# SOILS AND PLAN REVIEW

### WCCA Fall Conference – October 2023



### OBJECTIVES

- How do we review a soil report?
- How does this match up with the proposed plan?
- Discuss report examples
- Open Discussion



What is the soil and site telling you?

The role of the soil tester is to FIND THE STORY <u>AND</u> REPORT IT TO OTHERS



We are not just describing the soil but also applying it and relating it to the task at hand



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### SOIL EVALUATION REPORT

### SPS 385 Soil and Site Evaluations

### OTHER RESOURCES

### Web Soil Survey

• Soil Descriptions

### Surface Water Viewer

- Wetlands
- Floodplains

### **County GIS Site**

- Recent aerials
- Contours (have they changed)
- Parcel lines

### **Historical Aerials**



### WEB SOIL SURVEY



### ANTIGO SERIES

The Antigo series consists of very deep, well drained soils formed in 50 to 100 centimeters of loess or silty alluvium and in loamy alluvium and in the underlying stratified sandy outwash. These soils are on outwash plains, stream terraces, eskers, kames, glacial lake plains, and moraines. Slope ranges from 0 to 30 percent. Mean annual precipitation is about 810 millimeters. Mean annual air temperature is about 5 degrees C.

TAXONOMIC CLASS: Coarse-loamy over sandy or sandy-skeletal, mixed, superactive, frigid Haplic Glossudalfs

TYPICAL PEDON: Antigo silt loam, on a plane slope of less than 1 percent, in a cultivated field, at an elevation of about 463 meters above sea level. (Colors are for moist soil unless otherwise stated.)

Ap--0 to 23 centimeters; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak fine subangular blocky structure; very friable; many fine roots; about 6 percent gravel and 2 percent cobbles; pH 6.8; abrupt smooth boundary.

E-23 to 30 centimeters; brown (10YR 5/3) silt loam, very pale brown (10YR 7/3) dry; weak thin platy structure; very friable; common fine roots; about 1 percent gravel and 1 percent cobbles; pH 6.1; clear wavy boundary.

B/E-30 to 48 centimeters; about 70 percent dark yellowish brown (10YR 4/4) silt loam (Bt); moderate very fine angular blocky structure; friable; few distinct brown (7.5YR 4/4) clay films on faces of peds; penetrated by brown (10YR 5/3) silt loam (E), very pale brown (10YR 7/3) dry; weak thin platy structure; very friable; common fine roots; pH 4.9; clear irregular boundary.

**Bt1**—48 to 71 centimeters; dark yellowish brown (10YR 4/4) silt loam; moderate fine angular blocky structure; friable; common fine roots; common distinct brown (7.5YR 4/4) clay films on faces of peds; common coats of pale brown (10YR 6/3) clean silt and very fine sand grains on vertical faces of peds; about 1 percent gravel and cobbles; pH 4.5; abrupt wavy boundary.

2Bt2-71 to 79 centimeters; brown (7.5YR 4/4) loam; moderate medium subangular blocky structure; friable; common fine roots; common prominent dark reddish brown (5YR 3/4) clay films on faces of peds and in pores; common coatings of pale brown (10YR 6/3) clean silt and sand grains primarily on vertical faces of peds; about 11 percent gravel and 2 percent cobbles; pH 4.4; abrupt wavy boundary.

**2Bt3**—79 to 84 centimeters; brown (7.5YR 4/4) very gravelly sandy loam; weak coarse subangular blocky structure; friable; few fine roots; few distinct dark reddish brown (5YR 3/4) clay bridges between mineral grains; about 34 percent gravel and 2 percent cobbles; pH 4.5; abrupt wavy boundary.

3C-84 to 152 centimeters; brown (7.5YR 5/4) stratified sand and gravelly sand; single grain; loose; about 16 percent gravel and 2 percent cobbles; few fine roots; pH 5.1.

### STANDARDS

### **Checklist?**

### **CHECKLIST FOR CERTIFIED SOIL TESTS**

#### Submit the Following Originals (Use Permanent Ink):

Soil Evaluation Report (SBD-8330 R. 04/15)
 Plot Plan
 Review Form (Crew file sheet, system elevation sheet) optional
 Copies of Additional Information (Tax Statement, CSM, Deed) optional
 Fee

#### Soil Evaluation Report: (Include the Following Information)

Parcel Identification Number
 Property Owner's Information
 Property Location (Sec./Twp./Range, Lot #, Block #, CSM #)
 Fire Number and Nearest Road
 Floodplain Elevation, Flow Rate, Parent Material
 Proposed System elevation and system type
 Complete Soil Boring Information including loading rates
 Soils must be described accurately, including rock fragments, mottling, groundwater, bedrock or disturbed soil
 Soils must be described to at least three feet below the system elevation or more for sand with rock fragments of >35% (Table 383.44-3)
 Date Soil Evaluation was conducted

□ CST Name, Signature, Number, Address and Phone Number

#### Plot Plan: (Include the Following Information Drawn to Dimension or to Scale)

North arrow, scale size, legend
CST, owner and property information
Bench Mark (Description and Location)
Contour Lines (Example = 98.0'/96.0'/94.0')
Borings (Locations and Elevations)
Percent and Direction of Land Slope
Well Location (Including Neighboring Wells, If Applicable)
Location of Wetland Areas, Floodplain and Navigable Waters
Buildings, Driveways and Structures (Locations and Descriptions)
Location of Property Lines
Existing System Location
Fire Number and Road Name
Current Surface Elevation of Adjacent Navigable Waters

SOIL EVALUATION REPORT         In accordance with PP3 38, Vis. Am. Cost accordance with PP3 39, Vis. Additional design/site considerations (S) they hes ~ High Cosp C		Division of Indi			
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OIL EVALUATION REPORT       Property Owner       Property Owner       Block #       Dubl. Name or CSM#         City       State       20 Code       Phone Number       City       Vilage       Town       Nearest Road         City       State       20 Code       Phone Number       City       Vilage       Town       Nearest Road         City       State       20 Code       Phone Number       City       Vilage       Town       Nearest Road         City       State       20 Code       Phone Number       City       Vilage       Town       Nearest Road         Property Owner's Mailing Address       Lot #       Property Owner's Mailing Address       City       City       Vilage       Town       Nearest Road         City       State       20 Poole Number of bedrooms	formation you provide may be used for secondary purposes (Privacy Law, s. 15.04(1)(m)).	Personal Information			
OIL EVALUATION REPORT       Property Owner's Mailing Address       Lot #       Block #       Sudd. Name or CSM#         City       State       Zip Code       Phone Number       City       Village       Town       Nearest Road         Image: New Construction       Use:       Replacement       Public or commercial - Describe:       Pood Plan elevation if applicable       1.         Image: New Construction       Use:       Image: Residential / Number of bedrooms       4       Addition to existing building       1.         Image: Replacement       Public or commercial - Describe:       Prod Plan elevation if applicable       1.       1.         Code derived daily flow       600       gpd       Recommended design loading rate	wher Property Location Govt. Lot % % S T N R E (or)	Property Owner			
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□ Floodplain Elevation, Flow Rate, Parent Material
□ Proposed System elevation and system type
□ Complete Soil Boring Information including loading rates
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Buildings, Driveways and Structures (Locations and Descriptions)
Location of Property Lines
Existing System Location
Fire Number and Road Name
Current Surface Elevation of Adjacent Navigable Waters



### COLOR





#### SOIL EVALUATION REPORT County In accordance with SPS 385, Wis, Adm, Code Attach complete site plan on paper not less than 8 1/2 x 11 Inches In size. Plan must include, but not limited to: vertical and horizontal reference point (BM), direction and percent slope, scale or dimensions, north arrow, and location and distance to nearest road. Parcel I.D. Reviewed by Date Please print all information. Personal Information you provide may be used for secondary purposes (Privacy Law, s. 15.04(1)(m)). Property Owner Property Location Govt. Lot 54 14 S NR E (or) W T Property Owner's Mailing Address Lot # Block # Subd. Name or CSM# City City State ZIp Code Phone Number Vilage Town Nearest Road New Construction Use: Residential / Number of bedrooms Code derived design flow rate GPD Replacement Public or commercial – Describe: Parent material Flood Plan elevation if applicable \_\_\_\_\_ ft. General comments and recommendations: Boring Pit Boring # Ground surface elev. ft. Depth to limiting factor in. Soll Application Rate GPD/Ft Redox Description Consistence Roots Horizon Depth Dominant Color Texture Structure Boundary Munsell Qu. Az. Cont. Color Gr. Sz. Sh. In. "Ef#1 \*Eff#2 Boring Pit Boring # Depth to limiting factor \_\_\_\_\_ In. Ground surface elev. Ť. Soll Application Rate GPD/Ft<sup>2</sup> Dominant Color Redox Description Texture Structure Consistence Boundary Roots Hortzon Depth Munsell In. Qu. Az. Cont. Color Gr. Sz. Sh. "Ef#1 "Eff#2

Wisconsin Department of Safety and Professional Services

Division of Industry Services

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### COLOR

- Munsell Soil Color Charts use <u>moist</u> <u>samples</u>
- Report Hue, Value and Chroma in order (e.g. 10YR 4/4)
- Surface coatings impart color
  - Black organic matter
  - Red, brown, yellow different iron oxides
  - Gray lack of OM and Fe
- An A horizon is defined as a soil horizon distinguished by it's dark color because of the accumulation of organic material.



### TEXTURE



• **Defined:** Texture is the relative proportion (%) of the different soil separates in a given sample.

- Soil separates include <u>sand</u>, <u>silt</u> and <u>clay</u> size particles.
- 12 basic textural classes on the textural triangle.
  - Don't make up classes
  - Use texture modifiers
    - Very gravelly sand
    - Extremely cobbly sand
  - Use textural subclasses
    - Coarse sand
    - Coarse sandy loam

### TEXTURE



Field determination of soil texture is by feel



### TEXTURE



### **Rock Fragments**

- Non-soil fragments over 2mm in diameter Coarse fragments decrease water holding capacity (treatment) ۲



## Rock Fragment Size & Content

Fragment	(mm) dia.	(in)	Modifer Term
Gravel	2-75	0.08-3	GR (gravelly)
Cobble	75-250	3-10	COB (cobbly)
Stone	250-600	10-24	ST (stony)
Boulder	>600	>24	BY (bouldery)

• <15%	texture only	S	S
• 15-35%	modifier term	GRS	COBS
• 35-60%	modifier + very	GRVS	COBVS
• 60-90%	modifier + extremely	GRXS	COBXS
• >90%	modifier term only	GR	COB

### Soils Abbreviations Used By Certified Soil Testers

	USDA Texture,	Modifie	rs, and Terms Used in	n Lieu o	of Texture <sup>1</sup>
	Texture modifiers		Texture terms	Terms	used in lieu of texture
BY BYV BYX CB CBA CBV CBX CNV CBX CNV CNX FL FLV FLX GRC GRV GRX MK PT RB ST STV STX	Bouldery Very bouldery Extremely bouldery Cobbly Angular cobbly Very cobbly Extremely cobbly Channery Very channery Extremely channery Flaggy Very flaggy Extremely flaggy Gravelly Coarse gravelly Fine gravelly Very gravelly Extremely gravelly Extremely gravelly Mucky Peaty Rubbly Stratified Stony Very stony Extremely stony	COS S FS VFS LCOS LS LFS LVFS COSL SL FSL VFSL L SIL SIL SIL SIC SIC C	Coarse sand Sand Fine sand Very fine sand Loamy coarse sand Loamy sand Loamy fine sand Loamy very fine sand Coarse sandy loam Sandy loam Fine sandy loam Very fine sandy loam Loam Silt loam Silt Sandy clay loam Silty clay loam	CE CEM CIND DE FB FRAG GYP HM ICE IND MARL MPT MUCK PEAT SG SP UWB VAR WB	Coprogenous earth Cemented Cinders Diatomaceous earth Fibric material Fragmental material Gravel Gypsiferous material Leo or frozen soit Indurated Mari Macky-peat Mack Peat Sand and gravel Sapric material Unweathered bedrock Variable Weathered bedrock

<sup>1</sup> National Soil Survey Interpretations Handbook, Draft, 1992, p. 80.

### STRUCTURE



- Soil structure is the arrangement of individual particles of sand, silt, and clay into aggregates or clusters called <u>peds</u>.
- Peds are classified based on degree of distinctness, size, and shape.
- Abbreviation: 2msbk = moderate, medium, subangular blocky
- Structure is the result of many processes
  - Freeze/thaw cycles
  - Chemical processes of organic material and clays that act as binding agents
  - Earthworms
  - Plant roots
- Compaction destroys the structure

### STRUCTURE



- Distinctness (Grade)
  - Weak, moderate, strong
- Size Very fine, fine, medium, coarse, very coarse (use chart)
- Shape (Type)
  - Granular
  - Blocky
  - Prismatic
  - Platy
- Structureless
  - Non aggregated soil is termed structureless.
  - Single grained
    - Loose sand No peds
  - Massive





# Master Horizons

- O = Organic horizon
- A = Organically enriched mineral horizon
- E = Mineral horizon of eluviation
- B = Mineral illuvial horizon formed below an A, E, or O horizon (subsoil)

### SOIL SOLUM

- The upper layers of the soil profile that are affected by climate
- The solum generally has structure
- Below the solum is the parent material and not affected by soil genesis which means there is no structure (massive or single grain)

### STRUCTURE



- Water movement
  - Granular and single grain
    - Fast
  - Blocky and prismatic
    - Moderate
  - Platy and massive
    - Slow

Field Margins (not plowed in 30+ years) Tilled Field (history of field corn and currently vegetables) Wisconsin Department of Safety and Professional Services Division of Industry Services

### CONSISTENCE

Soil density affects water movement – smaller pores = slower water movement



			SOI	L EVAL	UATION F	REPORT							
			In accordance w	th SPS	385, Wis. Ad	m. Code	County						
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Property Ow	vner				Property Lo	cation							
					Govt. Lot	%	34 5	т	NR	E	(or) W		
Property Ow	vner's Mailin	ig Address			Lot #	Block #	SL	bd. Name or C	SM#				
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### BOUNDARY







**Good Soil** 

**Compact Soil** 

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SOIL EVALUATION REPORT

ince with SPS	385, Wis. Ad	m. Code	County						
Incres in size. (), direction ar to nearest roa	arest in size. Plan must include, , direction and percent slope, o nearest road. n. poses (Privacy Law, s. 15.04(1)(m)). Property Location		Parcel I.0	).	2014-02				
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	Govt. Lot	%	14 S	Т	E (or) W				
38	Lot #	Block #	Sub	d. Name or	CSM#				
ne Number City Vilagi		9e 🗆	Town	Nearest F	Road				

boms \_\_\_\_ Code derived design flow rate \_\_\_\_ GPD

sibe: \_\_\_\_\_

Flood Plan elevation if applicable \_\_\_\_\_ft.

- **f** 

Ground surface elev.

Depth to limiting factor \_\_\_\_\_ in.

_					-	Soll Applic	ation Rate
tion	Texture	Structure	Consistence	Boundary	Roots	GPD	D/Ft
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Ground surface elev. \_\_\_\_\_ft.

Depth to limiting factor in.

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### SOIL APPLICATION RATES

### FROM Table 383.44-2

Maximum soil application rates in gallons/sq ft/day for POWTS designs

			SOI	L EVAL	UATION R	EPORT					
			In accordance w	th SPS :	385, Wis. Adr	n. Code	County				
Attach cor but not lim scale or d	mplete site p nited to: vert limensions, r	plan on paper not les loai and hortzontal re north arrow, and loca	s than 8 1/2 x 11 Inches eference point (BM), dire ation and distance to ne	s in size. ection and arest roa	Plan must incl d percent slop d.	lude, ie,	Parcel I.	D.			
		Please p	rint all information.				Reviewe	d by		Da	te
Personal Inf	formation you	u provide may be use	ed for secondary purpose	s (Privac	y Law, s. 15.0	4(1)(m)).				33	
Property Ow	vner				Property Loc Govt. Lot	ation %	14 S	т	NR	E	(or) W
Property Ov	vner's Mailir	ng Address		- 19	Lot #	Block #	Sut	d. Name or C	SM#		
City		State Zij	Code Phone N	umber	City		ge 🗆	Town	Neares	st Road	
General con	nments and	recommendations:	Boring Pit	Grour	nd surface ele	v1	r.	Dep	oth to limiti	ng factor	in.
										Soll Apple	cation R
Horizon	Depth	Dominant Color	Redox Description	Textur	e Structu	re Co	insistence	Boundary	Roots	GP	D/Ft <sup>2</sup>
0 23	In.	Munsell	Qu. Az. Cont. Color		Gr. Sz.	Sh.				"Eff#1	"Eff#
			- 		-						
			isisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisisis								
Borin	ng #	(a) (a)	Boring	Grou	nd surface ele			Der	ath to limite	na factor	in.
				GIUU	iu suitave ele		5	-	APT to arrive		_ ar.
Hotzon	Denth	Dominant Color	Reday Description	Texture	e Structu		Insistence	Boundary	Roots	Soll Appli	cation R
101201	In.	Munsel	Qu. Az. Cont. Color	- exist	Gr. Sz.	sh.	A REPORT OF	Countrally	1000	"Eff#1	"Eff
		-	ia		-	-		-	-		-
- 8			-	-		-		-			-
			3						1 1	1	

Wisconsin Department of Safety and Professional Services

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# Soil Application Rates

Maximun	n Soil Application Rates B	Table 383.44– ased Upon Morpho	2 logical Soil Eval	uation (in gals	./sq. ft./day)		
	Soil Characteristics		Ν	aximum Mor	nthly Averag	e	
Textured	Structu	re <sup>e</sup>	BOD <sub>5</sub> >30 ≤220mg/L		BOD <sub>5</sub> ≤30 mg/L/		
	Shape	Grade	TSS >30 <	<150mg/L	TSS <u>&lt;</u> 3	0 mg/L <sup>c</sup>	
COS, S, LCOS, LS	64 <del>,7</del>	0	0.7 <sup>a</sup> 0.5 <sup>b,c</sup>		1.6 <sup>a</sup>		
FS, LFS	8 <del></del>	0	0.	5	1	.0	
VFS, LVFS	19 <del>-0</del>	0	0.	4	0	.6	
COSL, SL	1 <u>.41</u>	0 <b>M</b>	0.	2	0	.6	
	PL	1	0.	.4	0	.6	
		2, 3	0.	.0	0.2		
	PR, BK, GR	1	0.4		0.7		
		2, 3	0.	.6	1	.0	
FSL, VFSL	2 <u>41</u> -	0 <b>M</b>	0.	2	0	.5	
	PL	2, 3	0.0		0	.2	
	PL, PR, BK, GR	1	0.	2	0	.6	
	PR, BK, GR	2, 3	0.	4	0	.8	
L	8 <u>89</u>	0M	0.	.2	0.5		
	PL	2, 3	0.	.0	0.2		
	PL, PR, BK, GR	1	0.	.4	0.6		
Ī	PR, BK, GR	2, 3	0.	.6	0	.8	
SIL	1 <u></u>	0M	0.	0	0	.2	
Ì	PL	2, 3	0.	.0	0.2		
Ĩ	PL, PR, BK, GR	1	0.4 <sup>c</sup>		0.6		
Ī	PR, BK, GR	2, 3	0.6		0.8		
SI	8 <u>99</u>	1 <u>0110 - 10</u> 9	0.0		0.0		

# Soil Application Rates

	Soil Characteristics		Maximum Mo	nthly Average
Texture <sup>d</sup>	Struct	ure <sup>e</sup>	BOD <sub>5</sub> >30 ≤220mg/L	BOD <sub>5</sub> ≤30 mg/L <sup>c</sup>
	Shape	Grade	TSS >30 ≤150mg/L	TSS ≤30 mg/L <sup>c</sup>
SCL, CL, SICL		<u>0M</u>	0.0	0.0
	PL	1, 2, 3	0.0	0.2
Ī	PR, BK, GR	1	0.2	0.3
		2, 3	0.4	0.6
SC, C, SIC	101-0	0M	0.0	0.0
Ī	PL	1, 2, 3	0.0	0.0
	PR, BK, GR	1	0.0	0.0
		2, 3	0.2	0.3

Note a: With ≤60% rock fragments

Note b: With >60 to <90% rock fragments

Note c: Requires pressure distribution under sub. (5) (a)

Note d:	COS - Coarse Sand	LVFS - Loamy Very Fine Sand	SI – Silt
	S-Sand	COSL - Coarse Sandy Loam	SCL - Sandy Clay Loam
	LCOS - Loamy Coarse Sand	SL - Sandy Loam	CL - Clay Loam
	LS - Loamy Sand	FSL - Fine Sandy Loam	SICL - Silty Clay Loam
	FS - Fine Sand	VFSL - Very Fine Sandy Loam	SC - Sandy Clay
	LFS - Loamy Fine Sand	L - Loam	C - Clay
	VFS - Very Fine Sand	SIL - Silt Loam	SIC - Silty Clay
Note e:	PL - Platy	0 - Structureless	
	PR - Prismatic	1 – Weak	
	BK - Blocky	2 - Moderate	
	GR - Granular	3 - Strong	
	M – Massive		

# Vertical Separation Concept



## Minimum Depth of Soil for Treatment

Soil Characteristics		Influent	Quality <sup>e</sup> and Pe	rcent Coarse	Fragments	
Textured		Fecal Coliforı >10 <sup>4</sup> cfu/100m	ո ւԼ	-	Fecal Coliforn ≤10 <sup>4</sup> cfu/100mI	n _b
	≤35%	>35 to ≤60%	>60 to ≤90% <sup>b,c</sup>	≤35%	>35 to ≤60%	>60 to ≤90% <sup>c</sup>
COS, S, LCOS, LS	36	60	60	24	36	60
FS, VFS, LFS, LVFS		36	•	2	24	
COSL, SL		36		e.	24	
FSL, VFSL		36			24	
L		36		8	24	
SIL		36		8	24	
SI		36			24	
SCL, CL, SICL		36			24	
SC, C, SIC		36			24	

Table 383.44–3 Minimum Depth of Unsaturated Soil for Treatment Purposes<sup>a</sup> (in inches)

Note a: Influent quality as per s. SPS 383.44 (2)

Note b: Requires pressure distribution under sub. (5) (a)

Note c: All coarse fragment voids must be filled with fine earth

SI - Silt Note d: COS - Coarse Sand LVFS - Loamy Very Fine Sand COSL - Coarse Sandy Loam SCL - Sandy Clay Loam S-Sand LCOS - Loamy Coarse Sand SL - Sandy Loam CL - Clay Loam LS - Loamy Sand FSL - Fine Sandy Loam SICL - Silty Clay Loam FS - Fine Sand VFSL - Very Fine Sandy Loam SC - Sandy Clay LFS - Loamy Fine Sand L - Loam C - Clay VFS - Very Fine Sand SIL - Silt Loam SIC - Silty Clay

Note e: The values for fecal coliform are reported as a monthly geometric mean. The geometric mean shall be determined on the basis of measurements taken over 30 consecutive days, with at least 6 measurements occurring on 6 separate days.

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## More Soils Definitions SPS 81.01

(202) "Redoximorphic feature" means a feature formed in the soil matrix by the processes of reduction, translocation and oxidation of iron and manganese compounds in seasonally saturated soil.

(118) "High groundwater" means zones of soil saturation which include perched water tables, shallow regional groundwater tables or aquifers, or zones that are seasonally, periodically or permanently saturated.

(119) "High groundwater elevation" means the higher of either the elevation to which the soil is saturated when observed as a free water surface, or the elevation to which the soil has been seasonally or periodically saturated as indicated by the highest elevation of redoximorphic features in the soil profile.

### **REDOX DESCRIPTION**



### Iron Depletion and Concentration

- Redox feature formation requires:
  - Anaerobic conditions
    - Saturation
    - Near Saturation
  - Organic matter
  - Temperature
  - pH
  - Iron (Fe) and Manganese (Mn)

### **REDOX DESCRIPTION**

# Low Chroma Colors

- Value of 4 or more and a chroma of 2 or less.
  - Redox depletions
  - Reducing conditions
- Suspicious conditions with chromas of 3 or less.



### **REDOX DESCRIPTION**

**Reduced Matrices** 

- Soil matrices that have a low chroma color in-situ because of the presence of Fe(II)- Ferrous Iron.
- Color changes in hue or chroma when exposed to air as the Fe(II) is oxidized to Fe(III) Ferric Iron.







### BEDROCK

**"Bedrock"** means rock that is exposed at the earth's surface or underlies soil material and includes:

(a) Weathered in–place consolidated material, larger than 2 mm in size and greater than 50% by volume; AND

(b) Weakly consolidated sandstone at the point of increased resistance to penetration of a knife blade.



### BEDROCK





# **Determining System Elevation**

- Separation distance to limiting factor coarse fragments? Pretreatment?
- Under a tension saturated horizon? Entire system needs to below tension saturation
- Loading rate at system elevation (SPS 383.44(4)(a)1.c.)
- Loading rate in treatment area (SPS 383.44(4)(c))

   design SHALL reflect restrictive soil horizonsin
   the treatment zone that affect treatment or
   dispersal
- In-situ soil on sides of system (product approval)



## Minimum Depth of Soil for Treatment

Boring # 3



Ground surface elev. 99.70 ft.

Depth to limiting factor \_\_\_\_\_ in.

									Soil Applic	ation Rate
Horizon	Depth	Dominant Color	Redox Description	Texture	Structure	Consistence	Boundary	Roots	GPD	D/Ft <sup>2</sup>
	ln.	Munsell	Qu. Az. Cont. Color		Gr. Sz. Sh.				*Eff#1	*Eff#2
1	0-8	10YR 3/3	-	sil	3mgr	mfr	CS	3c-vf	0.6	0.8
2	8-15	10YR 5/3		sil	2fabk	mfr	CS	2c-vf	0.6	0.8
3	15-19	10YR 5/4		sil	2mabk	mfr	gs	1c-vf	0.6	0.8
4	19-24	10YR 5/4	f3d 7.5YR 5/8 & 10YR 6/1	sil	2mabk	mfr	gs	1c-vf	0.6	0.8
5	24-40	10YR 5/4	c3p 7.5YR 4/6 & 7.5YR 5/1	sil	1mabk	mfr-mfi	-	1m-vf	0.4c	0.6

	Jooth 4	Dereitarent Calad	Bodex Description	Texture	Structure	Consistence	Boundary	Roots	GP	D/ff
Iorizon	Depth in.	Munsell	Qu. Sz. Cont. Color	Texture	Gr. Sz. Sh.				*Ef#1	*E儲2
1	0-9	7.544 3/2	_	51	2mgt	MUEr	qw	1044	.6	1.0
2	Q-37	" 5/2	_	51	2ms6K	61	"	10FC	.6	1.0
3	27 49	11 4/4	-	5	0-59	m	4	105	.7	1.6
4	48-10	2 1 4/3	-	grs	ц	<i>bi</i>	~	IVF	.7	1.6
			*							

\* Effluent #1 = BOD, > 30 ≤ 220 mg/L and TSS >30 ≤ 150 mg/L

Effluent #2 =  $BOD_{s} \le 30$  mg/L and  $130 \le 30$ 

		1			1				Soil Applic	cation Rate
Horizon	Depth	Dominant Color	Redox Description	Texture	Structure	Consistence	Boundary	Roots	GPI	D/Ft <sup>2</sup>
	In.	Munsell	Qu. Az. Cont. Color		Gr. Sz. Sh.				*Eff#1	*Eff#2
1	0-7	7.5YR3/2		SIL	1-m-cr	mvfr	CW	2-f	0.4	0.6
2	7-10	7.5YR3/2		SIL	2-m-cr	mfr	CW	2-f	0.6	0.8
3	10-12	7.5YR5/4	c-2-d-7.5yr6/6	SIL	2-m-sbk	mfr	CW	2-f		
4	12-13	7.5YR5/4	c-2-d-7.5yr5/8, 6/2	SIL	2-m-sbk	mfr				

Ground surface elev. 97.6 ft. Depth to limiting factor 10 in.

4 Boring #

Boring #

3

☐ Boring
⊠ Pit

Boring

Ground surface elev. 97.5 ft. Depth to limiting factor 10 in.

									Soil Applie	cation Rate
Horizon	Depth	Dominant Color	Redox Description	Texture	Structure	Consistence	Boundary	Roots	GPI	D/Ft <sup>2</sup>
	In.	Munsell	Qu. Az. Cont. Color		Gr. Sz. Sh.				*Eff#1	*Eff#2
1	0-6	7.5YR3/1		SIL	1-m-cr	mvfr	cw	2-f	0.4	0.6
2	6-10	7.5YR3/2		SIL	2-m-cr	mvfr	CW	2-f	0.6	0.8
3	10-13	7.5YR3/2	c-2-d-7.5yr6/8	SIL	2-m-sbk	mf4r		1-f		

New Construction	Use: Residential / Number of bedrooms Code derived design flow rate GPD	
Replacement	Public or commercial – Describe:	~
Parent material Loamy	Till Flood Plan elevation if applicable ft.	
General comments and	recommendations: Top soil in area has been removed for building site.	

1 Boring #

☐ Boring ⊠ Pit

Ground surface elev. <u>96.7</u> ft. Depth to limiting factor <u>92</u> in.

r									Soil Applic	ation Rate
Horizon	Depth	Dominant Color	Redox Description	Texture	Structure	Consistence	Boundary	Roots	GPI	D/Ft <sup>2</sup>
	In.	Munsell	Qu. Az. Cont. Color		Gr. Sz. Sh.			1 N	*Eff#1	*Eff#2
1	0-92	5YR4/4		sl	2msbk	dsh	-	0	0.6	1.0
										~
		÷								
			· · · ·							
							×			

2 Boring #

☐ Boring ⊠ Pit

Ground surface elev. 101.2 ft.

Depth to limiting factor 90 in.

Soil Application Rate

		I second and the second s		1	The second secon				1-1-	
Horizon	Depth In.	Dominant Color Munsell	Redox Description Qu. Az. Cont. Color	Texture	Structure Gr. Sz. Sh.	Consistence	Boundary	Roots	GP	D/Ft <sup>2</sup>
									*Eff#1	*E##2
1	0-90	5YR4/4		sl	2msbk	dsh		0	.6	1.0
									t i	
									1.1	
				<i>i</i> .						
							5		5	

ieral co	erial <u>OUT</u> mments and	WASH recommendations:	AT GRADE	Floo	od Plan elevatio	n if applicable	NAft.			
Bori	ng #	Boring	Ground surface	e elev. 97.5_	ft.	Depth to	limiting factor	7 <u>8+</u> i	n.	
Jacimon	-	Device of Color		-				-	Soil Appli	cation Rate
Torizon	In.	Dominant Color Munsell	Qu. Az. Cont. Color	Texture	Gr. Sz. Sh.	Consistence	Boundary	Roots	GP *Ef#1	D/Ft <sup>2</sup> *Eff#2
	0-14	10YR5/3		SIL	2fsbk	mfr	CW	2m	0.6	0.8
				012						
	14-78	7.5YR4/4		CL	-0-	mvfi		-	0.0	0.0
Bori	14-78 ng #	7.5YR4/4	Ground surface	CL	-0-	mvfi Dooth is			0.0	0.0
Bori	14-78 ng #	7.5YR4/4	Ground surface	CL e elev. <u>99.(</u>	-0- 0ft.	mvfi Depth to		 r 82+ in.	0.0	0.0
Bori	14-78 ng #	7.5YR4/4	Ground surface	CL e elev. <u>99.(</u>	-0- 0ft.	mvfi Depth to		r 82+ in.	0.0 Soil Appli	0.0 ication Rate
Bori	ng #    	7.5YR4/4	Ground surface Redox Description Qu. Az. Cont. Color	CL e elev. <u>99.(</u> Texture	_0ft. Structure Gr. Sz. Sh.	mvfi Depth to Consistence	 limiting factor Boundary	r 82+ in. Roots	0.0 Soil Appli GP	0.0 ication Rate
Bori	14-78 ng # _  Depth  In. 0-11	7.5YR4/4	Ground surface Redox Description Qu. Az. Cont. Color	CL e elev. <u>99.(</u> Texture SIL	-0- 0ft. Structure Gr. Sz. Sh. 2fsbk	mvfi Depth to Consistence mfr	 limiting factor Boundary cw	r 82+ in. Roots 2m	0.0 Soil Appli GP *Eff#1 0.6	0.0 cation Rate PD/Ft <sup>2</sup> *Eff#2 0.8

3 Boring #

☐ Boring
⊠ Pit

Ground surface elev. 100 ft. Depth to limiting factor 82 in.

								Soil Application Rate		
Horizon	Depth In.	Dominant Color Munsell	Redox Description Qu. Az. Cont. Color	Texture	Structure Gr. Sz. Sh.	Consistence	Boundary	Roots	GPD/Ft <sup>2</sup>	
									*Eff#1	*Eff#2
1	0-8	10yr 3/2	none	cl	2fsbk	mfr	CS	3m	0.4	0.6
2	8-82	7.5yr 4/4	none	scl (g)	2msbk	mfr		1f	0.4	0.6
				*						1
				1. A.						
				ж						

4 Boring #

☐ Boring
⊠ Pit

Ground surface elev. <u>98.7</u> ft. Depth to limiting factor <u>79</u> in.

							1	Soil Application Rate		
Horizon	Depth In.	Dominant Color Munsell	Redox Description Qu. Az. Cont. Color	Texture	Structure Gr. Sz. Sh.	Consistence	Boundary	Roots	GPD/Ft <sup>2</sup>	
									*Eff#1	*Eff#2
1	0-9	10yr 3/2	none	cl	2fsbk	mfr	CS	3m	0.4	0.6
2	9-79	7.5yr 4/4	none	scl (g)	2msbk	mfr		1f	0.4	0.6
							1. A.			

# THANK YOU!

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