

- Barges movements will be determined on a day-to-day basis & will be dependent upon tides, depth of water, weather & anticipated in-channel vessel traffic
- No construction activities are planned at this stage in the navigation channels.
- The projects intent is to never impede vessel traffic within the channel, however for project purposes we will need to share and navigate the existing channels to move our equipment.
- Channel availability will be jointly determined each day based on direct communication with the USCG, US Navy Port Operations, VA Pilot Association, and VMA.
- Each evening, the USCG, US Navy Port Operations, VA Pilot Association, and VMA to receive notification of expected traffic scheduled for the following day which would impact the channel vessel traffic or any changes to our marine work plan.
- HRCP is keenly aware of the navigational hazards surrounding the use of anchors and anchor wires, specially to the public sector. We will take every precaution to inform the maritime community and the public of the use of anchors. This will include proper lighting, consistent notice to Mariners, and signage within our work zones denoting the use of anchors.

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Communication During Construction



- Constant and open communication between all parties
- Daily Email “blasts” with expected work over next 24-48 hrs to HRBT, USN, USCG, VA Pilots Assoc. Early AM delivery
- Provide update on work completed in previous 24 hours
- Provide stakeholders with 3 to 5 day look ahead schedule
- HRCP JV Team available by phone 24 hours a day
- Direct vessel contact via cell phone and marine radio
- The vessels will monitor CH 16/13
- Barges will be outfitted with an AIS system
- Others as required/requested

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- Safety is our number one Priority
- All personnel (HRCP, Subs, Owner) have “stop” work authority—See something, Say something
- All marine works will be vetted internally via a work plan. All crews will use the work plan specifically to ensure safe work.
- Toolbox talk to begin each shift- HRCP field staff will lead
- HRCP recognizes that environmental/weather conditions will be a significant factor for building a safe project. Based on equipment limitations and environmental conditions, safe working parameters will be set to minimize severe weather risks.
- A severe weather and hurricane plan will be submitted in the upcoming months.
- The ultimate decision on vessel movements will fall upon the vessel captain.
- Each and every crew member will undergo specific marine orientation which will include project oversight, weather risks, man overboard training and general familiarization of marine environments, as well as all the agency requirements when operating in the vicinity of navigational channels.

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Marine Incident October 10th



- HRBT lift boat conducting the marine supplemental geotechnical investigation experienced a marine vessel allision with the existing VDOT south roadway trestle at mile marker 271 on I-64 east-bound
- There were no injuries and minor property damage to the bridge parapet rail
- Proper notifications were provided
- Incident investigations are ongoing
- Corrective actions/lessons learned will be implemented prior to operations recommencing
- Lessons learned will also be used in developing plans for subsequent marine operations
- Repairs are being conducted

USACE/DEQ/VMRC JPA Permits

JPA submission – August 30, 2019
USACE Public Notice – September 24, 2019
Anticipated JPA permit issuance – April 2020

USCG BP Permit

PIR submitted to USCG on 9/24/2019
Submit NIR – November 2019
Anticipated PNCD Issuance – December 2019
Anticipated CGBP Issuance – April 2020

USACE Section 408 Permit

USACE Coordination Meetings – August 14, 2019 and September 19, 2019
Maritime Stakeholder Meeting – October 17, 2019
Section 408 Submission – November 26, 2019
Anticipated Section 408 Issuance – April 2020

Construction

Upland Early Work Start – December 2019
In-Water Construction Activities Start – April 2020
Anticipated Project Completion – November 2025

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Next Meeting



- Next Meeting : Third Thursday of November – November 21st
- Location : Same location (VMA)
- **408 application on November 26th**
 - => next monthly meeting = 408 pre-app.**
 - => December monthly meeting (December 19th TBC) = post 408 meeting**





Meeting Summary

Project: I-64 Hampton Roads Bridge-Tunnel (HRBT) Expansion Project
Meeting Title: HRBT – Compensatory Mitigation and Pile Driving Workshop
Date: 06 November 2019, 900 to 1200
Location: VMRC – Building 96, 380 Fenwick Road, Fort Monroe

Attendees:

Company	Name	Initials	Phone	E-mail	Present
USACE	George Janek	GJ	(757) 201-7135	george.a.janek@usace.army.mil	XX
USACE	Autumn Vaughn	AV	(757) 201-7841	autumn.vaughn@usace.army.mil	XX
USACE	Carolyn Keeler	CK	(804) 912-3042	carolyn.keeler@stantec.com	XX
USACE	Blair Mickel	BM	(804) 267-3474	blair.mickel@stantec.com	XX
NOAA	Dave O'Brien	DO	(804) 684-7828	david.l.obrien@noaa.gov	XX
EPA	Mark Wejrowski	MW	(215) 814-3241	wejrowski.mark@epa.gov	XX
EPA	Stephanie Kubico	SK	(215) 814-2762	kubico.stephanie@epa.gov	XX
FHWA	Ed Sundra	ES	(804) 775-3357	ed.sundra@dot.gov	XX
DEQ	Jeff Hannah	JH	(757) 518-2146	jeffrey.hannah@deq.virginia.gov	XX
DGIF	Ernie Aschenbach	EA	(804) 367-2733	ernie.aschenbach@dgif.virginia.gov	XX
DGIF	Alan Weaver	AW	(804) 367-6795	alan.weaver@dgif.virginia.gov	XX
VMRC	Randy Owen	RO	(757) 247 2241	randy.owen@mrc.virginia.gov	XX
VMRC	Allison Lay	AL	(757) 247-2254	allison.lay@mrc.virginia.gov	XX
VMRC	Somers Smott	SS	(757) 247-2004	somers.smott@mrc.virginia.gov	XX
VIMS	Emily Hein	EH	(804) 684-7482	eahein@vims.edu	XX
VIMS	Lyle Varnell	LV	(804) 684-7764	lyle@vims.edu	XX
VDOT	Jim Utterback	JU	(757) 802-0008	james.utterback@vdot.virginia.gov	XX
VDOT	Scott Smizik	SS	(804) 371-4082	scott.smizik@vdot.virginia.gov	XX
VDOT	Larissa Ambrose	LA	(757) 297-6891	larissa.ambrose@vdot.virginia.gov	XX
VDOT	Chris Frye	CF	(757) 503-3796	cfrye@vhb.com	XX
VDOT	Sean Murray	SM	(813) 431-6043	seanmurray@vhb.com	XX
HRCP	Jose I. Martin Alos	JIMA	(404) 702-1030	jmartinalos@hrcpjv.com	XX
HRCP	Taylor Sprenkle	TS	(804) 366-4097	tsprenkle@wrallp.com	XX
HRCP	David Barrier	DB	(514) 663-9198	dbarrier@hrcpjv.com	XX
HRCP	Emily Drahos	ED	(804) 822-2173	edrahos@wrallp.com	XX
HRCP	John Duschang	JD	(845) 596-7953	john.duschang@hdrinc.com	XX
HRCP	Angela Stowe	AS	(845) 216-3052	angela.stowe@hdrinc.com	XX
HRCP	Rebecca Wilk	RW	(252) 229-6045	rebecca.wilk@hdrinc.com	XX





HRCP	Josh Mace	JM	(804) 248-7050	Joshua.mace@hdrinc.com	XX
HRCP	Jane Rowan	JR	(215) 384-5633	jane.rowan@mottmac.com	XX

Agenda:

1. Welcome and Introduction
2. Meeting Objectives
3. Supporting Documentation for Workshop
4. Proposed Compensatory Mitigation
5. Explaining the Numbers
 - a. Crosswalk Appendix G (impacts) to Appendix P (compensatory mitigation)
6. Pile Driving

Meeting Notes:

Refer to Pile Driving Presentation

- **Pile Driving Presentation**
 - Dave O'Brien (NOAA) – Are South Island sheet piles driven before or after construction of Island berm (i.e., in open water)?
 - John Duschang (HRCP) – Intention is to drive piles before construction of the Island berm. Piles may be driven in the dry or in the water, so have been counted as in-water as worst case scenario.
 - George Janek (USACE) – possible permit condition: vibrate piles to the point of refusal and then use impact hammer to achieve final depth
 - John Duschang (HRCP) has seen this type of permit condition before and thinks it would be reasonable for this project
 - Randy Owen (VMRC) – Will all spuds be set using a vibratory hammer?
 - John Duschang (HRCP) – spuds will be set using their own weight or vibrated in if needed. No impact hammers will be used.
 - John Duschang (HRCP) – Down-the-hole hammers will be used to drive temporary piles through shoreline armor stone to avoid the need to remove the stone. Piles would be cut off and left in place after construction.
 - George Janek (USACE) – Usually piles are cut 2-3 feet below the mudline, but USACE will defer to VMRC. Pile cut depth will be a permit condition. Pile cut depth may be worked out during 408 process.
 - Jetting within casing will be used to set 30" square concrete piles.
 - Dave O'Brien (NOAA) – When you are jetting piles, would you fluidize sediment?
 - Jose Ignacio Martin Alos (HRCP) – When piles are jetted, we would not extract material.
 - George Janek (USACE) – Jetting within a casing minimizes turbidity, which is a good thing, and should be included as an avoidance and minimization measure. It would be helpful to have the approximate number of piles that will be jetted so that it can be added into USACE's MFR.
 - Emily Hein (VIMS) – Would you please speak to the test pile program? Specifically, the number of strikes per pile (2,100) associated with the test pile program?



- John Duschang (HRCP) – We have overestimated the number of strikes necessary per pile to allow for proofing of test piles.
 - Jose Ignacio Martin Alos (HRCP)– Test piles are driven using various hammer settings to determine acceptable levels of stress on concrete and to determine how other piles on the project will be driven.
- George Janek (USACE) will defer to NOAA PRD regarding how large/wide ensonified area could be at a given time.
- John Duschang mentioned other projects with NOAA permit condition to maintain a 5,000 foot non-ensonified area protective of Atlantic sturgeon. HRBT will have an approximately 6,500 foot non-ensonified area.
- George Janek (USACE) – How effective will the bubble curtains be in deeper water with currents?
 - John Duschang (HRCP) – It is possible to move the rings of the bubble curtain closer together so that bubbles aren’t swept away in an unconfined bubble curtain.
 - John Duschang (HRCP) – Typically, the spacing of the rings that supplies the bubbles of the curtain would be dimension to counter that effect. It is also possible to encase an entire pile template, so that the bubble curtain setup doesn’t have to be moved as often. HRCP is considering encasing piles at the TBM platform and jet grout trestle because the piles are in close proximity to one another.
- John Duschang (HRCP) – need to consider the impact that bubble curtains would cause on the project. The use of bubble curtains would impact schedule and could impact air emissions due to the use of air compressors.
- Dave O’Brien (NOAA) – Does HRCP have a graphic that shows the ensonified area around the TBM platform?
 - Based on the image displayed, Dave O’Brien (NOAA) stated that the isopleths don’t appear to extend beyond the Island.
- Emily Hein (VIMS) – Did HRCP consider overlapping ensonified areas (i.e., constructive interference) for piles that are driven concurrently?
 - John Duschang (HRCP) – Driving multiple piles concurrently does not amplify ensonified areas. If anything, the ensonified areas would counteract one another.
 - Jose Ignacio Martin Alos (HRCP) – The chance of concurrent pile driving causing overlapping isopleths is slim. HRCP would even be okay with a permit condition stating that there will be no overlapping isopleths.
 - George Janek (USACE) asked David Barrier (HRCP) if HRCP would be okay with a permit condition that states no more than three piles would be driven at a time.
 - David Barrier (HRCP) would prefer a permit condition that states there will be no overlapping isopleths.
 - George Janek (USACE) would prefer to focus on maintaining migratory corridor; that would be more of an enforceable permit condition.
 - Jose Ignacio Martin Alos (HRCP) explained pile driving setup. Each pile driving crew would probably only drive one day a week. Setup and moving would take the rest of the week. Each crew would be assigned bents in



- sequential number (e.g. Crew 1 has bents 1-15, Crew 2 has bents 16-30, etc.), so the likelihood of overlapping isopleths would be minimal.
- George Janek (USACE) – How many days would using bubble curtains add to the construction schedule? Please provide additional information that supports the claim that bubble curtains add time to the project schedule.
 - David Barrier (HRCP) – Using bubble curtains would add six months to the schedule.
 - John Duschang (HRCP) – Using bubble curtains may carry construction into another construction season.
 - Dave O’Brien (NOAA) – Is the soft start pile driving protocol in Appendix P? If not, please add it.
 - Emily Hein (VIMS) – soft start pile driving protocol is in Appendix P
 - Autumn Vaughn (USACE) – Has HRCP considered any alternatives to bubble curtains?
 - John Duschang (HRCP) stated that the Tappan Zee bridge project has anecdotal evidence that enclosing the pile driving area with barges traps sound. HRCP does not have numbers on the amount of sound attenuated by enclosing pile driving area with barges.
 - Autumn Vaughn - USACE is concerned with the use of barges to enclose pile driving area. Does not want to interfere with the federal navigation channel.
 - Jose Ignacio Martin Alos (HRCP) stated that HRCP does not intend to surround piles entirely with barges. This would not be practicable.
 - George Janek (USACE) stated that USACE is going to rely on VIMS and NOAA for guidance pertaining to the necessity of bubble curtains
 - George Janek (USACE) – FHWA will want numbers of noise attenuation from literature, not anecdotal evidence.
 - Dave O’Brien (NOAA) requested that if there is additional pile driving data from Tappan Zee or the Navy, to please provide it.
 - Dave O’Brien (NOAA) – there are still concerns about species that use shallow water. Is there sufficient passage in shallow water?
 - Emily Hein (VIMS) – VIMS is looking at resident fish species and juveniles as well and wants to make sure there is sufficient passage for them. VIMS is currently compiling a list of fish species using the area and will share that when it is ready.
 - Alan Weaver (DGIF) – Shad are moving through the HRBT area in January/February. There could be outmigration in the fall. Potentially, there could be juveniles in shallow water, but there currently isn’t a TOYR for juveniles.
 - Autumn Vaughn (USACE) – Based on tagged sturgeon migrations, what about using bubble curtains only during migration period?
 - Jose Ignacio Martin Alos (HRCP) – that would be preferred as opposed to year-round bubble curtains.
 - Lyle Varnell (VIMS) – VIMS is concerned with protection of fish that use shallow areas. Sturgeon and protected species have a protected deep water corridor. VIMS questions why bubble curtains are proposed in deep water and not shallow.
 - VIMS recommends that we consider larval and juvenile fish that have not been studied. They will be recommending protection of shallow water.



- Jose Ignacio Martin Alos (HRCP) – VIMS – if you require bubble curtains, would HRCP have to redo modeling for IHA/LOA?
 - Dave O’Brien (NOAA) – No, HRCP would not have to redo modeling
- TOYR
 - DGIF is not anticipating a lot of anadromous fish movement upstream other than early in the year. Therefore, DGIF does not think they would recommend a TOYR. DGIF is still considering juvenile and resident fish.
 - VIMS will be recommending TOYR (February 15-June 30). VIMS is concerned with juveniles and residents.
 - VMRC will consider all advisory resources before determining if they will recommend TOYR. The Commission will also have to weigh in. VMRC does not need additional information at this time.
 - NOAA believes there is sufficient passage for anadromous fish and sturgeon but is concerned about passage in shallow water. NOAA wants to review literature. Right now, NOAA is not inclined to request TOYR.
 - USACE will rely on advisory resources to determine if they will recommend TOYR.

Refer to Mitigation Presentation

- **Mitigation Presentation**

- Funding VIMS to seed impacted SAV areas
 - Lyle Varnell (VIMS) – VIMS is open to other options if there is another accepted practice
 - George Janek (USACE) – USACE would like to know how long SAV shading would occur. Some SAV may naturally come back
 - Angela Stowe (HRCP) – work trestle would be over SAV for approximately two years
 - Emily Hein (VIMS) – impacted SAV bed is mostly eelgrass and is a healthy population. Therefore, would recommend seeding to give population a boost, and then would be done. VIMS does yearly monitoring of SAV beds, but Emily Hein does not believe the SAV bed near HRCP is monitored in-water (only aerial)
 - Emily Hein (VIMS) – the HRBT project is unique in that SAV impacts would primarily be extended temporary due to shading. Because SAV already exists in this area, restoration/mitigation is likely to be successful. That is why VIMS would like to see seeding in place as opposed to another offsite location. VIMS would not like to see out-of-kind mitigation.
 - Lyle Varnell (VIMS) would prefer someone other than VIMS conduct SAV seeding
 - Dave O’Brien (NOAA) – Virginia Aquatic Resources Trust Fund (a part of TNC) may be interested in doing SAV seeding. However, they do not have anything approved for SAV at this time.
 - Taylor Sprenkle (HRCP) – Has the IRT responded favorably?
 - Dave O’Brien (NOAA) - IRT has not discussed it that much. But a project like HRBT could jump start TNC SAV restoration. Consider speaking to Karen Johnson (TNC).





- Randy Owen (VMRC) - If TNC is able to pull together SAV restoration project, VMRC would like strong oversight.
- Lyle Varnell (VIMS) – TNC could contract with VIMS to get SAV seeds, etc.
- Allison Lay (VMRC) – If TNC conducts SAV restoration, VMRC would still be okay with HRCP not conducting post-construction monitoring of SAV
- Randy Owen (VMRC) would like to discuss SAV seeding more if VIMS is stepping away
 - Lyle Varnell (VIMS) – Dr. Orth has been responsible for SAV seeding. Dr. Orth (VIMS) is retiring, that is why we would like to find another way to mitigate for SAV loss. If VIMS continues SAV seeding, the cost would need to be more than \$2/sf to cover costs
 - VIMS will do SAV reseeding if nobody else will.
- George Janek (USACE) - USACE is tentatively okay with mitigating loss of SAV with oysters from LRRT
 - George Janek (USACE) is okay with mitigating just the shade impact (0.40 acres, calculated using the DEQ equation) and not the unshaded areas under the temporary trestle deck.
 - George Janek (USACE) asked for assurance that impacts along the perimeters of trestles will be minimized.
- Dave O'Brien (NOAA) – SAV impacts are typically based on five-year composite, so that should be used for this project. Okay to not use 2018 data.
- Clam impacts
 - Emily Hein (VIMS) - VIMS is leaning towards no clam mitigation
 - Randy Owen (VMRC) – VMRC wants clam mitigation. Need to speak to Chief if no clam mitigation is proposed.
 - Randy Owen (VMRC) – VMRC would like clam mitigation for dredging (if clams were found in either the VIMS or VERSAR report in the areas to be dredged)
 - If no clams were identified in the dredging areas, then no clam mitigation will be requested.
 - VMRC did not state preference on mitigating for clams only at South Island or both Islands as a composite.
- George Janek (USACE) would like restoration plan for temporary/extended temporary wetland impacts in writing
- Stephanie Kubico (EPA) – please note that EPA typically recommends out-of-kind mitigation to be mitigated at a ratio higher than 1:1
- George Janek (USACE) requested that Mallory Street impacts be broken out separately
 - Angela Stowe (HRCP) – Mallory Street impacts are called out in the impact tables as well as Table P-1 in Appendix P
- George Janek (USACE) asked if there were any impacts to Monkey Bottom
 - Angela Stowe (HRCP) – No, the impacts are within VDOT ROW and HRCP is mitigating these impacts using standard ratios



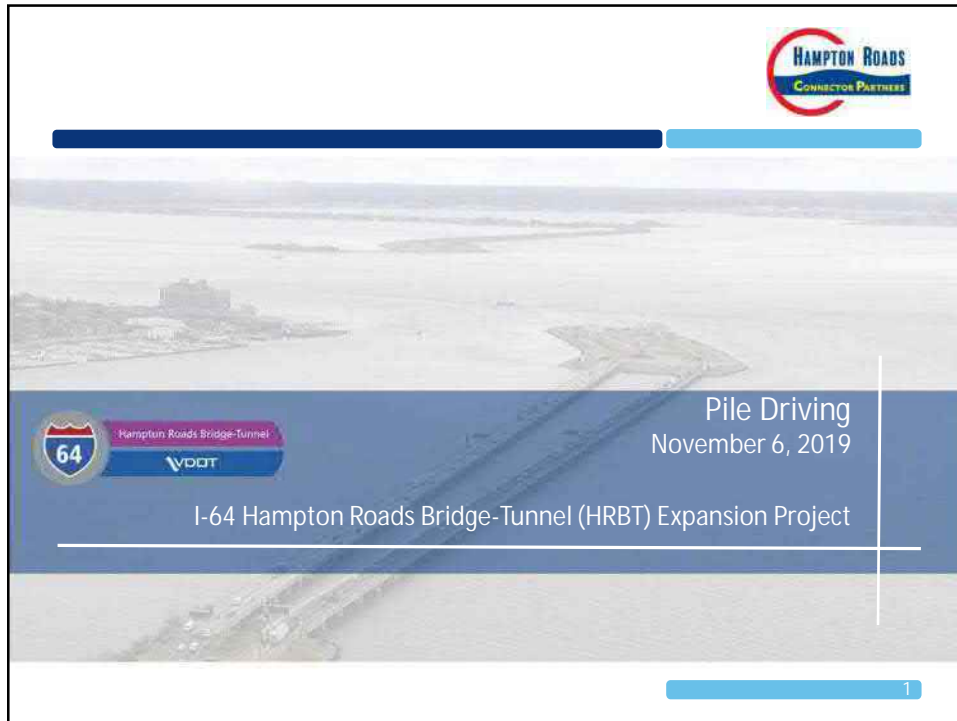
- George Janek (USACE) – okay with this approach
- Rebecca Wilk (HRCP) – There are temporary (less than 6 months) impacts to a mudflat at Mallory Street. HRCP is just proposing to restore this to grade.
 - George Janek (USACE) – okay with this approach
- Jeff Hannah (DEQ) – DEQ will require impacts and mitigation be rounded to two decimal places using standard math rounding
 - George Janek (USACE) – USACE is okay with this approach
- George Janek (USACE) stated it would be helpful to have small impact tables on each impact plate
 - Angela Stowe (HRCP) noted more details were added to the impact tables, and the revised tables will be included in the next table revision
- George Janek (USACE) – When will the next revision be? Will the revision be close to the final version?
 - Jose Ignacio Martin Alos (HRCP) – The next revision will be ready by the December 11th meeting. Jose Ignacio Martin Alos (HRCP) asked that USACE send any written RFIs before the December 11th meeting so that they can be addressed at that time. Jose Ignacio Martin Alos (HRCP) noted that the final revision will be sent to agencies around December 15th or 16th.
- Emily Hein (VIMS) – Will there be any tweaks to the alignment?
 - Jose Ignacio Martin Alos (HRCP) – The alignment is not changing. The Willoughby bridge may go from two piles to three smaller piles, but the impact would remain the same.
 - David Barrier (HRCP) – Additionally, the MOT trestles on the South Island will be widened.

Action Items:

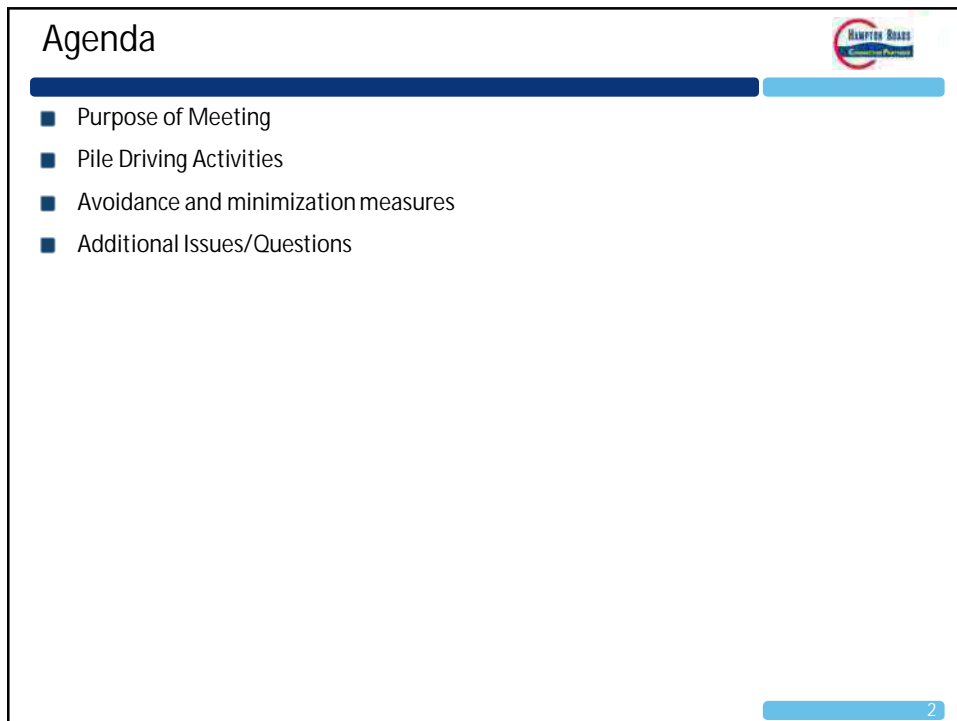
- Add jetting piles within casing as an avoidance and minimization measure and include approximate number of piles that will be jetted.
- Provide additional information that supports the claim that bubble curtains add time to the project schedule.
- Provide assurance that SAV impacts along the perimeters of trestles will be minimized.
- Confirm soft start pile driving protocol is in Appendix P
- Provide additional pile driving data from Tappan Zee and/or the Navy (if available)
- Contact Karen Johnson (TNC) about potential advance release SAV credits
- Provide justification for why clam mitigation would or would not be proposed for areas of shallow water dredging
- Provide restoration plan for temporary/extended temporary wetland impacts in writing
- Work with Allison Lay (VMRC) to determine number of clams to be mitigated for (both dredging and island expansion)
- Round impact and mitigation numbers to two decimal places using standard math rounding

End of Meeting.

Pile Driving Presentation



Slide 1 features a background image of a large body of water with a bridge structure extending across it. The slide includes the Hampton Roads logo in the top right corner, which consists of a red circle with the text "HAMPTON ROADS" and "CONNECTOR PARTNERS" below it. In the bottom left corner, there is a logo for Interstate 64 (I-64) with the text "Hampton Roads Bridge-Tunnel" and "VDOT" below it. The main text on the slide reads "Pile Driving" and "November 6, 2019" in the upper right, and "I-64 Hampton Roads Bridge-Tunnel (HRBT) Expansion Project" in the center. A blue horizontal bar is at the top, and a blue bar with the number "1" is at the bottom right.



Slide 2 features a background image of a large body of water with a bridge structure extending across it. The slide includes the Hampton Roads logo in the top right corner, which consists of a red circle with the text "HAMPTON ROADS" and "CONNECTOR PARTNERS" below it. The main text on the slide is the word "Agenda" in the upper left. Below it is a bulleted list with four items: "Purpose of Meeting", "Pile Driving Activities", "Avoidance and minimization measures", and "Additional Issues/Questions". A blue horizontal bar is at the top, and a blue bar with the number "2" is at the bottom right.

Purpose of Meeting



- Review HRBT Expansion Project pile driving plan and schedule
- Discuss and evaluate mitigation measures

3

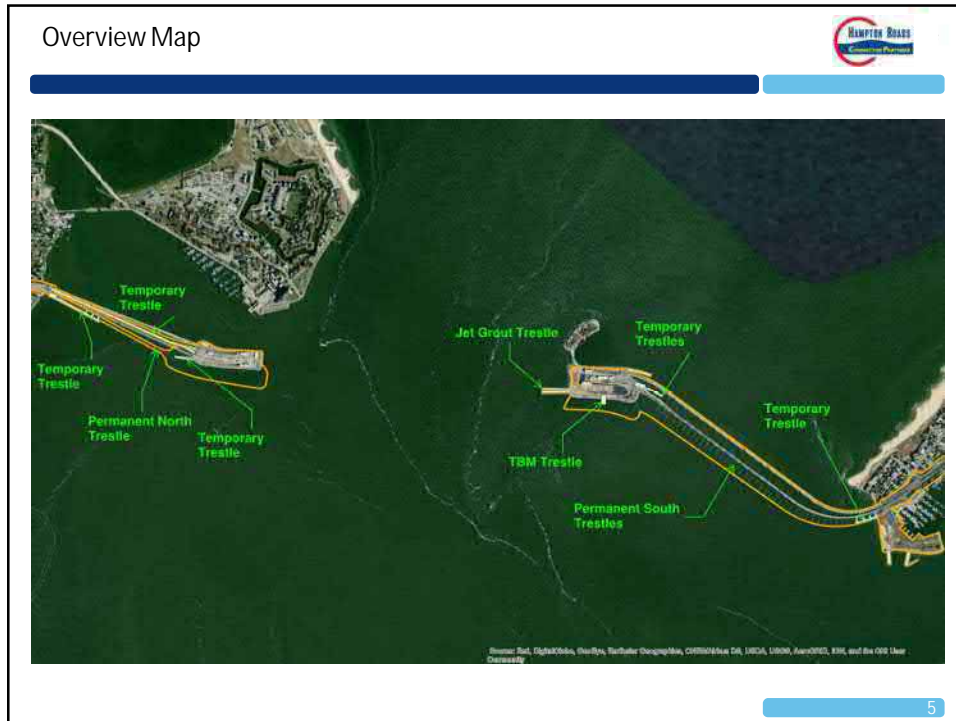
Overview Map



- Pile Driving Activities
 - Temporary Platforms
 - Temporary Construction Trestles
 - MOT Trestles
 - Permanent Trestles
 - South Island Expansion
 - North Island Expansion
 - Willoughby Spit



4




Pile Types and Installation/ Removal Methods

- Pile Installation
 - Vibratory
 - Impact
 - Down-the-hole
 - Jetting
- Pile removal
 - Vibratory
 - Cutting below mud line
- Pile – Quantity%
 - 24-inch square concrete piles – 7%
 - 24-inch steel pipe piles – 10%
 - 30-inch steel pipe piles – 3%
 - 30-inch square concrete piles – 2%
 - 36-inch steel pipe piles – 50%
 - 42-inch steel pipe piles – 4%
 - 54-inch cylindrical concrete pile – 23%
 - AZ-700 steel sheet pile
 - 16-in timber pile -










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Proposed Pile Installation and Removal




PROJECT COMPONENT PILES	TYPE OF PILE (SIZE)	TYPE OF PILE (MATERIAL)	TYPE OF PILE (DURATION)	NUMBER OF PILES (EA)	EMBEDMENT LENGTH	NUMBER OF PILES (DTH)	AVERAGE DTH DURATION PER PILE	NUMBER OF PILES VIBRO OR IMPACT	AVERAGE VIBRO DURATION PER PILE	# IMPACT STRIKES PER PILE	NUMBER OF PILES PER DAY	NUMBER OF PILES TO BE REMOVED
NORTH TRESTLE												
North Shore Work Trestle	36" Pipe Piles	Steel	Temp > 12m	194	100	10	120	184	50	40	3	194
Moorings	42" Pipe Piles	Steel	Temp > 12m	36	60	-	-	36	30	-	6	36
Moorings	24" Pipe Piles	Steel	Temp > 12m	30	60	-	-	30	30	-	6	30
Test Pile Program (Load Test)	54" Cylinder	Concrete	Temp < 2m	1	140	-	-	1	-	2100	1	1
Test Pile Program (Production Piles)	54" Cylinder	Concrete	Permanent	10	140	-	-	10	-	2100	1	-
Work Trestles	36" Pipe Piles	Steel	Temp > 12m	182	100	12	120	170	50	40	2	376
Moorings (Safe Heaven - Hampton Flats)	Bouy	-	-	40	-	-	-	-	-	-	-	-
Leap Frog Trestles	36" Pipe Piles	Steel	Temp < 2m	270	100	12	120	258	50	40	2	270
Demolition Trestles	36" Pipe Piles	Steel	Temp > 12m	344	100	24	120	320	50	40	2	344
Temporary MOT Trestle	30" Square	Concrete	Temp > 12m	31	140	-	-	31	-	2100	1	31
Permanent Piles	54" Cylinder	Concrete	Permanent	554	140	25	120	529	-	2100	1	-

Proposed Pile Installation and Removal



PROJECT COMPONENT PILES	TYPE OF PILE (SIZE)	TYPE OF PILE (MATERIAL)	TYPE OF PILE (DURATION)	NUMBER OF PILES (EA)	EMBEDMENT LENGTH	NUMBER OF PILES (DTH)	AVERAGE DTH DURATION PER PILE	NUMBER OF PILES VIBRO OR IMPACT	AVERAGE VIBRO DURATION PER PILE	# IMPACT STRIKES PER PILE	NUMBER OF PILES PER DAY	NUMBER OF PILES TO BE REMOVED
NORTH ISLAND												
Moorings	42" Pipe Piles	Steel	Temp > 12m	80	60	-	-	80	30	-	6	80
Channel Marker	TBD	TBD	Existing	1	-	-	-	-	-	-	-	1
SOUTH ISLAND												
TBM Platform	36" Pipe Piles	Steel	Temp > 12m	216	140	108	120	108	60	60	2	216
Jet Grout Trestle	36" Pipe Piles	Steel	Temp > 12m	204	100	20	120	184	50	40	3	204
Conveyor Trestle	36" Pipe Piles	Steel	Temp > 12m	84	100	8	120	76	50	40	3	84
Moorings	42" Pipe Piles	Steel	Temp > 12m	25	60	-	-	25	30	-	6	25
Settlement Reduction Piles	24" Pipe Piles	Steel	Permanent	712	85	-	-	712	60	40	6	-
Deep Foundation Piles	30" Pipe Piles	Steel + Concrete Fill	Permanent	250	85	25	120	225	60	40	6	-

Proposed Pile Installation and Removal




PROJECT COMPONENT PILES	TYPE OF PILE (SIZE)	TYPE OF PILE (MATERIAL)	TYPE OF PILE (DURATION)	NUMBER OF PILES (EA)	EMBEDMENT LENGTH	NUMBER OF PILES DTM	AVERAGE DTH DURATION PER PILE	NUMBER OF PILES VIBRO OR IMPACT	AVERAGE VIBRO DURATION PER PILE	# IMPACT STROKES PER PILE	NUMBER OF PILES PER DAY	NUMBER OF PILES TO BE REMOVED
SOUTH TRESTLE												
Moorings	42" Pipe Piles	Steel	Temp > 12m	41	60	--	--	41	30	--	6	41
Moorings	24" Pipe Piles	Steel	Temp > 12m	18	60	--	--	18	30	--	6	18
Test Pile Program (Load Test)	54" Cylinder	Concrete	Temp < 2m	2	140	--	--	2	--	2100	1	2
Test Pile Program (Production Piles)	54" Cylinder	Concrete	Permanent	20	140	--	--	20	--	2100	1	--
Work Trestles	36" Pipe Piles	Steel	Temp > 12m	256	100	36	120	220	50	40	2	256
Leap Frog Trestles	36" Pipe Piles	Steel	Temp < 2m	420	100	24	120	396	50	40	2	420
Demolition Trestles	36" Pipe Piles	Steel	Temp > 12m	72	100	12	120	60	50	40	2	72
Temporary MOT Trestle	30" Square	Concrete	Temp > 12m	123	140	12	120	111	--	2100	1	123
Permanent Piles	54" Cylinder	Concrete	Permanent	810	140	65	120	745	--	2100	1	--

Proposed Pile Installation and Removal




PROJECT COMPONENT PILES	TYPE OF PILE (SIZE)	TYPE OF PILE (MATERIAL)	TYPE OF PILE (DURATION)	NUMBER OF PILES (EA)	EMBEDMENT LENGTH	NUMBER OF PILES DTM	AVERAGE DTH DURATION PER PILE	NUMBER OF PILES VIBRO OR IMPACT	AVERAGE VIBRO DURATION PER PILE	# IMPACT STROKES PER PILE	NUMBER OF PILES PER DAY	NUMBER OF PILES TO BE REMOVED
WILLOUGHBY SPIT LAYDOWN AREA												
Dock on Spuds	36" Pipe Piles	Steel	Temp > 12m	8	100	--	--	8	50	40	3	8
Dock on Piles	36" Pipe Piles	Steel	Temp > 12m	44	100	--	--	44	50	40	3	44
Pontoon on Timber Piles	16" CCA Piles	Timber	Temp > 12m	36	60	--	--	36	30	--	4	36
Demo of existing Dock	--	--	Existing	--	--	--	--	--	--	--	--	--
WILLOUGHBY BAY BRIDGE												
Moorings	42" Pipe Piles	Steel	Temp > 12m	50	60	--	--	50	30	--	6	50
Moorings	24" Pipe Piles	Steel	Temp > 12m	18	60	--	--	18	30	--	6	18
Moorings (Safe Heaven - Willoughby Spit)	42" Pipe Piles	Steel	Temp > 12m	50	60	--	--	50	30	--	6	50
Test Pile Program (Load Test)	54" Cylinder	Concrete	Temp < 2m	1	140	--	--	1	--	2100	1	1
Test Pile Program (Production Piles)	54" Cylinder	Concrete	Permanent	15	140	--	--	15	--	2100	1	--
Work Trestles	36" Pipe Piles	Steel	Temp > 12m	212	100	--	--	212	50	40	2	212
Moorings (Safe Heaven - Willoughby Spit)	42" Pipe Piles	Steel	Temp > 12m	40	60	--	--	40	30	--	6	40
Leap Frog Trestles	36" Pipe Piles	Steel	Temp < 2m	544	100	--	--	544	50	40	2	544
Permanent Piles	24" Cylinder	Concrete	Permanent	504	140	--	--	504	--	2100	1	--

Proposed Pile Installation and Removal

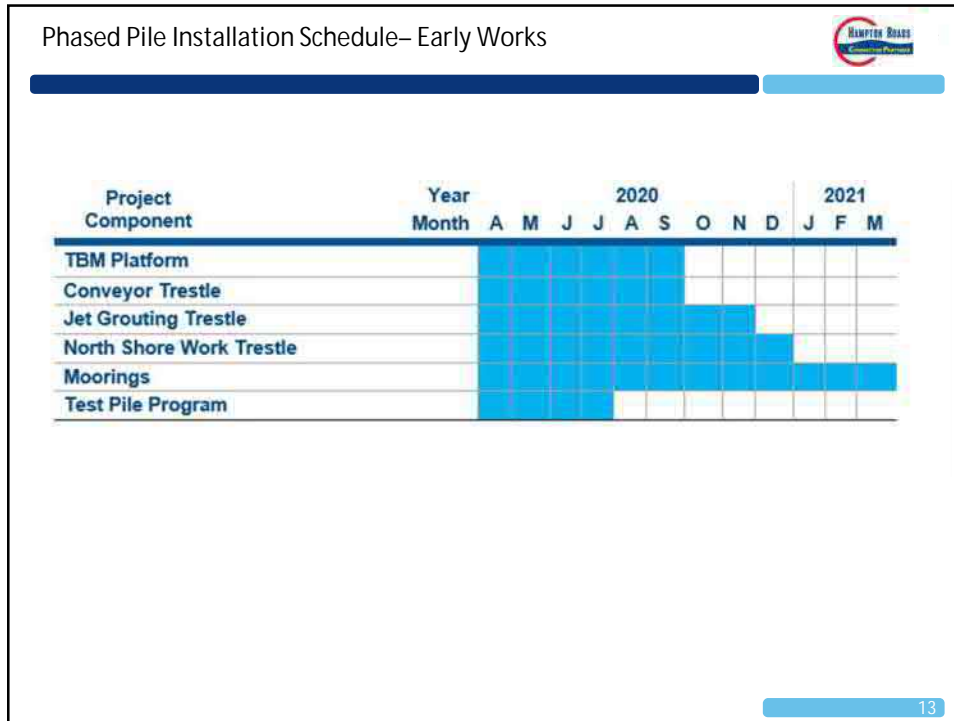


PROJECT COMPONENT PILES	TYPE OF PILE (SIZE)	TYPE OF PILE (MATERIAL)	TYPE OF PILE (DURATION)	NUMBER OF PILES (EA)	EMBEDMENT LENGTH	NUMBER OF PILES/DTH	AVERAGE DTH DURATION PER PILE	NUMBER OF PILES VIBRO OR IMPACT	AVERAGE VIBRO DURATION PER PILE	# IMPACT STROKES PER PILE	NUMBER OF PILES PER DAY	NUMBER OF PILES TO BE REMOVED
BAY AVENUE / OASTES CREEK												
Work Trestles	36" Pipe Piles	Steel	Temp > 12m	264	100	-	-	264	50	40	2	264
Leap Frog Trestles	36" Pipe Piles	Steel	Temp < 2m	304	100	-	-	304	50	40	2	304
Permanent Piles	54" Cylinder	Concrete	Permanent	210	100	-	-	210	-	2100	1	-
OASTES CREEK / MASON CREEK												
Work Trestles	36" Pipe Piles	Steel	Temp > 12m	138	100	-	-	138	50	40	2	138
Leap Frog Trestles	36" Pipe Piles	Steel	Temp < 2m	96	100	-	-	96	50	40	2	96
Permanent Piles	54" Cylinder	Concrete	Permanent	92	100	-	-	210	-	2100	1	-

Proposed Pile Installation and Removal



PROJECT COMPONENT SHEETPILES	MATERIAL	DURATION	PERIMETER	EMBEDMENT LENGTH	SURFACE
SHEETPILES					
Mallory	Steel	Temp < 12m	330	20	6600
North Shore Abutment	Steel	Temp < 12m	860	20	17200
North Island Abutment	Steel	Temp < 12m	590	20	11800
North Island Expansion	Steel	Temp < 12m	250	20	5000
South Island Expansion	Steel	Temp < 12m	700	20	14000
South Island Abutment	Steel	Temp < 12m	320	20	6400
South Shore Abutment	-	-	-	-	-
Willoughby N Abutment	-	-	-	-	-
Willoughby S Abutment	-	-	-	-	-
Bay Avenue N Abutment	Steel	Temp < 12m	260	20	5200
Bay Avenue S Abutment	Steel	Temp < 12m	480	20	9600
Oastes Creek N Abutment	Steel	Temp < 12m	260	20	5200
Oastes Creek S Abutment	Steel	Temp < 12m	260	20	5200



Year Two Pile Driving and Removal Schedule



Project Component	Year Month	2021				2022							
		S	O	N	D	J	F	M	A	M	J	J	A
North Trestle Work Trestle													
North Shore Work Trestle								X	X	X	X	X	
North Trestle Jump Trestle												X	X
North Trestle MOT Trestle													
South Island Sediment Reduction Piles													
South Island Deep Foundation Piles													
South Island Jet Grouting Trestle		X	X	X	X								
South Trestle Jump Trestle			X	X	X	X	X	X					
South Trestle Work Trestle													
South Trestle MOT Trestle													
Willoughby Bay Work Trestle											X	X	X
Willoughby Bay Jump Trestle													
Sheet Piles						X						X	
Permanent Piles													

X = Pile removal; Blue = Pile installation

MOT = Maintenance of Travel

Year Three Pile Driving and Removal Schedule



Project Component	Year Month	2022				2023							
		S	O	N	D	J	F	M	A	M	J	J	A
North Trestle Jump Trestle		X	X	X	X	X	X	X	X	X	X	X	X
South Trestle Work Trestle					X	X	X	X					
South Trestle Jump Trestle					X	X	X	X	X	X	X		
South Trestle Demolition Trestle													
South Trestle MOT Trestle					X	X	X						
Willoughby Bay Work Trestle		X	X										
Willoughby Bay Jump Trestle		X	X	X	X	X	X	X	X	X	X	X	X
Sheet Piles						X			X	X			
Permanent Piles													

X = Pile removal; Blue = Pile installation

MOT = Maintenance of Travel

Year Four Pile Driving and Removal Schedule



Project Component	Year Month	2023				2024							
		S	O	N	D	J	F	M	A	M	J	J	A
North Trestle Demolition Trestle												X	X
South Trestle Demolition Trestle				X		X	X	X					
South Trestle Work Trestle		X	X										
South Trestle MOT Trestle		X	X	X									
South Island TBM Platform											X	X	X
South Island Conveyor Trestle						X	X	X					
Sheet Piles											X		
Permanent Piles													

X = Pile removal, Blue = Pile installation

MOT = Maintenance of Travel, TBM = Tunnel Boring Machine

Year Five Pile Driving and Removal Schedule



Project Component	Year Month	2024				2025							
		S	O	N	D	J	F	M	A	M	J	J	A
North Trestle Moorings						X	X	X					
North Trestle Work Trestle		X	X	X	X	X							
North Trestle Demolition Trestle		X	X										
North Trestle MOT Trestle									X	X	X		
North Island Moorings						X	X	X					
South Island Moorings						X	X	X					
South Trestle Moorings						X	X	X					
Willoughby Spit Dock on Spuds						X	X	X					
Willoughby Spit Dock on Piles						X	X	X					
Willoughby Spit Finger Piers on Timber Piles						X	X	X					
Willoughby Bay Moorings						X	X	X					

X = Pile removal

MOT = Maintenance of Travel

Terms and Definitions



- **Peak Sound Pressure Level:** the largest absolute value of the instantaneous sound pressure expressed in decibels referenced to 1 micro Pascal (dB re: 1 μ Pa) in water.
- **Root Mean Square (RMS):** the square root of the average squared pressures over the duration of a pulse; most pile-driving impulses occur over a 50 to 100 millisecond (msec) period, with most of the energy contained in the first 30 to 50 msec (Illingworth and Rodkin, Inc. 2001, 2009). Therefore, RMS pressure levels are generally “produced” within seconds of the operations, and represent the effective pressure and the intensity (in dB re: 1 μ Pa) produced by a sound source.
- **Isopleth:** A line on a map connecting all points of a specified value, in this case it represents the area where specific noise thresholds are exceeded.
- **206dB Peak Injury Threshold:** Peak Sound Pressure Level threshold above which physiological effects or injury could be observed, distances from the pile to this threshold are evaluated.
- **150dB RMS Behavioral Disturbance Threshold:** RMS Sound Pressure Level threshold above which behavioral responses (startle, avoidance, etc) may be observed. Distances from the pile to this threshold are evaluated.

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Sound Source: Vibratory Hammer



Estimates of Underwater Sound Source Levels Generated during Vibratory and Impact Pile Installation, Down-the-Hole Hammer Installation, and Vibratory Removal

Method and Pile Type	Sound Source Level at 10 meters	Literature Source
Vibratory Hammer	dB rms	
42-inch steel pile	168	City and Borough of Sitka Department of Public Works 2017
36-inch steel pile	167	DoN 2015
30-inch steel pile	162	Denes et al. 2016
24-inch steel pile	161	DoN 2015
16-inch CCA timber pile ¹	162	Caltrans 2015
AZ 700-19 steel sheet pile	160	Caltrans 2015
AZ 700-26 steel sheet pile	160	Caltrans 2015

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Sound Source: Down the Hole and Impact Hammers



Estimates of Underwater Sound Source Levels Generated during Vibratory and Impact Pile Installation, Down-the-Hole Hammer Installation, and Vibratory Removal

Down-the-Hole Hammer	dB rms			
All pile sizes	166			Denes et al. 2016, Table 72
Impact Hammer	dB rms	dB SEL	dB peak	
36-inch steel pile	193	183	210	Chesapeake Tunnel Joint Venture 2018
30-inch steel pile	190	177	210	Caltrans 2015
24-inch steel pile	190	177	203	Caltrans 2015
54-inch concrete cylinder pile**	176	174	192	MacGillivray et al. 2007
30-inch concrete square pile**	176	174	192	MacGillivray et al. 2007

Note: It is assumed that noise levels during pile installation and removal are similar. SEL = sound exposure level; dB peak = peak sound level; rms = root mean square; DoN = Department of the Navy; CCA = Chromated, Copper Arsenate.

**Sound Source Levels (SSLs) taken from 12-inch timber piles in Norfolk, Virginia.

21

Surrogate Piles From GARFO Acoustic Tool



- Simplified Attenuation Formula
- Suitable for nearshore environments
- 36" steel pile impact hammer installation considered worst-case for potential underwater noise to sturgeon and other anadromous fish

Results from SAF for unmitigated and bubble curtain attenuated piles

Type of Pile	Hammer Type	Distance (m) to 206dBPeak (injury)	Distance (m) to Behavioral Disturbance Threshold (150 dBRMS)
24" Concrete	Impact	NA	62
36" Steel Pipe	Impact	18	96
24" Concrete-Bubble Curtain (10dB Reduction)	Impact	NA	52
36" Steel Pipe-Bubble Curtain (10 dB Reduction)	Impact	NA	76

22

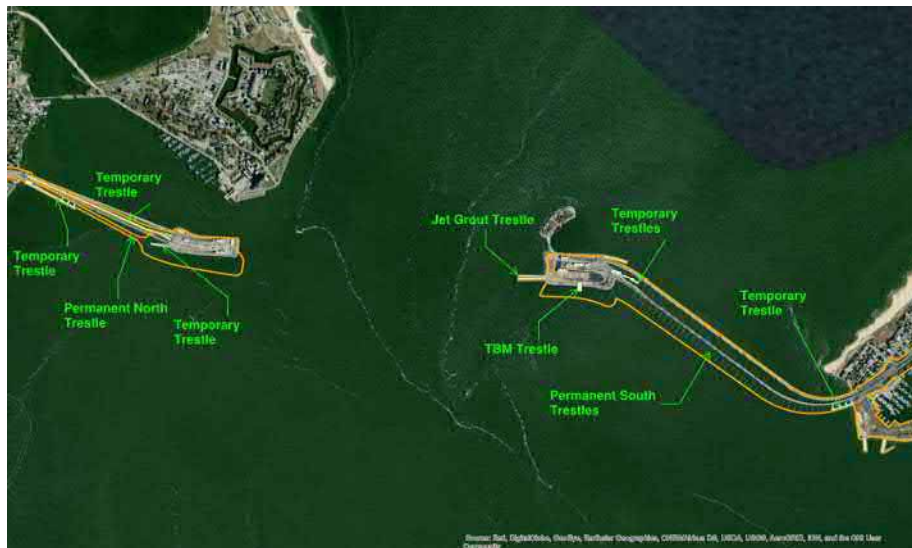
Surrogate From GARFO Acoustic Tool



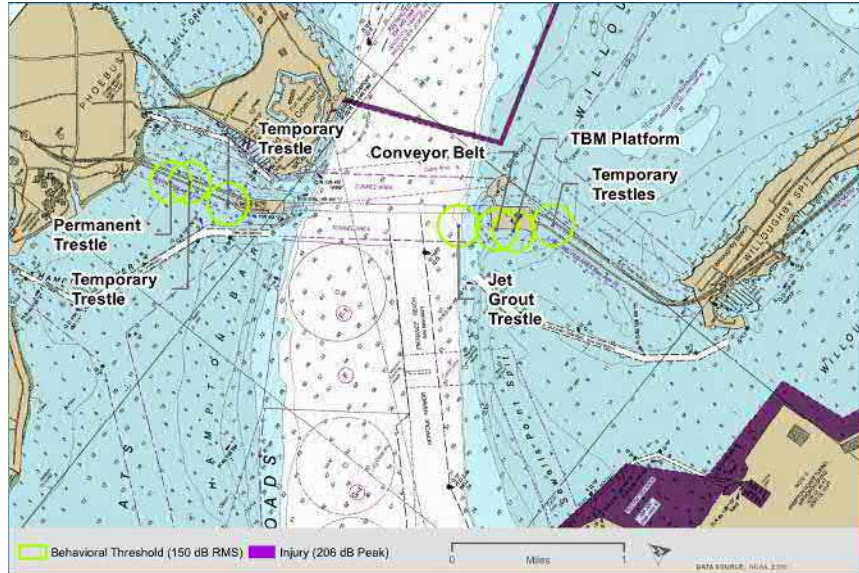
Results from SAF for Vibratory Hammer (Un-attenuated)

Type of Pile	Hammer Type	Distance (m) to 206dBPeak (injury)	Distance (m) to Behavioral Disturbance Threshold (150 dBRMS)
30" Steel	Vibratory	NA	60
36" Steel Pipe	Vibratory	NA	70

Pile Driving Activities

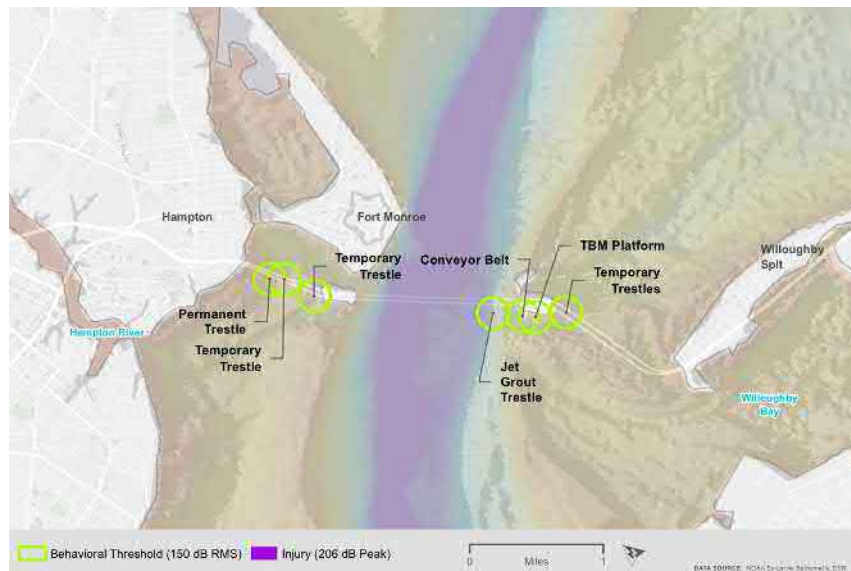


Distance to Fish Injury and Behavioral Thresholds During Pile Driving at Multiple Locations




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Distance to Fish Injury and Behavioral Thresholds During Pile Driving at Multiple Locations



26

Cumulative % of Available River Width During Pile Driving




36" Steel Pile Impact Hammer	Unmitigated: Width of 150 dB RMS Behavioral Isopleth(s)		Bubble Curtain (10dB reduction): Width of 150dB RMS Behavioral Isopleth(s)	
Number of Pile Driving Locations	River Occupied by Isopleth (ft)	Cumulative % of non-ensouffied River Width	River Occupied by Isopleth (ft)	Cumulative % of River Width
1	630	96%	498	97%
2	1260	92%	996	93%
3	1890	87%	1494	90%
4	2520	83%	1992	87%
5	3150	89%	2490	83%
6	3780	75%	2988	80%
7	4410	70%	3486	77%

- >90% of the deepwater available for passage under all pile driving scenarios
- 6,570 ft between the north and south portal islands
- 206 dB (Peak) injury threshold isopleth would be 59 ft per unmitigated pile driving location, if 7 simultaneous locations were active >95% of width would be below the 206dB Peak threshold.
- 150 dB RMS Behavioral impacts threshold focus of evaluation due to the larger size of isopleths and that non peak dB, injury threshold estimates do not reflect fish behavior of moving away from sound source.

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Avoidance and Mitigation Measures



- Avoid Impact and Down-the-hole Hammer of 42-in steel pipe piles
- Ramp up (all piles): Gradual increase in pile driving energy which allows aquatic organisms opportunity to move away from the noise source prior to the onset of full energy pile driving.
- Cushion block (impact driven piles as practical and safe) - Blocks of material placed between the top of the pile and the impact hammer. These blocks reduce the noise levels produced during pile driving.

Attenuation measure	Associated reduction in underwater noise	Source
Cushion Block (used with impact hammer)		
Wood	11 to 26 dB reduction from unattenuated impact hammer underwater sound levels	ICF Jones & Stokes (2009); page 4-11
Micarta	7 to 8 dB reduction from unattenuated impact hammer underwater sound levels	ICF Jones & Stokes (2009); page 4-11
Nylon	4 to 5 dB reduction from unattenuated impact hammer underwater sound levels	ICF Jones & Stokes (2009); page 4-11

- Link to ICF Jones and Stokes (2009) https://tethys.pnnl.gov/sites/default/files/publications/Caltrans_2009_Guidance_Manual_for_noise_effects_on_fish.pdf

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Avoidance and Mitigation Measures



- Bubble Curtains
 - TBM Platform and Jet Grout Trestles
 - Large number of steel piles closest to channel (deeper water): Sturgeon and other anadromous species most likely to use channel for migration
 - Least impact to construction schedule: installation around single or multiple



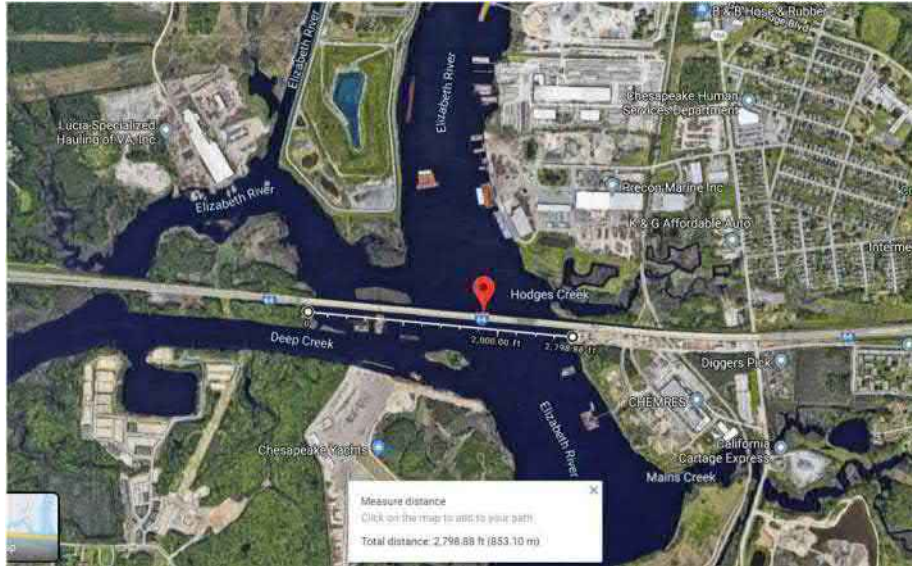
29

HRBT: 18,480 ft total width and 14,940 ft excluding islands



30

High Rise Bridge- Elizabeth River VA: 2,800 ft wide



31

Queen Creek Bridge, Queen Creek VA: 150-250ft wide



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Additional Considerations– TOYR



- Anadromous Fish
 - Below Route 17, DGIF recommends no TOYR unless project spans width of river, significantly impeding fish passage
 - Above Route 17, DGIF recommends TOYR February 15 – June 30 (135 days)
- Atlantic sturgeon
 - Below Route 17, DGIF recommends TOYR on “case by case” basis
 - Above Route 17, DGIF recommends TOYR:
 - March 15 – June 15 (90 days) – Spring spawning/migration
 - August 1 – November 15 (105 days) – Fall spawning/migration
 - Greg Garmin telemetry data
 - No evidence of significant staging or feeding near project area
 - Adults and sub-adults residence time near project area on the order of several hours
 - Juveniles – insufficient data
- Seasonal work window for pile driving would have significant impact on project schedule
- In lieu of dredging large areas of the site, temporary and “jump trestles” were selected to provide access for the large construction equipment necessary to complete the job

33

Additional Considerations – Environmental and Safety



- Increased air emissions from bubble curtain installation
- Construction schedule and safety
 - Additional bubble curtains and/or TOYRs would extend duration of construction
 - Longer construction duration:
 - increases time that marine environment is disrupted
 - increases safety risks to workers, motorists, and boaters
 - increases potential disruption to commercial vessel traffic using the Port of VA

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Summary



- Proposed mitigation measures are sufficient to protect anadromous fish species (including Atlantic sturgeon)
 - Soft starts
 - Cushion blocks
 - Bubble curtains on TBM and jet grout trestle piles in/near deeper water closest to main channel
- Additional mitigation measures (e.g., more bubble curtains, TOYR) would only marginally increase fish protection

35




Additional Issues



Questions and Discussion

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Mitigation Presentation




Compensatory Mitigation Workshop
6 November 2019

I-64 Hampton Roads Bridge-Tunnel (HRBT) Expansion Project

1

HRBT Compensatory Mitigation Workshop



- Agenda
 - Welcome and Introduction
 - Meeting Objectives
 - Supporting Documentation for Workshop
 - Proposed Compensatory Mitigation
 - Explaining the Numbers
 - Crosswalk Appendix G (impacts) to Appendix P (compensatory mitigation)
 - Pile Driving

2

HRBT Compensatory Mitigation Workshop



- Welcome and Introduction
- Meeting Objectives
 - Explain impacts for which we are proposing compensation and for which we are not.
 - Reach agreement regarding the types of mitigation proposed.
 - Explain how impact acreages from Appendix G were translated to compensatory mitigation quantities in Appendix P.
 - Discuss pile driving
- Supporting Documentation for Workshop
 - Revised Table P-1 Compensatory Mitigation Table
 - Clam compensation worksheet (using Versar 2018 data)
 - Impact tables and plates (from Appendix G Rev_1_September 18, 2019)
 - Versar 2018 Benthic Survey

3

Compensation: Overview



- Compensatory Mitigation Proposed for HRBT
 - VMRC clam seeding
 - Oyster reef credits for SAV (USACE); SAV seeding (VMRC)
 - Non-tidal vegetated wetland credits
 - Tidal vegetated wetland credits
 - Subaqueous credits

4

Compensation: Clams



- Clams (*Mercenaria mercenaria*)
 - Impacts where compensation proposed
 - Toe of fill within island expansion footprints (18.46 acres)
 - Impacts where compensation not proposed
 - Shallow water dredging for barge access
 - anticipated quick recovery of benthic community
 - Permanent Piles
 - More piles being removed than installed (in number and area)
 - 1,774 piles (12,346 sq. ft.) removed
 - 1,453 piles (9,082 sq. ft.) installed
 - Undercut dredging for island expansions
 - Already accounted for under island expansion footprints
 - Temporary piles

5

Compensation: Clams



- Clam compensation
 - Clam Compensation Worksheet
 - Determination of density
 - Derive proposed compensation
 - Chowder Clam Seeding
 - Satisfaction of VMRC permit condition (2.5 -3.0" brood stock)
 - Proposing compensation for *Mercenaria mercenaria*, not all bivalves

Location	Average abundance of clams ¹ (per square meter) ²	Square feet of impact (impacts from Appendix G)	Square meter of impact ³	Abundance of clams per impact	Total number of clams proposed for compensation (1.3:1 ratio) ⁴
North Island Expansion	0.00	646,030	60,020	---	---
South Island Expansion	3.79	157,933	14,675	55,618	72,305
North and South Island Expansions Combined	1.51	803,963	74,695	112,789	146,630

1. *Mercenaria mercenaria*
2. Abundance data derived from 2018 Versar report
3. Square meters of impact were rounded up to the nearest 5
4. Total number of clams proposed for compensation were rounded up to the nearest 5

6

Compensation: Vegetated Wetlands and SAV



- Impacts where compensation proposed
 - Perm. cut/fill/piles in vegetated wetlands
 - Perm. shading of vegetated wetlands (support piles included)
 - Perm. conv. of vegetated wetlands
 - Ext. temp. shading greater >6 mos. over vegetated wetlands/SAV (support piles included)
- Impacts where compensation not proposed
 - Shallow water dredging for barge access (not in areas where SAV occurs)
 - Ext. temp. trestles >6 months over vegetated wetlands but not shaded (per DEQ formula)
 - Ext. temp. trestles >6 months over non-vegetated wetlands
 - Temp. <6 months

7

Compensation: Vegetated Wetlands and SAV



- Non-tidal vegetated wetlands
 - Wetland Credits pre-purchased by VDOT and transferred to CJV (in process)
- Tidal vegetated wetlands
 - Wetland credits from LRRT and/or mitigation banks (Chesapeake Land Development)
- SAV
 - Oyster reef credits (USACE)
 - 1:1 ratio (0.40 credits)
 - Oyster reefs improve water quality
 - Direct filtration
 - Reefs with vertical structure reduce fetch and wind driven sediment resuspension
 - Fringing reefs reduce sediment input from shoreline erosion
 - Oyster-SAV positive feedback loop
 - Credits available (LRRT)
 - Consistent with mitigation hierarchy
 - SAV restoration in Hampton Flats (VMRC)
 - Payment to VIMS for SAV restoration (earmarked for Hampton Flats)
 - \$2/sf of impact
 - 17,468 sf = \$34,936
 - Permit condition satisfied upon payment to VIMS

8

Compensation: Non-veg Intertidal and Subaqueous



- Impacts where compensation proposed
 - Conversion of intertidal and subtidal subaqueous to upland
 - From MHHW landward
 - 14.12 acres calculated assuming 2:1 slope from toe of fill to MHHW
 - Represents “permanent loss” of waters of the U.S.
- Impacts where compensation not proposed
 - Conversion of intertidal and subtidal subaqueous to other intertidal and subtidal subaqueous
 - From toe of fill to MHHW
 - Does not constitute a “permanent loss” of waters of the U.S.
 - Shallow water dredging for barge access
 - Ext. temp. trestles >6 months
 - Permanent piles - fewer piles post construction than pre-construction
 - Temp. <6 months (including temporary piles)
- LRRT subaqueous credits
 - IRT coordination to secure 4.12 additional credits

9

Compensation: Other Waters of the U.S.



- No compensation proposed for impacts to PUB
 - Roadside PUBs within Project are essentially functioning as roadside ditches

10

Explaining the Numbers: Nomenclature



■ WOUS Impact Types

- P = Permanent Fill
- PC = Permanent Conversion
- PS = Permanent Shading
- ET = Extended Temporary Shading (>6 months)
- WT = Work Trestle (>6 months)
- MT = Maintenance of Traffic (MOT) Trestle (>6 months)
- JT = Jump Trestle (<6 months)
- T = Temporary (<6 months)
- D = Dredge

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Explaining the Numbers: App. G to App. P



■ Compensation proposed

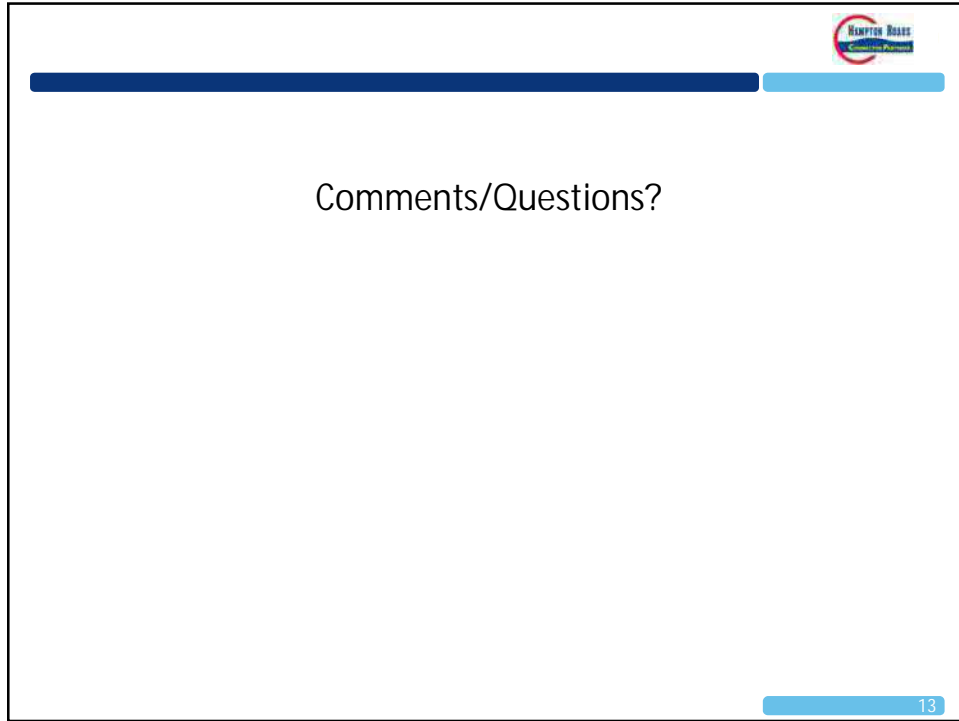
- Perm. cut/fill/piles in vegetated wetlands (P) (subsets of Tables G-2 and G-8)
- Perm. shading of vegetated wetlands (support piles included) (PS) (subset of Table G-7)
- Perm. conv. of vegetated wetlands (PC) (Table G-4)
- Ext. temp. shading greater >6 mos. over vegetated wetlands/SAV (support piles included) (ET) (subset of Table G-7)
- Conversion of intertidal and subtidal subaqueous to upland (assuming 2:1 slope from toe of fill; upland island expansion begins at MHHW)

■ Compensation not proposed

- Shallow water dredging (D) (Table G-10)
- Permanent fill impacts to PUB (P) (subset of Table G-2)
- Ext. temp. trestles >6 months over vegetated wetlands but not shaded (per DEQ formula) (WT/MT) (subset of Table G-12)
- Ext. temp. trestles >6 months over non-vegetated wetlands (WT/MT) (subset of Table G-12)
- Permanent piles in non-vegetated wetlands - fewer piles post construction than pre-construction
- Temp. <6 months (T, JT) (Table G-14)

■ Refer to Table P-1

12



A presentation slide with a white background and a black border. At the top right, there is a logo for 'HAWKINS ROAD CONSULTING' featuring a red circular graphic. Below the logo is a horizontal bar with a dark blue segment on the left and a light blue segment on the right. The text 'Comments/Questions?' is centered on the slide. In the bottom right corner, there is a light blue bar containing the number '13'.

Comment Response

HRBT Expansion Project

November 6, 2019 Compensatory Mitigation/Pile Driving Workshop

Comments Received November 6, 2019

Hampton Roads Connector Partners (HRCP) held a Compensatory Mitigation and Pile Driving Workshop on November 6, 2019. The purpose of the meeting was to discuss the overall compensatory mitigation strategy for the project, including potential mitigative measures for pile driving activities. Meeting minutes are attached to this memorandum and a summary of comments and responses are provided below.

Summary of Comments from November 6, 2019 Meeting:

1. *Add jetting piles within casing as an avoidance and minimization measure and include approximate number of piles that will be jetted.*

Response: A discussion of mitigation measures associated with pile driving including, jetting within casing, use of bubble curtains, soft starts, and cushion blocks will be added to Appendix P of the December 19, 2019 revised JPA submittal package.

2. *Provide additional information that supports the claim that bubble curtains add time to the project schedule.*

Response: The use of bubble curtains adds significant time to construction; therefore, bubble curtains will be limited to impact driving of hollow steel piles for the jet grout trestle and the TBM platform in deeper water that could be used by Atlantic sturgeon or other anadromous fish. A discussion of how the benefits of bubble curtains were balanced with the impact to the construction schedule will be included in the pile driving discussion in Appendix P of the December 19, 2019 revised JPA submittal package.

3. *Provide assurance that SAV impacts along the perimeters of trestles will be minimized.*

Response: Impacts to SAV adjacent to and underneath temporary work trestles (but outside of the shaded impact areas), will be avoided and minimized to the greatest extent practicable. The use of “top down” construction of temporary work trestles within the SAV areas will avoid impacts associated with the use of construction barges and associated shallow water dredging. This discussion will be added to Appendix P of the December 19, 2019 revised JPA submittal package.

4. *Confirm soft start pile driving protocol is in Appendix P.*

Response: Pile driving is not currently included in Appendix P. As noted in our response to Comment #1, a discussion of pile driving mitigation measures will be added to Appendix P of the December 19, 2019 revised JPA submittal package.

5. *Provide additional pile driving data from Tappan Zee and/or the Navy (if available).*

Response: Pile driving data from the Tappan Zee project and/or the Navy (if available) will be provided in the December 19, 2019 revised JPA submittal package.

6. *Contact Karen Johnson (TNC) about potential advance release SAV credits.*

Response: HRCP will contact The Nature Conservancy to determine whether or not advance release SAV credits could be available through the Virginia Aquatic Resources Trust Fund in time for the Project.

7. *Provide justification for why clam mitigation would or would not be proposed for areas of shallow water dredging.*

Response: As discussed during the November 6, 2019 meeting, VMRC would not expect compensation for areas that did not have clams prior to construction. The pre-construction surveys found no clams within the area of shallow water dredging; therefore, HRCP would not propose clam compensation for shallow water dredging. Appendix P will be revised accordingly and included in the December 19, 2019 revised JPA submittal package.

8. *Provide restoration plan for temporary/extended temporary wetland impacts in writing.*

Response: This comment will be addressed in the December 19, 2019 revised JPA submittal package.

9. Work with Allison Lay (VMRC) to determine number of clams to be mitigated for (both dredging and island expansion).

Response: Noted. HRCP will continue to coordinate with VMRC to develop a compensatory mitigation strategy for impacts to clams. This strategy will be included in Appendix P of the December 19, 2019 revised JPA submittal package.

10. Round impact and mitigation numbers to two decimal places using standard math rounding.

Response: All impact and mitigation quantities included in the December 19, 2019 revised JPA submittal package will be rounded in accordance with 9VAC25-210-80-B-1-h which states:

(1) Wetland impacts identified according to their Cowardin classification (i.e., emergent, scrub-shrub, or forested); and for each classification, the individual impacts quantified in square feet to the nearest whole number, cumulatively summed in square feet, and then the sum converted to acres and rounded to two decimal places using commonly accepted arithmetic principles of rounding.

(2) Individual stream impacts (i) quantified by length in linear feet to the nearest whole number and by average width in feet to the nearest whole number; (ii) quantified in square feet to the nearest whole number; and (iii) when compensatory mitigation is required, the impacts identified according to the assessed type using the Unified Stream Methodology.

(3) Open water impacts identified according to type; and for each type, the individual impacts quantified in square feet to the nearest whole number, cumulatively summed in square feet, and then the sum converted to acres and rounded to two decimal places using commonly accepted arithmetic principles of rounding.

In addition, any impact acreages less than 0.01 will be rounded up to 0.01 acres.



Meeting Summary

Project:	I-64 Hampton Roads Bridge-Tunnel (HRBT) Expansion
Meeting Title:	Section 408 Maritime Stakeholder Meeting
Date:	November 14, 2019 – 1:30-3:00pm
Location:	Virginia Maritime Association, 236 East Plume Street, Norfolk, VA, 2nd Floor Board Room

Attendees:

Company	Last Name	First Name	Initials	Phone Number	E-mail Address	Present
HRCP	Gaffney	Doug	DG	856-924-3363	Douglas.gaffney@mottmac.com	x
HRCP	Pico	Tina	TP	732-333-3257	Tina.pico@mottmac.com	x
HRCP	Magron	JP	JPM	212-671-0180	JP.magron@hdrinc.com	x
MAP ENV	Mansfield	Mark	MM	757-685-9864	mmansfield@mapenvironmental.com	x
VDOT	Reilly	Peter	PR	757-323-3307	Peter.reilly@vdot.virginia.gov	x
USACE	Powell	Steve	SP	757-201-7788	Stephen.j.powell@usace.army.mil	x
USCG – DS	Pitts	Hall	HP	757-395-6222	Hal.r.pitts@uscg.mil	X
USCG – DS	Thorogood	Michael	MT	757-398-6557	Michael.r.thorogood@uscg.mil	X
WRA	Williams	Laurel	LW	757-599-5101	lwilliams@wrallp.com	X
VMRC	Lay	Allison	AL	757-247-2254	Allison.lay@mrc.virginia.gov	x
TPG	Fessenden	Jamie	JF	925-766-5790	Jamie.fessenden@fessendenenergy.com	X
TPG	Lattanzi	Paul	PL	207-808-9846	Paul.r.lattanzi@paratusgroup.org	X
HRCP	Meyer	Ron	RM	757-264-3516	rmeyer@hrcpjv.com	x
City of Hampton	Shar	Mohammad	MS	757-727-6780	Mohammad.shar@hampton.gov	x
HRCP	Barrier	David	DB	514-663-9198	dbarrier@hrcpjv.com	x
USCG	Francisco	LCDR Peter	PF	757-668-5581	Peter.f.francisco@uscg.mil	x
Port of VA	Burket	Bill	BB	757-615-6661	bburket@portofvirginia.com	x
USCG	Barnes	CAPT Jerry	JB	757-398-6230	Jerry.r.barnes@uscg.mil	x
VA Pilots	Chisman	Whiting	WC	757-233-3012	vicepres@vapilotassn.com	x
City of Norfolk	Joyner	Chuck	CJ	757-664-4648	Chuck.joyner@norfolk.gov	X
US Navy	Hunt	Bob	BH	757-445-8371	Robert.p.hunt@navy.mil	x
HRCP	Meyers	Steve	SM	757-375-4725	smeyers@hrcpjv.com	x
City of Norfolk	McCarthy	Seamus	SMc	757-664-4363	Seamus.mccarthy@norfolk.gov	x
Moran Towing	Flowers	Ken	KF	757-625-6070	kenf@morantug.com	X
Hampton Police	Sanchez	Orlando	OS	757-759-4688	osanchez@hampton.gov	x
NAVFAC Naval Station Norfolk	Anderson	DeLaine	DA	757-341-0505	Delaine.anderson@navy.mil	x



Meeting Notes:

Meeting to solicit input from Maritime Stakeholders in order to gain 408 Concurrence.

No.	Description	Action
1.	Welcome and Introductions (1:30pm)	
	<p>DG – 2nd monthly maritime stakeholder meeting to show our progress on this project for construction in the marine environment. Soliciting input from the stakeholder community to incorporate into the permitting documents to ensure safety and efficiency. Agenda and project overview. Meeting objectives</p>	
2.	NSRA Part I	
	<p>PL – Overview of NSRA. Key elements include marine traffic survey, changes in vessel movements, weather conditions, and marine casualty assessment. Shows all marine activity in the waterway segmented by types and size of vessel. Overview of what activities will have to change because of construction i.e. fishing by bridge pilings. Document also looks at weather conditions, and historically where have there been marine casualties and what does that tell us, what can we learn, where are the trouble spots. NSRA and TCP show an understanding of what is happening in the waterway now and what risk mitigating measures can be used to improve safety.</p> <p>*see attached presentation for graphics from the NSRA</p> <p>MM – one of the ways to help get at the unknowns are lock statistics that USACE should have. Could help corroborate what is happening.</p> <p>PL – we feel confident that the NA in the data are almost entirely recreational. Study done by USCG 2 years ago. When it comes to length of vessel, tow boats create errors in the data because they are either leaving blank or not putting the right length when they are towing</p> <p>PL – foreign vessels get a pilot and they go through checks out in thimble shoals area, so there are a larger number of reportable marine casualties in that area due to finding problems during checks.</p> <p>PL – anchorage F area will be kept clear at all times. We recognize the importance of this area.</p>	
3.	TCP	
	<p>RM – TCP is part of the 408 package that HRCP is submitting to the USACE. In general, it is a marine operations plan that takes into account our impact on the channels and waterway. The NSRA figures out what happens and then the TCP uses that information to design a marine operations strategy.</p> <p>RM – vessel fleet information for each section of the project and a schedule of barges will be spelled out in the TCP. North trestle bridge will</p>	





No.	Description	Action
	<p>have a total of 18 barges (not all barges working at the same time), north island expansion, 19 total barges. South island expansion, total of 14 barges. South trestle bridge, 34 total barges. Willoughby Bay bridge, 27 total barges associated with this operation.</p> <p>*see attached powerpoint for graphics of general arrangement of barges</p> <p>RM – Severe weather plan will be incorporated in the 408 package. Protocols will be defined for all kind of weather conditions that could impact the project. Crew tugboat onsite 24/7. Safe harbour areas identified for marine equipment.</p> <p>RM – proposed anchor and mooring locations. Hampton flats mooring area has shrunk considerably from previous estimates. HRCP is proposing using Phoebus area as an additional safe harbour area. Phoebus safe harbour to Willoughby bay is 4.25 miles. Bringing all vessels into Willoughby bay would require all vessels on the north island and north trestle bridge work to cross federal channel. Would also take increased time to transit the 4.25 miles. Phoebus safe harbour area is approximately 300’ away from the Phoebus channel. Barges will be spudded down not anchor mooring.</p> <p>BB - How big are the tugs that will go in there?</p> <p>RM - Between 600 HP truckable barge and up to 2800 HP on a pushboat.</p> <p>JB – do vessels stay within the Phoebus channel when transiting in that area or do they go all over that area?</p> <p>PL – worst case scenario would be fall hurricane, people on the ICW may also try to safe harbour in the area. Otherwise, vessels stay within the channel.</p> <p>JB – would we ask USCG to set up a safety zone, would you use ATONS?</p> <p>PL – yes and yes.</p> <p>RM – we propose lighted buoys every 200 ft around the area</p> <p>BB - what is the standard of weather that you would leave barges in Phoebus?</p> <p>RM – primarily for severe weather. Our limits could be somewhat below captain of port depending on equipment. These conditions would be defined clearly. The faster we can get to safe harbour the better for everybody.</p> <p>PF – as a timely scenario, this weekend we suspect to have a nor’easter. Considering this scenario, would you use the Phoebus safe harbour?</p> <p>RM – yes, I believe so.</p> <p>PF – would be great to monitor remotely how those areas will be in different weather conditions</p>	



No.	Description	Action
	<p>CJ – the safe harbour areas are only for weather, or also staging areas?</p> <p>RM – no, Phoebus will be only safe harbour, but Willoughby will be used for safe harbour as well as daily mooring and staging. Willoughby doubles as both a safe harbour and a mooring area.</p> <p>DB – Willoughby will be used mostly for deck barges (when used as daily mooring). Crane barges will stay in their location. Barges with girders or material that arrive early and need to be moored temporarily until we are ready would be moored in Willoughby.</p> <p>RM – crane barges being brought in would be very limited but could be in Willoughby at times.</p> <p>RM – Hampton flats is not a severe weather area. Moorings present issues in severe weather. Material barges coming in working on north side of bridge can moor in Hampton flats until they are ready to be used in the operation. Barge staging area. Moorings will be detailed in the TCP. Standard inspection of these moorings. All hardware excluding anchor itself will all be purchased new and routine inspection will occur. We want to delineate Hampton flats mooring area from the public. Will be marked painted and lit. ideas on how to delineate area to keep recreational boats out?</p> <p>JB - NOAA can maybe put this area on ENC</p> <p>PL – lighting barges would be most effective. In NSRA, there are no vessels here besides small recreational vessels in Hampton flats area.</p> <p>JB – what will be displaced, are there crab pots?</p> <p>PL – small recreational crab pots in area. Unless USCG makes it an exclusionary zone, crab pots would still be going out. No dragging fishing takes place.</p> <p>RM – not trying to make it an exclusion zone, just trying to make it obvious that area is being used</p> <p>RM – Willoughby bay anchor and mooring zone was shrunk considerably as well. Almost no swell since blocked from most fetches. Left room for recreational boat access. Want to light perimeter of Willoughby anchor zone every 200 ft. will not impact boat ramp.</p> <p>CJ – boats will have to take a hard right outside of boat ramp?</p> <p>RM – yes, area is really shallow, so boats have to make that hard right regardless of construction activity in area</p> <p>CJ – what is the approximate size of the Willoughby mooring area?</p> <p>RM – approximately 1800' by 2600'</p> <p>CJ – perimeter lighting, how would that work?</p> <p>RM – every 200 ft buoys would be lit and say work zone</p>	



No.	Description	Action
	<p>RM – proposing a pile line to tie up barges. Two options: A and B. Option A: line parallel to bridge is possible but not preferred. 1000' mooring line steel pipe piles every 40'. Option B: preferred, 45 degree angle to bridge</p> <p>CJ – would line be lit as well?</p> <p>RM – yes, each pile would be lit. 360 degree viewable. Permitted by the USACE. And to specifications of USACE. will adhere to CFR requirements.</p> <p>JPM – one concern that we don't know is navy base activities, mine sweeping, etc.</p> <p>BH – information was forwarded to naval station Norfolk. There are a lot of tiers of interest. Taking time to digest the info. Steve Jones running point on this. For the mooring line, does that change the configuration in regards to distance to navy station?</p> <p>RM – we are further from navy now. Mooring area was shrunk. We can provide coordinates.</p> <p>BH – I won't modify what you sent because that is more conservative than current plan (I'm at the regional level) naval station Norfolk will have to say what activities are happening. From a regional standpoint, all okay.</p> <p>DA – only thing I can think of as a problem is height of cranes will that impact lights to base.</p> <p>RM – can commit to booming cranes down when they come into Willoughby and that elevation will be much more reasonable. RM can provide that</p> <p>SMc – how many daily barges in Willoughby mooring zone because we will get questions from the residents</p> <p>RM – TCP will spell that out. Don't have number on hand. Sometime in job there could be a severe weather event so the number of barges could be considerable in that circumstance. But will not be outside of delineated area no matter what.</p> <p>DB – residents will mostly see barges that are doing work on Willoughby bay bridge and few barges staging with materials. Willoughby has 27 total barges but not all barges working at same time. Transit times for other areas included in staging areas back and forth.</p> <p>CJ – residential access, is that the existing access?</p> <p>RM – yes, there is a fendering system not an actual channel.</p> <p>PL – the fendering system has fallen into a state of disrepair, but it's the only structural area to allow for vessels to go underneath. In practice, vessels don't use this area they just go under bridge wherever</p> <p>CJ – that would be my biggest concerns for residents coming from the boat ramp or under the bridge. More reasonable to cut northeast corner</p>	



No.	Description	Action
	<p>of delineated mooring area for vessels going through the designated residential access</p> <p>RM – we can definitely cut the corner to help</p> <p>JB – you should have a meeting with sector PATON manager. Desire to have safety zones. Nail down lighting and marking. District waterways management meeting.</p> <p>PL – meeting with PF, anyone else?</p> <p>PF – we will use my ATON officer as well</p> <p>JB – timeframe for on water activity to begin?</p> <p>RM – earliest for construction is early summer 2020</p> <p>CJ – mooring area, would you anticipate repairs to be done to equipment in the mooring area. Are there time of day restrictions on that work working on cranes etc?</p> <p>RM – Willoughby spit will have an area to bring barges in if we need. Rarely do in water barge repair. Maybe a mechanic to go change something minor. no major crane repairs. will have availability at shipyards</p> <p>PF – considering normal state and positioning barges into safe harbour areas, how long would that take?</p> <p>RM – need to fully develop fleet, then work backwards to see how many assets need to be moved during weather. Cannot decide on timing yet, but will be in TCP.</p> <p>PF – hurricanes not a problem, but we have intense seasonal fronts and other weather events that come on quickly.</p> <p>RM – we definitely will look into that. Have to take a look at all parameters and come up with an answer for you in the TCP</p> <p>CJ – are both trestles being replaced?</p> <p>DB – no, they are being widened.</p> <p>DB – the eastbound trestle, first one to be widened, will be done by barge because easy access from outside except from shore where water depth to shallow. Inside (westbound) difficult to access by barge. This side will be done by jump trestle. Will advance as work advances. Westbound will come second.</p> <p>PL – in order for Ron to write severe weather plan, we need to know that the areas that Ron proposed are all okay. Is everyone in the room okay with this?</p> <p>KF – work with coast guard to carve out recreational spot in Phoebus area. After November 1st all recreational vessels go away. 15 vessels max in that area during peak times</p>	<p>Action: HRCP trim northeast corner of designated mooring area in Willoughby bay</p> <p>Action: HRCP to plan meeting with USCG sector private aids to navigation manager and PF</p>



No.	Description	Action
	<p>CJ – concerned that there has been no outreach for this Willoughby mooring area. Numerous briefings but this area has never been brought up. Removing northeast corner of the Willoughby area would be good.</p> <p>SM – we will start planning outreach for in water works now that the data is developed</p>	
4.	NSRA Risks and Mitigations	
	<p>PL – 7 areas are noteworthy increases in risk. 2 designated as medium, 5 as low. High vs low consequence. High vs low probability. Two higher probability higher consequence events.</p> <ol style="list-style-type: none"> 1. Jet grouting trestles built off the south island. 2. Moored vessels in reduced visibility <p>Five lower consequence lower probability events</p> <ol style="list-style-type: none"> 1. Vessels crossing the navigation channel 2. North island operations near Hampton creek channel 3. Impact on regular maritime events 4. Wake impacts on construction operations 5. Congestion of barges in Willoughby bay <p>Mitigation strategies to be used: tunnel boring machine, local notice to mariners, changes in moorings area configurations, communication with local waterway users, inland rules of the road (COLREGS), and more</p> <p>*see presentation for all mitigating strategies proposed in the NSRA</p> <p>Marine traffic app – all vessels on this project will be recorded in that app. Can see where they are at all times.</p> <p>PL – Hampton creek approach channel temporary realignment discussion. Island expansion gets closer to approach channel. Add in barges needed for construction and the channel is even closer. Plenty of good water in this area. Need 12' for channel. Propose to move traffic temporarily away from this zone via channel realignment (will keep 12' depth).</p> <p>DB – mooring piles all along island to allow the construction barges to stay close to work area and away from channel</p> <p>PL – work with aids to navigation team in section USCG to temporarily realign away from work area. Red and green floating aid at end and at turn at minimum. Will need to remove marker number 2.</p> <p>DB – want to make sure that we get a project that works for all stakeholders. Want to explore the possibility of temporary realignment of the channel to provide more room for users of the channel.</p> <p>PL – focused USCG USACE meeting for aids to navigation and channel realignment.</p>	<p>Action: HRCPT to plan focused USCG, USACE, and NOAA</p>



No.	Description	Action
	<p>JB – is this [the Hampton creek approach channel] a USACE civil works project?</p> <p>PL – yes, but we would not need to do any additional dredging, we would follow natural bathy. Once construction is complete, channel can return to original configuration. Coordinating with USCG, put in new day marker</p> <p>MM – prepare sample risk-based scenarios that public could see. Find ways to help communicate what impacts are to broadest number of people and the good things that are being developed to mitigate these risks at certain points</p> <p>HP - USACE will have robust public notice that reaches out to public in multitude of ways</p> <p>JB – maybe some type of project overview of navigational impacts continuously run to notice to mariners. particularly anchorage areas. can we designate anchorage areas without public process? Maybe safety zone creation</p> <p>HP - VDOT project sponsor can schedule and hold a series of different public meetings focused on areas of interest.</p> <p>PL - we are at the tip of the spear with strategies that aren't necessarily public ready, but once the permits are submitted, public notice will be released. we have places to put this information at marinas, boat ramps, social media. people at HRCP are thinking about how to communicate risk to the public and also just what we are doing. there is a lot more work to be done but beginning work is happening</p> <p>JB - what's missing is the opportunity for public input. VDOT has talked about landside impacts but not in water works yet</p> <p>SM - now that we've developed this more, we can start introducing to the general public.</p> <p>PL - waterway user survey went out. team recognizes that there will be focused public outreach to particular communities</p> <p>JPM - temp channel realignment would have to go through local notice to mariners as well. which invites public participation</p> <p>JB – there are processes that cover individual components but there is nothing that covers things like Willoughby mooring area. that is why we need to have separate meeting to decide what needs to be done and timing of it</p> <p>CJ - VDOT made good effort to reach out to Willoughby community but didn't discuss marine impacts. this hasn't been communicated yet. need to focus on this now that we have more concrete plans.</p> <p>SMc - Hampton yacht club and Willoughby marina do sailing events for 6 months a year. I don't know if these people know about the impacts that are going to happen</p>	<p>charting meeting for all aids to navigation questions: channel realignment, Willoughby mooring area, Phoebus safe harbour, jet grouting trestles</p> <p>Action: HRCP will begin to host outreach events that talk about in -water works</p>



No.	Description	Action
	<p>JB - we have data for what those events are</p> <p>PL - we have all data incorporated into NSRA for all permitted events. include regattas sailing team weekly events, etc.</p> <p>JB - a lot of the smaller events are not permitted by the USCG</p> <p>PL – we will plan a focus group with USCG and USACE and NOAA charting for realignment discussion</p> <p>PL - jet grouting trestles lighting. We will need district 5 classification of the structures because classification determines lighting requirements. We will discuss during focus group meeting as well.</p>	
5.	Stakeholder Outreach	
	<p>SM - have focused so far on cities of Norfolk and Hampton land works, now will focus on maritime issues and how to communicate this to local communities. communication with Navy CDR Landess. future communications with maritime community will be outlined in maritime communications plan.</p> <p>CJ – which Norfolk city officials...mostly right of way division?</p> <p>SM - yes, mostly Frida from city of Norfolk and she pulled in Seamus. she pulls in whoever she thinks is needed.</p> <p>HP - make sure all DoD contacts are engaged. not just navy installation, also operators.</p> <p>PR - I'm sure all were engaged. I do not think Captain Moore will come, but he is aware.</p>	
6.	Roundtable Discussion	
	<p>DG - we are always available. please give us your comments via email or call. this is not the only venue for contact. TCP is being developed. will be finalized but it will still be a living document because on unforeseen construction activities that may not have been accounted for seeing that it is a 5 year project.</p> <p>DB - lots of stakeholder in area. please if you need anything come to us and we will address it</p>	
	Meeting Adjourned 3:34pm	

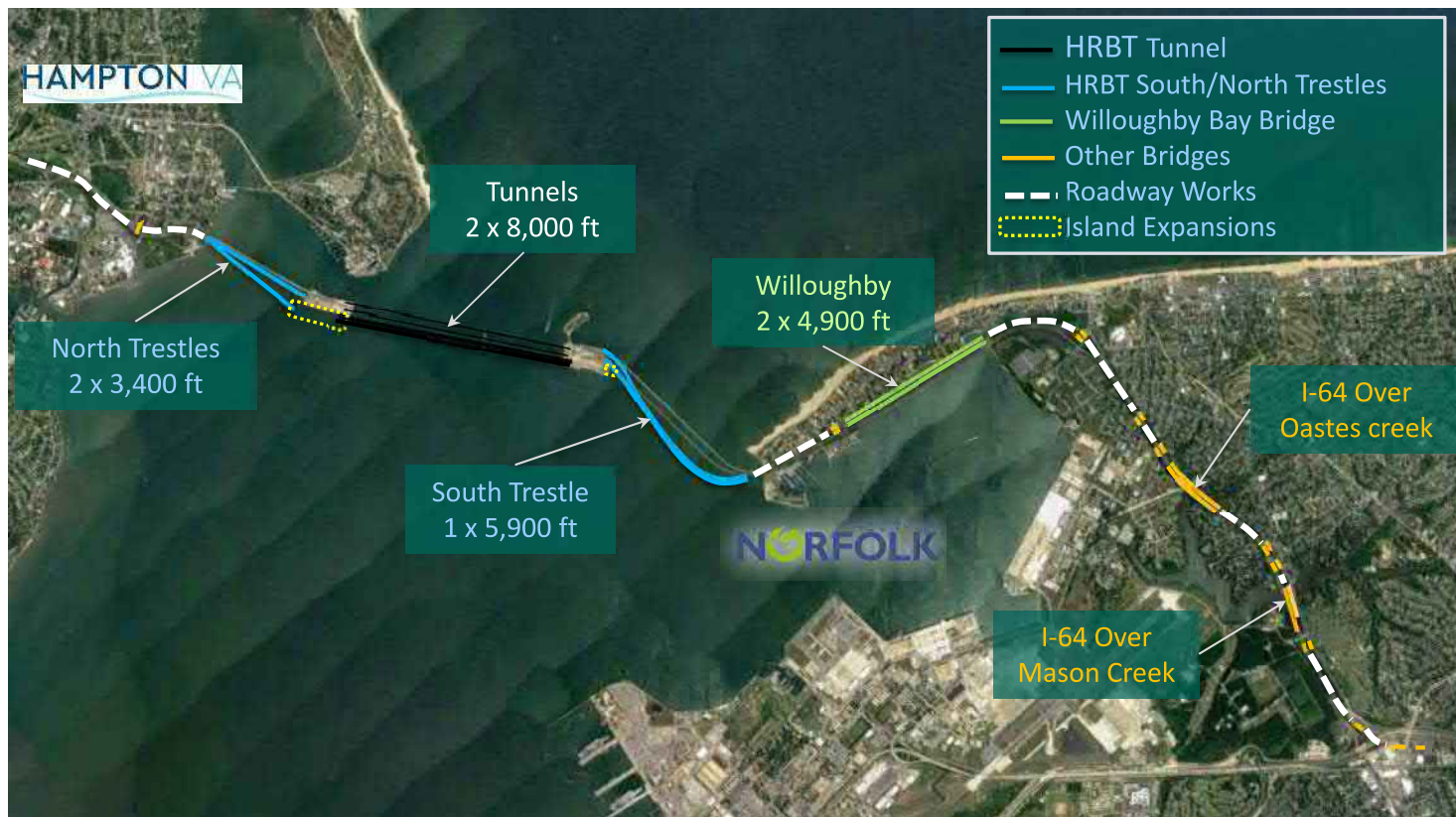


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Agenda



- Welcome/Introductions
- Meeting Objectives
- Navigation Safety Risk Assessment (NSRA) Part I
 - Significant findings of marine traffic survey
 - Historic marine casualty review
- Tunnel Construction Plan (TCP)
 - Expected construction fleet
 - Severe Weather Plan
 - Anchor, mooring, and safe harbor locations
 - Phoebus Safe Harbor Area
 - Hampton Flats anchor moorings
 - Willoughby Bay pile mooring line and barge spud area
 - Maritime Communications Plan
 - Signage and public awareness
- Navigation Safety Risk Assessment (NSRA) Part II
 - Key risks and mitigating strategies
- Stakeholder Outreach
- Roundtable Discussion



3

Meeting Objectives



- Provide maritime stakeholders with an overview of the HRBT Expansion Project, especially progress and new developments
- Facilitate consensus between HRCP Team and stakeholders on
 - Risk mitigation strategies
 - Willoughby Bay and other safety zones
 - Phoebus safe harbor area
 - Other key factors affecting construction planning
- Incorporate your input to finalize the NSRA, TCP, Severe Weather Plan, and Maritime Communications Plan

4

Marine Traffic Survey

- Accounts for all vessel traffic
- Segments traffic by size, type, and time
- Includes the waterway areas over the tunnel, tunnel approaches, other areas in which on-water construction, staging, or storage may occur (such as anchorages)

Changes in Vessel Movements

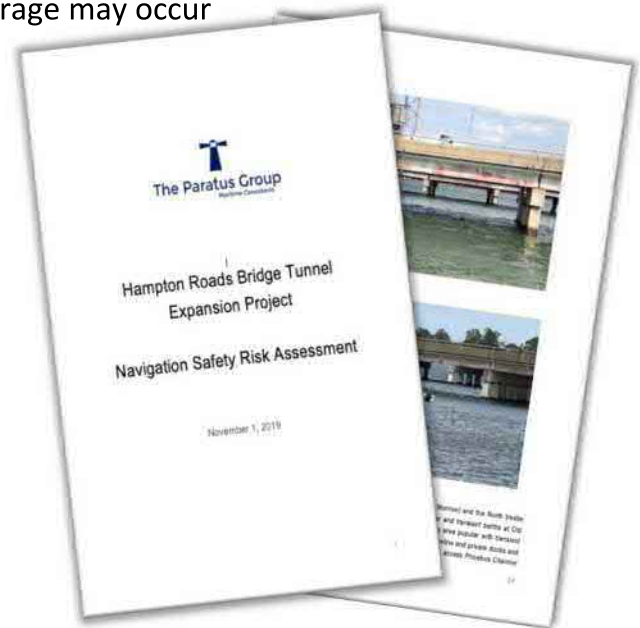
- Analysis of likely vessel movement changes due to project
- Sensitivity analysis
- Recovery time to return to normal operations

Weather Conditions

- Any navigation related impacts due to tide, current, weather and seasonal storms

Marine Casualty Assessment

- Assessment of historic casualties
- Assessment of marine casualties for disruption periods
- Assessment of marine casualties for recovery periods



5

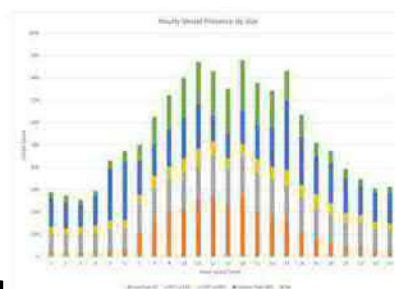
Objectives of the NSRA and TCP



- **Provide comprehensive understanding of current and forecasted vessel traffic**



- **Identify best/least disruptive times to schedule movement of construction vessels**

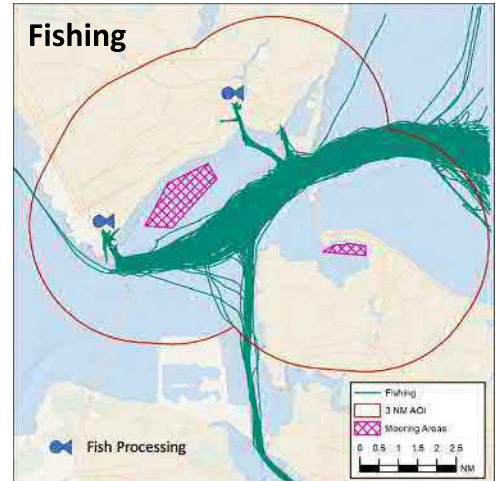
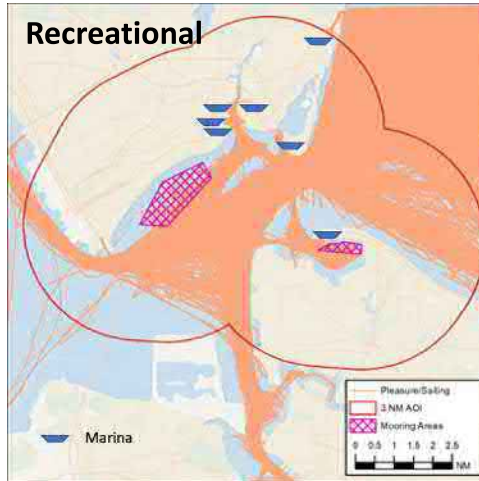
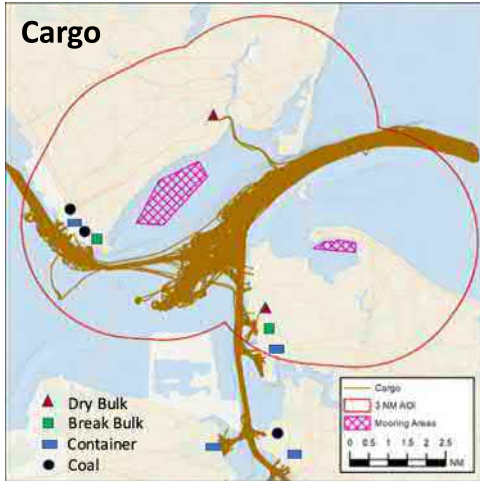
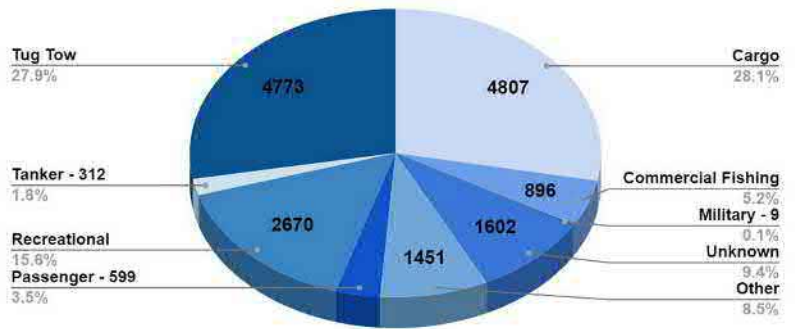


- **Identify risk mitigating measures to address environmental hazards to navigation**



Vessel Transits Through HRBT Complex

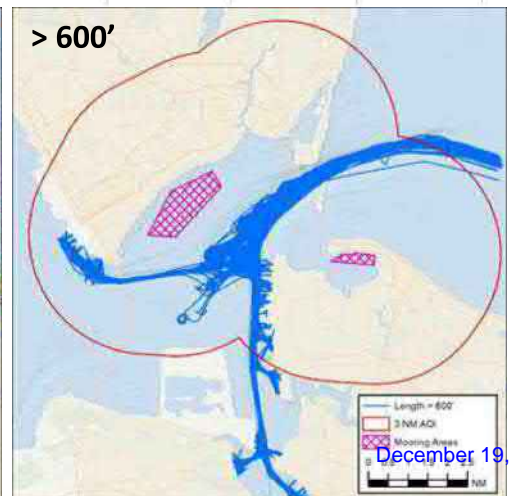
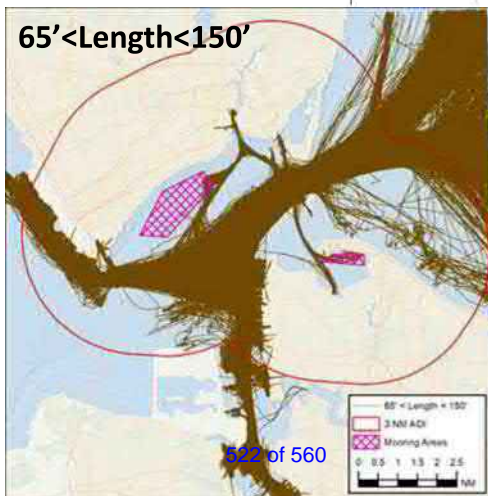
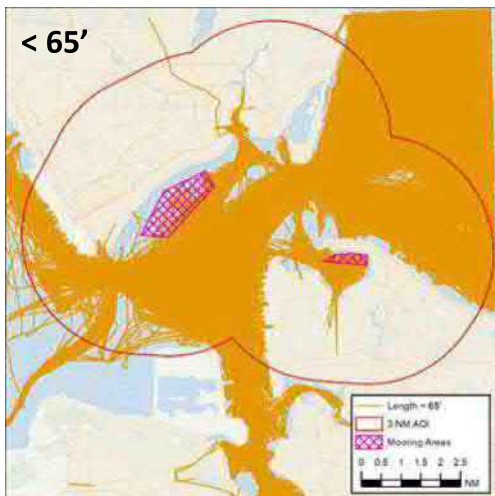
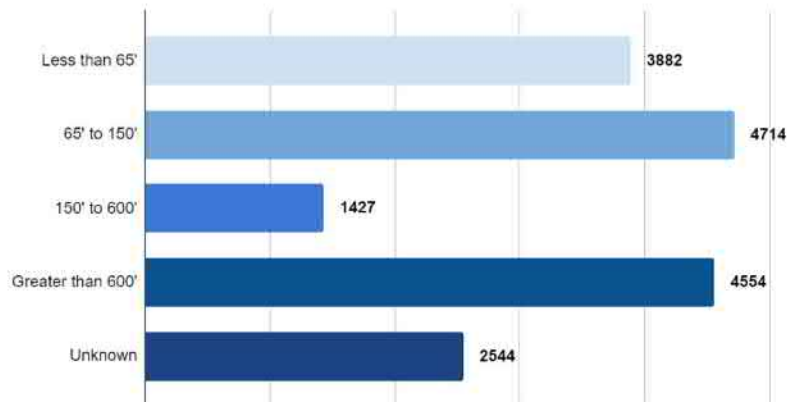
Transits by Vessel Type



Source: 2017 AIS Data

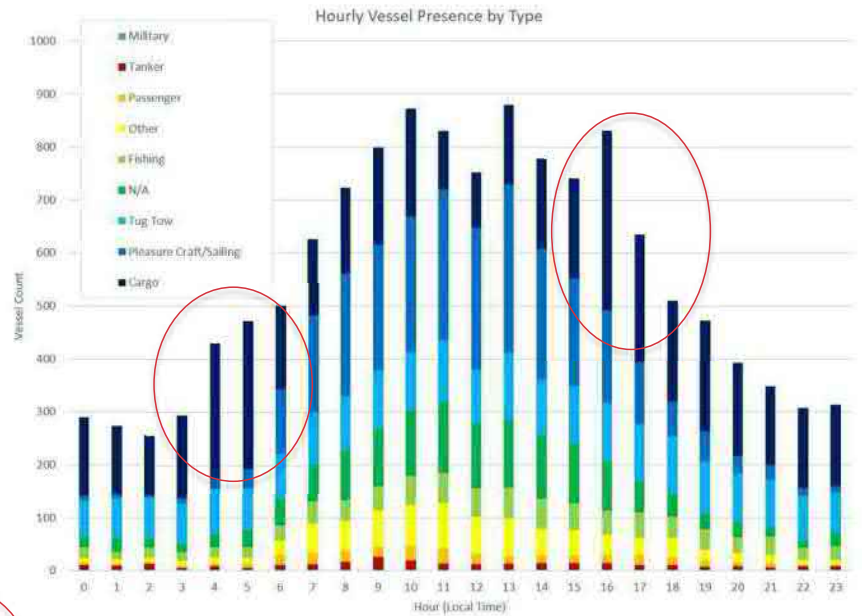
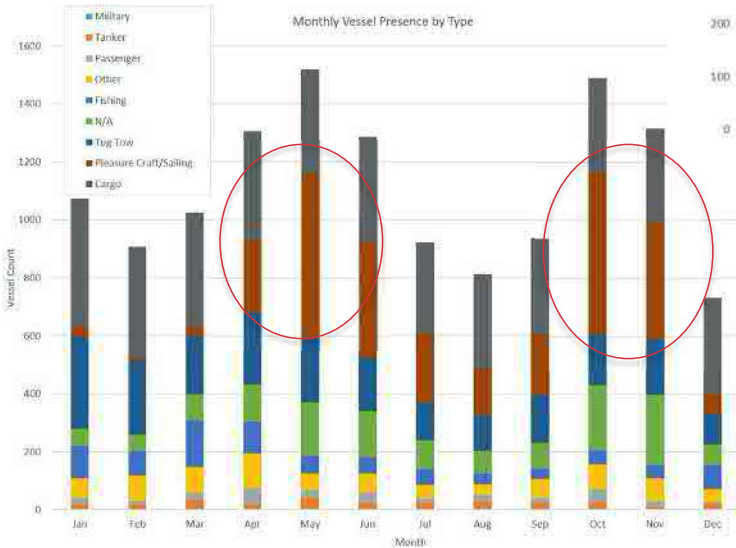
Transits by Vessel Size

Number of Transits vs. Vessel Size

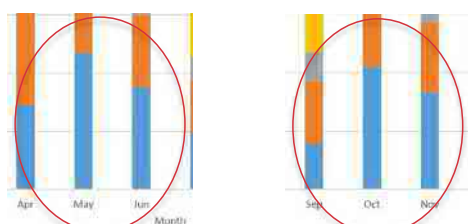
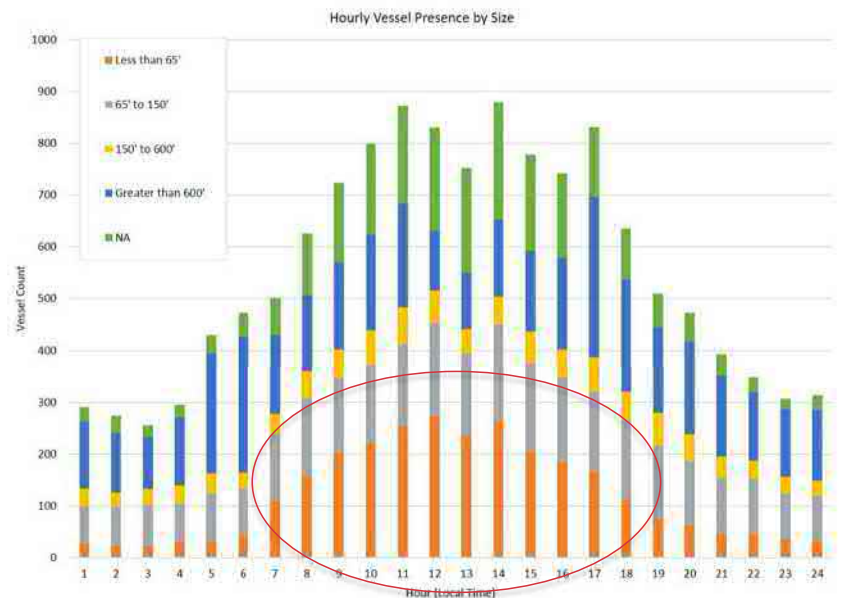


Source: 2017 AIS Data

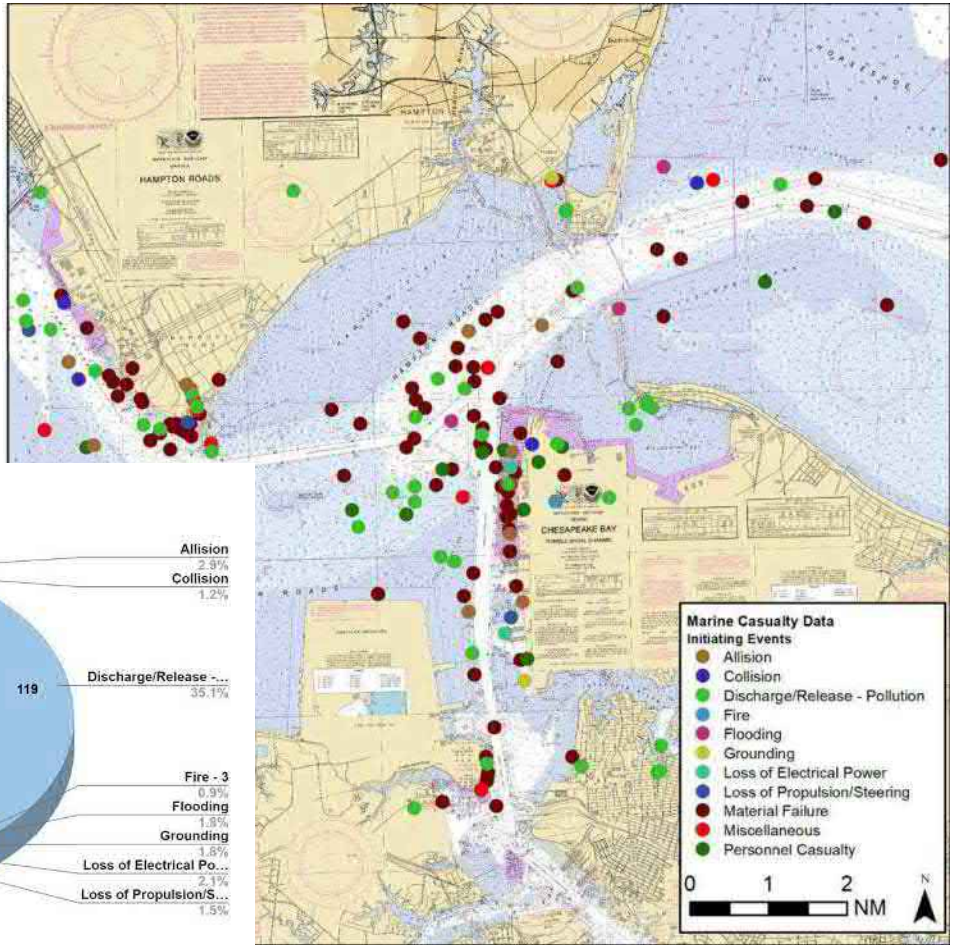
Transits by Type and Time



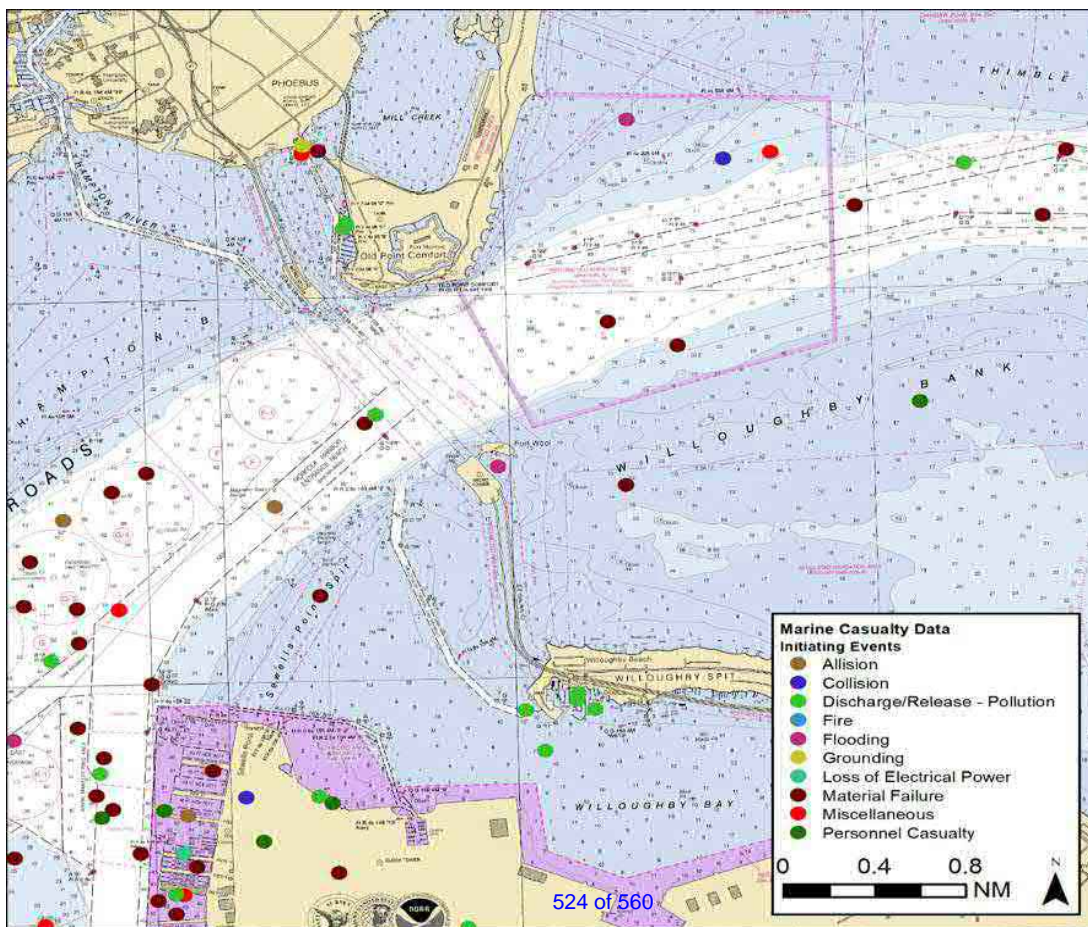
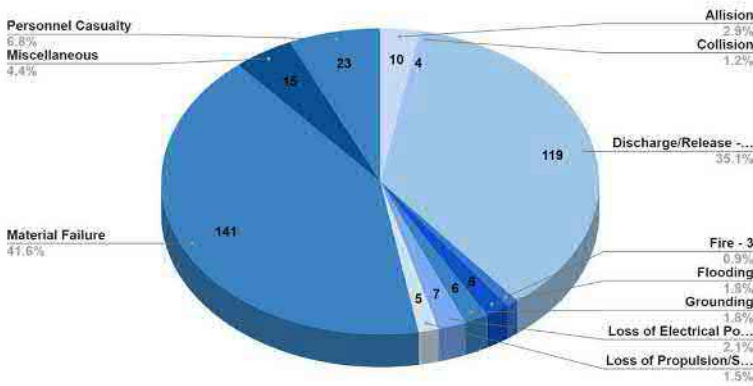
Transits by Size and Time



- USCG Sector CGBI
- Oct 2009 – Sept 2019
- 338 Reportable Marine Casualties
- 33 Serious Marine Incidents
- Investigations
 - 114 Informal, 1 formal
- VA DGIF



Marine Casualties by Type 2009-2019





TCP– Expected Construction Fleet



■ North Trestle – Preliminary Data

TOTAL NUMBER OF BARGES = 18

Marine Activity	Barge Size Approx	Type of Barge/Vessel	Quantity	Transits	Mooring Type	Nighttime Ops	Materials Type
Install Piles	200' x 72'	4100 Ringer Crane Barge or Similar	1	Mob/Demo b	Spuds	No	54 " Concrete Cylinder Piles
Deliver Piles	180' x 54'	Deck barge with stanchions	2	10	Alongside Crane Barge	No	54 " Concrete Cylinder Piles
Install Precast Pier Caps	200' x 72'	4100 Ringer Crane Barge or Similar	2	Mob/Demo b	Spuds	Yes	Precast Concrete
Deliver Pier Caps	180' x 54'	Deck barge with stanchions	1	5	Alongside Crane Barge	Yes	Precast Concrete
Construct Pier Cap Closures	140' x 60'	Crane barge, 240ton or similar	1	Mob/Demo b	Alongside Crane Barge	Yes	Cast-in-place Concrete
Deliver Precast Girders	180' x 54'	Deck barge with stanchions	2	8	Alongside Crane Barge	Yes	Precast Concrete Girders
Install Precast Girders	200' x 60'	Barge/Crawler Crane 330 ton	2	Mob/Demo b	Spuds	Yes	Precast Concrete Girders
Deliver Superstructure/Deck	140' x 45'	Deck barge	2	2	Alongside Crane Barge	Yes	Deck Rebar/Deck Pans/Etc
Install Superstructure Deck	140' x 60'	Crane barge, 240ton or similar	1	Mob/Demo b	Spuds	Yes	Deck Rebar/Deck Pans/Etc
Temporary Work Trestle							
Deliver Piles	180' x 54'	Deck barge with stanchions	1		Spuds/Anchors	No	54 " Concrete Cylinder Piles
Deliver Pier Caps	180' x 54'	Deck barge with stanchions	1		Spuds/Anchors	No	Precast Concrete
Deliver Girders	180' x 54'	Deck barge with stanchions	1		Spuds/Anchors	Yes	Precast Concrete Girders
Delivery Deck Rebar	140' x 45'	Deck barge	1		Spuds/Anchors	No	Deck Rebar

Note:
Not all the barges will be working at the same time.
Most of them will be in operation for less than 10 months.

■ North Island Expansion – Preliminary Data

TOTAL NUMBER OF BARGES = 19

Marine Activity	Barge Size Approx	Type of Barge/Vessel	Quantity	Transits	Mooring Type	Nighttime Ops	Materials Type
Dredge Unsuitable Materials	200' x 60'	Mechanical Dredge/Crane	1	Mob/Demob	Spuds	Yes	N/A
Dredge Unsuitable Materials	260' x 55'	Open Hopper Barge, 3300 Net Tons	3	24	Alongside Dredge/Pier	Yes	Dredge Spoils
Install Sheet Piles	180' x 60'	Deck Barge with Crawler Crane	1	Mob/Demob	Spuds/Anchors	No	N/A
Install Sheet Piles	140' x 45'	DeckBarge	1	2	Alongside Crane Barge	No	Steel Sheet Piles AZ
Island Expansion Rock Placement	200' x 60'	Crane Barge Duty Cycle	3	Mob/Demob	Spuds/Anchors	Yes	N/A
Island Expansion Rock Placement	180' x 54'	Deck Barge with Concrete Deck and Bin Walls *	2	129	Alongside Crane Barge	Yes	Bund (gravel/crushed rock)
Island Expansion Rock Placement	180' x 54'	Deck Barge with Concrete Deck and Bin Walls *	2	57	Alongside Crane Barge	Yes	Armor Stone W50 = .65 tons
Island Expansion Rock Placement	180' x 54'	Deck Barge with Concrete Deck and Bin Walls *	1	27	Alongside Crane Barge	Yes	Underlayer Rock = 100lb
Island Expansion Sand Transport	320' x 60'	Deck Barge (Vulcan Materials) 5000net tons	2	47	Offsite	Yes	Bundt
Island Expansion Sand Placement	200' x 40'	Deck barge with long reach excavator Cat385 and Conveyor	1	Mob/Demob	Spuds	Yes	N/A
Island Expansion Sand Placement	220 x 60'	Deck Barge with Concrete Deck and Bin Walls *	2	158	Alongside excavator barge	Yes	Sand Fill
* Note: Barges are similar and interchangeable							

Note:
Not all the barges will be working at the same time.

■ South Island Expansion - Preliminary Data

TOTAL NUMBER OF BARGES = 14

Marine Activity	Barge Size Approx	Type of Barge/Vessel	Quantity	Transits	Mooring Type	Nighttime Ops	Materials Type
Construct South Island TBM Dock	200' x 60'	Deck barge with Crane, 300 ton crawler	1	Mob/Demob	Spuds/Anchors	No	N/A
Construct South Island TBM Dock	180' x 54'	Deck barge with quay pipe piles, 1800 net ton cap.	1		Alongside Crane Barge	No	36" steel pipe piles
Construct South Island TBM Dock	180' x 54'	Deck barge with quay pre-cast concrete, 1800 net ton cap.	1		Alongside Crane Barge	No	Pre-cast Conc. Caps/Deck
TBM Delivery	220' x 60'	Deck Barge, ABS/Classed, 2200 net ton cap.	1		Alongside Port/Quay	Yes	TBM Disassembled
Tunnel Precast Liners (Segments)	180' x 54'	Deck Barge, 1800 net ton cap.	2		Alongside CPS dock/Quay	Yes	Pre-cast tunnel segments
TBM Spoils Disposal	260' x 55'	Hopper barge, open, 3300 net tons	4		Conveyor Pier	Yes	TBM drilled spoils
TBM Shaft Excavation	260' x 55'	Hopper barge, open, 3300 net tons	1		Conveyor Pier	Yes	TBM Shaft Ex. Spoils
Install Settlement Reduction Piles	140' x 60'	Deck Barge with Crawler Crane, 200-260 ton	1	Mob/Demob	Spuds	No	
Install Settlement Reduction Piles 24"	140' x 45'	Deck Barge with stanchions	1		Alongside Crane Barge	No	24" steel pipe piles
Install Settlement Reduction Piles 30"	140' x 45'	Deck Barge with stanchions	1		Alongside Crane Barge	No	30" steel pipe piles

Note:
Not all the barges will be working at the same time.

■ South Trestle - Preliminary Data

TOTAL NUMBER OF BARGES = 34

Marine Activity	Barge Size Approx	Type of Barge/Vessel	Quantity	Transits	Mooring Type	Nighttime Ops	Materials Type
Transport Piles	180' x 54'	Deck barge with stanchions	3	17	Alongside Crane Barge	No	54" Concrete Cylinder Piles
Drive Piles	200' x 72'	4100 Ringer Crane Barge or Similar	1	Mob/Demo b	Spuds/Anchors	No	54" Concrete Cylinder Piles
Transport and Install Template	140' x 60'	Crane barge, 240ton or similar	1	Mob/Demo b	Spuds/Anchors	No	Pile Template
Transport Precast Pier Caps	180' x 54'	Deck barge	2	14	Alongside Crane Barge	No	Precast Concrete
Install Precast Caps	200' x 72'	200' x 72'	1	Mob/Demo b	Spuds/Anchors	Yes	Precast Concrete
Construct Pier Cap Closures	140' x 60'	Crane/barge with 240 ton Crawler	1	Mob/Demo b	Spuds	Yes	Cast-in-place Concrete
Transport Girders	180' x 54'	Deck barge	3	32	Alongside Crane Barge	Yes	Precast Concrete Girders
Install Girders	200' x 60'	Barge/Crawler Crane 330 ton	2	Mob/Demo b	Spuds	Yes	Precast Concrete Girders
Transport Superstructure	180' x 54'	Deck Barge	2	5	Alongside Crane Barge	Yes	Deck Rebar
Construct Superstructure	140' x 60'	Crane barge, 240ton or similar	1		Spuds		
Temporary MOT Trestles							
Deliver Piles	180' x 54"	Deck Barge with stanchions	2		Alongside Crane Barge	No	54" Concrete Cylinder Piles
Install Piles	200' x 72'	4100 Ringer Crane Barge or Similar	1		Alongside Crane Barge		
Deliver Precast Pier Caps	180' x 54'	Deck barge	2		Alongside Crane Barge		Precast Concrete
Install Precast Pier Caps	200' x 72'	4100 Ringer Crane Barge or Similar	1		Alongside Crane Barge	No	
Construct Pier Cap Closures	140' x 60'	Crane barge, 240ton or similar	2		Alongside Crane Barge	Yes	Cast-in-place Concrete
Deliver Core Slabs	180' x 54"	Deck Barge with stanchions	2		Alongside Crane Barge		Precast Concrete Slabs
Hollow Core Slabs (TBD)	140' x 45'	Deck barge	1		Alongside Crane Barge	Yes	
Temporary Work Trestle							
Deliver Piles	180' x 54'	Deck barge with stanchions	2		Spuds/Anchors	No	54" Concrete Cylinder Piles
Deliver Pier Caps	180' x 54'	Deck barge with stanchions	1		Spuds/Anchors	No	Precast Concrete
Deliver Girders	180' x 54'						
Deliver Deck Rebar	180' x 54"						

Note:
Not all the barges will be working at the same time.
Half of them will be there for a short term duration (< 6 months)

TCP– Expected Construction Fleet



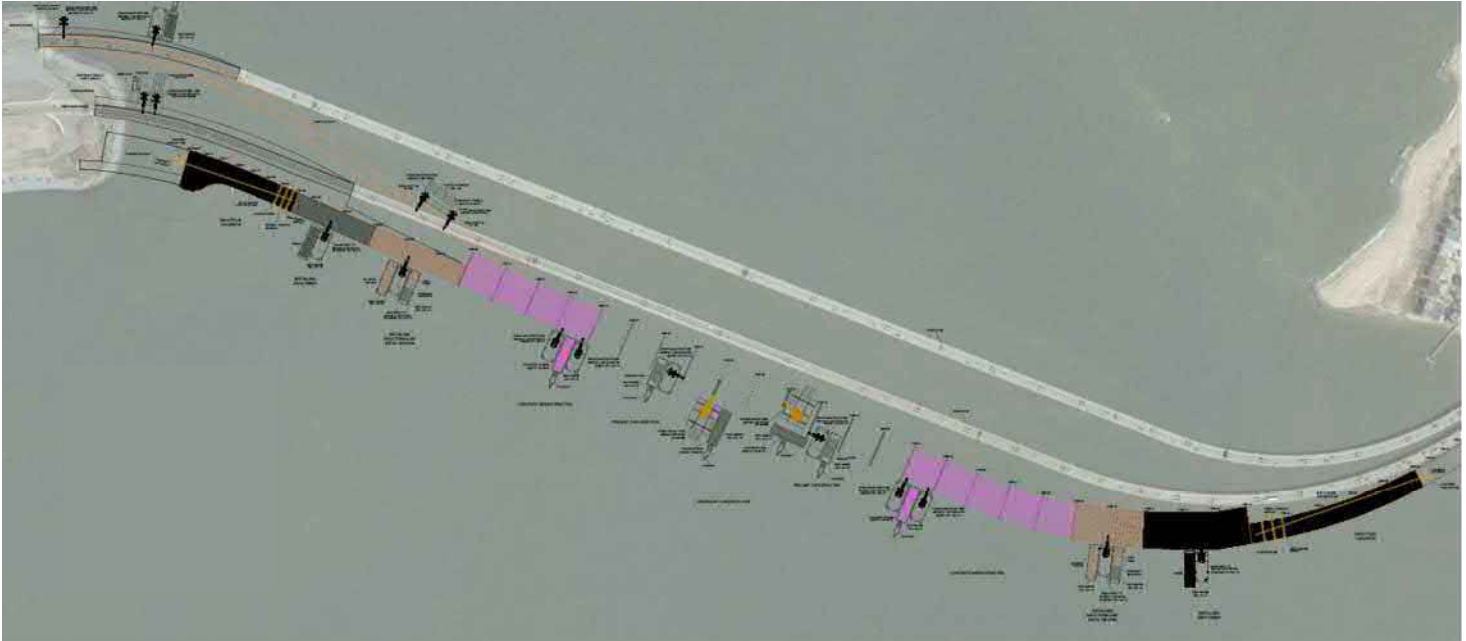
■ Willoughby Bay Bridge - Preliminary Data

TOTAL NUMBER OF BARGES = 27

Marine Activity	Barge Size Approx	Type of Barge/Vessel	Quantity	Transits	Mooring Type	Nighttime Ops	Materials Type
Deliver Piles	180' x 54'	Deck barge with stanchions	1		Alongside Crane Barge		30" Square Concrete Piles
Install Piles	200' x 72'	4100 Ringer Crane Barge or Similar	5		Alongside Crane Barge	No	
Deliver Precast Pile Caps	180' x 54'	Deck barge with stanchions	1		Alongside Crane Barge		Precast Concrete
Install Precast Pier Caps	200' x 72'	4100 Ringer Crane Barge or Similar	2		Alongside Crane Barge	No	
Deliver Girders	180' x 54'	Deck barge with stanchions	1		Alongside Crane Barge		Precast Concrete Girders
Install Girders	200' x 60'	Barge/Crawler Crane 330 ton	5		Alongside Crane Barge	Yes	
Deliver Superstructure/Deck	140' x 45'	Deck barge	1		Alongside Crane Barge		Deck Rebar
Construct Superstructure/Deck	140' x 60'	Crane barge, 240ton or similar	3		Spuds	Yes	
Temporary Work Trestle							
Deliver Piles	180' x 54'	Deck barge with stanchions	1		Spuds/Anchors	No	30" Square Concrete Piles
Deliver Pier Caps	180' x 54'	Deck barge with stanchions	1		Spuds/Anchors	No	Precast Concrete
Deliver Girders	180' x 54'	Deck barge with stanchions	1		Spuds/Anchors	Yes	Precast Concrete Girders
Delivery Deck Rebar	140' x 45'	Deck barge	1		Spuds/Anchors	No	Deck Rebar
Jumping Work Trestle							
Deliver Piles	180' x 54'	Deck barge with stanchions	1		Spuds/Anchors	No	30" Square Concrete Piles
Deliver Pier Caps	180' x 54'	Deck barge with stanchions	1		Spuds/Anchors	No	Precast Concrete
Deliver Girders	180' x 54'	Deck barge with stanchions	1		Spuds/Anchors	Yes	Precast Concrete Girders
Delivery Deck Rebar	140' x 45'	Deck barge	1		Spuds/Anchors	No	Deck Rebar

Note:
Not all the barges will be working at the same time.

■ South Trestle – Barges General Arrangement - Preliminary Drawing



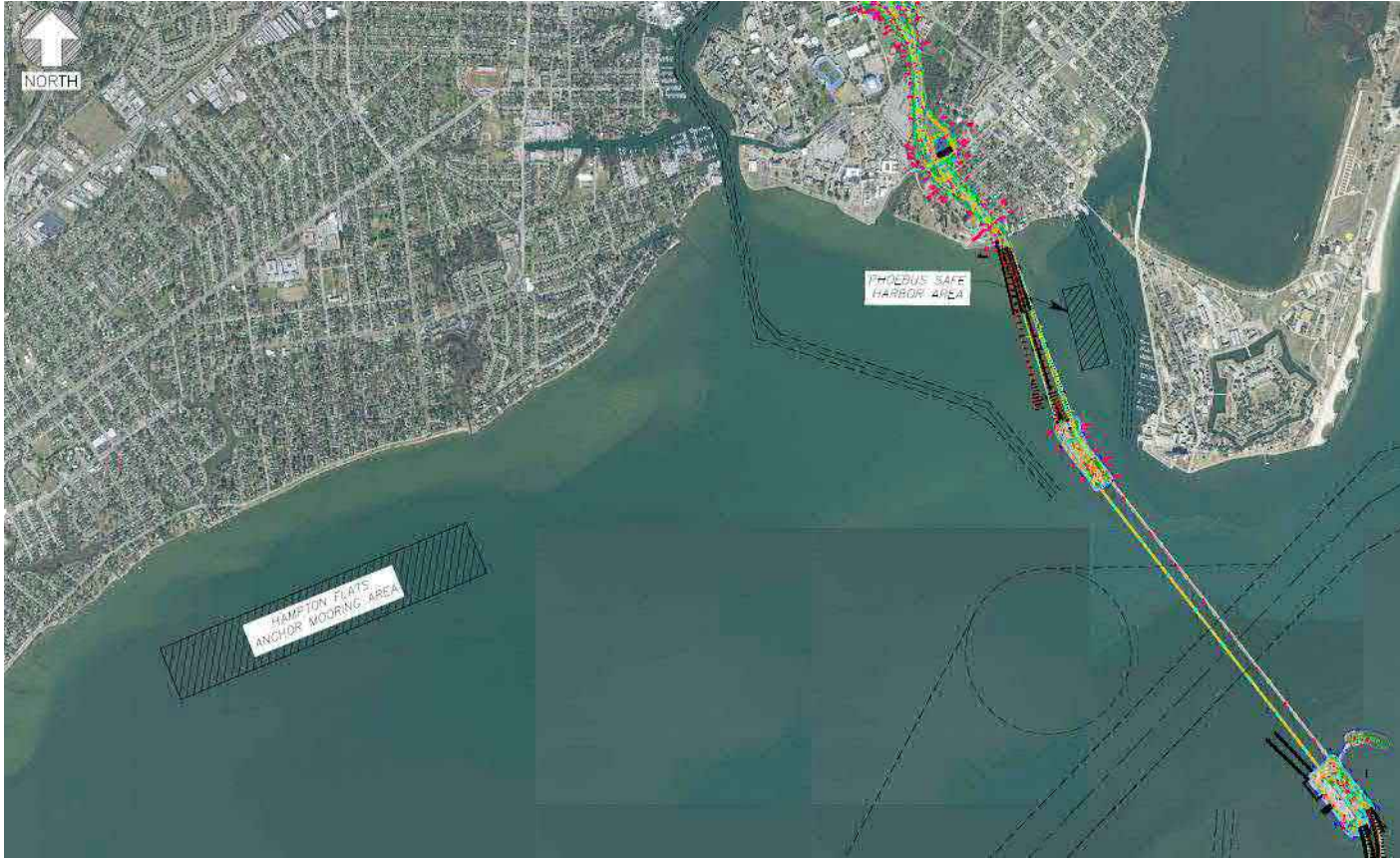
TCP - Severe Weather Plan



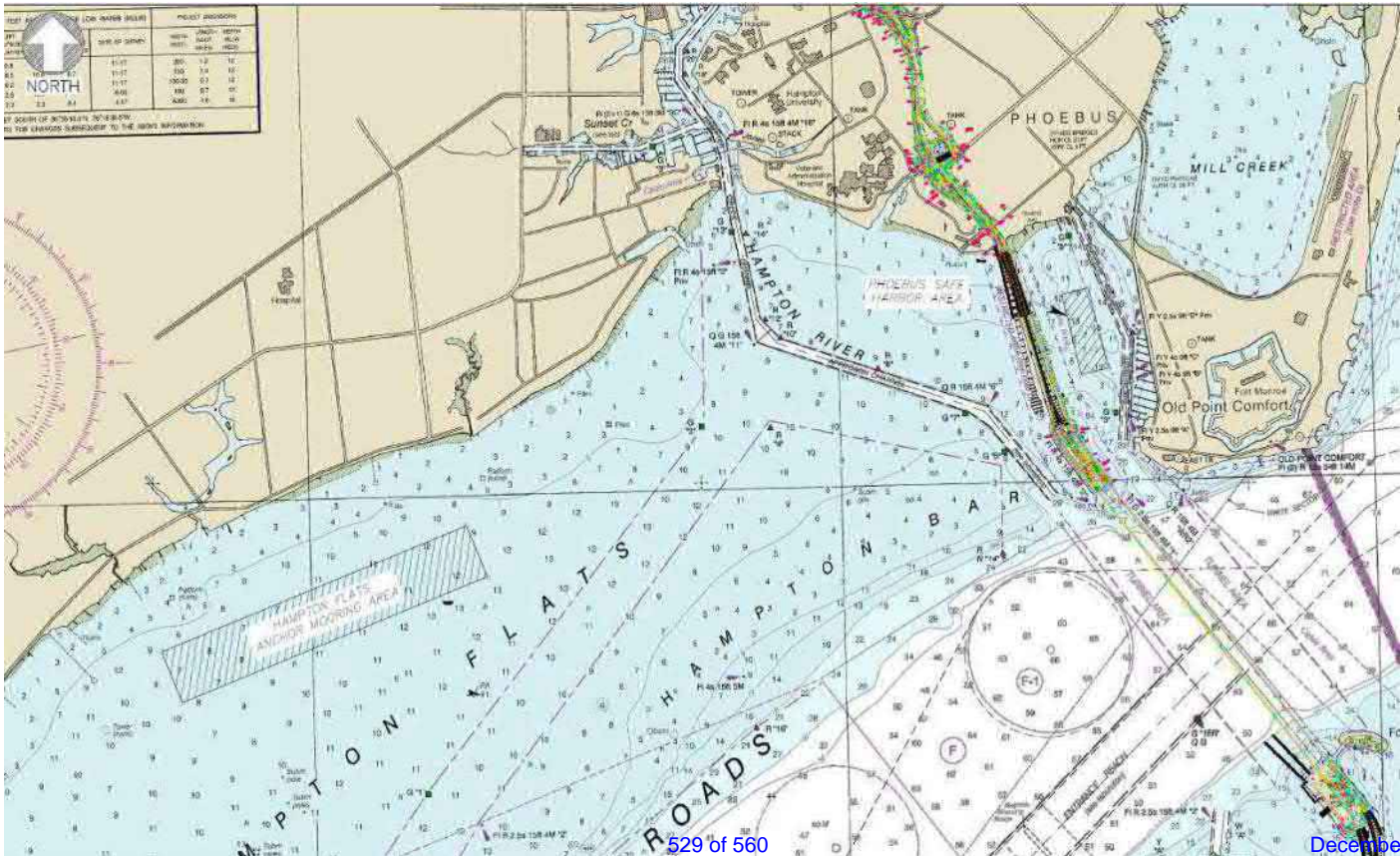
- Weather Protocols will be defined for the different weather conditions:
 - High Winds
 - Electrical Storms
 - Tornadoes
 - Waterspouts
 - Swell
 - Hurricanes
- We will be following the COPT H.R. Port Conditions
- Crewed Tugboat onsite 24/7
- Safe Harbor Areas
- Marine Equipment Staging & Safe Harbor Plan



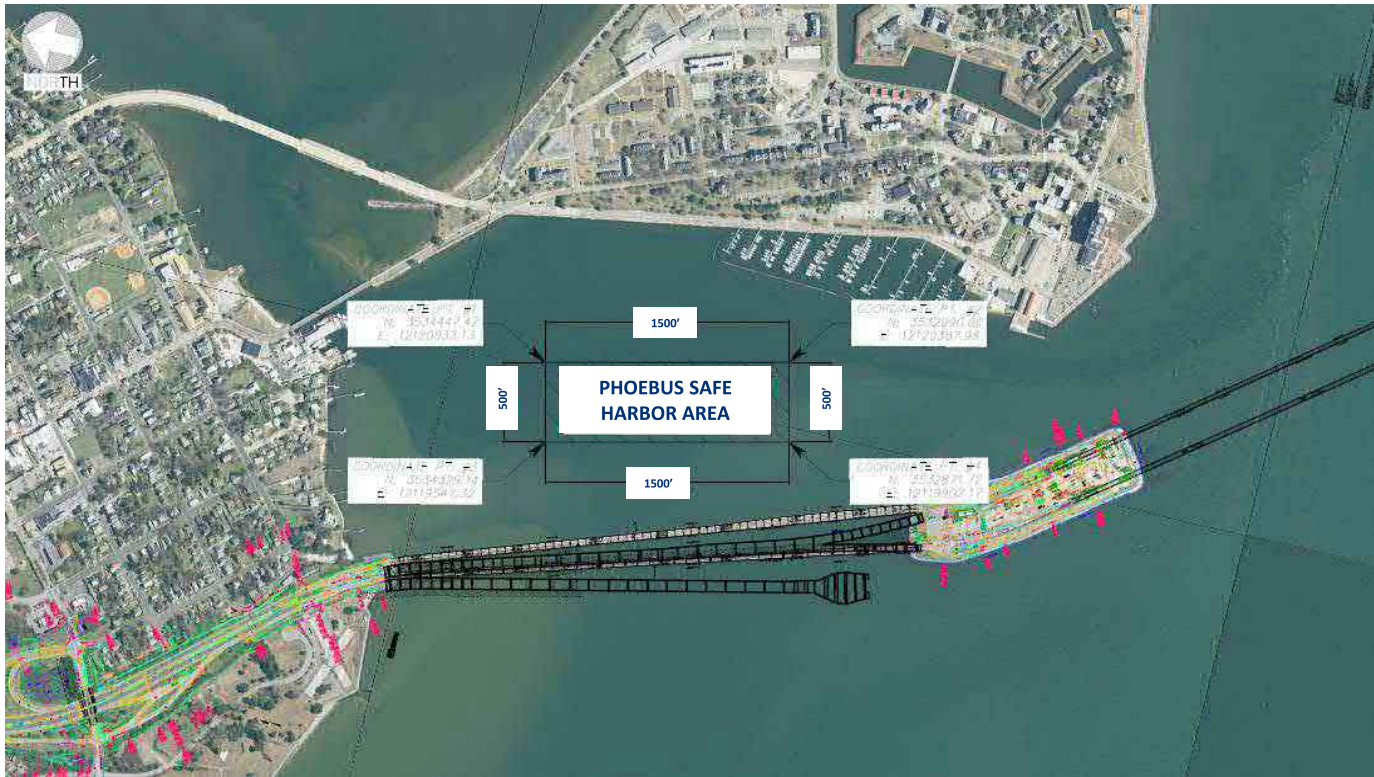
HAMPTON Overview



HAMPTON Overview



- Phoebus Safe Harbor Area – During Severe Weather Events
- Phoebus Safe Harbor to Willoughby Safe Harbor = 4.25 Miles



- Hampton Flats Anchor Moorings **(Not for Severe Weather)**
 - Documented inspections of anchor moorings and mooring lines
 - Engineered breakaways and new hardware

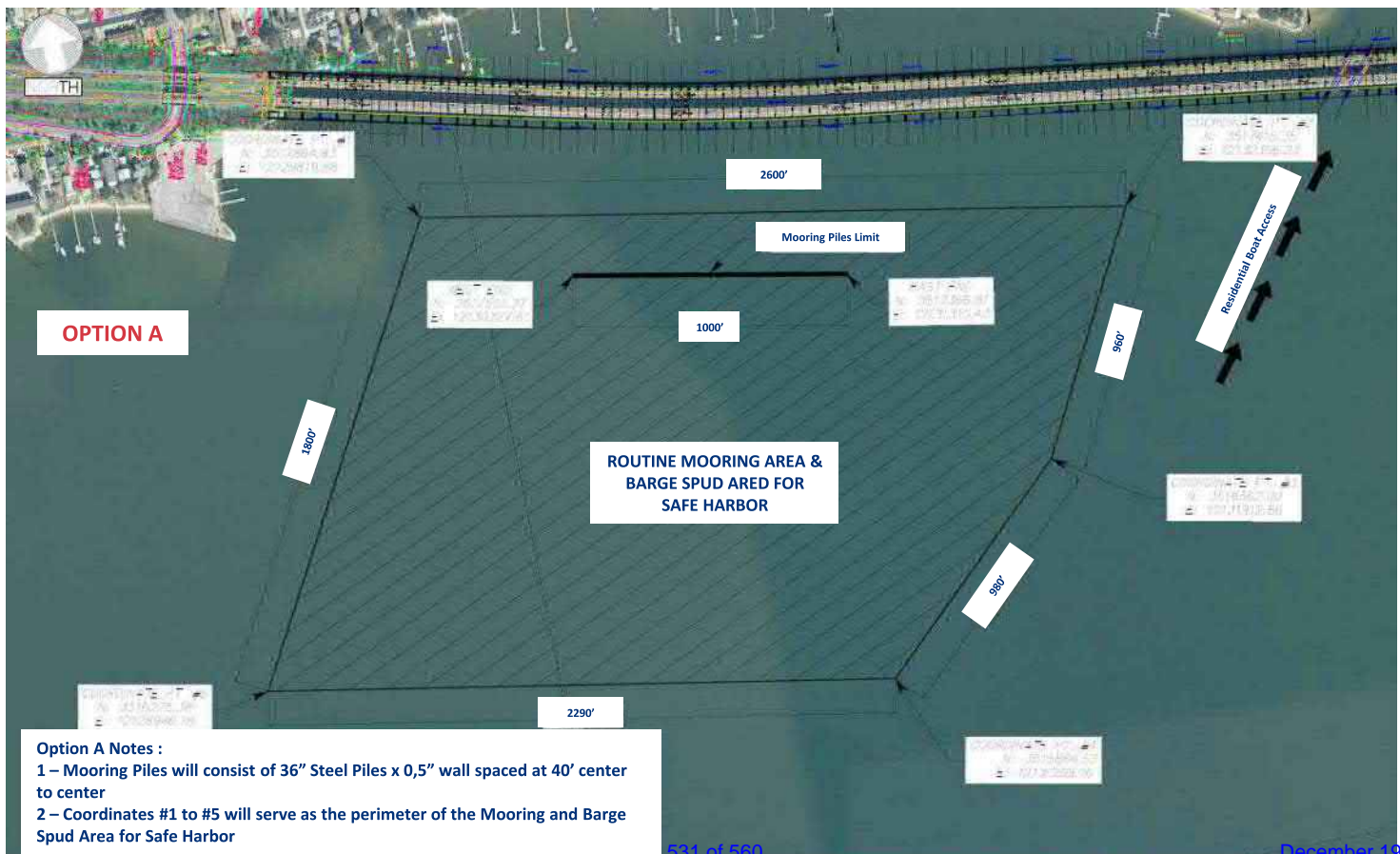


■ Willoughby Bay Pile Mooring Line and Barge Spud Area

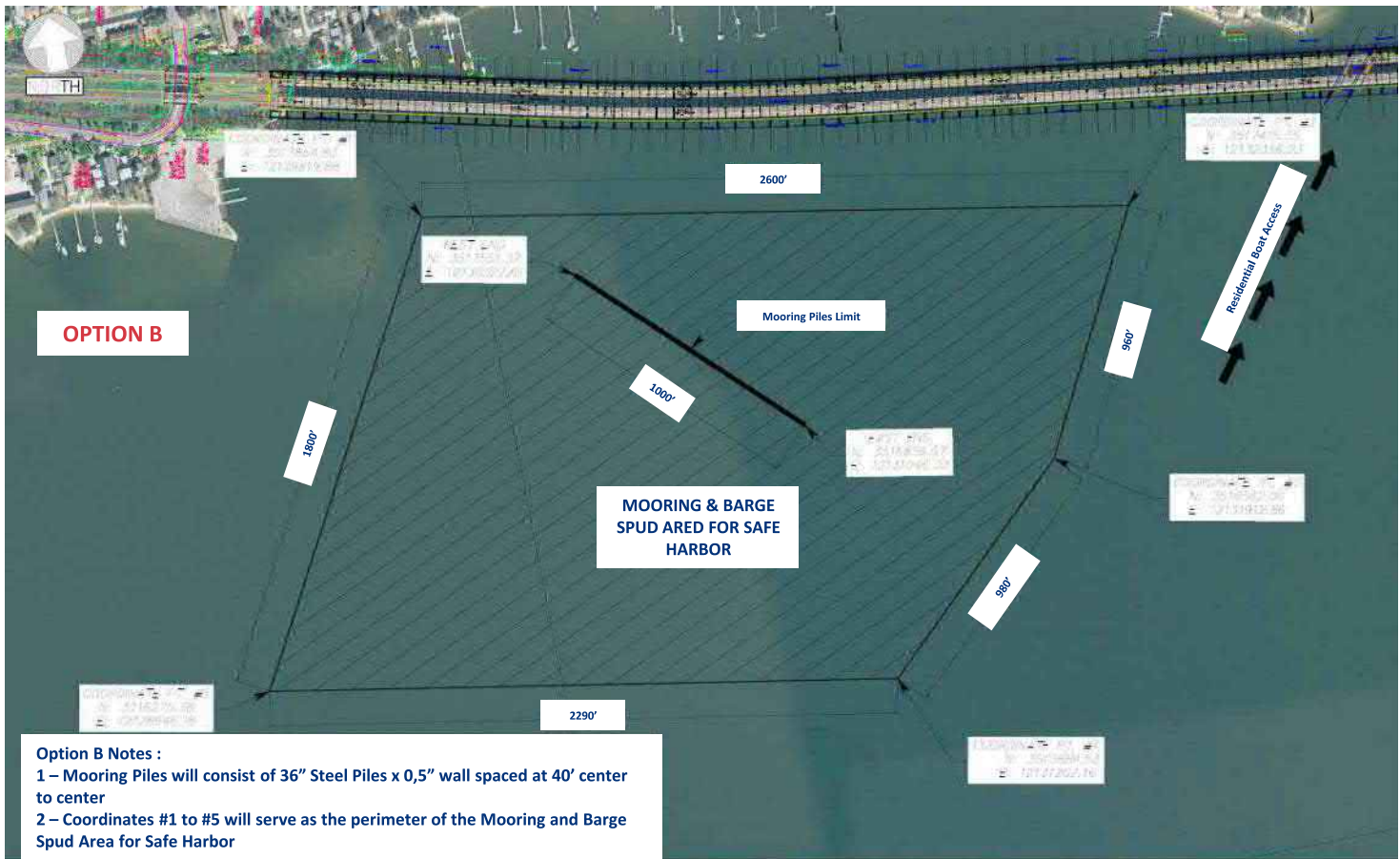
- Lighting and Private Aids to Navigation (PATON)
- Maintain a dedicated passage for recreational boats heading underneath WBB into the Spit.
- Hear concerns (if any) from US Navy Operations in Willoughby Bay – i.e., SPAWAR or Helicopter Mine Countermeasures Squadron Fourteen (HM-14)



TCP– Anchor & Mooring Locations



Option A Notes :
 1 – Mooring Piles will consist of 36” Steel Piles x 0,5” wall spaced at 40’ center to center
 2 – Coordinates #1 to #5 will serve as the perimeter of the Mooring and Barge Spud Area for Safe Harbor



TCP– Maritime Communications Plan



- The purpose of the document is to establish all maritime communications protocols that will be used during HRBT marine work.
- A few of the items included in the maritime communications plan:
 - Initial Notice to Mariners
 - Notice to Mariners for Critical Operations
 - HRCP Points of Contacts – single phone 24/7
 - Daily Emails
 - Monthly Progress Updates
 - Radio Communication onboard Boats and Barges
 - AIS Communication
 - Safety Boats/Security Boats/Work Boats
- Signage and Public Awareness

Risk →		Mitigation Strategy ↓								Comments
		M	M	L	L	L	L	L	L	
	Jet grouting trestles near navigation			✓		✓	✓			Negates impact to deep draft transits
	Moored vessels in reduced visibility	✓	✓	✓	✓	✓	✓	✓	✓	Weekly communication with professional mariners
	Vessels crossing navigable channels		✓			✓	✓		✓	Reduces conflict with traditional vessels transits
	North Island ops near Hampton Creek Channel	✓	✓	✓	✓	✓	✓	✓	✓	Comms to deconflict construction ops w/local vessels
	Impact on local marinas and waterways users		✓	✓	✓	✓	✓		✓	Supplements lights & radar for collisions avoidance
	Impact on regular Marine Events		✓	✓	✓	✓	✓		✓	Rules reduce risk of collision & impacts to navigation
	Wake impacts on construction operations			✓						Construction vsls will not interfere w/vsls restricted to channels
	Congestion of barges in Willoughby Bay		✓		✓	✓			✓	Ensures visibility of vsls at anchor/moored
			✓		✓	✓			✓	Increases visibility of anchored/moored vsls
				✓	✓					Provides space between construction ops and channel
		✓	✓	✓	✓	✓	✓	✓	✓	Periodic mtg of stakeholders to minimize impacts of project
		✓								Increases visibility of piers for collision avoidance
					✓	✓				Preemptive comms minimize impact on traditional events
		✓	✓		✓					Work with USCG to establish where appropriate

NSRA Part II – Mitigation Measures

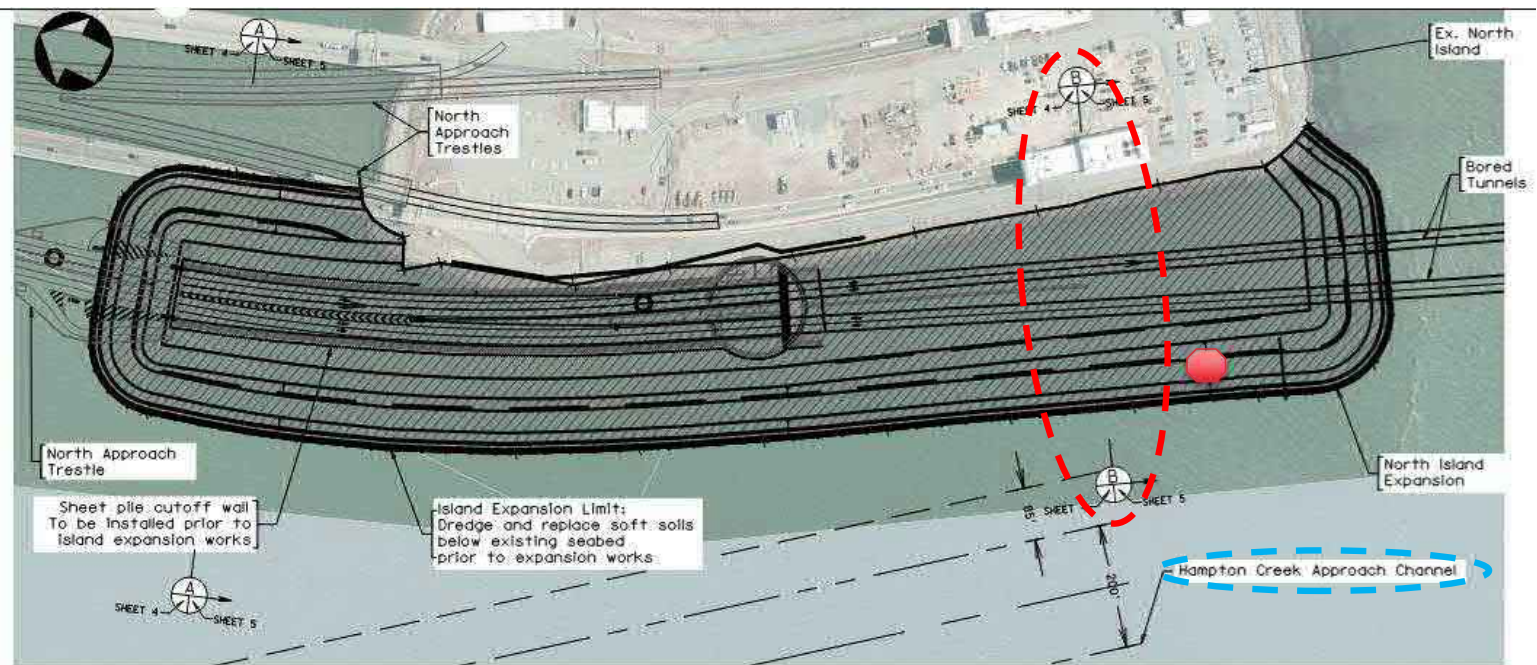


- TBM
- Rules of the Road
- Deck Lighting
- AIS
- Communications/Outreach
 - Signage
 - LNM
 - Email
 - Outreach to Marine Event organizers
- Temporary realignment of Hampton Creek Approach Channel
- Lighting of jet trestles

■ North Island Expansion – Barge placement



Hampton Creek Approach Channel :
 Relocate Aid to Navigation (ATON) light R2 and temporarily re-align of channel by 22 degree southwest – only during construction. Upon end of construction, ATON #R2 would be repositioned to its original location



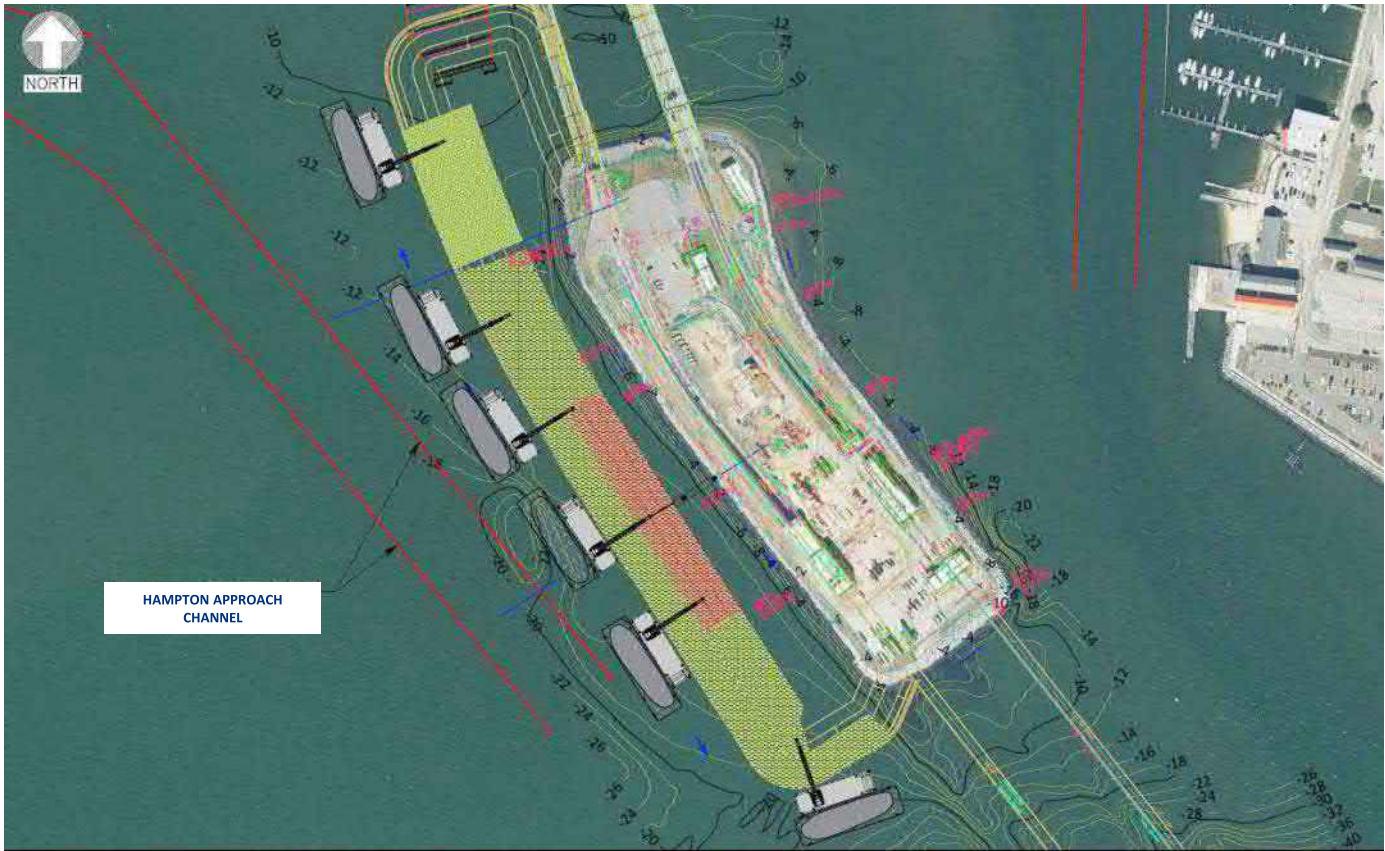
NORTH ISLAND EXPANSION - PLAN
 Scale: 1" = 250'

182'



534 of 560

■ North Island Expansion - Barge placement



Vessels Length Greater than 600 feet



Vessel Length Less than 65 feet



Lighting: 33 CFR 67

Structure classification to be determined by USCG D5

Stakeholder Outreach



■ Cities of Norfolk & Hampton

- CON: Second project progress meeting with city officials held in Oct – next meeting to be held in Nov to address installation of site office in Willoughby Spit
- COH: First meeting with city officials held in July – second progress meeting to be held in Nov and to address installation of site offices on North and South Islands
- CON and COH First Responders: Project EH&S management is having regular project progress meetings with fire and rescue personnel

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■ Maritime Community

- Initial "Waterway User Survey" communication initiated in Sep
- Future communications as outlined in Maritime Communications Plan


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 - VDOT and HRCF is planning project update meetings with large employers in Hampton Roads beginning in 2020

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- **Traveling Public**
 - Once HRCF begins construction activity, VDOT and HRCF will issue travel advisories and updates via local media, social media (Twitter, Facebook) and project websites



408 Maritime Stakeholders Meeting Under Development

JPA USACE - Update Meeting Meeting Attendees and
Notes Under Development - Slides Attached






HRBT Monthly Agency Coordination Meeting



VMRC Office, Fort Munroe




11 December 2019





Agenda


- Introductions
- USCG Bridge Permit
- JPA Updates
- RFI Review
- Pile Driving and Mitigation Workshop
- VPDES Application
- Review Permitting and Construction Schedule




2



USCG Bridge Permit




- PIR Response Letter – November 22, 2019
- 2 BPAs to be issued (HRBT N/S Trestle Replacements + WBB Widening)
- 3 USCG Requests
 - Expedite all other permit issuances by March 13, 2020 to meet original BPA permit goal of April 2020
 - A statement from DEQ indicating receipt of an application for a Virginia Water Program (VWP) permit (eq. Section 401 Water Quality Certificate)
 - A statement from USACE about the 404 wetland impacts to be permitted in JPA




3



Updated Impacts




Classification	Type	September 2019 Impact Area (acres)	December 2019 Impact Area (acres)	Impact Difference
Tidal Wetlands				
E10W	Permanent	18.921	19.17	0.25
	Dredge	7.896	17.82	9.92
	Temporary	26.527	26.42	-0.11
E2RS2	Permanent	0.699	0.87	0.17
	Temporary	1.393	1.55	0.16
E2US2	Permanent	0.692	0.92	0.23
	Temporary	3.492	3.30	-0.19
E2US3	Temporary	0.002	0.01	0.01
E2EM	Permanent	2.167	2.17	0.00
	Temporary	2.743	2.82	0.08
E2SS	Permanent	0.191	0.19	0.00
	Temporary	0.071	0.07	0.00
E2FO	Temporary	0.027	0.03	0.00
SAV	Permanent	0.401	0.48	0.08
	Temporary	0.522	0.57	0.05
Tidal Wetland Total	Permanent	23.071	23.80	0.73
	Temporary	34.778	34.77	0
	Dredge	7.896	17.82	9.92




4

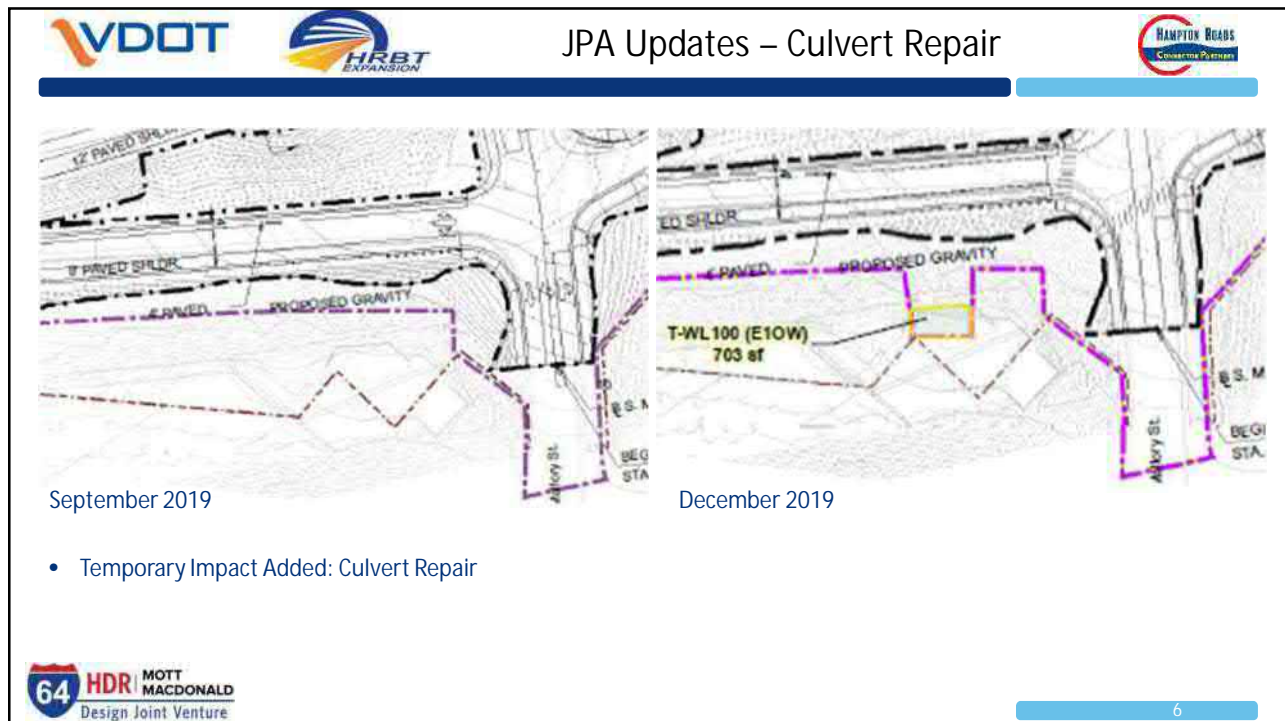
Updated Impacts



Classification	Type	September 2019 Impact Area (acres)	December 2019 Impact Area (acres)	Impact Difference
Nontidal Wetlands				
PUB	Permanent	0.110	0.16	0.05
	Temporary	0.254	0.21	-0.04
PEM	Permanent	0.266	0.28	0.01
	Temporary	0.383	0.37	-0.01
PSS	Permanent	0.364	0.36	0
	Temporary	0.042	0.04	0
PFO	Permanent	0.123	0.12	0
	Conversion	0.009	0.01	0
	Temporary	0.025	0.04	0.02
Nontidal Wetland Total	Permanent	0.863	0.93	0.07
	Conversion	0.009	0.01	0
	Temporary	0.704	0.66	-0.04
Nontidal Waters				
R2 ³	Temporary	0.006	0.01	0
	Temporary	0.006	0.01	0



5



VDOT **HRBT EXPANSION** **JPA Updates – Field Delineation** **HAMPTON ROADS**
CONSTRUCTIVE PARTNERS

- Additional impact added due to field delineation

September 2019 December 2019

64 HDR MOTT MACDONALD
Design Joint Venture

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VDOT **HRBT EXPANSION** **JPA Updates – Work Trestle Shifts** **HAMPTON ROADS**
CONSTRUCTIVE PARTNERS

- Work trestle shifted


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64 HDR MOTT MACDONALD
Design Joint Venture

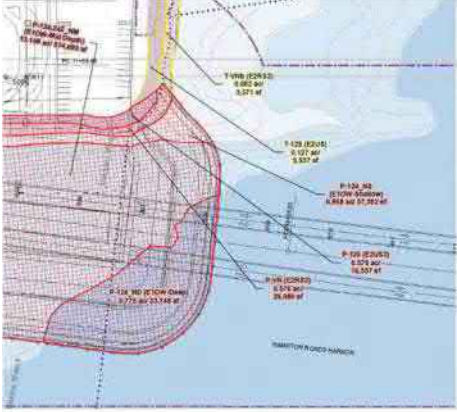
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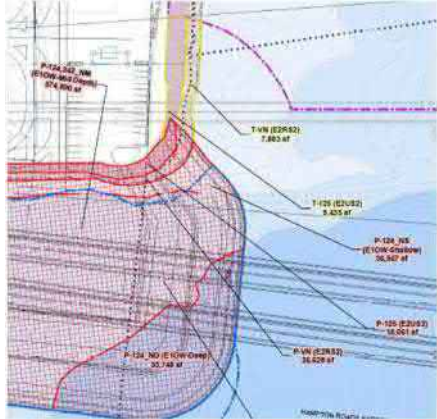
JPA Updates – Island Expansion




- Corner added for island expansion





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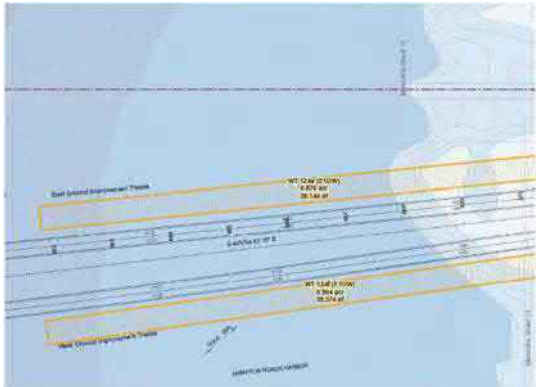
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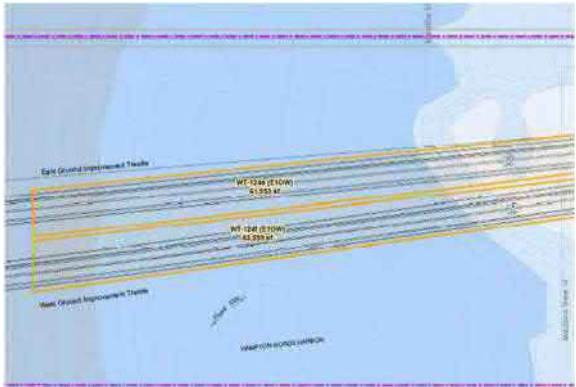
JPA Updates – Trestle Increase




- Jet grout trestles increased in size





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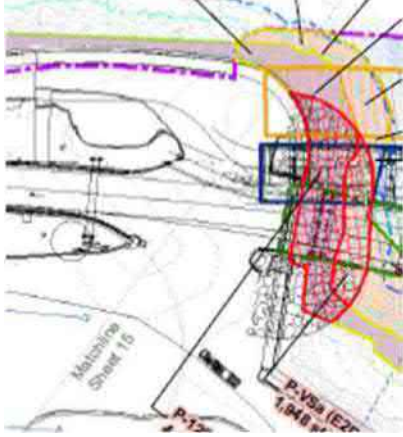
JPA Updates – Rip Rap




- Rip Rap added





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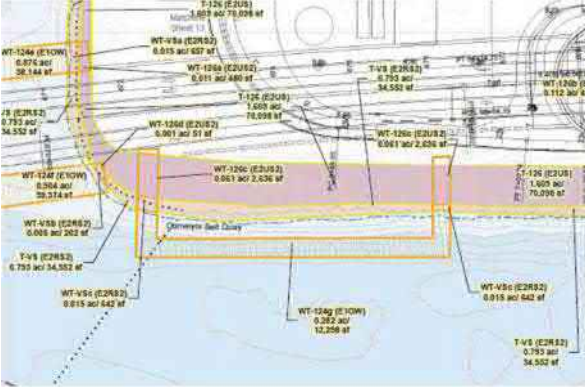
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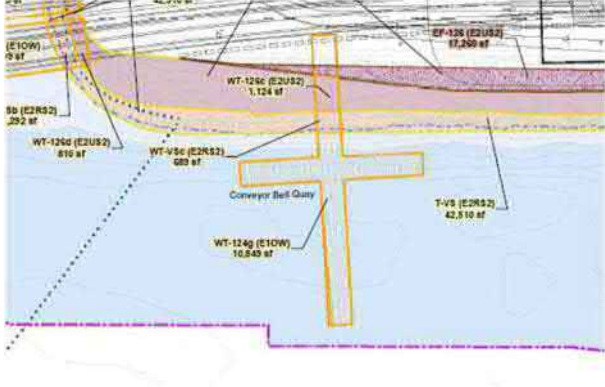
JPA Updates – Conveyor




- Conveyor belt changed shape and size



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December 2019



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