Attachment 3.0

Site Specific Quantity Development

Attachment 3.0
Evaluation of Applicable Dredge Equipment for the Upper Hudson River

For the development of production standards, each target area to be dredged throughout the three river sections of the Hudson River was evaluated with regard to water depth, depth of cut, sediment texture (cohesive, non-cohesive, rocky), and need for shoreline dredging. Sediment characteristic quantities were then computed per one-mile river segments and were further divided based on their location with respect to the Hudson River centerline (east or west). Based on this evaluation, relevant dredging equipment was selected and evaluated. The analysis was conducted for two scenarios: one wherein it was assumed that mechanical dredging equipment would primarily be utilized and the second wherein it was assumed that hydraulic dredging equipment would be the principal technology utilized.

For each of the scenarios, it was determined that specialty equipment would be required to remove contaminated sediment in areas such as wetlands, backwaters, near rocks, and around islands because the principal technology could not access these areas. Work accomplished by specialty equipment including small, cleanup dredges, amphibious excavators, and similar equipment is expected to be at lower production rates than that accomplished by the primary dredging equipment. In order to accurately estimate removal times for the specialty equipment, an analysis was conducted to identify areas where such equipment would operate and the associated volume of contaminated sediment that would be removed.

Within each river section, the targeted areas were divided into one-mile segments. For each one-mile segment, the total volume of sediment and the volume per sediment characteristic was computed (volume cohesive and volume non-cohesive). In addition, the volume of sediment requiring removal to depths less than three feet and to depths greater than three and half feet were quantified. Figure 3A-1 in Subpart 3A illustrates the targeted areas in terms of characteristics important to dredging operations. Tables 3A-1 and 3A-2 in Subpart 3A present this information per one-mile segment.

Mechanical Dredge Equipment and Analysis

For mechanical dredging equipment, it was assumed that a hydraulic excavator mounted on a floating platform would be capable of working from the channel shoreward to the six-foot post-dredge bathymetric contour plus 30-feet (thirty feet represents the working reach of the mechanical dredge in shallow water). The six -foot post-dredge contour was selected as the physical limit of removal for the mechanical dredge due to draft requirements of the associated hopper barges. The draft of barges loaded with 1,000 tons of material is approximately six-feet.

Based on these parameters, the six-foot post-dredge bathymetric contour was identified. This line was then off-set 30-feet in the direction of the shoreline. Shoreward of this line, alternative dredges or specialty excavating equipment would be needed to complete the work. If the six foot post-dredge bathymetric contour plus 30-feet fell beyond the Upper Hudson River shoreline, it was concluded that dredging could be completed with the principal mechanical dredge. Following identification of the working limits of the specialty equipment, associated volumes

and areas were computed using Arc View GIS. Figure 3B-1 in Subpart 3B presents these areas and Table 3B-1 in Subpart 3B presents the associated quantities.

Hydraulic Dredge Equipment and Analysis

For the second scenario wherein hydraulic dredging equipment will be used as the main type of dredge, it was assumed that the draft of the selected cutter head dredge would be three feet. The analysis was carried out assuming that the dredge could operate from the channel shoreward to the three feet post-dredge contour. This boundary condition was established for each target area. Specialty areas were then identified as areas where the main hydraulic dredge is not expected to function. After identification of the boundaries of work for the specialty equipment, the associated volumes and areas were computed using Arc View GIS. Figure 3C-1 in Subpart 3C presents these areas and Table 3C-1 in Subpart 3C presents the associated quantities.

Evaluation Completed

For the two scenarios presented above, it was possible to compute the time to dredge sediment contained within each river mile section. Using the production rates developed for the principal mechanical and hydraulic dredges, as well as the specialty equipment, it was possible to initiate the process of estimating overall removal time.

Subpart 3-A

Existing Sediment Characteristics

Tables 3A-1 and 3A-2

Sediment Characteristic Quantities

Table 3A-1: Existing Sediment Characteristics per Water Depth
Table 3A-2: Existing Sediment Characteristics per Targeted Sediment Removal Depth

Table 3A-1
Existing Sediment Characteristics per Water Depth

River Section by One Mile Increments	Location [1]	Total Volume	Water Depth								
			Less than 3ft water			3ft - 6ft Water			>6ft water		
			%NC	%C	Total (cy)	%NC	%C	Total (cy)	%NC	%C	Total (cy)
River Section 1- Thompson Island Pool [2]											
193.75-194.5	Rogers Island (both east and west dredge areas)	83,724.52	100%	0%	12,022.33	100%	0%	7,338.74	89%	11%	64,363.44
193.5-194	West	228,797.00	83%	83%	114,457.19	43%	57%	48,943.70	6%	94%	65,396.11
192.5-193.5	West	59,432.22	74%	26%	38,830.26	65%	35%	9,136.37	92%	8%	11,465.59
192.5-193.5	East	225,035.41	44%	56%	101,971.44	95%	5%	36,470.78	86%	14%	86,593.19
191.5-192.5	West	137,154.11	49%	51%	92,347.81	45%	55%	16,418.81	85%	15%	28,387.48
191.5-192.5	East	142,861.15	29%	71%	15,357.30	45%	55%	8,845.15	76%	24%	118,658.70
190.5-191.5	West	196,162.00	77%	23%	27,832.19	53%	47%	4,940.00	3%	97%	163,389.81
190.5-191.5	East	164,418.22	5%	95%	19,815.15	4%	96%	11,421.30	26%	74%	133,181.78
189.5-190.5	West	69,317.15	82%	18%	19,352.44	83%	17%	11,589.30	97%	3%	38,375.41
189.5-190.5	East	139,039.37	19%	81%	47,228.26	38%	62%	21,314.37	36%	64%	70,496.74
188.5-189.5	East	139,039.37	19%	81%	47,228.26	38%	62%	21,314.37	36%	64%	70,496.74
188.5-189.5	West	69,317.15	82%	18%	19,352.44	83%	17%	11,589.30	97%	3%	38,375.41

Table 3A-1
Existing Sediment Characteristics per Water Depth

River Section by One Mile Increments	Location [1]	Total Volume	Water Depth								
			Less than 3ft water			3ft - 6ft Water			>6ft water		
			%NC	%C	Total (cy)	%NC	%C	Total (cy)	%NC	%C	Total (cy)
River Section 2- Thompson Island Dam to Lock 5 [2]											
188.25-187.25	Land Locked Section: One Dredge Areas (on west side Thompson Island HS 22)	12,550.22	3%	97%	2,164.44	0%	100%	1,177.00	0%	100%	9,208.78
187.25-186.25	Land Locked Section: Two dredge areas (HS 25 and HS 26) [1]	41,544.67	32%	68%	12,321.67	11%	89%	11,106.00	9%	91%	18,117.00
186.25-185.25	East (HS 28) [2]	228,252.26	13%	87%	70,909.63	10%	90%	53,562.07	25%	75%	103,780.56
185.25-184.25	East (HS 31)	29,875.26	0%	100%	8,087.11	0%	100%	5,354.81	0%	100%	16,433.33
184.25-183.25	West (HS 34)	72,249.56	4%	96%	21,585.74	19%	81%	12,129.96	21%	79%	38,533.85
184.25-183.25	East (HS 33 and HS 35)	107,500.90	0%	100%	26,466.37	79%	21%	71,558.67	80%	20%	9,475.87

Table 3A-1
Existing Sediment Characteristics per Water Depth

River Section by One Mile Increments	Location [1]	Total Volume	Water Depth								
			Less than 3ft water			3ft - 6ft Water			>6ft water		
			%NC	%C	Total (cy)	%NC	%C	Total (cy)	%NC	%C	Total (cy)
River Section 3- Lock 5 to the Federal Dam at Troy, NY [2]											
			Water Depth [3]								
			Less Than 6ft Water			Greater Than 6ft water					
River Section by One Mile Increments	Location	Total Volume	%NC	%C	Total (cy)	%NC	%C	Total (cy)			
170.25-169.25	East (HS 36)	128,536.6	1%	99%	125,778.78	98%	2%	2,757.85			
166.75-165.75	West (HS 37)	120,868.6	46%	54%	65,584.56	0%	0%	0.00			
164.25-163.25	West (HS 39 and at Lock 2)	65,019.37	96%	4%	65,019.37	0%	0%	0.00			

HS = Hot Spot
%NC = % non-cohesive
%C = % cohesive

Notes:
(1) The Location (East and West) is relative to the Hudson River Centerline
(2) These volumes do not include the estimated total 198,800 cy of required navigational dredging
(3) Only the 6 foot and 12 foot bathymetry data exist for River Section 3 currently

Table 3A-2
Existing Sediment Characteristics per Targeted Sediment Removal Depth

River Section by One Mile Increments	Location [1]	Total Volume	Sediment Removal Depth					
			3 ft and Less			3.5 ft and Greater		
			%NC	%C	Total (cy)	%NC	%C	Total (cy)
River Section 1- Thompson Island Pool [2]								
193.75-194.5	Rogers Island (both east and west)	76,768.41	100%	0%	69,078.96	100%	0%	7,689.44
193.5-194	West	13,002.74	100%	0%	1.89	100%	0%	13,000.85
192.5-193.5	West	228,796.96	73%	27%	145,688.30	16%	84%	83,108.67
192.5-193.5	East	83,724.48	92%	8%	83,724.48	0%	0%	0
191.5-192.5	West	59,432.19	68%	32%	43,745.15	100%	0%	15,687.04
191.5-192.5	East	225,035.33	68%	32%	112,499.85	69%	31%	112,535.48
190.5-191.5	West	137,154.11	81%	19%	38,794.81	46%	54%	98,359.30
190.5-191.5	East	142,861.11	81%	19%	106,062.59	34%	66%	36,798.52
189.5-190.5	West	196,161.96	21%	79%	128,573.11	2%	98%	67,588.85
189.5-190.5	East	164,418.22	41%	59%	56,055.70	12%	88%	108,362.52
188.5-189.5	East	139,039.33	40%	60%	27,858.37	29%	71%	111,180.96
188.5-189.5	West	69,317.11	100%	0%	43,003.11	75%	25%	26,314.00

Table 3A-2
Existing Sediment Characteristics per Targeted Sediment Removal Depth

River Section by One Mile Increments	Location [1]	Total Volume	Sediment Removal Depth					
			3 ft and Less			3.5 ft and Greater		
			%NC	%C	Total (cy)	%NC	%C	Total (cy)
River Section 2: Thompson Island Dam to Lock 5 [2]								
188.25-187.25	Land Locked Section: One Dredge Areas (on west side Thompson Island)	12,550.22	0%	100%	12,550.22	0	0	0.00
187.25-186.25	Land Locked Section: Two dredge areas (HS 25 and HS 26) [1]	41,544.67	17%	83%	41,544.67	0	0	0.00
186.25-185.25	East (HS 28) [2]	228,252.26	68%	32%	45,072.78	5%	95%	183,178.33
185.25-184.25	East (HS 31)	29,875.26	0%	0%	0.00	0%	100%	29,875.26
184.25-183.25	West (HS 34)	72,249.56	0%	100%	10,249.00	18%	82%	62,000.52
184.25-183.25	East (HS 33 and HS 35)	107,500.90	42%	58%	136,043.63	38%	62%	18,832.74
River Section 3: Lock 5 to the Federal Dam at Troy, NY [2]								
170.25-169.25	East (HS 36)	128,536.63	1%	99%	125,778.78	0	0	0.00
166.75-165.75	West (HS 37)	120,868.67	46%	54%	120,868.67	0	0	0.00
164.25-163.25	West (HS 39 and at Lock 2)	65,019.37	67%	33%	48,483.37	100%	0%	16,536.00

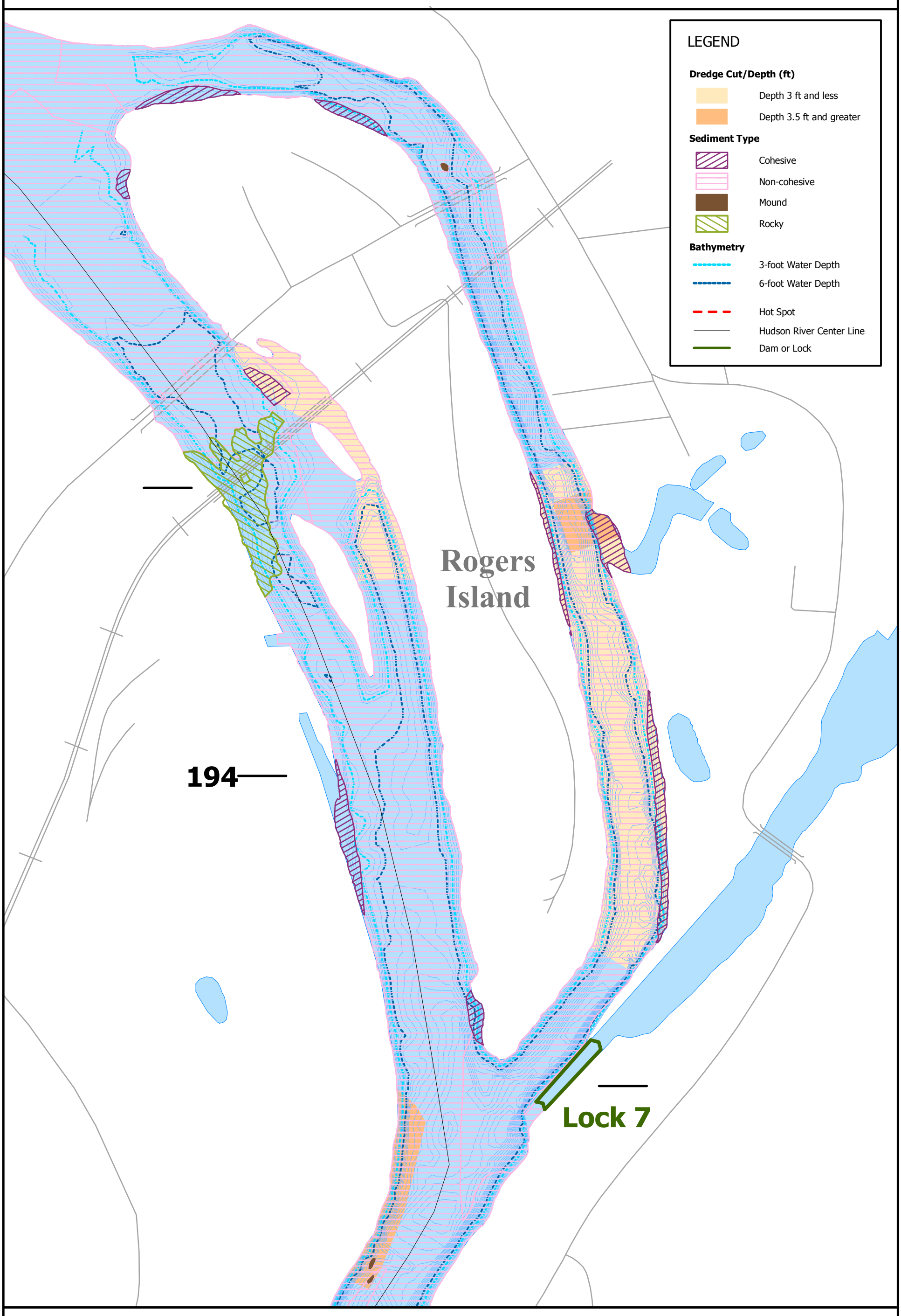
HS = Hot Spot
%NC = % non-cohesive
%C = % cohesive

Notes:
(1) The Location (East and West) is relative to the Hudson River Centerline
(2) These volumes do not include the estimated total 198,800 cy of required navigational dredging

Figure 3A-1

Sediment Characteristics

Sediment Characteristics - RM 193.75 - 194.5



Sediment Characteristics - RM 193.5 - 193.75

194

Lock 7

5

LEGEND

Dredge Cut/Depth (ft)

- Depth 3 ft and less
- Depth 3.5 ft and greater

Sediment Type

- Cohesive
- Non-cohesive
- Mound
- Rocky

Bathymetry

- 3-foot Water Depth
- 6-foot Water Depth
- Hot Spot
- Hudson River Center Line
- Dam or Lock

N

500 0 500 1000 Feet

100 0 100 200 Meters

MALCOLM PIRNIE
TAMS-Earth Tech

Sediment Characteristics - RM 192.5 - 193.5

5

6

193

6

6

7

LEGEND

Dredge Cut/Depth (ft)

- Depth 3 ft and less
- Depth 3.5 ft and greater

Sediment Type

- Cohesive
- Non-cohesive
- Mound
- Rocky

Bathymetry

- 3-foot Water Depth
- 6-foot Water Depth
- Hot Spot
- Hudson River Center Line
- Dam or Lock

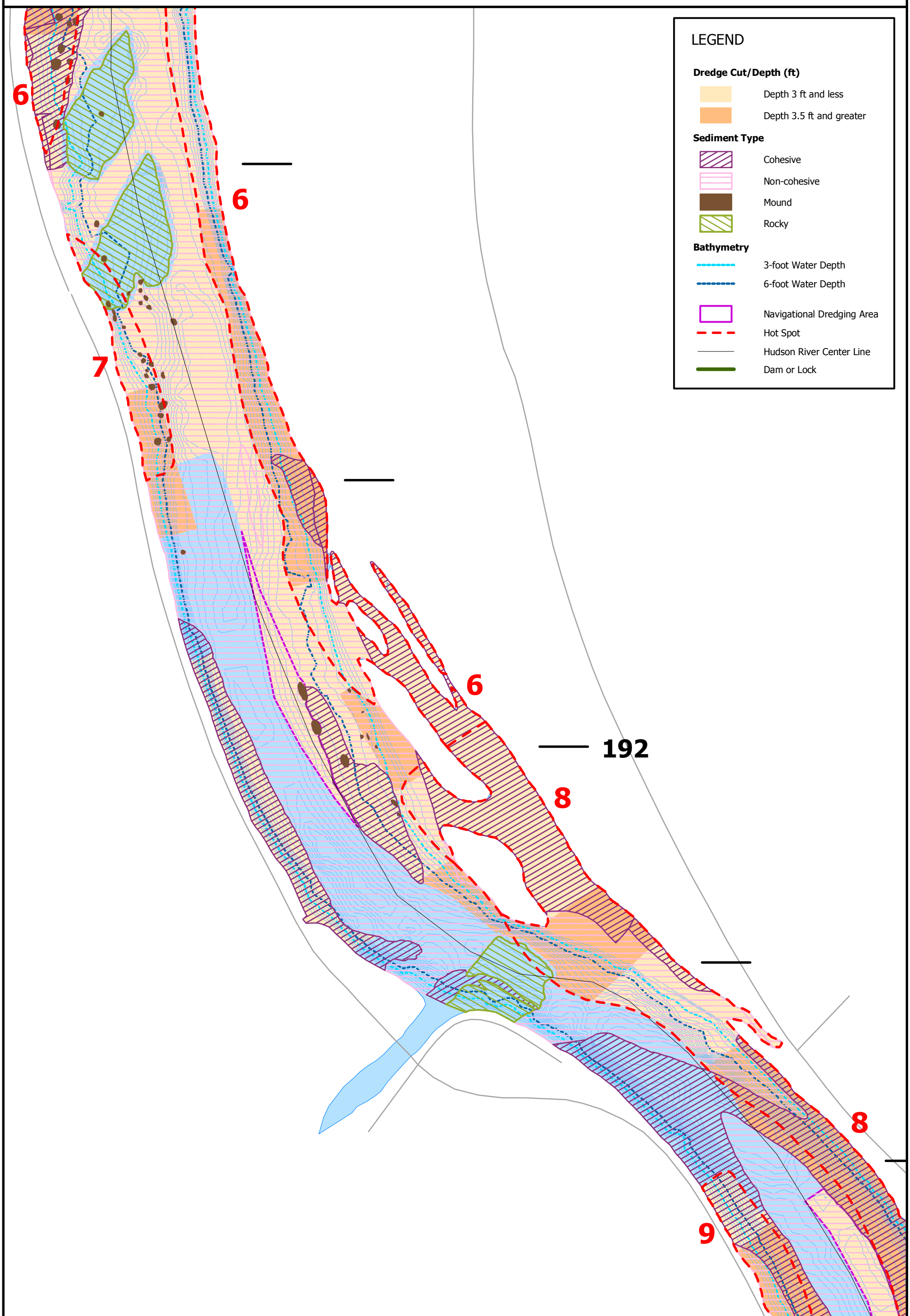
N

500 0 500 1000 Feet

100 0 100 200 Meters

MALCOLM PIRNIE
TAMS-Earth Tech

Sediment Characteristics - RM 191.5 - 192.5



LEGEND

Dredge Cut/Depth (ft)

- Depth 3 ft and less
- Depth 3.5 ft and greater

Sediment Type

- Cohesive
- Non-cohesive
- Mound
- Rocky

Bathymetry

- 3-foot Water Depth
- 6-foot Water Depth
- Navigational Dredging Area
- Hot Spot
- Hudson River Center Line
- Dam or Lock

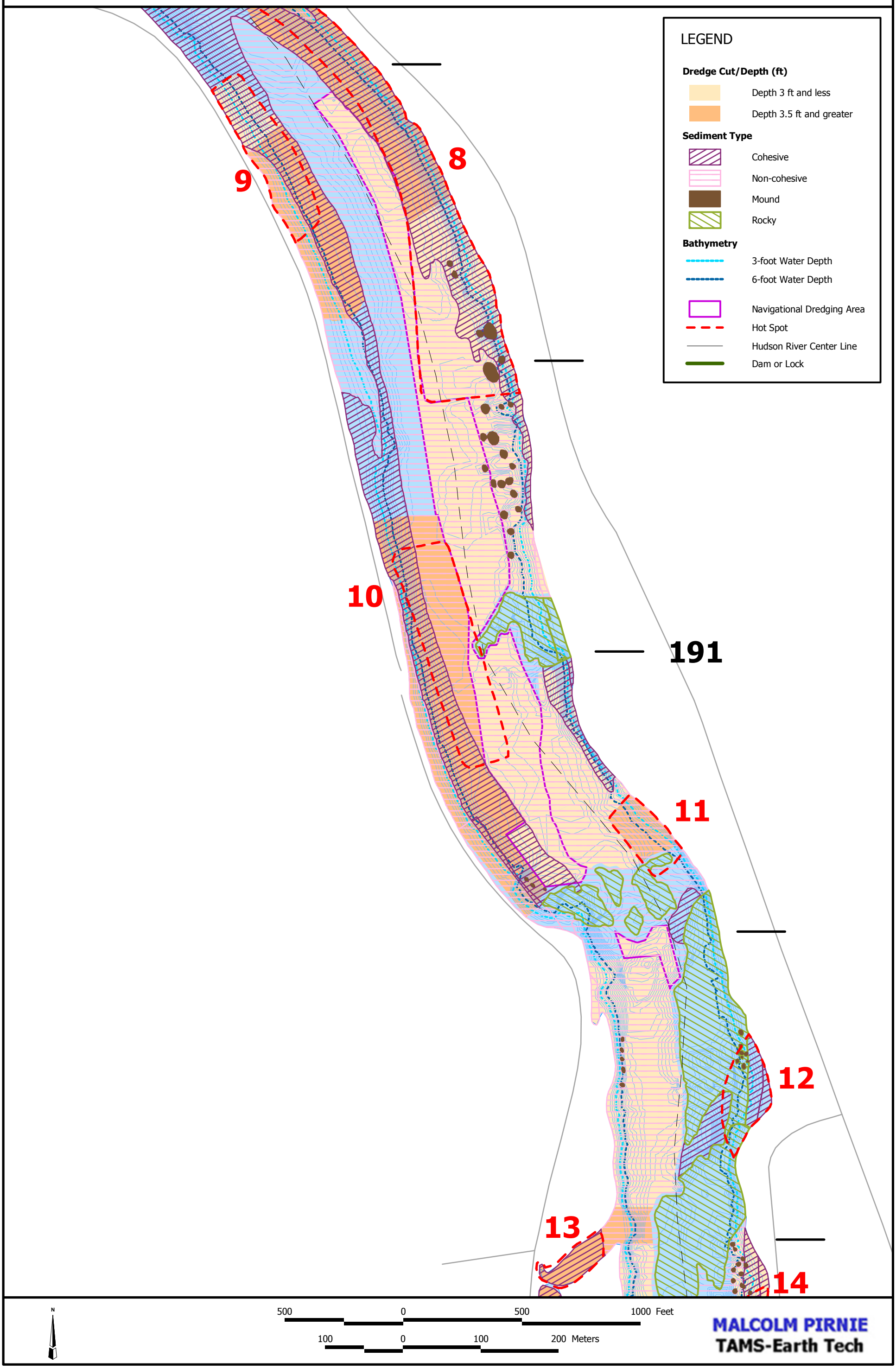
N

500 0 500 1000 Feet

100 0 100 200 Meters

MALCOLM PIRNIE
TAMS-Earth Tech

Sediment Characteristics - RM 190.5 - 191.5



Sediment Characteristics - RM 189.5 - 190.5

LEGEND

Dredge Cut/Depth (ft)

- Depth 3 ft and less
- Depth 3.5 ft and greater

Sediment Type

- Cohesive
- Non-cohesive
- Mound
- Rocky

Bathymetry

- 3-foot Water Depth
- 6-foot Water Depth
- Navigational Dredging Area
- Hot Spot
- Hudson River Center Line
- Dam or Lock

13

14

190

Griffin Island

15

16

N

500 0 500 1000 Feet

100 0 100 200 Meters

MALCOLM PIRNIE
TAMS-Earth Tech

Sediment Characteristics - RM 188.5 - 189.5

LEGEND

Dredge Cut/Depth (ft)

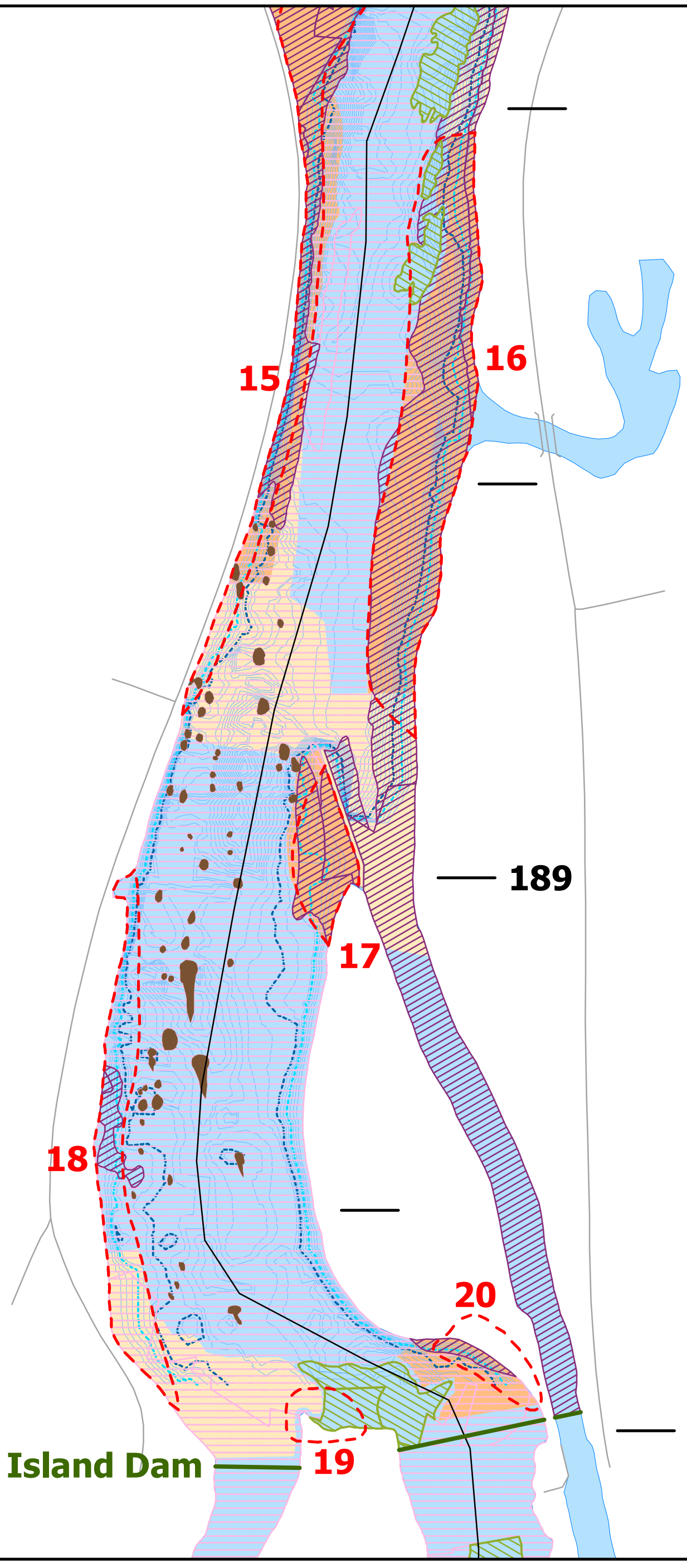
- Depth 3 ft and less
- Depth 3.5 ft and greater

Sediment Type

- Cohesive
- Non-cohesive
- Mound
- Rocky

Bathymetry

- 3-foot Water Depth
- 6-foot Water Depth
- Hot Spot
- Hudson River Center Line
- Dam or Lock



N

500 0 500 1000 Feet

100 0 100 200 Meters

MALCOLM PIRNIE
TAMS-Earth Tech