APPENDIX L

Storm Water Pollution Prevention Plan

APPENDIX L

G3 Terminal Vancouver

Port Metro Vancouver Project Permit Application

Kiewit

G3 Terminal Vancouver

G3 TERMINAL VANCOUVER PROJECT

PORT METRO VANCOUVER PROJECT PERMIT SUBMISSION

STORMWATER POLLUTION PREVENTION PLAN (SPPP)
REV.01

Revision	Date	Remarks
0	October 15, 2015	
01	October 28, 2015	
02		
03		
04		

MANAGEMENT APPROVAL

I certify that this plan has been reviewed and the methods contained in the plan are appropriate and adequate to minimize the discharge of pollutants by stormwater runoff. This plan receives full management support I authorize the necessary resources to the full implementation of this plan.

_____ _____

Signature Date

Name: TBD
Title: Site Manager

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1 INTRODUCTION

Stormwater is water that originates from precipitation events (such as rainfall) and from snow and ice melt. Stormwater remains on the ground surface through ponding, gets soaked into the ground, or becomes stormwater runoff, which ultimately enters nearby bodies of water. Stormwater runoff flows over land or impervious surfaces such as paved roadways, parking lots and building rooftops. As it flows it accumulates debris, soil and sediment, and contaminants that could negatively impact water quality.

This Stormwater Pollution Prevention Plan (SPPP) is developed for a not yet constructed export grain terminal. The site where the grain terminal will be located is an existing export terminal that has been in operation since 1971 handling primarily forestry, steel, general cargo, containers and other services catering to the pulp and paper lumber, general cargo and containers. G3 intends to transform the facility into a state-of-the-art grain export terminal.

The purpose of the SPPP is to develop a pollutant control strategy to minimize the discharge of pollutants by stormwater runoff. Best Management Practices (BMPs) are those management practices which are considered sound, are relatively low in cost, and are applicable to a broad category of industries and types of pollutants. Advanced BMPs are defined as those which are specific to a type of industry or pollutant. The BMPs discussed in this plan have been designed to improve the quality of stormwater discharged from the facility and to aid in the development, implementation and evaluation of the SPPP.

2 OVERVIEW

2.1 Background

The G3 Terminal Vancouver (G3TV) includes removal of existing terminal facilities and construction of a new grain terminal with associated and related facilities. The proposed G3TV includes the following main elements:

- **Rail Car Loop Tracks**

  This configuration will consist of a number of rail loops capable of holding up to three 100 plus car unit trains.

- **Receiving System**

  This consists of the transfer of grain from rail cars and movement of grain via tunnel and conveyors to the grain storage silos. These conveyors will feed samplers and bulk scales. From these bulk scales conveyors will move the grain to the silos. All conveyors will have dust control filters. The rail receiving system is equipped with an air aspiration system connected to the hoppers consisting of a bag house with a fan ductwork and associated pit baffle system.

- **Grain Silos**

  Travelling belt conveyors (i.e., shuttle conveyors) on top of the silos will move grain to the appropriate silo. These conveyors and conveyors feeding them will be equipped with dust control filters. Dust emissions from the grain silos, will be controlled by dust control filters that move with the shuttle conveyors.

- **Ship Loader and Dock**

  The ship loading system consists of three loading booms. Each boom is fed by a series of valves which divide the flow from two shipping belts. These shipping belts are fed from the grain silos via reclaim and cross belts. The ship loading facility is equipped with dust filters. Air entrainment is kept to a minimum through the use of weighted spouting dampers, thus reducing air borne dust.

2.2 Location

As indicated in Figure 1, the Project and terminal operation will be located at the current Lynnterm West marine breakbulk terminal within the Port of Vancouver at 95 Brooksbank Avenue in the City of North Vancouver. The site is bounded by the Lynn Creek estuary to the east, Neptune Bulk Terminals, to the west, Burrard Inlet to the south and the Canadian National Railway to the north.

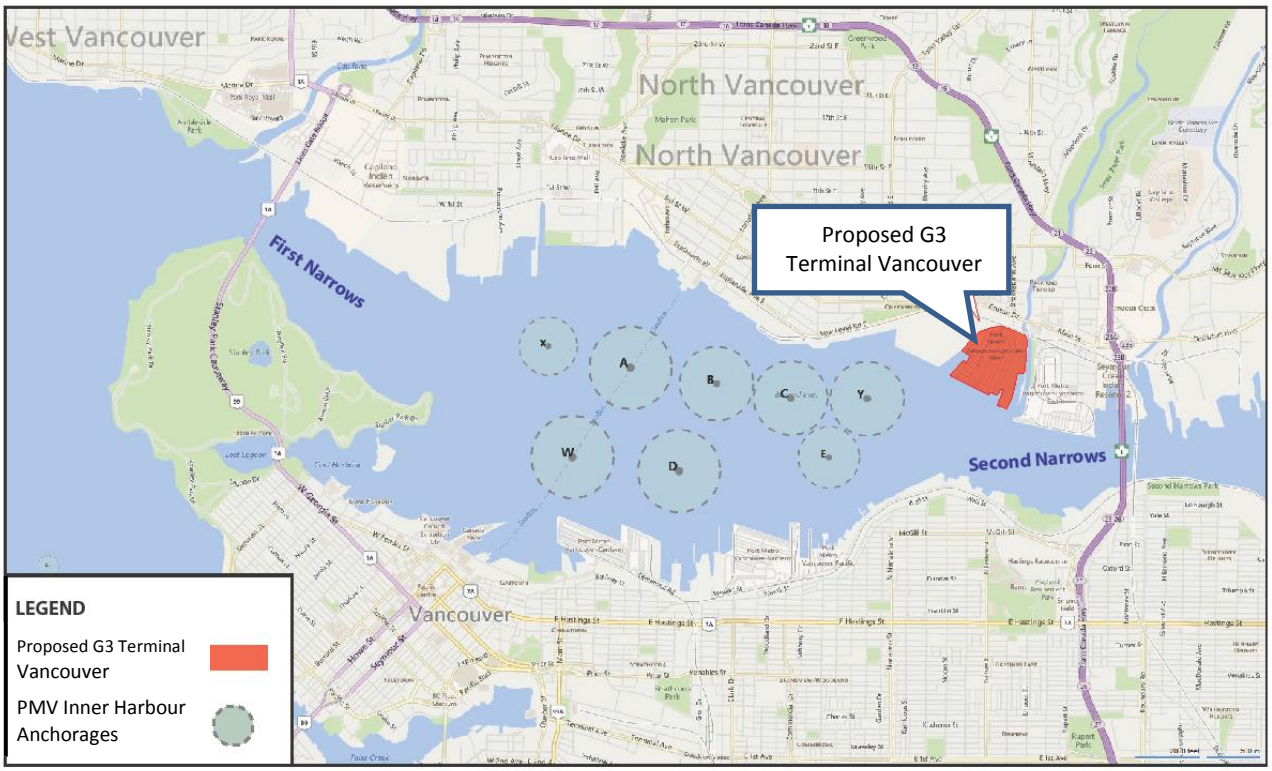


Figure 1: Project Location

3 SITE INVENTORY

3.1 Activities

Over the lifecycle of the site, the G3TV is expected to engage in the activities listed below that have the potential to expose stormwater runoff to contaminants. Figure 2 shows a proposed facility plan.

- Rail car storage;
- Grain receiving and transfer;
- Grain cleaning and storage;
- Grain ship loading;
- Dust aspiration;
- Waste disposal;
- Hazardous materials storage
- Fueling of service vehicles;
- Routine servicing of equipment; and,
- Repair and maintenance activities.

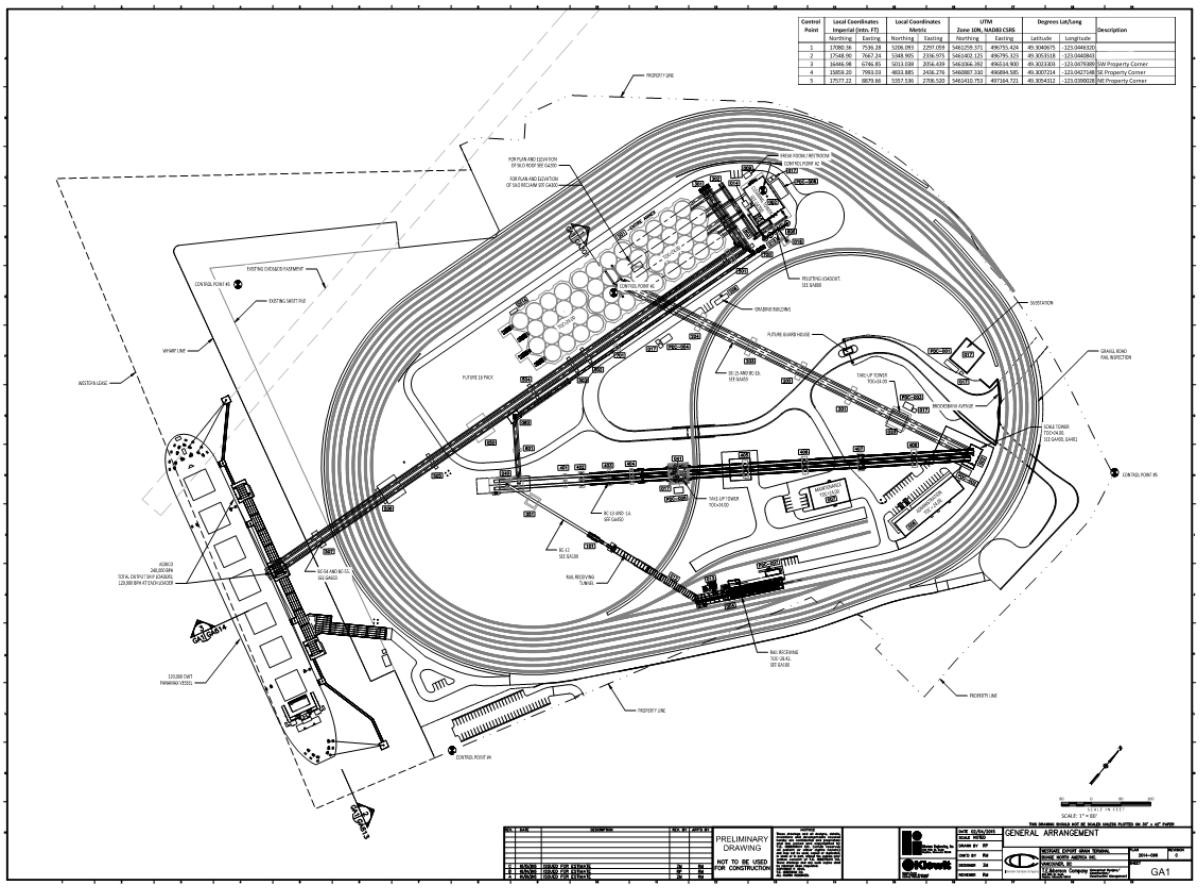


Figure 2: Proposed Facility Plan
(Note: Figure is preliminary and subject to change.)

3.2 Materials

Significant materials, as they relate to stormwater, include but are not limited to raw materials; material handling equipment or activities; storage, cleaning, by-products; final products or waste products. The significant materials the G3TV is expected to have located at the facility which are exposed to stormwater include the following:

- Agricultural grain commodities;
- Grain dust (from the aspiration of the grain handling);
- Petroleum fuels (diesel and gasoline);
- Solid waste/garbage; and,
- Hydraulic and lubricating oils.

3.3 Hydrologic Assessment

A hydrologic assessment was conducted for the final design of the site to estimate the runoff response, including peak flow rates and runoff volumes for various rainfall events. The design of the site stormwater management system will take into account the results of the hydrological assessment to ensure the stormwater infrastructure is appropriate for the site. The basic hydrological parameters used to model hydrological properties of the permanent design are as follows:

- Total Area – 26.4 hectares;
- Current design impervious – 16%;
- Average slope – 1.0% to 2.0%;
- Time of concentration – Single discharge to the existing outfall is 15.0 minutes;
- Precipitation event – Water quality event 25 mm in 24 hours and a 2 year 15 minute peak intensity 25 mm/hr.;
- Return Period – Enclosed storm sewer system sized for the 25 year design storm event. Low point pump stations sized for the 100 year design storm event; and,
- Extreme Event - 100 year design storm was used for sizing of storm sewer pump systems. The Port of Metro Vancouver's Revised Flood Construction Levels (FCL) was considered in the design of the site - 25 Year Peak Flow: 2,095 l/s, 25 Year Total Runoff: 14,431 m^3, 100 Year Peak Flow: 2,636 l/s, 100 Year Total Runoff: 18,008 m^3.

4 ISSUES IDENTIFICATION AND RISK ANALYSIS

4.1 Applicable Standards, Acts and Regulations

The following relevant legislation and standards are applicable given the potential pollutant sources listed above.

- *Canada Fisheries Act* regarding the deposition of deleterious substance in waters frequented by fish.
- *Canada Shipping Act*, National Spill Response Protocol regarding the release of pollutants to the marine environment.
- *Canada Environmental Protection Act* regarding the management of harmful substances.

- *Canada Transportation of Dangerous Goods Act* – regarding the transportation of dangerous goods.
- Canadian Council of Ministers of the Environment (CCME) Guidelines relating to water quality standards.
- *B.C. Environmental Management Act,* regarding the unauthorized release of substances into the environment.
- *B.C. Environmental Management Act,* regarding the storage, handling, and disposal of hazardous materials and waste.

4.2 Potential Pollutant Sources

An assessment of the G3TV was conducted to identify materials and practices which may reasonably be expected to add significant levels of pollutants to stormwater or which may result in the discharge of pollutants during dry weather from separate storm sewers draining the facility. This section will provide a description of potential sources which may contribute to the presence of contaminants in stormwater runoff.

- Grain receiving, handling, transfer, storage and ship loading could result in grain being spilled onto the ground.
- Grain dust from the dust control systems that aspirate the grain receiving and handling systems could be spilled onto the ground during maintenance of the equipment or as the result of a malfunction.
- Fuel, oil or coolant from service vehicles could leak from the vehicle from damage, normal wear and tear or during maintenance.
- Fuel could be dripped or spilled from diesel or gasoline fuel tanks during the fueling of service vehicles, during the filling of the tanks or as a result of damage to the tanks.
- Hydraulic oil or lubricating oil could be spilled during maintenance activities, or from leaks in oil-filled equipment.
- Garbage could be spilled onto the ground during the disposal of solid waste into designated dumpsters.

4.3 Potential Sensitive Receptors

In general terms, G3TV is situated in an area designated as ‘Port Terminal’ as provided in the *Port Metro Vancouver Land Use Plan* (October 28, 2014). While ‘Port Terminal’ areas are designated for a variety of light and heavy industrial activities, the G3TV site is bounded by Lynn Creek to the east and Burrard Inlet to the south. Lynn Creek, the Lynn Creek estuary and Burrard inlet are considered sensitive habitat features with Lynn Creek and its estuary designated as a ‘Conservation’ area in the *Port Metro Vancouver Land Use Plan*.

The stormwater design for the G3TV site has all stormwater runoff directed away from Lynn Creek and the Lynn Creek estuary to a single outfall into Burrard Inlet at the northwest corner of the site. The implementation of this SPPP and associated mitigation measures will minimize harmful impacts from stormwater runoff to Burrard Inlet.

4.4 Identified Issues

Given that grain and grain dust recovery systems will be in place during terminal operation, the risk of the release of these potential pollutants into stormwater is considered to be low.

There will be no large tank-type bulk fuel storage during the operational phase of the project. The storage area for small amounts of fuels, coolants hydraulic oils and lubricating oils used for maintenance purposes will be in a centralized location having secondary containment. Given that the potential source for the release of these pollutants into the environment will be primarily during maintenance operations (either planned or from equipment failure), operations crews conducting the maintenance will immediately clean up and report all spills in accordance with the site Spill Prevention and Emergency Response Plan. The risk for the introduction of chemical pollutants will be low with an effective implementation of the Spill Prevention and Emergency Response Plan.

4.5 Identified Pollutant Pathways

The only pollutant pathway for the site will be via the stormwater drainage system. The entire site will be graded so that all rainfall and snow melt is directed into a network of catch basins and sub-grade culverts to a single outfall at the west northwest side of the site where the existing site outfall is located.

A detailed site drainage plan drawing including the two oil-water-grit interceptors sited at the inlet of the outfall is provided in Appendix A of this plan. The site drainage drawing includes the following features:

- The boundaries for each sub-catchment;
- Unique identifiers for each sub-catchment;
- Stormwater drainage infrastructure;
- Stormwater drainage collection points;
- Stormwater drainage release points from the site;
- Location of treatment units;
- Downstream receiving water bodies; and,
- Special features within the site.

5 STORMWATER POLLUTION PREVENTION PLAN

5.1 Management Strategy

The G3TV stormwater pollution prevention strategy is to implement a set of best management practices to target the potential pollutant sources identified in section 4.2 of this plan. These practices will encompass prevention, containment/reduction and treatment.

5.1.1 Good Housekeeping

Maintenance of work areas which may contribute pollutants to stormwater will be the most effective management practice for this site. Good housekeeping practices are not only beneficial in terms of limiting exposure of materials to stormwater, but they also improve worker safety and often contribute to reducing losses of products thereby lowering operational or capital costs.

Good housekeeping will be practiced throughout the facility. All exposed areas of the facility are maintained in a clean and orderly manner. Trash and other waste products are removed from the site on a regular basis. Routine inspections are made to insure that good housekeeping is being practiced.

5.1.2 Preventive Maintenance

The G3TV will employ a preventive maintenance program that includes inspections, testing, maintenance, and repairs of facility equipment and systems whose failure could result in a non-stormwater discharge is in place at the facility.

5.1.3 Containment/Reduction

All hazardous material storage areas will be equipped with secondary containment to reduce the likelihood of stormwater to become contaminated by their contents. If the secondary containment accumulates stormwater, the water will be examined to ensure it is free of oil, foam or discoloration prior to being drained.

In areas where there is a likelihood of solid contaminants entering a waste water drain, the drain will be equipped with a screen to reduce the amount of solids allowed to enter the storm drain.

5.1.4 Spill Prevention and Response Procedures

Spill prevention and emergency response procedures are outlined in the Spill Prevention and Emergency Response Plan.

5.1.5 Treatment

Prior to leaving the property, the stormwater effluent will pass through one of two Contech Vortechs VX-9000 oil-water-grit (OWG) interceptors. The OWG interceptors are designed to remove sediment, total suspended solids, hydrocarbons and free oil from stormwater runoff. The VX-9000 model is appropriately sized for the predicted storm events for the site. The manufacturer's specifications for the OWG interceptors are provided in Appendix B of this Plan. The OWG interceptors will further reduce the chance of discharging any sediment and oily contamination in the stormwater discharge. The OWG interceptors will be inspected regularly and cleaned, as required.

6 IMPLEMENTATION AND MONITORING

6.1 Implementation and Monitoring

The G3TV Management will identify an operational SPPP Manager who will be responsible for the implementation of this plan. The SPPP Manager will possess the knowledge and skills to assess conditions and activities that could impact stormwater quality at the facility, and who can also evaluate the effectiveness of the management practices.

Regular site and effluent inspections shall be conducted by the SPPP Manager to confirm that stormwater best management practices (BMPs) outlined in this plan are being implemented effectively and to identify any possible concerns related to the quality of stormwater effluent.

At a minimum, the SPPP Manager will conduct weekly inspections of all areas of the facility where industrial materials or activities are exposed to stormwater and/or where the potential for exposure to stormwater exists. Such areas specifically include grain receiving areas, grain storage areas, grain loadout areas, the area around the aspiration filters, the areas around fuel tanks, the areas where vehicle or equipment maintenance takes place, and waste disposal areas.

During periods of dry weather (i.e., greater than 72 hours precipitation free), the weekly inspection may also identify possible non-stormwater sources that may be infiltrating into the stormwater system. Should this be the case, an investigation into the source will be conducted and appropriate steps will be taken to ensure the stormwater system is used as intended.

In addition to the weekly inspections, the SPPP Manager will monitor local weather reports for upcoming storm events and conduct inspections during a period when a stormwater discharge is occurring. The effluent will be inspected for the presence of odor, foam, discoloration, sediment and/or an oily sheen. If stormwater effluent is found to be abnormal, the cause of the abnormality will be investigated and appropriate mitigating action will be taken to return the quality of the stormwater effluent to normal and prevent future reoccurrences.

All weekly and storm event SPPP inspections will be documented in an SPPP inspection form that will include weather, BMPs inspected, effluent inspected, effectiveness of the BMPs, any repairs/maintenance of existing BMPS, any new BMPs proposed, the personnel responsible in BMP maintenance or installation and a timeline for completion of the prescribed maintenance or installation.

All operational site staff will receive training on the contents of this plan at hire orientation and annually. The training will clearly indicate that it is the responsibility of all staff to be able to recognize ineffective stormwater BMPs and to report them to their supervisor, the SPPP Manager and/or site management.

6.2 Adaptive Management and Continuous Improvement

A key process in the effective implementation of the SPPP is the ability to change mitigation measures or actions as site conditions warrant to protect stormwater quality. This approach, generally termed as 'adaptive management', is a planned and systematic process for continuously improving environmental management practices by learning about their outcomes.

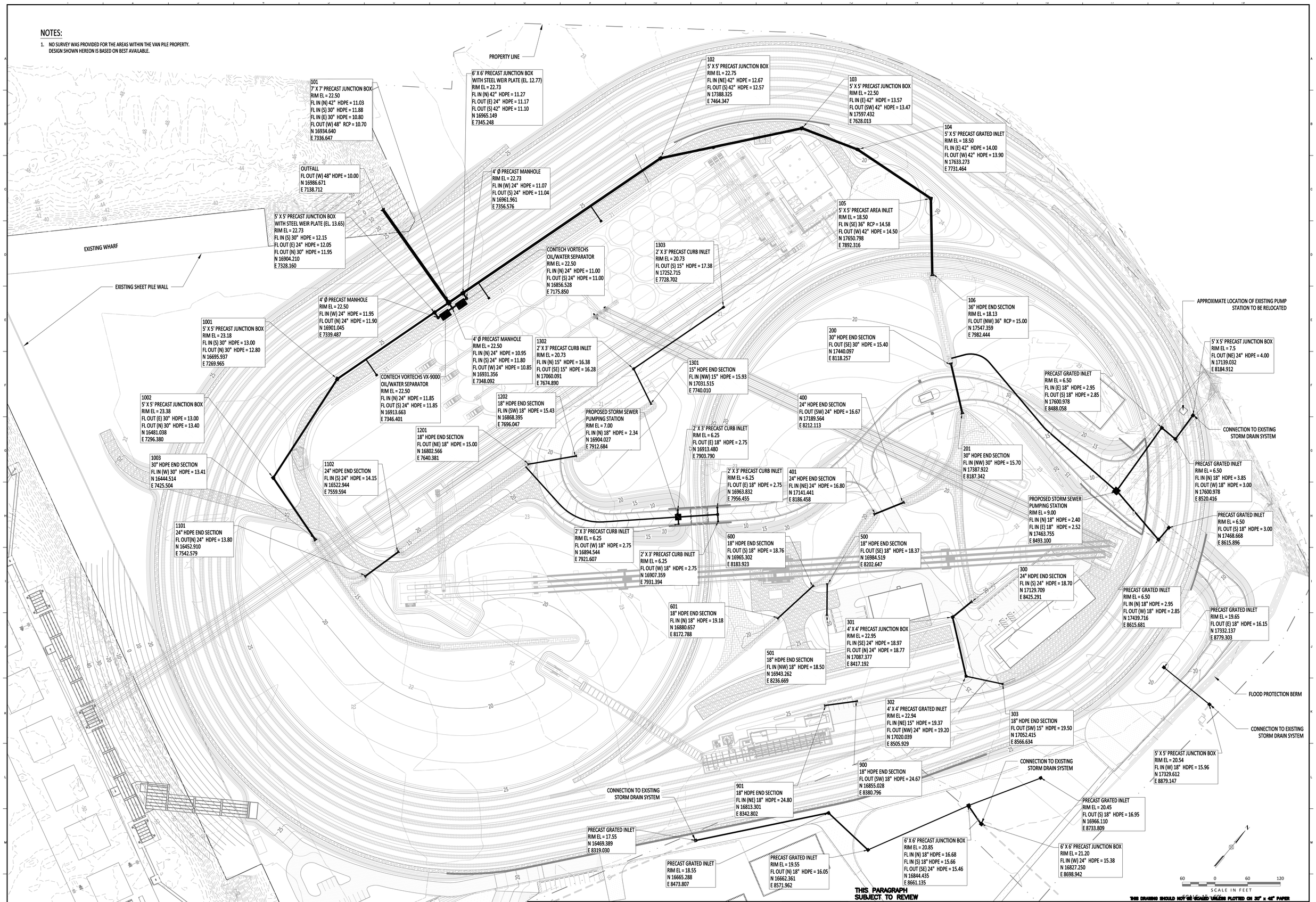
To ensure continuous improvement for the stormwater system, G3TV Management and the SPPP Manager will review the contents of this plan on an annual basis, to ensure all potential stormwater exposures have been identified and that the management practices are appropriate and adequate. The SPPP inspection reports will be reviewed for trends in effective and ineffective mitigation actions and measures. The results of these reviews may determine that current BMPs are working effectively or additional mitigation efforts are needed. Any changes to the actual SPPP will also be in the review. The reviews will be minuted with clear action items, those responsible and timelines for completion.

Appendix 1

Site Drainage Plan

NOTES:

1. NO SURVEY WAS PROVIDED FOR THE AREAS WITHIN THE VAN PILE PROPERTY. DESIGN SHOWN HEREON IS BASED ON BEST AVAILABLE.



THIS PARAGRAPH SUBJECT TO REVIEW

THIS DRAWING SHOULD NOT BE VIEWED UNLESS PLOTTED ON 30" x 42" PAPER

REV.	DATE	DESCRIPTION	REV. BY	APP'D BY	OWNER APP'D
B	09/03/15	IFP – PMV PERMIT APPLICATION	RRP	RCM	
A	07/24/15	IFP – PMV PERMIT APPLICATION	RRP	RCM	

PRELIMINARY DRAWING

NOT TO BE USED FOR CONSTRUCTION

DATE	09/03/15
SCALE	NOTED
DRAWN BY	RRP
CHK'D BY	ZAM
DESIGNER	RRP
REVIEWER	RCM

DRAINAGE PLAN
PMV PERMIT APPLICATION

G3 TERMINAL VANCOUVER
G3 TERMINAL VANCOUVER LIMITED PARTNERSHIP
VANCOUVER, BC

JOB NO. 2014–096
REVISION B

Ibberson Canada Company
IBBERSON CANADA COMPANY

SHEET SKC-C107

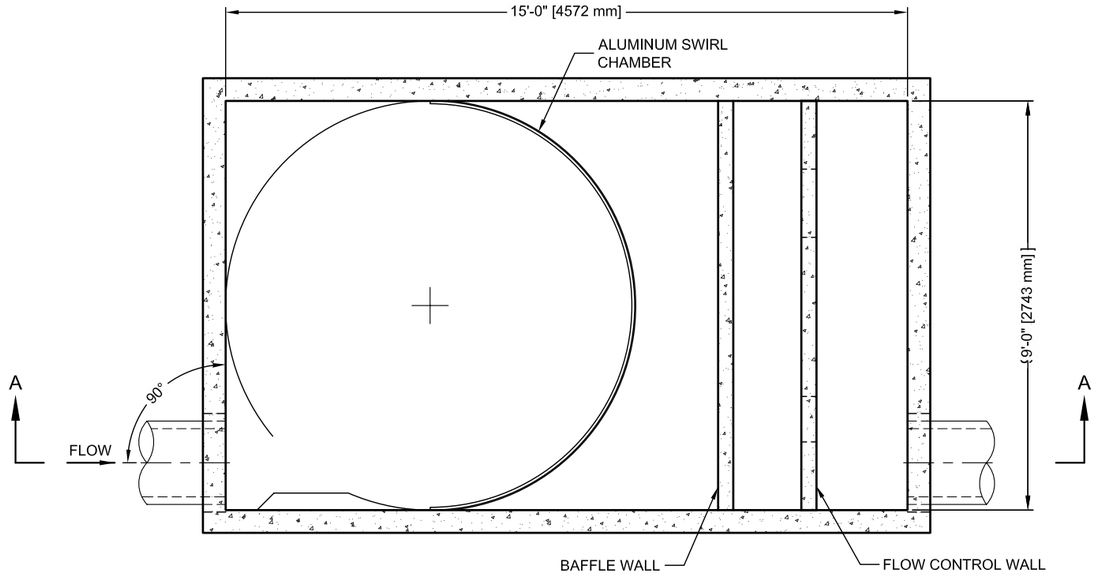
Appendix B

Manufacturer's Specifications for the oil-water-grit interceptors

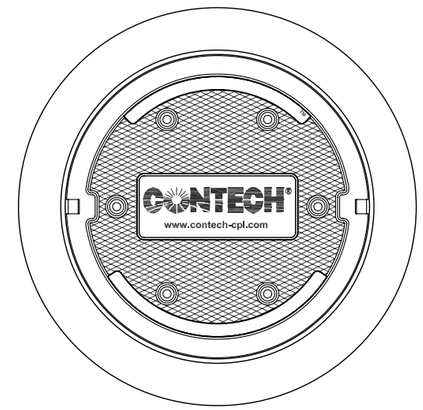
VORTECHS 9000 DESIGN NOTES

VORTECHS 9000 RATED TREATMENT CAPACITY IS 14 CFS, OR PER LOCAL REGULATIONS. IF THE SITE CONDITIONS EXCEED RATED TREATMENT CAPACITY, AN UPSTREAM BYPASS STRUCTURE IS REQUIRED.

THE STANDARD INLET/OUTLET CONFIGURATION IS SHOWN. FOR OTHER CONFIGURATION OPTIONS , PLEASE CONTACT YOUR CONTECH REPRESENTATIVE. www.contechES.com



SECTION B-B



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	*
WATER QUALITY FLOW RATE (CFS)	*
PEAK FLOW RATE (CFS)	*
RETURN PERIOD OF PEAK FLOW (YRS)	*

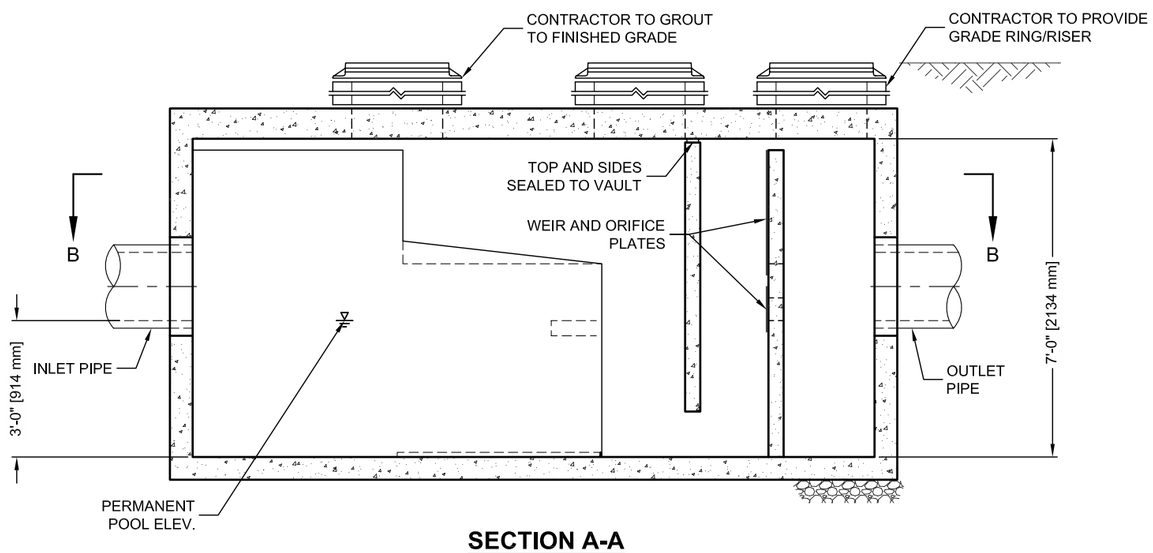
PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	*	*
INLET PIPE 2	*	*	*
OUTLET PIPE	*	*	*

RIM ELEVATION	*

ANTI-FLOTATION BALLAST	WIDTH	HEIGHT
	*	*

NOTES/SPECIAL REQUIREMENTS:

* PER ENGINEER OF RECORD



SECTION A-A

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH REPRESENTATIVE. www.contechES.com
4. VORTECHS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
5. STRUCTURE SHALL MEET AASHTO HS20 AND CASTINGS SHALL MEET AASHTO M306 LOAD RATING, ASSUMING GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION.
6. INLET PIPE(S) MUST BE PERPEDICULAR TO THE VAULT AND AT THE CORNER TO INTRODUCE THE FLOW TANGENTIALLY TO THE SWIRL CHAMBER. DUAL INLETS NOT TO HAVE OPPOSING TANGENTIAL FLOW DIRECTIONS.
7. OUTLET PIPE(S) MUST BE DOWN STREAM OF THE FLOW CONTROL BAFFLE AND MAY BE LOCATED ON THE SIDE OR END OF THE VAULT. THE FLOW CONTROL WALL MAY BE TURNED TO ACCOMODATE OUTLET PIPE KNOCKOUTS ON THE SIDE OF THE VAULT.

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE VORTECHS STRUCTURE (LIFTING CLUTCHES PROVIDED).
C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

Vortechs®

CONTECH®
ENGINEERED SOLUTIONS LLC
www.contechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

VORTECHS 9000
STANDARD DETAIL

SECTION [_____]

STORMWATER TREATMENT DEVICE

PART 1 – GENERAL

1.1 DESCRIPTION

A. Work Included

The Contractor, and/or a manufacturer selected by the Contractor and approved by the Engineer, shall furnish all labor, materials, equipment and incidentals required and install all precast concrete stormwater treatment systems and appurtenances in accordance with the Drawings and these specifications.

1.2 QUALITY CONTROL INSPECTION

A. The quality of materials, the process of manufacture, and the finished sections shall be subject to inspection by the Engineer. Such inspection may be made at the place of manufacture, or on the work site after delivery, or at both places, and the sections shall be subject to rejection at any time if material conditions fail to meet any of the specification requirements, even though sample sections may have been accepted as satisfactory at the place of manufacture. Sections rejected after delivery to the site shall be marked for identification and shall be removed from the site at once. All sections which have been damaged beyond repair during delivery will be rejected and, if already installed, shall be repaired to the Engineer's acceptance level, if permitted, or removed and replaced, entirely at the Contractor's expense.

B. All sections shall be inspected for general appearance, dimensions, soundness, etc. The surface shall be dense, close textured and free of blisters, cracks, roughness and exposure of reinforcement.

C. Imperfections may be repaired, subject to the acceptance of the Engineer, after demonstration by the manufacturer that strong and permanent repairs result. Repairs shall be carefully inspected before final acceptance. Cement mortar used for repairs shall have a minimum compressive strength of 4,000 psi (28 MPa) at the end of 7 days and 5,000 psi (34 MPa) at the end of 28 days when tested in 3 inch (76 mm) diameter by 6 inch (152 mm) long cylinders stored in the standard manner. Epoxy mortar may be utilized for repairs.

1.3 SUBMITTALS

A. Shop Drawings

The Contractor shall be provided with dimensional drawings and, when specified, utilize these drawings as the basis for preparation of shop drawings showing details for construction, reinforcing, joints and any cast-in-place appurtenances. Shop drawings shall be annotated to indicate all materials to be used and all applicable standards for materials, required tests of materials and design assumptions for structural analysis. Shop drawings shall be prepared at a scale of not less than 3/16-inches per foot (1:75). Six (6) hard copies of said shop drawings shall be submitted to the Engineer for review and approval.

PART 2 – PRODUCTS

2.1 MATERIALS AND DESIGN

A. Concrete for precast stormwater treatment systems shall conform to ASTM C 857 and C 858 and meet the following additional requirements:

1. The wall thickness shall not be less than 6 inches (152 mm) or as shown on the dimensional drawings. In all cases the wall thickness shall be no less than the minimum thickness necessary to sustain HS20-44 (MS18) loading requirements as determined by a Licensed Professional Engineer.

2. Sections shall have tongue and groove or ship-lap joints with a butyl mastic sealant conforming to ASTM C 990.

3. Cement shall be Type II Portland cement conforming to ASTM C 150.

4. All sections shall be cured by an approved method. Sections shall not be shipped until the concrete has attained a compressive strength of 4,000 psi (28 MPa) or until 5 days after fabrication and/or repair, whichever is the longer.

5. Pipe openings shall be sized to accept pipes of the specified size(s) and material(s), and shall be sealed by the Contractor with a hydraulic cement conforming to ASTM C 595M

B. Internal aluminum plate components shall be aluminum alloy 5052-H32 in accordance with ASTM B 209.

C. Sealant to be utilized at the base of the swirl chamber shall be 60 durometer extruded nitrile butadiene rubber (Buna N) and shall be provided to the concrete precaster for installation.

D. Brick or masonry used to build the manhole frame to grade shall conform to ASTM C 32 or ASTM C 139 and shall be installed in conformance with all local requirements.

E. Casting for manhole frames and covers shall be in accordance with ASTM A48, CL.30B and AASHTO M105. The manhole frame and cover shall be equivalent to Campbell Foundry Pattern #1009A or #1012D custom cast with the Contech Engineered Solutions logo and the words “Vortechs® Stormwater Treatment System”.

F. A bitumen sealant in conformance with ASTM C 990 shall be utilized in the sealing of the joint between the swirl chamber and the vault at the long wall tangent points. The butyl material shall be 3/4-inch thick by 3/4-inch wide.

2.2 PERFORMANCE

A. Each stormwater treatment system shall adhere to the following performance specifications at the design treatment capacities, as listed below:

Table 2.2

Vortechs® Model	**Design Treatment Capacity** (cfs)/(l/s)	**Sediment Storage** (yd^3)/(m^3)
1000	**0 - 1.6 (0 - 45)**	**0.7 (0.54)**
2000	**1.6 - 2.8 (45-80)**	**1.2 (0.91)**
3000	**2.8 - 4.5 (80-125)**	**1.8 (1.38)**
4000	**4.5 - 6.0 (125-175)**	**2.4 (1.84)**
5000	**6.0 - 8.5 (175-240)**	**3.2 (2.45)**
7000	**8.5 - 11.0 (240-315)**	**4.0 (3.06)**
9000	**11.0 - 14.0 (315-400)**	**4.8 (3.67)**
11000	**14.0 - 17.5 (400-495)**	**5.6 (4.28)**
16000	**17.5 - 25.0 (495-710)**	**7.1 (5.43)**

Each stormwater treatment system shall include a circular aluminum “swirl chamber” (or “grit chamber”) with a tangential inlet to induce a swirling flow pattern that will accumulate and store settleable solids in a manner and a location that will prevent re-suspension of previously captured particulates.

Each stormwater treatment system shall be of a hydraulic design that includes flow controls designed and certified by a professional engineer using accepted principles of fluid mechanics that raise the water surface inside the tank to a pre-determined level in order to prevent the re- entrainment of trapped floating contaminants.

Each stormwater treatment system shall be capable of removing 80% of the net annual Total Suspended Solids (TSS) load based on a 50-micron particle size. Annual TSS removal efficiency models shall be based on documented removal efficiency performance from full scale laboratory tests. Annual TSS removal efficiency models shall only be considered valid if they are corroborated by independent third party field testing. Said field testing shall include influent and effluent composite samples from a minimum of ten storms at one location.

Individual stormwater treatment systems shall have the Design Treatment Capacity listed in Table 2.2, and shall not re- suspend trapped sediments or re-entrain floating contaminants at flow rates up to and including the specified Design Treatment Capacity.

Individual stormwater treatment systems shall have usable sediment storage capacity of not less than the corresponding volume listed in Table 2.2. The systems shall be designed such that the pump-out volume is less than ½ of the total system volume. The systems shall be designed to not allow surcharge of the upstream piping network during dry weather conditions.

A water-lock feature shall be incorporated into the design of the stormwater treatment system to prevent the introduction of trapped oil and floatable contaminants to the downstream piping during routine maintenance and to ensure that no oil escapes the system during the ensuing rain event. Direct access shall be provided to the sediment and floatable contaminant storage chambers to facilitate maintenance. There shall be no appurtenances or restrictions within these chambers.

Stormwater treatment systems shall be completely housed within one rectangular structure.

2.3 MANUFACTURER

A. Each stormwater treatment system shall be of a type that has been installed and used successfully for a minimum of 5 years. The manufacturer of said system shall have been regularly engaged in the engineering design and production of systems for the physical treatment of stormwater runoff during the aforementioned period.

Each stormwater treatment system is shall be a Vortechs® System protected under U.S. Patent #5,759,415 as manufactured by

Contech Engineered Solutions
9025 Centre Pointe Drive, Suite 400
West Chester, Ohio 45069
800-338-1122

PART 3 – EXECUTION

3.1 INSTALLATION

A. Each Stormwater Treatment System shall be constructed according to the sizes shown on the Drawings and as specified herein. Install at elevations and locations shown on the Drawings or as otherwise directed by the Engineer.

B. Place the precast base unit on a granular subbase of minimum thickness of six inches (152 mm) after compaction or of greater thickness and compaction if specified elsewhere. The granular subbase shall be checked for level prior to setting and the precast base section of the trap shall be checked for level at all

four corners after it is set. If the slope from any corner to any other corner exceeds 0.5% the base section shall be removed and the granular subbase material re-leveled.

C. Prior to setting subsequent sections place bitumen sealant in conformance with ASTM C 990 along the construction joint in the section that is already in place.

D. After setting the base and wall or riser sections, prepare to install the swirl chamber. Place the 3/4-inch (19 mm) thick by 3/4-inch (19 mm) wide butyl mastic seal vertically on the outside of the swirl chamber starting one inch above the bottom of the swirl chamber and continuing to a height equal to the elevation of the bottom of the upper aperture of the swirl chamber. The butyl mastic seal should abut the downstream side of the pre- drilled mounting holes that attach the swirl chamber to the long walls of the concrete vault. Next, install the extruded Buna N seal on the bottom edge of the 180 degree downstream section of the swirl chamber by first applying a bead of Sikaflex-1a polyurethane elastomeric sealant into the extruded slot then slide the seal onto the swirl chamber. The extruded seal should extend 3-inches (76 mm) upstream of the mounting holes, toward the inlet end of the vault. Set the swirl chamber into position and keep the seal approximately ½-inch (13 mm) above the floor of the concrete vault. Apply a continuous bead of Sikaflex-1a sealant under the cupped bottom of the seal. Set the circular swirl chamber on the floor of the vault and anchor it by bolting the swirl chamber to the side walls of the concrete vault at the three (3) tangent points and at the inlet tab using HILTI brand stainless steel drop-in wedge anchors or equivalent 3/8-inch (10 mm) diameter by 2-3/4 inch (70 mm) minimum length at heights of approximately three inches (3”) (76 mm) off the floor and at fifteen inch (15”) (381 mm) intervals to approximately the same height of the butyl mastic sealant (at locations of pre-drilled holes in aluminum components). Apply a continuous bead of Sikaflex-1a sealant to the intersection of the inside bottom edge of the extruded seal and the vault floor.

E. If the oil baffle wall (Baffle A) and flow control wall (Baffle B) are not integrally cast-in to riser/wall sections then the Baffle wall panels shall be placed in the formed keyways or between bolted-in-place angle flanges as provided by the manufacturer. Apply non-shrink grout or Sikaflex-1a sealant to each end of Baffle A and Baffle B at the upstream intersection with the side walls of the concrete vault.

F. Prior to setting the precast roof section, bitumen sealant equal to ASTM C 990 shall be placed along the top of the oil baffle wall (Baffle A), using more than one layer of mastic if necessary, to a thickness at least 1-inch (25 mm) greater than the nominal gap between the top of the baffle and the roof section. The nominal gap shall be determined either by field measurement or the shop drawings. Do not seal the top of Baffle B unless specified on the shop drawings to do so. After placement of the roof section has compressed the butyl mastic sealant in the gap over Baffle A, finish sealing the gap with an approved non-shrink grout on both sides of the gap using the butyl mastic as a backing material to which to apply the grout. If roof section is “clamshell” or “bathtub” halves, then finish sealing the ends of the Baffle walls by applying non- shrink

grout or Sikaflex-1a sealant to each end of Baffle A at the upstream intersection with the side walls of the concrete vault and to each end of Baffle B at the downstream intersection with the side walls of the concrete vault.

G. After setting the precast roof section of the stormwater treatment system, set precast concrete manhole riser sections, to the height required to bring the cast iron manhole covers to grade, so that the sections are vertical and in true alignment with a ¼-inch (6 mm) maximum tolerance allowed. Backfill in a careful manner, bringing the fill up in 6- inch (152 mm) lifts on all sides. If leaks appear, clean the inside joints and caulk with lead wool to the satisfaction of the Engineer. Precast sections shall be set in a manner that will result in a watertight joint. In all instances, installation of Stormwater Treatment Systems shall conform to ASTM specification C 891 “Standard Practice for Installation of Underground Precast Utility Structures”.

H. Holes made in the concrete sections for handling or other purposes shall be plugged with a nonshrink grout or by using grout in combination with concrete plugs.

I. Where holes must be cut in the precast sections to accommodate pipes, do all cutting before setting the sections in place to prevent any subsequent jarring which may loosen the mortar joints. The Contractor shall make all pipe connections.

END OF SECTION