (V-302 and V-303)

FB-Series Vapor-Phase Carbon Adsorbers are well suited for removal of VOCs from low- to moderate-flow air streams. The deep carbon bed depths (a minimum of 3 feet) allow for efficient removal of VOCs. The FB1000 model provides for a maximum flow of 1,000 standard cubic feet per minute, and has a carbon capacity of 1,000 pounds.

SVE system influent samples collected during June 2016 HWF operations showed that total air-phase petroleum hydrocarbon (APH) concentrations in the soil vapor are low enough that vapor-phase carbon vessels are unnecessary. Additional system influent samples will be collected during HWF operations to determine the need for vapor-phase carbon treatment.

4.3.1.8 Control Panel

The HWF system includes the following control panels, located in the treatment compound:

- Skykomish School System Treatment Panel (Main PLC)
- Recovery Trench RW1-RW10 Pump Drive Panel (Recovery Trench Panel)
- SVE and Moisture Separator Pump Panel (SVE Panel)
- Transfer Pump Drive Panel (Main Transfer Pump Panel)

All panels were built and installed by Superior Custom Controls. Drawings of each control are provided in Appendix F.

4.3.2 Water Treatment Equipment

The following major components of the water treatment system are located at the treatment compound:

- Air to Water Heat Exchanger
  - Xchanger Air to Water Heat Exchanger Model LC-60-1
- Oil-Water Separator
  - Hydro Quip. Inc. 60 GPM Oil-Water Separator with Coalescing Plates Model AG-3SS-IP
- Transfer Pump and Flow Equalization
  - Plastic Mart 1,025-Gallon Polyethylene Vertical Tank Model No. 1025 VT
  - Goulds 5-Horsepower Centrifugal Transfer Pump Model 3BF1J5BO
- Water Treatment Equipment
  - Parker 160 gpm Carbon Steel Bag Housing Model CBC1D2T
  - 60 gpm, 25-Micron Bag Filter
  - Pure Effect 2,000 Liquid-Phase Carbon Adsorbers Model PEL2000

4.3.2.1 Air to Water Heat Exchanger (HTX-101)

Xchanger LC Series heat exchangers are designed specifically for cooling liquids or high-pressure air with ambient air. The LC Series exchangers feature a TEFC 230/460 VAC, a three-phase motor, a heavy-duty cooling fan, and an OSHA-approved fan guard.

4.3.2.2 Oil-Water Separator (T-101)

The oil-water separator is a special-purpose prefabricated parallel-corrugated plate rectangular gravity-displacement type oil-water separator. The separator is composed of a tank containing an inlet compartment, a separation chamber, a sludge chamber, and a clean water outlet chamber.

Operation and Maintenance: The oil-water separator should be checked weekly for oil accumulation in each of the chambers. The coalescing media should be cleaned as needed to allow water to pass unrestricted through the tank. During HWF mode, the media will require monthly cleaning events.

4.3.2.3 Equalization Tank (T-102)

The equalization tank is a rotationally molded polyethylene tank with a 1,025-gallon capacity. The vertical tank is designed for aboveground water storage, and measures 5 feet in diameter and 7.5 feet in height.

Operation and Maintenance: The set point for the equalization tank can be defined by the operator. Typically, the system is operated with an equalization tank set point of 55 inches. The equalization tank should be cleaned quarterly to remove biological growth from the surface that could foul bag filters or level transmitters.

4.3.2.4 Transfer Pump (P-201)

Goulds Water Technology 3656 S Bronze Fitted cast iron pump is a 4.04 HP single-stage end-suction centrifugal pump. Pump impellers are fully enclosed, key-driven and held in position by an impeller bolt and washer. Casings are full volute in design, with replaceable wear rings. Standard motors are NEMA-standard JM or JP motors with C-face mounting and key driven shaft extension.

Operation and Maintenance: The transfer pump typically is operated in auto mode controlled by the equalization tank set point. The transfer pump will speed up or slow down depending on the water level in the equalization tank. Depending on system flow rates, system pressures, and valve settings at the boiler or chiller, the pump operating speed and current will vary. Pump speeds range between 40 and 50 Hz. The transfer pump should be greased weekly and serviced according to the manufacturer recommendations.

4.3.2.5 Bag Filters (V-304)

Groundwater from wells is passed through bag filters prior to passing through the granular activated carbon (GAC) canisters. The bag filter system consists of two parallel legs of

two filters with a maximum flow of 160 gpm. The filters are encased in carbon steel housings fitted with a pressure gauge to monitor internal filter pressure. All piping and fittings are Schedule 40 carbon steel.

Operation and Maintenance: Bag filters are operated with 5 or 10 micron bag filters and typically are changed out every 12 to 96 hours depending on differential pressure between the inlet and outlet of the bag filter. Differential pressures should be checked daily. If differential pressures exceed 5 psi, bag filters should be replaced.

4.3.2.6 Liquid-Phase Carbon Vessels (V-305 and V-306)

Pure Effect PEL-2000 liquid phase carbon vessels are designed for the removal of dissolved contaminants from liquid streams with flow ranges up to 100 gpm per unit and a carbon capacity of 2,000 pounds. Vessels are constructed of high-grade carbon steel, with high solids epoxy lining and exterior paint of industrial enamel.

Operation and Maintenance: Prior to placement on stream, new carbon must be properly wetted. Wetting of the carbon is necessary to remove air from pore spaces, which could result in channeling in the carbon vessel. Carbon vessels should be wetted a minimum of 24 hours prior to placement on stream.

Once on stream, liquid-phase carbon vessel pressures should be checked daily. If differential pressure across the carbon vessel results in a system high-pressure alarm (typically set to 35 or 40 psi), the system should be shut down and the lead carbon vessel media should be replaced. Alternatively, carbon media may be manually inspected for surface buildup of suspended solids. If carbon media is clogged due to a surface layer of solids, this fouled media should be removed until clean media is exposed.

4.3.2.7 Flow Meters

The FLOMEC Stainless Steel Meter is a high-accuracy meter designed for use with output modules, sensors, and remote transmitters. Flow meters provide two totals (batch = resettable, cumulative = non-resettable) and allows user calibration.

Operation and Maintenance: Flow meters should be cleaned annually and serviced according to manufacturer recommendations.

4.3.3 Boiler Equipment

The Williams and Davis boiler (Model No. 2250D) is a two-pass, dry-back horizontal firetube boiler that offers high efficiency, flexibility, reliability, safety, and ease of operation. The Dryback design provides full access to boiler tubes, tube sheet, and furnace for ease of maintenance, and includes single rear tube sheet construction, which reduces tube sheet stresses. Series 2000D provides high flue gas velocities and low stack temperatures to maximize its performance. All units are factory fire-tested and shipped as an integrated package, ready for quick connection to utilities.

The boiler is equipped with a Watts 740 boiler-pressure-reducing valve on the system side of the heat exchanger. The pressure-reducing valve typically is set to 30 psi. During boiler startup and commissioning, a system shutdown is performed to verify that excess steam pressure does not migrate downstream of the boiler where it could damage equipment.

Operation and Maintenance: Boiler equipment should be operated and maintained by an experienced boiler technician. To prevent scale buildup inside the boiler during HWF mode, blowdowns are performed as recommended by the boiler provider. Blowdown water is collected in a container after passing through the blowdown tank. Once cooled to ambient temperature, blowdown water is discharged to the sanitary sewer.

Boiler operations during HWF activities conform to the performance requirements listed in the project specifications. The boiler is capable of heating the treated groundwater from approximately 50 °F up to 160 °F at flow rates up to 60 gpm. Boiler operations include sufficient turn-down capacity to allow for differential heating of lower flow rates experienced under low groundwater conditions.

4.3.4 Chiller Equipment

The Trane CGAM chiller units are scroll-type, air-cooled liquid chillers designed for installation outdoors. The 30-ton units have a single independent refrigerant circuit, with two compressors per circuit. The CGAM units are packaged with an evaporator and a condenser. The CGAM series features Trane's exclusive Adaptive Control logic with CH530 controls, which monitors the control variables that govern the operation of the chiller unit. Adaptive Control logic can correct these variables when necessary, to optimize operational efficiencies, avoid chiller shutdown, and keep producing chilled water.

Operation and Maintenance: The chiller unit should be serviced and cleaned according to manufacturer recommendations prior to each CWF season.

4.3.5 Chlorine Dosing and Monitoring

To mitigate bacterial growth in the extraction wells and HWF treatment compound, adequate chlorine levels should be maintained at the equalization tank. Chlorine may be manually dosed using the HWF Manual Dosing Plan provided in Appendix G, or automatically dosed using a Well Protector Dry Pellet Chlorinator.

Operation and Maintenance: Chlorine concentrations are measured using the LaMotte DC1500 Colorimeter. Residual chlorine should be maintained between 3 and 10 ppm at the equalization tank, and not to exceed 4 ppm at the lag GAC effluent.

4.3.6 Sequesterant Dosing and Monitoring

To mitigate bacterial growth and scale formation in the HWF treatment compound, adequate sequesterant dosing should be maintained at the influent to the oil-water separator. Sequesterant should be automatically dosed using a Stenner 45MJL1 Peristaltic Pump prior to inline mixing using a K-Flo Model 2-80-4-6-2 inline mixer.

Operation and Maintenance: Typical sequesterant dosing rates will maintain 1 milliliter per minute based on a 19 microliter per gallon recommended concentration as described in Appendix G. Phosphate concentrations are measured monthly to monitor phosphate concentrations at the groundwater extraction trench, and sequesterant dosing rates will be adjusted as needed.

5.0 SYSTEM MONITORING AND ADJUSTMENTS

System monitoring and adjustments will be performed in accordance with *Addendum #3 to 2010 Compliance Monitoring Plan Update, BNSF Former Maintenance and Fueling Facility, Skykomish, Washington* dated February 17, 2015, prepared by Farallon (2015b) (2015 CMP). A summary of compliance monitoring activities to be performed during HWF remediation operations is provided in Table 2.

5.1 TEMPERATURE

5.1.1 Interior Floor Temperature

The interior floor temperature will be measured weekly by the Project Engineer using a General IRT-206 Infrared Thermometer.

Floor temperature will be limited to a maximum of 84°F. The HWF treatment system will be operated with the goal of maintaining indoor floor temperatures below the maximum allowable 84°F temperature. If the floor surface temperature exceeds 80°F, efforts will be made to reduce the temperature by increasing SVE flows proximate to the area, adjusting water injection rates, or providing insulation blankets.

5.1.2 Interior Air Temperature

Interior room temperature will be monitored daily by the Project Engineer using LogTag HAXO-8 Humidity and Temperature Recorder thermometers located in all first-floor occupied rooms for continuous monitoring. Indoor air temperatures will be maintained in accordance with Section 3.5, Ventilation and Air Conditioning System.

5.2 INDOOR AIR QUALITY

Indoor air quality will be monitored in accordance with the 2015 CMP, which includes monitoring with a PID and indoor air sampling of VOCs in the School building. The objective of the VOC PID monitoring is to provide for notification of potential sudden intrusion of volatiles from the contaminant plume under the School building for the project duration. VOC monitoring will be accomplished by continuously monitored RAEGuard 2 PID instruments with 10.6 eV lamps in three locations. RAEGuard 2 PIDs are installed in the School building at the following locations:

- Cafeteria (1st floor);
- Kindergarten (1st floor); and
- Main office (2nd floor).

The PIDs monitor VOC levels continuously at the three locations and are factory calibrated; calibration was verified upon installation. VOC levels are continuously recorded by the PLC remote monitoring system and can be accessed remotely through the human machine interface (HMI).

If any of the notification levels described in the 2015 CMP are triggered, the PLC remote monitoring system will provide immediate e-mail notification to the Project Engineer, Ecology, and the Skykomish School District. The two notification levels for VOC monitoring are:

- Notification and Investigation – If a VOC level is measured exceeding 5 ppm for 5 sustained minutes, immediate notification and investigation, and mitigation of the VOC source within 4 hours of the notification is required.
- Notification and Evacuation – If VOC levels are measure exceeding 10 ppm for 5 sustained minutes at two monitoring locations, immediate notification, evacuation of the School building under standard Skykomish School District procedures, and investigation and mitigation of the VOC source within 4 hours of the notification is required.

Weekly VOC monitoring summaries will be provided to Ecology and the Skykomish School District summarizing VOC monitoring data. These data will be provided with a narrative identifying any fluctuations in PID measurements as related to treatment system operation, SVE system operation, and activities in the School building.

5.3 NOISE

Noise levels will be monitored for the first week of each phase of flushing operations in accordance with the 2015 CMP. At the start of each phase of flushing operations, a stationary noise level meter will continuously record noise levels proximate to machinery with the potential to cause noise for 1 week. A noise survey map of noise levels inside the School building will be created during the first week of each phase of flushing operation. The noise survey map and recorded noise levels will be compared to established noise action levels, which are:

- Exterior – 65 decibels A (dBA);
- Interior with windows closed – 40 dBA Leq and 50 dBA Lmax; and
- Interior with windows open – 45 dBA Leq and 70 dB (unweighted).

Noise mitigation measures will be implemented if HWF equipment or operation exceed noise action levels. Mitigation measures include equipment noise-isolating measures, and system adjustments of potential noise-generation equipment.

5.4 ODOR

Odor monitoring will occur during all phases of remediation system operations. Odor monitoring will be performed by the Engineer, Skykomish School District representatives, and neighboring property occupants. Odors related to remediation activities have been divided into five levels, each with a corresponding corrective action, listed below:

- Level 0 – No odor – No action required

- Level 1 – Odor barely detected – Document odor level hourly until return to Level 0. If odor remains at Level 1 for 24 hours or more, report to Skykomish School District, investigate source, and mitigate source.
- Level 2 – Odor is distinct and definite – Report odor to Skykomish School District and investigate, and mitigate odor source.
- Level 3 – Strong odor, occupants attempt to avoid odor – Evacuate building, report to Skykomish School District, investigate, and mitigate source of odor.
- Level 4 – Very strong odor, occupants do not want to remain present – Evacuate building, report to Skykomish School District, investigate, and mitigate source of odor.

5.5 FLOOR SUBSLAB TO INDOOR PRESSURE DIFFERENTIAL

Protection of indoor spaces from potential vapor intrusion of volatile substances related to HWF operations will be accomplished by monitoring indoor air VOC levels and subslab differential pressures. Subslab differential pressures are monitored with Ashcroft Model CXLdp differential pressure gauges in six locations throughout the first floor of the School. Subslab differential pressure probes locations are shown on Figure 2.

5.6 SOIL VAPOR EXTRACTION

The SVE system is designed to maintain a subsurface air flow rate of approximately 500 cubic feet per minute (cfm) and provide adequate subslab differential pressure beneath the School to prevent vapor intrusion.

SVE influent samples should be collected monthly during flushing operations to characterize soil vapor to determine if there is any risk of vapor intrusion. The monthly SVE influent sample data will also be used to document compliance with local air agency SVE system discharge requirements.

During the August cool-down phase, the soil vapor extraction system should be adjusted as needed to maintain 500 cfm air flow rate to remove subslab heat prior to the start of school.

5.7 TPH CONCENTRATIONS AT LIQUID-PHASE CARBON VESSELS

HWF system water treatment operations will be monitored by collecting water samples between the lead and lag liquid-phase GAC vessels and the discharge of the lag GAC vessel. Water samples will be analyzed in accordance with the 2015 CMP. Analytical results will be used to determine when the GAC will require changeout to ensure that discharge within the treatment area complies with the total petroleum hydrocarbon (TPH) Remediation Level limit of 477 micrograms per liter. Water treatment operations will be monitored weekly.

5.8 TPH CONCENTRATIONS AT VAPOR-PHASE CARBON VESSELS

SVE system vapor treatment will be monitored by collecting VOC concentrations using a PID from the lead vapor-phase GAC vessel influent, between the lead and the lag GAC vessels, and at

the lag GAC vessel effluent. The GAC vessels will remove a minimum of 95 percent of petroleum hydrocarbons, as measured by PID. Vapor treatment PID monitoring data will be reviewed weekly to determine whether carbon changeout is required.

Annual discharge sample data will be analyzed to ensure that the SVE system is not exceeding the Puget Sound Clean Air Agency (PSCAA) regulation 6.03(c) 94 annual discharge:

- >15 pounds per year of benzene; and
- >1,000 pounds per year of toxic air contaminants as defined by PSCAA chemicals table for emission reporting.

5.9 NAPL RECOVERY

Product thickness in each of the 10 recovery wells will be measured by the operator daily during HWF operations, and weekly during cold and ambient water flushing. Measurements will be documented using the HWF Operations and Maintenance Field Form provided in Appendix H, stored at the School Site in the operator's log, and available for remote access by the Project Engineer.

NAPL recovered by the recovery trench oil skimmers will be quantified by the operator weekly during HWF operations, and monthly during cold and ambient water flushing. Each oil skimmer has an associated 8-gallon oil storage tank that will be used to store and quantify oil in the recovery well vaults. Measurements will be documented using the HWF Operations and Maintenance Field Form provided in Appendix H, stored at the School Site in the operator's log, and available for remote access by the Project Engineer.

5.10 GROUNDWATER ELEVATION AND TEMPERATURE

Groundwater level and temperature elements are installed in 21 groundwater monitoring wells at the School, as shown on Figure 2. The elements for monitoring wells GWM-1 through GWM-7 are connected to the PLC. The remaining monitoring wells were installed with standalone Levelogger Junior Edge Model 3001 dataloggers. Following installation, the elements were calibrated and field-verified using manual water-level gauges.

The seven monitoring wells that connect to the PLC continuously record groundwater level and temperature readings, which are displayed in real time via the PLC, and are logged every 30 and 60 minutes, respectively.

The groundwater monitoring temperature and level elements are used to monitor groundwater beneath the School, along the hydraulic containment wall, and inside the recovery trench during HWF System operation to help balance and maintain operational effectiveness. Data from the dataloggers will be uploaded by the operator every 2 weeks, and available for remote access by the Project Engineer.

6.0 REPORTING AND NOTIFICATION

Reporting and notification of system operational data and conditions will be performed as described in the 2015 ANO Plan and the 2015 CMP. Below is a description of the implementation of these requirements.

6.1 AUTOMATED SYSTEM NOTIFICATIONS

Ecology and the School will be immediately notified of continuous PID measurements exceeding 5 ppm above background (sustained for 5 minutes). The HWF monitoring system PLC is programmed to send a notification via e-mail to an e-mail list that will include the Contractor, Project Engineer, Skykomish School District Representative/Superintendent, and Ecology representative. This e-mail will trigger an on-Site investigation within 4 hours, and mitigation of the VOC source as required.

6.2 WEEKLY REPORTING

During treatment system operation, weekly reports will be prepared by the Project Engineer and distributed to the School and Ecology. The weekly reports will include indoor air monitoring data, including APH analysis and PID readings, and subslab to indoor pressure differential data. The report will include a summary of any fluctuations in PID and subslab pressure differential measurements as related to treatment system operation, SVE system operation, and activities in the School.

6.3 LABORATORY ANALYTICAL DATA POSTING

In accordance with the 2015 CMP, preliminary (unvalidated) laboratory analytical results will be posted to a secure and password-protected Farallon website (Egnyte) within 24 hours of receipt, for review by Ecology.

6.4 SCHOOL HMI INTERFACE OF SCHOOL MONITORING SYSTEM.

An HMI of the HWF monitoring system includes a remote web interface that shows real-time monitoring data at the School, including VOC levels, subslab pressure differential measurements, groundwater elevations, and groundwater temperatures. The monitoring system was commissioned and verified during winter 2016. A snapshot of the HMI interface of the School Monitoring System is provided in Appendix E.

7.0 SCHEDULE

7.1 STANDARD ANNUAL OPERATING SCHEDULE

DATE *	EVENT
FEBRUARY 15	Estimated – Seasonal equipment installation, well cleaning, system start-up, begin flushing with cold water
JUNE 1	HWF seasonal equipment installation completed; begin testing and commissioning of hot water flushing system
JUNE 15	Estimated – Begin hot water flushing following the last day of school
AUGUST 15	Estimated – Begin cold water flushing
AUGUST 24	Teachers return
AUGUST 31	Students return
OCTOBER 31	Estimated – Seasonal shutdown and winterization

***** Note: Dates are approximate and subject to change.

7.2 COMPLETION OF OPERATIONS AND CLOSURE

The primary cleanup objective associated with the design of the HWF treatment system is to reduce the amount of petroleum beneath the School to the extent technically possible, with the goal of removing separate-phase mobile or volatile petroleum constituents or NAPL. Operation of the treatment system will be complete based on coordination with Ecology.

Summary reporting documentation will be provided following each annual treatment season, as follows:

- As-Built Completion reports will summarize the installation of the HWF treatment system and associated project components completed over the corresponding annual season. The 2016 As-Built Completion Report will include the Air Sparge System decommissioning, 6th Street sewer line installation, and carbon gate/vault replacement work. The draft 2016 As-Built Completion Report is due to Ecology by March 31, 2017.
- Annual HWF System Operations reports will summarize the treatment system operations and performance for the corresponding treatment season. The 2016 Annual HWF System Operations Report will include related operating and performance data; analyses and evaluations of operating procedures; a summary of air, odor, and noise monitoring

activities and results; and recommendations for modifications as needed. The draft 2016 Annual HWF System Operations Report is due to Ecology by March 31, 2017.

- Following completion of cleanup activities at the Site, a summary of the cleanup operations will be provided in the Final Annual HWF System Operations Report.

Following completion of cleanup activities at the School, a Final Restoration Plan will be provided to the Skykomish School District for review.

8.0 REFERENCES

EMB Consulting. 2015. *Hot Water Flushing Air, Noise, and Odor Monitoring Plan, 2015 to 2019, Skykomish School, 105 6th Street, Skykomish, Washington.* Prepared for BNSF Railway Company and Farallon Consulting, L.L.C. February 10.

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Washington State Department of Ecology. 2007. *Cleanup Action Plan for BNSF Former Maintenance and Fueling Facility, Skykomish, Washington*. Exhibit B of Consent Decree No. 07-2-33672-9 SEA between the Washington State Department of Ecology and BNSF. October 18.

FIGURES

OPERATIONS AND MAINTENANCE PLAN
Hot Water Flushing System
Skykomish School
Skykomish, Washington

Farallon PN: 683-057

LEGEND

- SCHOOL SITE
- HOT WATER FLUSHING SYSTEM AT THE SCHOOL SITE
- BNSF RAILYARD

IMAGERY SOURCE: USDA FARM SERVICE AGENCY(FSA)
NATIONAL AGRICTULTURE IMAGERY PROGRAM (NAIP) 2015

0 160
SCALE IN FEET

N

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Washington
Issaquah | Bellingham | Seattle

Oregon
Portland | Bend | Baker City

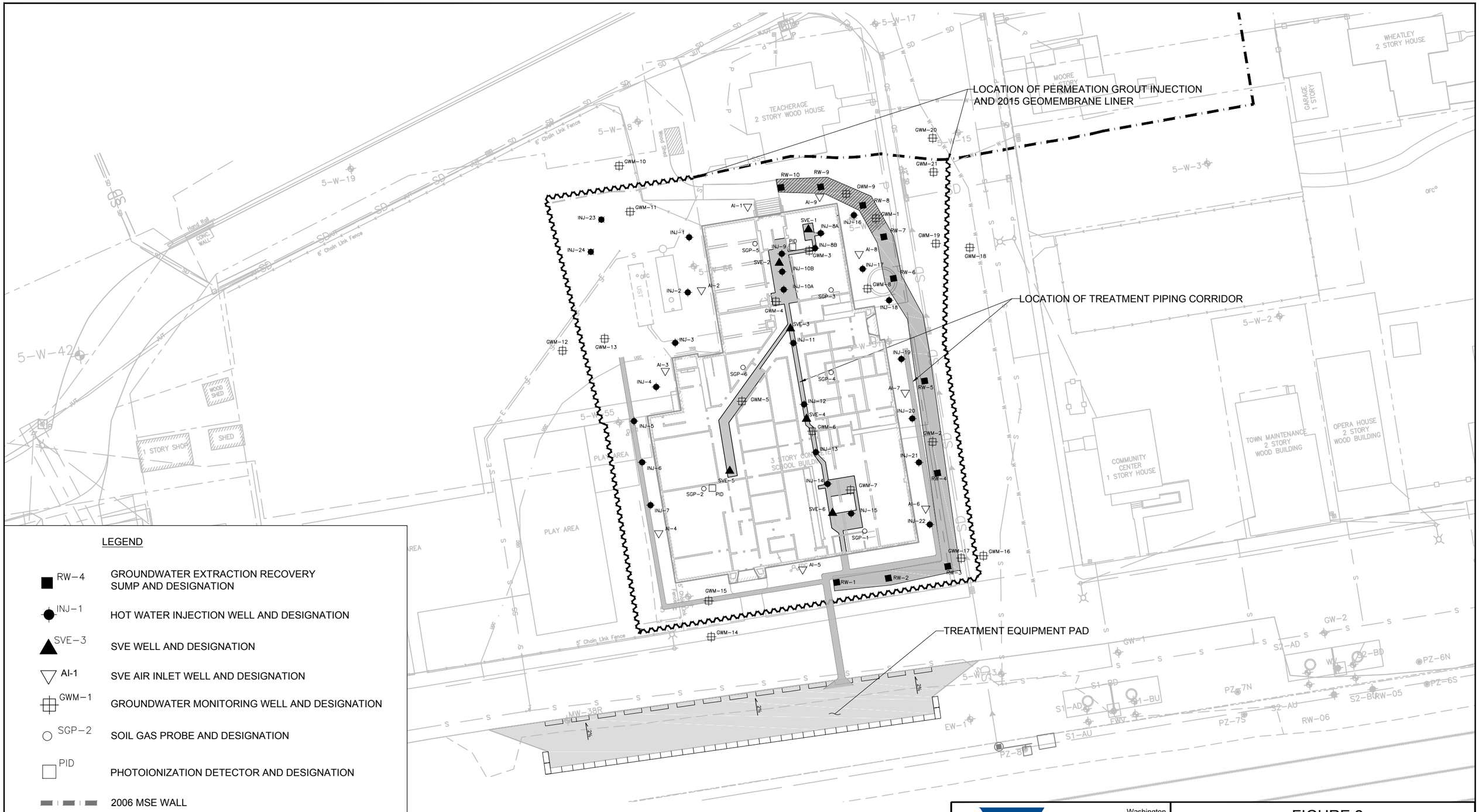
California
Oakland | Sacramento | Irvine

FIGURE 1

SITE LAYOUT
BNSF FORMER MAINTENANCE AND FUELING FACILITY
SKYKOMISH, WASHINGTON

FARALLON PN: 683-057

Drawn By: tperrin | Checked By:TC | Date: 11/8/2016 | Disc Reference:
Document Path: G:\Projects\683 BNSF\683043 Skykomish Ongoing Cleanup Activities\GIS\FIGURE1_683057_site.mxd



LEGEND

RW–4	GROUNDWATER EXTRACTION RECOVERY SUMP AND DESIGNATION
INJ–1	HOT WATER INJECTION WELL AND DESIGNATION
SVE–3	SVE WELL AND DESIGNATION
AI-1	SVE AIR INLET WELL AND DESIGNATION
GWM–1	GROUNDWATER MONITORING WELL AND DESIGNATION
SGP–2	SOIL GAS PROBE AND DESIGNATION
PID	PHOTOIONIZATION DETECTOR AND DESIGNATION
	2006 MSE WALL
	SHEET PILE BARRIER WALL
	GROUNDWATER AND LNAPL RECOVERY TRENCH
	GROUNDWATER AND LNAPL RECOVERY TRENCH INSTALLED TO 10'-13' BELOW GROUND SURFACE

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Washington
Issaquah | Bellingham | Seattle

Oregon
Portland | Bend | Baker City

California
Oakland | Sacramento | Irvine

FIGURE 2

HOT WATER FLUSHING SYSTEM AS-BUILT

BNSF FORMER MAINTENANCE AND FUELING FACILITY
SKYKOMISH, WASHINGTON

FARALLON PN: 683-057

Drawn By: MB | Checked By: AV | Date: 4/26/16 | Disk Reference: 683-038AS

PLAY AREA

PLAY AREA

PLAY AREA

3 STORY CONCRETE SCHOOL BUILDING

SIXTH STREET

FDC

5' Chain Link Fence

RAILROAD AVENUE

TEMPORARY 6' CHAIN LINK FENCE

PRECAST CONCRETE BARRIERS

CONDUIT DISTRIBUTION TRENCH

EXISTING SHED

ELECTRICAL SERVICE

BOILER/CHILLER

WATER TREATMENT CONTAINER

GAC

GAC

AIR/WATER HEAT EXCHANGER

SVE CONTAINER

VAPOR GAC

VAPOR GAC

C/L RAIL

0 40

Scale in feet

N

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Washington
Issaquah | Bellingham | Seattle

Oregon
Portland | Bend | Baker City

California
Oakland | Sacramento | Irvine

FIGURE 3

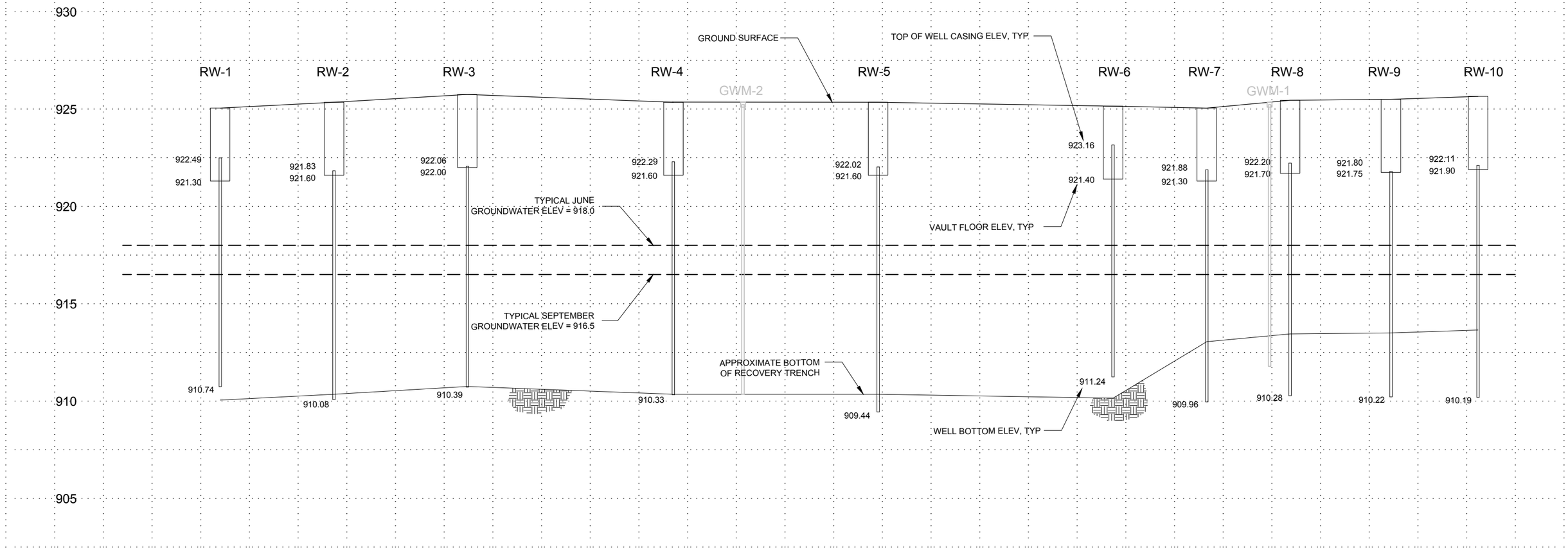
TREATMENT COMPOUND LAYOUT

BNSF FORMER MAINTENANCE AND FUELING FACILITY
SKYKOMISH, WASHINGTON

FARALLON PN: 683-057

Drawn By: JS Checked By: AV Date: 4/26/16 Disk Reference: 683-038AS

NOTE: TOP OF WELL CASING MAY BE ADJUSTED PRIOR TO START UP



PROFILES - RECOVERY WELLS

HORIZONTAL 1" = 20'
VERTICAL 1" = 5'

DATUM
NAVD88

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Washington
Issaquah | Bellingham | Seattle

Oregon
Portland | Bend | Baker City

California
Oakland | Sacramento | Irvine

FIGURE 4

RECOVERY TRENCH CROSS SECTION

BNSF FORMER MAINTENANCE AND FUELING FACILITY
SKYKOMISH, WASHINGTON

FARALLON PN: 683-057

Drawn By: MB | Checked By: AV | Date: 3/4/16 | Disk Reference: 683-038AS

TABLES

OPERATIONS AND MAINTENANCE PLAN
Hot Water Flushing System
Skykomish School
Skykomish, Washington

Farallon PN: 683-057

Table 1
Operation and Maintenance Matrix
Operation and Maintenance Plan
Skykomish, Washington
Farallon PN: 683-057

EQUIPMENT ON SCHOOL SITE	Equipment Model	Operating Conditions	Maintenance Tasks
Extraction Pumps	Goulds Water Technology GT073	Extraction pumps can be operated in manual or auto modes. Target groundwater elevations in auto mode range between 915 to 918 feet mean sea level, depending on seasonal groundwater conditions. Manual pump speeds range between 45 and 60 hertz (Hz).	Extraction wells need to be redeveloped annually to remove buildup of scale or biological growth. This will prevent pump damage caused by low recharge rate.
Oil Skimmers	Abanaki's PetroXtractor Px-B	Oil skimmers can be operated in auto or manual modes. Set the oil skimmer into auto mode if LNAPL is present in a recovery well. In auto mode, the skimmer will run for 6 minutes every 4 to 24 hours.	Maintain in accordance with manufacturer recommendations.
Recovery Well Instrumentation	Prosense Temperature Transmitter Model TTD25N DuraChoice Adjustable Industrial Bimetal Thermometer Model TA5D Seametrics Plastic-Bodied Electromagnetic Flow Meter Model WMP101	Recovery well vaults will be inspected daily during HWF operations to ensure equipment is operating properly.	Maintain in accordance with manufacturer recommendations.
Injection Well Instrumentation	FLOMEC Stainless Steel Industrial Flow Meter Model G2S05N09GMA Gems Buna N Float Single Point Level Switch Model LS1700	Pressures at the injection well range between 0 and 5 psi. Flow rates at injection wells range between 0 and 4 gallons per minute.	FLOMEC Stainless Steel Industrial Flow Meters must be cleaned out periodically to remove debris from internal propeller.
Groundwater Monitoring Well Instrumentation	Exterior wells: Levelogger Junior Edge Model 3001 datalogger Interior wells: Submersible Pressure and Temperature Sensors Model AST45PT	The Solinst Levelloader is used to calibrate Leveloggers and upload their data. This will be done as needed by the operator.	Maintain in accordance with manufacturer recommendations.
Photoionization Detectors	RAEGuard 2 Fixed PID	The PID in conjunction with the PLC will notify personnel of action level conditions.	PIDs are checked weekly and calibrated as needed using 100 ppm isobutylene calibration gas. PIDs should be serviced as needed by a certified RAE Systems Technician.
Floor Subslab to Indoor Air Pressure Montioring Equipment	Ashcroft Model CXLdp Differential Pressure Transmitter	Pressure transmitters are calibrated using a high-accuracy Infiltec DM1 Micro-Manometer.	Maintain in accordance with manufacturer recommendations.
Interior Temperature Montioring Equipment	Floor: General IRT-206 Infrared Thermometer Room: LogTag HAXO-8 Humidity and Temperature Recorder Thermometers	The HAXO-8 can log temperatures hourly, with custom alarms and LED indicators programmed to signal action-level conditions. LogTag software allows the operator to program alarms and retrieve data from dataloggers.	Maintain in accordance with manufacturer recommendations.
Condensate Diaphragm Pump	Flojet 4000 Diaphragm Pump	During summer HWF operations, the SVE system generates 15 to 30 gallons of condensate per week. Sumps should be checked weekly for condensate buildup and manually pumped as needed.	Maintain in accordance with manufacturer recommendations.

Table 1
Operation and Maintenance Matrix
Operation and Maintenance Plan
Skykomish, Washington
Farallon PN: 683-057

SOIL VAPOR EXTRACTION EQUIPMENT	Equipment Model	Operating Conditions	Maintenance Tasks
Air to Air Heat Exchanger (HTX-301)	Xchanger Air to Air Heat Exchanger Model AA-1000	The air to air heat exchanger should be used as needed to cool air prior to passing through the SVE blower.	Maintain in accordance with manufacturer recommendations.
Mositure Separator (V-301)	VLS-100 Moisture Separator from H2K Technologies	The moisture separator should be checked weekly for condensate accumulation. During the summer operation in HWF mode, the system produces 15 to 30 gallons per week.	Maintain in accordance with manufacturer recommendations.
Blower (B-301)	AirTech 19.44 HP Regenerative Blower Model 3BA1900-7AT16	Blower operates at full speed or 60 Hz. System flows range between 450 and 550 scfm. System vacuums range between 30 and 70 IWC. Blower current ranges between 14 and 20 amps.	Maintain in accordance with manufacturer recommendations.
Pressure-Relief Valve (RV-302)	Knuckle Vacuum Relief Valve Model 337	The pressure relief valve is factory set to 15 psi.	Test the pressure relief valve annually to ensure functionality.
Vapor-Phase Carbon Vessels (V-302, V-303)	Siemems 1,000-Pound Vapor-Phase Carbon Adsorbers Model FB1000	The FB1000 model has a carbon capacity of 1000 pounds. SVE system influent samples collected in Summer 2016, while the system was in HWF mode, showed that total air-phase hydrocarbon concentrations are less than levels that require carbon vessels.	If carbon vessels are deemed necessary, SVE effluent samples will periodically be taken in order to determine when a carbon changeout is required.
WATER TREATMENT EQUIPMENT	**Equipment Model**	**Operating Conditions**	**Maintenance Tasks**
Air to Water Heat Exchanger (HTX-101)	Xchanger Air to Water Exchanger Model LC-60-1	The air to water heat exchanger should be used as needed to cool water prior to passing through the chiller.	Maintain in accordance with manufacturer recommendations.
Oil-Water Separator (T-101)	Hydro Quip Inc. 60 GPM Oil-Water Separator with Coalescing Plates Model AG-3SS-IP	The oil-water separator tank is composed of an inlet compartment, separation chamber, sludge chamber, and clean water outlet chamber. Each of these chambers need to be checked on a weekly basis to inspect for oil accumulation.	Clean the coalescing media as needed so water can pass through the tank unrestricted. During HWF mode, the coalescing media should be cleaned on a monthly basis.
Equalization Tank (T-102)	Plastic Mart 1025-gallon Polyethylene Vertical Tank Model No. 1025 VT	The set point for the equalization tank can be defined by the operator. Typically, the system is operated with an equalization set point of 55 inches.	The equalization tank should be cleaned on a quarterly basis to remove biological growth.
Transfer Pump (P-201)	Goulds 5-Horsepower Centrifugal Transfer Pump Model 3BF1J5BO	The transfer pump is typically set in auto mode, which is controlled by the equalization tank set point. The pump speed varies between 40 and 50 Hz and is dependent on system flow rates, system pressures, and valve settings at the boiler or chiller.	The transfer pump should be greased weekly during flushing operation. Maintain in accordance with manufacturer recommendations.
Bag Filters (V-304)	Pentek Polypropylene Bag Filters	Bag filters vessels are operated with 5 or 10 micron bag filters and are typically changed out every 12 to 96 hours.	Differential pressures should be checked daily. If the differential pressure exceeds 5 psi, the bag filter should be replaced.

Table 1
Operation and Maintenance Matrix
Operation and Maintenance Plan
Skykomish, Washington
Farallon PN: 683-057

WATER TREATMENT EQUIPMENT	Equipment Model	Operating Conditions	Maintenance Tasks
Liquid-Phase Carbon Vessels (V-305 and V-306)	Pure Effect 2,000 Liquid-Phase Carbon Adsorbers Model PEL2000	Liquid-phase carbon vessels pressures should be checked daily.	New carbon must be wetted at least 24 hours prior to placement on stream. Shut the system down if differential pressure within a carbon vessel triggers a high-pressure alarm, which is set between 35 and 40 psi. If a surface layer is clogging the carbon media, remove fouled media until clean media is observed, or replace carbon media.
Boiler Equipment	The Williams and Davis Boiler Model No. 2250D	During boiler startup and commissioning, a system shutdown should be performed to verify pressure relief valve functionality. Boiler equipment should be started and maintained by an experienced boiler technician.	To prevent scale buildup inside the boiler during HWF mode, blowdowns should be performed as recommended by the provider. Blowdown water should be collected in a container, allowed to cool to ambient temperature, and discharged to sanitary sewer.
Chiller Equipment	Trane CGAM Chiller Units	The CGAM is equipped with Adaptive control logic with CH530 controls, which monitors the control variables that govern the its operation. To optimize operation efficiency, avoid chiller shutdown and keep producing chilled water.	The chiller should be serviced and cleaned according to the manufacturer's recommendations prior to each CWF season.
Chlorine Dosing	LaMotte DC1500 Colorimeter	The residual chlorine concentration of the equalization tank should be maintained between 3 and 10 ppm. Residual chlorine concentrations at the lag GAC effluent should not exceed 4 ppm.	Maintain in accordance with manufacturer recommendations.
Sequesterant Dosing	Dosage pump: Stenner 45 MJLI Peristaltic Pump	Typical sequesterant dosing rates are 1 milliliter per minute based on 19 microliters per gallon concentration detailed in Appendix F.	Maintain in accordance with manufacturer recommendations.

NOTES:

F = degrees Fahrenheit

µg/l = micrograms per liter

CWF = cold water flushing

GAC = granular activated carbon

HWF = hot water flushing period

IWC = inches water column

LNAPL = light nonaqueous-phase liquid

PID = photoionization detector

PLC = programmable logic controller

ppm = parts per million

psi = pounds per square inch

scfm = standard cubic feet per minute

SVE = soil vapor extraction

Table 2
Compliance Monitoring Matrix
Operation and Maintenance Plan
Skykomish, Washington
Farallon PN: 683-057

	HWF		Transition		CWF		Winter Shutdown	
	Events	**Action Levels**	**Events**	**Action Levels**	**Events**	**Action Levels**	**Events**	**Action Levels**
APH								
Inside First Floor (Basement)	8 hour weekly (1 location)	Ref Section 3.2 ANO Plan	8 hour weekly (3 locations)	Ref Section 3.2 ANO Plan	8 hour monthly (3 locations)	Ref Section 3.2 ANO Plan	8 hour monthly (3 locations)	Ref Section 3.2 ANO Plan
Inside Second Floor	8 hour weekly (1 location)	Ref Section 3.2 ANO Plan	8 hour weekly (2 locations)	Ref Section 3.2 ANO Plan	8 hour monthly (2 locations)	Ref Section 3.2 ANO Plan	8 hour monthly (2 locations)	Ref Section 3.2 ANO Plan
Inside Third Floor	8 hour weekly (1 location)	Ref Section 3.2 ANO Plan	8 hour weekly (1 locations)	Ref Section 3.2 ANO Plan	8 hour monthly (1 locations)	Ref Section 3.2 ANO Plan	8 hour monthly (1 locations)	Ref Section 3.2 ANO Plan
VOC								
Inside First Floor and Second Floor	Continuously, Upload Weekly (3 locations)	>5ppm for 5 min =R,I(4) >10ppm for 5 min at 2 locations =R,E,I(4)	Continuously, Upload Weekly (3 locations)	>5ppm for 5 min =R,I(4) >10ppm for 5 min at 2 locations =R,E,I(4)	Continuously, Upload Weekly (3 locations)	>5ppm for 5 min =R,I(4) >10ppm for 5 min at 2 locations =R,E,I(4)	Continuously, Upload Weekly (3	>5ppm for 5 min =R,I(4) >10ppm for 5 min at 2 =R,E,I(4)
Room Temperature								
Inside First Floor (Basement)	Daily Occupied Rooms (Upload Weekly)	>/= 10 degrees F above ambient =A, M	Daily Occupied Rooms (Upload Weekly)	>/= 10 degrees F above ambient =A, M	Daily Occupied Rooms (Upload Weekly)	> 78.5 F @ 60% RH > 80.0 F @30 % RH =A, M	None proposed	None proposed NA
NOISE								
Outside- At Introduced Equipment	Continuous first week of operation	>65 dB(A) @ nrst. occup. property =M	first week of operation	>65 dB(A) @ nrst. occup. property =M	first week of operation	>65 dB(A) @ nrst. occup. property =M	None proposed	None proposed NA
Inside - Noise Map	Initial Survey ANO Plan Section 2.3.2	>40dB(A) or 70 dB windows closed >45 dB(A) or 70 dB windows open. If school occupied =M	Initial Survey ANO Plan Section 2.3.2	>40dB(A) or 70 dB windows closed >45 dB(A) or 70 dB windows open. If school occupied =M	Initial Survey ANO Plan Section 2.3.2	>40dB(A) or 70 dB windows closed >45 dB(A) or 70 dB windows open =M	None proposed	None proposed NA
WATER TREATMENT								
After Primary GAC	Weekly	Any Detection TPH =C	Weekly	Any Detection TPH =C	Weekly	Any Detection TPH =C	None proposed	None proposed NA
System Effluent	Weekly	>/= 477 µg/L TPH =SD, C	Weekly	>/= 477 µg/L TPH =SD, C	Weekly	>/= 477 µg/L TPH =SD, C	None proposed	None proposed NA

Table 2
Compliance Monitoring Matrix
Operation and Maintenance Plan
Skykomish, Washington
Farallon PN: 683-057

FLOOR TEMPERATURE **First Floor (Basement) Temperature**	Weekly Occupied Areas	>/= 80 F	=A, M	Weekly Occupied Areas	>/= 80 F	=A, M	Weekly Occupied Areas	>/= 80 F	=A, M	Weekly Occupied	>/= 80 F	=A, M
SVE OPERATION **Sub-Slab Pressure Differential**	Continuously (Upload Weekly)	> 0.025 IWC vacuum	=A, M	Continuously (Upload	> 0.025 IWC vacuum	=A, M	Continuously (Upload	> 0.025 IWC vacuum	=A, M	None proposed	None proposed	NA
ODOR **Inside School**	Continuous monitoring by all occupants	Level 1 (barely detectable)	=R,I(24)	Continuous monitoring by all occupants	Level 1 (barely detectable)	=R,I(24)	Continuous monitoring by all occupants	Level 1 (barely detectable)	=R,I(24)	Continuous monitoring by all occupants	Level 1 (barely detectable)	=R,I(24)
		Level 2 (distinct and definite)	=R,I		Level 2 (distinct and definite)	=R,I		Level 2 (distinct and definite)	=R,I		Level 2 (distinct and definite)	=R,I
		Level 3 (strong, avoided areas	=R,E,I		Level 3 (strong, avoided areas	=R,E,I		Level 3 (strong, avoided areas	=R,E,I		Level 3 (strong, avoided areas)	=R,E,I
		Level 4 (very strong, areas avoided)	=R,E,I		Level 4 (very strong, areas avoided)	=R,E,I		Level 4 (very strong, areas avoided)	=R,E,I		Level 4 (very strong, areas avoided)	=R,E,I

NOTES:

A = HWF/SVE system adjustment

ANO Plan: Hot Water Flushing Air, Noise, and Odor Monitoring Plan, 2015 to 2019 dated February 10, 2015, prepared by EMB Consulting.

C = schedule carbon changeout

CWF = cold and ambient water flushing period

dB = decibels

dB(A) = decibels A

E = evacuate school

F = degrees Fahrenheit

HWF = hot water flushing period

I(4) = investigate source (within X hours of alarm)

IWC = inches water column

µg/l = micrograms per liter

M = HWF and/or school modification

ppm = parts per million

R = report to Ecology and/or Skykomish School District

RH = relative humidity

SD = system shut down

SVE = soil vapor extraction

TPH = total petroleum hydrocarbons

Transition = eight weeks following last day of HWF period

APPENDIX A
RESPONSE TO COMMENTS

OPERATIONS AND MAINTENANCE PLAN
Hot Water Flushing System
Skykomish School
Skykomish, Washington

Farallon PN: 683-057

RESPONSE TO COMMENTS
HWF OPERATION AND MAINTENANCE PLAN
FARALLON PN: 683-057

Draft O&M Plan Text	Ecology Comment	BNSF Response
Section 4.2.2, Extraction Pumps, Operation and Maintenance, page 4-2		
During annual system start-up and seasonally low groundwater conditions, extraction wells may experience lower well recharge rates. Lower well recharge rates can result in pumping wells dry and/or extraction pump cavitation, which can damage internal pump equipment. To maximize well recharge rates, extraction wells should be redeveloped annually to remove buildup of scale and/or biological growth.	Change "should" to "will" to ensure the wells get redeveloped annually. This will be consistent with Table 1 (page 1 of 3). "Extraction wells need to be redeveloped annually to remove buildup of scale or biological growth. This will prevent pump damage by low recharge rate." Add well redevelopment task to schedule in Section 7.1 Consider doing work during the School's spring break to minimize disruptions.	The text has been modified as requested. *During annual system start-up and seasonally low groundwater conditions, extraction wells may experience lower well recharge rates. Lower well recharge rates can result in pumping wells dry and/or extraction pump cavitation, which can damage internal pump equipment. To maximize well recharge rates, extraction wells* ***will*** *be cleaned and/or redeveloped as needed annually to remove buildup of scale and biological growth.* The well cleaning task has been added to the first line of the schedule in Section 7.1.
Section 4.3.3, Boiler Equipment, page 4-13		
Operation and Maintenance: Boiler equipment should be operated and maintained by an experienced boiler technician. To prevent scale buildup inside the boiler during HWF mode, blowdowns should be performed as recommended by the provider. Blowdown water should be collected in a container after passing through the blowdown tank. Once cooled to ambient temperature, blowdown water should be discharged to the sanitary sewer.	Add text to operate the boiler to meet the performance requirements of up to 60 gallons per minute (gpm) of treated groundwater from approximately 50 to 160 degrees Fahrenheit (see Section 15518/1.01A of Specifications).	The following text has been added to the end of Section 4.3.3: *Boiler operations during HWF activities conform to the performance requirements listed in the project specifications. The boiler is capable of heating treated groundwater from approximately 50 degrees Fahrenheit up to 160 degrees Fahrenheit at flow rates up to 60 gpm. Boiler operations include sufficient turn-down capacity to allow for differential heating of lower flow rates experienced under low groundwater conditions.*

RESPONSE TO COMMENTS
HWF OPERATION AND MAINTENANCE PLAN
FARALLON PN: 683-057

Draft O&M Plan Text	Ecology Comment	BNSF Response
Section 7.2, Completion of Operations and Closure, page 7-2		
The primary cleanup objective associated with the design of the HWF treatment system is to reduce the amount of petroleum beneath the School to the extent technically possible, with the goal of removing separate-phase mobile or volatile petroleum constituents or NAPL. Operation of the treatment system will be complete based on coordination with Ecology. Following completion of treatment operations at the School Site, a summary of the cleanup will be provided in the annual As-Built Report. The As-Built Report will include provisions for maintenance of the monitoring program and plans for restoration of the School property to its ultimate completed configuration. The Final Restoration Plan will be provided to the School District for review and coordination prior to final acceptance.	Revise or add section to address the following: • The 2016 As-Built Completion report will summarize the installation of the HWF treatment system. Note that the Air Sparge System decommissioning, 6th Street Sewer line installation, and Gate/vault carbon replacement work also needs to be included in this report (draft due to Ecology by March 31, 2017). • The Annual HWF System Operations Report will summarize the treatment operations/performance for each year of treatment (draft due to Ecology by March 31, 2017). • Summary of cleanup should be in the last Annual HWF System Operations Report. • What are the provisions for maintenance of the monitoring program? Why not include them in this O&M Plan? • The Final Restoration Plan for the School should be a separate document. Let's meet to discuss criteria for terminating the operation of this treatment system.	Section 7.2 has been revised as follows: *The primary cleanup objective associated with the design of the HWF treatment system is to reduce the amount of petroleum beneath the School to the extent technically possible, with the goal of removing separate-phase mobile or volatile petroleum constituents or NAPL. Operation of the treatment system will be complete based on coordination with Ecology.* *Summary reporting documentation will be provided following each annual treatment season, as follows:* • *As-Built Completion reports will summarize the installation of the HWF treatment system and associated project components completed over the corresponding annual season. The 2016 As-Built Completion Report will include the Air Sparge System decommissioning, 6th Street sewer line installation, and carbon gate/vault replacement work. The draft 2016 As-Built Completion Report is due to Ecology by March 31, 2017.* • *Annual HWF System Operations reports will summarize the treatment system operations and performance for the corresponding treatment season. The 2016 Annual HWF System Operations Report will include related operating and performance data; analyses and evaluations of operating procedures; a summary of air, odor, and noise monitoring activities and results; and recommendations for modifications as needed. The draft 2016 Annual HWF System Operations Report is due to Ecology by March 31, 2017.* • *Following completion of cleanup activities at the Site, a summary of the cleanup operations will be provided in the Final Annual HWF System Operations Report.* *Following completion of cleanup activities at the School, a Final Restoration Plan will be provided to the Skykomish School District for review.* Operation and maintenance of the monitoring equipment, including photoionization detectors, differential pressure transmitters, and groundwater monitoring instrumentation, are included in Section 5.

APPENDIX B
RULE AUTHORIZED UIC PERMIT

OPERATIONS AND MAINTENANCE PLAN
Hot Water Flushing System
Skykomish School
Skykomish, Washington

Farallon PN: 683-057

Automatically Meet the Nonendangerment Standard

For Class V wells that automatically meet the non endangerment standard in accordance with WAC 173-218-100.

Registration Status

Site Number: 32949
Authorization Status: Rule-Authorized
Comments:

Facility/Site Information

Facility Name: Skykomish School Hot Water Flushing
Address: 105 6th Street North
PO Box/Suite/Building:
City: Skykomish
State: WA **ZIP:** 98288
Phone: 360-677-2623
County: King
Facility Site ID:

Contact Information

Well Owner

Name: Charles Thomas
Organization: BNSF Railway Company
Address: 2454 Occidental Avenue South
PO Box/Suite/Building: Suite 1A
City: Seattle
State: WA **ZIP:** 98134-1451
E-mail: Bruce.Sheppard@bnsf.com
Phone: 206-625-6035

Property Owner

Name: Martin Schmidt (Superintendent)
Organization: Skykomish School
Address: 105 6th Street North
PO Box/Suite/Building:
City: Skykomish
State: WA **ZIP:** 98288
E-mail: mschmidt@skykomish.wednet.edu
Phone: 360-677-2623

Technical Contact

Name: Andrew Vining
Organization: Farallon Consulting LLC
Address: 975 5th Avenue NW
PO Box:
City: Issaquah
State: WA **ZIP:** 98027
E-mail: avining@farallonconsulting.com
Phone: 425-295-0847

Main Well Information

Well Name	UIC Well Type From Section C (1-12)	Construction Date	EPA Well Type	Status	Depth of UIC Well (ft.)	Latitude	Longitude
INJ-9	12	7/9/2015	5B5 - Aquifer remediation	Active	6	47.709586	-121.362350
INJ-8B	12	7/14/2015	5B5 - Aquifer remediation	Active	6	47.709598	-121.362300
INJ-8A	12	7/9/2015	5B5 - Aquifer remediation	Active	5	47.709611	-121.362270
INJ-7	12	6/24/2015	5B5 - Aquifer remediation	Active	12	47.709268	-121.365960
INJ-6	12	6/24/2015	5B5 - Aquifer remediation	Active	12	47.709321	-121.362610
INJ-5	12	6/25/2015	5B5 - Aquifer remediation	Active	12	47.709372	-121.362620
INJ-4	12	6/25/2015	5B5 - Aquifer remediation	Active	12	47.709418	-121.362570
INJ-3	12	6/25/2015	5B5 - Aquifer remediation	Active	12	47.709468	-121.635450
INJ-24	12	6/25/2015	5B5 - Aquifer remediation	Active	12	47.709586	-121.362690
INJ-23	12	6/25/2015	5B5 - Aquifer remediation	Active	12	47.709627	-121.362680
INJ-22	12	6/23/2015	5B5 - Aquifer remediation	Active	12	47.709246	-121.362080
INJ-21	12	6/23/2015	5B5 - Aquifer remediation	Active	12	47.709323	-121.362100
INJ-20	12	6/23/2015	5B5 - Aquifer remediation	Active	12	47.709379	-121.361080
INJ-2	12	6/25/2015	5B5 - Aquifer remediation	Active	12	47.709530	-121.362520
INJ-19	12	6/23/2015	5B5 - Aquifer remediation	Active	12	47.709452	-121.362120
INJ-18	12	6/23/2015	5B5 - Aquifer remediation	Active	12	47.709530	-121.362150
INJ-17	12	6/23/2015	5B5 - Aquifer remediation	Active	12	47.709563	-121.362200
INJ-16	12	6/22/2015	5B5 - Aquifer remediation	Active	11	47.709634	-121.362210
INJ-15	12	6/29/2015	5B5 - Aquifer remediation	Active	12	47.709231	-121.362210

INJ-14	12	6/24/2015	5B5 - Aquifer remediation	Active	12	47.709295 -121.362270
INJ-13	12	6/26/2015	5B5 - Aquifer remediation	Active	12	47.709340 -121.362290
INJ-12	12	6/30/2015	5B5 - Aquifer remediation	Active	12	47.709400 -121.362290
INJ-11	12	7/8/2015	5B5 - Aquifer remediation	Active	6	47.709469 -121.362330
INJ-10B	12	7/10/2015	5B5 - Aquifer remediation	Active	6	47.709565 -121.362360
INJ-10A	12	7/9/2015	5B5 - Aquifer remediation	Active	5	47.709541 -121.362350
INJ-1	12	6/25/2015	5B5 - Aquifer remediation	Active	12	47.709601 -121.367510

Main Well Information (continued)

Well Name	Permit Type	Permit ID	Permit Issuer
INJ-9	MTCA	07-2-33672-9	Dept. of Ecology
INJ-8B	MTCA	07-2-33672-9	Dept. of Ecology
INJ-8A	MTCA	07-2-33672-9	Dept. of Ecology
INJ-7	MTCA	07-2-33672-9	Dept. of Ecology
INJ-6	MTCA	07-2-33672-9	Dept. of Ecology
INJ-5	MTCA	07-2-33672-9	Dept. of Ecology
INJ-4	MTCA	07-2-33672-9	Dept. of Ecology
INJ-3	MTCA	07-2-33672-9	Dept. of Ecology
INJ-24	MTCA	07-2-33672-9	Dept. of Ecology
INJ-23	MTCA	07-2-33672-9	Dept. of Ecology
INJ-22	MTCA	07-2-33672-9	Dept. of Ecology
INJ-21	MTCA	07-2-33672-9	Dept. of Ecology
INJ-20	MTCA	07-2-33672-9	Dept. of Ecology
INJ-2	MTCA	07-2-33672-9	Dept. of Ecology
INJ-19	MTCA	07-2-33672-9	Dept. of Ecology
INJ-18	MTCA	07-2-33672-9	Dept. of Ecology
INJ-17	MTCA	07-2-33672-9	Dept. of Ecology
INJ-16	MTCA	07-2-33672-9	Dept. of Ecology
INJ-15	MTCA	07-2-33672-9	Dept. of Ecology
INJ-14	MTCA	07-2-33672-9	Dept. of Ecology
INJ-13	MTCA	07-2-33672-9	Dept. of Ecology
INJ-12	MTCA	07-2-33672-9	Dept. of Ecology
INJ-11	MTCA	07-2-33672-9	Dept. of Ecology
INJ-10B	MTCA	07-2-33672-9	Dept. of Ecology
INJ-10A	MTCA	07-2-33672-9	Dept. of Ecology
INJ-1	MTCA	07-2-33672-9	Dept. of Ecology

APPENDIX C
HVAC SYSTEM PLANS

OPERATIONS AND MAINTENANCE PLAN
Hot Water Flushing System
Skykomish School
Skykomish, Washington

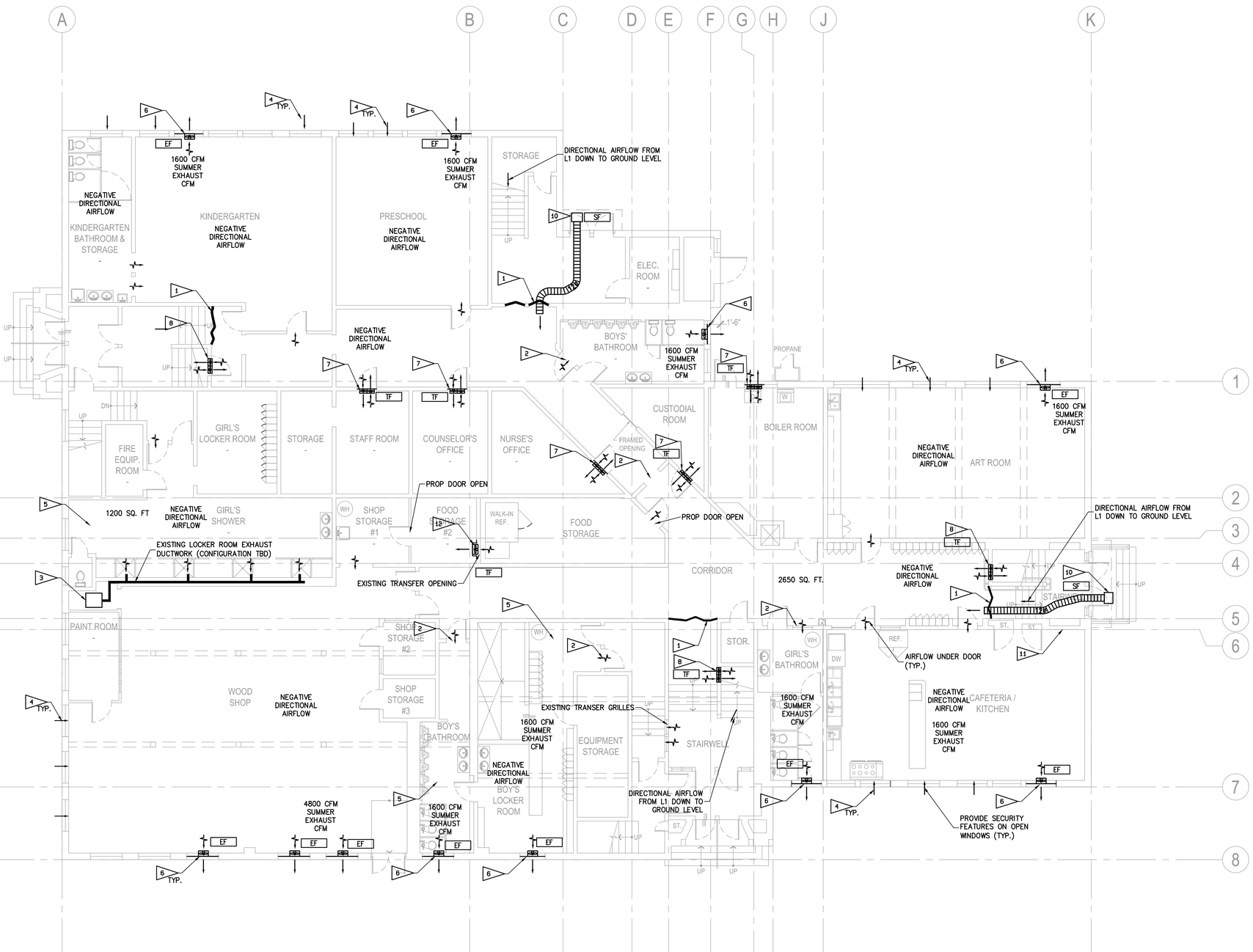
Farallon PN: 683-057

FLAG NOTES:

1. SEE ARCH. DRAWINGS/SPECIFICATIONS FOR TEMPORARY DUST CONTROL BARRIER AT APPROXIMATELY THIS LOCATION.
2. TRANSFER AIR VIA EXISTING OPERABLE TRANSOM RELIGHT WINDOW.
3. BASE BID, REPAIR EXISTING EXHAUST FAN AND MAKE OPERATIONAL. ADDITIVE ALTERNATE, REPLACE FAN WITH NEW FAN SIZED TO PROVIDE EXHAUST AIRFLOW RATE PER CODE.
4. SECURE WINDOW IN PARTIALLY OPEN POSITION TO ALLOW FOR AIR INTAKE. LIMIT VELOCITY OR PROVIDE OTHER PROTECTIVE MEASURES (I.E., RAIN HOOD) TO PREVENT DRAWING IN RAIN. PROVIDE MEANS AND METHODS TO SECURE WINDOW OPENING TO PREVENT INTRUSION BY UNAUTHORIZED PERSONNEL. DO NOT DAMAGE WINDOW FRAME. SEE ARCH. DWGS/DETAILS FOR FURTHER INFORMATION.
5. LOCKER ROOM TOILET FACILITIES TO REMAIN ACCESSIBLE FOR LIMITED USE BY SUMMER STAFF ONLY (I.E., NOT OPEN TO PUBLIC FOR OTHER EVENTS).
6. TEMPORARY WINDOW EXHAUST FAN, PRELIMINARY CONCEPT = GABLE MOUNT ATTIC FAN MOUNTED TO ¾" PLYWOOD AND SECURED IN OPENING. PROTECT EXISTING WINDOW FRAME FROM DAMAGE. SEE ARCH. DWGS/SPECS FOR MEANS AND METHODS TO SECURE AND PROTECT WINDOW OPENING. APPX. 1,600 CFM, 2 AMPS AT 115/1/60. (I.E., MASTER FLOW, VENTAMATIC, OR EQUAL.). PROVIDE SAFETY GUARDS AS REQUIRED.
7. TEMPORARY PUSH/PULL BI DIRECTIONAL TRANSFER FAN WITH SAFETY GAURDS. INSTALLED IN DOOR OPENING. (WINDOW TRANSFER FAN OR SIMILAR) 115/1/60.
8. TEMPORARY PUSH/PULL BI DIRECTIONAL TRANSFER (DUAL) FAN WITH SAFETY GAURDS INSTALLED IN UNDER STAIR ACCESS DOOR TO VENTILATE SPACE UNDER STAIRS. (WINDOW TRANSFER FAN OR SIMILAR) 115/1/60.
9. INSTALL TEMPORARY TRANSFER FAN IN EXISTING WALL OPENING TO PROVIDE VENTILATION COOLING OF WALK IN COOLER CONDENSER UNIT, PRELIMINARY CONCEPT = GABLE MOUNT ATTIC FAN MOUNTED TO ¾" PLYWOOD AND SECURED IN OPENING. APPX. 1,600 CFM, 2 AMPS AT 115/1/60. (I.E., MASTER FLOW, VENTAMATIC, OR EQUAL.).
10. VORTEX AXIAL FAN, 1 HP, 7.4 AMPS, 115V, DRI-EAZ F174, SUNBELT RENTALS OR SIMILAR.
11. PROVIDE TEMPORARY SEAL OFF OF NATURAL VENTILATION GRAVITY STACKS (TYP. ALL LOCATIONS ON GROUND FLOOR, FIELD VERIFY LOCATION AND QTY.).
12. PROVIDE TEMPORARY TRANSFER FAN TO ACCOUNT FOR HEAT REJECTED BY WALK-IN REFRIGERATOR. ONE OPTION WOULD BE A GABLE MOUNT ATTIC EXHAUST FAN ATTACHED TO ¾" PLYWOOD AND SECURED OVER OPENING. PROP OPEN DOOR ON FAR SIDE OF FOOD STORAGE ROOM TO PROVIDE MAKE UP AIR. APPX. 1,600 CFM, 2 AMPS AT 115/1/60. (I.E., MASTER FLOW, VENTAMATIC, OR EQUAL.).

GENERAL NOTES:

1. SEE SPECIFICATIONS FOR DETAILED PROJECT REQUIREMENTS.
2. EXHAUST AND SUPPLY FANS SHOWN ARE TEMPORARY FOR SUMMER OPERATION WHEN SCHOOL IS NOT IN SESSION AND GROUND FLOOR IS GENERALLY NOT OCCUPIED. SYSTEM IS INTENDED TO REDUCE THERMAL HEAT GAIN TO LEVEL 1 CAUSED BY ELEVATED GROUND FLOOR SLAB TEMPERATURES (UP TO 84 DEG F.) SYSTEM ALSO PROVIDES DIRECTIONAL AIRFLOW FROM LEVEL 1 TO GROUND LEVEL BY PROVIDING EXCESS EXHAUST ON THE GROUND LEVEL.
3. PROVIDE SECURITY FEATURES ON ANY GROUND LEVEL WINDOWS THAT ARE BEING LEFT OPEN. SEE ARCHITECTURAL DRAWINGS FOR FURTHER DETAILS.



NORTH

SUMMER VENTILATION COOLING CONCEPT

SCALE: 1/8" = 1'0"

DISCLAIMER NOTE: THESE DRAWINGS AND ASSOCIATED SPECIFICATIONS ARE CONCEPT ONLY AND ARE TO BE USED AS A REFERENCE FOR THE DESIGN BUILD CONTRACTOR IN ORDER TO GENERALLY HELP GUIDE CONTRACTOR IN ENGINEERING A COMPLETE FUNCTIONING SYSTEM. CONTRACTOR IS RESPONSIBLE FOR PROVIDING ALL CALCULATIONS AND DESIGN ELEMENTS REQUIRED TO CONFIRM AND COMPLETE THE CONCEPTS SHOWN. CONTRACTOR TO PROVIDE DRAWINGS ENGINEERED AND SEALED BY A PROFFESIONAL MECHANICAL ENGINEER LICENSED IN THE STATE OF WASHINGTON. SEE SPECIFICATIONS FOR FURTHER DETAILS.

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Project

SKYKOMISH SCHOOL
HOT WATER FLUSHING
REMEDIATION
FORMER MAINTENANCE
AND FUELING FACILITY

Location

105 6TH ST N
SKYKOMISH, WA 98288

Prepared For

THE BSNF RAILWAY COMPANY

2454 OCCIDENTAL AVE. S. SUITE #1A
SEATTLE WASHINGTON
ph. 206-625-6296

NO.	DATE	REVISION

PARTNER IN CHARGE: BWR
PROJECT MANAGER: BWR
PROJECT ENGINEER: BWR
PROJECT TEAM MEMBERS: MDB
CHECK: BWR

ENGINEERS SEAL

TITLE: SUMMER VENTILATION COOLING SCHEMATIC DRAWING

PROJECT NO.: 683-038
DATE: JANUARY 8, 2016
PROJECT NETWORK PATH:

SHEET NUMBER: M-101

FLAG NOTES:

1. ROUTE FLEXIBLE COOLING AIR SUPPLY DUCT THROUGH OPERABLE WINDOW. SECURE WINDOW OPENING. ONE OPTION IS TO PROVIDE DISCONNECTING MEANS TO ALLOW QUICK REMOVAL OF DUCT DURING UNOCCUPIED HOURS SOT THAT WINDOW CAN BE CLOSED.

2. PROVIDED PERFORATED FLEX DUCT OR OTHER MEANS FOR AIR DIFFUSION (SUBJECT TO MAX. 45 DBA REQUIREMENT).

3. 5 TON PORTABLE OUTDOOR UNIT, 208/1/60, 31.5 FLA, 36.6 MCA, 60 BREAKER, SUNBELT RENTALS PACSLIM 5 OR SIMILAR.

4. INDOOR PORTABLE AC UNIT WITH HEAT EXHAUSTED TO OUTDOORS. 5 TON CAPACITY, 208/1/60, 33 AMPS, 50 AMP BREAKER.

5. ROUTE FLEXIBLE REJECTED HEAT THROU AIR SUPPLY DUCT THROUGH OPERABLE WINDOW. SECURE WINDOW OPENING. ONE OPTION IS TO PROVIDE DISCONNECTING MEANS TO ALLOW QUICK REMOVAL OF DUCT DURING UNOCCUPIED HOURS SOT THAT WINDOW CAN BE CLOSED.

6. 8 TON PORTABLE OUTDOOR UNIT, 208/3/60, 50 FLA, 70 AMP FUSE TUCOHEAT TC96-3 OR SIMILAR.

7. LOCATE UNIT AWAY FROM WINDOWS TO MINIMIZE SOUND INTRUSION INTO CLASSROOM.

8. SUMMER TEMPORARY WINDOW EXHAUST FAN TO REMAIN IF REQUIRED FOR HEAT REMOVAL, PRELIMINARY CONCEPT = GABLE MOUNT ATTIC FAN MOUNTED TO ¾" PLYWOOD AND SECURED IN OPENING. PROTECT EXISTING WINDOW FRAME FROM DAMAGE. SEE ARCH. DWGS/SPECS FOR MEANS AND METHODS TO SECURE AND PROTECT WINDOW OPENING. APPX. 1,600 CFM, 2 AMPS AT 115/1/60. (I.E., MASTER FLOW, VENTAMATIC, OR EQUAL.) PROVIDE SAFETY GUARDS AS REQUIRED.

9. TEMPORARY PUSH/PULL BI DIRECTIONAL TRANSFER FAN. INSTALLED IN DOOR OPENING. 115/1/60.

10. TRANSFER AIR VIA EXISTING OPERABLE TRANSOM RELIGHT WINDOW.

GENERAL NOTES:

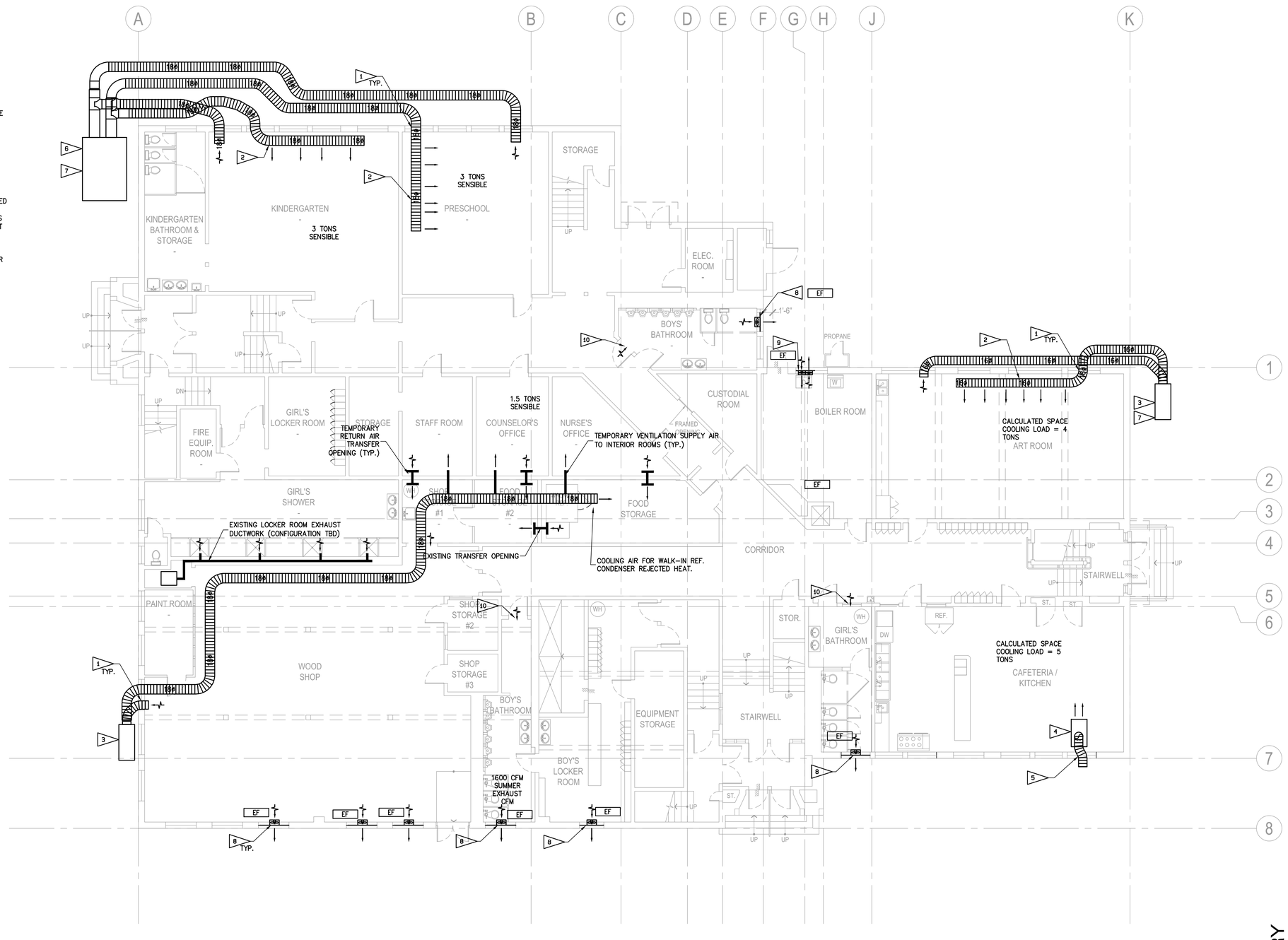
1. SEE SPECIFICATIONS FOR DETAILED PROJECT REQUIREMENTS.

2. THE FOLLOWING ROOMS SHALL BE DESIGNED TO MAINTAIN A 78 DEG. MAXIMUM ROOM TEMPERATURE ON AN 83 DEG. AMBIENT DAY:
   - KINDERGARTEN
   - PRESCHOOL
   - ART ROOM
   - CAFETERIA/KITCHEN.
   - STAFF ROOM
   - COUNSELOR'S OFFICE
   - NURSES'S OFFICE

3. THE ENTIRE GROUND FLOOR SHALL BE VENTILATION COOLED TO WITHIN 10 DEGREES F. OF AMBIENT, EXCEPT FOR THOSE AREAS THAT ARE AIR CONDITIONED PER NOTE 2. ABOVE.

3. PROVIDE SECURITY FEATURES ON ANY GROUND LEVEL WINDOWS THAT ARE BEING LEFT OPEN.

4. MECHANICAL EQUIPMENT SHALL BE DESIGNED/LOCATED AND CONFIGURED SO THAT THE NOISE LEVEL IN THE KINDERGARTEN, PRESCHOOL AND ART ROOM DO NOT EXCEED 45 DBA (PER WAC, SECTION 246-366-110)..



NORTH

FALL HVAC COOLING CONCEPT

SCALE: 1/8" = 1'0"

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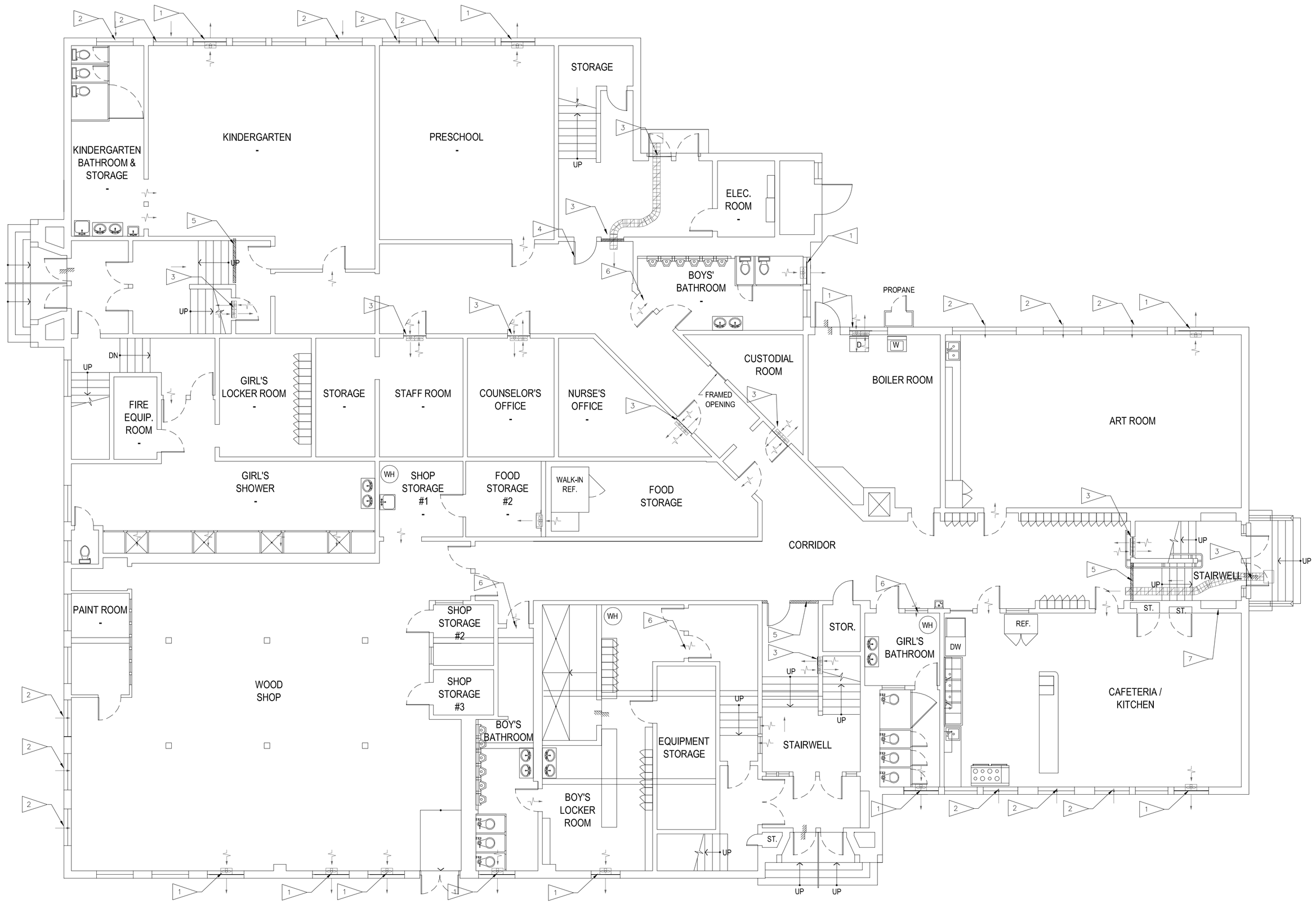
PROJECT MANAGER: BWR
PROJECT ENGINEER: BWR
PROJECT TEAM MEMBERS: MDB
CHECK: BWR

ENGINEERS SEAL

TITLE: FALL HVAC COOLING SCHEMATIC DRAWING

PROJECT NO.: 683-038
DATE: JANUARY 8, 2016
PROJECT NETWORK PATH

SHEET NUMBER
M-102



NORTH

FLOOR PLAN–SUMMER VENTILATION COOLING CONCEPT

SCALE: 1/8" = 1'0"

FLAG NOTES:

1. WINDOW W/PLYWOOD PANEL AND WINDOWSTOP. SECURE FAN OR DUCT IN PANEL PER MECHANICAL REQUIREMENT. SEE DETAILS 1/A3, 2/A3, 3/A3.
2. WINDOW W/PLYWOOD PANEL W/RAIN SCREEN AND WINDOWSTOP. SEE DETAILS 4/A3, 5/A3.
3. 3/4" PLYWOOD PANEL W/OPENING FOR DUCT PER MECHANICAL REQUIREMENT. INSTALL PANEL IN EXISTING DOOR FRAME. PROVIDE PANEL W/HINGES AND LATCH TO ALLOW ACCESS INTO ROOM WHERE USE OF DOOR IS REQUIRED. DEMOUNT AND SALVAGE EXISTING DOOR FOR REINSTALLATION AT COMPLETION OF WORK.
4. NEW HOLLOW CORE DOOR INSTALLED IN EXISTING DOOR FRAME. MATCH EXISTING HINGE LOCATION TO MINIMIZE DAMAGE TO FRAME. INSTALL CYLINDER PASSAGE SET TO PROVIDE LATCHING CLOSURE.
5. TEMPORARY DUST CONTROL BARRIER. PROVIDE 2X FRAMED DOOR OPENING AND HOLLOW CORE DOOR WHERE SHOWN, SIMILAR TO NOTE 4. PROVIDE FRAMED PLYWOOD PANEL TO HOLD FAN OR DUCT WHERE REQUIRED BY MECHANICAL DRAWINGS. SECURE PERIMETER OF 2X FRAMING TO EXISTING CONSTRUCTION W/ANCHORS AT 2' O.C. REMAINDER OF OPENING TO BE CLOSED WITH POLYETHYLENE SHEET STAPLED TO 2X FRAMING. SEE DETAILS 6/A3, 7/A3.
6. OPEN EXISTING TRANSOM PANEL IF POSSIBLE. IF NOT OPERABLE, REMOVE EXISTING TRANSOM LIGHT AND SALVAGE FOR REINSTALLATION AT COMPLETION OF WORK.
7. CLOSE OFF EXISTING VENT STACKS WITH POLYETHYLENE SHEET AND TAPE, TYP. FIELD VERIFY LOCATIONS AND QUANTITIES.

GENERAL NOTES:

1. INSTALL WORK SHOWN ON DRAWING SECURELY BUT WITH CARE TO MINIMIZE DAMAGE TO EXISTING TRIMS AND FINISHES.
2. REMOVE ALL NEW WORK SHOWN AND REPAIR AND REFINISH EXISTING TRIMS AND FINISHES AT COMPLETION OF WORK OR PHASE. COORDINATE WITH SHEET A2 FOR SCOPE OF WORK TO REMAIN IN PLACE DURING FALL PHASE. PHASE COOR. WITH A2 FOR WORK THAT CAN REMAIN IN PLACE FOR FALL PHASE.
3. MECHANICAL SYMBOLS LEFT FOR REFERENCE. SEE MECHANICAL DRAWINGS FOR FULL SCOPE OF WORK TO COORDINATE WITH.
4. POLYETHYLENE SHEET: PROVIDE MINIMUM 12MM REINFORCED-MULTI PLY VAPOR BARRIER PRODUCT.

REVISIONS

SKYKOMISH SCHOOL HOT WATER REMEDIATION FOUNDATION FORMER MAINTENANCE AND FUELING FACILITY

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NAC NO	121-09017
DRAWN	Z.M.P.
CHECKED	M.J.
DATE	1-8-2016

SHEET DESCRIPTION

A

1

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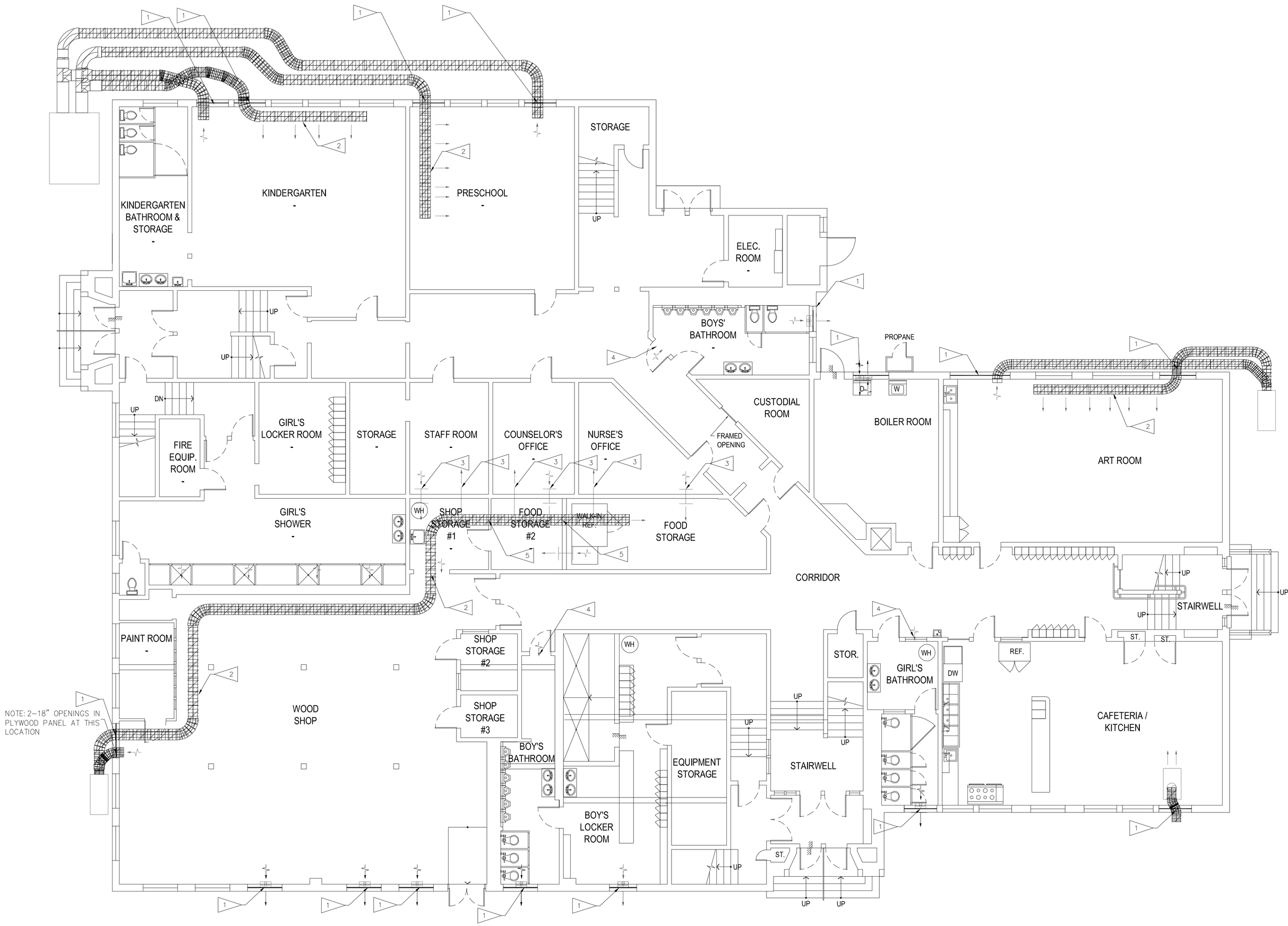

FLOOR PLAN–FALL HVAC COOLING CONCEPT

SCALE: 1/8" = 1'0"

FLAG NOTES:

1. WINDOW W/PLYWOOD PANEL AND WINDOWSTOP. SECURE FAN OR DUCT IN PANEL PER MECHANICAL REQUIREMENT. SEE DETAILS 1/A3, 2/A3, 3/A3.
2. SUSPEND DUCT FROM CEILING W/HANGERS. SPACE AS REQUIRED. REPAIR CEILING UPON COMPLETION OF WORK.
3. CUT HOLE IN EXISTING WALL FOR SUPPLY OR RETURN AIR APPROXIMATELY 12"X12". REPAIR OPENING UPON COMPLETION OF WORK. COORDINATE EXACT SIZE AND LOCATION WITH MECHANICAL.
4. OPEN EXISTING TRANSOM PANEL IF POSSIBLE. IF NOT OPERABLE REMOVE EXISTING TRANSOM LIGHT AND SALVAGE FOR REINSTALLATION AT COMPLETION OF WORK.
5. CUT HOLE IN EXISTING WALL FOR DUCT. APPROXIMATELY 18"DIA. REPAIR OPENING UPON COMPLETION OF WORK. COORDINATE EXACT SIZE AND LOCATION WITH MECHANICAL.

GENERAL NOTES:

1. INSTALL WORK SHOWN ON DRAWING SECURELY BUT WITH CARE TO MINIMIZE DAMAGE TO EXISTING TRIMS AND FINISHES.
2. REMOVE ALL NEW WORK SHOWN AND REPAIR AND REFINISH EXISTING TRIMS AND FINISHES AT COMPLETION OF PHASE.
3. MECHANICAL SYMBOLS LEFT FOR REFERENCE. SEE MECHANICAL DRAWINGS FOR FULL SCOPE OF WORK TO COORDINATE WITH.
4. POLYETHYLENE SHEET: PROVIDE MINIMUM 12MM REINFORCED-MULTI PLY VAPOR BARRIER PRODUCT.

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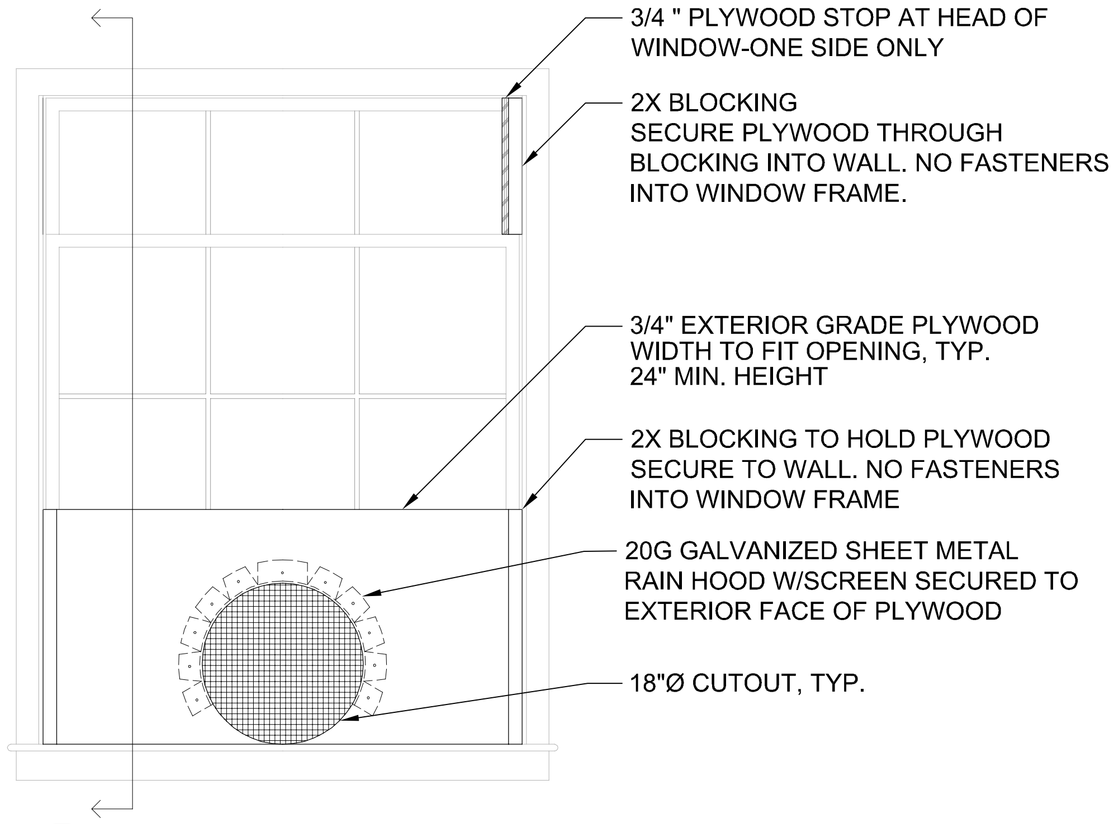
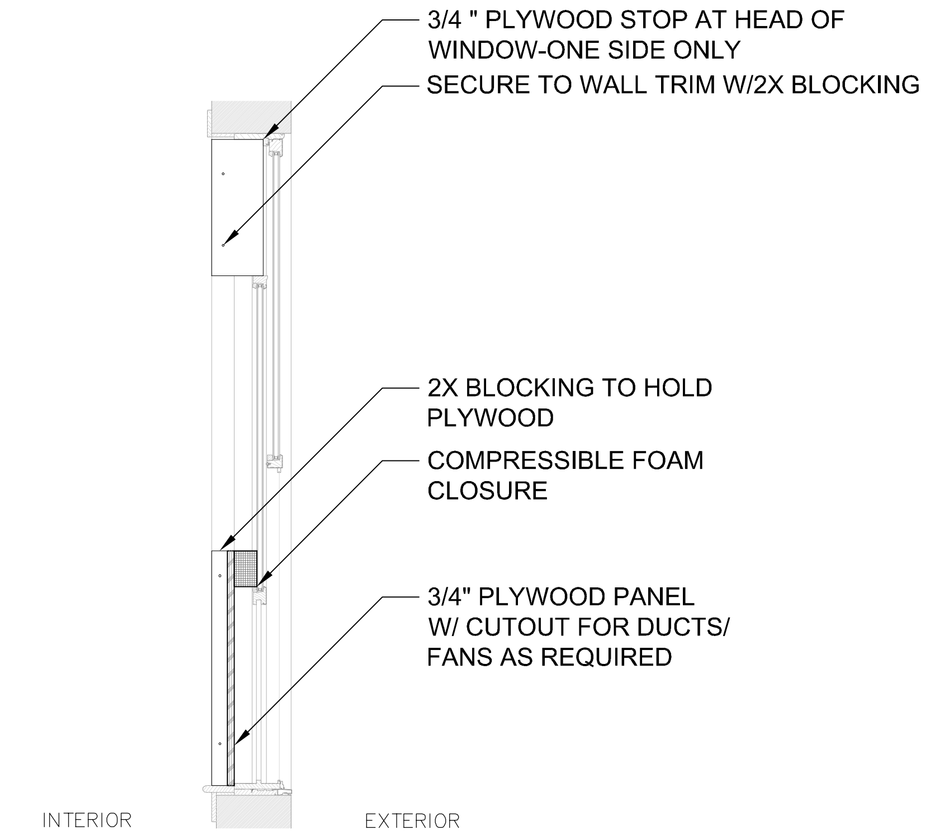


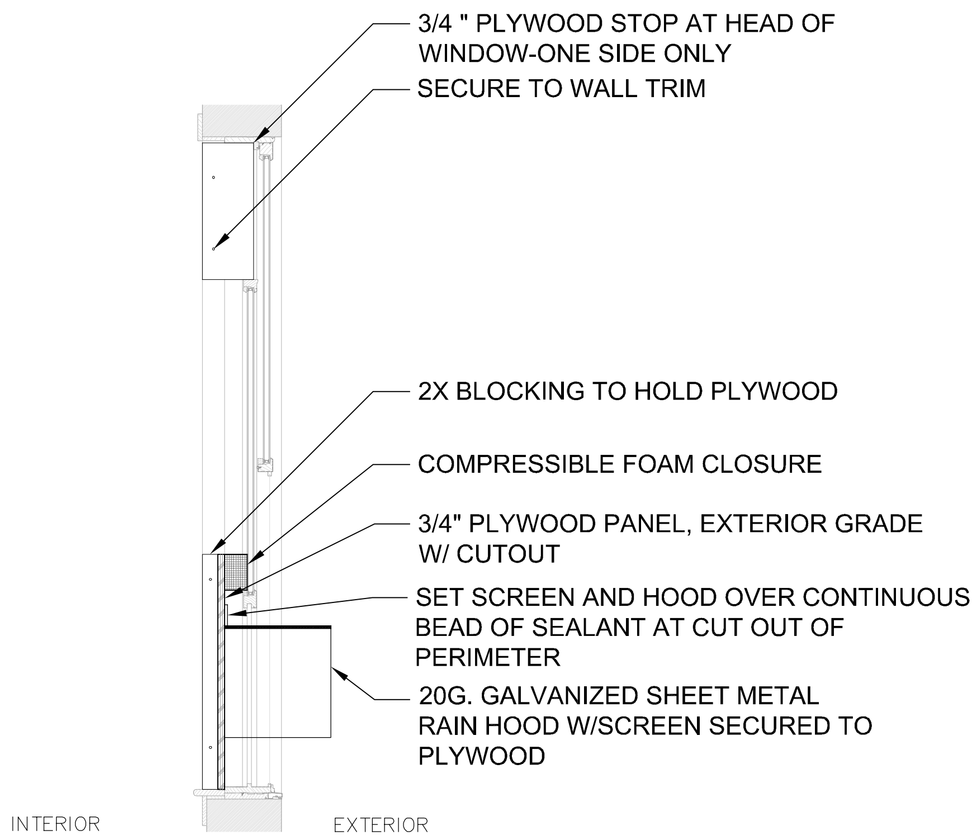
4 WINDOW ELEVATION AT PANEL W/RAINSCREEN

SCALE: 1"=1'-0"



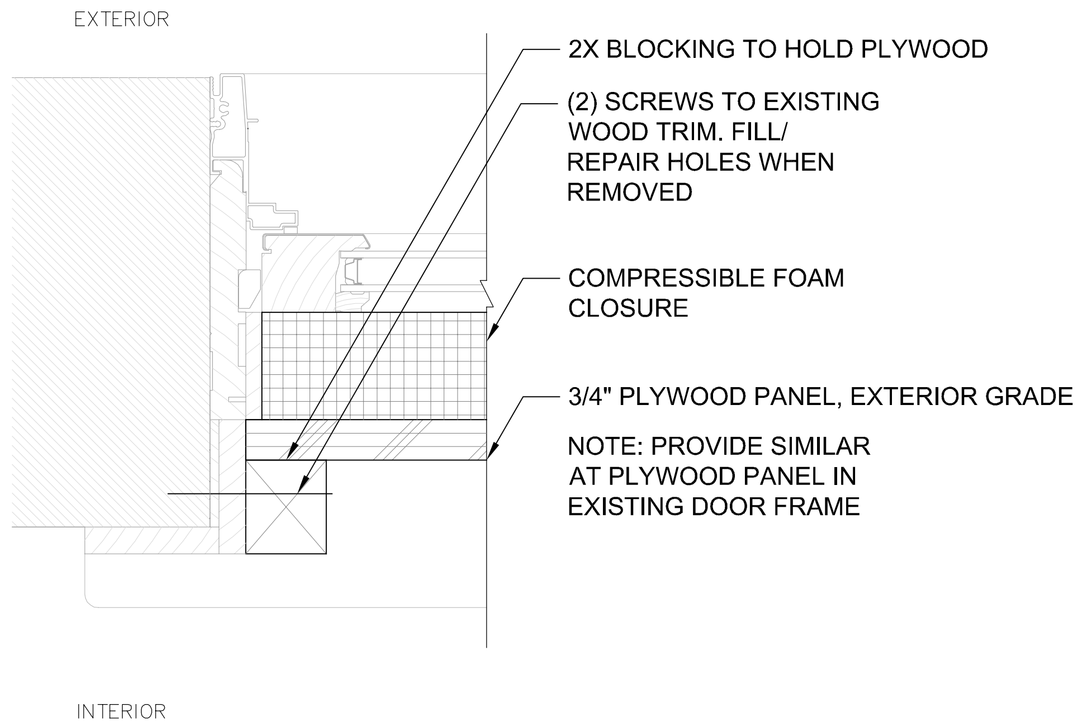
2 WINDOW SECTION AT PANEL

SCALE: 1"=1'-0"



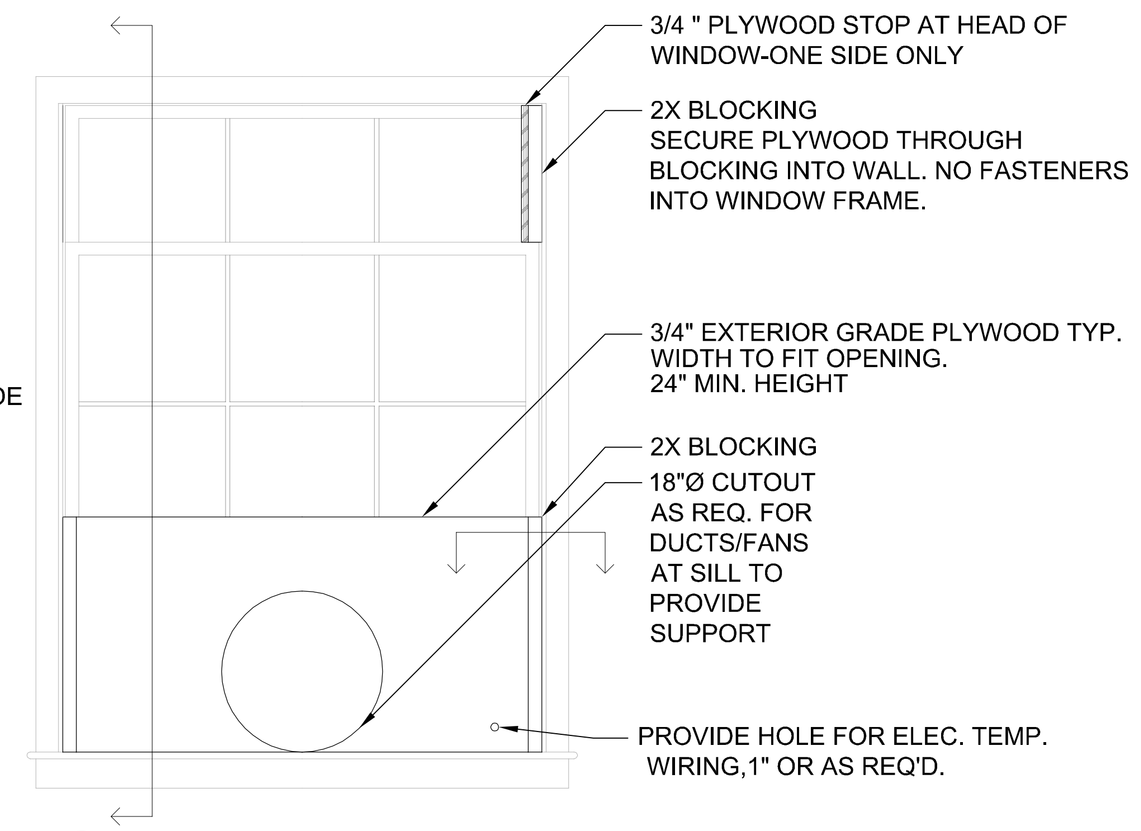
5 WINDOW SECTION AT PANEL WITH RAINSCREEN

SCALE: 1"=1'-0"



3 DETAIL AT WINDOW JAMB

SCALE: 6"=1'-0"



1 WINDOW ELEVATION AT PANEL

SCALE: 1"=1'-0"

REVISIONS

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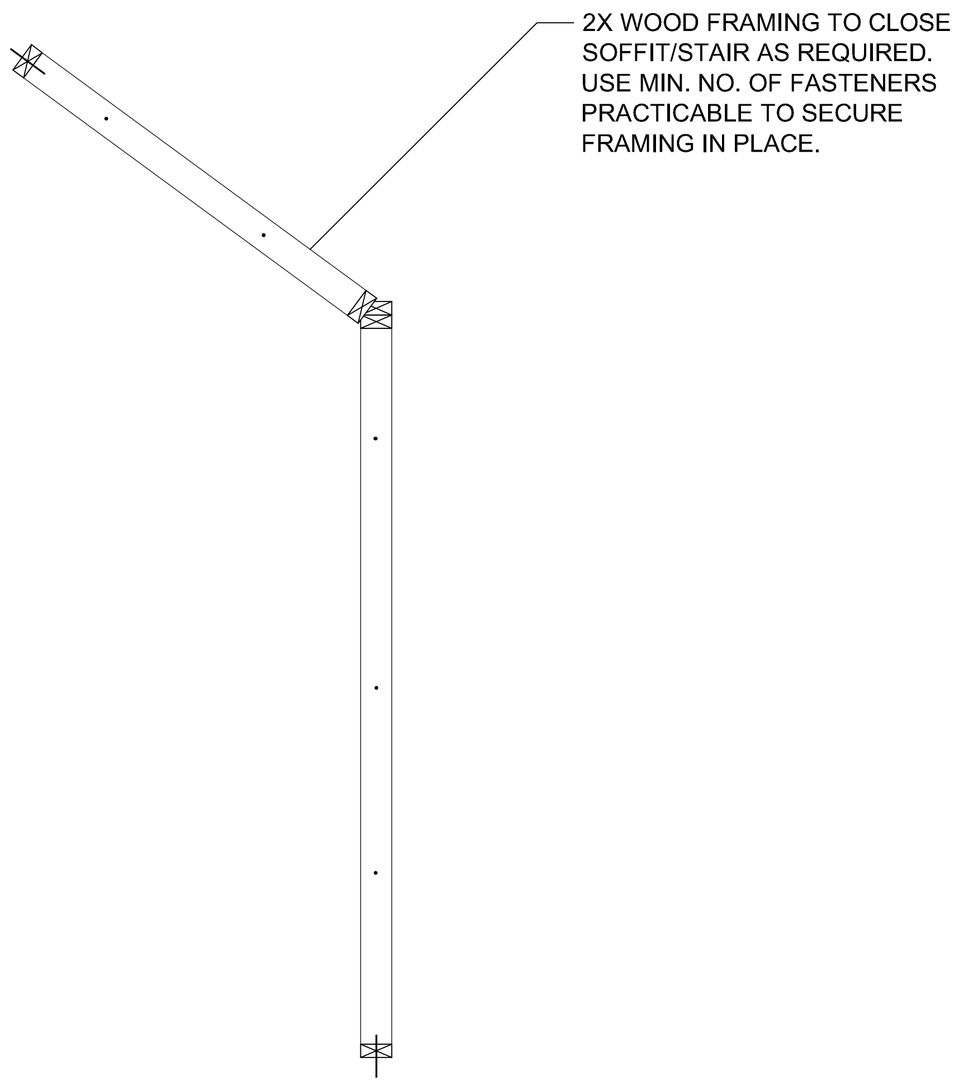
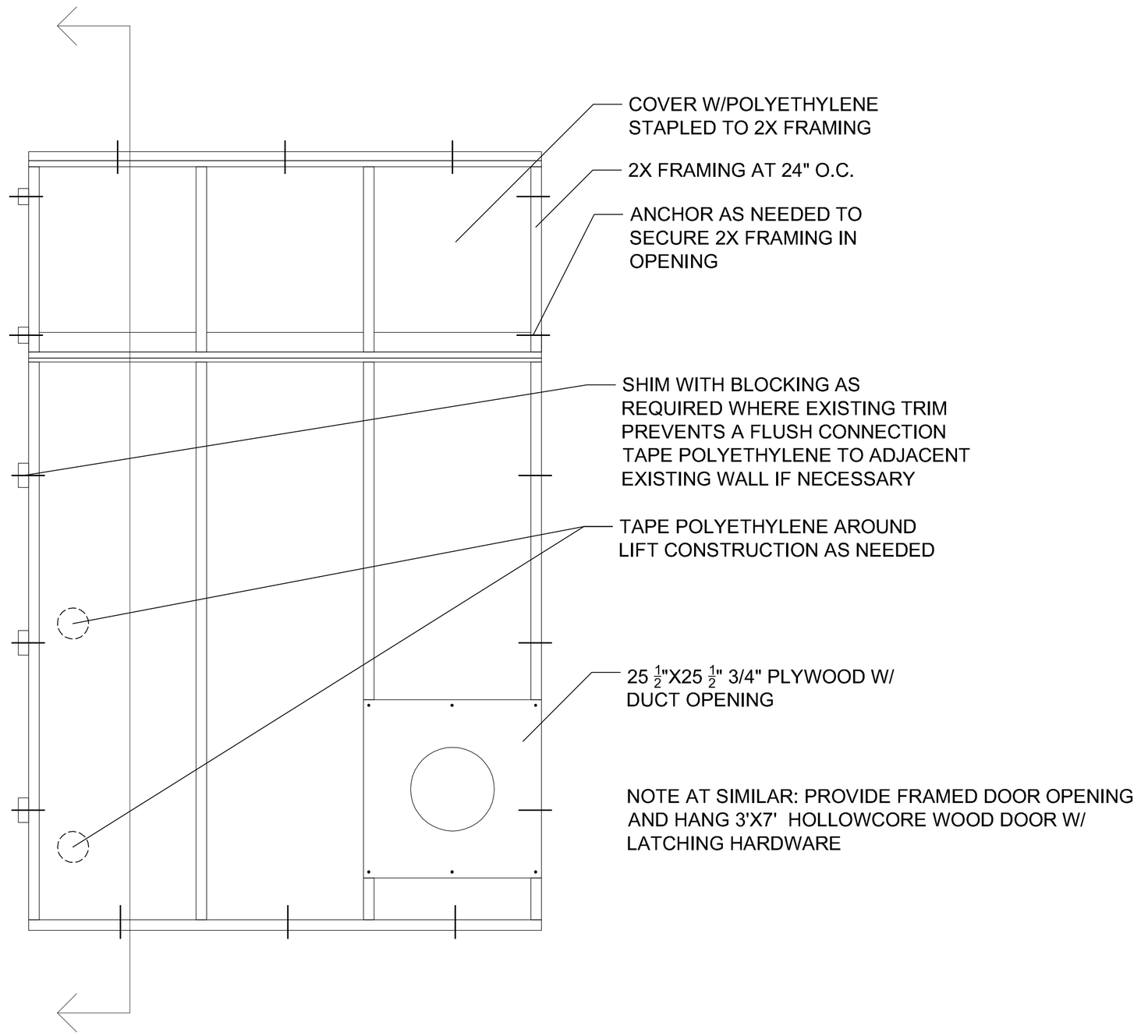


7 SECTION-TEMP. PARTITION W/ DUCT AND/OR DOOR

SCALE: 1"=1'-0"



6 ELEVATION-TEMP. PARTITION W/DUCT AND/OR DOOR

SCALE: 1"=1'-0"

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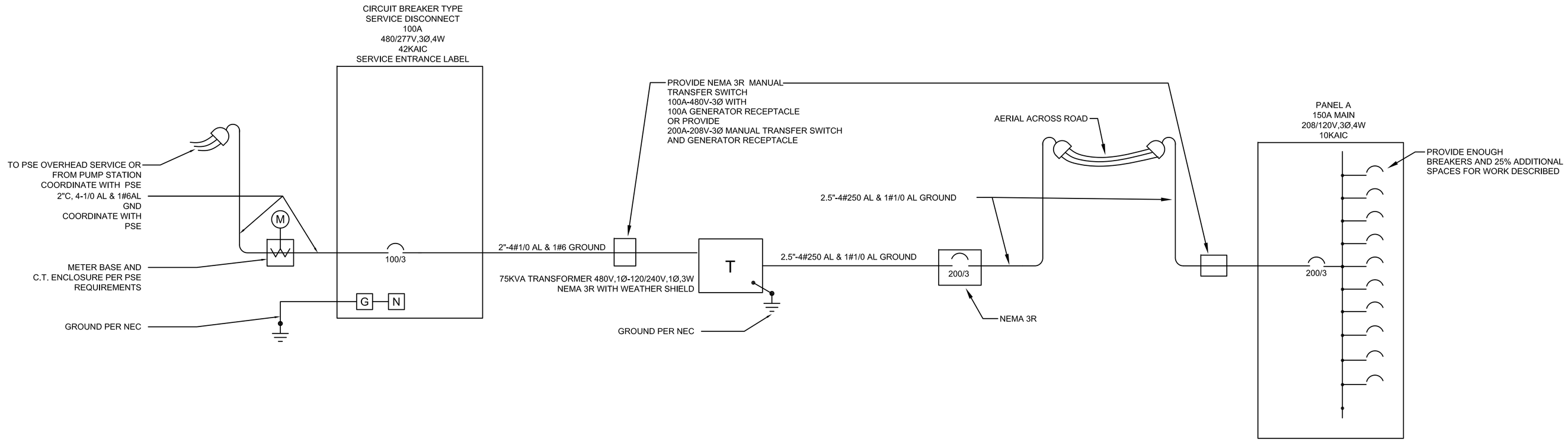
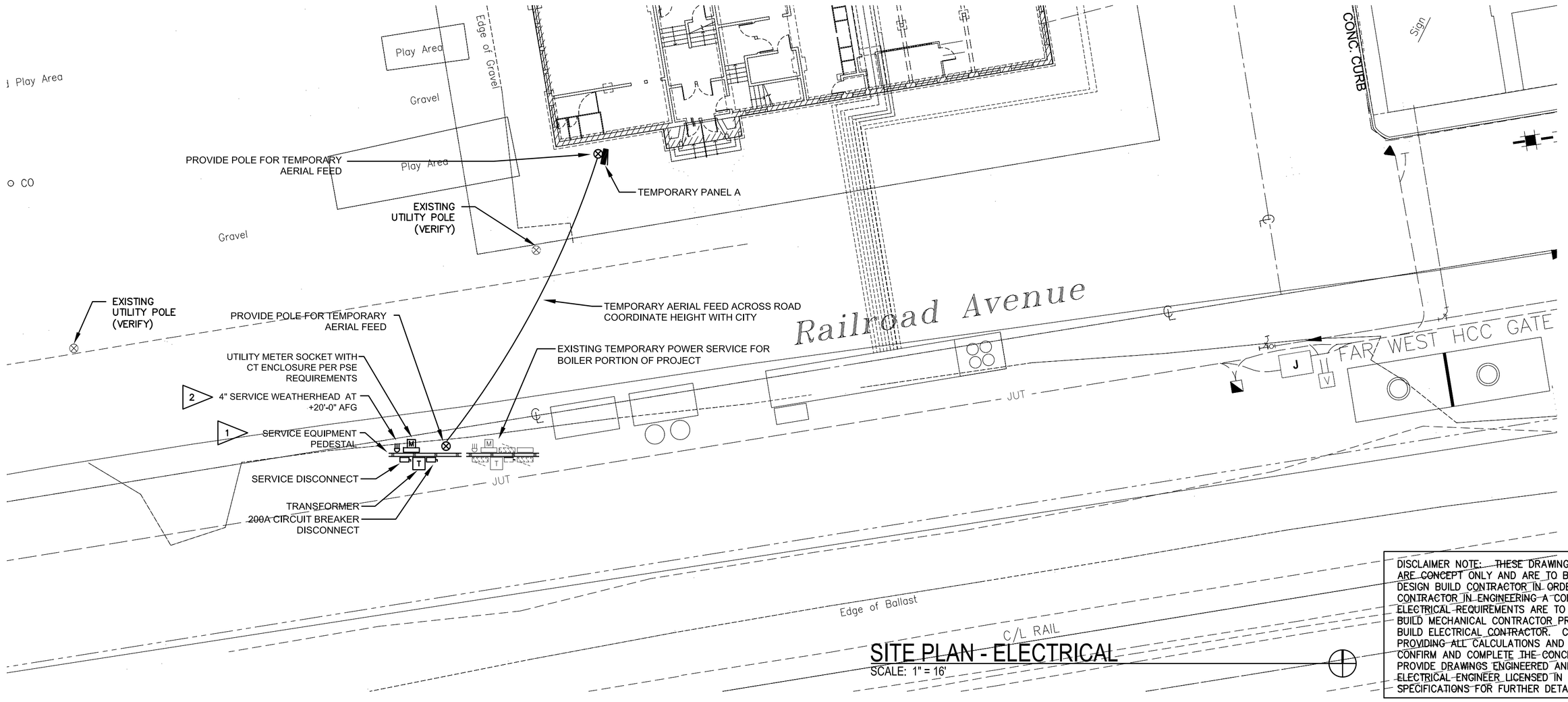


GENERAL NOTES:

1. ALL ELECTRICAL EQUIPMENT SHOWN SHALL BE NEMA 3R OR WEATHERPROOF RATED.
2. PROVIDE POWER CONNECTION TO ALL EQUIPMENT NOT SHOWN ON PLAN BUT SHOWN ON CIVIL, MECHANICAL AND PLUMBING PLANS. ALL ELECTRICAL SIZES SHOWN ARE FOR REFERENCE ONLY. COORDINATE WITH EQUIPMENT SUPPLIERS FOR EXACT ELECTRICAL REQUIREMENTS OF EQUIPMENT.
3. ALL ELECTRICAL TEMPORARY WIRING TO BE RUN OUTSIDE OF BUILDING AS MUCH AS POSSIBLE. ENTER BUILDING THROUGH HOLE IN TEMPORARY WINDOW PANELS. WHERE WIRING CROSSES DOORS OR PATHWAYS ELVATE OVER DOORS AND PATHWAYST TO HEIGHT AT LEAST 8 FEET AND SECURE.
4. FACILITIES: PROVIDE ELECTRICAL SYSTEMS TO SUPPORT CONSTRUCTION AS FOLLOWS. DESCRIPTION OF WORK IS GENERAL. REFER TO MECHANICAL PLANS, CIVIL PLANS, AND ELECTRICAL PLANS FOR FURTHER DETAILS OF REQUIRED WORK.
   - A. POWER SERVICE
     1. COORDINATE REQUIREMENTS FOR A 480V, 3 PHASE SERVICE TO THE SITE WITH PUGET SOUND ENERGY (PSE).
     2. PROVIDE ALL INFRASTRUCTURE REQUIRED FOR PSE SERVICE TO THE SITE INCLUDING CONDUITS, WEATHERHEADS, CT CABINET, METER BASE, VAULTS, AND TRANSFORMER PAD.
     3. SERVICE SHALL BE SIZED PER ELECTRICAL LOAD CALCULATIONS.
     4. ALL EQUIPMENT AND MATERIALS SHALL CONFORM WITH PSE STANDARDS.
   - B. POWER DISTRIBUTION SYSTEM
     1. PROVIDE MAIN DISTRIBUTION PANEL, BRANCH PANELS, TRANSFORMERS AND FEEDERS PER ONE LINE DIAGRAM.
     2. PROVIDE BRANCH CIRCUITRY AS REQUIRED TO LIGHTS, RECEPTACLES, MECHANICAL UNITS, AND EQUIPMENT.
     3. PERFORM LOAD CALCULATIONS TO VERIFY CAPACITY OF EQUIPMENT, FEEDERS AND BRANCH CIRCUITS.
     4. ALL EQUIPMENT LOCATED OUTSIDE OF THE BUILDING SHALL BE SUITABLE FOR OUTDOOR INSTALLATION AND USE. ENCLOSURES SHALL BE NEMA 3R.
   - C. ALL HVAC EQUIPMENT IS TO BE TEMPORARY ALL CONNECTIONS SHALL BE MADE EACH YEAR AND REMOVED EACH YEAR FOR REINSTALLATION THE NEXT YEAR. ALL TEMPORARY WIRING SHALL BE REMOVED FROM THE SITE AT THE END OF OPERATION.



SITE PLAN - ELECTRICAL
SCALE: 1" = 16'

FLAG NOTES:

1. ELECTRICAL SERVICE EQUIPMENT MOUNTING PEDESTAL, MOUNTED AND SUPPORTED BY (4)4"X4"X1/4" THICK SQUARE STEEL UNISTRUT ON CONCRETE FOUNDATION. COORDINATE FINAL LOCATION WITH PSE.
2. PROVIDE METAL SUPPORT FOR 4" SERVICE WEATHERHEAD.

LEGENDS:

- TEMPORARY ELECTRICAL CONDUCTORS COORDINATE TYPE WITH ELECTRICAL INSPECTOR
- DISCONNECT SWITCH
- T TRANSFORMER
- X / E-1 DETAIL INDICATOR
- 1 FLAG NOTE

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NO.	DATE	REVISION

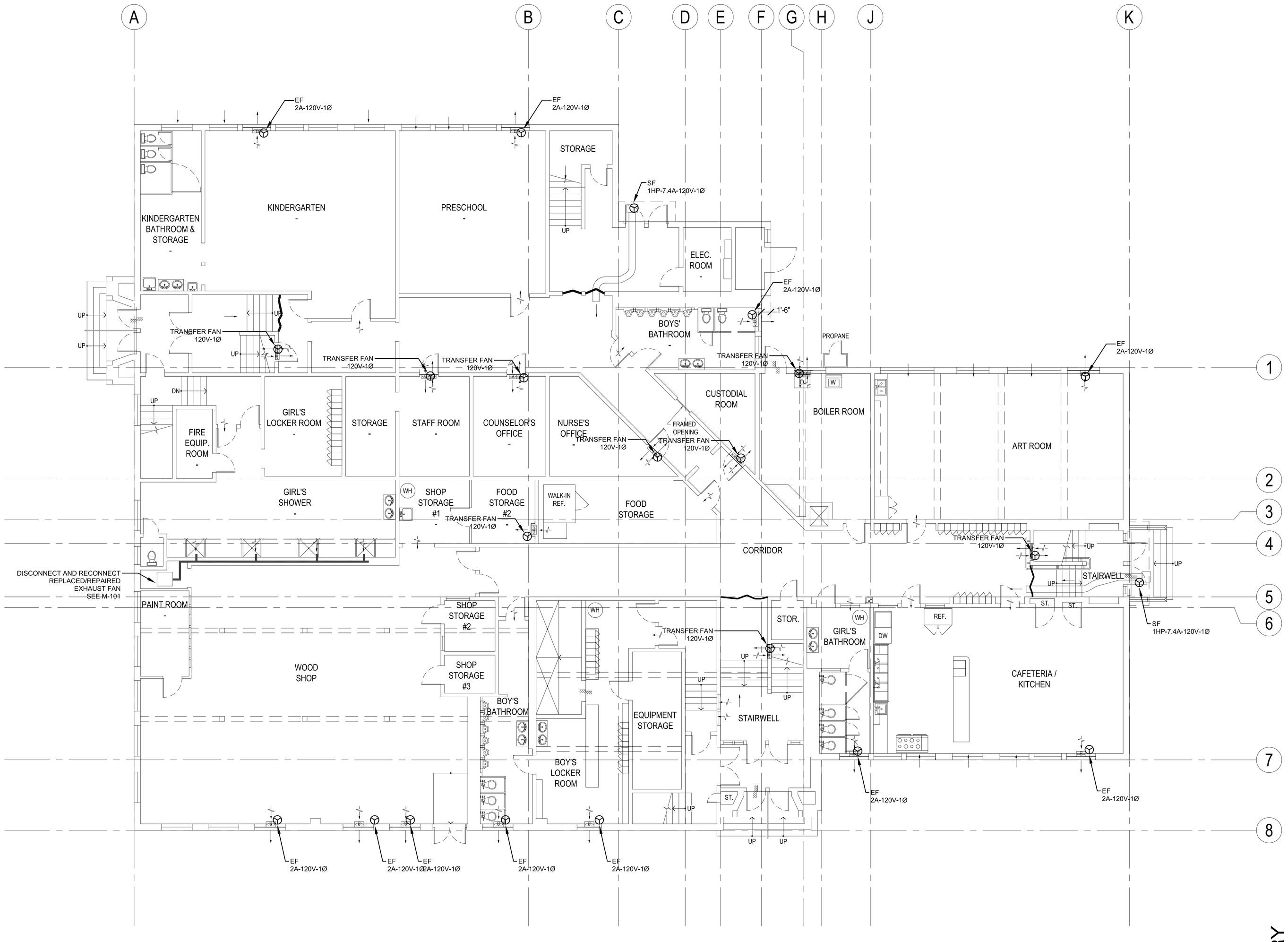
PARTNER IN CHARGE: KW
PROJECT MANAGER: PR
PROJECT ENGINEER: PR
PROJECT TEAM MEMBERS: KW,PR,AS
CHECK: KW,PR

ENGINEERS SEAL

TITLE: POWER ONE-LINE AND ELECTRICAL SITE PLAN

PROJECT NO.: 683-038
DATE: JANUARY 8, 2016
PROJECT NETWORK PATH:

SHEET NUMBER: **E-100**



SUMMER ELECTRICAL CONCEPT

DISCLAIMER NOTE: THESE DRAWINGS AND ASSOCIATED SPECIFICATIONS ARE CONCEPT ONLY AND ARE TO BE USED AS A REFERENCE FOR THE DESIGN BUILD CONTRACTOR IN ORDER TO GENERALLY HELP GUIDE CONTRACTOR IN ENGINEERING A COMPLETE FUNCTIONING SYSTEM. ALL ELECTRICAL REQUIREMENTS ARE TO BE COORDINATED WITH THE DESIGN BUILD MECHANICAL CONTRACTOR PRIOR TO FINAL DESIGN BY DESIGN BUILD ELECTRICAL CONTRACTOR. CONTRACTOR IS RESPONSIBLE FOR PROVIDING ALL CALCULATIONS AND DESIGN ELEMENTS REQUIRED TO CONFIRM AND COMPLETE THE CONCEPTS SHOWN. CONTRACTOR TO PROVIDE DRAWINGS ENGINEERED AND SEALED BY A PROFFESIONAL ELECTRICAL ENGINEER LICENSED IN THE STATE OF WASHINGTON. SEE SPECIFICATIONS FOR FURTHER DETAILS.

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VERIFY SCALE

BAR MEASURES ONE INCH ON ORIGINAL DRAWING

0" 1"

IF NOT ONE INCH ON THIS DRAWING, ADJUST SCALES ACCORDINGLY.

PRELIMINARY
NOT FOR CONSTRUCTION

TRAVIS FITZMAURICE
& ASSOCIATES Electrical Engineers
1200 Westlake Ave. N., Suite 509 Seattle, WA 98109
p 206-285-7228 f 206-285-7294

Project

SKYKOMISH SCHOOL
HOT WATER FLUSHING
REMEDIATION
FORMER MAINTENANCE
AND FUELING FACILITY

Location

105 6TH ST N
SKYKOMISH, WA 98288

Prepared For

THE BSNF RAILWAY COMPANY

2454 OCCIDENTAL AVE. S. SUITE #1A
SEATTLE WASHINGTON
ph. 206-625-6296

NO.	DATE	REVISION

PARTNER IN CHARGE: KW
PROJECT MANAGER: PR
PROJECT ENGINEER: PR
PROJECT TEAM MEMBERS: KW,PR,AS
CHECK: KW,PR

ENGINEERS SEAL

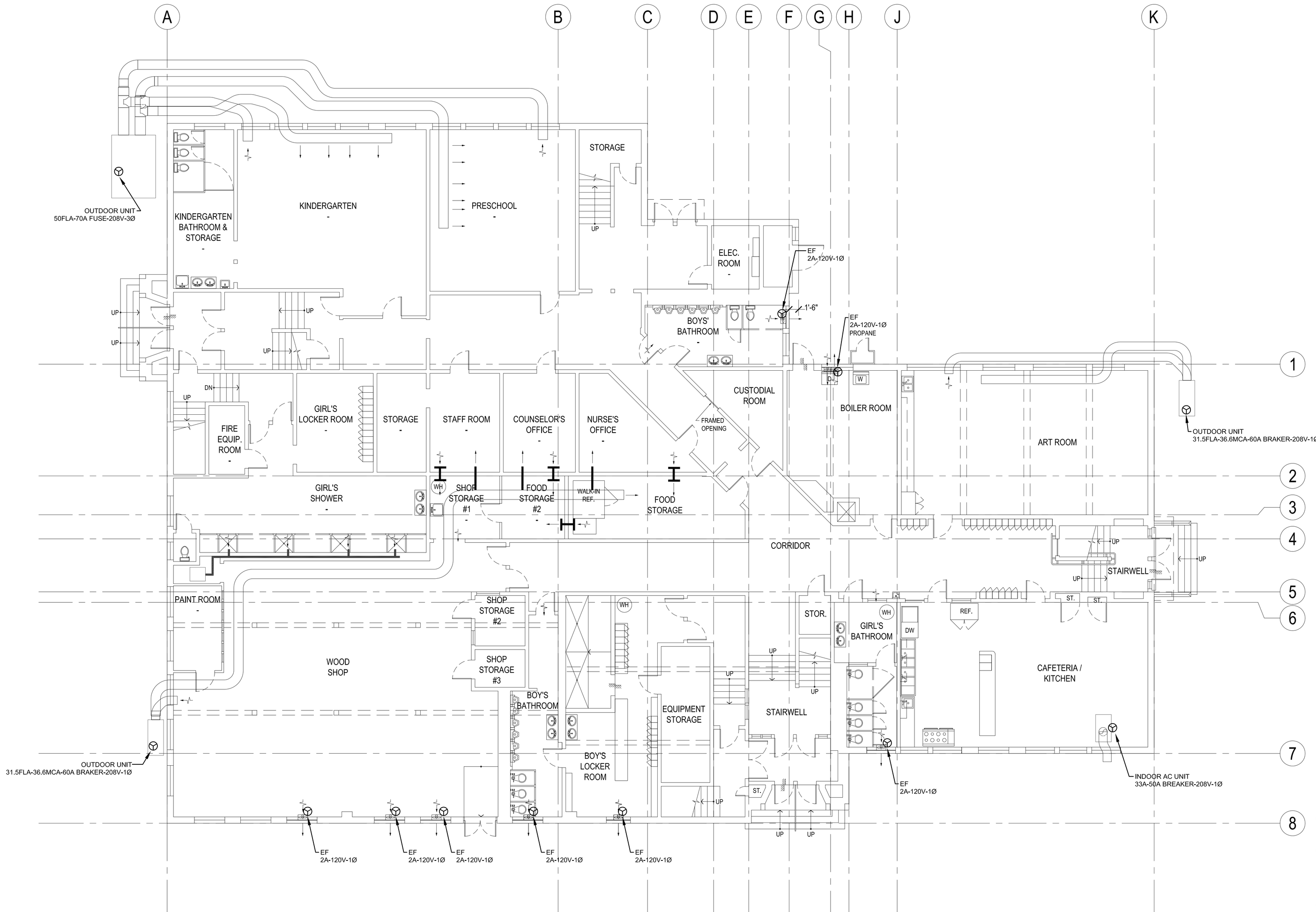
TITLE: SUMMER VENTILATION ELECTRICAL SCHEMATIC DRAWING

PROJECT NO.: 683-038

DATE: JANUARY 8, 2016

PROJECT NETWORK PATH:

SHEET NUMBER: **E-101**



FALL ELECTRICAL COOLING CONCEPT

DISCLAIMER NOTE: THESE DRAWINGS AND ASSOCIATED SPECIFICATIONS ARE CONCEPT ONLY AND ARE TO BE USED AS A REFERENCE FOR THE DESIGN BUILD CONTRACTOR IN ORDER TO GENERALLY HELP GUIDE CONTRACTOR IN ENGINEERING A COMPLETE FUNCTIONING SYSTEM. ALL ELECTRICAL REQUIREMENTS ARE TO BE COORDINATED WITH THE DESIGN BUILD MECHANICAL CONTRACTOR PRIOR TO FINAL DESIGN BY DESIGN BUILD ELECTRICAL CONTRACTOR. CONTRACTOR IS RESPONSIBLE FOR PROVIDING ALL CALCULATIONS AND DESIGN ELEMENTS REQUIRED TO CONFIRM AND COMPLETE THE CONCEPTS SHOWN. CONTRACTOR TO PROVIDE DRAWINGS ENGINEERED AND SEALED BY A PROFFESIONAL ELECTRICAL ENGINEER LICENSED IN THE STATE OF WASHINGTON. SEE SPECIFICATIONS FOR FURTHER DETAILS.

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VERIFY SCALE

BAR MEASURES ONE INCH ON ORIGINAL DRAWING
0" 1"
IF NOT ONE INCH ON THIS DRAWING, ADJUST SCALES ACCORDINGLY.

PRELIMINARY
NOT FOR CONSTRUCTION

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& ASSOCIATES Electrical Engineers
1200 Westlake Ave. N., Suite 509 Seattle, WA 98109
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Project

SKYKOMISH SCHOOL
HOT WATER FLUSHING
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Prepared For

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2454 OCCIDENTAL AVE. S. SUITE #1A
SEATTLE WASHINGTON
ph. 206-625-6296

NO.	DATE	REVISION

PARTNER IN CHARGE
KW
PROJECT MANAGER
PR
PROJECT ENGINEER
PR
PROJECT TEAM MEMBERS
KW,PR,AS
CHECK
KW,PR

ENGINEERS SEAL

TITLE
FALL ELECTRICAL COOLING SCHEMATIC DRAWING

PROJECT NO.
683-038
DATE
JANUARY 8, 2016
PROJECT NETWORK PATH

SHEET NUMBER
E-102

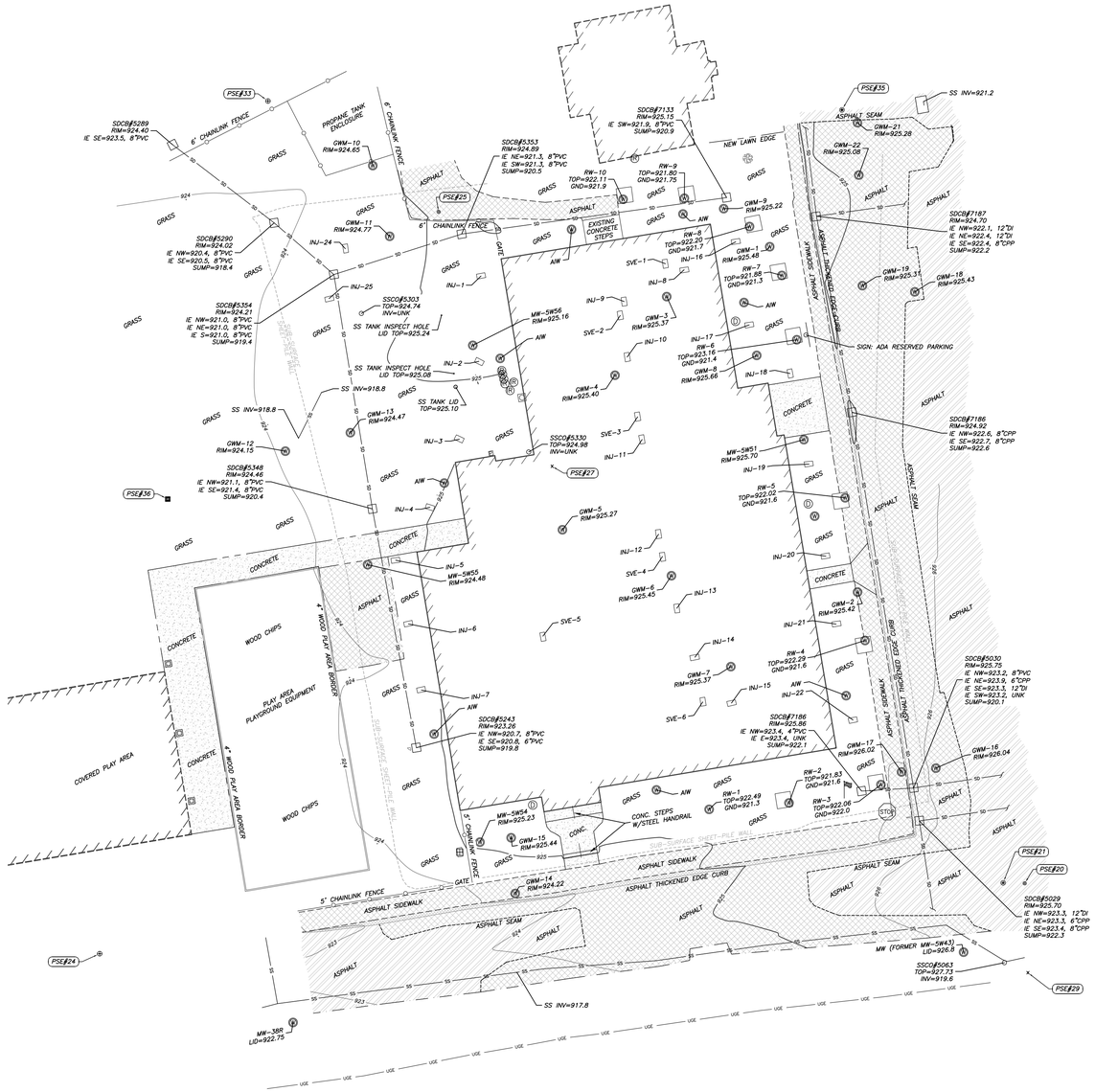
APPENDIX D
AS-BUILT SURVEY

OPERATIONS AND MAINTENANCE PLAN
Hot Water Flushing System
Skykomish School
Skykomish, Washington

Farallon PN: 683-057

FALL 2015 AS-BUILT SURVEY

SITUATE IN A PORTION OF THE OF SECTION , TOWNSHIP NORTH,
RANGE , W.M., CITY OF BELLINGHAM, WHATCOM COUNTY, WASHINGTON



EXISTING LINE LEGEND

1. DATA FOR THIS SURVEY WAS GATHERED BY FIELD TRAVERSE UTILIZING ELECTRONIC DATA COLLECTION IN SEPTEMBER 2015.
2. EQUIPMENT USED: THEOMAT 00'01.5" EDM: ± 2 PPM, ± 3 MM
3. PURPOSE OF SURVEY: TOPOGRAPHIC SURVEY OF COMPLETED CONDITIONS FOR FALL 2015.
4. HORIZONTAL DATUM: NAD 83/91 WASHINGTON STATE PLANE NORTH ZONE, GROUND
5. VERTICAL DATUM: NAVD88
6. CONTOUR INTERVALS ARE 1 FOOT AND ARE COMPUTER GENERATED FROM GROUND FIELD TOPOGRAPHY GATHERED FOR THIS SURVEY UTILIZING ELECTRONIC DATA COLLECTION.
7. REFERENCE "SKYKOMISH SCHOOL HOT WATER FLUSHING REMEDIATION" CONTRACT DOCUMENTS FOR ADDITIONAL INFORMATION.

EXISTING FEATURE SYMBOL LEGEND

- △ = SET REBAR & ORANGE PLASTIC CAP
- ■ = SET HUB AND TACK
- ⊕ = SET P.K. NAIL
- ◉ = EXISTING NAIL/FLASHER
- ◉ = SET NAIL/FLASHER
- ● = EXISTING NAIL
- × = SET CHISELED "X"
- (D) = EXISTING STORM DRAIN CLEANOUT
- ▣ = EXISTING AREA DRAIN
- □ = EXISTING CATCH BASIN
- ○ = EXISTING SANITARY SEWER CLEANOUT
- ⊞ = EXISTING WATER METER
- (W) = EXISTING WATER WELL (AS DESIGNATED)
- (R) = EXISTING IRRIGATION BOX
- STOP = EXISTING STOP SIGN
- = EXISTING STREET SIGN
- = EXISTING FLAG POLE
- = EXISTING TELEPHONE PEDESTAL/RISER
- = EXISTING GAS METER
- = EXISTING FRUIT TREE
- 15"ø = DIAMETER OF EXISTING TREE
- INJ-10 = INJECTION WELL
- RW-10 = GROUND WATER EXTRACTION RECOVERY SUMP
- GWM-10 = GROUND WATER MONITORING WELL
- SVE-10 = SOIL VAPOR EXTRACTION WELL
- MW-10 = EXISTING GROUND WATER MONITORING WELL
- AIW = AIR INLET WELL

EXISTING LINE LEGEND

- = EXISTING EDGE OF ASPHALT
- = EXISTING EDGE OF CONCRETE
- = EXISTING CURB
- = EXISTING SIDEWALK
- SD = EXISTING STORM DRAIN LINE
- SS = EXISTING SANITARY SEWER GRAVITY LINE
- UGE = EXISTING UNDERGROUND POWER
- 120 = EXISTING GRADE INDEX CONTOUR
- 118 = EXISTING GRADE INTERVAL CONTOUR
- = EXISTING EDGE OF LANDSCAPED AREA
- = EXISTING CHAINLINK FENCE
- = EXISTING SUB-SURFACE SHEET PILE WALL
- = EXISTING ASPHALT SEAM

PSE

GRAPHIC SCALE
(us survey feet)
0 20
20 10 40
1 inch = 20 feet

CALL BEFORE YOU DIG 1-800-424-5555

FIELD BOOKS	TBM. NO.	LOCATION	ELEV.
DESIGN: 602 SERIES			
STAKING:			
ASBUILT:			
SURVEY REFERENCE	VERTICAL DATUM		

DATA	DRAWN BY	CHECKED BY	SCALE
BASE	RMT	PKB	HORIZ: 1"=20'
DESIGN			VERT:
XREF:			
DWG # 2015115_svX_TB_2015.dwg			
PLAN CHECK			

REV	DATE	DESCRIPTION	BY
REVISIONS			

No.		DATE
1	FALL 2015 AS-BUILT	9.30.15
ISSUE		

GLACIER ENVIRONMENTAL SERVICES, INC.
P.O. BOX 1097
MUKILTEO, WA 98275

AS-BUILT SURVEY
SKYKOMISH SCHOOL FALL 2015 A-BUILT
SKYKOMISH, WA

JOB #: 2015115 SHEET 1 OF 1

PETER K. BRUCE STATE OF WASHINGTON 35147 REGISTERED PROFESSIONAL LAND SURVEYOR
PRELIMINARY

PACIFIC SURVEY & ENGINEERING INC
1812 CORNWALL, BELLINGHAM, WA 98225 PHONE:360.671.7387 FAX:360.671.4685 EMAIL: info@psesurvey.com
www.psesurvey.com

APPENDIX E
EQUIPMENT INFORMATION
PROVIDED ON CD IN PRINT COPY

OPERATIONS AND MAINTENANCE PLAN
Hot Water Flushing System
Skykomish School
Skykomish, Washington

Farallon PN: 683-057

APPENDIX F
CONTROL PANEL AND ELECTRICAL DRAWINGS
PROVIDED ON CD IN PRINT COPY

OPERATIONS AND MAINTENANCE PLAN
Hot Water Flushing System
Skykomish School
Skykomish, Washington

Farallon PN: 683-057

APPENDIX G
CHLORINE AND SEQUESTERANT DOSING PLANS

OPERATIONS AND MAINTENANCE PLAN
Hot Water Flushing System
Skykomish School
Skykomish, Washington

Farallon PN: 683-057

HWF MANUAL CHLORINE DOSING PLAN

After shock treating the wells and treating the water that was collected in that process, proceed with manually dosing the extraction wells that are going to be used to start the system back up. Assuming this will be done by either pumping 1, 2, or 3 of the extraction wells, dose the wells manually according to the following schedule. This should provide a dose of ~10 parts per million in the wells.

Flow rate from well	Number of pucks to dose	How frequently to dose
40 gpm	5.5	12 hours
30 gpm	4	12 hours
20 gpm	2.5	12 hours

Obtain a bucket of 3-inch GLB chlorinating pucks. These are available from American Pool Supply 1-800-628-7665 in Snohomish, Washington.

Wear nitrile gloves when handling the chlorine pucks. Each puck should be broken in half in order to fall easily down the well. Alternatively, use 8-ounce chlorinating sticks (but they do not seem as readily available). The sticks would be dosed at the same rate but would not have to be broken before dropping into the well.

This manual dose should provide a relatively controlled release of chlorine as they are formulated to dissolve slowly. Once the treated wells are pumping water into the treatment system, the residual chlorine coming from the wells should be measured periodically. This will provide confirmation of adequate dosing and provide some indication of how long they are lasting in the well. This sampling should be at the oil-water separator and as well as downstream of the granular activated carbons (GACs). During the period of manual dosing, measuring the residual chlorine 3 to 4 times per day is recommended. Depending on the residual chlorine concentration in the treatment system, we will want to refine the dosing rate.

AQUA-MAG CALCULATION SHEET

Skykomish School Groundwater Well with max of Ca and Mn used for composition. Hardness=sum(Ca,Mg)
"M:\CtoF\Farallon\ProjectDocuments\ConstructionMgmt\DesignModifications\GeochemicalSaturation\J52120-1 UDS Level 2 Report Final Report.pdf"

10+53=63

_____ (total water hardness in ppm) divided by 172 = 0.36 (A)

3.6 _____ (ppm iron) + 0.2 _____ (ppm manganese) divided by 2 = 1.9 _____ (B)

_____ (A) + _____ (B) = 2.3 _____ ($ppm\ PO_4$)

Gallons Per Day Feed Rate:

$$\frac{2.3}{(ppm\ PO_4)} \times \frac{60}{(gpm\ flow\ rate)} \times .006638 = \frac{0.9}{(gpd\ Aqua\text{-}Mag)}$$

The gpd Aqua-Mag value is based on a full strength solution – The recommended mix is 1 gallon of Aqua-Mag to each 10 gallons of water.

Pump Setting:

$$\frac{0.9}{(gpd\ Aqua\text{-}Mag)} \times 11 \text{ divided by } \frac{\quad}{(max\ gpd\ of\ pump)} = \frac{\quad}{(\%\ setting\ of\ pump)}$$

CAI equipment is typically configured with Stenner brand chemical feed pumps. Typical pumps used in our systems are rated as below:

85MHP40 40 gallons per day
85MHP17 17 gallons per day
45MHP2 3 gallons per day

We would select a pump under typical condition will operate close to a 50% pump rate. For questions, please call our customer service at 800-580-3033.

SAFETY DATA SHEET

1. Identification

Product identifier **CARUSQUEST®101 Water Treatment Chemical**

Other means of identification

SDS number -

Recommended use CARUSQUEST®101 Water Treatment Chemical is a premier water treatment chemical for use in potable and industrial water systems.

Recommended restrictions None known.

Manufacturer/Importer/Supplier/Distributor information

Company name CARUS CORPORATION

Address 315 Fifth Street,
Peru, IL 61354, USA

Telephone +1 815 223-1500 - All other non-emergency inquiries about the product should be directed to the company

E-mail salesmkt@caruscorporation.com

Website www.caruscorporation.com

Contact person Dr. Chithambarathanu Pillai

Emergency Telephone For Hazardous Materials [or Dangerous Goods] Incidents ONLY (spill, leak, fire, exposure or accident), call CHEMTREC at
CHEMTREC®, USA: 001 (800) 424-9300
CHEMTREC®, Mexico (Toll-Free - must be dialed from within country): 01-800-681-9531
CHEMTREC®, Other countries: 001 (703) 527-3887

2. Hazard(s) identification

Physical hazards Not classified.

Health hazards

Acute toxicity, oral	Category 4
Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 1

OSHA defined hazards Not classified.

Label elements

Signal word Danger

Hazard statement Harmful if swallowed. Causes skin irritation. Causes serious eye damage.

Precautionary statement

Prevention Do not eat, drink or smoke when using this product. Wear protective gloves. Wear eye/face protection. Wash thoroughly after handling.

Response If swallowed: Rinse mouth. Do NOT induce vomiting. If on skin: Wash with plenty of water. If skin irritation occurs: Get medical advice/attention. Take off contaminated clothing and wash before reuse. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a poison center/doctor. Specific treatment (see this label).

Storage Store away from incompatible materials.

Disposal Dispose of contents/container in accordance with local/regional/national/international regulations.

Hazard(s) not otherwise classified (HNOC) None known.

3. Composition/information on ingredients

Mixtures

Chemical name	CAS number	%
1-hydroxy ethylidene-1,1-diphosphonic acid	2809-21-4	<50
Phosphonic acid	13598-36-2	1-10
Other components below reportable levels		68

*Designates that a specific chemical identity and/or percentage of composition has been withheld as a trade secret.

Composition comments All concentrations are in percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4. First-aid measures

Inhalation Move to fresh air. Call a physician if symptoms develop or persist.

Skin contact Remove contaminated clothing. Wash with plenty of soap and water. If skin irritation occurs: Get medical advice/attention. Wash contaminated clothing before reuse.

Eye contact Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention immediately.

Ingestion Rinse mouth. Never give anything by mouth to a victim who is unconscious or is having convulsions. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs. Do not induce vomiting without advice from poison control center. Get medical advice/attention if you feel unwell.

Most important symptoms/effects, acute and delayed Contact with this material will cause burns to the eyes. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Permanent eye damage including blindness could result. Skin irritation. May cause redness and pain. Irritating to mouth, throat, and stomach.

Indication of immediate medical attention and special treatment needed Provide general supportive measures and treat symptomatically. Keep victim warm. Keep victim under observation. Symptoms may be delayed.

General information Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Show this safety data sheet to the doctor in attendance.

5. Fire-fighting measures

Suitable extinguishing media Water fog. Foam. Dry chemical powder. Carbon dioxide (CO2).

Unsuitable extinguishing media Do not use water jet as an extinguisher, as this will spread the fire.

Specific hazards arising from the chemical During fire, gases hazardous to health may be formed.

Special protective equipment and precautions for firefighters Self-contained breathing apparatus and full protective clothing must be worn in case of fire.

Fire fighting equipment/instructions Move containers from fire area if you can do so without risk.

Specific methods Wear positive pressure self-contained breathing apparatus (SCBA).

General fire hazards No unusual fire or explosion hazards noted.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Keep out of low areas. Wear appropriate protective equipment and clothing during clean-up. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ensure adequate ventilation. Local authorities should be advised if significant spillages cannot be contained. For personal protection, see section 8 of the SDS.

Methods and materials for containment and cleaning up This product is miscible in water.

Large Spills: Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Cover with plastic sheet to prevent spreading. Absorb in vermiculite, dry sand or earth and place into containers. Following product recovery, flush area with water.

Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination.

Never return spills to original containers for re-use. For waste disposal, see section 13 of the SDS.

Environmental precautions Avoid discharge into drains, water courses or onto the ground.

7. Handling and storage

Precautions for safe handling	Do not taste or swallow. When using, do not eat, drink or smoke. Do not get in eyes and avoid contact with skin and clothing. Avoid breathing mist or vapor. Avoid prolonged exposure. Provide adequate ventilation. Wear appropriate personal protective equipment. Wash hands thoroughly after handling. Observe good industrial hygiene practices.
Conditions for safe storage, including any incompatibilities	Store in original tightly closed container. Store in a well-ventilated place. Store away from incompatible materials (see Section 10 of the SDS).

8. Exposure controls/personal protection

Occupational exposure limits	No exposure limits noted for ingredient(s).
Biological limit values	No biological exposure limits noted for the ingredient(s).
Appropriate engineering controls	Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Eye wash facilities and emergency shower must be available when handling this product.

Individual protection measures, such as personal protective equipment

Eye/face protection	Wear safety glasses with side shields (or goggles) and a face shield.
Skin protection	
Hand protection	Wear appropriate chemical resistant gloves.
Other	Wear appropriate chemical resistant clothing.
Respiratory protection	In case of insufficient ventilation, wear suitable respiratory equipment. If vapors or mists are generated, wear a NIOSH/MSHA approved organic vapor mist respirator. In the United States of America, if respirators are used, a program should be instituted to assure compliance with OSHA 29 CFR 1910.134 and ANSI Z88.2.
Thermal hazards	Wear appropriate thermal protective clothing, when necessary.
General hygiene considerations	When using, do not eat, drink or smoke. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties

Appearance	Colorless solution.
Physical state	Liquid.
Form	Liquid. Colorless solution.
Color	Colorless.
Odor	None.
Odor threshold	Not available.
pH	pH of 1% solution = 2.5±0.5
Melting point/freezing point	< 32 °F (< 0 °C)
Initial boiling point and boiling range	Not available.
Flash point	Not available.
Evaporation rate	Not available.
Flammability (solid, gas)	Not available.

Upper/lower flammability or explosive limits

Flammability limit - lower (%)	Not available.
Flammability limit - upper (%)	Not available.
Explosive limit - lower (%)	Not available.
Explosive limit - upper (%)	Not available.
Vapor pressure	Not available.
Vapor density	Not available.
Relative density	1,.23±0.03 (77 °F (25 °C))

Solubility(ies)

Solubility (water)	Completely soluble
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.
Viscosity	Not available.

10. Stability and reactivity

Reactivity	The product is stable and non-reactive under normal conditions of use, storage and transport.
Chemical stability	Material is stable under normal conditions.
Possibility of hazardous reactions	No dangerous reaction known under conditions of normal use.
Conditions to avoid	Contact with incompatible materials.
Incompatible materials	Strong bases.
Hazardous decomposition products	Acids of phosphorous. Oxides of phosphorous. oxides of carbon

11. Toxicological information

Information on likely routes of exposure

Inhalation	Prolonged inhalation may be harmful.
Skin contact	Causes skin irritation.
Eye contact	Causes serious eye damage.
Ingestion	Harmful if swallowed.
Symptoms related to the physical, chemical and toxicological characteristics	Contact with this material will cause burns to the eyes. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Permanent eye damage including blindness could result. Skin irritation. May cause redness and pain. Irritating to mouth, throat, and stomach.

Information on toxicological effects

Acute toxicity Harmful if swallowed. Causes eye burns. Causes skin irritation.

Components	Species	Test Results
Phosphonic acid (CAS 13598-36-2)		
Acute		
Oral		
LD50	Rat	1895 mg/kg

Skin corrosion/irritation	Causes skin irritation.
Serious eye damage/eye irritation	Causes serious eye damage.

Respiratory or skin sensitization

Respiratory sensitization	Not a respiratory sensitizer.
Skin sensitization	This product is not expected to cause skin sensitization.
Germ cell mutagenicity	No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.
Carcinogenicity	This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

Reproductive toxicity	This product is not expected to cause reproductive or developmental effects.
Specific target organ toxicity - single exposure	Not classified.
Specific target organ toxicity - repeated exposure	Not classified.
Aspiration hazard	Not an aspiration hazard.
Chronic effects	Prolonged inhalation may be harmful.

12. Ecological information

Ecotoxicity The product is not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Persistence and degradability No data is available on the degradability of this product.

Bioaccumulative potential No data available.

Mobility in soil No data available.

Other adverse effects No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component.

13. Disposal considerations

Disposal instructions Collect and reclaim or dispose in sealed containers at licensed waste disposal site. Dispose of contents/container in accordance with local/regional/national/international regulations.

Local disposal regulations Dispose in accordance with all applicable regulations.

Hazardous waste code The waste code should be assigned in discussion between the user, the producer and the waste disposal company.

Waste from residues / unused products Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).

Contaminated packaging Empty containers should be taken to an approved waste handling site for recycling or disposal. Since emptied containers may retain product residue, follow label warnings even after container is emptied.

14. Transport information

DOT

Not regulated as dangerous goods.

IATA

Not regulated as dangerous goods.

IMDG

Not regulated as dangerous goods.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code Not established.

15. Regulatory information

US federal regulations This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.
All components are on the U.S. EPA TSCA Inventory List.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

CERCLA Hazardous Substance List (40 CFR 302.4)

Not listed.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories Immediate Hazard - Yes
Delayed Hazard - No
Fire Hazard - No
Pressure Hazard - No
Reactivity Hazard - No

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical Yes

SARA 313 (TRI reporting)

Not regulated.

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Safe Drinking Water Act (SDWA) Not regulated.

US state regulations

US. Massachusetts RTK - Substance List

Not regulated.

US. New Jersey Worker and Community Right-to-Know Act

Phosphonic acid (CAS 13598-36-2)

US. Pennsylvania Worker and Community Right-to-Know Law

Not listed.

US. Rhode Island RTK

Not regulated.

US. California Proposition 65

California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65): This material is not known to contain any chemicals currently listed as carcinogens or reproductive toxins.

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates this product complies with the inventory requirements administered by the governing country(s).
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

Issue date 10-February-2015

Revision date -

Version # 01

HMIS® ratings Health: 2
Flammability: 0
Physical hazard: 0

Disclaimer cannot anticipate all conditions under which this information and its product, or the products of other manufacturers in combination with its product, may be used. It is the user's responsibility to ensure safe conditions for handling, storage and disposal of the product, and to assume liability for loss, injury, damage or expense due to improper use. The information in the sheet was written based on the best knowledge and experience currently available.

APPENDIX H
FIELD INSPECTION FORMS

OPERATIONS AND MAINTENANCE PLAN
Hot Water Flushing System
Skykomish School
Skykomish, Washington

Farallon PN: 683-057

Operations and Maintenance Field Form
Skykomish School HWF
Skykomish, Washington
Farallon PN: 683-057

OPERATOR NAME: _____

DATE: _____

***INSPECTIONS SHALL BE PERFORMED DAILY DURING HOT WATER FLUSHING OPERATIONS AND WEEKLY DURING COLD WATER FLUSHING OPERATIONS.**

WATER TREATMENT											
System Flow		Heat Exchanger/ HTX-101		Sequestrant Injection		BAG FILTERS/ V-304		PRIMARY GAC/ V-305		SECONDARY GAC/ V-306	
INSTANT FLOW/ FE150 (GPM)	TOTAL FLOW/ FE150 (GALLONS)	INLET TEMP/ TI150 (F)	OUTLET TEMP / TI151 (F)	Sequestrant Injection (gal/hr)	Sequestrant Storage (gal)	INLET PRESSURE (PSI)	OUTLET PRESSURE (PSI)	INLET PRESSURE (PSI)	OUTLET PRESSURE (PSI)	INLET PRESSURE (PSI)	OUTLET PRESSURE (PSI)

Soil Vapor Extraction System												
SVE-1 FLOW / FE301 (SCFM)	SVE-2 FLOW / FE302 (SCFM)	SVE-3 FLOW / FE303 (SCFM)	SVE-4 FLOW / FE304 (SCFM)	SVE-5 FLOW / FE305 (SCFM)	SVE-6 FLOW / FE306 (SCFM)	HTX INF TEMP / TI351 (°F)	HTX EFF TEMP / TI352 (°F)	SYSTEM VACUUM (IWC)	Blower Speed (RPM)	VOCs LEAD GAC INF (PPM via PID)	VOCs LEAD GAC EFF (PPM via PID)	VOCs at Stack (PPM, via PID)

BOILER/CHILLER									
Boiler		Heat Exchanger		Fuel		Chiller		Heat Exchanger	
BLOW-DOWN TANK (GAL)	PRESSURE (PSI)	INLET TEMP (F)	OUTLET TEMP (F)	DIESEL TANK (gal)		Recycle Flow (GPM)	PRESSURE (PSI)	INLET TEMP (F)	OUTLET TEMP (F)

Operations and Maintenance Field Form
Skykomish School HWF
Skykomish, Washington
Farallon PN: 683-057

RECOVERY WELLS

RW-1			RW-2			RW-3			RW-4			RW-5		
Depth to Product (Feet)	Depth to Water (Feet)	Oil Tank Level	Depth to Product (Feet)	Depth to Water (Feet)	Oil Tank Level	Depth to Product (Feet)	Depth to Water (Feet)	Oil Tank Level	Depth to Product (Feet)	Depth to Water (Feet)	Oil Tank Level	Depth to Product (Feet)	Depth to Water (Feet)	Oil Tank Level

RW-6			RW-7			RW-8			RW-9			RW-10		
Depth to Product (Feet)	Depth to Water (Feet)	Oil Tank Level	Depth to Product (Feet)	Depth to Water (Feet)	Oil Tank Level	Depth to Product (Feet)	Depth to Water (Feet)	Oil Tank Level	Depth to Product (Feet)	Depth to Water (Feet)	Oil Tank Level	Depth to Product (Feet)	Depth to Water (Feet)	Oil Tank Level

NAPL RECOVERY

RW-1			RW-2			RW-3			RW-4			RW-5		
SKIMMER MODE (HOA)	SKIMMER TANK (% FULL)	QUANTITY NAPL REMOVED (GAL)	SKIMMER MODE (HOA)	SKIMMER TANK (% FULL)	QUANTITY NAPL REMOVED (GAL)	SKIMMER MODE (HOA)	SKIMMER TANK (% FULL)	QUANTITY NAPL REMOVED (GAL)	SKIMMER MODE (HOA)	SKIMMER TANK (% FULL)	QUANTITY NAPL REMOVED (GAL)	SKIMMER MODE (HOA)	SKIMMER TANK (% FULL)	QUANTITY NAPL REMOVED (GAL)

RW-6			RW-7			RW-8			RW-9			RW-10		
SKIMMER MODE (HOA)	SKIMMER TANK (% FULL)	QUANTITY NAPL REMOVED (GAL)	SKIMMER MODE (HOA)	SKIMMER TANK (% FULL)	QUANTITY NAPL REMOVED (GAL)	SKIMMER OPERATION MODE (HOA)	SKIMMER TANK (% FULL)	QUANTITY NAPL REMOVED (GAL)	SKIMMER OPERATION MODE (HOA)	SKIMMER TANK (% FULL)	QUANTITY NAPL REMOVED (GAL)	SKIMMER OPERATION MODE (HOA)	SKIMMER TANK (% FULL)	QUANTITY NAPL REMOVED (GAL)