

August 11, 2021  
File No. 2021-081A

Dirk Grotenhuis  
Nottingham Planning Board  
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Nottingham, NH 03290  
[Dirk.Grotenhuis@aecom.com](mailto:Dirk.Grotenhuis@aecom.com)

Re: Hydrogeologic Study  
Case #21-003-SIT  
214 Raymond Road  
Nottingham, New Hampshire

Dear Planning Board Members:

On behalf of Kubota Trust, Aries Engineering, LLC (Aries) is pleased to provide to the Town of Nottingham Planning Board this Hydrogeologic Study and evaluation of potential environmental impacts related to operating modified snowmobiles on an approximate seven-acre, manmade pond at the Nottingham Sand and Gravel, Inc. (NS&G) property (site), located at 214 Raymond Road in Nottingham, New Hampshire. Aries understands that Kubota Trust has submitted a Site Plan for Planning Board review to operate three watercross race events hosted by Northeast Watercross. Figure 1 depicts a site locus, while Figure 2 depicts a site plan.

The objectives of our evaluation were to:

1. Evaluate the proposed watercross events' impacts to surface water and groundwater within the site property and the surrounding land.
2. Review and update available spill response plans for the proposed watercross events consistent with current best management practices (BMPs) to prevent fuel spillage to site land and/or water surface during the proposed watercross events; and
3. Address the limited threat posed by the proposed watercross events to area surface water and groundwater resources located within the Town's Aquifer Protection District.

The findings and conclusions presented herein are not scientific certainties, but rather our professional opinions concerning our evaluation of information and data submitted by others. Aries makes no warranty, either expressed or implied.

## BACKGROUND

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Aries understands that Northeast Watercross proposes holding up to three watercross race events per year at the site. These events center around riding snowmobiles on the site pond in a manner that is often referred to as “skimming”. Other uses during the proposed events include limited, self-contained camping.

According to Northeast Watercross representatives, the watercross snowmobiles have been modified for water crossings and have limited, closed loop fuel systems that have a capacity of up to two gallons of fuel. In the event that a snowmobile sinks, the event sponsors will provide two purpose-built recovery boats to pull the snowmobile and driver from the water in less than 30 seconds to a minute. If spilled fuel is observed on the water surface during the snowmobile recovery, each boat is equipped with petroleum-absorbent pads and booms that can be deployed to recover the fuel sheens on the water surface. According to Northeast Watercross representatives, the occurrence of fuel spills during the watercross events is not common.

## SITE HYDROGEOLOGIC SUMMARY

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According to available U.S. Geologic Survey (USGS) documents<sup>1</sup>, the site is located on a small, approximate 150-acre sand and gravel (stratified-drift) aquifer that generally extends north to south along the Pawtuckaway River valley. Sand and gravel deposits are generally associated with valley floor glacial outwash deposition. Based on USGS estimates, the transmissivity, or the rate at which groundwater flows horizontally through the site sand and gravel aquifer, is estimated to be less than 500 square feet per day (ft<sup>2</sup>/d), indicating a relatively limited groundwater resource in the unconsolidated overburden sand and gravel deposits beneath the site when compared to larger stratified-drift aquifers elsewhere in New Hampshire.

The surrounding hillsides are comprised of low-permeability glacial till (till) and bedrock that cause surface water and groundwater to drain toward the Pawtuckaway River. The Pawtuckaway River surface water elevation can increase rapidly during precipitation events due to the thin layer of low permeability till overlying bedrock, even though the river stage is controlled by dams. The Pawtuckaway River is the principal hydrologic feature located in the site area, with a smaller tributary stream that bisects the site property south of the site pond and joins the Pawtuckaway River along the western property boundary.

During periods of high surface water flow in the Pawtuckaway River and/or during precipitation events, surface water is recharged to the sand and gravel aquifer at the site. Conversely, during dry periods, groundwater baseflow from the sand and gravel aquifer provides water to the Pawtuckaway River.

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<sup>1</sup> Moore, R.B., 1990, Geohydrology and Water Quality of Stratified-Drift Aquifers in the Exeter, Lamprey, and Oyster River Basins, Southeastern New Hampshire, U.S. Geological Survey, WRI Report 88-4128.

A summary of site hydrogeology follows:

1. Based on site topography, regional and site groundwater flow is anticipated to be in a southerly direction concordant with the Pawtuckaway River channel flow to the south.
2. According to USGS<sup>2</sup>, underlying site bedrock consists of the metasedimentary bedrock of the Berwick Formation, which consists of purple biotite quartz feldspar granofels or schist and interbeds of calc-silicate granofels and minor metapelites. The underlying bedrock is anticipated to provide limited communication with the overlying sand and gravel aquifer
3. Based on data obtained from the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Web Soil Survey online geographic data tool, site soils are generally described to be in Hydrologic Soil Groups A and B in the event area in the northern portion of the site and C or D in the eastern portion of the site. Hydrologic Soil Groups A and B are indicative of well-drained to moderately well-drained soils, while Group C and D Soils are indicative of soils with slow to very slow infiltration rates.
4. The existing site residence and facilities are serviced by one overburden and one bedrock water supply well and on-site individual sewage disposal systems (ISDS).

## **SPILL RESPONSE PLAN REVIEW**

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Aries reviewed the spill response plan provided by Kubota Trust for the proposed watercross events and found it to be generally consistent with U.S. Environmental Protection Agency (EPA) oil spill contingency planning requirements, which are intended to minimize the impact of spills and protect the environment.

According to the EPA, an oil spill contingency plan should be a set of instructions that outline necessary procedures for before, during, and after an emergency. The primary objectives of spill response plans are to:

1. Allow response personnel to prepare for and safely respond to spill incidents;
2. Ensure an effective and efficient response that highlight and account for geographical challenges;
3. Identify potential equipment, manpower, and other resources necessary to implement a spill response;
4. Outline response procedures and techniques for combating the spill at a specific location; and
5. Improve regulatory compliance efforts.

According to the *SPILL RESPONSE PLAN for Northeast Watercross Championship, Snowmobile Watercross Events*, prepared by Kubota Trust, the following practices will be implemented as part of the plan:

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<sup>2</sup> Lyons et. al., 1997, *Bedrock Geologic Map of New Hampshire*, USGS

1. Sleds will be inspected before use to ensure that there are no leaks and do not pose a safety or environmental hazard;
2. Sled fueling will be conducted on land and in a manner that limits spillage to the ground surface.
3. Fuel storage will be managed individually by the event participants with no common fuel storage tanks allowed on the premises.
4. Oil-sorbent fueling pads will be placed around the fuel fill ports to collect drips and spillage of fuel during fueling of the sleds.
5. Spill cleanup requirements shall be clearly posted and site personnel and racers shall be made aware of the site-specific spill response plan requirements.
6. Materials and equipment necessary for spill cleanup shall be kept in the material storage area shown on the provided SITE PLAN and MAP;
7. A spill response team will be designated before each event and will receive training on recovery of submerged snowmobiles and containment and cleanup of fuel impacts to surface water;
8. Spill response team personnel shall wear appropriate protective clothing to prevent injury from contact with petroleum products. The personal protective equipment shall be located in the Emergency Spill Kit;
9. Two purpose-built recovery boats will be stationed at the event to recover snowmobile and driver from the water. Each boat is to be equipped with petroleum-absorbent pads and booms that can be deployed to recover the fuel sheens on the water surface.
10. If spilled fuel is observed on the water surface during the snowmobile recovery, the event will stop until the fuel sheen is fully cleaned up and no observable sheen is present;
11. All spills shall be cleaned up immediately after discovery. The location of the spill will be documented and recorded as part of the notification protocol.
12. Recovered fuel and adsorbent pads and booms will be containerized for appropriate off-site treatment and disposal; and
13. Spill notification will be provided to applicable agencies on accordance with New Hampshire Department of Environmental Services (NHDES) statutory and regulatory requirements<sup>3</sup>.

The site-specific spill response plan provides a spill kit inventory, an inventory of equipment provided on each recovery boat and a location map for the provided spill response equipment.

The site-specific spill response plan follows best management practices (BMPs) for equipment fueling<sup>4</sup> to avoid overfilling fuel tanks by requiring operators to:

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<sup>3</sup> Reporting Oil Spills, Hazardous Waste Spills and Groundwater Contamination, 2020, NHDES Environmental Fact Sheet REM-13, <https://www.des.nh.gov/sites/g/files/ehbemt341/files/documents/2020-01/rem-13.pdf>.

<sup>4</sup> *Lake-Friendly Boating*, NH Lakes, <https://nhlakes.org/wp-content/uploads/13-Lake-Friendly-Recreation-Lake-Friendly-Boating-NH-LAKES.pdf>

1. Use a funnel or a spout with an automatic stop device to prevent overfilling the gas tank; and
2. Use absorbent materials or petroleum absorption pads while fueling to catch splash-back and any drops during fueling.

### **COMPLIANCE WITH AQUIFER PROTECTION DISTRICT ORDINANCE**

As provided in the Nottingham Zoning Ordinance, amended June 8, 2021, the intent of this Aquifer Protection District (APD) Ordinance is to provide for the protection of the water resources from contamination by polluting, hazardous or toxic materials. The objectives for establishing an Aquifer Protection District are to:

1. Protect the public health and general welfare of the citizens of Nottingham and adjacent affected towns;
2. Prevent development and land use practices that would contaminate or reduce the recharge of the identified aquifers; including primary and secondary recharge areas;
3. Provide for future growth and development of the Town, in accordance with the Master Plan, by ensuring the future availability of adequate public and private water supplies; and
4. Encourage uses that can appropriately and safely be located in the aquifer recharge areas.

Based on these criteria, Aries understands that the intent of the APD Ordinance is to protect both groundwater quality and quantity within APD sand and gravel aquifer area.

Prohibited uses within the APD include:

1. Disposal of solid waste;
2. On-site disposal, storage, processing or recycling of toxic or hazardous materials or wastes;
3. Buried storage of petroleum fuel and other refined petroleum products;
4. Outdoor unenclosed or uncovered storage of road salt and other de-icing chemicals;
5. Dumping of snow containing road salt or other de-icing chemicals;
6. Animal feedlots.
7. Dry cleaning establishments;
8. Industrial uses which discharge contact-type wastes on site;
9. Waste injection wells;
10. Non-municipal wells that may result in an aquifer volume reduction that exceeds the recharge rate.

Based on these criteria, operation of the proposed watercross events is not prohibited by the APD Ordinance prohibitions. The proposed watercross events is not anticipated to result in excessive of groundwater use within the APD because site users will utilize

portable toilets and site camping will be self-contained. As such, Aries does not anticipate that the proposed watercross events will have an observable impact to site hydrogeology.

With the implementation of the aforementioned Spill Response Plan and equipment fueling BMPs, the proposed watercross events are also not anticipated to result in groundwater quality impacts within the APD beyond those associated with allowed uses in the APD, such as operation of gasoline-powered vehicles, including automotive and recreational vehicles, snowmobiles and watercraft.

## **CONCLUSIONS**

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Presence of gasoline-powered snow machines and other appurtenant uses of petroleum products during the proposed watercross events do not appear to represent a significant threat to site and off-site surface water and groundwater quality. Pro-active BMPs will be implemented to limit releases of fuel to the ground surface during equipment fueling and operation, as the Group A soils located in the event area are susceptible to infiltration of petroleum products due to their general high permeability.

It is Aries opinion that implementation of the proposed BMPs for equipment fueling and the proposed site-specific spill response plan will provide sufficient spill prevention and spill countermeasures that will limit the impact of petroleum releases to the environment.

The proposed watercross events are in compliance with the Aquifer Protection District use regulations and are not anticipated to result in groundwater quality impacts within the APD beyond those associated with allowed uses in the APD.

Please contact me at (603) 228-0008 if you have any questions.

Sincerely,  
Aries Engineering, LLC



George C. Holt, P.G.  
Principal Hydrogeologist



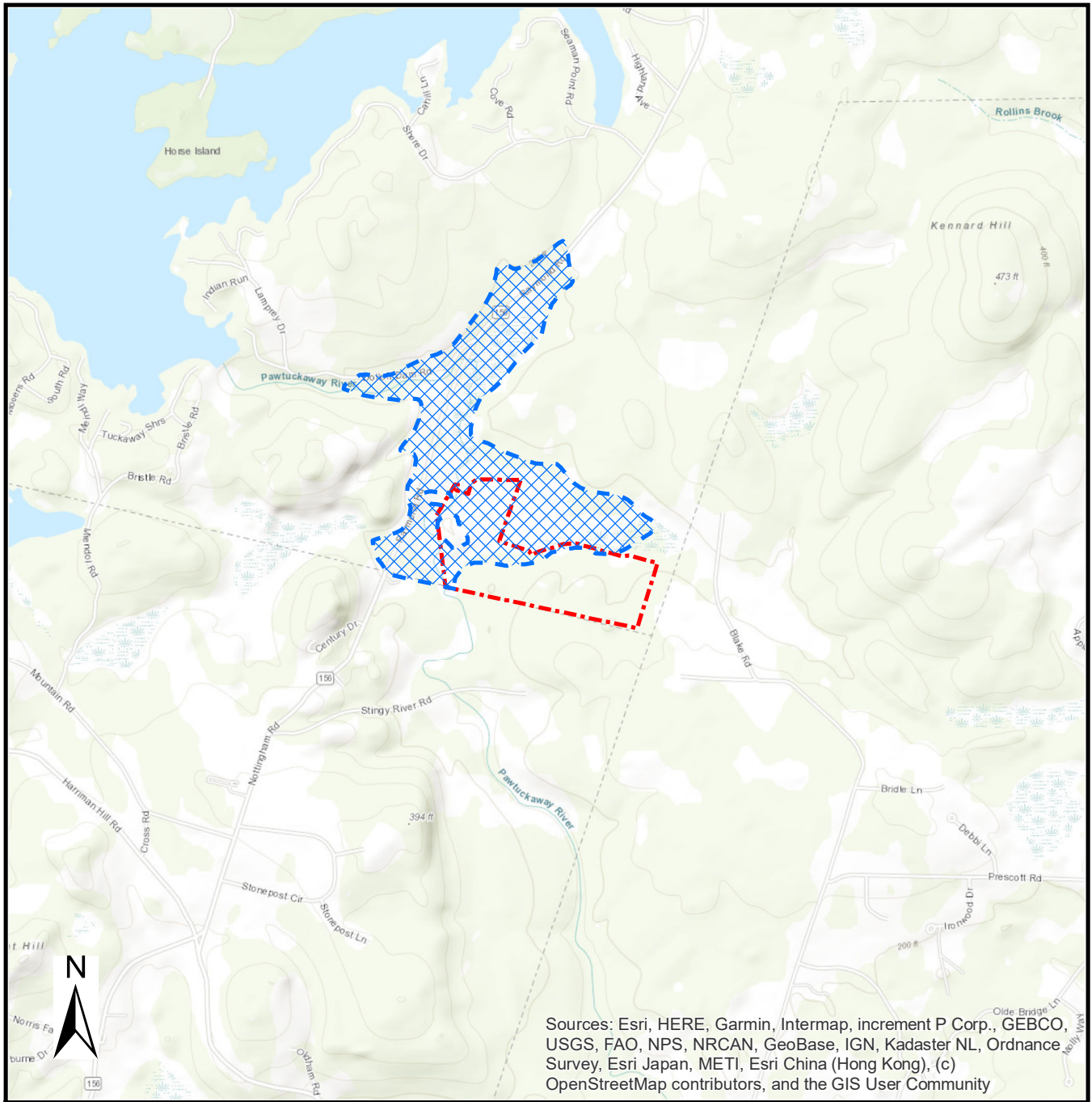
Kathryn A. Ward, P.E.  
Principal Engineer

GCH:pj



Attachments: Figure 1 – Site Locus  
Figure 2 – Site Plan

cc: Mr. Chris Sterndale - Town Administrator - [csterndale@nottingham-nh.gov](mailto:csterndale@nottingham-nh.gov)  
Mr. Terry Bonser – Chair, Zoning Board of Adjustment - [tmbonser@yahoo.com](mailto:tmbonser@yahoo.com)  
Ms. Jen Czysz - Town Planner - [jczysz@strafford.org](mailto:jczysz@strafford.org)  
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### Legend

-  Aquifer Protection District
-  Site Boundary

NOTES: Aries developed the Locus Map from the New Hampshire Geographically Referenced Analysis and Information Transfer System (NH GRANIT) maintained by University of New Hampshire and the NH Office of Strategic Initiatives.

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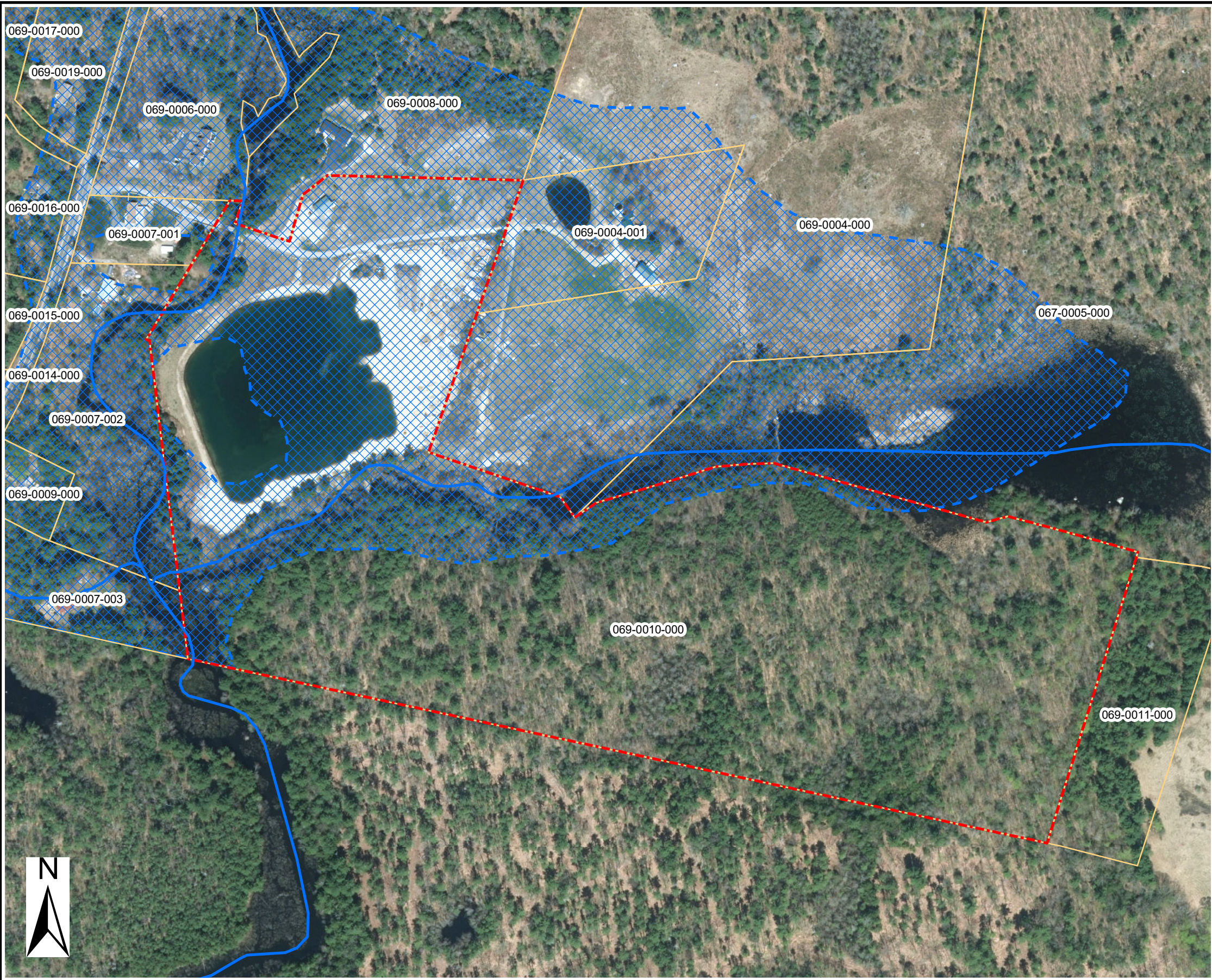


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HYDROGEOLOGIC STUDY  
214 RAYMOND ROAD  
NOTTINGHAM, NEW HAMPSHIRE

LOCUS PLAN  
AUGUST 2021  
FIGURE 1







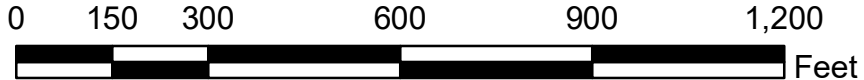


**NOTES**

1. Plan prepared from Geographic Information System (GIS) data provided by the New Hampshire Geographically Referenced Analysis and Information Transfer System (NH GRANIT) maintained by University of New Hampshire and the NH Office of Strategic Initiatives.
2. Site boundary locations are based on an overlay of the site features on NH GRANIT GIS data. Therefore, all site features are approximately located.
3. This plan is not to be used for construction, survey or boundary purposes.

**Legend**

-  River/Stream
-  Site Boundary
-  Property Boundaries
-  Aquifer Protection District



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SITE PLAN

AUGUST 2021

FIGURE 2