M² Associates Inc
Providers of Geologic, Environmental, & Groundwater Consulting Services
Water: A Natural Renewable Resource

February 11, 2020

Brian Plushanski
Brian Plushanski Construction Co.
78 New Jersey Highway 173
Hampton, New Jersey 08827

Re: Phase I Geologic Report for Brian Plushanski Site Plan, Block 22 Lots 3 and 4 in Union Township, Hunterdon County, New Jersey.

Dear Mr. Plushanski:

Brian Plushanski (Plushanski) retained M² Associates in November 2019 to conduct a geologic investigation in accordance with the Township of Union, County of Hunterdon Land Use Code § 30-6.9 Carbonate Area District. This ordinance establishes the Carbonate Area District for the Township and requires an investigation of the presence or absence of rock containing carbonate minerals. Based on the ordinance, a Phase I geologic report has been prepared for submittal to Union Township Planning Board. A copy of the completed Phase I checklist is provided in Attachment A.

The report herein provides the data and information necessary to assess the geology of the site as required for a Phase I investigation. Based on the findings of the Phase I geologic evaluation, the site is not underlain by rock containing carbonate minerals to the extent necessary to be considered susceptible to land subsidence, sinkhole formation, or bedrock cavity collapse. The site is underlain by bedrock primarily comprised of silicate minerals, which unlike calcium carbonate (calcite) and magnesium carbonate (dolomite), do not dissolve in weak acidic solutions such as rainwater. And therefore, the rocks beneath the site are not susceptible to solution cavities, sinkholes, and/or land subsidence.

PRIOR INVESTIGATIONS

A geologic investigation of Block 22 Lots 3, 4, and 5 was completed in 2001 by Demicco & Associates as part of a site plan application made by the Perryville Group to construct storage units. Peter Demicco, P.G. concluded that all three lots were underlain by non-carbonate rock. In November 2001, M² Associates independently evaluated the geology of the three lots and concurred with Mr. Demicco.

In August and September 2018, M² Associates conducted an updated geologic evaluation of Block 22 Lot 5 and submitted a report dated September 2, 2018 to V.A. Spatz & Son's and the Union Township Planning Board's geotechnical consultant. This report utilized updated mapping prepared by the New Jersey Geological Survey (NJGS) as well as site-specific information to again conclude that Lot 5 is not underlain by carbonate rock. Lot 5 shares a property boundary with Lot 4.

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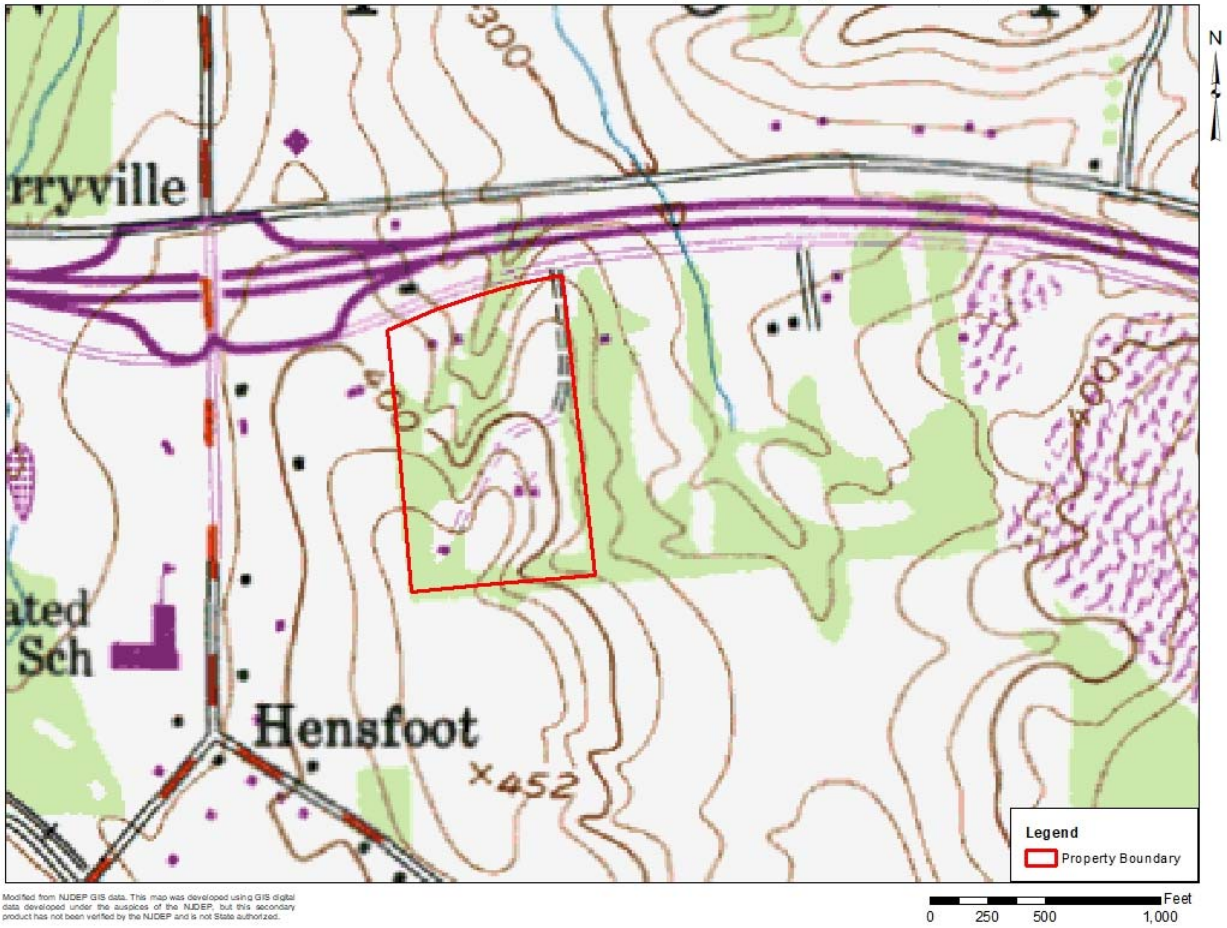
The September 2018 updated evaluation of Lot 5 and this January 2020 evaluation of Lots 3 and 4 confirm the findings made in 2001 by both Mr. Demicco and M^2 Associates with respect to Lot 3, 4 and 5. These three lots are not underlain by carbonate rock.

PHASE I

SITE LOCATION

The Plushanski site is located along Frontage Road approximately 770 feet east of the intersection of this road and Perryville Road. The site extends approximately 800 feet along Frontage Road to the east. The property is labeled on Union Township, Hunterdon County tax maps as Block 22 Lots 3 and 4. The location of the site against the background of the U.S. Geological Survey (USGS) 7.5-minute High Bridge, New Jersey topographic quadrangle is shown on Figure 1. The site boundary was drawn from tax parcel mapping as depicted in the NJGIN geographic information system (GIS) database and combines Lots 3 and 4 into a single polygon.

Figure 1: Location of Brian Plushanski Site, Block 22 Lots 3 & 4, Union Township, Hunterdon County, New Jersey



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As shown on Figure 1, an unnamed tributary starts east of the site and drains beneath Interstate 78 to Spruce Run Reservoir. Prior to the reservoir, the stream was a tributary to Mulhockaway Creek. There are no USGS mapped streams or water bodies on Block 22 Lots 3 and 4. Topography indicates the eastern and southern portions of the property drain to the east toward the unnamed tributary. The northern and western portions drain north.

The USGS High Bridge Topographic Map depicts two crossed shovels on the site indicating that the site has been used for quarrying. Similar to the much larger Red Hills Quarry to the east of the site (disturbed purple area on Figure 1), red shale was extracted.

Block 22 Lots 3 and 4 encompasses approximately 22.4 acres. Figure 2 depicts the site against a background of aerial photographs taken on February 18, 2016. These aerial photographs were obtained from the NJGIN GIS database.

Figure 2: 2016 Aerial Photographs Depicting Brian Plushanski Site, Block 22 Lots 3 & 4, Union Township, Hunterdon County, New Jersey

The blue line trending from south to north and intersecting the southwestern corner of the property is the Union Township boundary between the Carbonate Drainage Area (CDA) to the west and the Carbonate Rock District (CRD) to the east. Approximately 0.1-acre of the site is in the CDA and the remainder is located within the CRD. The Union Township

boundary between the CDA and CRD was defined as the geologic contact between Triassic Lockatong Formation conglomerates west of the boundary and Ordovician-Middle Cambrian Jutland Klippe rocks. Based on absence of carbonate rocks beneath the property, the entire site should be in the CDA and not in the CRD.

The 2016 aerial photograph used to create Figure 2 indicates a single-story building encompassing approximately 2700 square feet located in the southern portion of the property. An easement, 90-feet in width, for three underground natural gas transmission pipelines transects the eastern portion of the site from south to north. Former quarrying operations are apparent in the southern section of the site.

PROPOSED USE

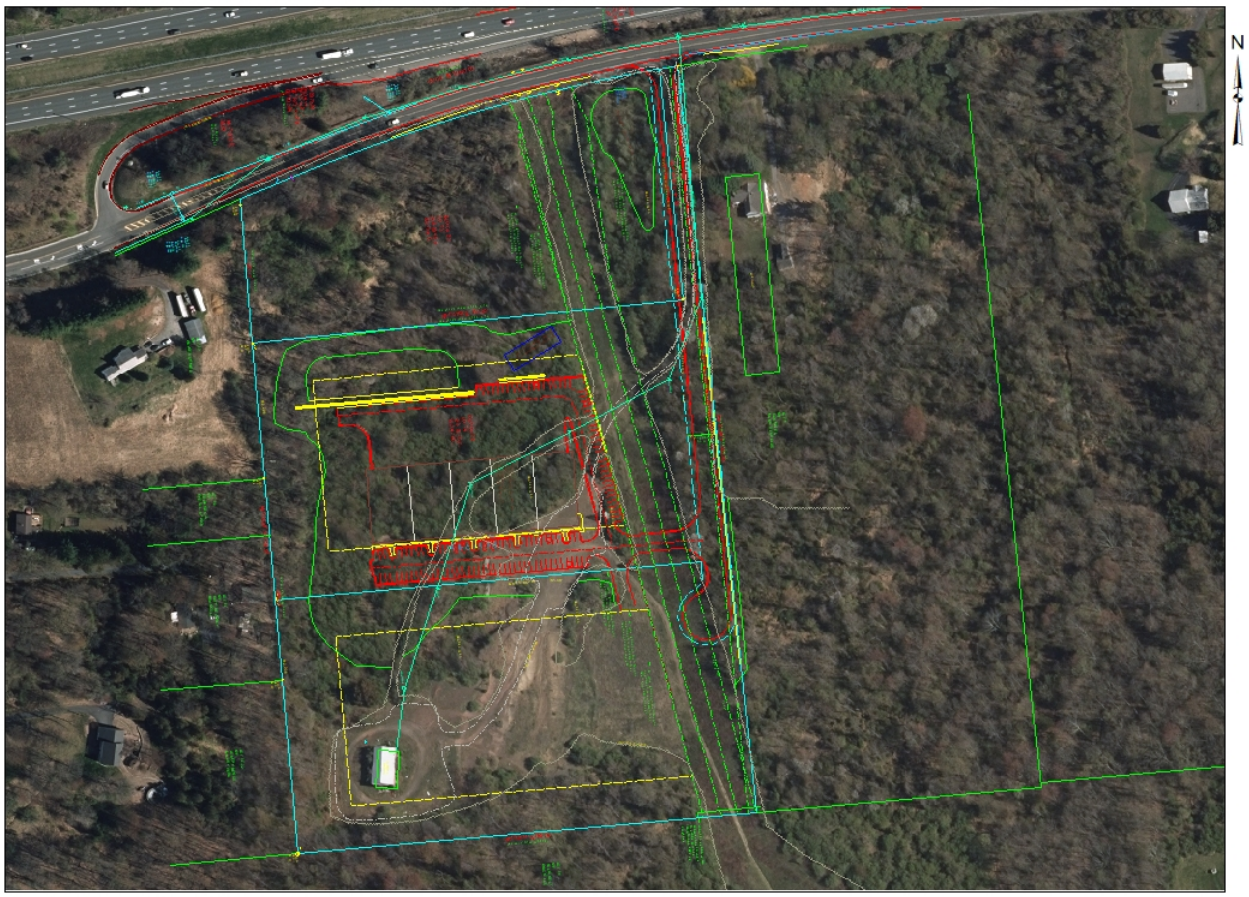
Plushanski is requesting approval to construct a 1-story building encompassing 46,800 square feet (ft^2) approximately centered on the site. Approximately 6000 ft^2 will be used for office space and the remaining 40,800 ft^2 will be used for warehouse purposes. The small building depicted on Figure 2 will remain. In addition to the building, other infrastructure to be constructed will include parking areas, treated wastewater disposal bed, and two stormwater detention basins. Additional details are provided on site plans prepared by PS&S. A sketch plan derived from the PS&S site plans is provided on Figure 3.

Site plans have been prepared by PS&S and have been submitted to the Township and the Figure 3 sketch does not replace the PS&S site plans and should not be used for actual construction. No hazardous substances or toxic materials will be manufactured at the site. While it is possible that some petroleum products will be stored and used at the site, these materials will be used, recycled, and disposed in accordance with NJDEP regulations.

There are no mapped faults, surface-water bodies, springs, sinkholes or disappearing streams on the site. There are no ponds or lakes within the site or no adjacent properties. The site is not characterized by karst conditions or topography. The site is not underlain by carbonate rock.

A small outcrop primarily of red shale created as part of quarrying operations is present along the driveway approximately 180 feet east-northeast of the northeast corner of the existing building (see photograph below). Small piles of shale are present at the site as a result of past quarry operations. A well for the existing 1-story Morton Building is present approximately 16-feet northwest of the northwestern corner of this building.

Figure 3: Sketch Map of the Proposed Project for Brian Plushanski Site, Block 22 Lots 3 & 4, Union Township, Hunterdon County, New Jersey



GEOLOGY

Carbonate Area District, Carbonate Drainage Area, and Carbonate Rock District

The Plushanski site is located within Union Township's Carbonate Area District (see Figure 2). The Carbonate Area District is comprised of the Carbonate Rock District (CRD) (sections of the Township underlain by rocks primarily comprised of carbonate minerals) and Carbonate Drainage Area (CDA) (sections of the Township where water drains toward carbonate rock). Based on current mapping of local geology, the site should be located in the Carbonate Drainage Area but not in the Carbonate Rock District. The site is not underlain by limestone or dolomite, in which cavities and sinkholes could form.

Minerals comprised of calcium and magnesium such as calcite (calcium carbonate: primary mineral in limestone) or dolomite (magnesium carbonate) can dissolve in weak acidic solutions (rainwater) and over geologic periods of time, cavities can form in the rock. Soils eroded from land surface into a cavity can create a sinkhole. Collapse of a cavity or creation of a sinkhole can result in land subsidence. Changes in drainage patterns can cause sinkholes to form at ground surface as soils are eroded into a subsurface cavity.

Block 22 Lots 3 and 4 are underlain by rocks almost entirely comprised of silicate minerals, which are not susceptible to dissolution in weak acidic solutions and therefore, not susceptible to cavities forming in the rock. While there may be some thin beds or clasts of limestone, these units are not vertically and/or horizontally extensive, and when present are dispersed or appear as thin (less than 1-inch) to very thin (laminate) layers surrounded by or within gray, red, tan or green shales and mudstone. These highly dispersed clasts, laminates, or beds have experienced significant tectonic displacement and are not susceptible to dissolution. The rocks beneath Block 22 Lots 3 and 4 are not susceptible to solution cavities, sinkhole formation, and/or land subsidence.

Water draining from the Carbonate Drainage Area to the Carbonate Rock District in an uncontrolled manner could result in subsurface erosion and/or land subsidence beneath properties underlain by carbonate rock. Block 22 Lots 3 and 4 is not susceptible to subsurface erosion through bedrock cavities. PS&S developed plans for managing and controlling stormwater runoff from the site in accordance with New Jersey Department of Environmental Protection (NJDEP) stormwater management regulations.

The plans for development of Block 22 Lots 3 and 4 will not result in significant or adverse changes to the existing stormwater/surface-water flow network from the southside of Interstate 78 to the northside of this highway and ultimately, to Spruce Run Reservoir. Based on mapping of local geology, the rock formations beneath the drainage areas for the site and the stream to the east of the site, to the confluence with the reservoir are not carbonate rocks. Therefore, the site plans will not create conditions that could result in sinkhole formation and/or land subsidence in the Carbonate Rock District. The nearest carbonate rocks are more than 3600 feet north of the site and located beneath the reservoir.

Bedrock

Multiple sources of geologic mapping were reviewed including the following:

1966, “Geology and Ground Water Resources of Hunterdon County, N.J. Special Report 24,” Haig Kasabach, NJGS.

1992, “Bedrock Geologic Map of the Pittstown and Flemington Quadrangles, Hunterdon and Somerset Counties, New Jersey” Greg C., Herman, Houghton, Hugh F., Monteverde, Donald H., Volkert, Richard, A. NJGS OFM-10.

1996, "Bedrock Geologic Map of Northern New Jersey" Drake, Avery A. Jr.,Volkert, Richard, A., Monteverde, Donald H., Herman, Gregory C., Houghton,Hugh F., Parker, Ronald A., and Dalton, Richard F. USGS Miscellaneous Investigation Series Map I-2540-A.

1999, Bedrock Geology for New Jersey 1:100,000 Scale. NJDEP GIS Data. CD-01.

2014, “Bedrock Geologic Map of New Jersey” Richard F. Dalton, Monteverde, Donald H., Sugarman, Peter J., and Volkert, Richard, A. NJDEP.

2015, “Bedrock Geologic Map of the High Bridge Quadrangle, Hunterdon and Warren Counties,” New Jersey” Donald H. Monteverde, Volkert, Richard A., Dalton, Richard F. NJGWS-GMS 15-2.

2018, “Surficial Geologic Map of the Pittstown Quadrangle, Hunterdon County, New Jersey,” Ron W. Witte, Stanford, Scott D. NJGS Open File Map OFM 123.

Unpublished Draft, “Bedrock Geologic Map of the Pittstown Quadrangle, Hunterdon County, New Jersey,” Ron W. Witte, Monteverde, Donald H., Herman, Gregory C. NJGS

The oldest of the publications (Kasabach 1966) indicates that the entire site and neighboring properties are underlain by the Ordovician (485 to 445 million years ago) Martinsburg Formation. The Martinsburg Formation is described by Kasabach (1966) as “black, gray, red, green, yellow, or variegated shale with beds of limestone and beds of coarse sandstone.” Kasabach (1966) further indicates that the Martinsburg shale beneath Hunterdon County is highly fractured and folded. The rocks beneath the site and surrounding areas of Union Township are no longer considered part of the Martinsburg Formation.

Jutland Klippe

The USGS’ "Bedrock Geologic Map of Northern New Jersey" (1996) and the New Jersey Geological Survey (NJGS) geographic information system (GIS) 1999 map entitled “Bedrock Geology for New Jersey” were reviewed for the 2001 evaluation by Demicco and he concluded that the site was underlain by non-carbonate rocks of the Jutland Klippe.

These two maps (1996 and 1999) along with the 1992 and 2014 maps indicate that the site is underlain by Jutland Klippe. The on-site quarry and the Red Hills Quarry also located along Frontage Road to the east of the site, extracted and exposed Jutland Klippe shales.

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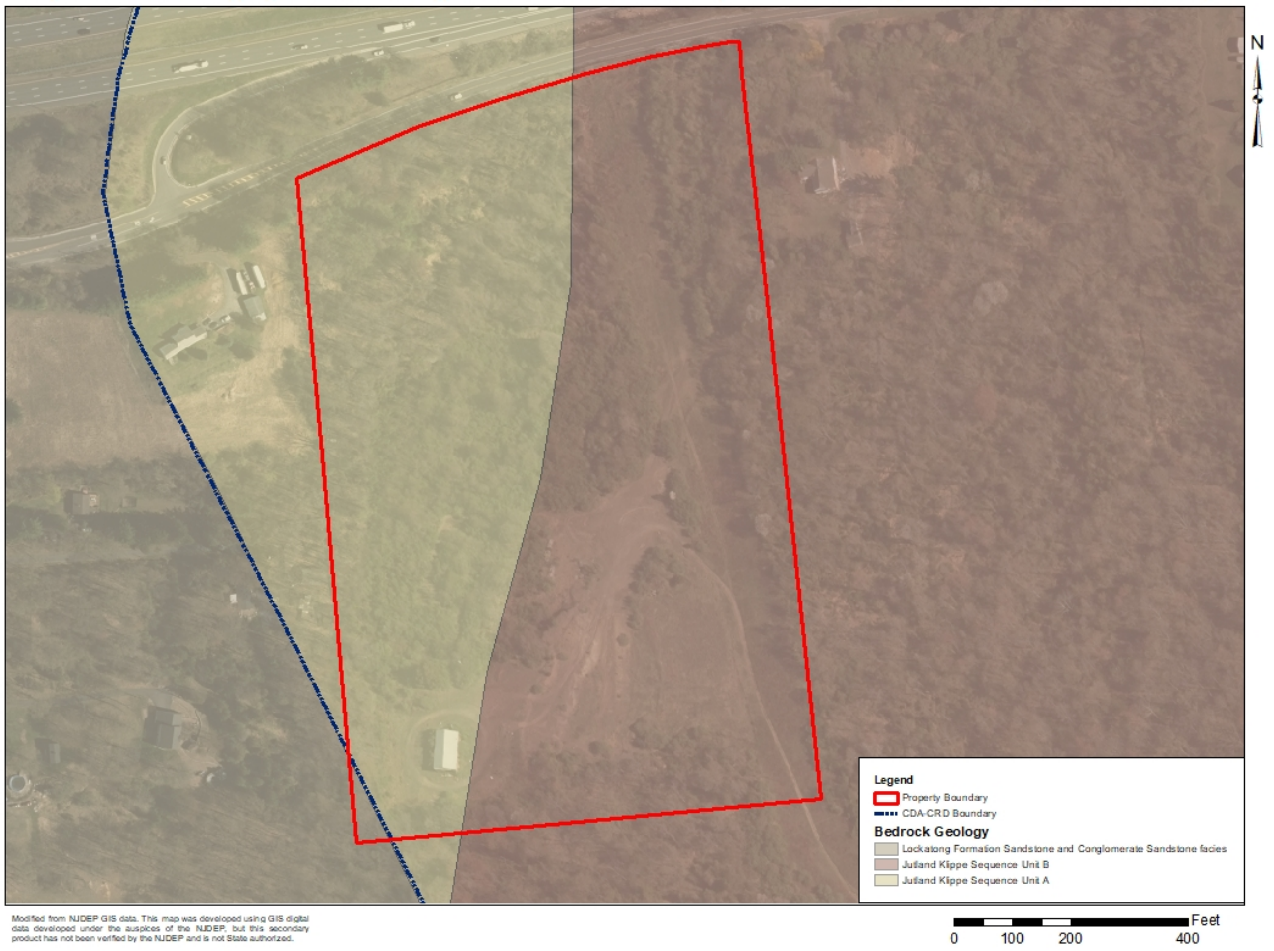
The on-site quarry may have operated during construction of U.S. Highway 22 several years before the construction of Interstate 78.

Outcrops of the Jutland Klippe are apparent along the railroad tracks near Jutland in Union Township and in the former quarry on the site (see photograph above). These four regional maps (1992, 1996, 1999, and 2014) differentiate the Jutland Klippe into three sequences: Sequence Unit A, Sequence Unit B, and Undifferentiated, which is not present in Union Township. Figure 4 depicts bedrock geology beneath the site based on the 1996, 1999, and 2014 GIS regional mapping provided by NJGS.

Figure 4: Pre-2015 Mapping of Bedrock Geology beneath Brian Plushanski Site, Block 22 Lots 3 & 4, Union Township, Hunterdon County.



The Jutland Klippe is Middle Ordovician to Upper Cambrian or the sediments that comprise these rocks were deposited approximately 470 to 490 million years ago in shallow waters between an island volcanic arc and a continental plate. The volcanic islands formed as a result of an oceanic plate subducting beneath a continental plate. The collision of these plates during the Taconic Orogeny, which ended approximately 440 million years ago, pushed the rocks that comprise the Jutland Klippe onto the over-riding continental plate. Geologically, the Jutland Klippe is an accretionary prism, which is a wedge of sediments

scraped off subducting oceanic crust, onto an over-riding continental plate. The collision folded the beds into a series of anticlines and synclines.

There are six isolated fragments of the Jutland Klippe in central New Jersey with the largest and best exposed sections mapped near Jutland in Union Township. The rocks have been quarried along Frontage Road, primarily at Red Hills Quarry but also from the on-site quarry. The rock is primarily used for crushed stone.

Pre-2015 maps depict Jutland Klippe Sequence Unit A as present beneath the western side of the site. The rocks of this unit are described by the USGS as red, green, tan, and brown shale with some fine- to coarse-grained sandstone, dark-gray aphanitic to fine-grained limestone containing floating quartz, sand grains and quartz-pebble conglomerate. The primary type of rock is mudstone and shale with minor presence of sandstone, limestone, and conglomerate. The rocks are highly faulted, fractured, and displaced as a result of tectonics and accretion onto the continental plate.

Beneath the eastern side of the site, Jutland Klippe Sequence Unit B has been mapped. This unit is described by USGS as red, green, tan and gray shale; interlaminated dolomite; interbedded fine-grained graywacke siltstone and sandstone; quartzite; and fine-grained, thin-bedded limestone between beds of red and green shale. The limestone is described as similar to an “intraformational conglomerate because it is disrupted, boudinaged, and surrounded by shale beds.” Sequence Unit B is primarily comprised of shale and mudstone with minor presence of limestone, quartzite, siltstone, and sandstone.

While there are limestone/dolomite clasts and thin beds present in both Sequence A and Sequence B, these thin to laminate layers have been highly deformed, pulled apart, and are not horizontally or vertically extensive. These rocks are constricted by surrounding thick beds of shale, mudstone, and some sandstone. The Jutland Klippe sequences mapped beneath the site are not susceptible to sinkhole formation or land subsidence.

West of the site toward Perryville Road, the Triassic Lockatong Formation has been mapped. The Lockatong Formation rocks unconformably (large gap in time) overlay the Jutland Klippe. The Lockatong Formation conglomerate and shales mapped in this area of Union Township were deposited 220 to 235 million years ago.

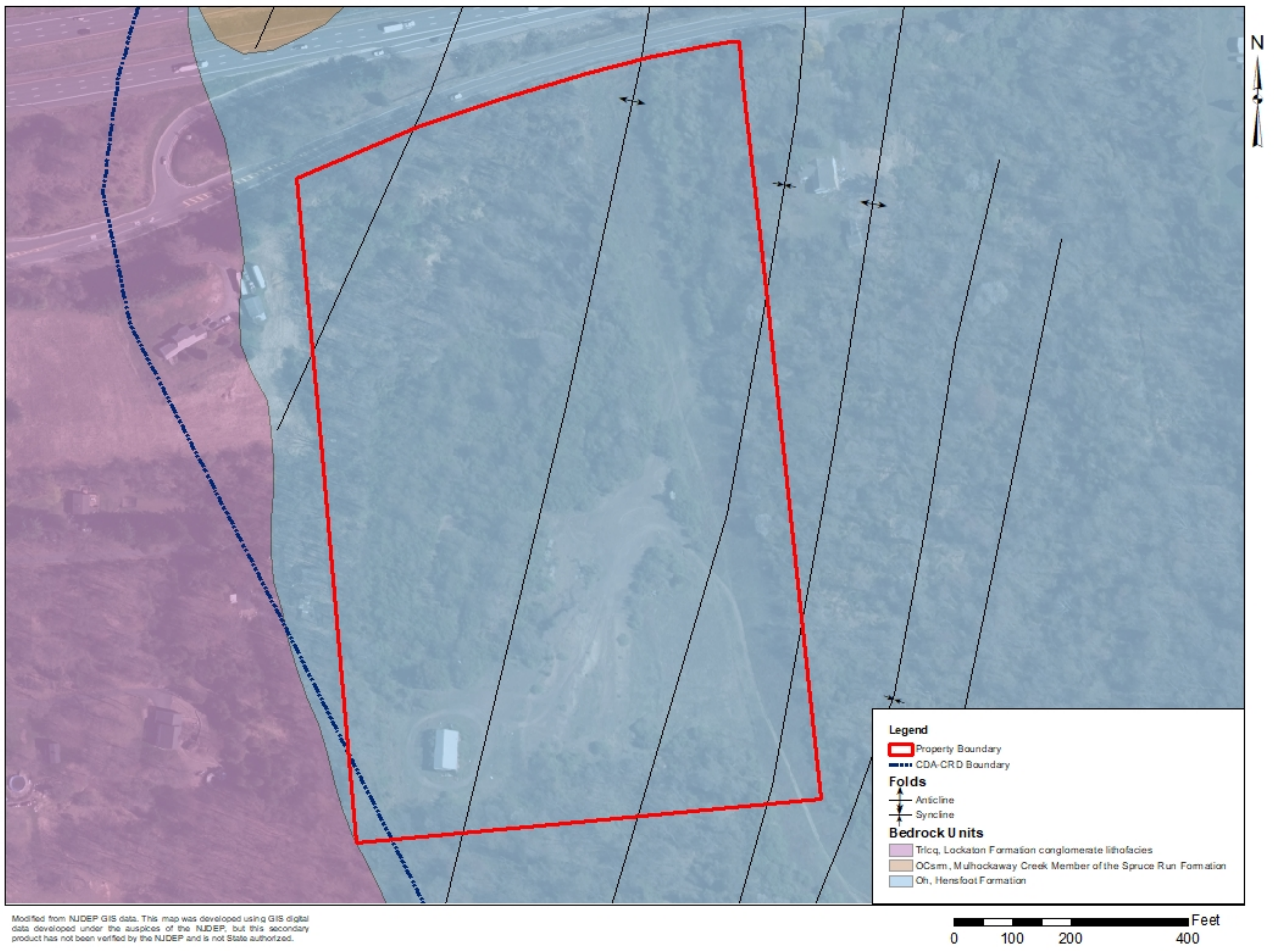
Local Mapping

In 2015, the NJGS published “Bedrock Geologic Map of the High Bridge Quadrangle, Hunterdon and Warren Counties, New Jersey” (GMS 15-2, Donald H. Monteverde, Richard A. Volkert, and Richard F. Dalton). This updated map provides more detailed information with respect to bedrock beneath the site. The 2015 mapping further refines the Jutland Klippe sequences and provides distinct formational data. Portions of Sequence Unit A are now defined as the Mulhockaway Creek Member of the Spruce Run Formation and Sequence Unit B is now defined as the Hensfoot Formation.

The bedrock geology beneath the site as obtained from the NJGS GIS database for the 2015 mapping of the High Bridge quadrangle is depicted on Figure 5. The contact between

the Jutland Klippe rocks and the younger Lockatong Formation required adjustment when the 2015 map was published. The contact on the older maps paralleled the boundary between the CDA and CRD (blue line on Figure 2 and 5). The most recent mapping indicates that the entire site is underlain by one formation and not three units.

Figure 5: 2015 Mapping of Bedrock Geology beneath Brian Plushanski Site, Block 22 Lots 3 & 4, Union Township, Hunterdon County.



Based on the 2015 mapping, Block 22 Lots 3 and 4 are underlain by the Hensfoot Formation, which is described by Monteverde, et. al (2015) as “heterogeneous sequence of interbedded red and green, thin-bedded shale; interlaminated dolomite and shale; thinly interbedded fine-grained graywacke-siltstone to medium-grained sandstone and shale; yellow, red, green, pale brown, and gray shale; and light-gray to pale pinkish gray quartzite.” The Hensfoot Formation is folded into a series of synclines and anticlines trending from northeast to southwest across the site as shown by the black lines transecting the site. No faults have been mapped beneath the site or on nearby properties.

The Hensfoot Formation is not considered a carbonate rock. Except for the dolomite laminates on shale, the rock is essentially comprised of silicate minerals. The laminated dolomite is not of sufficient extent or nature to result in sinkhole formation and/or land

subsidence. Based on the recent mapping, the entire site is underlain by shales, siltstones, and sandstones that are not susceptible to the type of cavity formation necessary to create sinkholes or result in land subsidence.

North of the site, Monteverde, et. al (2015) mapped the Mulhockaway Creek Member of the Spruce Run Formation. This unit is primarily comprised of interbedded, thin beds of red, light brown, and green shale with some sandstone. Some thin beds of fine-grained to aphanitic limestone interbedded with quartz conglomerate have been mapped in this unit. These thin limestone beds are not of sufficient extent or nature to result in sinkhole formation or land subsidence. Where present, the limestones are underlain by fine-grained red, light brown, and green shales and siltstones. The Mulhockaway Creek Member of the Spruce Run Formation is not considered a carbonate rock since the shales, siltstones, sandstones, and conglomerates are most abundant and these rocks are comprised of silicate minerals.

Immediately west of the site, Monteverde, et. al (2015) mapped the Lockatong Formation conglomerate. The rocks of this formation are described as red to grayish-red, medium- to thick-bedded pebble to boulder conglomerate with fine- to medium-grained sand matrix. The rocks present in the Lockatong Formation conglomerate are not susceptible to the formation of sinkholes or solution cavities and are not carbonate rocks.

The Plushanski project can be completed on Block 22 Lots 3 and 4 without creating sinkholes or causing land subsidence either on Block 22 Lots 3 and 4 or other sites to which stormwater will drain from Block 22 Lot Lots 3 and 4.

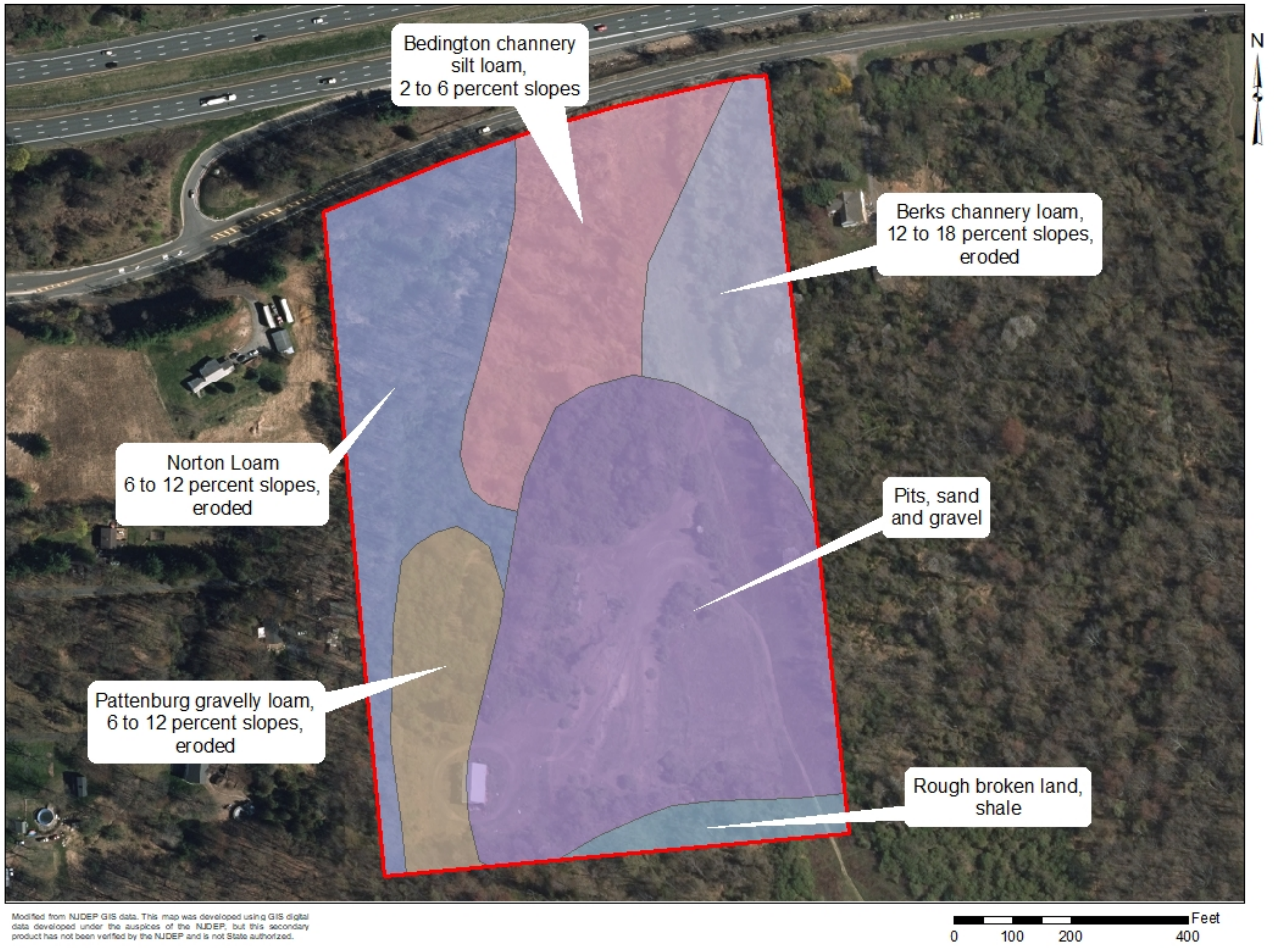
Surface Materials

The maps entitled “Surficial Geology of New Jersey” published in 2006 and updated September 20, 2016 by NJGS on the NJDEP GIS database, and “Hydrogeologic Character and Thickness of the Glacial Sediment of New Jersey” (NJGS 1990 updated 2003, Open File Map 3) depict Block 22 Lots 3 and 4. These maps were reviewed to evaluate surficial geologic materials beneath the property. Based on these maps, the unconsolidated geologic materials beneath the site are comprised of clays, silts, and sands derived from weathering of the underlying shale, siltstone, and sandstone bedrock. The surficial geologic data from NJGS indicates that the site is not underlain by carbonate rocks.

The Soil Conservation Service’s “Soil Survey of Hunterdon County” and soil mapping compiled by the United States Department of Agriculture-Natural Resources Conservation Service (USDA-NRCS) were used to evaluate soil conditions beneath the site. The USDA-NRCS mapping obtained from their GIS system is depicted on Figure 6.

Based on the USDA-NRCS mapping, slightly more than 9-acres of the site are underlain by broken rock and sandy soils derived from past quarrying operations (Pits, sand and gravel). Approximately 4.4-acres of the site are underlain by Norton loam with 6 to 12 percent slopes. Norton loam is present along the western boundary of the property and described by USDA-NRCS as red fine-grained silty till and/or colluvium derived from weathering underlying bedrock encountered at depths ranging from 7 to 8 feet below ground surface.

Figure 6: Soils Beneath the Brian Plushanski Site, Block 22 Lots 3 & 4, Union Township, Hunterdon County, New Jersey



Approximately 3.6-acres near the northern boundary and center of the site are underlain by Bedington channery silt loam on slopes ranging from 2 to 6 percent. These soils are derived from weathering of shale and siltstone bedrock encountered at depths ranging from 5 to 7 feet below ground surface. Approximately 2.7-acres located in the northeastern corner of the site are underlain by Berks channery loam with slopes ranging from 12 to 18 percent. These soils are also derived from weathering of shallow (3 to 7 feet below ground surface) shale and siltstone bedrock.

Approximately 1.9-acres in the southwestern section of the site are underlain by Pattenburg gravelly loam with slopes ranging from 6 to 12 percent. These red soils contain quartz and are derived from weathering of underlying conglomerate and are likely associated with the Lockatong Formation conglomerate mapped along the western property boundary. Along the south-central to southeastern property boundary and approximately 0.7-acre, the USDA-NRCS has mapped the presence of “Rough, broken land shale” or talus derived from weathering of very shallow conglomeratic bedrock.

The soils beneath Block 22 Lots 3 and 4 have been derived from weathering of shales and siltstones of the Hensfoot Formation (a.k.a. Jutland Klippe) or conglomerate of the Lockatong Formation beneath neighboring properties immediately west of the site. The USDA-NRCS mapping does indicate the presence of soils derived from carbonate rock. The soils data indicate that the property is not susceptible to the formation of sinkholes and/or land subsidence.

WELL RECORDS

Records for wells in the area were obtained from the NJDEP Dataminer database. Data from these well records are tabulated in Attachment B. One well installed in 1949 was reported by NJDEP to be located in Readington Township and a second well installed in 1959 was reportedly installed in Alexandria Township. The address locations suggest that these two wells were actually completed in Union Township.

AERIAL PHOTOGRAPHS

Aerial photographs taken in 1931, 1940, 1948, 1953, 1957, 1960, 1970, 1989, 1995, 2002, 2007, 2012, and 2016 of the site and adjacent properties were reviewed for structural geologic features indicative of faults and fractures. These linear features may include straight sections of streams, abrupt changes in soil color, topographic peaks or narrow valleys, and vegetation controlled by a geologic structure. In addition to the linear features, the aerial photographs were reviewed for features indicative of sinkholes and solution cavities. These types of features may be indicated by vanishing streams, losing stream channels, depressions, and cylindrical changes in soil shading and vegetation. No indications of past or incipient sinkhole activity are present in any of the aerial photographs.

A copy of the 2016 aerial photograph obtained from the NJDEP is provided as Figure 2. Figures 7, 8, 9, and 10 show the site in 1953, 1970, 1995, and 2007. The 1953 aerial photograph depicts a section of the property that extends further north than the current boundary. The roadway observed north of the site is the former U.S. Highway 22 and not Interstate 78. The northern property boundary was modified after construction of the interstate highway which is apparent on the 1970 aerial photograph (see Figure 8).

The 1931 and 1940 aerial photographs depict the site as likely used for agricultural purposes and was partially woodland and open field. The 1948 aerial photographs indicate that the site was clear and quarrying operations appear to have started both at this site and at the larger Red Hills Quarry property.

By 1953, quarrying operations are evident (see Figure 7) but the extent does not significantly change between 1953, 1957, and 1960. The gas transmission easement is apparent in the 1960 aerial photograph transecting the site. The 1970 aerial photograph indicates a small building in the southwestern corner and a house with an outbuildings in the northwestern corner, of the property.

Figure 7: 1953 Aerial Photograph of Brian Plushanski Site, Block 22 Lots 3 & 4, Union Township, Hunterdon County, New Jersey

Figure 8: 1970 Aerial Photograph of Brian Plushanski Site, Block 22 Lots 3 & 4, Union Township, Hunterdon County, New Jersey

Figure 9: 1995 Aerial Photograph of Brian Plushanski Site, Block 22 Lots 3 & 4, Union Township, Hunterdon County, New Jersey

Figure 10: 2007 Aerial Photograph of Brian Plushanski Site, Block 22 Lots 3 & 4, Union Township, Hunterdon County, New Jersey

The 1989 aerial photograph indicates four buildings in the southwestern corner of the property with an access driveway similar to the current entrance road and a house with an outbuilding in the northwestern corner. The 1995 aerial photograph indicates two buildings in the southwestern corner and the house and outbuildings in the northwestern corner (see Figure 9). In 2002, one building and a possible foundation of the second is present in the southwestern corner and the house and a smaller outbuilding remain in the northwestern corner. By 2007, only the building in the southwestern corner is present at the site and that same building is present in the 2012 and 2016 aerial photographs.

The aerial photographs do not indicate any past or incipient sinkhole activity on Block 22 Lots 3 and 4, or, on any of the adjoining properties. The site is underlain by the types of rocks that are not susceptible to sinkhole formation.

SITE INSPECTION

On December 9, 2019, a professional geologist employed by M^2 Associates conducted an inspection of the Plushanski site for features indicative of solution cavities and sinkhole activity. In addition, the geologist inspected four test pits excavated as part of the stormwater management system design and test pit logs are provided in Attachment C.

Bedrock encountered in the excavations was shale and siltstone that was non-reactive to hydrochloric acid. Calcite and dolomite react to hydrochloric acid. The outcrop in the southwestern section of the property is comprised of red and gray shale and mudstone. Former quarry tailings piles are comprised of shale and mudstone fragments. No outcrops were present along the gas transmission easement and no sinkholes or land subsidence was observed in any section of the site.

The rocks encountered in the excavations, outcrop, and in tailings piles are shales and mudstones comprised of silicate minerals and are not carbonate rocks. The rocks observed during the site inspection are not susceptible to the formation of sinkholes or land subsidence. No indications of past or incipient sinkhole activity was observed at the site.

CONCLUSIONS

Based on the geologic data and information reviewed, the aerial photographs and the site inspection, the following conclusions are made:

1. The Plushanski site is underlain by the Hensfoot Formation, which is a unit of the Jutland Klippe. The Hensfoot Formation includes shales, siltstones, and fine-grained sandstones that are almost entirely comprised of silica-based minerals. The small percentage of carbonate minerals that may be present in these rocks is not sufficient to result in sinkhole formation and/or land subsidence. The rocks beneath Block 22 Lots 3 and 4 are not carbonate rocks.

2. USDA-NRCS mapping indicates site soils were derived from weathering of underlying shale and mudstone bedrock and does not indicate the presence of

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soils derived from carbonate rock. The soils data indicate that the property is not susceptible to the formation of sinkholes and/or land subsidence.

3. Historic aerial photographs do not indicate any past or incipient sinkhole activity on Block 22 Lots 3 and 4, or, on any of the adjoining properties. The site is not underlain by the types of rocks where sinkholes or karst features could be present.

4. Block 22 Lots 3 and 4 are located in the Carbonate Rock Area, which is comprised of the Carbonate Rock District and Carbonate Drainage Area. The site should not be located in the Carbonate Rock District because it is not underlain by carbonate rocks. The site could be considered for location within the Carbonate Drainage Area but that designation may not be accurate because stormwater/surface water runoff from the site drains into an unnamed tributary that drains directly into Spruce Run Reservoir. The stream does not flow through or across any properties underlain by carbonate rock before joining the reservoir.

5. Since the site is not underlain by carbonate rock, a Phase II investigation is not warranted.

6. The Plushanski project can be completed on Block 22 Lots 3 and 4 without creating sinkholes or causing land subsidence either on Block 22 Lots 3 and 4 or other sites to which stormwater will drain from Block 22 Lots 3 and 4.

If you have any questions, please call Matt Mulhall at (908) 238-0827.

Respectfully submitted,
M^2 Associates Inc.

Matthew J. Mulhall, P.G.

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ATTACHMENT A:
PHASE I CHECKLIST

SUBMISSION COVER SHEET

CARBONATE AREA DISTRICT; CARBONATE ROCK DISTRICT
CARBONATE DRAINAGE AREA

GEOLOGIC INVESTIGATION PROGRAM

SUBMISSION FOR X PHASE I___PHASE II

OWNER'S NAME AND ADDRESS:__ Brian Plushanski, Brian Plushankski Construction Co., 78 New Jersey Highway 173, Hampton, New Jersey 08827

OWNER'S SIGNATURE:_____

DEVELOPER'S NAME & ADDRESS:___ Brian Plushanski _____

APPLICANT'S NAME & ADDRESS:__Brian Plushankski Construction Co., 78 New Jersey Highway 173, Hampton, New Jersey 08827

Location of proposed development site:__Block 22 Lots 3 and 4_____

Type of proposed development: __1-story 40,800 sq. ft. building_____

Tax Block:__22___

Tax Lot (s):___3 and 4__

Indicate if development occurs in Carbonate Rock District (CRD) or Carbonate Drainage Area (CDA):_____CRD_____

Proposed density units per acre or lot coverage:_____

Any other data which the applicant wishes the municipality to consider:__See report__
_____

Toxic/hazardous materials (if applicable):____See report_____

DISCLAIMER OF LIABILITY

In limestone areas the alteration and development of land may be hazardous with respect to the foundation safety of structures, the creation of unstable land as a result or changes in drainage and grading, and the contamination of ground and surface waters.

The exact occurrence of sinkholes and/or subsidence is not always predictable; therefore, the administration of these regulations shall create no liability on behalf of the municipality, the Township engineer, the Township geologist, municipal employees, or municipal agencies as to damages which may be associated with the formation of sinkholes or subsidence. Compliance with these regulations represents no warranty, finding, guarantee, or assurance that a sinkhole and/or subsidence will not occur on an approved property. The municipality, its agencies, consultants, and employees assume no liability for any financial or other damages which may result from sinkhole activity.

It is also noted that sinkholes and ground subsidence may occur in areas outside the CRD and/or in areas of carbonate geology presently not identified as such. The applicant and/or property owner should always make independent investigations of these matters prior to using this land for construction of a building or structure or any activity which alters the soil and bedrock materials.

PHASE I CHECKLIST

Township of Union Carbonate Area District (CAD) investigation program submission requirements: (check if attached)

__X__ US Geologic Survey 7 ½ minute topographic quadrangle maps with the parcel identified. *See Figure 1 of M² Associates February 11, 2020 report entitled "Phase I Geologic Report for Brian Plushanski Site Plan, Block 22 Lots 3 and 4 in Union Township, Hunterdon County, New Jersey."*

__X__ USDA Soil Conservation Service soil survey map indicating soils present on parcel. *See Figure 6 of M² Associates February 11, 2020 report entitled "Phase I Geologic Report for Brian Plushanski Site Plan, Block 22 Lots 3 and 4 in Union Township, Hunterdon County, New Jersey."*

__X__ Information from any special reports completed by NJ State Geological Survey, US Geologic Survey, or NJ Department of Environmental Protection. *References provided in M² Associates February 11, 2020 report entitled "Phase I Geologic Report for Brian Plushanski Site Plan, Block 22 Lots 3 and 4 in Union Township, Hunterdon County, New Jersey."*

__X__ Site plan map at a scale of 1" = 1,000' identifying proposed development site and boundaries of site that are within the CRA and/or CDA as designated on the municipal CAD map. *See Figure 2 of M² Associates February 11, 2020 report entitled "Phase I Geologic Report for Brian Plushanski Site Plan, Block 22 Lots 3 and 4 in Union Township, Hunterdon County, New Jersey."*

__X__ Aerial photograph print for the proposed site and surrounding area (taken at a minimum scale of 1"=1,000' obtained during periods of little or no foliage cover), *See Figures 2, 7, 8, 9, and 10 of M² Associates February 11, 2020 report entitled "Phase I Geologic Report for Brian Plushanski Site Plan, Block 22 Lots 3 and 4 in Union Township, Hunterdon County, New Jersey."*

__X__ Location of all known water production wells and well log information within one-half mile of the project. *See Attachment B of M² Associates February 11, 2020 report entitled "Phase I Geologic Report for Brian Plushanski Site Plan, Block 22 Lots 3 and 4 in Union Township, Hunterdon County, New Jersey.".*

__X__ A project sketch plat at a minimum scale of 1"=200' with existing surface water bodies location of any existing water production wells, faults, outcrops springs, sinkholes, disappearing streams, and surface water flows. *See Figure 3 of M² Associates February 11, 2020 report entitled "Phase I Geologic Report for Brian Plushanski Site Plan, Block 22 Lots 3 and 4 in Union Township, Hunterdon County, New Jersey."*

__X__ Written narrative describing proposed activity. *See report.*

Does the proposed project include the use, storage or manufacturing of toxic or hazardous materials? __ __no __X_yes

If Yes attach an explanation of the type of activity.

No hazardous substances or toxic materials will be manufactured at the site. See page 4 section "Propososed Use" of M² Associates February 11, 2020 report entitled "Phase I Geologic Report for Brian Plushanski Site Plan, Block 22 Lots 3 and 4 in Union Township, Hunterdon County, New Jersey." Some petroleum products may be stored and used at the site. These materials will be used, recycled, and disposed in accordance with NJDEP regulations.

Other Published geologic information which applicant deems pertinent. (Information from other geologic investigation programs is on file with the municipal clerk.) Please specify; _____ *See M² Associates February 11, 2020 report entitled "Phase I Geologic Report for Brian Plushanski Site Plan, Block 22 Lots 3 and 4 in Union Township, Hunterdon County, New Jersey."*_____

Water: A Natural Renewable Resource

ATTACHMENT B:
WELLS LISTED BY NJDEP WITHIN ONE-HALF MILE OF SITE

Wells Located Within One-Half Mile of Union Township Block 22 Lots 3 and 4.

Permit Number	Well Use	Date	Municipality	Block	Lot	Easting (X)	Northing (Y)	Depth (ft)	Capacity (gal/min)	Distance (ft)
2400003379	Domestic	8/3/1959	Union Twp			362718	655999	110	0	401.64
E201713044	Domestic	11/28/2017	Union Twp	22	37	362633	655773	360		519.17
2400000210	Domestic	5/12/1949	Union Twp			363236	656671	161	0	721.64
2400027127	Domestic	7/19/1990	Union Twp	22	38	362362	655903	600	5	757.74
2400003655	Domestic	6/8/1960	Union Twp			362201	655327	115	0	1113.49
2400043647	Domestic Replacement	9/22/2004	Union Twp	22	37.01	362251	655192	1000	5	1157.40
2400043830	Domestic Replacement	11/1/2004	Union Twp	22	37.01	362251	655192	175	0	1157.40
2400043831	Domestic Replacement	11/4/2004	Union Twp	22	37.01	362251	655192	400	5	1157.40
2400045046	Domestic Replacement	7/7/2006	Union Twp	22	37.01	362251	655192	100	5	1157.40
2400000210	Domestic	5/12/1949	Readington Twp			362208	656676	161	0	1158.18
2400003926	Domestic	11/14/1960	Union Twp			362208	656676	335	0	1158.18
2400002373	Domestic	1/1/1957	Union Twp			364264	656666	110	10	1346.76
2400015918	Domestic	8/13/1982	Union Twp	22	7	364264	656666	200	0	1346.76
2400003453	Domestic	8/28/1959	Union Twp			361716	656004	115	0	1402.38
2400003464	Domestic	10/2/1959	Union Twp			361716	656004	150	0	1402.38
2400011311	Domestic	8/20/1976	Union Twp	22	37-I	361716	656004	240	10	1402.38
2400003189	Domestic	3/11/1959	Union Twp			362725	657315	194	0	1411.58
2400002165	Domestic	4/20/1956	Union Twp			362711	654582	124	0	1435.92
2400003004	Domestic	8/15/1960	Union Twp			363804	657309	90	0	1514.34
2400006706	Domestic	6/8/1967	Union Twp			363804	657309	85	0	1514.34
2400001546	Domestic	7/26/1954	Union Twp			363790	654577	202	0	1536.98
2400041609	Domestic	6/10/2002	Union Twp	22	31.04	363790	654577	320	15	1536.98

Wells Located Within One-Half Mile of Union Township Block 22 Lots 3 and 4.

Permit Number	Well Use	Date	Municipality	Block	Lot	Easting (X)	Northing (Y)	Depth (ft)	Capacity (gal/min)	Distance (ft)
2400041610	Domestic	6/12/2002	Union Twp	22	31.05	363790	654577	300	15	1536.98
2400025080	Test	3/8/1989	Union Twp	22	32	364800	655988	425		1682.59
E201303535	Domestic	5/21/2013	Union Twp	22	9	365025	656261	200		1931.08
2400001149	Domestic	7/14/1953	Union Twp			361723	657320	143	0	1948.60
2400003393	Domestic	8/28/1959	Alexandria Twp			361723	657320	195	0	1948.60
2400011090	Domestic	4/6/1976	Union Twp	11	24C	361723	657320	410	0	1948.60
2400001275	Domestic	12/26/1953	Union Twp			361708	654588	104	0	1966.50
2400023858	Public Non-Community	1/27/1989	Union Twp	22	34.03	361708	654588	490	7	1966.50
2400039328	Domestic	8/15/2000	Union Twp	29.03	18	361708	654588	605	10	1966.50
2400009492	Domestic	10/15/1973	Union Twp			363222	653973	120	0	1988.87
2400011501	Domestic	10/2/1976	Union Twp	22	34.01	363222	653973	310	5	1988.87
E201303536	Domestic	5/22/2013	Union Twp	22	10	365155	655769	200		2046.19
2400000510	Domestic	8/15/1951	Union Twp			361180	656682	111	0	2068.11
2400003579	Domestic	12/5/1959	Union Twp			364807	657304	145	0	2159.29
2400039785	Domestic	6/15/2001	Union Twp	22	31.03	364792	654572	200	15	2174.29
2400041566	Domestic	11/27/2002	Union Twp	22	31.01	364792	654572	180	10	2174.29
2400006491	Domestic	10/21/1966	Union Twp			362194	653978	403	0	2185.87
2400012015	Domestic	5/28/1977	Union Twp	21	4	362194	653978	150	8	2185.87
2400001901	Domestic	7/18/1955	Union Twp			362168	653978	132	0	2196.98
2400044157	Public Non-Community	5/16/2005	Union Twp	21	7	362244	653877	500	0	2257.99
2400007207	Domestic	3/18/1969	Union Twp			364250	653967	115	0	2291.46
2400012889	Domestic	8/24/1978	Union Twp	22	33	364250	653967	300	0	2291.46

Wells Located Within One-Half Mile of Union Township Block 22 Lots 3 and 4.

Permit Number	Well Use	Date	Municipality	Block	Lot	Easting (X)	Northing (Y)	Depth (ft)	Capacity (gal/min)	Distance (ft)
2400014992	Domestic	8/14/1981	Union Twp	22	33A	364250	653967	372	0	2291.46
2400018737	Domestic	5/6/1986	Union Twp	22	33.01	364250	653967	755	10	2291.46
2400020605	Domestic	5/29/1986	Union Twp	11	22	364347	657913	300	10	2308.44
2400001207	Domestic	8/22/1953	Union Twp			360714	656010	148	0	2404.20
2400003315	Domestic	8/17/1959	Union Twp			360714	656010	115	0	2404.20
2400003564	Domestic	2/3/1960	Union Twp			360714	656010	154	0	2404.20
2400006226	Domestic	2/12/1966	Union Twp			360714	656010	150	0	2404.20
2400008049	Domestic	9/20/1971	Union Twp			360714	656010	598	0	2404.20
2400034111	Domestic	4/29/1996	Union Twp	22	33.01	360714	656010	800	0	2404.20

Water: A Natural Renewable Resource

ATTACHMENT C:
TEST PIT LOGS

Test Pit Log

Name: Plushanksi Date: 12/9/2019 Page 1 of 1 .

Site: Block 22 Lots 3 and 4 Weather Rain/overcast

Test Pit No. 500 Total Depth: 12 feet below ground surface

Type of Excavator: Trackhoe Contractor: Mark Seguine

Sampling Interval (Depth in feet below ground surface)		Unified Soil Classification System Symbol	Sample/Interval Description	Comments
From:	To:			
0	1.5	OL	Silt, trace clay. Brown, organic topsoil. Soft.	
1.5	5.5		Red-brown weathered Jutland Klippe shale. Foliated, angular to subangular. Hard. Fine- to very-fine grained. Highly fractured. Residual bedding. Dry.	
5.5	12		Gray to dark-gray interbedded with red-brown, moderately weathered, Jutland Klippe shale. Blocky, angular to subangular. Cobble to pebble size blocks. Moderately hard. Moderately fractured along joints. Fine- to very-fine grained. Residual bedding. Dry.	
			Notes: 1. No groundwater or seepage observed in test pit. 2. Expanded test pit floor area to 50 ft^2 for basin flood testing with bottom of pit at 12 ft.	
			Basin Flood Test 1: Emplaced 400 gallons to fill 1-foot of water in bottom. Filled at 11:45. Empty at 12:05. Drained 400 gallons in 20 minutes.	
			Basin Flood Test 2: Emplaced 400 gallons to create 1-foot of water in bottom. Filled at 13:12. Empty at 13:30. Drained 400 gallons in 18 minutes.	
			Backfilled basin flood pit on 12/9/2019.	

Test Pit Log

Name: Plushanksi Date: 12/9/2019 Page 1 of 1 .

Site: Block 22 Lots 3 and 4 Weather Rain/overcast

Test Pit No. 501 Total Depth: 12 feet below ground surface

Type of Excavator: Trackhoe Contractor: Mark Seguine

Sampling Interval (Depth in feet below ground surface)		Unified Soil Classification System Symbol	Sample/Interval Description	Comments
From:	To:			
0	1.5	OL	Silt, trace clay. Brown, organic topsoil. Soft.	
1.5	5.5		Red-brown weathered Jutland Klippe shale. Foliated, angular to subangular. Hard. Fine- to very-fine grained. Highly fractured. Residual bedding. Dry.	
5.5	12		Yellow-orange, tan interbedded with black, moderately to slightly weathered, Jutland Klippe shale. Blocky, angular to subangular. Cobble to pebble size blocks. Moderately hard. Highly fractured. Fine- to very-fine grained. Residual bedding. Dry.	
			Notes: 1. No groundwater or seepage observed in test pit. 2. Expanded test pit floor area to 50 ft^2 for basin flood testing with bottom of pit at 12 ft.	
			Basin Flood Test 1: Emplaced 400 gallons to fill 1-foot of water in bottom. Filled at 12:08. Empty at 12:30. Drained 400 gallons in 22 minutes.	
			Basin Flood Test 2: Emplaced 400 gallons to create 1-foot of water in bottom. Filled at 13:37. Empty at 14:16. Drained 400 gallons in 39 minutes.	
			Backfilled basin flood pit on 12/9/2019.	

Test Pit Log

Name: Plushanksi Date: 12/9/2019 Page 1 of 1 .

Site: Block 22 Lots 3 and 4 Weather Rain/overcast

Test Pit No. 502 Total Depth: 12 feet below ground surface

Type of Excavator: Trackhoe Contractor: Mark Seguine

Sampling Interval (Depth in feet below ground surface)		Unified Soil Classification System Symbol	Sample/Interval Description	Comments
From:	To:			
0	1.5	OL	Silt, trace clay. Brown, organic topsoil. Soft.	
1.5	4		Red-brown weathered Jutland Klippe shale. Foliated, angular to subangular. Hard. Fine- to very-fine grained. Highly fractured. Residual bedding. Dry.	
4	12		Yellow-orange, tan interbedded with black, moderately to slightly weathered, Jutland Klippe shale. Blocky, angular to subangular. Cobble to pebble size blocks. Moderately hard. Highly fractured. Fine- to very-fine grained. Residual bedding. Dry.	
			Notes: 1. No groundwater or seepage observed in test pit. 2. Expanded test pit floor area to 50 ft^2 for basin flood testing with bottom of pit at 12 ft.	
			Basin Flood Test 1: Emplaced 800 gallons to fill 1-foot of water in bottom. Filled at 9:20. Empty at 9:46. Drained 800 gallons in 26 minutes.	
			Basin Flood Test 2: Emplaced 800 gallons to create 1-foot of water in bottom. Filled at 10:08. Empty at 10:33. Drained 800 gallons in 25 minutes.	
			Backfilled basin flood pit on 12/9/2019.	

Test Pit Log

Name: Plushanksi Date: 12/9/2019 Page 1 of 1 .

Site: Block 22 Lots 3 and 4 Weather Rain/overcast

Test Pit No. 503 Total Depth: 12.5 feet below ground surface

Type of Excavator: Trackhoe Contractor: Mark Seguine

Sampling Interval (Depth in feet below ground surface)		Unified Soil Classification System Symbol	Sample/Interval Description	Comments
From:	To:			
0	1.5	OL	Silt, trace clay. Brown, organic topsoil. Soft.	
1.5	4	ML	Silt, little clay. Red-brown. Medium. Highly weathered residual shale (Jutland Klippe). Dry. Likely fill from backfilled shallow test pit previosly excavated at site.	
4	6		Red-brown weathered Jutland Klippe shale. Foliated, angular to subangular. Hard. Highly fractured. Fine- to very-fine grained. Residual bedding. Dry.	
6	12.5		Yellow-orange, tan interbedded with black, moderately to slightly weathered, Jutland Klippe shale. Blocky, angular to subangular. Cobble to pebble size blocks. Moderately hard. Highly fractured. Fine- to very-fine grained. Residual bedding. Dry.	
			Notes: 1. No groundwater or seepage observed in test pit. 2. Moved 5 feet east and excavated new test pit to create 10 x 5 foot area for basin flood testing with bottom of pit at 12 ft. 3. Moved to avoid possible fill for basin flood test.	
			Basin Flood Test 1: Emplaced 500 gallons to create 1-foot of water in bottom. Filled at 10:41. Empty at 13:57. Drained 500 gallons in 196 minutes.	
			Basin Flood Test 2: Emplaced 400 gallons to create 1-foot of water in bottom. Filled at 14:18. Empty at 20:18. Drained 400 gallons in 360 minutes.	Rain intensity increased when filling and during this test.
			Backfilled basin flood pit on 12/10/2019.	