Combination Remedy Innovations & Issues Fox River

Passaic River Community Advisory Group
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James Hahnenberg
U.S. EPA RPM

Today's topics
Fox River cleanup

- Combination remedy & modification of original decisions
- Cleanup innovations & lessons learned
- Community issues

Fox River PCB cleanup

- **Largest environmental sediment cleanup**
- **$800 million cleanup cost estimate**
- **Collaborative effort between Agencies (State lead) and companies**

Fox team

	Upper river	Lower river
Agencies	WDNR* & EPA	
Agencies oversight	Boldt, NRT, et al	
Potentially Responsible Parties (PRPs)	• Glatfelter • WTMI • Menasha	• API • NCR • GP
PRP contractors	• Brennan • CH2MHILL	• Tetratech • Brennan • Boskalis-Dolman

* Lead Agency

Agency oversight team

Fox cleanup decisions

2002/2003

Dredging/disposal
(with capping contingency)

2007/2008

Dredging/disposal

Engineered caps

Thin cap

Cap monitoring & maintenance

PCB Action Level: 1 ppm

PCB post-cleanup goal: 0.25 ppm

Changes to initial decisions

- **50% dredging & 50% capping from all dredging**
- **Caps** - 3.4 million cubic yards vs. 0.5 million cubic yards* previously
- **Thin caps** - 0.6 million cubic yards*

* Volumes based on Decision documents and final results (where completed).

Capping & covering details

- Dredge and cap (for deep PCBs)
  - Navigation channel (PCBs up to 15’ below mudline)
  - Along river banks
- Caps generally over areas with lower PCB concentrations
- “Covers” or thin caps
  - Placement of 6 inches of sand
  - Over areas with 6-inches or less with PCB concentrations 1-2 ppm

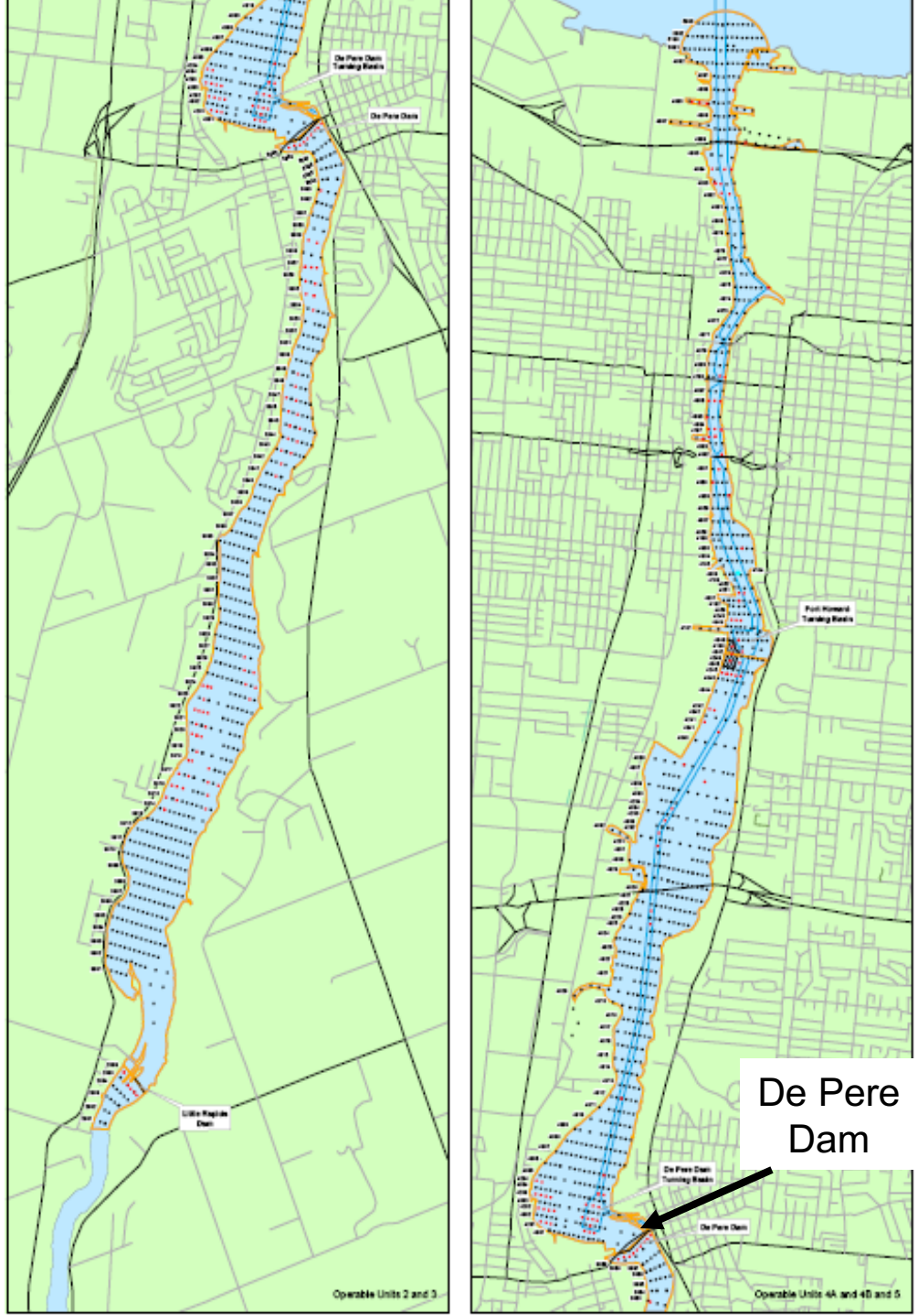
Things that didn't change

- **PCB Action Level (for targeted areas): 1 ppm**
- **PCB post-cleanup goal: 0.25 ppm average surface concentrations**
- **Landfill disposal for dredged (although less volume)**
- **Time after cleanup needed to get to acceptable fish levels**

New information (2006)

- **1,300 cores***
- **9,100 samples* (6-inch intervals)**
- **Design**

Note: as of 2010:
3000 cores &
16,000 samples



New information

1. More PCB sediments & new hotspot
2. Deep contamination (15'+)
3. Thin zones with 1-2 ppm PCB concentrations
4. Landfill capacity compared to dredge volume
5. River bank stability

Dredging/capping/covering vs. All-dredging remedy

- 9 years versus 15+ years for cleanup work
- Lower surface PCB concentrations after cleanup
- 74% of PCBs still removed compared to all-dredging approach

Dredging/capping/covering vs. All-dredging remedy

- Less disposal volume
- Flexibility
- Costs
  - Dredging/capping/covering: $700 million
  - All-dredging: $957 million

Cap stability considerations

- Capping & dredging experience
- Possible disruptive effects
  - Propeller wash
  - High flow events
  - Ice scour
  - Biological effects

Possible cap maintenance actions

1. Additional monitoring and evaluation
2. Cap repair
3. Cap & sediment removal

Cap summary

- Caps stable
- Larger armor stone gives safety margin
- Taylored for different situations
- Monitoring and maintenance
- Re-evaluation triggered if water level changes (determined by Agencies)

Environmental hydraulic dredge

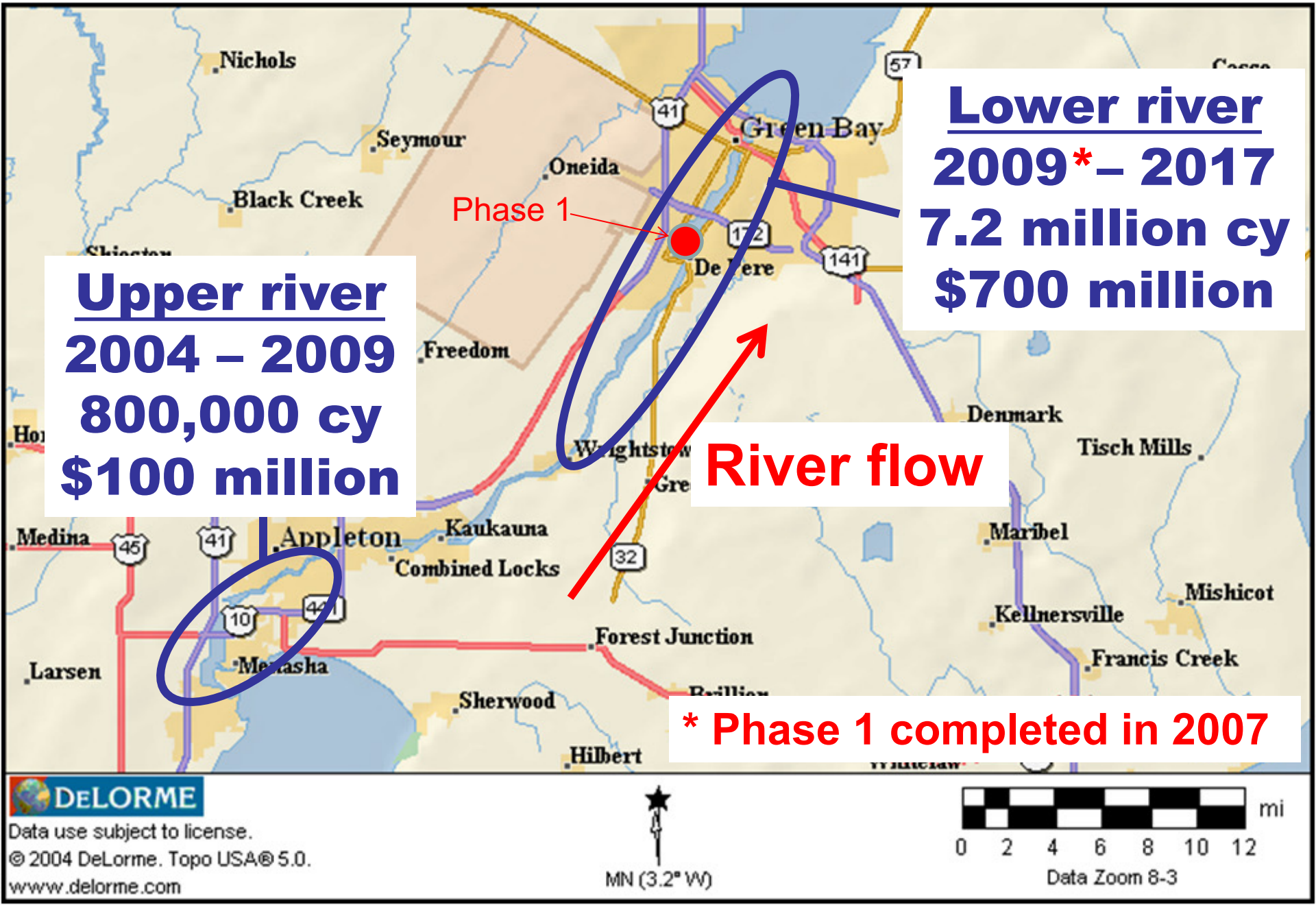
Environmental mechanical dredge

Photos courtesy of Boldt

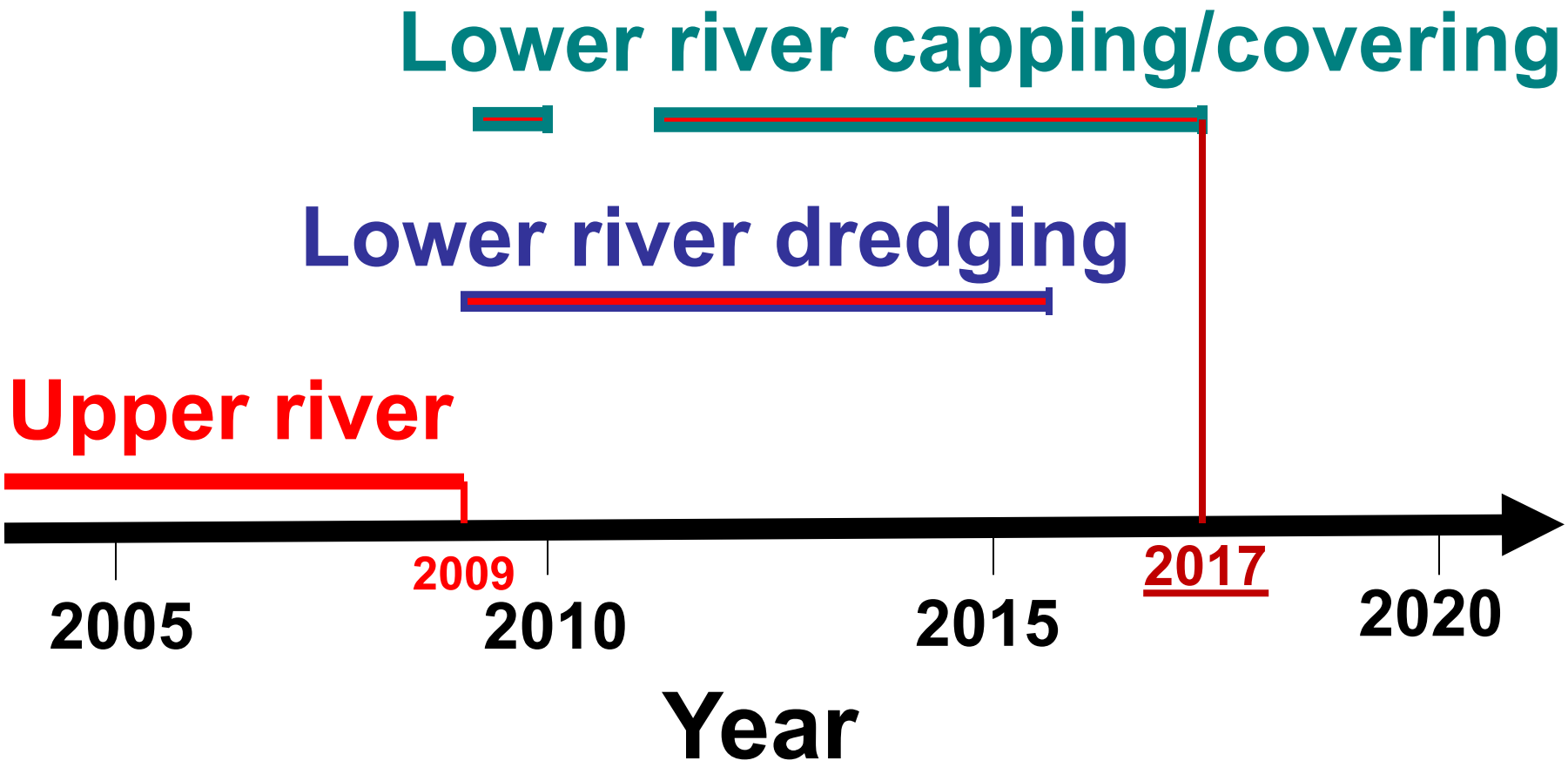
Mechanical vs. Hydraulic dredging

- Mechanical dredging better for:
  - Areas with debris
  - Tighter spaces (e.g., near infrastructure)
- Hydraulic dredging better for:
  - Thinner sediment “cuts”
  - Lower resuspension (?)
- Other operational aspects need consideration (e.g., access, dewatering methods, transportation, and disposal)

River cleanup



Fox cleanup timeline



Dredging & related innovations

- GPS – RTK system for dredging
- Neatline dredging
- Vic Vac® dredge
- Multiple hydraulic dredges
- Geotextile tubes for dewatering (upper river)

Other project innovations

- Cap placement method
- Infill sampling of dredge areas
- Annual Work Plans

Fox upper river Cleanup actions (northern half)

Legend

- Capped
- Dredged areas
- Sand covered
- No Action

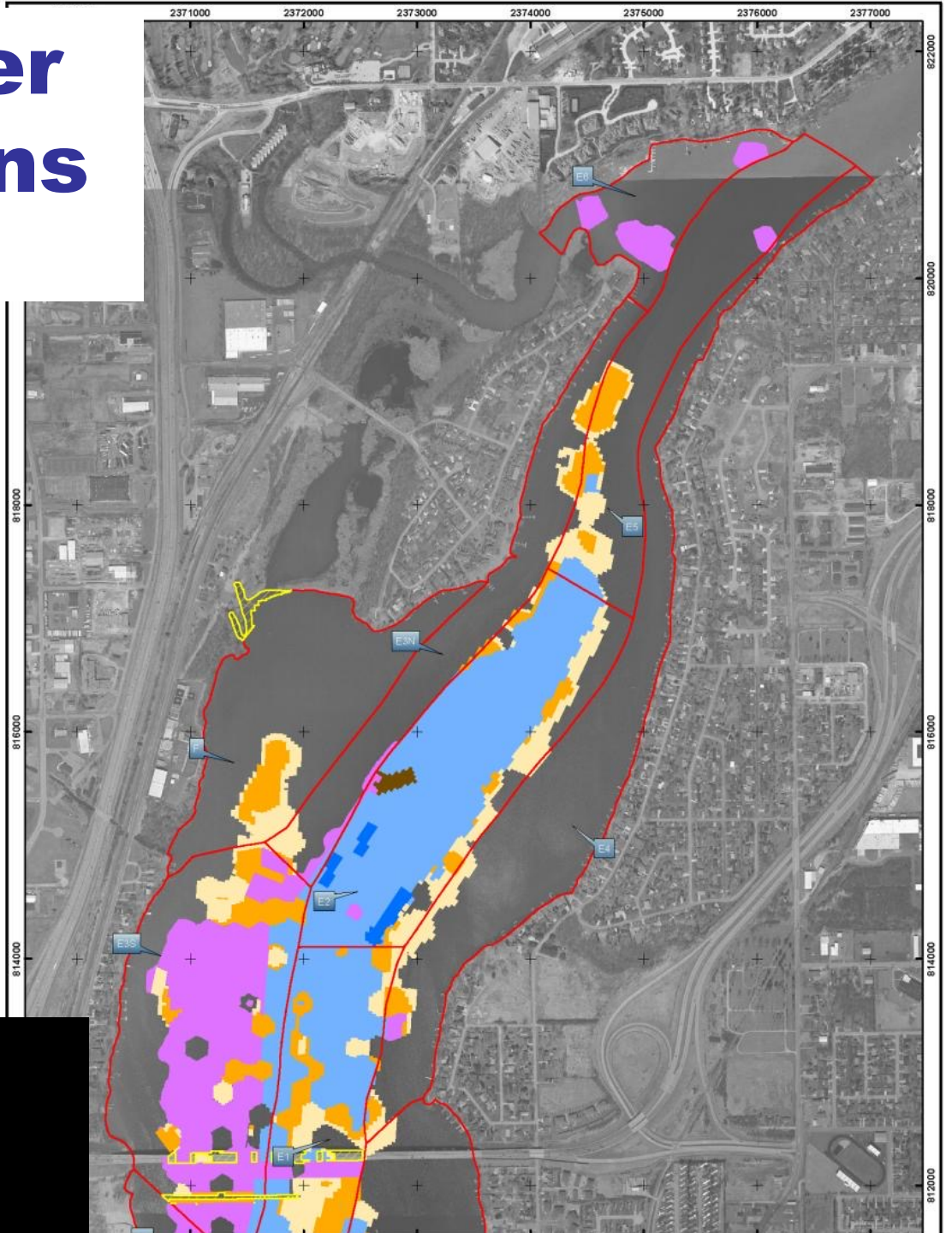
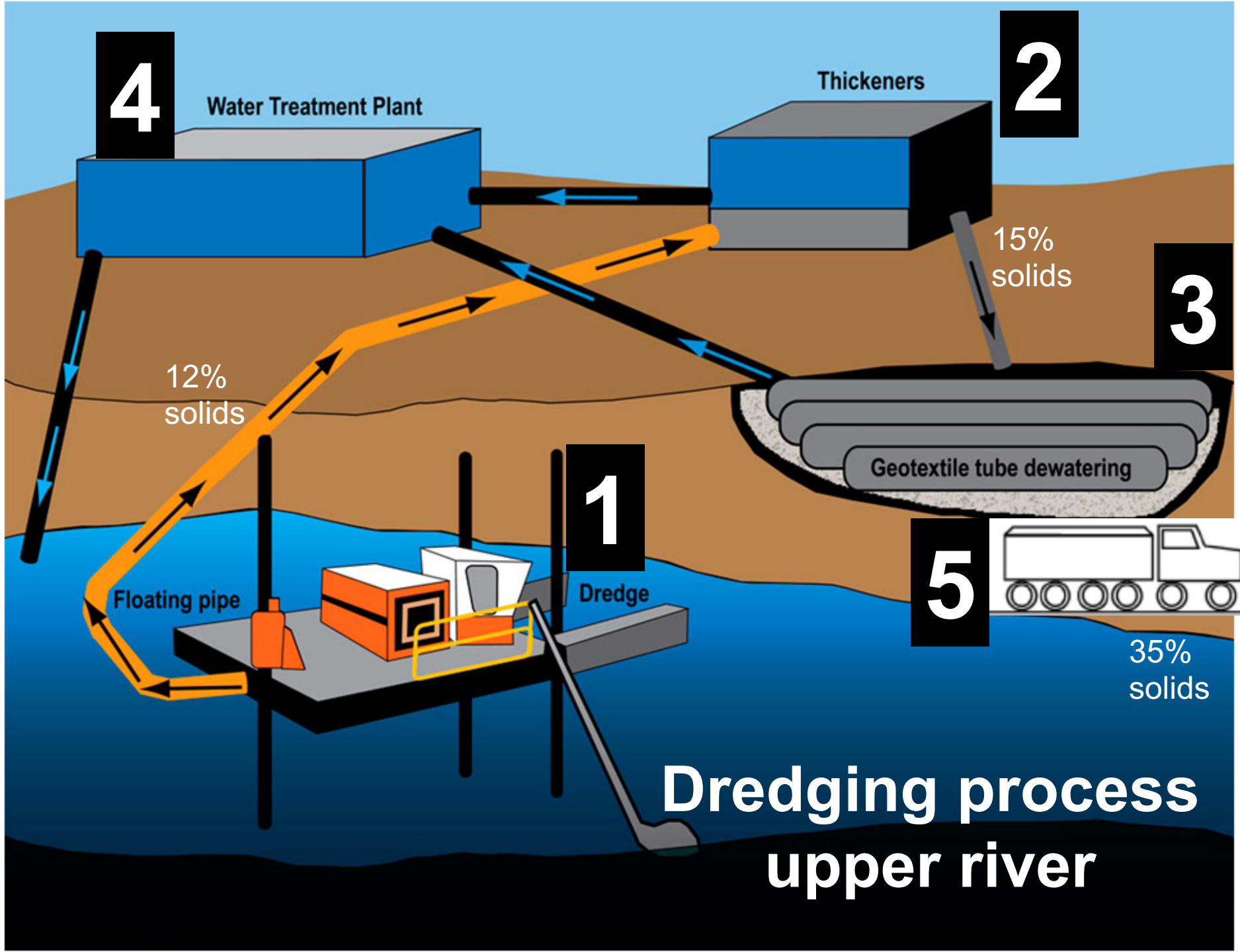


Figure 1-3, from: GW Partners, LLC, Remedial Action Certification of Completion Report, Lower Fox OU1, November 2010.


4
Water Treatment Plant
Thickeners
2
15%
solids
3
12%
solids
Geotextile tube dewatering
1
Floating pipe
Dredge
5
35%
solids
Dredging process
upper river

“Small” cutterhead dredge

Dredge operator controls: GPS – RTK

Photo courtesy of Boldt

Monitor for dredge operator

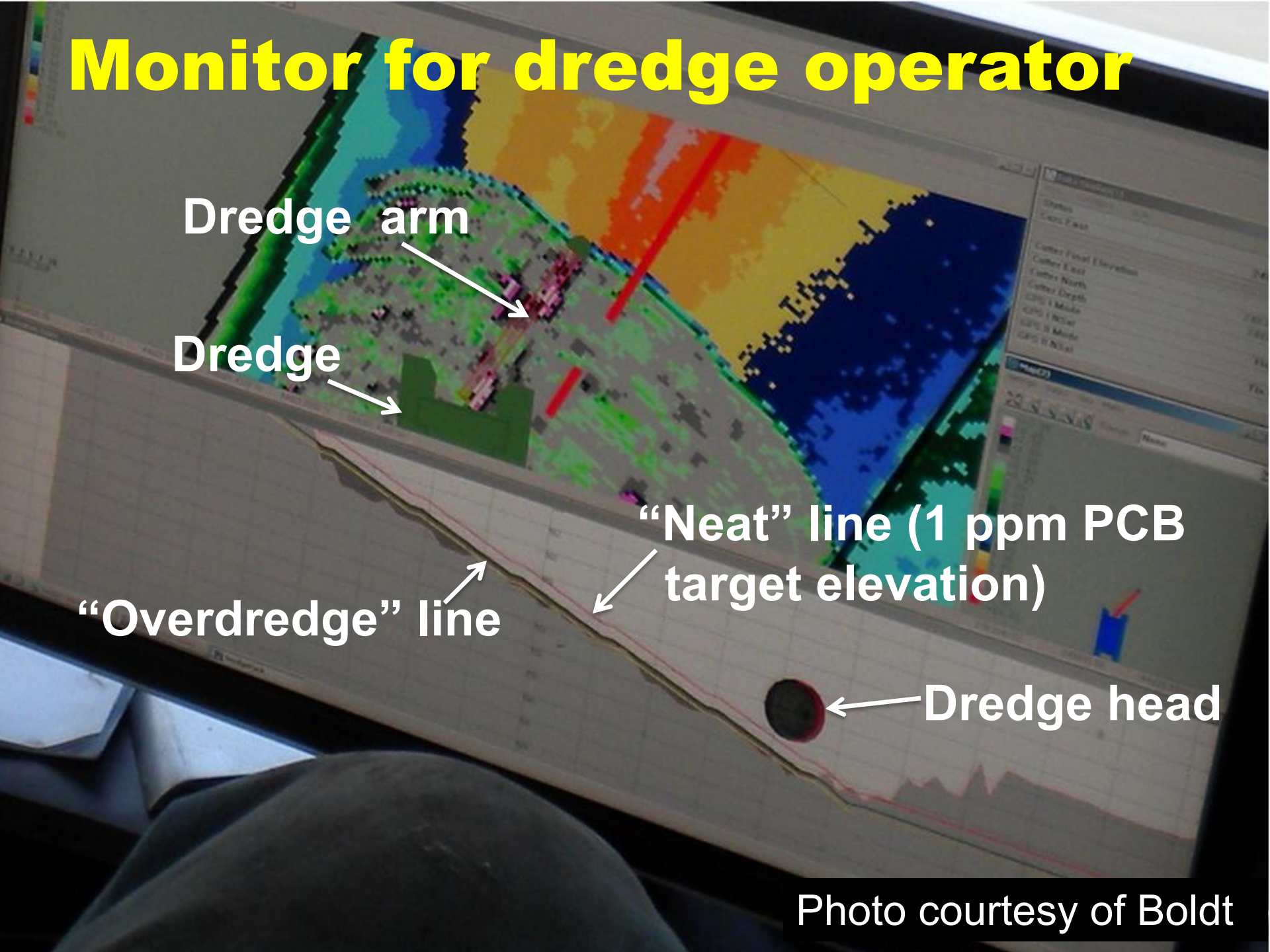
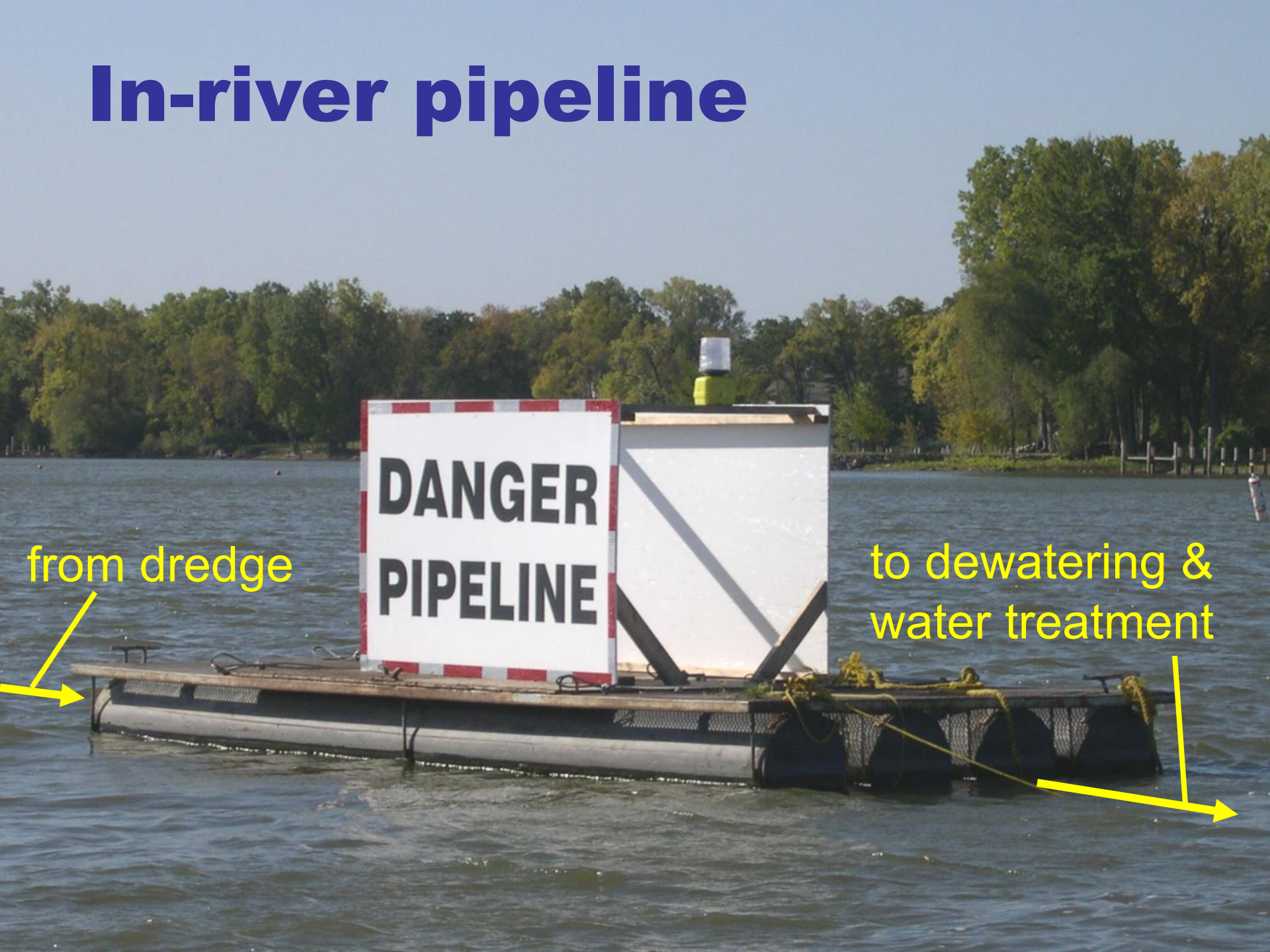


Photo courtesy of Boldt

Post-dredge PCB concentrations: less than 0.19 ppm from greater than 50 ppm

In-river pipeline



2004 – 2008 dredging upper river

Dredging

Dewatering (geotextile tubes)

Loading

Disposal

Photos courtesy of Boldt

Stacked geotextile tubes

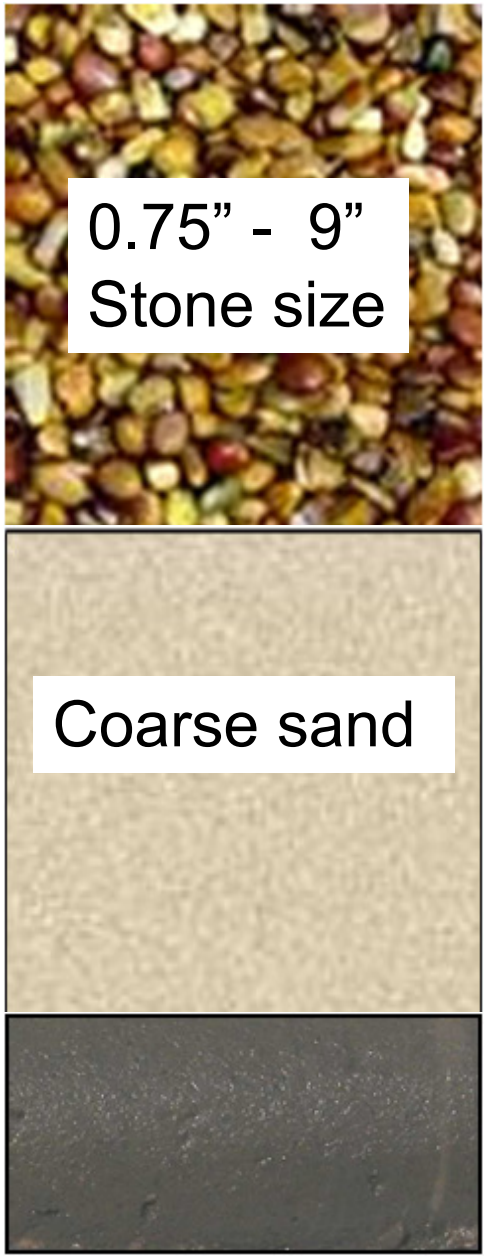
From: GW Partners, LLC, Remedial Action Certification of Completion Report, Lower Fox OU1, November 2010.

Geotextile tubes for dewatering

Pros	Cons
No moving parts & less manpower	More space needed
Lower dewatering cost	Lower solids content (may increase disposal costs)
Flexibility (tubes always available)	Tube breakage


“Throwing stone”
(cap armor stone)
Photo courtesy of Boldt

Cap designs

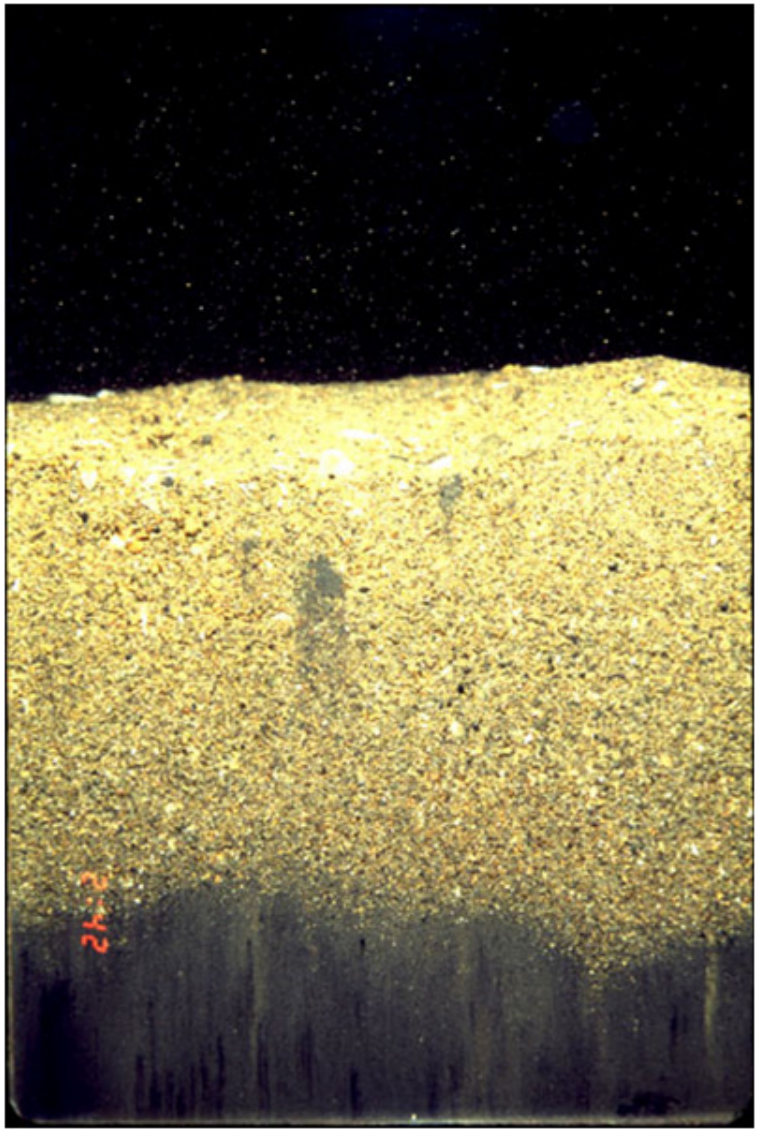


Armor stone thickness:
7” – 24”

Sand thickness: 6” – 9 ”

Contaminated sediment

Thin cap (“sand cover”)

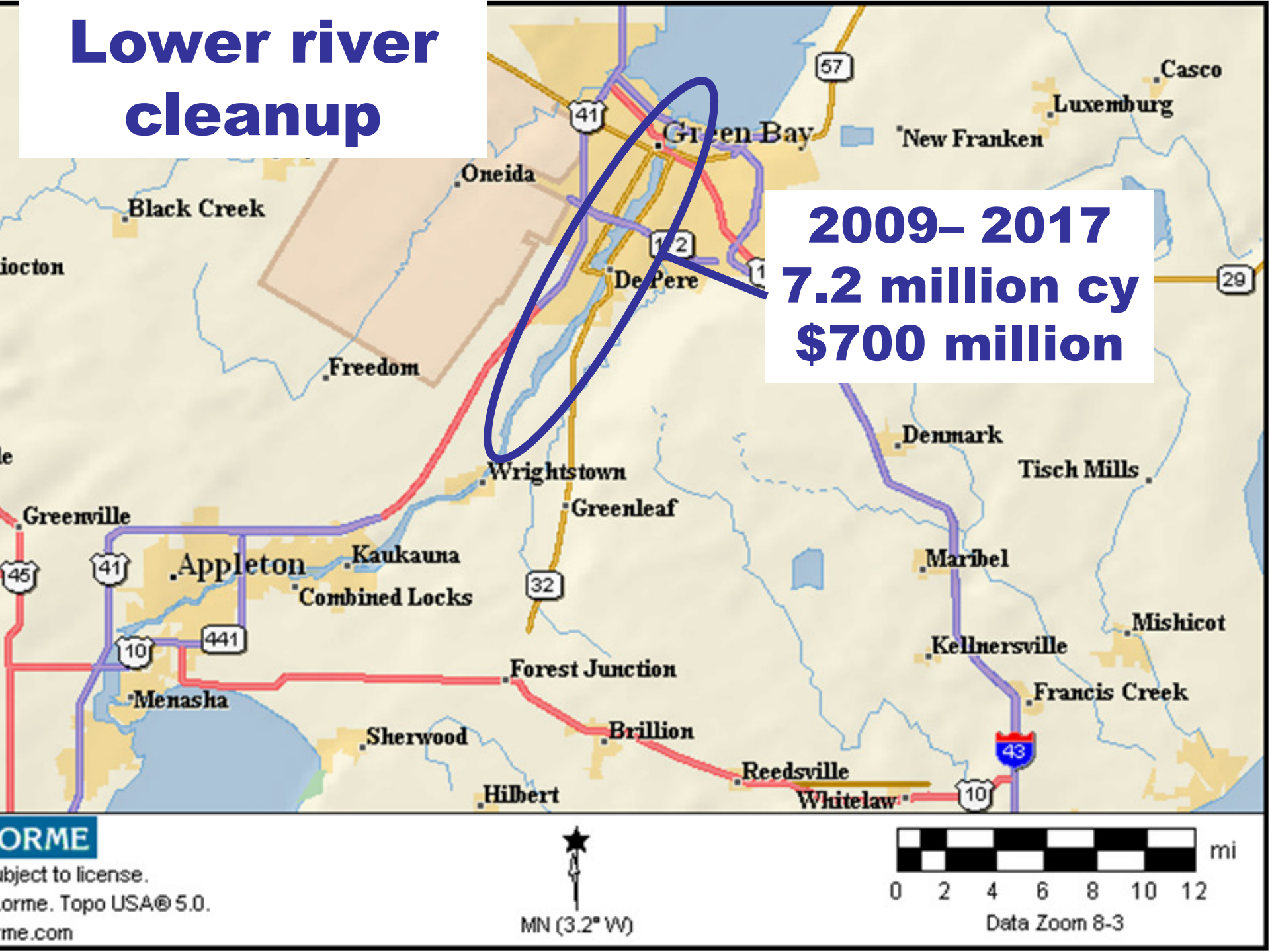


6-inches of sand

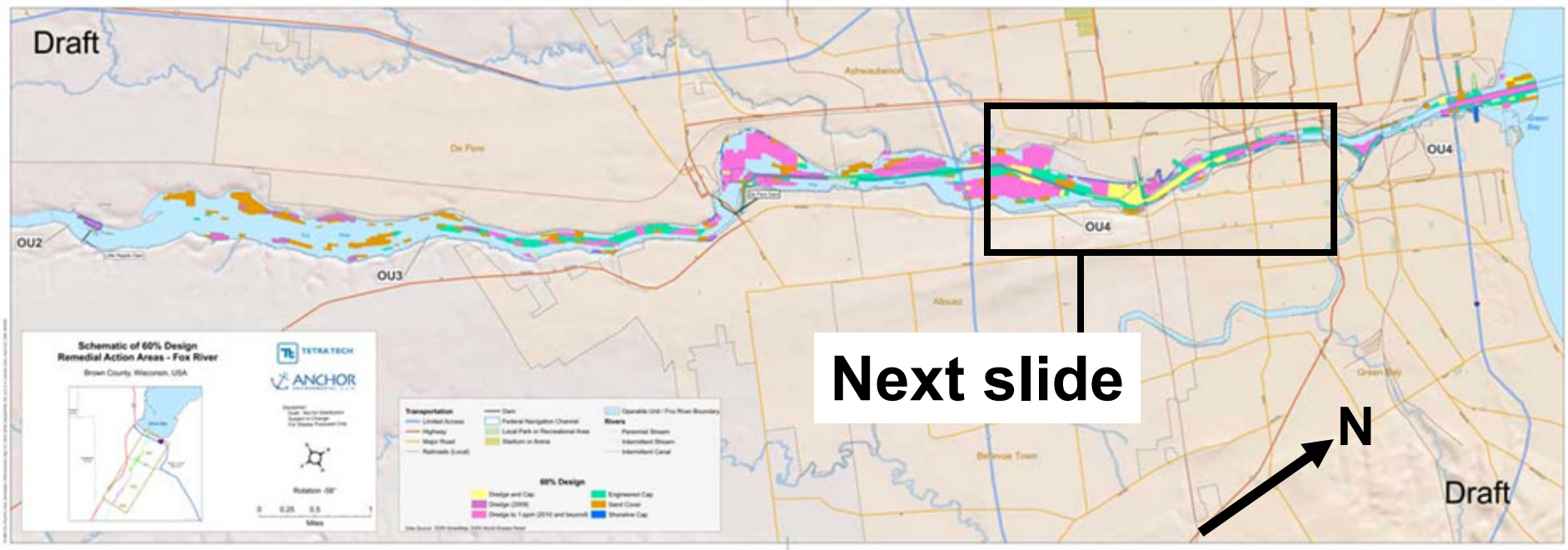
Mixing zone

Contaminated sediment

Lower river cleanup



Lower river cleanup



Dredging

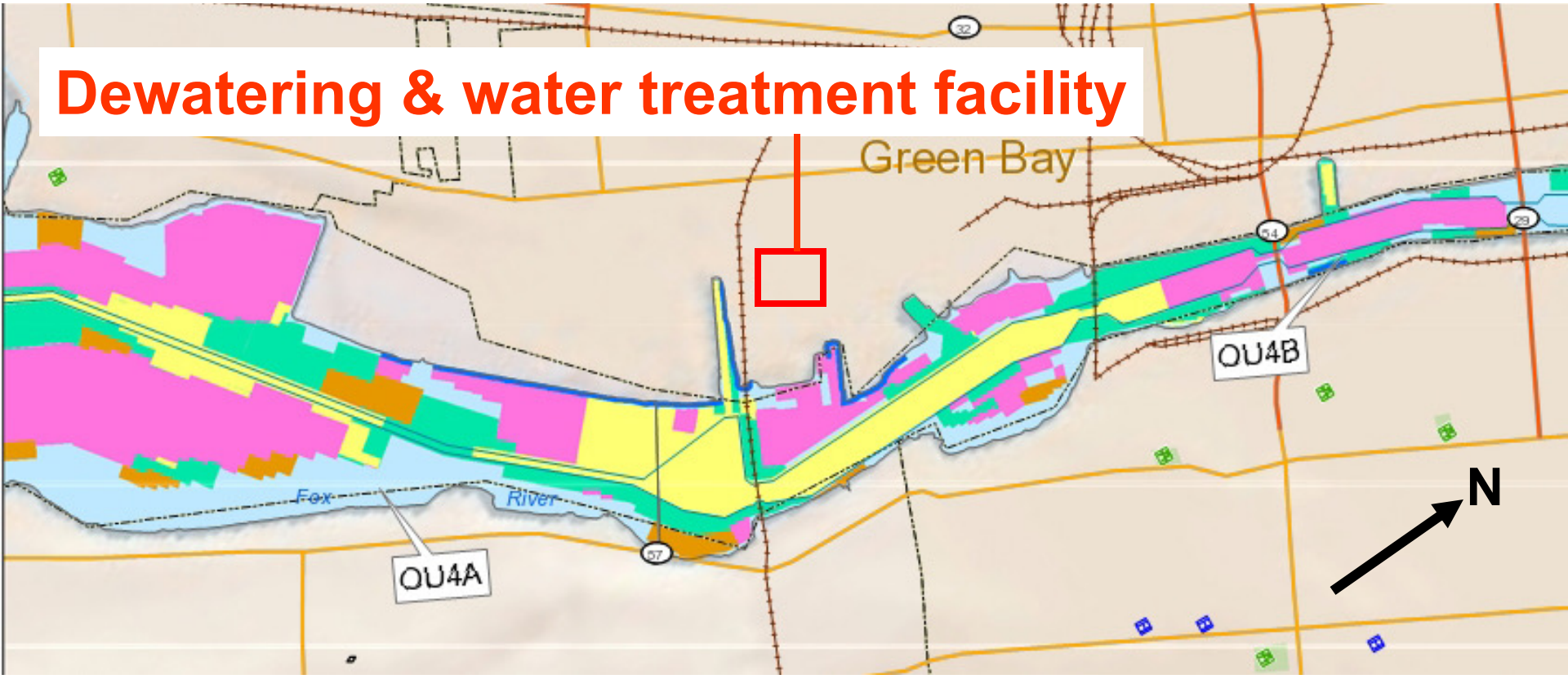
Cap (sand and gravel)

Dredge and Cap

Cover (sand only)

Courtesy of Tetra Tech

Lower river cleanup



Dredging

Cap (sand and gravel)

Dredge and cap

Cover (sand only)

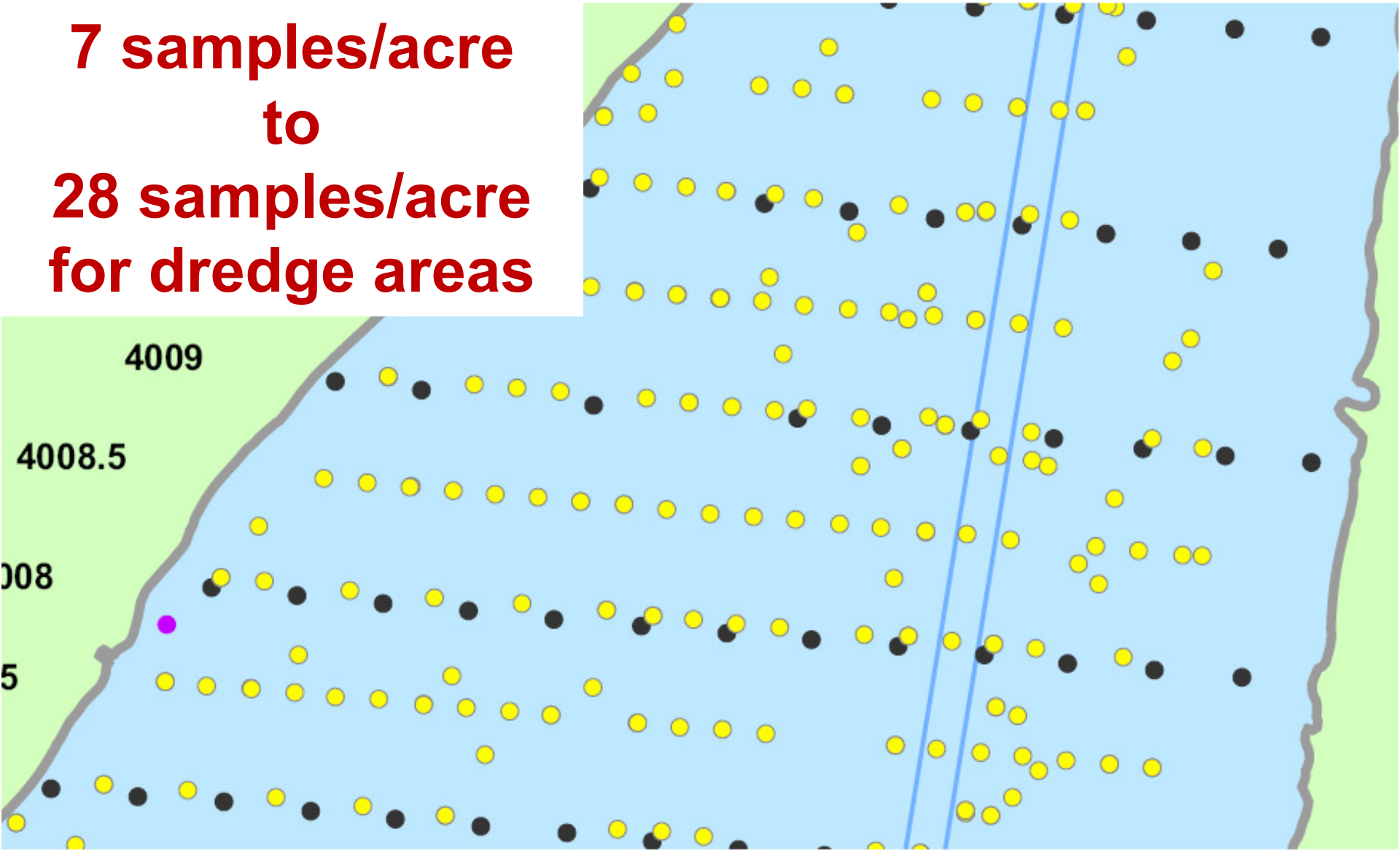
Courtesy of Tetra Tech

Infill sampling lower river

2010 sampling

2004 - 2006 sampling

7 samples/acre
to
28 samples/acre
for dredge areas



Multiple hydraulic dredges (lower river)

Output pipe	Auger	Contamination thickness	Number
8 inches	24 inches	2 - 3 feet	2
12 inches	36 inches	3 - 12 feet	1

Dredging operations

- **April – November**
- **24 hours/day, 5 days/week**

Debris removal

- Magnetometer and side scan sonar identify debris areas
- Backhoe used
- Mostly old wood pilings (some steel and rock also)
- 19 areas (23 acres) with debris of 1200 total acres being cleaned up

Debris removal

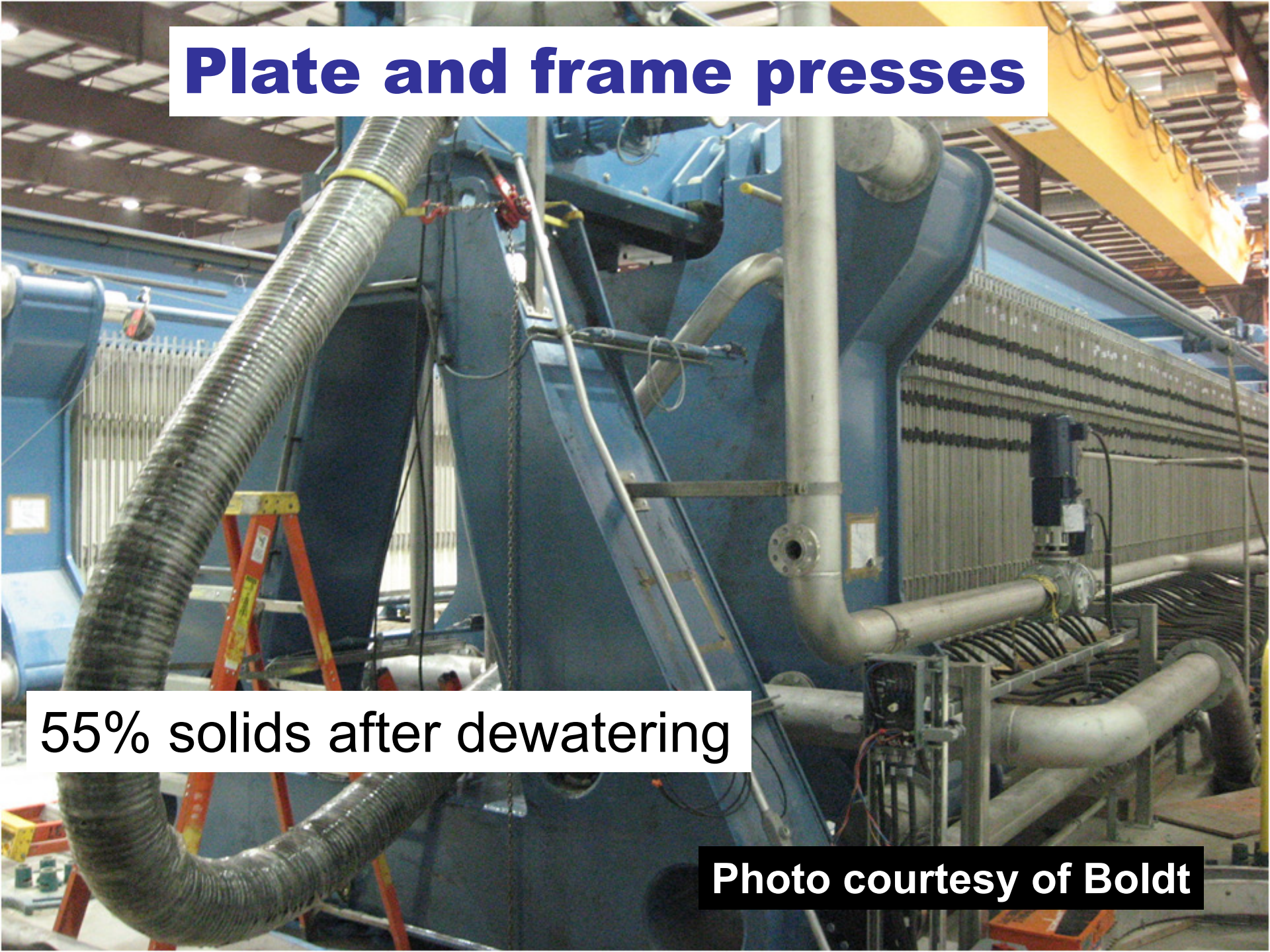
Photos courtesy of Boldt

Debris

Dewatering facility for lower river cleanup

Photo courtesy of TetraTech

Plate and frame presses



55% solids after dewatering

Photo courtesy of Boldt

Landfill disposal

Photo courtesy of Boldt

“Beneficial re-use” of sand

2010: 35,000 tons of sand of 300,000 tons sediment - roadway construction (PCB concentration: ~0.27 ppm)

Possible opportunity	Description of use	Estimated PCB concentrations
Bayport disposal facility	Construction	≤ 1 ppm
Landfill	Construction	≤ 5 ppm
Roadways	**Construction**	**≤ 1ppm**
Mines	Reclamation	≤ 0.25 ppm
Upland	Construction for non-residential uses	≤ 1ppm

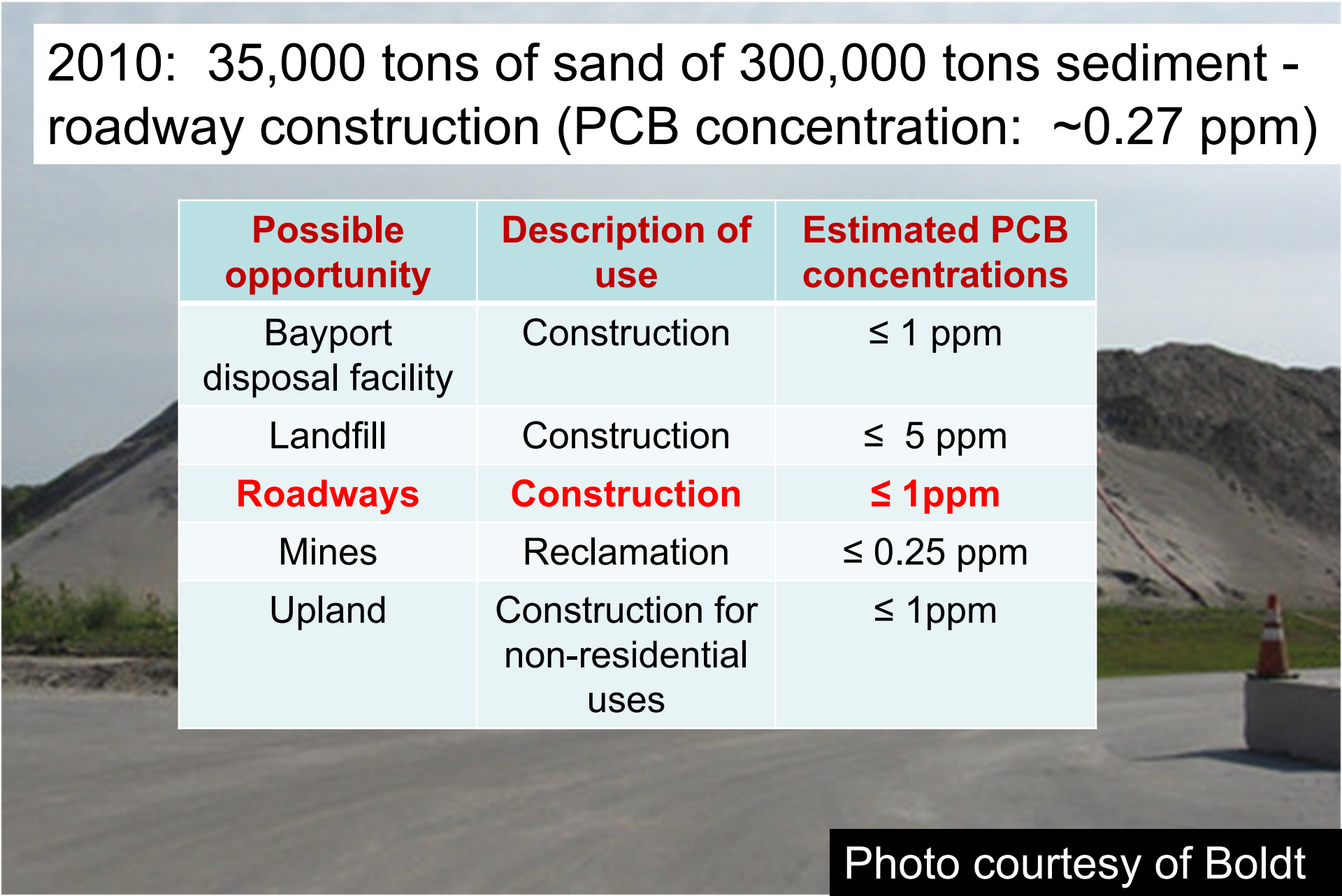


Photo courtesy of Boldt

Community issues

- Cap “permanence” (discussed earlier)
- Transportation & disposal of dredged sediment
- Sediment disposal locations
- Noise on river and water traffic
- Cleanup results & benefits

Truck route for dredged sediments (550 trucks/week)

Primary route

Disposal Site
(for PCBs less than 50 ppm)

Map courtesy of STS/AECOM

Radar monitoring

Sediment disposal

- PCBs less than 50 ppm (“non-TSCA”)
  - Local commercial facility
  - Disposal location: 34 miles
  - 3.6 million cubic yards

  downriver cleanup
- PCBs more than 50 ppm (“TSCA”)
  - Local disposal opposition
  - Disposal location: 460 miles
  - 180,000 cubic yards total

Noise & river traffic

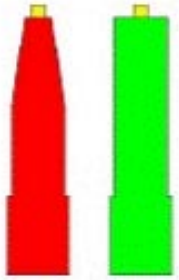
- Noise solutions
  - Move operations or time differently
  - Add sound insulation
- In-river pipeline
  - Public education
  - Signs, buoys & markers
  - River patrols

Safety Markers

Large rectangular signs mark the pipeline.
DO NOT CROSS!

Lighted orange and white buoys alert watercraft to the pipeline area.
STAY CLEAR!

Orange pipe delineators mark where the pipeline is submerged.
PROCEED WITH CAUTION!



Lighted green and red buoys mark channels for safe crossing.
CROSS BETWEEN GREEN and RED BUOYS!

Progress on river cleanup

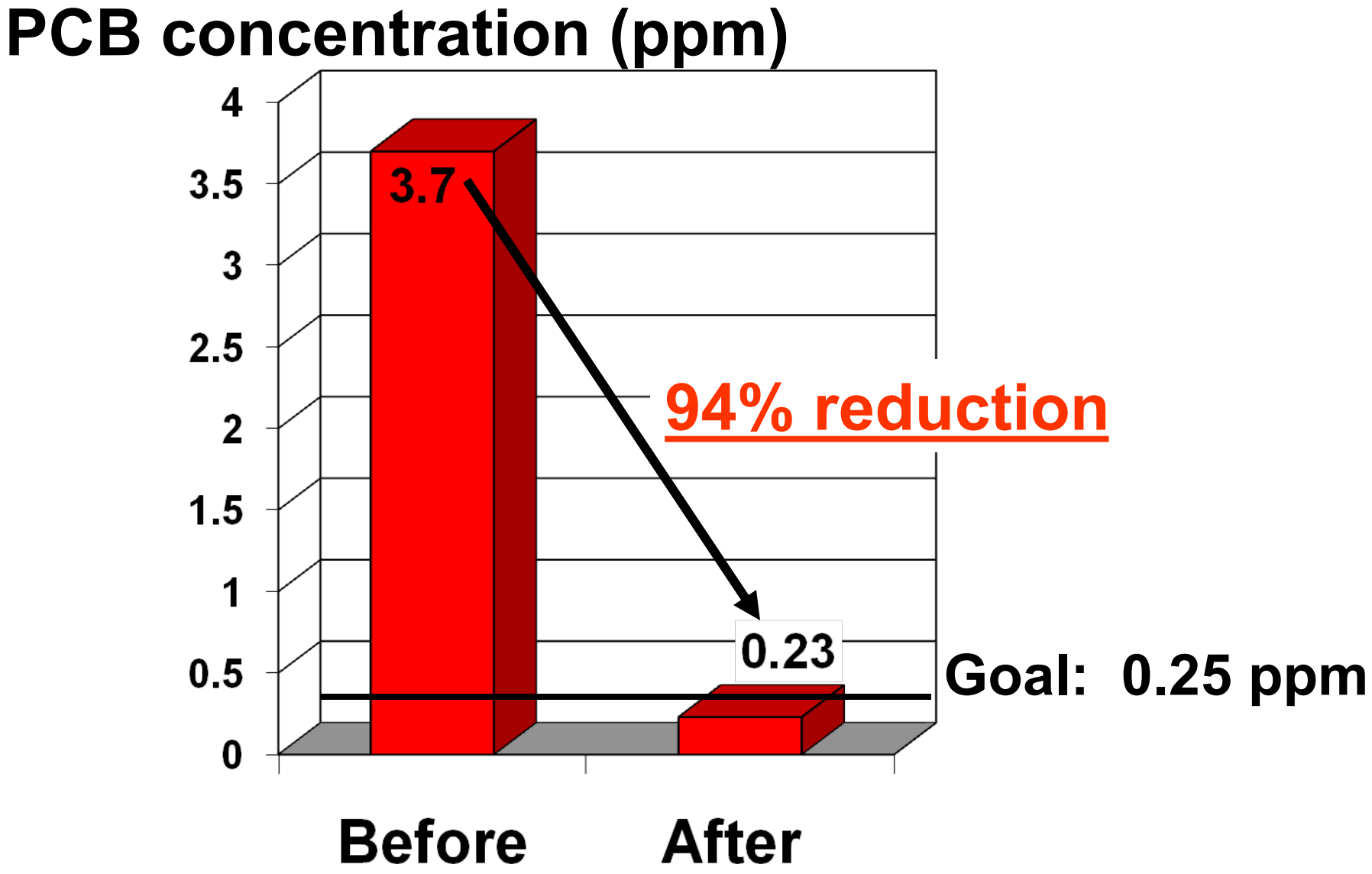
River reach & Phase		Start date	Completion date	Volumes addressed (cubic yards)
Upper river		2004	May 2009	750,000
Lower river	Phase 1	2007	2011	160,000
	Phase 2	2009	2017	7,040,000
TOTAL				7,950,000

2009 - 2010: 1,300,000 cy dredged

Results - upper river

- 370,000 cy PCB sediments removed & 500,000 cy capped (2004 – 2009)
- 95% of PCBs removed in 1–2 dredge passes
- Cost: ~$100 million
- Post-cleanup PCB concentration: 0.23 ppm average surface concentration from 3.7 ppm

Results for Upper river



Post-cleanup PCB concentrations Upper river (northern half)

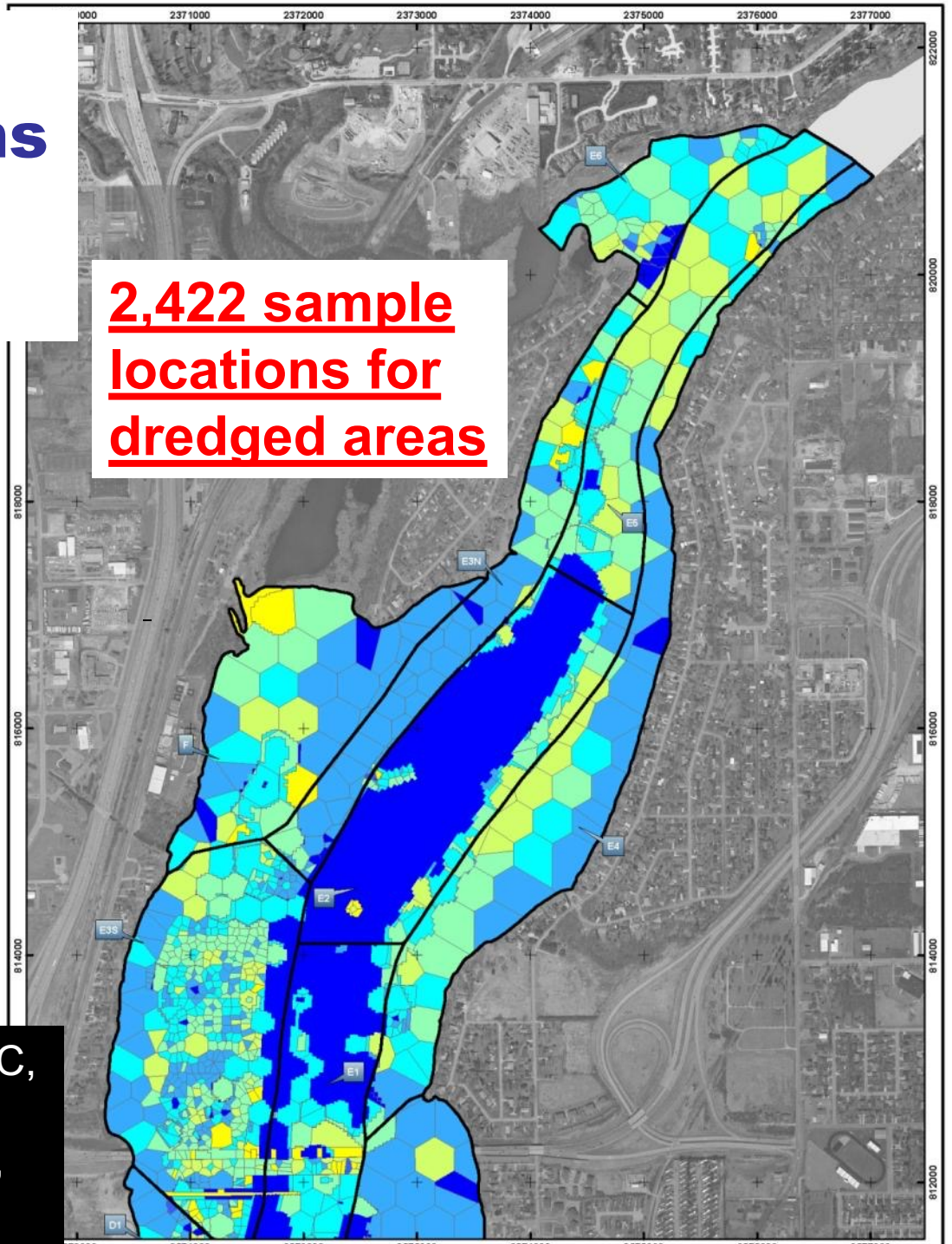
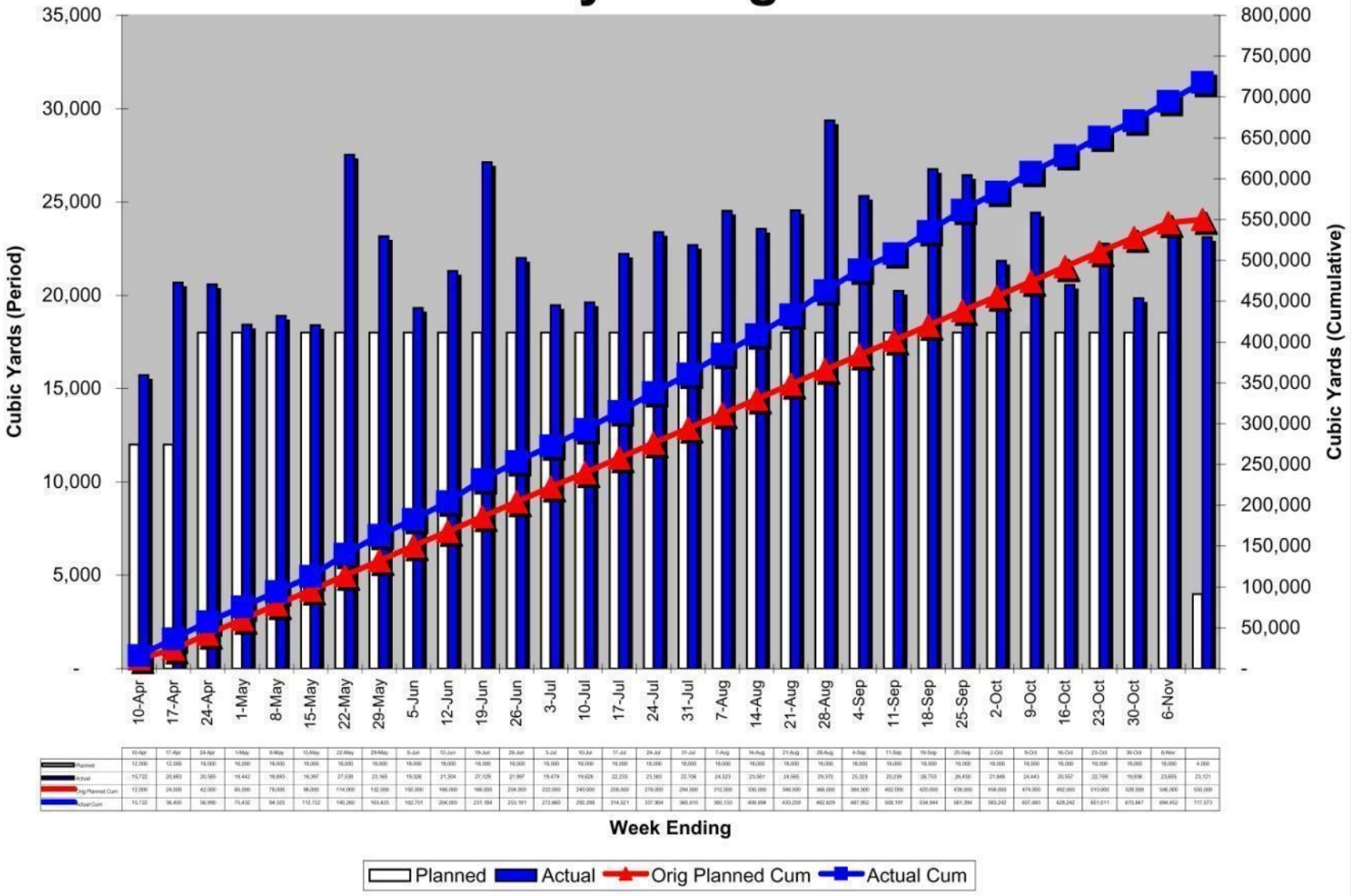


Figure 1-26, from: GW Partners, LLC, Remedial Action Certification of Completion Report, Lower Fox OU1, November 2010.

2010 Summary Dredge Production



Local economic benefits

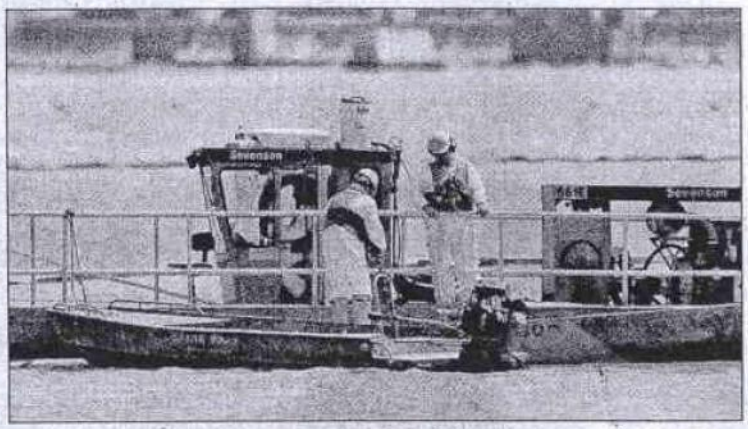
PCB removal dredges up work for local companies

River project has generated state, regional revenue

BY TONY WALTER
twalter@greenbaypressgazette.com

The negative environmental impact of PCBs in the Fox River is providing a positive economic result for many local companies.

The 10-year project that includes removing polychlorinated biphenyl sediment from the Lower Fox, treating it in a process plant under construction, and hauling it to a Calumet County landfill has resulted in $200 million in contracts to local, regional and state companies, project officials say.



Fox River PCB cleanup site workers float on a dredging barge offshore from Fort Howard Avenue in De Pere. **File/Press-Gazette**

"We definitely wanted to hire local companies," said Ray Mangrum, project manager for Tetra Tech, the company in charge of the river cleanup project. "We just bid it out to locals."

Tetra Tech is supervising construction of a 247,800-square-foot processing facility on a 25-acre site on the river's west side, just south of Georgia Pacific Corp.'s Broadway plant. Dredging of almost 4 million cubic yards of PCB-contaminated sediment is scheduled to begin in May south of the De Pere dam and eventually cover the river portions north of the dam to the bay.

It will be the largest PCB river remediation project in the world and is estimated to cost about $600 million, although the paper mills responsible for dumping the PCBs — a waste material from the production of carbonless paper — haven't reached countability.

The processing center is the first of its kind, something Mangrum said he designed on a napkin.

"Everybody in the world with a major sediment project will come here to see what's going on," said Stephen McGee, project coordinator for Tetra Tech.

They will see that the majority of the work is being provided by local companies and laborers. Mangrum said there will be about 140 workers on site through the winter and 85 to 100 working at the center when it becomes operational.

"I've worked all over the U.S. and these are the best

More online

For archived coverage, go to www.greenbaypressgazette.com/foxrivercleanup.

Feb. 2008 Green Bay Press Gazette

- **$300 million+ contracts with local, state, & regional companies**
- **140 jobs for initial construction & 85-100 ongoing (most local)**

Additional local benefits

- Cleanup contractors spending
  - Hotels and restaurants
  - Local supplies
  - Home purchases, etc.
- River improvement
  - Tourism
  - Recreational

Natural Resource Damage compensation

- 110 projects funded (40 completed)
  - Land acquisition
  - Stream and wetland restoration
  - Land acquisition
  - Fish hatcheries
  - Public use

- $58 million spent to-date
  - $36 million by Potentially Responsible Parties
  - $22 million by governmental parties


Questions, discussion
http://www.epa.gov/region5/sites/foxriver/index.html