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Watershed Assessment of New Boston Air Force Station (NBAFS)

New Hampshire Water Resources Research Center (NH WRRC)

Project: Watershed Assessment of New Boston Air Force Station (NBAFS)

Background: In the fall of 1941, the Federal Government acquired the 2,826 acres comprising the current configuration of NBAFS. This land was used as an active bombing range in support of Grenier Field at nearby Manchester, NH, from the fall of 1941 until 1956. In addition to bombing activities, training and maneuver activities were performed on the property from 1956 until 2002, when the range officially closed. As a result, munitions and explosives of concern (MEC) have been found or observed in a number of areas at NBAFS. Approximately 1,400 of the 2,826 acres have been identified for further investigation for the presence of MEC. Remediation actions for the identification and removal of MEC are on-going at the installation.

In addition, NBAFS is investigating other sites which are areas of concern because they pose a potential risk/hazard based on historical data of past use. These sites include areas such as landfills, fuel spills, and chemical spills. The investigation of these sites is on-going and includes water and soil sampling.

Requirement: As part of developing the Conceptual Site Model (CSM) for the installation, a hydrological investigation is required and was never completed under the original Installation Restoration Program (IRP). This investigation is important to sufficiently understand groundwater flow, predict potential contaminant migration, determine transport pathways of potential contaminants, and determine impacts to surface and sub-surface water.

In addition, this information could be used to brief local citizens to reassure them that their private wells are not at risk of contamination from NBAFS.

Objectives:

1). Inventory the inputs (precipitation) and outputs (evapotranspiration and streamflow) for NBAFS(for one calendar year).

2). Evaluate surface water flow and develop a delineated watershed profile showing surface water movement.

3). Identify groundwater flow paths throughout the year.

4). Identify surrounding public and private wells and determine the potential that these wells are receiving water from NBAFS

Methods:

1). An understanding of the annual hydrologic cycle for NFAFS is necessary to assess the amount of water that is leaving the installation through the outlet at Joe English Brook. As the location of the base does not allow daily access by the Research Assistant, the BROOK90 hydrologic model is being employed to model the hydrologic cycle. This

model was developed for use at the Hubbard Brook Experimental Forest, in the White Mountain National Forest in New Hampshire. Though many of the parameters are similar, localized parameters for NBAFS were obtained from existing reports (from Shaw Environmental, Inc.) and New Hampshire GRANIT.

This model requires inputs of precipitation, wind speed, and maximum and minimum temperatures at a daily time interval. A weather station was previously installed on NBAFS. The station was calibrated for the correct latitude, longitude, and elevation and a heating element was installed to allow for winter precipitation data to be collected. Monthly readings are obtained and checked against weather data from the nearby Manchester, NH airport. Collection and input of weather data is completed and represents conditions on NBAFS from 11/07 – 2/08.

BROOK90 allows for input of measured streamflow and compares this to streamflow predicted by the model. As it was not possible to obtain daily streamflow, the modeled streamflow value will be used to approximate discharge leaving theinstallation.

2). An understanding of the surface water flow paths is necessary to determine the direction of water movement on the installation. Direction of surface water flow can be determined by delineating the NBAFS watershed (using GIS) and overlaying a topographic map. Surface water flow direction follows contour intervals.

3). It is necessary to identify the direction of groundwater flow to determine if groundwater is leaving the installation, or is contained within the watershed boundaries. Approximately 15 groundwater wells were installed throughout NBAFS during past studies. The depth to water table is being measured monthly to allow a potentiometric map of groundwater flow paths to be drawn and to allow for seasonal fluctuations in flow direction to be identified. For these maps to be created, it is necessary to know the relative elevation of these wells. This information was provided by Shaw Environmental, Inc. Spot-checking of their values with surveying equipment has shown that they have a margin of error between five and ten feet. As this error is too large to allow for an accurate assessment of groundwater flow direction, the wells surrounding the lake were surveyed in relation to the lake surface. A staff gage was also installed to monitor fluctuation of the lake level throughout the year. Relative DTWT and lake elevation data was collected from 4/08 – 4/09.

Major findings and significance: As this study aims to provide a one-year hydrologic budget for NBAFS, data is currently being analyzed and final reports are being prepared.

Publications, presentations, awards: N/A

Publications from WRRC supported work completed in previous years and not reported previously (if applicable): N/A

Outreach or Information Transferred: N/**Number of students supported (and degree level, undergrad, Master, PhD)**: 1 Master's Candidate