

05.28.2021

District 2 Onsite Septic Suitability Review

To:

Michael Ridley
Tuscarora Township
Via email:
supervisor@tuscaroratwp.com

From:

Aaron Nordman
Performance Engineers
406 Petoskey Ave.
Charlevoix, MI 49720

Re:

District 2
Evaluation for Onsite Septic
System Suitability

Project No.:

19-5213

Project Summary:

Performance Engineers, Inc. (PEI) has been working with Tuscarora Township on the feasibility of extending municipal sewer into the residential area west of their existing commercial sewer district. As part of this process, we have performed an evaluation of this area to assess the suitability of these properties for onsite septic systems. The basis for this determination is whether or not the properties can comply with the District Health Department No. 4 Sanitary Code regulations for onsite sewage treatment and disposal. A partial analysis (for the southerly service area) was provided to the Health Department for their review and comment on May 7, 2021. However, the Health Department declined to provide comment on that original submittal, citing the fact that evaluations are performed by the Health Department on a case-by-case basis, not neighborhood wide.

The basic issue is that we performed the original analysis on the southerly service area utilizing the dimensional setback requirements of the Code as the basis for evaluating compliance on a neighborhood-wide scale. As a follow up to that original submittal, we have since revised the phasing plan to set Phase I as the area north of Mack Avenue and Phase II would be the area south of Mack Avenue. We have also conducted a more thorough parcel by parcel dimensional analysis and included information on the soils present. This expanded analysis is presented here, along with our reference material.

Maps for Phase I and Phase II of the proposed sewer expansion are provided with this report for reference. The maps contain information related to the Sanitary Code setbacks, property dimensions, and the soils present in the area.

Background Information:

The proposed service area covers a total of approximately 200 acres and 420 properties. Of this area, approximately 30 acres are public road right-of-way and 12 acres are water, leaving 158 acres for the 420 properties. If the properties were all equal in size, it would leave just over 0.37 acres per lot (about 16,400 sf) per lot.

The USDA Soil Survey of Cheboygan County, Michigan maps approximately 77.7 acres of this area as unsuitable soils for onsite septic systems. This is based on the attached mapping of Grousehaven variant muck, Roscommon muck, and Udipsammets soils within the area. Although we recognize the fact that the USDA soil mapping is large in scale and cannot be applied to a specific site or localized area, we are also looking at this from a larger scale perspective to make generalized assumptions.

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The local Sanitary Code (District Health Department 4, effective October 12, 2009) states as its purpose "*These regulations are hereby adopted for the purpose of protecting public health and the quality of the environment as it affects human health, and to prevent the occurrence of public health hazards, risks and nuisances.*" Pursuant to that stated purpose, the Code contains design standards, special provisions, and requirements for the onsite discharge of sanitary sewage. The Code requirements for a compliant onsite septic system that PEI applied to this evaluation include the following:

- 100-ft surface water setback (Table 405)
- 50-ft well isolation (Table 405)
- 10-ft setback from property lines (Table 405)
- 10-ft setback from building foundation (Table 405)
- 50-ft setback from an intermittent wet area (Table 405)
- 24-in vertical isolation from bottom of aggregate to high groundwater (Table 409)
- Area shall be available for both the primary sewage disposal system & a replacement area (404.C)
- The replacement area shall be large enough for a sewage disposal system that complies with the Code (404.G)
- Structures, driveways, parking areas, etc. shall not be constructed over the drainfield area (404.D)
- The design sizing information in Section 410

Additional background information was collected during site visits to visually assess the surrounding environmental conditions. A key factor noticed is that there appears to be many artesian wells in the area, some of which were observed with a constant flow to the road ditch system (see attached photos). A subsequent review of well records from the area confirmed that this area is mainly drilled into an artesian aquifer with many flowing wells.

Basis for Determining Code Compliance:

The Code requires a 100-foot surface water setback, which renders about 114 (27%) of these properties non-compliant. The remaining 306 properties may be subject to additional setbacks related to the constant and/or intermittent flow of surrounding ditches (at least 51 additional properties are within 100 feet of a constantly flowing road ditch), but for our purposes, we will ignore this.

The Code requires a 10-foot setback from property lines, a 50-foot radius around a well, and 10-feet from a foundation. If we look at these minimum requirements and extrapolate this to a theoretically optimized lot, where the neighbor's well does not impact it, we estimate that any lot under about 10,000 sf would not reasonably be

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expected to meet the Code requirements for an onsite septic system. This assumption is based on the following dimensional information:

- Property line setback (150'x66' lot) requires 3,920 sf
- Well isolation (50' radius) requires 7,854 sf
- House footprint of 900 sf with 10-foot setback requires 2,500 sf
- Small driveway of 16' by 30' requires 480 sf
- Assume no garage, shed, or other accessory structures

So, the theoretical small house on a small lot described here requires 6,900 sf for just the driveway, house, and property setbacks. When you add the well envelope, the theoretical land required is 14,754 sf before you even begin to place an onsite septic system, which itself would require at least another 400 sf for a two-bedroom home in ideal conditions, plus an equally sized replacement system.

The reality is that any property under about 0.33 acres (14,000 sf) will have difficulty fitting everything on their site. However, in our conservative analysis, we identified 94 properties, outside of the surface water setback that are under 10,000 sf. This alone means that at least 208 properties (49.5%) cannot meet the Sanitary Code's dimensional requirements for proper setbacks and are thus non-conforming.

When you then apply the USDA soil survey information to the remaining properties, we find another 65 properties are located within area mapped as muck or made land. The Sanitary Code would prohibit the installation of a conforming onsite septic system on these soils (Section 410, deems these "unsuitable" without a variance). This would put the total number of non-conforming properties at 273 or 65% of the total 420 properties.

Summary of Findings:

Based on this analysis, it is obvious to us that the area is severely limited in regard to properties being able to install onsite septic systems that would adequately protect the surrounding environment and adjacent property owners from the potential impacts of an onsite septic system discharge, per the local Sanitary Code. There could be arguments made against our theoretical home and property dimensions, such as overlapping well envelopes or overlapping well and property line setbacks. However, this is why we have conservatively identified only the properties under 10,000 sf. and we did not take into account the Code requirement for a property to have not only room for the drainfield, but also an equivalent replacement area. Nor did we take into account the very likely scenario that many of these properties will have high groundwater conditions that require "mounded" drainfields that take up even more space. It is probably closer to

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75% of the properties in this area that would need some form of variance from strict application of the Code for a new or replacement onsite septic system.

PEI recognizes that the local Health Department can only make specific determinations on a case-by-case basis and that the Code gives them the ability to grant variances and approve alternative treatment systems. While these are more costly than a conventional system, it is our assumption that this is the most likely scenario for the majority of properties in the proposed District 2 service area. However, the setbacks, design criteria, and requirements cited here were promulgated for the protection of public health and the environment, as the stated purpose of the Code, and should not be discounted just because the Health Department has to have a means to deal with these existing situations.

PEI believes that we have clearly demonstrated that over 51% of the properties within the proposed service area have non-conforming septic systems based on application of Section 404 General Requirements of the Sanitary Code. This Section requires that *"All sewage shall be disposed in a sewage system meeting the requirements of this Code"*. While we have done this dimensionally, utilizing aerial imagery, tax maps, well records, USDA Soil Maps, and AutoCAD software, we believe that an actual field investigation would only turn up additional issues.

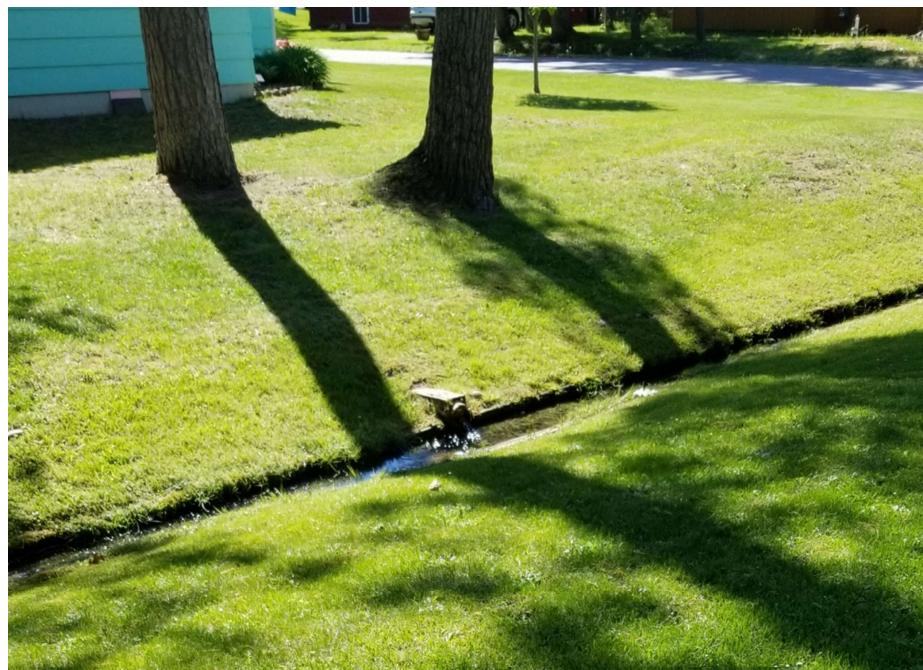
It is readily apparent why there has been such a demand for an expansion of the municipal sewer system into this residential area. Municipal sewer is the only viable way for the high density of properties within this area to reasonably be expected to discharge sanitary sewage without impact to the sensitive environment surrounding this location. We hope that you concur with our findings, but invite you to please provide any comment or additional information that you feel may not have been considered.

Sincerely,

Performance Engineers, Inc.

Aaron Nordman

Aaron Nordman, P.E.
Principal



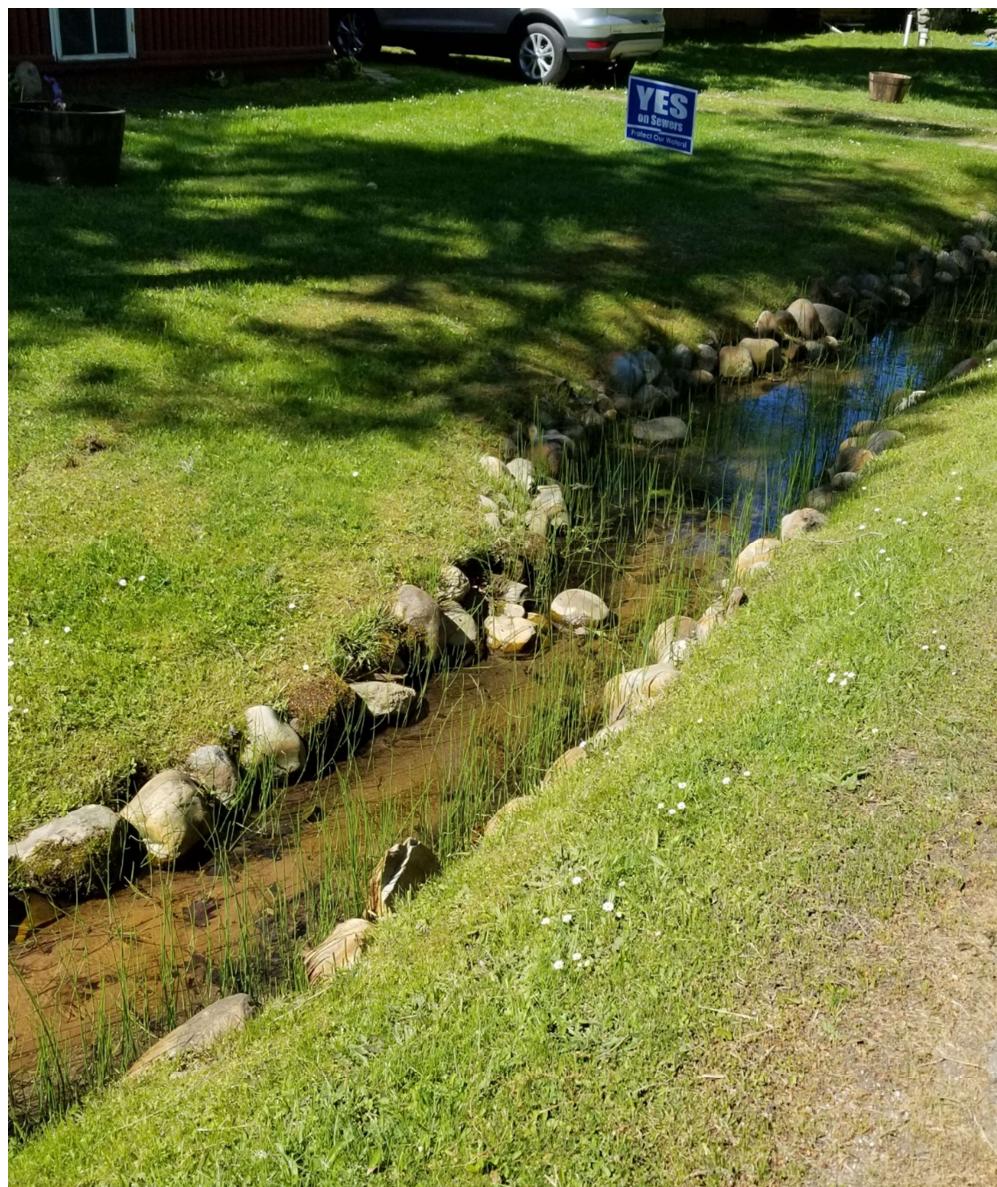
One of several constant flows to road ditch system



Another example of constant ditch flow.



Upstream source of some ditch water all the way up at Poplar & Mack



Road ditch on Witt becomes substantial with successive upstream flows

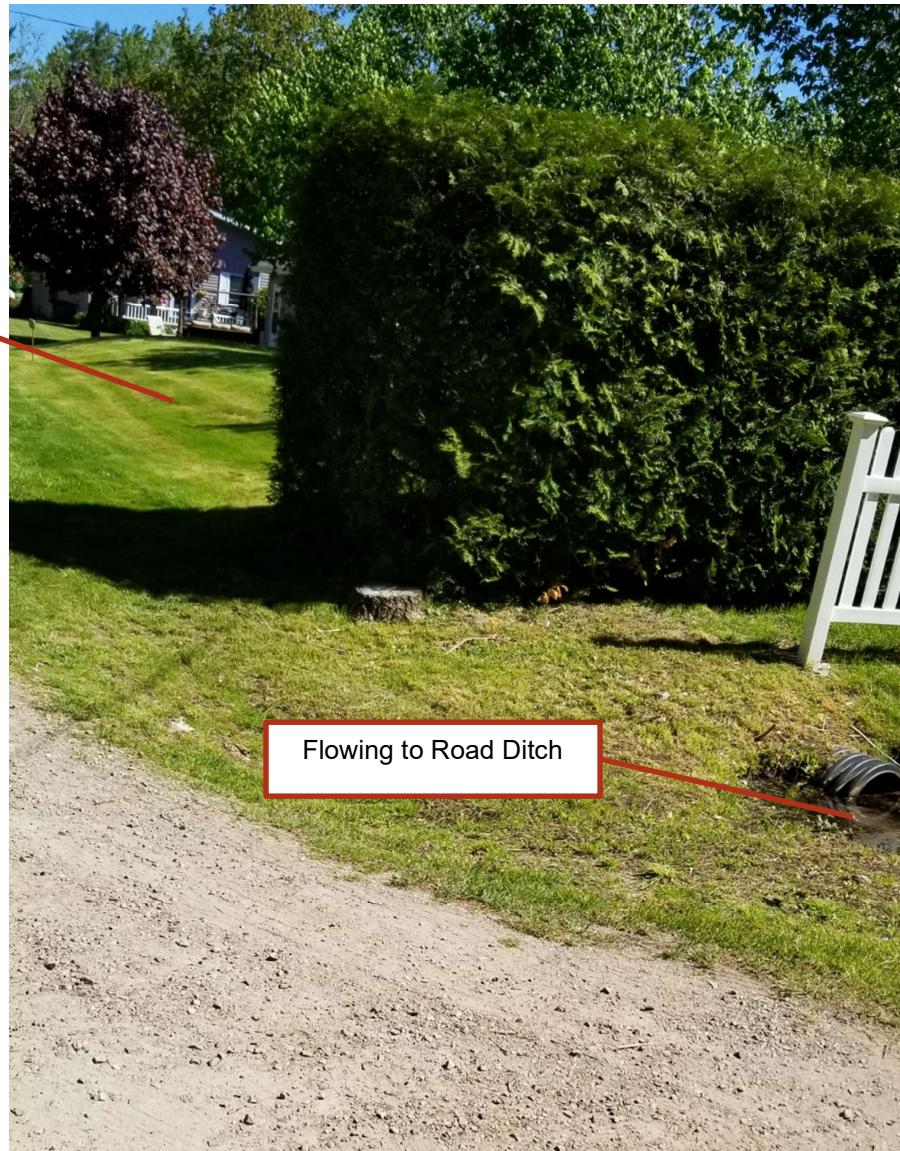


Flow from Witt to Oak Glen that gets piped under mounds



Mounded drainfields
directly over piped flow
from ditch

Oak Glen Mounds over the piped flow from Witt Rd.



Another example of mounded drainfield with a direct discharge to road ditch under it.

Soil Map—Cheboygan County, Michigan (Tuscarora Twp District 2 Soils Map)



Map Scale: 1:10,700 if printed on A portrait (8.5" x 11") sheet.

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84

MAP LEGEND

Area of Interest (AOI)		Spoil Area
Soils		Stony Spot
		Very Stony Spot
		Wet Spot
		Other
		Special Line Features
Special Point Features		Blowout
		Borrow Pit
		Clay Spot
		Closed Depression
		Gravel Pit
		Gravelly Spot
		Landfill
		Lava Flow
		Marsh or swamp
		Mine or Quarry
		Miscellaneous Water
		Perennial Water
		Rock Outcrop
		Saline Spot
		Sandy Spot
		Severely Eroded Spot
		Sinkhole
		Slide or Slip
		Sodic Spot

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.
Soil Survey Area: Cheboygan County, Michigan
Survey Area Data: Version 16, Jun 8, 2020
Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.
Date(s) aerial images were photographed: Dec 31, 2009—Mar 31, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
7	Grousehaven variant muck	8.9	4.1%
12B	Grayling sand, 0 to 8 percent slopes	11.2	5.2%
13B	Rubicon sand, 0 to 6 percent slopes	5.5	2.6%
13D	Rubicon sand, 6 to 18 percent slopes	14.5	6.7%
13F	Rubicon sand, 30 to 60 percent slopes	2.6	1.2%
27D	Cheboygan loamy sand, 12 to 30 percent slopes	5.1	2.4%
41A	Au Gres sand, 0 to 3 percent slopes	70.1	32.4%
56A	Riggsville loamy sand, 0 to 3 percent slopes	3.2	1.5%
61	Roscommon muck	50.4	23.3%
81	Udipsammets, nearly level to steep	18.4	8.5%
CswaaA	Croswell sand, 0 to 6 percent slopes	13.2	6.1%
W	Water	13.4	6.2%
Totals for Area of Interest		216.5	100.0%

TABLE 14.--SANITARY FACILITIES

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "poor," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
2----- Lupton	Severe: subsides, ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: ponding, excess humus.	Severe: seepage, ponding.	Poor: ponding, excess humus.
5----- Loxley	Severe: subsides, ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, excess humus.	Severe: seepage, ponding.	Poor: ponding, excess humus, too acid.
7----- Grousehaven Variant	Severe: flooding, ponding, poor filter.	Severe: seepage, flooding, excess humus.	Severe: flooding, seepage, excess humus.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
8----- Tawas	Severe: subsides, ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
9----- Greenwood	Severe: subsides, ponding.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, excess humus.	Severe: seepage, ponding.	Poor: ponding, excess humus.
10----- Dawson	Severe: subsides, ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, excess humus.	Severe: seepage, ponding.	Poor: ponding, excess humus.
11B----- Kalkaska	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
11C----- Kalkaska	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
11D, 11F----- Kalkaska	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
12B----- Grayling	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
13B----- Rubicon	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
13C----- Rubicon	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage.	Poor: seepage, too sandy.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
49A----- Finch	Severe: cemented pan, wetness, percs slowly.	Severe: seepage, cemented pan, wetness.	Severe: seepage, wetness, too sandy.	Severe: cemented pan, seepage, wetness.	Poor: cemented pan, seepage, too sandy.
50A----- Bonduel	Severe: depth to rock, seepage, wetness.	Severe: depth to rock, seepage, wetness.	Severe: depth to rock, seepage, wetness.	Severe: wetness, seepage.	Poor: area reclaim, wetness, thin layer.
51A----- Otisco	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
52A----- Ogemaw	Severe: cemented pan, wetness, percs slowly.	Severe: seepage, cemented pan, wetness.	Severe: wetness, too clayey.	Severe: cemented pan, seepage, wetness.	Poor: cemented pan, too clayey, wetness.
55A----- Solona	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
56A----- Riggsville	Severe: wetness, percs slowly.	Severe: seepage.	Severe: wetness.	Severe: wetness.	Poor: wetness.
57A----- Brimley	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too sandy.	Severe: wetness.	Poor: wetness.
58A----- Alstad	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
60A----- Rudyard	Severe: wetness, percs slowly.	Slight-----	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
61----- Roscommon	Severe: ponding, poor filter.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
62----- Wheatley	Severe: ponding, poor filter.	Severe: seepage, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, small stones.
63----- Brevort	Severe: ponding, percs slowly, poor filter.	Severe: seepage, ponding.	Severe: ponding.	Severe: seepage, ponding.	Poor: ponding.
64----- Burleigh	Severe: ponding, percs slowly, poor filter.	Severe: seepage, ponding.	Severe: ponding, too sandy.	Severe: seepage, ponding.	Poor: ponding.

LEGEND		
DESCRIPTION	PROPOSED	EXISTING
BUILDING		
STORM SEWER	— ST —	— ST —
SANITARY SEWER	— SAN —	— SAN —
WATER	— W —	— W —
NATURAL GAS	— G —	— G —
UNDRGRND ELEC.	— U/E —	— U/E —
OVERHEAD ELEC.	— E —	— E —
UNDRGRND TEL.	— U/T —	— U/T —
WELL		
MANHOLE		
CATCH BASIN		
FIRE HYDRANT		
UTILITY POLE		
LIGHT POLE		
CLEANOUT		
WATER VALVE		
DECIDUOUS TREE		
CONIFEROUS TREE		
BUSH		
TREELINE		
DITCH OR SWALE		
ELEVATION	000.00	000.00
CONTOUR	000	000
PROPERTY LINE		
UNIT LINE	— - - - -	— - - - -
FENCE	— X — X —	— X — X —

ABBREVIATIONS			
ASPH	- ASPHALT	IE	- INVERT ELEVATION
BF	- BARRIER FREE	LFT	- LINEAR FEET
BC	- BACK OF CURB	MH	- MANHOLE
BLDG	- BUILDING	PVC	- POLYVINYLCHLORIDE
B.M.	- BENCH MARK	R	- PIPE
CFT	- CUBIC FEET	RAD	- RADIUS
C/C	- CENTER TO CENTER	RCP	- REINFORCED CONCRETE PIPE
CMP	- CORRUGATED METAL PIPE	RR	- RAILROAD
CONC	- CONCRETE	SAN	- SANITARY
DIP	- DUCTILE IRON PIPE	STL	- STEEL
FDN	- FOUNDATION	STM	- STORM
FFE	- FINISH FLOOR ELEVATION	T/C	- TOP OF CURB
F.G.	- FINISH GRADE ELEVATION	T/W	- TOP OF WALK
HDPE	- HIGH DENSITY POLYETHYLENE	T/WALL	- TOP OF WALL
		TE	- TOP/RIM ELEVATION
		TYP	- TYPICAL

**SANITARY CODE REFERENCE,
SECTION 405**
 (REQUIRED MINIMUM ISOLATION
DISTANCES TO ABSORPTION BEDS
AND TRENCHES)

- WELL - 50'
- BUILDING FOUNDATION - 10'
- SURFACE WATER - 100'
- PROPERTY LINE - 10'



PHASE I - ONSITE SANITARY LIMITATIONS



PHASE I
LIMITATIONS

C1

SHEET 1 OF 2

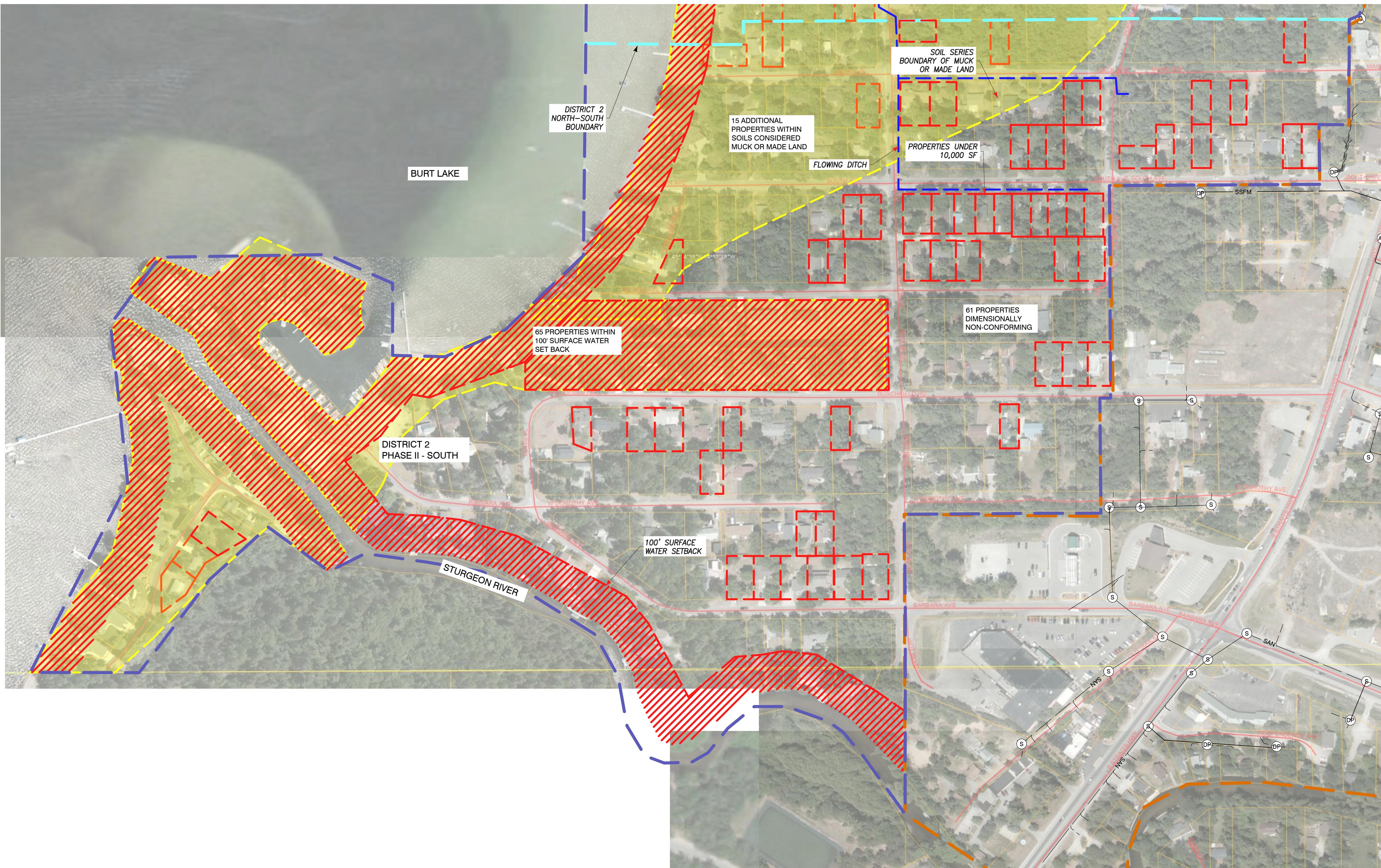
SHEET TITLE
PHASE I
LIMITATIONS

1

Performance Engineers, Inc.

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LEGEND			
DESCRIPTION	PROPOSED	EXISTING	
BUILDING			
STORM SEWER	— ST —	— ST —	
SANITARY SEWER	— SAN —	— SAN —	
WATER	— W —	— W —	
NATURAL GAS	— G —	— G —	
UNDRGRND ELEC.	— U/E —	— U/E —	
OVERHEAD ELEC.	— E —	— E —	
UNDRGRND TEL.	— U/T —	— U/T —	
WELL			
MANHOLE	(S) (W) (ST)	(S) (W) (ST)	
CATCH BASIN	(CB) (CB)	(CB) (CB)	
FIRE HYDRANT			
UTILITY POLE			
LIGHT POLE			
CLEANOUT	(CO)	(CO)	
WATER VALVE			
DECIDUOUS TREE			
CONIFEROUS TREE			
BUSH			
TREELINE			
DITCH OR SWALE			
ELEVATION	000.00	000.00	
CONTOUR	— 000 —	— 000 —	
PROPERTY LINE	— RL —	— RL —	
UNIT LINE	— - - - -	— - - - -	
FENCE	— X — X —	— X — X —	
ABBREVIATIONS			
ASPH	- ASPHALT	IE	- INVERT ELEVATION
BF	- BARRIER FREE	LFT	- LINEAR FEET
BC	- BACK OF CURB	MH	- MANHOLE
BLDG	- BUILDING	PVC	- POLYVINYLCHLORIDE PIPE
B.M.	- BENCH MARK	R	- RADIUS
CFT	- CUBIC FEET	RCP	- REINFORCED CONCRETE PIPE
C/C	- CENTER TO CENTER	RR	- RAILROAD
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CONC	- CONCRETE	STL	- STEEL
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FDN	- FOUNDATION	T/C	- TOP OF CURB
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F.G.	- FINISH GRADE	T/WALL	- TOP OF WALL
HDPE	- HIGH DENSITY POLYETHYLENE	TE	- TOP/RIM ELEVATION
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SANITARY CODE REFERENCE,
SECTION 405
**(REQUIRED MINIMUM ISOLATION
DISTANCES TO ABSORPTION BEDS
AND TRENCHES)**

- WELL - 50'
- BUILDING FOUNDATION - 10'
- SURFACE WATER - 100'
- PROPERTY LINE - 10'



PHASE II - ONSITE SANITARY LIMITATIONS

1":150'



PHASE II LIMITATIONS

SHEET T

STREET NAME

PHASE II

PHASE II

LIMITATIONS

LIMITATIONS

62

SHEET 2 OF 2
