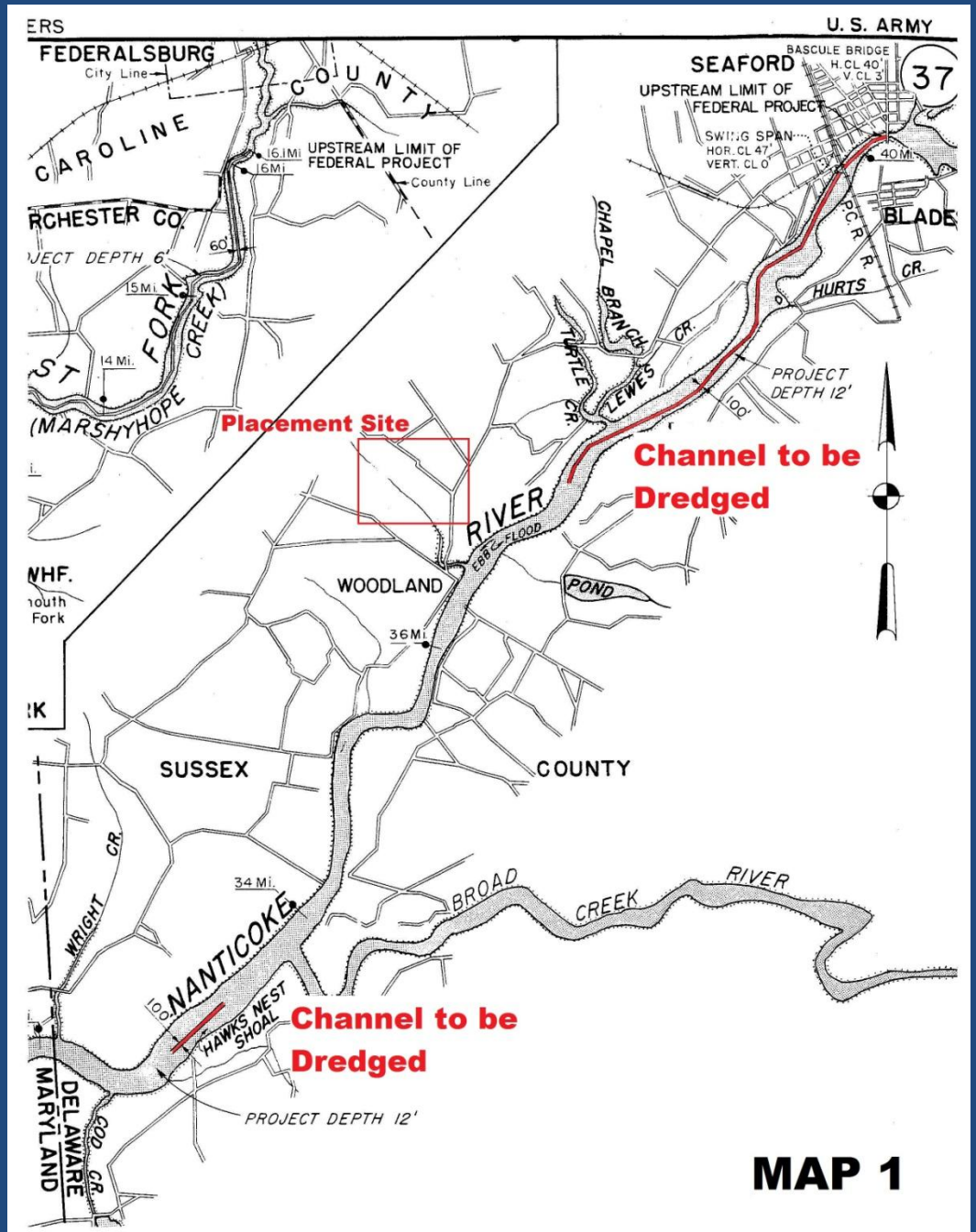
MAINTENANCE DREDGING
NANTICOKE RIVER
SEAFORD, DELAWARE

NANTICOKE RIVER

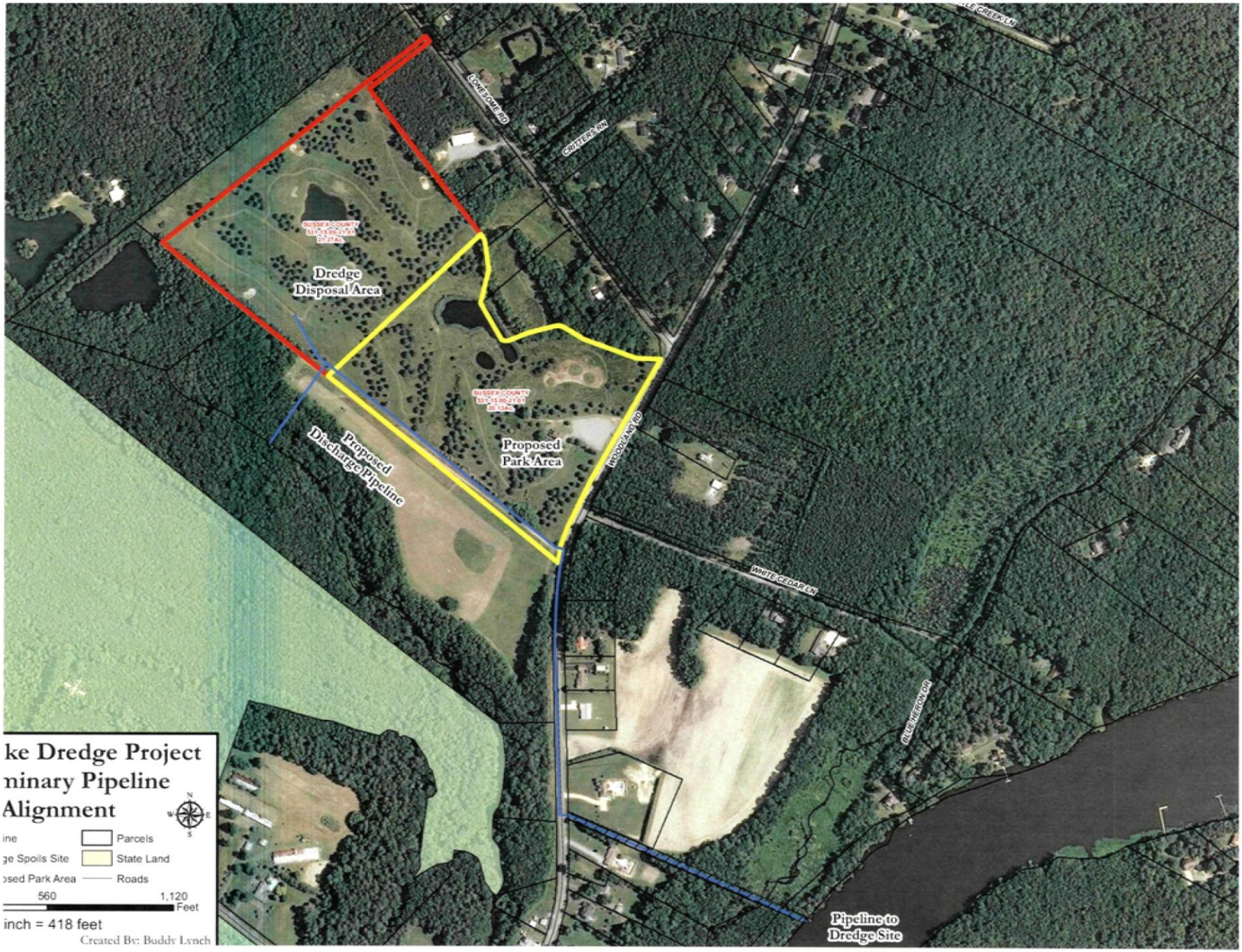
- Channel is authorized to a depth of 12 feet and a width of 100 feet
- Approximately 55,000 cubic yards of material will be hydraulically dredged
- A 20 acre placement site will be constructed
- Return water will be pumped back to the Nanticoke River
- No dredging 15 February through 15 June

Seaford, Delaware
© 2006 Navteq
Image © 2006 TerraMetrics
© 2005 Google
Pointer 38°35'47.95" N 75°37'05.30" W
Streaming 100%
Eye alt 45887 ft

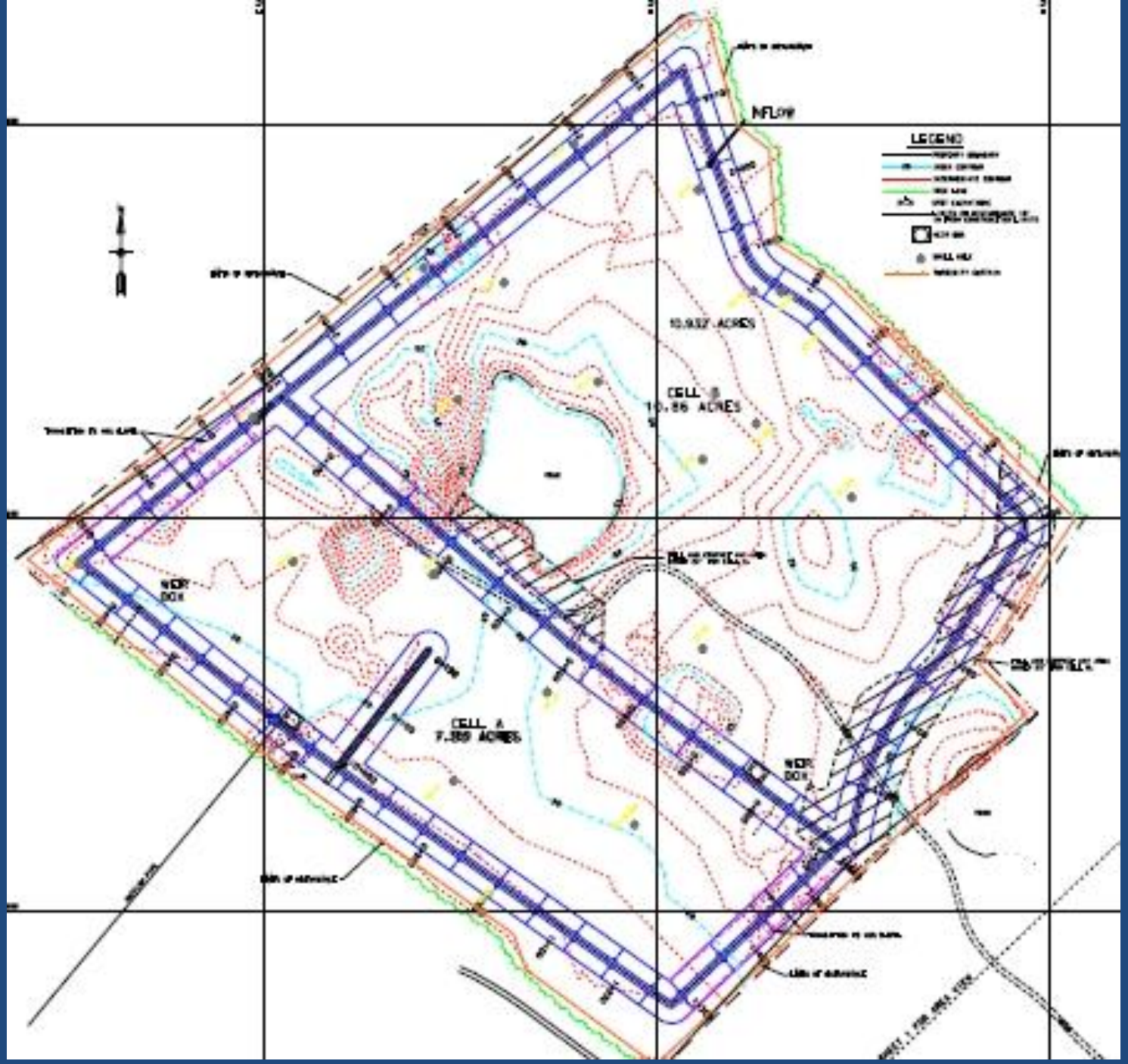

U. S. ARMY
FEDERALSBURG
City Line
CAROLINE
COUNTY
UPSTREAM LIMIT OF FEDERAL PROJECT
County Line
16.1Mi
16Mi
RCHESTER CO.
JECT DEPTH 6'
60'
15Mi
14 Mi.
FORK
CREEK)
(MARSHYHOPE
SEAFORD
BASCULE BRIDGE
H. CL 40'
V. CL 3'
37
UPSTREAM LIMIT OF FEDERAL PROJECT
SWING SPAN
HOR. CL 47'
VERT. CL 0
40Mi
BLADE
P.C.R.R.
HURTS
CR.
CHAPEL BRANCH
TURTLE CR.
LEWES
CR.
PROJECT DEPTH 12'
100'
Placement Site
Channel to be Dredged
RIVER
EBB FLOOD
WOODLAND
POND
36Mi
WHF.
Fork
SUSSEX
COUNTY
WRIGHT
CR.
34 Mi.
NANTICOKE
BROAD
CREEK
RIVER
100'
HAWKS NEST SHOAL
Channel to be Dredged
PROJECT DEPTH 12'
DELAWARE
MARYLAND
COD
CR.

MAP 1

TRESPASSING
E PROPERTY
O FISHING
SWIMMING
FERRY SLIPS
LOW CLEARANCE
VEHICLES
MAY NOT CLEAR RAMPS
DURING LOW AND HIGH TIDES.
BOARD FERRY AT OWN RISK!
WOODLAND
FERRY
CLOSED THURSDAYS
FOR SERVICING
10:00 AM-12:00 PM
WOODLAND FERRY
HOURS OF OPERATION
7:00 A.M. - 6:30 P.M.
(CONDITIONS PERMITTING)
CLOSED:
THANKSGIVING DAY, CHRISTMAS DAY
AND NEW YEARS DAY



LONESOME RD
CRITTERS RN
Dredge
Disposal Area
Proposed
Park Area
Proposed
Discharge Pipeline
WOODLAND RD
WHITE CEDAR LN
BLUE HERON DR
Pipeline to
Dredge Site
ke Dredge Project
ninary Pipeline
Alignment
ine
ge Spoils Site
osed Park Area
Parcels
State Land
Roads
560
1,120
Feet
inch = 418 feet
Created By: Buddy Lynch


INFLOW
LEGEND
CELL B
10.55 ACRES
CELL A

Testing and Evaluation of Dredged Materials

Protection of Human Health and the Environment

Introduction

- Navigation channel dredging
- US ACE must test and evaluate dredge materials (sediment) within the federal channel before dredging and for placement
- US ACE must be protective of human health and the environment

Introduction – Nanticoke River

- Sediment in the Nanticoke River near Seaford have been tested three times in the last 15 years
- DNREC (1997), *"Chemical Contaminants in Sediments of the Nanticoke River"*

Introduction – Local Conditions

- Local Conditions: types and amounts of chemicals present in the river today
- US ACE compares these conditions to those that could be created by dredging

Screening - Basics

- Many different types of screening and many different sets of numbers that regulators have created for this purpose
- Bulk Chemical (what is in the water or what is attached to the sediment)
- Elutriate (what comes off the sediment when dredging occurs)
- TCLP (what comes off the sediment when in the placement site) that could leach into the groundwater

Screening - Basics

- **Lab results for these tests will report:**
  - **(1) a real number from the analysis**
  - **(2) identify that the chemical was undetected (“U”), or**
  - **(3) estimated (“J”)**
- **Screen using real numbers (i.e. no “U” or “J”)**
- **Compare to DNREC or DNREC approved standards**
- **Terminology: “no impacts” or “exceedance”**
- **Slight exceedances of conservative screening standards are acceptable**

Screening - Results

Bulk Chemistry – Surface water

- **Environmental: No adverse impacts (Table 1)**
- **Human Health: No adverse impacts (Table 2)**

Elutriate:

- **Environmental: No adverse impacts (Table 3)**
- **Human Health: No adverse impacts (Table 4)**

TCLP:

- **No adverse impacts to groundwater (Table 5)**

Screening - Results

Bulk Chemistry – Sediment

- Environmental (sediment dwelling organisms in the river): No adverse impacts (Table 6)
- Environmental (terrestrial receptors at the placement site): No adverse impacts (Table 7)
- Human Health (restricted and unrestricted uses for humans): No adverse impacts (Table 8)

Sediment Characteristics - Results

- Sediment properties that make chemicals bind to particles and not be available to receptors include fine particulates and Total Organic Carbon (TOC)
- Nanticoke sediments at Seaford are fine textured (% silt and % clay are high; >65% fines) and have 3-6% TOC (1% TOC = 10,0000 mg/kg)
- See Table 9

Sediment Then (1997) & Now (2012)

- Table 10 summarizes analytical data for sediment from 1997 and 2006
- PAH levels have increased but only slightly exceed the screening standard; organics bind to sediment fines and TOC
- PCB: cannot really compare the data; the two methods have vastly different sensitivities BUT both sets of data are less than screening standard; PCBs bind to sediment fines and TOC
- Metals: concentrations decreasing over time; all below screening standards; metals bind to sediment fines and TOC

Bottom Line

Will this dredging adversely impact aquatic/terrestrial environments or impact ecological/human receptors?

Answer: No

Additional Questions?

Mr. Bob Blama, Project Manager
US ACE, Baltimore District
Robert.N.Blama@usace.army.mil
410-962-6068

Dr. Cheryl R. Montgomery, Research Biologist
US ACE, Engineer Research and Development Center
Cheryl.R.Montgomery@usace.army.mil
978-318-8644

Testing
&
Additional Data Evaluation

Local Conditions - Surface Water (Testing)

- Evaluation at the dredging site
- Polychlorinated biphenyls (PCBs)
- Metals/inorganics (arsenic, cadmium, chromium, copper, lead, mercury, zinc)
- Misc: ammonia, nitrogen, phosphorus, total suspended solids (TSS)

Local Conditions - Surface Water (Evaluation)

Environment (Table 1)

- No exceedances
- No adverse impacts

Human Health (Table 2)

- Total PCBs – Slight exceedance of one standard
- No adverse impacts

Effluent Elutriate (water) - Testing

- Evaluation for the placement site
- Designed to mimic partitioning of chemicals off of sediment during the settling phase
- Put sediment in a beaker with water, stir and let it settle
- Test water phase the same way you test surface water (total PCBs, metals and general chemistry)

Effluent Elutriate - Evaluation

Environment (Table 3)

- Slight exceedances of metals (copper and zinc)
- Instantaneous mixing/dilution with river water when CDF water is returned to the river
- No adverse impacts

Human Health (Table 4)

- Total PCBs – Slight exceedance of one standard
- No adverse impacts

Comparison - River Water & Elutriate

Chemical	Ecological (ug/L) (Table 3)			Human Health (ug/L) (Table 4)		
(Dissolved)	Lowest Standard	River Water	Elutriate	Lowest Standard	River Water	Elutriate
PCBs	0.014	0.00026	0.0099	0.05 (MCL)/ 0.000064	0.00026	0.0099
Arsenic	150	1	8.1	10 (MCL)	1	8.1
Cadmium	0.2	0.5	0.5	5 (MCL)	0.5	0.5
Chromium	49	1	2.1	100 (MCL)	1	2.1
Copper	5.8	1.8	12.9	1300 (MCL)	1.8	12.9
Lead	1.2	0.5	5.5	15 (MCL)	0.5	5.5
Mercury	0.077	0.02	0.02	NC	0.02	0.02
Zinc	76	15	406	7,400	15	406

Leaching Potential (TCLP) - Testing

- Use this test to see if there will be impact to groundwater
- TCLP (acidic water percolates through a soil column)
- Severe leaching test (acid dissolves chemicals, especially metals)
- Tested for VOCs, SVOCs, total PCBs, pesticides, metals

Leaching Potential (TCLP) - Evaluation

- Impacts to Groundwater
- No exceedances of drinking water standards
- No impact to local wells and drinking water supply
- Summarized in Table 5

Local Conditions - Bulk Sediment (Testing)

- Evaluation at the dredging site as sediment and at the placement site as soil;
- Tested for multiple categories of analyses (VOCs, SVOCs, PAHs, pesticides, total PCBs, metals)
- Tested for general chemistry (nitrogen, phosphorous, as well as general chemistry and sediment texture (sand, silt, clay and percent solids)

Local Conditions - Bulk Sediment (Evaluation)

Environmental (Table 6):

- Slight exceedances of two metals (arsenic, zinc)
- Sediments are very fine textured and have high TOC (bind chemicals tightly) (Table 9)
- No adverse impacts

Sediment as Soil – Evaluation

- Evaluation at the placement site (Table 7)
- Terrestrial receptors
- 4 exceedances of metals
- 3 of the 4 metals are within Delaware background conc.
- Zinc is about double background
- No adverse impacts

Local Conditions - Sediment as Soil (Table 7) Comparison to Typical DE Soil Concentrations

Metal	DE Bkgrd (mg/kg)	Lowest Standard (EcoSSL) (mg/kg)	Dredge Material (mg/kg)
Cadmium	1 -3	0.36	1
Lead	30 – 100	11	23
Mercury	0.1 - 0.3	0.10	0.14
Zinc	60 - 90	46	173

Sediment as Soil - Evaluation

- Evaluation at the placement site (Table 8)
- Human receptors (unrestricted & restricted use)
- Unrestricted use: residential (live, play, grow veggies and eat them etc.)
- Restricted use: commercial (work there)
- Same results for both restricted/unrestricted; slight exceedance for:
  - PCBs (Standard = 2 mg/kg; Result = 3.4 mg/kg)
  - Arsenic (DE background = 1 – 10 mg/kg; Result = 11 mg/kg)
- No adverse impacts

Nanticoke Sediment – Then and Now (Table 10)

Chemical Name	Units	Screening TEC	DNREC Conc Range (1997)	US ACE Conc Range (2006)
Total PAHs	ug/kg	1,610	1 – 2	512 - 2566
Total PCBs	ug/kg	59.8	5.66E-05 – 1.04E-04	0 - 7
METALS				
Arsenic	mg/kg	9.79	11 - 18	6 - 15
Cadmium	mg/kg	0.99	2 - 3	0.67 - 2
Chromium	mg/kg	43.4	25 - 32	8 - 18
Copper	mg/kg	31.6	29 - 42	15 - 33
Lead	mg/kg	35.8	29 - 34	15 - 29
Mercury	mg/kg	0.18	0.035 - 3	0.079 – 0.16
Zinc	mg/kg	150	208 - 235	91 - 224

Compare River Water and Elutriate

Chemical	Ecological (ug/L)			Human Health (ug/L)		
(Dissolved)	Lowest Standard	River Water (Table 1)	Elutriate (Table 3)	Lowest Standard	River Water (Table 2)	Elutriate (Table 4)
PCBs	0.014	0.00026	0.0099	0.05 (MCL)/ 0.000064	0.00026	0.0099
Arsenic	150	1	8.1	10 (MCL)	1	8.1
Cadmium	0.2	0.5	0.5	5 (MCL)	0.5	0.5
Chromium	49	1	2.1	100 (MCL)	1	2.1
Copper	5.8	1.8	12.9	1300 (MCL)	1.8	12.9
Lead	1.2	0.5	5.5	15 (MCL)	0.5	5.5
Mercury	0.077	0.02	0.02	NC	0.02	0.02
Zinc	76	15	406	7,400	15	406

Leaching to Groundwater

- Acid leaching test showed no exceedances
- No leaching to groundwater (TCLP, Table 5)
- Sediments are fine textured and have high TOC therefore chemicals will bind tightly to them
- County will install sentinel wells to ensure these conditions are maintained

Bottom Line

Will this dredging adversely impact the aquatic or terrestrial environments for ecological and human receptors?

Answer: No

Additional Questions?

Mr. Bob Blama, Project Manager
US ACE, Baltimore District
Robert.N.Blama@usace.army.mil
410-962-6068

Dr. Cheryl R. Montgomery, Research Biologist
US ACE, Engineer Research and Development Center
Cheryl.R.Montgomery@usace.army.mil
978-318-8644