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Town Complex Study
422 Main Road – Route 143
Chesterfield, MA 01012

December 03, 2018

The Davenport Building – Existing Conditions

The existing Davenport Building was built in 1948, and has had a small addition in 1958. The original building (1948) was built as a one story school with an unfinished basement, and is approximately 4,900 square feet (gross) of space per floor. The addition (1958) is approximately 600 square feet (gross) of space, and is also a single story but has only a crawl space below. The building is wood framed on a concrete foundation. The current exterior finish is vinyl siding, which may be installed over the original exterior finish. The roof is a built-up flat roof system that has been repaired over the years.

Since its construction on 1948, numerous problems have arisen, and only limited repairs have been made to the building. As with any building of this vintage it has several shortcomings with regard to current code requirements and the list of necessary repairs have only compounded over time. Many existing conditions and renovations assessments were performed; the first was in 1995. The various assessments investigated not only the feasibility of renovating the existing building, but also razing the existing building as well as adding on to the existing building to meet the necessary area requirements for the intended function. The various assessments also investigated several different uses of the existing building and site.

1995 - Tessier Associates, Inc. Architects

In 1995 Tessier Associates, Inc. Architects together with Lindgren Associates, Inc. Mechanical and Electrical Engineers were hired to assess the existing conditions of the building in order to utilize the building for one of two purposes. The first possibility was to continue to use the building as an elementary school and have it meet not only the then current building codes, but the requirements set forth by the Department of Education as well. The second possibility was to utilize the building as town offices. Prior to either change of use though, certain repairs and deficiencies were identified in the assessment.

The building was noted as having a vinyl siding system over the original exterior finish, and was not in good condition in 1995. The assessment called for both exterior finish systems to be removed, and a new (clapboard) siding system installed. The windows are wood framed, single pane, with a storm window and are original to the building. All the windows in the building were noted as needing to be replaced. The original roof remains, and is a system of built-up roofing felts with a tar and gravel finish course. The assessment noted areas of ponding do to a lack of roof slope and drains being higher than the roof itself. In 1995, the town hired a contractor to repair several roof leaks. The assessment recommended a total roof replacement (down to the roof decking) with new tapered insulation and a single-ply membrane system. The roof leaks were repaired shortly after the completion of this assessment. We understand that replacement has not occurred; only patching as needed.

The interior finish floor is noted as being a mix of vinyl composition tile, vinyl asbestos tile, carpet, and the original wood flooring. The assessment noted that all existing flooring materials be removed (in accordance with regulations pertaining to removal and disposal of hazardous materials) down to the sub-floor, and new vinyl composition tile and carpeting be installed. We understand the vinyl asbestos tile remains currently.

Interior walls, original to the building, are wood framing with lath and plaster finish. Other interior partitions have been constructed with wood framing and gypsum board. The recommended list of renovations includes the furring out of the exterior walls to add 3 ½" of batt. insulation. This would not be sufficient to meet today's (Stretch) energy code, which requires a minimum of R-13+R-7.5. The interior doors are mostly wood panel, while others are hollow core wood. Door hardware was noted as past its useful life and not code compliant. All doors and hardware are noted as needing to be replaced.

The original ceilings are composition tiles attached to wood furring, which are noted as failing to remain attached to the wood joists. The original ceilings have also been concealed in various locations with a suspended ceiling system. The list of renovations includes removal of all existing ceiling systems, installation of fire resistant gypsum board to the underside of structural members, and installation of a new suspended ceiling system.

The existing plumbing fixtures and plumbing components are noted as not code compliant. Sanitary drainage within the building is noted as being in good condition, but problems with the septic system and leaching field were reported. The septic system was replaced shortly after the completion of this assessment. Site drainage and roof drainage are noted as having problems, and have rendered leaching pits and catch basins inoperative during heavy storms.

The existing heating system is a low pressure steam system fed from an oil-fired boiler. In addition, there is a unit ventilator system that is not utilized due to noise and cold air temperature fluctuation. Therefore, the air quality in the building is poor. Prior to this study, the Division of Occupational Hygiene tested the air quality and produced a report (dated July 07, 1995) that concluded the air quality to be poor and ventilation to extremely poor, and "should be addressed without delay". It was recommended in the (Tessier) assessment to replace the entire heating and ventilation system.

The electrical service for the building is noted as "barely adequate" for the current use (at the time of this study). In addition, there are not enough electrical outlets throughout the building. At the time of this study, the lighting had been updated to efficient lamps and ballasts. It is noted that there are not any emergency lights in the building, and would have to be installed throughout. The fire alarm system is deemed adequate as of the date of this study.

The study also noted that a handicapped access ramp was planned to be added at the rear of the building, making the first floor accessible. The basement on the other hand could not be made accessible without the installation of an elevator. It was noted that the expense of an elevator could be avoided if the use of the basement space was restricted to storage and boiler room.

Structural deficiencies noted in the assessment are some stress cracks in the plaster walls on the first floor. There were no signs of movement in the foundation. It was noted that the cracks have been repaired in the past but continue to become exposed. No further investigation was performed.

Water infiltration was noted in the basement and reported to be due to road work in the front of the building, as well as locations where roof leaders are located.

In addition to the deficiencies discussed above the cost assessment also included other items such as: reconfiguration of the existing concrete entrance stairs with new code compliant stairs and railings; replacement of existing wood trim at doors and windows as necessary; upgrade the fire rating of the main corridor; replacement of toilet partitions; painting of walls, doors and frames, and trim; demolition of existing finishes and partitions in basement space as necessary; replacement of interior stair treads, risers, and handrails.

According to the assessment, the total renovation cost (for all the work described above, except for hazardous materials remediation) in 1995 was estimated to be $391,800. However, the assessment estimates the total renovation cost (in 1995) to reuse the building as town offices as $ 548,800, which again did not include hazardous materials remediation. The cost for the same scope of work reuse of the building as town offices would be approximately $ 874,475 in today's dollars.

2000 – Winslow Design Associates

In 2000, Winslow Design Associates was hired to do a feasibility study for the development of the Davenport site as a senior center and Community Development Corporation offices, as well as senior housing. Winslow apparently had three consultants: Christopher White Associates (surveyor); Dufresne-Henry (civil engineer); Aberjona Engineering (structural engineer). The Davenport building itself would remain, with renovations to the building as discussed within this study. As part of this study, an evaluation of applicable permitting/approvals was performed. While this evaluation was performed under the intent of constructing multiple buildings for a senior center/offices and senior housing program, many of the required permitting/approvals will be the same. The determining factor will be the various options of how the site is developed. A variance from the Zoning Board of Appeals may be required if multiple buildings are proposed for the site, as well as for minimum frontage requirements and land use restrictions. A special permit with site plan approval may be required by the Planning Board. The Board of Health has jurisdiction over on-site septic and public water systems, and their approval may be required based upon the capacity of the current on-site septic and calculated production from proposed new/existing building(s). The septic system was replaced in 1995. The Department of Public Works has jurisdiction of entrances to the site from Route 143, and any change would need their approval. Depending upon the severity of the change this could require a traffic study from a certified engineer.

In addition, the Davenport site was surveyed and delineated for wetlands by consultant Christopher White Associates (surveyor) in 2000. The wetlands survey delineated a large "finger-shaped" area of wetlands in the northern section of the site. Thus, if any construction is to occur within one hundred feet (100'-0") of the delineated wetlands area, approval will be required by the Conservation Commission in town.

In 2001, consultant Dufresne-Henry (civil engineer) was retained to evaluate the existing septic system, water supply, and basement water problem. The report concluded that existing septic system was capable of handling the occasional larger groups if the Davenport building were to be renovated into a senior center, and that no further modifications to the existing system would be required. Additional buildings on-site or additions to the existing building however, would require evaluation by a licensed engineer.

The existing water supply for the Davenport building is a well system located only five feet from the east side of the building. The existing well location does not meet current setback requirements from the building but due to its vintage, it has been "grandfathered", and allowed to remain in use. This is provided that a significant change of use does not occur. The report states that the capacity of the existing well is very limited, and that construction of a new well would be very costly and not necessarily guarantee any additional capacity. It is recommended (in the report) that "suitable" water storage be provided with new pump and controls to meet the demands of a potential fire sprinkler system and the domestic use needs of a senior center.

The sources of the water infiltration problem in the basement of the Davenport building were concluded to be a result of hydrostatic pressure caused by high groundwater levels entering the basement by the following: improperly sealed pipe penetrations in the foundation walls and concrete slab; cracks in the concrete walls and slab; construction or "cold" joints not properly sealed; weepage through the concrete itself. The recommended solutions to this problem would be to remove the hydrostatic pressure with perimeter drainage (inside and outside), replace the existing concrete slab with new on vapor barrier, as well as waterproofing the exterior of the foundation.

Also in 2001, consultant Aberjona Engineering (structural engineer) was retained to evaluate the existing structure of the Davenport building. It is noted in the report that much of the existing structural system does not have enough reserve capacity to support any additional loading. Many of the existing structural members are overstressed by today's (2001) code requirements. Any addition or renovation of the building (future floor and new roof according to the report) would require that the existing structure meet current (2001) code requirements (wind and seismic). The report states that this means the installation of moment frames, cross-bracing, or shear-walls.

2004 – Department of Environmental Protection

In 2004, a letter was sent to the Board of Selectmen regarding the testing and presence of perchlorate in the water from the well serving the Davenport building. The DEP recommends that water containing perchlorate not be consumed by pregnant women, infants, children under the age of 12, and people with hypothyroidism. The Davenport was being utilized by a daycare center at the time of this letter. The letter stated that the concentration was just below the level requiring issuance of a public notice. However, the town decided to supply the daycare center with bottled water and notify the parents of children attending the daycare. We understand the daycare center is no longer located at the Davenport building, and there are no plans to relocate one there.

2008 – Reinhardt Associates

In 2008, Reinhardt Associates was commissioned to produce a study for a municipal building. The study looked at three various options for utilizing the Davenport site, as well as the DPW site, the Old Town Hall site, the Judd site, and the Fire Station site.

The first option proposed renovating the existing building and adding a substantial addition onto the north side to house Fire/Police/Emergency. The proposed renovations for the existing building (according to this study) would include new windows, new siding, and a new pitched roof constructed over the existing flat roof. Other renovations mentioned in previous studies/reports would be completed as well, in order to make the existing building completely code compliant and occupiable. The site plan would allow for forty-eight off-street parking spaces, two of which would be handicapped accessible. In this site plan, all vehicular traffic would be on the west side of the building. The location of the existing Davenport dictates and therefore limits the possible size and location of an addition, parking, and vehicular/pedestrian circulation.

The second option proposed the complete demolition of the existing Davenport building, and building a brand new facility oriented differently to help maximize emergency access. The brand new building would have police and fire on the first floor and town offices on the second floor. The building would be oriented between the property boundaries to allow for emergency vehicle access from both sides. The site plan would allow for thirty-nine off-street parking spaces, two of which would be handicapped accessible.

The third option was the complete renovation of the existing Davenport building into town offices only. The study mentions “the possibility of an addition to lease space for other public or semi-public agencies whose services could be utilized as a convenience to town residents”. The renovation would entail the complete remediation of hazardous materials from the building, a new handicapped accessible entrance/lobby with elevator. This is in addition to correcting all other deficiencies mentioned in previous studies/reports of the building.

The Davenport Building – Recommendations

The town opted for the building to be used for town offices, but did not perform any of the renovations, except where noted above. In addition, the Department of Public Safety occupied the basement level of the building. This was until August of 1995 when the town was ordered not to use the basement space due to the presence of mold, mildew and other microbial contaminants. These microbial contaminants were attributed to the poor air circulation in the building in concert with constant water infiltration through the concrete slab in the basement, as well as roof leaks. More recently (3 years ago), the town had a mold and asbestos abatement project performed in the basement, and it is now an open and unused space (other than utilities).

The town currently utilizes the first floor for not only town office space, but also for the Department of Public Safety. The lighting conditions have been described as poor. Storage is inadequate for town files and records, including a lack of a storage vault required for historical records. All occupants, including police and their detainees, share one single bathroom. There is one single meeting room that is not large enough to accommodate large groups of people, and creates scheduling conflicts between the various town groups and committees that need to utilize the space. Parking accommodations have also proven inadequate when large meetings are held. In addition, the town spends $22,000 per year on utilities and maintenance.

Renovating the Davenport building to make it 100% code compliant and correcting all the problems discussed in previous studies/reports would seem to be an expensive investment for not much gain. The estimated renovation cost from the 1995 assessment from Tessier Associates in today's dollars was approximately $ 874,475. However, this cost did not include the installation of an elevator, a central handicapped accessible entrance lobby on grade, remediation of all remaining hazardous materials in the building, or correcting the water infiltration problem in the basement as recommended (in the 2001 Dufresne-Henry report). Renovations to the site as delineated in the most current study (2008) done by Reinhardt Associates were also not factored into the cost. The total estimated cost to renovate the existing Davenport building for just town office use, and remedy all of the aforementioned deficiencies, would be approximately $1.5 million.

Therefore, it is our recommendation that the existing Davenport building be razed completely so that a new building or buildings can be built to accommodate the specific needs of the police/fire/emergency/town offices. New construction would also guarantee less maintenance and operating costs, as well as a longer lifespan of the building(s). The estimated cost to raze the existing Davenport building would be $ 200,000.

01/ 19/ 18

Geotechnical Considerations

In June 2017 we solicited soil borings and a geotechnical report to determine the feasibility of constructing one or more buildings on the Davenport site. Considerations are bearing capacity, unfavorable subsurface conditions like presence of peat, clay or ledge and depth to ground water. The full report by O'Reilly, Talbot and Okun is appended to this report.

In summary the report finds that the site is suitable for construction of one or two buildings with the recommendations made in the report. The report describes allowable bearing pressure, recommends import of gravel in certain conditions, recommends foundation perimeter drainage, thickness of gravel beneath concrete slabs, bituminous pavement and thickness of bituminous pavement.

We presented more than half a dozen site plans with two building and single building solutions. Use of the extreme northwest corner of the site added to the length of the driveway and brought the access road near the wetland on one side and the leach field on the other. That corner used for the public safety complex also created a needlessly long driveway for emergency vehicles.

Almost from the outset it became clear that the ideal site plan required separate driveways for emergency vehicles from normal business traffic or night meeting traffic. We were able to accomplish this with two driveways: one on the west side for normal business traffic and one on the east side for emergency vehicles. The fire apparatus bays are central and nearest the Main Road.

The lot is pork-chop shaped with a fairly narrow street frontage on the south. While this leaves no space for lateral expansion of the apparatus area, there is still an option for future expansion to the south.

There have been comments concerning the limited area for stock piling of snow which are acknowledged. However these do not seem to be so difficult to overcome by hiring additional trucks and/or loaders on call to deal with occasional blizzards. Or by installing snow melting in the pavement or by arranging an easement with neighbors for temporary stockpiling of snow after blizzards. Additionally it is common practice in suburban areas and especially in rural areas like Chesterfield to push excessive snow down the driveway and across the street. This is indeed possible on this site because there is no other driveway directly across the street.

Other Site Conditions

Assets:
The site has a substantial septic system constructed in 1998. It also has a well drilled in circa 1950 and the pump was replaced in 1996, according to the Dufresne-Henry study in 2001.

Conservation Commission Recommendations

The site is somewhat restricted in the northwest area by a wetland. The new building(s) must maintain proper clearance from this. We met with the Conservation Commission 2/19/2018 and showed them the two buildings preliminary plan. We had a concern about the required clearance from the wetland. We were informed that as long as we did no construction in the wetland we could construct the buildings as shown and even push them a little nearer to the wetland. At the time of construction documents, it would be necessary to create a silt fence barrier so that the construction activities would not impact the wetland. We were also informed that the wetland delineation was done by the Conservation Commission and not by a licensed professional. Nevertheless, the commission agreed to revisit their own delineation in the spring of 2018. At this writing we have not seen that report.

Traffic Separation

The committee's concern from the time of our second meeting has been to be able to separate emergency traffic from normal business traffic or night meeting traffic. The concern has some justification. No one would want there to be an incident such that some kind of important town meeting were occurring at the same time there would be a fire emergency, an ambulance emergency, a traffic accident emergency or a police emergency. Certainly, any emergency must take precedence over any other traffic. Still it bears noting that emergency vehicular traffic with sirens sounding legally take precedence over all other vehicles in all locations including the driveway.

We explored the possibility of one the town hall building separated up in the northwest corner of the property. That caused two problems: an access driveway across the wetland and the possible need for a secondary roadway via easement through neighboring property. We explored several other site layouts with a single building or with two buildings in various locations on the site. In all cases, the limiting factors were the wetland in the upper center of the parcel, the fixed location of the existing septic system, and the somewhat restricted street frontage along Main Road

We were eventually able to develop a three-driveway scheme with the Town Hall

access driveway to the west, the Fire Station driveway in the center and the Police Station emergency driveway to the east. Though some objections were raised that there would be no place to plow snow, we would submit that many people plow snow down a driveway and directly across the street. And across the Main Road from the new public safety complex there are no driveways that would be impacted. Once a snowstorm would end, any excess snow could be trucked elsewhere if necessary.
We also developed a two-driveway scheme, which allows snow to be stockpiled more easily on the property. The fire apparatus would still have the same broad dedicated driveway directly to the street, but the police emergency vehicles with sirens engaged would use the common driveway on the west side. Having looked at many police station site plans with a similar arrangement, and all in more densely populated and high traffic locations, we do not believe it to be a material problem. We believe that either the three driveway plan or the two driveway plan is viable. The cost difference is negligible. In the two driveway plan the office building portion of the building is simply mirrored left for right.

Cost Considerations

The following is a partial list of recent similar projects in MA:

Year	Project	Cost/S.F.
2010	Granby- Police/Fire	$266.
2014	Monson- Town Hall/ Police	396.
2015	Attleboro- Police/Fire	319.
2015	Newbury- Police/ Fire	525.
2015	Sutton- Police	470.
2016	Norfolk- Police/Fire	341.
2016	West Boylston- Police	452.
2016	Salisbury- Police	630.
2016	Westford- Fire	668
2016	Wilbraham- Police	545.
2017	Plainville- Police/Fire	539.
2017	Norwell- Police	418.
2018	Templeton- Police Addition/Renovation	333.

From this list please note that the Granby project was bid during the Great Recession, when all project pricing was artificially depressed. It is also eight years old. The Templeton project involves renovation, which skews the overall cost downward.

In addition, what is not clear from what information is available is the breakdown of hard and soft costs, except in the case of Sutton. There the $470 represents the hard cost. The soft cost ads another 18% or $106/ S.F. Soft costs involve design and engineering, owner's project manager, furniture, fixtures and equipment, construction testing, etc. Inflation in the last several years has been around 3.5% per annum.

<u>Town Hall Budget</u>

In Massachusetts almost all town halls are older buildings or rehabilitated schools, so there is little current construction data. The best recent data we have is the Monson project, which is skewed slightly upward because it includes the police station. The town hall alone probably would have been in the $325/S.F range. Using that our likely cost for the 5888 S.F. Chesterfield Town Hall yields a construction cost of $1,913,600. The construction is anticipated to be slab-on-grade floor, simple wood frame, wood trussed roof with asphalt shingles, vinyl or fiber-plank siding, and painted drywall interior. See attached preliminary drawings.

<u>Safety Complex Budget</u>

We have better data for the safety complex because more such projects have been recently constructed in Massachusetts. Taking an average of the Attleboro, the Newbury, the Norfolk, and the Plainville safety complexes and adjusting for inflation, the likely construction cost of the 9768 S.F. Chesterfield Public Safety Complex would be in the range of$480/S.F or $4,688.640. The construction is anticipated to be rigid frame walls and roof, slab on grade floors, metal siding and metal roof, interior office walls metal studs and painted drywall. Upgrades could be sandwich panel walls and roofs and radiant heated floors. See attached preliminary drawings.

These estimates assume bidding these projects in 2018 and do not include soft costs. Inflation has recently been in the range of 3-3.5% per annum.

<u>Davenport Building Demolition</u>

The existing town hall building is approximately 133,000 C.F. The demolition cost is in the range of $200,000.

<u>Site Development</u>

The above figures should include normal excavation, backfill, driveways and parking. But because there is very little space left for detention basins, storm water will need to be dispersed via leaching basins under pavement. The additional cost of that is likely to be $150,000.

<u>Soft Costs</u>

For projects estimated to cost more than $1.5M, Massachusetts law requires that the town first hire an Owner's Project Manager. That is likely to cost 5-8% of the construction budget or $460,000. (In some instances the state has allowed the local building inspector some latitude to act as the OPM.) The OPM is also charged with assisting the town in hiring the design team. The design budget is likely to be in the range of 10% or $700,000.

Total:

New Town Hall:	$1,913,600.
Demolish Davenport Building:	200,000.
New Public Safety Complex:	6,688,640.
Site Development:	150,000.
Owner's Project Manager:	460,000.
Design Team:	700,000.
Sum:	$8,112,240.

Note that no contingency is included in this sum.
It is customary to add 15% or $1,216,836 in this case.

J1824-06-01
July 19, 2017

Mr. Roy Brown
Roy S. Brown Architects
85 Chilson Road
Wilbraham, Massachusetts 01095

Re: Geotechnical Engineering Recommendations
Chesterfield Safety Complex and Town Offices
422 Main Road –Route 143
Chesterfield, Massachusetts

Dear Mr. Brown:

O'Reilly, Talbot & Okun Associates, Inc. (OTO) is pleased to provide this letter report summarizing our geotechnical engineering recommendations for the proposed safety complex and town office buildings, to be located at 422 Main Road in Chesterfield, Massachusetts. The project consists of the demolition of the former Davenport School building and the construction of two new buildings. A Site Locus is provided as Figure 1. A Site Plan is provided as Figure 2.

Our geotechnical recommendations are based upon subsurface conditions observed in eight soil borings. Our services consisted of the full-time observation of the borings, review of the logs and soil samples, engineering analyses, and preparation of this report. This report is subject to the attached limitations.

PROJECT DESCRIPTION

The Site is located at 422 Main Road in Chesterfield, Massachusetts, and is bounded to the east, north, and west by residential properties, and to the south by Main Road. The location of the Site is presented on Figure 1. The former Davenport School building is located on the Site, and consists of a single story, wood-framed structure with one basement level. The former school building is currently occupied by the town administrative offices. The location of the existing building is shown on Figure 2.

In general, topography slopes downward from the east (approximate elevation 100 feet[1]) to the west (elevation 96 feet). A driveway is located to the west of the existing building and a parking lot is located to the north. The existing driveway slopes downward from approximate elevation 98 feet at the parking lot to 92 feet at Main Road. The northern portion of the Site consists of an undeveloped field and wooded areas.

Project plans call for the demolition of the former Davenport School building and the construction of two structures. A new town offices building, having an approximate

[1] Elevations based upon contours and arbitrary datum obtained from drawing titled "Site Plan – Existing (C.1)" drawn by Roy S. Brown Architects, dated 5/3/2017.

footprint of 7,300 square feet will be located in the northern portion of the Site, and an 11,850 square foot integrated police and fire safety complex building will be located in the southern portion. The location of each building is presented on Figure 2. Additionally, parking lots will be constructed to the north and east of the proposed safety complex.

We anticipate that the new town offices building will be a one or two story slab on grade. The proposed safety complex will be a split-level building: the fire department will be at the front of the building with a slab elevation lower in elevation (assumed elevation 94 feet), and the police department will be at the rear of the building with a higher slab elevation near the existing grade (98 feet). Therefore, we expect cuts of up to 10 feet in order to construct the proposed safety complex.

We expect structural loads to be supported on both isolated column and continuous strip footings. Structural loads are unknown at this time; however, it is expected that maximum column loads will be less than 100 kips. We anticipate bearing walls will carry a load of approximately five kips per linear foot, or less. These assumptions should be confirmed by the design team.

SUBSURFACE EXPLORATIONS

Subsurface investigations consisted of eight soil borings (TO-1 through TO-8). The borings were performed on July 6 and 7, 2017 by Seaboard Drilling of Chicopee, Massachusetts. Borings were performed using a Mobile B-53 truck mounted drill rig, using hollow stem drilling techniques. Borings TO-1, TO-2, TO-7, and TO-8 were performed within or near the footprint of the proposed safety complex, and borings TO-3 through TO-6 were performed within or near the proposed town office building. The boring locations were adjusted in the field to avoid subsurface and overhead utilities and other Site features. Boring locations are shown on Figure 2. Boring logs are attached. In general, soil samples were collected continuously from the ground surface to a depth of four feet below ground surface, at a depth of five feet, and every five feet thereafter.

Soil samples were collected using a two-inch diameter split spoon sampler, driven 24 inches with a 140 pound safety hammer falling 30 inches (American Society for Testing and Materials Test Method D1586-99 “Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils”). The number of blows required to drive the sampler each six inches was recorded. The standard penetration resistance, or N-value, is the number of blows required to drive the sampler the middle 12 inches. Soil properties, such as strength and density, are related to the N-value.

The headspace of each soil sample collected from the borings was screened using a MiniRAE Lite photo-ionization detector (PID). PID screening provides an assessment of the volatile organic content of the sample. PID readings are discussed below and are provided on the boring logs.

An O’Reilly, Talbot & Okun Associates, Inc. (OTO) engineer observed and logged the borings. Samples were classified according to both the Unified Soil Classification System (USCS) and a modified version of the Burmister Soil Classification System. USCS group symbols are presented on the boring logs. After drilling, bore holes were backfilled with soil cuttings and patched with asphalt, where applicable.

SUBSURFACE CONDITIONS

Subsurface conditions were interpreted based upon the soil borings. In general, subsurface conditions consisted of the following, in order of increasing depth: a surface layer of topsoil or asphalt with granular base; non-engineered fill (where encountered); native granular soils; and glacial till. Soil conditions are favorable for the proposed construction.

Soil Conditions

Borings TO-1 and TO-3 through TO-7 were performed in landscaped areas, with one to four inches of topsoil present at the ground surface. The topsoil generally consisted of loose to medium dense, dark brown fine sand containing little silt and trace amounts of organics (roots). We note that testing for nutrient content, pH, or organic content was not part of this study. We recommend this testing be performed to evaluate the suitability of existing Site topsoil for reuse.

Approximately three inches of asphalt pavement was present at the ground surface of boring location TO-2. The asphalt was immediately underlain by approximately 12 inches of granular base, consisting of a dense, fine to medium sand with some gravel and little silt. Beneath the granular base, an approximately two inch thick layer of debris (asphalt) was encountered.

Granular fill was present at the ground surface of boring location TO-8 and below the surficial layers in borings TP-6 and TO-7. In general, the fill consisted of medium dense to very dense, fine to medium sand containing little to some coarse sand and silt.

In borings TO-1 through TO-3, and TO-6 through TP-8, native granular soils were encountered beneath the surficial topsoil or granular fill (where encountered). These native soils generally consisted of loose to very dense, fine sand and silt containing little medium to coarse sand and trace amounts of fine gravel. Sandy glacial till was encountered in each of the borings at a depth of between one and 12 feet below ground surface. Glacial till is a very dense, heterogeneous mixture of silt, clay, sand and gravel, and is generally present immediately above bedrock throughout New England. Each boring encountered auger refusal within the glacial till at a depth of between 12.5 and 23 feet below ground surface, corresponding to approximate elevations of 74 and 86 feet. Auger refusal was upon very dense till or likely boulders (TO-2, TO-7, and TO-8).

Environmental Field Screening

As discussed above, the headspace of each soil sample jar was screened to estimate the content of volatile organic compounds (VOCs). PID readings ranged from 0.0 ppm (parts per million) to 0.9 ppm. The results are typical for background values and do not indicate significant VOC contamination. PID readings are presented on the boring logs.

Groundwater Conditions

At the time of our explorations, groundwater was encountered in each of the borings at a depth of between 2.5 and 5 feet below ground surface. Repeat observations were made in borings TO-1 (5.8 feet) and TO-3 (5.2 feet) after approximately 3.0 and 21.5 hours, respectively. Based upon the dense and impermeable nature of the glacial till and native silty soils present at the Site, perched groundwater layers may be encountered at higher levels during periods of wet weather. Therefore, groundwater may be encountered during construction and the building should be designed to control groundwater and surface water infiltration.

SIGNIFICANT GEOTECHNICAL ISSUES

The significant geotechnical issues for the proposed construction addressed in this report include the following: the demolition of the existing Site building; foundation bearing capacity and settlement; seismic design considerations; pavement design; water control in basements; and the suitability of on-Site materials for use as engineered fill.

DESIGN RECOMMENDATIONS

The following recommendations are provided for the construction assumed in this report.

The recommendations in this report refer to the 8th Edition of the Massachusetts State Building Code (MSBC). We note that the 9th Edition of the MSBC is expected to become effective in 2017. Additionally, we understand that there will be a six-month concurrency period, where either the 8th or the 9th Edition MSBC can apply to newly permitted projects. Some of the expected changes, as they may affect this project, are noted in the appropriate sections below. Furthermore, we recommend that information provided in this report be reviewed and updated once the new building code becomes effective.

Demolition of Existing Building

We understand that the former Davenport School is to be demolished to prepare the Site for the new construction, and that a portion of the safety complex will be located within the footprint of the demolished building. Any foundation walls or slabs, basements, or utilities that are located within the footprint of the proposed building should be removed in their entirety. These excavations may extend below the planned slab and footing levels. Any excavations resulting from the removal of existing foundations and/or slabs, should be backfilled with compacted engineered fill, consistent with the recommendations provided below and in the Earthwork Considerations section. Furthermore, it is likely that non-engineered fill will be encountered around the perimeter of the existing building.

Abandoned buried utilities containing asbestos (such as electrical conduit insulation or transite pipe) are commonly found during construction excavations. Furthermore, former structures (pipes, conduits, foundation walls) may contain or be covered with materials containing asbestos. Asbestos materials should be handled in accordance with MassDEP's asbestos regulations (310 CMR 7.15). We recommend that suspect materials be managed appropriately and tested by a Department of Labor Standards (DLS) certified asbestos inspector prior to disturbances.

Foundation Recommendations

Since the native Site soils are susceptible to disturbance due to their high silt content, we recommend that footing subgrades be over-excavated by six inches and that a minimum of six inches of Crushed Stone be placed upon the native soils to protect the subgrade from disturbance. A non-woven geotextile fabric should be placed between the native subgrade and Crushed Stone to maintain separation between the Crushed Stone and soil layers. Wet and/or disturbed soils encountered below slabs and footings should be removed and replaced with Crushed Stone.

The proposed buildings can be founded on normal spread footing foundations bearing on the densified native soils and compacted engineered fill. Provided the recommendations presented in this section are followed, a maximum allowable bearing pressure of 4,500 pounds per square foot may be used for the design of exterior and isolated column footings.

We estimate that settlement of footings and slabs bearing on the densified native soils or compacted engineered fill should be small and largely elastic in nature. Maximum settlements should be less than 1.0 inch, with a maximum differential settlement less than 0.5 inches between column center-lines. Settlement should occur relatively quickly after load application (during construction).

Exterior footings should be embedded a minimum of 48 inches below the lowest adjacent grade for frost protection. Interior footings should bear at least two feet below the surrounding floorslab. Strip footings, beneath the load bearing walls, should be at least 18 inches wide. Isolated column footings should be at least 24 inches wide. All other applicable requirements of the Massachusetts State Building Code (MSBC) should be followed.

If winter construction occurs, footings should not be placed on frozen soils. Footing excavations should be free of loose or disturbed materials. Any boulders or cobbles larger than four inches in diameter should be removed from within one foot of the bottom of the footings and replaced with Crushed Stone. The footing subgrades should be densified immediately prior to placement of footing concrete with at least three passes with a vibrating plate compactor. If loose materials are present in the excavations, they shall be recompacted to form a firm, dense bearing surface.

Concrete Slabs

We recommend that concrete floorslabs bear on at least 12 inches of compacted Sand and Gravel fill or Crushed Stone to provide uniform support and a capillary moisture break. The subgrade should also be free of large boulders or cobbles, if encountered. The Sand and Gravel or Crushed Stone fill beneath the concrete slabs should meet the grain size distribution characteristics outlined in Table 2.

The subgrade within the footprint of each proposed building should be stripped of topsoil, asphalt, and any non-engineered fill. Prior to the placement of any engineered fill, we recommend that the building footprint be thoroughly densified to treat any loose areas. If non-engineered fill or soft and/or disturbed soils are present, these materials should be removed and recompacted or replaced with compacted, Sand and Gravel or Crushed Stone fill. Fill supporting slabs should be placed in accordance with the recommendations presented on Sheet 1.

Groundwater and Surface Water Control

Wet soils were observed in each boring at a depth of between 2.5 and 5 feet below ground surface, corresponding to approximate elevations of 91.5 and 94.2 feet. In addition, perched groundwater may be present during periods of wet weather. Therefore, we recommend that the building include perimeter drainage to control groundwater and surface water infiltration. The perimeter drainage system can consist of perforated PVC pipe, installed in a Crushed Stone trench, and wrapped in a non-woven geotextile fabric. Furthermore, we recommend that a Crushed Stone drainage layer be included beneath the lower level floor slab of the safety complex building. The Crushed Stone drainage layer and perimeter drain should be hydraulically connected to allow the water to flow away from the foundation via gravity. Clean-outs should be provided in the sub-slab and/or perimeter drainage system, to allow for future maintenance. Since it appears that the lower level will be partially below grade, we recommend that water proofing be provided below the slab, water-stops be included, and at a minimum, the below grade walls should be damp-proofed. We recommend that complete (membrane) waterproofing be strongly considered by the architect, depending on the planned use of below grade spaces, and final design and slab elevations. A typical detail of the underdrain system is shown on Sheet 2.

If groundwater is encountered during excavations for footings and utilities, it should be possible to dewater these excavations by trenching or using sump pumps. Furthermore, the contractor should establish and maintain proper drainage of soils during construction. The underlying glacial till present at the Site is susceptible to moisture, due to the high percentage of fines within the soil mass. If these soils become wet during construction, they will become soft and easily disturbed. To prevent the disturbance of soils, the contractor may elect to place Crushed Stone at the base of excavations to achieve an acceptable working surface.

Seismic Considerations

Earthquake loadings must be considered under requirements in Section 1613 and 1806 of the 8th Edition (February 2011) of the Massachusetts State Building Code (MSBC). The 8th Edition of the MSBC is based upon the International Building Code 2009 (IBC) with Massachusetts amendments. Note that the IBC refers to ASCE-7, Minimum Design Loads for Buildings and Other Structures.

The 9th Edition of the MSBC is expected to be issued in 2017, and expected changes include revised Table 1604.11 values. The 8th Edition values are presented below. Therefore, a supplemental review and update to the recommendations provided in this section may be necessary once the new code becomes effective. Regardless, if the new building code comes into effect prior to the permitting of the project, the recommendations below should be reviewed.

Site Class and Earthquake Design Factors

Section 1613 of the IBC covers lateral forces imposed on structures from earthquake shaking and requires that every structure be designed and constructed to resist the effects of earthquake motions in accordance with ASCE-7. Lateral forces are dependent on the type and properties of soils present beneath the Site, along with the geographic location. Per Table 1604.11, the maximum considered earthquake spectral response acceleration at short periods (S_s) and at 1-sec (S_1) was determined to be 0.22 and 0.067, respectively, for Chesterfield, Massachusetts.

Soil properties are represented through Site Classification. Procedures for the Site-specific determination of Site Classification are provided in Section 1613.5.4 of the IBC 2009. At this Site, we evaluated Site Classification using one of the parameters allowed under the IBC 2009, Standard Penetration Resistance (N-value). The Site Class was determined to be Class D based upon soil data collected. Furthermore, the Site coefficients F_a and F_v were determined according to Tables 1613.5.3(1) and 1613.5.3(2), using both the S_s and S_1 values and the Site Class. For this Site, F_a and F_v were determined to be 1.6 and 2.4, respectively.

Basement and retaining walls should be designed to resist dynamic lateral earth forces in accordance with Section 1610.2 of the MSBC. The seismic earth forces as defined in Section 1610.2 should be applied as an inverted triangle over the height of the wall and added to the static lateral pressures. For purposes of the calculation, a total unit weight of 125 pounds per cubic foot should be used for the backfill against below grade walls.

Liquefaction

Section 1806.4 relates to the liquefaction potential of the underlying soils. The liquefaction potential was evaluated for saturated Site soils, using Figure 1806.4b of the MSBC. However, based upon the observed density, liquefaction is unlikely to occur under the design earthquake. In addition, loose soil layers below the maximum depth explored are not anticipated.

Lateral Earth Pressures against Basement Walls

Static lateral earth pressures will be imposed on below grade walls in the lower level (fire department) of the proposed safety complex. These walls should be designed for unbalanced loading conditions. We anticipate that these walls will be cantilevered (unrestrained), and therefore, need to be designed to resist overturning, sliding, and bearing capacity failure. We recommend an equivalent fluid pressure of 35 pounds per cubic foot (pcf) be used to determine design pressures on the rear of the wall. If the walls will be structurally braced (not free to deflect), we recommend that an equivalent fluid pressure of 55 pcf be used. Additionally, braced walls should not be backfilled until the first floor slab is installed. A coefficient of friction of 0.45 is recommended to evaluate frictional resistance to sliding along the base of the wall and footings. A bearing pressure of 4,500 pounds per square foot should be used to design the wall footing. These values apply to unsaturated soil conditions.

The soil against the outside of below grade walls should not be over-compacted, since this would greatly increase lateral loads against the walls. The recommended degree of compaction for engineered fill and compaction means and methods are presented on Sheet 1. We note that these are general guidelines and if it is determined that a location falls into two or more categories, as presented in Table 1-1, the design team should be notified to determine appropriate compaction efforts and/or methods.

Exterior Slabs and Pavements

This section provides recommendations for exterior entryways and slabs, sidewalks, and flexible and rigid pavements. The significant issue affecting pavement and exterior slab design is the presence of frost susceptible soils near the base of exterior walls. Given the impermeable nature of the soils (these soils do not provide proper vertical drainage), it is likely that pavement subgrades and bases will become saturated. If the water remains in the subgrade and freezes, frost heaves and ice lenses may form, potentially causing severe pavement movement and cracking.

Entryways and Sidewalks

Exterior concrete slabs, such as those at entryways, and sidewalks adjacent to building should be designed to mitigate differential frost movement between adjacent slabs, doorways, and pavements. We recommend that concrete sidewalks and entryways bear on at least 24 inches of imported, compacted Sand and Gravel to provide uniform support and adequate drainage. We note that the native silty fine sand and glacial till soils present just below the ground surface are relatively impermeable. If surface water infiltrates into the subgrade layer, it may freeze and cause sidewalks to heave. Therefore, we recommend that proper drainage be provided to allow the subgrade to adequately drain. We recommend that the design team incorporate drainage into the sidewalk and entryway areas to remove water from the subgrade, in order to limit frost and the resulting vertical movement of concrete slabs and sidewalks.

Subgrades should be free of large boulders. We recommend that the entire subgrade of the sidewalk be proof compacted to treat any loose areas.

Fill should be placed in accordance with the recommendations for compaction provided on Sheet 1. The Sand and Gravel fill beneath the concrete slabs and sidewalks should meet the grain size distribution characteristics described in Table 2.

Flexible Pavement Design

We understand that the proposed project will involve the construction of parking areas and roadways for both light vehicles and heavy vehicles, such as fire engines and rescue vehicles. We have proposed a relatively robust flexible pavement section for use in areas accessed by heavy vehicles. Recommended designs are presented for both loading conditions in Table 1.

Table 1
Pavement Design Sections

Layer	Thickness (in)	
	Light Vehicle	Heavy Traffic
Asphalt Finish Course	1.5	2
Asphalt Binder Course	1.5	2
Gravel Base Course	6	10
Sand & Gravel Sub base	6	8

We recommend that the pavement subgrade be proof compacted to treat any loose areas present. In addition, we note that the silty fine sand and glacial till soils are poorly drained and may cause frost heaves to occur in pavements. We recommend that pavements be pitched to promote surface water runoff and that subsurface drainage be provided to prevent water from accumulating in the pavement section.

Table 2 presents recommendations for gradation requirements for the Sand and Gravel sub-base (structural fill), and Gravel Base Course materials. Please note that the Sand and Gravel sub-base specification is approximately that for Mass Highway M1.03.0, Type B Gravel Borrow.

Earthwork Considerations

We anticipate that earthwork for this project will include the following: engineered fill to backfill the existing basement following demolition; removal and replacement of non-engineered fill; excavations for new basements and footings; placement of compacted engineered fill beneath the building, floorslab and pavements (as needed); and the treatment of the existing soils to address any localized loose areas that may be present.

Engineered Fill Recommendations

Four engineered fill types are recommended:

- Sand and Gravel for use immediately below slabs, sidewalks, and beneath pavements;
- Crushed Stone for use immediately below footings and in drainage system;
- Gravel Base Course for use beneath pavements; and
- Granular Fill for use as miscellaneous fill and to form the building pads at depths greater than 12 inches beneath floor slabs and footings.

Grain size distribution requirements are presented in Table 2. The near surface, native soils encountered at the Site generally consisted of fine sand containing substantial amounts of silt (20 to 40% fines). Therefore, it does not appear that significant quantities of on-Site soils will meet requirements for use as engineered fill.

Table 2
Grain Size Distribution Requirements

Size	Sand and Gravel	Gravel Base Course	Granular Fill	Crushed Stone
	Percent Finer by Weight			
3 inch	100	100	100	100
1 inch	---	---	---	100
¾ inch	---	---	---	90-100
½ inch	50-85	50-80	---	10-50
⅜ inch	---	---	---	0-20
No. 4	40-75	40-75	---	0-5
No. 10	---	30-60	30-90	---
No. 40	10-35	10-35	10-70	---
No. 100	---	5-20	---	---
No. 200	0-8	2-10	0-15	---

Compaction Recommendations

Fill, debris, topsoil, or organic soils should be removed from beneath the building footprint and should not be re-used as fill beneath structures. To avoid point loads, any cobbles or boulders larger than four inches in diameter, encountered at the subgrade should also be removed. As noted, former floor slabs and footings should be completely removed from within the footprint of proposed buildings, and large excavations may result from the removal of these structures. Prior to the placement of any engineered fill, we recommend that the entire building footprint be thoroughly proof compacted. Proof compaction should be accomplished by a minimum of six passes with a 6,000 pound vibratory roller. To facilitate compaction, the moisture content of the on-Site material should be maintained at or near the optimum moisture content as determine by ASTM D1557.

The resulting excavations should be backfilled with compacted Sand and Gravel or Crushed Stone fill. Compacted fill should be placed in lifts ranging in thickness between 6 and 12 inches depending on the size and type of equipment. Recommended degrees of compaction and compaction means and methods are presented on Sheet 1.

Compaction within five feet of foundation or retaining walls should be performed using a hand-operated roller or vibratory plate compactor. If the new walls are to be backfilled on both sides, placement and compaction of engineered fill should proceed on both sides of the wall so that the difference in top of fill on either side does not exceed two feet. For basement or retaining walls (walls where backfill is only on one side), the walls should be designed for unbalanced loading conditions and the engineered fill within ten feet of the wall should be compacted using hand-operated plate or drum rollers weighing 250 pounds or less.

Weather Considerations

The contractor should note that the near-surface silty fine sand and underlying glacial till are susceptible to moisture, due to the high percentage of fines within the soil mass. If these soils are exposed and become wet during construction, they will become soft and easily disturbed. During winter construction periods, these soils will tend to remain wet and cannot be easily dried or stabilized. It may be necessary to remove the disturbed soils and replace the materials with Crushed Stone or imported Sand and Gravel fill. To avoid this potential issue, the contractor should establish and maintain proper drainage of soil surfaces.

Sloping and Earth Support

At this time, it does not appear that significant amounts of sloping, shoring and/or underpinning will be necessary to construct the proposed building and protect existing structure and personnel. However, the need for temporary earth support should be evaluated during final design. Sloping and earth support may be needed during the installation of utilities and if foundations are extended to depths greater than four feet below existing grade.

The upper unconsolidated native soils encountered at the Site are estimated to be Type C soils for slope stability purposes. The maximum allowable slope for excavations of Class C soils is 1.5H:1V (34°). The underlying dense, glacial till soils would likely be considered Type B soils; however, we recommend that a geotechnical engineer be on-Site to observe actual soil conditions during the construction, if appropriate. We note that protective systems for any excavation exceeding 20 feet in depth must be designed by a registered professional engineer. All excavations should conform to current OSHA requirements.

FINAL DESIGN AND CONSTRUCTION PHASE SERVICES

It is recommended that O'Reilly, Talbot & Okun Associates, Inc. (OTO) be retained during final design to prepare and/or review appropriate specification sections and drawings, if necessary. During construction phases, we recommend that OTO be retained to provide engineering support and to document subgrade conditions and preparation.

We appreciated the opportunity to be of service on this project. If you have any questions, please do not hesitate to contact the undersigned.

Sincerely yours,
O'Reilly, Talbot & Okun Associates, Inc.

Ashley L. Sullivan, P.E.
Associate

Michael J. Talbot, P.E.
Principal

Attachments: Limitations, Site Locus, Site Plan, Sheets, Boring Logs

LIMITATIONS

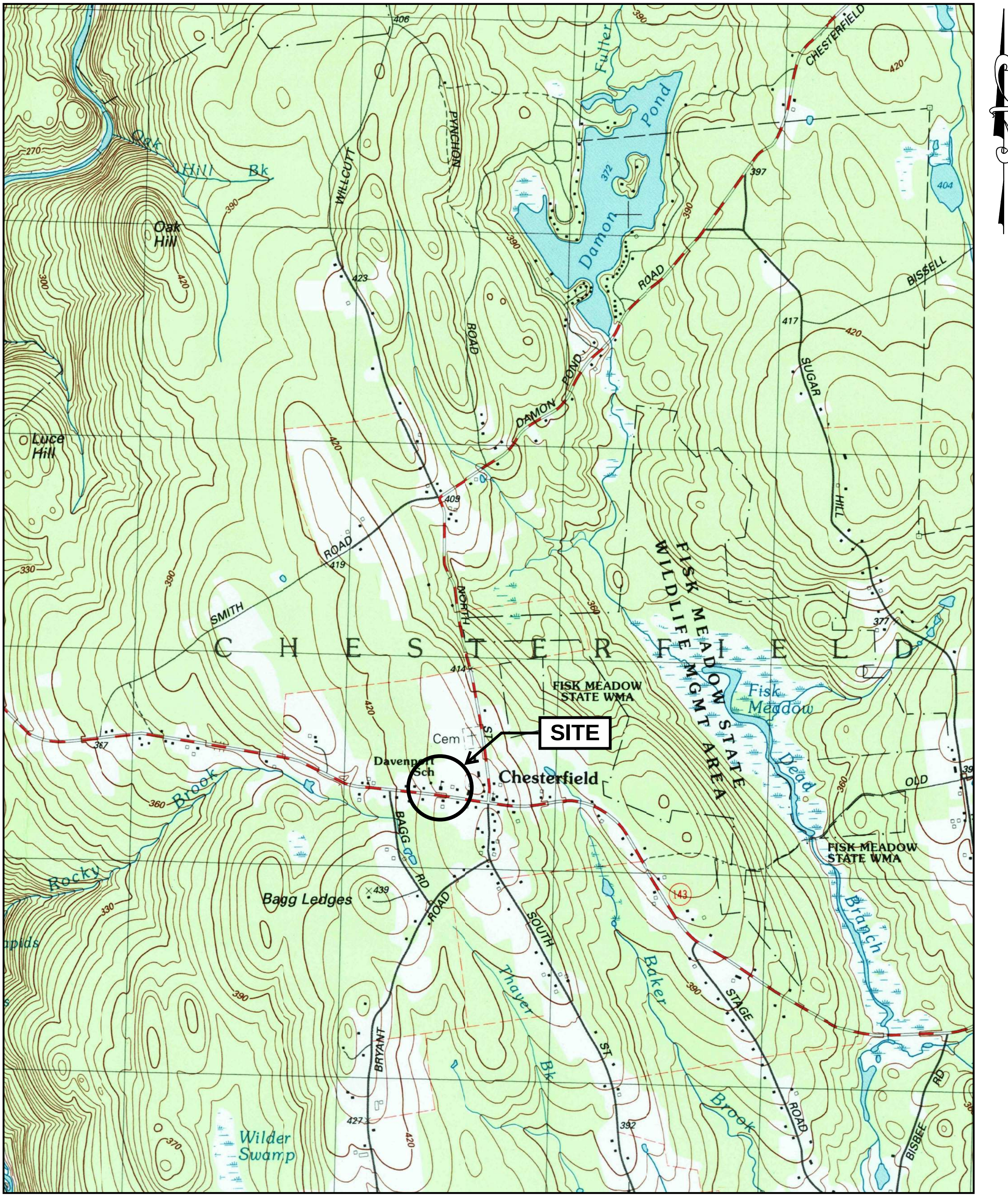
1. The observations presented in this report were made under the conditions described herein. The conclusions presented in this report were based solely upon the services described in the report and not on scientific tasks or procedures beyond the scope of the project or the time and budgetary constraints imposed by the client. The work described in this report was carried out in accordance with the Statement of Terms and Conditions attached to our proposal.

2. The analysis and recommendations submitted in this report are based in part upon the data obtained from widely spaced subsurface explorations. The nature and extent of variations between these explorations may not become evident until construction. If variations then appear evident, it may be necessary to reevaluate the recommendations of this report.

3. The generalized soil profile described in the text is intended to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized and have been developed by interpretations of widely spaced explorations and samples; actual soil transitions are probably more erratic. For specific information, refer to the boring logs.

4. In the event that any changes in the nature, design or location of the proposed structures are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and conclusions of this report modified or verified in writing by O'Reilly, Talbot & Okun Associates Inc. It is recommended that we be retained to provide a general review of final plans and specifications.

5. Our report was prepared for the exclusive benefit of our client. Reliance upon the report and its conclusions is not made to third parties or future property owners.



0 1000 FEET
0 0.5 1.0 MILES
0 0.5 1 KILOMETERS

1:25,000 SCALE NATIONAL GEODETIC VERTICAL DATUM 1929 10 FOOT CONTOUR INTERVAL

O'Reilly, Talbot & Okun
ENGINEERING ASSOCIATES
293 Bridge Street, Suite 500 Springfield, MA 01103 413.788.6222
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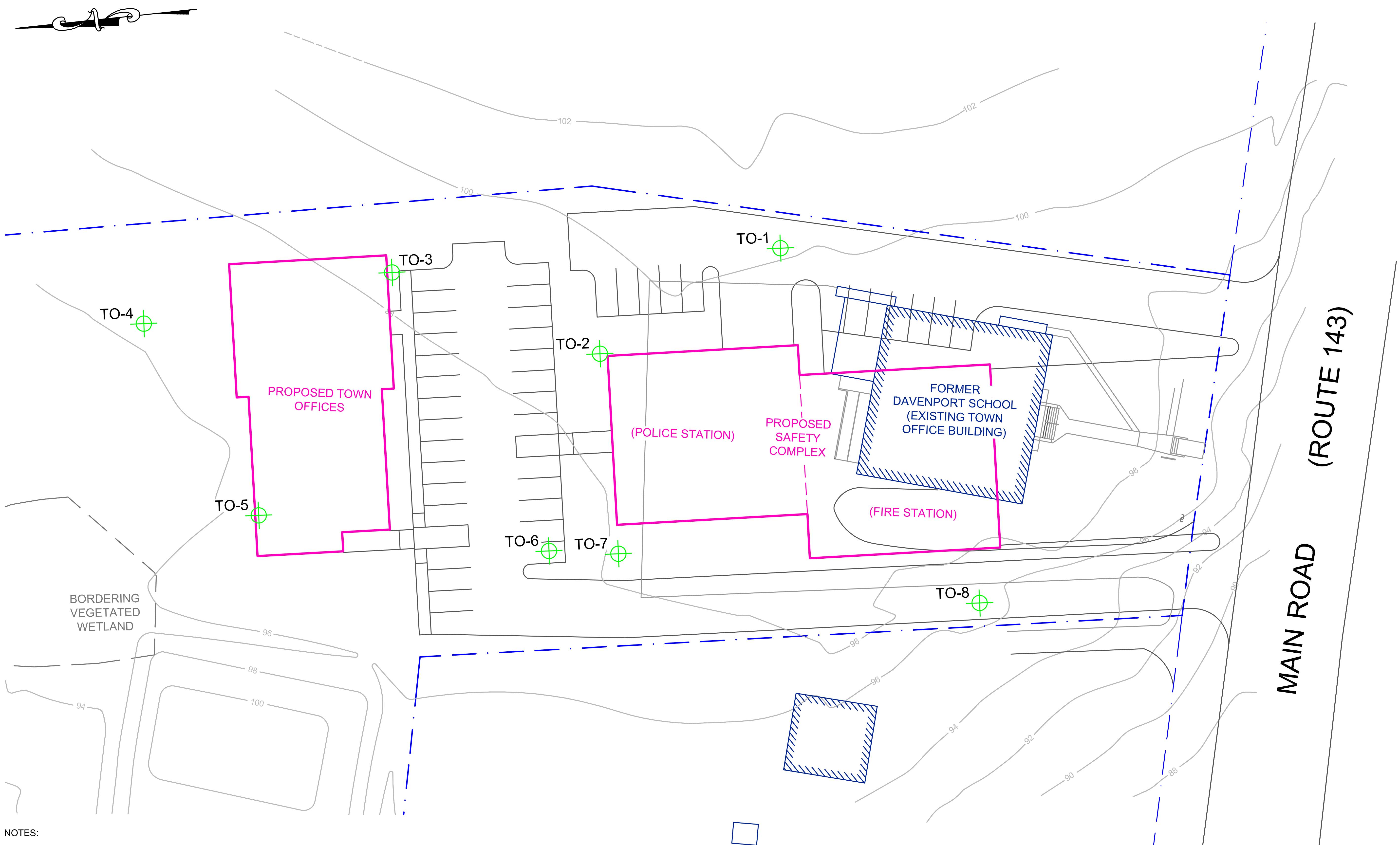
CHESTERFIELD SAFETY COMPLEX AND TOWN OFFICES
422 MAIN ROAD
CHESTERFIELD, MASSACHUSETTS

SITE LOCUS

Topographic Map Quadrant: GOSHEN, MA
Map Version: 1997
Current As Of: 2000
Date: JULY 2017

PROJECT No.
J1824-06-01

FIGURE No.
1



NOTES:

1. BASE PLANS PROVIDED TO OTO IN ELECTRONIC FORMAT BY ROY S. BROWN ARCHITECTS; ORIGINAL PLANS TITLED "SITE PLAN - EXISTING AND SITE PLAN - OPTION F", DATED 5/3/2017.
2. SAMPLE LOCATIONS ARE SHOWN ACCORDING TO TAPED MEASUREMENTS TAKEN FROM EXISTING SITE FEATURES.
3. ALL DATA IS TO BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD(S) USED IN THE DEVELOPMENT OF THIS PLAN.

LEGEND:

⊕ SOIL BORINGS PERFORMED BY SEABOARD DRILLING ON 7/6 AND 7/7/2017, OBSERVED BY OTO

SCALE IN FEET
1" = 50'
0' 25' 50' 100'

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PROJECT No.: J1824-06-01
DESIGNED BY: DAH
DRAWN BY: CRL
CHECKED BY: ALS
DATE: JULY 2017
REV. DATE:

PUBLIC SAFETY COMPLEX & TOWN OFFICES
422 MAIN ROAD
CHESTERFIELD, MASSACHUSETTS

SITE PLAN

FIGURE No.
2

O:\J1800\1824 Roy S Brown Architects\06-01 Chesterfield Public Safety\CAD\Safety Complex & Town Office 1824-06-01.dwg

Table 1-1
Degree of Compaction Recommendations

Location	Minimum Compaction
Below Structures (Foundations and Slabs)	95%
Below Pavements/Sidewalks/Exterior Slabs	95%
Against Basement Walls/Retaining Walls	92%
Utility Trenches	95%
General Landscaped Areas	90%

Notes.
1. Percentage of the maximum dry density as determined by Modified Proctor ASTM D1557, Method C.
2. When location falls into two or more categories, the engineer should be notified to determine appropriate compaction efforts and/or methods.
3. Crushed stone should be compacted in lifts of 12 inches to form a dense matrix using either traditional compaction methods (vibratory plate and/or roller) or tamping with an excavator bucket in deep excavations. It is generally not necessary to perform laboratory or field density testing on crushed stone.

Table 1-2
General Guidelines for Compaction Means and Methods

Compaction Method	Maximum Stone Size (Inches Diameter)	Maximum Lift Thickness (Inches)		Minimum Number of Passes	
		Below Structures & Pavement	Non-Critical Areas	Below Structures & Pavement	Non-Critical Areas
Hand-operated Vibratory Plate and confined spaces	3	6	8	6	4
Hand-operated vibratory drum roller (less than 1000 pounds)	3	6	8	6	4
Hand-operated vibratory drum roller (at least 1,000 pounds)	6	8	10	6	4
Light vibratory drum roller (minimum 3000 pounds)	6	10	14	6	4
Heavy vibratory drum roller (minimum 6000 pounds)	6	12	18	6	4

Note: The contractor should reduce or stop drum vibration if pumping of the subgrade is observed.

O:\J1800\1824 Roy S Brown Architects\06-01 Chesterfield Public Safety\Figures\Sheet 1 - Compaction 1824-06-01.pdf

NO SCALE

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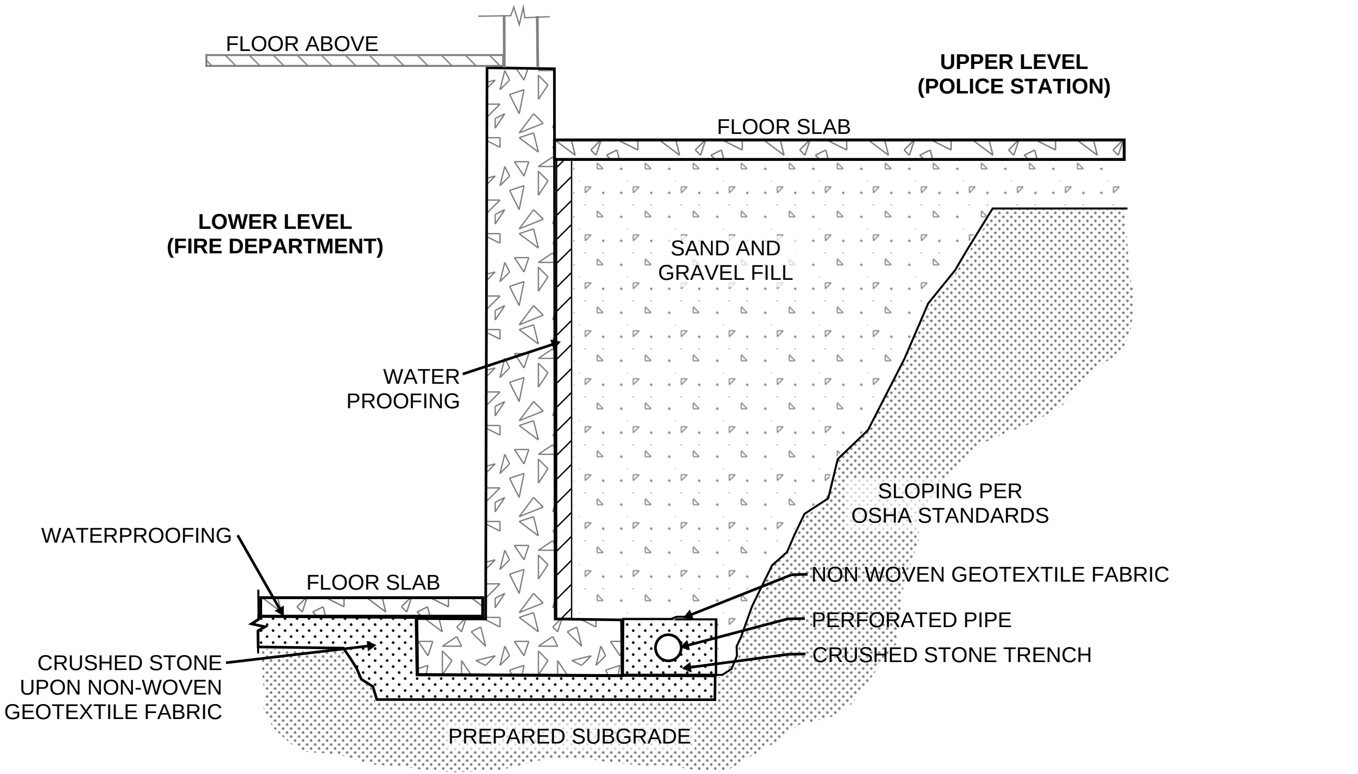
CHESTERFIELD, MASSACHUSETTS

GENERAL COMPACTION GUIDELINES

DESIGNED BY: ALS
DRAWN BY: CRL
CHECKED BY: MJT
DATE: 7/7/2017
REV. DATE: 7/10/2017

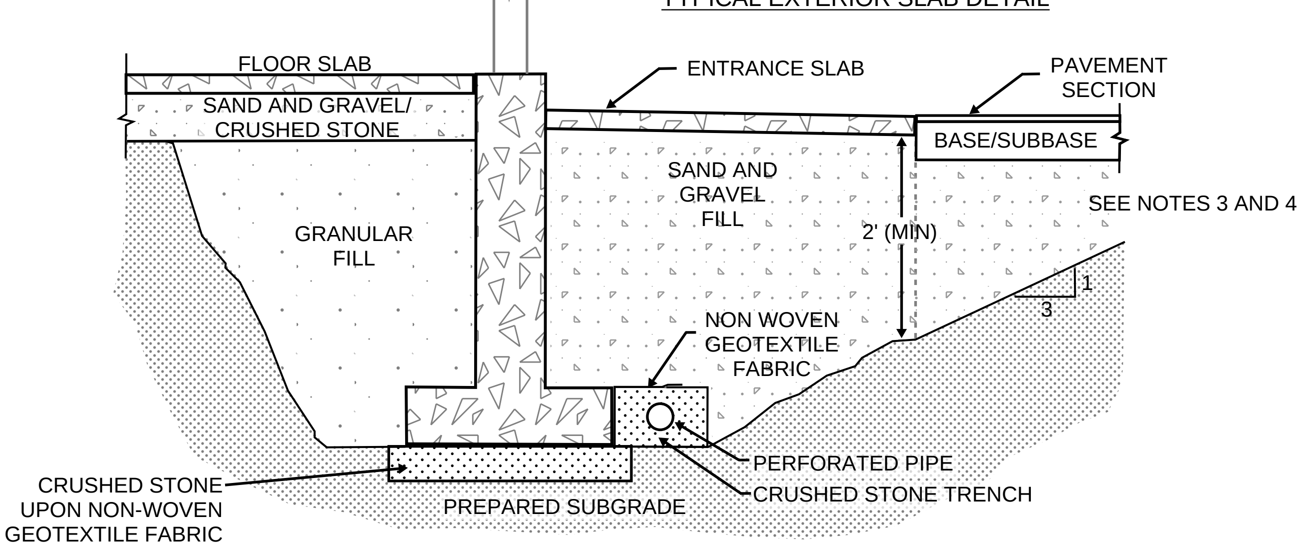
PROJECT No.
J1824-06-01

SHEET No.
1



TYPICAL FOUNDATION SECTION - UNDERDRAIN SYSTEM
BASEMENT FOUNDATION, ENTRANCE SLAB

TYPICAL EXTERIOR SLAB DETAIL



TYPICAL FOUNDATION SECTION - NATURAL SOIL SUPPORT
SLAB ON GRADE FOOTING, ENTRANCE SLAB

NOTES:

1. NOT FOR CONSTRUCTION, FOR ILLUSTRATION PURPOSES ONLY
2. FOR ADDITIONAL INFORMATION, REFER TO OTO's GEOTECHNICAL REPORT DATED JULY 2017
3. UNPAVED AREAS SHALL INCLUDE LOAM CAP AND SHOULD BE GRADED TO DIRECT SURFACE FLOW AWAY FROM BUILDING
4. PERMEABLE BACKFILL SHALL BE USED IN AREAS WITH UNDERDRAIN SYSTEMS

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TYPICAL FOUNDATION SECTION

DESIGNED BY: ALS
DRAWN BY: DAH
CHECKED BY: MJT
DATE: 11/9/2016
REV. DATE: 7/10/2017

PROJECT No.
J1824-06-01

SHEET No.
2

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BORING LOGS

SUMMARY OF THE BURMISTER SOIL CLASSIFICATION SYSTEM (MODIFIED)

RELATIVE DENSITY (of nonplastic soils) OR CONSISTENCY (of plastic soils)

STANDARD PENETRATION TEST (SPT)
Method: Samples were collected in accordance with ASTM D1586-99, using a 2" diameter split spoon sampler driven 24 inches. If samples were collected using direct push methodology (geoprobe), SPTs were not performed and relative density/consistency were not reported. **N-Value**: The number of blows with a 140 lb. hammer required to drive the sampler the middle 12 inches. **WOR**: Weight Of Rod (depth dependent) **WOH**: Weight Of Hammer (140 lbs.)

COHESIONLESS SOILS		COHESIVE SOILS	
BLOWS/FOOT (SPT N-Value)	RELATIVE DENSITY	BLOWS/FOOT (SPT N-Value)	CONSISTENCY
0-4	Very loose	<2	Very soft
4-10	Loose	2-4	Soft
10-30	Medium dense	4-8	Medium
30-50	Dense	8-15	Stiff
>50	Very dense	15-30	Very stiff
*Based upon uncorrected field N-values		>30	Hard

MATERIAL: (major constituent identified in CAPITAL letters)

COHESIONLESS SOILS		
MATERIAL	FRACTION	GRAIN SIZE RANGE
GRAVEL	Coarse	3/4" to 3"
	Fine	1/4" to 3/4"
SAND	Coarse	1/16" to 1/4"
	Medium	1/64" to 1/16"
	Fine	Finest visible & distinguishable particles
SILT/CLAY	see adjacent table	Cannot distinguish individual particles
COBBLES	3" to 6" in diameter	
BOULDERS	> 6" in diameter	
Note: Boulders and cobbles are observed in test pits and/or auger cuttings.		

COHESIVE SOILS		
SMALLEST DIAMETER	PLASTICITY	IDENTITY
None	Nonplastic	**SILT**
1/4" (pencil)	Slight	**Clayey SILT**
1/8"	Low	**SILT & CLAY**
1/16"	Medium	**CLAY & SILT**
1/32"	High	**Silty CLAY**
1/64"	Very High	**CLAY**
Wetted sample is rolled in hands to smallest possible diameter before breaking.		

ORGANIC SILT: Typically gray to dark gray, often has strong H2S odor. May contain shells or shell fragments. Light weight.
Fibrous PEAT: Light weight, spongy, mostly visible organic matter, water squeezed readily from sample. Typically near top of layer.
Fine grained PEAT: Light weight, spongy, little visible organic matter, water squeezed from sample. Typically below fibrous peat.
DEBRIS: Detailed contents described in parentheses (wood, glass, ash, crushed brick, metal, etc.)
BEDROCK: Underlying rock beneath loose soil, can be weathered (easily crushed) or competent (difficult to crush).

ADDITIONAL CONSTITUENTS

TERM	% OF TOTAL
and	35-50%
some	20-35%
little	10-20%
trace	1-10%

COMMON TERMS

Glacial till: Very dense/hard, heterogeneous mixture of sand, silt, clay, sub-angular gravel. Deposited at base of glaciers, which covered all of New England.

Varved clay: Fine-grained, post-glacial lake sediments characterized by alternating layers (or varves) of silt, sand and clay.

Fill: Material used to raise ground, can be engineered or non-engineered.

COMMON FIELD MEASUREMENTS

Torvane: Undrained shear strength is estimated using an E285 Pocket Torvane (TV). Values in tons/ft^2.

Penetrometer: Unconfined compressive strength is estimated using a Pocket Penetrometer (PP). Values in tons/ft^2.

RQD: Rock Quality Designation is determined by measuring total length of pieces of core 4" or greater and dividing by the total length of the run, expressed as %. 100-90% excellent; 90-75% good; 75-50% fair; 50-25% poor; 25-0% very poor.

PID: Soil screened for volatile organic compounds (VOCs) using a photoionization detector (PID) referenced to benzene in air. Readings in parts per million by volume.

O'Reilly, Talbot & Okun
ENGINEERING ASSOCIATES

LOG OF BORING TO-1

PROJECT	Chesterfield Safety Complex and Town Offices			CONTRACTOR	Seaboard Environmental Drilling				
JOB NUMBER	1824-06-01	FINAL DEPTH (ft)	19.6	DRILLING EQUIPMENT	B-53 Truck Mounted Rig				
LOCATION	Chesterfield, MA	SURFACE ELEV (ft)	100.0	FOREMAN	Mike	CASING			
START DATE	7/6/2017	DISTURBED SAMPLES	5	HELPER	Al	CASE DIAMETER	N/A		
FINISH DATE	7/6/2017	UNDISTURBED SAMPLES	0	BIT TYPE	Hollow Stem Auger	HAMMER WGT	N/A		
ENGINEER/SCIENTIST	Dustin Humphrey	WATER LEVEL		ROD TYPE	A (1 5/8" O.D.)	HAMMER DROP	N/A		
BORING LOCATION	East of proposed safety complex	FIRST (ft)	3.5	SAMPLER	2" O.D. Split Spoon	ROCK CORING INFORMATION			
		LAST (ft)	5.8	HAMMER TYPE	Safety	TYPE	N/A		
		TIME (hr)	3.00	HAMMER WGT/DROP	140 lb / 30" Wire Line	SIZE	N/A		

DEPTH (ft)/ SAMPLES	SAMPLES: PENETR. RESIST. (bl / 6 in)	REC. (in)	TYPE/ NO.	USCS & TEST DATA	SAMPLE DESCRIPTION (MODIFIED BURMISTER)	PROFILE DEPTH (ft) ELEV.	REMARKS/ WELL CONSTRUCTION
0	2/4/4/7	20/24	S-1 (0-2')	SP-SM SM 0.0 ppm	Top 1": Loose, dark brown, fine SAND, little silt, trace organics (roots), damp (TOPSOIL) Bottom 19": Loose, gray-brown to light brown, fine SAND and SILT, trace organics (roots), damp (approximately 10% rust mottling in top 6")	TOPSOIL / FINE SAND AND SILT	
2	23/26/26/28	22/24	S-2 (2-4')	SM 0.0 ppm	Very dense, gray-brown, fine SAND and SILT, little medium to coarse sand, trace (+) fine gravel, moist (bottom 3" wet)		
5'							1
	11/11/12/20	24/24	S-3 (5-7')	SM 0.0 ppm	Medium dense, gray-brown, fine SAND and SILT, little medium to coarse sand, trace (+) fine gravel, wet (2" layer of medium sand, trace silt near center)	▽ 94.2	
10'	9/11/11/27	20/24	S-4 (10-12')	SM 0.0 ppm	Medium dense, gray, fine SAND and SILT, little to some medium to coarse sand, trace fine gravel, wet	12.0 88.0 / GLACIAL TILL	2
							1
15'	23/13/24/38	22/24	S-5 (15-17')	SM 0.0 ppm	Dense, gray, fine SAND and SILT, some medium to coarse sand, trace (-) fine gravel, moist (TILL)		
20'	50 for 1"	0/1	S-6 (19.5 -19.6')	--	NO RECOVERY	19.6 80.4	3
					Auger refusal at 19.6' upon very dense till		
25'							

Remarks:
1. Auger grinding at 4.5' and from 14-15' below ground surface.
2. Drilling slow, beginning at 12'.
3. Spoon bouncing during sample S-6.
4. Bore hole collapsed at 13.5' prior to final water level reading.
5. Soil screened in field using MiniRAE Lite photoionization detector (PID) referenced to benzene in air. Readings in parts per million by volume.

PROJECT NO. 1824-06-01

LOG OF BORING TO-1

O'Reilly, Talbot & Okun
ENGINEERING ASSOCIATES

LOG OF BORING TO-2

PROJECT	Chesterfield Safety Complex and Town Offices			CONTRACTOR	Seaboard Environmental Drilling
JOB NUMBER	1824-06-01	FINAL DEPTH (ft)	15.5	DRILLING EQUIPMENT	B-53 Truck Mounted Rig
LOCATION	Chesterfield, MA	SURFACE ELEV (ft)	99.0	FOREMAN	Mike
START DATE	7/6/2017	DISTURBED SAMPLES	6	HELPER	Al
FINISH DATE	7/6/2017	UNDISTURBED SAMPLES	0	BIT TYPE	Hollow Stem Auger
ENGINEER/SCIENTIST	Dustin Humphrey	WATER LEVEL		ROD TYPE	A (1 5/8" O.D.)
BORING LOCATION	Northeast corner of proposed safety complex	FIRST (ft)	5.0	SAMPLER	2" O.D. Split Spoon
		LAST (ft)	--	HAMMER TYPE	Safety
		TIME (hr)	--	HAMMER WGT/DROP	140 lb / 30" Wire Line

CASING	
CASE DIAMETER	N/A
HAMMER WGT	N/A
HAMMER DROP	N/A
ROCK CORING INFORMATION	
TYPE	N/A
SIZE	N/A

DEPTH (ft)/ SAMPLES	PENETR. RESIST. (bl / 6 in)	REC. (in)	TYPE/ NO.	USCS & TEST DATA	SAMPLE DESCRIPTION (MODIFIED BURMISTER)	PROFILE DEPTH (ft) ELEV.	REMARKS/ WELL CONSTRUCTION
			S-1		3" Asphalt pavement	ASPHALT	
	--	--	(0.5-1')	SP-SM	From cuttings: Light brown, fine to medium SAND, some gravel, little silt, damp (BASE)	BASE COURSE	1
	15/22/11/16	14/24	S-2	SP-SM	Top 4": Dense, very light brown, fine to medium SAND, some gravel, little silt, damp (BASE)	1.5 97.5	
			(1-3')	--	Middle 2": Dense, black, DEBRIS (asphalt), damp	DEBRIS	
				SM 0.9 ppm	Bottom 8": Dense, light brown, fine SAND and SILT, moist	FINE SAND AND SILT	
	19/19/19/19	20/24	S-3 (3-5')	SM 0.2 ppm	Dense, gray-brown, fine SAND and SILT, little medium to coarse sand, trace fine gravel, moist (approximately 20% rust mottling)		
5'						▽ 94.0	
	6/8/12/13	20/24	S-4 (5-7')	SM 0.0 ppm	Medium dense, gray-brown, fine SAND and SILT, little medium to coarse sand, trace (+) fine gravel, wet		
10'						10.0 89.0	
	10/15/23/26	18/24	S-5 (10-12')	SM 0.0 ppm	Dense, gray-brown, fine SAND and SILT, little medium to coarse sand, trace (+) fine gravel, moist (TILL)	GLACIAL TILL	
							2, 3
15'	50 for 4"	4/4	S-6 (15-15.3')	SM 0.5 ppm	Very dense, gray, fine SAND and SILT, little to some medium to coarse sand, little to trace fine gravel, wet (TILL)	15.5 83.5	3, 4
					Auger refusal at 15.5' upon likely boulder		
20'							
25'							

Remarks:
1. PID reading for sample S-1: 0.2 ppm.
2. Drilling slow, beginning at 12' below ground surface.
3. Auger grinding from 12-13' and 15-15.5'.
4. Spoon bouncing during sample S-6.
5. Soil screened in field using MiniRAE Lite photoionization detector (PID) referenced to benzene in air. Readings in parts per million by volume.

PROJECT NO. **1824-06-01**

LOG OF BORING **TO-2**

O'Reilly, Talbot & Okun
ENGINEERING ASSOCIATES

LOG OF BORING TO-3

PROJECT	Chesterfield Safety Complex and Town Offices			CONTRACTOR	Seaboard Environmental Drilling		
JOB NUMBER	1824-06-01	FINAL DEPTH (ft)	16.5	DRILLING EQUIPMENT	B-53 Truck Mounted Rig		
LOCATION	Chesterfield, MA	SURFACE ELEV (ft)	99.0	FOREMAN	Mike	CASING	
START DATE	7/6/2017	DISTURBED SAMPLES	5	HELPER	Al	CASE DIAMETER	N/A
FINISH DATE	7/6/2017	UNDISTURBED SAMPLES	0	BIT TYPE	Hollow Stem Auger	HAMMER WGT	N/A
ENGINEER/SCIENTIST	Dustin Humphrey	WATER LEVEL		ROD TYPE	A (1 5/8" O.D.)	HAMMER DROP	N/A
BORING LOCATION	Southeast corner of proposed town office building	FIRST (ft)	2.5	SAMPLER	2" O.D. Split Spoon	ROCK CORING INFORMATION	
		LAST (ft)	5.2	HAMMER TYPE	Safety	TYPE	N/A
		TIME (hr)	21.50	HAMMER WGT/DROP	140 lb / 30" Wire Line	SIZE	N/A

DEPTH (ft)/ SAMPLES	SAMPLES: PENETR. RESIST. (bl / 6 in)	REC. (in)	TYPE/ NO.	USCS & TEST DATA	SAMPLE DESCRIPTION (MODIFIED BURMISTER)	PROFILE DEPTH (ft) ELEV.	REMARKS/ WELL CONSTRUCTION
0-2'	2/7/12/17	24/24	S-1 (0-2')	SP-SM SM 0.3 ppm SM	Top 4": Medium dense, dark brown, fine SAND, little silt, trace organics (roots), moist (TS) Middle 10": Medium dense, light brown, fine SAND, some silt, trace (-) organics (roots), moist Bottom 10": Medium dense, gray-brown, fine SAND and SILT, little medium to coarse sand, moist	TOPSOIL FINE SAND AND SILT	
2-4'	30/31/22/17	18/24	S-2 (2-4')	SM 0.1 ppm	Very dense, gray-brown, fine SAND and SILT, some medium to coarse sand, little to trace fine gravel, wet (approximately 10% rust mottling)		
5'	6/11/13/18/	24/24	S-3 (5-7')	SM 0.0 ppm	Medium dense, gray-brown, fine SAND and SILT, little medium to coarse sand, trace (+) fine gravel, wet	▽ 93.8	
10'	11/16/24/36	20/24	S-4 (10-12')	SM 0.1 ppm	Dense, gray, fine SAND and SILT, little to some medium to coarse sand, little to trace fine gravel, moist (TILL)	10.0 89.0 GLACIAL TILL	1
							2
15'	12/21/ 50 for 5"	10/17	S-5 (15-16.4')	SM 0.0 ppm	Very dense, gray, fine SAND and SILT, some medium to coarse sand, little to trace silt, trace fine gravel, trace clay, moist (TILL)	16.5 82.5	
					Auger refusal at 16.5' upon very dense till		
20'							
25'							

Remarks:
1. Drilling slow, beginning at 10' below ground surface.
2. Very wet cuttings from 14-15'.
3. Bore hole collapsed at 7' prior to final water level reading.
4. Soil screened in field using MiniRAE Lite photoionization detector (PID) referenced to benzene in air. Readings in parts per million by volume.

PROJECT NO. 1824-06-01

LOG OF BORING TO-3

O'Reilly, Talbot & Okun
ENGINEERING ASSOCIATES

LOG OF BORING TO-4

PROJECT	Chesterfield Safety Complex and Town Offices			CONTRACTOR	Seaboard Environmental Drilling
JOB NUMBER	1824-06-01	FINAL DEPTH (ft)	18.0	DRILLING EQUIPMENT	B-53 Truck Mounted Rig
LOCATION	Chesterfield, MA	SURFACE ELEV (ft)	97.5	FOREMAN	Mike
START DATE	7/6/2017	DISTURBED SAMPLES	5	HELPER	Al
FINISH DATE	7/6/2017	UNDISTURBED SAMPLES	0	BIT TYPE	Hollow Stem Auger
ENGINEER/SCIENTIST	Dustin Humphrey	WATER LEVEL		ROD TYPE	A (1 5/8" O.D.)
BORING LOCATION	Northeast corner of proposed town office building	FIRST (ft)	5.0	SAMPLER	2" O.D. Split Spoon
		LAST (ft)	--	HAMMER TYPE	Safety
		TIME (hr)	--	HAMMER WGT/DROP	140 lb / 30" Wire Line

CASING	
CASE DIAMETER	N/A
HAMMER WGT	N/A
HAMMER DROP	N/A
ROCK CORING INFORMATION	
TYPE	N/A
SIZE	N/A

DEPTH (ft)/ SAMPLES	PENETR. RESIST. (bl / 6 in)	REC. (in)	TYPE/ NO.	USCS & TEST DATA	SAMPLE DESCRIPTION (MODIFIED BURMISTER)	PROFILE DEPTH (ft) ELEV.	REMARKS/ WELL CONSTRUCTION
0	2/3/7/17	18/24	S-1 (0-2')	SP-SM SM SM 0.0 ppm	Top 4": Loose, dark brown, fine SAND, little silt, little organics (roots), moist (TOPSOIL) Middle 6": Loose, light brown, fine SAND and SILT, trace (+) organics (roots), moist Bottom 8": Loose, gray-brown, fine SAND and SILT, little medium to coarse sand, trace (-) organics (roots), moist (TILL)	TOPSOIL FINE SAND & SILT GLACIAL TILL	
2	27/33/16/16	16/24	S-2 (2-4')	SM 0.0 ppm	Dense, gray-brown, fine SAND and SILT, little medium to coarse sand, trace (+) fine gravel, moist (TILL)		
5'	14/16/18/20	20/24	S-3 (5-7')	SM 0.0 ppm	Dense, gray-brown, fine SAND and SILT, little medium to coarse sand, trace fine gravel, wet (TILL)	▽ 92.5	1
							2
10'	10/13/21/25	14/24	S-4 (10-12')	SM 0.0 ppm	Dense, gray-brown, fine SAND and SILT, trace medium to coarse sand, moist (2" layer of medium to coarse sand and fractured rock near bottom; TILL)		
15'	12/17/22/35	20/24	S-5 (15-17')	SM 0.0 ppm	Dense, dark gray, fine SAND and SILT, little medium to coarse sand, trace fine gravel, moist (TILL)	18.0 79.5	
					Auger refusal at 18' upon very dense till		
20'							
25'							

Remarks:
1. Drilling slow, beginning at 6' below ground surface.
2. Auger grinding at 9'.
3. Soil screened in field using MiniRAE Lite photoionization detector (PID) referenced to benzene in air. Readings in parts per million by volume.

PROJECT NO. 1824-06-01

LOG OF BORING TO-4

LOG OF BORING TO-5

PROJECT	Chesterfield Safety Complex and Town Offices			CONTRACTOR	Seaboard Environmental Drilling		
JOB NUMBER	1824-06-01	FINAL DEPTH (ft)	17.5	DRILLING EQUIPMENT	B-53 Truck Mounted Rig		
LOCATION	Chesterfield, MA	SURFACE ELEV (ft)	96.5	FOREMAN	Mike	CASING	
START DATE	7/6/2017	DISTURBED SAMPLES	4	HELPER	Al	CASE DIAMETER	N/A
FINISH DATE	7/6/2017	UNDISTURBED SAMPLES	0	BIT TYPE	Hollow Stem Auger	HAMMER WGT	N/A
ENGINEER/SCIENTIST	Dustin Humphrey	WATER LEVEL		ROD TYPE	A (1 5/8" O.D.)	HAMMER DROP	N/A
BORING LOCATION	Northwest corner of proposed town office building	FIRST (ft)	5.0	SAMPLER	2" O.D. Split Spoon	ROCK CORING INFORMATION	
		LAST (ft)	--	HAMMER TYPE	Safety	TYPE	N/A
		TIME (hr)	--	HAMMER WGT/DROP	140 lb / 30" Wire Line	SIZE	N/A

DEPTH (ft)/ SAMPLES	SAMPLES: PENETR. RESIST. (bl / 6 in)	REC. (in)	TYPE/ NO.	USCS & TEST DATA	SAMPLE DESCRIPTION (MODIFIED BURMISTER)	PROFILE DEPTH (ft) ELEV.	REMARKS/ WELL CONSTRUCTION
0	2/3/7/13	22/24	S-1 (0-2')	SP-SM SM SM 0.5 ppm	Top 4": Loose, dark brown, fine SAND, little silt, little organics (roots), moist (TOPSOIL) Middle 8": Loose, brown, fine SAND and SILT, little organics (roots), moist Bottom 10": Loose, gray-brown, fine SAND and SILT, little medium to coarse sand, moist (approximately 20% rust mottling; TILL)	TOPSOIL FINE SAND & SILT GLACIAL TILL	
2	17/18/20/22	24/24	S-2 (2-4')	SM 0.1 ppm	Dense, gray-brown, fine SAND and SILT, little to some medium to coarse sand, trace fine gravel, moist (TILL)		
5'	22/24/31/24	0/24	S-3 (5-7')	--	NO RECOVERY	▽ 91.5	
7–8.5							1 1 2
10'	14/12/21/32	20/24	S-4 (10-12')	SM 0.0 ppm	Dense, dark gray, fine SAND and SILT, little fine gravel, little medium to coarse sand, moist (TILL)		
15'	14/22/25/32	16/24	S-5 (15-17')	SM 0.0 ppm	Dense, dark gray, fine SAND and SILT, little fine gravel, little to trace medium to coarse sand, moist (TILL)	17.5 79.0	
20'					Auger refusal at 17.5' upon very dense till		
25'							

Remarks:
1. Auger grinding at 7' and 7.5' below ground surface.
2. Drilling slow, beginning at 8.5'.
3. Soil screened in field using MiniRAE Lite photoionization detector (PID) referenced to benzene in air. Readings in parts per million by volume.

PROJECT NO. 1824-06-01

LOG OF BORING TO-5

O'Reilly, Talbot & Okun
ENGINEERING ASSOCIATES

LOG OF BORING TO-6

PROJECT	Chesterfield Safety Complex and Town Offices			CONTRACTOR	Seaboard Environmental Drilling			
JOB NUMBER	1824-06-01	FINAL DEPTH (ft)	23.0	DRILLING EQUIPMENT	B-53 Truck Mounted Rig			
LOCATION	Chesterfield, MA	SURFACE ELEV (ft)	97.0	FOREMAN	Mike	CASING		
START DATE	7/7/2017	DISTURBED SAMPLES	5	HELPER	Al	CASE DIAMETER	N/A	
FINISH DATE	7/7/2017	UNDISTURBED SAMPLES	0	BIT TYPE	Hollow Stem Auger	HAMMER WGT	N/A	
ENGINEER/SCIENTIST	Dustin Humphrey	WATER LEVEL		ROD TYPE	A (1 5/8" O.D.)	HAMMER DROP	N/A	
BORING LOCATION	Southwest corner of proposed town office building	FIRST (ft)	5.0	SAMPLER	2" O.D. Split Spoon	ROCK CORING INFORMATION		
		LAST (ft)	--	HAMMER TYPE	Safety	TYPE	N/A	
		TIME (hr)	--	HAMMER WGT/DROP	140 lb / 30" Wire Line	SIZE	N/A	

DEPTH (ft)/ SAMPLES	PENETR. RESIST. (bl / 6 in)	REC. (in)	TYPE/ NO.	USCS & TEST DATA	SAMPLE DESCRIPTION (MODIFIED BURMISTER)	PROFILE DEPTH (ft)	PROFILE ELEV.	REMARKS/ WELL CONSTRUCTION
0	5/11/10/9	22/24	S-1 (0-2')	SP-SM	Top 2": Medium dense, dark brown, fine SAND, little silt, little organics (roots), damp (TS)	TOPSOIL		
				SM 0.0 ppm	Middle 18": Medium dense, gray-brown, fine SAND, some silt, trace (+) organics (roots), damp (FILL)	GRANULAR FILL		
				SP-SM	Bottom 2": Medium dense, brown, medium to coarse SAND, little silt, damp (FILL)			
2	9/53/16/26	14/24	S-2 (2-4')	SP-SM	Top 1": Very dense, brown, medium to coarse SAND, little silt, damp (FILL)	2.5	94.5	1
				SM --	Bottom 13": Very dense, gray-brown, fine SAND and SILT, trace (+) medium to coarse sand, damp (2" fractured rock near bottom; approximately 20% rust mottling; TILL)	GLACIAL TILL		2
5'	10/18/24/48	20/24	S-3 (5-7')	SM 0.0 ppm	Dense, gray-brown, fine SAND and SILT, little to trace fine gravel, trace medium to coarse sand, wet (approximately 20% rust mottling; 1" fractured rock at bottom; TILL)	▽ (water)	92.0	3
10'	18/22/25/32	22/24	S-4 (10-12')	SM 0.0 ppm	Dense, gray, fine SAND and SILT, little medium to coarse sand, trace fine gravel, moist (TILL)			4
15'	6/12/21/42	18/24	S-5 (15-17')	SM 0.0 ppm	Dense, gray, fine SAND and SILT, trace (+) fine gravel, trace (+) medium to coarse sand, moist (TILL)			
20'	23/23/29/42	14/24	S-6 (20-22')	SM 0.0 ppm	Very dense, gray, fine SAND and SILT, little to some medium to coarse sand, little to trace fine gravel, moist (TILL)	23.0	74.0	
					Auger refusal at 23' upon very dense till			
25'								

Remarks:
1. Sample S-2 was disposed of before soil was retained.
2. Ground heaving and auger grinding upon likely boulder at 3' below ground surface.
3. Drilling slow, beginning at 7'.
4. Auger grinding at 12.5'.
5. Soil screened in field using MiniRAE Lite photoionization detector (PID) referenced to benzene in air. Readings in parts per million by volume.

PROJECT NO. 1824-06-01

LOG OF BORING TO-6

O'Reilly, Talbot & Okun
ENGINEERING ASSOCIATES

LOG OF BORING TO-7

PROJECT	Chesterfield Safety Complex and Town Offices				CONTRACTOR	Seaboard Environmental Drilling			
JOB NUMBER	1824-06-01	FINAL DEPTH (ft)		12.5	DRILLING EQUIPMENT	B-53 Truck Mounted Rig			
LOCATION	Chesterfield, MA	SURFACE ELEV (ft)		98.5	FOREMAN	Mike	CASING		
START DATE	7/7/2017	DISTURBED SAMPLES		3	HELPER	Al	CASE DIAMETER	N/A	
FINISH DATE	7/7/2017	UNDISTURBED SAMPLES		0	BIT TYPE	Hollow Stem Auger	HAMMER WGT	N/A	
ENGINEER/SCIENTIST	Dustin Humphrey		WATER LEVEL		ROD TYPE	A (1 5/8" O.D.)	HAMMER DROP	N/A	
BORING LOCATION	Northwest corner of proposed safety complex		FIRST (ft)	5.0	SAMPLER	2" O.D. Split Spoon	ROCK CORING INFORMATION		
			LAST (ft)	--	HAMMER TYPE	Safety	TYPE	N/A	
			TIME (hr)	--	HAMMER WGT/DROP	140 lb / 30" Wire Line	SIZE	N/A	

DEPTH (ft)/ SAMPLES	SAMPLES: PENETR. RESIST. (bl / 6 in)	REC. (in)	TYPE/ NO.	USCS & TEST DATA	SAMPLE DESCRIPTION (MODIFIED BURMISTER)	PROFILE DEPTH (ft) ELEV.	REMARKS/ WELL CONSTRUCTION
0	5/9/7/5	10/24	S-1 (0-2')	SM 0.0 ppm SM	Top 3": Medium dense, dark brown, fine SAND, little to some silt, trace (+) organics (roots), moist (TOPSOIL) Bottom 7": Medium dense, brown, fine to medium SAND, little coarse sand, little to some silt, moist (FILL)	TOPSOIL; GRANULAR FILL; 2.0 96.5	
2	5/10/8/27	12/24	S-2 (2-4')	SM 0.0 ppm	Medium dense, light brown, fine SAND, some silt, trace medium to coarse sand, moist (approximately 10% rust mottling)	FINE SAND AND SILT; ▽ 93.5	
5'	50 for 1"	0/1	S-3 (5-5.1')	--	NO RECOVERY	GLACIAL TILL	1, 2, 3
10'	10/15/25/36	20/24	S-4 (10-12')	SM 0.0 ppm	Dense, gray-brown, fine SAND and SILT, little fine gravel, little medium to coarse sand, moist (TILL)	12.5 86.0	3
					Auger refusal at 12.5 upon likely boulder		
15'							
20'							
25'							

Remarks:
1. Spoon bouncing during sample S-3.
2. Drilling slow, beginning at 5' below ground surface.
3. Auger grinding at 5' and 9.5'.
4. Soil screened in field using MiniRAE Lite photoionization detector (PID) referenced to benzene in air. Readings in parts per million by volume.

PROJECT NO. **1824-06-01**

LOG OF BORING **TO-7**

O'Reilly, Talbot & Okun
ENGINEERING ASSOCIATES

LOG OF BORING TO-8

PROJECT	Chesterfield Safety Complex and Town Offices			CONTRACTOR	Seaboard Environmental Drilling
JOB NUMBER	1824-06-01	FINAL DEPTH (ft)	15.0	DRILLING EQUIPMENT	B-53 Truck Mounted Rig
LOCATION	Chesterfield, MA	SURFACE ELEV (ft)	97.0	FOREMAN	Mike
START DATE	7/7/2017	DISTURBED SAMPLES	4	HELPER	Al
FINISH DATE	7/7/2017	UNDISTURBED SAMPLES	0	BIT TYPE	Hollow Stem Auger
ENGINEER/SCIENTIST	Dustin Humphrey	WATER LEVEL		ROD TYPE	A (1 5/8" O.D.)
BORING LOCATION	Southwest corner of proposed safety complex	FIRST (ft)	4.0	SAMPLER	2" O.D. Split Spoon
		LAST (ft)	--	HAMMER TYPE	Safety
		TIME (hr)	--	HAMMER WGT/DROP	140 lb / 30" Wire Line

CASING	
CASE DIAMETER	N/A
HAMMER WGT	N/A
HAMMER DROP	N/A
ROCK CORING INFORMATION	
TYPE	N/A
SIZE	N/A

DEPTH (ft)/ SAMPLES	SAMPLES: PENETR. RESIST. (bl / 6 in)	REC. (in)	TYPE/ NO.	USCS & TEST DATA	SAMPLE DESCRIPTION (MODIFIED BURMISTER)	PROFILE DEPTH (ft) ELEV.	REMARKS/ WELL CONSTRUCTION
	4 / 50 for 2"	6/8	S-1 (0-0.6')	SP-SM 0.0 ppm	Very dense, brown, fine to medium SAND, some coarse sand, little organics (roots), little to trace silt, damp (FILL)	GRANULAR FILL	1, 2
	7/7/18/36	6/24	S-2 (2-4')	SP-SM 0.0 ppm SM	Top 3" Medium dense, brown, fine to medium SAND, some coarse sand, little silt, damp (FILL) Bottom 3": Medium dense, light brown, fine SAND, some silt, little organics (roots), damp	3.0 94.0 SILTY FINE SAND ▽ 93.0	
5'	19/35/24/25	20/24	S-3 (5-7')	SM 0.0 ppm	Very dense, gray-brown, fine SAND and SILT, some medium sand, trace fine gravel, moist (TILL)	5.0 92.0 GLACIAL TILL	3
10'	50 for 1"	1/1	S-4 (10-10.1')	SM 0.0 ppm	Very dense, gray, fine SAND and SILT, trace medium to coarse sand, moist (TILL)		4
						15.0 82.0	4
15'	50 for 0"	0/0	S-5 (15')	--	Auger refusal at 15' upon likely boulder		1
20'							
25'							

Remarks:
1. Spoon bouncing during samples S-1 and S-5.
2. Boulder (12" diameter by 3" thick) encountered at approximately 1' below ground surface.
3. Drilling slow, beginning at 6'.
4. Auger grinding from 10-11' and 14-15'.
5. Soil screened in field using MiniRAE Lite photoionization detector (PID) referenced to benzene in air. Readings in parts per million by volume.

PROJECT NO. 1824-06-01

LOG OF BORING TO-8

COMPILED FROM DRAWINGS BY REINHARDT ASSOCIATES, 430 MAIN STREET, AGAWAM, MA 01001 DATED MARCH 17, 2008 AND MASSACHUSETTS GIS MAPPING ONLINE RESOURCES.

SITE PLAN - OPTION K

1"=30'-0"

ROY S. BROWN ARCHITECTS
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WILBRAHAM, MA 01095
PH 413.596.2360
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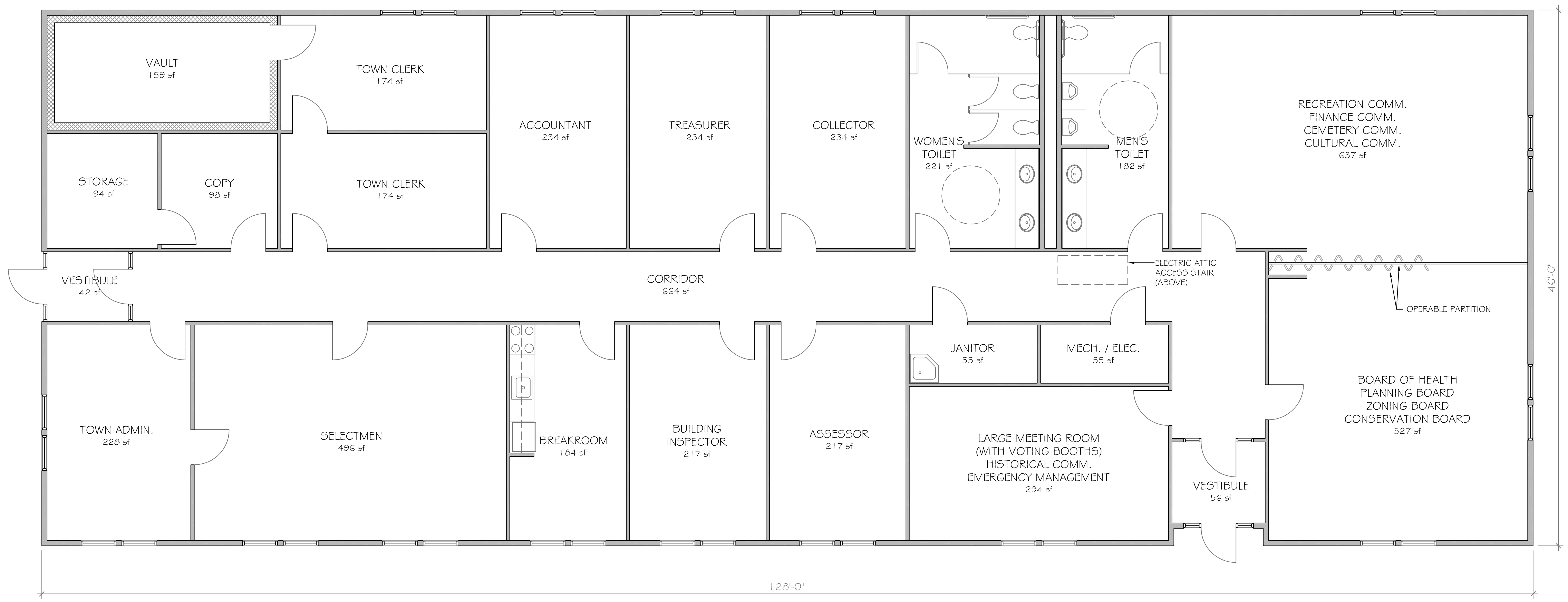
CHECK	REVISIONS	DATE
DRFTSN MPG		
PROJ. ARCH. RSB		
DATE: 07.09.18		
PROJECT No. 17-05-01		

FEASIBILITY STUDY
PUBLIC SAFETY COMPLEX/TOWN OFFICES
TOWN OF CHESTERFIELD
422 MAIN ROAD - ROUTE 143
CHESTERFIELD, MA 01012

SHEET C.1 OF 1



FLOOR PLAN
3/16"=1'-0"

TOTAL FOOTPRINT = 5,888 sf

ROY S. BROWN ARCHITECTS
85 CHILSON ROAD
WILBRAHAM, MA 01095
PH 413.596.2360
FAX 413.596.2360

REVISIONS	DATE

CHECK
DRFTSN MPG
PROJ. MNGR.
PROJ. ARCH. RSB
DATE: 07.09.18
PROJECT No. 17-08-01

TOWN OFFICES
TOWN OF CHESTERFIELD
422 MAIN ROAD
CHESTERFIELD, MA 01012

SHEET A.1 2 OF

SOUTH ELEVATION

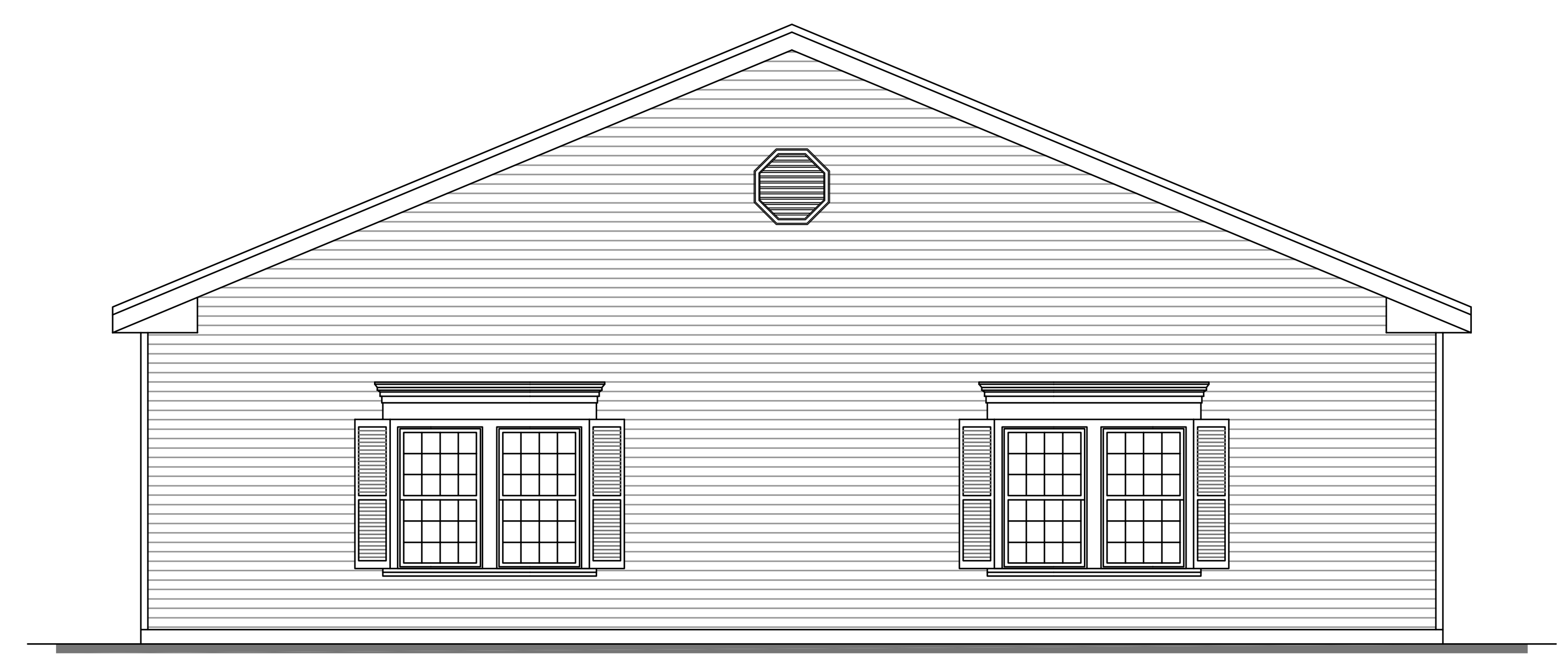
3/16"= 1'-0"

NORTH ELEVATION

3/16"= 1'-0"

WEST ELEVATION

3/16"= 1'-0"



EAST ELEVATION

3/16"= 1'-0"

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85 CHILSON ROAD
WILBRAHAM, MA 01095
PH 413.596.2360
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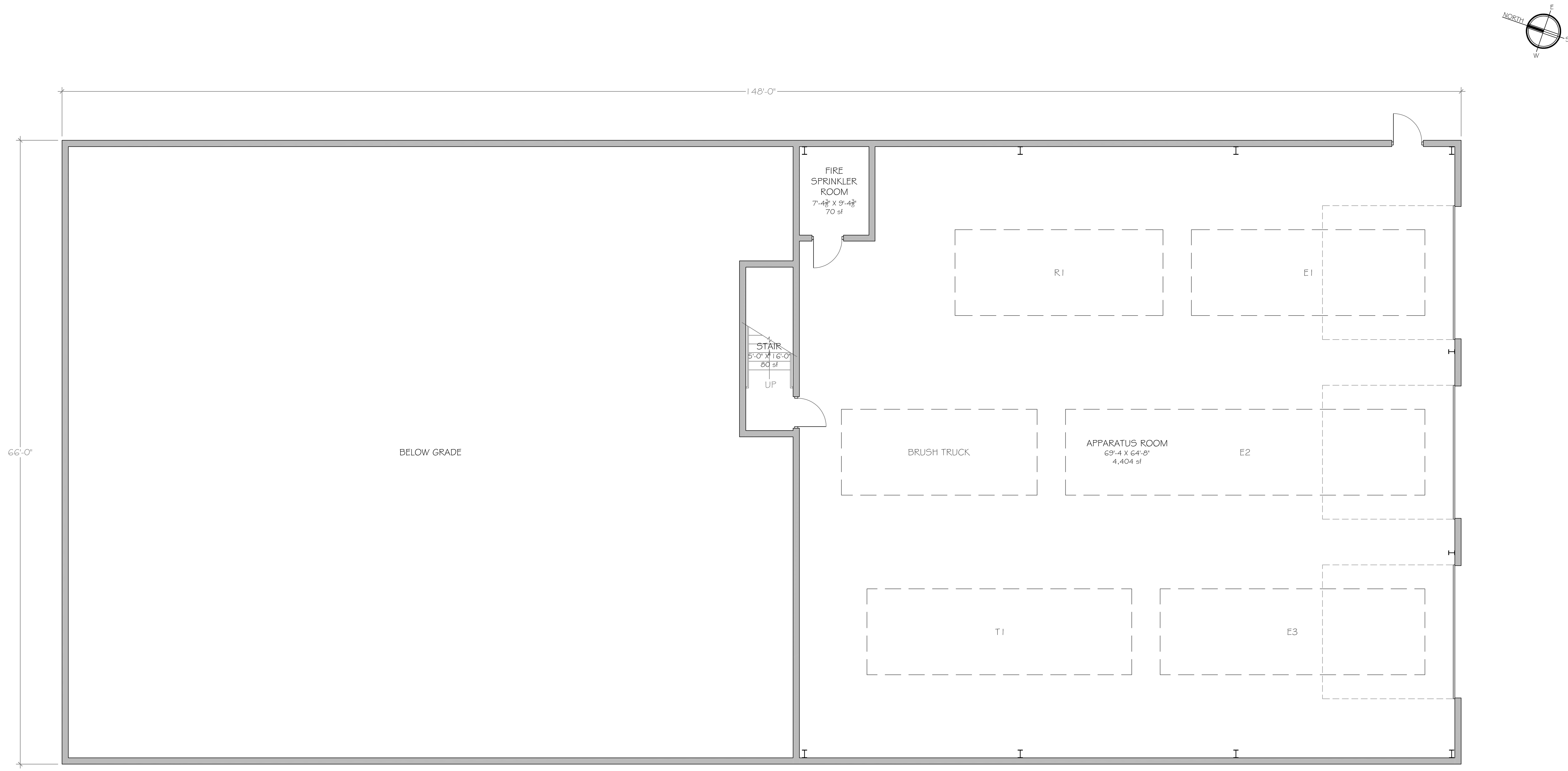
PROJECT No. 17-08-01		

TOWN OFFICES
TOWN OF CHESTERFIELD
422 MAIN ROAD
CHESTERFIELD, MA 01012

SHEET A.2 OF 2



FIRST FLOOR PLAN

3/16"=1'-0"

SEE SITE PLAN OPTION K

TOTAL FOOTPRINT = 9,768 sf

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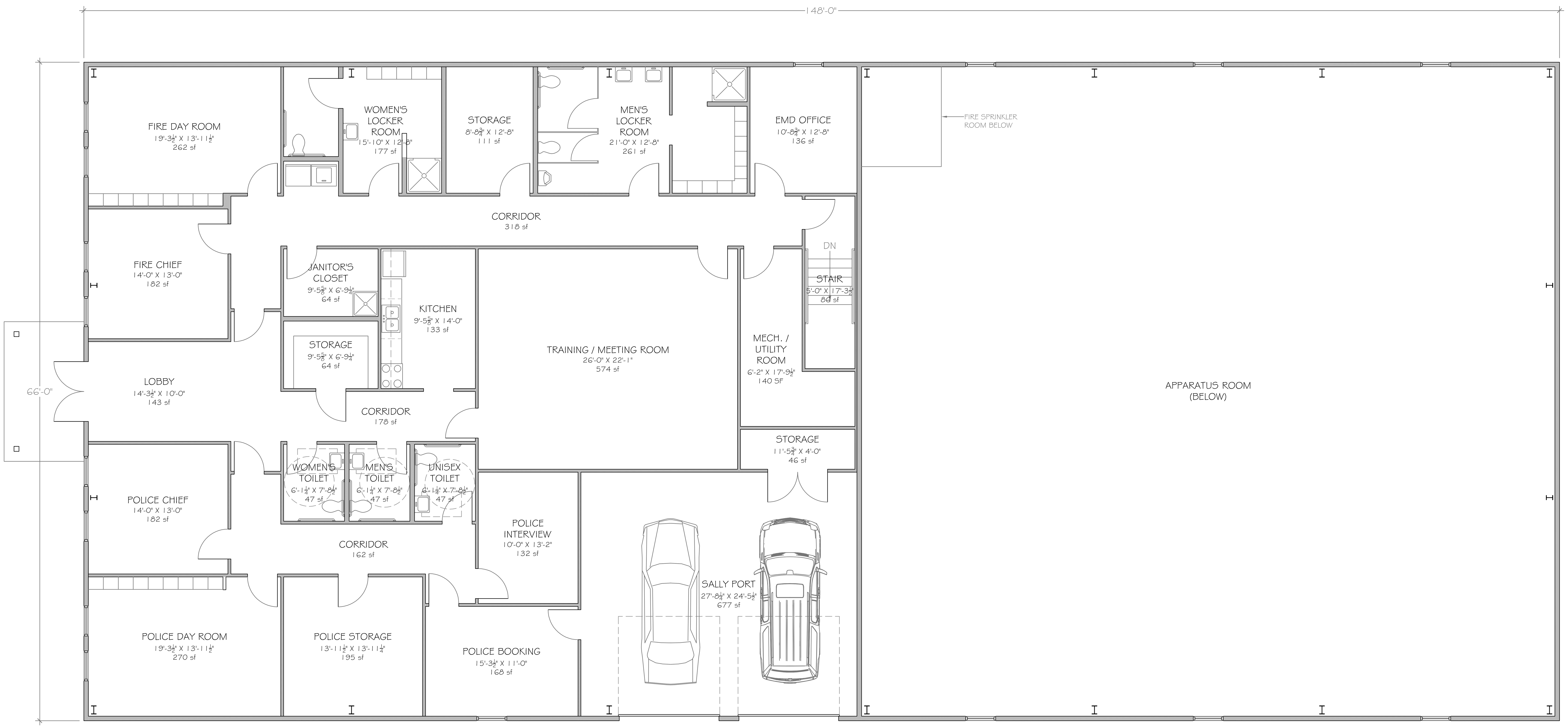
SAFETY COMPLEX
TOWN OF CHESTERFIELD
422 MAIN ROAD
CHESTERFIELD, MA 01012

SHEET A.1 OF 4



SECOND FLOOR PLAN

3/16" = 1'-0"

SEE SITE PLAN OPTION K

TOTAL FOOTPRINT = 9,768 sf

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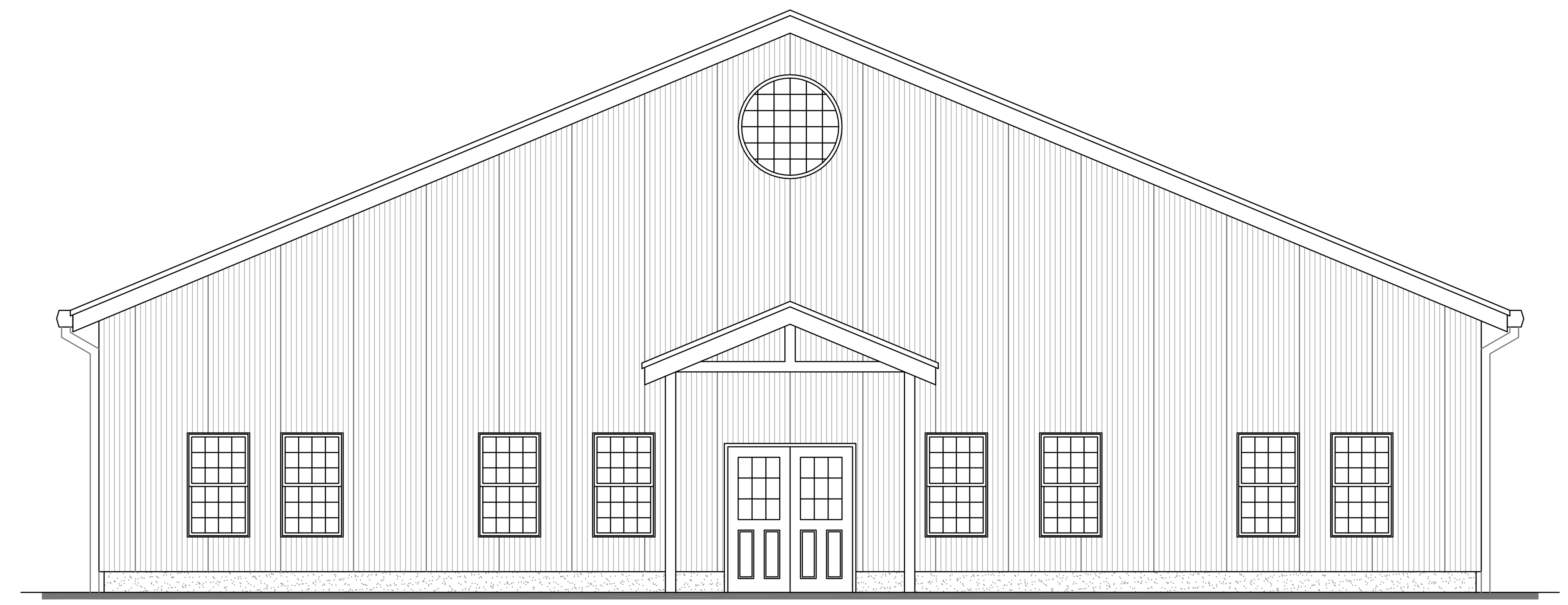
PROJECT No. 17-08-01		

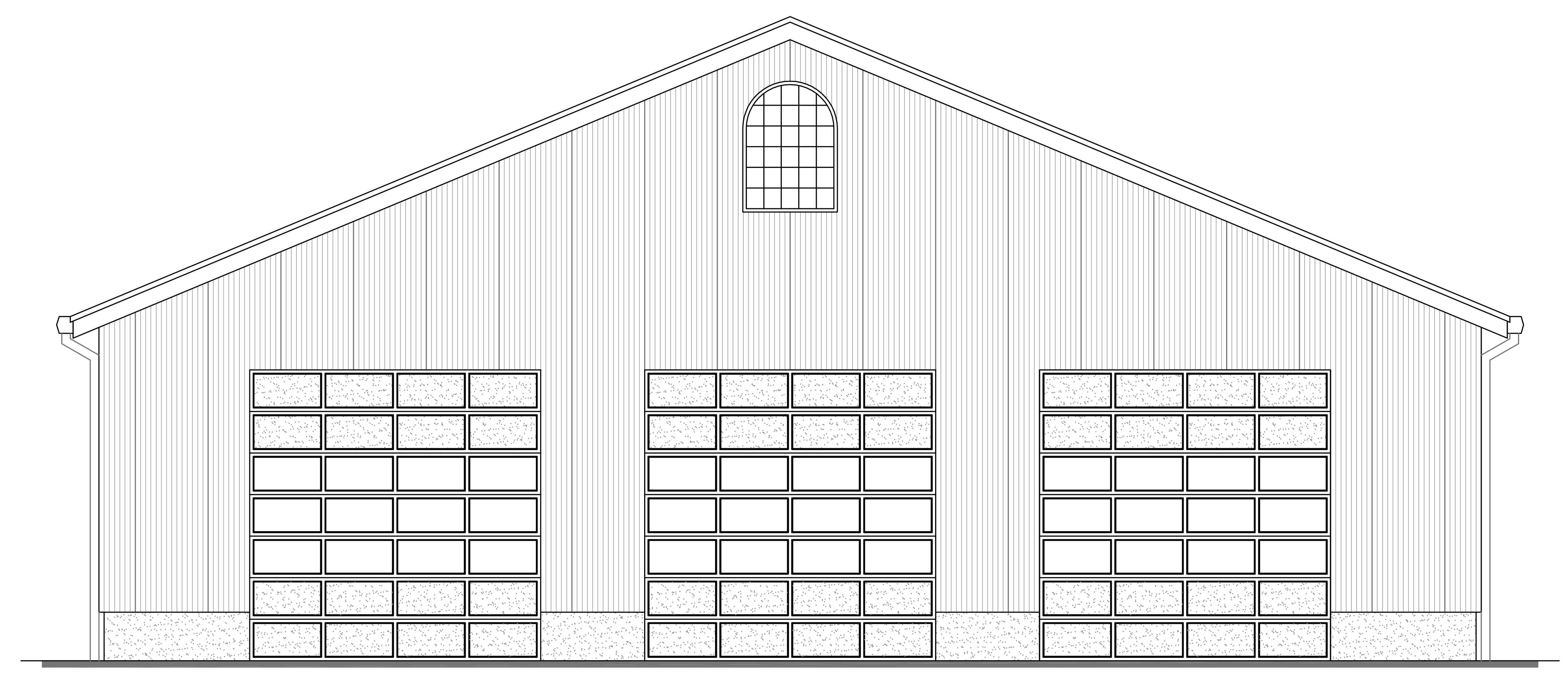
SAFETY COMPLEX
TOWN OF CHESTERFIELD
422 MAIN ROAD
CHESTERFIELD, MA 01012

SHEET A.2 OF 4



NORTH ELEVATION

3/16"= 1'-0"



SOUTH ELEVATION

3/16"= 1'-0"

SEE SITE PLAN OPTION K

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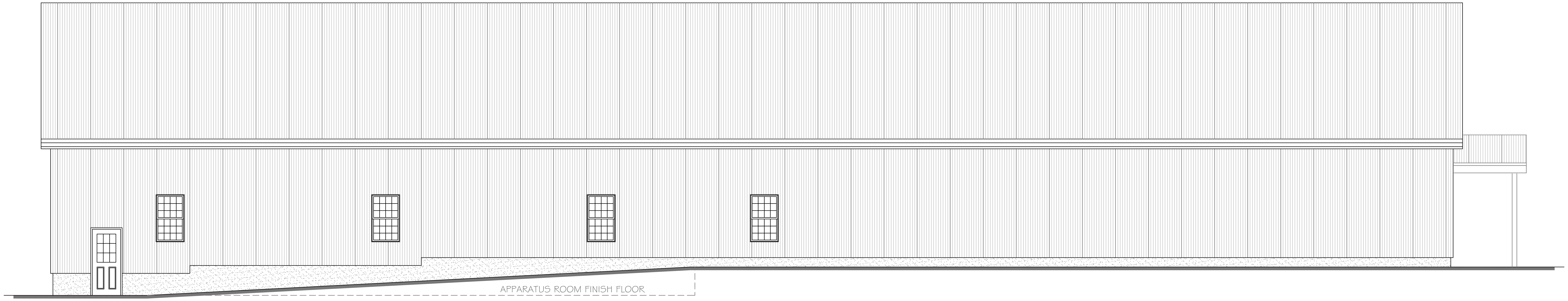
SAFETY COMPLEX
TOWN OF CHESTERFIELD
422 MAIN ROAD
CHESTERFIELD, MA 01012

SHEET A.3 OF 4



EAST ELEVATION
3/16" = 1'-0"

WEST ELEVATION
3/16" = 1'-0"

SEE SITE PLAN OPTION K

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CHESTERFIELD, MA 01012

SHEET A.4 OF 4