

# SNOW'S CREEK RESTORATION – RAPID ASSESSMENT

Hyannis, Massachusetts

June 2011



Funded By:  
Massachusetts Division of Ecological Restoration  
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In June 2011 Comprehensive Environmental Inc. (CEI) completed a rapid assessment of the Snow's Creek system to assess restoration potential. The following is a brief overview of project methodologies, site assessment and data collection.

### **Project Methodology**

As requested by the Division of Ecological Restoration, CEI used the rapid assessment protocol outlined in the MA Office of Coastal Zone Management's Wetlands Restoration Program's (WRP) *Great Marsh Coastal Wetlands Restoration Plan*. The Snow's Creek system, including the Ocean Street culvert, defines the geographic extent of the project. The rapid assessment effort involved a field data collection program, qualitative field assessment and desktop (GIS) analysis.

The adopted WRP assessment protocol includes the following criterion and associated qualifiers:

#### Ecological Integrity

- Surrounding land use
- Prevalence of invasive plant cover
- Overall severity of impairment(s)
- Extent of wooded buffer
- Connectivity to other habitat types
- Listed species or critical habitat designation
- Anadromous fish run
- Barriers to fish passage
- Shellfish habitat suitability

#### Recreational Value

- Public access
- Watercraft use and connectivity
- Wildlife viewing opportunities

#### Educational Value

- Proximity to schools
- Ongoing research
- Accessibility and safety concerns
- Overall educational and outreach potential

#### Uniqueness/Heritage Value

- Rare species habitat
- ACEC designation
- Cultural resource features
- Urban viewscape value (natural setting within a primarily urban landscape)
- Urban habitat value (important habitat within a primarily urban landscape)

#### Construction Logistics/Feasibility

- Traffic volumes and detour potential
- Accessibility for construction and staging

- Fill material considerations (nature, quantity, hazardous concerns)
- Low lying properties
- Utility infrastructure constraints
- Permitting complexity
- Municipal project support
- Estimated project costs (design, permitting and construction)

The criteria are used in a qualitative manner to assess overall restoration potential. The specific data collection methods used to assess each criterion are described below.

#### *Field Program*

The field component of the rapid assessment involved the collection of physical and ecological data, ground elevation survey, digital photography, as well as tidal range data along the Ocean Street culvert. Tide gauges were deployed by CEI on both sides of the Ocean Street culvert. Water level data were collected from June 14, 2011 through June 24, 2011 at 10 minute intervals with Global WL16 data loggers. Additionally, a real-time conductivity and temperature meter was added to the gauge on June 21, 2011 through June 24, 2011 and collected readings at 10-minute intervals using a CTD Diver D1271. Each probe was secured at the culvert and housed in 2-inch PVC tubing with a series of drilled ½ inch holes to allow unrestricted water flow over the probes. Tide gauges were then surveyed by CEI relative to NAVD 88 vertical datum referencing a known bonnet bolt on a nearby fire hydrant. Water level gauges were checked on June 21, 2011 to confirm data collection. After retrieving the gauges, data were downloaded and corrected to the available datum. Upstream and downstream data were plotted together to determine the existence and severity of tidal restrictions.

#### *Assessment of Structural Conditions*

A visual inspection of the Ocean Street culvert was performed to assess restrictions of tidal flow into Snow's Creek. Inspections included the road, road embankment, channel, channel embankment, culvert end sections, headwalls, and the culvert itself. The type, dimensions, and relevant elevations of these features were recorded as part of the ground survey. The inspection of the road consisted of looking for visible signs of fatigue, which included cracks in asphalt, sinkholes, and dips and humps in the road. The inspection of the road embankment included looking for signs of erosion, sinkholes, and the stability of the slope. Channel inspections included checking for scour or material build up that would impede the flow through the channel and/or the culvert. The channel embankment was checked for signs of erosion and undermining of the embankments. The headwalls and end sections of the culvert pipe were checked for cracks, missing material, and undermining. The culvert pipe was submerged during low and high tide which limited inspection to the end sections. The pipe ends were checked for misalignment, joint dislocation, cracks, holes, and other signs of damage. The type, size, length, and invert elevations of the culvert were recorded. Based on the results of the inspections, the culvert condition, as well as the roadway and headwall were both considered to be in good condition. A general estimated remaining life of the structural components of the crossing was also determined.

Other features influencing restoration feasibility were also noted during the field inspections. These included the presence of above or below ground utilities, presence of construction staging

areas, site access limitations, relative traffic volumes, potential to detour traffic during construction, and presence of low-lying properties which could be impacted by increased tidal exchange through the culvert and channel. Approximate dimensions of the fill material were noted for later volume calculations. The type of material was visually characterized to determine the level of effort required to remove it.

#### *Ecological and Ground Survey Methods*

A field assessment of ecological features and structures was conducted. This field data collection focused on the identifying indicators of potential impairment to coastal wetlands, water quality, or marine habitats, and estimates of relative severity. Potential ecological impairment factors included:

- Presence of a tidal restriction
- Obstructed tidal creeks/ditches
- Evidence of fill
- Presence of invasive species
- Potential sources of water-borne pollutants in the surrounding landscape.

In addition to the results of the tide gauge deployments, secondary evidence of a possible tidal restriction were also noted. These included the presence of creek bank erosion features, obstructed or impounded flow conditions and differences in invasive species cover and professional judgments of habitat quality indicators including the relative coverage of invasive species, the presence of an intact wooded buffer, barriers to fish passage, and connectivity to other wetland habitat types.

#### *Digital Inventory and Data Interpretation Methods*

The assessment also included an inventory of relevant MassGIS data to supplement the field investigation. This digital information included the following data layers: Natural Heritage and Endangered Species Program Priority Habitats for Rare Species and Estimated Habitats of Rare Wildlife, Areas of Critical Environmental Concern (ACEC), BioMap Core Habitat and Surrounding Natural Landscape, anadromous fisheries, shellfish suitability areas, schools, cultural resource features (Register of Historic Places), hazardous materials (Tier Classified 21E Sites), and protected or recreational open space. These resource layers were reviewed for inclusion within or close proximity to potential restoration sites.

### **Snow's Creek Rapid Assessment Results**

#### *Overview:*

Snow's Creek is a 20 acre wetland system consisting of open water and adjacent wetlands located near inner Lewis Bay in the Hyannis section of Barnstable, MA. Connected to the ocean (Lewis Bay) through a culvert located under Ocean Street, Snow's Creek is bordered by private residential lots (medium density) containing mainly single family homes and several small townhouse units. In addition to Ocean Street to the East, it is bounded beyond the residential neighborhood by Gosnold Street to the South, Old Colony Road to the West and Nantucket Street to the North. Historic maps show culverts located on each of these roadways connecting directly to the Snow's Creek area.

Two water level data loggers (Global WL16 data loggers) were installed at the Ocean Street culvert (upstream/pond – west of the road and downstream/ocean – east of the road). Water level data and temperature was collected continuously at 10-minute intervals from June 14<sup>th</sup> through June 24<sup>th</sup>. Additionally, conductivity data was collected in the same locations using CTF Diver D1271 data loggers at 10-minute intervals from June 21<sup>st</sup> through June 24<sup>th</sup>. Raw water level data was then adjusted based on benchmark elevation points that were collected. The data loggers were installed at the upstream and downstream sides of the culvert to assess its hydraulic characteristic and capacity. Culvert hydrographs and representative Snow's Creek tidal hydrographs were produced based on this data.

#### *Structural Conditions:*

The Ocean Street culvert is a single 36-inch corrugated metal pipe (CMP) encased in a precast concrete headwall on both ends. The upstream headwall includes two 16-foot wingwalls to protect the adjacent bank from erosion. Concrete has been poured on the banks at the downstream headwall to stabilize the soil. A sinkhole has formed behind the downstream headwall in which stormwater flows through and is causing soil to erode. The structural integrity of the headwall will decline as the bank becomes unstable with the loss of soil.

There is no scour protection at either pipe invert, however the streambed is firm with a mixed gradation of sand and stones. A structural anomaly was noted consisting of a semi-submerged weir or knee wall structure in front of the culvert. This appeared to be a remnant from previous construction. This weir blocks half of the pipe opening which effectively decreases the culvert capacity in half and reduces tidal exchange in and out of Snow's Creek.

The road surface appears in good condition and drainage structures are included on either side of the culvert to collect runoff. A 5-foot wide sidewalk is provided on the west side of the road and is in good condition. The road surface is 23 feet wide, approximately 7 feet above the culvert pipe invert and 3 feet above the elevation of the adjacent marsh. The total length of the culvert is approximately 35 feet with a 10 foot wide headwall on the downstream side and a 6 foot wide headwall on the upstream side.

#### *Ecological Integrity:*

Snow's Creek is a slow moving tidally influenced wetland system containing a large open, shallow ponded area. It is connected to Lewis Bay via the Ocean Street culvert. Based on available information and field observations, freshwater inflow may take place along the Old Colony Road/Nantucket Street to the northwest and from the freshwater system located to the southwest from the Gosnold Street west culvert. A culvert to the east along Gosnold Street is also shown on available maps however its current condition and connection to Snow's Creek is unknown. As a result, it is suspected that much of Snow's Creek is brackish and freshwater while the area closest to the Ocean Street culvert remains higher in salinity.

Surrounded by residential neighborhoods with backyards abutting water and wetland in most areas, Snow's Creek is characterized by high marsh and marsh border dominant vegetation as described in R. W. Tiner's generalized plant zonation.<sup>1</sup> Eastern portions of the creek contain

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<sup>1</sup> Tiner, R. W., Jr. 1987. *A Field Guide to Coastal Wetland Plants of the Northeastern United States*. The University of Massachusetts Press, Amherst.

sparse middle high marsh areas with a mix of *Spartina patens* (salt meadow grass) and *Distichlis spicata* (salt/spike grass). This mix is similar to the vegetation observed on the sandy shore inlet east of Ocean Street leading to Veterans Beach along with the short form of *Spartina alterniflora*. Further west as salinities likely decrease, the marsh border is colonized by nearly monospecific stands of *Typha sp.* (Cattail). Serving as potential habitat for some wetland and shoreline species, *Typha sp.* can provide nesting habitat, substrate cover and erosion control functions. Although not on the MA Department of Agricultural Resources (MassDAR) *Prohibited Plant List* (invasive species), *Typha sp.* are considered aggressive and invasive by some as it can form dense stands in aquatic habitats thereby reducing plant diversity and limiting direct waterbody access. With similar growth patterns, *Phragmites australis* (Common Reed) was observed in most marsh border areas directly abutting the stands of *Typha sp.* *P. australis* is on the MassDAR *Prohibited Plant List* as an invasive plant species and although some may argue that it can provide some habitat functionality, its benefits are limited. As in Snow's Creek, *P. australis* often dominates an area with monospecific stands of vegetation that can displace the more desirable *Spartina sp.* known to support greater marsh diversity. Conversations with several abutting residents indicated that invasive species removal along some shoreline properties by the property owners for better access and aesthetic views resulted in a significant Canada Goose problem now with direct access to lawns and patios. Increased tidal flow can often increase the salinity to a level that may help reduce/eliminate the existing *P. australis* stands. However, freshwater influences may inhibit this effort. Additionally, hydrologic modifications may also result in simply moving the *P. australis* stand to a slightly higher elevation. Upper elevations of Snow's Creek are characterized by typical forested and scrub/shrub freshwater wetland habitat that appear to provide a moderate buffer to Snow's Creek. Invasive vegetation such as *P. australis* and *Lonicera japonica* (Japanese Honeysuckle) were observed in several areas adjacent to roadways within the watershed. Despite the urban medium density setting, vegetated buffers appeared to be maintained and the area has urban viewscape value for residents.

In comparison, field observations of the seaward side of the Ocean Street culvert show a more open salt marsh/dune habitat accessible via Veterans Beach. This area east of the culvert is dominated by a low high and middle high marsh vegetation mix of *S. patens*, *D. spicata*, and *S. alterniflora*. Marsh border vegetation includes *Myrica sp.* (Bayberry), *Rosa palustris* (Swamp Rose) and *Rosa rugosa* (Rugosa Rose). The intertidal area along this waterway showed signs of crab and clam habitat while minnows were observed around the ocean side of the Ocean Street culvert. The Ocean Street culvert was not visible. The adjacent landowner indicated that the culvert at one time was visible during low tides however he had not observed it for several years due to increased sedimentation, which would also affect the hydraulic characteristics of the culvert.

With small elevated areas of substrate accumulation creating island type habitat for ducks and swans, several small sediment deltas were observed. Other than periodic evidence of typical marsh mammal foraging and avifauna, no other unique characteristics were noted. Snow's Creek is mapped as BioMap Critical Natural Landscape which is identified as habitat for wide-ranging native species, supports intact ecological processes, maintains connectivity among habitats, and enhances ecological resilience including buffering uplands around coastal, wetland, and aquatic Core Habitats to ensure long term integrity. Snow's Creek is northwest of Core Habitat/Species

of Conservation Concern located in the southern portion of Lewis Bay. Snow's Creek is also identified as having tern foraging habitat of MESA listed tern species that spans much of the Massachusetts coastline. Snow's Creek is not an anadromous fish run nor is it open to shellfishing although east of Ocean Street is considered shellfish habitat.

Water elevation data collected over the 10-day period show a correlation to available tidal predictions for Hyannis Port. While the data does show what appear to be some anomalies, the overall trends indicate that there were several cycles of consistent data showing the same trend around the middle of the data set. The upstream fluxes regularly peak with one daily high tide observed from the downstream location however regularly appear to lag significantly behind the second daily high tide indicating a restriction. Conductivity data shows significant spikes on the upstream side with a temperature gradient likely. Combined with the water elevation lag, these elements indicate the potential presence of a salinity lens with saltwater at lower depths with freshwater at the surface.

The weir wall at the Ocean Street culvert restricts flow through the culvert. At lower tides/flows, the restriction may have less influence as the restricted pipe capacity may be able to pass the full flows under these conditions. Under higher flows and tides, the influence will be greater as the restricted pipe may not be able to pass the full flows under these conditions. This could result in a shift in the trends from extreme high tides to extreme low tides.

The downstream data regularly show a peak followed by a sustained high tide with another small jump before subsiding. One explanation is that as the high tide peaks at the restriction it then reaches the top of bank along the inlet and plateaus accordingly. This would explain the sustained level at the culvert as the tide continues to rise while allowing the surrounding floodplain to absorb the incoming volume. As the tide turns the water elevation in the channel starts to drop. Another peak occurs with inflow and drainage of the floodplain and the increased flow out of Snow's Creek. Additional data will be needed to assess the long term trends of this influence as well as the impact relative to spring and neap tides.

The shoal at the outlet of the Ocean Street tributary contains a buildup of sediment that may also be influencing flows. As mentioned above, an abutting neighbor commented that they used to be able to see the Ocean Street culvert during low tide and have not seen it for a number of years. This infilling of sediment can also influence flows. If the sediment elevation is higher than the culvert elevation, it may cause water to remain at higher elevations than normal at the Ocean Street culvert under low tide conditions. Removal of the weir will increase the capacity of the Ocean Street culvert and allow greater flows and thus higher velocity flows to pass through, which may help wash out the sediment shoal over time, helping to restore a more natural high and low tidal exchange in Snow's Creek

There may be several other hydrologic connections to Snow's Creek, including a potential tidal connection via a culvert along the eastern end of Gosnold Street. This tributary was followed down to the wetland/pond and beach and is connected to the ocean through a 36" culvert. Although we were unable to confirm its connection to Snow's Creek in the field, the connection would help explain the lower water levels observed in Snow's Creek compared with the water levels on the downstream side of the Ocean Street culvert, as water may be leaving Snow's Creek through this culvert. This combined with the downstream sediment shoal coincide with the observations and data set. Additionally, USGS maps indicate potential hydrologic connections along West Gosnold Street and along Nantucket Street/Old Colony Road.

Despite the anomalies and unusual data, we feel the effort was valuable as it identified the weir wall, which is a relatively inexpensive fix, and identified other possible influences for further investigation.

### *Socioeconomic:*

The recreational values of Snow's Creek are limited due to the lack of public access. Although the Town owns several parcels along the northwest inlet, this area is very thickly vegetated with freshwater forested and scrub/shrub wetland habitat. No access trail was identified that would easily lead an educational group down through Snow's Creek. This is unfortunate since there are several schools in the vicinity and ample public parking nearby to support those visiting the nearby beaches. Additionally, the Kennedy Memorial and Veterans Memorial are steps from the Snow's Creek culvert along Ocean Street and have a daily influx of visitors. Snow's Creek does not include any known cultural resource elements or urban setting values. There is no known ongoing research in the area although Snow's Creek was included in the Lewis Bay report as part of the Massachusetts Estuaries Project.

### *Restoration Potential:*

It is unlikely that an increase in tidal exchange will significantly reduce or eliminate invasive species vegetation such as *P. australis*. However, additional tidal exchange will increase salinities further throughout the interior of Snow's Creek and to the west. An increased exchange will also likely aid in the movement of young fish populations that were observed at the downstream culvert currently likely unable to travel into Snow's Creek because of the weir wall. Additionally, water quality is often improved when greater tidal flushing is achieved, presenting a healthier habitat for area species and often an overall benefit to the entire area.

### *Construction Logistics/Feasibility:*

Increasing tidal flow into Snow's Creek could be achieved by simply removing a section of the existing weir wall that is blocking the opening of the culvert pipe. Work would include cutting a notch in the concrete weir wall and removing the section that is currently obstructing flow. This would allow the existing culvert to remain in place and avoid the need for new construction and limit the time needed for a temporary traffic detour. Channel restoration on the upstream side of the culvert would also improve tidal flow by removing material that has built up against the weir wall.

Removing the weir wall would increase flow velocity in the pipe and at either end of the culvert. Project design considerations should include scour protection at each end of the culvert pipe to stabilize the channel. Loss of channel material at either end of the culvert could compromise the foundation of the headwalls. Complete removal of the weir wall is not recommended since it could affect the structural integrity of the culvert and wingwalls. The total construction costs associated with this project to remove a notch from the weir wall, remove material from the creek channel and placement of scour protection are estimated to be \$15,000. The cost to permit the project is estimated to be \$12,500.

Constructability at this site is high. There are underground water, sewer, drain and gas lines but none of these utilities would affect the work performed on the weir wall. Overhead utilities within the project work area should be considered when removing material in front of the weir wall. Traffic volume along Ocean Street is steady due to the proximity of Veterans Memorial Park. Work should be performed during the fall/winter during times of seasonal low traffic. Old Colony Road could be used to detour traffic as needed during construction.





**Above: Upstream culvert data logger.  
Below: Downstream culvert data logger.**



**Above: Upstream culvert from Ocean Street.  
Below: Downstream culvert from Ocean Street.**





**Above: Snow's Creek east of Ocean Street looking west.  
Below: Minnows at downstream culvert area.**



**Above: Mouth of Snow's Creek; view of Lewis Bay.  
Below: Weasel near culvert.**





**Above: Western side of Snow's Creek viewed from 16 Walley Court.  
Below: Sediment delta in foreground; NE Snow's Creek viewed from 381 Ocean Street.**



**Above: NE section of Snow's Creek from 381 Ocean Street.  
Below: Center of Snow's Creek from 20 Stanley Place.**





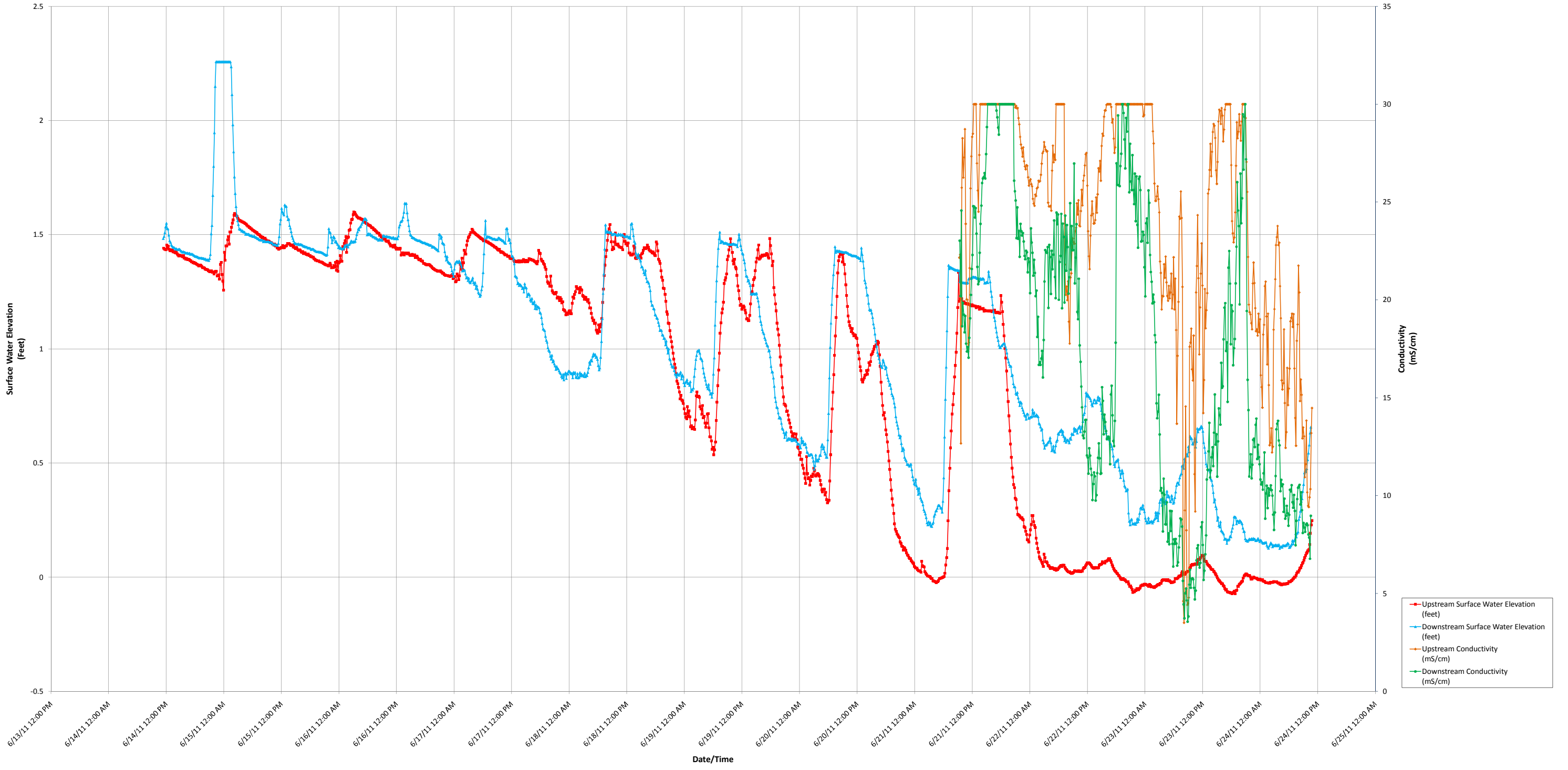
Above: Northern area of Snow's Creek from 56 Cook Circle.  
Below: *Phragmites australis* along Gosnold Street.



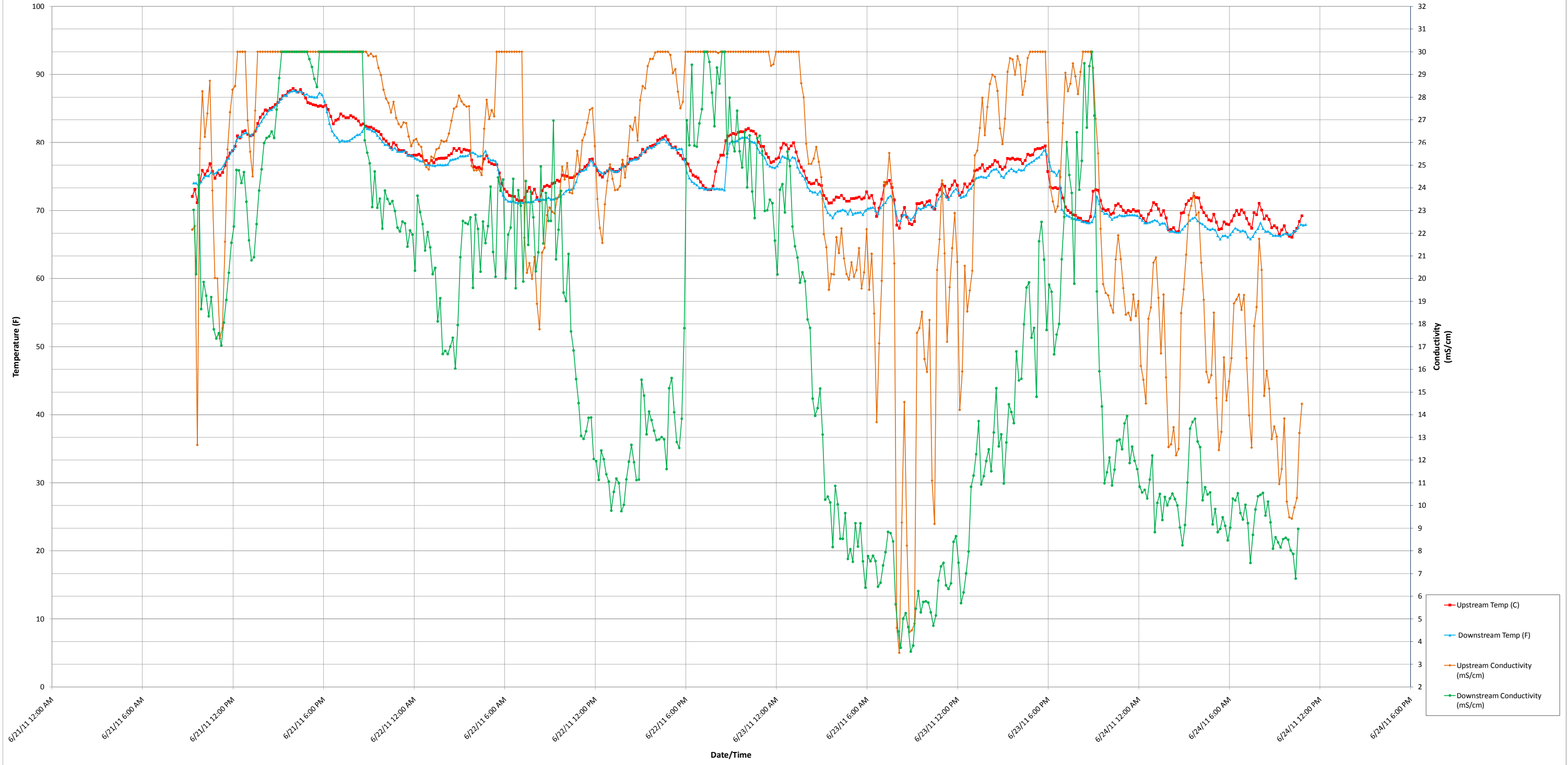
Above: South of upstream culvert at 431 Ocean Street.



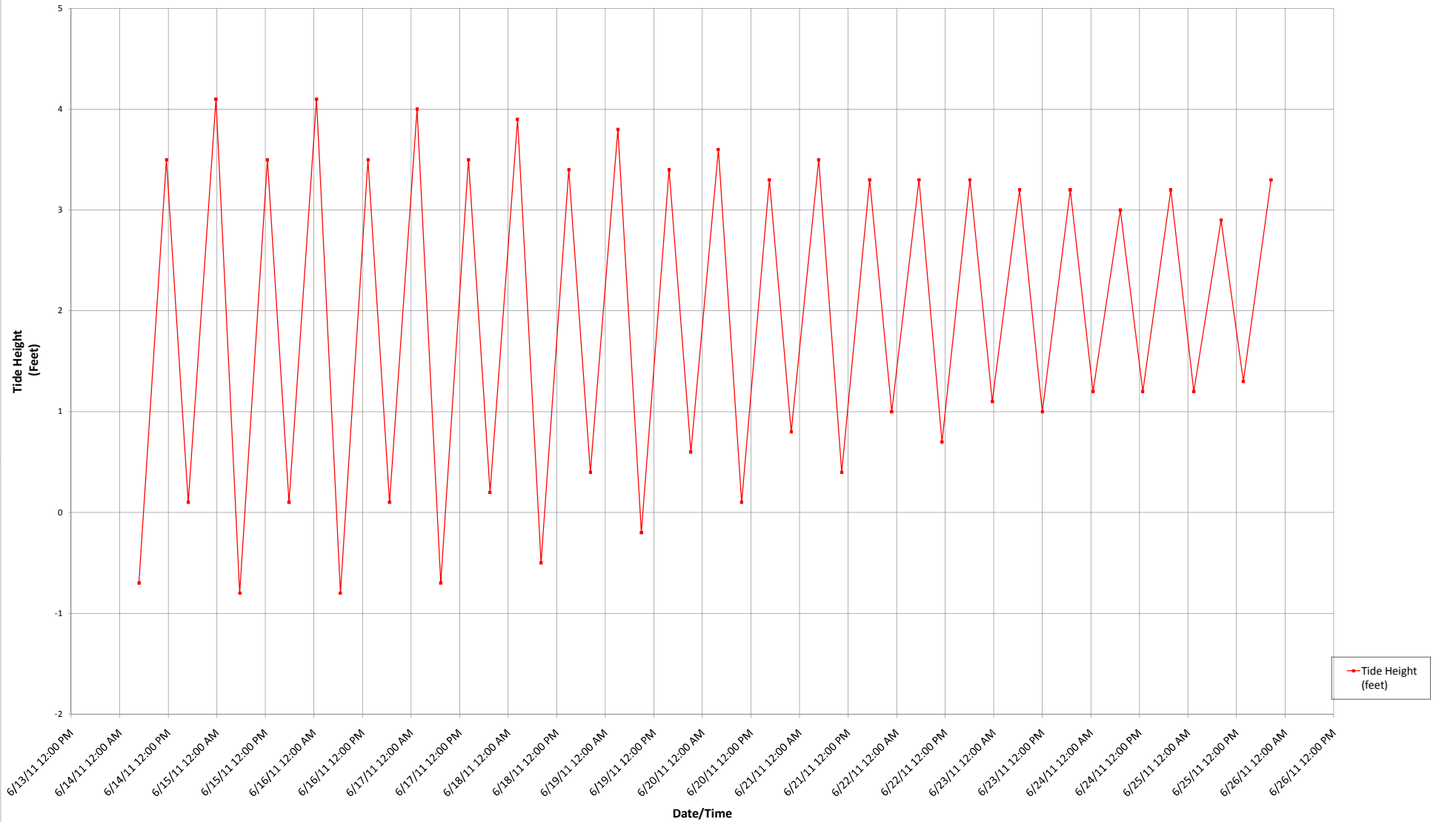
Snow's Creek Culvert  
Water Elevation and Conductivity



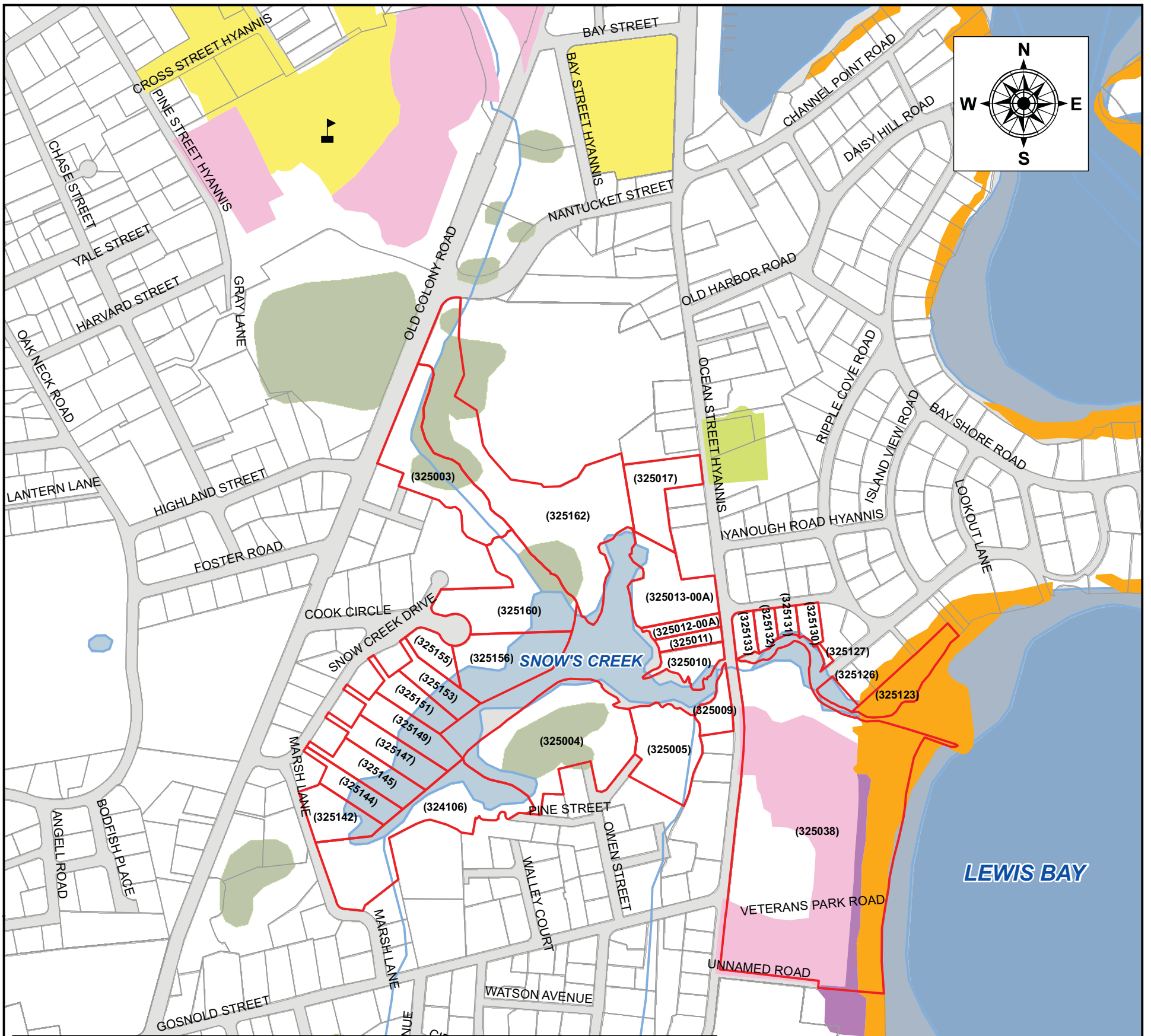
### Snow's Creek Culvert Water Temperature and Conductivity



### Hyannis Port Tide Chart



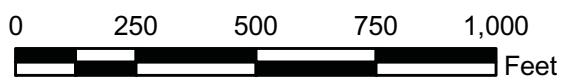
Tide Height  
(feet)



Parcel Number	Address	OWNER	BUILDING
325123	85 HARBOR BLUFFS ROAD	MUNRO, PISACANO & ROCHA & MUNRO, GEORG L JR & CAROLA (OWNERS OF 73	VACANT LOT
325126	59 HARBOR BLUFFS ROAD	BARNSTABLE, TOWN OF; CONSERVATION COMMISSION	VACANT LOT
325127	58 HARBOR BLUFFS ROAD	BARNSTABLE, TOWN OF; CONSERVATION COMMISSION	VACANT LOT
325130	27 HARBOR BLUFFS ROAD	ROGERS, JANET MTR	2 STORY HOUSE
325131	17 HARBOR BLUFFS ROAD	MCLEAN, DAVID R & MARY E	2 STORY HOUSE
325132	11 HARBOR BLUFFS ROAD	LABONTE, ROSEMARY A	1 STORY HOUSE
325133	5 HARBOR BLUFFS ROAD	DILORENZO, LEONARD A & GARCEAU, ANNMARIE P	2 STORY HOUSE
325142	66 MARSH LANE	GRAYSON, RICHARD D JR & ELIZABETH A; REVOCABLE LIVING TRUST	1 STORY HOUSE
325144	19 SNOW CREEK DRIVE	ROCHE, LINDA (SAME OWNER AS 15 SNOW CREEK DR)	VACANT LOT
325145	21 SNOW CREEK DRIVE	MAHONEY, SHARON A; SKM REALTY TRUST (SAME OWNER AS 25 SNOW CREEK DR)	VACANT LOT
325147	33 SNOW CREEK DRIVE	DAVIS, ELIZABETH	1 STORY
325149	43 SNOW CREEK DRIVE	MEZZETTI, JOHN H & SHEEHY, EMILY A	2 STORY
325151	57 SNOW CREEK DRIVE	HOROWITZ ENTERPRISES LLC	1 STORY
325153	69 SNOW CREEK DRIVE	VETTERLEIN, FREDERICK	1 STORY
325155	71 SNOW CREEK DRIVE	SALERNO, LAURA	2 STORY HOUSE
325156	15 TOBY CIRCLE	LAMB, P TERRENCE; C/O STEPHEN W NEALON	1 STORY HOUSE
325160	4 TOBY CIRCLE	RUDDMAN, GLORIA W; N MJ REALTY TRUST	2 STORY HOUSE
325162	0 OCEAN STREET	BARNSTABLE, TOWN OF; CONSERVATION COMMISSION	VACANT LOT
325038	480 OCEAN STREET	BARNSTABLE, TOWN OF; BEACH	1 STORY BUILDING
324106	42 MARSH LANE	COOK, W BRIAR & SHIRLEY A	2 STORY HOUSE
325004	21 STANLEY PLACE	RUSSELL, TOBY JON & CORRALES, ANNA-LISA C	1 STORY HOUSE
325005	20 STANLEY PLACE	SLOANE, JOHN MTR	2 STORY HOUSE
325009	427 OCEAN STREET	ST ONGE, RICHARD D & VALERIE C	2 STORY HOUSE
325010	401 OCEAN STREET	WEITZ, GERALD L & VIRGINIA; WEITZ FAMILY IRREV TRUST	2 STORY HOUSE
325011	395 OCEAN STREET	SORDILLO, ELEANOR	2 STORY HOUSE
32501200A	389 OCEAN STREET	RUBEN, GLENN & PAULA B	2 STORY CONDOMINIUM
32501300B	381 OCEAN STREET	GALUSZA, JANICE B	2 STORY CONDOMINIUM
325017	337 OCEAN STREET	CALLAHAN, RICHARD P; CENTERVILLE VILLAGE TRUST	2 STORY COMMERCIAL
325033	230 OLD COLONY ROAD	AMARAL, MANUEL A; C/O DOROTHY L PIPER	VACANT LOT

**Legend**

- Schools
- Abutter Properties (number)
- Parcel Boundaries
- Open Land
- Participation Recreation
- Water-Based Recreation
- Saltwater Sandy Beach
- Urban Public/Institutional
- Hydrography**
- Lake, Pond
- Tidal Flat, Shoal
- Ocean, Bay
- Marsh, Wetland
- Salt Wetlands
- Stream, Brook

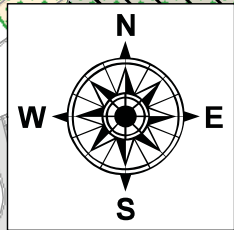
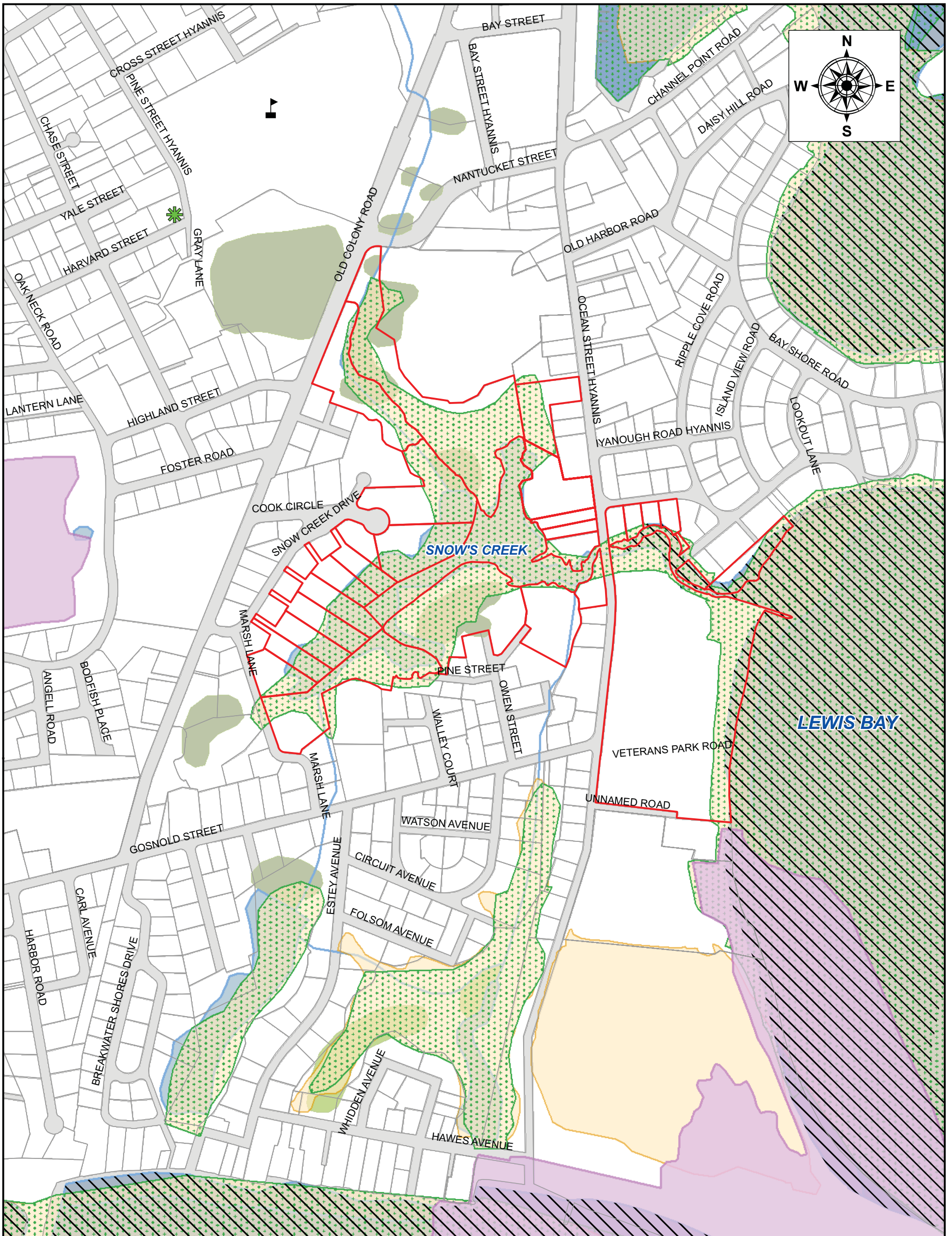


**Snow's Creek**  
**Tide Restriction Evaluation**  
**Recreational Open Space**  
**and**  
**Property Ownership**  
**Barnstable, Massachusetts**



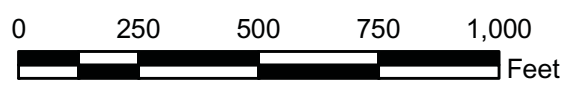
**Comprehensive Environmental Inc.**





**Legend**

- |                                              |                    |
|----------------------------------------------|--------------------|
| State Register of Historic PLaces            | <b>Hydrography</b> |
| Schools                                      | Lake, Pond         |
| Abutter Properties                           | Tidal Flat, Shoal  |
| Parcel Boundaries                            | Ocean, Bay         |
| Core Habitat/Species of Conservation Concern | Marsh, Wetland     |
| Critical Natural Landscape                   | Salt Wetlands      |
| Shellfish Suitability Areas                  | Stream, Brook      |
| Tern Foraging                                |                    |



**Snow's Creek  
Tide Restriction Evaluation  
Natural & Cultural  
Resource Map  
Barnstable, Massachusetts**



**Comprehensive Environmental Inc.**