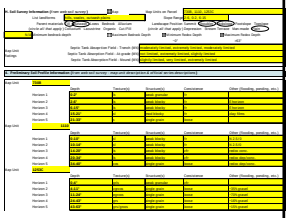
Preliminary & Site Evaluation

Sara Heger
University of Minnesota
FIRST DISTRICT HEALTH UNIT
Regional Public Health Agency

A Good Preliminary Evaluation = A Better Field Evaluation

- 1st a complete preliminary evaluation should be completed
- Soils of the area are important to characterize and understand
- Hydrology, soil and landscape variability, and slope
- Physical constraints of site



Local Unit of Government/Regulations

- Requirements
  - Timing
- Contacts
  - Numbers
  - Timing

Administrative

- Site protection
- Maintenance route
- Design
  - Site evaluation
  - Site map
  - Design

Homeowner information

- Bedrooms
  - Flow
  - Unfinished space
- Other uses
- Gray water
- Site issues

Other issues

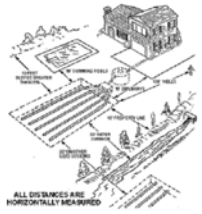
- In-home business
  - Daycare
  - Taxidermy
  - Photography
  - Other
- Future plans
  - Additions

Site issues

- Wood pile
- Deck
- Shed
- Pool
- Water softener
  - Drainage

Property Lines

- Easements
  - Pipeline
  - Rural water
  - Road right of way



Setbacks

- Well
  - Wellhead Protection Area
  - Public well
  - Sensitive well <100' deep
- Building
- Lakeshore Issues

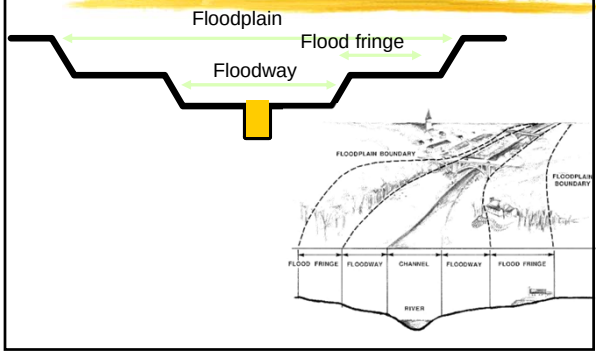
	Well 100'	Well 100'	Distribution Device	Treatment Area	Property Lines	Building
Bldg Sewer	100	50	-	-	-	-
Septic Tank	100	50	5	10	10	10
Distribution Device	100	50	-	-	10	20
Treatment Area	100	50	5	-	10	10
Well 100'	-	-	100	100	n/a	n/a
Well 100'	-	-	50	50	n/a	n/a
Water line (pressure)	-	-	10	10	n/a	n/a
(suction)	-	-	50	50	n/a	n/a
Surface Water bodies	n/a	n/a	100	100	n/a	n/a

Lakes, Wetlands & Reservoirs

- Ordinary high water level
- Wetlands are not always wet
- Verify and sign agreement with LGU

Rivers

Flooding



Where to look

- Soil Survey
- FEMA
- DNR
- LGU
  - Provide elevation

Nobody knows?

- Make the call
- Wetlands?
  - LGU/SWCD
- LGU agreement
- DENR and Corps of Engineers

Other Floods

- Non-floodplain
- Ponding
- Drainage
  - Natural
  - Imp. Surfaces
- Surface water
- Easements

Non Conventional System

- Site conditions
- Preference
- Technology
- Operating permit
  - Monitoring [testing]
  - Mitigation [fixing]
- Location for Monitoring

Soil/Site Evaluations

- Most important phase of system design
- Soil is a
  - physical,
  - biological, and
  - chemical treatment system.
- Need for standard procedures and reporting methods

What SHOULD be on the Site Evaluation?

- Sewage Source Location(s)
- Setbacks
- Bedrock
- Slope
  - Contours
  - Shape
- System location
  - Scale
- Site evaluation
  - Soil observations
  - Perc tests

Tools for Evaluation

- Forms
- References
- Recording
  - Camera
- Measuring tools
  - Elevations
  - Distances
- Soil tools
- Perc tools

Site evaluation

- Visual Selection
  - Slope
  - Setbacks
- Observations
  - Borings
  - Pits
- Perc tests
- Other
  - Survey for property lines
  - Monitoring plan

When to use a Pit?

- Large system
  - > 1,000 gpd
- Bedrock
- Questions

Choosing the Site

Look at the Site

- Sewage location
- Setbacks
- Landscape

Landscapes

- Parent material(s)
  - Special consideration
  - Limiting conditions
  - Problem soil areas
- Land uses
  - Present, Future, Past
    - Compaction, erosion, fill, alteration from natural

Topography

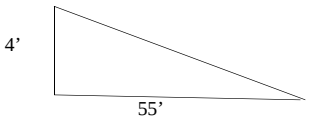
- Water movement
- Slope [%]
- Slope location
  - positions
- Slope shape
  - names, types
- Landscape variation
  - Dissected regions
  - Broad, flat regions

Slope

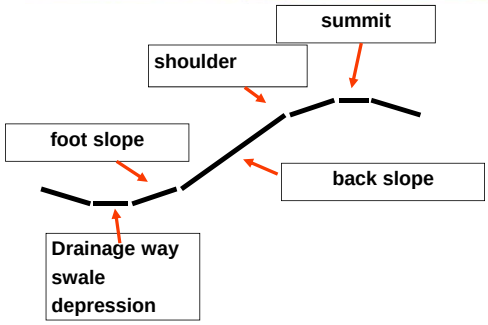
- Slope
  - Ratio of elevation change to distance
  - Slope = Rise ÷ Run x 100
- Rise = Elevation change
- Run = Distance

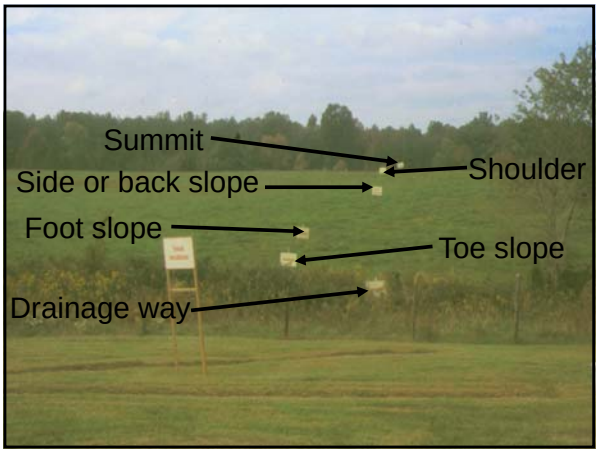
Example

- Slope = Rise ÷ Run x 100
- Rise = Elevation change [4’]
- Run = Distance [55’]
- Slope = 4’ ÷ 55’ x 100 = 7% slope



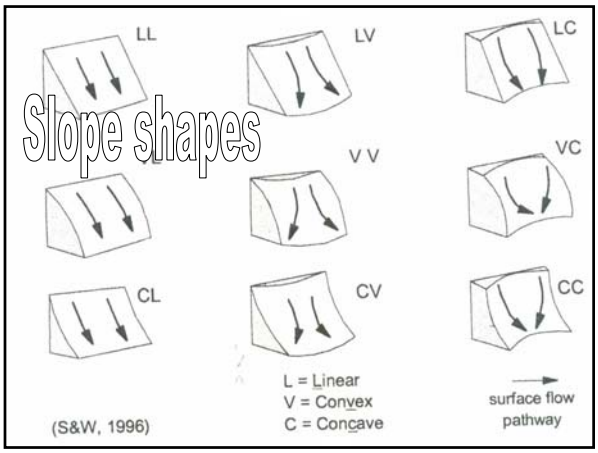
Landscape position

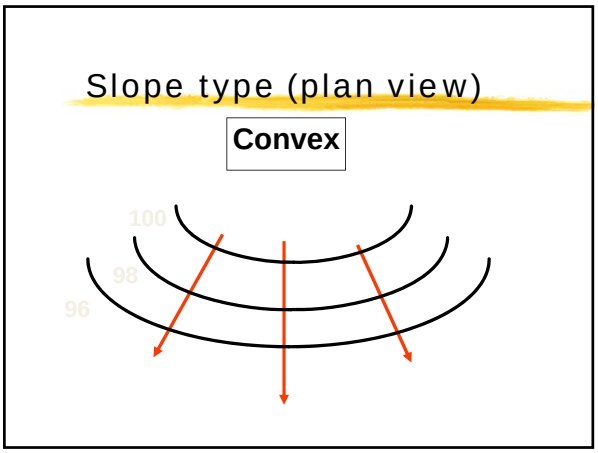


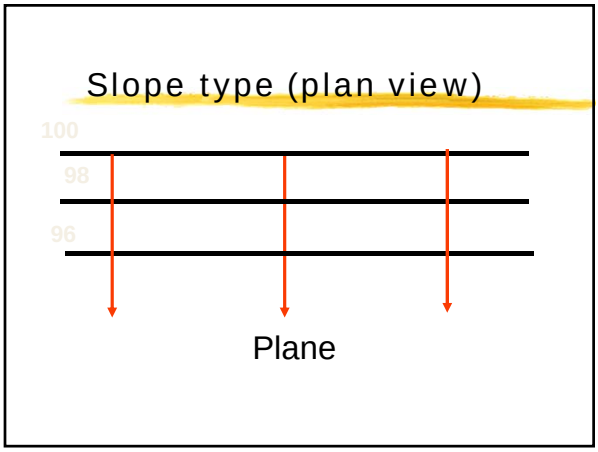


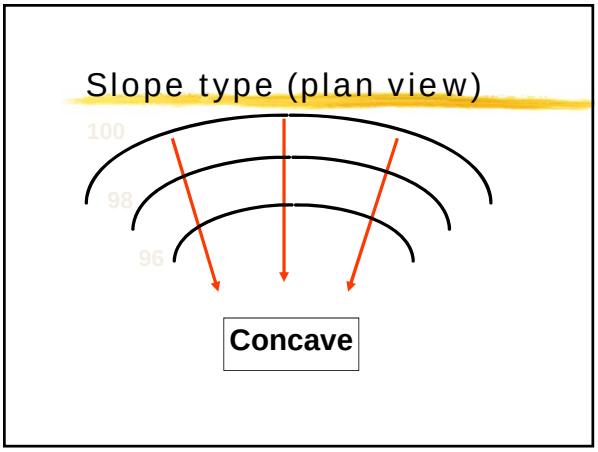
Landscape form & Contours

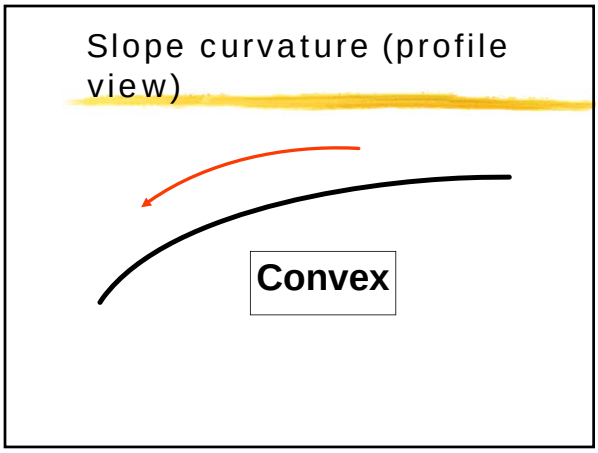
- Landscape forms
  - Location
  - Type
- Contours
  - Points of equal elevation
  - 1- 2’ difference
  - Find points and map
  - Create grid and find elevations

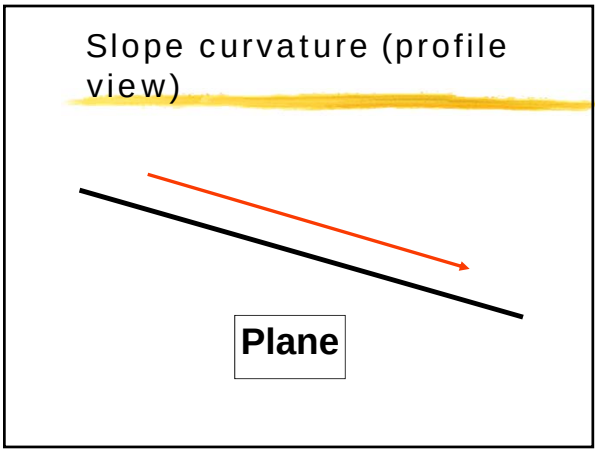

Slope shapes
LL
LV
LC
V V
VC
CL
CV
CC
L = Linear
V = Convex
C = Concave
surface flow pathway
(S&W, 1996)


Slope type (plan view)
Convex
100
98
96

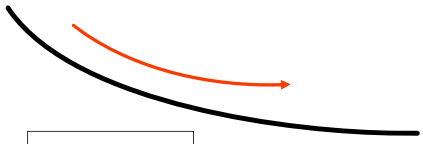

Slope type (plan view)
100
98
96
Plane


Slope type (plan view)
100
98
96
Concave

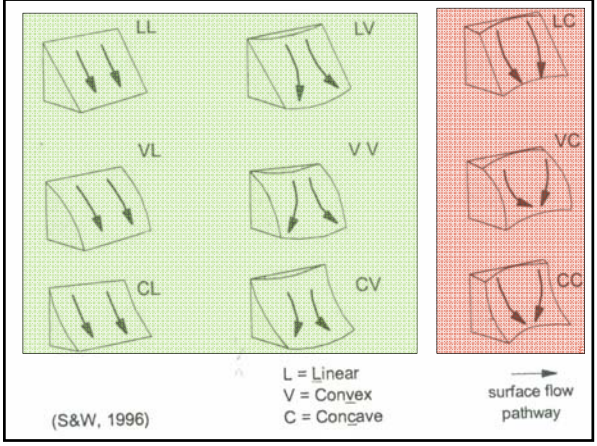

Slope curvature (profile view)
Convex


Slope curvature (profile view)
Plane

Slope curvature (profile view)



Concave



Tools for evaluating soil

Backhoe pit

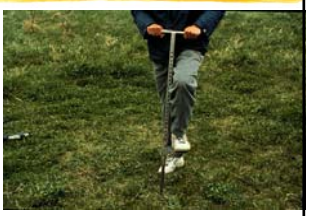
- Best view
- Variability
- Structure and consistence
- Larger systems
- Coarse, rocky or bedrock

Open/Closed Bucket Auger

- Low cost
- 3-4” diameter is better
- Disturbed sample
- Very portable

Probe

- Quickest
- Small view/sample
- Equipment failure – break or rocks
- Limited on depths



Bedrock identification

50% or greater rock fragments
Bedrock type – fissures
sink holes

Doing a Observation

- Read
  - Color
  - Structure
  - Texture
- Location
  - Best Site
- Number
- PIT
  - If necessary

How many observations

- Minimum
  - 3 per Site
  - Required- Understand the site
- Recommended
  - 3-5 per Site
  - More variation= More observations

What is Soil?

Why do we care?

Role of Soil in an Onsite Wastewater System

- Provide treatment for public health and environment
- Successfully handle large volumes of water on a continuous basis
- Repository for recycling/reuse of water

Soil

- Made of:
  - minerals
  - air
  - water
  - and
  - organic matter
- Changes, or has changed, in response to
  - climate
  - topography
  - time
  - and
  - organisms

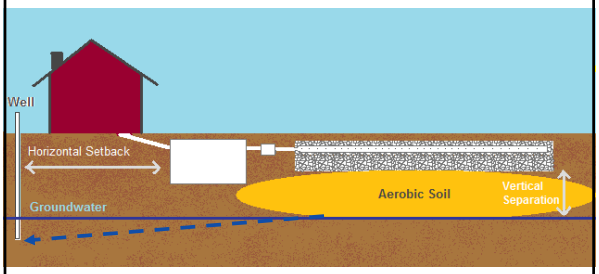
What is Soil?

- Solids
  - Minerals
  - Organic matter
- Pore spaces
  - Air
  - Water

Importance of Soil to Onsite Wastewater Treatment

- Biological treatment
- Chemical treatment
- Physical treatment
- Dispersal

How does soil treat wastewater?



- Aerobic soil is needed to treat – remove pathogens – and disperse treated wastewater back into the environment

What are Aerobic Soil Conditions?

- Pores filled primarily with air (oxygen)
- Aerobic organisms present
- Air can move through pores, pores are open
  - Soil is not compacted
  - Soil is not smeared
- Soil is *not* saturated or likely to become so

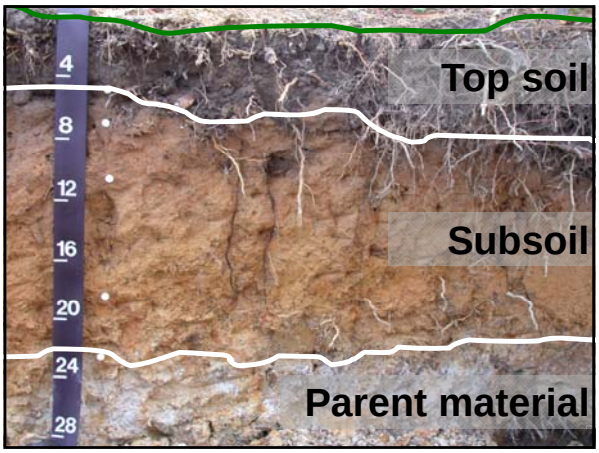
Anaerobic conditions are the opposite of aerobic conditions

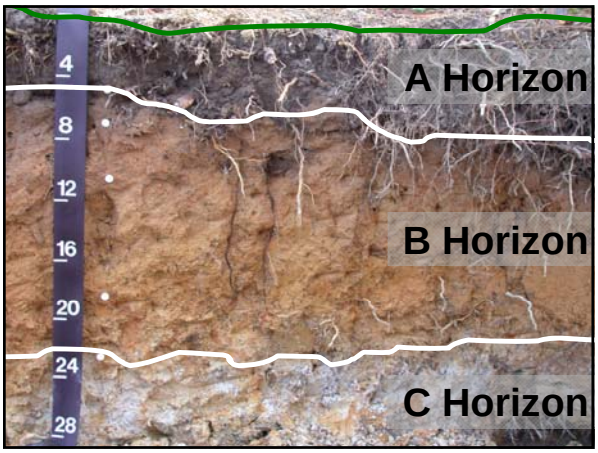
Main components of a soil description

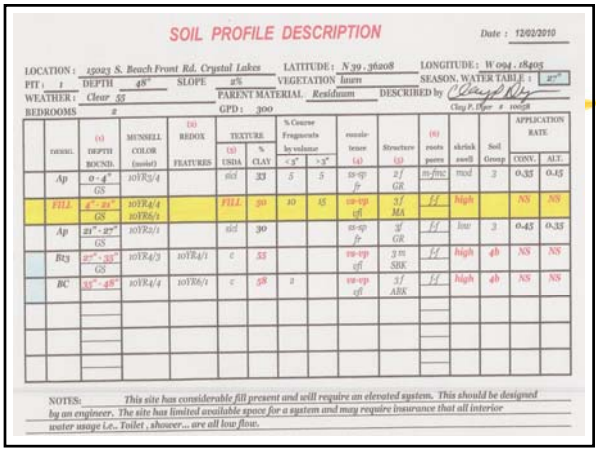
- Horizon
- Depth
- Texture
- Structure
- Color

Soil Profile Descriptions

- Soil horizon - A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil forming processes.
- Soil profile - A vertical section of the soil extending through all its horizons and into the parent material.







SOIL PROFILE DESCRIPTION

Date : 12/02/2010

LOCATION : 15023 S. Beach Front Rd. Crystal Lakes LATITUDE : N 39 . 36208 LONGITUDE : W 094 . 18405

PIT : 1 DEPTH 48" SLOPE 2% VEGETATION lawn SEASON. WATER TABLE : 27"

WEATHER : Clear 55 PARENT MATERIAL Residium DESCRIBED by

BEDROOMS 2 GPD : 300

HORIZ.	(1) DEPTH BOUND.	MUNSELL COLOR (moist)	(2) REDOX FEATURES	TEXTURE (3) USDA	TEXTURE % CLAY	% Coarse Fragments by volume <3"	% Coarse Fragments by volume >3"	consistence (4)	Structure (5)	(6) roots pores	shrink swell	Soil Group	APPLICATION RATE CONV.	APPLICATION RATE ALT.
Ap	0 - 4" GS	10YR3/4		sicl	33	5	5	ss-sp fr	2f GR	m-frac	mod	3	0.35	0.15
FILL	4" - 21" GS	10YR4/4 10YR6/1		FILL	50	10	15	vs-vp sfl	3f MA	ff	high		NS	NS
Ap	21" - 27" GS	10YR3/1		sicl	30			ss-sp fr	2f GR	ff	low	3	0.45	0.35
Bt3	27" - 39" GS	10YR4/3	10YR4/1	c	55			vs-vp sfl	3 m SBK	ff	high	4b	NS	NS
BC	39" - 48"	10YR4/4	10YR6/1	c	58	2		vs-vp sfl	3f ABK	ff	high	4b	NS	NS

NOTES: This site has considerable fill present and will require an elevated system. This should be designed by an engineer. The site has limited available space for a system and may require insurance that all interior water usage i.e.. Toilet , shower... are all low flow.

Disturbed Soil

- Problem
  - Compaction
  - Drainage
- Identification
  - Boring
    - Mixed Colors
    - Hard: Compaction
  - Perc tests

Percolation Test

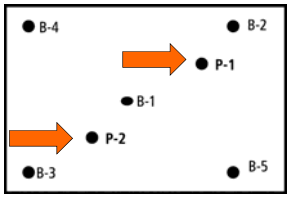
- What is it?
- How fast water moves thru a 6" hole
- It identifies soil properties
  - Soil texture
  - Soil structure
- Soil Damage

Location of the Test

Problem areas

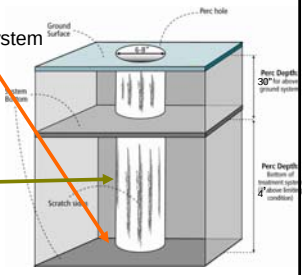
Run 3 (recommended)

Carefully prepare the Hole



Hole Prep

- Depth
  - To the bottom of the System
  - 12 inch for Mounds
- Condition
  - Like April– Consistent numbers
- Protection
  - Natural soil



Scratch sides

Protect bottom

- 2” Rock of ¼ - ¾ in size

Soak hole

- 4 hours minimum
- Unfrozen
- 12 inches of water at all times
- Automatic
  - Watering devices
- Manual

Soaking

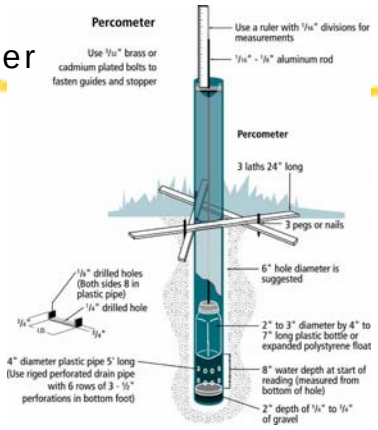
- Key for consistent results
  - Like April
  - Wetter better
- Non sand soils particles
  - Soaking-- 4 Hours minimum
  - Swelling-- 16-30 hours

Running Test

- Refill to 8 inches
- Record drop in to nearest 1/8 of an inch
- Time (minutes) to drop 1”

Time and Distance

Percometer



Running- When is it finished

- 3 consecutive readings within 10%
  - 1- 10 mpi
  - 2- 11 mpi
  - 3- 12 mpi
- 12 mpi - 10mpi = 2 mpi
- 10 mpi x .10 = 1
- Run again

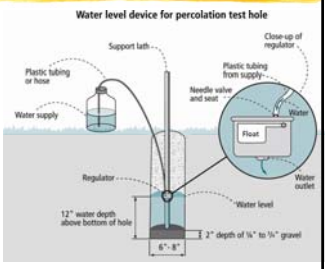
Next time

~~1- 10 mpi~~
2- 11 mpi
3- 12 mpi
4- 11 mpi

- 12 mpi - 11 mpi = 1 mpi
- 11 mpi x .10 = 1.1
- Yes, they are within 10%

Problems

- The hole
- Soaking
- Time required
- Averaging readings
- The soil



What do you know?

- Bedrock depth
- Color
  - Depth to Saturated soil
  - System type
- Texture/ Structure
  - System size
- Natural

Final Site Eval. Report

- MAP
  - Setbacks
  - Locations
    - Bench mark
- Soil information
  - Soil Survey
  - Observation logs
    - Interpretations
    - Bottom elevation
  - Perc test sheets
- Design forms suite (septic.umn.edu)

Difficulties
Landforms
Soil survey