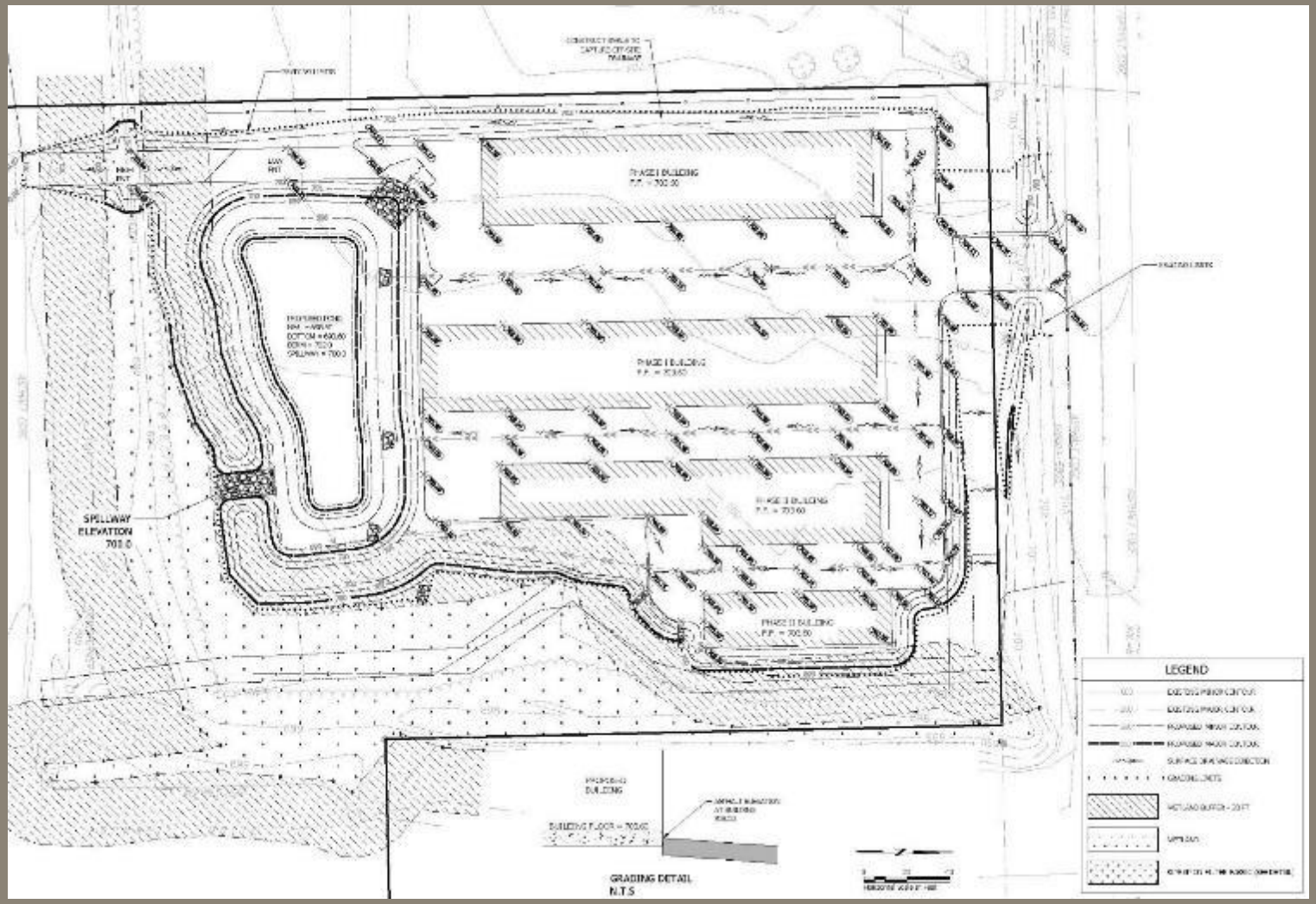
Other Considerations

NEWSC

Stormwater Pond Vegetation Management and Maintenance Workshop

November 14, 2017

Site Selection and Planning



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Pond Location

- Regional facility or site-specific?
- Public or private owned?
- Watershed and hydrology evaluation

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Hydrology: Detention for Peak Flows / Floods

- Consider watershed-specific criteria
- Downstream capacity

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The **base level** limits are applied everywhere stream protection limits are not applicable. The **stream protection level** limits apply to development taking place in and around the Ulao Creek and Mole Creek watersheds, referred to as the **stream protection area**.

The **base level** limits are generally equivalent to a simpler rendition of existing discharge limits as follows:

1. The 100-year post-development peak runoff discharge shall not exceed the lesser of:

a. **10-year predevelopment peak runoff discharge, or**

b. **Maximum hydraulic capacity of existing downstream conveyance facilities as determined by the Town.**

2. The post-development runoff discharges for storms up to and including the 10-year shall not exceed the 2-year predevelopment peak runoff discharge.

The **stream protection level** limits focus on reducing discharges for the most common rainfalls and try to maintain a more natural water regime in the watershed.

1. The 100-year post-development peak runoff discharge shall not exceed the lesser of:

a. 2-year predevelopment peak runoff discharge, or

b. Maximum hydraulic capacity of existing downstream conveyance facilities as determined by the Town.

2. The post-development runoff discharges for storms up to and including the 25-year shall not exceed the 2-year predevelopment peak runoff discharge.

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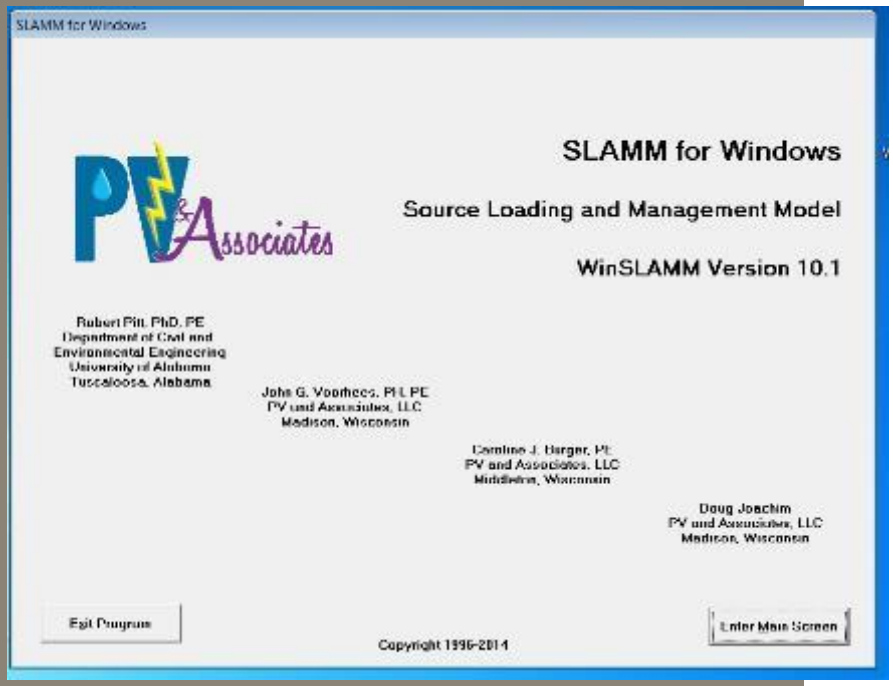
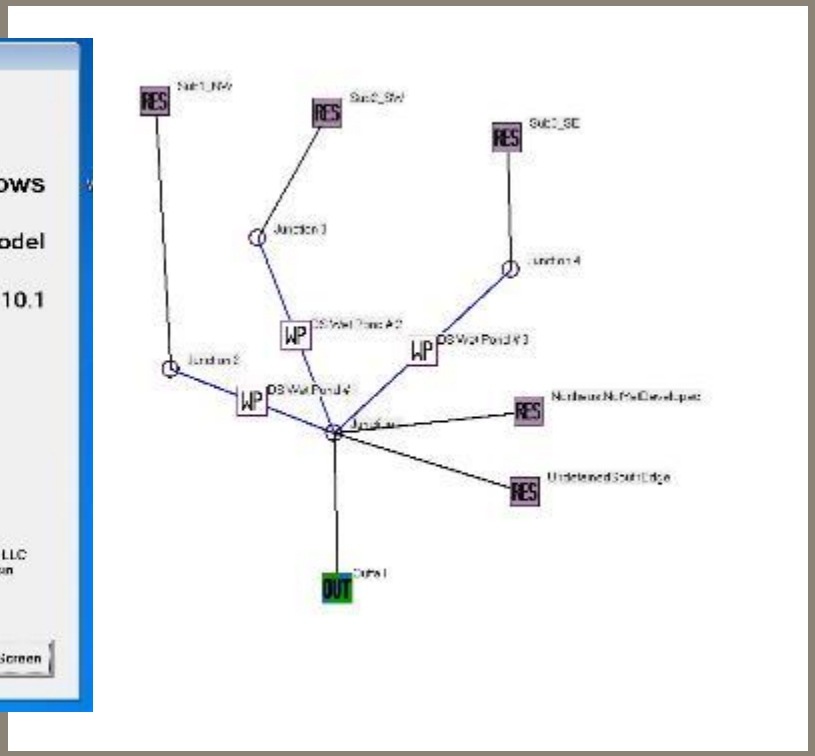
Hydrology: Water Quality Mgmnt. and Low Flows





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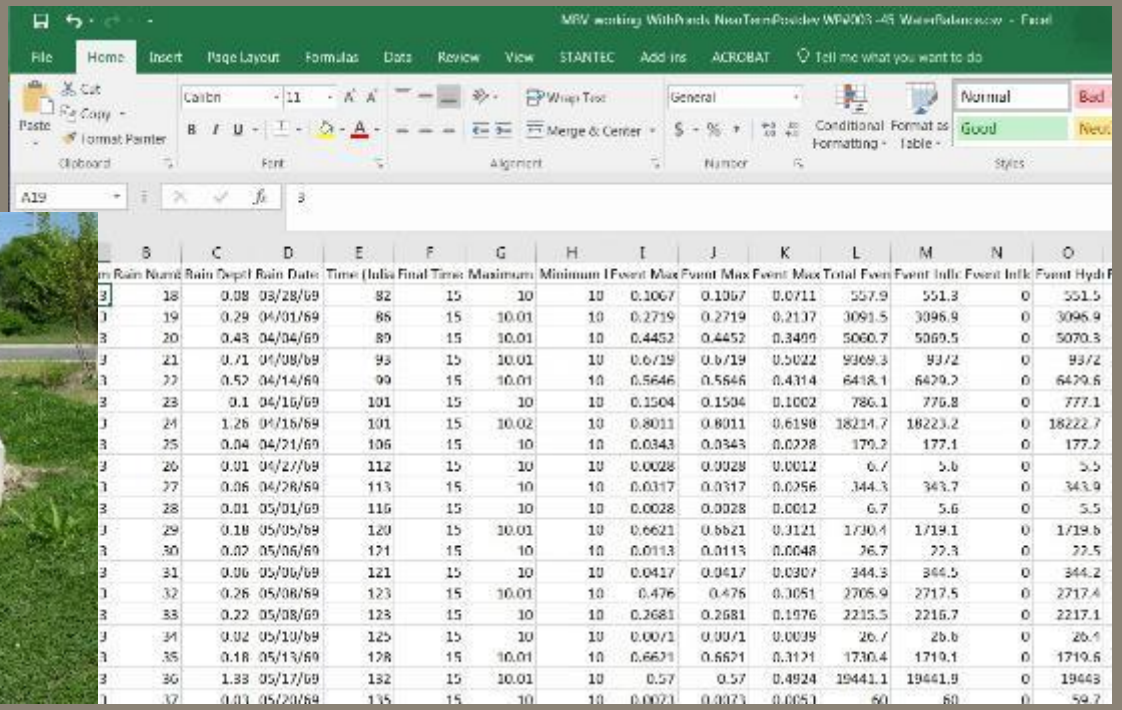
WinSLAMM: water budget and rain-by-rain performance

- Can be useful for planting design



	B	C	D	E	F	G	H	I	J	K	L	M	N	O
	Rain Numb	Rain Depth	Rain Date	Time (Julia	Final Time	Maximum	Minimum I	Event Max	Event Max	Event Max	Total Even	Event Inflc	Event Inflc	Event Hydr
2	18	0.08	03/28/69	82	15	10	10	0.1067	0.1067	0.0711	557.9	551.3	0	551.5
3	19	0.29	04/01/69	86	15	10.01	10	0.2719	0.2719	0.2137	3091.5	3096.9	0	3096.9
3	20	0.43	04/04/69	89	15	10.01	10	0.4452	0.4452	0.3499	5060.7	5069.5	0	5070.3
3	21	0.71	04/08/69	93	15	10.01	10	0.6719	0.6719	0.5022	9369.3	9372	0	9372
3	22	0.52	04/14/69	99	15	10.01	10	0.5646	0.5646	0.4314	6418.1	6429.2	0	6429.6
3	23	0.1	04/16/69	101	15	10	10	0.1504	0.1504	0.1002	786.1	776.8	0	777.1
3	24	1.26	04/16/69	101	15	10.02	10	0.8011	0.8011	0.6198	18214.7	18223.2	0	18222.7
3	25	0.04	04/21/69	106	15	10	10	0.0343	0.0343	0.0228	179.2	177.1	0	177.2
3	26	0.01	04/27/69	112	15	10	10	0.0028	0.0028	0.0012	6.7	5.6	0	5.5
3	27	0.06	04/28/69	113	15	10	10	0.0317	0.0317	0.0256	344.3	343.7	0	343.9
3	28	0.01	05/01/69	116	15	10	10	0.0028	0.0028	0.0012	6.7	5.6	0	5.5
3	29	0.18	05/05/69	120	15	10.01	10	0.6621	0.6621	0.3121	1730.4	1719.1	0	1719.6
3	30	0.02	05/06/69	121	15	10	10	0.0113	0.0113	0.0048	26.7	22.3	0	22.5
3	31	0.06	05/06/69	121	15	10	10	0.0417	0.0417	0.0307	344.3	344.5	0	344.2
3	32	0.26	05/08/69	123	15	10.01	10	0.476	0.476	0.3051	2706.9	2717.5	0	2717.4
3	33	0.22	05/08/69	123	15	10	10	0.2681	0.2681	0.1976	2215.5	2216.7	0	2217.1
3	34	0.02	05/10/69	125	15	10	10	0.0071	0.0071	0.0039	26.7	26.6	0	26.4
3	35	0.18	05/13/69	128	15	10.01	10	0.6621	0.6621	0.3121	1730.4	1719.1	0	1719.6
3	36	1.33	05/17/69	132	15	10.01	10	0.57	0.57	0.4924	19441.1	19441.9	0	19443
	37	0.01	05/20/69	135	15	10	10	0.0071	0.0071	0.0051	60	60	0	59.7

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Water budget and permanent pool levels

- Permanent pool too low
- Permanent pool too high

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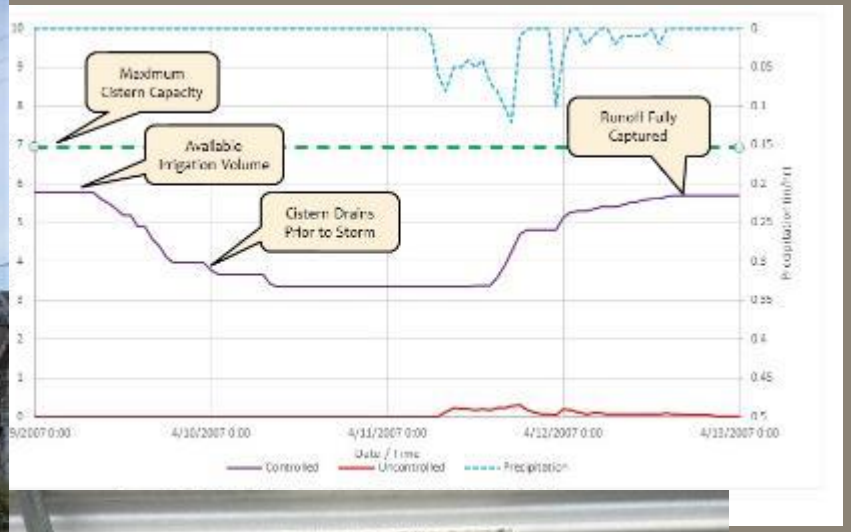
Real Time Control



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Soil Investigation and Testing

- Geotechnical
- Environmental
- Stormwater infiltration
- Vegetation selection and growth

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Vegetation Selection

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Plant Establishment

- Seeding
- Plugs
- Containers

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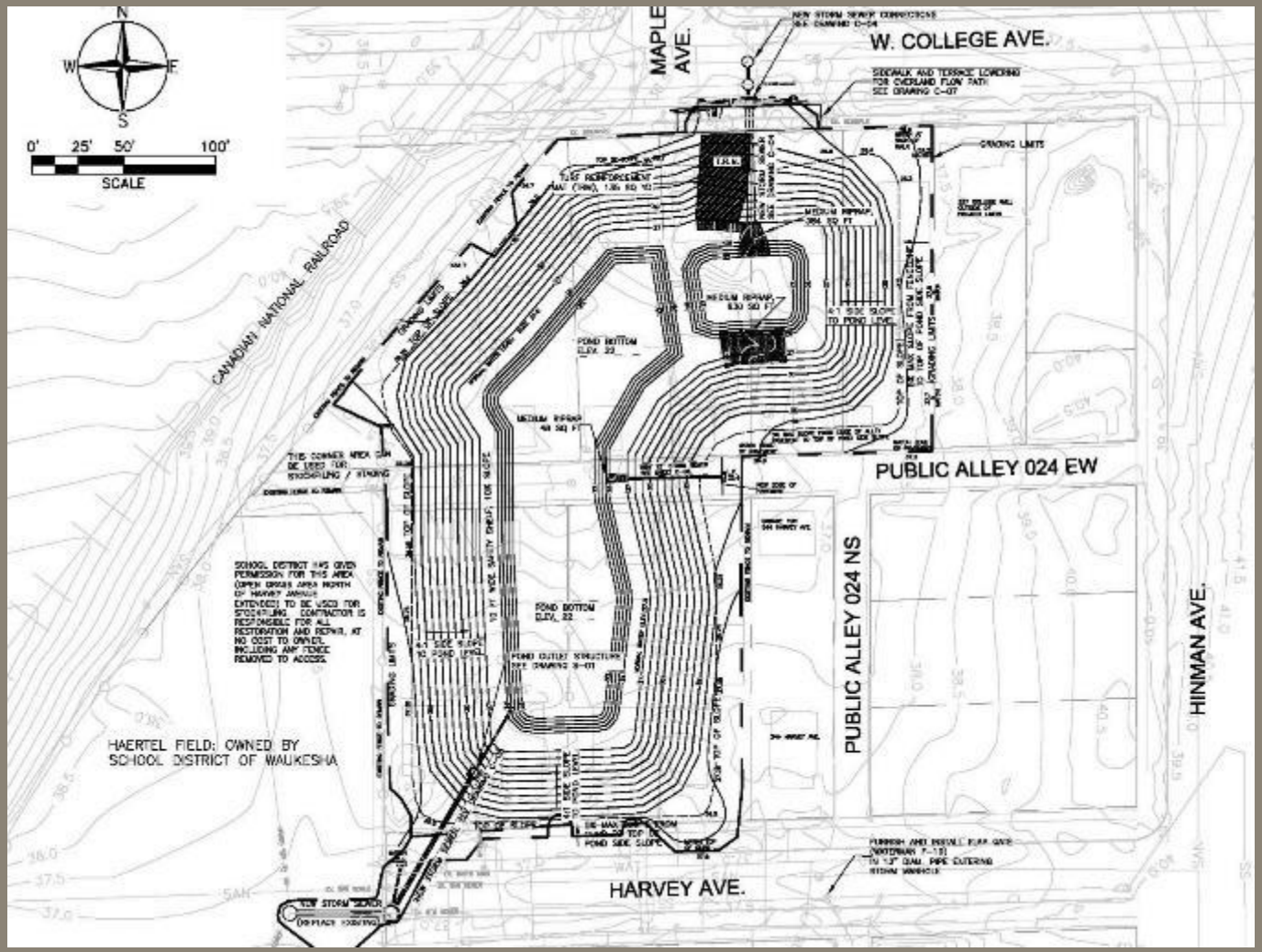
Layout and Grading Design



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Erosion Protection and Turf Reinforcement Mats

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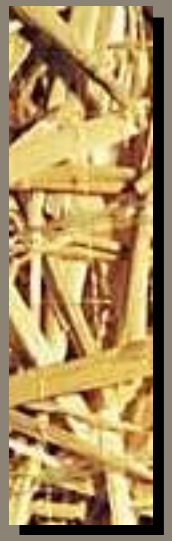
Temporary Degradable Materials



Single Net Straw

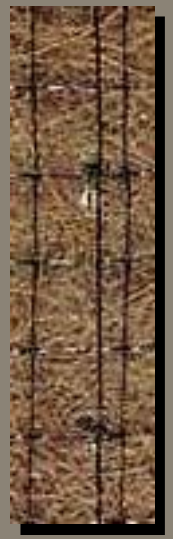
Use on slopes with moderate run-off conditions. Made from 100% straw with a lightweight photodegradable netting on the top side.

Coconut Straw

For slopes with heavy runoff conditions and where protection is needed for 2-4 years. Made from a homogenous blend of 70% straw and 30% coir fiber. CS2 has a light-weight photodegradable netting on the bottom side and a long lasting UV stabilized, photo- degradable netting on the top side.

Double Net Straw

Use on slopes with medium run-off conditions. Made from 100% straw with a lightweight photodegradable netting on both sides.



Coconut

Typically used as an erosion control blanket on extreme slopes and very harsh sites. Made from 100% natural coir fiber with a long lasting UV stabilized, photodegradable net on both sides.

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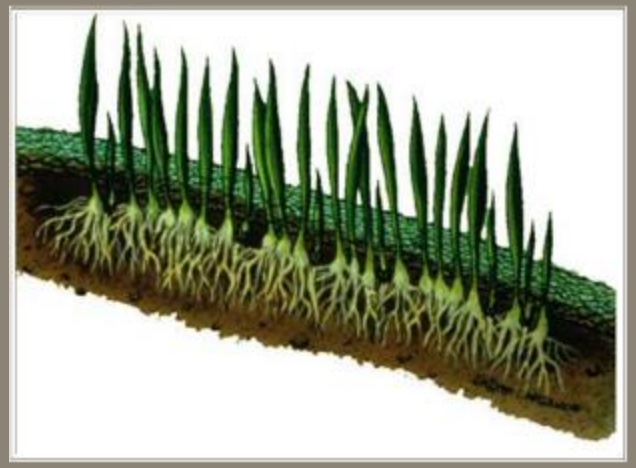
What are Turf Reinforcement Mats (TRMs)?

- UV stabilized, non-degradable, synthetic fibers, nettings and/or filaments processed into three dimensional reinforcement matrices
- Designed for permanent soil erosion and drainage applications where water flows exert stresses that exceed the limits of vegetation



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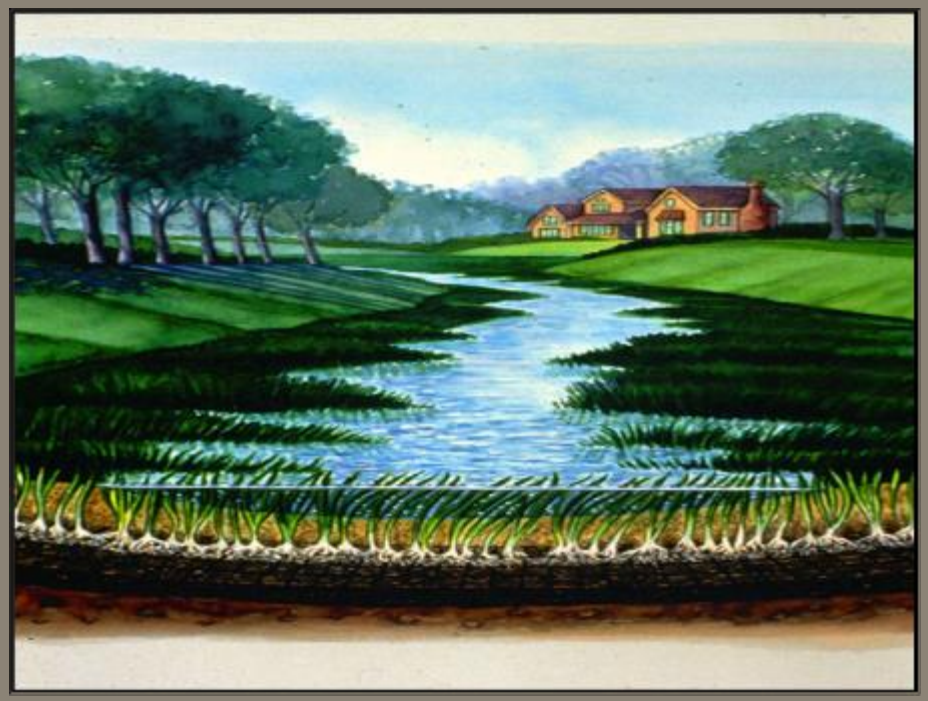
How Do TRMs Function?

- They extend the performance limits of natural vegetation by:
  - Acting as an "artificial" root system
  - Retaining soil particles and seeds
  - Accelerating vegetative development
  - Permanently reinforcing the vegetative



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Major TRM Manufacturers

- Coldbond (EnkaMat)
  - Nylon Fibers Chemically Fused
- Propex
  - Polypropolene Woven and stitchbonded products
- North American Green (NAG)
  - All Stitch-Bonded Products, many with bio-degradables
- Western Excelsior
  - All Stitch Bonded Products with no UV additives
- ECB (Erosion Control Blanket)
  - All Stitch Bonded Products with no UV additives

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Standard Stitch-Bonded TRMs (LL450)

- First Generation TRMs
- Three Layers
  - Two Nets on the Outside
  - Polypropylene Fibers / Composite Biodegradable Layer
  - Stitch-Bonded
- Tensile Strength (400 lb/ft)
- Moderate UV Stabilization
  - 12 year design life
  - 80% at 1000 hours (ASTM D 4355)
- Appropriate Applications
  - Vegetated and Irrigated Moderate Flow Channels
  - Greenbelts, Golf Courses, etc.
  - Low stress conditions
  - Slopes

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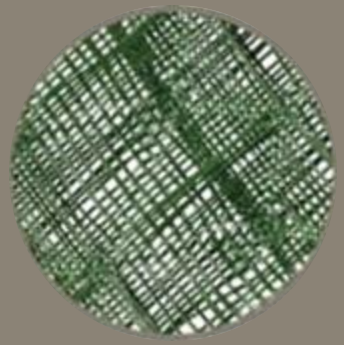
2nd Generation Standard TRM (LL300)



- Unique WOVEN Technology
  - No nets or stitching = No weak layers
  - NOT a composite
  - Designed to Address the limitations of 1st Generation TRMs
- UV Stabilized Polypropylene Fibers, Woven into Homogeneous Three-Dimensional Structure
- Tensile strength (2,000 lb/ft)
- High UV stabilization (90% @ 3,000 hours)
- Greater Flexibility
- Estimated Functional Life 25 years

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Riprap

Pond Overflows

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Vegetated Testing

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Vegetated Testing

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Vegetated Testing

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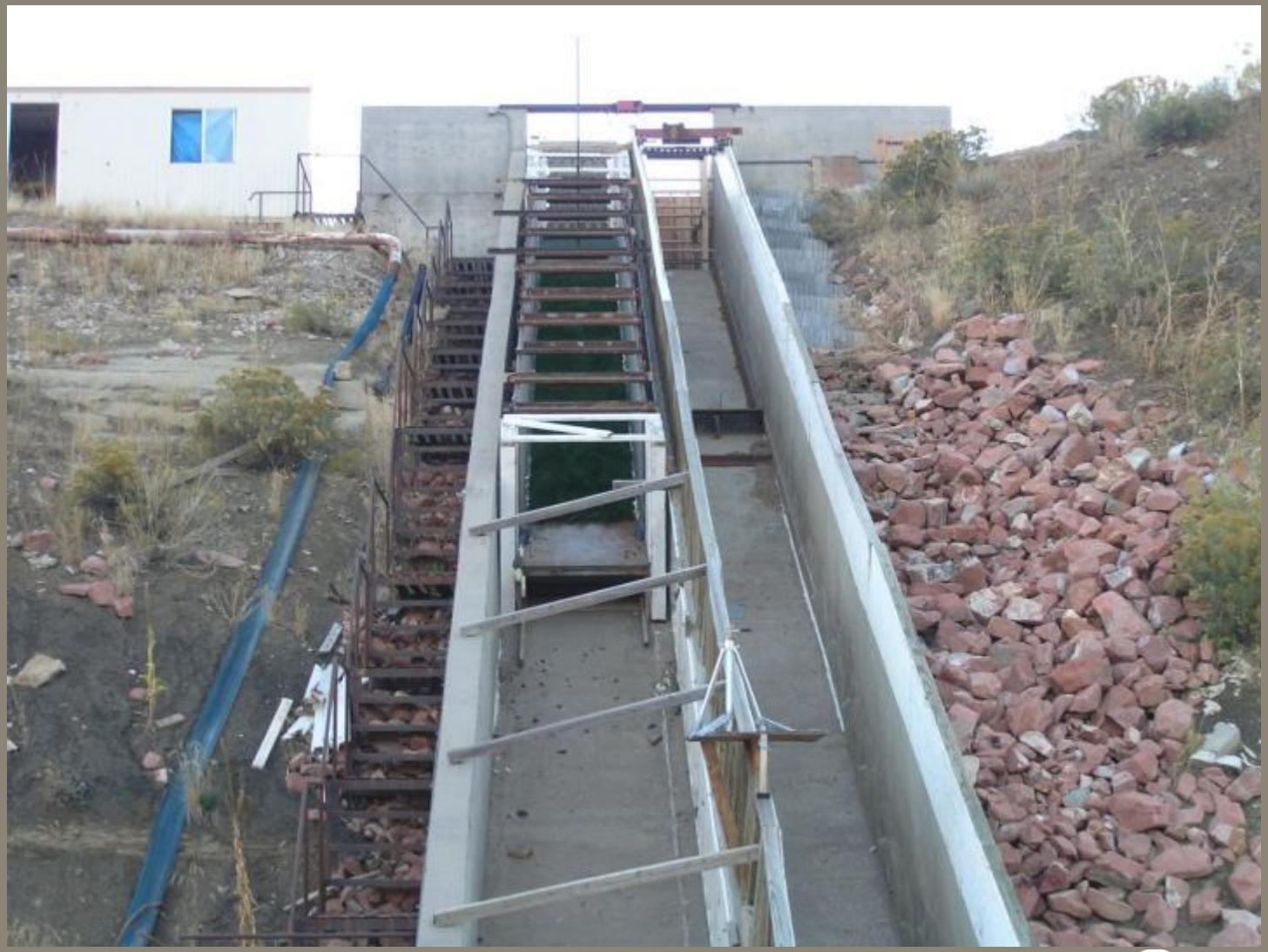
Vegetated Testing



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Vegetated Testing

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Vegetated Testing

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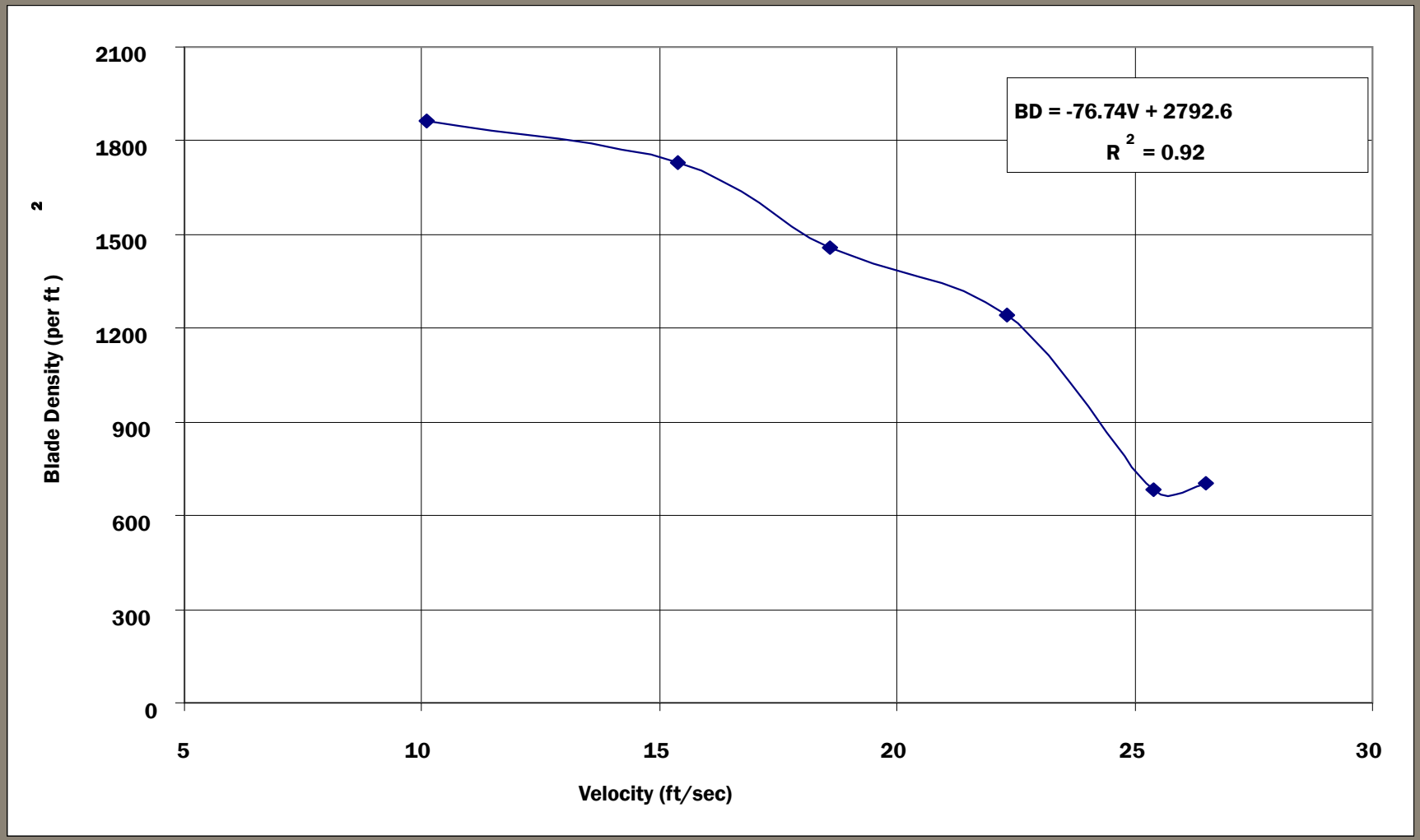
Vegetated Testing



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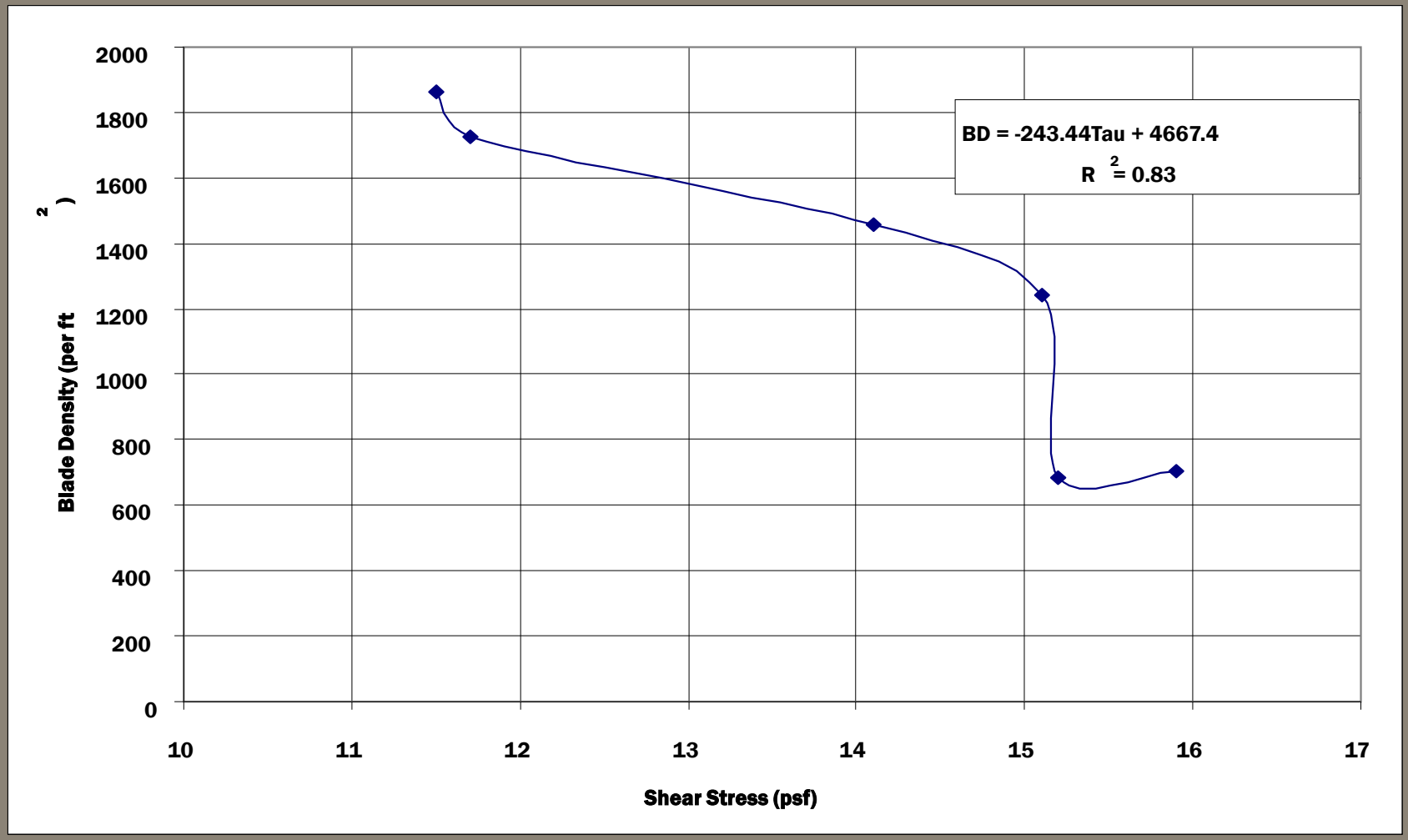
Vegetated Density Checked After Testing

Vegetated Testing



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Vegetated Testing

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Vegetated Testing

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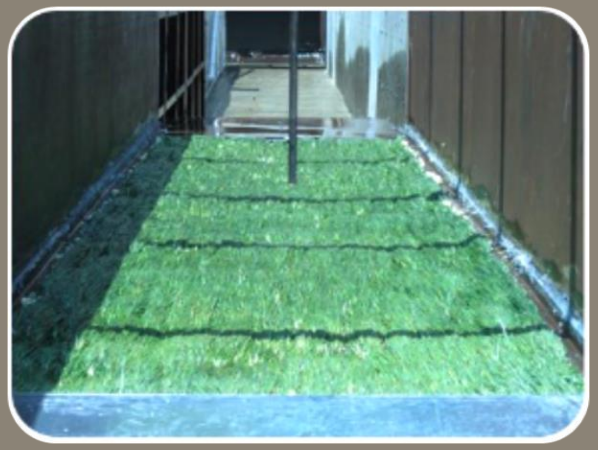
Tested Extensively



- Developed to withstand catastrophic storm conditions like those generated by Hurricane Katrina
- Tested in over 25 large-scale, high velocity flumes at independent testing facilities
- Tested by experts at Colorado State University Engineering Research Center with USACOE oversight

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Designing for future access and maintenance

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Maintenance Agreements and Plans

Vince Bocci, U.S. Fish & Wildlife Service

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Specifications

- Soil preparation
- Decompaction
- Topsoil quality and thickness

Bidding / Contracting

- Contractor Prequalification
- Consider separating earthwork and landscape contracts
- Native landscape contractors

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Construction Sequencing

Construction Phase Oversight

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Questions?

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