Kem-Tec, A Group of Companies
Professional Engineering, Surveying & Environmental Services
22556 Gratiot Avenue, Eastpointe, Michigan 48021
Phone: (586) 772-2222   Fax: (586) 772-4048

January 6, 2026

STONEFIELD ENGINEERING & DESIGN, LLC
92 PARK AVENUE
RUTHERFORD, NJ 07070

RE: 9731 Chilson Commons Circle, Hamburg Township, Michigan
KTA Job No.: 25-02256

Dear Mrs. McMachen,

Kem-Tec & Associates was retained by Mrs. McMachen to conduct a Geotechnical investigation at 9731 Chilson Commons Circle, Hamburg Township. The geotechnical investigation was conducted by McDowell & Associates of Ferndale, Michigan.

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McDowell & Associates
Geotechnical, Environmental & Hydrogeological Services • Materials Testing & Inspection
21355 Hatcher Avenue • Ferndale, MI 48220
Phone: (248) 399-2066 • Fax: (248) 399-2157
www.mcdowasc.com

December 19, 2025

Kem-Tec & Associates
22556 Gratiot Avenue
Eastpointe, Michigan 48021

Job No. 25-553

Attention: Ms. Renata Garbarino

Subject: Soils Investigation
Proposed Car Wash
9731 Chilson Commons Circle
Hamburg Township, Michigan

Dear Ms. Garbarino:

In accordance with your request, we have made a Soils Investigation at the subject project.

Project Description

It is understood that the project will consist of constructing a new single-story, slab-on-grade, car wash building with parking areas and drives at the subject property. It is anticipated that the structures will transmit relatively light loads to the supporting soils and pavements will support mostly automobile traffic with occasional delivery and sanitation trucks.

Field Work and Laboratory Testing

Five Soil Test Borings, designated as 1 through 5, were performed at the subject property at the approximate locations shown on the Soil Boring Location Plan which accompanies this report. The approximate boring locations were field located by our drillers. The borings were advanced to depths ranging from about ten feet (10’) to twenty feet (20’) below the existing ground surface at the boring locations.

Soil descriptions, groundwater observations and the results of field and laboratory tests are to be found on the accompanying Logs of Soil Test Boring and summary sheet of Sieve Analysis results.

The borings encountered three inches (3”) to one foot four inches (1’4”) or surficial topsoil underlain by fill and/or possible fill materials generally consisting of sand-type soils with varying silt content. The underlying apparent native materials generally consisted of sand-type soils with varying silt content. Silty clay-type soils were encountered below eighteen feet five inches (18’5”) in Boring 1 and at various depths in Borings 3 and 4.

Soil descriptions and depths shown on the boring logs are approximate indications of change from one soil type to another and are not intended to represent an area of exact geologic change or stratification. The transition from one soil type to the next may be gradual rather than abrupt and subsurface conditions may be different from those found by the borings at locations between or beyond the actual boring locations. Also, the site shows some signs of modification which could indicate fill and soil conditions different from those encountered at the boring locations.

Groundwater was encountered in each of the borings at initial depths ranging from three feet ten inches (3’10”) to seven feet ten inches (7’10”) below the existing ground surface. Upon completion of drilling, water and/or cave-in levels were recorded in each of the borings at depths ranging from four feet one inch (4’1”) to seven feet ten inches (7’10”) below the existing ground surface. It should be noted that short-term groundwater observations may not provide a reliable indication of the depth of the water table. In soils with significant fines content (clay and/or silt), this is due to the slow rate of infiltration of water into the borehole as well as the potential for water to become trapped in overlying layers of granular soils during periods of heavy rainfall. Water levels in granular soils fluctuate with seasonal and climatic changes as well as the amount of rainfall in the area immediately prior to the measurements. It should be expected that groundwater fluctuations could occur on a seasonal basis and that seams of water-bearing sands or silts could be found within the various clay strata at the site.

Standard Penetration Tests (SPTs) made during the sampling operation indicate that the site soils have variable strengths and densities. Tests throughout the borings resulted in values ranging from 5 to 27 blows per foot. It should be noted that an automatic hammer was used for all SPTs. Considering our drilling equipment and procedures, it has been seen that blow counts with an automatic hammer should be increased by a factor of about 1.3 to be comparable with typical blow counts using a safety hammer.

Foundation Recommendations

Based on the project information provided and the results of field and laboratory tests, the indications are that the structures could be supported by conventional to deeper than normal spread or strip footings. All exterior footings should be constructed at, or below, a minimum frost penetration depth of three feet six inches (3’6”) below finished grade. All interior and exterior load-bearing footings should extend through non-engineered fill soils, soils containing significant amounts of organic substances, or excessively weak soils. All strip footings should be continuously reinforced in order to minimize any noticeable effects of differential settlement. It should be noted that some groundwater control may be required for foundation installation.

Where sand-type soils are overlying clay soils, it is suggested that footing inverts be at least one foot (1’) above the top of clay. If this is not possible, it is suggested that the footings extend down to the underlying clay.

Footings constructed at the following boring locations could be proportioned for the design soil pressures shown below, provided this results in the footings bearing on native, non-organic soils:

Boring	Depth	Soil Pressure (psf)
1	3’6” to 6’0”	2,500*
	6’0” to 10’0”	2,500
2	3’10” to 6’2”	2,000
	6’2” to 10’0”	2,500
3	4’6” to 6’0”	3,000
4	2’0” to 3’9”	3,000*
	3’9” to 10’0”	3,000
5	2’0” to 4’3”	3,000*
	4’3” to 10’0”	2,500

* Soils at these locations were described by our drillers and/or lab technician as possible fill materials or containing some organic matter. During footing excavation, if it is determined that these soils contain significant amounts of organic material or are indeed fill soils, then the footing depths should be extended so that they bear on native, non-organic material.

A maximum design soil pressure of 3,000 psf was considered for this project. Higher design soil pressures are available at various depths in the borings and could be detailed, if desired.

Engineered Fill

As an alternative to deeper than normal footings where fill is present or where the site grade is potentially raised, the building’s spread or strip footings could be supported on engineered fill. All existing non-engineered fill, organic soils, soft soils and loose granular soils should be excavated and removed from the proposed foundation area. The excavations should extend beyond the edge of the structure’s proposed footings at least nine inches (9”) for every foot below the footing. Groundwater flow into the excavation may require special dewatering techniques in order to facilitate the excavation of the unsuitable soil. Extreme caution should be practiced during the dewatering operation if the nearby building, utilities or other structures are sensitive to settlement. The removal of the unsuitable soils should be done in the presence of a qualified soils engineer or technician to limit the potential for uncontrolled fill or highly organic soils being left behind before the placement of engineered fill. After the unsuitable soils have been removed, the excavation should preferably be filled with compacted bank run sand similar to MDOT Class I or II granular soils. If clay material is utilized, it should be placed within 3% of its optimum moisture content. If the bottom of the excavation is not sufficiently stable to install the fill material, then a layer of coarse stone fill such as MDOT 6AA crushed stone could be installed. Geotextile filter fabric should be placed between the coarse stone engineered fill material and lower native granular soils to minimize the amount of fines infiltrating into the aggregate material. If granular material is to be placed above the stone, a six-inch (6”) layer of MDOT 21AA or an additional layer of filter fabric should be placed above the stone, overlapping the underlying fabric to further minimize the amount of material infiltrating into the aggregate material. The fill soils should be deposited in horizontal lifts not to exceed nine inches (9”) in thickness with each lift being compacted uniformly to a minimum density of 95% of its maximum value as determined by the Modified Proctor Test (ASTM D-1557).

One inch by three inch (1” x 3”) size crushed stone or crushed concrete could be used in lieu of the MDOT Type 6AA aggregate and bank run sand that we recommended above. The crushed material would need to be placed and compacted in lifts not exceeding nine inches (9”) up to about one foot (1’) below the planned footings and/or floor slabs. About a one foot (1’) thick layer of MDOT 21AA dense graded aggregate could then be placed above the crushed material in an effort to choke off the stone. The crushed stone or crushed concrete material should not contain significant amounts of brick and should be relatively clean of lime or cement dust which could potentially foul up or clog potential drain tiles. We suggest that the brick content should be less than 5% and cement/lime dust should be less than 3%. The large crushed material will need to be separated from the existing site granular soils by a geotextile fabric. We suggest that a geotextile filter fabric be placed along the bottom and sides of the engineered fill excavation in an effort to minimize fines from migrating into the voids within the crushed material. It should be noted that the use of crushed concrete could cause problems for potential drains and sump pumps. When water percolates through crushed concrete, the pH of the water can increase and minerals can precipitate out of the solution (mostly calcium salts and, in some cases, calcium hydroxide). Mineral deposits precipitating from the solution can shorten the life of sump pumps and plug drain tiles. High pH water can also corrode metal pipes. See AASHTO M 319-02 (2023) for discussion of these problems. Since the new structure will have a slab-on-grade, precipitating mineral deposits should not be a major concern.

Foundations placed on the engineered fill could be proportioned for a design soil pressure of 3,000 psf provided the strength is not limited by the presence of weaker underlying materials. Engineered fill should be placed and compacted up to footing and floor invert elevations.

Groundwater Considerations

Considering the present elevations, footing excavations extending through the fill or possible fill materials are expected to extend near or below the encountered water level in the vicinity of Borings 2 through 5. Footing excavations in the vicinity of Boring 1 are expected to be above the indicated groundwater level. It is sometimes possible to construct strip footings or install fabric and crushed stone engineered fill a foot or so below the water table in granular soils using a rapid sequence of excavation and rapid placement of concrete. If this is not possible, it may be necessary to use special dewatering techniques to depress the water table in the vicinity of Borings 2 through 5. Extreme care must be exercised during any dewatering operation if nearby buildings or utilities are sensitive to settlement. Care must be taken to minimize the removal of soil fines during any pumping operations.

Floor Slabs

Fill and/or possible fill soils were encountered in each of the borings to depths ranging from three feet nine inches (3’9”) to six feet (6’) below the existing ground surface. If the possibility of more than normal differential settlement can be tolerated, slab-on-grade floors or floor-supporting backfill could be placed at, or near, the present grade in the vicinity of the borings. Any topsoil or other obviously objectionable material should be removed and the subgrade thoroughly proof compacted. If, during the proof-compaction operation, areas are found where the soils yield excessively, the yielding materials should be scarified, dried, and recompacted or removed and replaced with engineered fill as outlined above.

If the possibility of more than normal differential movement cannot be tolerated, then all existing fill soils should be removed and replaced with engineered fill meeting the requirements outlined above, or the floor slab should be structurally supported.

If any existing structures are found, they should be entirely removed from the proposed building areas. Buried utilities should be removed or grouted in place. Resulting excavations should be backfilled with engineered fill meeting the requirements outlined above.

To minimize capillary action under floor slabs, we suggest placing at least four inches (4") of clean material on the subgrade followed by a suitable plastic vapor barrier between the clean material and the concrete slab. The clean material would preferably consist of MDOT 6AA crushed stone or MDOT Class II sand.

Pavement Design

The site subgrade soils are generally considered to be moderately susceptible to frost heave. As noted above for floor slabs, if the potential for more than normal settlement can be tolerated, it is anticipated that the existing fill soils could be left in place below the proposed pavement at the boring locations. If the possibility of more than normal differential movement cannot be tolerated, then all existing fill soils should be removed and replaced with engineered fill meeting the requirements outlined above.

In the areas to be paved, any topsoil, existing pavement structures, loose soil, soft soil, organic soil (including the buried topsoil encountered below 1' in Borings 4 and 5) or other obviously objectionable materials should be removed and the subgrade thoroughly proof-compacted for stability with heavy (>50,000 lbs.), rubber-tired equipment such as a loaded dump truck. If, during the proof-compaction operation, areas are found where the soil yields excessively, the yielding materials should be scarified, dried and recompacted or removed and replaced with similar material to maintain a relatively uniform subgrade. The entire subgrade should be reworked until approximately the upper one foot (1') of the subgrade is compacted to at least 95% of its Modified Proctor Maximum Dry Density (MPMDD) determined in accordance with ASTM D-1557.

Good drainage provisions will optimize pavement performance. It is recommended that the subgrade should be properly sloped to allow drainage of water. As a minimum, stub drains should be provided at the storm sewer catch basins to provide some drainage for the pavement base. The finished pavement surface should be free of depressions and sloped to provide effective surface drainage towards catch basins, where applicable. Edge drains should be installed in watered landscaped areas and in shallow groundwater areas (typically where groundwater is found to be within 18" of the planned pavement surface). These drains could be field determined during construction.

Flexible Pavements

Based on the above estimated subgrade CBR values and anticipated traffic loading, the following minimum flexible pavement structures for a 20-year analysis period are recommended:

Pavement Layers	Light Duty (Cars and Seldom Trucks)	Heavy/Medium Duty (Cars and Occasional Trucks)
Asphalt	1.5” 36A or 5EL (Top Course) 2.5” 13A or 4EL (Base Course)	2.0” 36A or 5EL (Top Course) 3.0” 3C or 3EL (Base Course)
21AA Granular Base	8”	10”

Notes:
1. The granular base should be compacted to 98% of its Modified Proctor Maximum Dry Density (MPMDD) determined in accordance with ASTM D-1557.
2. The asphalt should be placed in accordance with MDOT specifications as well as applicable local requirements and is recommended to be compacted to a minimum of 92% of the Theoretical Maximum Density (TMD).

The recommended asphalt binder is PG58-28 for the above mixes and a tack coat is recommended to be applied between lifts in accordance with MDOT and/or local standards. These recommended pavement structures are not intended to support concentrated or heavy construction traffic. Other pavement structure configurations and HMA mixes may be possible and can be reviewed upon request. In areas of concentrated slower moving truck traffic and/or areas with frequent stopping and starting, consideration can be given to increasing the asphalt binder to PG64-28 to improve the pavement performance.

The recommended flexible pavement structures outlined above should result in reasonably stable pavements, provided the geotechnical recommendations are followed. It should be recognized, however, that all asphalt pavements need maintenance from time to time as a result of progressive yielding under repeated traffic loads for a prolonged period of time. The 20-year design period assumes that regular maintenance will be carried out on the pavement structures. Placing the new pavement materials over existing non-engineered fill soils may result in long-term differential settlement and some potential cracking of the pavement.

Rigid Pavements

Based on the anticipated traffic conditions, the following rigid pavement designs are recommended for the parking areas and drives:

Pavement Layers	Light Duty (~50,000 ESAL)	Heavy Duty (~150,000 ESALs)
Concrete	6”	8”
21AA Granular Base	6”	8”

Note:
1. The granular base should be compacted to 95% of its Modified Proctor Maximum Dry Density (MPMDD) determined in accordance with ASTM D-1557.

Eight inches (8”) of concrete pavement should be used in the dumpster area and other intensive truck wheel load areas on top of the compacted granular base.

Closing

Experience indicates that actual subsurface conditions at the site could vary from those found at the five test borings made at specific locations. It is, therefore, essential that McDowell & Associates be notified of any variation of soil conditions to determine their effects on the recommendations presented in this report. The evaluations and recommendations presented in this report have been formulated on the basis of reported or assumed data relating to the proposed project. Any significant change in the final design plans should be brought to our attention for review and evaluation with respect to the prevailing subsoil conditions.

It is recommended that the services of McDowell & Associates be engaged to observe the soils in the footing excavations prior to concreting and engineered fill placement in order to test the soils for the required bearing capacities. Testing should also be performed to check that suitable materials are being used for controlled fills and that they are properly placed and compacted.

If we can be of any further service, please feel free to call.

Very truly yours,

McDOWELL & ASSOCIATES

Loran Stenzel-Sebastian
Staff Geologist

David Quintal, P.E.
Senior Engineer

DQ/

McDOWELL & ASSOCIATES
Geotechnical, Environmental, & Hydrogeologic Services
21355 Hatcher Avenue • Ferndale, MI 48220
Phone: (248) 399-2066 • Fax: (248) 399-2157

LOG OF SOIL BORING NO. 1

PROJECT Soils Investigation
Proposed Car Wash

LOCATION 9731 Chilson Commons Circle
Hamburg Township, Michigan

JOB NO. 25-553

SURFACE ELEVATION ____________ **DATE** 12/11/2025

Sample & Type	Depth	Legend		SOIL DESCRIPTION	Penetration Blows for 6"	Moisture %	Natural Wt. P.C.F.	Dry Den Wt. P.C.F.	Unc. Comp. Strength PSF.	Str. %
				Moist dark brown sandy TOPSOIL, fill						
	1		0'7"							
A	2			Compact moist brown silty fine SAND, fill	2					
UL					3	3.0	99			
	3				3					
			3'6"							
	4									
B				Compact moist brown silty fine SAND, possible fill	3					
UL	5				3	2.8	---			
					4					
	6		6'0"							
C	7			Compact moist brown silty fine SAND with occasional trace	2					
UL				of clay	3	9.8	113			
	8		7'10"		3					
				Compact wet brown silty fine SAND						
	9		8'7"							
D					2					
UL	10				3	10.7	138			
					4					
	11									
	12									
	13			Compact wet brown silty gravelly SAND						
	14									
E					2					
UL	15				3					
					4					
	16									
	17									
	18									
			18'5"							
	19									
F				Stiff moist blue silty CLAY with occasional wet silt lense and	3					
UL	20			occasional wet sand lense	4					
					6					
	21		20'6"							
	22									
	23									
	24									
	25									

TYPE OF SAMPLE
D. - DISTURBED
U.L. - UNDIST. LINER
S.T. - SHELBY TUBE
S.S. - SPLIT SPOON
R.C. - ROCK CORE
* - CALIBRATED PENETROMETER (POCKET PENETROMETER)

Note:
Used Track Rig "P".

SPT Hammer: Automatic   Crew Chief: T.C.

Standard Penetration Test - Driving 2" O.D. Sampler 1' With 140lb Hammer Falling 30": Count Made at 6" Intervals

GROUND WATER OBSERVATIONS

G.W. ENCOUNTERED AT	7	FT.	10	INS.
G.W. ENCOUNTERED AT		FT.		INS.
G.W. AFTER COMPLETION	7	FT.	10	INS.
G.W. AFTER HRS.		FT.		INS.

G.W. VOLUMES Heavy Cave-In at 7'10"

McDOWELL & ASSOCIATES
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LOG OF SOIL BORING NO. 2

PROJECT Soils Investigation
Proposed Car Wash

LOCATION 9731 Chilson Commons Circle
Hamburg Township, Michigan

JOB NO. 25-553

SURFACE ELEVATION ____________ **DATE** 12/11/2025

Sample & Type	Depth	Legend	SOIL DESCRIPTION	Penetration Blows for 6"	Moisture %	Natural Wt. P.C.F.	Dry Den Wt. P.C.F.	Unc. Comp. Strength PSF.	Str. %
			Moist dark brown sandy TOPSOIL, fill						
	1								
			1'4"						
A	2			3					
UL			Compact moist brown silty fine SAND, fill	4	8.0	113			
	3			4					
	4		3'10"						
B				1					
UL	5		Medium compact wet brown fine SAND with trace of silt	2	22.6	122			
				3					
	6								
			6'2"						
C	7			3					
UL				3	13.6	132			
	8			3					
	9								
D				2					
UL	10			3	12.4	---			
			Compact wet brown silty fine to medium SAND	3					
	11								
	12								
	13								
	14								
E				2					
UL	15			4					
				4					
	16		15'6"						
	17								
	18								
	19								
	20								
	21								
	22								
	23								
	24								
	25								

TYPE OF SAMPLE
D. - DISTURBED
U.L. - UNDIST. LINER
S.T. - SHELBY TUBE
S.S. - SPLIT SPOON
R.C. - ROCK CORE
* - CALIBRATED PENETROMETER (POCKET PENETROMETER)

Note:

SPT Hammer: Automatic Crew Chief: T.C.

Standard Penetration Test - Driving 2" O.D. Sampler 1' With 140lb Hammer Falling 30": Count Made at 6" Intervals

GROUND WATER OBSERVATIONS

G.W. ENCOUNTERED AT 3 FT. 10 INS.
G.W. ENCOUNTERED AT FT. INS.
G.W. AFTER COMPLETION 4 FT. 5 INS.
G.W. AFTER HRS. FT. INS.

G.W. VOLUMES Heavy Cave-In at 4'5"

McDOWELL & ASSOCIATES
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LOG OF SOIL BORING NO. 3

PROJECT Soils Investigation
Proposed Car Wash

LOCATION 9731 Chilson Commons Circle
Hamburg Township, Michigan

JOB NO. 25-553

SURFACE ELEVATION ____________ **DATE** 12/11/2025

Sample & Type	Depth	Soil Description	Penetration Blows for 6"	Moisture %	Natural Wt. P.C.F.	Dry Den Wt. P.C.F.	Unc. Comp. Strength PSF.	Str. %
		Moist brown sandy TOPSOIL, fill						
	1	0'6"						
A	2		3					
UL		Compact moist brown silty fine SAND with trace of clay, fill	3	11.7	124			
	3		3					
	4							
B		4'6"	7					
UL	5	Extremely compact wet brown gravelly SAND with trace of silt and moist sand and gravel seams	12	8.9	139			
			15					
	6							
C	7	6'9"	7					
UL			10	23.0	126			
	8	Extremely stiff moist blue silty CLAY	12			*	(9000)	
	9							
D		9'6"	2					
UL	10	Compact wet brown SAND with a moist silt seam	4					
		10'6"	5					
	11							
	12							
	13							
	14							
	15							
	16							
	17							
	18							
	19							
	20							
	21							
	22							
	23							
	24							
	25							

TYPE OF SAMPLE
D. - DISTURBED
U.L. - UNDIST. LINER
S.T. - SHELBY TUBE
S.S. - SPLIT SPOON
R.C. - ROCK CORE
* - CALIBRATED PENETROMETER (POCKET PENETROMETER)

Note:

SPT Hammer: Automatic Crew Chief: T.C.

Standard Penetration Test - Driving 2" O.D. Sampler 1' With 140lb Hammer Falling 30": Count Made at 6" Intervals

GROUND WATER OBSERVATIONS

G.W. ENCOUNTERED AT	4 FT.	6 INS.		
G.W. ENCOUNTERED AT	FT.	INS.		
G.W. AFTER COMPLETION	4 FT.	1 INS.		
G.W. AFTER HRS.	FT.	INS.		
G.W. VOLUMES	Light	Cave-In at 4'1"		

McDOWELL & ASSOCIATES
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LOG OF SOIL BORING NO. 4

PROJECT Soils Investigation
Proposed Car Wash

LOCATION 9731 Chilson Commons Circle
Hamburg Township, Michigan

JOB NO. 25-553

SURFACE ELEVATION ____________ **DATE** 12/11/2025

Sample & Type	Depth	Legend	SOIL DESCRIPTION	Penetration Blows for 6"	Moisture %	Natural Wt. P.C.F.	Dry Den Wt. P.C.F.	Unc. Comp. Strength PSF.	Str. %
			0'3" Moist dark brown sandy TOPSOIL, fill						
	1								
A	2		Very compact moist brown silty fine SAND, possible fill	7					
UL				9	6.6	111			
	3			9					
	4		3'10"						
B			Compact wet brown silty fine to medium SAND with traces of gravel and clay	2					
UL	5			4	18.1	130			
			5'4"	4					
	6		5'11" Stiff moist blue silty CLAY						
C	7		Very compact wet brown silty fine to medium SAND with occasional trace of gravel	7					
UL				9	11.3	---			
	8			9					
	9		8'7"						
D				4					
UL	10		Very stiff moist blue silty CLAY	6	22.7	128			
				10			*	(5500)	
	11								
			11'5"						
	12								
	13								
	14		Compact wet brown silty fine to coarse SAND						
E				2					
UL	15			3					
				5					
	16								
			16'3"						
	17								
	18								
			Compact wet brown silty fine SAND with occasional moist blue silty clay layer						
	19								
F				2					
UL	20			3					
				3					
	21		20'6"						
	22								
	23								
	24								
	25								

TYPE OF SAMPLE
D. - DISTURBED
U.L. - UNDIST. LINER
S.T. - SHELBY TUBE
S.S. - SPLIT SPOON
R.C. - ROCK CORE
* - CALIBRATED PENETROMETER (POCKET PENETROMETER)

Note:

SPT Hammer: Automatic Crew Chief: T.C.

Standard Penetration Test - Driving 2" O.D. Sampler 1' With 140lb Hammer Falling 30": Count Made at 6" Intervals

GROUND WATER OBSERVATIONS

G.W. ENCOUNTERED AT	3 FT.		10 INS.	
G.W. ENCOUNTERED AT	FT.		INS.	
G.W. AFTER COMPLETION	5 FT.		10 INS.	
G.W. AFTER	HRS.	FT.	INS.	

G.W. VOLUMES Heavy

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LOG OF SOIL BORING NO. 5

PROJECT Soils Investigation
Proposed Car Wash

LOCATION 9731 Chilson Commons Circle
Hamburg Township, Michigan

JOB NO. 25-553

SURFACE ELEVATION ____________ **DATE** 12/11/2025

Sample & Type	Depth	Legend	SOIL DESCRIPTION	Penetration Blows for 6"	Moisture %	Natural Wt. P.C.F.	Dry Den Wt. P.C.F.	Unc. Comp. Strength PSF.	Str. %
			0'3" Moist dark brown sandy TOPSOIL, fill						
	1								
A	2			10					
UL			Extremely compact moist brown silty fine SAND, possible fill	11	7.7	111			
	3			12					
	4								
B			4'3"	3					
UL	5		Compact moist to wet gray silty fine to medium SAND	4	10.0	---			
				5					
	6		5'9"						
C	7			3					
UL				3	15.8	---			
	8		Compact wet brown silty fine to coarse SAND with	4					
			occasional moist blue clay layers						
	9								
D				3					
UL	10			3					
				5					
	11		10'6"						
	12								
	13								
	14								
	15								
	16								
	17								
	18								
	19								
	20								
	21								
	22								
	23								
	24								
	25								

TYPE OF SAMPLE
D. - DISTURBED
U.L. - UNDIST. LINER
S.T. - SHELBY TUBE
S.S. - SPLIT SPOON
R.C. - ROCK CORE
* - CALIBRATED PENETROMETER (POCKET PENETROMETER)

Note:

SPT Hammer: Automatic   Crew Chief: T.C.

Standard Penetration Test - Driving 2" O.D. Sampler 1' With 140lb Hammer Falling 30": Count Made at 6" Intervals

GROUND WATER OBSERVATIONS

G.W. ENCOUNTERED AT	4	FT.	7	INS.
G.W. ENCOUNTERED AT		FT.		INS.
G.W. AFTER COMPLETION	5	FT.	7	INS.
G.W. AFTER HRS.		FT.		INS.

G.W. VOLUMES Heavy Cave-In at 5'7"

SIEVE ANALYSIS

Boring	Sample	% Passing #4 Sieve	% Passing #10 Sieve	% Passing #40 Sieve	% Passing #100 Sieve	% Passing #200 Sieve
1	D	75.5	63.5	39.1	17.1	13.7
2	B	100.0	99.9	87.2	7.4	4.7
3	B	47.9	41.6	28.8	14.1	11.6
4	B	94.8	90.5	61.2	23.7	19.7
5	B	85.5	80.6	62.4	23.7	15.5

McDowell & Associates
Geotechnical, Environmental & Hydrogeological Services • Materials Testing & Inspection
21355 Hatcher Avenue • Ferndale, MI 48220
Phone: (248) 399-2066 • Fax: (248) 399-2157
www.mcdowasc.com

General Notes

1. Terminology - Unless otherwise noted, all terms used herein refer to standard definitions presented in ASTM D653 and NAVFAC DM-7.1 Table 2 (Pages 7.1-8)
2. Particle Size

Boulder	Greater than 12"
Cobble	3" to 12"
Gravel	#4 Sieve to 3"
Stone	¾" to 3"
Pebble	#4 Sieve to ¾"

Coarse Sand	#10 Sieve to #4 Sieve
Medium Sand	#40 Sieve to #10 Sieve
Fine Sand	#200 Sieve to #40 Sieve
Silt	0.005mm to #22 Sieve
Clay	Less than 0.005mm

3. Classification of Constituents

-Major soil constituent or soil property is the principal noun (i.e. clay, silt, sand, etc.)
-Second and third major constituents (percent by weight) are reported as follows:

Trace	2% to 12%
Adjective (clayey, silty, etc.)	Over 12%

-Minor constituents (percent by weight) are reported as follows:

Occasional	Sporadic
Trace	2% to 12%
Little	13% to 22%
Some	23% to 33%

4. Stratified Descriptions

Streak	0" to 1/16" thickness
Parting	1/16" to ¼" thickness
Lense	¼" to 1" thickness
Seam	1" to 3" thickness
Layer	3" to 9" thickness

5. Soil Consistency – If clay content is sufficient so that clay dominates the soil properties, then clay becomes the principal noun with the other major constituent as modifier (i.e. silty clay, sandy clay, etc.). Relative density of granular soils is based upon the evaluation of the standard penetration resistance modified as required for depth effects, sampling effects, etc.

6. Unified Soil Classifications – Soils have been classified utilizing the Unified Soil Classification System (ASTM D2487) based on visual characteristics, particle size distributions, liquid limits, and plasticity index information. Unified Soil Classifications are shown as CL, ML, SW, SM, etc.

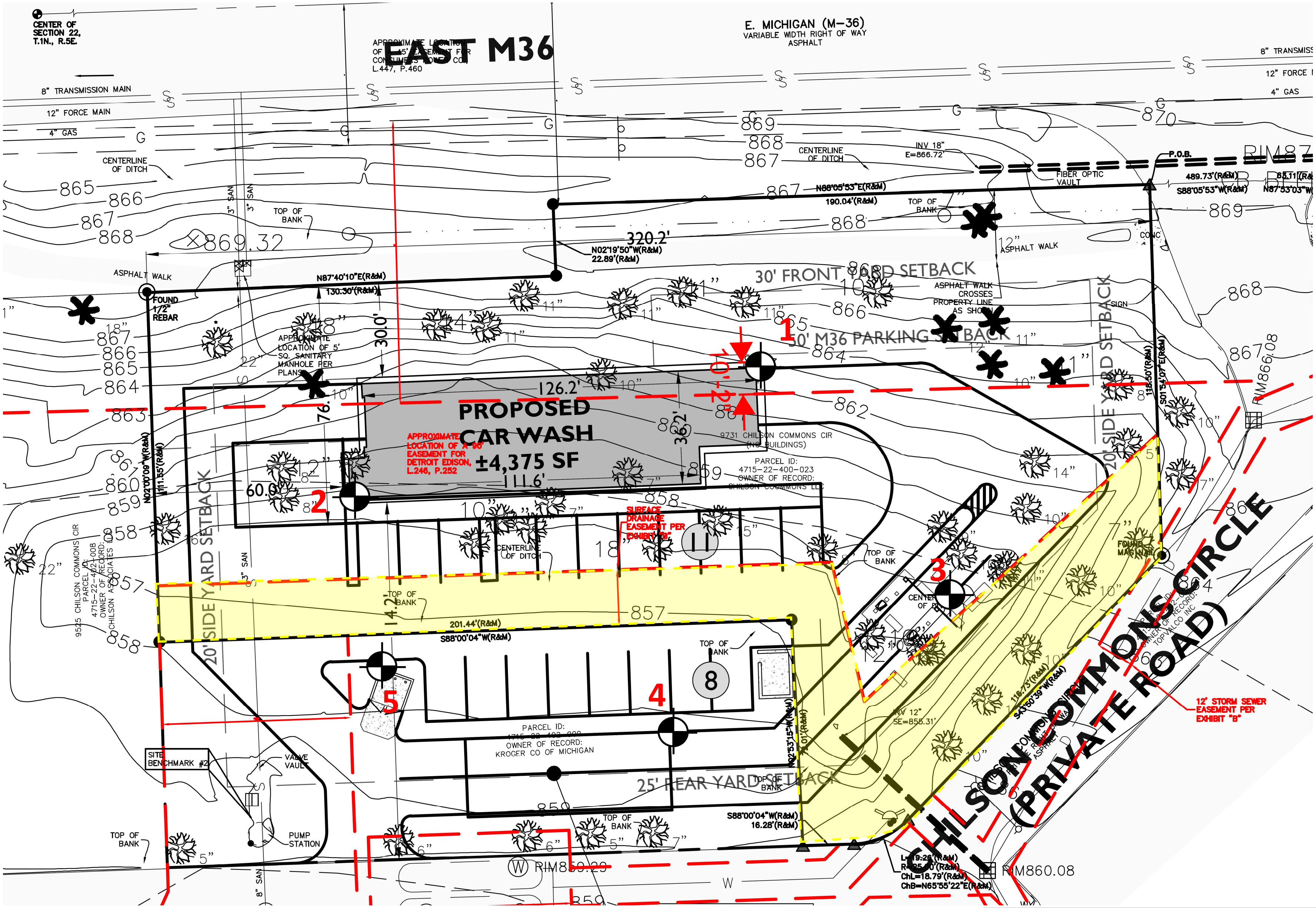
Cohesive Consistency	Approximate Unconfined Compressive Strength (psf)	Granular Consistency	Approximate Relative Density (%)	Range of Penetration (N)
Extremely Soft	Below 250	Very Loose	0 to 5	Less than 1
Very Soft	250 to 500	Loosely Compact	5 to 10	1 to 1.5
Soft	500 to 1000	Slightly Compact	10 to 20	2 to 4.5
Firm	1000 to 2000	Medium Compact	20 to 30	5 to 7.5
Stiff	2000 to 4000	Compact	30 to 45	8 to 16.5
Very Stiff	4000 to 8000	Very Compact	45 to 60	17 to 25
Extremely Stiff	Over 8000	Extremely Compact	60 to 100	Over 25

7. Sample Designations

D	Disturbed Sample – Directly from auger
SS	Split Spoon Sample – Without liner inserts
UL	Undisturbed Liner – Split Spoon Sample with liner inserts
ST	Shelby Tube Sample – 3" diameter unless otherwise noted
RC	Rock Core – NX core unless otherwise noted

8. Standard Penetration Test (ASTM D1586) – A 2.0" outside diameter, 1 ⅜" inside diameter split barrel sampler is driven into soil by means of a 140-pound weight falling freely through a vertical distance of 30". The sampler is normally driven in three successive 6" increments with the number of blows required to drive the sampler through each increment recorded. The sum of the second and third increment is termed the Standard Penetration Resistance (N).

Mid-Michigan Office
3730 James Savage Road, Midland, MI 48642
Phone: (989) 496-3610 • Fax: (989) 496-3190



Note: Base drawing prepared by others.

LEGEND

Soil Boring Locations, 1 through 5: Drilled by McDowell & Associates

McDowell & Associates
21355 Hatcher Avenue
Ferndale, Michigan 48220
Phone: (248) 399-2066
Fax: (248) 399-2157

Soil Boring Location Plan

Job No. 25-553