Silver Lake Commission
5:30 PM – May 16, 2012
Large Conference Room, Dover City Hall
Dover, DE
APPROVED SEPTEMBER 5 2012

Present Members
Dean Holden, Chairman
David Edgell
Zach Carter
James Burcham

Absent
Cheryl Biddle
Nancy Wagner
Melanie Tymes

Others in Attendance
Carolyn Courtney
Lyle Jones
Brittany Sturgis
Gary Johnston
Councilman Sean Lynn
Councilman Adam Perza
Melissa Savin
Scott Koenig
Rick Greene
Lara Allison
Bruce Allison

Welcome/Call To Order
Chairman Holden called the meeting to order at 5:30 PM.

Approval of April 2012 Meeting Minutes
Mr. Carter motioned to accept the minutes as presented with Mr. Edgell as second, minutes were passed without objection.

DNREC Mirror Lake Public Outreach
The Chair gave a brief intro of the Mirror Lake issues and introduced Lyle Jones of DNREC & presentation -- attached.

Mr. Jones gave a brief introduction of DNREC staff and turned to Rick Greene – Dept. Engineer, DNREC Watershed Stewardship

Reviewed presentation: Overall plan is to inject carbon pellet (carbon & mineral pellet) into area with water draw down that is necessary to get carbon pellet to work best.

There is potential for fish kill, however plans are being made to make this minimal. The plan incorporates the use of a temporary dam to assist moving the water so that work can be performed. Mr. Jones stated DNREC's Fish & Wildlife section was supportive of the project overall. Additional statements and concerns voice from the participants included: PCB's are sequestered and not removed. This is only covering problem and leaving for future does not remove the PCB's/containments. Long term affects are not known to be bad at this time.

The concept will be the first in a state/city use, has been used on a federal level only. This will be a pilot project but the scientist believes it is a great site for this type of treatment.

Mr. Greene has spoken with the Army Corp of Engineers and the have provided information they will require should this go to full spec and permits are applied for to complete the project. DRNEC cannot apply for permit until the public outreach, council approval and other steps are completed. Timeframe would be November 2013 to begin project construction with all the public outreach and planning to be done in the remaining 2012 months and into 2013.

Commission would work with DNREC and offer the public education of the project. Then bring back to City Council accordingly.

The group advised Mr. Greene & Mr. Jones to take presentation to Parks & Recreation Community Enhancement with the exclusion of November 2012 and use 2013 as the target date.

Funding is being covered by the state & grants, with some in-kind from the City.

Mr. Green is optimistic that the permits (Army Corp) could be issued. However application cannot move forward until final specs are completed.

It was noted by Mr. Jones that DNREC will also be working on their storm water issue and the same for Treadway Towers. Plan will design flow into a wetland area that filters water before hitting the lake.

The commission agreed the intent will be to get this on June PR & CE meeting. DNREC will produce a summary of work that has been done and potential for this project. Envision for design – permitting is approx. 6 months. Design work is funded and they are ready to move forward on the design following the public hearing and council involvement.

Public outreach will be a combination of efforts on behalf of DNREC and the City.

Project Updates

Mill Race

Mr. Jones reviewed the information discussed at the last meeting. Noting they have moved forward with the design phase of this project. Noting the intent is to improve hydrology of Mill Race. This project will put a few structures in to filter water before it hits the St. Jones. Cut out the wettest area and plant wetland plants still allowing use for the project intent is to help dry the area and make usable. The $25K needed is available in the 319 grant. Shovel ready by September 30 is the goal of this project. Preliminary talks with the Corp appear as though permits will be granted.

Central Middle School

Mr. Jones reported that they were working on cleaning area along fence line, removing invasive plants and working to pull out fence that is mostly covered, intent to have access to water with room for education areas. CMS is behind project and has offered volunteers. Hand out provided. 21st Century Fund may be available for this project. SLC would have to make a request.

After brief discussion it was noted to consider these two projects as individual. The Commission would need to apply for the 21st Century Funds that were set aside for capital projects.

Mr. Edgell made the motion to contact Frank Piorko for consideration of using 21st Century Funds for the Central Middle School project. Mr. Carter seconded and the motion carried without objection

Park Drive Oxbow Plantings: Mr. Jones reported the planting took place April 29th. With a group of volunteers and city staff a total of 94 shrub & trees was planted in approximately 2 hours.

Meeting Schedule

At this time, no future SLC meetings are scheduled. We will base our next meetings off of the public workshops and movement forward on Mirror Lake project.

Adjournment

With no further business, Mr. Carter motioned to adjourn with Mr. Burcham as second the meeting adjourned without objection.

Restoration & Remediation of Mirror Lake, Dover



May 16, 2012

Vision for Mirror Lake

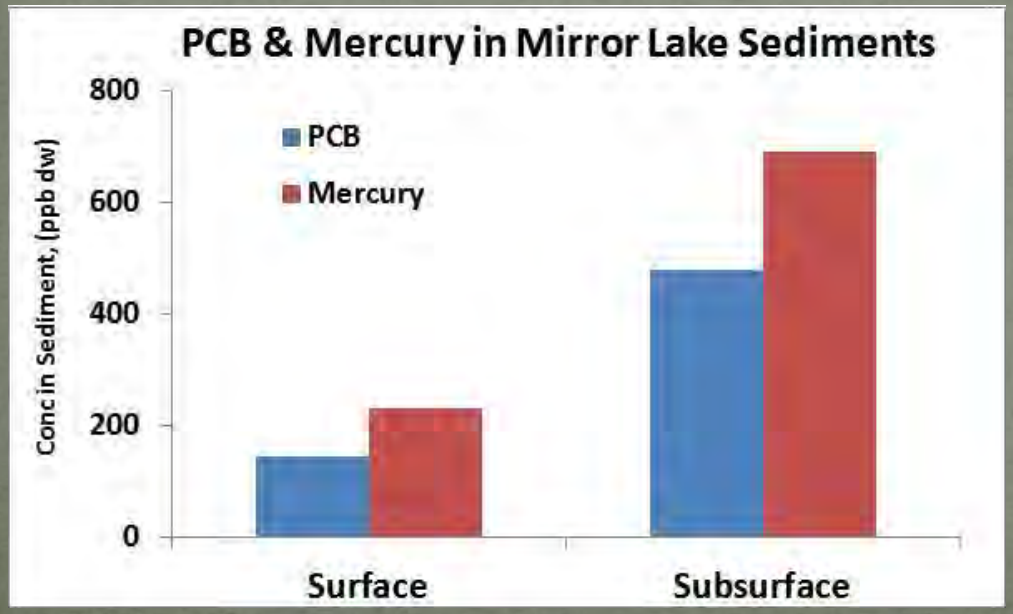
- Restore/enhance habitat & ecological function
- Remediate contaminated sediments
- Provide a comprehensive and long-term solution

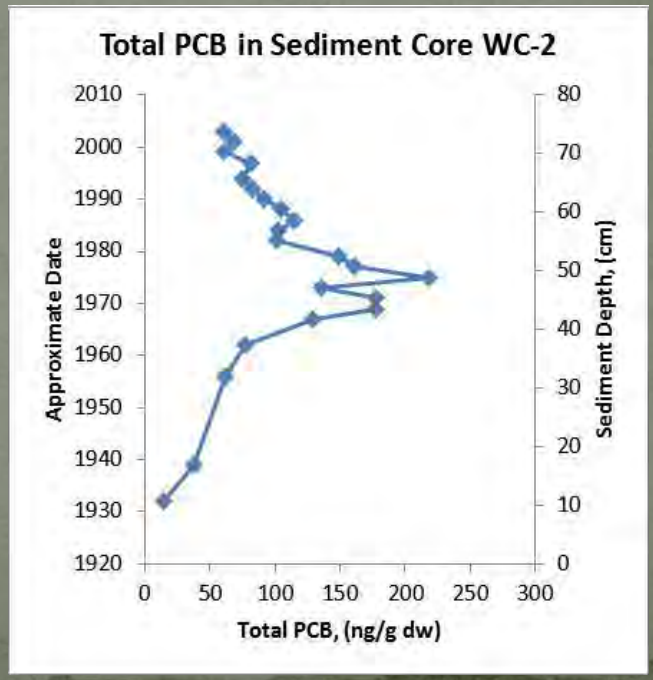
Habitat Issues

- Limited ecological services and functions
- Sandbar
- Canada geese
- Invasive plants
- Eroding banks
- Stormwater Impacts (parking lots & other paved areas)

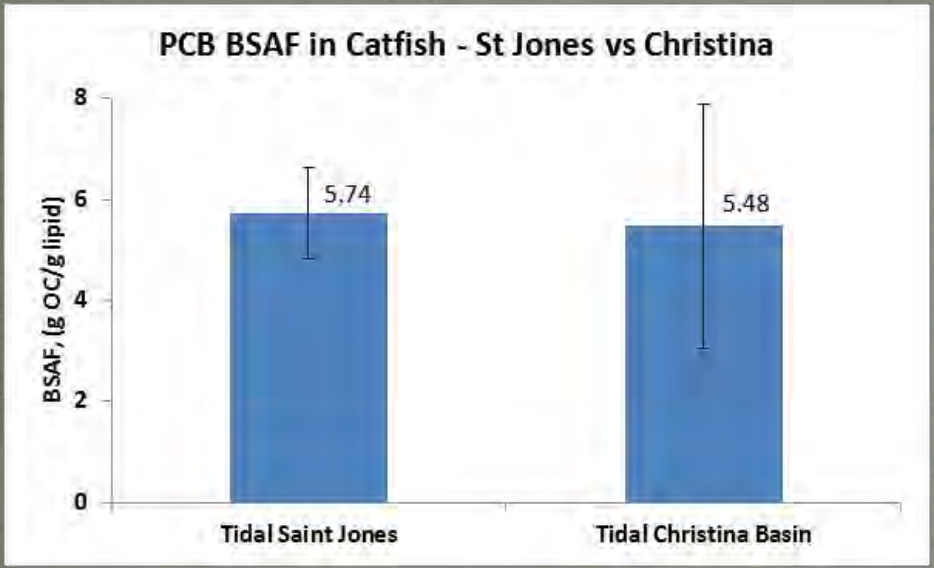
Contaminant Problem

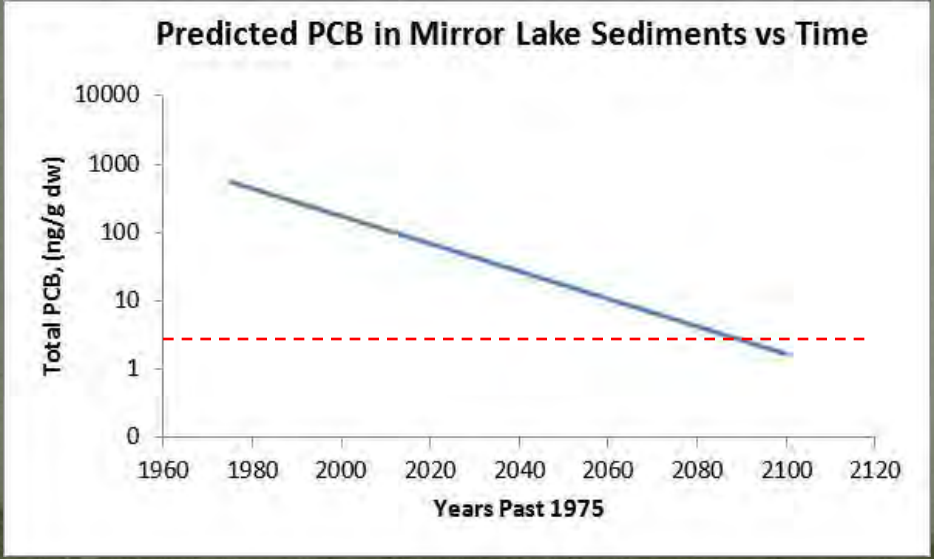
- Fish, sediment and surface water within the St. Jones River and Mirror Lake are contaminated with PCBs, mercury and other pollutants
  - *Fish advisory first issued in 1988 to reduce public exposure*
  - *Concentrations falling, but very slowly. Why?*





Contaminant Problem (cont.)





- PCB & Hg in fish depend on concentrations in the sediment
- PCBs & Hg very persistent
- Sediments act like a capacitor which release contamination to water
- 74 years predicted for conc of PCB in Mirror Lake sediments to drop to point that fish OK to eat

Options for Restoration and Remediation:

A. Do nothing and wait it out
   - *No cost but fails to address habitat or contaminant problems. Long wait (~74 years) on contaminants .*

B. Dredge
   - *Several downsides for this particular situation.*

C. Cap it
   - *Medium costs, contaminants remain & may diffuse through cap. Can be integrated with habitat restoration.*

D. "Sequester" it
   - *Contaminants remain but bioavailability & bioaccumulation greatly reduced; Half the cost of dredging. Can be integrated with habitat restoration. This is DNREC's preferred option.*

Dredging Mirror Lake

- Not needed to support navigation/commerce, recreation, or education.
- Will not enhance habitat or ecological functions
- Expensive (~$1.5 M). Contaminants in sediments likely to drive up disposal costs even further.
- Worst of contamination is deeper down in sediments. Dredging will release some of that contamination.
- Not a permanent solution to “sand bar” problem. Sandbar will reform over time.
- Very low likelihood of being permitted. Non-starter.

Proposal

- DNREC staff contacted Dr. Upal Ghosh, UMBC, in summer of 2011 to explore feasibility of carbon treatment of Mirror Lake & downstream channel
- Mirror Lake considered good candidate
- Proposal developed and circulated internally with great interest
- Expected Reduction of contaminant bioavailability:
  70 – 90% or better

What is activated carbon?

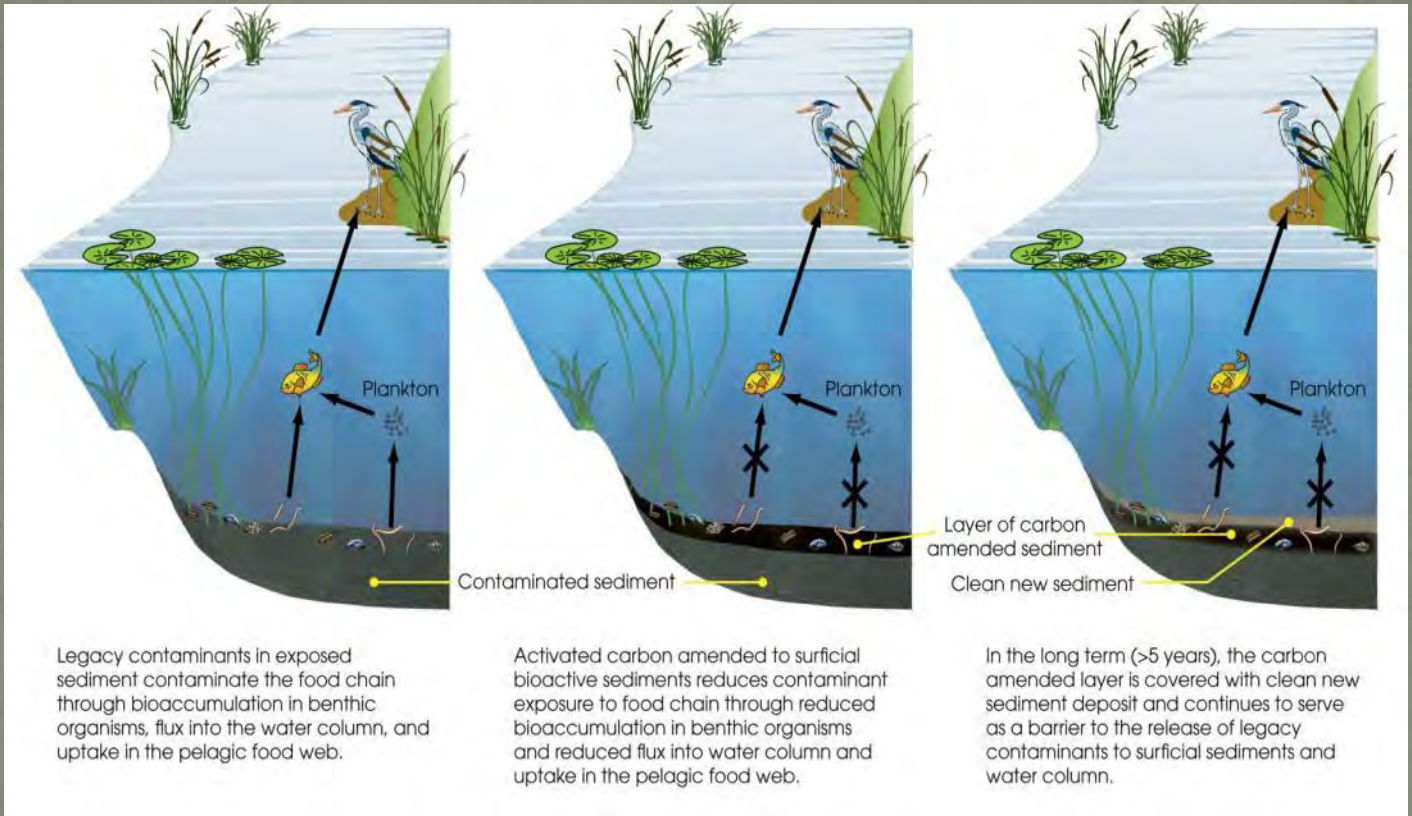


Has strong sorption properties that act to bind contaminants, making them less available to the food chain

Activated Carbon Sequestration

- Involves incorporating activated carbon directly into sediments to bind the contamination and reduce bioavailability.

How it works:



bioaccumulation → reduced bioaccumulation → new sediment=barrier

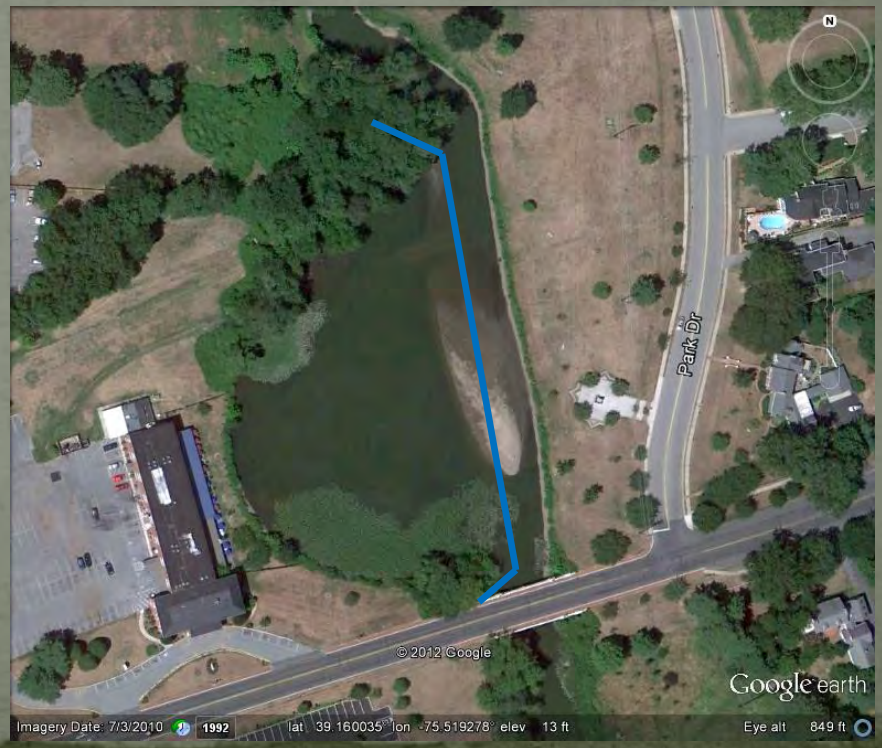
Proposed remediation area for carbon sequestration



Dewatering Operation

- Optimum time is November
  - *Lower risk of hurricanes and frontal storms; also base flow still low*
  - *Avoids fish spawning runs; also recreational fishing winding down*
- Draw down Silver Lake as buffer
- Install Portadam & dewater Mirror Lake w/ high capacity pumps



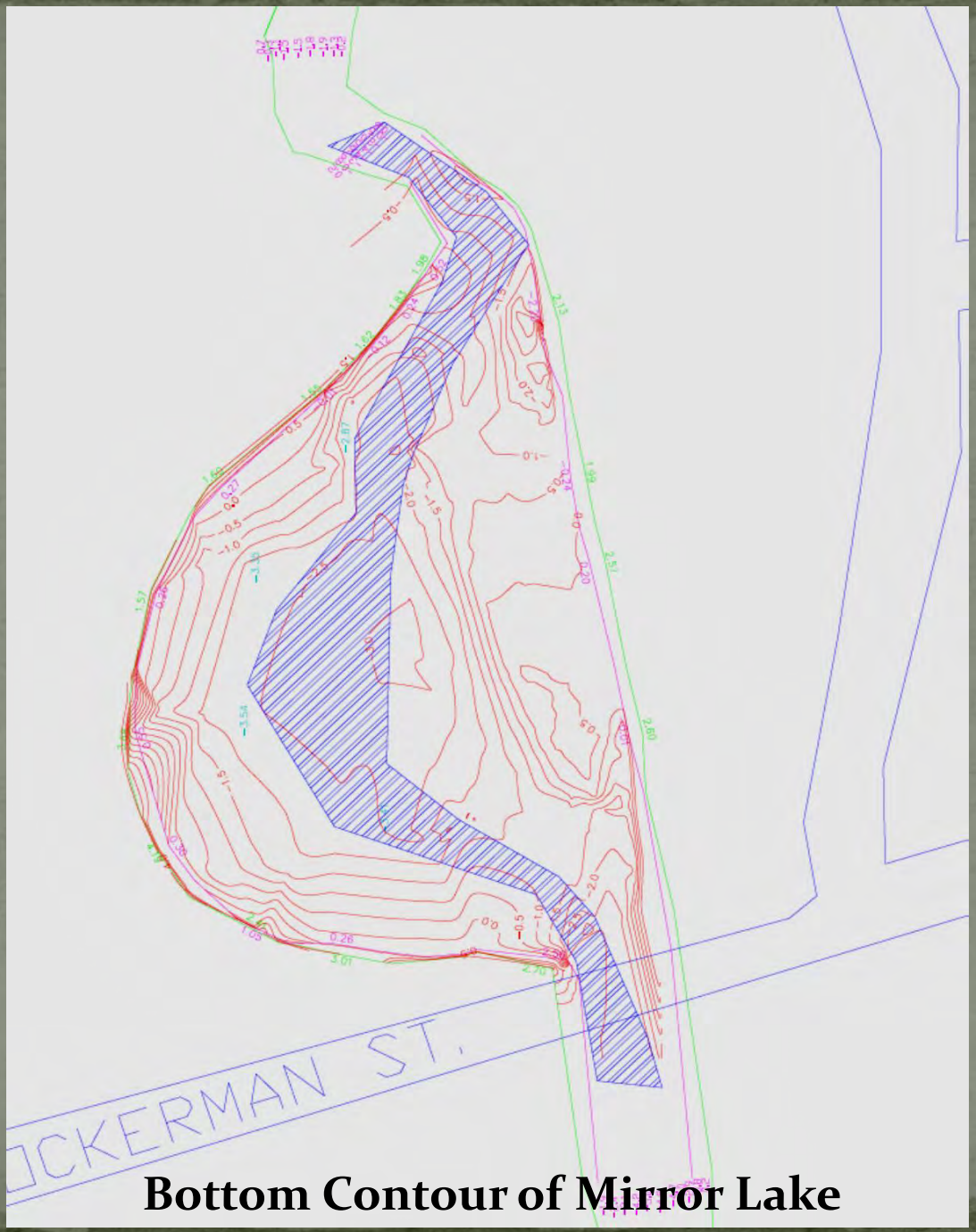


Methods of Carbon Addition

- For dewatered areas: broadcast and till in immediately
- For wet areas: shoot in pellets with “hydroseeder”-type device







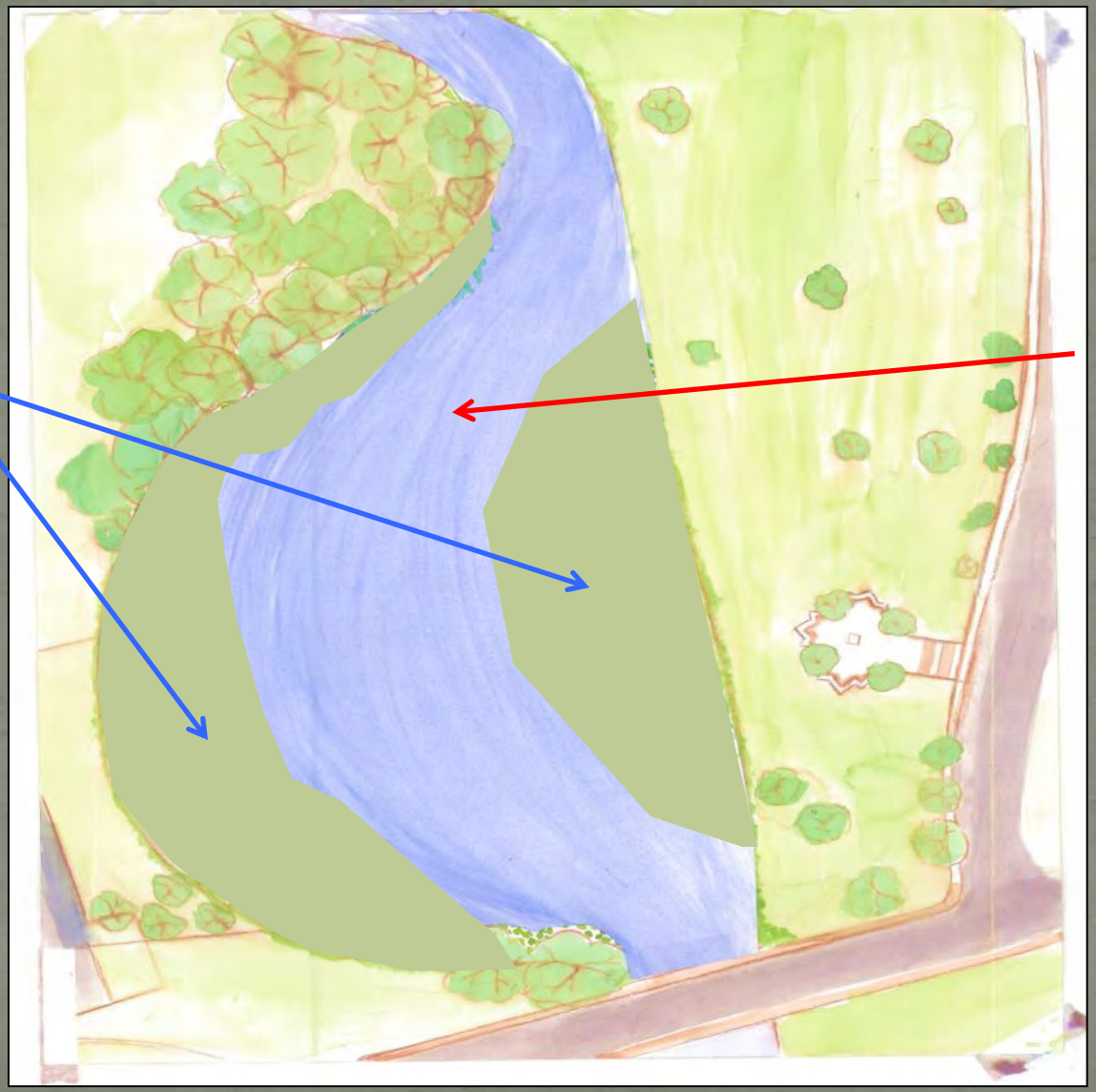
Bottom Contour of Mirror Lake

Sketch of existing conditions



Sketch of proposed conditions

Emergent wetlands will be increased in size.



Channel will remain

Artist's rendering looking north



Artist's rendering looking east



Artist's rendering looking west



HERBACEOUS PLANTS



Sweet flag



Water plantain



Fox sedge



Swamp sunflower



Blue flag iris



Soft rush



Arrow arum



Torrey's rush



Black needle rush



Lizards tail



Pickerel weed



Green bulrush



Duck potato



Soft stem bulrush



Common three-square



American white water lilly



Woolgrass

Benefits

- Unsightly sandbar will be converted into an attractive intertidal wetland, beautifying the gateway to historic Dover.
- Wetland plantings will enhance biodiversity & ecological function of Mirror Lake
- Reduce Canada geese & invasive plants
- Reduce toxicity to benthic aquatic life and reduce fish contamination, thereby lowering human health & wildlife risks

Funding

- Estimated Cost = $0.75 million (includes planning, design, construction, and monitoring)
- Potential Funding Sources:
  - *State Penalty Funds*
  - *319 NPS (Paid for most of Silver Lake work already)*
  - *Clean Water Council Community Funds*
  - *Various EPA grants (e.g., ORD, urban waters)*
  - *Research grant to UMBC*
  - *State Cleanup Funds*
  - *Natural Resource Damage Funds*
  - *City of Dover (in-kind)*

In-House Labor to Defray Cost



Next Steps

- Develop artist renderings 
- Gather community input and support
- Prepare design plans melding remediation/ restoration
- Submit permit applications
- Baseline monitoring
- Construction (Nov 2012 or Nov 2013)
- Post-construction monitoring

Acknowledgements

- Upal Ghosh, UMBC
- Steve Williams
- Lyle Jones
- Brittany Sturgis
- John Cargill
- Melanie Tymes
- Steve Wright
- Mark Biddle
- Ed Bonner, USACE
- Capt. Sean Knapp, USMC
- Frank Piorko
- Chuck Williams
- Dave McQuaide
- Lara Allison
- John Schneider
- Stew Michels
- Cathy Martin
- Bob Enright
- Virgil Holmes
- Silver Lake Commission

References

Ghosh, U. and Greene, R. 2012. In-situ Treatment of Mirror Lake Sediments to reduce Uptake of Pollutants in the Food Chain. Proposal.

Greene, R. Saint Jones & Mirror Lake PCB Time Response without Carbon Treatment. Delaware Department of Natural Resources and Environmental Control, Dover, DE.

Greene, R. 2012. Managing Water During the Mirror Lake Restoration and Remediation Project. Delaware Department of Natural Resources and Environmental Control, Dover, DE.

Biohabitats
Incorporated

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April 24, 2012

Mr. Lyle Jones
Delaware Department of Natural Resources and Environmental Control
Watershed Assessment Division
820 Silver Lake Boulevard
Suite 220
Dover, DE 19904

RE: **Central Middle School RSC**
Biohabitats Proposal No.: 12039.01

Subject: **Proposal to Perform Stream Stabilization and RSC Services**

Mr. Jones:

Per your request, we are submitting a scope of work and fee to perform stream stabilization along the St. Jones River and provide regenerative stormwater conveyance design plans, for the outfall located near the northeast corner of the Central Middle School property.

We look forward to working with you on this project. If you have any questions, please feel free to contact me.

Sincerely,

BIOHABITATS, INC.

Michael Thompson
Natural Resources Ecologist

SCOPE OF WORK

Our fee associated with this proposal is based upon discussions between Michael Thompson with Biohabitats and Lyle Jones with the Delaware Department of Natural Resources and Environmental Control (DNREC). If any of these assumptions are inconsistent with DNREC's understanding of the project requirements or the needs of DNREC, we would be pleased to discuss them and revise our level of effort and associated fee accordingly.

The project is located within Central Middle School Grounds between Delaware Street and Maryland Avenue. Biohabitats will develop and prepare final design and construction drawings, specifications and a cost estimate (75% and 100% submittals) for a reach of the St Jones River along the right bank (downstream view) from the end of the newly constructed Washington Street regenerative stormwater conveyance system. The stabilization of the St. Jones will start at the end of the Washington Street system and run approximately 1200 feet downstream.

The design will also include a Regenerative Stormwater Conveyance (RSC) at the outfall located in the northeast corner of the Central Middle School property. Currently, a concrete trapezoidal channel conveys water from a reinforced concrete pipe outfall down to the St. Jones River. Biohabitats will develop and prepare final design and construction drawings, specifications and a cost estimate (75% and 100% submittals) for the RSC, from the outfall pipe approximately 100 feet downstream to the St. Jones River. The proposed design will remove the unsightly concrete flume and provide a means to attenuate stormwater, potentially elevate local groundwater levels, and provide water quality treatment for the stormwater runoff associated with the surrounding watershed.

1. DNREC shall provide Biohabitats with a land survey that illustrates, to scale, the physical features of the ground, utilities, built features and other topographic data as necessary to perform the stream restoration design. The land survey shall be prepared in Delaware State Plane Coordinate System using the NAD83 datum. Vertical datum shall be NAVD 1988. Biohabitats will review the survey to determine its extent and accuracy. If it is determined that the survey data is insufficient, it may be necessary to have the area resurveyed.

2. DNREC shall provide Biohabitats access to all other relevant horizontal and vertical surveys, plans, aerial photographs, hydraulic and hydrologic modeling data, construction documents, concept designs, and data applicable to this design effort.

3. DNREC shall also make available to Biohabitats all applicable studies performed by other agencies, consultants, or non profit organizations that are relevant to the proposed project.

4. It is our understanding that DNREC has already performed a wetland delineation and found no jurisdictional wetlands at the site. It is also assumed that the ordinary high water mark/mean high tide line will be delineated in the field by Biohabitats.

5. DNREC shall be responsible for submitting and acquiring all permits for the construction of the project.

6. DNREC shall be responsible for all permit fees, bonds, and financial obligations related to local, state, and federal permits.

7. The scope of work does not include geotechnical investigations or the identification, assessment, and remediation of hazardous waste.

8. Revisions and changes in drawings, specifications or other documents when such revisions are inconsistent with approvals or instructions previously given by DNREC; required by the enactment or revision of codes, laws, or regulations subsequent to the preparation of such documents; or the preparation of alternates or deductive change orders requested by DNREC, shall be considered extra services and may require adjustments to the fee and schedule.

9. Submissions not specified in the scope shall also be considered extra services and may require adjustments to the fee and schedule.

10. This proposal is valid for 90 days, after which it may be renegotiated.

WORK PLAN

PHASE 1 – STREAM STABILIZATION DESIGN DEVELOPMENT

Task 1.1 Kick-Off Meeting

Biohabitats will attend a kick-off meeting with DNREC to accomplish the following objectives:

1. Review, and if necessary, refine a final scope of work, work plan, schedule, budget and overall project expectations.
2. Develop specific technical goals and measurable project objectives for.
    a. Channel stability thresholds
    b. Habitat structure
    c. Ecosystem processes
    d. Construction budget
    e. Operation and maintenance commitment/budget
    f. Stakeholder participation
3. Collect copies of all client supplied available existing maps, documents and data which may prove useful in the assessment and design of the stream restoration project.
4. Lead a site walk of the project reach to solicit information on the stream and surrounding community as well as discuss potential design ideas.

Biohabitats will prepare minutes of the meeting and electronically distribute them to all attendees within one (1) week of the meeting.

Task 1.2 Flow Determination

Biohabitats will estimate the complete range of flows emanating from the concrete pipe outfall, including base flow and flood flows (i.e. the 2-, 10- and 100-year events).

Biohabitats will plot the discharges and using best professional judgment, choose a discharge that best conveys flood flows that can be incorporated into a conveyance channel from the outfall to the St. Jones River.

Task 1.3 Field Reconnaissance

Stream Morphology & Riparian Vegetation

Biohabitats will perform a field reconnaissance of the study area to collect the following information:

- Channel geometry measurements (based upon a Table of Morphological Characteristics)
- Channel 'improvements'
- Riparian characteristics and biological benchmarks

Task 1.4 Land Survey & Base Map Production

DNREC shall provide Biohabitats with a land survey that illustrates, to scale, the physical features of the ground, utilities, built features and other topographic data as necessary to perform the stream restoration design. The land survey shall be prepared in Delaware State Plane Coordinate System using the NAD83 datum. Vertical datum shall be NAVD 1988. Biohabitats will provide DNREC with a requirements sheet for survey and base map for use in procuring survey services.

PHASE 2 – FINAL DESIGN AND CONSTRUCTION DOCUMENTS

Task 2.1 Design and Construction Package- 75% Submittal

DESIGN PROCESS

The design plan will be based on natural channel attributes using a combination of analog, empirical and analytical design approaches. Biohabitats will prepare final design and construction documents that illustrate the proposed restoration strategies including changes to cross section and plan geometry, stream bed and bank stabilization techniques, habitat enhancement features, and riparian restoration. Biohabitats will document the selected design discharge as well as develop a list of design channel dimensions, and a preliminary cost estimate for the design concept.

Using a reiterative design process, we will test the stability of the proposed channel for the following parameters:

1. **Hydraulics** - Using the runoff hydrographs and the existing condition channel hydraulics developed in 1.2, Biohabitats will model the post design discharge elevations associated with the bankfull, 2, 10, and 100-year flood events. We will compare pre and post flood elevations to determine if adjustments need to be made to the design to both comply with local floodplain regulations and to support targeted hydrologic regimes for the riparian floodplain.
2. **Channel stabilization and habitat structures** – Using the hydraulics model described above, Biohabitats will determine and compare pre and post design shear stresses within the channel to ensure that channel dimensions and associated channel stabilization and habitat structures will remain stable for flows up to the 10-year discharge.

DESIGN PRODUCTS

Biohabitats will prepare the following products for the 75% Final Design and Construction Package submittal:

Drawings – Using the base map created in Task 1.4, Biohabitats will prepare 75% complete drawings. Drawings will be prepared in AutoCad format, based on DNREC standards. In general, drawings may consist of the following:

1. Title sheet
2. Geometry plan
3. Grading plan

4. Placement of channel stability and habitat structures
5. Preliminary grading details
6. Preliminary channel stability and habitat structures
7. Erosion and sediment control plan
8. Preliminary E&S Sequence of Construction, details, notes
9. Existing and proposed channel cross-sections and profile
10. Planting plan
11. Preliminary planting composition and planting schedules
12. Preliminary planting details

Specifications – Biohabitats will prepare a detailed outline of special provision specifications. The specifications will be prepared in Microsoft Word.

Construction Cost Estimate – Biohabitats will prepare an estimate of probable construction costs. Quantity takeoffs will be based on the 75% drawings. Estimates will reflect current prices for labor, materials, and equipment. Back-up data will include quantity computations of major items and suppliers quotations for major equipment and materials. The estimate will be prepared in Microsoft Excel.

DESIGN DELIEVRABLES
Biohabitats will make one set of deliverables for this task, consisting of the following items:

1. One electronic copy of the drawings, specifications and construction cost estimate.
2. If necessary, up to three (3) sets of the drawings, specifications and construction cost estimate. However, Biohabitats prefers to make all submittals electronically in an effort to reduce paper consumption.

Task 2.2 Plan in Hand Field Review

DESIGN REVIEW
Biohabitats will attend one meeting with DNREC to review the 75% plans, answer questions, and provide clarifications. Biohabitats will prepare minutes of the meeting and electronically distribute them to all attendees within one (1) week of the meeting.

Biohabitats fee assumes there will be only one round of review and revisions for this task. Revisions to the 75% final design plans due to errors and omissions will be completed in accordance with this proposal. Revisions due to changes from the scope of work will be considered an addition to the Scope of Work and Fee Estimate. All review comments shall be compiled and reviewed for consistency by DNREC before being forwarded to Biohabitats.

Task 2.3 Design and Construction Package - 100% Submittal

Biohabitats will incorporate comments from the 75% submittal review to the drawings, specifications, and construction cost estimate. Biohabitats will make one set of deliverables for this task, consisting of the

following items:

1. One (1) CD containing *PDF files (with seals) for the drawings, specifications and construction cost estimate.
2. One (1) CD containing AutoCad drawings; Word files for the specifications and Excel file for the construction cost estimate (no seals).
3. Three (3) sets of the final drawings (with seals), specifications and construction cost estimate.

Revisions to the 100% final design plans due to errors and omissions will be completed in accordance with this proposal. Revisions due to first time reviews and unanticipated reviews along with changes from the scope of work delineated in the Final Design and Construction Package (75%) will be considered an addition to this Scope of Work and accompanying Fee Estimate.

SCHEDULE

Biohabitats is available to begin work on these tasks within seven (7) days of a Notice-To-Proceed. Delays beyond Biohabitats' control may result in scheduling delays.

TASK:	DAYS TO COMPLETION (from NTP):
PHASE 1 – CENTRAL MIDDLE ASSESSMENT	
Task 1.1 Kick Off Meeting	30
Task 1.2 Flow Determination	30
Task 1.3 Field Reconnaissance	45
Task 1.4 Land Survey & Base Map Production	60
PHASE 2 – CENTRAL MIDDLE CONSTRUCTION DOCUMENTS	
Task 2.1 Design and Construction Package- 75% Submittal	90
Task 2.2 Review Meeting	120
Task 2.3 Design and Construction Package - 100% Submittal	150

FEE

The Lump Sum fee represents the effort required to design, permit and provide construction oversight services as specified above. The Lump Sum fee includes all labor, direct costs, reimbursables, travel expenses, and equipment required to successfully complete the project as outlined above. Invoices will be prepared and submitted monthly, based on the percent of work completed for each Phase listed below.

TASK:	FEE:
PHASE 1 – CENTRAL MIDDLE SCHOOL ASSESSMENT	**$ 7,097.50**
PHASE 2 – CENTRAL MIDDLE SCHOOL CONSTRUCTION DOCUMENTS	**$ 17,197.50**
TOTAL **TOTAL**	**$ 24,295.00**

Biohabitats Hourly Rates

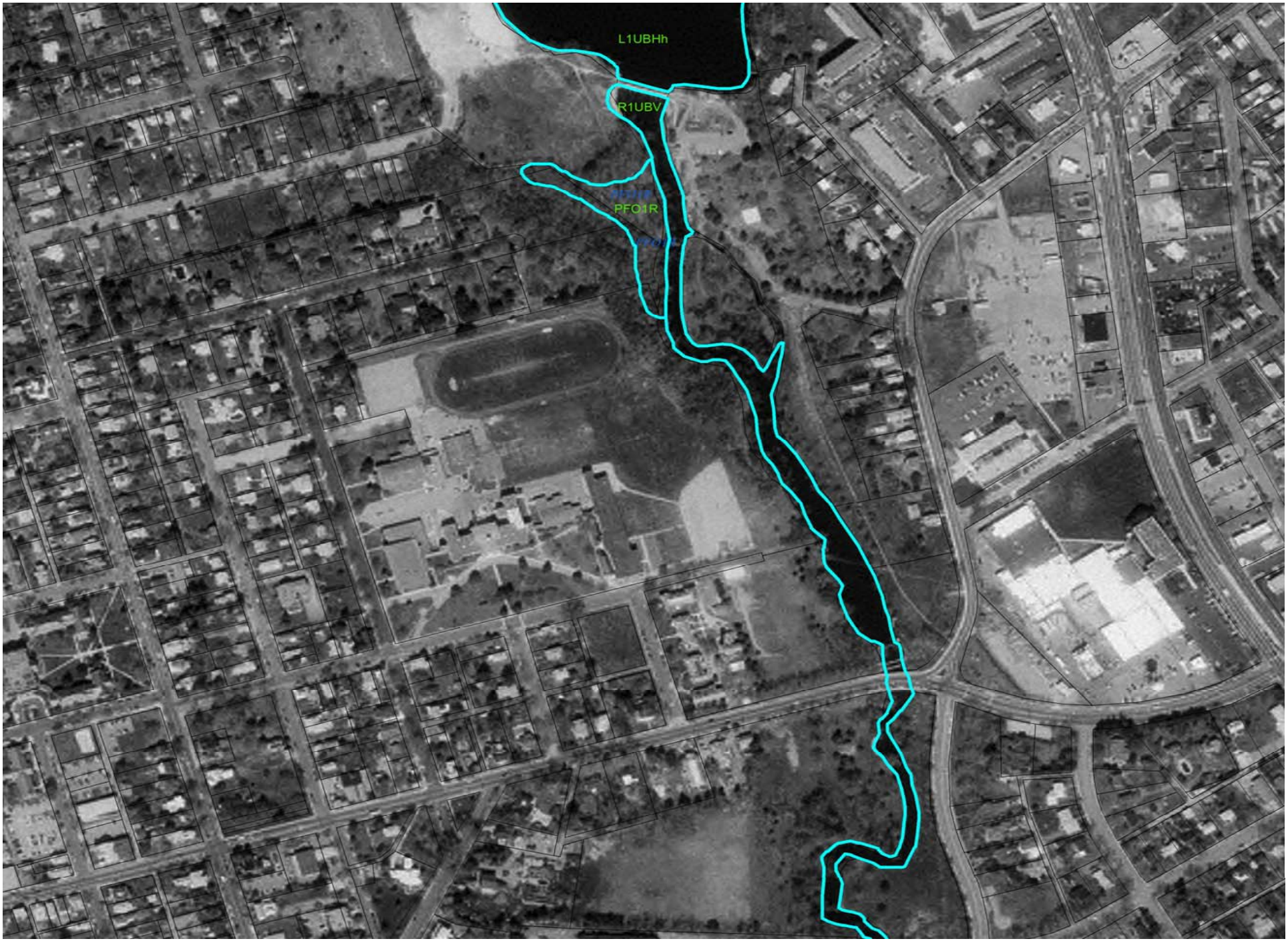
Labor Classification	Hourly Rate
Principal	$ 165.00
Project Team Leader	$ 150.00
Environmental Scientist	$ 125.00
Environmental Technician	$ 95.00
CADD Technician	$ 85.00
Clerical	$ 65.00

TERMS - Progress payments shall be made on a monthly basis based on the percentage of work completed during the month. Invoices are due and payable within thirty days of receipt of invoice. Any unpaid balance shall bear the interest rate of 1.5% per month starting at the end of the month following the month the invoice is dated. Certifications will not be released and/or work will not proceed if payment is post-dated. Certifications will not be released and/or work will not proceed if invoices are past due sixty (60) days. If the DNREC should fail to pay Biohabitats within sixty (60) days after the date of the invoice, Biohabitats shall have the right, upon written notice to the DNREC, to stop work on the project until payment of the full amount owing, including all interest charges and collection costs, has been received. The date of the invoice shall be the date entered on the first invoice for the work in question.

ACCEPTANCE

Your signature below authorizes Biohabitats to initiate the Work Plan in accordance with the Scope of Work, Schedule, and Fee provided above. Biohabitats will prepare and submit a full contract for execution between each party prior to the submittal of any deliverables.

ACCEPTED BY _____ _____ _____
Signature Title Date


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R1UBV
PFO1R

Biohabitats
Incorporated

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April 24, 2012

Mr. Lyle Jones
Delaware Department of Natural Resources and Environmental Control
Watershed Assessment Division
820 Silver Lake Boulevard
Suite 220
Dover, DE 19904

RE: **Central Middle School RSC**
Biohabitats Proposal No.: 12039.01

Subject: **Proposal to Perform Stream Stabilization and RSC Services**

Mr. Jones:

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2. DNREC shall provide Biohabitats access to all other relevant horizontal and vertical surveys, plans, aerial photographs, hydraulic and hydrologic modeling data, construction documents, concept designs, and data applicable to this design effort.

3. DNREC shall also make available to Biohabitats all applicable studies performed by other agencies, consultants, or non profit organizations that are relevant to the proposed project.

4. It is our understanding that DNREC has already performed a wetland delineation and found no jurisdictional wetlands at the site. It is also assumed that the ordinary high water mark/mean high tide line will be delineated in the field by Biohabitats.

5. DNREC shall be responsible for submitting and acquiring all permits for the construction of the project.

6. DNREC shall be responsible for all permit fees, bonds, and financial obligations related to local, state, and federal permits.

7. The scope of work does not include geotechnical investigations or the identification, assessment, and remediation of hazardous waste.

8. Revisions and changes in drawings, specifications or other documents when such revisions are inconsistent with approvals or instructions previously given by DNREC; required by the enactment or revision of codes, laws, or regulations subsequent to the preparation of such documents; or the preparation of alternates or deductive change orders requested by DNREC, shall be considered extra services and may require adjustments to the fee and schedule.

9. Submissions not specified in the scope shall also be considered extra services and may require adjustments to the fee and schedule.

10. This proposal is valid for 90 days, after which it may be renegotiated.

WORK PLAN

PHASE 1 – STREAM STABILIZATION DESIGN DEVELOPMENT

Task 1.1 Kick-Off Meeting

Biohabitats will attend a kick-off meeting with DNREC to accomplish the following objectives:

1. Review, and if necessary, refine a final scope of work, work plan, schedule, budget and overall project expectations.
2. Develop specific technical goals and measurable project objectives for.
    a. Channel stability thresholds
    b. Habitat structure
    c. Ecosystem processes
    d. Construction budget
    e. Operation and maintenance commitment/budget
    f. Stakeholder participation
3. Collect copies of all client supplied available existing maps, documents and data which may prove useful in the assessment and design of the stream restoration project.
4. Lead a site walk of the project reach to solicit information on the stream and surrounding community as well as discuss potential design ideas.

Biohabitats will prepare minutes of the meeting and electronically distribute them to all attendees within one (1) week of the meeting.

Task 1.2 Flow Determination

Biohabitats will estimate the complete range of flows emanating from the concrete pipe outfall, including base flow and flood flows (i.e. the 2-, 10- and 100-year events).

Biohabitats will plot the discharges and using best professional judgment, choose a discharge that best conveys flood flows that can be incorporated into a conveyance channel from the outfall to the St. Jones River.

Task 1.3 Field Reconnaissance

Stream Morphology & Riparian Vegetation

Biohabitats will perform a field reconnaissance of the study area to collect the following information:

- Channel geometry measurements (based upon a Table of Morphological Characteristics)
- Channel 'improvements'
- Riparian characteristics and biological benchmarks

Task 1.4 Land Survey & Base Map Production

DNREC shall provide Biohabitats with a land survey that illustrates, to scale, the physical features of the ground, utilities, built features and other topographic data as necessary to perform the stream restoration design. The land survey shall be prepared in Delaware State Plane Coordinate System using the NAD83 datum. Vertical datum shall be NAVD 1988. Biohabitats will provide DNREC with a requirements sheet for survey and base map for use in procuring survey services.

PHASE 2 – FINAL DESIGN AND CONSTRUCTION DOCUMENTS

Task 2.1 Design and Construction Package- 75% Submittal

DESIGN PROCESS

The design plan will be based on natural channel attributes using a combination of analog, empirical and analytical design approaches. Biohabitats will prepare final design and construction documents that illustrate the proposed restoration strategies including changes to cross section and plan geometry, stream bed and bank stabilization techniques, habitat enhancement features, and riparian restoration. Biohabitats will document the selected design discharge as well as develop a list of design channel dimensions, and a preliminary cost estimate for the design concept.

Using a reiterative design process, we will test the stability of the proposed channel for the following parameters:

1. **Hydraulics** - Using the runoff hydrographs and the existing condition channel hydraulics developed in 1.2, Biohabitats will model the post design discharge elevations associated with the bankfull, 2, 10, and 100-year flood events. We will compare pre and post flood elevations to determine if adjustments need to be made to the design to both comply with local floodplain regulations and to support targeted hydrologic regimes for the riparian floodplain.
2. **Channel stabilization and habitat structures** – Using the hydraulics model described above, Biohabitats will determine and compare pre and post design shear stresses within the channel to ensure that channel dimensions and associated channel stabilization and habitat structures will remain stable for flows up to the 10-year discharge.

DESIGN PRODUCTS

Biohabitats will prepare the following products for the 75% Final Design and Construction Package submittal:

Drawings – Using the base map created in Task 1.4, Biohabitats will prepare 75% complete drawings. Drawings will be prepared in AutoCad format, based on DNREC standards. In general, drawings may consist of the following:

1. Title sheet
2. Geometry plan
3. Grading plan

4. Placement of channel stability and habitat structures
5. Preliminary grading details
6. Preliminary channel stability and habitat structures
7. Erosion and sediment control plan
8. Preliminary E&S Sequence of Construction, details, notes
9. Existing and proposed channel cross-sections and profile
10. Planting plan
11. Preliminary planting composition and planting schedules
12. Preliminary planting details

Specifications – Biohabitats will prepare a detailed outline of special provision specifications. The specifications will be prepared in Microsoft Word.

Construction Cost Estimate – Biohabitats will prepare an estimate of probable construction costs. Quantity takeoffs will be based on the 75% drawings. Estimates will reflect current prices for labor, materials, and equipment. Back-up data will include quantity computations of major items and suppliers quotations for major equipment and materials. The estimate will be prepared in Microsoft Excel.

DESIGN DELIEVRABLES
Biohabitats will make one set of deliverables for this task, consisting of the following items:

1. One electronic copy of the drawings, specifications and construction cost estimate.
2. If necessary, up to three (3) sets of the drawings, specifications and construction cost estimate. However, Biohabitats prefers to make all submittals electronically in an effort to reduce paper consumption.

Task 2.2 Plan in Hand Field Review

DESIGN REVIEW
Biohabitats will attend one meeting with DNREC to review the 75% plans, answer questions, and provide clarifications. Biohabitats will prepare minutes of the meeting and electronically distribute them to all attendees within one (1) week of the meeting.

Biohabitats fee assumes there will be only one round of review and revisions for this task. Revisions to the 75% final design plans due to errors and omissions will be completed in accordance with this proposal. Revisions due to changes from the scope of work will be considered an addition to the Scope of Work and Fee Estimate. All review comments shall be compiled and reviewed for consistency by DNREC before being forwarded to Biohabitats.

Task 2.3 Design and Construction Package - 100% Submittal

Biohabitats will incorporate comments from the 75% submittal review to the drawings, specifications, and construction cost estimate. Biohabitats will make one set of deliverables for this task, consisting of the

following items:

1. One (1) CD containing *PDF files (with seals) for the drawings, specifications and construction cost estimate.
2. One (1) CD containing AutoCad drawings; Word files for the specifications and Excel file for the construction cost estimate (no seals).
3. Three (3) sets of the final drawings (with seals), specifications and construction cost estimate.

Revisions to the 100% final design plans due to errors and omissions will be completed in accordance with this proposal. Revisions due to first time reviews and unanticipated reviews along with changes from the scope of work delineated in the Final Design and Construction Package (75%) will be considered an addition to this Scope of Work and accompanying Fee Estimate.

SCHEDULE

Biohabitats is available to begin work on these tasks within seven (7) days of a Notice-To-Proceed. Delays beyond Biohabitats' control may result in scheduling delays.

TASK:	DAYS TO COMPLETION (from NTP):
PHASE 1 – CENTRAL MIDDLE ASSESSMENT	
Task 1.1 Kick Off Meeting	30
Task 1.2 Flow Determination	30
Task 1.3 Field Reconnaissance	45
Task 1.4 Land Survey & Base Map Production	60
PHASE 2 – CENTRAL MIDDLE CONSTRUCTION DOCUMENTS	
Task 2.1 Design and Construction Package- 75% Submittal	90
Task 2.2 Review Meeting	120
Task 2.3 Design and Construction Package - 100% Submittal	150

FEE

The Lump Sum fee represents the effort required to design, permit and provide construction oversight services as specified above. The Lump Sum fee includes all labor, direct costs, reimbursables, travel expenses, and equipment required to successfully complete the project as outlined above. Invoices will be prepared and submitted monthly, based on the percent of work completed for each Phase listed below.

TASK:	FEE:
PHASE 1 – CENTRAL MIDDLE SCHOOL ASSESSMENT	**$ 7,097.50**
PHASE 2 – CENTRAL MIDDLE SCHOOL CONSTRUCTION DOCUMENTS	**$ 17,197.50**
TOTAL **TOTAL**	**$ 24,295.00**

Biohabitats Hourly Rates

Labor Classification	Hourly Rate
Principal	$ 165.00
Project Team Leader	$ 150.00
Environmental Scientist	$ 125.00
Environmental Technician	$ 95.00
CADD Technician	$ 85.00
Clerical	$ 65.00

TERMS - Progress payments shall be made on a monthly basis based on the percentage of work completed during the month. Invoices are due and payable within thirty days of receipt of invoice. Any unpaid balance shall bear the interest rate of 1.5% per month starting at the end of the month following the month the invoice is dated. Certifications will not be released and/or work will not proceed if payment is post-dated. Certifications will not be released and/or work will not proceed if invoices are past due sixty (60) days. If the DNREC should fail to pay Biohabitats within sixty (60) days after the date of the invoice, Biohabitats shall have the right, upon written notice to the DNREC, to stop work on the project until payment of the full amount owing, including all interest charges and collection costs, has been received. The date of the invoice shall be the date entered on the first invoice for the work in question.

ACCEPTANCE

Your signature below authorizes Biohabitats to initiate the Work Plan in accordance with the Scope of Work, Schedule, and Fee provided above. Biohabitats will prepare and submit a full contract for execution between each party prior to the submittal of any deliverables.

ACCEPTED BY _____ _____ _____
Signature Title Date