Leetes Island Tidal Marsh

Habitat Restoration Project

Guilford, CT

Funding application through the

Housatonic River Basin Natural Resource Damages

Funding Program

Prepared By:

Harry Yamalis
Environmental Analyst 2
Connecticut Department of Energy and Environmental Protection
Office of Long Island Sound Programs

Prepared For:

Paul Capotosto
Program Specialist 1
Connecticut Department of Energy and Environmental Protection
Wetlands Habitat and Mosquito Management Program

December 7, 2011

Abstract

Leetes Island marsh is a 40-acre tidal wetland located along the coast in southwestern Guilford, CT. The property is privately owned, and has been held by the same family, the Leete family, since colonial times. Until recently, they have farmed the marsh for salt hay (*Spartina patens*), but the system has subsided in elevation and is too wet to sustain much vegetation. Historically, the hay was harvested once per year and sold as a weed-free mulch, and was possibly used to feed livestock as well.

The marsh is connected to Island Bay and Long Island Sound by a man-made channel; this primary tidal creek is effectively the backbone of the remnant grid pattern of mosquito ditches found throughout many of Connecticut's tidal wetlands. The mouth of this creek has been piped and flows underground, under Shell Beach Road and one residential property, and finally empties into Island Bay. There is also a tide gate in an underground concrete chamber, which acts to drain the marsh at low tide, and it was this practice of draining that marsh that has caused subsidence of the marsh surface.

The proposal for restoration of the tidal marsh at Leetes Island is to repair the leaky 42" diameter pipe, and replace the old flapper-style tide gate with a with a new flap gate that has the ability to be raised and lowered vertically. Currently, too much water enters this subsided marsh at high tide when the gate is in its open position. Our plan is to install the new tide gate so that the 42" diameter pipe functions as a smaller pipe during the flood tide, but functions to its fullest capacity for low tide drainage.

Project Narrative

There is a clear need to restore Connecticut's tidal marshes to provide critical marsh functions such as habitat for wildlife, upland buffer during coastal storms, and to provide pollution filtration of upland runoff. As with many other coastal states, Connecticut's tidal marshes have been subjected to centuries of abuse and degradation based primarily on a lack of knowledge of the importance of these sensitive coastal habitats. Since colonial times, tidal marshes have been filled for agricultural purposes, and for residential and commercial development; they have been diked, drained and ditched for mosquito control; and have been restricted or cut off completely from tidal flow for transportation corridors.

Only during the mid-twentieth century were tidal marshes recognized as a critical primary or nursery habitat for many commercially important species, in addition to primary habitat for many of the organisms those species depend upon for food and shelter. Even more recently tidal marshes were granted federal and state protection from further exploitation and development through enactment of legislation establishing regulatory programs. Through strong policies in the Connecticut Coastal Management Act and Tidal Wetlands Act, Connecticut's tidal wetland regulatory program is not only geared toward the protection and conservation of tidal wetlands, but also focuses on their restoration. Connecticut's Department of Energy and Environmental Protection (CTDEEP) is recognized as a national leader in the field of tidal marsh restoration.

The primary objective of this project is to restore the 40-acre Leetes Island tidal marsh to a self-sustaining ecosystem that supports the diverse assemblage of plant and animal species found in healthy tidal marshes. If funded, the proposed construction plan would permanently restore 15.5 acres. The remaining 24.5 acres will also be restored, but may possibly be subjected to agricultural activities (harvesting of *Spartina patens*, or salt hay) beginning at some point in the future. More detail on this is provided below.

Specific objectives include:

- drainage of areas that remain saturated even at low tide;
- restoration of salt marsh grasses in these saturated areas currently devoid of vegetation;
- reduction in the invasive *Phragmites australis* (common reed);

- an increase in invertebrate, fish (primarily *Fundulus* spp.), and bird use of the marsh;
- a natural form of mosquito control whereby Fundulus will prey upon mosquito larvae;
- point source pollution control, since degraded wetlands are often sources of pollution;
- most importantly, promoting the vertical growth of the subsided tidal marsh.

The restoration of the productive salt hay dominated high marshes that were once farmed by the Leete family is not among the project goals. Granted, the family would like to one day be able to harvest salt hay from this marsh once again, but in the permission letter that they signed (attached), they agreed that the new tide gate will not be managed for salt hay production; rather for tidal marsh restoration as defined by CTDEEP. They also agreed to set aside the northern-most sections and eastern 1/3 of the marsh (north of Route 146, plus the area that is east of the primary tidal creek), 15.5 acres in all, for research, monitoring, and undisturbed habitat for wildlife. They understand that if any future salt hay operations were to occur, they would be limited to the area west of the primary tidal creek. But first they must wait until the *Spartina patens* dominated high marsh reestablishes itself before they can resume.

If all goes as intended, the conditions promoting growth of *Spartina patens* will establish themselves at some point during post-construction tidal marsh recovery. Realistically, however, we are unable to predict how long it will take to restore any of these areas back to *Spartina patens* dominated high marsh, and the Leetes understand this. They also understand that a very thick sub-surface root/rhizome mat is necessary in order to achieve the necessary level of firmness. Without that, even with a healthy crop of *Spartina patens*, they cannot harvest as the marsh surface will not be firm enough to support the weight of their harvesting equipment. How long it will take for the marsh surface to reach an adequate level of firmness is also unknown. Finally, once colonized, we do not know what the dominant plant species in these areas will be. There is no guarantee that *Spartina patens* will become the dominant plant within large sections of this marsh. Our plan is to restore tidal flow and then let the tides transport seeds of the marsh plants, allowing a completely natural recolonization of marsh plants to occur. CTDEEP has done this very successfully for many years and saved a lot of time and money by not purchasing new plant stock. If, over time, *Spartina alterniflora* dominated low marsh becomes established over the majority of the marsh, the tide gate will not be adjusted to promote the establishment of more salt hay dominated high marsh. Conversely, the tide gate will not be adjusted to promote low marsh in the event that salt hay dominated high marsh is first to recover.

The practice of farming salt hay is quite hands-off during much of the growing season so there will not be any associated impacts to the vegetation or marsh-nesting birds. If / when salt haying resumes, it will take place over a short period of time late in the growing season (September), after marsh-nesting birds have fledged and moved on. However, it will also be necessary to temporarily adjust the tide gate so that no water enters at high tide, but still allows drainage at low tide. It should also be noted that it wasn't the harvesting of salt hay from Leetes Island tidal marsh that led to the current state of habitat degradation. It was the decades-long mismanagement of the tide gate, effectively cutting off tidal flow, that caused all of the problems. There are a few other active and former salt hay farms that do not have the same issues as Leetes Island marsh because they do not have a tide gate associated with them. One of these farms, in Stonington, has been continually farmed since the 1600s. Finally, in case there are any concerns over the potential for commercial gain of the Leete family from the restoration of this marsh, it should be noted that the potential is very low. They look forward to harvesting salt hay again mostly as a way of carrying on a centuries-old family tradition, and do not rely on the salt hay as a significant source of income.

Community Involvement / Partnerships

Leetes Island tidal marsh is private property and there will be no community involvement with the restoration of this system. There are, however, several noteworthy partnerships. CTDEEP was awarded $10,000 worth of *pro bono* engineering & design services through the CT Corporate Wetlands Restoration Partnership. Through

this award, Fuss & O'Neill, Inc., drafted design plans and a construction methodology for the project, and recently sent us the construction cost estimate.

During the fall of 2010, researchers from Yale University installed 9 permanent Sediment Elevation Tables (SETs) on the eastern portion of this site (the area that the Leetes will not harvest from again). The SETs were installed to get baseline data on the elevation of the marsh surface, and to track long-term changes to marsh surface elevation down to 2mm accuracy. The SETs will also provide good data to how the marsh surface responds to the new proposed tidal regime within the system.

Additional letters indicating funding and property owner support are also attached.

CT CWRP

June 21, 2010

Harry Yamalis
Environmental Analyst
CT Department of Environmental Protection
Office of Long Island Sound Programs
79 Elm Street
Hartford, CT 06106-5127

RE: Leetes Island

Dear Mr. Yamalis,

This letter is to confirm that Fuss & O'Neill Design Build Services, LLC, has entered into a contract for in-kind services with the Connecticut Chapter of the Corporate Wetlands Restoration Partnership. The work will be performed on the Leetes Island project. The value of these services is $10,000.

Should you have addition questions or need further information, please contact me at (860) 665-5762.

Sincerely,

Tracy A. Gionfriddo
CT Corporate Wetlands Restoration Partnership

YALE UNIVERSITY
School of Forestry
& Environmental Studies

Greeley Lab
370 Prospect Street
New Haven, CT 06511
w.yale.edu/environment

ww

August 19, 2010

Sharon Koroski
Division of Wildlife and Sport Fish Restoration
U.S. Fish and Wildlife Service
300 Westgate Center Drive
Hadley, MA 01035-9589

Dear Ms. Koroski:

I am writing in support of the Connecticut Department of Environmental Protection's proposal for funding for the Leetes Island tidal marsh habitat restoration in Guilford, CT.

As part of the restoration plan, we have committed to monitoring changes in marsh surface elevation and water/soil chemistry. In particular, we will be carrying out the following activities:

- installation of sediment elevation table (SET) benchmarks: We will be installing 3-6 permanent benchmarks for monitoring of sediment surface elevation, as well as feldspar plots for measuring the accumulation of sediment on the marsh surface. We have applied for a permit for this activity, and plan to install the benchmarks and related sampling platforms this fall.
- monitoring of SETs: We will carry out long-term monitoring of surface elevations and sedimentation using the SET benchmarks and feldspar plots (see http://www.pwrc.usgs.gov/set/ for details). We plan to monitor at least annually for the next 10 years (beginning this fall), with more frequent sampling as warranted.
- soil and water chemistry: During our SET monitoring, we will also collect samples of soil and water (both porewater and surface water). Soil samples will be analyzed for bulk density and organic content, while water samples will be analyzed for salinity, sulfide, pH, dissolved oxygen, and possibly nutrient and metal concentrations.

The table below provides a rough estimate of the cost of this work. Note that this does not include the time spent on analyzing and publishing the results, and assumes that we will not be sampling more frequently than annually. With those conservative assumptions, we estimate that we are providing an in-kind contribution to this project of $6200 this fall, plus $4050/year for the next 10 years.

	Anisfeld time ($70/hr)	**student time ($20/hr)**	**supplies**	**total value**
SET installation	40 hours	120 hours	$1000	$6200
SET monitoring	15 hours/year	15 hours/year		$1350/year
soil/water chemistry	10 hours/year 50	hours/year	$1000/year	$2700/year

I look forward to working with CT DEP on the Leetes Island restoration. Please feel free to contact me at Shimon.anisfeld@yale.edu or 203-432-5748 if I can provide further information.

Sincerely,

Shimon Anisfeld, Ph.D.
Senior Lecturer and Research Scientist

STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION

BUREAU OF WATER PROTECTION & LAND REUSE

Memorandum

Office of the Bureau Chief

To: Harry Yamalis

From: Betsey Wingfield BW

Subject: Match for National Coastal Wetlands Conservation Grant-Leetes Island

Cc: Rick Huntley

I am confirming the Bureau of Water Protection and Land Reuse financial commitment of $47,324 for a wetlands restoration grant application for the Leetes Island project to be funded through USFWS – National Coastal Wetlands Conservation program. Funds from the CTDEP's Long Island Sound Clean-up Account will be used to help meet the 25% non-federal match component of the grant.

In addition, $2,676 was already spent from this account ($50,000 in all) for professional pipe inspection services as part of the project engineering.

Memo

To: Harry Yamalis, Paul Capotosto

CC: Dennis Thibodeau, Roslyn Reeps, Betsey Wingfield

From: Bob Kaliszewski RK

Date: June 24, 2010

Re: SEP authorization – *Leetes Island tidal wetland habitat restoration proposal*

The SEP project request to conduct the *Leetes Island tidal wetland habitat restoration* has been approved by Commissioner Marrella to be funded in an amount not to exceed $25,500. The $25,500 currently in the *Marsh Restoration Project Account* #3087012 shall be reallocated to this project and the account renamed for tracking purposes. Once the project is complete this subaccount of the State wide Account shall be closed with any residual monies transferred to the parent Statewide Account # 3087001. All disbursements of funds under this project shall reference account #3087012.

Should this project proceed, the project manager must follow all applicable state procurement/grant management requirements. Before expending any funds under this project, please have the assigned project manager contact Roslyn Reeps, x3465, so that she can provide an introduction to the necessary project tracking processes. The project manager will be responsible for assuring that the project is managed within the approved budget and providing regular project updates. Upon completion of this project, the project manager shall complete a project report, and any funds not expended in accordance with this proposal shall be returned to the parent account(s). If you have any questions please let me know.

June 22, 2010

Harry Yamalis
Connecticut Department of Environmental Protection
Office of Long Island Sound Programs
79 Elm Street
Hartford, CT 06106-5127

Re: Restoration of Leetes Island tidal marsh, Guilford, CT

Dear Mr. Yamalis:

As an important part of any successful tidal wetland habitat restoration project, Leete Associates Inc. hereby grants permission to Yale University and to the State of Connecticut Department of Environmental Protection (CTDEP) to proceed with pre- and post-construction monitoring of various tidal marsh parameters at Leetes Island tidal marsh in Guilford, CT. Leete Associates Inc. authorizes Yale University and CTDEP to sample for and run analyses of water and soil chemistry, fish and invertebrate use, mosquito breeding, and changes to marsh elevation. Marsh elevation data will be collected using Sediment Elevation Tables (SETs) to track long-term changes in the elevation of the marsh surface, accurate to about 2mm. Leete Associates Inc. grants permission to Yale University and CTDEP to install up to 9 permanent SETs in the eastern 1/3 of the marsh system (eastern marsh), which lies to the east of the primary tidal creek.

To reduce the risk of damage to the SETs and to our own agricultural equipment, Leete Associates Inc. agrees to minimize driving our equipment within the eastern marsh, and agrees to permanently cease salt hay mowing and harvesting operations within the eastern marsh. Leete Associates Inc. requests a map or aerial photograph indicating the locations of the 9 SETs upon installation. In the event that equipment must be driven through the eastern side of the marsh, Leete Associates Inc will use this map to avoid the SETs. However, operating equipment on the eastern marsh will be avoided whenever possible. Leete Associates Inc will also avoid operating our equipment in the connected marsh areas north of Route 146.

Leete Associates Inc. agrees that CTDEP shall manage the tide gate in order to promote marsh restoration, as defined by CTDEP. Leete Associates Inc. will not request, now or in the future, that the marsh be drained for hay production. Leete Associates Inc. still retains the right to conduct salt haying in any areas of the Leetes Island tidal marsh that lie to the west of the primary tidal creek. When tidal hydrology and marsh elevation begin to once again support a thriving salt hay crop, Leete Associates Inc shall be allowed to close the tide gate and drain the marsh for a short period of time toward the end of the growing season to facilitate harvesting. The tide gate will be immediately returned to its previous open condition once the harvest has been completed.

Sincerely Yours,

L R Leete Jr

Lawrence R. Leete Jr., President
Leete Associates, Inc.
151 Corn Crib Hill
Guilford, CT 06437

cc: Shimon Anisfeld, Yale University
Paul Capotosto, CTDEP-WHAMM
Roger Wolfe, CTDEP-WHAMM

June 22, 2010

Harry Yamalis
Connecticut Department of Environmental Protection
Office of Long Island Sound Programs
79 Elm Street
Hartford, CT 06106-5127

Re: Restoration of Leetes Island tidal marsh, Guilford, CT

Dear Mr. Yamalis:

Leete Associates Inc. hereby grants permission to the State of Connecticut, Department of Environmental Protection (CTDEP) to proceed with the restoration of the Leetes Island tidal marsh in Guilford, CT. It is understood that 1) the practice of draining the marsh during the growing season will be discontinued, 2) tidal flows will be gradually restored so as to maximize the amount of emergent vegetation, and 3) as feasible, restoration will attempt to maintain some high marsh habitat. Leete Associates, Inc. acknowledges that physical changes to existing structures will require the appropriate federal and state permits which require review and approval by Leete Associates, Inc.

Leete Associates Inc. agrees to minimize driving our equipment within the eastern 1/3 of the marsh system (eastern marsh) and the connected marsh areas north of Route 146, and agrees to permanently cease salt hay mowing and harvesting operations within the eastern marsh. In the event that equipment must be driven through the eastern side of the marsh, Leete Associates Inc will use the SETs (Sediment Elevation Tables) map to avoid the sensitive areas. However, operating equipment on the eastern marsh will be avoided whenever possible.

Leete Associates Inc. agrees that CTDEP shall manage the tide gate in order to promote marsh restoration, as defined by CTDEP. Leete Associates Inc. will not request, now or in the future, that the marsh be drained for hay production. Leete Associates Inc. still retains the right to conduct salt haying in any areas of the Leetes Island tidal marsh that lie to the west of the primary tidal creek. When tidal hydrology and marsh elevation begin to once again support a thriving salt hay crop, Leete Associates Inc shall be allowed to close the tide gate and drain the marsh for a short period of time toward the end of the growing season to facilitate harvesting. The tide gate will be immediately returned to its previous open condition once the harvest has been completed.

Sincerely Yours,

L R Leete Jr.

Lawrence R. Leete Jr., President
Leete Associates, Inc.
151 Corn Crib Hill
Guilford, CT 06437

cc: Shimon Anisfeld, Yale University
Paul Capotosto, CTDEP-WHAMM
Roger Wolfe, CTDEP-WHAMM

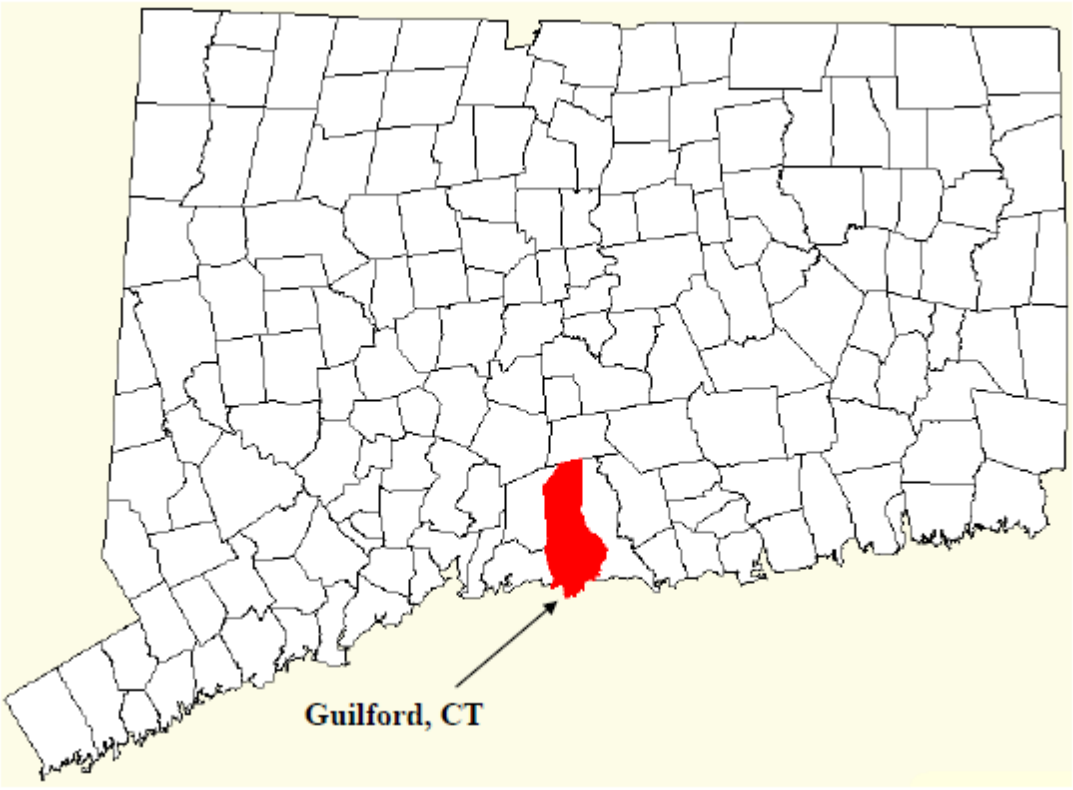
Assessment of the 'environmental effects'

No permanent or long-term negative impacts are expected by the completion of this tidal marsh restoration project. Only short-term impacts from the installation of the cofferdams during construction, and even these are negligible. The current tide gate management plan calls for installing the tide gate during the growing season, and removing it during the winter. During the growing season, the only tidal water entering the system is what leaks around the sides of the tide gate. At worst, the cofferdams will essentially mimic the current "normal" growing-season conditions (tide gate on, very little tidal exchange). The cofferdams will also be installed with 10-inch diameter valves which can be opened at any time to allow tidal exchange or stormwater drainage as necessary.

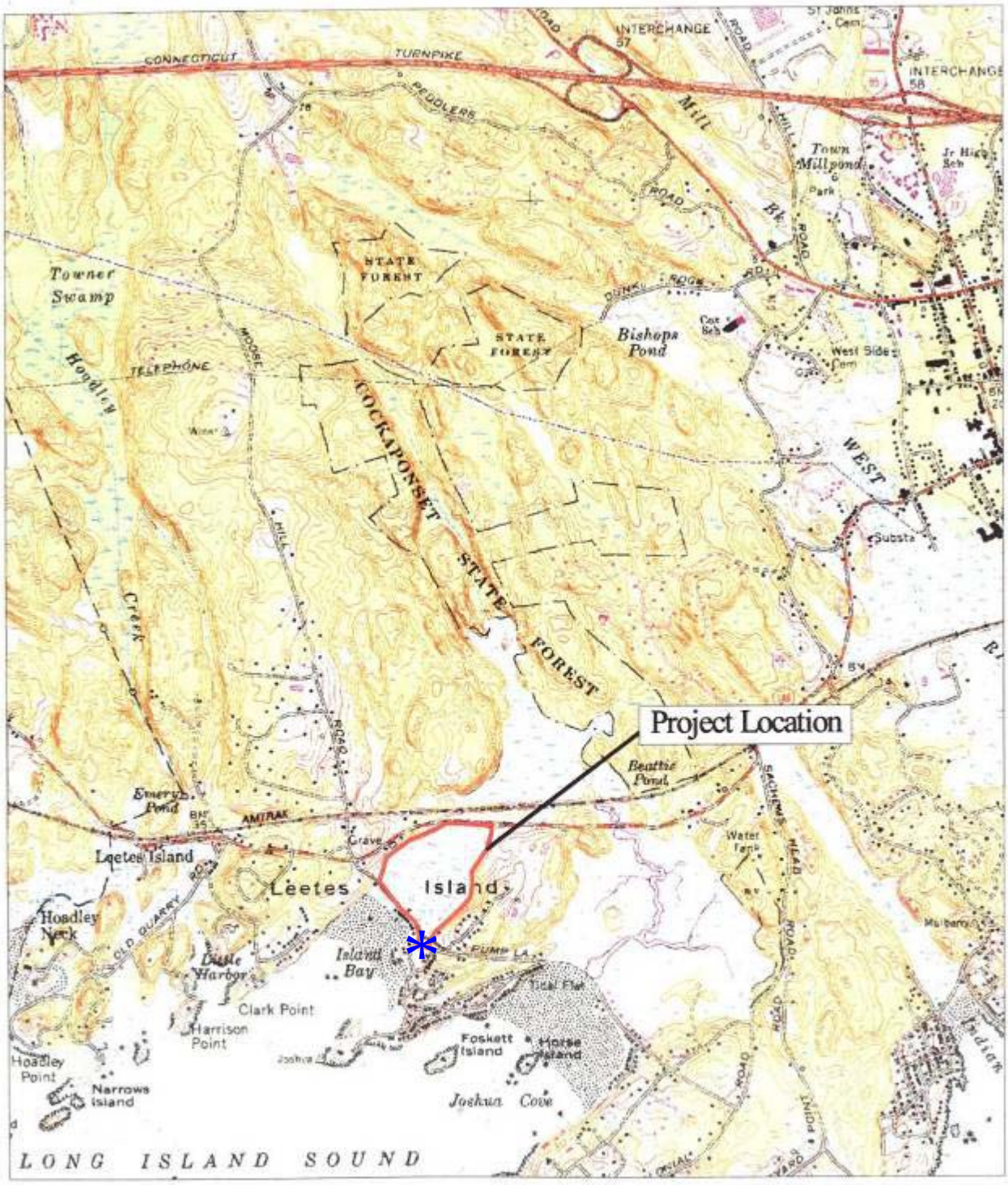
We expect only long-term positive benefits from the increased tidal flow during the growing season, without the risk of drowning additional areas of the marsh. The new tide gate, which will have the ability to be raised and lowered (vertically, and perpendicular to the flow of water) will be installed a few inches above the bottom of the culvert. This will allow some water in during the rising tide, essentially acting as a small pipe, but will still act to drain the marsh as a full, 40-inch diameter pipe during the falling tide. The existing 42-inch diameter pipe will be slip-lined, sealing the leaks and resulting in a new inside diameter of approximately 40-inches. The final position of the tide gate will be determined after construction, and after a few months of observations and adjustments.

Future work that we are considering for this site includes marsh surface enhancements, including creation of deeper ponds, strategically making some mosquito ditches wider and deeper, and placing the excavated material into some of the subsided marsh areas to help create marsh elevations that are more suitable to supporting vegetation. We will also punch holes in the "micro-levees" or berms that were created during the mosquito ditching process to improve low tide drainage. None of these activities are part of the current proposal. We would like to observe the response of the marsh to the altered hydrology for a few years before doing any additional work.

Site Map, Plans, and Photos



Project Location



Leetes Island Marsh
Guilford, Connecticut

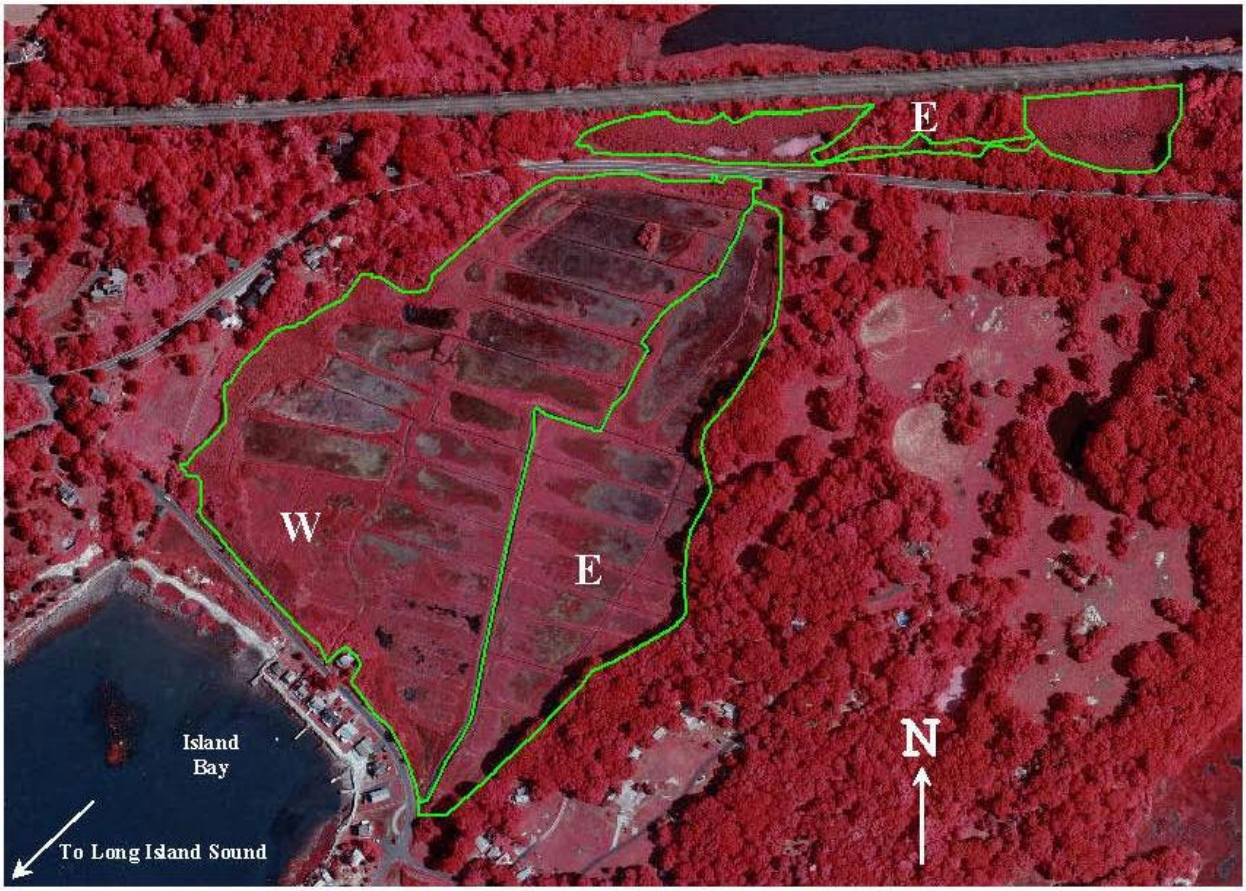
N
W E
S

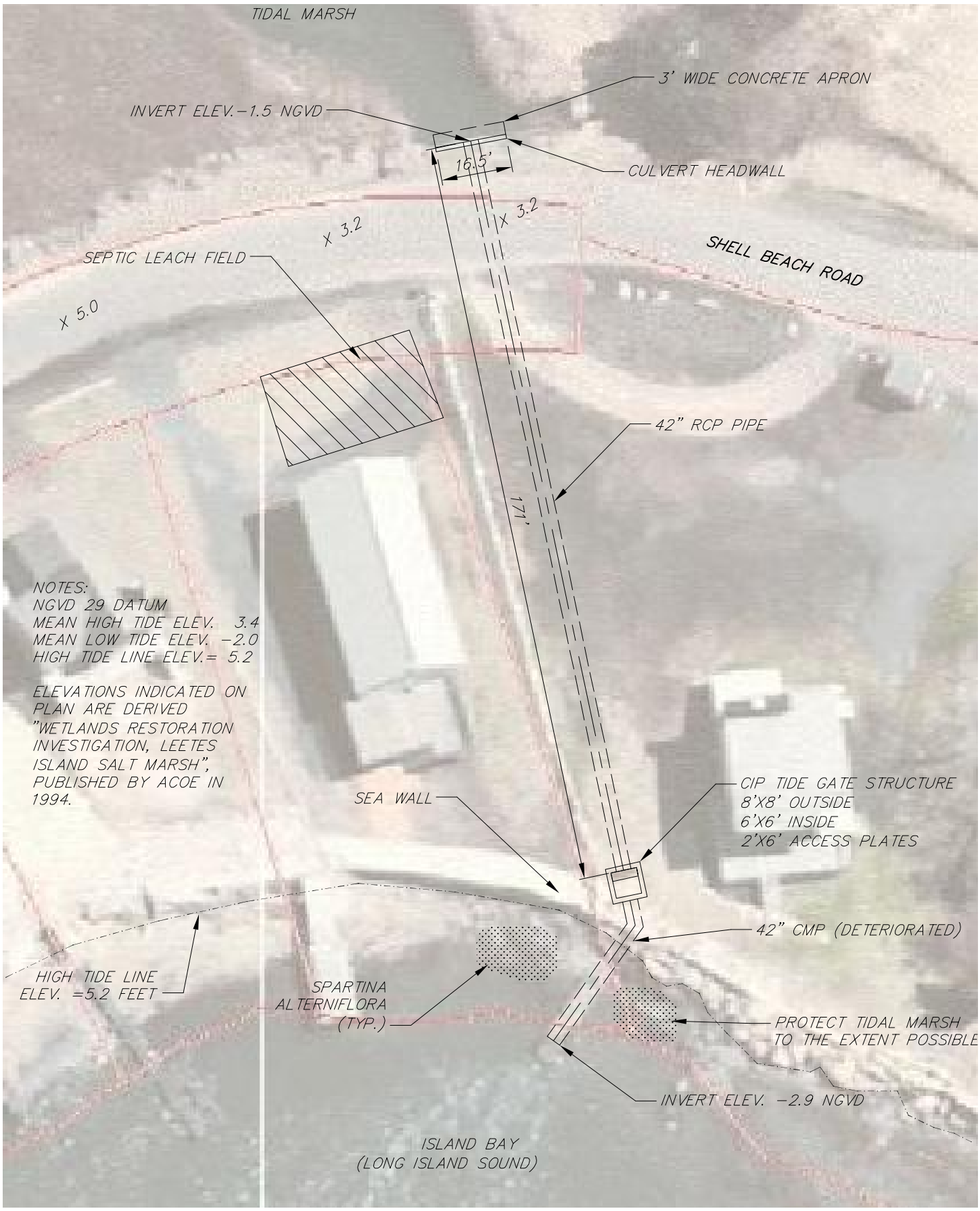
1000 0 1000 2000 Feet

Attachment A, Sheet a
Project Location Map
U.S.G.S. Guilford Quadrangle
Scale: 1 inch = 2,000 feet

MILONE & MACBROOM

W = western marsh (24.5 acres). This portion of the marsh may be used for salt hay harvesting in the future.
E = eastern marsh (15.5 acres total among both sections). Salt hay will never be harvested from these sections again.





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CORPORATE WETLANDS RESTORATION PARTNERSHIP

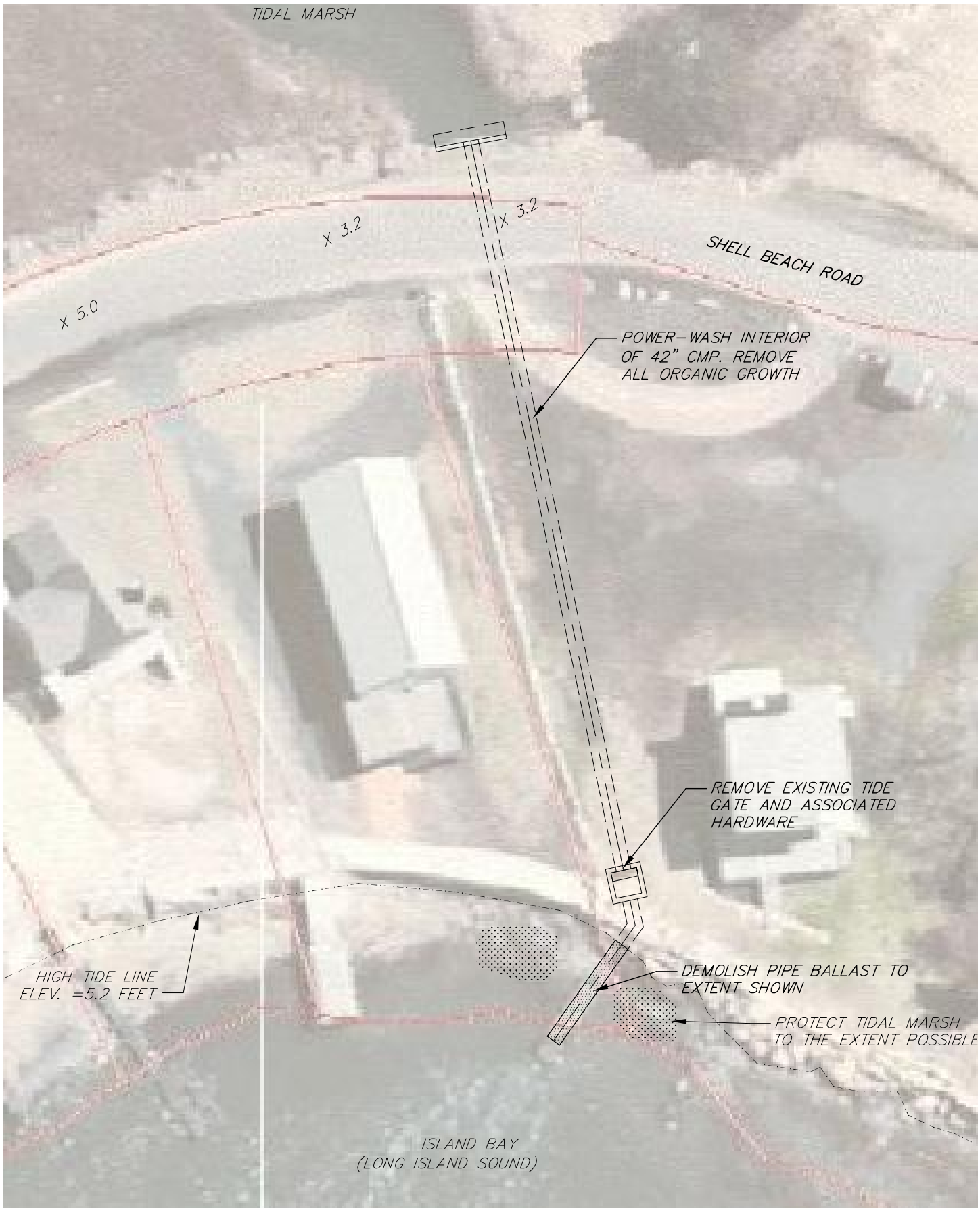
EXISTING CONDITIONS PLAN

LEETES ISLAND TIDE GATE RENOVATION

GUILFORD CONNECTICUT

PROJ. No.:	20090180.A10
DATE:	APRIL 2010

CS-101



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CORPORATE WETLANDS RESTORATION PARTNERSHIP

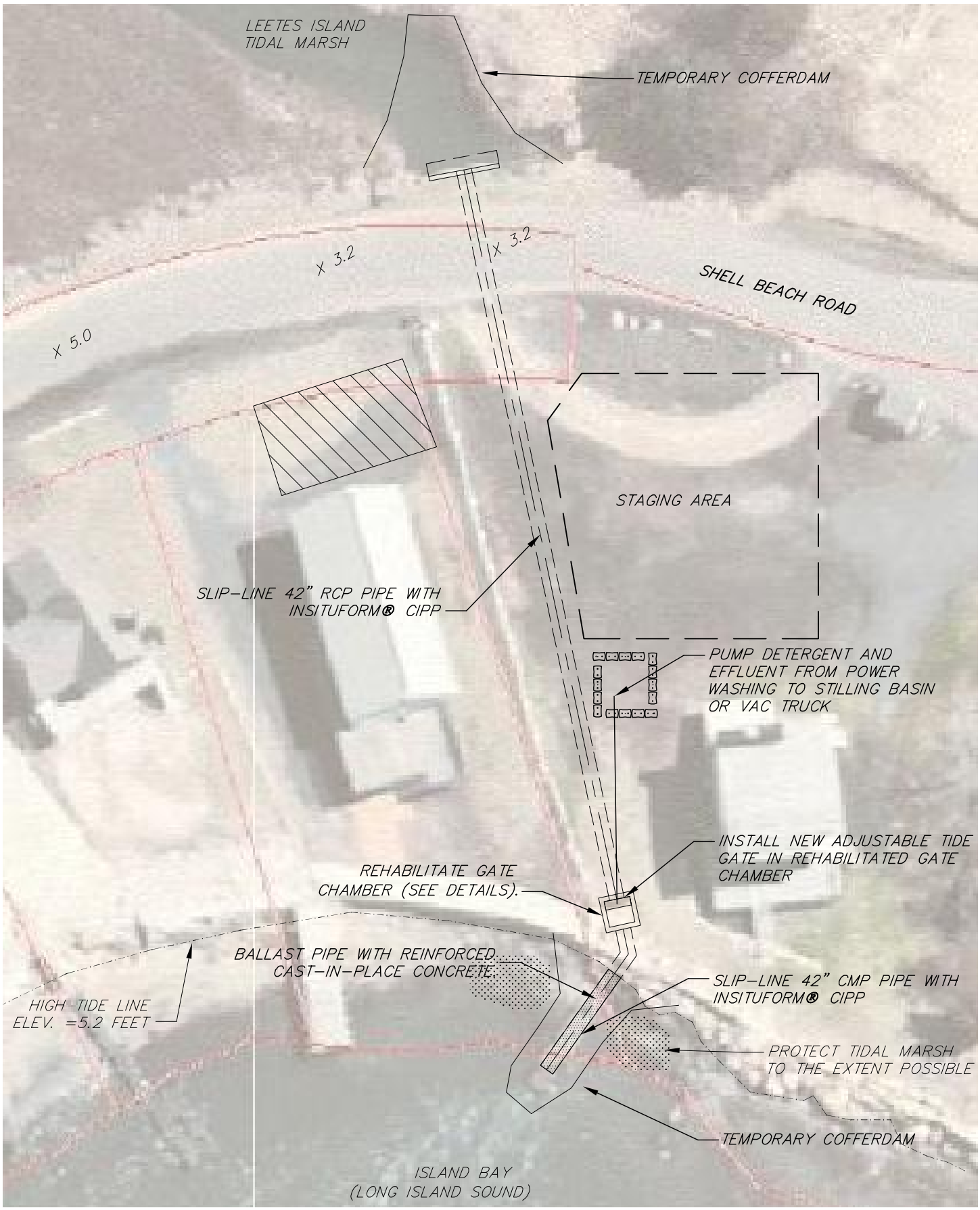
EXISTING CONDITIONS PLAN

LEETES ISLAND TIDE GATE RENOVATION

GUILFORD CONNECTICUT

PROJ. No.:	20090180.A10
DATE:	APRIL 2010

CS-102



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CORPORATE WETLANDS RESTORATION PARTNERSHIP

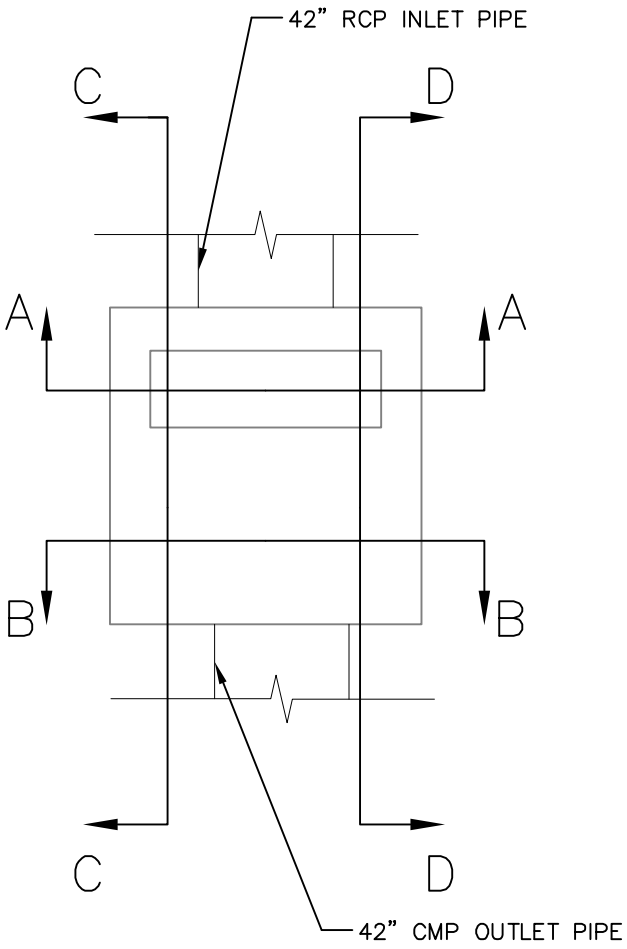
PROPOSED CONDITIONS PLAN

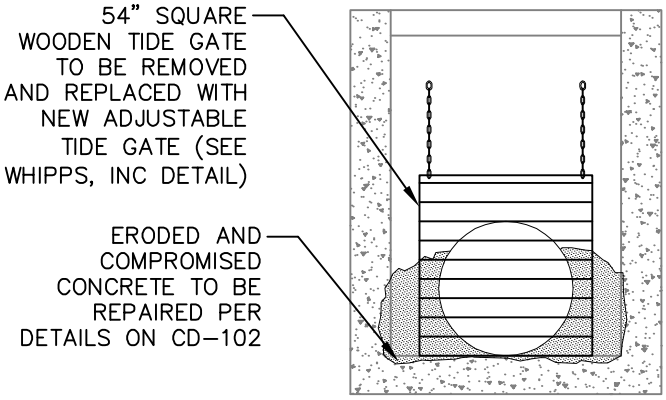
LEETES ISLAND TIDE GATE RENOVATION

GUILFORD CONNECTICUT

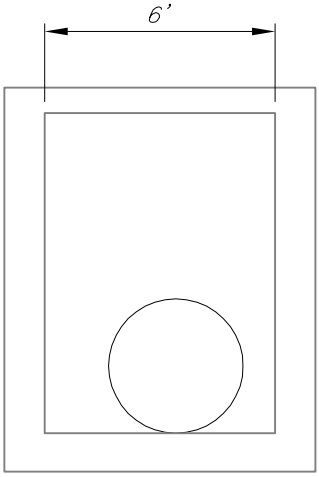
PROJ. No.:	20090180.A20
DATE:	APRIL 2010

CS- 103





SECTION A-A



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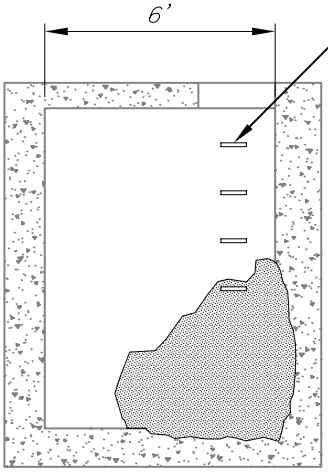

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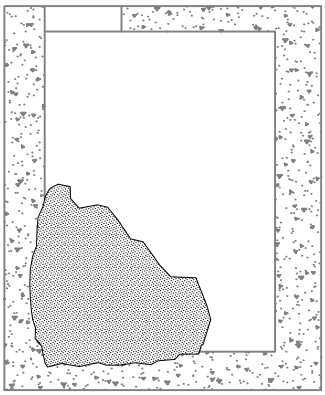


SECTION C-C

SCALE: HORZ.: 1" = 30' VERT.: DATUM: HORZ.: VERT.: NGVD29 0 15 30 GRAPHIC SCALE	WWW.FandO.COM FUSS & O'NEILL *Disciplines to Deliver* 146 HARTFORD RD MANCHESTER, CT 06040 860.646.2469	**CORPORATE WETLANDS RESTORATION PARTNERSHIP** GATE CHAMBER DETAILS LEETES ISLAND TIDE GATE RENOVATION GUILFORD CONNECTICUT	PROJ. No.: 20090180.A20 DATE: APRIL 2010 CD- 101

CONCRETE REPAIR NOTES:

1. 100% OF CONCRETE SURFACES SHALL BE SOUNDED IN ORDER TO DETERMINE THE LOCATION OF DETERIORATED CONCRETE.

2. ALL AREAS OF DETERIORATION SHALL BE REMOVED TO SOUND CONCRETE BY MECHANICAL MEANS. ALL AREAS SHALL BE CLEANED OF LOOSE AND DETERIORATED CONCRETE AND SHALL BE FREE OF DUST AND DEBRIS PRIOR TO REPAIR.

3. ANY STEEL REINFORCEMENT ENCOUNTERED DURING THE REMOVAL OF DETERIORATED CONCRETE SHALL BE THOROUGHLY PREPARED BY MECHANICAL CLEANING TO REMOVE ALL TRACES OF RUST.

4. TYPE "A" CONCRETE REPAIR DETAIL SHALL BE USED FOR PATCHES THAT MEET THE FOLLOWING PARAMETERS:
   A. THE AREA OF THE PATCH IS LESS THAN 3 SQ. FT.
   B. THE PATCH DOES NOT EXCEED 3 FEET IN ANY DIMENSION.
   C. THE DEPTH OF THE PATCH IS LESS THAN 1½"

5. TYPE "B" CONCRETE REPAIR DETAIL SHALL BE USED FOR PATCHES THAT MEET THE FOLLOWING PARAMETERS:
   A. THE AREA OF THE PATCH IS GREATER THAN 3 SQ. FT.
   B. THE PATCH EXCEEDS 3 FEET IN ANY DIMENSION.
   C. 20% OR MORE OF THE PATCH IS GREATER THAN 1½"

6. TYPE "A" REPAIR SHALL USE SIKATOP 123 PLUS IN ACCORDANCE WITH THE MANUFACTURES INSTRUCTIONS OR APPROVED EQUAL.

7. TYPE "B" REPAIR SHALL USE CLASS "S" CONCRETE IN ACCORDANCE WITH THE SPECIFICATIONS, SIKAREPAIR SHB IN ACCORDANCE WITH MANUFACTURES INSTRUCTIONS, OR APPROVED EQUAL.

8. REMOVE CONCRETE IN TYPE "B" REPAIR, INCLUDING SOUND CONCRETE, TO A DEPTH OF 3¼" MINIMUM.

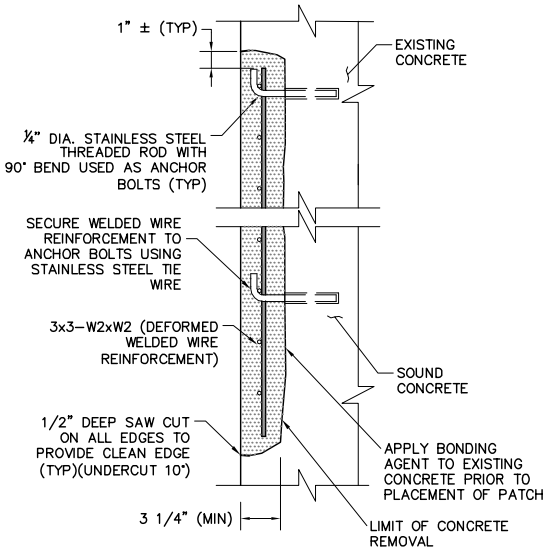
9. WELDED WIRE REINFORCEMENT SHALL BE 3x3–W2xW2

10. SPLICES IN WELDED WIRE REINFORCEMENT SHALL BE IN ACCORDANCE WITH THE MANUAL OF STANDARD PRACTICE FOR STRUCTURAL WELDED WIRE REINFORCEMENT PUBLISHED BY THE WIRE REINFORCEMENT INSTITUTE.

11. SAW CUTS SHALL BE MADE WITH A 10° UNDERCUT

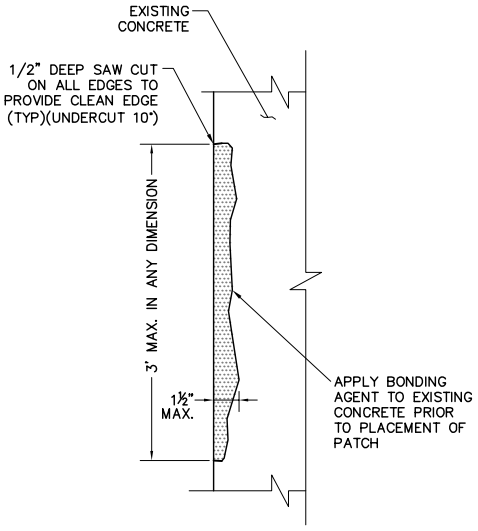
12. ¼"ø STAINLESS STEEL THREADED RODS SHALL BE USED AS ANCHOR BOLTS TO SECURE THE WELDED WIRE REINFORCEMENT TO THE CONCRETE. THE THREADED RODS SHALL BE EMBEDDED 3" MIN. INTO SOUND CONCRETE AND SECURED WITH HILTI HIT RE–500 EPXOY ADHESIVE OR APPROVED EQUAL.

13. ANCHOR BOLTS FOR TYPE "B" REPAIRS SHALL BE SPACED SUCH THAT THE MAXIMUM DISTANCE BETWEEN EACH ANCHOR BOLT IS 20". A MINIMUM OF 2 ANCHORS SHALL BE USED FOR EACH TYPE "B" REPAIR.



TYPE "B" CONCRETE REPAIR DETAIL

SCALE: NOT TO SCALE

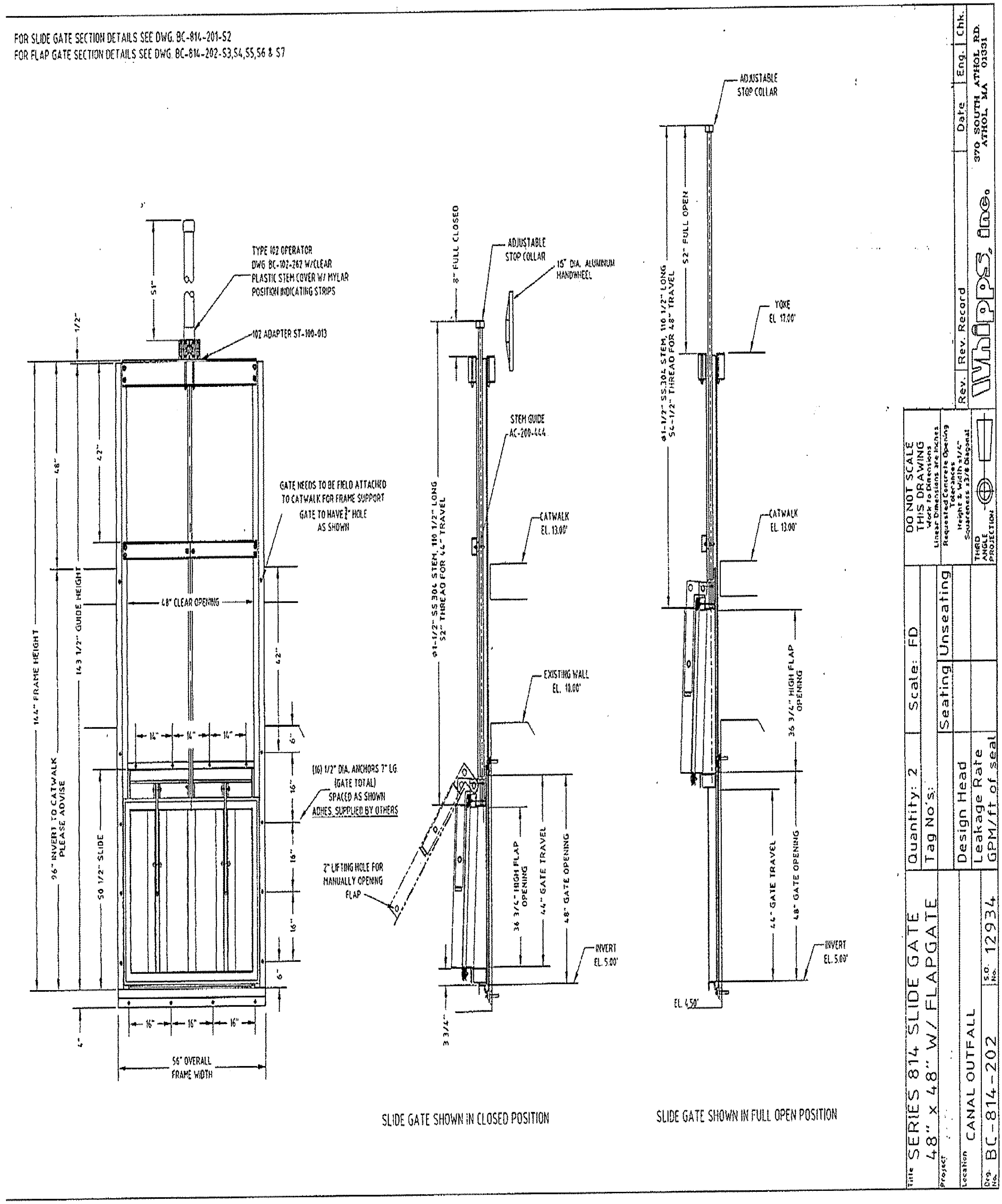


TYPE "A" CONCRETE REPAIR DETAIL

SCALE: NOT TO SCALE

SCALE: HORZ.: 1" = 30' VERT.:	WWW.FandO.COM FUSS & O'NEILL *Disciplines to Deliver* 146 HARTFORD RD MANCHESTER, CT 06040 860.646.2469	**CORPORATE WETLANDS RESTORATION PARTNERSHIP** CONCRETE REPAIR DETAILS LEETES ISLAND TIDE GATE RENOVATION GUILFORD CONNECTICUT	PROJ. No.: 20090180.A20 DATE: APRIL 2010 CD- 102
DATUM: HORZ.: VERT.: NGVD29 0 15 30 GRAPHIC SCALE			

UCS: MS VIEW: LMAN: CTB:



SCALE:	
HORZ.: 1" = 30'	
VERT.:	
DATUM:	
HORZ.:	
VERT.: NGVD29	
0 15 30 GRAPHIC SCALE	

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CORPORATE WETLANDS RESTORATION PARTNERSHIP

GATE DETAIL

LEETES ISLAND TIDE GATE RENOVATION

GUILFORD CONNECTICUT

PROJ. No.: 20090180.A20
DATE: APRIL 2010

CD- 103

Project Photos

Views of concrete and timber pier as seen from Island Bay

Views of concrete and timber pier as seen from top of sea wall

Looking down inside tide gate chamber; note ladder rungs to the left

Water rushing out of upstream pipe and into tide gate chamber (after round metal tide gate had broken off)
Below: upstream headwall and pipe at mid-high tide

Saturated marsh panels in the upper reaches of Leetes Island Marsh, October 31, 2006. Note vegetated areas only along edges of mosquito ditches.

Project Budget

	Leetes Island budget
$400,000	cost estimate for construction
-47,324	from C&E / Bond Commission funds
-25,500	from SEP funds
-350,000	from Housatonic River NRD Fund
($22,824)	

We would like to reserve this **$22,824** for potential cost over-runs; balance will be refunded to Housatonic River NRD Fund