Final Report

CE491

Sokol Park Ball-fields

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1. Introduction

This report and appendices convey an appropriate erosion and storm-water control plan for the Sokol Ballpark project scheduled for completion on September 2, 2007. This plan follows the June 2003 Alabama Handbook for Erosion Control.

2. Project Description

This project consists of creating 4 baseball fields, 2 soccer fields, and renovating an existing model airplane field.

Cost: $3.6 million excluding the soccer field finishes (lights, stands, etc.) which will be completed at a later date.

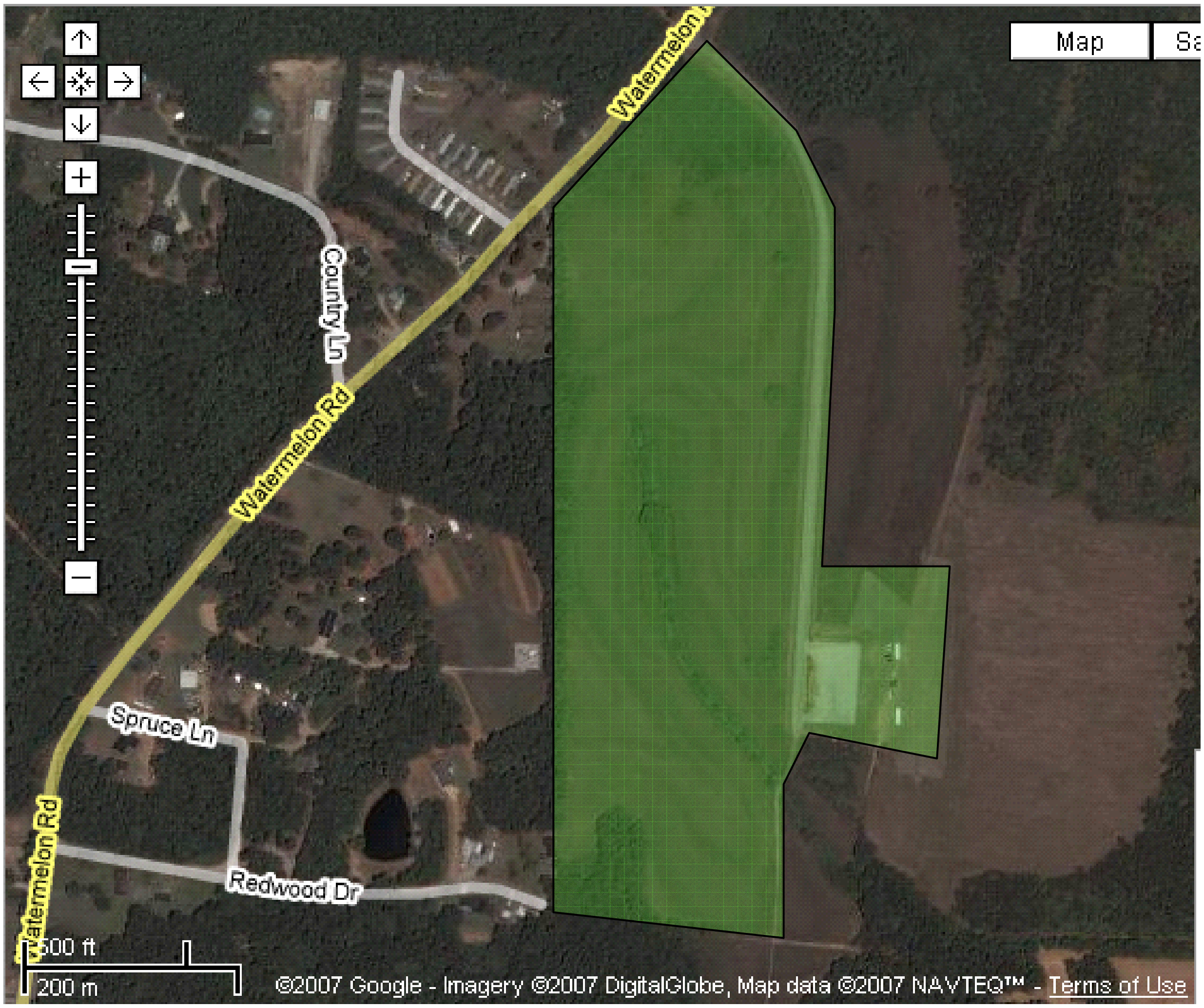
Duration: Started February 2007 and scheduled for completion by September 2007.

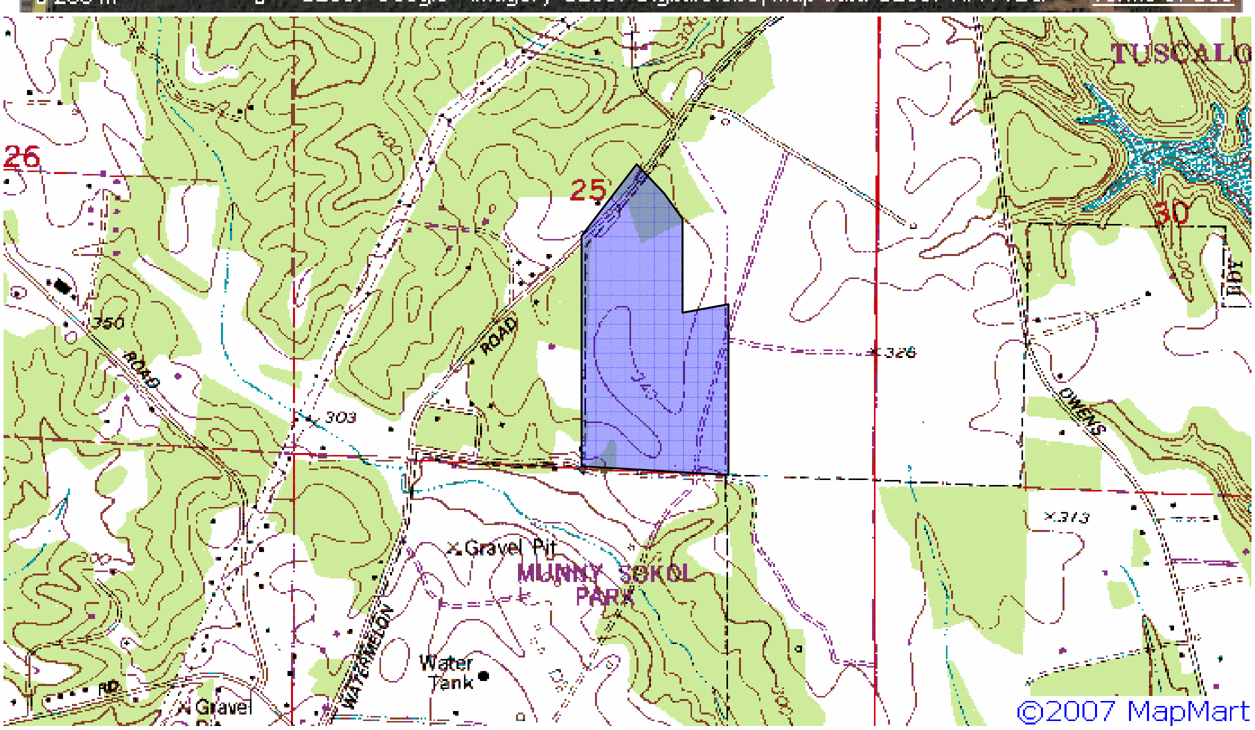
Phasing:

Phase 1- initial clearing and grubbing operations (based of off maps **Topo1** and **SH1**)

Phase 2- final grading (based of off maps **Topo2** and **SH2**)

Location: Off of Watermelon Rd. in Tuscaloosa, AL. 1 mile north of the existing Sokol Park on the right.

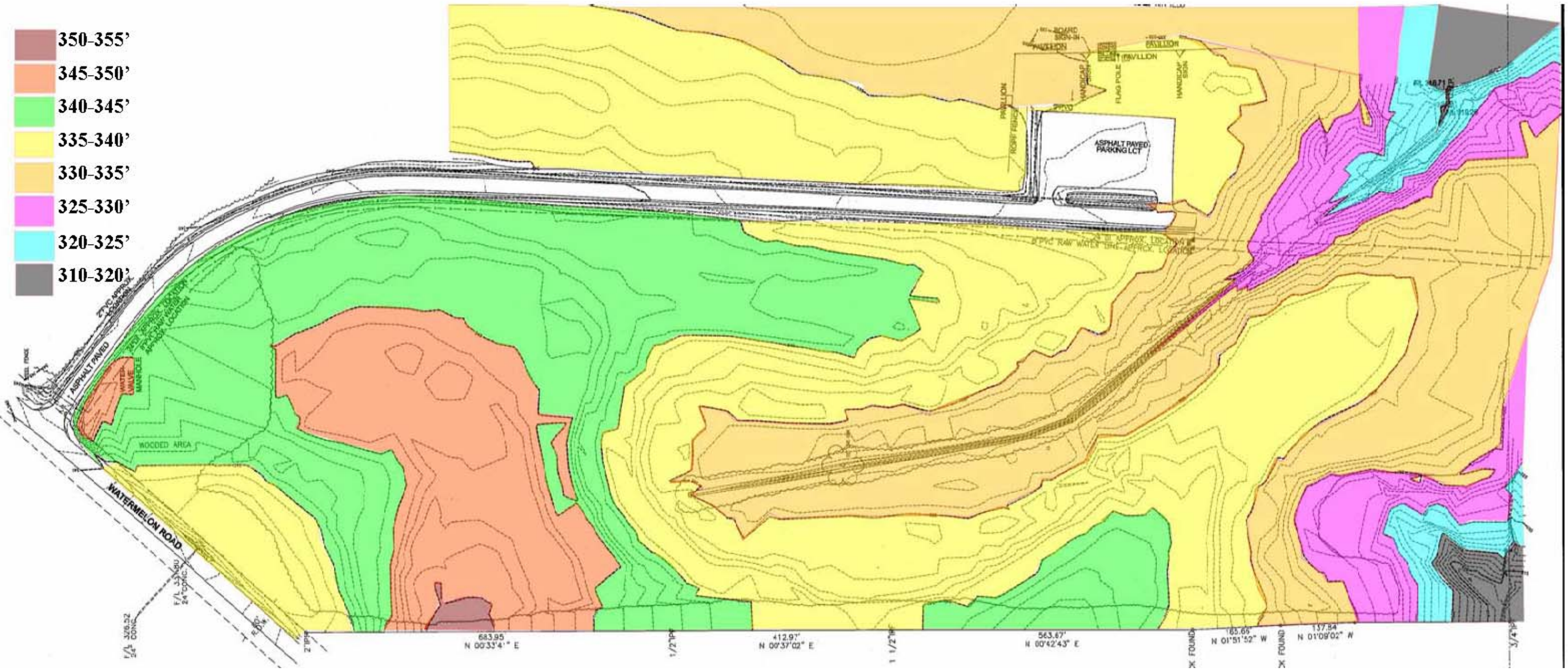




3. Data Collection

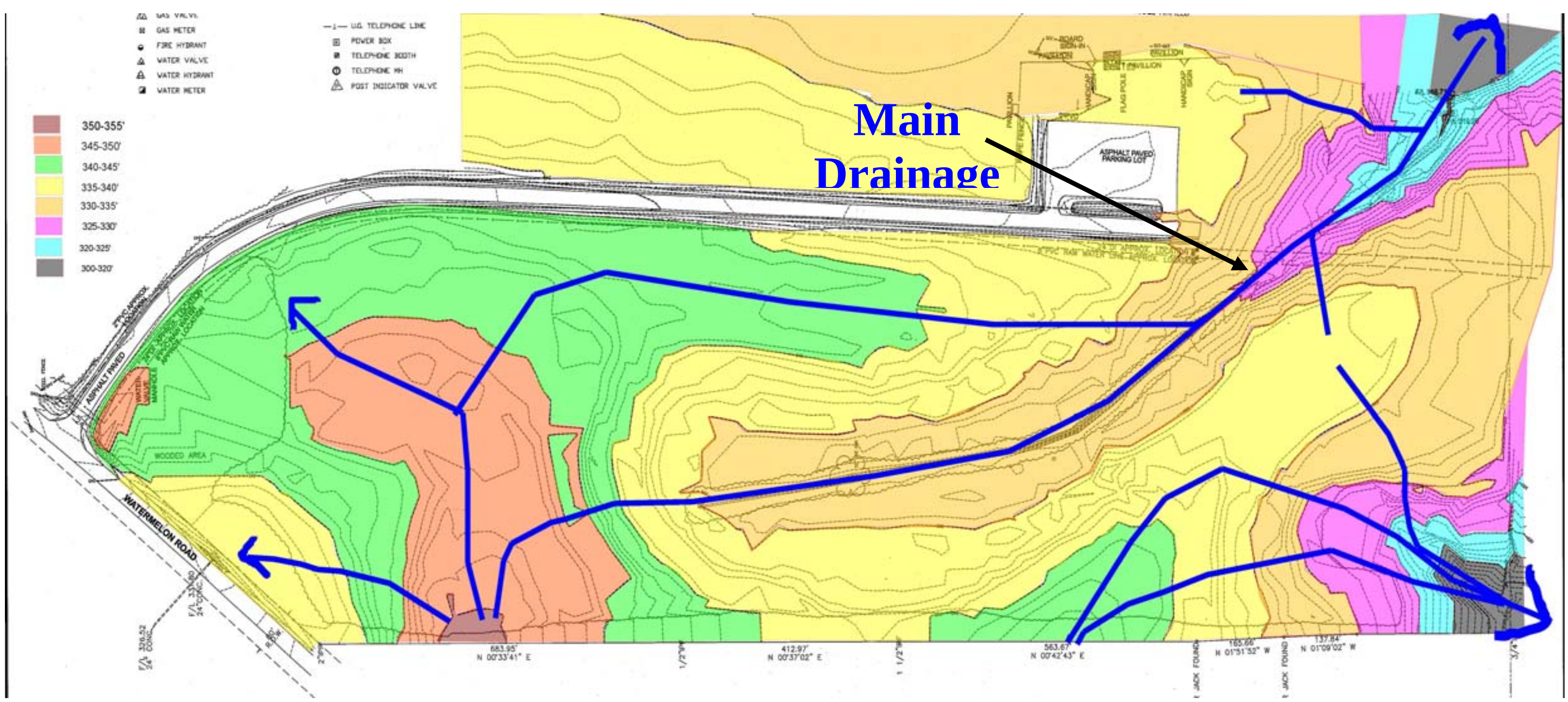
A. Topography:

The elevation of this area is between 310’ and 355’. (**Topo1** below)



B. Drainage Patterns:

A very identifiable natural drainage swale does exist and is pointed out on map **Topo1A** below.



C. Soils:

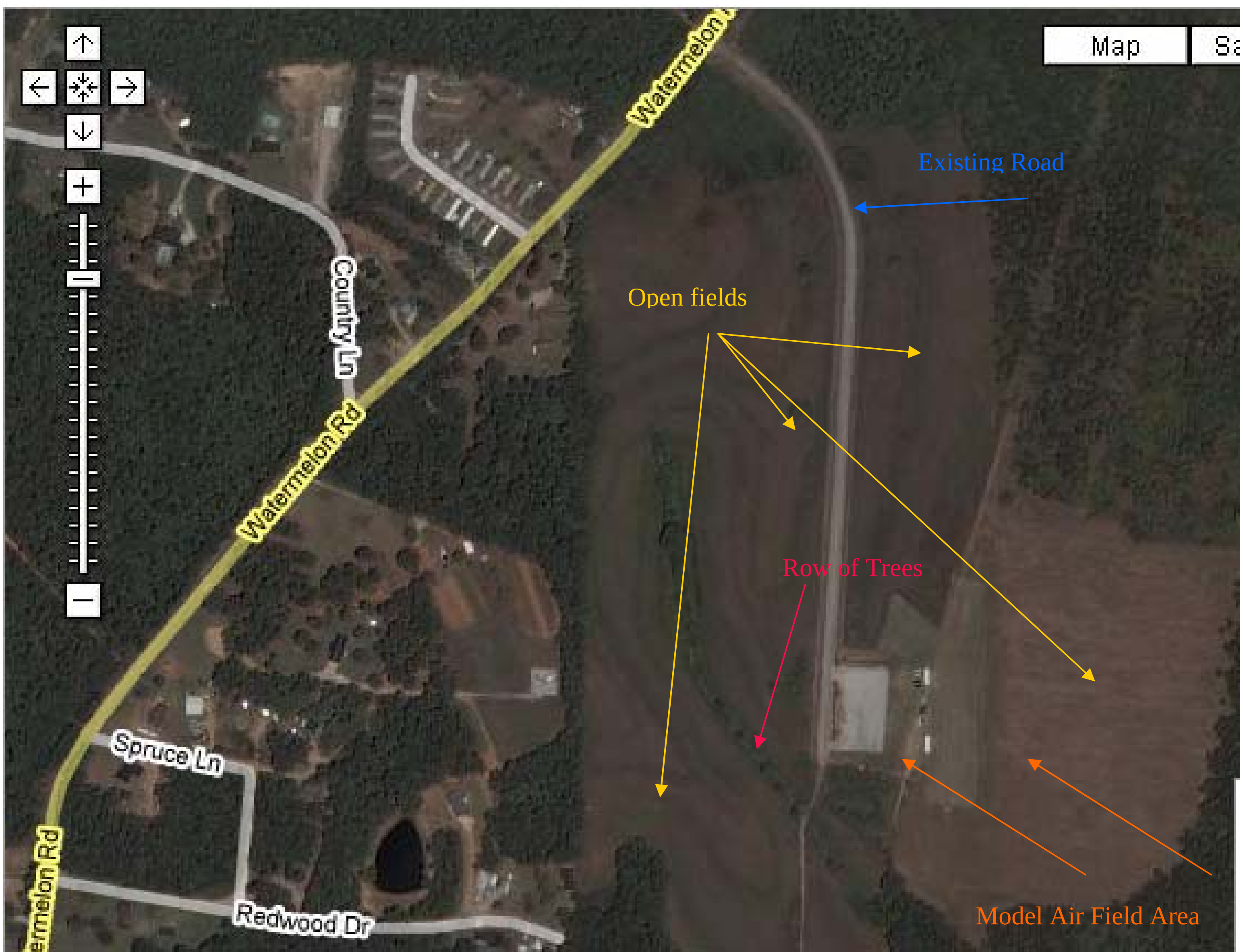
According to the USGS online soil map, about 70% of the project area is Bama fine sandy loam. The other 30% is Smithdale fine sandy loam. A small percentage is Smithdale-Flomaton complex soil. For the purposes of this plan I used: k-value = .24 for sandy loam soils.

(See **Table 1** for details)

Because we are building baseball fields with infields of sandy soils, I later incorporated a k-value= .10 for those areas in Phase 2.

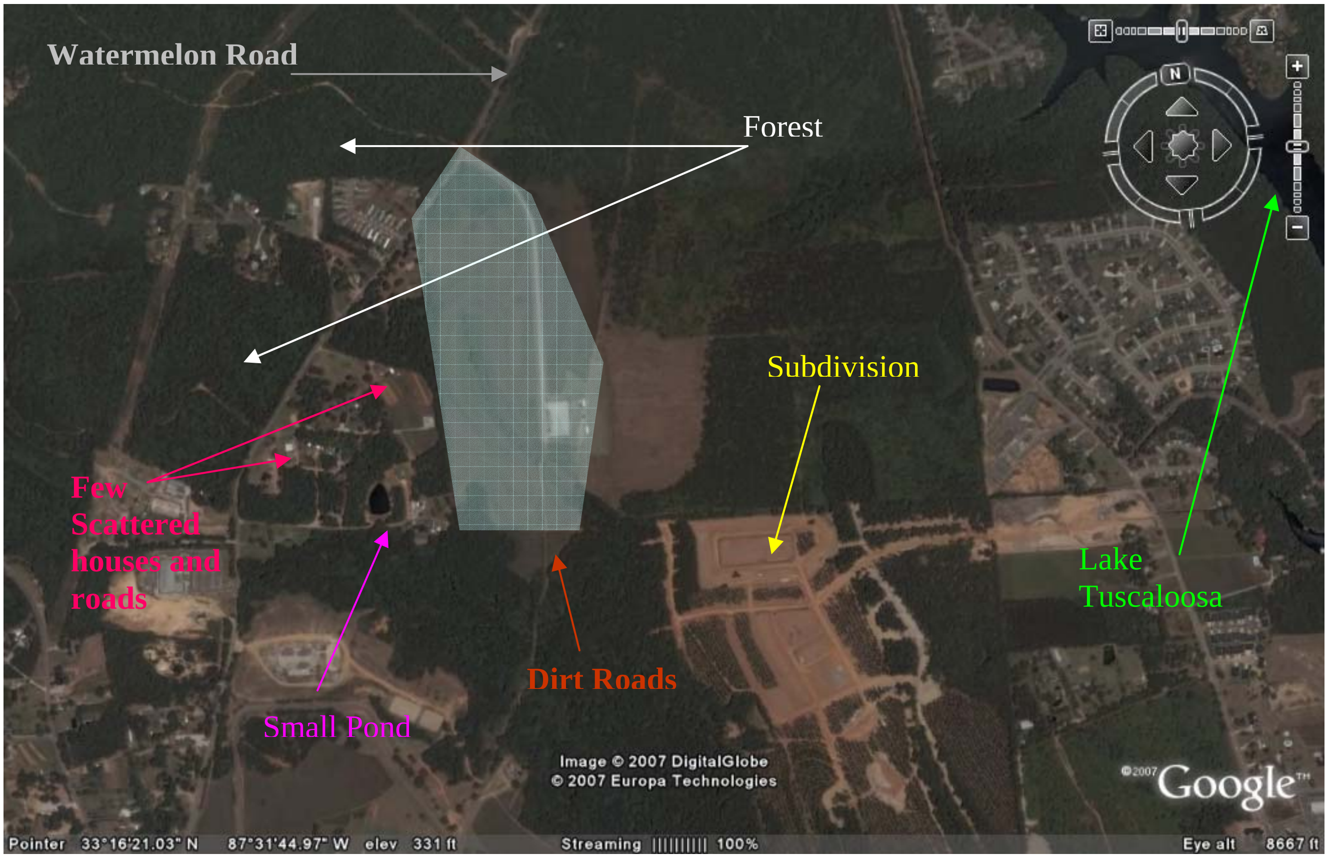
D. Ground Cover:

The site was already mostly cleared with open fields in place. Part of the area was already being used for a model airplane field. There were some trees left in place. Almost all of the site was and is bordered by forest. Even the side that touches Watermelon Rd. is bordered with some trees. There was an asphalt road leading to the airfield which will be repaved and kept in



E. Adjacent Areas:

Outside of the immediate forest, there is one neighborhood just southeast. Lake Tuscaloosa is about a mile to the East and there is a small pond about 300 feet to the west. Other than that there are just a few scattered houses to the west and forest everywhere else. A small stretch of the project borders Watermelon Road and two dirt roads are found at the southern tip of the project.



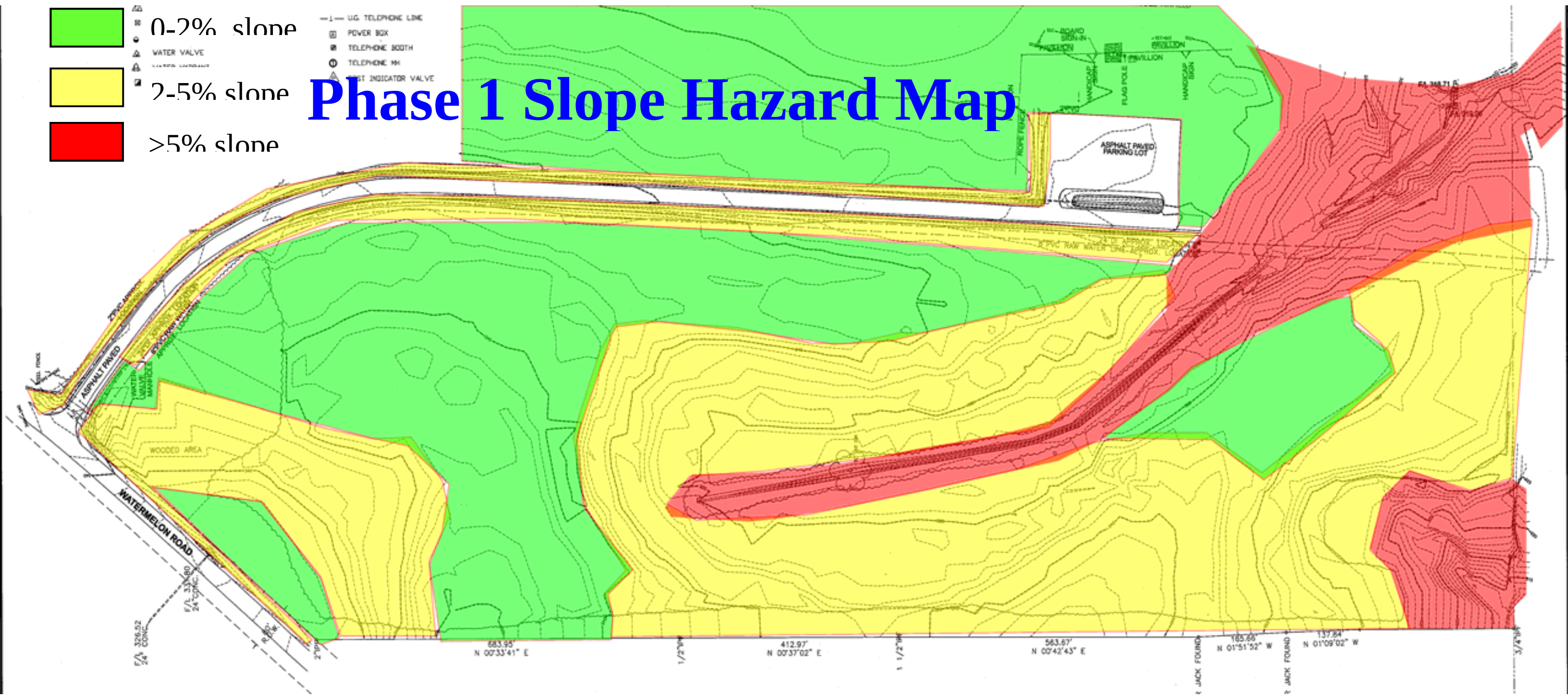
F. Other Issues:

Floodplains, Wetlands, Waste Materials, Cultural Resources, and Endangered Species are not issues relating to this project.

4. Data Analysis

A. Topography

I used the topographic map **Topo1** to determine my slope hazards for this area. Below is the slope hazard map which shows different hazard levels. Green is 0-2% slope, yellow is 2-5% slope, and red is >5% slope. We will focus on the red zones in our plan. (Map **SH1** below)



B. Drainage Patterns:

The path of the water will be the same as before for the early portions of construction (Feb-May). There are no upslope areas to this site and there are no immediate rivers or streams down-slope. There is plenty of natural forest and tall weeds to filter the water before it will eventually either dissipate or reach Lake Tuscaloosa. We do need to control the speed and sediment lost during construction. Unfortunately, we will be altering the drainage pattern quite a bit with our project. Methods are described later for controlling speed and sediment.

C. Soils:

Our sandy loam soils fall into group A. From the AL Handbook, these are deep, well drained sands and gravels with low runoff potential and high infiltration rates.

D. Groundcover:

Unfortunately, because our project will be moving dirt from one end of the site to the other, most ground cover will be demolished. Because this is a larger site, we will be able to leave some groundcover in tact for at least part of the time. Only 5 acres are supposed to be left exposed during any 30 day period of time.

E. Adjacent Areas:

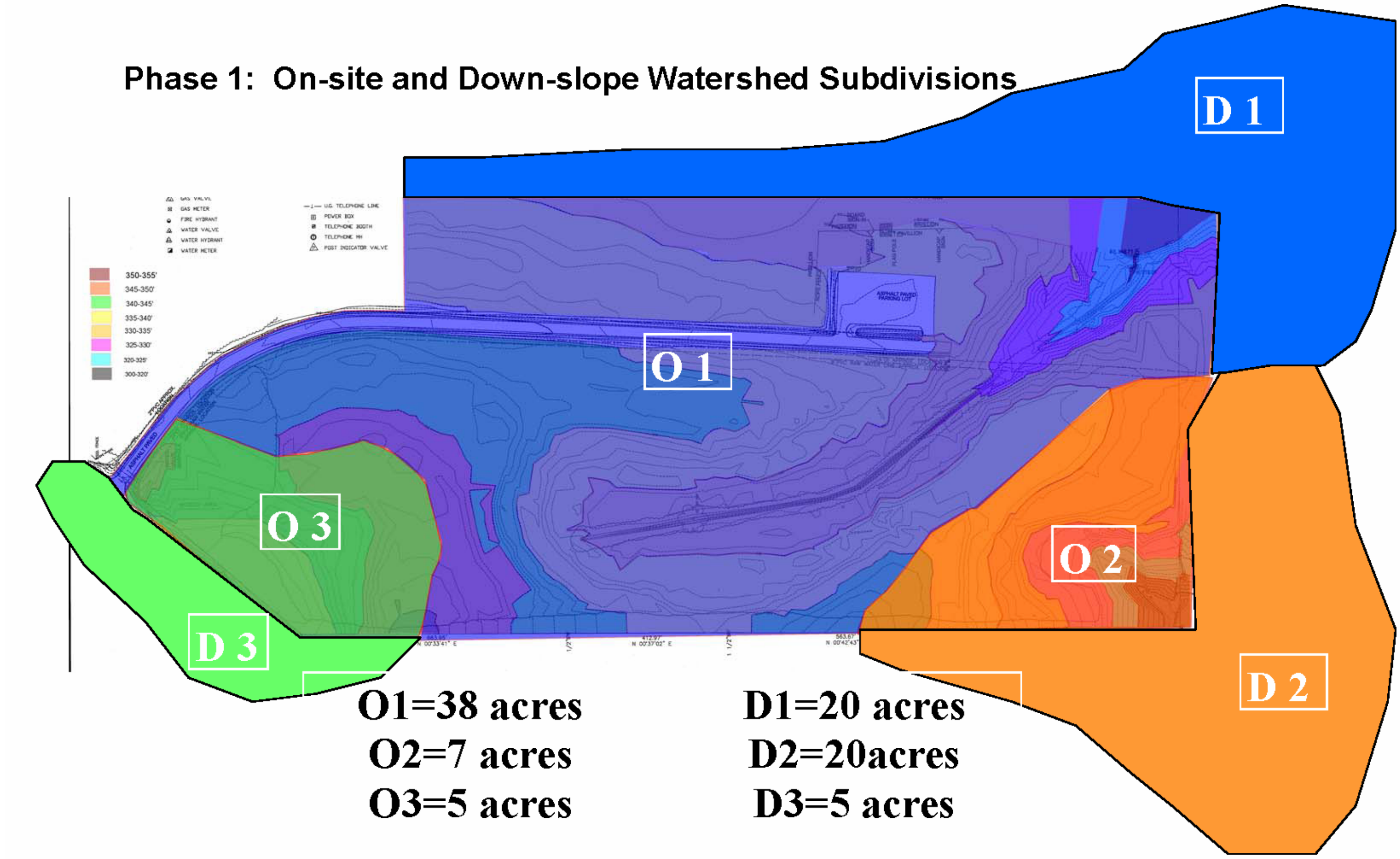
The down-slope areas might see an increase of sediment. Because there are no houses or paved roads in the immediate down-slope areas, the increase will not be noticed. Later I will explain methods used to help protect adjacent down-slope areas, but I must mention this site is in a good location as to avoid any conflict.

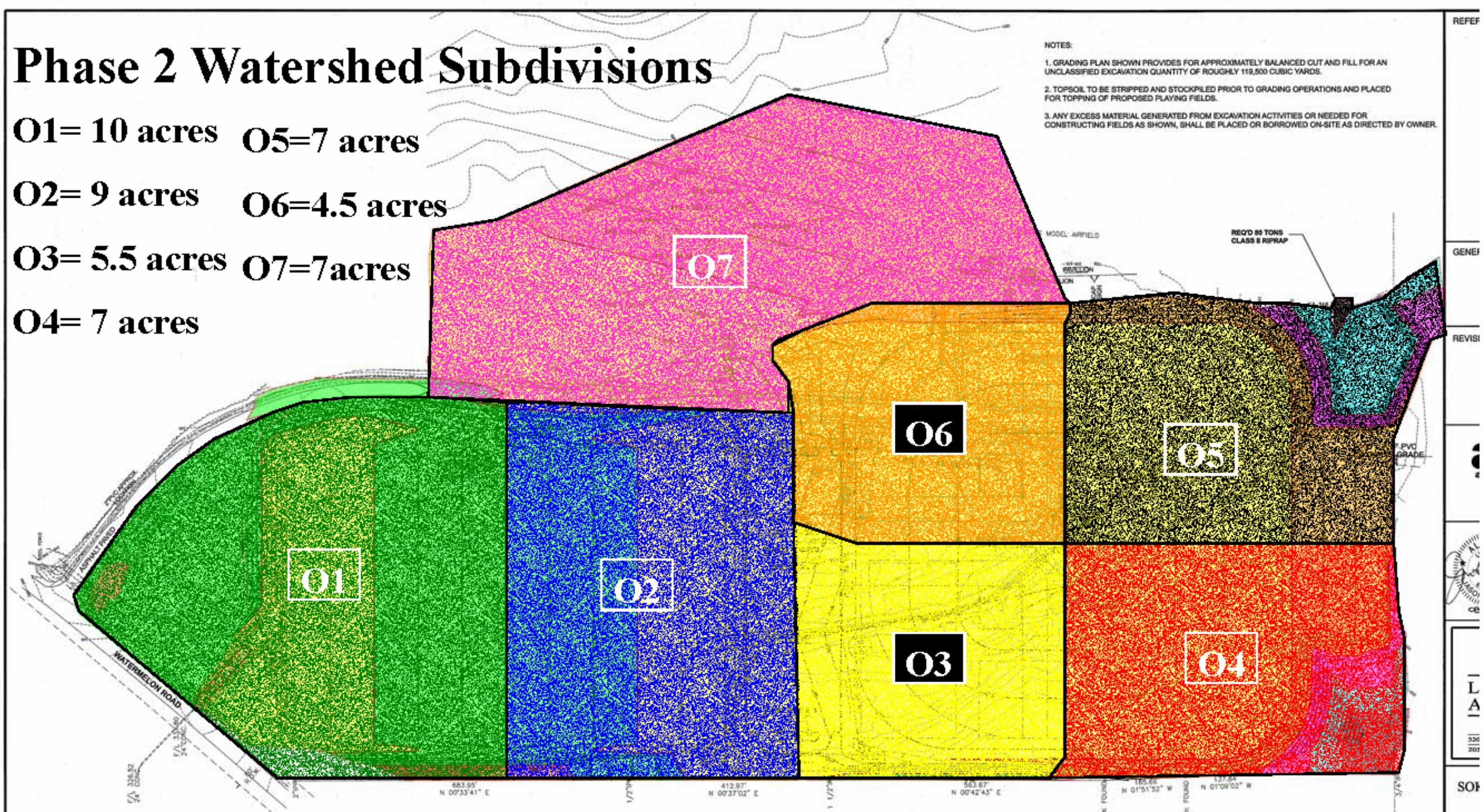
5. Facility Plan Development

Because this site was already underway when data analysis began, this step does not apply to this project.

6. Planning for Erosion and Sediment Control and Stormwater Management

A. Division of Site into Watershed Boundaries: (Maps **Topo1B** and **Topo2B** below)





B. Site Preparation:

Construction Exit Pad: Because this site was the existing model airplane field, there is already a road going to the site. This old paved road should be adequate to remove debris from tires before getting onto Watermelon Road.

Top-soil Stockpiling: It would be good to have some top-soil on hand to speed up the plant growth in select areas. There is plenty of space for a stockpile or two.

C. Design Storm Periods: (**Table 2**)

Control Practice	Selected Design Return Period(yr)
Filter Fence	5 yr
Site Channels	10 yr
Detention Pond	50 yr

D. RUSLE:

Table 3 shows the true RUSLE calculations for the site. Modified values were used during the sediment pond portion of the plan. To summarize the tables:

Existing soil loss for 1 year =36 tons

Phase 1 soil loss = 120 tons

Phase 2 soil loss = 182 tons

Soil loss after permanent vegetation established for 1 year = 10.2 tons

I think that it is very impressive that our new site layout will actually have a third less soil loss than the pre-existing natural conditions.

E. WinTR-55:

WinTR-55 was used to determine our peak flow rates for different design periods which helped us determine which control methods were needed. The extended results and calculations can be found in **WinTR1,WinTR2,** and **TcCalc**. A summary of results follows: **Table 4**

Peak Flow Rates at Overall Outlet (cfs)			
	5yr storm	10yr storm	50yr storm
Phase1	6.66	13.46	34.61
Phase2	169.48	202.39	256.9

F. Surface Stabilization:

<u>Phase 1:</u>

Identified below are several representative slopes followed by recommendations from our book and from North American Green. (**SH1A** below)

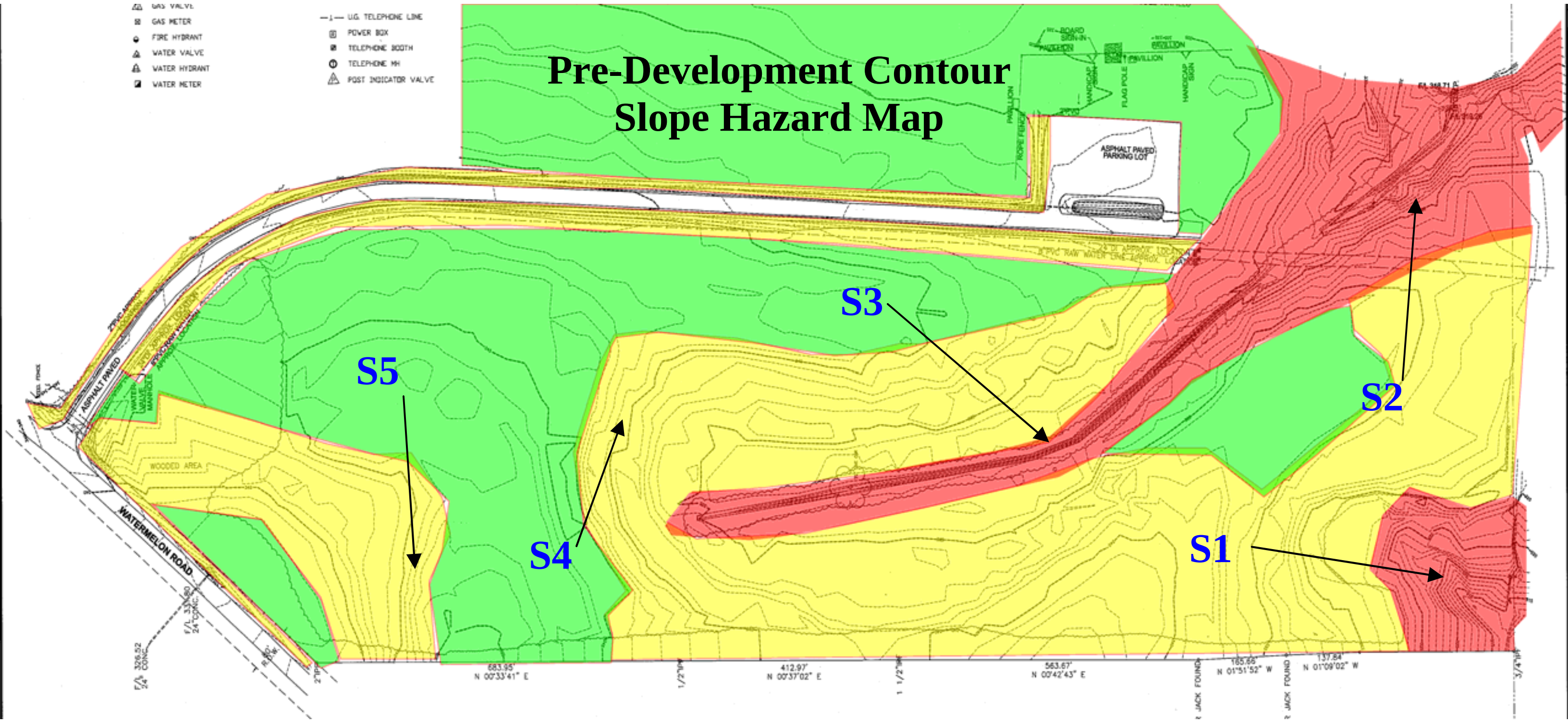


Table 5

Slope	% Slope	Protection Duration(mo)	North American Green Rec.	Other Rec.
S1	10	3	S75	Straw or Hay Mulch, tied down by anchoring and tacking equipment
S2	10	3	S75	Straw or Hay Mulch, tied down by anchoring and tacking equipment
S3	6	1.5	DS75	Sudangrass, Sorghum,Millet, Browntop or German Grass
S4	4	1.5	DS75	Sudangrass, Sorghum,Millet, Browntop or German Grass
S5	5	1.5	DS75	Sudangrass, Sorghum,Millet, Browntop or German Grass

See **NAMSPECS** for further information on the North American Green products listed.

See **NAMSLOPE1** for screenshot from North American Green Software.

Phase 2:

Identified below are several representative slopes followed by recommendations from our book and from North American Green (**SH2A** below)

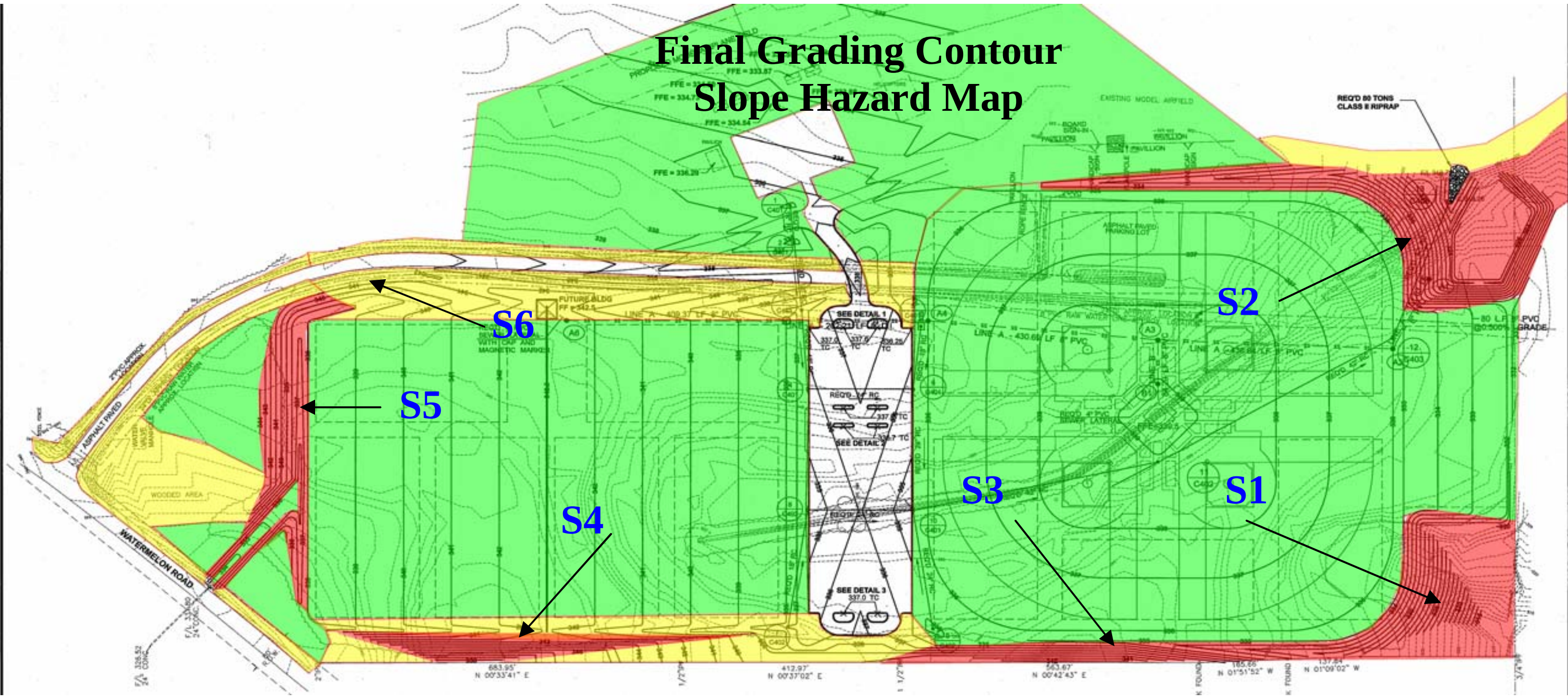


Table 6

Slope	% Slope	Protection Duration(mo)	North American Green Rec.	Other Recommendations
S1	11	3	S75	Straw or Hay Mulch, tied down by anchoring and tacking equipment, wood chips, or crushed stone
S2	11	3	S75	Straw or Hay Mulch, tied down by anchoring and tacking equipment, wood chips, or crushed stone
S3	20	3	S75	Wood Chips
S4	20	3	S75	Wood Chips
S5	10	3	S75	Straw or Hay Mulch, tied down by anchoring and tacking equipment

See **NAMSPECS** for further information on the North American Green products listed.

See **NAMSLOPE2** for screenshot from North American Green Software.

See **SLOPECALC** for hand calculation of a representative slope.

Note: Filter fences also aid in surface stabilization and will be discussed later.

G. Runoff Conveyance:

All channels for this project were designed using 10yr peak flow rate data from WinTR-55.

<u>Phase 1:</u>

The natural diversion swale will remain in place during phase 1, but will initially have to be cleared due to the presence of trees in the area. We will line the channel as shown below in order to keep it in tact for at least 2 months.

Identified below is the channel during phase 1 followed by recommendations from our book and from North American Green. (**SH1B** below)

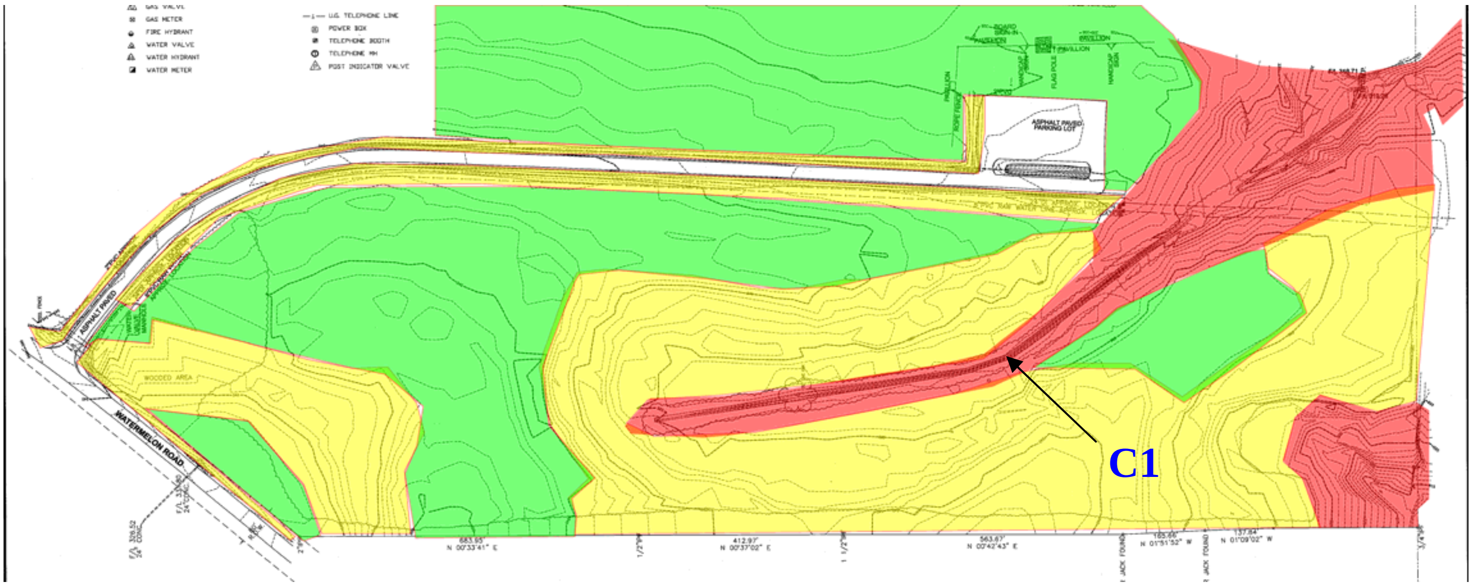


Table 7

Channel	% Slope	% Side Slopes	Design Period	North American Green Rec.	Other Recommendations
C1	1	10	2 months	DS75	German, foxtail, and pearl millet grasses; sorghum grasses

See **NAMSPECS** for further information on the North American Green products listed.

See **NAMCHANNEL1** for screenshot from North American Green Software.

This channel is actually very mild with a peak discharge of only 8.5 cfs.

<u>Phase 2:</u>

The 2 channels will change the routing of the water significantly from Phase 1 and these channels will remain in place after construction is completed.

Identified below are the 2 channels in phase 2 followed by recommendations from our book and from North American Green. (**SH2B** below)

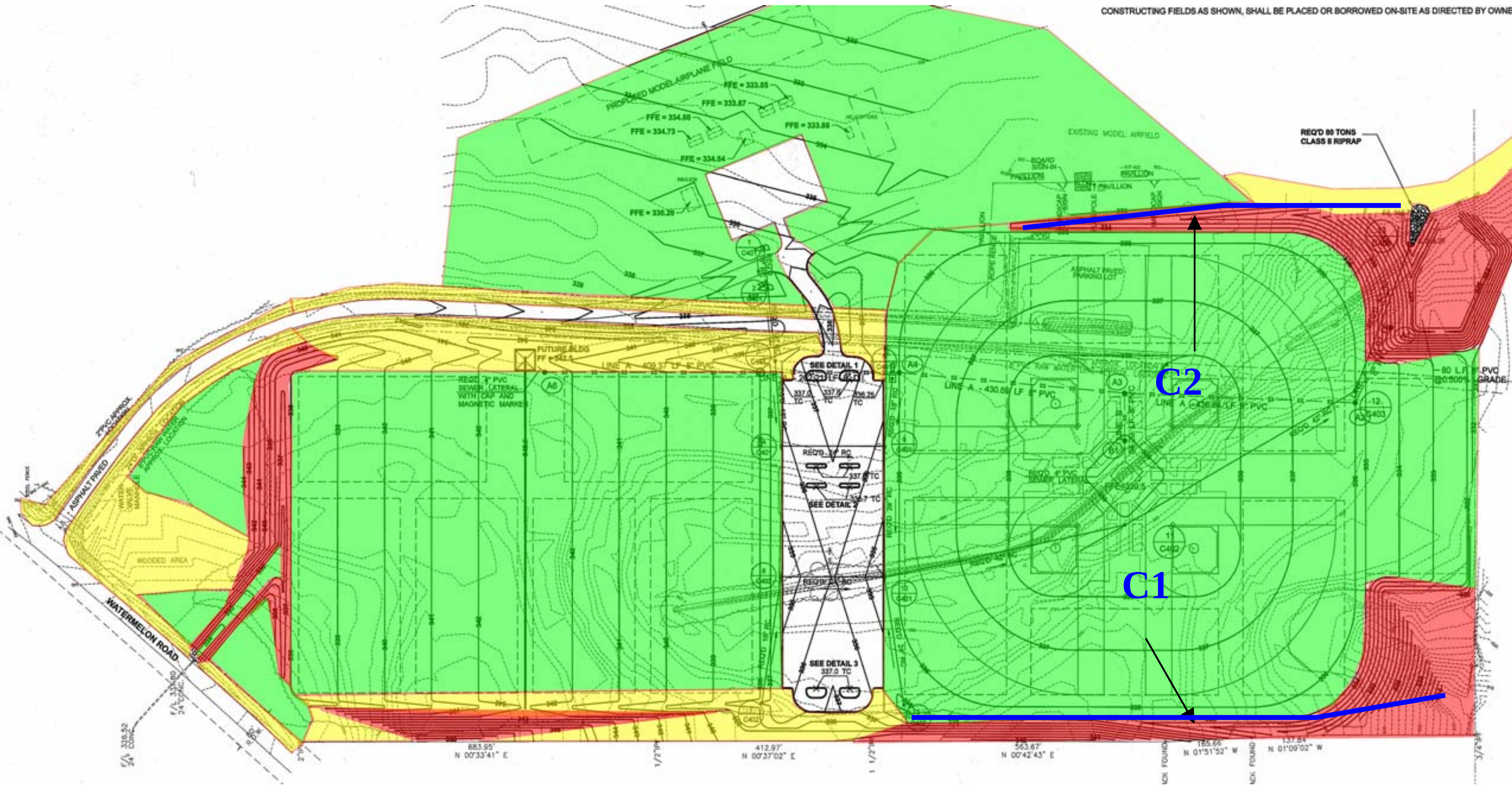


Table 8

Channel	% Slope	% Side Slopes	Design Period	North American Green Rec.	Other Recommendations
C1	2.30	10	permanent	P550	bermudagrass
C2	2	10	permanent	P550	bermudagrass

See **NAMSPECS** for further information on the North American Green products listed.

See **NAMCHANNEL2** for screenshot from North American Green Software.

See **CHANNELCALC** for hand calculation of representative channel.

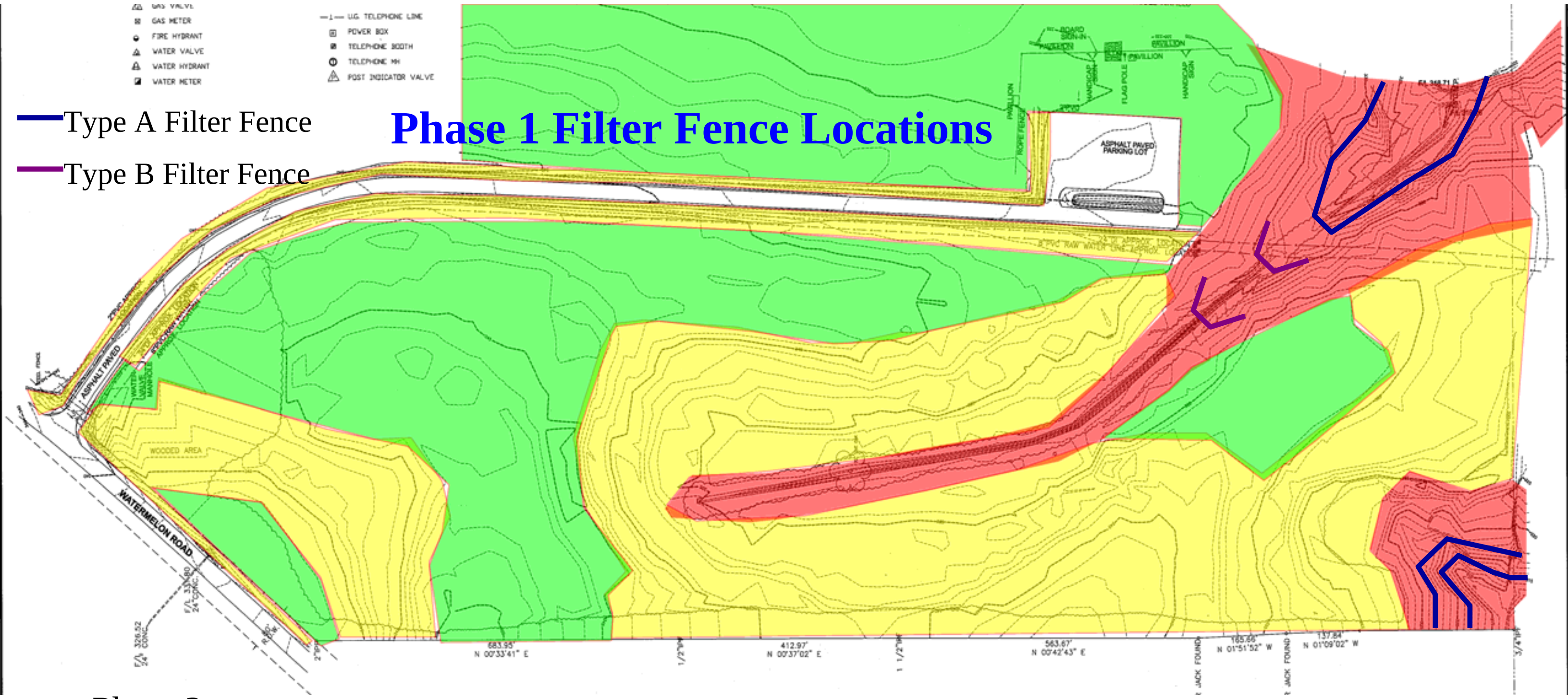
Although the discharge for C2 was a mere 19.47cfs compared to 58cfs, P550 or bermudagrass was the permanent solution for both channels. I would recommend that riprap be placed before the outlet of Channel 2 due to the intense flow. Details of riprap amount discussed in next section.

H. Sediment Control:

Filter Fences:

<u>Phase 1:</u>

App. 2200 ft of filter fence should be installed for phase 1 to be on the safe side. See **SH1C** below. Fences should have no more than 50ft of 10% slope above them or 75ft of 2-5% slope.



<u>Phase 2:</u>

App. 6000’ could be used during this phase. Depending on how well the vegetation is doing, I would say that only the fences in the channels would be necessary. (**SH2C** below)

Rip-Rap:

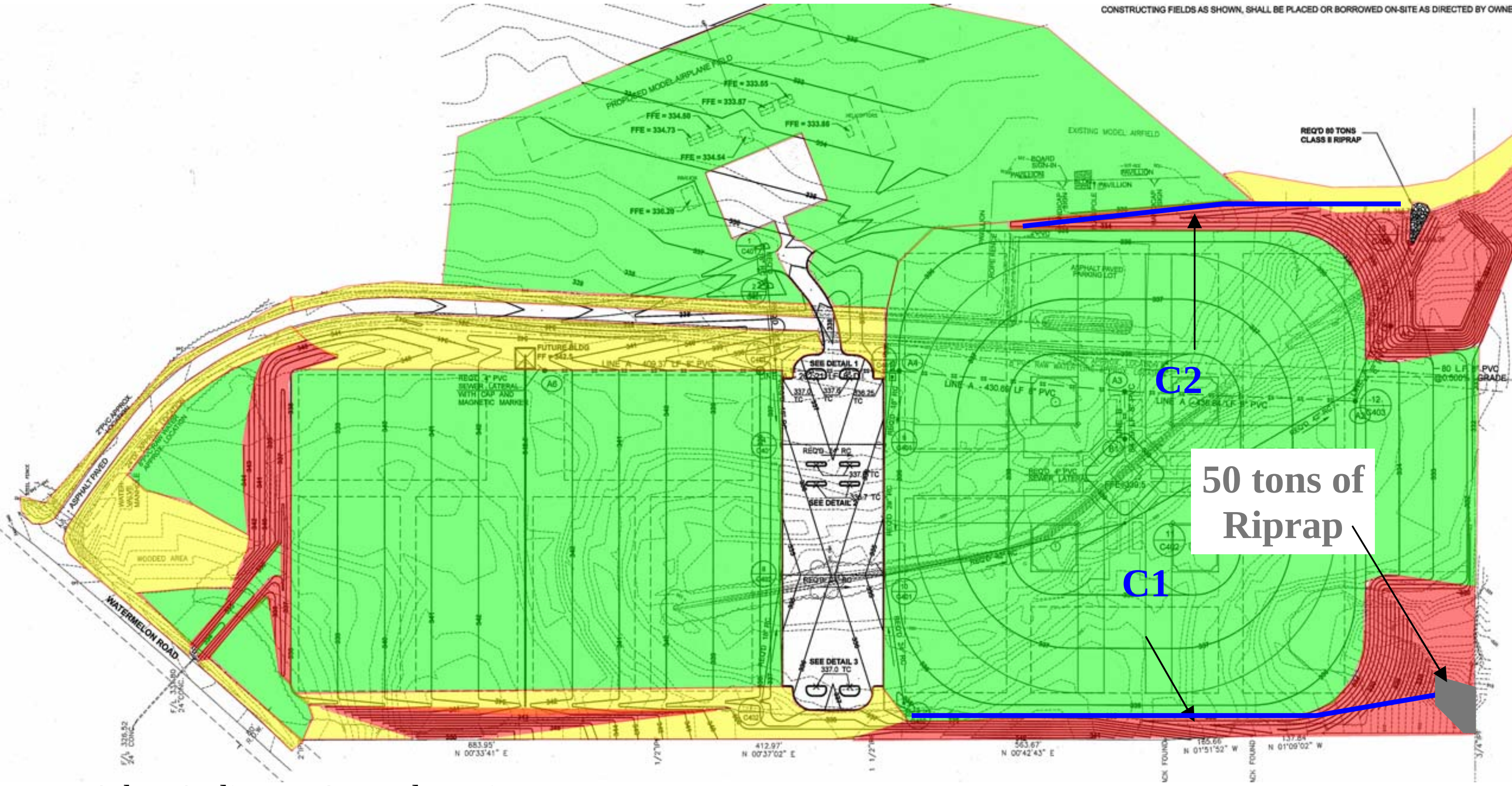
Phase 1:

Because rip-rap is a permanent device and the land will be changing so much, none is used during phase 1.

Phase 2:

Due to the intense pace that water could reach and the amount of sediment it could carry, I recommend that a riprap dam be placed for the channel C1 outlet in Phase 2. 58 cfs is the peak flow during a 10 year design storm for channel C1 in Phase 2. Because this is a permanent channel, we will need rip-rap to slow the water down and capture some sediment when such an even occurs.

I was unable to access a copy of R. S. Means (2000), so I will make an estimate that 50 tons of Class II riprap will be necessary to protect this channel outlet.



Other Sediment Control Devices:

Whenever the new parking lot is paved and curbs and gutters complete, I would recommend adding a row of hay bales at the edge of the curb on both sides of the lot to guard the new pavement from the sediment runoff.

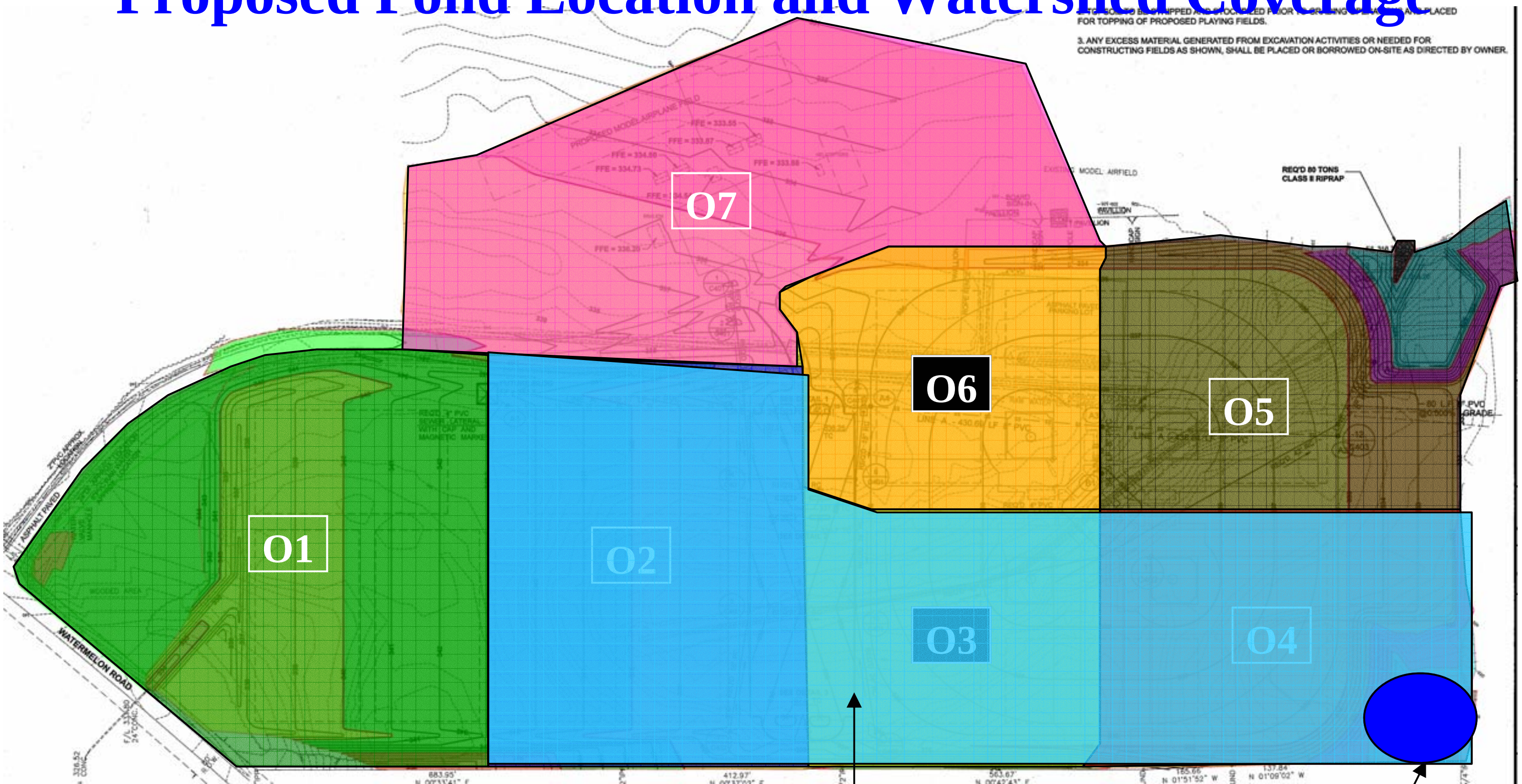
I. Stormwater Management

The following plan is not part of my real plan for this site. I feel that the riprap mentioned above would be sufficient for any storm that could take place. This detention pond is based on hypothetical R, C, and K values to provide enough soil loss to justify a pond.

<u>Detention Pond:</u>

Location: Map **Topo2C** below.

Proposed Pond Location and Watershed Coverage



Pond

Watershed Area for Pond

O2= 9 acres

O3= 5.5 acres

O4= 7 acres

Pond Size Selection:

The watershed for the pond is 21.5 acres so the surface area is .32 acres.

Live Storage Depth: 2 ft

Side slopes: 9%

Primary Outlet Device: 22.5 degree V-Notch Weir

Sacrificial Storage Volume: 676 yd^3 (from hypothetical RUSLE)

Sacrificial Storage Depth: 4 ft

Side Slopes: 15%

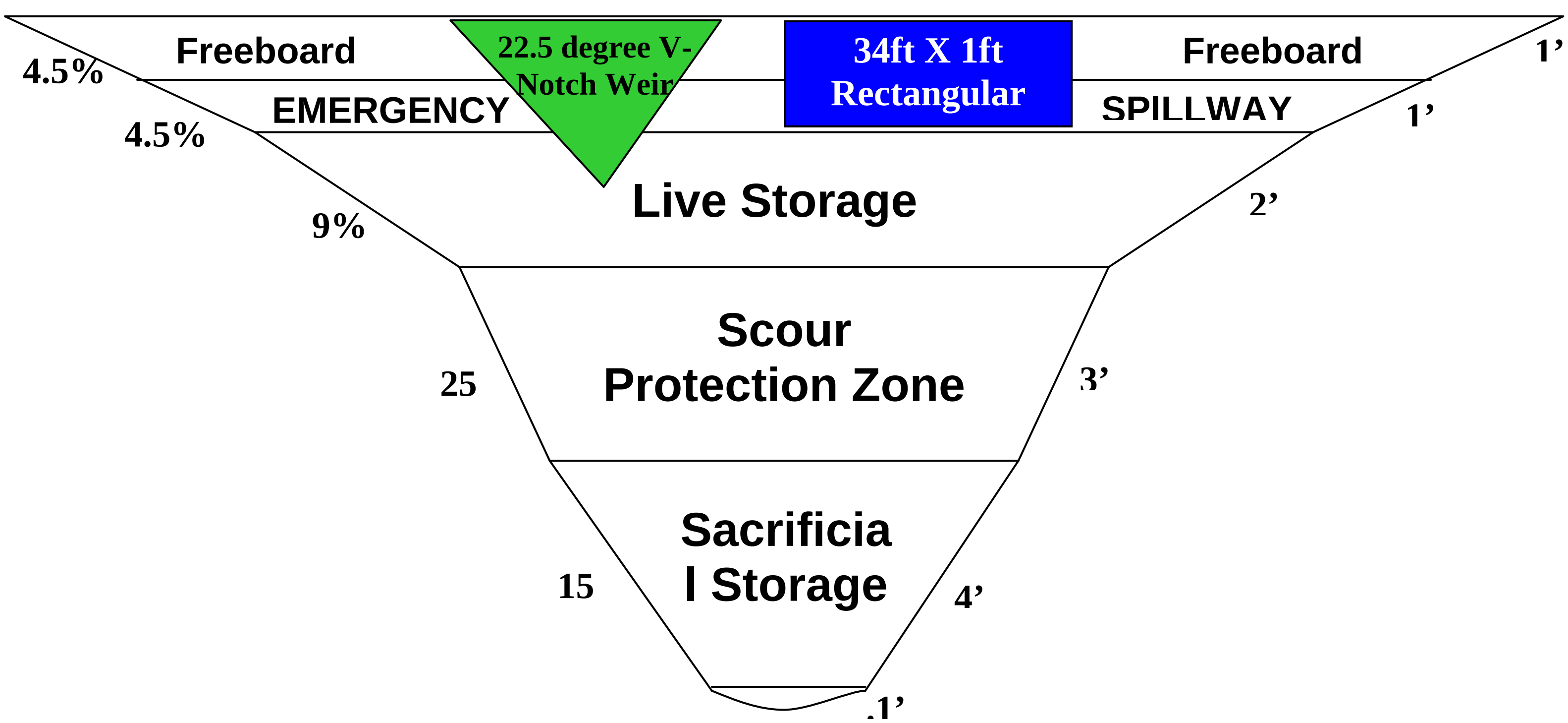
Emergency Spillway: Rectangular Weir to allow 112 cfs

Depth: 1 ft

Width: 34 ft

See **Mod6** for details, calculations, and tables relating to pond selection.

Final Pond Profile



7. Conclusion

If we were to use the 50 yr design storm for a detention pond, there would be a 2% chance of failure in 1 year and only 1.167% chance for our construction period. This would be a fairly extreme design for such a project and location. I think using the 10 year design storm channels would be sufficient providing 90% chance of stability and the 5 year design silt fencing also providing some stability. I do suggest placing permanent riprap at the outlet of channel C1 in Phase 2 as soon as convenient. The riprap would help protect the site if a major storm did occur during construction and would be very necessary as a permanent device.

I think that this plan is very safe especially considering the area where the project takes place. There are no immediate receiving waters or any roads or houses directly downstream from the site. The riprap is an extra precaution that would be valid during construction and necessary for a permanent protection device.

The filter fences were not maintained properly on this site, but I saw no major repercussions.

Perhaps if this had been a rainier wet season then there would have been some. Again I think the location of this project, in the middle of nowhere, had bearing on the project's erosion control conscience. The most important maintenance issue would be to insure vegetation growth for channel C1 during Phase 2. Without stability, this could result in major soil loss.

In closing, I would like to mention that the actual approach taken to the site was somewhat different than my own. The major natural channel seen in Phase 1 was actually used as the route of a major storm sewer. The parking lot, in-field areas, and outfield areas of the ball-fields all drained into this storm sewer. This is why there is actually 80 tons of riprap at the washout of this sewer which is located at the outlet of channel C2 in Phase 2. The reason I chose not to base my plan on the existing plans is that it would created too many sub-watersheds to show the actual in-field drainages, separate out-field drainages, and subdividing the parking lot and having road channels. I feel that this would have been outside the scope of this class. I do feel that my plan would have been sufficient for this site in actuality if the in-field slopes did not very as they do. The detail of these in-field slopes is not depicted by the Phase 2 contours.

8. References

Alabama Handbook for Erosion Control, Sediment Control and Stormwater Management on Construction Sites and Urban Areas
June 2003
Alabama Soil and Water Conservation Committee

Construction Site Erosion and Sediment Controls
Pitt, Clark, Lake

http://unix.eng.ua.edu/~rpitt/

http://www.usgs.gov

http://maps.google.com/maps

http://www.usda.gov

North American Green Software

WinTR-55 Software