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1. PROJECT INFORMATION

Project Name:

Project Location:

Subject: Enhanced Gravity Oil/Water Separation

SWTU: StormVault Coalescing Plate-Pack Separator (SCPS)

Model: SVCMS-X/X-XX

2. COALESCING PLATE SEPARATOR COMPONENTS

Figure 1: Coalescing Separator showing Inlet, separation and Outlet chamber
3. WARNING, DISCLAIMER & SAFETY PRECAUTIONS

This manual is provided for use only by persons experienced and knowledgeable in underground oil/water separator operation and maintenance. This manual provides general guidance, and conditions. Your specific installation site may make some or all of the guidance inapplicable. If you think you may need some professional guidance or more information and instructions, please contact Jensen Stormwater Systems prior to implementing operations or maintenances.

As an owner, you are solely responsible for compliance with all federal, state and local laws, regulations and ordinances applicable to your installation and operation and disposal of captured solid and liquid pollutants. Jensen Stormwater Systems disclaims all liability related to any misuse of the oil/water separator or failure to follow all guidance and instruction provided by Jensen Stormwater Systems.

The following safety precaution is in addition to other warnings provided within the text of this manual. These safety precautions are recommended and must be applied during operations and maintenance. It is not possible to determine in advance all of the possible situations that may arise, so the operator should exercise caution and use good operation procedures in the use of the unit. In addition to the procedures contained herein, observe all other required safety procedures. Always wear correct safety clothing and equipment and respect all safety rules. Safety is the sole responsibility of the owner and operating and maintenance personnel.

1. All operating personnel performing service on the separator system must be familiar with normal safety precautions and this manual before doing any work.
2. Do not service the equipment alone. Do not perform any work on the unit without another person present to render aid in the event of problems.
3. Do not perform any service on the equipment with any electrical power connected. Prior to any service, disconnect the power and use a voltmeter to ensure that there is no power to the system. Use approved lockout and tag-out procedures.

Confined Space

The StormVault Coalescing Plate Separator (SVCPS) separator is a confined space environment. Only properly trained personnel possessing the necessary safety equipment should enter the unit to perform maintenance or inspection procedures. Inspections of the internal components can, in most cases, be accomplished through access and observations hatches from the ground surface.

Never enter the SVCPS separator or any of its enclosed spaces without proper confined space entry training and approved equipment. See OSHA, Regulations for Permit-Required Confined Spaces 29 C.F.R. § 1910.146.
4. INTRODUCTION

The *StormVault Coalescing Plate Separator (SVCPS)* is a passive gravity-flow system for the separation of oil from rainwater runoff. The design utilizes the floatation, buoyancy force of oil due to its lighter specific gravity than water to produce enhanced coagulation and separation by the use of inclined, closely spaced parallel plates. This separation treatment process is generically referred to as lamella coalescing.

The *JCPS* separator is designed to process rainwater (or Stormwater) flow under gravity flow conditions and provide coalescing treatment as a flow-through treatment process. The *SVCPS* separator vessel is typically deployed in a precast concrete vault or manhole structure, though other container materials are available to meet project specific applications. The coalescing plates of the *SVCPS* are manufactured of oleophilic (oil-loving), marine grade Aluminum (Al).

The separator consists of a baffled pre-sedimentation section often referred to as the grit chamber. Stormwater enters this grit chamber through a down spouted inlet, which is typically PVC piping. The inflow is distributed across the width of this chamber, as uniformly as possible, upstream of the Aluminum Coalescing Plate Assembly. The outlet, underflow and overflow piping fixture is located at the discharge side of the unit, downstream of the Aluminum coalescing plate assembly. The Aluminum Coalescing Plate Assembly is installed in the treatment chamber. It is mounted in an Aluminum baffle wall via a self-wedging mechanism, which seals the coalescing assembly against the stationary baffle wall and ensures that all of the oily influent water is treated through the parallel coalescing plates. See figure 1 for details.

The oil transported in the influent Stormwater, is typically somewhat mixed and usually in the form of droplets of various sizes. The oily rainwater flows through the gap between the inclined parallel plates, following a downward path. The oil droplets rise due to their buoyancy, strike and adhere to the undersides of the plates and are captured and then coalesced, agglomerated into large size oil droplets. The initial rise of the oil droplets is governed by Stokes’ Law.

![Figure 2: Movement of Oil and Water through Coalescing Plates](image-url)
Again, as the oil droplets adhere to the plates, they coalesce into larger droplets and eventually form an oil film, which eventually climbs to the top of the inclined plates as the oil droplets grow in size. This oil film and these larger droplets migrate upward along the surface of the inclined plates, eventually separating from plates and float to the surface, where it is collected as a larger layer of oil on the surface of the water.

The Aluminum plates are approximately 14-inches wide and 28-inches long and typically placed at a 60-degree incline. The spacing, gap between plates provided by Jensen is typically 3/8, 1/2 & 3/4-inches, though any spacing can be provided. The closer the spacing of these plates, the more efficient the separation of oil. However, extremely closely spaced plates are more prone to clogging and considerations needs to be taken for selecting the plate spacing. The “stacks” of inclined plates are fixed in a removable assembly that sits in the slots of a baffle wall. The treatment flow is forced through the parallel plates with this coalescing assembly.

![Figure 3: Illustration of Coalescing Plates (3/4-in spacing)](image)

Typical plate spacing are 3/8, 1/2 & 3/4-inches.

Though the removal of oil is one of the primary objectives of the SVCPS separators, small solid particles having specific gravities close to one are also removed in this coalescing process. The presence of suspended solids in Stormwater discharges is also a primary water quality constituent of concern which can be effectively resolved by SVCPS separators.

Fine and coarse solid material settles on the floor of the inlet chamber and space beneath the down flow inlet of the Coalescing Plate Assembly. Fine solids also collect beneath the Coalescing Plate Assembly. The Coalescing Plate Assembly has been designed with a fine solids deposition zone immediately beneath its discharge to ensure that these separated fine solids do not clog the treatment flow path as they do in other coalescing systems, in which the deposition zone is within the treatment flow path.

As discussed above, captured oil agglomerates, coagulants on the surface of the unit, and fine and coarse solid material settles on the floor of the vault between the down flow inlet piping and the Coalescing Plate Assembly.
5. OPERATIONS

The unit is a passive gravity system. It should be initially filled with clean water first, prior to receiving Stormwater inflows. The SVCPS separator should be filled with clean water each time it is emptied to keep the outlet area from being contaminated with oil from the inlet area.

6. OPTIMIZING PERFORMANCE - CONSIDERATION POINTS:

I. The amount of debris, such as sand, gravel, dirt, leaves, wood, rags, etc., permitted to enter the JCPS separator must be reduced for maximum effectiveness. Installation of an appropriately sized Collection Catch Basin or other similar device upstream of the SVCPS separator is recommended.

II. Detergents and solvents must not enter the SVCPS separator. The SVCPS separator will not remove chemical emulsions or dissolved hydrocarbons, and their presence retards the recovery of oils that would otherwise be separated.

III. Wastewater containing high concentrations of dissolved solids (such as untreated sanitary sewage) must be excluded due to their emulsifying tendency. Wastewater, which exhibits high Biological Oxygen Demand, Chemical Oxygen Demand, and Total Suspended Solids (TSS) may require additional treatment after the SVCPS separator.

IV. The location of your JCPS separator should be in an area with sufficient truck access (top-side clearance) for waste removal.

V. The JCPS separator is the correct treatment process to remove chemical or physical emulsions, dissolved hydrocarbons, solvents or Volatile Organic Compounds. Installation of an appropriately sized filtration system equipped with Cationic Exchange media is recommended for treatment of water contaminated with these pollutants.

VI. Waste oils, such as automobile and truck crank case oil, should not be intentionally drained into the SVCPS separator. Filling the SVCPS separator with waste oils adversely affects SVCPS separator performance. Waste oil should be dumped into a waste holding tank designated for proper disposal.

VII. The SVCPS separator needs to be maintained in a timely manner for proper removal of free, accumulated oil and settled sediment. A vactor truck is recommended for cleanout of the SVCPS unit. Suction removal of waste using a vactor truck, as needed, is the recommended method of maintenance, though oil sorbent mats is a good method as well for capturing the separated oil.
VIII. If the unit is situated such that gravity flow through the unit isn’t possible, the SVCPS separator will need a pump station to drive treatment flows through it. Any pumping facility should absolutely be located downstream of the SVCPS separator. Pumping should be restricted to the clean water layer below the surface oil and above the settled sludge on layer on the unit’s floor, from discharge, effluent end of the SVCPS separator.

It is strongly recommended that any treatment flow pumping is not implemented up-stream of the SVCPS separator. If pumping is implemented up-stream of the unit, the pump will mix the oil and water, increasing the emulsified and dissolved oil content and hamper the oil separation process.

If a pump must be installed upstream of the SVCPS separator, it should be a positive displacement pump (e.g. progressive cavity, diaphragm, sliding shoe), set at minimum flow rate or revolutions per minute (RPM) and installed as far upstream as possible to minimize the oil/water mixing and emulsification.

IX. Piping to and from the unit should be designed to minimize turbulence and promote laminar flow.

X. The SVCPS separator must be kept from freezing at all times. The SVCPS separator and piping should be installed below local frost levels. If necessary, a thermostatically controlled steam or electric heating device may be installed.
7. MAINTENANCE

I. During the rainy season, the unit should be inspected at least once every 30-days or after a significant rainfall event of 0.5-inches or higher or after a series of smaller rainfall events.

   The settled solids should be removed from the grit chamber upstream of the Coalescing Plate Assembly as well as the area beneath the Coalescing Plate Assembly when the depth of the solids in either of these zones is more than 1-foot.

   If floatables accumulate more rapidly than the settleable solids, the floatables should be removed using a vactor truck or dip net before the floatable layer thickness exceeds 4 to 6 inches.

II. Cleanout of the StormVault Coalescing Plate Separator (SVCPS) unit at the end of a rainy season is recommended because of the nature of pollutants collected and the potential for odor generation from the decomposition of organic material and hydrocarbons collected and retained in the SVCPS. This end of season cleanout will assist in preventing the discharge of “pore”, putrid water from the SVCPS separator unit during summer months.

III. For a routine cleanout, the inlet area or grit chamber of the SVCPS unit should be checked to determine if an excessive amount of solids exceeding 1-foot of depth have accumulated on the vault floor, and on the discharge side of the Coalescing Plate Assembly.

   The removal of settled solids is necessary to prevent the accumulation of solids to a height that they plug either the inlet or the lower part of the coalescing plates on the discharge side. When the treatment flow path through the plates become obstructed, blocked by solids and debris, efficiency will be reduced and hydrocarbons in the outlet water may exceed allowable limits.

IV. Clean the inlet anytime fouled conditions are observed. Clean as follows:

   a. Remove cover or open lids as appropriate.
   b. Remove, pump / vacuum the water from the vault.
   c. Remove any sludge accumulation from the grit chamber section as well as from beneath the Coalescing Plate Assembly on the inlet and discharge side.
   d. Note sludge quantity and depths in both the inlet/ grit chamber and beneath the Coalescing Plate Assembly.

   If a large quantity of solids have accumulated in the grit chamber, in front of or beneath the Coalescing Plate Assembly, the plate assembly should either be cleaned in place or removed and cleaned.

   Before initiating any cleaning operations, influent flow into the unit should be stopped or diverted. The cleaning of the unit essentially consists of removing the floatables and Oil Sorbent Mats, drain or pump out the water from within the unit and then removal of the fine and coarse solids from the grit chamber and beneath the Coalescing Plate Assembly. The Coalescing Plate Assembly can be hosed down in place or hoisted out to the unit for cleaning if necessary.

   In general, those solids that enter the coalescing plate flow path will accumulate immediately below the Coalescing Plate Assembly on its discharge side. These separated are substantially finer in size then the
material settled upstream of the Coalescing Aluminum Plate Assembly.

**Cleaning When Coalescing Aluminum Plate Assembly Remains in Place**

For cleaning the Coalescing Plate Assembly in place, first pump down the unit. Connect a pressure water hose (at least 60-psig) to an extended cleaning wand so that the spray nozzle can be placed right at the entrance face of the plates. The extended wand allows for the plate assembly to power flush the channel between the plates clean, from the surface. As the water flushes the dirt out of the plate modules into the downstream chamber of the unit, it should be removed by the vacuum hose or pumped to an oily water sewer.

A vacuum truck is the suggested means for collecting and disposing of the sludge and dirt from the vault when it is cleaned with the Coalescing Plate Assembly remaining in place.

*Note: If desired, the water can be collected and recycled to the inlet of the separator later after cleaning.*

In addition, some oil on the plates will not cause deterioration of performance. It is only necessary to remove debris that may be blocking the entrance of the plates or solids and sludge from between the plates. It should be noted that all free oil and grease separated from the rainwater is coalesced and collected within the Oil Sorbent Mats.

**Cleaning When Coalescing Aluminum Plate Assembly Removed**

The Coalescing Plate Assembly can be easily removed from the vault and the vault can be cleaned separately. The Coalescing Plate Assembly typically weighs less than 1,500-lbs and can be hoisted out of the vault with most forklifts.

Hoist the Coalescing Plate Assembly from the vault per the “HOIST MOVEs” notes on the clean sketch in Appendix D of this Operations & Maintenance Manual. The Coalescing Aluminum Plate Assembly came equipped with Stainless Steel wire rope and lifting shackles already attached.

Once the Coalescing Plate Assembly has been removed, hoisted out of the vault, flush the Coalescing Plate Assembly with a standard hose or power sprayer over a retention tub or position the Coalescing Plate Assembly over a sanitary sewer floor drain.

**DO NOT DISASSEMBLE** Coalescing Plate Assembly; only handle it as a complete assembly.

Use a hose to flush the vault and sweep or squeegee all sediment out of the drain connections. A standard hose at 10 to 15-gpm with spray nozzle at normal, domestic 50 to 80-psi domestic pressure is effective, or the cleaning wand from a power sprayer can be used to flush the surface of the plates free of solids. In a similar manner, steam hoses can be used to flush plate assembly if desired.

Examine vault interior for damage and repair any damage to internal coating (if provided). Inspect oil sorbent mats for remaining adsorption capacity and replace as necessary.
Figure 5: Hoisting / Lifting of Coalescing Aluminum Plate Assembly

Figure 6: Inlet, Down Flow Side of Coalescing Aluminum Plate Assembly
To restart unit, first re-install the Coalescing Plate Assembly back in the vault, by following the “HOIST MOVEs” notes on the clean sketch in Appendix D of this Operation & Maintenance (O & M) Manual in reverse. Then, fill with clean water and open any valves that might have been closed so that Stormwater will flow through the unit.

Note: The quantity of sludge found in the Inlet side/ grit chamber of the vault, should be used as a basis for determining the next interval before cleaning.

If the sludge level is very low, say less than 3-inches, the cleaning interval can be extended. If the sludge layer is thicker, more than 9-inches in depth, the interval should be shortened.

New Installations – The condition of the unit should be checked after every runoff event for the first 30-days. The visual inspection should ascertain that the unit is functioning properly (no blockages or obstructions of the entrance inlet to the parallel plates) by measuring the amount of solid materials that have accumulated in the grit chamber, the amount of fine sediment accumulated beneath the Coalescing Assembly, and determining the amount of floating trash and debris in the grit chamber. This can be done with a calibrated “dip stick” so that the depth of deposition can be tracked. Schedules for inspections and cleanout should be based on storm events and pollutant accumulation.
Visually inspect the interior wall of the unit above the stationary baffle, on the upstream side, to note any water scum line that may indicate if the unit has been in bypass.

**Ongoing Operation** – During the rainy season, the unit should be inspected at least once every 30-days. The floatables should be removed and the solids removed from the floor when 1-foot in depth or greater in the grit chamber or beneath the Coalescing Plate Assembly.

If floatables accumulate more rapidly than the settleable solids, the floatables should be removed using a vactor truck or dip net before the layer thickness exceeds one to two feet.

Cleanout of the **SVCPS** unit at the end of a rainfall season is recommended because of the nature of pollutants collected and the potential for odor generation from the decomposition of material collected and retained. This end of season cleanout will assist in preventing the discharge of pore water from the **SVCPS** unit during summer months.

**Use of Sorbents** – It needs to be emphasized that the addition of sorbents does not necessarily increase the removal of Oil and Grease from Stormwater. The properly sized Coalescing Plate Assembly within the unit assures satisfactory removal of oil and grease. However, the addition of sorbents will enhance the solidification and retention of the oil and grease coalesced on the water surface.

Under normal operations, the **SVCPS** will provide effluent concentrations of oil and grease less than 15-parts per million (ppm / mg/L) for all dry weather spills where the volume is less than or equal to the spill capture volume of the **SVCPS** separator.

During wet weather flows, a properly sized **SVCPS** can be expected to remove between 80% and 90% of the free oil and grease from the Stormwater runoff.

**Jensen** only recommends the addition of sorbents to the **SVCPS** separator if there are specific land use activities in the catchment watershed that could produce exceptionally large concentrations of oil and grease in the runoff; concentration levels well above typical amounts. If site evaluations merit an increased control of free oil and grease then oil sorbents can be added to the **SVCPS** separator to enhance solidification of the oil.

**Recommended Oil Sorbent Material**

Observe hydrocarbon absorbent mats. The **SVCPS** separator may be is equipped with Rubberizer®, a Sorbent Solidifier™ that transforms spilled hydrocarbons into a rubber-like solid when it comes in contact. Rubberizer® absorbent pillows or mats that should be observed for color change. These units will be solid white when they are initially installed and will darken as they absorb oils.

They are capable of retaining up to five times their weight in hydrocarbons; therefore, as they absorb oil they will darken in color from the bottom up. When the mats or pillows are floating low in the water and are solid dark brown or black they may need to be replaced. Refer to Rubberizer’s maintenance guidelines for further information. Often the mats will collect some sediments and dust. By pulling on the attachment lanyard and dunking the mats in the water, it can be observed if the mats are dirty or are saturated with oils and greases.

To remove the mats or pillows, find the lanyards attached to the access cover and pull the mats out
utilizing a “sewer hook” or similar rod. Care should be taken in lifting the saturated mats out of the access way as they may weigh up to five times more than the replacement mats. Care should be taken with mats that are saturated with oil. Many state and local agencies have their own regulations regarding used oil and oil containing devices. Any material determined to be hazardous waste must be disposed of per applicable EPA Regulatory Citation, Statutory Citation (RCRA) requirements. Replacement mats or pillows can be obtained from Jensen Stormwater Systems or nearest Jensen Precast sales office.

The amount of sorbent to be added to the SVCPS separator’s chamber can be determined if sufficient information is known about the concentration of oil and grease in the runoff. Frequently the actual concentrations of oil and grease are too variable and the amount to be added and frequency of cleaning will be determined by periodic observation of the sorbents.

As an initial application, it is recommended that approximately 4 to 8 pounds of sorbent material be added to the grit chamber of the SVCPS unit per acre of parking lot or road surface per year. Typically this results in 1 to 4 sorbent mats for most all applications. The oil and grease loading of the sorbent material should be observed after major storm events. Oil Sorbent material may also be furnished in pillow or boom configurations.

The sorbent material should be replaced when it is fully discolored by skimming the sorbent from the surface. The sorbent may require disposal as a special or hazardous waste, but will depend on local and state regulatory requirements.

**Disposal**

Standard vactor operations should be employed in the cleanout of the unit. Disposal of material from the SVCPS unit should be in accordance with the local municipality’s requirements.

Disposal of the decant liquid/material to a Publicly Operated Waste Water Treatment Plant is recommended. Field decanting to the storm drainage system is not recommended, unless through a proven fine filtration process.
APPENDIX A

ANNUAL RECORD OF OPERATION AND MAINTENANCE
JENSEN STORMWATER SYSTEMS
Annual Record of Operation and Maintenance
StormVault Coalescing Plate Separator; Model: SVCPS-X/X-XXX

Owner
Address
Owner Representative       Phone

SVCPS INSTALLATION:
Model Designation ___________________________ Date ___________________________
Site Location ___________________________
Depth from cover to bottom of Grit chamber ___________________________

INSPECTIONS:

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<th>Date</th>
<th>Inlet Integrity</th>
<th>Floatables Depth</th>
<th>Sediment depth</th>
<th>Oil Sorbent Mats Discoloration</th>
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</thead>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Grit Chamber</td>
<td>Beneath Coalescing Plates</td>
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OBSERVATIONS OF FUNCTION:

CLEANOUT:

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<th>Sediment volume</th>
<th>Method of disposal of floatables, sediments and decant and sorbents</th>
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</thead>
</table>

OBSERVATIONS OF FUNCTION:

COALESCING PLATE ASSEMBLY MAINTENANCE

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<th>Inspection</th>
<th>Plate integrity</th>
<th>Powerwash of Plate assembly</th>
<th>Method of disposal of sediments</th>
</tr>
</thead>
</table>

OBSERVATIONS OF FUNCTION:

CERTIFICATION: _________________________ TITLE: _________________________ DATE: _____________
APPENDIX B

SITE LOCATION PLANS
APPENDIX C

PLAN & PROFILE DRAWINGS
APPENDIX D

CLEAN OUT DETAIL SKETCH/ DRAWINGS
APPENDIX E

BROCHURE INFORMATION – CLEARTECH RUBBERIZER OIL SORBENT MATS