



FIELDSTONE

Surveying ♦ Engineering
Land Planning ♦ Septic Designs

LAND CONSULTANTS, PLLC

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December 24, 2014

William Parker
Community Development Director
Town of Milford
1 Union Square
Milford, NH 03055

RE: Brox Community Lands Mining Feasibility Study
Heron Pond Road, Milford
Map 38, Lot 58

Dear Mr. Parker,

Fieldstone Land Consultants, PLLC (Fieldstone) understands that the Town is considering mining the unconsolidated soils from the project site, Tax Map Parcel 38-58, in conjunction with the 2014 Conceptual Master Plan. The site encompasses approximately 145 acres and has been mined for sand and gravel since the 1950's as it was previously owned by Brox Industries. The site is currently accessed via Heron Pond Road and is situated east of Whitten Road, north of Mason Road and south of Herron Pond and Birch Brook as depicted on the plan set entitled Preliminary Development Plans – Brox Community Lands, prepared by this office and dated December 1, 2014 and last revised December 24, 2014.

In order to determine the feasibility of mining the project site, Fieldstone performed the following tasks:

- Performed exploratory test pits throughout the project area to evaluate soil materials and depth to seasonal high ground water.
- Prepared preliminary grading plan for the project area contemplating the 2014 Conceptual Master Plan and the local and state permitting requirements for projects of this nature (such as isolation distances to abutting properties, jurisdictional areas, separation to seasonal high ground water, etc).
- Determined an estimate for the total quantity of marketable unconsolidated soils available within the project area.
- Prepared a summary of project feasibility.

SOIL INVESTIGATION SUMMARY

Fieldstone has completed the preliminary soil exploration and test pits to evaluate the type and depth of the soils located on the subject parcel. Soil exploration fieldwork investigation included advancing and logging test pits in representative locations across the subject property. There are three dominate land cover / uses on the subject property which consist of 1) the active and inactive sand & gravel pit areas and associated gravel access

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roads; 2) the Upland forested areas around the perimeter of the active pit area and 3) wetland areas associated with Birch Brook and beaver activity.

Exploratory Test Pit Observation Summary:

The soils at the subject property are dominated by Hinckley Loamy Sand formed by glacial outwash sands and gravels. The sands encountered in the test pits were generally poorly sorted (individual layers of same size particles) with an upper layer of coarser sands between 2 feet and 8 feet below ground surface followed by fine-med sand below 8 feet. The depth of sand deposits varies widely across the property due to natural glacial depositional features and previously excavated and human altered areas, but range between 0 and 30' above the seasonal high water table. The sands observed within the test pits were very clean overall did not contain significant amounts of very fine sands or silty material.

At least two areas of dissimilar inclusions were encountered during the exploration, including two areas of glacial till with a fair amount of stones and boulders throughout the soil profile and ledge or large boulders encountered at or near 8 feet below ground surface. The first area is located in the forested area just east of the northeast corner of the active gravel pit area north of the proposed school (Test Pits 7, 32, 33, 34, 35, 36, and 39). The second area is in the northeastern most corner of the parcel near the proposed DPW building and yard (Test Pit 12).

The area along the northern side of the parcel toward Birch Brook (Test Pits 19, 20, 37 and 38) tended to have a slightly larger percentage of coarse sand and gravel size particles than the remainder of the site which was dominated by fine-med sand.

Explorations conducted in the northwestern portion of the site (Test Pits 9, 10, 17, 18) indicated that although sand and gravel was still present, much of the area had already had sand excavated and the area reclaimed and restored by the backfilling with stony material and loamy topsoil layer placed and vegetation planted (pine trees). Similar excavated and reclaimed conditions also exist in the area south of Heron Pond Road (Test Pits 1 and 2)

Explorations conducted in the central active pit area portion of the site (Test Pits 3, 4, 5, 21, 22, 40) indicated that although sand and gravel was still present, much of the area has already been excavated near the seasonal high water table. The perimeter of the active pit area also contain cut banks of sand and gravel as well as stockpiles of loam, topsoil, boulders and other assorted materials; most of these areas have naturally re-vegetated with grasses, shrubs and trees. Please find attached test pit logs conducted on the subject property.

Existing Sand and Gravel Pit Areas:

The soils at the subject property are dominated by Hinckley Loamy Sand formed by glacial outwash sands and gravels. Terrain within the pit areas varies from level areas to steep bank cuts and material stockpiles. Historical sand and gravel removal operations have typically removed material down to several feet above the seasonal ground water table in the area. The water table in the vicinity fluctuates seasonally as well as in response to nearby beaver activity damming and impounding Birch Brook. Due to the high transmissivity of sands and gravel deposits, beaver dams tend to raise the water table in surrounding areas, including the gravel pit area, occasionally creating seasonal ponding in excavated areas within the pit area.

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Other soils within the pit area would be classified as anthropogenic due to the placement and removal by human activities. These soils include stockpiles of boulders, loam, concrete debris, woody debris, and organic materials such as leaves and stumps. Many of these stockpile areas have also artificially restricted water movement throughout the soil profile and stockpiles due to compaction and pile location and variable topography.

Vegetation cover within the active pit area is either non-existent or a mixture of pioneer species such as raspberries, birch, poplar and assorted shrubs and grasses.

Upland Forested Areas:

The soils within the majority of the forested areas surrounding the sand pit are also dominated by Hinckley Loamy Sand with the exception of several localized areas of Glacial Till soils with boulders and bedrock present within 10+/- feet of the ground surface. These areas would be classified as Canton Sandy Loam and are typically a well-drained glacial till with some areas of bedrock present within several feet of the ground surface. These areas typically have numerous stones and boulders visible on the ground surface in contrast to the Hinckley soils which have very few stones or boulders visible on the ground surface. Topography in these areas vary from level plateaus to steep slopes typical of glacial outwash landforms such as eskers and kames. Vegetation in these upland areas is dominated by a mature forest of mixed hardwoods and pines such as red oak, black birch, white pine and eastern hemlock.

Wetland Areas:

Several of the low lying areas present within the upland area tend to have finer sands and silty deposits which restrict water movement greater than the surrounding sands creating isolated wetland areas. Several of these areas are also the result of sand and gravel removal activities which excavated material out below the seasonal high water table, thus creating man-made seasonal wet areas in some portions of the property.

The wetlands on site were delineated in accordance with the 1987 US Army Corps of Engineers Wetland Delineation Manual Y-87 and regional supplements and the Field Indicators for Identifying Hydric Soils in New England Version 3. Soil auger holes were advanced at regular intervals to verify hydric soil conditions and hydrophytic plant community dominance and hydrology were continuously evaluated during wetland delineation. Although many of these wetland areas are naturally occurring it also should be noted that several are also the result of man-made excavation activities in conjunction with nearby beaver activities creating areas of wetland that under other conditions may not otherwise exist naturally.

PRELIMINARY CONCEPTUAL MASTER PLAN

Fieldstone prepared a Conceptual Master Plan upon completion of the soil investigations. This depicts the proposed improvements as outlined in the 2014 Brox Community Property Conceptual Master Plan/Land Development Plan that was prepared by the Town. Fieldstone made adjustments to the layout of the Town's plan to accommodate the observed soil conditions. This consisted of mainly re-positioning proposed athletic field and associated parking locations. The preliminary grading shown on the master plan, prepared by this office, provides for a minimum of four (4) feet of separation between the proposed finished grade and the observed seasonal high water table (SHWT) except for the area of the future cemetery where six (6) feet of separation was maintained. Maintaining this separation will provide for flexibility in the future development of the property as adequate material and separation will exist for the construction of necessary roads, buildings,

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athletic fields, subsurface disposal systems and other necessary site infrastructure. The preliminary grading plan targeted the areas with marketable material and avoided areas with less desirable material which is evident when evaluating the plan along with the test pit data. The preliminary design was prepared with the future development in mind and does not maximize the potential marketable material on-site. Excavation slopes were maintained at a maximum of 3 to 1 slopes along the perimeter to prevent a requirement for benches along the slope and to provide a manageable surface for future development purposes. The grading also does not maximize depths to seasonal in every location as the future build-out of the site was considered. For example the future development of the project consists of athletic fields, parking areas and buildings which are depicted in the master conceptual plan require relatively flat grades so excavations were maintained at elevations to accommodate this future development rather than pushing all excavation to the maximum depths. The site was also design to be self-contained which will prevent any erosion, sedimentation or drainage impacts to adjacent properties. It is anticipated that stormwater will be infiltrated on-site both during the mining activities and eventually for the future development. The total land altering activities depicted on Fieldstone's Conceptual Master Plan consists of approximately 71.5 acres.

Considering the area of land to be impacted for this project Fieldstone decided to break the excavation into three areas depicted as Phase 1, Phase 2 and Phase 3 in the plan set. Phase 1 consists of reworking the floor of the active pit area to provide adequate separation to the SHWT and mining the material towards the southern boundary of the parcel. Phase 1 mining yields approximately 686,000 cubic yards. The subsurface investigations through this section of the property indicates that the unconsolidated soils consist of fine to coarse sands with little fine to coarse gravel and a small silt content. The material through this section of the property will require processing (screening) to be sold as construction material meeting NHDOT Standard Specifications for Road and Bridges.

Phase 2 would consist of mining the material along the northern side of the parcel south of Heron Pond as depicted on the plan. Phase 2 mining yields approximately 180,000 cubic yards. This area tends to have a slightly larger percentage of coarse sand and gravel size particles than the remainder of the site.

Phase 3 would consist of mining the material along the northeast side of the parcel. Phase 3 mining yields approximately 128,000 cubic yards. This area is similar to the soils found in Phase 1 in that the subsurface investigations through this section of the property indicates that the unconsolidated soils consist of fine to coarse sands with little fine to coarse gravel and a small silt content. The material through this section of the property would also most likely require processing (screening) to be sold as construction material meeting NHDOT Standard Specifications for Road and Bridges.

SUMMARY OF PROJECT FEASIBILITY

The grading and soil explorations show that this project will provide for approximately 994,000 cubic yards of marketable material, accounting for all three Phases as depicted in the plan set. This is the material available assuming the site is graded as shown on the Conceptual Master Plan prepared by this office. Assuming that the Town's Department of Public Works will keep 75,000 cubic yards the total marketable material for the project will be approximately 919,000 cubic yards.

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The estimate of the total volume of unconsolidated soils available to mine is based entirely on the preliminary plans and soil observations made. This estimate could vary based upon the presence of boulders, SHWT or a change in soil conditions not encountered during the subsurface investigation or modifications to Conceptual Master Plan and the associated grading (finished ground surface).

In determining a dollar value for the material for this project Fieldstone has consulted with companies that run local sand and gravel mining operations. It is our understanding that the Town will not be looking to operate this operation but will be looking for a company to manage the project and all operations. Based on this arrangement we have found that typically companies are willing to pay in the range of \$1.25 per yard with the assumption that the operator will be responsible for all permit costs, reclamation and operating costs. Using this number the approximate revenue generated from each Phase would be \$763,750 for Phase 1 (assuming the Department of Public Works keeps 75,000 yards), \$225,000 for Phase 2 and \$160,000 for Phase 3. The total mining operation could therefore generate approximately \$1,148,750 for the Town.

Please do not hesitate to contact us should you have any questions or require additional information.

Sincerely,

FIELDSTONE LAND CONSULTANTS, PLLC



Chad E. Branon, P.E.
Project Civil Engineer



Christopher A. Guida, C.S.S., C.W.S.
Certified Soil Scientist #91