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Memorandum

To:	Michelle White, Cape Cod Commission
From:	Mark White
Cc:	Tom Cambereri, Cape Cod Commission Scott Michaud, Cape Cod Commission
Date:	May 15, 2018
Subject:	Eastham Water System – Phase 2 District H Water Supply Well Field – Monitoring Program

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The groundwater and surface water monitoring program at District H has the following objectives:

1. Salt water interface monitoring to confirm conditions predicted by the SEAWAT groundwater modeling developed as part of the aquifer testing program is consistent with what is obseerved under actual operating conditions of the well field.

2. Vernal pool monitoring (pool stage and groundwater elevation) at select vernal pools

3. Water quality monitoring of sentinel wells to District H.

This monitoring program was originally developed as part of the DEP New Source Approval permitting for the well field, and is included as a condition in DEP's approval of the Pumping Test Report (BWP WS 19, September 12, 2013), and the Cape Cod Commission staff participated in its scoping.

Salt Water Interface Monitoring

Water level monitoring:

- Zone A (water table), Zone B (shallow aquifer), Zone C (intermediate aquifer), and Zone D (deep aquifer)
- Monitored hourly with data logging pressure transducers. Manual water-level measurement to be taken semi-annually immediately prior to downloading the data logger data.
- Baseline monitoring (pre-pumping operations) to be initiated minimum two quarters before well field start up.

Water quality monitoring

- Zone C and Zone D wells of clusters OW-1 and OW-2
- Monitored semi-annually for:
  Field parameters - temperature, specific conductance, and pH
  Laboratory analysis - sodium, chloride, sulfate, TDS, iron, and manganese
- Trends of the collected water quality data will be evaluated bi-annually (every two years)

- The water quality sampling results will be summarized in a data information report once every two years. Every five years after operations startup the monitoring data will be compared to water quality and head distributions predicted in the groundwater model.

Monitoring Network:

Water Table

OW-1A, OW-2A, OW-4A

Shallow and Intermediate Aquifer Zones

TPW-1B (or OW-1B)	OW-2C1*	OW-3C
OW-1C*	OW-4B	
OW-2B	OW-4C	

Deep Aquifer Zone

OW-1D*, OW-2D*

*Wells for water quality sampling; all others are for water level monitoring

Vernal Pool Surface Water/Groundwater Monitoring

Objective: document, under actual operating conditions of the wellfield, the effect of water withdrawals on water level drawdown at nearby vernal pools and vernal pool stage levels. The vernal pool model predicted that surface water levels at VP-01 and VP-09 would have no effect on vernal pool stage when the District H well was pumping at an average of 500,000 gpd; a drawdown of 0.96" was predicted at VP-11 when pumping at an annual average rate of 250,000 gpd (where 80% of the withdrawal was from the Zone C well and 20% from the Zone B well).

- Surface water and groundwater monitoring locations:

  VP-06 (background), VP-01, VP-09, VP-11, VP-11E, VP5, VP-5A

- Rainfall data collection at the Site (by weather station)

- Start monitoring during 2018 (approximately two years before start of wellfield operations) to develop baseline conditions

- Other elements of Conservation & Management Plan (see attached summary): phased water withdrawals, ecological restoration area, Conservation Restriction Area

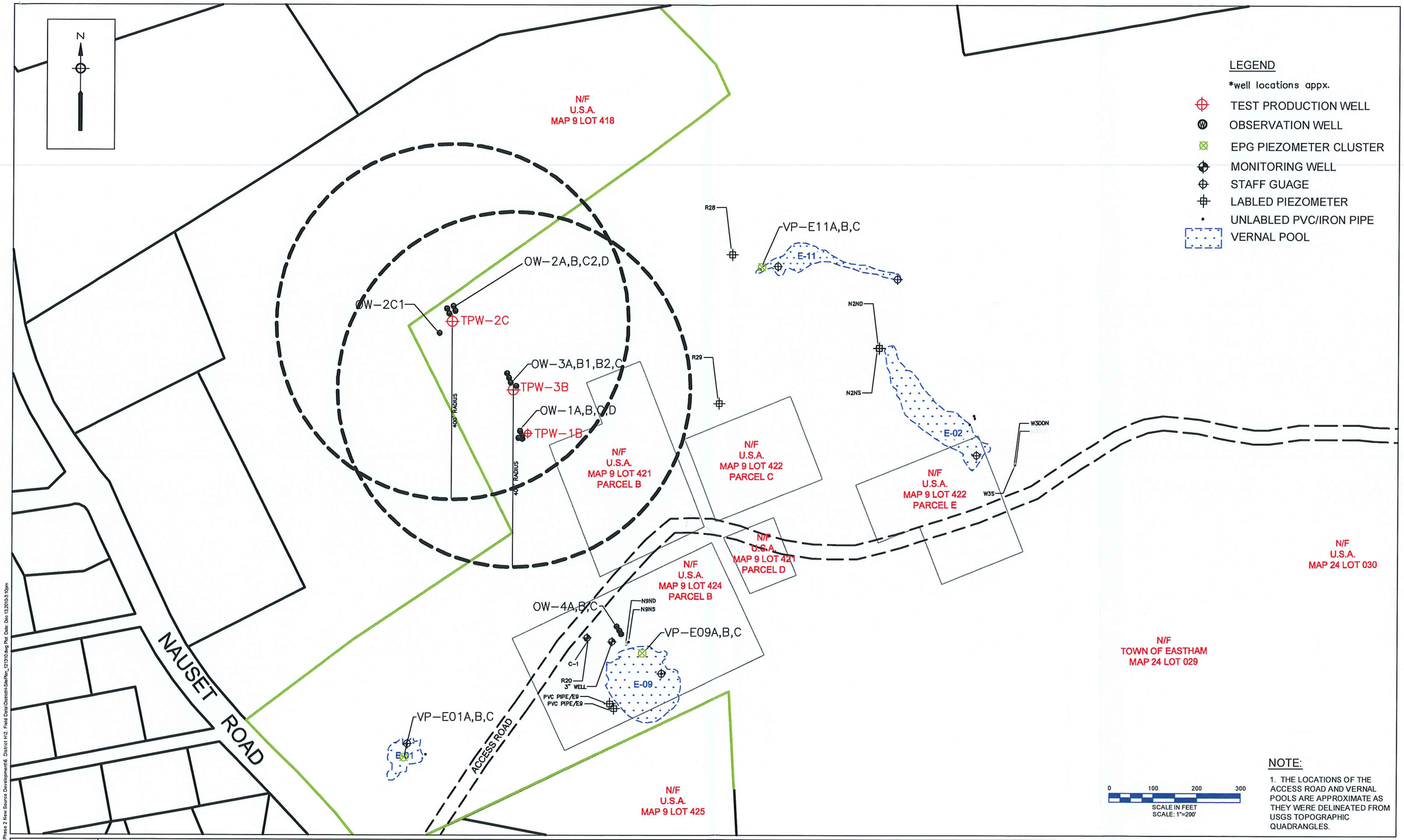
Sentinel Well Monitoring

Objective: monitor groundwater quality upgradient of well field to provide early-on indication of water quality.

- Sentinel monitoring wells to be located at the western edge of the District H property adjacent to Nauset Road.

- Wells to be screened in Zone B and Zone C aquifers (one monitoring well couplet).

- Sample wells for nitrate, VOCs (Method 524.2) and 1,4-doxane (Method 522.1 Modified) together with standard field parameters (pH, specific conductivity and temperature) on a semi-annual basis.



NOTE:

1. THE LOCATIONS OF THE ACCESS ROAD AND VERNAL POOLS ARE APPROXIMATE AS THEY WERE DELINEATED FROM USGS TOPOGRAPHIC QUADRANGLES.

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MARK	DATE	DESCRIPTION

Scale	1"=200' (11X17)
Date	
Job No.	
Designed by	NMA
Drawn by	NMA
Checked by	AMP
Approved by	MNW

SITE PLAN OF DISTRICT H

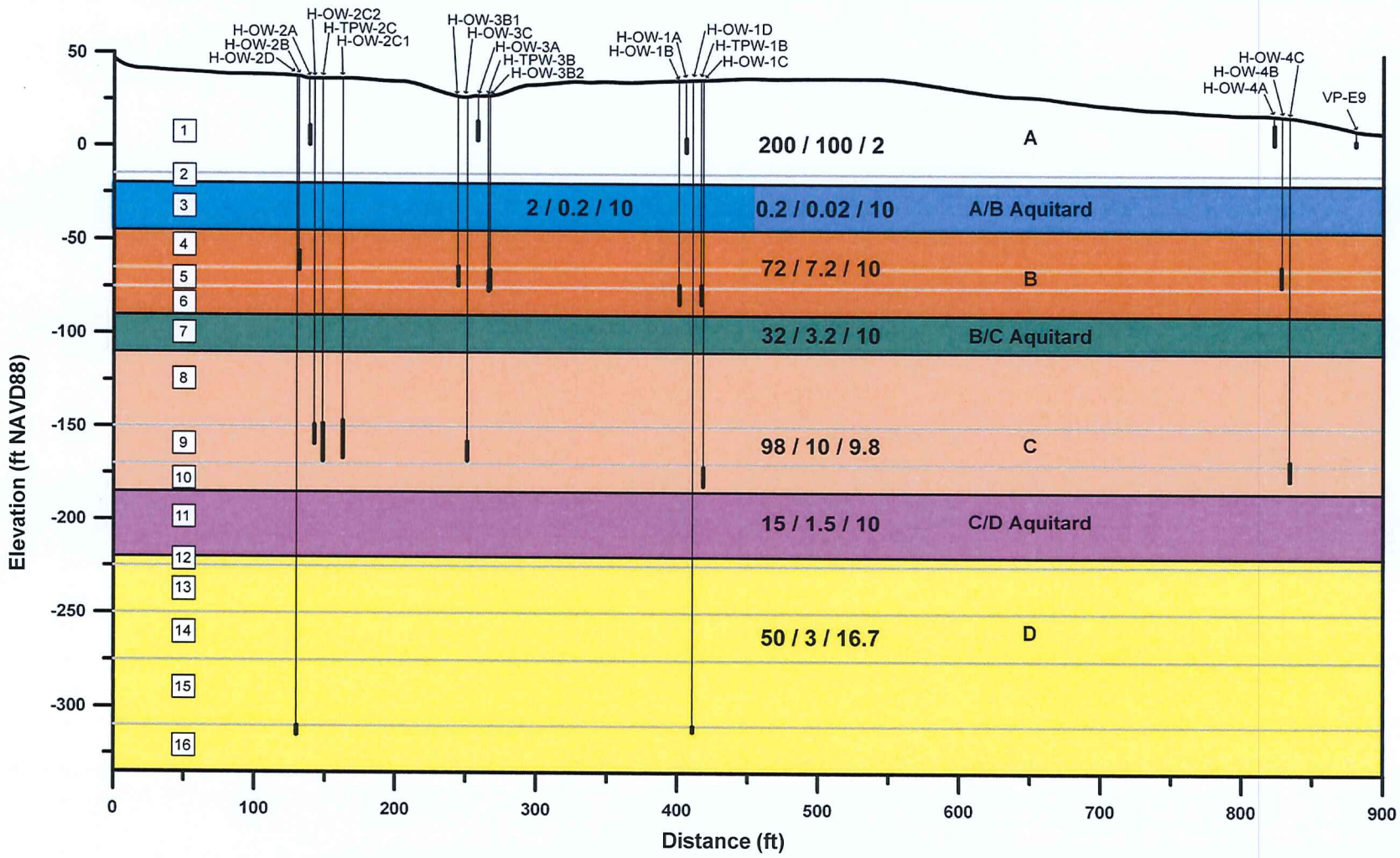
DISTRICT H
NAUSET ROAD
EASTHAM, MA

NOT FOR CONSTRUCTION

Sheet No.

Figure 1-5

Drawing file: I:\Eastham\2172171001 Phase 2 New Source Development\6. District H\2. Field Data\District H-SitePlan_121310.dwg Plot Date: Dec 13,2010-3:10pm



District H Model Cross-Section:
North-South

McLane Environmental, LLC
McLane Environmental, LLC, 707 Alexander Rd, Suite 206
Princeton, NJ 08540 | www.mclaneenv.com

Figure 8-1

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DEP Division of Fish & Wildlife, Natural Heritage & Endangered Species Program

Eastham Water System Phase 2
District H Conservation & Management Plan

Plan Elements

A. Water Withdrawals

- Phased withdrawals (average daily over the period)
  - Years 1 & 2
    - During Eastern Spadefoot Toad breeding (April – Sept) 100,000 gpd
    - Remainder of year 200,000gpd
  - Years 3 and beyond 250,000 gpd
- Greater reliance on C-zone vs. B-zone wells (ratio 20:80%)

B. Groundwater & Vernal Pool Monitoring Program

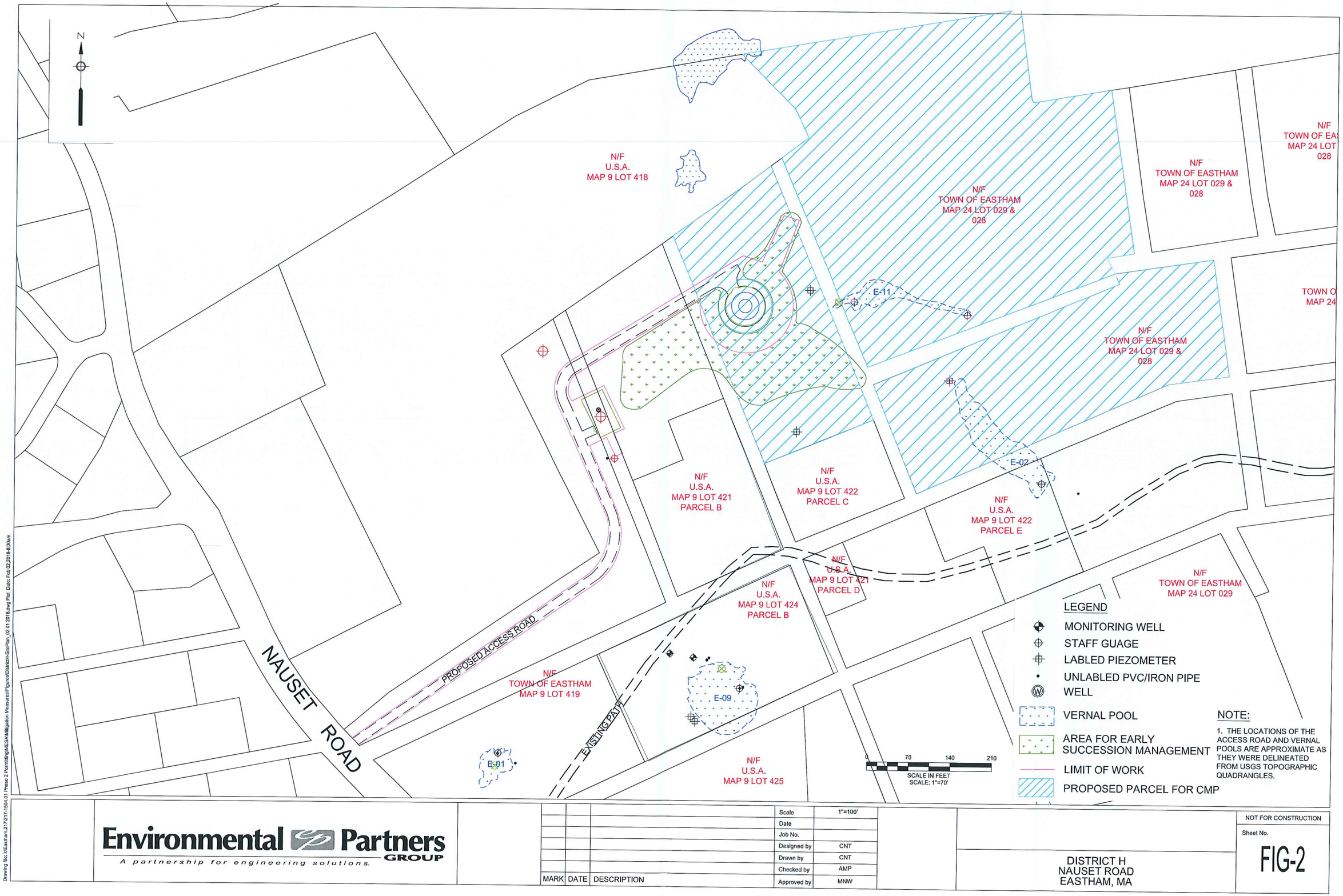
- Groundwater & vernal pool monitoring as per DEP New Source approval
  - Groundwater – shallow, intermediate and deep aquifer zones
    - OW-1A, OW-1B, OW-1C, OW-1D, OW-2A, OW-2B, OW-2C1, OW-2D, OW-4A, OW-4C
  - Vernal Pools –
    - Surface water and groundwater below the pools
    - Locations: VP-01, VP-09, VP-11, VP5, VP-5A, VP-06 (background)
  - Data collected with transducers placed within piezometers/monitoring wells
- Additional vernal pool locations to be added by NHESP
  - VP-11e, possibly VP-2540
- Rainfall data collection at the Site (by weather station)
- Start monitoring program now (approx. 2 years before start of wellfield operations) to develop baseline conditions

C. Ecological Restoration Area

- Approx. 2.4 acres of tank laydown area
- Maintained as "early successional habitat"
- Ongoing inspections (similar to District G Commons Panic Grass)

D. Conservation Restriction Area

- 19.9 acres to be designated for Conservation Restriction
- Need to identify entity to hold the Conservation Restriction
- Conservation Restriction application form to be prepared (we have template from NHESP); will likely need legal support/input
- Will require a recordable plan for Registry of Deeds



Drawing file: I:\Eastham_2\7217-1504.01 Phase 2 Permitting\MESA\Mitigation Measures\Figures\District-H-SitePlan_02 01 2018.dwg Plot Date: Feb 02,2018-8:30am

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MARK	DATE	DESCRIPTION

Scale	1"=100'
Date	
Job No.	
Designed by	CNT
Drawn by	CNT
Checked by	AMP
Approved by	MNW

DISTRICT H
NAUSET ROAD
EASTHAM, MA

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Sheet No.

FIG-2