INSTALLATION FUNDAMENTALS
Installation 101 for 2016

INSTALLATION FUNDAMENTALS
Preconstruction

- Read and understand the plan
- "PLAN YOUR WORK, WORK YOUR PLAN"
- What is happening with the move to electronic plans and submission?

INSTALLATION FUNDAMENTALS
Preconstruction- Reading the Plan

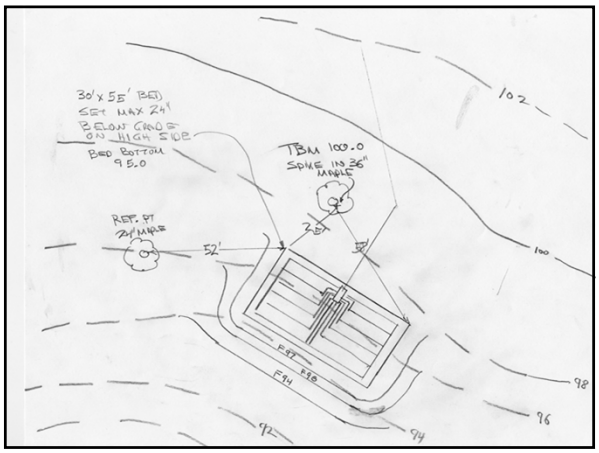
- **DESIGN INTENT** is the basic instructions for the EDA – Like the DNA of the EDA
  - Includes an elevation for the EDA bottom
  - And the relationship of EDA bottom to the original grade
- IT IS GOOD PRACTICE TO FIND THIS AND UNDERSTAND IT

INSTALLATION FUNDAMENTALS
Preconstruction- Reading the Plan

- Ties
- Elevations of key components
- Lots of specifications
- And, often LOTS OF BOILERPLATE

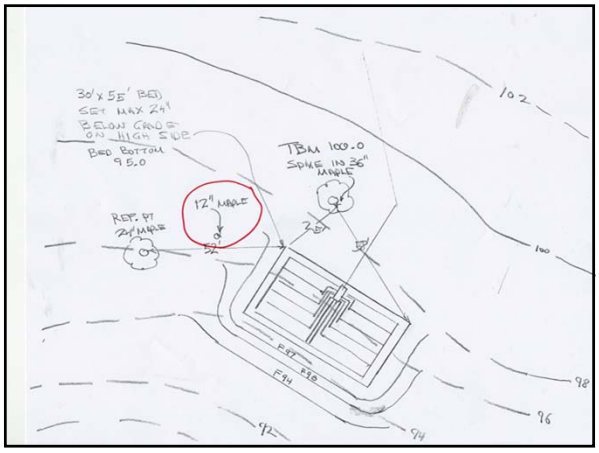
INSTALLATION FUNDAMENTALS
Preconstruction- Reading the Plan

- Here is an example of what can happen
- A stone and pipe bed from about 30 years ago
- A call from the installer said the bed area he had dug out didn't seem right
- Design intent said bed bottom 2 feet below original grade



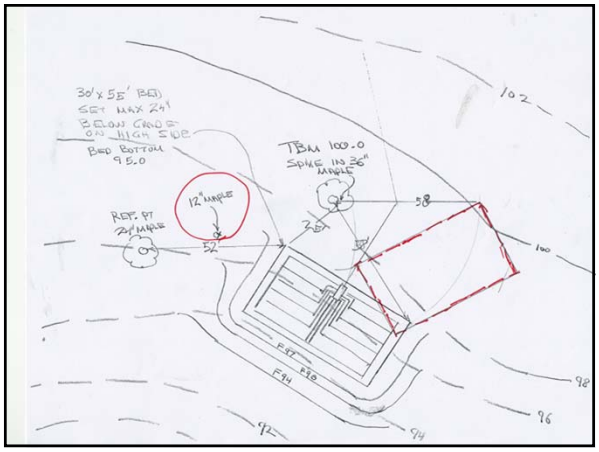
INSTALLATION FUNDAMENTALS
Preconstruction- Reading the Plan

- When I arrived it was obvious what had happened
- One feature on this open lot was not on the plan
- A single extra tree



INSTALLATION FUNDAMENTALS
Preconstruction- Reading the Plan

- The installer, a person with plenty of experience, laid out the bed and dug the area out like this:



INSTALLATION FUNDAMENTALS
Preconstruction- Reading the Plan

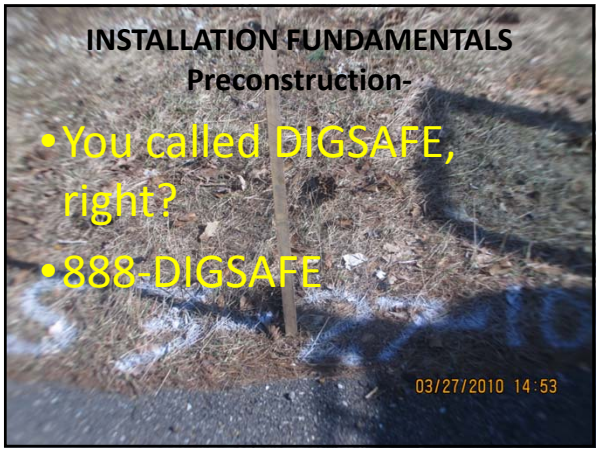
- Then he called me
- the excavation was over four feet deep , looked like a cellar hole
- Just comparing design intent with the elevations would have sent up major red flags

INSTALLATION FUNDAMENTALS

- Site prep planning
  - PROTECT THE SITE
  - EROSION CONTROL
  - ACCESS
- Phasing the job-work your way in, build your way out

INSTALLATION FUNDAMENTALS
Preconstruction

- Check for local inspections and expectations
  - VERY IMPORTANT IN MANY TOWNS
  - KNOW WHAT THE LOCAL INSPECTOR MEANS BY A TERM (i.e. “Bed Bottom”)
  - GOOD COMMUNICATIONS CAN MEAN TIMELY INSPECTIONS




INSTALLATION FUNDAMENTALS
Preconstruction-Layout and Controls
• My typical layout kit includes:
• Two tapes, in feet and tenths plus feet and inches, with "Stickers"
• Laser, of course
• Clipboard with calculator
• Plan on clipboard
03/27/2010 15:07


INSTALLATION FUNDAMENTALS
Preconstruction-Layout and Controls
• Wire flags and stakes and small sledge
• Paint, "Paint stick", Flagging
• Soil testing auger
• Nails or spikes
• Bucket to hold stuff
• Markers
03/27/2010 15:07

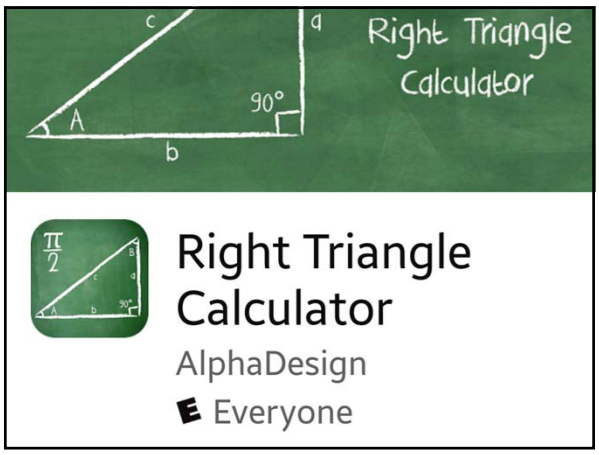

INSTALLATION FUNDAMENTALS
Preconstruction
• Layout of EDA-ISDS
–Ties to leaching components
•Square it up
–TBMs
–Confirm design intent
–Lay out fill extent, toes of slopes
03/27/2010 14:02

INSTALLATION FUNDAMENTALS
Preconstruction-Layout and Controls

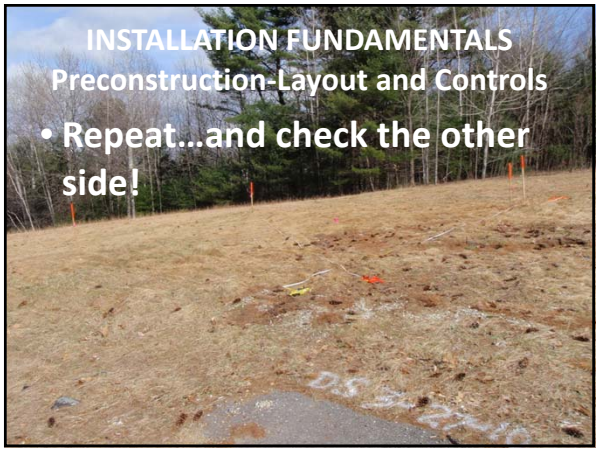
- Set your own controls
  - Location (ties), elevation
  - Offset control points
- Protect your control work
- Some systems require designer layout (UGH)
- I usually only do the "ties" once


INSTALLATION FUNDAMENTALS
Preconstruction-Layout and Controls
• Paint marks along the line
• Wire flags are handy

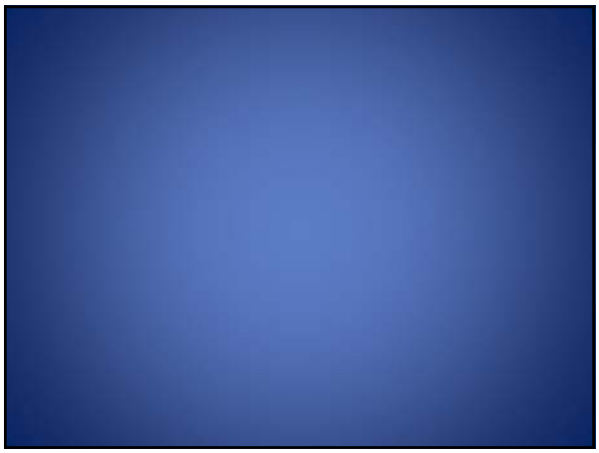

Two tapes and Mr. Pythagoras to lay out third corner (Or a construction calc or an "APP")


c
a
A
90°
b
Right Triangle Calculator
Right Triangle Calculator
AlphaDesign
Everyone


INSTALLATION FUNDAMENTALS
Preconstruction-Layout and Controls
• This 20' x 30' bed has a diagonal of 36.1"


INSTALLATION FUNDAMENTALS
Preconstruction-Layout and Controls
• Repeat…and check the other side!


INSTALLATION FUNDAMENTALS
Preconstruction-Layout and Controls
• I set "offset stakes" either up or downslope,
• or along the slope, past the fill extensions



INSTALLATION FUNDAMENTALS EDA CONSTRUCTION

- Sewage flows from the building,
- BUT the ISDS-design and construction- flows from the EDA; ultimately from the soil.
- In most cases, we will begin construction from the EDA.

INSTALLATION FUNDAMENTALS EDA CONSTRUCTION

- THE TYPE, LOCATION, AND ELEVATION OF THE DISPOSAL COMPONENTS OF THE ISDS –THE EDA, THE "BED"
- ARE THE PORTIONS OF THE PLAN WHICH **CANNOT CHANGE** FROM THE PLAN
- WITHOUT A REVISED PLAN AND NEW APPROVAL

INSTALLATION FUNDAMENTALS EDA CONSTRUCTION

- Everything-design and construction- “flows” back uphill from the bed (violating the third rule of plumbing).

INSTALLATION FUNDAMENTALS EDA CONSTRUCTION

- In most cases, we will begin construction from the EDA.

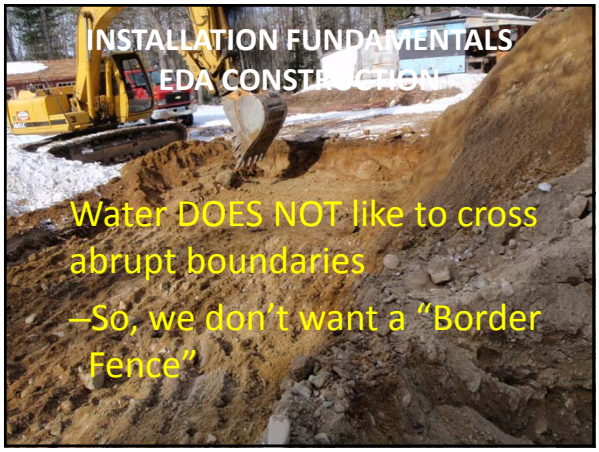
INSTALLATION FUNDAMENTALS EDA CONSTRUCTION

- GETTING READY
- Is the soil ready? (KIDD)
  - –Test for dryness
  - –Plastic limit
- Layout, grade control
  - –Do it once to (KISS)


INSTALLATION FUNDAMENTALS
EDA CONSTRUCTION

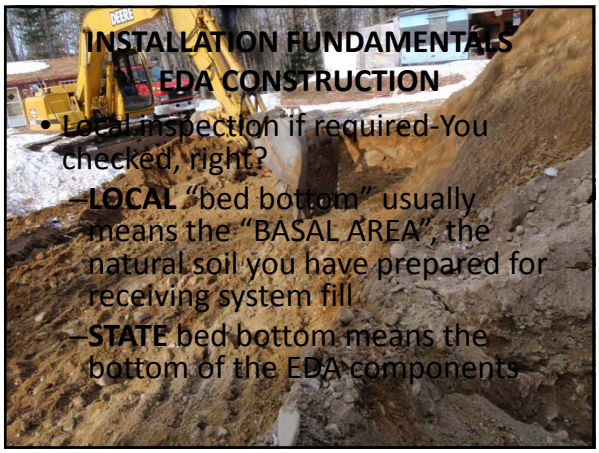

INSTALLATION FUNDAMENTALS
EDA CONSTRUCTION
• BEGIN CONSTRUCTION
• Prep the area, toe to toe (most systems in NH require fill)
–Plan the material moves, stockpiles
–Erosion control
–Stump, strip, grub


INSTALLATION FUNDAMENTALS
EDA CONSTRUCTION



INSTALLATION FUNDAMENTALS EDA CONSTRUCTION

- In soils finer than fine sand, STRUCTURE- the little cracks and pores in soil- is key to drainage
- PROTECT STRUCTURE AT ALL COSTS



INSTALLATION FUNDAMENTALS EDA CONSTRUCTION

- Protect the site (KILL- Keep it loose L---!)
  - DON'T DRIVE OVER THE BASAL AREA!!!
  - DON'T BACK TRUCKS IN!!!
- Protect this important surface by pushing system fill in from the edges with a tracked machine or placing with an excavator

INSTALLATION FUNDAMENTALS EDA CONSTRUCTION

- Place SYSTEM FILL
- This is the sand used to build the mound, in which the "SYSTEM SAND" is placed
- By 1021.03, c
- "…clean bank run sand, free of topsoil or humus, dredgings or stones more than six inches…"

INSTALLATION FUNDAMENTALS EDA CONSTRUCTION

- BUT system fill must not settle excessively
  - Fill from the top or the ends
  - Work the slopes
  - Overfill and trim
- KEEP 12" TO 18" SAND BETWEEN PREPARED SURFACE AND MACHINERY
- Protecting the basal area and getting compaction is a balancing act

INSTALLATION FUNDAMENTALS EDA CONSTRUCTION

- Using a tracked excavator, and keeping 12” TO 18” MINIMUM between receiving soil and tracks-overfill the bed area
- Construct the slopes
- This will get reasonable compaction to the system sand and system fill while protecting the basal soil surface


INSTALLATION FUNDAMENTALS
EDA CONSTRUCTION
DEERE
• Build the slopes-topsoil
• Best done before constructing the EDA
• Place topsoil with dozer from sides
• Or with excavator from above
• Inspectors often expect to see topsoil on finished slopes


CAT


INSTALLATION FUNDAMENTALS
PROPRIETARY EDA
• THIS SYSTEM WAS CALLED IN FOR INSPECTION! READY???

INSTALLATION FUNDAMENTALS
EDA CONSTRUCTION

- BUILD THE DISPOSAL AREA
- Trim out system fill to allow for system sand (Specified sand)
- 6" minimum under most component types
  - –Choosing system sand-key to ISDS success

INSTALLATION FUNDAMENTALS
EDA CONSTRUCTION

- –Three rules of EDA SUCCESS: SAND, SAND, SAND
- –ESPECIALLY with GEOTEXTILE (FABRIC) EDA types

INSTALLATION FUNDAMENTALS
EDA CONSTRUCTION

- And the three system sand specs
  - –State text
  - –Concrete (ASTM C-33 SMALL AGGREGATE) "washed sand"
  - –ENVIRO-SEPTIC SYSTEM SAND


INSTALLATION FUNDAMENTALS
EDA CONSTRUCTION
• Place system sand in the EDA area
–Overfill , trim and level
• This is often the last leveling the EDA components will get


INSTALLATION FUNDAMENTALS
EDA CONSTRUCTION
• Be careful, take your time!

INSTALLATION FUNDAMENTALS EDA CONSTRUCTION

- BUILD THE DISPOSAL AREA
- EDA construction depends on component type (DUH)

INSTALLATION FUNDAMENTALS EDA CONSTRUCTION

- Choose the D-box
- Concrete
  - –AVOID THE MINI SIZES- they often "rot" in a few years
  - –And don't stay level well

INSTALLATION FUNDAMENTALS EDA CONSTRUCTION

- Plastic- not subject to deterioration
- But may be deformed by soil pressure
- Best set on a small slab to help maintain level
- "Plastic is fantastic, like Vinyl it's final"…or maybe not

INSTALLATION FUNDAMENTALS
EDA CONSTRUCTION

STONE & PIPE

- This is the old standby
- Robust and forgiving
- Well understood

INSTALLATION FUNDAMENTALS
EDA CONSTRUCTION

- BUT finding clean stone has become a challenge
- Regional inspectors can help
- S&P easy with excavator, truck as "stone bin"

D-box, network ready for stone


INSTALLATION FUNDAMENTALS
EDA CONSTRUCTION
•Placing shim stone

INSTALLATION FUNDAMENTALS EDA CONSTRUCTION

- Chambers
  - –Concrete
  - –Plastic
    - Both are subject to settlement
    - Adding some ¾" stone to the system sand may help
  - –Smaller footprint

Stone will be covered with filter fabric

INSTALLATION FUNDAMENTALS EDA CONSTRUCTION

- Plastic units may settle (less so with newer units)
- May be damaged by backfill
- Best backfilled by excavator, from outside the EDA

INSTALLATION FUNDAMENTALS EDA CONSTRUCTION

- "Proprietary" geotextile fabric EDA components
  - –Large Diameter Gravelless Pipe
    - EnviroSeptic
  - –Elgen Geotextile Sand Filter (GSF)

INSTALLATION FUNDAMENTALS PROPRIETARY EDA

- These geotextile EDA products have come to dominate the new EDA market in the years since their introduction

INSTALLATION FUNDAMENTALS PROPRIETARY EDA

- These geotextile EDA types may be closer to the water table
- Are typically one-third the footprint (or less) than a design equivalent S&P
- All elements of construction are more critical
- From basal prep to finish and venting

INSTALLATION FUNDAMENTALS PROPRIETARY EDA

- The fundamentals of basal area preparation, system fill selection and placement, and system sand selection are made more important by the reduced footprint and reduced actual disposal surface

INSTALLATION FUNDAMENTALS PROPRIETARY EDA

- And the three rules are MUCH more critical to EDA success
- SAND SAND SAND!!!

INSTALLATION FUNDAMENTALS PROPRIETARY EDA

- Many would like to make the sand suppliers or the State responsible for sand
- BUT the installer is ultimately the responsible party

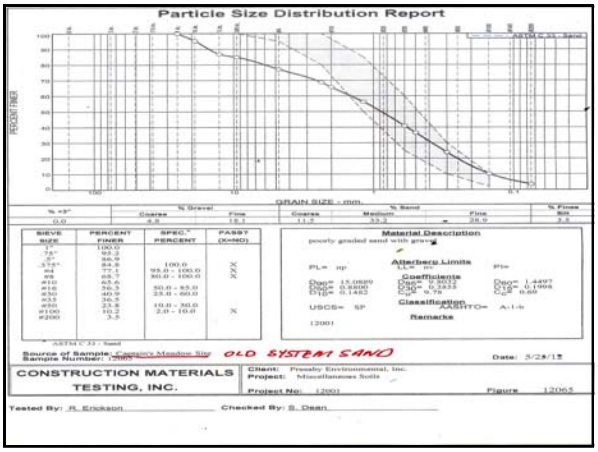
INSTALLATION FUNDAMENTALS PROPRIETARY EDA

- I do my own tests (at a lab) on sand
- And, only use sand with an "effective size" of at least 0.25 MM
- Supplier sieves don't show effective size

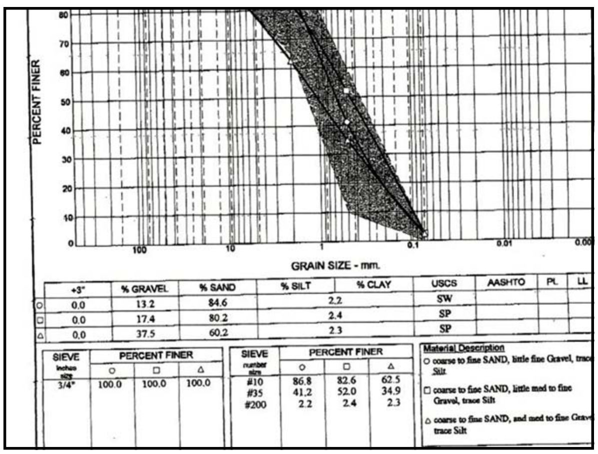
Gravel Size: Concrete Sand **Date:**5/31/2012

Plant #: Ossipee Aggregates **Time:** 3:00

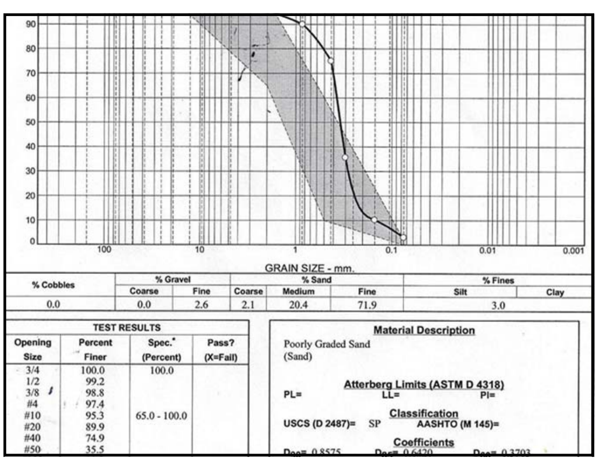
SCREEN SIZE	WEIGHT	PERCENT RETAINED	PERCENT PASSING	SPEC.
3/8"	0	0.0	100.0	100
#4	10	2.0	98.0	95-100
#8	48	9.4	90.6	80-100
#16	129	25.4	74.6	50-85
#30	289	56.9	43.1	25-60
#50	427	84.1	15.9	10-30
#100	490	96.5	3.5	2-10



Particle Size Distribution Report
PERCENT FINER
GRAIN SIZE - mm.
% +3" 0.0
% Gravel Coarse 4.8 Fine 18.1
% Sand Coarse 11.5 Medium 33.2 Fine 28.9
% Fines Silt 3.5
SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO)
1" 100.0
.75" 95.2
.5" 86.9
.375" 84.8 100.0 X
#4 77.1 95.0 - 100.0 X
#8 68.7 80.0 - 100.0 X
#10 65.6
#16 56.3 50.0 - 85.0
#30 40.9 25.0 - 60.0
#35 36.5
#50 23.8 10.0 - 30.0
#100 10.2 2.0 - 10.0 X
#200 3.5
Material Description
poorly graded sand with gravel
Atterberg Limits
PL= np LL= nv PI=
Coefficients
D90= 15.0829 D85= 9.8032 D60= 1.4497
D50= 0.8800 D30= 0.3833 D15= 0.1998
D10= 0.1482 Cu= 9.78 Cc= 0.69
Classification
USCS= SP AASHTO= A-1-b
Remarks
12001
* ASTM C 33 - Sand
Source of Sample: Captain's Meadow Site
Sample Number: 12065
OLD SYSTEM SAND
Date: 3/28/12
CONSTRUCTION MATERIALS TESTING, INC.
Client: Pressby Environmental, Inc.
Project: Miscellaneous Soils
Project No: 12001
Figure 12065
Tested By: R. Erickson
Checked By: S. Dean



PERCENT FINER
GRAIN SIZE - mm.
+3" | % GRAVEL | % SAND | % SILT | % CLAY | USCS | AASHTO | PL | LL
○ 0.0 | 13.2 | 84.6 | 2.2 | SW
□ 0.0 | 17.4 | 80.2 | 2.4 | SP
△ 0.0 | 37.5 | 60.2 | 2.3 | SP
SIEVE inches size | PERCENT FINER ○ □ △
3/4" 100.0 100.0 100.0
SIEVE number size | PERCENT FINER ○ □ △
#10 86.8 82.6 62.5
#35 41.2 52.0 34.9
#200 2.2 2.4 2.3
Material Description
○ coarse to fine SAND, little fine Gravel, trace Silt
□ coarse to fine SAND, little med to fine Gravel, trace Silt
△ coarse to fine SAND, and med to fine Gravel, trace Silt



GRAIN SIZE - mm.
% Cobbles 0.0
% Gravel Coarse 0.0 Fine 2.6
% Sand Coarse 2.1 Medium 20.4 Fine 71.9
% Fines Silt 3.0 Clay
TEST RESULTS
Opening Size | Percent Finer | Spec.* (Percent) | Pass? (X=Fail)
3/4 100.0 100.0
1/2 99.2
3/8 98.8
#4 97.4
#10 95.3 65.0 - 100.0
#20 89.9
#40 74.9
#50 35.5
Material Description
Poorly Graded Sand (Sand)
Atterberg Limits (ASTM D 4318)
PL= LL= PI=
Classification
USCS (D 2487)= SP AASHTO (M 145)=
Coefficients

Opening Size	Percent Finer	Spec.* (Percent)	Pas (X=F
3/4	100.0	100.0	
1/2	99.2		
3/8	98.8		
#4	97.4		
#10	95.3	65.0 - 100.0	
#20	89.9		
#40	74.9		
#50	35.5		
#100	10.2		
#200	3.0	0.0 - 2.0	X

Material Description

Poorly Graded Sand
(Sand)

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS (D 2487)= SP AASHTO (M 145)=

Coefficients

D_{90}= 0.8575 D_{85}= 0.6420 D_{60}= 0.3703
D_{50}= 0.3411 D_{30}= 0.2824 D_{15}= 0.2132
D_{10}= 0.1464 C_u= 2.53 C_c= 1.47

Remarks

- MY TAKE: D10 SHOULD BE MORE THAN 0.25MM

INSTALLATION FUNDAMENTALS PROPRIETARY EDA

- Some areas such sand may not be easily obtained

INSTALLATION FUNDAMENTALS PROPRIETARY EDA

- Poor choices will lead to failure in a much shorter time than with "standard" EDA types

INSTALLATION FUNDAMENTALS PROPRIETARY EDA

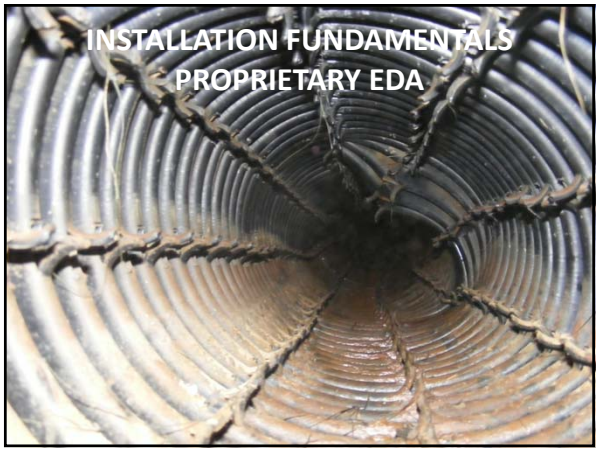
- The two major construction causes of geotextile EDA failure
- Improper sand
- "suffocation" due to too much cover fill, poor sand and lack of proper venting-
- Leads to lack of air supply, and lack of gas exhaust


INSTALLATION FUNDAMENTALS
PROPRIETARY EDA
• These products may be designed and installed in a great variety of layouts
• Limited only by the manuals and the imaginations of designers


INSTALLATION FUNDAMENTALS
PROPRIETARY EDA
• Parallel, serial, and combination distribution
• Flat, sloping and even multilevel (PEI)


INSTALLATION FUNDAMENTALS
PROPRIETARY EDA
• Again, careful leveling of the prepared bed bottom (the REAL bed bottom) is a critical step


INSTALLATION FUNDAMENTALS
PROPRIETARY EDA
• Construction "from the edges" with no traffic over the components works best to protect the components
• Most may be easily crushed


INSTALLATION FUNDAMENTALS
PROPRIETARY EDA


INSTALLATION FUNDAMENTALS
PROPRIETARY EDA
Spacing of "Large Diameter Gravelless Pipe" LDGP may be done several ways
• Commonly by "spacers", easily made from lumber scraps

INSTALLATION FUNDAMENTALS SECONDARY TREATMENT

- THE GEOTEXTILE PRODUCTS CAN HAVE GREATLY REDUCED SIZING
- PUTTING MUCH MORE LOAD INTO A SMALLER FOOTPRINT

INSTALLATION FUNDAMENTALS SECONDARY TREATMENT

- THE CAREFUL HANDLING AND PROPER PREP OF THE CRITICAL BASAL ZONE, THE "TRANSITION AREA" WHERE SYSTEM FILL MEETS THE NATURAL SOIL IS EVEN MORE HIGHLY STRESSED

INSTALLATION FUNDAMENTALS SECONDARY TREATMENT

- INCREASING USE OF SECONDARY TREATMENT PRODUCTS CAN RESULT IN FOOTPRINTS OF 100 SQUARE FEET OR LESS

INSTALLATION FUNDAMENTALS BASAL AREA TRANSITION

INSTALLATION FUNDAMENTALS EDA CONSTRUCTION

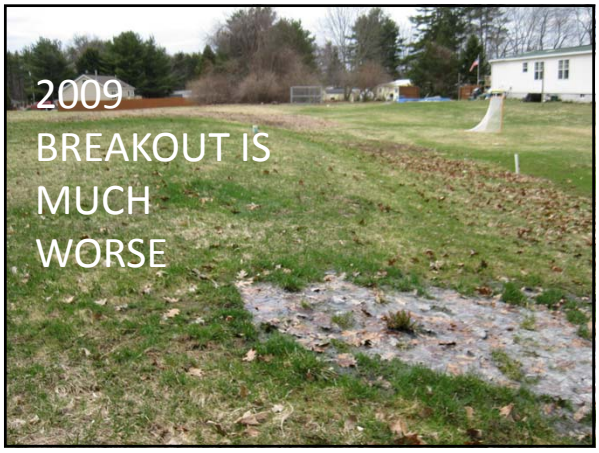
- An example of lack of transition preparation follows
- Two, 20’ by 100’ stone beds, separated by 25’ in one mound
- Receiving pretreated effluent
- Basal soil is sandy loam
- System fill and sand is a coarse sand
- Failure in a few months


TEST PIT BETWEEN BEDS


SYSTEM SAND FULLY SATURATED AT BED BOTTOM ELEVATION


SYSTEM FILL SAND
BASAL SOIL, UNPREPARED
AND UNSATURATED


NOTE THIS GRAY LAYER
AT TRANSITION


2009
BREAKOUT IS
MUCH
WORSE