APPENDIX D

Open Marsh Water Management
Project Monitoring Requirements
Suffolk County Vector Control & Wetlands Management Long Term Plan & Environmental Impact Statement

TASK 4: OPEN MARSH WATER MANAGEMENT PROJECT MONITORING REQUIREMENTS

Prepared for:
Suffolk County Department of Public Works
Suffolk County Department of Health Services
Suffolk County, New York

Prepared by:
CASHIN ASSOCIATES, P.C
1200 Veterans Memorial Highway, Hauppauge, NY

May 2005
SUFFOLK COUNTY VECTOR CONTROL AND WETLANDS MANAGEMENT
LONG-TERM PLAN AND ENVIRONMENTAL IMPACT STATEMENT

PROJECT SPONSOR

Steve Levy
Suffolk County Executive

Department of Public Works
Charles J. Bartha, P.E.
Commissioner
Richard LaValle, P.E.
Chief Deputy Commissioner
Leslie A. Mitchel
Deputy Commissioner

Department of Health Services
Brian L. Harper, M.D., M.P.H.
Commissioner
Vito Minei, P.E.
Director, Division of Environmental Quality

PROJECT MANAGEMENT

Project Manager: Walter Dawydiak, P.E., J.D.
Chief Engineer, Division of Environmental Quality, Suffolk County Department of Health Services

Suffolk County Department of Public Works, Division of Vector Control
Dominick V. Ninivaggi
Superintendent
Tom Iwanejko
Entomologist
Mary E. Dempsey
Biologist

Suffolk County Department of Health Services, Office of Ecology
Martin Trent
Acting Chief
Kim Shaw
Bureau Supervisor
Robert M. Waters
Bureau Supervisor
Laura Bavaro
Senior Environmental Analyst
Phil DeBlasi
Environmental Analyst
Jeanine Schlosser
Principal Clerk
## Suffolk County Long Term Plan Consultant Team

### Cashin Associates, P.C.
Hauppauge, NY

<table>
<thead>
<tr>
<th>Subconsultants</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cameron Engineering, L.L.P.</td>
<td>Syosset, NY</td>
</tr>
<tr>
<td>Integral Consulting</td>
<td>Annapolis, MD</td>
</tr>
<tr>
<td>Bowne Management Systems, Inc.</td>
<td>Mineola, NY</td>
</tr>
<tr>
<td>Kamazima Lwiza, PhD</td>
<td>Stony Brook University, Stony Brook, NY</td>
</tr>
<tr>
<td>Ducks Unlimited</td>
<td>Stony Brook, NY</td>
</tr>
<tr>
<td>Steven Goodbred, PhD &amp; Laboratory</td>
<td>Stony Brook University, Stony Brook, NY</td>
</tr>
<tr>
<td>RTP Environmental</td>
<td>Westbury, NY</td>
</tr>
<tr>
<td>Sinnreich, Safar &amp; Kosakoff</td>
<td>Central Islip, NY</td>
</tr>
<tr>
<td>Bruce Brownwell, PhD &amp; Laboratory</td>
<td>Stony Brook University, Stony Brook, NY</td>
</tr>
<tr>
<td>Anne McElroy, PhD &amp; Laboratory</td>
<td>Stony Brook University, Stony Brook, NY</td>
</tr>
<tr>
<td>Andrew Spielman, PhD</td>
<td>Harvard School of Public Health, Boston, MA</td>
</tr>
<tr>
<td>Richard Pollack, PhD</td>
<td>Harvard School of Public Health, Boston, MA</td>
</tr>
<tr>
<td>Masahiko Hachiya, PhD</td>
<td>Harvard School of Public Health, Boston, MA</td>
</tr>
<tr>
<td>Wayne Crans, PhD</td>
<td>Rutgers University, New Brunswick, NJ</td>
</tr>
<tr>
<td>Susan Teitelbaum, PhD</td>
<td>Mount Sinai School of Medicine, NY</td>
</tr>
<tr>
<td>Zawicki Vector Management Consultants</td>
<td>Freehold, NJ</td>
</tr>
<tr>
<td>Michael Bottini, Turtle Researcher</td>
<td>East Hampton, NY</td>
</tr>
<tr>
<td>Robert Turner, PhD &amp; Laboratory</td>
<td>Southampton College, NY</td>
</tr>
<tr>
<td>Christopher Gobler, PhD &amp; Laboratory</td>
<td>Southampton College, NY</td>
</tr>
<tr>
<td>Jerome Goddard, PhD</td>
<td>Mississippi Department of Health, Jackson, MS</td>
</tr>
<tr>
<td>Sergio Sanudo, PhD &amp; Laboratory</td>
<td>Stony Brook University, Stony Brook, NY</td>
</tr>
<tr>
<td>Robert Cerrato, PhD</td>
<td>Stony Brook University, Stony Brook, NY</td>
</tr>
<tr>
<td>Suffolk County Department of Health Services, Division of Environmental Quality</td>
<td>Hauppauge, NY</td>
</tr>
</tbody>
</table>
Abbreviations and Acronyms

OMWM  Open Marsh Water Management
DMCAC  Delaware Mosquito Control Advisory Committee
MCA   Mosquito Control Agency
NYSDEC  New York State Department of Environmental Conservation
USACOE  US Army Corps of Engineers
USFWS  US Fish and Wildlife Service
USGS   US Geological Survey
OMWM Monitoring Requirements

The following information was compiled through telephone interviews and e-mail contacts with appropriate State officials.

**Connecticut**

In 1985, Connecticut began replacing the standard practice of maintaining the existing mosquito ditch network throughout its tidal marsh system with a variety of OMWM techniques. Presently, there are no formal requirements for monitoring OMWM projects in the state of Connecticut.

Prior to implementation, data are collected in order to determine what type of OMWM to install at a candidate salt marsh. These data consist of general water quality parameters (dissolved oxygen, temperature, salinity, and pH), marsh inundation measurements, vegetation analysis, and marsh monitoring through photo stations. Vegetation studies are performed in early fall, when seeds have formed. Water quality parameters are collected during higher water levels over a month: once at full moon, and once at new moon. Photo documentation at select photo stations is done three times a year, during the spring, mid-summer and fall. Marsh float tubes are used to measure marsh inundation during full and new moon phases. Fish sampling is performed once, in early fall. No post construction monitoring is required.

Source: Paul Capotosto, Connecticut Department of Environmental Protection, pers. comm., March 2005

**New Jersey**

The New Jersey Mosquito Extermination Commission has been implementing OMWM at salt marshes for approximately 30 years. The Commission believes that the effectiveness of OMWM has been amply demonstrated. Therefore, no pre- or post-project biological, physical or chemical monitoring is required. Earlier monitoring efforts had shown that the kinds of OMWM installed in New Jersey allow for fish presence on the marsh, sustained marsh vegetation patterns, and reductions in mosquito breeding. OMWM
installations are monitored only through anecdotal observations, performed on a casual basis. If unwanted changes in vegetation are noticed, more precise measurements can be made to locate the cause of the change, although techniques to accomplish this are not specified or even required.

Source: Richard Candelelli, Ocean County, Mosquito Extermination Commission, pers. comm., April 2005

Delaware

All OMWM wetland alterations in Delaware are performed under regulatory oversight by the Delaware Mosquito Control Advisory Committee (DMCAC). The DMCAC consists of four federal agencies (US Army Corps of Engineers [USACOE], US Environmental Protection Agency, US Fish and Wildlife Service [USFWS] and National Marine Fisheries Service), three Delaware Natural Resources and Environmental Conservation agencies (Division of Fish and Wildlife, Wetlands and Subaqueous Lands Section and the Delaware Coastal Management Program), and the State Historic Preservation Office.

In the early 1980s, Delaware performed a detailed five-year environmental assessment of OMWM impacts to salt marshes. Many of the current permit requirements are based upon this assessment. Permitting agencies have not required continued monitoring. If an agency develops concerns regarding OMWM in general, or for a particular project, previous projects are used to demonstrate the resource benefits associated with OMWM.

Currently, Delaware performs OMWM under a five-year blanket permit issued by the USACOE and the State Wetland program. Under this permit, advanced notification of all OMWM projects is required by the DMCAC prior to any OMWM installation. A detailed map is provided to each agency before any marsh alterations can commence. All agencies are encouraged to attend an on-site pre-construction site visit to address any specific concerns.

It is not required to collect or submit any pre- or post-project biological sampling data to any agency in the DMCAC. However, prior to implementing OMWM at a federal refuge, it is necessary to determine if the proposed marsh alterations could affect historic
properties that are included in the National Register of Historic Places, or properties that meet the criteria for the National Register, in accordance with Section 106 of the National Historic Preservation Act of 1966. If it is thought that the marsh alterations could affect historical properties, a State Historic Preservation Officer/Tribal Historic Preservation Officer is required to be involved during the OMWM process. Areas of marsh alterations must be carefully monitored and examined for the presence of any Indian artifacts that, if found, are required to be submitted to the state.

Source: Chet Stachecki, Delaware Mosquito Control, pers. comm., April 2005
Chris Lesser, Delaware Natural Resources and Environmental Conservation, pers. comm., April 2005

National Wildlife Refuges

National Wildlife Refuges require Mosquito Control Agencies (MCAs) to collect quantifying data that are used to support the thesis that the proposed OMWM will effectively restore hydrology, significantly enhance fish and wildlife functions, and control salt marsh mosquito production. In 1998, USFWS issued its “Guidance for Meeting US Fish and Wildlife Service Trust Resource Needs When Conducting Coastal Marsh Management for Mosquito Control on Region 5 National Wildlife Refuges.”

In Region 5, if an OMWM is to be installed, a paired ditched marsh and control marsh are selected. They are to be sampled for one year prior to implementing any OMWM alterations. In the second year, OMWM is performed on the ditched marsh and sampling proceeds. USFWS sample parameters and sampling frequency are listed in Table 1.

National Wildlife Refuges require a minimum of two years post OMWM monitoring, with repeat monitoring several years thereafter once the marsh has adjusted to the alterations. If an OMWM system fails, the MCA is responsible for rectifying any problems for up to five years after completion of the project.
Table 1. USFWS OMWM Sampling Protocols

<table>
<thead>
<tr>
<th>Sample Parameter</th>
<th>Sampling Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetation</td>
<td>Once at the end of the growing season</td>
</tr>
<tr>
<td>Water table level measurements</td>
<td>10-14 day intervals during the growing season</td>
</tr>
<tr>
<td>Soil salinity</td>
<td>10-14 day intervals during the growing season</td>
</tr>
<tr>
<td>Mosquito larval sampling</td>
<td>4-5 days after a tide has flooded the marsh surface</td>
</tr>
<tr>
<td>Nekton sampling in ponds</td>
<td>A minimum of twice during the summer</td>
</tr>
<tr>
<td>Nekton sampling in ditches/creeks</td>
<td>At 10 locations, twice in early summer and once in later summer-early fall</td>
</tr>
<tr>
<td>Water quality measurements</td>
<td>Taken during nekton sampling</td>
</tr>
<tr>
<td>Bird surveys</td>
<td>Performed during both the breeding and non-breeding seasons, five times for each season</td>
</tr>
</tbody>
</table>

Sources:  

**Monitoring at the Suffolk County Vector Control and Wetlands Management Long-Term Plan OMWM Project (Wertheim National Wildlife Refuge, Shirley, NY)**

Wertheim National Wildlife Refuge is comprised of approximately 2,550 acres located on the south shore of Long Island at the mouth of the Carmans River. In conjunction with USFWS, the Long-Term Plan project team proposed to conduct an OMWM demonstration project in approximately 80 acres of the salt marshes along the east bank of the Carmans River, near its confluence with the Great South Bay, in 2003. The project
locations consisted of two distinct areas, called Area 1 and Area 2, with two similarly-sized control areas, called Area 3 and Area 4.

A joint USFWS-US Geological Survey (USGS) appraisal of OMWM in the north-east US had used an area of the Refuge, located between Area 3 and Area 4, as a study site. Therefore, the USFWS/USGS monitoring protocols (see above) formed the basis of the proposed monitoring approach. New York State Department of Environmental Conservation (NYSDEC) does not have defined monitoring protocols for marsh alterations. NYSDEC requested that the Long-Term Plan team propose a protocol that would be appropriate to measure any significant change in the marsh, and be able to determine if the change was due to the project or some other cause (such as natural variability). NYSDEC also stated its concerns regarding potential impacts to sedimentation rates, invertebrate populations, fish species, and birds. NYSDEC also, at a later date, specified a need for photo documentation.

Therefore, an adapted USFWS-USGS approach was created. 88 stations (48 in Areas 1 and 2 and 40 in Areas 3 and 4) were identified on the marsh surface, and 10 stations were set in ditches in each area ("fish stations"). Four Carmans River water quality monitoring stations (one associated with each Area), and two water quality monitoring stations in navigable sections of the major creeks were also established.

The construction of the OMWM in Area 1 (completed, March, 2005) and Area 2 (proposed for fall, 2005) will result in the loss of the ditches that contain 15 of the 20 fish stations. Relocated stations will be used to replace these losses. Three surface water stations will be established in each area (one in a small pond, one in a large pond, and one in an isolated pond). In Area 1, in addition to the three remaining fish stations and the three surface water stations, five additional stations will be established in the newly constructed streams. In Area 2, in addition to the remaining two stations and the three surface water stations, four additional stations will be selected in either new streams or remnant ditches.

Permanent photo stations were also established, using either transect points or fish stations, with clear fields of view that allowed for panoramic views across the
surrounding marsh. Where possible, photo stations were located at the original fish stations, or at transect points.

50 m radius bird survey points were established throughout the four Areas in 2004. The survey points were placed 25 m from any edge (unsuitable or non-marsh habitat) and point centers were 150 m apart.

In effort to monitor freshwater inputs and locate the freshwater interface, monitoring wells were installed near Areas 1 and 4. Two single shallow (12-foot) wells and a cluster of three wells (depths of 12 feet, 150 feet and 180 feet) were installed along the upland perimeter of Area 1. Four 12-foot wells, two 150-foot wells, and one 175-foot well were installed along the upland perimeter of Area 4.

Monitoring has been characterized into three concentrations: Biological, physical, and chemical characteristics. The following lists the general monitoring approaches adopted for the project:

**Biological Monitoring**

- Mosquito Breeding Concentration Areas (one week intervals throughout each breeding season, across all four Areas)
- Mosquito Dip Transects (every 15-20 m along each transect, monthly)
- Vegetation Quadrats (88 transect stations, annually)
- Nekton Sampling (40 fish stations, three times a year)
- Invertebrates (26 transect stations, 28 fish stations [both water column and benthic], annually)
- Vegetation Biomass (44 transect stations, surface biomass, 22 transect stations, surface and root biomass, annually)
- Overall Marsh Composition (pre-project)
• Bird Observations (bird stations, three times a year)

• Photo Stations (annually)

Physical Parameter Monitoring

• Ditch Qualities (43 ditches, pre-project)

• Sedimentation Rates (marker horizons) (88 transect stations, one-third tested each year)

• Salt Marsh Water Table Height (88 transect stations, approximately every two weeks, April-October)

• Water Table Heights (Ground Water Monitoring Wells, continuous record)

• Marsh Inundation (Areas 1 and 2, pre-project)

Chemical Parameter Monitoring

• Water Quality Monitoring in Ditches (40 fish stations, monthly)

• Ditch Salinity Survey (43 ditches, pre-construction; ditches and creeks, post-construction)

• Water Table/Pore Water Salinity (88 transect stations, approximately every two weeks, April-October)

• Nutrient Sampling (12 fish stations, quarterly)

• Carmans River Water Quality (6 stations, three times a year)

• Estuarine Water Quality (three stations, three rounds, pre-construction)

NYSDEC originally requested three years of pre-project monitoring data, because of concerns that large interannual variability for many variables would obscure impacts
associated with the project. NYSDEC accepted the approximately one and a half years of pre-project monitoring, as the Long-Term Plan team was persuasive regarding its ability to use sophisticated statistical analyses to address some of these issues, along with the availability of more than three years of key monitoring data from the USFWS-USGS project.

However, as a permit condition, NYSDEC is requesting that monitoring continue for 10 years. It is unlikely that it will be possible to continue to monitor the site at the current intensity, as annual consultant costs associated with monitoring are in excess of $100,000, and the County and USFWS have provide much in-kind assistance. The monitoring plan submitted with the permit application called for re-evaluations of monitoring parameters and frequencies after the completion of construction, within the first two to three years. NYSDEC did not comment on that portion of the monitoring plan.
