



APPENDIX – T

STORMWATER FACILITIES, REV 1

I-64 Hampton Roads Bridge-Tunnel Expansion Project

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TABLE OF CONTENTS

T.	Stormwater Facilities	1
T.1	Introduction.....	1
T.2	Stormwater Management	3
T.2.1	Upland Stormwater management facilities.....	3
T.2.2	Upland Stormwater outfalls	10
T.2.3	Willoughby Spit Temporary Laydown Yard Stormwater outfalls	11
T.2.4	Island Stormwater management facilities.....	12
T.2.5	Island & Tunnel outfalls – VPDES.....	13
T.2.5.1	Existing HRBT Island VPDES Stormwater facilities.....	13
T.2.5.2	Proposed HRBT Island VPDES Stormwater facilities	14
T.2.6	Temporary HRBT Island Construction outfalls – VPDES.....	16

FIGURES

Figure T-1:	HRBT Design Segments and Key Map.....	2
Figure T-2:	BMP 1.....	4
Figure T-3:	BMP 2.....	4
Figure T-4:	BMP 4B	5
Figure T-5:	Existing Island Outfalls	14
Figure T-6:	Proposed Island Outfalls	15
Figure T-7:	Temporary Construction Island Outfalls.....	17

TABLES

Table T- 1:	BMP Plan References	3
Table T- 2:	Stormwater Management Facilities –BMP-1	6
Table T- 3:	Stormwater Management Facilities - BMP-2.....	7
Table T- 4:	Stormwater Management Facilities - BMP-4B.....	8
Table T- 5:	Existing VDOT MS4 Outfalls	10
Table T- 6:	Island Outfall Locations	13
Table T- 7:	Island Required Design Discharge Rates.....	16

T. STORMWATER FACILITIES

T.1 INTRODUCTION

This Appendix identifies stormwater management facilities used in the Hampton Roads Bridge-Tunnel (HRBT) Expansion Project (Project) area and was prepared in support of the Joint Permit Application (JPA) for the Project. The design is divided into five segments as seen in Figure T-1 below. Refer to Appendix E for related project descriptions.



Figure T-1: HRBT Design Segments and Key Map

T.2 STORMWATER MANAGEMENT

T.2.1 UPLAND STORMWATER MANAGEMENT FACILITIES

Upland Stormwater Management (SWM), to meet stormwater quality and quantity requirements, will be accomplished through the use of the off-site nutrient credit purchase and the construction of SWM facilities to control post-construction discharge rates.

For quality and quantity control, three SWM Best Management Practices (BMPs) will be constructed throughout the Project area as shown in Appendix G on the JPA Impact Plates and the JPA Roadway Plan Set and captured in the figures below. BMP-1 will be located at the Mallory Street Interchange in Hampton while BMP-2 and BMP-4B will be located at the 4th View Interchange in Norfolk. During the initial design BMPs 1, 2, 3A, 3B, 4A, and 4B were proposed. BMPs 3A, 3B, and 4A were removed during design refinement. The naming sequence remained the same in the event these BMPs are incorporated during future design refinements. Table T-1 describes the BMP Plan References. Refer to the following plan sheets outlined in Figure T-1 for each BMP and plan excerpts shown in Figure T-2 and Figure T-3.

Table T- 1: BMP Plan References

Proposed BMP	JPA Impact Plate	JPA Roadway Plan Sheet
BMP-1	Sheet 3 of 38	Sheet 5 of 50
BMP-2	Sheet 26 of 38	Sheet 28 of 50
BMP-4B	Sheet 27 of 38	Sheet 28 of 50

All SWM facilities for this project will discharge to existing outfall locations throughout the area and no new outfalls are proposed for upland SWM. Additional details related to these BMPs are described in Table T- 2, Table T-3 and Table T-4.

The following tables (T-2 through T-4) follow the format of Section 22 of the Standard JPA form and have been presented in a table format for each BMP for ease of answering and incorporating into Section 22 of the JPA. The Tables list the questions in Section 22 with the applicable answers. The questions are generic and not specific to this Project. Questions that are not applicable to this Project were answered with a Not Applicable (N/A).

The BMPs described above also provide a portion of the stormwater quality required for this Project. The remaining quality requirements will be satisfied through the purchase of off-site nutrient credits as approved by Virginia Department of Environmental Quality (VDEQ) for this Project. Approximately 20

percent of the required nutrient credits will be generated through the use of on-site BMPs and the remainder will be purchased as off-site nutrient credits.

Figure T-2: BMP 1

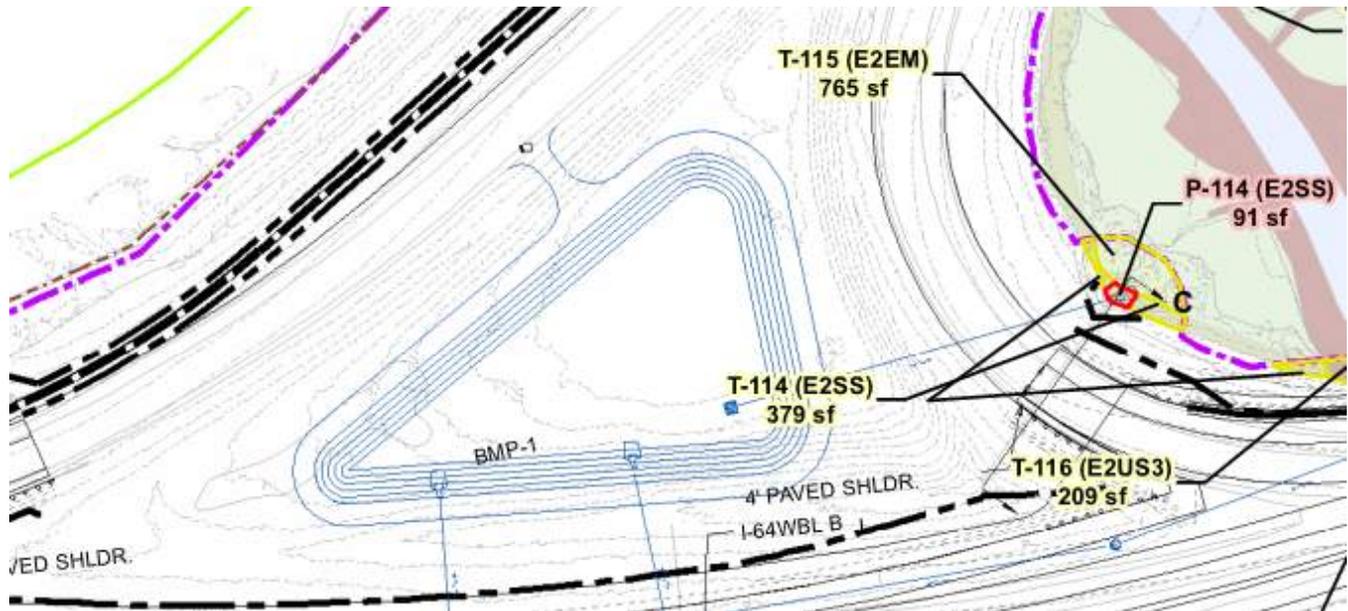


Figure T-3: BMP 2

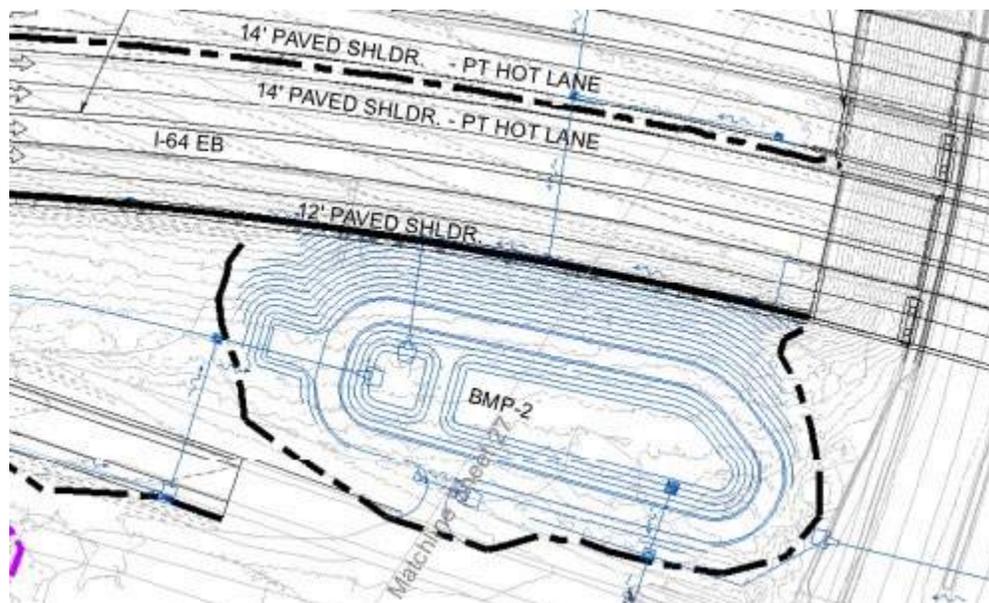


Figure T-4: BMP 4B

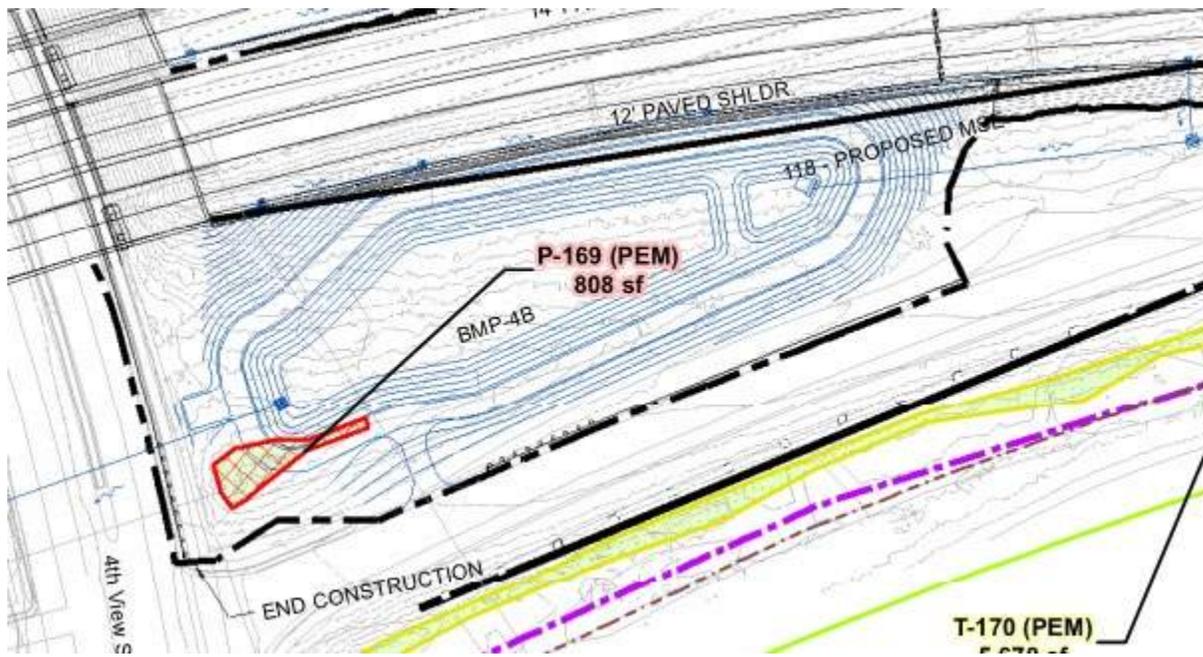


Table T- 2: Stormwater Management Facilities –BMP-1

Question	Answer
Will the proposed impoundment, dam, or stormwater management facility be used for agricultural purposes?	No
What type of materials will be used in the construction?	Soil, vegetation, concrete
What is the source of these materials?	Reusable materials on-site and off-site clean material
Provide the dimensions of the proposed impoundment, dam, or stormwater management facility, including the height and width of all structures.	Length = 223 feet Width= 133 feet Height= 5 feet
Storage capacity of impoundment:	1.84 acre-feet
Surface area of impoundment:	19,913 square feet (ft ²)
Is the proposed Project excluded from the Virginia Dam Safety Regulations?	Yes
If not excluded, does your proposed Project comply with the Virginia Dam Safety Regulations?	N/A
Does the proposed design include a vegetation management area per 10.1-609.2?	Yes
Design storm event:	10-Year, 24-Hour
Retention time:	39 hours (hrs.)
Current average flow (flow rate under normal rainfall conditions):	11.22 ft ³ /second (cfs)
Method used to derive average flow:	SCS Method
Proposed peak outflow for the design storm provided above:	10.29 cfs
Has the facility been designed as an Enhanced Extended Detention Basin or an Extended Detention Basin in accordance with the Minimum Standard 3.07 of the Virginia Stormwater Management Handbook, Volume I, or in accordance with the latest version of this handbook?	Yes
Will the impoundment structure be designed to pass a minimum flow at all times?	No
If so, please give the minimum rate of flow:	

Question	Answer
What is the drainage area upstream of the proposed impoundment?	0.012 square miles
How much of your proposed impoundment structure will be located on the stream bed?	0 ft ²
What is the area of vegetated wetlands that will be excavated and/or back-flooded by the impoundment?	0 ft ²
What is the area and length of streambed that will be excavated and/or back-flooded by the impoundment?	0 ft ² and linear feet (If)
Are fish ladders being proposed to accommodate the passage of fish?	No

Table T- 3: Stormwater Management Facilities - BMP-2

Question	Answer
Will the proposed impoundment, dam, or stormwater management facility be used for agricultural purposes?	No
What type of materials will be used in the construction?	Soil, vegetation, concrete
What is the source of these materials?	Reusable materials on-site and off-site clean material
Provide the dimensions of the proposed impoundment, dam, or stormwater management facility, including the height and width of all structures.	Length = 360 feet Width= 70 feet Height= 5 feet
Storage capacity of impoundment:	1.20 acre-feet
Surface area of impoundment:	15,839 ft ²
Is the proposed Project excluded from the Virginia Dam Safety Regulations?	Yes
If not excluded, does your proposed Project comply with the Virginia Dam Safety Regulations?	N/A
Does the proposed design include a vegetation management area per 10.1-609.2?	Yes

Question	Answer
Design storm event:	10-Year, 24-Hr
Retention time:	20 hrs.
Current average flow (flow rate under normal rainfall conditions):	6.462 cfs
Method used to derive average flow:	SCS Method
Proposed peak outflow for the design storm provided above:	3.145 cfs
Has the facility been designed as an Enhanced Extended Detention Basin or an Extended Detention Basin in accordance with the Minimum Standard 3.07 of the Virginia Stormwater Management Handbook, Volume I, or in accordance with the latest version of this handbook?	Yes
Will the impoundment structure be designed to pass a minimum flow at all times?	No
If so, please give the minimum rate of flow:	
What is the drainage area upstream of the proposed impoundment?	0.007 square miles
How much of your proposed impoundment structure will be located on the stream bed?	0 ft ²
What is the area of vegetated wetlands that will be excavated and/or back-flooded by the impoundment?	0 ft ²
What is the area and length of streambed that will be excavated and/or back-flooded by the impoundment?	0 ft ² and If
Are fish ladders being proposed to accommodate the passage of fish?	No

Table T- 4: Stormwater Management Facilities - BMP-4B

Question	Answer
Will the proposed impoundment, dam, or stormwater management facility be used for agricultural purposes?	No

Question	Answer
What type of materials will be used in the construction?	Soil, Vegetation, concrete
What is the source of these materials?	Reusable materials on-site and off-site clean material
Provide the dimensions of the proposed impoundment, dam, or stormwater management facility, including the height and width of all structures.	Length = 336 feet Width= 75 feet Height= 5 feet
Storage capacity of impoundment:	1.32 acre-feet
Surface area of impoundment:	16,437 ft ²
Is the proposed Project excluded from the Virginia Dam Safety Regulations?	Yes
If not excluded, does your proposed Project comply with the Virginia Dam Safety Regulations?	N/A
Does the proposed design include a vegetation management area per 10.1-609.2?	Yes
Design storm event:	10-Year, 24-Hr
Retention time:	28 hrs.
Current average flow (flow rate under normal rainfall conditions):	7.749 cfs
Method used to derive average flow:	SCS Method
Proposed peak outflow for the design storm provided above:	7.582 cfs
Has the facility been designed as an Enhanced Extended Detention Basin or an Extended Detention Basin in accordance with the Minimum Standard 3.07 of the Virginia Stormwater Management Handbook, Volume I, or in accordance with the latest version of this handbook?	Yes
Will the impoundment structure be designed to pass a minimum flow at all times?	No
If so, please give the minimum rate of flow:	

Question	Answer
What is the drainage area upstream of the proposed impoundment?	0.01 square miles
How much of your proposed impoundment structure will be located on the stream bed?	0 ft ²
What is the area of vegetated wetlands that will be excavated and/or back-flooded by the impoundment?	0 ft ²
What is the area and length of streambed that will be excavated and/or back-flooded by the impoundment?	0 ft ² and lf
Are fish ladders being proposed to accommodate the passage of fish?	No

T.2.2 UPLAND STORMWATER OUTFALLS

The Project proposes to reuse multiple existing outfall locations. Refer to the table of existing VDOT MS4 outfalls below (T-5). All existing outfalls will be video inspected and repaired/reused if found to be in an acceptable condition. If video inspection determines replacement is required, it is proposed to replace the outfall in kind. Outfall protection will be designed in accordance with the requirements and detailed design will be shown in the Project's Roadway/Drainage plans as the design progresses. Based on the VDOT Drainage Manual "If it can be demonstrated that the total drainage area to the point of analysis within the receiving channel is 100 times greater than the contributing drainage area from within the project site, the receiving channel may be considered adequate, with respect to the stability (erosion) requirements, without further analysis." As the design progresses, modifications to existing discharge rates for existing outfall permits will be modified as needed.

Table T- 5: Existing VDOT MS4 Outfalls

Design Segment	VDOT MS4 Outfall
1	e402808
1	VB-AC17-02
1	e402801
3	e402730
3	e402737
3	e402738

Design Segment	VDOT MS4 Outfall
3	e402739
	e402729
3	e402728
3	e402727
3	e402726
3	e402725
3	e402724
3	e402723
3	e402722
4	e402702
4	e402703
4	e402704
4	e402705
4	e402706
4	e402797
4	e402798
4	e402799
5	e402420

T.2.3 WILLOUGHBY SPIT TEMPORARY LAYDOWN YARD STORMWATER OUTFALLS

To facilitate the temporary work at the Willoughby Bay Laydown Yard, three new stormwater outfalls are proposed along the east side of the Willoughby Spit Property. Refer to JPA Impact Plates Sheet 19 of 38 in Appendix G for the locations of these outfalls. The outfalls will discharge surface stormwater

directly to Willoughby Bay without retention/impoundment of flows. A new Virginia Pollutant Discharge Elimination System (VPDES) permit application for the proposed permanent stormwater outfalls is being prepared. Outfall protection will be designed in accordance with the requirements and detailed design will be shown in the Project's Roadway/Drainage plans.

T.2.4 ISLAND STORMWATER MANAGEMENT FACILITIES

Stormwater runoff from North Island, South Island, and the connecting tunnels, is captured and discharged at five outfalls as described below.

The existing North Island (south side) and South Island (north side) tunnel stormwater outfalls will be used as combined outfalls for discharging surface flows from the islands and drainage from the existing tunnels. The existing outfalls will be modified to provide a 36-inch RCP at the North Island and a 42-inch RCP at the South Island to accommodate the increase in discharge. Additionally, a new stormwater outfall is also proposed to the north of North Island for stormwater run-off from the north side of North Island.

The site surface stormwater management system for the islands are separate from the Tunnels and Approach Structures (TAS) drainage system. Two new outfalls are proposed for the new tunnel drainage system, one each at the North and South Islands. Locations of all existing and proposed outfalls are described in Table T- 6 below.

The VPDES permit application for the proposed permanent stormwater outfalls is currently pending until inspections are completed. Associated outfall discharge rates are provided in Section 23 of the Standard JPA form.

The North Island and South Island stormwater management systems do not control stormwater quantity. Collected stormwater will be discharged directly to the Chesapeake Bay/James River without retention/impoundment of flows. The proposed stormwater management design for the islands does not include water quality control BMPs. Stormwater quality requirements at the North Island and South Island will be satisfied through the purchase of off-site nutrient credits as approved by VDEQ for this Project.

Table T- 6: Island Outfall Locations

Island Outfall	Approximate Location
North Island (south side) existing outfall	36°59'56.00"N, 76°19'1.00"W
South Island (north side) existing outfall	36°59'8.00"N, 76°18'16.00"W
North Island (north side) new outfall	37° 0'11.30"N, 76°19'10.45"W
North Island TAS outfall	37° 0'5.11"N, 76°19'11.37"W
South Island TAS outfall	36°58'59.02"N, 76°18'16.47"W

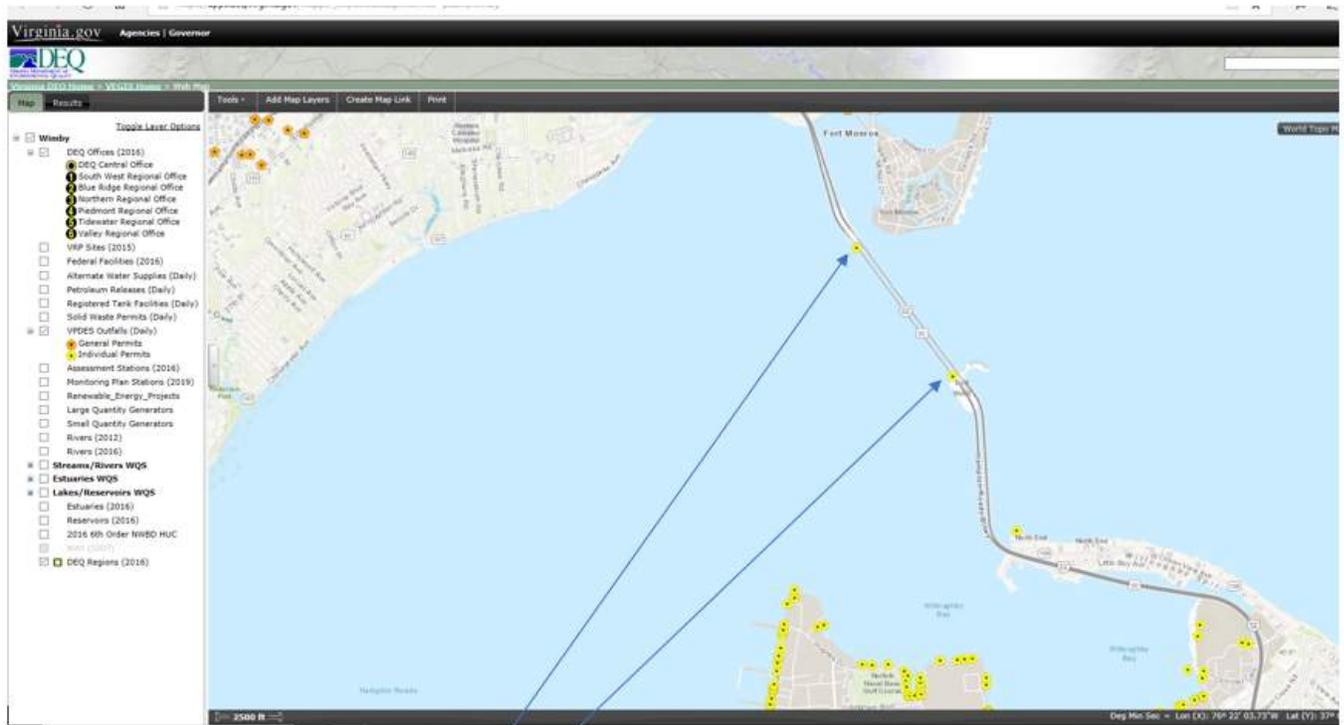
T.2.5 ISLAND & TUNNEL OUTFALLS – VPDES

T.2.5.1 EXISTING HRBT ISLAND VPDES STORMWATER FACILITIES

Currently HRBT has two outfalls (001 and 002) permitted under VPDES for tunnel stormwater discharges. VPDES Permits numbered VA0005657001 North Island, and VA0005657002 South Island are for discharge of stormwater that is collected by the tunnel facility and discharged to the James River. These permits are existing and are classified as industrial minor. Both permits have design flow of 0.06 million gallons per day (mgd).

The following Figure T-5 shows the location of these two outfalls.

Figure T-5: Existing Island Outfalls



Permit No. VA0005657
 North Island Discharge: Outfall: VA0005657001
 South Island Discharge: Outfall: VA0005657002

Current VPDES outfalls for HRBT

T.2.5.2 PROPOSED HRBT ISLAND VPDES STORMWATER FACILITIES

Prior to full commissioning of the new constructed I-64 HRBT and bridge structure, new outfalls for stormwater discharges are to be permitted through VPDES for the expanded facilities. The new facilities will have new outfalls installed or will have the existing outfalls modified as described in section T.2.6. Water will be treated in grit and oil separation systems prior to discharge. The VPDES permit will be similar to, or a modification of, the existing outfall permits that currently handle the stormwater collected in the tunnel facility structures and subsequently discharged. Figure T-6 below shows the location of these outfalls.

Figure T-6: Proposed Island Outfalls



Map Source: Mott MacDonald

Table T- 7: Island Required Design Discharge Rates

Island Outfall	Required Design Discharge Rates
North Island (south side) existing outfall	25 cfs
South Island (north side) existing outfall	60 cfs
North Island (north side) new outfall	35 cfs
North Island TAS outfall*	7.9 mgd
South Island TAS outfall*	7.9 mgd

**This discharge rate for each tunnel outfall considers one pump running at full capacity for the design storm (100-year) and assuming fire suppression is in operation concurrently.*

T.2.6 TEMPORARY HRBT ISLAND CONSTRUCTION OUTFALLS – VPDES

Two new temporary outfalls are to be utilized to facilitate the disposal of waste waters generated during the construction phases of jet grouting, slurry wall construction, boring of the tunnel with the Tunnel Boring Machine (TBM), handling intermittent Non-Contact Coolant Water (NCCW), and minor intermittent discharges of excavation water from precipitation events or seepage. These two outfalls are proposed as shown in Figure T-7. The process water will be treated by temporary Water Treatment Units (WTU) constructed on the islands before discharge under a VPDES process wastewater permit.

