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1. Skagit Valley Farm Coding LLC
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P38129

I Reilly Desmul, am hereby requesting an emergency non-standard recording for an additional fee provided in RCW 36.18.010. I understand that the recording processing requirements may cover up or otherwise obscure some part of the text of the original document. Recording fee is ~~$99.00~~ 10.50 for the first page, $1.00 per page thereafter per document. In addition to the standard fee, an emergency recording fee of $50.00 is assessed. This statement is to become part of the recorded document.

Signed Reilly Desmul Dated 07/10/2019

TRICO Companies, LLC
PO Box 409
Burlington, WA 98233

Permanent Stormwater Control Facilities Operation and Maintenance (O&M) Manual

Grantor:

TRICO Companies, LLC

Grantee:

Skagit Valley Farm Cooling, LLC

Legal Description:

The North half of government lot 2, except the as-built and existing county road running along the west line thereof known as Pulver Road; also the North half of the Southeast quarter of the of the Northwest quarter of Section 31, Township 35 North, Range 4 East, W.M.

The North half of the South half of government lot 2, section 31, Township 35 North, Range 4 East, W.M.; except the as-built and existing county road running along the west line thereof known as Pulver Road.

Situate in the County of Skagit, State of Washington.

Parcel Number:

P38129

Permanent Stormwater Control Facilities Operation and Maintenance (O&M) Manual

for:

Skagit Valley Farm Cooling, LLC

Located at:

11261 Pulver Road Burlington, WA 98233

Prepared by:

TRICO Companies, LLC
15066 Josh Wilson Road Burlington, WA 98233

STORMWATER SYSTEM MAINTENANCE PLAN
for
SKAGIT VALLEY FARM COOLING, LLC

1.0 Introduction

The intent of this stormwater maintenance manual is to provide the owners and assistance in performing proper maintenance of their stormwater facilities.

The stormwater drainage system designed and constructed for the facility, is located throughout the property at parcel number P38129.

Maintenance of the drainage system is of primary importance in order to ensure that the infiltration structures function as originally designed. The infiltration structures included within the designed stormwater system include bioretention swales, an infiltration pond, as well as a Contech storm filter and oil water separator. It is the sole responsibility of the property owners to maintain and repair the systems, as required.

The system shall be maintained in conformity with applicable sections of the Stormwater Management Manual for Western Washington (excerpts attached), and the requirements of the Skagit County. See attached checklists for requirements.

Stormwater management facilities onsite consist of collection and conveyance systems, infiltration and treatment facilities. The combination will convey and treat the stormwater runoff from the site, as well as infiltrate the water into the existing native soils.

As-built construction drawings are attached in Appendix B, and should be consulted for pipe size and material, and existing easements.

As-built construction drawings should be consulted during maintenance, inspection and repair activities.

2.0 Stormwater Management Facilities

It is useful to have a general knowledge of how the stormwater management facilities on site function, to better understand the facility's maintenance requirements. There are three components to the existing system: collection / conveyance, quantity and quality control.

The on-site permanent stormwater facilities to be maintained by the owner consist of common storm drains, common roof drains, bioretention cells, storm filters, and the associated plantings, except any such items which are dedicated to, owned by or maintained by the County.

2.1 Collection and Conveyance Systems

Collection and conveyance systems intercept and transport stormwater, and consist of catch basins, pavement graded to conduct sheet flow towards curb cuts to the bio retention cells that collects water, swales/ditches and pipes (solid and perforated) that convey the water. Stormwater conveyance systems are designed to provide adequate capacity for the site. Typical failures include reduced capacity due to clogged catch basin grates or pipes. Plugging commonly occurs due to sediment and large debris washed down from adjacent surfaces. Reduced conveyance system capacity can result in localized flooding.

2.2 Stormwater Quality Control

Stormwater treatment facilities onsite provide sediment settling and filtration through treatment soils and vegetation. Stormwater treatment facilities have limited treatment capability, and are not intended to replace proper site management. The most effective technique for reducing pollutant discharge from the site is to provide good housekeeping through source control Best Management Practices, provided in Appendix A.

2.3 Stormwater Quantity Control

Stormwater flow control facilities onsite provide mitigation for the additional runoff that the development will create. Stormwater control facilities are engineered to detain and infiltrate stormwater runoff.

3.0 Facility Descriptions

Each of the following subsections includes a facility description. The required maintenance and checklists can be found in Appendices D through N – Inspection and Maintenance Requirements.

3.1 Catch Basins / Area Drains
3.2 Shrubbery / Landscaping
3.3 Roof Downspouts
3.4 Bioretention Cells
3.5 Debris Barriers
3.6 Energy Dissipators
3.7 Filter Strips
3.8 Manufactured Media Filter
3.9 Oil Water Separator
3.10 Stormwater Pump Station
3.11 Infiltration Pond

3.1 Catch Basins / Area Drains

Catch basins are underground concrete structures typically provided with a slotted grate to collect stormwater runoff and route it through underground pipes.

A Type 1 and 1L are rectangular structures, utilized when the connected pipes are less than 18" in diameter and the depth from the grate to the bottom of the lowest pipe is less than 5 feet.

A Type 2 catch basin is a round structure, ranging in diameter of 4 to 8 feet, and is utilized when the connecting pipes are 18" or greater in diameter, or the depth from grate to bottom of the lowest pipe exceeds 5 feet. They will typically have a ladder mounted on the inside of the structure to allow for access and maintenance.

A Burlington basin or other localized area drain is a small rectangular or round structure, utilized at intersections or directional changes for roofdrains, yard drains, or other small diameter pipes.

A cleanout is an access point to a junction or end of pipe. It is typically the same diameter of the pipe it is connected to, and gives access for flow observation, water level observation and the ability to flush a pipe out with high velocity flow.

Curb and gutter along the sidewalk is graded to convey sheet flow run off to the curb cuts to infiltrate the bioretention cells and discharge to catch basins.

All catch basin types typically provide a storage volume below the outlet pipe, called a sump, to allow sediments and debris to settle out of the stormwater runoff.

The most common cleaning method for catch basin sumps is to utilize a truck with a tank and vacuum hose (vactor truck) to remove sediment and debris buildup from the sump. Catch basins are an enclosed space, where vapors can accumulate. If the inspection or cleaning requires entering the catch basin, it should be conducted by an individual with training and certification in working in hazardous, confined spaces.

There are 27 Type I or IL catch basins on-site, 9 Type II and 1 Burlington Basin.

See Appendix D for maintenance items and schedule

3.2 Shrubbery / Landscaping

Landscaping is an essential component of stormwater management. Bare soil areas generate higher levels of stormwater runoff and sedimentation in stormwater facilities. There are many landscaped areas on site that are prone to erosion if not maintained.

Landscaping and vegetation should be maintained, deleterious plants and materials removed. Erosion or other types of soil disturbance should be remedied on a regular basis, and new mulch applied yearly.

See Appendix E for maintenance items and schedule.

3.3 Building Downspouts

Building downspouts connect the building's roof gutters to the storm conveyance/infiltration systems. Due to minimal pipe slope from the downspout pipe to the underground storm system, these need to be inspected each year and jetted if a build-up of deleterious material is found. Jetting shall occur from the cleanout to a downstream CB or cleanout, prior to the infiltration system. Jetting shall not occur through perforated storm pipe.

Gutters must be maintained and kept clean and free of silt and deleterious organics.

See Appendix F for maintenance items and schedule.

3.4 Bioretention Cells

Bioretention cells are localized depressions within the landscaped areas, that can collect runoff from the adjoining impervious areas. These shallow ponding areas are constructed with an engineered soil mix and plantings, that treat the stormwater as the stormwater infiltrates through the system's soils, into an underlying rock reservoir and pipe underdrain.

The bioretention cells both treat the stormwater they catch, and provide a small amount of detention within the cell and underlying rock reservoir, while infiltration into the underlying soils occurs.

There are seven (7) bioretention cell on site. Typical maintenance of bioretention cells includes removal of trash, debris, deleterious plants/weeds, soil maintenance, and renewal of plants and mulch/organic soils within the bottom.

See Appendix G for maintenance items and schedule.

3.5 Debris Barriers / Trash Racks

Debris barriers are a structural device used to prevent debris from entering a spillway or other hydraulic structure. Debris barriers should be kept free of debris to maintain designed flow capacity and inspected for damage.

See Appendix H for maintenance items and schedule.

3.6 Energy Dissipators

Energy dissipators are mechanisms that reduce velocity prior to, or at, discharge from an outfall in order to prevent erosion. They are utilized as outlet protection and generally consist of quarry spalls. Energy dissipaters should be inspected and repaired as needed by adding rock and removing sediment build-up.

See Appendix I for maintenance items and schedule.

3.7 Filter Strip

The filter strip is a grassy area with gentle slopes that treats stormwater runoff from adjacent paved areas before it concentrates into a discrete channel. The filter strip is designed to remove low concentrations and quantities of total suspended solids (TSS), heavy metals, petroleum hydrocarbons, and/or nutrients from stormwater. Pollutants are removed through filtration, soil sorption, and/or plant uptake.

See Appendix J for maintenance items and schedule.

3.8 Manufactured Media Filter

Both water quality and catchment issues can be resolved with the use of the Catch Basin Storm Filter (CBSF). The CBSF consists of a sumped inlet chamber and a cartridge chamber. Runoff enters the sumped inlet chamber either by sheet flow from a paved surface or from an inlet pipe discharging directly to the unit vault. The inlet chamber is equipped with an internal baffle, which traps debris and floating oil and grease, and an overflow weir. While in the inlet chamber, heavier solids are allowed to settle into the deep sump, while lighter solids and soluble pollutants are directed under the baffle and into the cartridge chamber through a port between the baffle and the overflow weir. Once in the cartridge chamber, polluted water ponds and percolates horizontally through the media in the filter cartridges. Treated water collects in the cartridge's center tube from where it is directed by an under-drain manifold to the outlet pipe on the downstream side of the overflow weir and discharged. When flows into the CBSF exceed the water quality design value, excess water spills over the overflow weir, bypassing the cartridge bay, and discharges to the outlet pipe

See Appendix K for maintenance items and schedule.
See Appendix K for Manufactured Media Filter Operation and Maintenance Manual

3.9 Oil Water Separator

Oil Separators are utilized to remove oil and other water-insoluble hydrocarbons, and settleable solids from storm-water runoff. The CDS system screens, separates and traps debris, sediment, and oil and grease from stormwater runoff. The indirect screening capability of the system allows for 100% removal of floatables and neutrally buoyant material without blinding. Flow and screening controls physically separate captured solids, and minimize the re-suspension and release of previously trapped pollutants.

Pollutant transport and deposition may vary from year to year and regular inspections will help ensure that the system is cleaned out at the appropriate time. At a minimum, inspections should be performed twice per year (e.g. spring and fall) however more frequent inspections may be necessary in equipment washdown areas.

See Appendix L for maintenance items and schedule.
See Appendix L for Contech CDS Operation and Maintenance Manual.

3.10 Stormwater Pump Station

The stormwater pump station accepts stormwater accumulated through the storm water system and utilizes duplex 6" Zoeller 64 series pumps to convey stormwater to the infiltration pond. The pumps are contained in an 84" diameter Type II Catch Basin (See Catch Basins 3.1) and are mounted on guide rails. The pumps are triggered to discharge water when the water level inside the pump station rises to the float switches.

See Appendix M for maintenance items and schedule.
See Appendix M for Zoeller Pump Operation and Maintenance Manual.

3.11 Infiltration Pond

An infiltration pond is a drainage facility designed to use the hydrologic process of surface and stormwater runoff soaking into the ground, commonly referred to as a percolation, to dispose of surface and stormwater runoff. The infiltration facility also allows for sediment settlement prior to any discharge of stormwater. Follow the maintenance plan schedule for visual inspection and remove sediment if the volume of the ponding area has been compromised.

See Appendix N for maintenance items and schedule

4.0 Maintenance Responsibilities and Reporting

All permanent stormwater facilities: conveyance systems with catch basins and pipes, infiltration galleries, bioretention cells, shall be maintained in perpetuity in a manner that allows them to function as originally designed.

The owner, or it's designated representative (third-party), is solely responsible for the inspection, maintenance, repair and replacement of all private permanent stormwater facilities located outside of the roadway, and any and all costs associated therewith. The public conveyance system located in the roadway will be owned and maintained by Skagit County. The drainage district Dike 14 and DikeDrain 12 is responsible for the ditch on the west side of property.

The owner, or its designated representative, shall submit an annual operation and maintenance report for the permanent stormwater facilities, to the County, on or before March 31st of each year for the previous year's inspections and maintenance activities. The report shall include any remedial actions taken, how the actions were completed, who performed them, any problems encountered and any required follow-up actions such as maintenance, repair or replacement. Annual report and other maintenance records shall be maintained on-site and available to the County upon request.

The County shall have the right to enter onto the property for inspection and compliance purposes. Should inspection reports (either by the property owner or by the County) indicate the permanent stormwater facilities are not being properly maintained, or show signs of failure and the property owner has not remedied any maintenance standards exceedances, the County of reserves the right but not the obligation to perform work that is necessary to maintain the permanent stormwater facilities that have not been maintained by the property owner, and recover any and all costs so incurred by the County from the property owner. Failure to properly maintain the permanent stormwater facilities may also result in County levied fines in accordance with.

5.0 Source Control Best Management Practices

Source control Best Management Practices address multiple situations that may occur at the proposed development. Source control of pollution can prevent damage to the onsite stormwater system and its components. Source control Best Management Practices can be found in Appendix A, and are listed below:

- Landscaping and Lawn/Vegetation Management (S411 BMP)
- Maintenance of Stormwater Drainage and Treatment Systems (S417 BMP)
- Roof / Building Drains at Manufacturing and Commercial Buildings (S424 BMP)
- Spills of Oil and Hazardous Substances (S426 BMP)

Appendix A – Source Control Best Management Practices

S411 BMPs for Landscaping and Lawn/ Vegetation Management

Description of Pollutant Sources: Landscaping can include grading, soil transfer, vegetation removal, pesticide and fertilizer applications, and watering. Stormwater contaminants include toxic organic compounds, heavy metals, oils, total suspended solids, coliform bacteria, fertilizers, and pesticides.

Lawn and vegetation management can include control of objectionable weeds, insects, mold, bacteria, and other pests with pesticides. Examples include weed control on golf course lawns, access roads, and utility corridors and during landscaping; sap stain and insect control on lumber and logs; rooftop moss removal; killing nuisance rodents; fungicide application to patio decks, and residential lawn/plant care. It is possible to release toxic pesticides such as pentachlorophenol, carbamates, and organometallics to the environment by leaching and dripping from treated parts, container leaks, product misuse, and outside storage of pesticide contaminated materials and equipment. Poor management of the vegetation and poor application of pesticides or fertilizers can cause appreciable stormwater contamination.

Pollutant Control Approach: Control of fertilizer and pesticide applications, soil erosion, and site debris to prevent contamination of stormwater.

Develop and implement an Integrated Pest Management Plan (IPM) and use pesticides only as a last resort. Carefully apply pesticides/ herbicides, in accordance with label instructions. Maintain appropriate vegetation, with proper fertilizer application where practicable, to control erosion and the discharge of stormwater pollutants. Where practicable grow plant species appropriate for the site, or adjust the soil properties of the subject site to grow desired plant species.

Applicable Operational BMPs for Landscaping:

- Install engineered soil/landscape systems to improve the infiltration and regulation of stormwater in landscaped areas.
- Do not dispose of collected vegetation into waterways or storm sewer systems.

Recommended Additional Operational BMPs for Landscaping:

- Conduct mulch-mowing whenever practicable
- Dispose of grass clippings, leaves, sticks, or other collected vegetation, by composting, if feasible.
- Use mulch or other erosion control measures on soils exposed for more than one week during the dry season or two days during the rainy season.
- Store and maintain appropriate oil and chemical spill cleanup materials in readily

accessible locations when using oil or other chemicals. Ensure that employees are familiar with proper spill cleanup procedures.

- Till fertilizers into the soil rather than dumping or broadcasting onto the surface. Determine the proper fertilizer application rate for the types of soil and vegetation encountered.
- Till a topsoil mix or composted organic material into the soil to create a well-mixed transition layer that encourages deeper root systems and drought-resistant plants.
- Use manual and/or mechanical methods of vegetation removal rather than applying herbicides, where practical.

Applicable Operational BMPs for the Use of Pesticides:

- Develop and implement an IPM (See section on IPM in Applicable Operational BMPs for Vegetation Management) and use pesticides only as a last resort.
- Implement a pesticide-use plan and include at a minimum: a list of selected pesticides and their specific uses; brands, formulations, application methods and quantities to be used; equipment use and maintenance procedures; safety, storage, and disposal methods; and monitoring, record keeping, and public notice procedures. All procedures shall conform to the requirements of Chapter 17.21 RCW and Chapter 16-228 WAC (Appendix IV-D: Regulatory Requirements That Impact Stormwater Programs (p.723) R.7).
- Choose the least toxic pesticide available that is capable of reducing the infestation to acceptable levels. The pesticide should readily degrade in the environment and/or have properties that strongly bind it to the soil. Conduct any pest control activity at the life stage when the pest is most vulnerable. For example, if it is necessary to use a Bacillus thuringiens application to control tent caterpillars, apply it to the material before the caterpillars cocoon or it will be ineffective. Any method used should be site-specific and not used wholesale over a wide area.
- Apply the pesticide according to label directions. Do not apply pesticides in quantities that exceed manufacturer's instructions.
- Mix the pesticides and clean the application equipment in an area where accidental spills will not enter surface or ground waters, and will not contaminate the soil.
- Store pesticides in enclosed areas or in covered impervious containment. Do not discharge pesticide contaminated stormwater or spills/leaks of pesticides to storm sewers. Do not hose down the paved areas to a storm sewer or conveyance ditch. Store and maintain appropriate spill cleanup materials in a location known to all near the storage area.
- Clean up any spilled pesticides. Keep pesticide contaminated waste materials in

designated covered and contained areas.

- The pesticide application equipment must be capable of immediate shutoff in the event of an emergency.
- Spraying pesticides within 100 feet of open waters including wetlands, ponds, and rivers, streams, creeks, sloughs and any drainage ditch or channel that leads to open water may have additional regulatory requirements beyond just following the pesticide product label. Additional requirements may include:
    - Obtaining a discharge permit from Ecology.
    - Obtaining a permit from the local jurisdiction.
    - Using an aquatic labeled pesticide.
- Flag all sensitive areas including wells, creeks, and wetlands prior to spraying.
- Post notices and delineate the spray area prior to the application, as required by the local jurisdiction or by Ecology.
- Conduct spray applications during weather conditions as specified in the label direction and applicable local and state regulations. Do not apply during rain or immediately before expected rain.

Recommended Additional Operational BMPs for the use of pesticides:

- Consider alternatives to the use of pesticides such as covering or harvesting weeds, substitute vegetative growth, and manual weed control/moss removal.
- Consider the use of soil amendments, such as compost, that are known to control some common diseases in plants, such as Pythium root rot, ashy stem blight, and parasitic nematodes. The following are three possible mechanisms for disease control by compost addition (USEPA Publication 530-F-9-044):
    1. Successful competition for nutrients by antibiotic production;
    2. Successful predation against pathogens by beneficial microorganism; and
    3. Activation of disease-resistant genes in plants by composts.

    Installing an amended soil/landscape system can preserve both the plant system and the soil system more effectively. This type of approach provides a soil/-landscape system with adequate depth, permeability, and organic matter to sustain itself and continue working as an effective stormwater infiltration system and a sustainable nutrient cycle.
- Once a pesticide is applied, evaluate its effectiveness for possible improvement. Records should be kept showing the effectiveness of the pesticides considered.
- Develop an annual evaluation procedure including a review of the effectiveness of

pesticide applications, impact on buffers and sensitive areas (including potable wells), public concerns, and recent toxicological information on pesticides used/-proposed for use. If individual or public potable wells are located in the proximity of commercial pesticide applications, contact the regional Ecology hydrogeologist to determine if additional pesticide application control measures are necessary.

- Rinseate from equipment cleaning and/or triple-rinsing of pesticide containers should be used as product or recycled into product.

For more information, contact the Washington State University (WSU) Extension Home-Assist Program, (253) 445-4556, or Bio-Integral Resource Center (BIRC), P.O. Box 7414, Berkeley, CA.94707, or EPA to obtain a publication entitled "Suspended, Canceled, and Restricted Pesticides" which lists all restricted pesticides and the specific uses that are allowed.

Applicable Operational BMPs for Vegetation Management:

- Use at least an eight-inch "topsoil" layer with at least 8 percent organic matter to provide a sufficient vegetation-growing medium. Amending existing landscapes and turf systems by increasing the percent organic matter and depth of topsoil can substantially improve the permeability of the soil, the disease and drought resistance of the vegetation, and reduce fertilizer demand. This reduces the demand for fertilizers, herbicides, and pesticides. Organic matter is the least water-soluble form of nutrients that can be added to the soil. Composted organic matter generally releases only between 2 and 10 percent of its total nitrogen annually, and this release corresponds closely to the plant growth cycle. Return natural plant debris and mulch to the soil, to continue recycling nutrients indefinitely.
- Select the appropriate turfgrass mixture for the climate and soil type. Certain tall fescues and rye grasses resist insect attack because the symbiotic endophytic fungi found naturally in their tissues repel or kill common leaf and stem-eating lawn insects. However, they do not, repel root-feeding lawn pests such as Crane Fly larvae, and are toxic to ruminants such as cattle and sheep. The fungus causes no known adverse effects to the host plant or to humans. Endophytic grasses are commercially available; use them in areas such as parks or golf courses where grazing does not occur. Local agricultural or gardening resources such as Washington State University Extension office can offer advice on which types of grass are best suited to the area and soil type.
- Use the following seeding and planting BMPs, or equivalent BMPs to obtain information on grass mixtures, temporary and permanent seeding procedures, maintenance of a recently planted area, and fertilizer application rates: BMP C120: Temporary and Permanent Seeding (p.278), BMP C121: Mulching (p.284), BMP C123: Plastic Covering (p.294), and BMP C124: Sodding (p.296).
- Adjusting the soil properties of the subject site can assist in selection of desired

plant species. For example, design a constructed wetland to resist the invasion of reed canary grass by layering specific strata of organic matters (e.g., composted forest product residuals) and creating a mildly acidic pH and carbon-rich soil medium. Consult a soil restoration specialist for site-specific conditions.

- Aerate lawns regularly in areas of heavy use where the soil tends to become compacted. Conduct aeration while the grasses in the lawn are growing most vigorously. Remove layers of thatch greater than ¾-inch deep.
- Mowing is a stress-creating activity for turfgrass. Grass decreases its productivity when mown too short and there is less growth of roots and rhizomes. The turf becomes less tolerant of environmental stresses, more disease prone and more reliant on outside means such as pesticides, fertilizers, and irrigation to remain healthy. Set the mowing height at the highest acceptable level and mow at times and intervals designed to minimize stress on the turf. Generally mowing only 1/3 of the grass blade height will prevent stressing the turf.

Irrigation:

- The depth from which a plant normally extracts water depends on the rooting depth of the plant. Appropriately irrigated lawn grasses normally root in the top 6 to 12 inches of soil; lawns irrigated on a daily basis often root only in the top 1 inch of soil. Improper irrigation can encourage pest problems, leach nutrients, and make a lawn completely dependent on artificial watering. The amount of water applied depends on the normal rooting depth of the turfgrass species used, the available water holding capacity of the soil, and the efficiency of the irrigation system. Consult with the local water utility, Conservation District, or Cooperative Extension office to help determine optimum irrigation practices.

Fertilizer Management:

- Turfgrass is most responsive to nitrogen fertilization, followed by potassium and phosphorus. Fertilization needs vary by site depending on plant, soil, and climatic conditions. Evaluation of soil nutrient levels through regular testing ensures the best possible efficiency and economy of fertilization. For details on soils testing, contact the local Conservation District, a soils testing professional, or a Washington State University Extension office.
- Apply fertilizers in amounts appropriate for the target vegetation and at the time of year that minimizes losses to surface and ground waters. Do not fertilize when the soil is dry. Alternatively, do not apply fertilizers within three days prior to predicted rainfall. The longer the period between fertilizer application and either rainfall or irrigation, the less fertilizer runoff occurs.
- Use slow release fertilizers such as methylene urea, IDBU, or resin coated fertilizers when appropriate, generally in the spring. Use of slow release fertilizers is especially important in areas with sandy or gravelly soils.

- Time the fertilizer application to periods of maximum plant uptake. Ecology generally recommends application in the fall and spring, although Washington State University turf specialists recommend four fertilizer applications per year.
- Properly trained persons should apply all fertilizers. Apply no fertilizer at commercial and industrial facilities, to grass swales, filter strips, or buffer areas that drain to sensitive water bodies unless approved by the local jurisdiction.

Integrated Pest Management

An IPM program might consist of the following steps:

Step 1: Correctly identify problem pests and understand their life cycle

Step 2: Establish tolerance thresholds for pests.

Step 3: Monitor to detect and prevent pest problems.

Step 4: Modify the maintenance program to promote healthy plants and discourage pests.

Step 5: Use cultural, physical, mechanical or biological controls first if pests exceed the tolerance thresholds.

Step 6: Evaluate and record the effectiveness of the control and modify maintenance practices to support lawn or landscape recovery and prevent recurrence.

For an elaboration of these steps, refer to Appendix IV-F: Example of an Integrated Pest Management Program (p.739).

S417 BMPs for Maintenance of Stormwater Drainage and Treatment Systems

Description of Pollutant Sources: Facilities include roadside catch basins on arterials and within residential areas, conveyance systems, detention facilities such as ponds and vaults, oil/water separators, biofilters, settling basins, infiltration systems, and all other types of stormwater treatment systems presented in Volume V (p.765). Oil and grease, hydrocarbons, debris, heavy metals, sediments and contaminated water are found in catch basins, oil and water separators, settling basins, etc.

Pollutant Control Approach: Provide maintenance and cleaning of debris, sediments, and oil from stormwater collection, conveyance, and treatment systems to obtain proper operation.

Applicable Operational BMPs:

Maintain stormwater treatment facilities per the operations and maintenance (O&M) procedures presented in V-4.6 Maintenance Standards for Drainage Facilities (p.829) in addition to the following BMPs:

- Inspect and clean treatment BMPs, conveyance systems, and catch basins as needed, and determine necessary O&M improvements.
- Promptly repair any deterioration threatening the structural integrity of stormwater facilities. These include replacement of clean-out gates, catch basin lids, and rock in emergency spillways.
- Ensure adequacy of storm sewer capacities and prevent heavy sediment discharges to the sewer system.
- Regularly remove debris and sludge from BMPs used for peak-rate control, treatment, etc. and discharge to a sanitary sewer if approved by the sewer authority, or truck to an appropriate local or state government approved disposal site.
- Clean catch basins when the depth of deposits reaches 60 percent of the sump depth as measured from the bottom of basin to the invert of the lowest pipe into or out of the basin. However, in no case should there be less than six inches clearance from the debris surface to the invert of the lowest pipe. Some catch basins (for example, WSDOT Type 1L basins) may have as little as 12 inches sediment storage below the invert. These catch basins need frequent inspection and cleaning to prevent scouring. Where these catch basins are part of a stormwater collection and treatment system, the system owner/operator may choose to concentrate maintenance efforts on downstream control devices as part of a systems approach.
- Clean woody debris in a catch basin as frequently as needed to ensure proper operation of the catchbasin.
- Post warning signs; "Dump No Waste - Drains to Ground Water," "Streams," "Lakes," or emboss on or adjacent to all storm drain inlets *where possible*.
- Disposal of sediments and liquids from the catch basins must comply with Appendix IV-G: Recommendations for Management of Street Wastes (p.743).

Additional Applicable BMPs: Select additional applicable BMPs from this chapter depending on the pollutant sources and activities conducted at the facility. Those BMPs include:

- S425 BMPs for Soil Erosion and Sediment Control at Industrial Sites (p.665)
- S427 BMPs for Storage of Liquid, Food Waste, or Dangerous Waste Containers (p.667)
- S426 BMPs for Spills of Oil and Hazardous Substances (p.666)
- S410 BMPs for Illicit Connections to Storm Drains (p.633)
- S430 BMPs for Urban Streets (p.684)

S424 BMPs for Roof/ Building Drains at Manufacturing and Commercial Buildings

Description of Pollutant Sources: Stormwater runoff from roofs and sides of manufacturing and commercial buildings can be sources of pollutants caused by leaching of roofing materials, building vents, and other air emission sources. Research has identified vapors and entrained liquid and solid droplets/particles as potential pollutants in roof/building runoff. Metals, solvents, acidic/alkaline pH, BOD, and organics, are some of the pollutant constituents identified.

Ecology has performed a study on zinc in industrial stormwater. The study is presented in Ecology Publication 08-10-025 *Suggested Practices to reduce Zinc Concentrations in Industrial Stormwater Discharges*, website: https://-fortress.wa.gov/ecy/publications/summarypages/0810025.html. The user should refer to this document for more details on addressing zinc in stormwater.

Pollutant Control Approach: Evaluate the potential sources of stormwater pollutants and apply source control BMPs where feasible.

Applicable Operational Source Control BMPs:

- If leachates and/or emissions from buildings are suspected sources of stormwater pollutants, then sample and analyze the stormwater draining from the building.
- Sweep the area routinely to remove any zinc residuals.
- If a roof/building stormwater pollutant source is identified, implement appropriate source control measures such as air pollution control equipment, selection of materials, operational changes, material recycle, process changes, etc.

Applicable Structural Source Control BMPs:

- Paint/coat the galvanized surfaces as described in Ecology Publication # 08-10-025.

Applicable Treatment BMPs:

Treat runoff from roofs to the appropriate level. The facility may use enhanced treatment BMPs as described in Volume V (p.765). Some facilities regulated by the Industrial Stormwater General Permit, or local jurisdiction, may have requirements than cannot be achieved with enhanced treatment BMPs. In these cases, additional treatment measures may be required. A treatment method for meeting stringent requirements such as Chitosan-Enhanced Sand Filtration may be appropriate.

S426 BMPs for Spills of Oil and Hazardous Substances

Description of Pollutant Sources: Federal law requires owners or operators of facilities engaged in drilling, producing, gathering, storing, processing, transferring, distributing, refining, or consuming oil and/or oil products to have a Spill Prevention and Emergency Cleanup Plan (SPECP). The SPECP is required if the above ground storage capacity of the facility, is 1,320 gallons or more of oil. Additionally, the SPECP is required if any single container with a capacity in excess of 660 gallons and which, due to their location, could reasonably be expected to discharge oil in harmful quantities, as defined in 40 CFR Part 110, into or upon the navigable waters of the United States or adjoining shorelines {40 CFR 112.1 (b)}. Onshore and offshore facilities, which, due to their location, could not reasonably be expected to discharge oil into or upon the navigable waters of the United States or adjoining shorelines are exempt from these regulations {40 CFR 112.1(1)(i)}. State Law requires owners of businesses that produce dangerous wastes to have a SPECP. These businesses should refer to Appendix IV-D: Regulatory Requirements That Impact Stormwater Programs (p.723) R.6. The federal definition of oil is oil of any kind or any form, including, but not limited to petroleum, fuel oil, sludge, oil refuse, and oil mixed with wastes other than dredged spoil.

Pollutant Control Approach: Maintain, update, and implement a Spill Prevention and Emergency Cleanup Plan.

Applicable Operational BMPs: The businesses and public agencies identified in Appendix IV-A: Urban Land Uses and Pollutant Generating Sources (p.695) required to prepare and implement a Spill Prevention and Emergency Cleanup Plan shall implement the following:

- Prepare a Spill Prevention and Emergency Cleanup Plan (SPECP), which includes:
    - A description of the facility including the owner's name and address.
    - The nature of the activity at the facility.
    - The general types of chemicals used or stored at the facility.
    - A site plan showing the location of storage areas for chemicals, the locations of storm drains, the areas draining to them, and the location and description of any devices to stop spills from leaving the site such as positive control valves.
    - Cleanup procedures.
    - Notification procedures used in the event of a spill, such as notifying key personnel. Agencies such as Ecology, local fire department, Washington State Patrol, and the local Sewer Authority, shall be notified.
    - The name of the designated person with overall spill cleanup and notification responsibility.

- Train key personnel in the implementation of the SPECP. Prepare a summary of the plan and post it at appropriate points in the building, identifying the spill cleanup coordinators, location of cleanup kits, and phone numbers of regulatory agencies to contact in the event of a spill.
- Update the SPECP regularly.
- Immediately notify Ecology, the local jurisdiction, and the local Sewer Authority if a spill may reach sanitary or storm sewers, ground water, or surface water, in accordance with federal and Ecology spill reporting requirements.
- Immediately clean up spills. Do not use emulsifiers for cleanup unless there is an appropriate disposal method for the resulting oily wastewater. Do not wash absorbent material down a floor drain or into a storm sewer.
- Locate emergency spill containment and cleanup kit(s) in high-potential spill areas. The contents of the kit shall be appropriate for the type and quantities of chemical liquids stored at the facility.

Recommended Additional Operational BMP: Spill kits should include appropriately lined drums, absorbent pads, and granular or powdered materials for neutralizing acids or alkaline liquids where applicable. In fueling areas: Package absorbent material in small bags for easy use and make available small drums for storage of absorbent and/or used absorbent. Deploy spill kits in a manner that allows rapid access and use by employees.

Appendix B – As-Built Construction Plans

IN A PORTION OF SECTION 18, TOWNSHIP 33 N., RANGE 4 E., W.M.

SKAGIT VALLEY FARM COOLING FACILITY SITE PLAN
FOR
HARTHORNE HAGEN ARCHITECTS

SKAGIT COUNTY, WASHINGTON
APRIL 2018

LEGAL DESCRIPTION
THE NORTH HALF OF GOVERNMENT LOT 2, EXCEPT THE AS-BUILT AND EXISTING COUNTY ROAD RUNNING ALONG THE WEST LINE THEREOF KNOWN AS PULVER ROAD; ALSO THE NORTH HALF OF THE SOUTHEAST QUARTER OF THE NORTHWEST QUARTER OF SECTION 31, TOWNSHIP 35 NORTH, RANGE 4 EAST, W.M.

THE NORTH HALF OF THE SOUTH HALF OF GOVERNMENT LOT 2, SECTION 31, TOWNSHIP 35 NORTH, RANGE 4 EAST, W.M.; EXCEPT THE AS-BUILT AND EXISTING COUNTY ROAD RUNNING ALONG THE WEST LINE THEREOF KNOWN AS PULVER ROAD,

SITUATE IN THE COUNTY OF SKAGIT, STATE OF WASHINGTON.

BASIS OF BEARING
S 88°49'08" E ALONG THE MONUMENTED EAST/WEST CENTER OF SECTION 31, TOWNSHIP 35 NORTH, RANGE 4 EAST, WM. [DATUM: NAD83-(2011)]

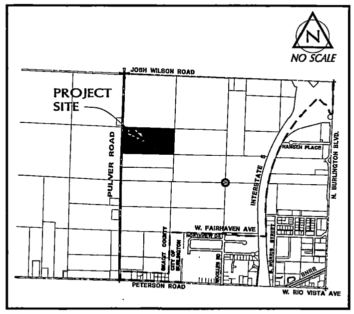
VERTICAL NOTE - DATUM NAVD 88'
VERTICAL DATUM BASED ON W.S.R.N. GPS TIE. DATUM = N.A.V.D. 88'
NAVD 88 – NGVD 29 = 3.81'
FLOOD ELEV. = 23.5' (NGVD 29) + 3.81' = 27.31' NAVD 88
27.31' + 1.00 = FINISH FLOOR 28.31' NAVD 88.
BENCHMARK SHOWN HEREON IS THE TOP NUT OF A FIRE HYDRANT ON THE WEST SIDE OF PULVER ROAD ON THE WEST SIDE OF THE ROAD NEAR THE NORTHWEST CORNER OF THE PROPERTY.

HORIZONTAL DATUM
NORTH AMERICAN DATUM (NAD) 1983/1991 ADJUSTMENT, GEOID 2012.

FIELD EQUIPMENT
THIS SURVEY WAS ACCOMPLISHED BY FIELD TRAVERSE WITH A "TRIMBLE S6" AND A TRIMBLE 5800 DUAL FREQUENCY GPS RECEIVER, STANDARD ERROR DISTANCE +/- 2CM (+ 1 PPM), AND MEETS OR EXCEEDS STANDARDS AS SET FORTH IN W.A.C. CH. 332-130.

UNDERGROUND UTILITY NOTE
UNDERGROUND UTILITY LOCATIONS SHOWN HEREON ARE BASED ON SURFACE INDICATORS, AND UTILITY MAPS PROVIDED BY THE CITY OF BURLINGTON, NO UNDERGROUND UTILITY SERVICE WAS USED FOR THEIR EXACT LOCATION. THE USE OF THIS MAP FOR THEIR EXACT LOCATION IS NOT WARRANTED.

SITE INFORMATION
PARCEL NUMBER: P38129
ADDRESS: 11261 AND 11263 PULVER ROAD
ZONING: AG-NRL, AGRICULTURAL NATURAL RESOURCE LAND
PARCEL AREA: 838,522 SF – 19.25 ACRES
ADJOINING OWNERSHIP: P38156, P38130



VICINITY MAP
SCALE: 1" = 1000'

SHEET INDEX

SHEET NUMBER	SHEET TITLE
C1 OF 19	COVER SHEET
~~C2 OF 19~~	~~EXISTING CONDITIONS, DEMOLITION & SWPP PLAN~~
~~C3 OF 19~~	~~TESC DETAILS AND SPECIFICATIONS~~
~~C4 OF 19~~	~~SITE AND DIMENSIONAL PLAN~~
C5 OF 19	OVERALL GRADING AND UTILITY PLAN
C6 OF 19	NORTH SITE GRADING PLAN
C7 OF 19	SOUTH SITE GRADING PLAN
C8 OF 19	NORTH SITE STORMWATER PLAN
C9 OF 19	SOUTH SITE STORMWATER PLAN
C10 OF 19	SITE CROSS SECTION A-A
~~C11 OF 19~~	~~SITE CROSS SECTION B-B~~
C12 OF 19	POND CROSS SECTION C-C
C13 OF 19	CONSTRUCTION DETAILS
C14 OF 19	CONSTRUCTION DETAILS
C15 OF 19	CONSTRUCTION DETAILS
~~C16 OF 19~~	~~WSDOT STANDARD PLANS~~
C17 OF 19	PUMP STATION DETAILS AND SPECIFICATIONS
~~C18 OF 19~~	~~CONSTRUCTION SPECIFICATIONS~~
~~C19 OF 19~~	~~PUD WATER DETAILS AND SPECIFICATIONS~~

LEGEND

EXISTING	PROPOSED
EXISTING RIGHT OF WAY LINE	PROPOSED SIGN
EXISTING ROAD CENTERLINE	PROPOSED STORM DRAIN
EXISTING PROPERTY LINE	PROPOSED STORM DRAIN FORCEMAIN
EXISTING PROPERTY CORNER	PROPOSED GRAVEL TRENCH BED
EXISTING STORM DRAIN	PROPOSED STORM CATCH BASIN TYPE II
EXISTING TYPE 2 CB	PROPOSED STORM CATCH BASIN
EXISTING TYPE 1 CB	PROPOSED BUILDING DOWNSPOUT
EXISTING SANITARY SEWER	PROPOSED SANITARY SEWER
EXISTING SANITARY MANHOLE	PROPOSED SANITARY MANHOLE
EXISTING WATERLINE	PROPOSED SANITARY SEWER CLEANOUT
EXISTING WATER VALVE	PROPOSED WATERLINE
EXISTING FIRE HYDRANT	PROPOSED WATER GATE VALVE
EXISTING GAS LINE	PROPOSED FIRE HYDRANT
EXISTING POWERLINE	PROPOSED AIR-VAC RELEASE ASSEMBLY
EXISTING FENCELINE	PROPOSED BLOW-OFF ASSEMBLY
EXISTING EDGE OF ASPHALT	PROPOSED UTILITY TRENCH
EXISTING CONCRETE	PROPOSED GAS LINE
EXISTING ASPHALT	PROPOSED POWERLINE
EXISTING GRAVEL	PROPOSED CURB AND GUTTER
EXISTING CONTOUR	PROPOSED CONCRETE
PROPOSED CONTOUR	PROPOSED HEAVY ASPHALT SECTION
	PROPOSED LIGHT ASPHALT SECTION
	PROPOSED GRAVEL
	ECC PROPOSED EXTRUDED CONCRETE CURB
	TBC PROPOSED CONCRETE TRAFFIC BARRIER CURB
	BRC PROPOSED BIORETENTION CELL

REVISION CLOUDS FOUND ON REFERENCED SHEET
REVISION DATE 08.20.18.REV.7

CONSTRUCTION RECORD DRAWING

CONSTRUCTION RECORD NOTE:
THESE DRAWINGS ARE PREPARED USING A COMBINATION OF CONTRACTOR PROVIDED REDLINES AND AN AS-BUILT SURVEY. THE CONSTRUCTION RECORDS OF SAID DRAWINGS WERE PERFORMED BY SOUND DEVELOPMENT GROUP 07.08.19.

CONSTRUCTION RECORD LEGEND
102.00 -INDICATES UN-MEASURABLE
~~102.00~~ 102.02 -INDICATES CONSTRUCTION RECORD
102.00 ✓ -INDICATES CONSTRUCTED AS DESIGNED

UTILITIES SERVING THE SITE

WATER:
SKAGIT COUNTY PUD No. 1
CONTACT: MIKE DEMERS
(360) 848-2157

TELEPHONE:
FRONTIER
CONTACT: CHRIS PARMETER
(360) 707-0641

GAS:
CASCADE NATURAL GAS
CONTACT: TED MCCAMMANT/JAMES HOBBS
(360) 336-3876

CABLE:
COMCAST
CONTACT: CASEY JONES
(360) 527-8243

POWER:
PUGET SOUND ENERGY/POTELCO
CONTACT: STEVE DODSON
(360) 766-5475

ENGINEER/SURVEYOR:
SOUND DEVELOPMENT GROUP, L.L.C.
PAT SEVERIN, P.E./TAMMY ZEMPEL
P.O. BOX 1705
MOUNT VERNON, WA 98273
PHONE: (360) 404-2010
FAX: (360) 404-2013
EMAIL: PAT@SDG-LLC.COM/TAMMY@SDG-LLC.COM

CONTRACTOR
TRICO COMPANIES
NATE WOLFE
15066 JOSH WILSON ROAD
BURLINGTON, WA 98233
PHONE: 360.757.2373
CELL: 360.333.1271
EMAIL: NATE@TRICOCOMPANIES.COM

OWNER:
SKAGIT VALLEY FARM COOLING, LLC
TONY WISDOM
23159 HOWEY ROAD
SEDRO-WOOLLEY, WA 98284
EMAIL: TONY@SKAGITVALLEYFARM.COM

ARCHITECT:
HARTHORNE HAGEN ARCHITECTS
BOB HARTHORNE
1725 8TH AVENUE NORTH
SEATTLE, WA 98109
PHONE: 206.285.3555
EMAIL: STUARTS@HHASEATTLE.COM

GEOTECHNICAL ENGINEER
GEOTEST SERVICES INC.
DAVID RAUCH
741 MARINE DRIVE
BELLINGHAM, WA 98225
PHONE: 360.733.7318
EMAIL: DAVIDR@GEOTEST-INC.COM

PATRICK SEVERIN, STATE OF WASHINGTON, 32228, REGISTERED PROFESSIONAL ENGINEER

PN 3750 CO 5019

SKAGIT COUNTY PLANNING & DEVELOPMENT | DATE

SKAGIT CO. 18-0124
JOB No. 18005

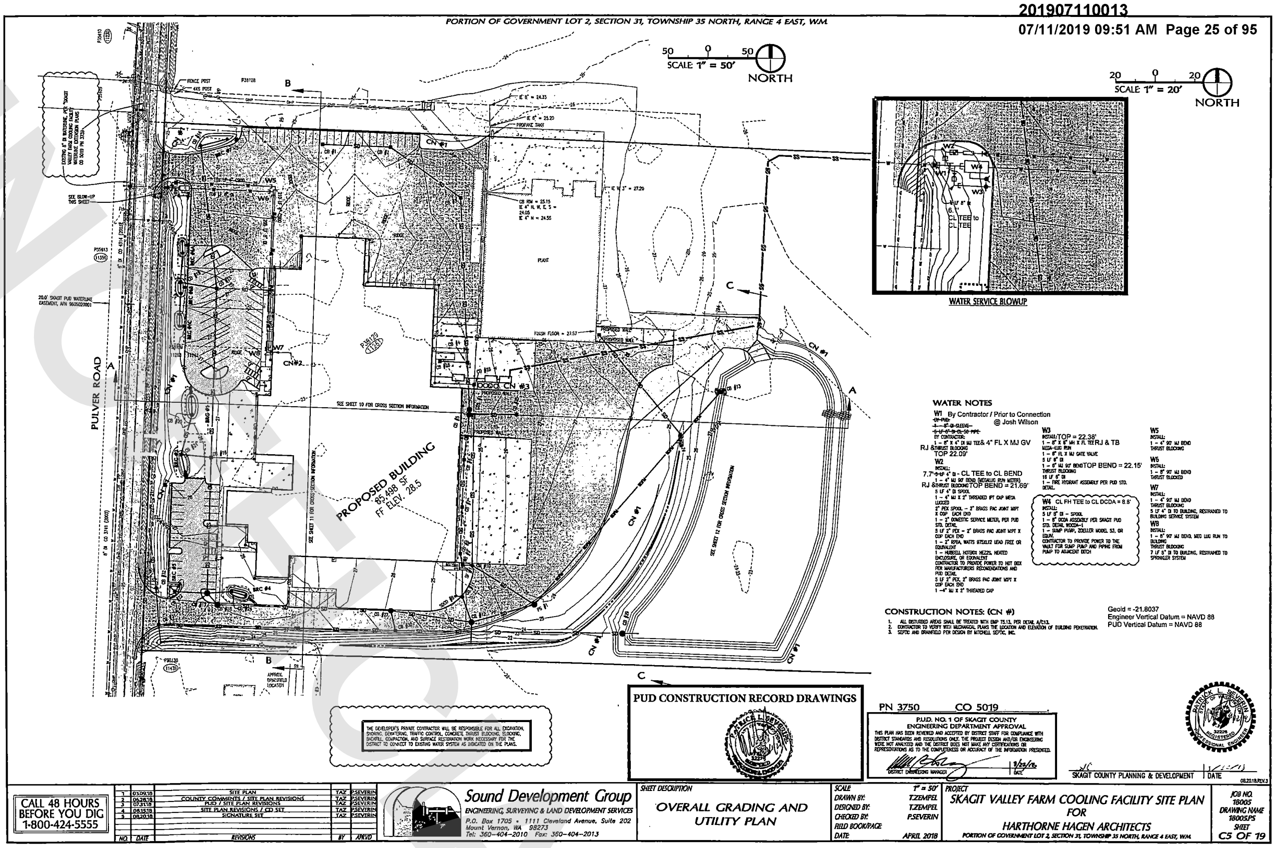
CALL 48 HOURS BEFORE YOU DIG 1-800-424-5555

NO.	DATE	REVISIONS	BY	APRVD
1	03.09.18	SITE PLAN	TAZ	P.SEVERIN
2	06.28.18	COUNTY COMMENTS / SITE PLAN REVISIONS	TAZ	P.SEVERIN
3	07.31.18	PUD / SITE PLAN REVISIONS	TAZ	P.SEVERIN
4	08.15.18	SITE PLAN REVISIONS / CD SET	TAZ	P.SEVERIN
5	08.20.18	SIGNATURE SET	TAZ	P.SEVERIN
6	07.08.19	CONSTRUCTION RECORD DRAWINGS	TAZ	P.SEVERIN

FIRE SUPPRESSION FLOW CAPACITY PROVIDED BY SKAGIT PUD NO. 1 ON ________ AND WAS STATED TO BE: ________ GPM AT ________ PSI
APPROVED BY:
FIRE MARSHAL | DATE

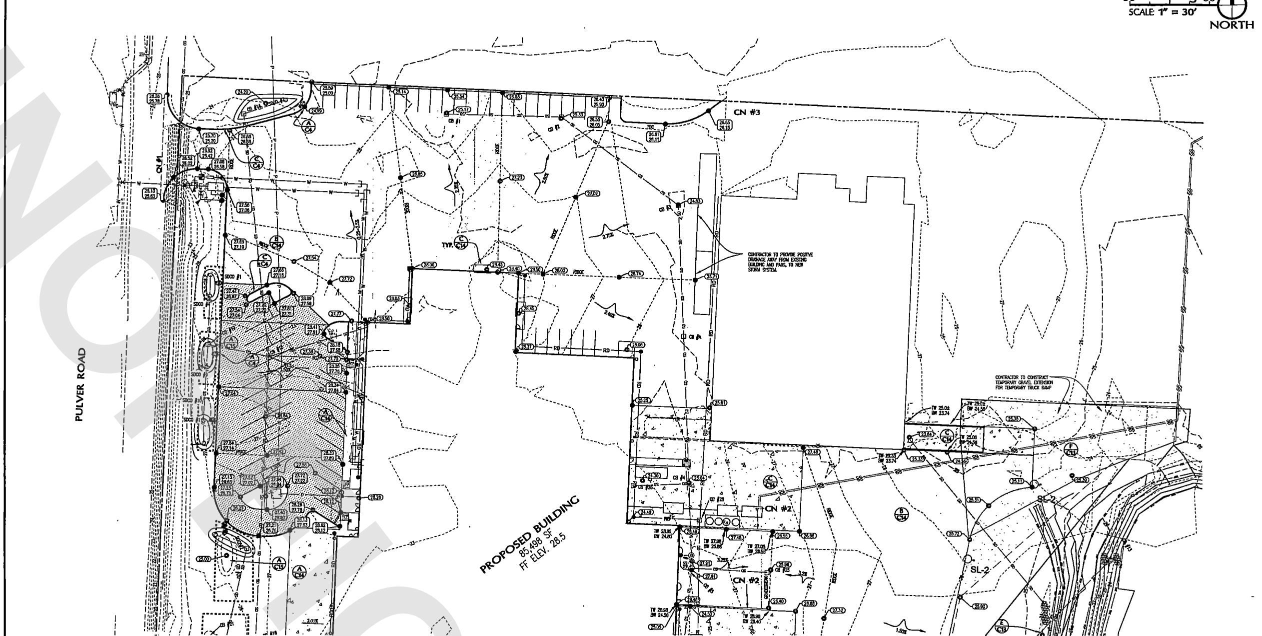
P.U.D. NO. 1 OF SKAGIT COUNTY
ENGINEERING DEPARTMENT APPROVAL
THIS PLAN HAS BEEN REVIEWED AND ACCEPTED BY DISTRICT STAFF FOR COMPLIANCE WITH DISTRICT STANDARDS AND RESOLUTIONS ONLY. THE PROJECT DESIGN AND/OR ENGINEERING WERE NOT ANALYZED AND THE DISTRICT DOES NOT MAKE ANY CERTIFICATIONS OR REPRESENTATIONS AS TO THE COMPLETENESS OR ACCURACY OF THE INFORMATION PRESENTED.
DISTRICT ENGINEERING MANAGER | DATE

Sound Development Group
ENGINEERING, SURVEYING & LAND DEVELOPMENT SERVICES
P.O. Box 1705 • 1111 Cleveland Avenue, Suite 202
Mount Vernon, WA 98273
Tel: 360-404-2010 Fax: 360-404-2013



PORTION OF GOVERNMENT LOT 2, SECTION 31, TOWNSHIP 35 NORTH, RANGE 4 EAST, W.M.

SCALE: 1" = 30'
NORTH



SEE SHEET C7 FOR SITE GRADING CONTINUATION

CONSTRUCTION NOTES: (CN #)

1. CONTRACTOR TO SAWCUT FULL DEPTH AND REMOVE. ASPHALT TO BE DISPOSED OF AT AN APPROVED WASTE FACILITY.
2. CONTRACTOR TO COORDINATE WITH STRUCTURAL PLANS FOR WALL DETAIL AND CONSTRUCTION.
3. CONTRACTOR TO PROTECT INTEGRITY OF EXISTING IMPROVEMENTS. CONTRACTOR SHALL REPAIR AND REPLACE ANY DAMAGE TO EXISTING CONCRETE SIDEWALK, UTILITIES, ROADWAY, ETC, CAUSED DURING THE CONSTRUCTION OF THIS PROJECT.

SHEET NOTES:

1. SEE SHEET 5 FOR POND CONSTRUCTION INFORMATION.
2. SEE SHEETS 8 & 9 FOR STORMWATER INFORMATION.
3. CONTRACTOR TO PROTECT INTEGRITY OF EXISTING IMPROVEMENTS. CONTRACTOR SHALL REPAIR AND REPLACE ANY DAMAGE TO EXISTING CONCRETE SIDEWALK, UTILITIES, ROADWAY, ETC, CAUSED DURING THE CONSTRUCTION OF THIS PROJECT.
4. ADA STALLS SHALL NOT EXCEED 2% SLOPE IN ANY DIRECTION.

CONSTRUCTION RECORD DRAWING

CONSTRUCTION RECORD NOTE:
THESE DRAWINGS ARE PREPARED USING A COMBINATION OF CONTRACTOR PROVIDED REDLINES AND AN AS-BUILT SURVEY. THE CONSTRUCTION RECORDS OF SAID DRAWINGS WERE PERFORMED BY SOUND DEVELOPMENT GROUP 07.08.19.

CONSTRUCTION RECORD LEGEND

102.00	-INDICATES UN-MEASURABLE
~~102.00~~ 102.02	-INDICATES CONSTRUCTION RECORD
102.00 ✓	-INDICATES CONSTRUCTED AS DESIGNED

PATRICK L. SEVERIN, STATE OF WASHINGTON, 32228, REGISTERED PROFESSIONAL ENGINEER

SKAGIT COUNTY PLANNING & DEVELOPMENT | DATE

08.20.18.REV.5

CALL 48 HOURS BEFORE YOU DIG 1-800-424-5555

NO.	DATE	REVISIONS	BY	APRVD
1	03.09.18	SITE PLAN	TAZ	P.SEVERIN
2	06.28.18	COUNTY COMMENTS / SITE PLAN REVISIONS	TAZ	P.SEVERIN
4	08.15.18	SITE PLAN REVISIONS / CD SET	TAZ	P.SEVERIN
5	08.20.18	SIGNATURE SET	TAZ	P.SEVERIN
6	07/08/19	CONSTRUCTION RECORD DRAWINGS	T.ZEMPEL	P.SEVERIN

Sound Development Group
ENGINEERING, SURVEYING & LAND DEVELOPMENT SERVICES
P.O. Box 1705 • 1111 Cleveland Avenue, Suite 202
Mount Vernon, WA 98273
Tel: 360-404-2010 Fax: 360-404-2013

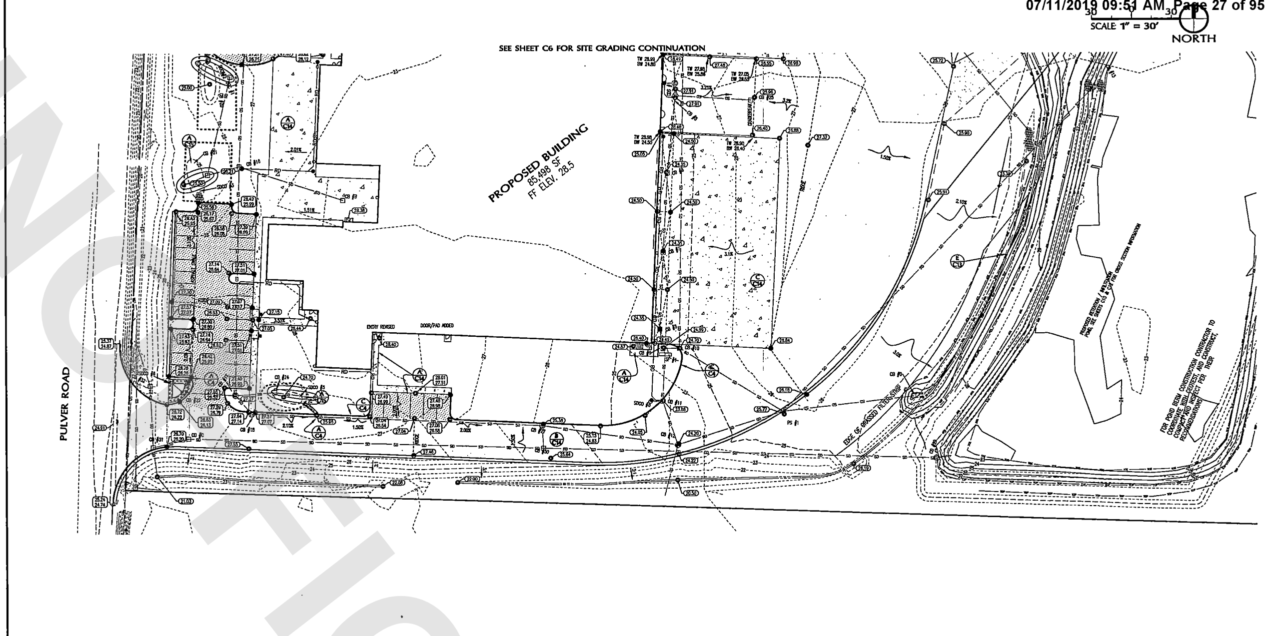
SHEET DESCRIPTION: NORTH SITE GRADING PLAN

SCALE	1" = 30'
DRAWN BY:	T.ZEMPEL
DESIGNED BY:	T.ZEMPEL
CHECKED BY:	P.SEVERIN
FIELD BOOK/PAGE	
DATE	APRIL 2018

PROJECT: SKAGIT VALLEY FARM COOLING FACILITY SITE PLAN FOR HARTHORNE HAGEN ARCHITECTS
PORTION OF GOVERNMENT LOT 2, SECTION 31, TOWNSHIP 35 NORTH, RANGE 4 EAST, W.M.

JOB NO. 18005
DRAWING NAME 18005.PS
SHEET C6 OF 19

PORTION OF GOVERNMENT LOT 2, SECTION 31, TOWNSHIP 35 NORTH, RANGE 4 EAST, W.M.



CONSTRUCTION NOTES: (CN #)

1. CONTRACTOR TO SAWCUT FULL DEPTH AND REMOVE. ASPHALT TO BE DISPOSED OF AT AN APPROVED WASTE FACILITY.
2. CONTRACTOR TO COORDINATE WITH STRUCTURAL PLANS FOR WALL DETAIL AND CONSTRUCTION.
3. CONTRACTOR TO PROTECT INTEGRITY OF EXISTING IMPROVEMENTS. CONTRACTOR SHALL REPAIR AND REPLACE ANY DAMAGE TO EXISTING CONCRETE SIDEWALK, UTILITIES, ROADWAY, ETC. CAUSED DURING THE CONSTRUCTION OF THIS PROJECT.

SHEET NOTES:

1. SEE SHEET C5, C10 AND C12 FOR POND CONSTRUCTION INFORMATION.
2. SEE SHEET C8 & C9 FOR STORMWATER INFORMATION.
3. CONTRACTOR TO PROTECT INTEGRITY OF EXISTING IMPROVEMENTS. CONTRACTOR SHALL REPAIR AND REPLACE ANY DAMAGE TO EXISTING CONCRETE SIDEWALK, UTILITIES, ROADWAY, ETC. CAUSED DURING THE CONSTRUCTION OF THIS PROJECT.
4. ADA STALLS SHALL NOT EXCEED 2% SLOPE IN ANY DIRECTION.

CONSTRUCTION RECORD DRAWING

CONSTRUCTION RECORD NOTE:
THESE DRAWINGS ARE PREPARED USING A COMBINATION OF CONTRACTOR PROVIDED REDLINES AND AN AS-BUILT SURVEY. THE CONSTRUCTION RECORDS OF SAID DRAWINGS WERE PERFORMED BY SOUND DEVELOPMENT GROUP 07.05.19.

CONSTRUCTION RECORD LEGEND

102.00	-INDICATES UN-MEASURABLE
~~102.00~~ 102.02	-INDICATES CONSTRUCTION RECORD
102.00 ✓	-INDICATES CONSTRUCTED AS DESIGNED

SKAGIT COUNTY PLANNING & DEVELOPMENT | DATE

PATRICK L. SEVERIN, STATE OF WASHINGTON, 32226, REGISTERED PROFESSIONAL ENGINEER

08.20.18.REV.4

CALL 48 HOURS BEFORE YOU DIG 1-800-424-5555

NO.	DATE	REVISIONS	BY	APRVD
1	03.09.18	SITE PLAN	TAZ	P.SEVERIN
2	06.28.18	COUNTY COMMENTS / SITE PLAN REVISIONS	TAZ	P.SEVERIN
4	08.15.18	SITE PLAN REVISIONS / CD SET	TAZ	P.SEVERIN
5	08.20.18	SIGNATURE SET	TAZ	P.SEVERIN
6	07.05.19	CONSTRUCTION RECORD DRAWINGS	T.ZEMPEL	P.SEVERIN

Sound Development Group
ENGINEERING, SURVEYING & LAND DEVELOPMENT SERVICES
P.O. Box 1705 • 1111 Cleveland Avenue, Suite 202
Mount Vernon, WA 98273
Tel: 360-404-2010 Fax: 360-404-2013

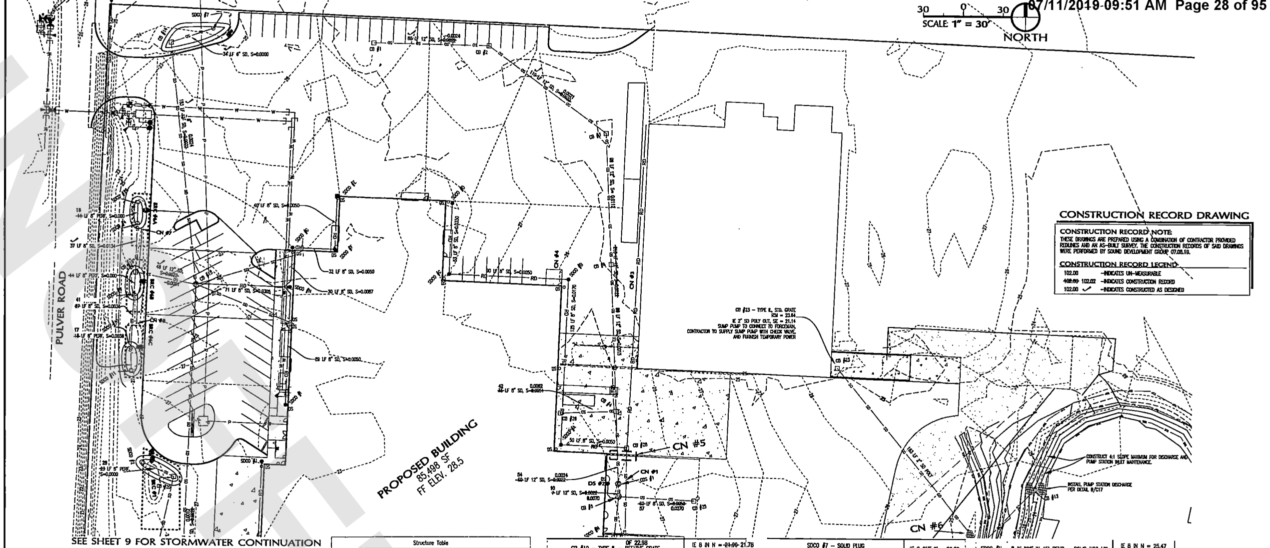
SHEET DESCRIPTION: SOUTH SITE GRADING PLAN

SCALE: 1" = 30'
DRAWN BY: T.ZEMPEL
DESIGNED BY: T.ZEMPEL
CHECKED BY: P.SEVERIN
FIELD BOOK/PAGE:
DATE: APRIL 2018

PROJECT: SKAGIT VALLEY FARM COOLING FACILITY SITE PLAN FOR HARTHORNE HAGEN ARCHITECTS
PORTION OF GOVERNMENT LOT 2, SECTION 31, TOWNSHIP 35 NORTH, RANGE 4 EAST, W.M.

JOB NO. 18005
DRAWING NAME 18005.PS
SHEET C7 OF 19

PORTION OF GOVERNMENT LOT 2, SECTION 31, TOWNSHIP 35 NORTH, RANGE 4 EAST, W.M.



CONSTRUCTION RECORD DRAWING

CONSTRUCTION RECORD NOTE:
THESE DRAWINGS ARE PREPARED USING A COMBINATION OF CONTRACTOR PROVIDED REDLINES AND AN AS-BUILT SURVEY. THE CONSTRUCTION RECORDS OF SAID DRAWINGS WERE PERFORMED BY SOUND DEVELOPMENT GROUP 07.08.19.

CONSTRUCTION RECORD LEGEND

102.00	-INDICATES UN-MEASURABLE
~~102.00~~ 102.02	-INDICATES CONSTRUCTION RECORD
102.00 ✓	-INDICATES CONSTRUCTED AS DESIGNED

DOWNSPOUT NOTES

DS #2
INSTALL 6" SD CLEANOUT AND CONNECT PROPOSED DOWNSPOUT TO THE SOUTH. CONTRACTOR TO PROVIDE REQUIRED FITTINGS TO DISCHARGE TO CB #5.

CONSTRUCTION NOTES: (CN #XX)

1. CONTRACTOR TO PROVIDE ANY FITTINGS/REDUCERS NECESSARY FOR CONNECTION TO CDS STRUCTURE.
2. DOWNSPOUTS TO BE TEE'D INTO ROOFDRAIN HARD LINE WITH 8" WYE.
3. CONTRACTOR TO REROUTE EXISTING DOWNSPOUT SYSTEM SOUTH, TO NEW STORM SYSTEM CONNECTION AT CB #28.
4. CONTRACTOR TO CONNECT PROPOSED SIEVE PUMP STATION WASH WATER DISCHARGE PER DOE PERMIT, AND FILTER/SIEVE PUMP DISCHARGE FACILITY TO BE DESIGN BUILD.
5. INSTALL STORM PIPES WITH CDF, A MINIMUM OF 5' FROM EDGE OF WALL FOOTINGS, AND PIPE OUTER DIAMETER.
6. CONTRACTOR TO DAYLIGHT FORCEMAIN OUTLET TO SWALE START. CONSTRUCT A MINIMUM 6'X8'X8" – 4-6" QUARRY SPALL PAD TO DISPERSE OUTFALL.
7. CONTRACTOR TO CONSTRUCT SPILLWAY TO DITCH OVERFLOW FOR BRC #AA, AT ELEVATION 25.90, PER E/C13, WITH A DEPTH OF 0.5', TO BRC B.
8. CONTRACTOR TO CONSTRUCT SPILLWAY TO DITCH OVERFLOW FOR BRC #CC, AT ELEVATION 25.5, PER E/C13, WITH A DEPTH OF 0.5', TO BRC B

SHEET NOTES

1. SEE WSDOT STD PLAN SHEET 13, FOR CB REQUIREMENTS.
2. SEE SHEETS C8 & C10 FOR POND INFORMATION.
3. SEE SHEET 18 FOR PUMP STATION INFORMATION.

Structure Table

Structure Name	Structure Details
CB #1 – TYPE I – STD. GRATE RIM ELEV = ~~25.17~~ 24.68	IE 12 OUT E = ~~22.26~~ 22.65
CB #2 – TYPE I – STD GRATE RIM ELEV = ~~25.33~~ 25.18	IE 12 IN W = ~~22.07~~ 22.88 IE 12 OUT SE = ~~22.07~~ 22.86
CB #3 – TYPE I – STD. GRATE RIM ELEV = ~~24.83~~ 24.93	IE 12 IN NW = ~~21.83~~ 22.63 IE 12 OUT S = ~~21.83~~ 22.63
CB #4 – TYPE I – SOLID LID RIM ELEV = 25.04 ✓	IE 12 IN N = 21.37 ✓ IE 8 IN W = ~~21.45~~ 21.37 IE 12 OUT S = 21.37 ✓
CB #5 –TYPE II – 48 – STD. GRATE RIM ELEV = ~~27.91~~ 28.02	IE 12 IN N = ~~21.23~~ 21.17 IE 8 IN E = ~~22.90~~ 21.82 IE 12 OUT S = ~~21.23~~ 21.17
CB #13 – TYPE II – 48 – BEEHIVE GRATE RIM ELEV = ~~25.59~~ 25.73	IE 10 IN SW = ~~17.09~~ 21.6±
CB #14 – TYPE IL – BEEHIVE GRATE NEW 2" W= 22.43 RIM ELEV = ~~24.60~~ 24.68	IE 6 IN E = ~~22.20~~ 22.43 IE ~~12~~ OUT S = ~~22.20~~ 8" 21.64
CB #15 – TYPE I – SOLID LOCKING LID RIM ELEV = ~~26.63~~ 27.30	IE ~~12~~ IN N = ~~21.80~~ 8" 21.20 IE 12 IN W = ~~21.80~~ 22.20 IE 8 IN E = ~~23.30~~ 22.20 IE 12 OUT S = ~~21.80~~ 21.20
CB #19 – TYPE IL – BEEHIVE GRATE OF 22.98 RIM ELEV = ~~25.40~~ 25.13	IE 8 IN N = ~~21.90~~ 21.78 IE 8 IN S = ~~21.90~~ 21.78 IE 12 OUT E = ~~21.90~~ 21.78
CB #20 – TYPE IL – BEEHIVE GRATE OF 23.28 RIM ELEV = ~~25.75~~ 25.38	IE 8 IN N = ~~22.00~~ 22.21 IE 12 OUT S = ~~22.00~~ 22.21
CB #23 – TYPE IL – STD. GRATE RIM ELEV = ~~23.64~~ 24.43	IE ~~4~~ OUT SE = ~~21.14~~ 2" 23.13
CB #25 – TYPE I – STD. GRATE RIM ELEV = ~~25.96~~ 26.16	IE 8 OUT W = ~~23.29~~ 23.38
CB #26 – TYPE I – STD. GRATE RIM ELEV = ~~24.30~~ 24.21	6" IN N/S = 22.11 IE 8 OUT E = 21.63 ✓
CB #28 – TYPE I – SOLID LID RIM ELEV = ~~26.19~~ 25.37	IE 8 IN N = ~~21.02~~ 21.37 IE 8 IN W = ~~20.44~~ 22.67 IE 8 OUT S = ~~20.44~~ 20.57
CDS #1 – SOLID H20 LID RIM ELEV = ~~27.91~~ 28.02	IE 12 IN N = 21.24 ✓ IE 12 OUT S = 21.24 ✓
SDCO #1 – SOLID PLUG RIM ELEV = ~~25.50~~ 23.50	IE 8 OUT S = 22.40
SDCO #2 – SOLID PLUG RIM ELEV = ~~25.10~~ 23.64	IE 8 OUT S = 22.00
SDCO #4 – SOLID PLUG RIM ELEV = ~~25.00~~ 23.88	IE 8 IN N = 22.40 IE 8 OUT S = 22.40
SDCO #7 – SOLID PLUG RIM ELEV = ~~24.30~~ 22.74	IE 6 OUT W = 22.20
SDCO #9 – – SOLID PLUG RIM ELEV = ~~25.00~~ 23.38	IE 8 IN S = 21.90 IE 8 OUT N = 21.90
SDCO #10 – SOLID PLUG RIM ELEV = ~~25.10~~ 23.63	IE 8 IN S = 22.00 IE 8 OUT N = 22.00
SDCO #11 – SOLID PLUG RIM ELEV = ~~25.10~~ 23.58	IE 8 OUT N = 22.00
SDCO #A – 8# WYE W 45' BEND – SOLID H20 LID RIM ELEV = 24.44 NOT LOCATED	IE 8 IN N = 20.69 IE 8 OUT E = 20.69
SDCO #B – 8# WYE W 45' BEND – SOLID H20 LID RIM ELEV = 25.86 NOT LOCATED	IE 8 IN W = 22.82 IE 8 OUT S = 22.82
SDCO #C – 8 IN WYE W 45' BEND – SOLID H20 LID RIM ELEV = 28.01 NOT LOCATED	IE 8 IN N = 23.27 IE 8 OUT E = 23.27
SDCO #D – 8 IN WYE W 45' BEND – SOLID H20 LID RIM ELEV = 28.31 NOT LOCATED	IE 8 OUT S = 25.14
SDCO #E – 8 IN WYE W 45' BEND –SOLID LID RIM ELEV = 27.96 NOT LOCATED	IE 8 OUT S = 26.09
SDCO #F – 8 IN WYE W 45' BEND – SOLID H20 LID RIM ELEV = 28.08 NOT LOCATED	IE 8 IN N = 25.89 IE 8 OUT W = 25.89
SDCO #G – 8 IN WYE W 45' BEND – SOLID H20 LID RIM ELEV = 27.97 NOT LOCATED	IE 8 IN E = 25.73 IE 8 OUT S = 25.73
SDCO #H – 8 IN WYE W 45' BEND – SOLID H20 LID RIM ELEV = 27.95 NOT LOCATED	IE 8 IN N = 25.47 IE 8 IN S = 25.47 IE 8 OUT W = 25.47
SDCO #I – 8 IN WYE W 45' BEND – SOLID H20 LID RIM ELEV = 28.11 NOT LOCATED	IE 8 OUT N = 25.92
SDCO #J – 8 IN WYE W 45' BEND – SOLID LID RIM ELEV = 28.19 NOT LOCATED	IE 8 OUT S = 26.00
SDCO #K –8 IN CROSS WYE W 45' BEND – SOLID LID RIM ELEV = 27.96 NOT LOCATED	IE 8 IN N = 25.58 IE 8 OUT W = 25.58

ADDED STRUCTURES:
CB #A
RIM ELEV. = 25.47
IE 12" N/S = 21.52

PATRICK L. SEVERIN
STATE OF WASHINGTON
32220
REGISTERED PROFESSIONAL ENGINEER

SKAGIT COUNTY PLANNING & DEVELOPMENT | DATE

08.20.18.REV.8

CALL 48 HOURS BEFORE YOU DIG 1-800-424-5555

NO.	DATE	REVISIONS	BY	APRVD
1	03.09.18	SITE PLAN	TAZ	P.SEVERIN
2	06.28.18	COUNTY COMMENTS / SITE PLAN REVISIONS	TAZ	P.SEVERIN
4	08.15.18	SITE PLAN REVISIONS / CD SET	TAZ	P.SEVERIN
5	08.20.18	SIGNATURE SET	TAZ	P.SEVERIN
6	07.05.19	CONSTRUCTION RECORD DRAWINGS	T.ZEMPEL	P.SEVERIN

Sound Development Group
ENGINEERING, SURVEYING & LAND DEVELOPMENT SERVICES
P.O. Box 1705 • 1111 Cleveland Avenue, Suite 202
Mount Vernon, WA 98273
Tel: 360-404-2010 Fax: 360-404-2013

SHEET DESCRIPTION
NORTH SITE STORMWATER PLAN

SCALE:	1" = 30'
DRAWN BY:	T.ZEMPEL
DESIGNED BY:	T.ZEMPEL
CHECKED BY:	P.SEVERIN
FIELD BOOK/PAGE	
DATE	APRIL 2018

PROJECT
SKAGIT VALLEY FARM COOLING FACILITY SITE PLAN
FOR
HARTHORNE HAGEN ARCHITECTS
PORTION OF GOVERNMENT LOT 2, SECTION 31, TOWNSHIP 35 NORTH, RANGE 4 EAST, W.M.

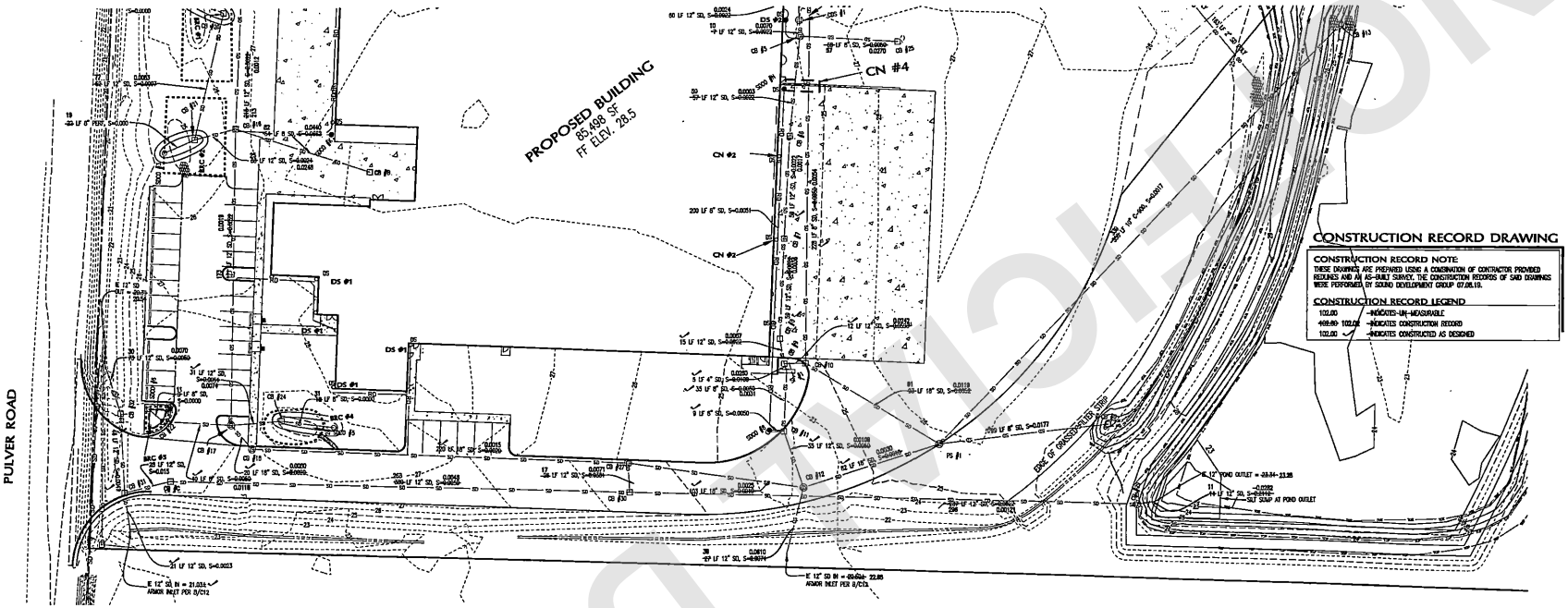
JOB NO. 18005
DRAWING NAME 18005.PS
SHEET C8 OF 19

PORTION OF GOVERNMENT LOT 2, SECTION 31, TOWNSHIP 35 NORTH, RANGE 4 EAST, W.M.

SCALE: 1" = 30'

NORTH

SEE SHEET 8 FOR STORMWATER CONTINUATION



CONSTRUCTION RECORD DRAWING

CONSTRUCTION RECORD NOTE

THESE DRAWINGS ARE PREPARED USING A COMBINATION OF CONTRACTOR PROVIDED REDLINES AND AN AS-BUILT SURVEY. THE CONSTRUCTION REVISIONS OF SAID DRAWINGS WERE PERFORMED BY SOUND DEVELOPMENT GROUP 07.05.19.

CONSTRUCTION RECORD LEGEND

102.00	-INDICATES UN-MEASURABLE
~~103.00~~ 102.00	-INDICATES CONSTRUCTION REVISED
102.00 ✓	-INDICATES CONSTRUCTED AS DESIGNED

DOWNSPOUT NOTES

DS #1
DOWNSPOUT TO BE TIGHT-LINED TO STORM DRAIN LINE. CONTRACTOR TO PROVIDE REQUIRED WYE'S AT CONNECTION POINTS.

DS #2
INSTALL 6" SD ELBOWOUT AND CONNECT PROPOSED DOWNSPOUT TO THE SOUTH. CONTRACTOR TO PROVIDE REQUIRED FITTINGS TO DISCHARGE TO DS #1.

CONSTRUCTION NOTES (CN #XX)

1. CONTRACTOR TO PROVIDE ANY FITTINGS/REDUCERS NECESSARY FOR CONNECTION TO CDS STRUCTURE.
2. DOWNSPOUTS TO BE TIED INTO ROOFDRAIN HARD LINE WITH 6" WYE.
3. CONTRACTOR TO REROUTE EXISTING DOWNSPOUT SYSTEM SOUTH, TO NEW STORM SYSTEM CONNECTION AT CB #26.
4. INSTALL STORM PIPES WITH CDF, A MINIMUM OF 8" FROM EDGE OF WALL FOOTINGS, AND PIPE OUTER DIAMETER.
5. INSTALL 12" SHEAR GATE WITH LIFT ROD, ON OUTLET PIPE SOUTH. LIFT ROD SHALL BE FABRICATED FROM STEEL, AND PROVIDED A PROTECTIVE COATING (PAINT). A HANDLE SHALL BE PROVIDED, WITH MEANS OF RETAINING HANDLE AT OR WITHIN HANDS REACH OF CB OPENING.

SHEET NOTES

1. SEE WSDOT STD PLAN SHEET 15, FOR CB REQUIREMENTS.
2. SEE SHEETS C9 & C10 FOR POND INFORMATION.
3. SEE SHEET 18 FOR PUMP STATION INFORMATION.

Structure Table							
Structure Name	Structure Details						
CB #5 –TYPE II – 48 – STD. GRATE RIM ELEV = ~~27.91~~ 28.02	IE 12 IN N = ~~21.33~~ 21.17 IE 8 IN E = ~~22.09~~ 21.82 IE 12 OUT S = ~~21.23~~ 21.17	CB #13 – TYPE I – 48 – BEEHIVE GRATE RIM ELEV = 25.39 SEE SHEET C8	IE 10 IN SW = 17.89	CB #27 – TYPE II – 48 – SHEAR GATE SOUTH – – SOLID LID RIM ELEV = ~~25.39~~ 28.59	IE 18 IN W = 19.13 ✓ IE 18 OUT E = 19.13 ✓ IE 12 OUT S = ~~22.39~~ 22.49	SDCO #8 – 45 BENDS – SOLID LID RIM ELEV = ~~24.61~~ 23.48	IE 8 IN N = 21.28 IE 8 OUT E = 20.61
CB #6 – TYPE I – STD. GRATE RIM ELEV = 24.35 ✓	IE 12 IN N = ~~21.10~~ 21.15 IE 12 OUT S = ~~21.10~~ 21.15	CB #16 – TYPE I – SOLID LOCKING LID RIM ELEV = ~~26.21~~ 27.05	IE 12 IN N = ~~21.33~~ 20.95 IE 12 IN W = ~~21.41~~ 20.85 IE 8 IN E = ~~22.09~~ 23.15 IE 12 OUT S = ~~21.23~~ 20.95	CB #29 – TYPE II – 54 – SOLID LID RIM ELEV = ~~27.59~~ 27.87	IE 12 IN E = ~~24.09~~ 22.97 IE 12 OUT W = ~~24.09~~ 22.97	SDCO #K –8 IN CROSS WYE W 45° BEND – SOLID LID RIM ELEV = 27.95 NOT LOCATED	IE 8 IN N = 25.58 IE 8 OUT W = 25.58
CB #7 – TYPE I – STD. GRATE RIM ELEV = ~~24.35~~ 24.30	IE 12 IN N = ~~20.97~~ 21.05 IE 12 OUT S = ~~20.97~~ 21.05	CB #17 – TYPE II – 48 – SOLID LOCKING LID RIM ELEV = ~~27.27~~ 27.17	IE 12 IN N =~~20.55~~20.62 IE 8 IN W = 21.60 ✓ IE 8 IN E = ~~21.54~~ 21.52 IE 18 OUT SE = 19.81 ✓	CB #30 – TYPE I – SOLID LID RIM ELEV = ~~25.85~~ 28.84	IE 12 IN E = ~~23.37~~ 22.61 IE 12 IN N = ~~23.37~~ 22.61 IE 12 OUT W = ~~23.37~~ 22.61	SDCO #N – 8 IN WYE W 45° BEND – CO – SOLID H20 LID RIM ELEV = 24.49 NOT LOCATED	IE 8 OUT S = 22.30
CB #8 – TYPE I – STD. GRATE RIM ELEV = ~~24.35~~ 24.23	IE 12 IN N = 20.84 ✓ IE 12 OUT S = 20.84 ✓	CB #18 – TYPE II – 48 – SOLID LOCKING LID RIM ELEV = ~~27.13~~ 28.95	IE 18 IN NW = ~~19.57~~ 19.45 IE 18 OUT E = ~~19.57~~ 19.45	CB #31 – TYPE I – SOLID LOCKING LID RIM ELEV = ~~25.59~~ 25.80	IE 12 IN E = ~~21.97~~ 20.95 IE 12 IN S = 20.95 ✓ IE 12 OUT N = 20.95 ✓	STORMFILTER #1 – Standard RIM ELEV = 24.98 ✓	IE 4 IN N = 20.76 IE 8 OUT S = 20.76
CB #9 – TYPE I – SOLID LID RIM ELEV = ~~24.99~~ 24.74	IE 12 IN N = ~~20.81~~ 20.74 IE 4 OUT S = ~~20.81~~ 20.89 IE 12 OUT E = ~~22.29~~ 22.04	CB #19 – TYPE L – BEEHIVE GRATE RIM ELEV = 25.75 SEE SHEET C8	IE 8 IN N = 22.00 IE 12 OUT S = 22.00	CB #32 – TYPE I – SOLID LID RIM ELEV = ~~24.91~~ 25.02	IE 12 IN S = 20.75 ✓ IE 12 OUT N = 20.75 ✓		
CB #10 – TYPE I – SOLID LID RIM ELEV = ~~24.70~~ 24.85	IE 12 IN W = ~~21.55~~ 21.75 IE 8 IN N = ~~19.39~~ 19.35 IE 18 OUT SE = ~~19.39~~ 19.50	CB #21 – TYPE 1L – BEEHIVE GRATE RIM ELEV = 25.00 ✓ OF 22.8	IE 8 IN S = ~~21.59~~ 21.57 IE 12 IN N = ~~21.59~~ 21.57 IE 12 OUT E = ~~21.59~~ 21.57	PS #1 – TYPE II – 72 – SOLID LID RIM ELEV = ~~25.77~~ 25.72 NOR 8" IN E = 19.22	IE 18 IN W = ~~18.79~~ 18.82 IE 18 IN NW = ~~19.82~~ 18.42 IE 10 OUT NE = ~~19.68~~ 22.46		
CB #11 – TYPE I – STD. GRATE RIM ELEV = ~~23.86~~ 25.55	IE 8 IN N = ~~20.59~~ 20.65 IE 8 IN W = ~~20.59~~ 21.65 IE 12 OUT S = ~~20.57~~ 20.65	CB #22 – TYPE 1L – BEEHIVE GRATE RIM ELEV = 25.30 ✓ OF 22.97	IE 8 IN NW = ~~21.80~~ 21.97 IE 8 OUT E = ~~21.80~~ 22.07	SDCO #3 – SOLID PLUG RIM ELEV = ~~24.60~~ 23.02	IE 8 OUT N = 21.50		
CB #12 – TYPE II – 48 – SOLID LID RIM ELEV = ~~24.20~~ 28.37	IE 12 IN N = ~~20.40~~ 20.27 IE 12 IN S = 20.30 ✓ IE 18 IN W = ~~18.93~~ 18.87 IE 18 OUT E = ~~18.93~~ 19.07	CB #24 –TYPE 1L – BEEHIVE GRATE RIM ELEV = ~~25.20~~ 25.25 OF 22.95	IE 8 IN E = ~~21.79~~ 21.85 IE 8 OUT W = ~~21.79~~ 21.85	SDCO #5 – SOLID PLUG RIM ELEV = ~~24.60~~ 23.61	IE 8 OUT W = 21.70		
		CB #25 – TYPE L – STD. GRATE RIM ELEV = 25.35 SEE SHEET C8	IE 8 OUT W = 23.29	SDCO #6 – SOLID PLUG RIM ELEV = ~~24.60~~ 23.48	IE 8 OUT SE = 21.80		

ADDED STRUCTURES:
CB #8
RIM ELEV. = 25.24
IE 4" E = 20.76

SKAGIT COUNTY PLANNING & DEVELOPMENT | DATE

05.25.18REV.19

NO	DATE	REVISIONS	BY	APVD
1	03.29.18	SITE PLAN	TAZ	PSEVERIN
2	05.25.18	COUNTY COMMENTS / SITE PLAN REVISIONS	TAZ	PSEVERIN
3	06.13.18	SITE PLAN REVISIONS / CD SET	TAZ	PSEVERIN
4	08.20.18	SIGNATURE SET	TAZ	PSEVERIN
5	7/2019	CONSTRUCTION RECORD DRAWINGS	TZEMPEL	PJSEVERIN

CALL 48 HOURS BEFORE YOU DIG 1-800-424-5555

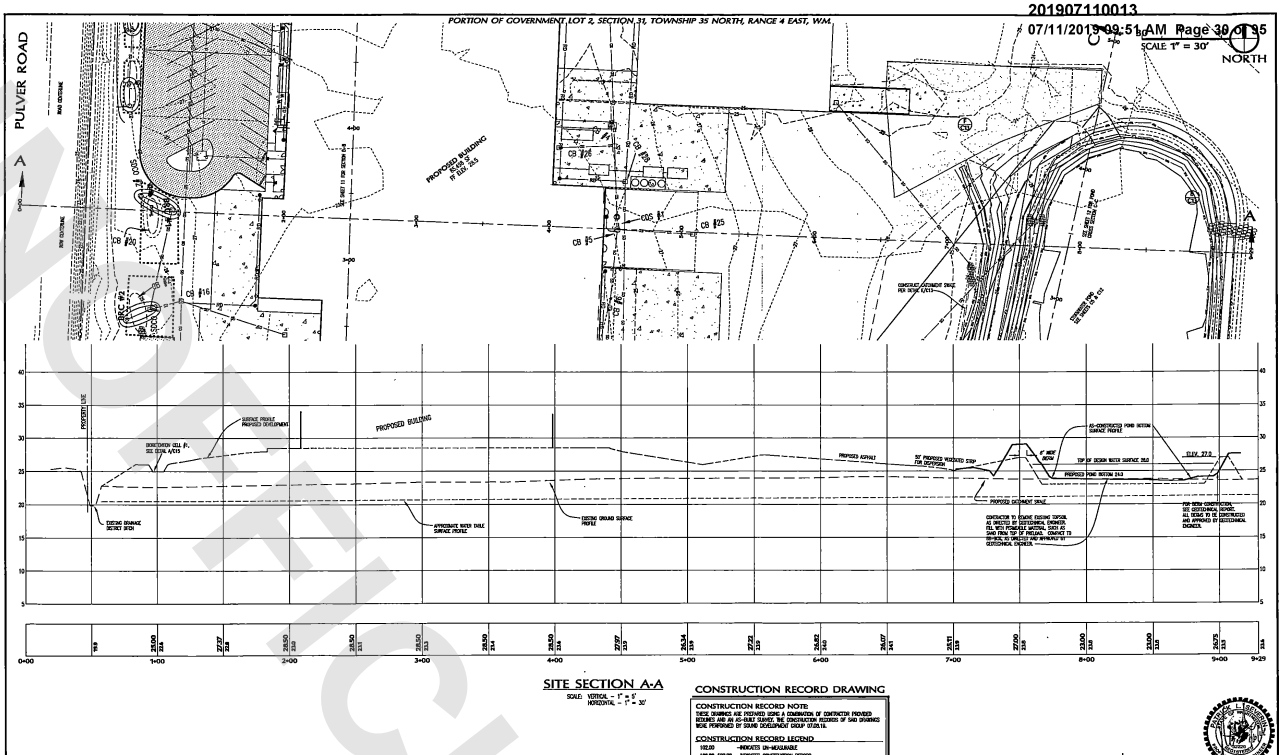
Sound Development Group
ENGINEERING, SURVEYING & LAND DEVELOPMENT SERVICES
P.O. Box 1705 - 1111 Cleveland Avenue, Suite 202
Mount Vernon, WA 98273
Tel: 360-404-2010 Fax: 360-404-2013

SHEET DESCRIPTION
SOUTH SITE STORMWATER PLAN

SCALE: 1" = 30'
DRAWN BY: T.ZEMPEL
DESIGNED BY: T.ZEMPEL
CHECKED BY: P.SEVERIN
FIELD BOOK/PAGE:
DATE: APRIL 2018

PROJECT
SKAGIT VALLEY FARM COOLING FACILITY SITE PLAN
FOR
HARTHORNE HAGEN ARCHITECTS
PORTION OF GOVERNMENT LOT 2, SECTION 31, TOWNSHIP 35 NORTH, RANGE 4 EAST, W.M.

JOB NO. 18005
DRAWING NAME 18005FS
SHEET C9 OF 19



SITE SECTION A-A

SCALE: VERTICAL - 1" = 5'
HORIZONTAL - 1" = 30'

CONSTRUCTION RECORD DRAWING

CONSTRUCTION RECORD NOTE:
THESE DRAWINGS ARE PREPARED USING A COMBINATION OF CONTRACTOR PROVIDED RECORDS AND AN AS-BUILT SURVEY. THE CONSTRUCTION REVISIONS OF SAID DRAWINGS WERE PERFORMED BY SOUND DEVELOPMENT GROUP LLC/PLLC.

CONSTRUCTION RECORD LEGEND

102.00	-INDICATES UN-MODIFIABLE
102.00	-INDICATES CONSTRUCTION RECORD
102.00 ✓	-INDICATES CONSTRUCTED AS DESIGNED

SKAGIT COUNTY PLANNING & DEVELOPMENT | DATE

CALL 48 HOURS BEFORE YOU DIG 1-800-424-5555

NO	DATE	REVISIONS	BY	APVD
1	12/09/18	SITE PLAN	TAS	PJSEVERN
2	04/25/19	COUNTY COMMENTS / SITE PLAN REVISIONS	TAS	PJSEVERN
3	05/31/19	SITE PLAN REVISIONS / CO. SET	TAS	PJSEVERN
4	06/28/19	CONSTRUCTION SET	TAS	PJSEVERN
5	07/09/19	CONSTRUCTION RECORD DRAWINGS	CAD/PM	PJSEVERN

Sound Development Group
ENGINEERING, SURVEYING & LAND DEVELOPMENT SERVICES
P.O. Box 1725 • 1111 Cleveland Avenue, Suite 202
Mount Vernon, WA 98273
Tel: 360-424-2010 Fax: 360-424-2013

SHEET DESCRIPTION: SITE CROSS SECTION A-A

SCALE: 1" = 30'
DRAWN BY: TZEMPEL
DESIGNED BY: TZEMPEL
CHECKED BY: PJSEVERN
HBCI BOOKPAGE:
DATE: APRIL 2018

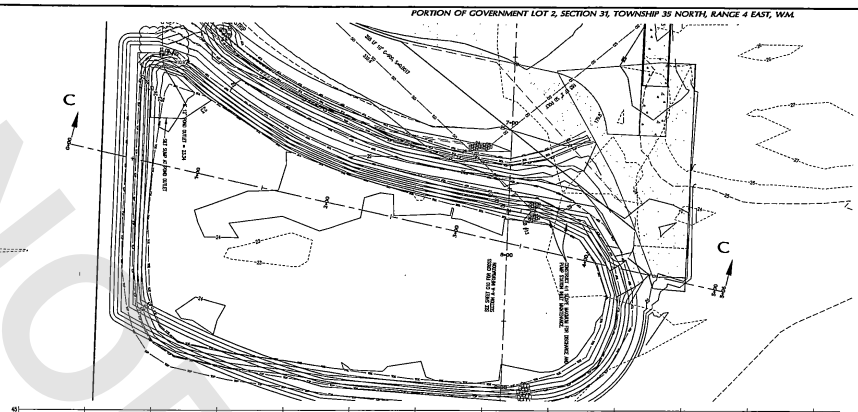
PROJECT: SKAGIT VALLEY FARM COOLING FACILITY SITE PLAN FOR HARTHORNE HAGEN ARCHITECTS
PORTION OF GOVERNMENT LOT 2, SECTION 31, TOWNSHIP 35 NORTH, RANGE 4 EAST, WM

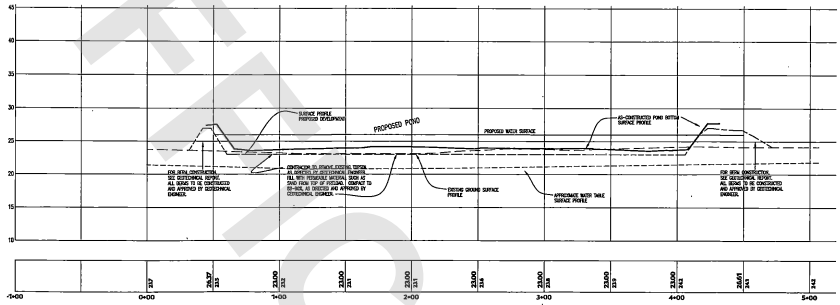
JOB NO. 180105
DRAWING NAME 180105PS
SHEET C10 OF 19

PORTION OF GOVERNMENT LOT 2, SECTION 31, TOWNSHIP 35 NORTH, RANGE 4 EAST, W.M.

SCALE 1" = 30'

NORTH





SITE SECTION C-C

SCALE: VERTICAL - 1" = 5'
HORIZONTAL - 1" = 30'

CONSTRUCTION RECORD DRAWING

CONSTRUCTION RECORD NOTE:
THESE DRAWINGS ARE PREPARED USING A COMBINATION OF CONTRACTOR PROVIDED DRAWINGS AND AS-BUILT SURVEY. THE CONSTRUCTION RECORDS OF SAID DRAWINGS WERE PERFORMED BY SOUND DEVELOPMENT GROUP 07.09.19.

CONSTRUCTION RECORD LEGEND
- 102.00 - INDICATES UN-ACCEPTABLE
- 103.00 102.00 - INDICATES CONSTRUCTION RECORD
- 102.00 ✓ - INDICATES CONSTRUCTED AS DESIGNED

SKAGIT COUNTY PLANNING & DEVELOPMENT | DATE

CALL 48 HOURS BEFORE YOU DIG 1-800-424-5555

NO	DATE	REVISIONS	BY	APVD
1	04/09/19	SITE PLAN COUNTY COMMENTS / LOT LINE ADJ. REVISIONS	TJC	STEVENS
2	05/31/19		TJC	STEVENS
3	06/13/19	SITE PLAN REVISIONS / CO SET	TJC	STEVENS
4	09/20/19	CONSTRUCTION RECORD MARKINGS	TJC	STEVENS
5	07/09/19		CSTVNS	STEVENS

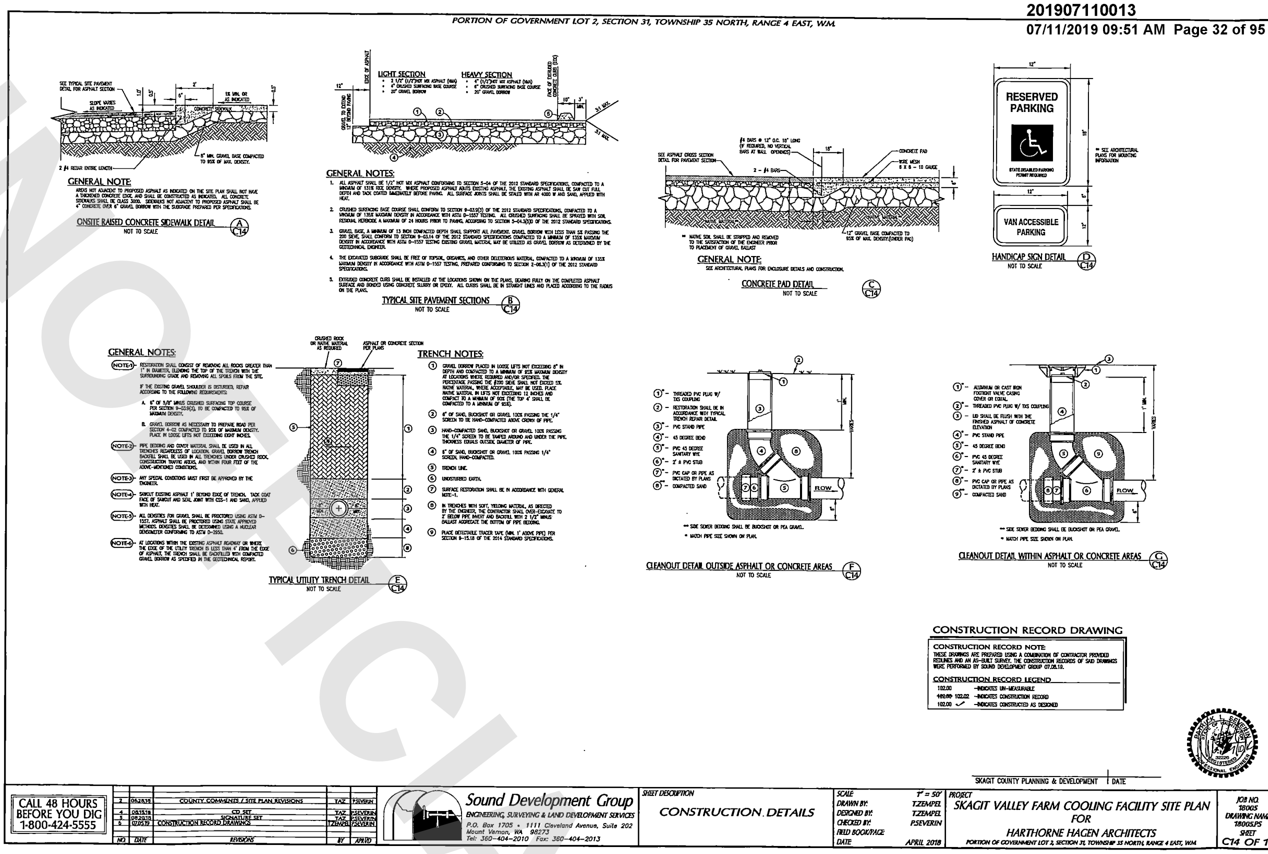
Sound Development Group
ENGINEERING, SURVEYING & LAND DEVELOPMENT SERVICES
P.O. Box 1705 - 1111 Cleveland Avenue, Suite 202
Mount Vernon, WA 98273
Tel: 360-424-2010 Fax: 360-424-2013

SHEET DESCRIPTION: POND CROSS SECTION C-C

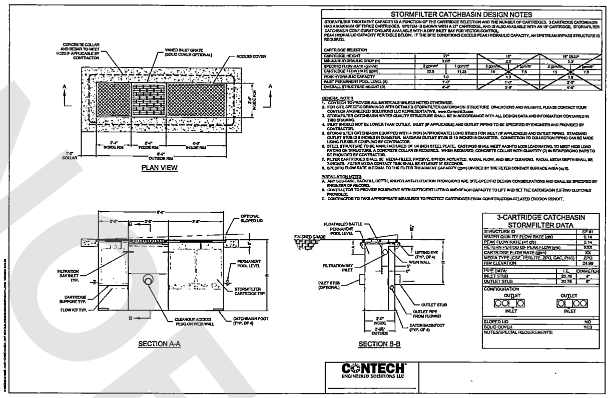
SCALE:	1" = 30'
DRAWN BY:	TZEMPEL
DESIGNED BY:	TZEMPEL
CHECKED BY:	PSEVERIN
FIELD BOOK/PAGE:	
DATE:	APRIL 2018

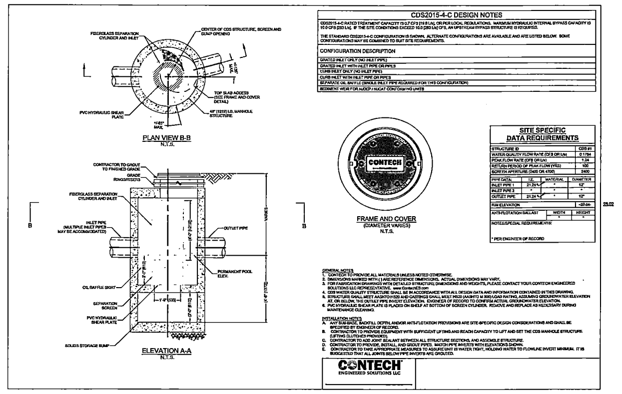
PROJECT: SKAGIT VALLEY FARM COOLING FACILITY SITE PLAN FOR HARTHORNE HAGEN ARCHITECTS
PORTION OF GOVERNMENT LOT 2, SECTION 31, TOWNSHIP 35 NORTH, RANGE 4 EAST, W.M.

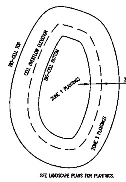
JOB NO: 18005
DRAWING NAME: 18005.SPS
SHEET: C12 OF 19

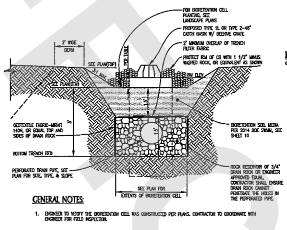


PORTION OF GOVERNMENT LOT 2, SECTION 31, TOWNSHIP 35 NORTH, RANGE 4 EAST, W.M.









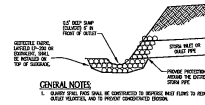
BIORETENTION CELL TABLE

CELL NO.	BOTTOM CELL ELEV.	BOTTOM CELL AREA (SF)	CELL OVERFLOW (RIM ELEV)	TOP OF TRENCH BED ELEV.	BOTTOM OF TRENCH BED ELEV.	TRENCH BED AREA (SF)	TRENCH OVERFLOW ELEV.	MODE OF OVERFLOW
1	25.00	150	25.5	23.50	22.00	1550	23.40	ELBOW ON 8" OUTLET PIPE
2	24.50	150	25.00	23.00	21.50	1550	22.85	ELBOW ON OUTLET PIPE
3	UNUSED							
4	24.70	100	25.20	23.20	21.70	600	23.10	ELBOW ON OUTLET PIPE
5	24.80	78	25.30	23.30	21.80	156	23.20	ELBOW ON OUTLET PIPE
6A	25.40	100	25.90	23.90	22.40	500	23.35	ELBOW ON OUTLET PIPE, CB #9
6B	24.90	100	25.40	23.40	21.90	500	23.30	ELBOW ON OUTLET PIPE
6C	25.0	100	24.50	23.50	22.00	500	23.30	ELBOW ON OUTLET PIPE, CB #9
7	24.20	400	24.60	–	–	–	–	–

GENERAL NOTES:

1. ENGINEER TO VERIFY THE BIORETENTION CELL WAS CONSTRUCTED PER PLANS. CONTRACTOR TO COORDINATE WITH ENGINEER FOR FIELD INSPECTION.

BIORETENTION CELL DETAIL (A / C12)
NOT TO SCALE



GENERAL NOTES:

1. QUARRY SPALL PADS SHALL BE CONSTRUCTED TO DISPERSE INLET FLOWS TO REDUCE INLET AND OUTLET VELOCITIES, AND TO PREVENT CONCENTRATED EROSION.
2. SPALLS SHALL BE CAST TO A MINIMUM 12" DEPTH, A MINIMUM OF 3x PIPE DIAMETER LENGTH, AND A 2x PIPE DIAMETER WIDTH. THE SPALLS SHALL BE MECHANICALLY COMPACTED SUCH THAT THE TOP OF SPALLS IS SET FLUSH WITH THE PIPE INVERT ELEVATION.
3. QUARRY SPALLS SHALL CONFORM TO SECTION 9-13.6 OF THE 2018 STANDARD SPECIFICATIONS.

TYPICAL INLET/OUTLET PROTECTION DETAIL (B / C12)
NOT TO SCALE

CONSTRUCTION RECORD DRAWING

CONSTRUCTION RECORD NOTE:
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CONSTRUCTION RECORD LEGEND
102.00 –INDICATES UN-MEASURABLE
~~102.00~~ 102.02 –INDICATES CONSTRUCTION RECORD
102.00 ✓ –INDICATES CONSTRUCTED AS DESIGNED

SKAGIT COUNTY PLANNING & DEVELOPMENT | DATE

CALL 48 HOURS BEFORE YOU DIG 1-800-424-5555

NO.	DATE	REVISIONS	BY	APRVD
2	06.26.18	COUNTY COMMENTS / SITE PLAN REVISIONS	TAZ	P.SEVERIN
4	08.13.18	CD SET	TAZ	P.SEVERIN
5	08.20.18	SIGNATURE SET	TAZ	P.SEVERIN
6	07.05.19	CONSTRUCTION RECORD DRAWINGS	T.ZEMPEL	P.SEVERIN

Sound Development Group
ENGINEERING, SURVEYING & LAND DEVELOPMENT SERVICES
P.O. Box 1705 • 1111 Cleveland Avenue, Suite 202
Mount Vernon, WA 98273
Tel: 360-404-2010 Fax: 360-404-2013

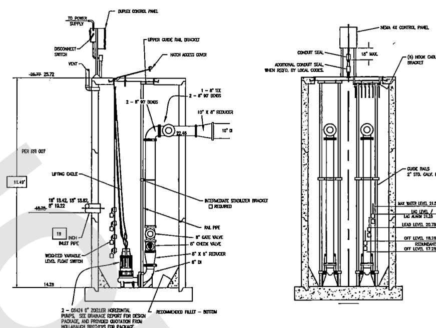
SHEET DESCRIPTION: CONSTRUCTION DETAILS

SCALE: AS NOTED
DRAWN BY: T.ZEMPEL
DESIGNED BY: T.ZEMPEL
CHECKED BY: P.SEVERIN
FIELD BOOK/PAGE:
DATE: APRIL 2018

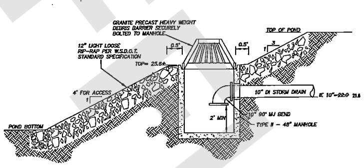
PROJECT: SKAGIT VALLEY FARM COOLING FACILITY SITE PLAN FOR HARTHORNE HAGEN ARCHITECTS
PORTION OF GOVERNMENT LOT 2, SECTION 31, TOWNSHIP 35 NORTH, RANGE 4 EAST, W.M.

JOB NO. 18005
DRAWING NAME 18005.PS
SHEET C15 OF 19

PORTION OF GOVERNMENT LOT 2, SECTION 31, TOWNSHIP 35 NORTH, RANGE 4 EAST, W.M.



STORMWATER PUMP STATION
NOT TO SCALE
(A / C17)



PUMP DISCHARGE TO POND DETAIL
NOT TO SCALE
(B / C17)

Project:
SVF Farms Pump Station
Designed: Sound Development Group
Date: 05.2018

Assumption:
Both Pumps Pump at 25yr Capacity 4.83 CFS
2167.70 GPM
One Pump Design to Pump at 1/2 25 yr 2.42 CFS
1083.85 GPM

Full Build Out		Gallons	Cubic Feet
Minimum Volume Wetwell Storage	V=tQ/4	16.00	2.14
V=minumum volume (gallons)			
t=minimum time between pump starts	9.0		
Q=pump capacity (gallons/minute)	1122 gpm		

Basin Flows	Flow cfs	Flow cfm	Duration Minutes	Wet Well vol/dur.min	Flow gpm
Basin Peak Flow	2.42	144.9000	5.00	724.500	1083.8520

Pump Station Parameters		Pump Specification
Top of Lift station elev.	25.770	
IE Storage Pipe	18.780	
IE Pump Outlet at Flange	14.280	4.5 Feet Below Storage Pipe IE
Distance to Discharge (lf)	150.000	
Elev. of Forcemain Outlet	22.810	Pond Surface
Pump Discharge Diameter (inches)	6.00	
Force main Dia. (inches) = (D)	10.80	
Pump Flow (cfs) = (Q)	2.50	1122.00 Gallon/Min
Velocity in forcemain ft/sec.	4.59	min 2 f/s max 8 f/s

HEADLOSS IN FORCEMAIN
Minor Fitting Losses
*Note: All Bends less than 45 Deg. Use 45 Deg. Bend

Desciption	Number Fittings	Equiv. Length	Sub Total
Tee(run)	0	20	0
Tee(branch)	1	60	60
90 Bend	2	32	64
45 Bend	0	15	0
Gate valve	0	17	0
Swing Check Valve	1	135	135
Butter Fly Valve	0	40	0
Equiv. Lengths			259
Actual Pipe Length			150
Total Pipe Length (L)			409

Hazen Williams Constant (C) 100
Hoodies Equation
Hl=(10.44)*L*((Q^1.85))/((C^1.85)*(D^4.8655)) 5.10 Feet

Dynamic Head	5.10	Feet
Static Head	8.33	Feet
Total head	13.43	Feet

Pump Station Wet Well				
Wetwell Manhole Diameter	3.00	ft		
On float (pipe ie +pipe dia + plus slope)	20.760	ft		
Off float Elev. (Storage Pipe -0.5)	18.280	ft		
Elev. Diff. Off and On	2.480	ft		
Designed Wetwell Working Volume	70.085	Cubic Feet	524.23	Gallons
Additional Pipe Storage				
Size 10.00 Inch				
Length 400.00 Feet	706.50	Cubic Feet	5284.62	Gallons
Pipe Slope 0.0012 0.48				
Total Pump Storage	776.58	Cubic Feet	5808.85	Gallons
Pump Run Time	5.18	Minutes		

CONSTRUCTION RECORD DRAWING

CONSTRUCTION RECORD NOTE:
THESE DRAWINGS ARE PREPARED USING A COMBINATION OF CONTRACTOR PROVIDED REDLINES AND AN AS-BUILT SURVEY. THE CONSTRUCTION RECORDS OF SAID DRAWINGS WERE PERFORMED BY SOUND DEVELOPMENT GROUP 07.08.19.

CONSTRUCTION RECORD LEGEND
102.00 -INDICATES UN-MEASURABLE
~~102.00~~ 102.02 -INDICATES CONSTRUCTION RECORD
102.00 ✓ -INDICATES CONSTRUCTED AS DESIGNED

SKAGIT COUNTY PLANNING & DEVELOPMENT | DATE

03.20.18.REV.1

CALL 48 HOURS BEFORE YOU DIG 1-800-424-5555

NO.	DATE	REVISIONS	BY	APRVD
2	06.28.18	COUNTY COMMENTS / SITE PLAN REVISIONS	TAZ	P.SEVERIN
4	08.15.18	CD SET	TAZ	P.SEVERIN
5	08.20.18	SIGNATURE SET	TAZ	P.SEVERIN
6	07.05.19	CONSTRUCTION RECORD DRAWINGS	T.ZEMPEL	P.SEVERIN

Sound Development Group
ENGINEERING, SURVEYING & LAND DEVELOPMENT SERVICES
P.O. Box 1705 • 1111 Cleveland Avenue, Suite 202
Mount Vernon, WA 98273
Tel: 360-404-2010 Fax: 360-404-2013

SHEET DESCRIPTION
STORMWATER PUMP STATION DETAILS & SPECIFICATIONS

SCALE 1" = 50'
DRAWN BY: T.ZEMPEL
DESIGNED BY: T.ZEMPEL
CHECKED BY: P.SEVERIN
FIELD BOOK/PAGE
DATE APRIL 2018

PROJECT
SKAGIT VALLEY FARM COOLING FACILITY SITE PLAN
FOR
HARTHORNE HAGEN ARCHITECTS
PORTION OF GOVERNMENT LOT 2, SECTION 31, TOWNSHIP 35 NORTH, RANGE 4 EAST, W.M.

JOB NO. 18005
DRAWING NAME 18005PS
SHEET C17 OF 19

Appendix C – Maintenance Activity Log

Appendix C - Maintenance Activity Log

This maintenance activity log shall be kept and made available for inspection by local government.

Facility Inspected	Date	Inspector	Comments	Corrections Required	Date Corrected/ Initial

Appendix D – Inspection and Maintenance Requirements - Catch Basins

Appendix D

Maintenance of Catch Basins Date Inspected: _____

Frequency	Maintenance Component	Defect	Condition When Maintenance is needed	Results Expected When Maintenance is Performed
MS	General	Trash and Debris (Includes Sediment)	Material exceeds 25% of sump depth or 1 foot below orifice plate.	Control structure orifice is not blocked. All trash and debris removed.
		Structural Damage	Structure is not securely attached to manhole wall.	Structure securely attached to wall and outlet pipe.
			Structure is not in upright position (allow up to 10% from plumb)	Structure in correct position.
			Connections to outlet pipe are not watertight and show signs of rust.	Connections to outlet pipe are water tight; structure repaired or replaced and works as designed.
			Any holes—other than designed holes—in the structure	Structure has no holes other than designed holes.
	Clean out Gate	Damaged or missing	Clean out gate is not watertight or is missing.	Gate is watertight and works as designed.
			Gate cannot be moved up and down by one maintenance person.	Gate moves up and down easily and is watertight
			Chain/rod leading to gate is missing or damaged.	Chain is in place and works as designed
			Gate is rusted over 50% of its surface area.	Gate is repaired or replaced to meet design standards.
	Orifice Plate	Damaged or missing	Control device is not working properly due to missing out of place, or bent orifice plate	Plate is in place and works as designed.
		Obstructions	Any trash, debris, sediment, or vegetation blocking the plate.	Plate is free of all obstructions and works as designed.
	Overflow pipe	Obstruction	Any trash or debris blocking (or having the potential of blocking) the overflow pipe	Pipe is free of all obstruction and works as designed.
A	General	Trash & Debris	Trash or debris which is located immediately in front of the catch basin opening or is blocking inletting capacity of the basin by more than 10%.	No Trash or debris located immediately in front of catch basin or on grate opening.
			Trash or debris (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of six inches clearance from the debris surface to the invert of the lowest pipe.	No trash or debris in the catch basin
			Trash or debris in any inlet or outlet pipe blocking more than 1/3 of its height.	Inlet and outlet pipes free of trash or debris.
			Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).	No dead animals or vegetation present within the catch basin.
		Sediment	Sediment (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6 inches clearance from the sediment surface to the invert of the lowest pipe. Measured from the bottom of basin to invert of the lowest pipe into or out of the basin.	No sediment in the catch basin.

Appendix D
Maintenance of Catch Basins Date Inspected: _____

		Structure Damage to Frame and/or Top Slab	Top slab has holes larger than 2 square inches or cracks wider than ¼ inch (Intent is to make sure no material is running into basin).	Top slab is free of holes and cracks.
			Frame not sitting flus on top slab, i.e., separation of more than ¾ inch of the frame from the top slab. Frame not securely attached.	Frame is sitting flush on the riser rings or top slab and firmly attached.
		Fractures or Cracks in Basin Walls/Bottom	Maintenance person judges that structure is unsound.	Basin replaced or repaired to design standards.
			Grout fillet has separated or cracked wider than ½ inch and longer than 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering catch basin through cracks.	Pipe is regrouted and secure at basin wall.
		Settlement/ Misalignment	If failure of basin has created a safety, function, or design problem.	Basin replaced or repaired to design standards.
		Vegetation	Vegetation growing across and blocking more than 10% of the basin opening.	No vegetation blocking opening to basin.
			Vegetation growing in inlet/outlet pipe joints that is more than six inches tall and less than six inches apart.	No vegetation or root growth present.
		Contamination and Pollution	Any evidence of oil, gasoline, contaminants or other pollutants.	No pollution present. Catch basin cover is closed
A	Catch Basin Cover	Cover not in place.	Cover is missing or only partially in place. Any open catch basin requires maintenance.	Catch basin cover is closed.
		Locking Mechanism not working.	Mechanism cannot be opened by one maintenance person with proper tools. bolts into frame have less than ½ inch of thread.	Mechanism opens with proper tools.
		Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. (intent is keep cover from sealing off access to maintenance.)	Cover can be removed by one maintenance person.
A	Ladder	Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, not securely attached to basin wall, misalignment, rust, cracks, or sharp edges.	Ladder meets design standards and allows maintenance person safe access.
M	Outlet Pipe	Trash, Debris, Beaver dam	Trash, debris or any signs of beaver dam activity shall be removed upon inspection.	Outlet is free of trash, debris, or beaver dam blockage.
A	Metal Grates (If Applicable)	Grate Opening unsafe	Grate with opening wider than 7/8 inch.	Grate opening meets design standards.
M S		Trash and Debris	Trash and debris that is blocking more than 20% of grate surface inletting capacity.	Grate free of trash and debris.
A		Damaged or Missing	Grate missing or broken member(s) of the grate.	Grate is in place and meets design standards.

A – Annually – preferably in September
M – Monthly – from November through April
S – After any major storm (1 inch in a 24 hour period)

Appendix E – Inspection and Maintenance Requirements –Shrubbery / Landscaping

Appendix E

Shrubbery Screen/ Landscaping Date of Inspection:

Frequency	Drainage System Feature	Problem	Conditions to Check For	Conditions That Should Exist
M	General	Dead shrubbery	Dead or dying plants	Plants should be removed and a native non-invasive type of vegetation replanted.
M	General	Unruly vegetation	Shrubbery is growing out of control or is infested with weeds.	Shrubbery is trimmed and weeded to provide appealing aesthetics. Do not use chemicals to control weeds.
A	General	Soil aeration	Soil vegetation should be kept from compaction, and well aerated.	If evidence of compaction, vehicle compaction, or other, soils should be re-aerated.
A	General	Mulch/Fertilizer	Organic soil levels (mulch) should be renewed each year.	Vegetation should be mulched yearly, with an approved mulch and organic content. Chemical fertilizers should not be used.

A – Annually – preferably in September
M – Monthly – from November through April
S – After any major storm (1 inch in a 24 hour period)

Appendix F – Inspection and Maintenance Requirements – Roof Downspouts

Appendix F

Downspout Checklist Date Inspected: _____

Frequency	Maintenance Component	Defect	Condition When Maintenance is needed	Results Expected When Maintenance is Performed
A, S	General	General	Gutters, downspouts and their connection points should be inspected for leakage, failure, blockage.	Free-flowing roof water being conveyed.
A	Catch basin/Structure connection	Blockage between downspout and downstream structure connection.	Water is not freely flowing from downspout to downstream connection point/structure. See CB inspection checklist. Do NOT force with air or water the blockage downstream into the infiltration facility, unless the inlet pipe to the infiltration facility has been completely blocked, and the CB or structure is then vacuumed.	Outlet to downstream structure is clear, water freely flowing.

A – Annually – preferably in September
M – Monthly – from November through April
S – After any major storm (1 inch in a 24 hour period)
BW – Bi-weekly
D - Daily

Appendix G – Inspection and Maintenance Requirements – Bioretention Cells

Appendix G

Maintenance of Bioretention Swale and Conveyance Ditch/Swale Date Inspected: _____

Frequency	Maintenance Component	Defect	Condition When Maintenance is needed	Results Expected When Maintenance is Performed
M S A	General	Trash and Debris	Trash and debris accumulated in the bio-swale.	Trash and debris cleared from swale.
		Sediment Accumulation on Grass	Sediment Depth exceeds 2 inches	Remove sediment deposits on grass treatment area of the bio-swale. When finished, swale should be level from side to side and drain freely toward outlet. There should be no areas of standing water once inflow has ceased.
		Standing Water	When water stands in swale between storms and does not drain freely.	Any of the following may apply: remove sediment or trash blockages; improve grade from head to foot of swale, remove clogged check dams, add underdrains or convert to a wet biofiltration swale.
		Flow Spreader	Flow spreader uneven or clogged so that flows are not uniformly distributed through entire swale depth.	Level the spreader and clean so that flows are spread evenly over entire swale width.
		Constant Baseflow	When small quantities of water continually flow through the swale, even when it has been dry for weeks, and an eroded, muddy channel has formed in the swale bottom.	Add a low flow pea gravel drain the length of the swale or bypass the baseflow around the swale.
		Poor Vegetation Cover	When grass is sparse or bare or eroded patchesoccur in more than 10% of the swale bottom.	Determine why grass growth is poor and correct that condition. Re-plant with plgus of grass from the upper slope: plant in the swale bottom at 8" intervals, or reseed into loosened fertile soil.
		Vegetation	When the grass becomes excessively tall (greater than 10"); when nuisance weeds and other vegetation starts to take over.	Mow vegetation or remove nuisance vegetation so that flow not impeded. Grass should be mowed to a height of 3 to 4 inches. Remove grass clippings.
		Excessive Shading	Grass growth is poor because sunlight does not reach swale.	If possible, trim back over hanging limbs and remove brushy vegetation on adjacent slopes.
		Inlet/Outlet	Inlet/Outlet clogged with sediment and/or debris	Remove material so that there is no clogging or blockage in the inlet and outlet area.
		Trash & Debris / Sediment in downstream catch basins	Sediment (in the basin) that exceeds 50 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6 inches clearance from the sediment surface to the invert of the lowest pipe. Measured from the bottom of basin to invert of the lowest pipe into or out of the basin.	No sediment in the catch basins.
		Erosion / Scouring	Eroded or scoured swale bottom due to flow channelization, or higher flows	For ruts or bare areas less than 12" wide, repair the damaged area by filling with crushed gravel. If bare areas are large, generally greater than 12" wide, the swale should be regraded and reseeded. For smaller bare areas, overseed when bare spots are evident, or take plugs of grass from the upper slope and plant in the swale bottom at 8" intervals.

A – Annually – preferably in September
M – Monthly – from November through April
S – After any major storm (1 inch in a 24 hour period)

Appendix H – Inspection and Maintenance Requirements – Debris Barriers

Appendix H - Debris Barriers

Date of Inspection: _____

Frequency	Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Preformed
A M S	General	Trash and Debris	Trash or debris that is plugging more than 20% of the openings in the barrier.	Barrier cleared to design flow capacity.
	Metal	Damaged/ Missing Bars	Bars are bent out of shape more than 3 inches. Bars are missing or entire barrier missing. Bars are loose and rust is causing 50% deterioration to any part of barrier.	Bars in place with no bends more than ¾ inch. Bars in place according to design. Barrier replaced or repaired to design standards.
		Inlet/Outlet Pipe	Debris barrier missing or not attached to pipe	Barrier firmly attached to pipe

A – Annually – preferably in September
M – Monthly – from November through April
S – After any major storm (1 inch in a 24-hour period)

Appendix I – Inspection and Maintenance Requirements – Energy Dissipators

Appendix I - Energy Dissipaters Date of Inspection: _____

Frequency	Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Preformed
External:				
M S	Rock Pad	Missing or Moved Rock	Only one layer of rock exists above native soil in area five square feet or larger, or any exposure of native soil.	Rock pad replaced to design standards.
		Erosion	Soil erosion in or adjacent to rock pad.	Rock pad replaced to design standards.
Internal:				
A	Manhole/Chamber	Worn or Damaged Post, Baffles, Side of Chamber	Structure dissipating flow deteriorates to 1/2 of original size or any concentrated worn spot exceeding one square foot which would make structure unsound.	Structure replaced to design standards.
		Other Defects	See Catch Basins	See Catch Basins

A – Annually – preferably in September
M – Monthly – from November through April
S – After any major storm (1 inch in a 24-hour period)

Appendix J – Inspection and Maintenance Requirements – Filter Strips

Appendix J - Filter Strips

Date of Inspection: _____

Frequency	Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Preformed
A S	General	Sediment Accumulation on Grass	Sediment depth exceeds 2 inches.	Remove sediment deposits, re-level so slope is even and flows pass evenly through strip.
M		Vegetation	When the grass becomes excessively tall (greater than 10-inches); when nuisance weeds and other vegetation start to take over.	Mow grass, control nuisance vegetation, such that flow not impeded. Grass should be mowed to a height between 3-4 inches.
A S		Trash and Debris Accumulation	Trash and debris accumulated on the filter strip.	Remove trash and Debris from filter.
A M S		Erosion/Scouring	Eroded or scoured areas due to flow channelization, or higher flows	For ruts or bare areas less than 12 inches wide, repair the damaged area by filling with crushed gravel. The grass will creep in over the rock in time. If bare areas are large, generally greater than 12 inches wide, the filter strip should be re-graded and re-seeded. For smaller bare areas, over-seed when bare spots are evident.

A – Annually – preferably in September
M – Monthly – from November through April
S – After any major storm (1 inch in a 24-hour period)

Appendix K – Inspection and Maintenance Requirements – Manufactured Media Filters

Appendix K - Manufactured Media Filter Date of Inspection: _____

See Manufactured Media Filter Operations and Maintenance Manual

Frequency	Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Preformed
A	Below Ground Vault.	Sediment Accumulation on Media	Sediment depth exceeds 0.25 inches.	No sediment deposits which would impede permeability of the filter section.
		Sediment Accumulation in Vault	Sediment depth exceeds 6-inches in first chamber.	No sediment deposits in first chamber of vault.
		Trash and Debris Accumulation	Trash and debris accumulated on compost filter bed.	Trash and debris removed from the compost filter bed.
		Sediment in Drain Pipes/Cleanouts	When drainpipes, cleanouts become full with sediment and/or debris.	Sediment and debris removed.
		Short Circuiting	When seepage/flow occurs along the vault walls and corners. Sand eroding near inflow area.	Sand filter media section re-laid and compacted along perimeter of vault to form a semi-seal. Erosion protection added to dissipate force of incoming flow and curtail erosion.
		Damaged Pipes	Any part of the pipes that are crushed or damaged due to corrosion and/or settlement.	Pipe repaired and/or replaced.

A		Access Cover Damaged/Not Working	Cover cannot be opened; one per-son cannot open the cover using normal lifting pressure, corrosion/deformation of cover.	Cover repaired to proper working specifications or replaced
A		Vault Structure Damaged; Includes Cracks in Walls, Bottom, Damage to Frame and/or Top Slab.	Cracks wider than 1/2-inch or evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the vault is not structurally sound. Cracks wider than 1/2-inchat the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.	Vault replaced or repairs made so that vault meets design specifications and is structurally sound. Vault repaired so that no cracks exist wider than 1/4-inch at the joint of the inlet/outlet pipe.
A		Baffles/Internal walls	Baffles or walls corroding, cracking, warping and/or showing signs of failure as determined by maintenance/inspection person.	Baffles repaired or replaced to specifications.
A	Below Ground Cart-ridge Type	Media	Drawdown of water through the media takes longer than 1 hour, and/or overflow occurs frequently.	Media cartridges replaced.
A		Short Circuiting	Flows do not properly enter filter cartridges.	Filter cartridges replaced. 1. Establish a safe working area as per typical catch basin service activity. 2. Remove steel grate and diamond plate cover (weight 100 lbs. each). 3. Turn cartridge(s) counter-clockwise to disconnect from pipe manifold. 4. Remove 4" center cap from cartridge and replace with

				lifting cap. 5. Remove cartridge(s) from catch basin by hand or with vactor truck boom. 6. Remove accumulated sediment via vactor truck (min. clearance 13" x 24"). 7. Remove accumulated sediment from cartridge bay. (min. clearance 9.25" x 11"). 8. Rinse interior of both bays and vactor remaining water and sediment. 9. Install fresh cartridge(s) threading clockwise to pipe manifold. 10. Replace cover and grate. 11. Return original cartridges to Contech for cleaning. Media may be removed from the filter cartridges using the vactor truck before the cartridges are removed from the catch basin structure. Empty cartridges can be easily removed from the catch basin structure by hand. Empty cartridges should be reassembled and returned to Contech as appropriate. Materials required include a lifting cap, vactor truck and fresh filter cartridges. Contact Contech for specifications and

				availability of the lifting cap. The vactor truck must be equipped with a hose capable of reaching areas of restricted clearance. the owner may refresh spent cartridges. Refreshed cartridges are also available from Contech on an exchange basis. Contact the maintenance department of Contech at 503-258-3157 for more information. Maintenance is estimated at 26 minutes of site time. For units with more than one cartridge, add approximately 5 minutes for each additional cartridge

A – Annually – preferably in September
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CONTECH®
ENGINEERED SOLUTIONS

OPERATION AND MAINTENANCE

CatchBasin StormFilter™

Important: These guidelines should be used as a part of your site stormwater plan.

Overview

The CatchBasin StormFilter™ (CBSF) consists of a multi-chamber steel, concrete, or plastic catch basin unit that can contain up to four StormFilter cartridges. The steel CBSF is offered both as a standard and as a deep unit.

The CBSF is installed flush with the finished grade and is applicable for both constrained lot and retrofit applications. It can also be fitted with an inlet pipe for roof leaders or similar applications.

The CBSF unit treats peak water quality design flows up to 0.13 cfs, coupled with an internal weir overflow capacity of 1.0 cfs for the standard unit, and 1.8 cfs for the deep steel and concrete units. Plastic units have an internal weir overflow capacity of 0.5 cfs.

Design Operation

The CBSF is installed as the primary receiver of runoff, similar to a standard, grated catch basin. The steel and concrete CBSF units have an H-20 rated, traffic bearing lid that allows the filter to be installed in parking lots, and for all practical purposes, takes up no land area. Plastic units can be used in landscaped areas and for other non-traffic-bearing applications.

The CBSF consists of a sumped inlet chamber and a cartridge chamber(s). Runoff enters the sumped inlet chamber either by sheet flow from a paved surface or from an inlet pipe discharging directly to the unit vault. The inlet chamber is equipped with an internal baffle, which traps debris and floating oil and grease, and an overflow weir. While in the inlet chamber, heavier solids are allowed to settle into the deep sump, while lighter solids and soluble pollutants are directed under the baffle and into the cartridge chamber through a port between the baffle and the overflow weir.

Once in the cartridge chamber, polluted water ponds and percolates horizontally through the media in the filter cartridges. Treated water collects in the cartridge's center tube from where it is directed by an under-drain manifold to the outlet pipe on the downstream side of the overflow weir and discharged.

When flows into the CBSF exceed the water quality design value, excess water spills over the overflow weir, bypassing the cartridge bay, and discharges to the outlet pipe.

Applications

The CBSF is particularly useful where small flows are being treated or for sites that are flat and have little available hydraulic head to spare. The unit is ideal for applications in which standard catch basins are to be used. Both water quality and catchment issues can be resolved with the use of the CBSF.

Retro-Fit

The retrofit market has many possible applications for the CBSF. The CBSF can be installed by replacing an existing catch basin without having to "chase the grade," thus reducing the high cost of re piping the storm system.

CONTECH® ENGINEERED SOLUTIONS

OPERATION AND MAINTENANCE

CatchBasin StormFilter™

Maintenance Guidelines

Maintenance procedures for typical catch basins can be applied to the CatchBasin StormFilter (CBSF). The filter cartridges contained in the CBSF are easily removed and replaced during maintenance activities according to the following guidelines.

1. Establish a safe working area as per typical catch basin service activity.
2. Remove steel grate and diamond plate cover (weight 100 lbs. each).
3. Turn cartridge(s) counter-clockwise to disconnect from pipe manifold.
4. Remove 4" center cap from cartridge and replace with lifting cap.
5. Remove cartridge(s) from catch basin by hand or with vactor truck boom.
6. Remove accumulated sediment via vactor truck (min. clearance 13" x 24").
7. Remove accumulated sediment from cartridge bay. (min. clearance 9.25" x 11").
8. Rinse interior of both bays and vactor remaining water and sediment.
9. Install fresh cartridge(s) threading clockwise to pipe manifold.
10. Replace cover and grate.
11. Return original cartridges to Contech for cleaning.

Media may be removed from the filter cartridges using the vactor truck before the cartridges are removed from the catch basin structure. Empty cartridges can be easily removed from the catch basin structure by hand. Empty cartridges should be reassembled and returned to Contech as appropriate.

Materials required include a lifting cap, vactor truck and fresh filter cartridges. Contact Contech for specifications and availability of the lifting cap. The vactor truck must be equipped with a hose capable of reaching areas of restricted clearance. the owner may refresh spent cartridges. Refreshed cartridges are also available from Contech on an exchange basis. Contact the maintenance department of Contech at 503-258-3157 for more information.

Maintenance is estimated at 26 minutes of site time. For units with more than one cartridge, add approximately 5 minutes for each additional cartridge. Add travel time as required.

Mosquito Abatement

In certain areas of the United States, mosquito abatement is desirable to reduce the incidence of vectors.

In BMPs with standing water, which could provide mosquito breeding habitat, certain abatement measures can be taken.

1. Periodic observation of the standing water to determine if the facility is harboring mosquito larvae.
2. Regular catch basin maintenance.
3. Use of larvicides containing Bacillus thuringiensis israelensis (BTI). BTI is a bacterium toxic to mosquito and black fly larvae.

In some cases, the presence of petroleum hydrocarbons may interrupt the mosquito growth cycle.

Using Larvicides in the CatchBasin StormFilter

Larvicides should be used according to manufacturer's recommendations.

Two widely available products are Mosquito Dunks and Summit B.t.i. Briquets. For more information, visit http://www.summitchemical.com/mos_ctrl/d efault.htm.

The larvicide must be in contact with the permanent pool. The larvicide should also be fastened to the CatchBasin StormFilter by string or wire to prevent displacement by high flows. A magnet can be used with a steel catch basin.

For more information on mosquito abatement in stormwater BMPs, refer to the following: http://www.ucmrp.ucdavis.edu/publications/managingmosquitoesstormwater8125.pdf

Appendix L – Inspection and Maintenance Requirements – Oil Water Separator

Appendix L - Oil Water Separator Date of Inspection: _____

See CDS Operation and Maintenance Manual

Frequency	Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Preformed
M S	General	Monitoring	Inspection of discharge water for obvious signs of poor water quality.	Effluent discharge from vault should be clear with no visible thick sheen.
A		Sediment Accumulation	Sediment depth in bottom of vault exceeds 6-inches in depth and/or visible signs of sediment on plates.	No sediment deposits on vault bottom and plate media, which would impede flow through the vault and reduce separation efficiency.
A M S		Trash and Debris Accumulation	Trash and debris accumulated in vault, or pipe inlet/outlet, floatables and non-floatables.	Trash and debris removed from vault, and inlet/outlet piping.
A M S		Oil Accumulation	Oil accumulation that exceeds 1-inch at the water surface	Oil is extracted from vault using vactoring methods. Coalescing plates are cleaned by thoroughly rinsing and flushing. Should be no visible oil depth on water.
A		Damaged Coalescing Plates	Plate media broken, deformed, cracked and/or showing signs of failure.	A portion of the media pack or the entire plate pack is replaced depending on severity of failure.

A		Damaged Pipes	Inlet or outlet piping damaged or broken and in need of repair.	Pipe repaired and/or replaced.
A		Vault Structure Damage -Includes Cracks in Walls, Bottom, Damage to Frame and/or Top Slab	Cracks wider than 1/2-inch or evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the vault is not structurally sound. Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.	Vault replaced or repairs made so that vault meets design specifications and is structurally sound. Vault repaired so that no cracks exist wider than 1/4-inch at the joint of the inlet/outlet pipe

A – Annually – preferably in September
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CDS Guide
Operation, Design, Performance and Maintenance

STORMWATER SYSTEM MAINTENANCE PLAN 2019-07-02

CDS®

Using patented continuous deflective separation technology, the CDS system screens, separates and traps debris, sediment, and oil and grease from stormwater runoff. The indirect screening capability of the system allows for 100% removal of floatables and neutrally buoyant material without blinding. Flow and screening controls physically separate captured solids, and minimize the re-suspension and release of previously trapped pollutants. Inline units can treat up to 6 cfs, and internally bypass flows in excess of 50 cfs (1416 L/s). Available precast or cast-in-place, offline units can treat flows from 1 to 300 cfs (28.3 to 8495 L/s). The pollutant removal capacity of the CDS system has been proven in lab and field testing.

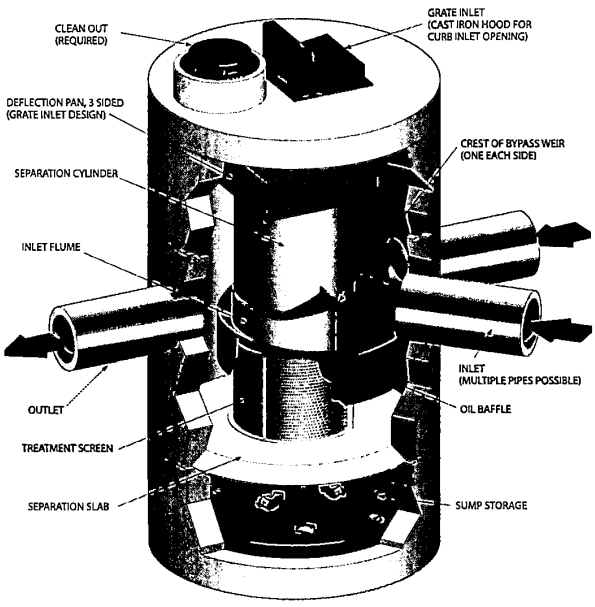
Operation Overview

Stormwater enters the diversion chamber where the diversion weir guides the flow into the unit's separation chamber and pollutants are removed from the flow. All flows up to the system's treatment design capacity enter the separation chamber and are treated.

Swirl concentration and screen deflection force floatables and solids to the center of the separation chamber where 100% of floatables and neutrally buoyant debris larger than the screen apertures are trapped.

Stormwater then moves through the separation screen, under the oil baffle and exits the system. The separation screen remains clog free due to continuous deflection.

During the flow events exceeding the treatment design capacity, the diversion weir bypasses excessive flows around the separation chamber, so captured pollutants are retained in the separation cylinder.



Design Basics

There are three primary methods of sizing a CDS system. The Water Quality Flow Rate Method determines which model size provides the desired removal efficiency at a given flow rate for a defined particle size. The Rational Rainfall Method™ or the and Probabilistic Method is used when a specific removal efficiency of the net annual sediment load is required.

Typically in the Unites States, CDS systems are designed to achieve an 80% annual solids load reduction based on lab generated performance curves for a gradation with an average particle size (d50) of 125 microns (μm). For some regulatory environments, CDS systems can also be designed to achieve an 80% annual solids load reduction based on an average particle size (d50) of 75 microns (μm) or 50 microns (μm).

Water Quality Flow Rate Method

In some cases, regulations require that a specific treatment rate, often referred to as the water quality design flow (WQQ), be treated. This WQQ represents the peak flow rate from either an event with a specific recurrence interval, e.g. the six-month storm, or a water quality depth, e.g. 1/2-inch (13 mm) of rainfall.

The CDS is designed to treat all flows up to the WQQ. At influent rates higher than the WQQ, the diversion weir will direct most flow exceeding the WQQ around the separation chamber. This allows removal efficiency to remain relatively constant in the separation chamber and eliminates the risk of washout during bypass flows regardless of influent flow rates.

Treatment flow rates are defined as the rate at which the CDS will remove a specific gradation of sediment at a specific removal efficiency. Therefore the treatment flow rate is variable, based on the gradation and removal efficiency specified by the design engineer.

Rational Rainfall Method™

Differences in local climate, topography and scale make every site hydraulically unique. It is important to take these factors into consideration when estimating the long-term performance of any stormwater treatment system. The Rational Rainfall Method combines site-specific information with laboratory generated performance data, and local historical precipitation records to estimate removal efficiencies as accurately as possible.

Short duration rain gauge records from across the United States and Canada were analyzed to determine the percent of the total annual rainfall that fell at a range of intensities. US stations' depths were totaled every 15 minutes, or hourly, and recorded in 0.01-inch increments. Depths were recorded hourly with 1-mm resolution at Canadian stations. One trend was consistent at all sites; the vast majority of precipitation fell at low intensities and high intensity storms contributed relatively little to the total annual depth.

These intensities, along with the total drainage area and runoff coefficient for each specific site, are translated into flow rates using the Rational Rainfall Method. Since most sites are relatively small and highly impervious, the Rational Rainfall Method is appropriate. Based on the runoff flow rates calculated for each intensity, operating rates within a proposed CDS system are

determined. Performance efficiency curve determined from full scale laboratory tests on defined sediment PSDs is applied to calculate solids removal efficiency. The relative removal efficiency at each operating rate is added to produce a net annual pollutant removal efficiency estimate.

Probabilistic Rational Method

The Probabilistic Rational Method is a sizing program Contech developed to estimate a net annual sediment load reduction for a particular CDS model based on site size, site runoff coefficient, regional rainfall intensity distribution, and anticipated pollutant characteristics.

The Probabilistic Method is an extension of the Rational Method used to estimate peak discharge rates generated by storm events of varying statistical return frequencies (e.g. 2-year storm event). Under the Rational Method, an adjustment factor is used to adjust the runoff coefficient estimated for the 10-year event, correlating a known hydrologic parameter with the target storm event. The rainfall intensities vary depending on the return frequency of the storm event under consideration. In general, these two frequency dependent parameters (rainfall intensity and runoff coefficient) increase as the return frequency increases while the drainage area remains constant.

These intensities, along with the total drainage area and runoff coefficient for each specific site, are translated into flow rates using the Rational Method. Since most sites are relatively small and highly impervious, the Rational Method is appropriate. Based on the runoff flow rates calculated for each intensity, operating rates within a proposed CDS are determined. Performance efficiency curve on defined sediment PSDs is applied to calculate solids removal efficiency. The relative removal efficiency at each operating rate is added to produce a net annual pollutant removal efficiency estimate.

Treatment Flow Rate

The inlet throat area is sized to ensure that the WQQ passes through the separation chamber at a water surface elevation equal to the crest of the diversion weir. The diversion weir bypasses excessive flows around the separation chamber, thus preventing re-suspension or re-entrainment of previously captured particles.

Hydraulic Capacity

The hydraulic capacity of a CDS system is determined by the length and height of the diversion weir and by the maximum allowable head in the system. Typical configurations allow hydraulic capacities of up to ten times the treatment flow rate. The crest of the diversion weir may be lowered and the inlet throat may be widened to increase the capacity of the system at a given water surface elevation. The unit is designed to meet project specific hydraulic requirements.

Performance

Full-Scale Laboratory Test Results

A full-scale CDS system (Model CDS2020-5B) was tested at the facility of University of Florida, Gainesville, FL. This CDS unit was evaluated under controlled laboratory conditions of influent flow rate and addition of sediment.

Two different gradations of silica sand material (UF Sediment & OK-110) were used in the CDS performance evaluation. The particle size distributions (PSDs) of the test materials were analyzed using standard method "Gradation ASTM D-422 "Standard Test Method for Particle-Size Analysis of Soils" by a certified laboratory.

UF Sediment is a mixture of three different products produced by the U.S. Silica Company: "Sil-Co-Sil 106", "#1 DRY" and "20/40 Oil Frac". Particle size distribution analysis shows that the UF Sediment has a very fine gradation (d50 = 20 to 30 μm) covering a wide size range (Coefficient of Uniformity, C averaged at 10.6). In comparison with the hypothetical TSS gradation specified in the NJDEP (New Jersey Department of Environmental Protection) and NJCAT (New Jersey Corporation for Advanced Technology) protocol for lab testing, the UF Sediment covers a similar range of particle size but with a finer d50 (d50 for NJDEP is approximately 50 μm) (NJDEP, 2003).

The OK-110 silica sand is a commercial product of U.S. Silica Sand. The particle size distribution analysis of this material, also included in Figure 1, shows that 99.9% of the OK-110 sand is finer than 250 microns, with a mean particle size (d50) of 106 microns. The PSDs for the test material are shown in Figure 1.

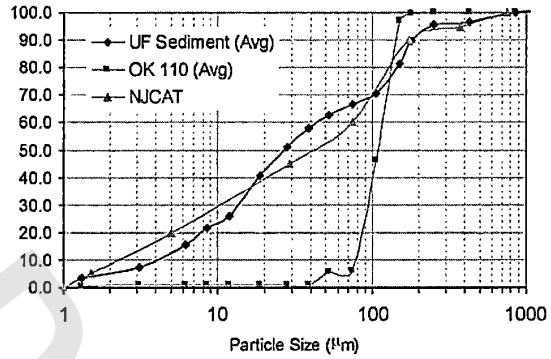


Figure 1. Particle size distributions

Tests were conducted to quantify the performance of a specific CDS unit (1.1 cfs (31.3-L/s) design capacity) at various flow rates, ranging from 1% up to 125% of the treatment design capacity of the unit, using the 2400 micron screen. All tests were conducted with controlled influent concentrations of approximately 200 mg/L. Effluent samples were taken at equal time intervals across the entire duration of each test run. These samples were then processed with a Dekaport Cone sample splitter to obtain representative sub-samples for Suspended Sediment Concentration (SSC) testing using ASTM D3977-97 "Standard Test Methods for Determining Sediment Concentration in Water Samples", and particle size distribution analysis.

Results and Modeling

Based on the data from the University of Florida, a performance model was developed for the CDS system. A regression analysis was used to develop a fitting curve representative of the scattered data points at various design flow rates. This model, which demonstrated good agreement with the laboratory data, can then be used to predict CDS system performance with respect

to SSC removal for any particle size gradation, assuming the particles are inorganic sandy-silt. Figure 2 shows CDS predictive performance for two typical particle size gradations (NJCAT gradation and OK-110 sand) as a function of operating rate.

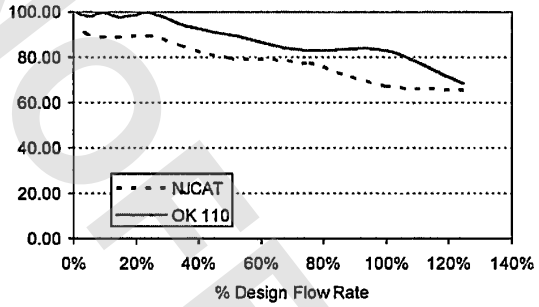


Figure 2. CDS stormwater treatment predictive performance for various particle gradations as a function of operating rate.

Many regulatory jurisdictions set a performance standard for hydrodynamic devices by stating that the devices shall be capable of achieving an 80% removal efficiency for particles having a mean particle size (d50) of 125 microns (e.g. Washington State Department of Ecology — WASDOE - 2008). The model can be used to calculate the expected performance of such a PSD (shown in Figure 3). The model indicates (Figure 4) that the CDS system with 2400 micron screen achieves approximately 80% removal at the design (100%) flow rate, for this particle size distribution (d50 = 125 μm).

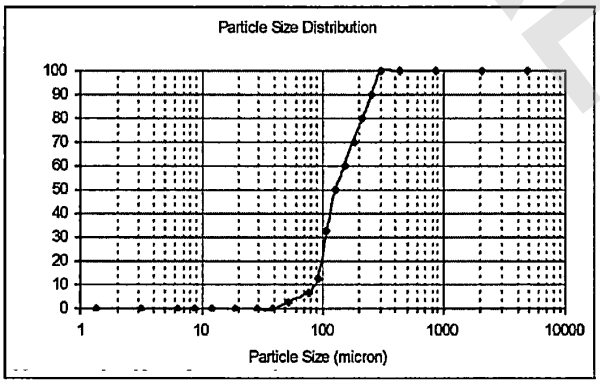


Figure 3. WASDOE PSD

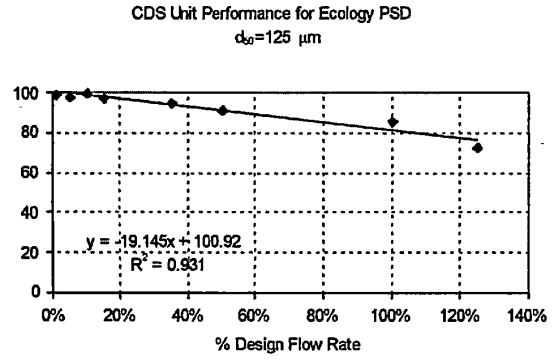


Figure 4. Modeled performance for WASDOE PSD.

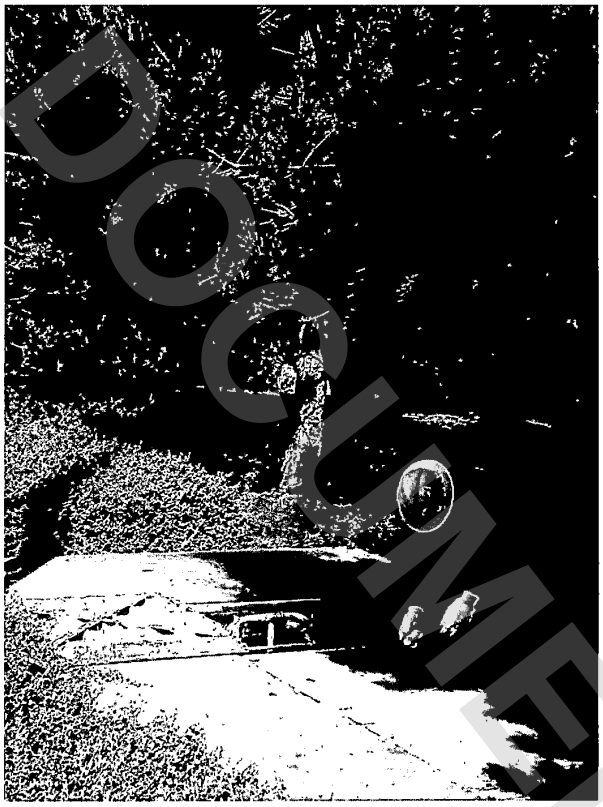
Maintenance

The CDS system should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects pollutants will depend more heavily on site activities than the size of the unit. For example, unstable soils or heavy winter sanding will cause the grit chamber to fill more quickly but regular sweeping of paved surfaces will slow accumulation.

Inspection

Inspection is the key to effective maintenance and is easily performed. Pollutant transport and deposition may vary from year to year and regular inspections will help ensure that the system is cleaned out at the appropriate time. At a minimum, inspections should be performed twice per year (e.g. spring and fall) however more frequent inspections may be necessary in climates where winter sanding operations may lead to rapid accumulations, or in equipment washdown areas. Installations should also be inspected more frequently where excessive amounts of trash are expected.

The visual inspection should ascertain that the system components are in working order and that there are no blockages or obstructions in the inlet and separation screen. The inspection should also quantify the accumulation of hydrocarbons, trash, and sediment in the system. Measuring pollutant accumulation can be done with a calibrated dipstick, tape measure or other measuring instrument. If absorbent material is used for enhanced removal of hydrocarbons, the level of discoloration of the sorbent material should also be identified



during inspection. It is useful and often required as part of an operating permit to keep a record of each inspection. A simple form for doing so is provided.

Access to the CDS unit is typically achieved through two manhole access covers. One opening allows for inspection and cleanout of the separation chamber (cylinder and screen) and isolated sump. The other allows for inspection and cleanout of sediment captured and retained outside the screen. For deep units, a single manhole access point would allows both sump cleanout and access outside the screen.

The CDS system should be cleaned when the level of sediment has reached 75% of capacity in the isolated sump or when an appreciable level of hydrocarbons and trash has accumulated. If absorbent material is used, it should be replaced when significant discoloration has occurred. Performance will not be impacted until 100% of the sump capacity is exceeded however it is recommended that the system be cleaned prior to that for easier removal of sediment. The level of sediment is easily determined by measuring from finished grade down to the top of the sediment pile. To avoid underestimating the level of sediment in the chamber, the measuring device must be lowered to the top of the sediment pile carefully. Particles at the top of the pile typically offer less resistance to the end of the rod than consolidated particles toward the bottom of the pile. Once this measurement is recorded, it should be compared to the as-built drawing for the unit to determine weather the height of the sediment pile off the bottom of the sump floor exceeds 75% of the total height of isolated sump.

Cleaning

Cleaning of a CDS systems should be done during dry weather conditions when no flow is entering the system. The use of a vacuum truck is generally the most effective and convenient method of removing pollutants from the system. Simply remove the manhole covers and insert the vacuum hose into the sump. The system should be completely drained down and the sump fully evacuated of sediment. The area outside the screen should also be cleaned out if pollutant build-up exists in this area.

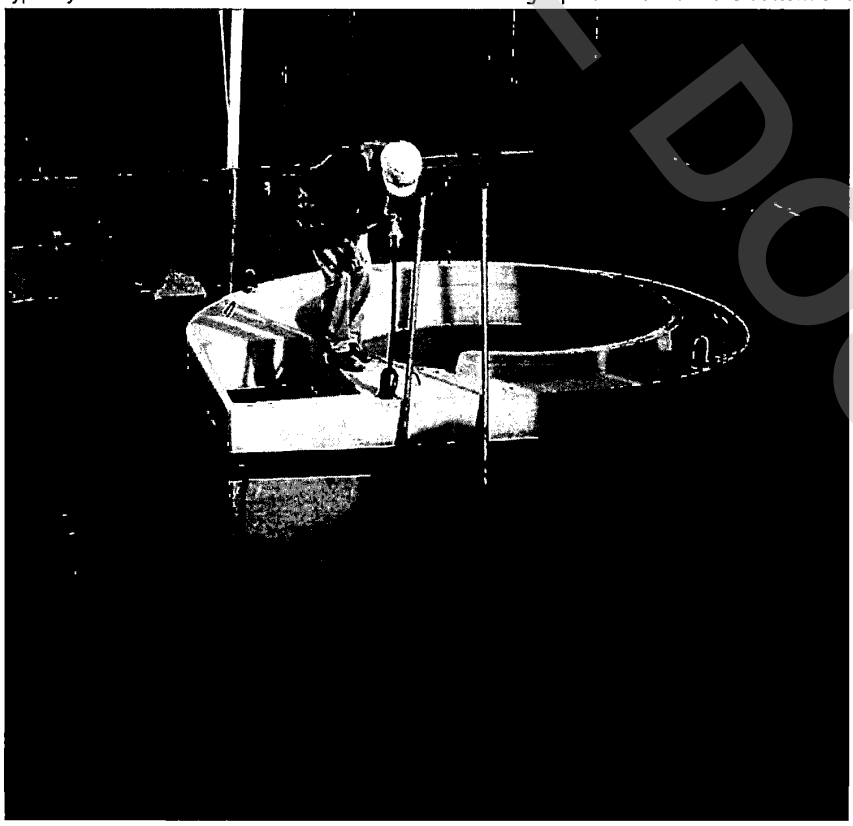
In installations where the risk of petroleum spills is small, liquid contaminants may not accumulate as quickly as sediment. However, the system should be cleaned out immediately in the event of an oil or gasoline spill. Motor oil and other hydrocarbons that accumulate on a more routine basis should be removed when an appreciable layer has been captured. To remove these pollutants, it may be preferable to use absorbent pads since they are usually less expensive to dispose than the oil/water emulsion that may be created by vacuuming the oily layer. Trash and debris can be netted out to separate it from the other pollutants. The screen should be cleaned to ensure it is free of trash and debris.

Manhole covers should be securely seated following cleaning activities to prevent leakage of runoff into the system from above and also to ensure that proper safety precautions have been followed. Confined space entry procedures need to be followed if physical access is required. Disposal of all material removed from the CDS system should be done in accordance with local regulations. In many jurisdictions, disposal of the sediments may be handled in the same manner as the disposal of sediments removed from catch basins or deep sump manholes. Check your local regulations for specific requirements on disposal.

CDS Model	Diameter		Distance from Water Surface to Top of Sediment Pile		Sediment Storage Capacity	
	ft	m	ft	m	y^3	m^3
CDS1515	3	0.9	3.0	0.9	0.5	0.4
CDS2015	4	1.2	3.0	0.9	0.9	0.7
CDS2015	5	1.5	3.0	0.9	1.3	1.0
CDS2020	5	1.5	3.5	1.1	1.3	1.0
CDS2025	5	1.5	4.0	1.2	1.3	1.0
CDS3020	6	1.8	4.0	1.2	2.1	1.6
CDS3025	6	1.8	4.0	1.2	2.1	1.6
CDS3030	6	1.8	4.6	1.4	2.1	1.6
CDS3035	6	1.8	5.0	1.5	2.1	1.6
CDS4030	8	2.4	4.6	1.4	5.6	4.3
CDS4040	8	2.4	5.7	1.7	5.6	4.3
CDS4045	8	2.4	6.2	1.9	5.6	4.3
CDS5640	10	3.0	6.3	1.9	8.7	6.7
CDS5653	10	3.0	7.7	2.3	8.7	6.7
CDS5668	10	3.0	9.3	2.8	8.7	6.7
CDS5678	10	3.0	10.3	3.1	8.7	6.7

Table 1: CDS Maintenance Indicators and Sediment Storage Capacities

Note: To avoid underestimating the volume of sediment in the chamber, carefully lower the measuring device to the top of the sediment pile. Finer silty particles at the top of the pile may be more difficult to feel with a measuring stick. These finer particles typically offer less resistance to the end of the rod than larger particles toward the bottom of the pile.



CDS Inspection & Maintenance Log

CDS Model: _____ Location: _____

Date	Water depth to sediment[1]	Floatable Layer Thickness[2]	Describe Maintenance Performed	Maintenance Personnel	Comments

1. The water depth to sediment is determined by taking two measurements with a stadia rod: one measurement from the manhole opening to the top of the sediment pile and the other from the manhole opening to the water surface. If the difference between these measurements is less than the values listed in table 1 the system should be cleaned out. **Note: to avoid underestimating the volume of sediment in the chamber, the measuring device must be carefully lowered to the top of the sediment pile.**

2. For optimum performance, the system should be cleaned out when the floating hydrocarbon layer accumulates to an appreciable thickness. In the event of an oil spill, the system should be cleaned immediately.

Appendix M – Inspection and Maintenance Requirements – Storm Pump Station

Appendix M - Stormwater Pump Station Date of Inspection: _____

See Zoeller Operations and Maintenance Manual

Frequency	Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Preformed
M S	General	Trash and Debris (Includes Sediment)	Material exceeds 25% of sump depth or 1 foot below orifice plate.	Control structure orifice is not blocked. All trash and debris removed.
		Structural Damage	Structure is not securely attached to manhole wall.	Structure securely attached to wall and outlet pipe.
			Structure is not in upright position (allow up to 10% from plumb)	Structure in correct position.
			Connections to outlet pipe are not watertight and show signs of rust.	Connections to outlet pipe are watertight; structure repaired or replaced and works as designed.
			Any holes—other than designed holes—in the structure	Structure has no holes other than designed holes.
A	General	Trash & Debris	Trash or debris which is located immediately in front of the catch basin opening or is blocking inletting capacity of the basin by more than 10%.	No Trash or debris located immediately in front of catch basin or on grate opening.
			Trash or debris (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of six inches clearance from the debris	No trash or debris in the catch basin

			surface to the invert of the lowest pipe.	
			Trash or debris in any inlet or outlet pipe blocking more than 1/3 of its height.	Inlet and outlet pipes free of trash or debris.
			Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).	No dead animals or vegetation present within the catch basin.
A		Sediment	Sediment (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6 inches clearance from the sediment surface to the invert of the lowest pipe. Measured from the bottom of basin to invert of the lowest pipe into or out of the basin.	No sediment in the catch basin
A		Structure Damage to Frame and/or Top Slab	Top slab has holes larger than 2 square inches or cracks wider than ¼ inch (Intent is to make sure no material is running into basin).	Top slab is free of holes and cracks.
			Frame not sitting flus on top slab, i.e., separation of more than ¾ inch of the frame from the top slab. Frame not securely attached.	Frame is sitting flush on the riser rings or top slab and firmly attached
A		Fractures or Cracks in Basin Walls/Bottom	Maintenance person judges that structure is unsound.	Basin replaced or repaired to design standards.
			Grout fillet has separated or cracked wider than ½ inch and longer than 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering catch basin through cracks.	Pipe is regrouted and secure at basin wall.

A		Settlement/ Misalignment	If failure of basin has created a safety, function, or design problem.	Basin replaced or repaired to design standards.
A		Vegetation	Vegetation growing across and blocking more than 10% of the basin opening.	No vegetation blocking opening to basin.
			Vegetation growing in inlet/outlet pipe joints that is more than six inches tall and less than six inches apart.	No vegetation or root growth present.
A		Contamination and Pollution	Any evidence of oil, gasoline, contaminants or other pollutants.	No pollution present.
A	Catch Basin Cover	Cover not in place.	Cover is missing or only partially in place. Any open catch basin requires maintenance.	Catch basin cover is closed
		Locking Mechanism not working.	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than ½ inch of thread.	Mechanism opens with proper tools.
		Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. (intent is keep cover from sealing off access to maintenance.)	Cover can be removed by one maintenance person.
A	Ladder	Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, not securely attached to basin wall, misalignment, rust, cracks, or sharp edges.	Ladder meets design standards and allows maintenance person safe access
M	Outlet Pipe	Trash, Debris, Beaver dam	Trash, debris or any signs of beaver dam activity shall be removed upon inspection.	Outlet is free of trash, debris, or beaver dam blockage
A	Pumps	Float Malfunction	Floats are obstructed	Remove obstruction. Floats should remain unobstructed.
A		Dark Oil, Burnt Odor	Pump has overheated. Check the motor winding resistance to ground. Ohm readings of 1 megohm or higher is required. If lower readings are present, return the unit to a Zoeller Authorized Service Station for service.	Clear oil, no burnt odor - Oil, motor and seals are in satisfactory condition.

A		Milky, emulsifed oil	Seals have failed. Unit must be returned to an authorized service facility for service	Clear oil, no burnt odor - Oil, motor and seals are in satisfactory condition.
A		Power Cables Damaged	Wiring in cables is exposed or broken.	Inspect power cables for damage or wear. Replace immediately if damage or wear is detected. Power cables should be fully insulated and have no exposed wiring.
A		Impeller damaged or worn	Impeller is cracked, broken or shows signs of wearing,	Inspect impeller for damage or wear. Replace as required by a Zoeller Authorized Service Station
A		Motor Overheats and trips over load or blows fuse	Incorrect Voltage. Unbalanced power source. Incorrect motor rotation. Negative or low head. Excessive water temperature. Impeller or seal mechanically bound. Defective capacitor or relay. Motor shorted. Lost one line in a Three Phase unit	Motor runs smoothly at proper temperature. Motor is in proper rotation. Head is at proper level. Water temperature is acceptable for pump functionality. Capacitor is repaired or replaced.
A		Pumps starts and stops too often	Check valve stuck open. Level controls out of adjustment. Temperature sensor tripping. Thermal overload switch out of adjustment or defective. Pit too small.	Check Valve opens and closes as designed. Temperature sensor is functioning properly and temperature is at acceptable levels. Pit is of proper size.
A M S		Pumps not shutting off.	Debris under float switch. Float travel obstructed. Defective or damaged float switch. Magnetic starter contacts shorted. Air lock - check vent hole	Float switches are unimpeded by debris. Float switches are repaired and in good condition. Magnetic started contacts have been repaired.
A M S		Pump operates but delivers little or no water.	Check for plugged Pump housing, discharge pipe or sticking check valve. Vent hole clogged or not drilled. Discharge head exceeds pumps capacity. Low or incorrect voltage. Incorrect motor rotation. Defective capacitor	Pump housing is clean and clear of debris. Check valve opens and closes as designed. Vent hole is present, clean, and clear of debris and sediment. Discharge head is within design parameters. Voltage meets pump power requirements. Motor is in proper rotation. Capacitor is repaired or replaced.

A		Drop in head and/or capacity after a period or use	Increased Pipe Friction. Clogged line or check valve. Abrasive material & chemical. Deteriorated impeller and pump housing.	Pipes are repaired so that friction does not occur. Check valve is clean and free of debris and sediment. Abrasive chemicals and materials are removed and cleaned. Pump impeller is repaired or replaced.
A M S		Pumps will not start or run	See Zoeller O & M	See Zoeller O & M
M A	Panel	Panel not operating properly	Moisture present in enclosure.	Panel enclosure is dry to prevent any damage to electrical components.
A			Loose Connections	Connections inside panel are secure.

A – Annually – preferably in September
M – Monthly – from November through April
S – After any major storm (1 inch in a 24-hour period)

Trusted. Tested. Tough.™

Product information presented here reflects conditions at time of publication. Consult factory regarding discrepancies or inconsistencies.

Register your Zoeller Engineered Product on our website: http://reg.zoellerengprod.com/

ZOELLER® ENGINEERED PRODUCTS

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SECTION: Z2.30.170
ZM3013
0119
Supersedes
0517

REPAIR MANUAL

64 HD SERIES HEAVY DUTY SOLIDS HANDLING PUMPS

Since 1939 the name Zoeller has represented the standard for submersible dewatering and sewage pumps. The same high quality workmanship and easy maintenance design has been incorporated into this line of heavy-duty solids-handling submersible sewage pumps.

This manual incorporates the parts list and repair instructions into one document to aid in the ownership of a Zoeller submersible non-clog wastewater product. Please read and review this manual before repairing the product. Follow the steps and procedures listed on ZM1074 for a proper start-up upon installation. Many items contained within, when followed correctly, will not only ensure a long and problem-free life for the pump, but also save time and money during installation. Reference ZM3014 for owner's manual on 64 HD Series Pumps. Should further assistance be necessary please call our Product Support Department at 1-800-928-PUMP (7867).

Table of Contents

To Order Replacement Parts

PLEASE FURNISH THE FOLLOWING INFORMATION:

- Model Number
- Part Number of Pump
- Serial Number
- System Voltage
- Replacement Part Number and Description (refer to pages 2 & 3).

Short Term Storage

Storage of six months or less will not damage the submersible pump. However, to ensure the best possible protection, the following is advised:

- Store pump inside whenever possible or cover with some type of protective covering.
- Tape or seal in plastic bag the terminal ends of wire leads.
- Spray coat unpainted surfaces with rust-inhibiting oil.
- See ZM3014 Owner's Manual before start-up.

Safety Instructions

TO AVOID SERIOUS OR FATAL PERSONAL INJURY OR MAJOR PROPERTY DAMAGE, READ AND FOLLOW ALL SAFETY INSTRUCTIONS IN THIS MANUAL AND ON THE PUMP.

THIS MANUAL IS INTENDED TO ASSIST IN THE INSTALLATION AND OPERATION OF THIS UNIT AND MUST BE KEPT WITH THE PUMP.

This is a **SAFETY ALERT SYMBOL.** When you see this symbol on the pump or in the manual, look for one of the following signal words and be alert to the potential for personal injury or property damage.

⚠ DANGER Warns of hazards that **WILL** cause serious personal injury, death or major property damage.

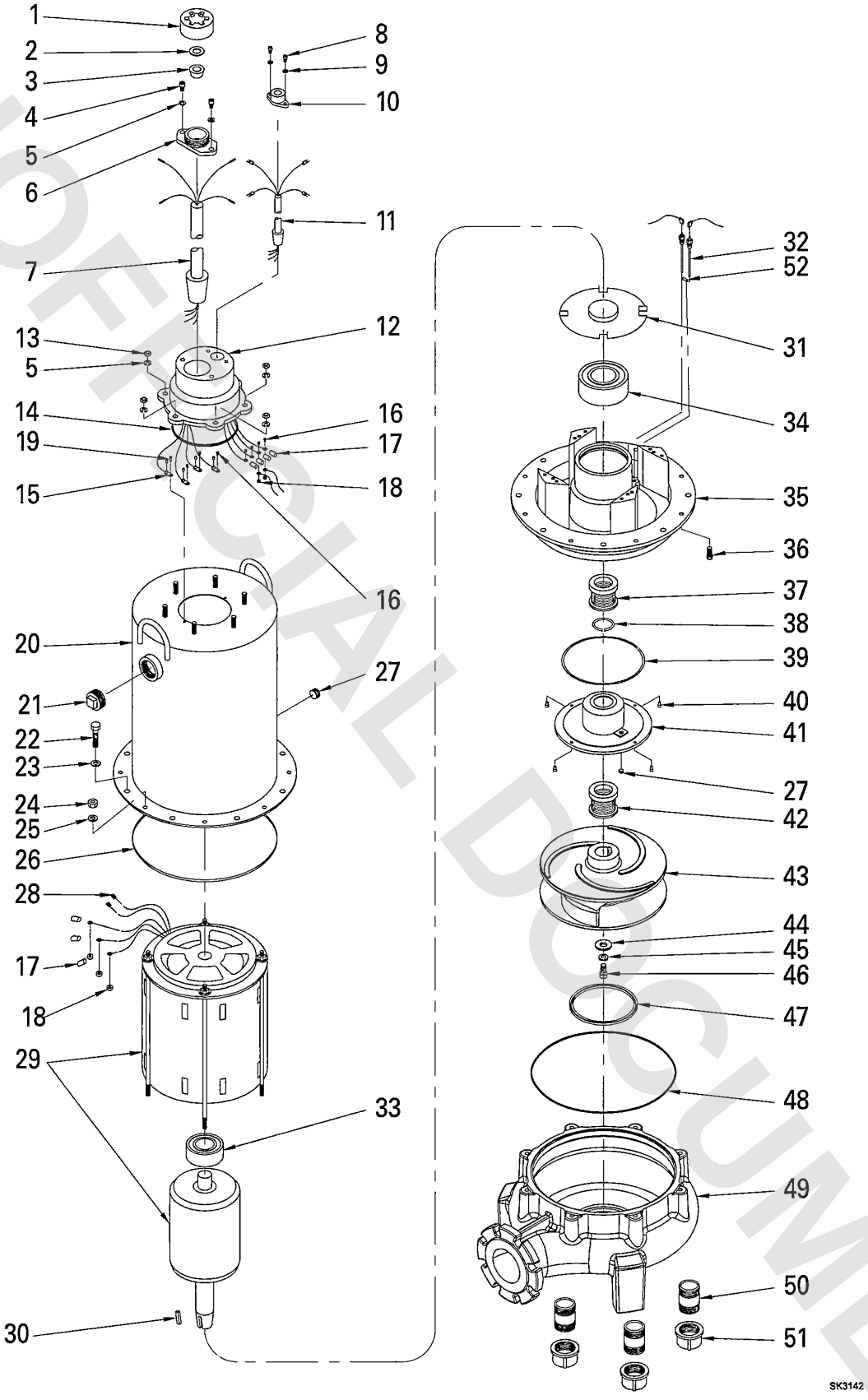
⚠ WARNING Warns of hazards that **CAN** cause serious personal injury, death or major property damage.

⚠ CAUTION Warns of hazards that **CAN** cause personal injury or property damage.

⚠ NOTICE INDICATES SPECIAL INSTRUCTIONS WHICH ARE VERY IMPORTANT AND MUST BE FOLLOWED.

THOROUGHLY REVIEW ALL INSTRUCTIONS AND WARNINGS PRIOR TO PERFORMING ANY WORK ON THIS PUMP.

MAINTAIN ALL SAFETY DECALS.



REPLACEMENT PARTS LIST FOR MODELS

6424 - 6425 - 6426 - 6427 - 6428, 3 PHASE

REF. NO.	DESCRIPTION	QTY	NOTES	5/17 thru Current
1	Lead Clamp Cap	1		007155
2	Washer	1	5	007156
3	Lock Ring	1	5	151483
4	Hex Head Screw	2		007400
5	Lock Washer	8		007132
6	Lead Clamp	1		007158
7	Lead Wire Assembly	1	1, 5	007424
8	Hex Head Screw	2		002608
9	Lock Washer	2		006402
10	Lead Clamp	1		008021
11	Sensor Wire Assembly	1	1	006503
12	Lead Housing	1		007420
13	Nut	6		007390
14	O-Ring	1	2	007129
15	Wire Connector	4		007130
16	Screw	10		008038
17	Shrink Tubing Sensor	8		007204
	Shrink Tubing Motor	12		016933
18	Nut	10		001822
19	Screw	1		007545
20	Motor Housing	1		007394
21	Pipe Plug	1		007392
22	Hex Head Cap Screw	8		007402
23	Lock Washer	8		006404
24	Nut	8		001809
25	Lock Washer	8		007132
26	O-Ring	1	2	007127
27	Pipe Plug	2		006460
28	Temperature Sensor	1		007190
29	Motor	1		SEE JOB FILE
30	Impeller Key	1		007408
31	Fan	1		008223
32	Moisture Probe Assembly	1		008026
33	Upper Bearing	1		008225
34	Lower bearing			007415
35	Bearing Housing	1		008224
36	Screw	8		008451
37	Rotary Seal (upper) Carbon/Ceramic	1	2	007131
	Optional SiliconeCarbide/SiliconeCarbide			011139
38	Snap Ring	1		007126
39	O-Ring 267	1	2	007589
40	Screw 1/4" - 20 x .375"	4		006456
41	Seal Retainer	1		007506
42	Rotary Seal (lower) Carbon/Ceramic	1	2	007131
	Optional SiliconeCarbide/SiliconeCarbide			011139
43	Impeller	1	3	SEE JOB FILE
44	Impeller Washer	1		007410
45	Lock Washer 3/4" S/S	1		006455
46	Screw 3/4" - 16 UNF x 1.38"	1		007434
47	Wear Ring 4" Discharge	1	2	154627
	U-Cup Packing 6" Discharge	1	2	007169
48	O-Ring 281	1	2	007128
49	Pump Housing 4" or 6" Discharge	1		SEE JOB FILE
50	Pipe Nipple	3		007133
51	Pipe Cap	3		007406
52	Resistor	1		013740

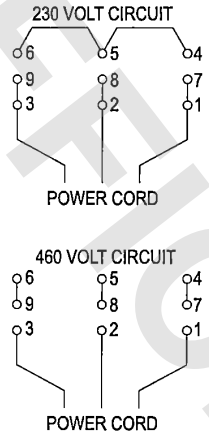
NOTES:

1) Consult factory for cords over 25 feet.
2) If pump was ordered with special seals, consult factory.
3) If pump was equipped with a trimmed impeller, consult factory.

Disassembly Procedures

230/460 pump stators are wound so they can be wired either 230 or 460 volt. New pumps are shipped connected for specific voltage ordered.

To change the voltage, remove the six nuts (13) that secure the lead wire housing (12). Lift off the lead wire housing being careful not to damage the seal ring (14) assembly. Change wiring as required per the following diagram (See section D3 - D6).



3 PHASE DUAL VOLTAGE WIRING DIAGRAM

After changing leads, lightly oil seal ring (14). Insure that wire leads will not be pinched and position the lead wire housing (12) on the motor housing (20) securing with nuts (13).

Before installing a pump, check the pump rotation. Insure that wiring has been completed to proper power source and that the green lead of power cord (see illustration) is connected to a valid ground. Momentarily energize the pump, observing the direction of kick back due to starting torque. Rotation is correct if kick back is in the opposite direction of rotation arrow on the pump casing. If rotation is not correct, switching of any two power leads other than ground will provide the proper rotation.

See page 7 for illustration for identification of wire leads in the sensor cord to make proper connections for the seal failure alarm and the motor temperature sensor circuit.

OPERATION

Before putting the pump into operation, the following items should be checked to insure that the pump is installed correctly.

- Electrical connections
- Pump rotation

DISASSEMBLY PROCEDURES

A. Before you begin...
1. Shut off pump.
2. Disconnect power source.
3. Remove pump from system.

B. When removing impeller (42)...
1. Complete Section A.
2. Remove the eight screws (22) and lock washers (23) from the flange of the motor housing (20).
3. Remove the pump housing (48), O-ring (47), and U-cup/ wear ring packing (46).
4. Immobilize the impeller (42) by holding the vanes with a pipe wrench. Using a socket, remove the impeller bolt (45), lock washer (44), and impeller washer (43).
5. Using two long-handled screwdrivers as levers, carefully pry the impeller (42) from the shaft.
6. Remove the square key (30) from motor shaft.

Note: Impeller hub serves as lower seal retainer. When impeller is removed, seal spring will fall free.

C. When removing rotary seals (36 and 41)...
1. Complete Sections A and B.

CAUTION

Do not touch sealing face of the rotating section or the stationary section of the rotary seal (36 or 41) when removing or installing seal. When seal replacement is required, cleanliness is of utmost importance. Seal replacement should be done in shop atmosphere if possible.

2. Remove the spring of the lower rotary seal (41) from the shaft. See rotary seal component placement diagram for part identification.
3. Remove the pipe plug (27) in the bottom seal retainer (40) and drain oil from the chamber behind the retainer.
4. Remove the four socket head cap screws (39) from the seal retainer (40).
5. Remove the seal retainer (40) with remaining parts of the lower seal assembly (41).
6. Press seal seat out of the seal retainer (40).
7. Remove the seal ring (38) and inspect.
8. Slowly remove the large pipe plug (21) from side of motor housing (20).
9. Remove the lower pipe plug (27) from the side of motor housing (20) and drain the oil from the motor housing (20).

Note: Pump assembly will have to be tipped on its side to completely drain the oil.

10. Remove the snap ring (37) from the shaft and remove the spring holder and seal spring of the upper rotary seal (36) from the shaft.
11. Using a bearing puller or other suitable tools, pull the rotating section of the upper rotary seal (36) from the rotor shaft. If needed, carefully pry rotating section loose with screwdrivers and pull off by hand.
12. The stationary seat can be pried out of the bearing housing (34) with a screwdriver. Use care not to chip seat as chips may fall into motor.

D. When removing power cord and sensor cords (7 and 11)...
1. Complete Section A.
2. Remove six nuts (13) and lock washers (5), that secure the lead wire housing (12) to the motor housing (19).
3. Pry the lead wire housing (19) off using two screwdrivers.

Disassembly Procedures, *continued*

CAUTION
Block the lead wire opening in the motor housing (19) to prevent any parts from falling down into the motor.

4. Cut shrink tubing (17) off wire connections. Remove hex nuts (18), and screws (16) as necessary to break connects between lead wire assy. (7) and motor (29). Tag wires as disconnecting. Break connection between sensor wire assy. (11) and sensor wires. Remove hex head screw (19) and disconnect ground wire.
5. If necessary, remove and replace wire connector (15).
6. To replace sensor cord (11), remove screws (8), lock washers (9), and lead clamp (10). Pull sensor cord (11) from lead wire housing (12).
7. To replace power cord (7), remove lead clamp cap (1), washer (2), and lock ring (3). Remove screws (4), lock washers (5) and lead clamp (6). Pull power cord (7) from lead wire housing (12).
8. Remove seal ring (14) from lead wire housing and inspect for damage.

E. When removing motor (29)...
1. Complete Sections A, B, C and D.
2. Remove the eight nuts (24), washers (25) and socket head screws (35) which secure the bearing housing (34) to the motor housing (20).
3. Set motor assembly vertical on blocks and lift the motor housing (20) off the bearing housing (34) and motor assembly. Be careful to lift the motor housing (20) straight off, so as not to damage the motor (29).
4. Remove the seal ring (26) from the bearing housing (34).
5. Remove four long hex head through bolts that attach motor (29) to bearing housing (34) and note which holes in bearing housing each one was removed from. Pry off top cap of motor and then remove stator and rotor separately. Be careful not to damage stator windings.
6. Using a bearing puller, bearing against the inner race, remove the double row bearing (33). Replace the bearing if needed.

Note: The bearing should be cleaned with volatile mineral spirits and relubricated with proper lubricants immediately after cleaning. Never dry bearings with compressed air, and never spin unlubricated bearings.

F. When removing sensor studs (32)...
1. Complete Sections A through E5.
2. Pull pin terminals of moisture sensor leads (32) loose from moisture sensors.
3. Unscrew moisture sensors and remove.

Assembly Procedures

ASSEMBLY PROCEDURES
Pumps are reassembled in reverse order of disassembly. The following suggestions are offered.

Note: While pump is dismantled, all gaskets, seal rings and retaining rings should be checked for wear and deterioration. Replace all worn items. Insure that all parts are thoroughly cleaned before assembly.

A. Installing fan (31) (Applies to installation of new motor only)...
1. Press the fan (31) on the rotor shaft until seated against the rotor end ring. Note that the fan blades are bent away from the motor rotor.

B. Installing sensor studs (37 or 39)... (Before S/N 00605)
1. Screw sensors (32) into bearing housing (34). Apply 34 in. lbs. of torque.
2. Push terminals of moisture sensor leads (32) onto moisture sensors (32).

C. Installing motor (29)...
Note: Before installing the bearing (33), wipe the bearing seat on the shaft clean and coat the seat with oil to prevent galling of the shaft as the bearing (33) is pressed onto the shaft. A properly sized pressing sleeve should be used to install bearing (33), with pressure being applied to only the inner bearing race.
1. Install the double row ball bearing (33) and the upper bearing on the shaft.
2. Install the rotor/bearing assembly into the bearing housing (34) then lower stator down over rotor and position motor cap. Secure motor (29) to bearing housing (34) with four long hex head through bolts (supplied with motor).

CAUTION
Do not damage motor windings.

3. Lightly oil and position the seal ring (26) around the pilot shoulder of bearing housing (34).
4. Set the motor assembly vertical with the bearing housing (34) down, resting on blocks. Lower the motor housing (20) over the motor assembly, pulling the sensor wires (32) between the housing (20) and motor stator as the housing (20) is lowered.
5. Pull the motor leads through the top of the housing (20).
6. Seat the motor assembly in the motor housing (20) and secure with eight screws (35), nuts (24), and lock washers (25).
7. Install the pipe plug (27) in the lower of the two holes in the side of the motor housing.

D. Installing sensor cord (7) and power cord (11)...
1. Apply light coating of oil on the molded part of both the power cord (7) and sensor cord (11), and install the two cords in the tapered bores of the wire housing (12).
2. Slide the lead clamps (6 and 10) over the cords and secure to lead wire housing (11) with lock washers (5 and 9) and screws (4 and 8). Press lock ring (3) over power cord (7), and seat in lead clamp (6). Install washer (2) and cap (1) over clamp (6).
3. Install the seal ring (14) on the lead wire housing (12).
4. Connect lead wire terminals to motor lead terminals in the proper arrangement as per wiring diagram using screws (16) and nuts (18) and shrink tubing (17). Place shrink

Assembly Procedures, *continued*

tubing (17) over wires, make up connections, then place shrink tubing in proper location and shrink. Be careful not to burn through shrink tubing. Install ground wire to motor housing (20) with hex head screw (19).

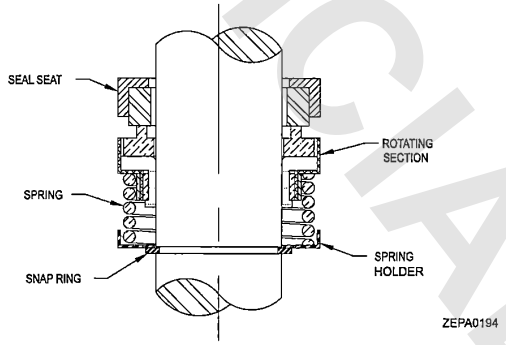
5. Connect sensor wire assy. (11) to sensor wires per wiring diagram using the same method and components as the lead wires.

Note: Tighten nuts securely.

6. Install the lead wire housing (12) in proper position on the pump assembly, securing with the nuts (13) and lock washers (5).

E. Installation of rotary seals (36 and 41) and seal retainer (40)...

CAUTION
Make sure all seal faces remain free of dirt particles.
Apply a light coat of oil to seal faces before installing.



UPPER ROTARY SEAL COMPONENT PLACEMENT DIAGRAM
(Lower rotary seal is same except impeller hub serves as spring holder and snap ring)

1. Refer to rotary seal component placement diagram for relative positioning of seal parts.
2. Apply a coating of oil to the seal seat and the bore of bearing housing (34), and using a nonmetallic sleeve press the seat into position in the bearing housing (34).
3. Apply 80-90 weight gear oil to the shaft and to the inside diameter of the rotating section of rotary seal. Push the rotating section onto the shaft in a continuous motion until the seal faces meet.
4. Install the spring and spring holder over the shaft and seat against the rotating section. Compress the spring as necessary and install retaining ring (37) in groove of motor shaft.

Leak Test

(Before oiling pump) Perform a leak test on the pump seals by installing a regulated air supply into the oil fill holes. Both the motor chamber and seal chamber must be checked. The pressure of the air supply should be set at approximately 9 PSI. Submerge the pump in clear water watching for small air bubbles around square ring seals, rotary seal, cord connection, and oil fill plugs. NOTE: Make certain that the pump is placed in the water so that no areas are present that would trap air (such as the cavity around the lower rotary seal), not allowing the bubbles to rise to the water surface.

If it is not possible to leak test the pump using the submersion method, a regulated air supply with a (0-15 PSI) air gage can be installed in the fill holes. Stabilize the pressure inside the pump to 9 PSI. After removing the air supply, the pressure should not drop more than 1/2 PSI in a 24 hour period.

Note: When leak testing the lower seal chamber, the lower seal (41) must be in place and tension on the spring to the point the impeller would hold it.

5. Install seal ring (38) on the seal retainer (40).
6. Press the seal retainer (40) into the bearing housing (34) and secure with the four socket head screws (39).

Note: Make certain that the seal retainer (40) is centered so that the ceramic seal is not in contact with the shaft.

7. Install the seal seat and rotating section of the lower rotary seal assembly (41) into the seal housing (40) in the same manner described in steps 2 and 3 above.
8. Position the unit so that the seal retainer (40) is up. Fill the cavity behind the seal retainer (40) with an antiwear, non-detergent, rust inhibiting, paraffinic oil of approximately 100 SUS. (See table below for acceptable types of oil.)

Refiner	Product Name
Arco	Duro 32
Exxon	Teresstic 32
or acceptable equal	

9. Install the pipe plug (27) in the seal retainer (40).

F. Installing the impeller (42)...

1. Install the spring of the lower rotary seal (41), on the exposed end of the rotor/shaft.

Note: Spring holder not required on lower rotary seal.

2. Install the square key (30) in the groove in the shaft.
3. Install the impeller (42), impeller washer (43), lock washer (44), and secure the impeller by immobilizing it using a pipe wrench to grip the vanes and installing the impeller bolt (45) in the end of the shaft.

Note: Apply thread locking compound to impeller bolt (45).

4. Using waterproof rubber adhesive sealant (i.e. liquid silicone), secure U-cup packing (46) to groove inside suction opening of pump housing (48). Wear ring for 4" discharge is a light press fit; no sealants required.
5. Install O-ring (47) on flange of bearing housing (34). Attach pump housing (48) to pump with screws (22) and lock washers (23).
6. If removed, install the pipe nipples (49) and pipe caps (50), being sure the motor housing sits level when caps are installed.

G. Final assembly...

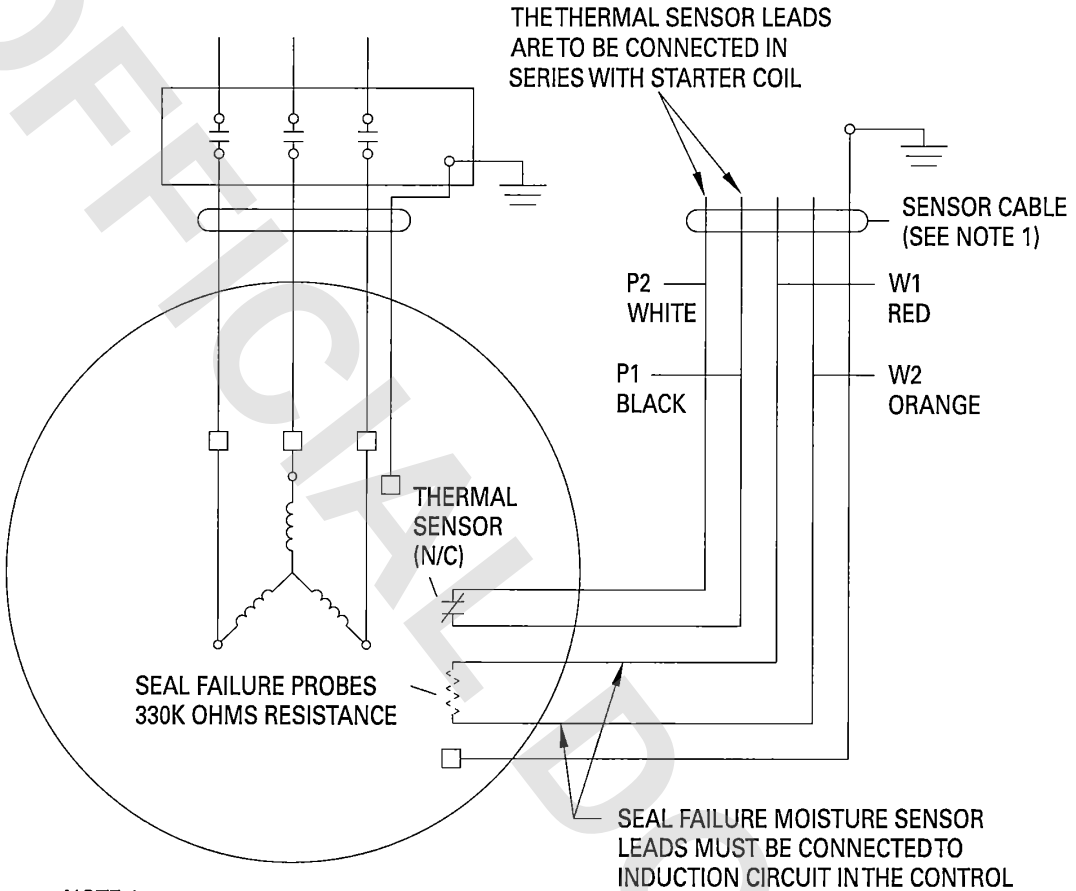
1. Fill the motor housing (20) with the same oil used to fill the seal retainer cavity in step E.8. above. Fill until oil is level with the upper plug (20) in the side of the motor housing (20).

WARNING
DO NOT OVERFILL

2. Install the pipe plug (21).

Pump Wiring Diagram

SUBMERSIBLE MOTOR
TYPICAL 3 PHASE WIRING DIAGRAM



NOTE 1

NOTE 1
ON PUMPS WITH 4 LEAD SENSOR CABLES:
GREEN AND RED ARE THERMAL SENSORS, BLACK AND WHITE LEADS ARE MOISTURE SENSORS

Service Checklist & Trouble Shooting

⚠ WARNING ELECTRICAL PRECAUTIONS Before servicing a pump, always shut off the main power breaker to the panel and then disconnect the pump - making sure you are wearing insulated protective sole shoes and are not standing in water. Under flooded conditions, contact your local electric company or a qualified licensed electrician for disconnecting electrical service prior to pump removal.

⚠ WARNING Submersible pumps contain oils which become pressurized and hot under operating conditions - **allow 2-1/2 hours after disconnecting before attempting service.**

CONDITION

A. Pump will not start or run.

Steps	Check Voltage At	If No Voltage	If Voltage
No. 1	Line terminals in pump's control panel L_1 - L_2 - L_3 (3 Phase).	Check Disconnect switch, line fuse, and/ or circuit breakers in power supply circuit.	Proceed to No. 2.
No. 2	Pump motor terminals in pump's control panel T_1 - T_2 - T_3.	Check for control circuit voltage. Check out magnetic starter contacts, thermal overloads, and float switches.	Check starting relay and capacitor (1 phase units). Check pump for ground, and binding impeller.

COMMON CAUSES

B. Motor overheats and trips overload or blows fuse.

- Incorrect Voltage
- Unbalanced power source
- Incorrect motor rotation
- Negative or low head
- Excessive water temperature
- Impeller or seal mechanically bound
- Defective capacitor or relay
- Motor shorted
- Lost one line in a Three Phase unit

C. Pumps starts and stops too often.

- Check valve stuck open
- Level controls out of adjustment
- Temperature sensor tripping
- Thermal overload switch out of adjustment or defective
- Pit too small

D. Pump will not shut off.

- Debris under float switch
- Float travel obstructed
- Defective or damaged float switch
- Magnetic starter contacts shorted
- Air lock - check vent hole

E. Pump operates but delivers little or no water.

- Check for plugged Pump housing, discharge pipe or sticking check valve
- Vent hole clogged or not drilled
- Discharge head exceeds pumps capacity
- Low or incorrect voltage
- Incorrect motor rotation
- Defective capacitor

F. Drop in head and/or capacity after a period or use.

- Increase Pipe Friction
- Clogged line or check valve
- Abrasive material & chemical, deteriorated impeller and pump housing

If the above check list does not uncover the problem, consult the factory - Do not attempt to service or otherwise disassemble pump.

SECTION: Z2.30.160
ZM3014
0517
Supersedes
New

Trusted. Tested. Tough.™

Product information presented here reflects conditions at time of publication. Consult factory regarding discrepancies or inconsistencies.

Register your Zoeller Engineered Product on our website: http://reg.zoellerengprod.com/

ZOELLER® ENGINEERED PRODUCTS

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(502) 778-2731 • 1 (800) 928-PUMP • **FAX** (502) 774-3624

Visit our web site: zoellerengineered.com

Submersible Wastewater Pump Association SWPA MEMBER

OWNER'S MANUAL

64 HD SERIES SUBMERSIBLE NON-CLOG UNITS

Congratulations on the purchase of the Zoeller 64 HD Series submersible pump. For over seventy years the name Zoeller has represented the standard for submersible dewatering and sewage pumps. The same high quality workmanship and easy maintenance design has been incorporated into this line of heavy-duty solids-handling submersible sewage pumps. This Zoeller pump will provide years of trouble-free service when installed according to the manufacturers' recommendations.

This manual incorporates the installation, operation, maintenance, and service instructions into one document to aid in the ownership of a Zoeller submersible non-clog wastewater product. Please read and review this manual before installing the product. Follow the steps and procedures listed on ZM1074 for a proper start-up. Many items contained within, when followed correctly, will not only ensure a long and problem-free life for the pump, but also save time and money during installation. Reference ZM3013 for repair manual on 64 HD Series Pumps. Should further assistance be necessary please call our Product Support Department at 1-800-928-PUMP (7867).

Table of Contents

Owner's Information

Model Number: G6424 **Date Code:** _____
Serial Number: Pump 1 _____ **Pump 2** _____
☐ **Simplex** ☐ **Panel P/N** _____
☒ **Duplex** ☐ **Rail System P/N** _____
Job Name: Skagit Valley Farm Cooling
Distributor: Hollabaugh Brothers and Associates
Sales Order Number: _____
Contractor: TRICO Companies
Date of Installation: 6/10/2019
System Readings During Operation: Voltage 460V **Amps** _____

Safety Instructions

TO AVOID SERIOUS OR FATAL PERSONAL INJURY OR MAJOR PROPERTY DAMAGE, READ AND FOLLOW ALL SAFETY INSTRUCTIONS IN THIS MANUAL AND ON THE PUMP.

THIS MANUAL IS INTENDED TO ASSIST IN THE INSTALLATION AND OPERATION OF THIS UNIT AND MUST BE KEPT WITH THE PUMP.

This is a **SAFETY ALERT SYMBOL.** When you see this symbol on the pump or in the manual, look for one of the following signal words and be alert to the potential for personal injury or property damage.

⚠ **DANGER** Warns of hazards that **WILL** cause serious personal injury, death or major property damage.

⚠ **WARNING** Warns of hazards that **CAN** cause serious personal injury, death or major property damage.

⚠ **CAUTION** Warns of hazards that **CAN** cause personal injury or property damage.

⚠ **NOTICE** INDICATES SPECIAL INSTRUCTIONS WHICH ARE VERY IMPORTANT AND MUST BE FOLLOWED.

THOROUGHLY REVIEW ALL INSTRUCTIONS AND WARNINGS PRIOR TO PERFORMING ANY WORK ON THIS PUMP.

MAINTAIN ALL SAFETY DECALS.

REFER TO WARRANTY ON PAGE 2.

Limited Warranty

The Zoeller Engineered Products warrants its 64 HD Series of submersible pumps to the original owner to be free from defects in workmanship and materials under the following conditions and limitations by the owner paying the applicable percentage of the list price of the following parts in effect at time of replacement in the specified *installations.

Conditions

1. Approval of installation and start up of the equipment by the companies authorized on-site representative
2. Transportation charges shall be borne by the buyer
3. Labor charges for warranty repair shall not be assumed by the company for repairs made after one year from date of installation (nine months in Construction/Mining and other portable installations) to end customer. Returns must have prior written authorization from the company.
4. Hazardous Environment Series pumps have special repair procedures. Contact Zoeller.
5. Controls and accessories warranty (See specific warranty below).

***MUNICIPAL SEWAGE PERMANENT INSTALLATION**
Five Year (10,000 hr) Months After Shipment - Limited Warranty

MONTHS	0-18	19-30	30-45	46-60
HOURS	0-3,000	3,000-5,000	5,000-7,500	7,500-10,000
Rotor & Stator	0%	30%	50%	80%
Mechanical Seal	0%	30%	50%	75%
Impeller	0%	30%	50%	80%
Wear Rings	0%	50%	80%	100%
Ball Bearings	0%	50%	80%	100%
Pump Housing	0%	30%	50%	100%

Controls and accessories included for 18 months.

***AGRICULTURAL/FOOD PROCESSING AND PERMANENT INDUSTRIAL INSTALLATIONS CONTAINING LIMITED QUANTITIES (5% BY VOLUME) OF WASTE OR ABRASIVES AND PERMANENT INDUSTRIAL INSTALLATIONS**

15 Months After Shipment - Limited Warranty

MONTHS	0-9	9-15
Rotor & Stator	0%	50%
Mechanical Seal	25%	50%
Impeller	25%	50%
Wear Rings	25%	50%
Ball Bearings	0%	50%
Pump Housing	25%	50%

Controls and accessories included for nine months.

***CONSTRUCTION/MINING - OTHER PORTABLE INSTALLATIONS**
Nine Months After Shipment - Limited Warranty

MONTHS	0-9
Rotor & Stator	0%
Mechanical Seal	25%
Wear Rings	25%
Ball Bearings	0%
Pump Housing	25%

Controls and accessories included for nine months.

Limited Repair Warranty At An Authorized Service Station

Beginning on the date of repair, the term of the repair warranty shall be the longer of the unexpired original warranty term or 30 days.

Limited Replacement Parts Warranty - 30 Days After Purchased

Each Zoeller 64 HD Series Pump installation is required to have a completed Zoeller Engineered Products Start-up Report (ZM1074). The report is to be completed by an approved Start-up Technician in the presence of the installing contractor. A copy of this report will be kept on file at the Zoeller Engineered Products offices in Louisville, KY. **Failure to comply with the requirement will void the 5 year pro-rated warranty agreement.**

Limitations

Zoeller Engineered Products' sole obligation under all the above warranties shall be to make repairs and to replace parts when necessary on products that have been returned to Zoeller Engineered Products or an authorized service facility and found to be defective by the company. Part(s) that fail and that inspection determines to be defective in material or workmanship, will be repaired, replaced, or remanufactured at Zoeller Engineered Product's option provided, however, that by so doing we shall not be obligated to replace an entire assembly, the entire mechanism, or the complete unit. Major components and controls not manufactured by the company are covered by the original manufacturer warranty in lieu of this warranty. This warranty shall not apply to any product or part of a product, including pumps, controls, lifting devices, basins, and power cables which are damaged or subject to misuse, accident, neglect, operated outside the limits of the pump curves, used in a manner contrary to the printed instruction, or damaged due to a defective power supply, improper electrical protection, or faulty installation or repair.

The company will not be responsible for travel expenses, rented equipment, outside contractor fees, or unauthorized repair shop expenses. No allowance will be made for shipping charges, damages, labor or other charges that may occur due to product failure, repair, or replacement.

This warranty does not apply to any material that has been disassembled without prior approval of Zoeller Engineered Products, subjected to misuse, misapplication, neglect, alternation, accident or act of God; that has not been installed in accordance with Zoeller Engineered Products installation instructions; that has been exposed to but not limited to hydrocarbons, hydrocarbon derivatives (oil, gasoline, solvents, etc.) or other abrasive or corrosive substances, is in lieu of all other warranties expressed or implied.

Contact authorized service station to obtain any needed repair replacement parts. For additional information pertaining to our warranty or if service cannot be obtained locally, contact Zoeller Engineered Products, 3649 Cane Run Road, Louisville, Kentucky 40211-1961, Attn: Customer Service.

ZOELLER ENGINEERED PRODUCTS EXPRESSLY DISCLAIMS LIABILITY FOR SPECIAL, CONSEQUENTIAL, OR INCIDENTAL DAMAGES OR BREACH OR EXPRESSED OR IMPLIED WARRANTY; AND ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE AND OF MERCHANTABILITY SHALL BE LIMITED TO THE DURATION OF THE EXPRESSED WARRANTY.

Some states do not allow limitation on the duration of an implied warranty, so the above limitation may not apply to you. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Zoeller Engineered Products neither assumes nor authorizes any person or company to assume for it any other obligation in connection with the sale of its equipment. Any enlargement or modification of this warranty by any other party is their sole responsibility. No other warranties expressed or implied, including implied warranties of merchantability and fitness for a particular purpose will apply.

Preinstallation Information

1. **Inspect your pump.** Occasionally, products are damaged during shipment. If the unit is damaged, contact your dealer before using. **DO NOT** remove the test plugs in the cover nor the motor housing.
2. **Carefully read the literature** provided to familiarize yourself with specific details regarding installation and use. These materials should be retained for future reference.

⚠ WARNING

SEE BELOW FOR LIST OF WARNINGS

1. Do not lift, carry, or hang pump by the electrical cables. Damage to the electrical cables can cause shock, burns or death.
2. **Make sure there is a properly grounded connection available.** All pumps are furnished with provisions for proper grounding to help protect you against the possibility of electrical shock.
3. Make certain that the control box is within the reach of the pump's power supply cord. **DO NOT USE AN EXTENSION CORD.** Extension cords that are too long or too light do not deliver sufficient voltage to the pump motor. But, more important, they could present a safety hazard if the insulation were to become damaged or the connection end were to fall into the sump.
4. **Make sure the pump electrical supply circuit is equipped with fuses and disconnect or circuit breakers of proper capacity.** A separate branch circuit is recommended, sized according to the "National Electrical Code" for the current shown on the pump nameplate.
5. Care should be taken during the initial installation to be sure that adequate air supply is available whenever any person is in the basin. Always follow OSHA guidelines on confined space requirements.
6. Risk of Electric Shock - These pumps have not been investigated for use in swimming pool areas.

⚠ CAUTION

SEE BELOW FOR LIST OF CAUTIONS

1. Check to be sure your power source is capable of handling the voltage requirements of the motor, as indicated on the pump nameplate.
2. The installation of pumps using auxiliary variable level float switches is the responsibility of the installing party and care should be taken that the tethered float switch will not hang up on the pump apparatus or pit peculiarities and is secured so that the pump will shut off. It is recommended that rigid piping and fittings be used and the pit be 36" or larger in diameter.
3. **INFORMATION - VENT HOLE PURPOSE.** It is necessary that all submersible pumps capable of handling various sizes of solid waste be of the bottom intake design to reduce clogging and seal failures. If a check valve is incorporated in the installation, a vent hole (approx. 3/16") must be drilled in the discharge pipe below the check valve and pit cover to purge the unit of trapped air. Water stream will be visible from this hole during pump run periods. This vent hole should be checked periodically for clogging and cleaned as necessary. Trapped air is caused by agitation and/or a dry basin.
4. Water hammer creates momentary high pressure surges. These surges can cause severe damage to check valves and the piping system. Consideration for water hammer must be included in the piping system design. Reference ASPE Data Book, Chapter 2.33. Some systems may require external spring or lever weighted check valves or other engineered solutions.
5. Three phase pumps must be connected for proper rotation, which is counterclockwise looking into impeller inlet. See page 4 for instructions for checking 3 phase rotation.

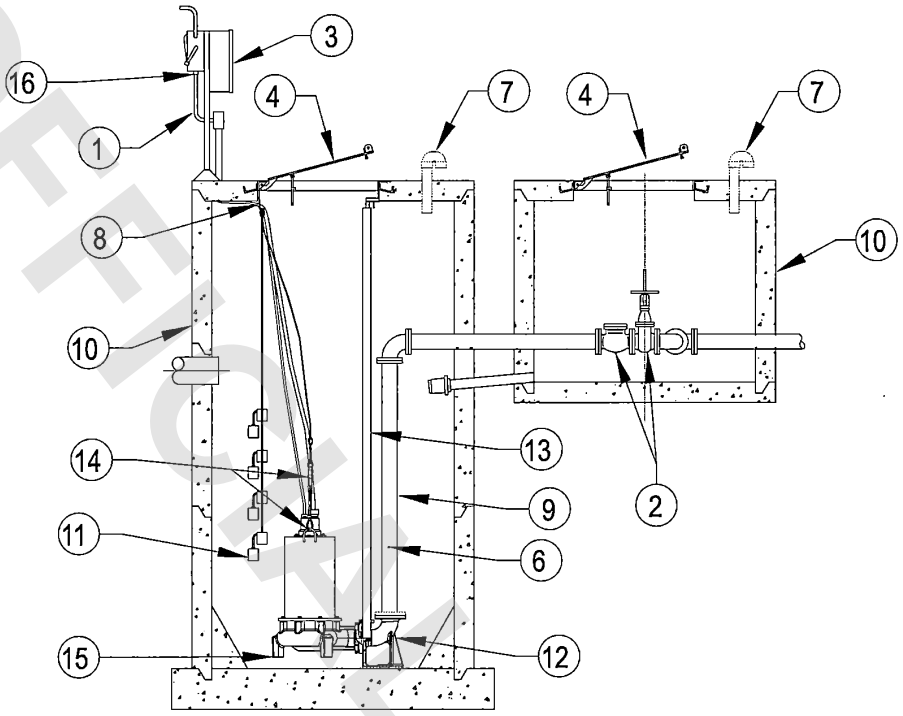
Electrical Data

Model	BHP	Service	RPM	Voltage	Phase	Hertz	In Air	Full Load	Shut-off	Lock Rotor	Winding Resistance line to line
6424	25	1.2	1750	230	3	60	16	68	28	314	0.12 - 0.14
6424	25	1.2	1750	460	3	60	8	34	14	157	0.49 - 0.55
6425	30	1.2	1750	230	3	60	20	80	30	360	0.09 - 0.10
6425	30	1.2	1750	460	3	60	10	40	15	180	0.37 - 0.41
6426	40	1.2	1750	460	3	60	12	52	21	240	0.31 - 0.35
6427	50	1.2	1750	460	3	60	14	62	24	278	0.21 - 0.24
6428	60	1.0	1750	460	3	60	14	75	28	278	0.21 - 0.24

Typical Sewage/Waste Pumping System Installation

All installations must comply with all applicable electrical and plumbing codes, including, but not limited to, National Electrical Code, local, regional, and/or state plumbing codes, etc.

TYPICAL OUTDOOR CONCRETE BASIN WITH VALVE BOX AND HINGED ACCESS COVERS



(1) Electrical wiring and protection **must** be in accordance with the National Electrical Code, and any other applicable state and local electrical requirements.

(2) Install proper full flow check and shut-off valve.

(3) Install proper controls. (Outdoor panels **require** NEMA 3R or 4X enclosure)

(4) All installations **require** a basin cover to prevent debris from falling into the basin and to prevent accidental injury.

(5) Gas tight seals are **required in all indoor sewage installations** to contain gases and odors.

(6) **When check valve is installed**, drill a 3/16" diameter hole in the discharge pipe below the check valve even with the top of the pump. NOTE: The hole must be below the basin cover and cleaned periodically. Water stream will be visible from this hole during pump run periods. Also a vent hole is drilled in the pump housing. Be sure that this hole is cleared during any servicing.

(7) Vent gases and odors to the atmosphere through vent pipe per Local and State codes.

(8) Secure power cord to avoid entanglement with variable level float switch mechanism.

(9) **Do not** reduce pump discharge pipe below 4" IPS size.

(10) Basin **must** be in accordance with all applicable codes and specifications. Basin must be sized to allow a minimum 3 minute lapse time between starts.

(11) Pump must be level and the tethered variable level float switch must be free and not hang up on pump or pit peculiarities.

(12) **If** a rail system is used, discharge elbow **must** be firmly anchored to the bottom of basin. In fiberglass basin, the bottom will need to be reinforced if the discharge elbow is used.

(13) **If** a rail system is used, the guide rails are 2" schedule 40 pipe for flanged horizontal discharge units. Brass, stainless steel or galvanized steel is recommended.

(14) Install ring and cable for lifting pump from pit.

(15) Basin must be clean and free of debris after installation.

(16) Cords must be properly sealed to prevent moisture and gases from entering the control panel.

Pump Wiring Instructions

⚠ WARNING Installation and checking of electrical circuits and hardware should be performed by a qualified licensed electrician.
⚠ WARNING **"Risk of electrical shock"** Do not remove power supply cord and strain relief or connect conduit directly to the pump.
⚠ CAUTION Power cords, sensor cords, and float cords all must be sealed to prevent gases from the basin entering the control panel.

INSTRUCTIONS FOR CHECKING ROTATION OF THREE PHASE UNITS

It is very important that these units be connected for proper rotation. Since no rotating parts are visible without removing the pump from the pit, the rotation on 3 phase units should be checked before installation into the pit as follows:
After the proper electrical connections are made, momentarily energize the pump observing the direction of kick back due to starting torque. The rotation is correct if the kick back is in the opposite direction of the rotation arrow. If the rotation is not correct, disconnect power and switch any two power leads. Turn power back on and retest for proper rotation.

SENSOR CABLE

The sensor cable is the smaller cable, which contains 5 wires. The red and orange wires connect to the thermal cut-out circuit and the black and white wires connect to the seal leak probes. The green wire is a ground connection. All 5 wires must terminate in the control panel.

The following should be noted:

(1) The thermal sensors are normally closed and mounted adjacent to the motor windings. If internal temperatures exceed a maximum limit, the pump will deactivate when the red and orange wires are connected in series to the control coil of the motor starter circuit. The pump is able to restart once the motor cools down. Continued deactivation of this circuit requires the attention from maintenance personnel.

(2) The black and white seal leak wires are connected to a 330K ohm moisture detection circuit. An indicator light will activate whenever water is present in the shaft seal cavity or cord cap assembly. Whenever the seal leak light is activated, indicating the entry of moisture into the pump, it should be removed and serviced in order to avoid damage to the motor. Moisture sensor circuit can be checked for continuity (complete circuit) with a (Volt-OHM-Meter). Set the VOM to read resistance and connect the VOM leads to the sensor cord black and white wires. The VOM should read approximately 330k Ohms. Resistance readings significantly lower indicates an entry of moisture into the pump. If VOM reading is open then a problem exists with moisture detection circuit.

(3) The green wire shall be connected to a ground lug in the panel. Check resistance between the green ground conductor of the pump power cord and the sensor cord black and white wires. This resistance reading should indicate an open circuit. If VOM reading returns a reading other than open, then a problem exists with the sensor circuit wiring or cordage. If resistance readings show a problem with either test, then pump should be repaired by a Zoeller Authorized Service Station.

CONTROL PANELS

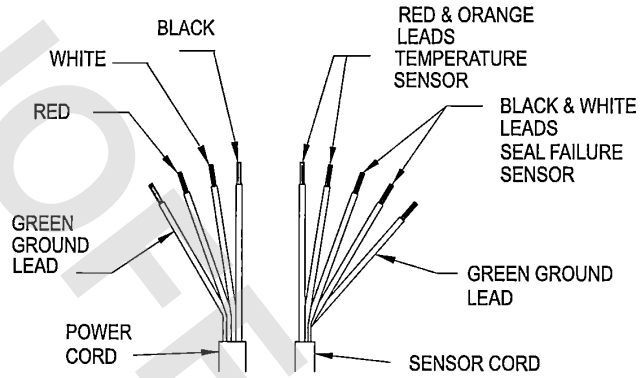
These pumps are nonautomatic and they require a control panel. A motor starter circuit, control circuit, and high-water alarm circuit within the panel are standard features. Enclosures rated for outdoor use and alternating relays are often required. Variable level float switches are the most common level sensing device. The following should be noted.

(1) The seal failure sensor and thermal sensor protection require that interfacing terminals and functions be incorporated into the panel.

(2) All pumps require overload protection in panel. Use with approved motor control that matches motor input in full load amperes with overload element(s) selected or adjusted in accordance with control instructions.

(3) Lightning arrestors, condensation heaters and elapsed-time meters are optional features that provide added protection.

PHASE POWER AND SENSOR CORD, LEAD IDENTIFICATION



"64 HD SERIES" FOUR CONDUCTOR AWG. POWER CORD SIZE			
MODEL	**BHP**	**230/3PH**	**460/3PH**
6424	25	2 AWG.	2 AWG.
6425	30	2 AWG.	2 AWG.
6426	40	2 AWG.	2 AWG.
6427	50	2 AWG.	2 AWG.
6428	60	2 AWG.	2 AWG.
APPROXIMATE CORD DIAMETER PER GAUGE			
18/5 AWG.	.50"		
2/4 AWG.	1.38"		
NOTE: SENSOR CORD 18/5 AWG. APPROXIMATELY .50" DIAMETER.			

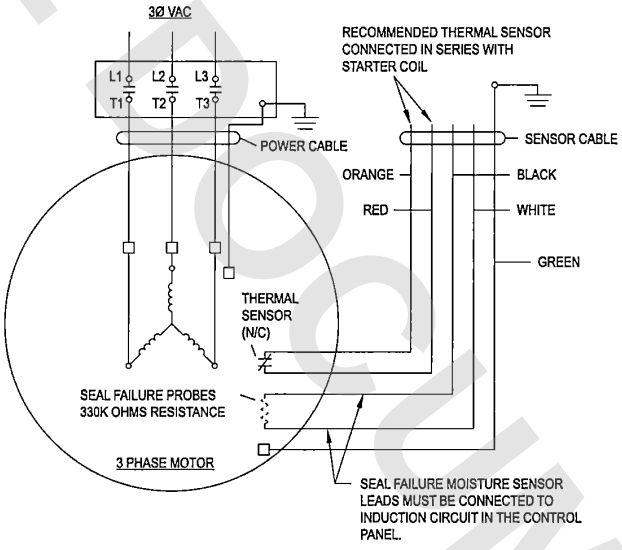
Three Phase Installation

Three phase pumps are nonautomatic. To operate automatically, a control panel is required. Follow the instructions provided with the panel to wire the system.

Before installing a pump, check the pump rotation to insure that wiring has been connected properly to power source, and that the green lead of power cord (See wiring diagram), is connected to a valid ground, Momentarily energize the pump, observing the directions of kick back due to starting torque. Rotation is correct if kick back is in the opposite direction of rotation arrow on the pump casing. If rotation is not correct, switching of any two power leads other than ground, should provide the proper rotation.

Refer to the wiring diagram supplied with specific electrical control panel for correct cable termination locations.

TYPICAL 3-PHASE WIRING DIAGRAM



NOTE: Sensor cable includes 5 leads; 2 leads for thermal sensor, 2 leads for moisture sensor, and a green ground lead. Sensor wire colors are as shown.

Operation

GENERAL
Zoeller pumps are lubricated and tested at the factory prior to shipment and require minimum pre-start-up maintenance.

Maximum continuous operating temperature of pump liquid for standard model pumps must not exceed 104 °F (40 °C). For longest service life all pumps should be totally submerged on long pumping cycles and a maximum of ½ hour run time per hour.

These units are not designed to handle liquids other than water or sewage. If pump is used in water contaminated with heavy, viscous, or abrasive materials, the warranty will be voided.

NAMEPLATE DATA
The nameplate, located on the top of pump, indicates specific information about the construction of the pump. The model number, date code, and serial number information should be recorded on the front page in the "Owner's Information" section of this manual.

SHORT TERM STORAGE
If pump is to be stored, the following is advised:
- Store pump inside whenever possible or cover with some type of protective covering.
- Tape or seal in plastic bag the terminal ends of wire leads.
- Spray coat unpainted surfaces with rust inhibiting oil.
- The impeller should be rotated every six months in order to keep the seals lubricated and not develop a permanent set.

If panel is to be stored, the following is advised:
- Store the panel inside whenever possible and leave in the shipping box.
- All openings shall be sealed.
- Store in an upright position.
- Do not stack anything on top of panel.

START-UP PROCEDURE
Before placing the equipment into operation the following checked:
- Correct pump rotation (3 Phase units only).
- Clean pit.
- Panel dry and securely installed.
- Floats positioned properly.
- Discharge valves open.
- 3/16" vent hole drilled in pipe between check valve and pump.

Once the above has been verified proceed with the following checks:
- Pump power cables properly connected to panel.
- Float cables properly connected to panel.
- Conduit connections to panel are properly sealed.
- Thermal overload adjustments made in the panel.
- After installing the pump into the containment area, with adequate submergence, open the discharge valve fully. Start the unit using manual controls. If flow is appreciably less than rated performance, pump may be air locked. To expel trapped air, jog the unit several times, using the manual controls.
- Have a qualified electrician take voltage and current measurements on the black wire of single phase or all three power wires of three phase with the pump running. Record these readings in the space provided in the **"Owner's Information"** section on page 1 of this manual for future reference.

After the preoperational functional test has been completed, system is ready for operation. Zoeller requires completing a Start-up Report (ZM1074) whenever a system is started for the first time or after a system has had a significant change take place (i.e. pump replacement, overhaul, etc..). A copy of the Start-up Report should remain with the system for future reference.

ADJUSTMENT PROCEDURE
Pumps: No adjustments are required other than assuring correct rotation.
Panels: The thermal overloads in the panel must be set to the F.L.A. rating on the pump nameplate (or refer to pump data sheet).
Floats: Refer to the system drawing for desired location of each float function.
Valves: Discharge valves should be placed in the fully open position. Systems should not be operated for extended periods of time with the discharge valves partially closed due to damaging the valve.

SHUTDOWN PROCEDURES
If a system is shutdown for more than six months, the following is recommended:
Pumps: If pit is to remain dry, then the pump can remain in the pit. With the pump in the pit, it should be operated for five minutes once every three months. If the pit is to remain wet, the pump should be removed and stored as noted above.

Panels: The panel should have all openings sealed to prevent moisture and dust from entering the enclosure. Prior to restarting system, the panel should be inspected for presence of moisture and any loose connections.

Valves: Consult the valve/actuator supplier for information concerning these systems components.

Maintenance

⚠ NOTICE Repair and service should be performed by a Zoeller Pump Company Authorized Service Station only.

SAFETY PROCEDURES
⚠ WARNING For your protection, always disconnect pump and panel from its power source before handling.

⚠ WARNING Never enter the basin until it has been properly vented and tested. Any person entering a basin should be wearing a harness with safety rope extending to the surface so that they can be pulled out in case of asphyxiation. Sewage water gives off methane and hydrogen sulfide gases, both of which can be highly poisonous.

Installation and checking of electrical circuits and hardware should be performed by a qualified electrician.

Pump is never to be lifted by power cord.

⚠ WARNING Unit must be flushed and disinfected, inside and out, prior to servicing.

GENERAL SYSTEM INSPECTION
Before the system is placed into operation, a system Start-up Report should be conducted by a qualified technician.

⚠ WARNING Wiring and grounding must be in accordance with the national electrical code and all applicable local codes and ordinances.

LUBRICATION PROCEDURES
No lubrication is required.

If pumps are to be stored for more than six months, refer to short term storage procedure in the Operation section.

PREVENTIVE MAINTENANCE
Preventive maintenance is recommended to ensure a long service life from the product. Provided is a suggested maintenance schedule.

Every month:
- Check for proper and unobstructed float operation.
- Listen for proper check valve operation.
- Duplex Units - Check for even operating times. Uneven times indicate a defective unit, float switch or control.
- Inspect the panel for any presence of moisture in enclosure, loose connections, and general component condition. check out location and condition of float switches.

Every year:
- In addition to the monthly checks, the basin should be inspected and cleaned. Any defective components should be replaced. Inspect and remove any sand, debris, or mud present in the pump basin assembly.

Every two years:
- Check insulating oil in motor and seal chambers. Inspect oil for contaminations as follows:
- Clear oil, no burnt odor - Oil, motor and seals are in satisfactory condition.
- Dark oil, burnt odor - Pump motor has overheated. Check the motor winding resistance to ground. Ohm readings of 1 megohm or higher is required. If lower readings are present, return the unit to an Zoeller Authorized Service Station for service.
- Milky, emulsified oil - Seals have failed. Unit must be returned to an authorized service facility for service.
- Dispose of the motor insulating oil properly if replacement is required.
- Inspect power cables for damage or wear. Replace immediately if damage or wear is detected.
- Inspect impeller for damage or wear. Replace as required by a Zoeller Authorized Service Station.

DOUBLE SEAL PUMPS
- Double seal pumps offer extra protection from damage caused by seal failure.
- Oil in a motor housing and lower seal cavity must be checked when pump is serviced. If oil from the motor housing contains water or other contamination, both seals should be replaced during maintenance. Always replace with new factory recommended oil and service parts. All repairs must be made by Zoeller Authorized Service Stations.

Service Checklist & Trouble Shooting

⚠ WARNING ELECTRICAL PRECAUTIONS Before servicing a pump, always shut off the main power breaker to the panel and then disconnect the pump - making sure you are wearing insulated protective sole shoes and are not standing in water. Under flooded conditions, contact your local electric company or a qualified licensed electrician for disconnecting electrical service prior to pump removal.

⚠ WARNING Submersible pumps contain oils which become pressurized and hot under operating conditions - **allow 2-1/2 hours after disconnecting before attempting service.**

CONDITION

A. Pump will not start or run.

Steps	Check Voltage At	If No Voltage	If Voltage
No. 1	Line terminals in pump's control panel L_1 - L_2 - L_3 (3 Phase)	Check Disconnect switch, line fuse, and/or circuit breakers in power supply circuit.	Proceed to No. 2
No. 2	Pump motor terminals in pump's control panel T_1 - T_2 - T_3	Check for control circuit voltage. Check out magnetic starter contacts, thermal overloads, and float switches	Check starting relay and capacitor (1 phase units). Check pump for ground, and binding impeller

COMMON CAUSES

B. Motor overheats and trips overload or blows fuse.

- Incorrect Voltage
- Unbalanced power source
- Incorrect motor rotation
- Negative or low head
- Excessive water temperature
- Impeller or seal mechanically bound
- Defective capacitor or relay
- Motor shorted
- Lost one line in a Three Phase unit

C. Pumps starts and stops too often.

- Check valve stuck open
- Level controls out of adjustment
- Temperature sensor tripping
- Thermal overload switch out of adjustment or defective
- Pit too small

D. Pump will not shut off.

- Debris under float switch
- Float travel obstructed
- Defective or damaged float switch
- Magnetic starter contacts shorted
- Air lock - check vent hole

E. Pump operates but delivers little or no water.

- Check for plugged Pump housing, discharge pipe or sticking check valve
- Vent hole clogged or not drilled
- Discharge head exceeds pumps capacity
- Low or incorrect voltage
- Incorrect motor rotation
- Defective capacitor

F. Drop in head and/or capacity after a period or use.

- Increase Pipe Friction
- Clogged line or check valve
- Abrasive material & chemical, deteriorated impeller and pump housing

If the above check list does not uncover the problem, consult the factory - Do not attempt to service or otherwise disassemble pump.

Notice to installing contractor: Instructions must remain with installation.

SECTION: Z5.00.180
ZM1170
0418
Supersedes
0617

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Product information presented here reflects conditions at time of publication. Consult factory regarding discrepancies or inconsistencies.

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Submersible Wastewater Pump Association SWPA MEMBER

GUIDE RAIL SYSTEMS
INSTALLATION PROCEDURES
Zoeller Engineered Products
2.5" thru 6" Pumps with Flanged Discharge
2.5" / 3" Systems – P/N 39-0094 and 39-0095
4" Systems – P/N 6039-0016 and 6039-0017 (Discontinued, March 2018)
6" Systems – P/N 6039-0072 and 6039-0073

GENERAL INFORMATION

These models are complete systems used in sewage or dewatering installations with side outlet flanged pumps. They can be used in basins at any depth. The guide rail systems are particularly useful when the liquid level is above the discharge pump. The systems feature easy automatic engagement and disengagement for removing the pump for service or repair without draining the basin.

General Construction: A flanged discharge elbow is supplied with the rail system which also supports the lower rail guides. The discharge elbow, as well as the mounting plate are made of durable class 30 cast iron that is epoxy coated. Upper guide rail brackets (supplied) and intermediate guide brackets (optional) along with guide brackets are stainless steel. The mounting plate and guide brackets (where required) are available in non-sparking brass. All models require the use of 2" schedule 40 (galvanized steel or stainless steel) pipe for guide rails. Pipe is furnished by the user.

Lifting Cable: The pump is equipped with lifting lugs that are an integral part of the motor housing or cover for lifting. A permanently attached chain, cable or choker (purchased separately), should be used to aid in pump installation and removal. It is not necessary to use a separate pull chain on the mounting plate which is bolted to the pump discharge flange.

Rail Support Bracket: As mentioned above, all the rail systems utilize 2" standard pipe for the guide rails. The supplied top rail support is to be mounted to the hatch frame. Intermediate brackets are available for deep installations. It is recommended that a intermediate stabilizer support bracket be ordered separately and used for each 15 feet of basin depth (20 feet for the 2.5"/3" systems).

INSTALLING RAIL SYSTEM PARTS

Discharge Base and Rails:

1. Lower the base elbow into the basin.
2. Position the base elbow by dropping a plumb line from the center of the pipe supports, located on top rail support, to center of rail pins protruding from the base elbow. Level the elbow flange in two directions 90° to each other. Mark the position of the base, hold down bolts through the holes/slots in the base. The use of the shims provided with the discharge base should be used to level out the discharge prior to securing the base with mounting bolts.
3. Move the base aside to allow for installation of 1/2" mounting bolts (not included). Secure base with mounting bolts.
4. Cut the 2" pipe guide rails (supplied by others) to the proper length and install them between the upper guide rail bracket and the pins on the base elbow. It is recommended that the guide rails are to be schedule 40, galvanized or stainless steel.

IMPORTANT: Discharge pipe and guide rails must be parallel if intermediate guide bracket is used.

INSTALLING INTERMEDIATE GUIDE BRACKET (Required for each 15 feet of basin depth, 20 feet for the 2.5"/3" systems.)

1. Remove the guide rails and cut a piece from each one. The amount to cut from each one must be determined to permit installing the intermediate guide bracket in the desired location. After cutting, the pipes must be exactly the same length. The intermediate guide rail bracket attaches to the discharge piping.
2. Place the cut pieces of pipe over the guide rail pins located on the base elbow.
3. Set the intermediate guide bracket in position with the guides into the pipe. Put a U-bolt around the discharge pipe and tighten lightly.
4. Measure from pipe seat on intermediate guide bracket to pipe seat on top rail support and cut two (2) guide rails to length. Put rails in place and tighten screws in top support.
5. Recheck guide rails, they must be straight and plumb. Move intermediate guide bracket if necessary to perfectly align. After aligning rails, finish tightening the nuts on the U-bolt.
6. If a second intermediate guide bracket is used, the above procedure must be followed again.

ATTACHING MOUNTING PLATE TO PUMP

1. Install the Buna-N gasket onto the mounting plate. Position mounting plate against pump discharge flange. Plate to be oriented so that guide brackets or machined angle surface of mounting plate face up and are on the opposite side of the pump discharge flange.
2. Secure mounting plate to pump with screws and washers provided. Tighten securely.
3. The 3-7-1/2 HP 71 Series grinder pumps have 3 legs. Remove these legs from the pump.

INSTALLING PUMP AND DISCONNECT

Position pump so the guide rails are captured by the mounting plate. Slowly lower the pump down the guide rails with the pump tilted at a slight angle protecting the Buna-N gasket as the plate engages the base elbow. Refer to drawing on next page.

If the pump is supported from beneath with concrete blocks or extended legs on the pump base, make certain the mounting plate gasket is sufficiently compressed for sealing. The cantilevered weight of the pump is required for compressing and sealing the mounting plate gasket against the face of the discharge elbow.

After lowering the pump down the guide rail, secure the upper end of the lifting cable to the top rail support to keep it from falling into the pit.

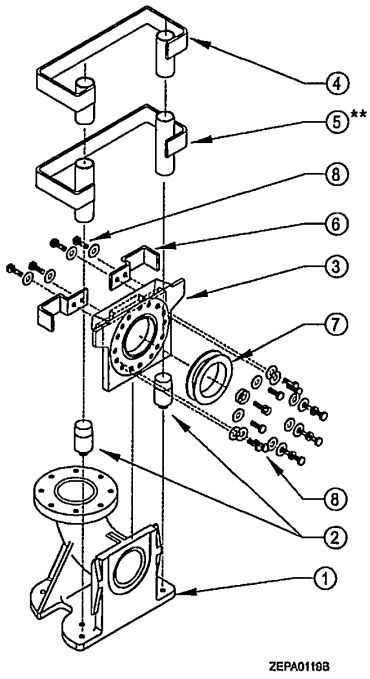
Order intermediate stabilizer for basin depths greater than 15 feet (20 feet for the 2.5"/3" systems).

Zoeller Engineered Products 4" *and* 6" Guide Rail System

4" Systems - P/N 6039-0016 and 6039-0017(Discontinued, March 2018)

Parts List For 6039-0016 - 4" Guide Rail System (39-0154)				
Item No.	*Description*	*Qty.*	*2/91 - 2/00 Revision A & B*	*2/00 - Current Revision C*
1	Epoxy Coated C.I. Discharge Elbow	*1	006574	006574
2	Lower Guides	2	006055	011265
3	Epoxy Coated C.I. Mounting Plate	1	006572	006572
4	S.S. Upper Guide Rail Bracket	1	006045	006045
** 5	Optional S.S. Intermediate Stabilizer for systems over 15' deep	1	006050	006050
6	Stainless Steel Guide Brackets	2	006057	006057
7	Buna-N Gasket	1	006041	006041
8	Stainless Steel Hardware	--	Consult Factory	Consult Factory

Parts List For 6039-0017 - 4" Guide Rail System (Non-Sparking Systems)(39-0155)				
Item No.	*Description*	*Qty.*	*2/91 - 2/00 Revision A & B*	*2/00 - Current Revision C*
1	Epoxy Coated C.I. Discharge Elbow	*1	006574	006574
2	Lower Guides	2	006055	011265
3	Bronze Mounting Plate	1	006961	006961
4	S.S. Upper Guide Rail Bracket	1	006045	006045
** 5	Optional S.S. Intermediate Stabilizer for systems over 15' deep	1	006050	006050
6	Bronze Guide Brackets	2	006964	006964
7	Buna-N Gasket	1	006041	006041
8	Stainless Steel Hardware	--	Consult Factory	Consult Factory



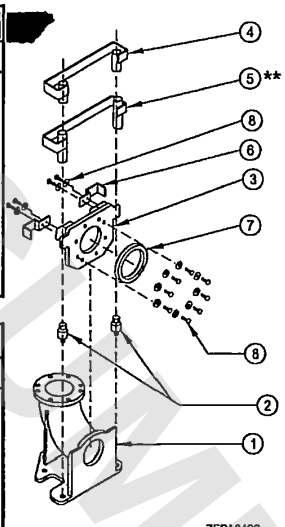
* NOTE: Discharge Elbow 006574 Revision A & B will have Stainless Steel Lower Guides, and Revision C will have Cast Iron Lower Guides.
** Optional: order P/N 6039-0014 for pit depths greater than 15 ft.

Uses 2" I.P.S. guide rails and pull cable or chain (not furnished)

6" Systems - P/N 6039-0072 and 6039-0073

Parts List For 6039-0072 - 6" Guide Rail System			
Item No.	*Description*	*Qty.*	*1/00 thru current*
1	6" Epoxy Coated Cast Iron Discharge Elbow	1	011282
2	Epoxy Coated Cast Iron Lower Guides	2	011265
3	Cast Iron Mounting Plate	1	011278
4	Upper Guide Rail Bracket	1	006665
** 5	Optional Intermediate Stabilizer for systems over 15' deep	1	007513
6	Guide Brackets	2	006057
7	Buna N Gasket	1	006664
8	Stainless Steel Hardware	--	Consult Factory

Parts List For 6039-0073 - 6" Guide Rail System (Non-Sparking Systems)			
Item No.	*Description*	*Qty.*	*1/00 thru current*
1	6" Epoxy Coated Cast Iron Discharge Elbow	1	011282
2	Epoxy Coated Cast Iron Lower Guides	2	011265
3	Bronze Mounting Plate	1	011280
4	Upper Guide Rail Bracket	1	006665
** 5	Optional Intermediate Stabilizer for systems over 15' deep	1	007513
6	Bronze Guide Brackets	2	006964
7	Buna N Gasket	1	006664
8	Stainless Steel Hardware	--	Consult Factory



Uses 2" I.P.S. guide rails and pull cable or chain (not furnished).

* Not replaceable - order complete discharge elbow.
** Optional: order P/N 6039-0021or pit depths greater than 15 ft.

Appendix N – Inspection and Maintenance Requirements – Infiltration Pond

Appendix N
Maintenance of Pond Date Inspected: _____

Frequency	Maintenance Component	Defect	Condition When Maintenance is needed	Results Expected When Maintenance is Performed
M S	General	Trash and Debris (Includes Sediment)	Any trash and debris which exceed 5 subic feet per 1000 square feet (approximately 1 std size garbage can) shall be removed. Trash not meeting this volume should be removed monthly.	Trash and debris cleared from pond.
		Poisonous/Noxious Vegetation	Any poisonous or nuisance vegetation which may constitute a hazard to maintenance personnel or the public. Any evidence of noxious weeds as defined by State or City of East Wenatchee.	No danger of poisonous vegetation where maintenance personnel or the public might normally be. Complete eradication of noxious weeds may not be possible, compliance with State and City of East Wenatchee eradication policies required.
		Contaminants and Pollution	Any evidence of oil, gasoline, contaminants or other pollutants.	No Contaminants or Pollutants present.
		Rodent Holes	Any evidence of rodent holes if facility is acting as a dam or berm, or any evidence of water piping through rodent holes.	Rodents destroyed and berm repaired.
		Insects	When insects such as wasps and hornets interfere with maintenance activities.	Insects destroyed or removed from site. Apply insecticides in compliance with State and East Wenatchee policies.
		Tree Growth and Hazard trees	Tree growth that does not allow maintenance access or interferes with maintenance activity.	Trees do not hinder maintenance activities. Harvested trees should be recycled into mulch or other beneficial uses. Remove hazard trees.
A	Side Slopes of Pond	Erosion	Eroded damage over 2 inches deep where cause of damage is still present or where there is potential for continued erosion. Any erosion observed on a compacted berm embankment.	Slopes should be stabilized using appropriate
	Storage Area	Sediment	Accumulated sidement that exceeds 10% of the designed pond depth unless otherwise specified or affects inletting or outletting condition of the facility.	Sediment cleaned out to designed pond shape and depth; pond reseeded if necessary to control erosion.
	Emergency Overflow/ Spillway	Emergency Overflow/ Spillway	Emergency overflow / Spillway is the inlet piping to the pond. If the pond fails, the water will back up to Cb #1, with an outflow to the existing large swale along 3rd Street SE. Culvert inlet shall be clear of trash, and blockages.	Overflow culvert is 100% clear of blockages, silt and trash.
		Trash & Debris / Sediment in downstream catch basins	Sediment (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6 inches clearance from the sediment surface to the invert of the lowest pipe. Measured from the bottom of basin to invert of the lowest pipe into or out of the basin.	No sediment in the catch basins.

A – Annually – preferably in September
M – Monthly – from November through April
S – After any major storm (1 inch in a 24 hour period)