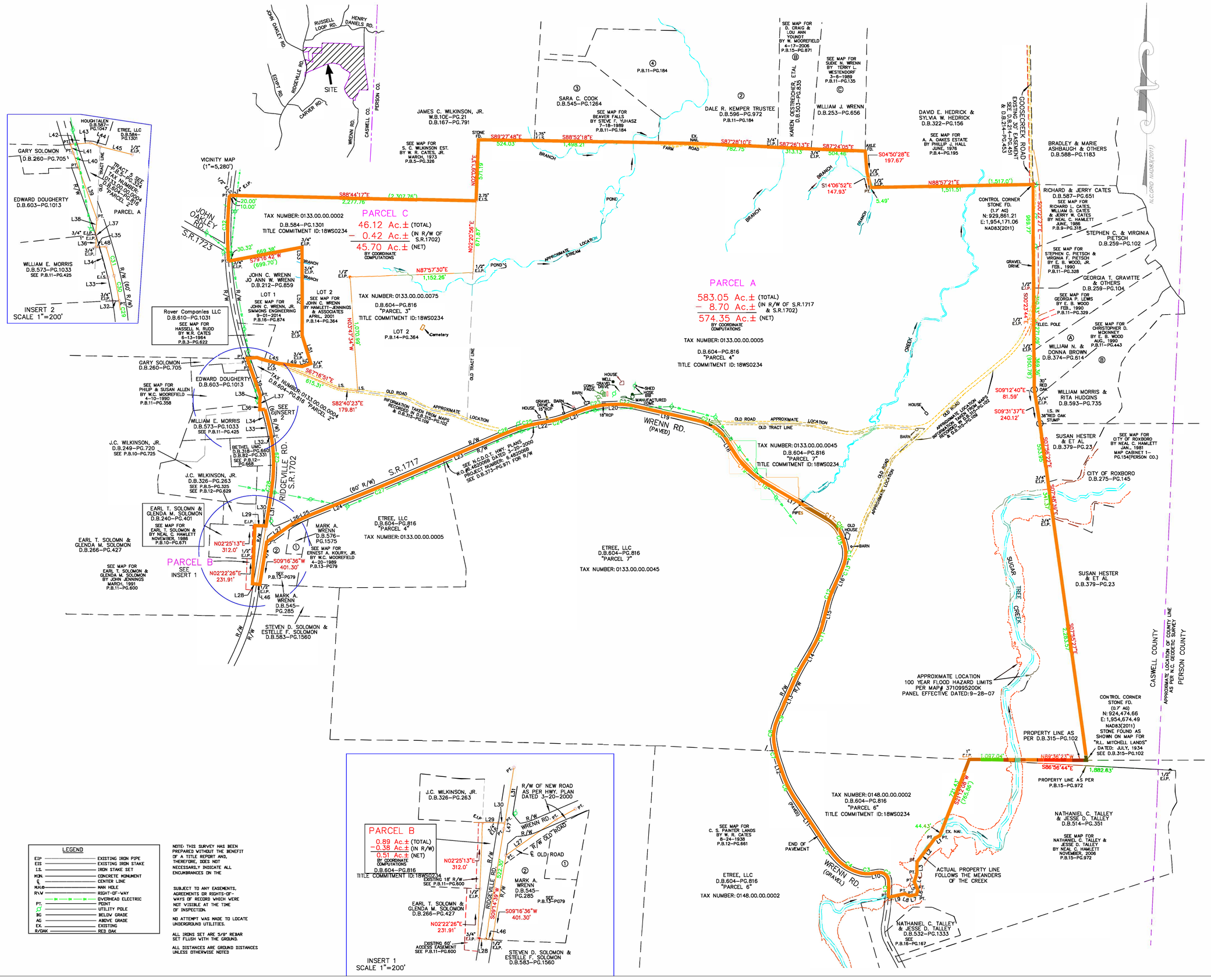


General Notes

Property/Mine Permit Boundary

PLAT OF SURVEY
FOR
Carolina Sunrock LLC

HIGHTOWERS TWSP. CASWELL COUNTY
NORTH CAROLINA
JANUARY 23, 2019 SCALE 1" = 400'
REVISED FEBRUARY 19, 2019

C.E. ROBERTSON & ASSOCIATES, P.C.
PROFESSIONAL LAND SURVEYOR L–1421
CERTIFICATION NUMBER: C–2928
P.O. BOX 584
EDEN, NC 27289
PH. (336) 627–0498
EMAIL: lfoulks@cersurveyors.com
JOBNAME: SUNROCK20182

No.	Revision/Issue	Date
1.	Addition of Cemetery Location	01/2020
1.	Update of Surrounding Parcel Owners	01/2020

Firm Name and Address

SUNROCK®
CAROLINA SUNROCK LLC

200 HORIZON DRIVE, SUITE 100
RALEIGH, NC 27615

Project Name and Address

Prospect Hill Quarry & Distribution Center Property Survey & Permit Boundary

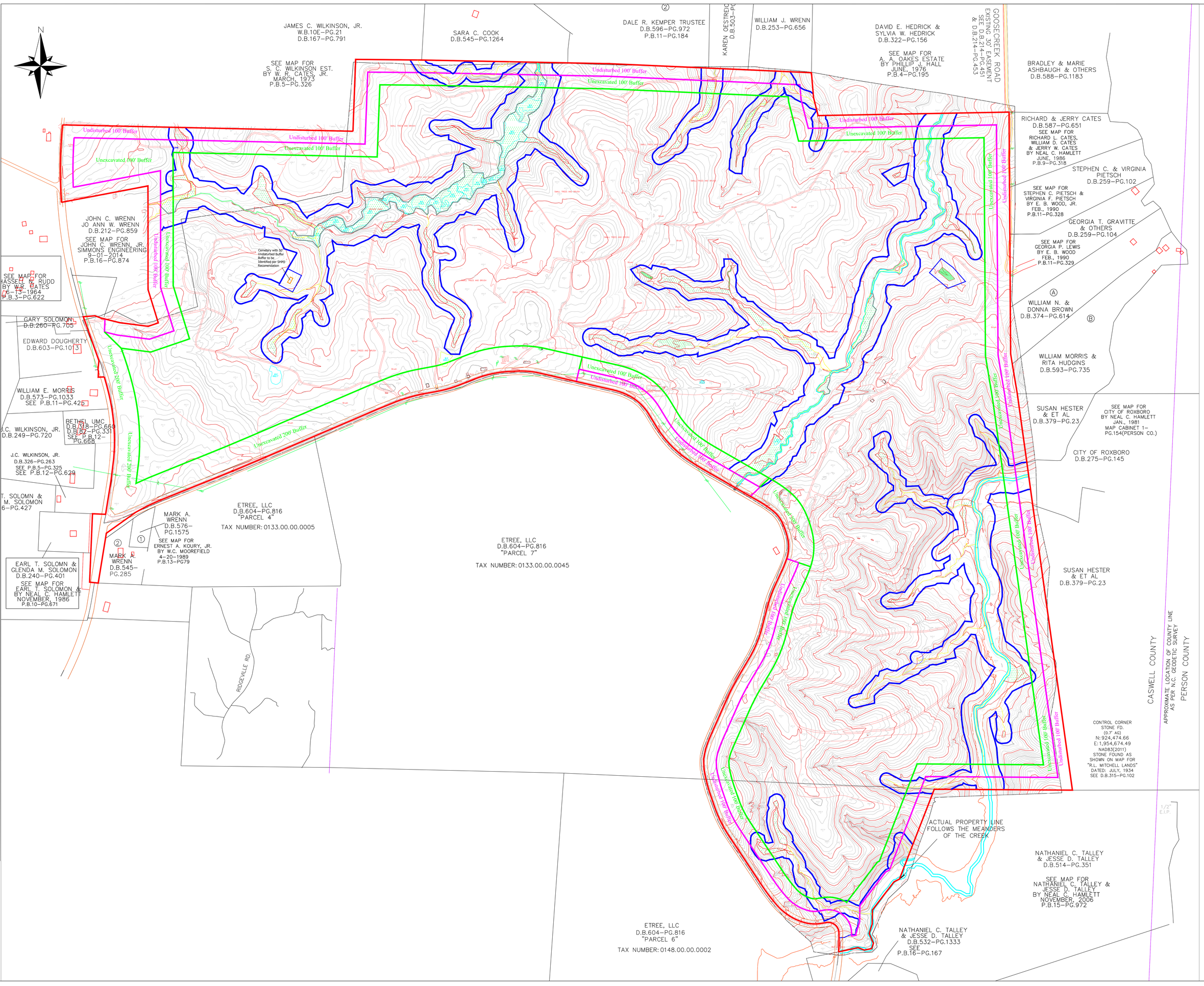
Drawn By: S Martino

Project: Property Survey

Date: 08–14–2019

Scale: 1" = 400'

Sheet: 3



General Notes

- Property/Mine Permit Buffer
- 100' Undisturbed Buffer
- 100' or 200' Disturbed Buffer No Excavation
- 100' Perennial Undisturbed Stream Buffer
- 50' Intermittent Stream and Wetland Undisturbed Buffer
- Stream
- Intermittent Stream
- Wetlands
- 100 Year Flood Plain
- Adjoining Property John B. Drumwright Estate 25.91 ac. Record # 379
- Non–owned Structure
- Adjoining Property Boundary
- Power Pole

No.	Revision/Issue	Date
1	Revised Wetland & Cemetery Buffer	01/20
1	Addition of Cemetery Location	01/20
1	Update of Surrounding Parcel Owners	01/20

Firm Name and Address

SUNROCK
CAROLINA SUNROCK LLC

200 HORIZON DRIVE, SUITE 100
RALEIGH, NC 27615

Project Name and Address

Prospect Hill Quarry
& Distribution Center

Exisitng Site Conditions
&
Proposed Buffer Map

Drawn By: S Martino

Project: Topo/Wetlands

Date: 05–08–2019

Scale: 1" = 225'

Sheet: 4

Facility Development Sequence

ASPHALT/CONCRETE PLANTS AREA:
1. Survey and flag limits
2. Install silt fence as detailed within the supplied S&E drawings by Timmons Group.
3. Install Sediment Basins 3 and 12 with associated diversions as detailed within the supplied S&E drawings by Timmons Group.
4. Grading and construction of the asphalt and concrete plant facilities excess grading material to be used to construct Diversion Berms.
5. Upon completed construction, provide permanent seeding
6. Upon permanent stabilization and germination remove silt fence.

CREEK CROSSING 1 & 2:
1. Survey and flag limits
2. Install silt fence along top of bank on each side of the creek
3. Install horseshoe filter basins upstream of silt fence on each side of the creek as shown on Sheet 7c
   3.1. Creek Crossing 1: Install HF-1, HF-2, HF-3, & HF-4
   3.2. Creek Crossing 2: Install HF-5, HF-6, HF-7, & HF-8
4. At Creek Crossing 1, remove existing 36"- pipe (no excavation is required)
5. Begin construction of bridge span
6. Upon completion of construction, provide permanent seeding
7. Upon permanent stabilization and germination, remove silt fence

ENTRANCES:
1. Establishment of the three (3) construction entrances to the property off Wrenn Road as shown in the storm water detail maps
2. Development and paving per NCDOT Driveway Permits
3. Installation of lockable gate at each access point.
4. Planting and seeding of screening vegetation

OVERBURDEN DISPOSAL AREAS (ODA 1, ODA 2, ODA 3)
1. All Overburden Disposal Areas shall be constructed as needed throughout the life of the mine.
2. Survey and flag limits of each overburden disposal area to be constructed
3. Install silt fence as detailed within the supplied S&E drawings by Timmons Group.
4. Installation of Sediment Basins and their associated diversions as detailed within the supplied S&E drawings by Timmons Group.
   4.1. ODA-1 Construct Basins 8 and 9
   4.2. ODA-2 Construct Basins 10 and 11
   4.3. ODA-3 Construct Basins 50, 52, 53, 54, and 55
5. Removal of existing vegetation and topsoil within each 10' interval lifts, ultimate foot print of each overburden disposal area, as storage is needed
6. Construction will begin at topographical low raising contours in 10' intervals along existing topography
7. Each 10' lift's outer slope is to be constructed at a 2-foot horizontal to 1-foot vertical slope
8. Each 10'lift will be stabilized with groundcover upon completion of final grading of each lift's perimeter and prior to the deposition of the internal fill

OVERBURDEN DISPOSAL BERMS
1. All Overburden Disposal Berms shall be constructed as needed throughout the life of the mine.
2. Survey and flag limits of each berm to be constructed
3. Install silt fence behind landscaping of visual screening berm or along undisturbed buffer boundary
4. Install Sediment Basins within vicinity of berms and associated diversions as detailed within the supplied S&E drawings by Timmons Group.
   4.1. Overburden Disposal Berm 1 - Construct Basins: 5, 6 and 7
   4.2. Overburden Disposal Berm 2 - Construct Basins: 1, 2, 4 and 5
   4.3. Overburden Disposal Berm 3 - Construct Basins: 3
   4.4. Overburden Disposal Berm 4 - Construct Basins: 31, 32, and 33
   4.5. Overburden Disposal Berm 5 - Construct Basins: 24, 25, and 26
   4.6. Overburden Disposal Berm 6 - Construct Basins: 38, 39, and 40
   4.7. Overburden Disposal Berm 7 - Construct Basins: 44, 47, and 49
   4.8. Overburden Disposal Berm 8 - Construct Basins: 50 and 55
5. Construct all overburden berms 2-foot horizontal to 1-foot vertical
6. Upon suspension of construction of the overburden berm, provide temporary seeding
7. Upon completed construction of the overburden berms, provide permanent seeding of the berm and associated disturbed areas, as needed.
8. Upon permanent stabilization of the overburden berms, remove silt fence and sediment basins (area dependent).

PIT DEWATERING POND -NEAR WRENN ROAD:
1. Survey and flag limits
2. Install silt fence as detailed within the supplied S&E drawings by Timmons Group.
3. Installation of Sediment Basins and their associated diversions 32 and 33 as detailed within the supplied S&E drawings by Timmons Group.
4. Begin construction of pit dewatering pond and settling ponds
5. Upon completed construction, provide permanent seeding
6. Upon permanent stabilization and germination, remove silt fence.

QUARRY PLANT PROCESS WATER POND AND SETTLING PONDS:
1. Survey and flag limits
2. Install silt fence as detailed within the supplied S&E drawings by Timmons Group.
3. Installation of Sediment Basins and their associated diversions 17, 18, and 19 as detailed within the supplied S&E drawings by Timmons Group.
4. Begin excavation of pit dewatering pond and settling ponds
5. Upon completed construction, provide permanent seeding
6. Upon permanent stabilization and germination, remove silt fence.

QUARRY PLANT AND STOCKPILE YARD:
1. Survey and flag limits
2. Install silt fence as detailed within the supplied S&E drawings by Timmons Group.
3. Installation of Sediment Basins and their associated diversions 14, 15, 16, 17, 18, 19, 30, 31, and 32 as detailed within the supplied S&E drawings by Timmons Group
4. Begin grading quarry plant and stockpile area; excess grading material to be used to construct Diversion Berms
5. Installation of scale house, employee building, maintenance shop facility, and associated auxiliary features.
6. Begin construction of quarry plant facilities
7. Upon completed construction, provide permanent seeding
8. Upon permanent stabilization and germination, remove silt fence.

VISUAL SCREENING BERMS:
1. Survey and flag limits
2. Install silt fence along roadway easement as detailed within the supplied S&E drawings by Timmons Group.
3. Install Sediment Basins 1, 2, 3, 4, 12, 15, 31, 32, 34, 44, and 47 with associated diversions as detailed within the supplied S&E drawings by Timmons Group prior to construction of each corresponding visual screening berm segment.
4. Construct all visual screening berm slopes to 3-foot horizontal to 1-foot vertical
5. Stabilization and permanent seeding of visual screening berms and roadway frontage as needed.
6. Upon stabilization, remove silt fence and plant screening shrubs and trees along crest of berm.
7. Upon completion of all visual screening berms, borrow area to be graded and stabilized to a 2-foot horizontal and 1-foot vertical slope.
8. Borrow area to be seeded and planted with shorleaf pines for future harvest along with cultivation for future agricultural purposes (i.e. existing Tobacco Fields).
9. Upon stabilization and established germination, remove all sediment basins, associated silt fence, and diversions.

PHASED PIT DEVELOPMENT WITHIN PIT A AND B:

Note: Phases within both Pit A & B will be mined leaving a 50-foot undisturbed buffer along all streams and wetlands within the ultimate pit boundary.

All Pit Phases to be opened and operated as needed. A minimum of two months prior to commencement of de-watering of Pit A or Pit B, follow the pump and monitoring plan provided on Sheet 5D.

Pit A Phase I (~15-acres)
1. Survey and flag limits
2. Install silt fence as detailed within the supplied S&E drawings by Timmons Group.
3. Installation of sediment basins and their associated diversions 19, 21, & 30 as detailed within the supplied S&E drawings by Timmons Group.
4. Begin overburden stripping/mining activities within Pit A - Phase I

Pit A Phase II (~10-acres)
1. Survey and flag limits
2. Install silt fence as detailed within the supplied S&E drawings by Timmons Group.
3. Installation of sediment basins and their associated diversion 29 as detailed within the supplied S&E drawings by Timmons Group.
4. Begin overburden` stripping/mining activities within Pit A - Phase II

Pit A Phase III (~11 acres)
1. Survey and flag limits
2. Abandon Wells 1 thru 3 per applicable regulations
3. Install silt fence as detailed within the supplied S&E drawings by Timmons Group.
4. Installation of Sediment Basins and their associated diversions 27 and 28 as detailed within the supplied S&E drawings by Timmons Group.
5. Begin overburden stripping/mining activities within Pit A - Phase III

Pit A Phase IV (~10-acres)
1. Survey and flag limits
2. Install silt fence as detailed within the supplied S&E drawings by Timmons Group.
3. Installation of Sediment Basins and their associated diversions 24, 25, and 26 as detailed within the supplied S&E drawings by Timmons Group.
4. Begin overburden stripping/mining activities within Pit A - Phase IV

Pit A Phase V (~5-acres)
1. Survey and flag limits
2. Install silt fence as detailed within the supplied S&E drawings by Timmons Group.
3. Installation of Sediment Basins and their associated diversions 22 and 23 as detailed within the supplied S&E drawings by Timmons Group.
4. Begin overburden stripping/mining activities within Pit A - Phase V

Pit A Phase VI (~5-acres)
1. Survey and flag limits
2. Install silt fence as detailed within the supplied S&E drawings by Timmons Group.
3. Installation of Sediment Basins and their associated diversion 20 as detailed within the supplied S&E drawings by Timmons Group.
4. Begin overburden stripping/mining activities within Pit A - Phase VI

Pit B Phase I (~9-acres)
1. Survey and flag limits
2. Abandon Wells 4 thru 8 per applicable regulations
3. Install silt fence as detailed within the supplied S&E drawings by Timmons Group.
4. Installation of Sediment Basins and their associated diversions 35, 36, and 42 as detailed within the supplied S&E drawings by Timmons Group.
5. Begin overburden stripping/mining activities within Pit B - Phase I

Pit B Phase II (~7-acres)
1. Survey and flag limits
2. Install silt fence as detailed within the supplied S&E drawings by Timmons Group.
3. Installation of sediment basins and their associated diversions 37 and 38 as detailed within the supplied S&E drawings by Timmons Group.
4. Begin overburden stripping/mining activities within Pit B - Phase II

Pit B Phase III (~7-acres)
1. Survey and flag limits
2. Install silt fence as detailed within the supplied S&E drawings by Timmons Group.
3. Installation of sediment basins and their associated diversion 40 as detailed within the supplied S&E drawings by Timmons Group.
4. Begin overburden stripping/mining activities within Pit B - Phase III

Pit B Phase IV (~7-acres)
1. Survey and flag limits
2. Install silt fence as detailed within the supplied S&E drawings by Timmons Group.
3. Installation of sediment basins and their associated diversion 41 as detailed within the supplied S&E drawings by Timmons Group.
4. Begin overburden stripping/mining activities within Pit B - Phase IV

Pit B Phase V (~10-acres)
1. Survey and flag limits
2. Abandon Wells 9 per applicable regulations
3. Install silt fence as detailed within the supplied S&E drawings by Timmons Group.
4. Installation of sedim(~11-acres)nt basins and their associated diversions 34, 43, and 44 as detailed within the supplied S&E drawings by Timmons Group.
5. Begin overburden stripping/mining activities within Pit B - Phase V

Pit B Phase VI (~13-acres)
1. Survey and flag limits
2. Install silt fence as detailed within the supplied S&E drawings by Timmons Group.
3. Installation of Sediment Basins and their associated diversion 47 as detailed within the supplied S&E drawings by Timmons Group.
4. Begin overburden stripping/mining activities within Pit B - Phase VI

Pit B Phase VII (~4-acres)
1. Survey and flag limits
2. Install silt fence as detailed within the supplied S&E drawings by Timmons Group.
3. Installation of Sediment Basins and their associated diversions 45 and 46 as detailed within the supplied S&E drawings by Timmons Group.
4. Begin overburden stripping/mining activities within Pit B - Phase VII

Pit B Phase VIII (~10-acres)
1. Survey and flag limits
2. Install silt fence as detailed within the supplied S&E drawings by Timmons Group.
3. Installation of Sediment Basins and their associated diversions 48 and 49 as detailed within the supplied S&E drawings by Timmons Group.
4. Begin overburden stripping/mining activities within Pit B - Phase VIII

Pit B Phase IX (~8-acres)
1. Survey and flag limits
2. Install silt fence as detailed within the supplied S&E drawings by Timmons Group.
3. Installation of Sediment Basins and their associated diversion 51 as detailed within the supplied S&E drawings by Timmons Group.
4. Begin overburden stripping/mining activities within Pit B - Phase IX

Pit B Phase X (~11-acres)
1. Survey and flag limits
2. Install silt fence as detailed within the supplied S&E drawings by Timmons Group.
3. Installation of Sediment Basins and their associated diversions 50 and 52 as detailed within the supplied S&E drawings by Timmons Group.
5. Begin overburden stripping/mining activities within Pit B - Phase X

AAR Summary	
Tailings Ponds	15–ac
Stock Piles	40–ac
Waste Piles	92–ac
Plant Area/Haul Roads	40–ac
Pit A Mine Ex.	56–AC (future 92–ac)
Pit B Mine Ex.	86–ac (future 107–ac)
Asphalt/Concrete Plant	23–ac
Total Disturbed	409–ac

General Notes

- Property Line
- 100' Undisturbed Buffer
- 100' Disturbed Buffer No Excavation
- 100' Perennial Undisturbed Stream Buffer
- 50' intermittent Stream and Wetland Undisturbed Buffer
- Stream
- 100 Year Flood Plain
- Future Ultimate Pit Boundary upon appropriate State & Federal Approvals have been Obtained
- Open Pit Crest
- Open Pit Mid–Bench
- Open Pit Bench Toe
- 2' Contour Interval
- 10' Contour Interval
- Temp Basin #32 Sheet C3.06 — Planned Sed. Basin See Supplied Detail Drawling's from Timmons Group
- Storm Water Swales See Supplied Detail Drawings from Timmons Group
- ~ Silt Fence Location Silt fence to be adjusted as need See Supplied Detail Drawings from Timmons Group
- ~ Silt Fence Outlet See Supplied Detail Drawling's from Timmons Group
- Storm Water Divide
- Non–owned Structure
- Adjoining Property Boundary
- Power Pole

Adjoining Property
John B. Drumwright Estate
25.91 ac.
Record # 379

- Monitoring Location

No.	Revision/Issue	Date
1	Stormwater Drainage Divides	03/20
1	Pit De–Watering Pond	03/20
1	Up Date Facility Entrance Design	03/20
1	Up Date S&E Control	03/20
1	Revised Wetland & Cemetery Buffer	01/20
1	Addition of Cemetery Location	01/20
1	Update of Surrounding Parcel Owners	01/20

Firm Name and Address

SUNROCK
CAROLINA SUNROCK LLC
200 HORIZON DRIVE, SUITE 100
RALEIGH, NC 27615

Project Name and Address

Prospect Hill Quarry & Distribution Center

Initial Mine Map

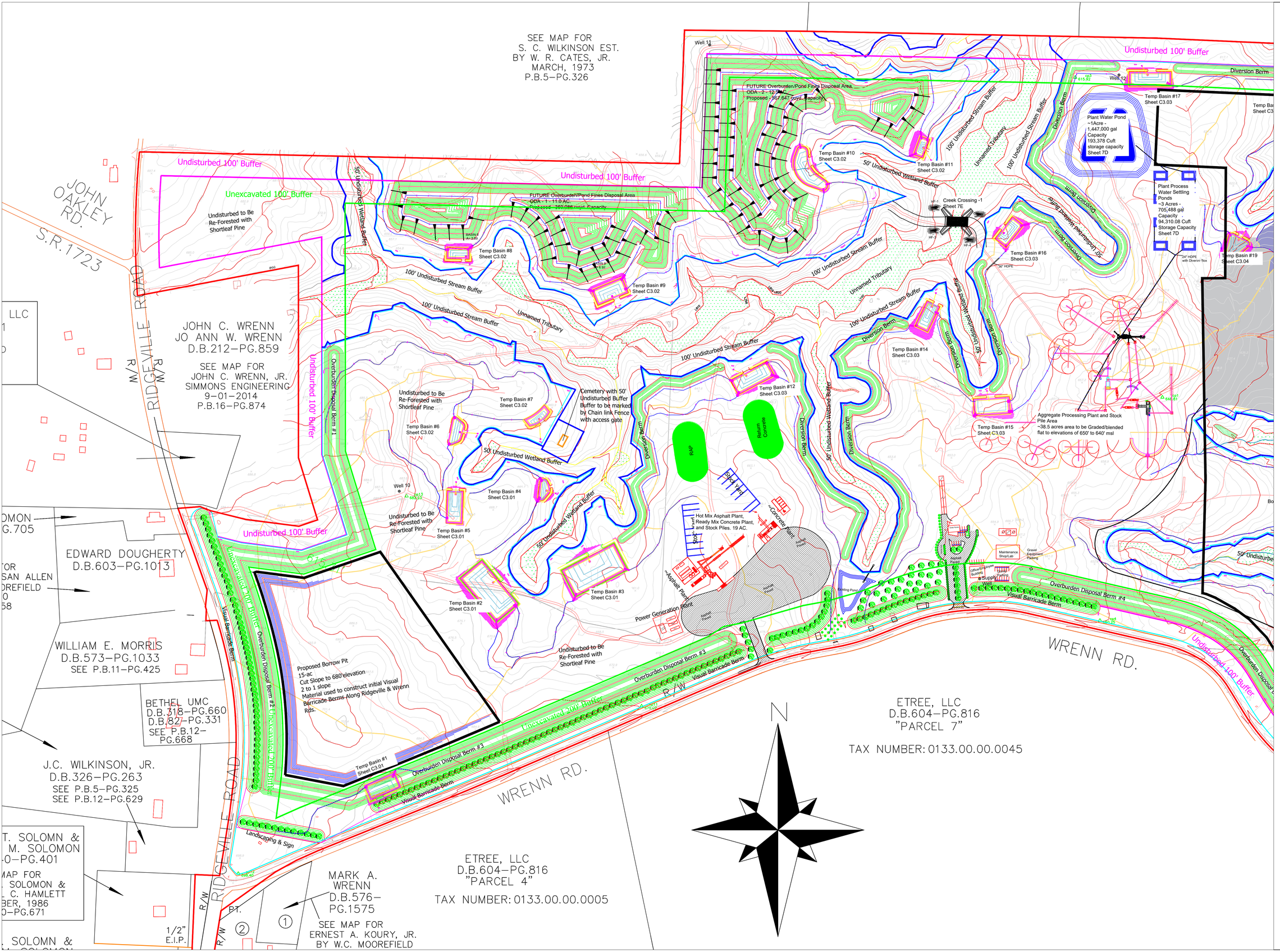
Drawn By: S Martino

Project

Date 07–29–2019

Scale 1" = 250'

Sheet 5



General Notes

- Property Line
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- ~ Silt Fence Outlet See Supplied Detail Drawings from Timmons Group
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- Non–owned Structure
- Adjoining Property Boundary
- Power Pole

Adjoining Property
John B. Drumwright Estate
25.91 ac.
Record # 379

- Monitoring Location

No.	Revision/Issue	Date
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1	Up Date Facility Entrance Design	03/20
1	Up Date S&E Control	03/20
1	Revised Wetland & Cemetery Buffer	01/20
1	Addition of Cemetery Location	01/20
1	Update of Surrounding Parcel Owners	01/20

Firm Name and Address

SUNROCK
CAROLINA SUNROCK LLC

200 HORIZON DRIVE, SUITE 100
RALEIGH, NC 27615

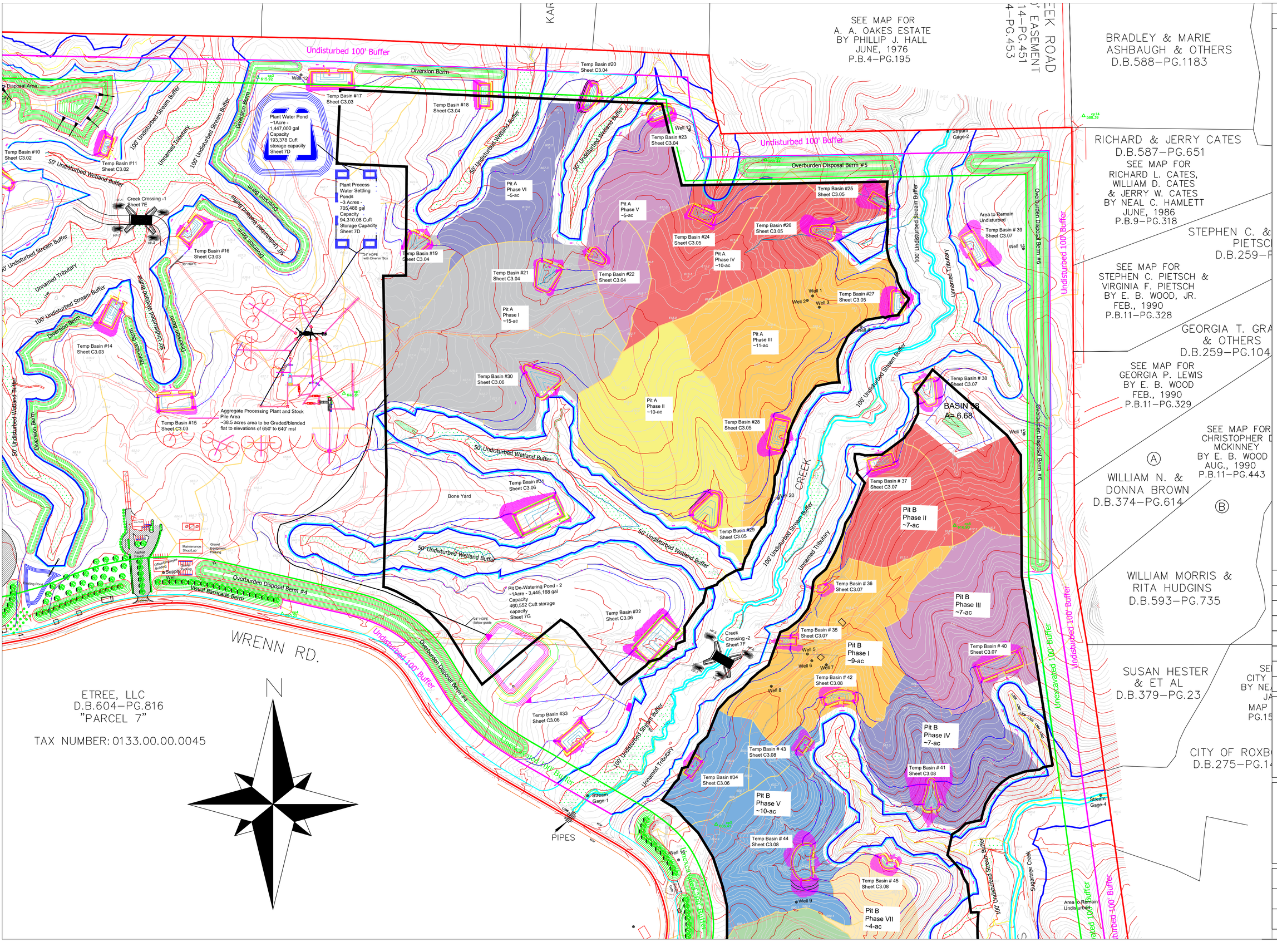
Project Name and Address

Prospect Hill Quarry
& Distribution Center

Initial Mine Map

Drawn By: S Martino

Project	Sheet
PLANT	5a
Date: 07–29–2019	
Scale: 1"=175'	



General Notes

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- Stream
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- Open Pit Mid–Bench
- Open Pit Bench Toe
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- ~ Silt Fence Outlet See Supplied Detail Drawings from Timmons Group
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Adjoining Property
John B. Drumwright Estate
25.91 ac.
Record # 379

- Monitoring Location

No.	Revision/Issue	Date
1	Stormwater Drainage Divides	03/20
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Firm Name and Address

SUNROCK
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200 HORIZON DRIVE, SUITE 100
RALEIGH, NC 27615

Project Name and Address

Prospect Hill Quarry
& Distribution Center

Initial Mine Map

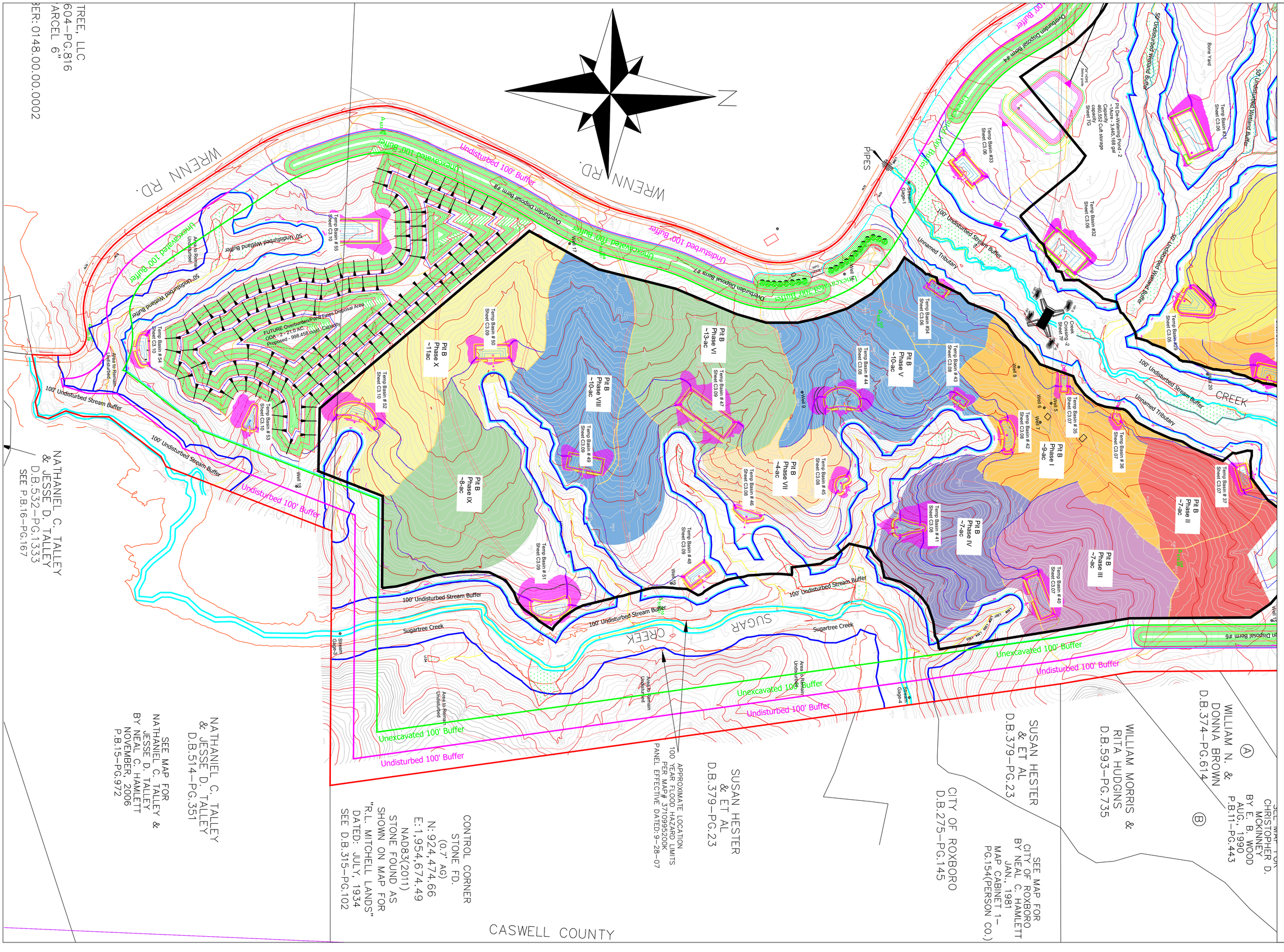
Drawn By: S Martino

Project: PLANT

Date: 07–29–2019

Scale: 1"=175'

Sheet: 5b



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- Open Pit Bench Toe
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- 10' Contour Interval
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- Storm Water Swales See Supplied Detail Drawings from Timmons Group
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- ~ Silt Fence Outlet See Supplied Detail Drawings from Timmons Group
- Storm Water Divide
- Non-owned Structure
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Adjoining Property
John B. Drumwright Estate
25.91 ac.
Record # 379

- Monitoring Location

No.	Revision/Issue	Date
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Firm Name and Address

SUNROCK
CAROLINA SUNROCK LLC
200 HORIZON DRIVE, SUITE 100
RALEIGH, NC 27615

Project Name and Address

Prospect Hill Quarry & Distribution Center

Initial Mine Map

Drawn By: S Martino

Project: Prospect Hill Quarry
Date: 08-19-2019
Scale: 1"=175'
Sheet: 5c

AAR Summary	
Tailings Ponds	15–ac
Stock Piles	40–ac
Waste Piles	92–ac
Plant Area/Haul Roads	40–ac
Pit A Mine Ex.	56–AC (future 92–ac)
Pit B Mine Ex.	86–ac (future 107–ac)
Asphalt/Concrete Plant	23–ac
Total Disturbed	409–ac

General Notes

Property/Mine Permit Buffer
100' Undisturbed Buffer
100' or 200' Disturbed Buffer No Excavation
100' Perennial Undisturbed Stream Buffer
50' Intermittent Stream and Wetland Undisturbed Buffer
Stream
Intermittent Stream
Wetlands
100 Year Flood Plain
Adjoining Property John B. Drumwright Estate 25.91 ac. Record # 379
Non–owned Structure
Adjoining Property Boundary
Power Pole
~Deep Monitoring Well Location
~Deep & Shallow Monitoring Well Location
~Stream Gage Location
Proposed Open Pit Locations

Pit De-Watering Pump and Monitoring Plan:

Note: Phases within both Pit A & B will be mined leaving a 50-foot undisturbed buffer along all streams and wetlands within the ultimate pit boundary. All Pit Phases to be opened and operated as needed. Existing onsite pumping/observation wells installed as part of the 2019 hydrogeological study, and the existing onsite water supply well, will be retained and incorporated into the monitoring plan (as observation wells MW-10 through MW-10D). A minimum of two months prior to any de-watering activities, additional deep (D) and shallow (S) observation wells will be installed, and the entire well network will be monitored as indicated below:

1. Obtain necessary permits or approvals to construct additional observation wells from the N.C. Division of Water Resources.
2. Install deep and shallow monitoring wells MW-45, MW-10D, MW-11D, MW-12D, MW-12S, MW-13D, MW-13S, MW-14D, MW-15D, MW-16D, MW-16S, MW-17D, MW-17S, MW-18D, MW-18S, MW-19D, MW-19S, MW-20D, and MW-20S.
   2.1. The deep observation wells shall be drilled wells cased into consolidated rock and grouted to the surface. The wells (boreholes) shall be extended at least 50 feet below static water level, or at least 50 feet into unweathered rock, whichever is deeper.
   2.2. The shallow observations wells shall be drilled wells to the depth of top of rock at each relative location. Wells will be constructed per the encountered hydrogeologic conditions present at the time of installation.
3. Install Stream Gages, SG-1, SG-2, SG-3, and SG-4.
4. Monitor and record groundwater elevation and stream data monthly throughout the life of the project.
5. As needed, abandon monitoring wells per applicable regulations prior to being incorporated into pit excavations.
6. Abandon and/or replace monitoring wells as needed due to maintenance needs per applicable regulations.
7. Replace and maintain stream gages as needed throughout the life of the project.
8. At the conclusion of mining, abandon all remaining onsite wells per applicable regulations.

No.	Revision/Issue	Date
1	Stormwater Drainage Divides	03/20
1	Pit De–Watering Pond	03/20
1	Up Date Facility Entrance Design	03/20
1	Up Date S&E Control	03/20
1	Revised Wetland & Cemetery Buffer	01/20
1	Addition of Cemetery Location	01/20
1	Update of Surrounding Parcel Owners	01/20

Firm Name and Address

SUNROCK
CAROLINA SUNROCK LLC

200 HORIZON DRIVE, SUITE 100
RALEIGH, NC 27615

Project Name and Address

Prospect Hill Quarry
& Distribution Center

Proposed Monitoring Plan

Drawn By: S Martino

Project

Date 07–29–2019

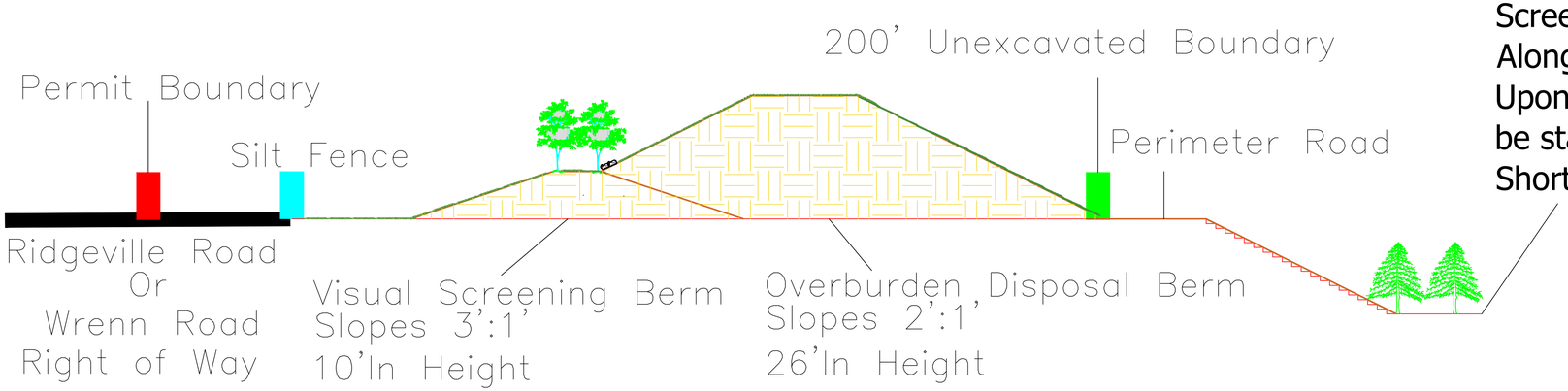
Scale 1" = 250'

Sheet 5D

N
JAMES C. WILKINSON, JR.
W.B.10E–PG.21
D.B.167–PG.791
SARA C. COOK
D.B.545–PG.1264
DALE R. KEMPER TRUSTEE
D.B.596–PG.972
P.B.11–PG.184
KAREN OESTREICHER, ETAL
D.B.503–PG.835
WILLIAM J. WRENN
D.B.253–PG.656
DAVID E. HEDRICK &
SYLVIA W. HEDRICK
D.B.322–PG.156
SEE MAP FOR
A. A. OAKES ESTATE
BY PHILLIP J. HALL
JUNE, 1976
P.B.4–PG.195
GOOSECREEK ROAD
EXISTING 30' EASEMENT
SEE P.B.7–PG.453
& D.B.314–PG.453
BRADLEY & MARIE
ASHBAUGH & OTHERS
D.B.588–PG.1183
RICHARD & JERRY CATES
D.B.587–PG.651
SEE MAP FOR
RICHARD L. CATES,
WILLIAM D. CATES
& JERRY W. CATES
BY NEAL C. HAMLETT
JUNE, 1986
P.B.9–PG.318
STEPHEN C. & VIRGINIA
PIETSCH
D.B.259–PG.102
SEE MAP FOR
STEPHEN C. PIETSCH &
VIRGINIA F. PIETSCH
BY E. B. WOOD, JR.
FEB., 1990
P.B.11–PG.328
GEORGIA T. GRAVITTE
& OTHERS
D.B.259–PG.104
SEE MAP FOR
GEORGIA P. LEWIS
BY E. B. WOOD
FEB., 1990
P.B.11–PG.329
SEE MAP FOR
CHRISTOPHER D.
MCKINNEY
BY E. B. WOOD
AUG., 1990
P.B.11–PG.443
WILLIAM N. &
DONNA BROWN
D.B.374–PG.614
WILLIAM MORRIS &
RITA HUDGINS
D.B.593–PG.735
SUSAN HESTER
& ET AL
D.B.379–PG.23
SEE MAP FOR
CITY OF ROXBORO
BY NEAL C. HAMLETT
JAN., 1981
MAP CABINET 1–
PG.154(PERSON CO.)
CITY OF ROXBORO
D.B.275–PG.145
SEE MAP FOR
S. C. WILKINSON EST.
BY W. R. CATES, JR.
MARCH, 1973
P.B.5–PG.326
JOHN OAKLEY RD.
S.R.1723
Rover Companies LLC
D.B.610–PG.1031
SEE MAP FOR
HASSELL N. RUDD
BY W.R. CATES
6–13–1964
P.B.3–PG.622
JOHN C. WRENN
JO ANN W. WRENN
D.B.212–PG.859
SEE MAP FOR
JOHN C. WRENN, JR.
SIMMONS ENGINEERING
9–01–2014
P.B.16–PG.874
RIDGEVILLE ROAD
GARY SOLOMON
D.B.260–PG.705
EDWARD DOUGHERTY
D.B.603–PG.1013
SEE MAP FOR
PHILIP & SUSAN ALLEN
BY W.C. MOOREFIELD
4–10–1990
P.B.11–PG.358
WILLIAM E. MORRIS
D.B.573–PG.1033
SEE P.B.11–PG.425
BETHEL UMC
D.B.318–PG.660
D.B.82–PG.331
SEE P.B.12–PG.668
J.C. WILKINSON, JR.
D.B.249–PG.720
SEE P.B.10–PG.725
J.C. WILKINSON, JR.
D.B.326–PG.263
SEE P.B.5–PG.325
SEE P.B.12–PG.629
EARL T. SOLOMN &
GLENDA M. SOLOMON
D.B.240–PG.401
SEE MAP FOR
EARL T. SOLOMN &
BY NEAL C. HAMLETT
NOVEMBER, 1986
P.B.10–PG.671
EARL T. SOLOMN &
GLENDA M. SOLOMON
D.B.266–PG.427
SEE MAP FOR
EARL T. SOLOMN &
GLENDA M. SOLOMON
BY JOHN JENNINGS
MARCH, 1991
P.B.11–PG.600
MARK A.
WRENN
D.B.576–
PG.1575
SEE MAP FOR
ERNEST A. KOURY, JR.
BY W.C. MOOREFIELD
4–20–1989
P.B.13–PG79
SEE
P.B.13–PG79
MARK A.
WRENN
D.B.545–
PG.285
ETREE, LLC
D.B.604–PG.816
"PARCEL 4"
TAX NUMBER: 0133.00.00.0005
ETREE, LLC
D.B.604–PG.816
"PARCEL 7"
TAX NUMBER: 0133.00.00.0045
WRENN RD.
Undisturbed 100' Buffer
Unexcavated 100' Buffer
Undisturbed to Be Re-Forested with Shortleaf Pine
Plant Process Water Settling Ponds
Plant Water Pond
Pit A Design - 53 Acres
Pit De-Watering Pond
Pit De-watering Pond 2
Aggregate Processing Plant and Stock Pile Area
Proposed Borrow Pit
Overburden Disposal Area #4
Overburden Disposal Area #3
Overburden Disposal Area #2
Overburden Disposal Area #1
Temp Basin #1
Temp Basin #2
Temp Basin #3
Temp Basin #4
Temp Basin #5
Temp Basin #6
Temp Basin #7
Temp Basin #8
Temp Basin #9
Temp Basin #10
Temp Basin #11
Temp Basin #12
Temp Basin #13
Temp Basin

Typical Permit Boundary, Berm Construction and Borrow Pit Cross-section

Proposed Borrow Pit Cut Slope to 680'MSL
2 to 1 slope to allow for positive drainage towards Basin 2
Material used to construct initial Visual Screening Berms
Along Ridgeville & Wrenn Rds.
Upon Completion of Berms Borrow area to be stabilized/reclaimed and forested with Shortleaf Pines for future harvest



Visual Screening Berm Construction Sequence (Initial Site Construction)

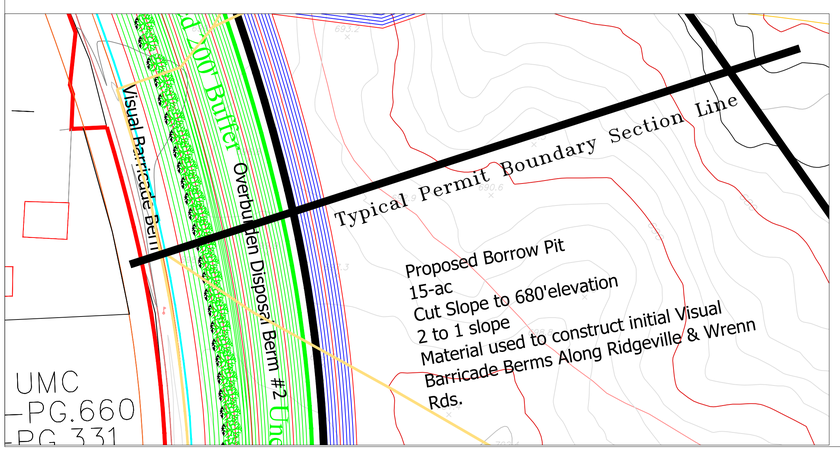
1. Survey and flag limits
2. Install silt fence along roadway easement as detailed within the supplied S&E drawings by Timmons Group.
3. Install Sediment Basins 1, 2, 3, 4, 12, 15, 31, 32, 34, 44, and 47 with associated diversions as detailed within the supplied S&E drawings by Timmons Group prior to construction of each corresponding visual screening berm segment.
4. Construct all visual screening berm slopes to 3-foot horizontal to 1-foot vertical
5. Stabilization and permanent seeding of visual screening berms and roadway frontage as needed.
6. Upon stabilization, remove silt fence and plant screening shrubs and trees along crest of berm.
7. Upon completion of all visual screening berms, borrow area to be graded and stabilized to a 2-foot horizontal and 1-foot vertical slope.
8. Borrow area to be seeded and planted with shorleaf pines for future harvest along with cultivation for future agricultural purposes (i.e. existing Tobacco Fields).
9. Upon stabilization and established germination, remove all sediment basins, associated silt fence, and diversions.

Overburden Disposal Berm Construction Sequence

1. All Overburden Disposal Berms shall be constructed as needed throughout the life of the mine.
2. Survey and flag limits of each berm to be constructed
3. Install silt fence behind landscaping of visual screening berm or along undisturbed buffer boundary
4. Install Sediment Basins within vicinity of berms and associated diversions as detailed within the supplied S&E drawings by Timmons Group.

4.1. Overburden Disposal Berm 1 - Construct Basins: 5, 6 and 7
4.2. Overburden Disposal Berm 2 - Construct Basins: 1, 2, 4, and 5
4.3. Overburden Disposal Berm 3 - Construct Basins: 3
4.4. Overburden Disposal Berm 4 - Construct Basins: 31, 32, and 33
4.5. Overburden Disposal Berm 5 - Construct Basins: 24, 25, and 26
4.6. Overburden Disposal Berm 6 - Construct Basins: 38, 39, and 40
4.7. Overburden Disposal Berm 7 - Construct Basins: 44, 47, and 49
4.8. Overburden Disposal Berm 8 - Construct Basins: 50 and 55

5. Construct all overburden berms 2-foot horizontal to 1-foot vertical
6. Upon suspension of construction of the overburden berm, provide temporary seeding
7. Upon completed construction of the overburden berms, provide permanent seeding of the berm and associated disturbed areas, as needed.
8. Upon permanent stabilization of the overburden berms, remove silt fence and sediment basins (area dependent).



General Notes

- Property Line
- 100' Undisturbed Buffer
- 100' Disturbed Buffer No Excavation
- 100' Perennial Undisturbed Stream Buffer
- 50' intermittent Stream and Wetland Undisturbed Buffer
- Stream
- 100 Year Flood Plain
- Future Ultimate Pit Boundary upon appropriate State & Federal Approvals have been Obtained
- Open Pit Crest
- Open Pit Mid-Bench
- Open Pit Bench Toe
- 2' Contour Interval
- 10' Contour Interval
- Temp Basin #32 Sheet C3.06 — Planned Sed. Basin See Supplied Detail Drawing's from Timmons Group
- Storm Water Swales See Supplied Detail Drawings from Timmons Group
- ~ Silt Fence Location Silt fence to be adjusted as need See Supplied Detail Drawings from Timmons Group
- ~ Silt Fence Outlet See Supplied Detail Drawing's from Timmons Group
- Storm Water Divide
- Non-owned Structure
- Adjoining Property Boundary
- Power Pole

Adjoining Property
John B. Drumwright Estate
25.91 ac.
Record # 379

- Monitoring Well Location

No.	Revision/Issue	Date
1	Stormwater Drainage Divides	03/20
1	Pit De-Watering Pond	03/20
1	Up Date Facility Entrance Design	03/20
1	Up Date S&E Control	03/20
1	Revised Wetland & Cemetery Buffer	01/20
1	Addition of Cemetery Location	01/20
1	Update of Surrounding Parcel Owners	01/20

Firm Name and Address

SUNROCK
CAROLINA SUNROCK LLC
200 HORIZON DRIVE, SUITE 100
RALEIGH, NC 27615

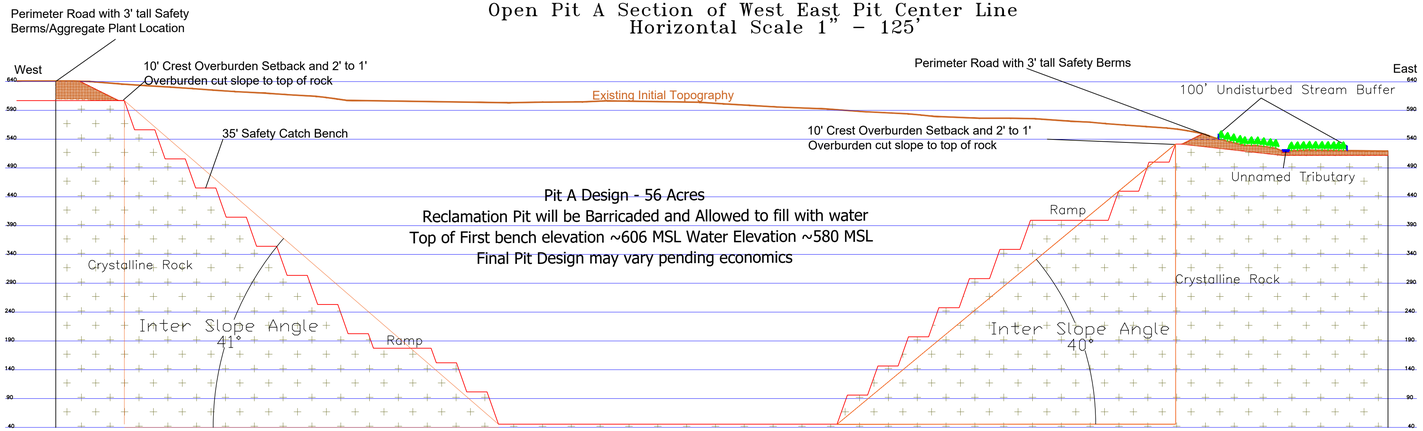
Project Name and Address

Prospect Hill Quarry
& Distribution Center
Typical Permit Boundary
Berm Construction
Borrow Pit
Cross-Section

Drawn By: S Martino

Project: PLANT
Date: 08-06-2019
Scale: 1"=15'
Sheet: 7A

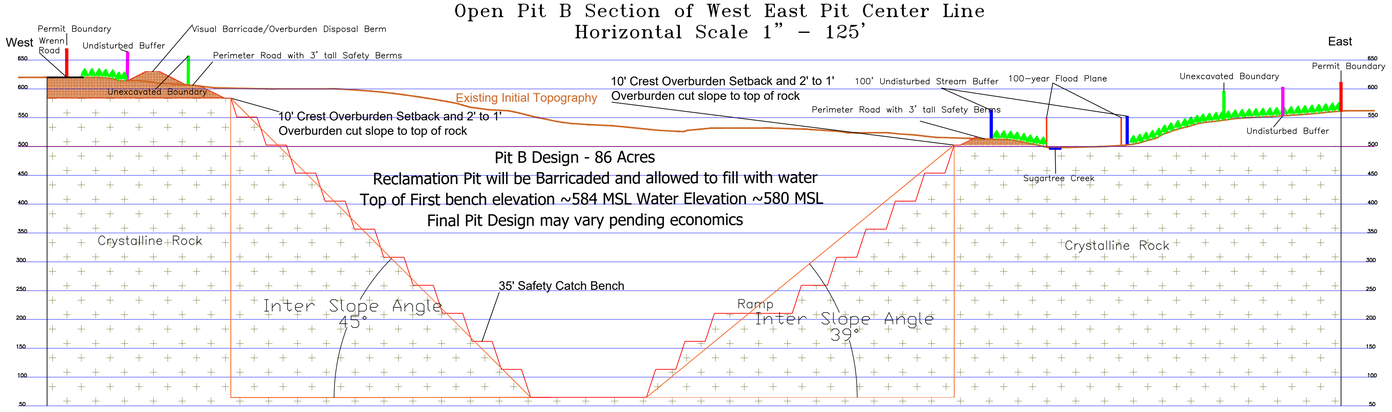
Open Pit A Section of West East Pit Center Line
Horizontal Scale 1" - 125'



Pit A Construction Sequence
1. Phase I (~15-acres)
 1.1. Survey & flag limits
 1.2. Prior to stripping install silt fence & associated measures as detailed within the supplied S&E drawings, by Timmons Group
 1.3. Install sediment basins as detailed within the supplied S&E drawings by Timmons Group
  1.3.1. Construct basins: 19, 21, &30
 1.4. Conduct stripping
2. Phase II (~10-acres)
 2.1. Survey & flag limits
 2.2. Prior to stripping install silt fence & associated measures as detailed within the supplied S&E drawings by Timmons Group
 2.3. Install sediment basins as detailed within the supplied S&E drawings by Timmons Group.
  2.3.1. Construct basins: 29
 2.4. Conduct stripping
3. Phase III (~11-acres)
 3.1. Survey & flag limits
 3.2. Prior to stripping install silt fence & associated measures as detailed within the supplied S&E drawings, by Timmons Group
 3.3. Install sediment basins as detailed within the supplied S&E drawings by Timmons Group
  3.3.1. Construct basins: 27 & 28
 3.4. Conduct stripping

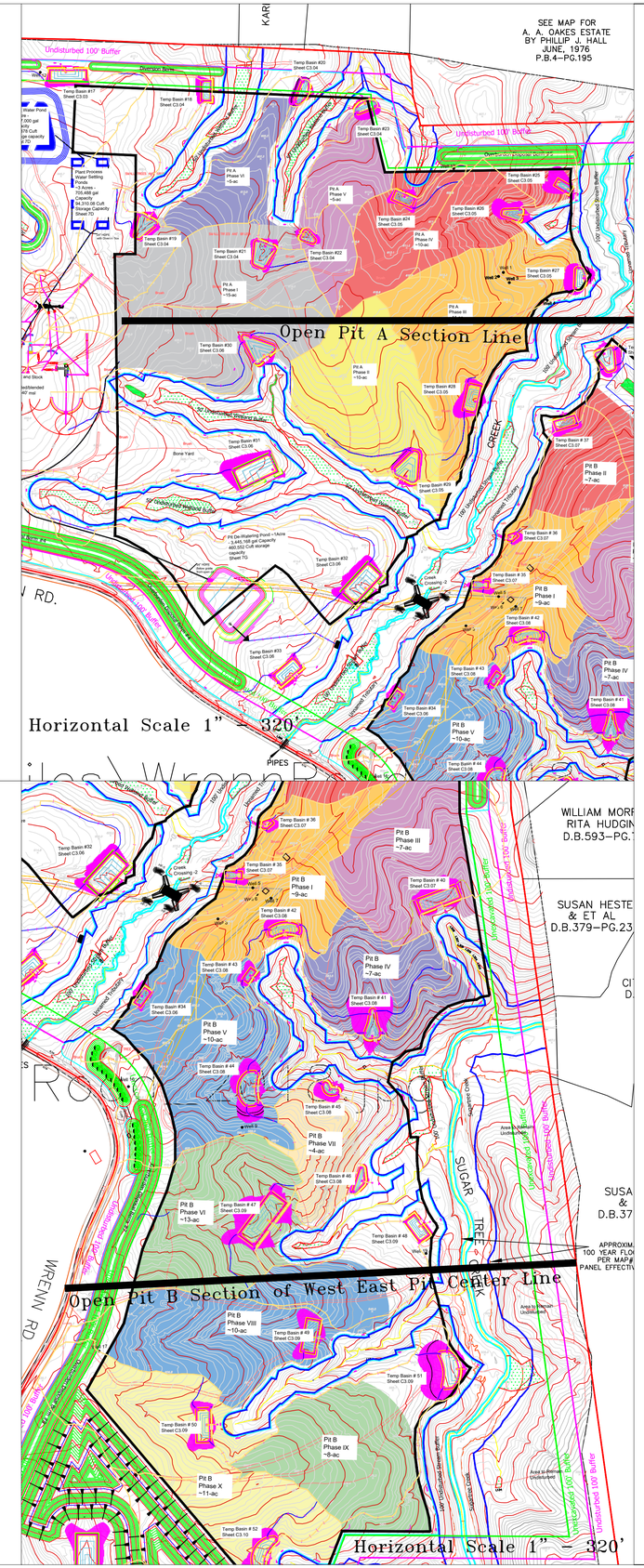
Pit A Construction Sequence
4. Phase IV (~10-acres)
 4.1. Survey & flag limits
 4.1. Prior to stripping install silt fence & associated measures as detailed within the supplied S&E drawings, by Timmons Group
 4.2. Install sediment basins as detailed within the supplied S&E drawings by Timmons Group
  4.2.1. Construct basins: 24, 25, & 26
 4.3. Conduct stripping
5. Phase V (~5-acres)
 5.1. Survey & flag limits
 5.1. Prior to stripping install silt fence & associated measures as detailed within the supplied S&E drawings, by Timmons Group
 5.2. Install sediment basins as detailed within the supplied S&E drawings by Timmons Group
  5.2.1. Construct basins: 22 & 23
 5.3. Conduct stripping
6. Phase VI (~5-acres)
 6.1. Survey & flag limits
 6.1. Prior to stripping install silt fence & associated measures as detailed within the supplied S&E drawings, by Timmons Group
 6.2. Install sediment basins as detailed within the supplied S&E drawings by Timmons Group
  6.2.1. Construct basins: 20
 6.3. Conduct stripping

Open Pit B Section of West East Pit Center Line
Horizontal Scale 1" - 125'



Pit B Construction Sequence
1. Phase I (~9-acres)
 1.1. Survey & flag limits
 1.2. Prior to stripping install silt fence & associated measures as detailed within the supplied S&E drawings, by Timmons Group
 1.3. Install sediment basins as detailed within the supplied S&E drawings by Timmons Group
  1.3.1. Construct basins: 35, 36, & 42
 1.4. Conduct stripping
2. Phase II (~7-acres)
 2.1. Survey & flag limits
 2.2. Prior to stripping install silt fence & associated measures as detailed within the supplied S&E drawings by Timmons Group
 2.3. Install sediment basins as detailed within the supplied S&E drawings by Timmons Group.
  2.3.1. Construct basins: 37 & 38
 2.4. Conduct stripping
3. Phase III (~7-acres)
 3.1. Survey & flag limits
 3.2. Prior to stripping install silt fence & associated measures as detailed within the supplied S&E drawings, by Timmons Group
 3.3. Install sediment basins as detailed within the supplied S&E drawings by Timmons Group
  3.3.1. Construct basins: 40
 3.4. Conduct stripping
4. Phase IV (~7-acres)
 4.1. Survey & flag limits
 4.2. Prior to stripping install silt fence & associated measures as detailed within the supplied S&E drawings, by Timmons Group
 4.3. Install sediment basins as detailed within the supplied S&E drawings by Timmons Group
  4.3.1. Construct basins: 41
 4.4. Conduct stripping
5. Phase V (~10-acres)
 5.1. Survey & flag limits
 5.2. Prior to stripping install silt fence & associated measures as detailed within the supplied S&E drawings, by Timmons Group
 5.3. Install sediment basins as detailed within the supplied S&E drawings by Timmons Group
  5.3.1. Construct basins: 34, 43, & 44
 5.4. Conduct stripping

Pit B Construction Sequence
6. Phase VI (~13-acres)
 6.6. Survey & flag limits
 6.1. Prior to stripping install silt fence & associated measures as detailed within the supplied S&E drawings, by Timmons Group
 6.2. Install sediment basins as detailed within the supplied S&E drawings by Timmons Group
  6.2.1. Construct basins: 47
 6.3. Conduct stripping
7. Phase VII (~4-acres)
 7.1. Survey & flag limits
 7.1. Prior to stripping install silt fence & associated measures as detailed within the supplied S&E drawings by Timmons Group
 7.2. Install sediment basins as detailed within the supplied S&E drawings by Timmons Group.
  7.2.1. Construct basins: 45 & 46
 7.3. Conduct stripping
8. Phase VIII (~10-acres)
 8.1. Survey & flag limits
 8.1. Prior to stripping install silt fence & associated measures as detailed within the supplied S&E drawings, by Timmons Group
 8.2. Install sediment basins as detailed within the supplied S&E drawings by Timmons Group
  8.2.1. Construct basins: 49 & 48
 8.3. Conduct stripping
9. Phase IX (~8-acres)
 9.1. Survey & flag limits
 9.1. Prior to stripping install silt fence & associated measures as detailed within the supplied S&E drawings, by Timmons Group
 9.2. Install sediment basins as detailed within the supplied S&E drawings by Timmons Group
  9.2.1. Construct basins: 51
 9.3. Conduct stripping
10. Phase X (~11-acres)
 10.1. Survey & flag limits
 10.1. Prior to stripping install silt fence & associated measures as detailed within the supplied S&E drawings, by Timmons Group
 10.2. Install sediment basins as detailed within the supplied S&E drawings by Timmons Group
  10.2.1. Construct basins: 50 & 52
 10.3. Conduct stripping



General Notes

- Property Line
- 100' Undisturbed Buffer
- 100' Disturbed Buffer No Excavation
- 100' Perennial Undisturbed Stream Buffer
- 50' intermittent Stream and Wetland Undisturbed Buffer
- Stream
- 100 Year Flood Plain
- Future Ultimate Pit Boundary upon appropriate State & Federal Approvals have been Obtained
- Open Pit Crest
- Open Pit Mid-Bench
- Open Pit Bench Toe
- 2' Contour Interval
- 10' Contour Interval
- Temp Basin #32 Sheet C3.06 — Planned Sed. Basin See Supplied Detail Drawling's from Timmons Group
- Storm Water Swales See Supplied Detail Drawings from Timmons Group
- ~ Silt Fence Location Silt fence to be adjusted as need See Supplied Detail Drawings from Timmons Group
- ~ Silt Fence Outlet See Supplied Detail Drawling's from Timmons Group
- Storm Water Divide
- Non-owned Structure
- Adjoining Property Boundary
- Power Pole
- Adjoining Property John B. Drumwright Estate 25.91 ac. Record # 379
- Monitoring Well Location

No.	Revision/Issue	Date
1	Stormwater Drainage Divides	03/20
1	Pit De-Watering Pond	03/20
1	Up Date Facility Entrance Design	03/20
1	Up Date S&E Control	03/20
1	Revised Wetland & Cemetery Buffer	01/20
1	Addition of Cemetery Location	01/20
1	Update of Surrounding Parcel Owners	01/20

Firm Name and Address

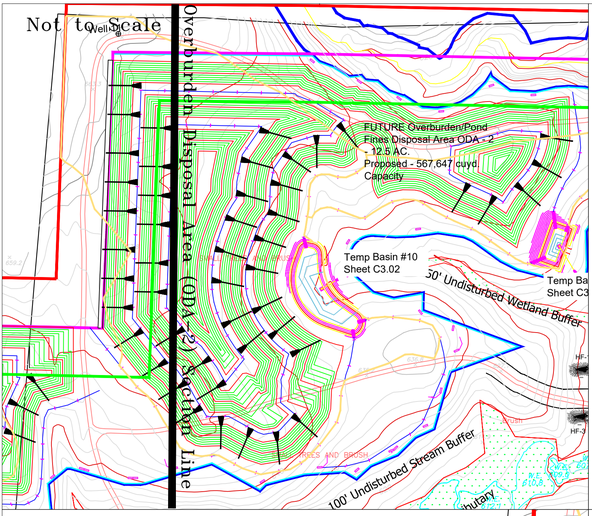
SUNROCK
CAROLINA SUNROCK LLC
200 HORIZON DRIVE, SUITE 100
RALEIGH, NC 27615

Project Name and Address

Prospect Hill Quarry
& Distribution Center
Cross Sections
Open Pits A and B

Drawn By: S Martino

Project	Sheet
Pit Cross-Sections	7B
Date: 08-13-2019	
Scale: As Shown	

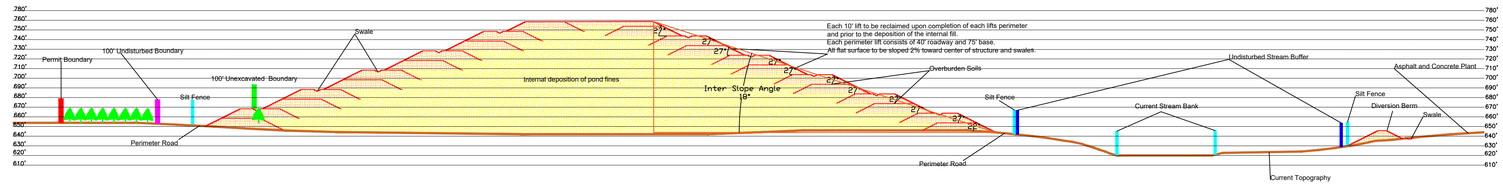


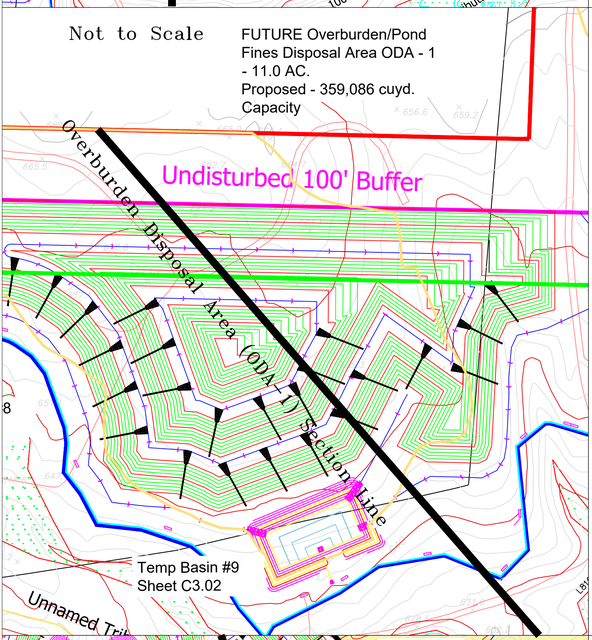
Horizontal Scale 1" – 75'

FUTURE Overburden/Pond Fines Disposal Area
ODA - 2 - 12.5 AC.
Proposed - 567,647 cuyd. Capacity
Cross-Section Center Line of Structure
To be built in 10' lifts w/ seeding/stabilization
upon each completed lift

Construction Sequence

1. Survey & Flag limits
2. Install silt fence & associated measures as detailed within the supplied S&E drawings, by Timmons group.
3. Install Sediment Basins as detailed within the supplied S&E drawings by Timmons Group
   3.1. Construct Basins 10 & 11
4. Begin construction at topographical low raising contours in 10' intervals along existing topography
5. Each 10' lift's outer slope is to be constructed 2' horizontal to 1' vertical elevation.
6. Removal of existing vegetation and topsoil within each 10' interval lift's ultimate foot print
7. Upon individual lift's completion or termination of overburden/pond fines disposal activities, outer slopes shall be stabilized to designed grade and either provided temporary or permanent ground cover depending upon schedule of completion





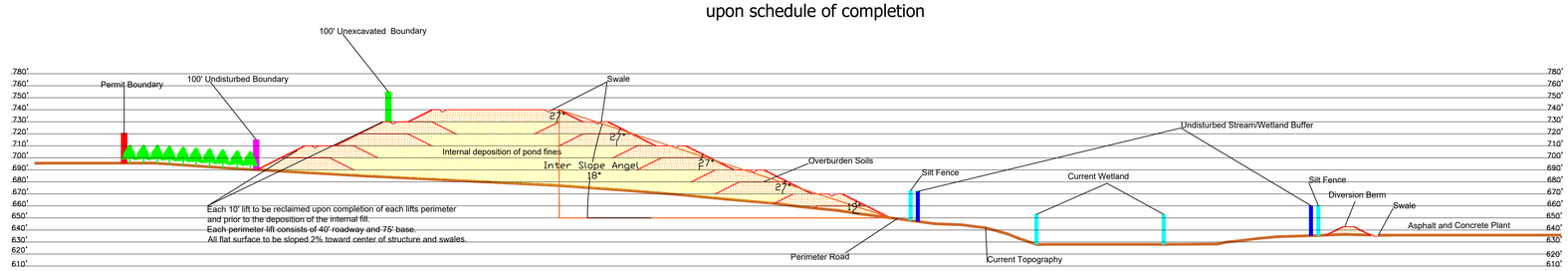
Horizontal Scale 1" – 60'

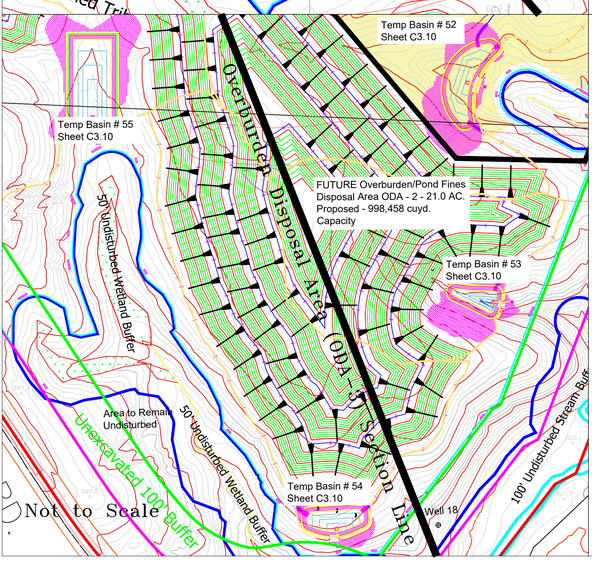
FUTURE Overburden/Pond Fines Disposal Area ODA - 1 - 11.0 AC.
Proposed - 359,086 cuyd. Capacity

Cross-Section Center Line of Structure
To be built in 10' lifts w/ seeding/stabilization upon each completed lift

Construction Sequence

1. Survey and Flag Limits
2. Install silt fence & associated measures as detailed within the supplied S&E drawings, by Timmons group.
3. Install Sediment Basins as detailed within the supplied S&E drawings by Timmons Group
   3.1. Construct Basins 8 & 9
4. Begin construction at topographical low raising contours in 10' intervals along existing topography
5. Removal of existing vegetation and topsoil within each 10' interval lift's ultimate foot print
6. Each 10' lift's outer slope is to be constructed 2' horizontal to 1' vertical elevation.
7. Upon individual lift's completion or termination of overburden/pond fines disposal activities, outer slopes shall be stabilized to designed grade and either provided temporary or permanent ground cover depending upon schedule of completion



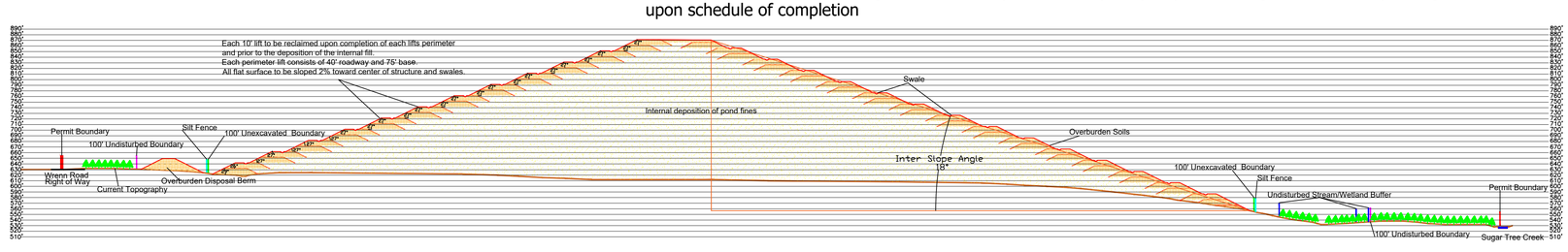


Horizontal Scale 1" – 125'

FUTURE Overburden/Pond Fines
Disposal Area ODA - 3 - 21.0 AC.
Proposed - 998,458 cuyd. Capacity
Cross-Section Center Line of Structure
To be built in 10' lifts w/ seeding/stabilization upon
each completed lift

Construction Sequence

1. Survey and flag Limits
2. install silt fence & associated measures as detailed within the supplied S&E drawings, by Timmons group.
3. Install Sediment Basins as detailed within the supplied S&E drawings by Timmons Group
   3.1. Construct Basins 50, 52, 53, 54, & 55
4. Begin construction at topographical low raising contours in 10' intervals along existing topography
5. Each 10' lift's outer slope is to be constructed 2' horizontal to 1' vertical elevation.
6. Removal of existing vegetation and topsoil within each 10' interval lift's ultimate foot print
7. Upon individual lift's completion or termination of overburden/pond fines disposal activities, outer slopes shall be stabilized to designed grade and either provided temporary or permanent ground cover depending upon schedule of completion



General Notes

- Property Line
- 100' Undisturbed Buffer
- 100' Disturbed Buffer No Excavation
- 100' Perennial Undisturbed Stream Buffer
- 50' intermittent Stream and Wetland Undisturbed Buffer
- Stream
- 100 Year Flood Plain
- Future Ultimate Pit Boundary upon appropriate State & Federal Approvals have been Obtained
- Open Pit Crest
- Open Pit Mid–Bench
- Open Pit Bench Toe
- 2' Contour Interval
- 10' Contour Interval
- Temp Basin #32 Sheet C3.06 — Planned Sed. Basin See Supplied Detail Drawling's from Timmons Group
- Storm Water Swales See Supplied Detail Drawings from Timmons Group
- ~ Silt Fence Location Silt fence to be adjusted as need See Supplied Detail Drawings from Timmons Group
- ~ Silt Fence Outlet See Supplied Detail Drawling's from Timmons Group
- Storm Water Divide
- Non–owned Structure
- Adjoining Property Boundary
- Power Pole
- Adjoining Property John B. Drumwright Estate 25.91 ac. Record # 379
- Monitoring Well Location

No.	Revision/Issue	Date
1	Stormwater Drainage Divides	03/20
1	Pit De–Watering Pond	03/20
1	Up Date Facility Entrance Design	03/20
1	Up Date S&E Control	03/20
1	Revised Wetland & Cemetery Buffer	01/20
1	Addition of Cemetery Location	01/20
1	Update of Surrounding Parcel Owners	01/20

Firm Name and Address

SUNROCK CAROLINA SUNROCK LLC

200 HORIZON DRIVE, SUITE 100
RALEIGH, NC 27615

Project Name and Address

Prospect Hill Quarry & Distribution Center

Overburden Disposal Area
Cross–Sections

Drawn By: S Martino

Project: PLANT

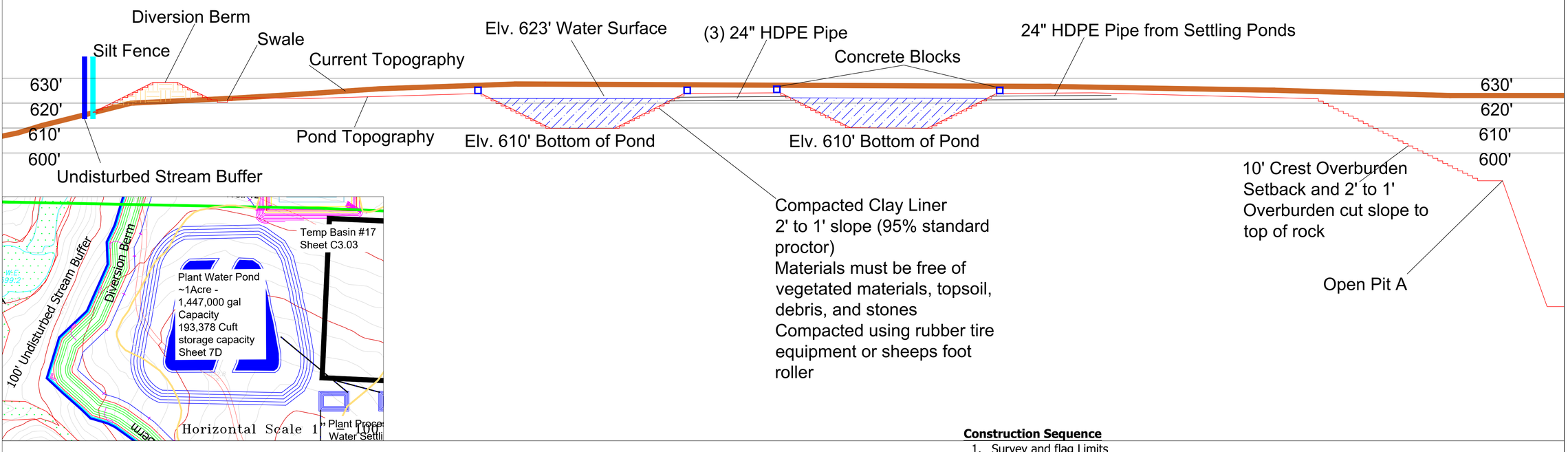
Date: 08–13–2019

Scale: As Shown

Sheet: 7C

Horizontal Scale 1" – 20'

Plant Water Pond
~1Acre - 1,447,000 gal Capacity
193,378 Cuft storage capacity



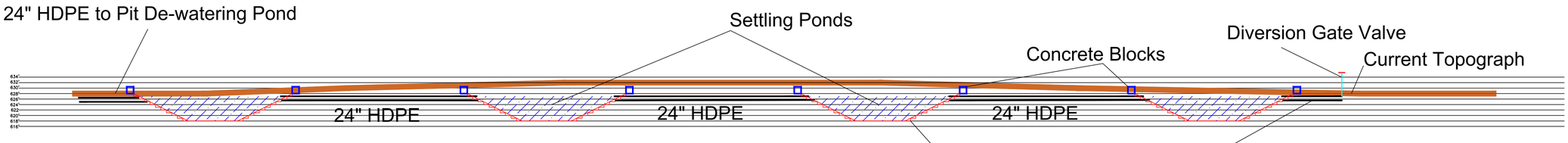
Compacted Clay Liner
2' to 1' slope (95% standard proctor)
Materials must be free of vegetated materials, topsoil, debris, and stones
Compacted using rubber tire equipment or sheeps foot roller

Horizontal Scale 1" – 15'

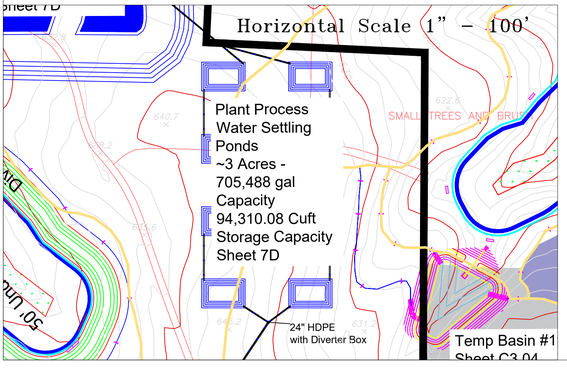
Construction Sequence

1. Survey and flag Limits
2. Install silt fence & associated measures as detailed within the supplied S&E drawings, by Timmons group.
3. Install Sediment Basins as detailed within the supplied S&E drawings by Timmons Group
   3.1. Construct Basins 17, 18, & 19
4. Begin Construction of Plant Water & Settling Ponds
5. Upon Completed Construction, Provide Permanent Seeding per supplied S&E drawings by Timmons Group
6. Upon permanent stabilization and germination remove silt fence

Plant Process Water Settling Ponds
~3 Acres - 705,488 gal Capacity
94,310.08 Cuft Storage Capacity



Compacted Clay Liner
2' to 1' slope (95% standard proctor)
Materials must be free of vegetated materials, topsoil, debris, and stones
Compacted using rubber tire equipment or sheeps foot roller



General Notes

- Property Line
- 100' Undisturbed Buffer
- 100' Disturbed Buffer No Excavation
- 100' Perennial Undisturbed Stream Buffer
- 50' intermittent Stream and Wetland Undisturbed Buffer
- Stream
- 100 Year Flood Plain
- Future Ultimate Pit Boundary upon appropriate State & Federal Approvals have been Obtained
- Open Pit Crest
- Open Pit Mid–Bench
- Open Pit Bench Toe
- 2' Contour Interval
- 10' Contour Interval
- Temp Basin #32 Sheet C3.06 — Planned Sed. Basin See Supplied Detail Drawling's from Timmons Group
- Storm Water Swales See Supplied Detail Drawings from Timmons Group
- ~ Silt Fence Location Silt fence to be adjusted as need See Supplied Detail Drawings from Timmons Group
- ~ Silt Fence Outlet See Supplied Detail Drawling's from Timmons Group
- Storm Water Divide
- Non–owned Structure
- Adjoining Property Boundary
- Power Pole

Adjoining Property
John B. Drumwright Estate
25.91 ac.
Record # 379

- Monitoring Well Location

Note: there is no discharge of process water to any surface water features or stormwater basins all excess process water is returned to the open pit for future use via pump or gravity flow.

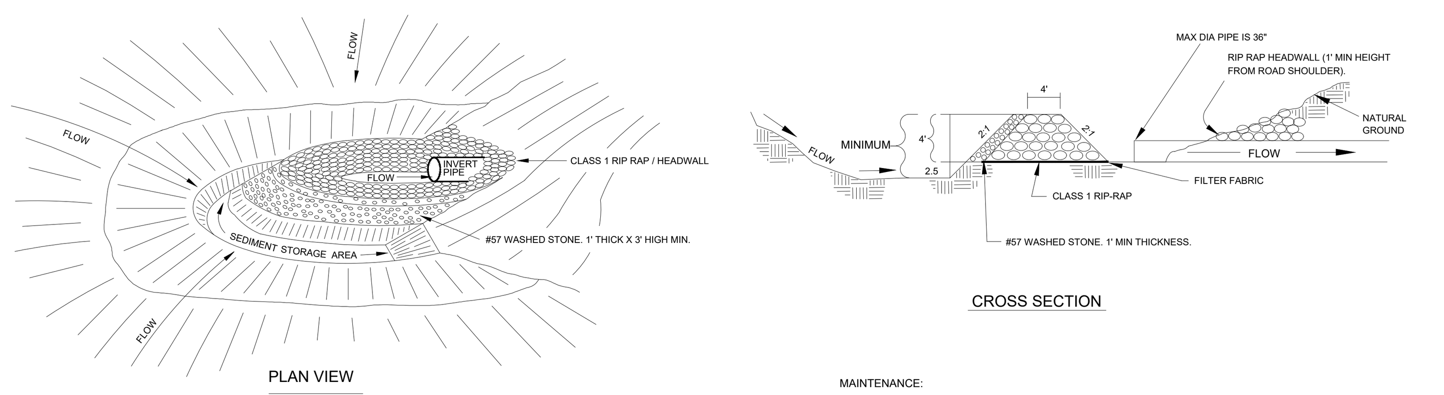
No.	Revision/Issue	Date
1	Stormwater Drainage Divides	03/20
1	Pit De–Watering Pond	03/20
1	Up Date Facility Entrance Design	03/20
1	Up Date S&E Control	03/20
1	Revised Wetland & Cemetery Buffer	01/20
1	Addition of Cemetery Location	01/20
1	Update of Surrounding Parcel Owners	01/20

Firm Name and Address
SUNROCK
CAROLINA SUNROCK LLC
200 HORIZON DRIVE, SUITE 100
RALEIGH, NC 27615

Project Name and Address
Prospect Hill Quarry
& Distribution Center
Makeup Water Pond
&
Typical Plant Settling Pond
Cross–Sections
Drawn By: S Martino

Project: PLANT
Date: 08–13–2019
Scale: As Shown
Sheet: 7D

Typical Horse Shoe Filter Design



MAINTENANCE:

Inspect temporary sediment basins at least weekly and after each significant (1/2 inch or greater) rainfall event and repair immediately. Remove sediment and restore the basin to its original dimensions when it accumulates to one-half the design depth.
Place removed sediment in an area with sediment controls.

Check the embankment, spillways, and outlet for erosion damage, and inspect the embankment for piping

REMOVE SEDIMENT & RESTORE THE SEDIMENT STORAGE AREA TO ITS ORIGINAL DIMENSION WHEN SEDIMENT HAS ACCUMULATED TO 1/2 DESIGN DEPTH OF THE TRAP.

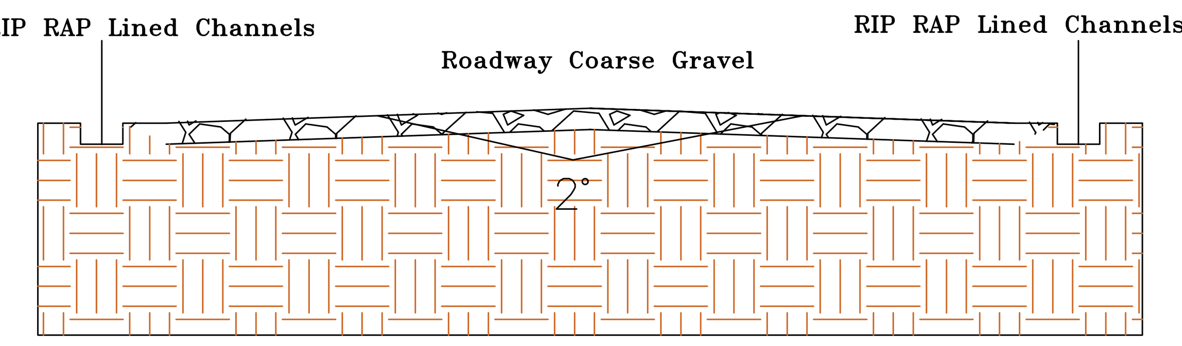
ANY RIP-RAP DISPLACED FROM THE STONE HORSESHOE MUST BE REPLACED IMMEDIATELY.

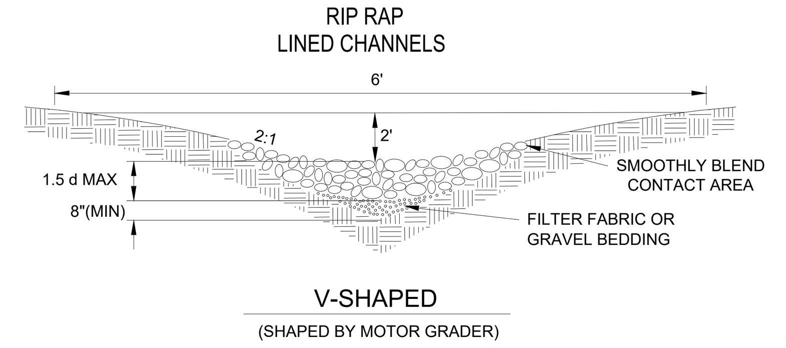
NOTES:
IF EXCAVATED STORAGE AREA IS USED AS TEMPORARY SEDIMENT TRAP, THE DESIGN CRITERIA FOR TEMPORARY SEDIMENT TRAP MUST BE SATISFIED.

DATA BLOCK

BASIN NO.	DRAINAGE AREA (ACRES)	BASIN VOLUME		BASIN SURFACE AREA		CLEANOUT DEPTH (FT.) H/2	H (FEET)
		REQUIRED (CUBIC FT.)	PROVIDED (CUBIC FT.)	REQUIRED (SQ FT.)	PROVIDED (SQ FT.)		
HF−1	1	3,500	3,750	395	625	3	6.5
HF−2	1	3,500	3,750	395	625	3	6.5
HF−3	1	3,500	3,750	395	625	3	6.5
HF−4	1	3,500	3,750	395	625	3	6.5

Typical Roadway Cross−Section Prior to Bridge



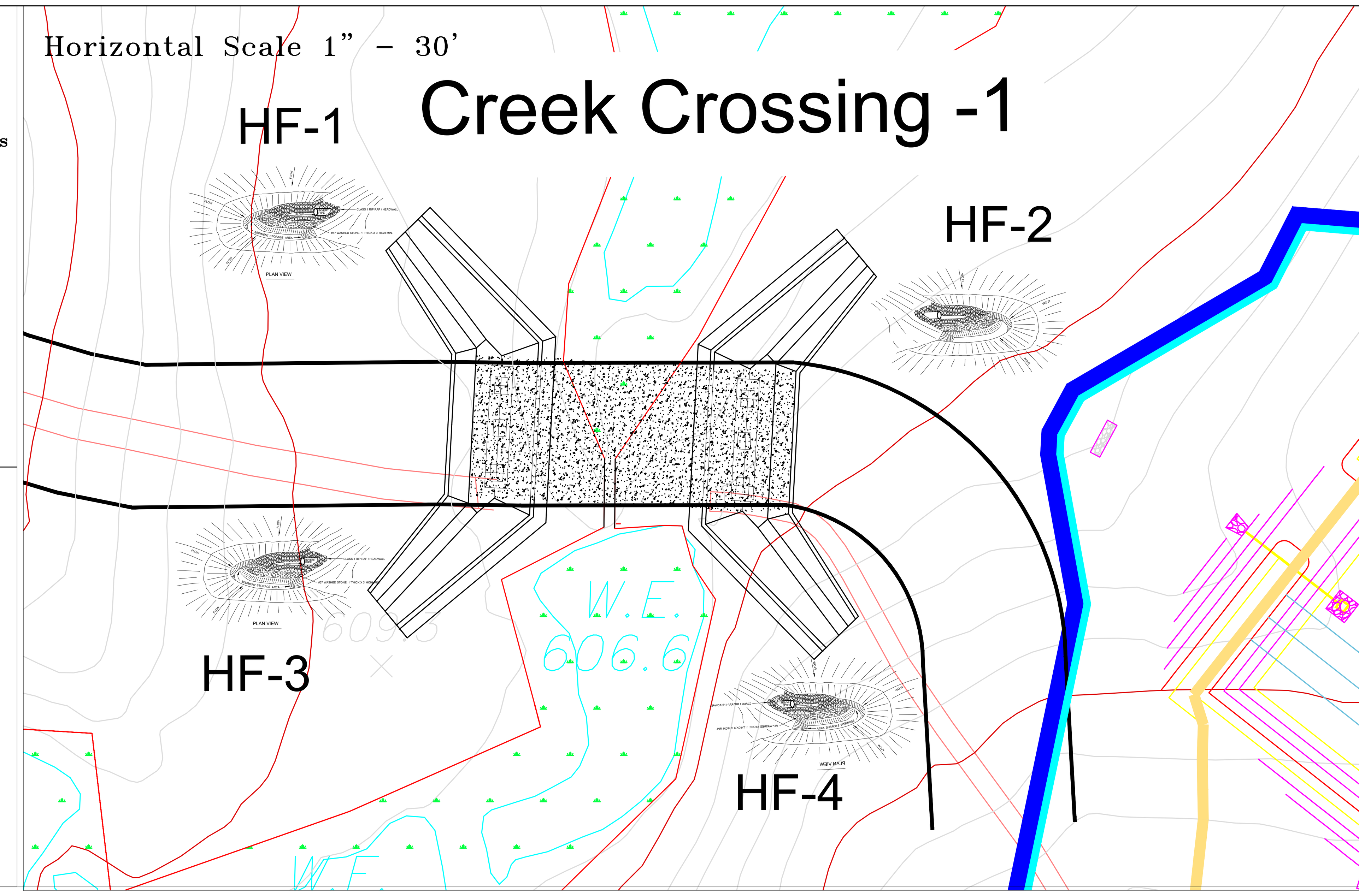


TABLE

d MAX	STONE CLASSIFICATION	RIP RAP DEPTH
8"	A	12"
12"	B	18"
18"	CLASS 1	27"
24"	CLASS 2	36"

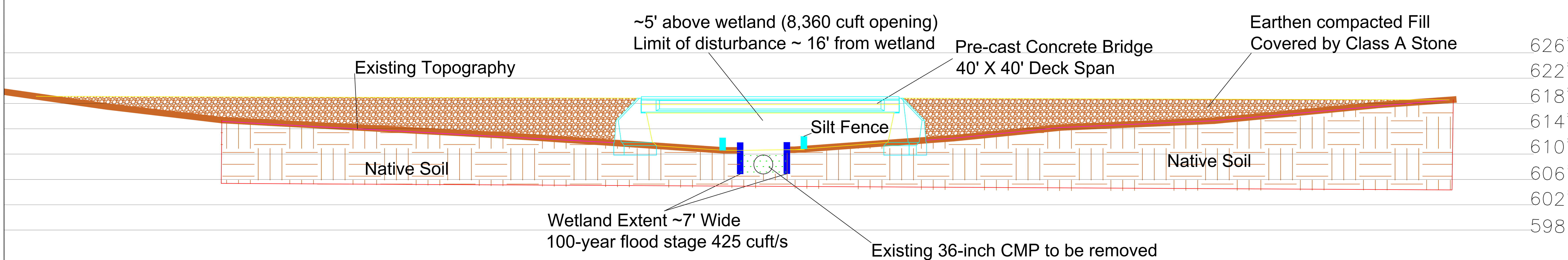
Horizontal Scale 1" − 30'

Creek Crossing -1

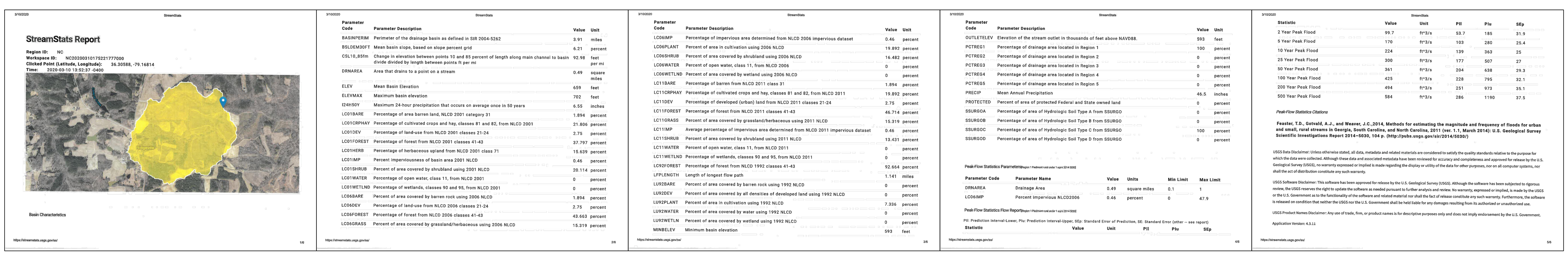


Horizontal Scale 1" − 8'

Creek Crossing 1 Cross-Section and Details



Note: Bridge structural design to be completed by a licensed bridge engineer following NCDOT approved structures design manual



3/10/2020 StreamStats

StreamStats Report

Region ID: NC
Workspace ID: NC20200310175221777000
Clicked Point (Latitude, Longitude): 36.30588, -79.16814
Time: 2020-03-10 13:52:37 -0400

Basin Characteristics

https://streamstats.usgs.gov/ss/ 1/6

3/10/2020 StreamStats

Parameter Code	Parameter Description	Value	Unit
BASINPERIM	Perimeter of the drainage basin as defined in SIR 2004-5262	3.91	miles
BSLDEM30FT	Mean basin slope, based on slope percent grid	6.21	percent
CSL10_85fm	Change in elevation between points 10 and 85 percent of length along main channel to basin divide divided by length between points ft per mi	92.98	feet per mi
DRNAREA	Area that drains to a point on a stream	0.49	square miles
ELEV	Mean Basin Elevation	659	feet
ELEVMAX	Maximum basin elevation	702	feet
I24H50Y	Maximum 24-hour precipitation that occurs on average once in 50 years	6.55	inches
LC01BARE	Percentage of area barren land, NLCD 2001 category 31	1.894	percent
LC01CRPHAY	Percentage of cultivated crops and hay, classes 81 and 82, from NLCD 2001	21.806	percent
LC01DEV	Percentage of land-use from NLCD 2001 classes 21-24	2.75	percent
LC01FOREST	Percentage of forest from NLCD 2001 classes 41-43	37.797	percent
LC01HERB	Percentage of herbaceous upland from NLCD 2001 class 71	15.639	percent
LC01IMP	Percent imperviousness of basin area 2001 NLCD	0.46	percent
LC01SHRUB	Percent of area covered by shrubland using 2001 NLCD	20.114	percent
LC01WATER	Percentage of open water, class 11, from NLCD 2001	0	percent
LC01WETLND	Percentage of wetlands, classes 90 and 95, from NLCD 2001	0	percent
LC06BARE	Percent of area covered by barren rock using 2006 NLCD	1.894	percent
LC06DEV	Percentage of land-use from NLCD 2006 classes 21-24	2.75	percent
LC06FOREST	Percentage of forest from NLCD 2006 classes 41-43	43.663	percent
LC06GRASS	Percent of area covered by grassland/herbaceous using 2006 NLCD	15.319	percent

https://streamstats.usgs.gov/ss/ 2/6

3/10/2020 StreamStats

Parameter Code	Parameter Description	Value	Unit
LC06IMP	Percentage of impervious area determined from NLCD 2006 impervious dataset	0.46	percent
LC06PLANT	Percent of area in cultivation using 2006 NLCD	19.892	percent
LC06SHRUB	Percent of area covered by shrubland using 2006 NLCD	16.482	percent
LC06WATER	Percent of open water, class 11, from NLCD 2006	0	percent
LC06WETLND	Percent of area covered by wetland using 2006 NLCD	0	percent
LC11BARE	Percentage of barren from NLCD 2011 class 31	1.894	percent
LC11CRPHAY	Percentage of cultivated crops and hay, classes 81 and 82, from NLCD 2011	19.892	percent
LC11DEV	Percentage of developed (urban) land from NLCD 2011 classes 21-24	2.75	percent
LC11FOREST	Percentage of forest from NLCD 2011 classes 41-43	46.714	percent
LC11GRASS	Percent of area covered by grassland/herbaceous using 2011 NLCD	15.319	percent
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	0.46	percent
LC11SHRUB	Percent of area covered by shrubland using 2011 NLCD	13.431	percent
LC11WATER	Percent of open water, class 11, from NLCD 2011	0	percent
LC11WETLND	Percentage of wetlands, classes 90 and 95, from NLCD 2011	0	percent
LC92FOREST	Percentage of forest from NLCD 1992 classes 41-43	92.664	percent
LFPLENGTH	Length of longest flow path	1.141	miles
LU92BARE	Percent of area covered by barren rock using 1992 NLCD	0	percent
LU92DEV	Percent of area covered by all densities of developed land using 1992 NLCD	0	percent
LU92PLANT	Percent of area in cultivation using 1992 NLCD	7.336	percent
LU92WATER	Percent of area covered by water using 1992 NLCD	0	percent
LU92WETLN	Percent of area covered by wetland using 1992 NLCD	0	percent
MINBELEV	Minimum basin elevation	593	feet

https://streamstats.usgs.gov/ss/ 3/6

3/10/2020 StreamStats

Parameter Code	Parameter Description	Value	Unit
OUTLETELEV	Elevation of the stream outlet in thousands of feet above NAVD88.	593	feet
PCTREG1	Percentage of drainage area located in Region 1	100	percent
PCTREG2	Percentage of drainage area located in Region 2	0	percent
PCTREG3	Percentage of drainage area located in Region 3	0	percent
PCTREG4	Percentage of drainage area located in Region 4	0	percent
PCTREG5	Percentage of drainage area located in Region 5	0	percent
PRECIP	Mean Annual Precipitation	46.5	inches
PROTECTED	Percent of area of protected Federal and State owned land	0	percent
SSURGOA	Percentage of area of Hydrologic Soil Type A from SSURGO	0	percent
SSURGOB	Percentage of area of Hydrologic Soil Type B from SSURGO	0	percent
SSURGOC	Percentage of area of Hydrologic Soil Type C from SSURGO	100	percent
SSURGOD	Percentage of area of Hydrologic Soil Type D from SSURGO	0	percent

Peak-Flow Statistics Parameters [Region 1 Piedmont rural under 1 sqmi 2014 5030]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.49	square miles	0.1	1
LC06IMP	Percent Impervious NLCD2006	0.46	percent	0	47.9

Peak-Flow Statistics Flow Report [Region 1 Piedmont rural under 1 sqmi 2014 5030]

PII: Prediction Interval-Lower, Plu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

https://streamstats.usgs.gov/ss/ 4/6

3/10/2020 StreamStats

Statistic	Value	Unit	PII	Plu	SEp
2 Year Peak Flood	99.7	ft^3/s	53.7	185	31.9
5 Year Peak Flood	170	ft^3/s	103	280	25.4
10 Year Peak Flood	224	ft^3/s	139	363	25
25 Year Peak Flood	300	ft^3/s	177	507	27
50 Year Peak Flood	361	ft^3/s	204	638	29.3
100 Year Peak Flood	425	ft^3/s	228	795	32.1
200 Year Peak Flood	494	ft^3/s	251	973	35.1
500 Year Peak Flood	584	ft^3/s	286	1190	37.5

Peak-Flow Statistics Citations

Feaster, T.D., Gotvald, A.J., and Weaver, J.C.,2014, Methods for estimating the magnitude and frequency of floods for urban and small, rural streams in Georgia, South Carolina, and North Carolina, 2011 (ver. 1.1, March 2014): U.S. Geological Survey Scientific Investigations Report 2014–5030, 104 p. (http://pubs.usgs.gov/sir/2014/5030/)

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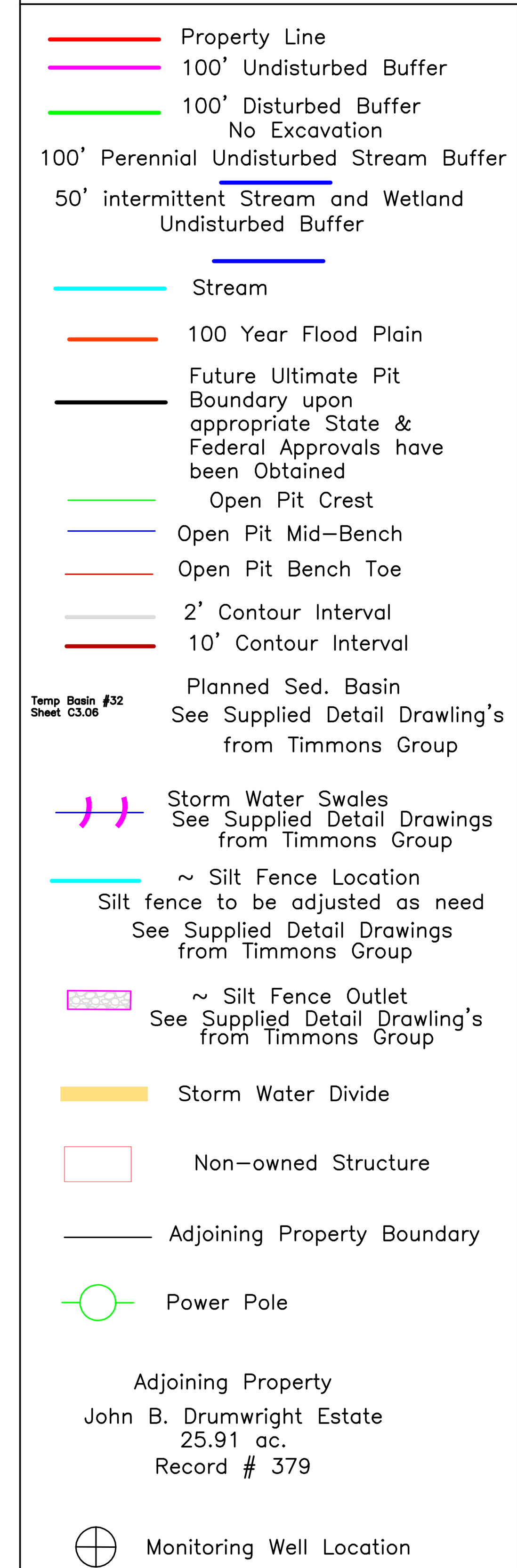
Application Version: 4.3.11

https://streamstats.usgs.gov/ss/ 5/6

General Notes



Adjoining Property
John B. Drumwright Estate
25.91 ac.
Record # 379

Note: **Crossings are for internal facility use only**

No.	Revision/Issue	Date

Firm Name and Address

SUNROCK
CAROLINA SUNROCK LLC

200 HORIZON DRIVE, SUITE 100
RALEIGH, NC 27615

Project Name and Address

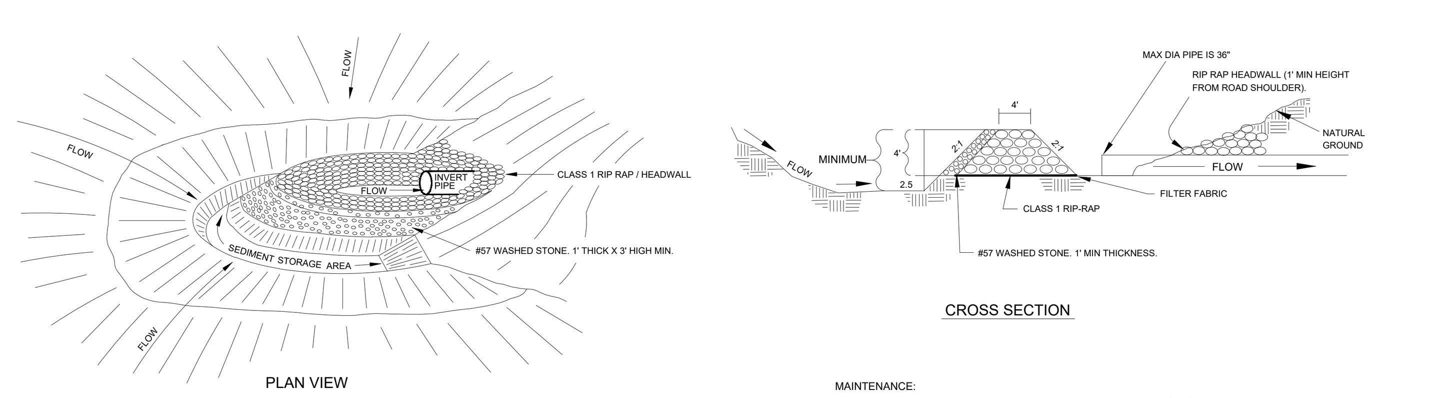
Prospect Hill Quarry & Distribution Center

Creek Crossing − 1 Details

Drawn By: S Martino

Project	Sheet
PLANT	7E
Date: 04−20−2020	
Scale: As Shown	

Typical Horse Shoe Filter Design



MAINTENANCE:

Inspect temporary sediment basins at least weekly and after each significant (1/2 inch or greater) rainfall event and repair immediately. Remove sediment and restore the basin to its original dimensions when it accumulates to one-half the design depth.
Place removed sediment in an area with sediment controls.

Check the embankment, spillways, and outlet for erosion damage, and inspect the embankment for piping

REMOVE SEDIMENT & RESTORE THE SEDIMENT STORAGE AREA TO ITS ORIGINAL DIMENSION WHEN SEDIMENT HAS ACCUMULATED TO 1/2 DESIGN DEPTH OF THE TRAP.

ANY RIP-RAP DISPLACED FROM THE STONE HORSESHOE MUST BE REPLACED IMMEDIATELY.

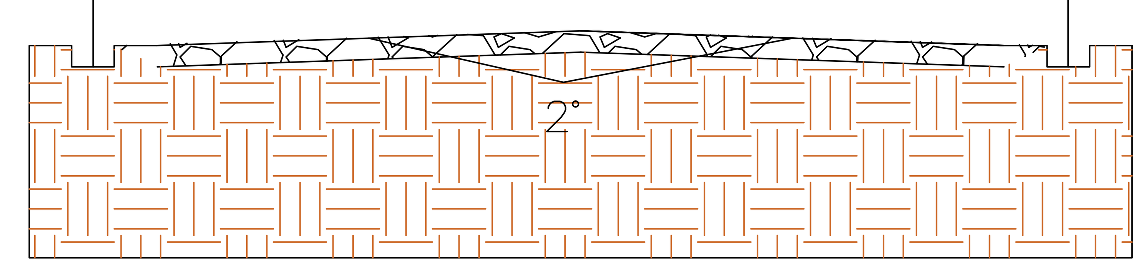
NOTES:
IF EXCAVATED STORAGE AREA IS USED AS TEMPORARY SEDIMENT TRAP, THE DESIGN CRITERIA FOR TEMPORARY SEDIMENT TRAP MUST BE SATISFIED.

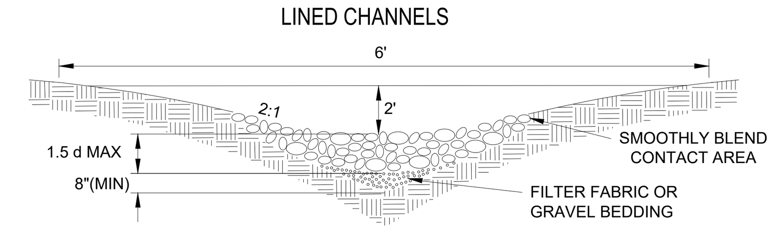
DATA BLOCK

BASIN NO.	DRAINAGE AREA (ACRES)	BASIN VOLUME		BASIN SURFACE AREA		CLEANOUT DEPTH (FT.) H/2	H (FEET)
		REQUIRED (CUBIC FT.)	PROVIDED (CUBIC FT.)	REQUIRED (SQ FT.)	PROVIDED (SQ FT.)		
HF–5	1	3,500	3,750	395	625	3	6.5
HF–6	1	3,500	3,750	395	625	3	6.5
HF–7	1	3,500	3,750	395	625	3	6.5
HF–8	1	3,500	3,750	395	625	3	6.5

Horizontal Scale 1" – 8'

Typical Roadway Cross–Section Prior to Bridge

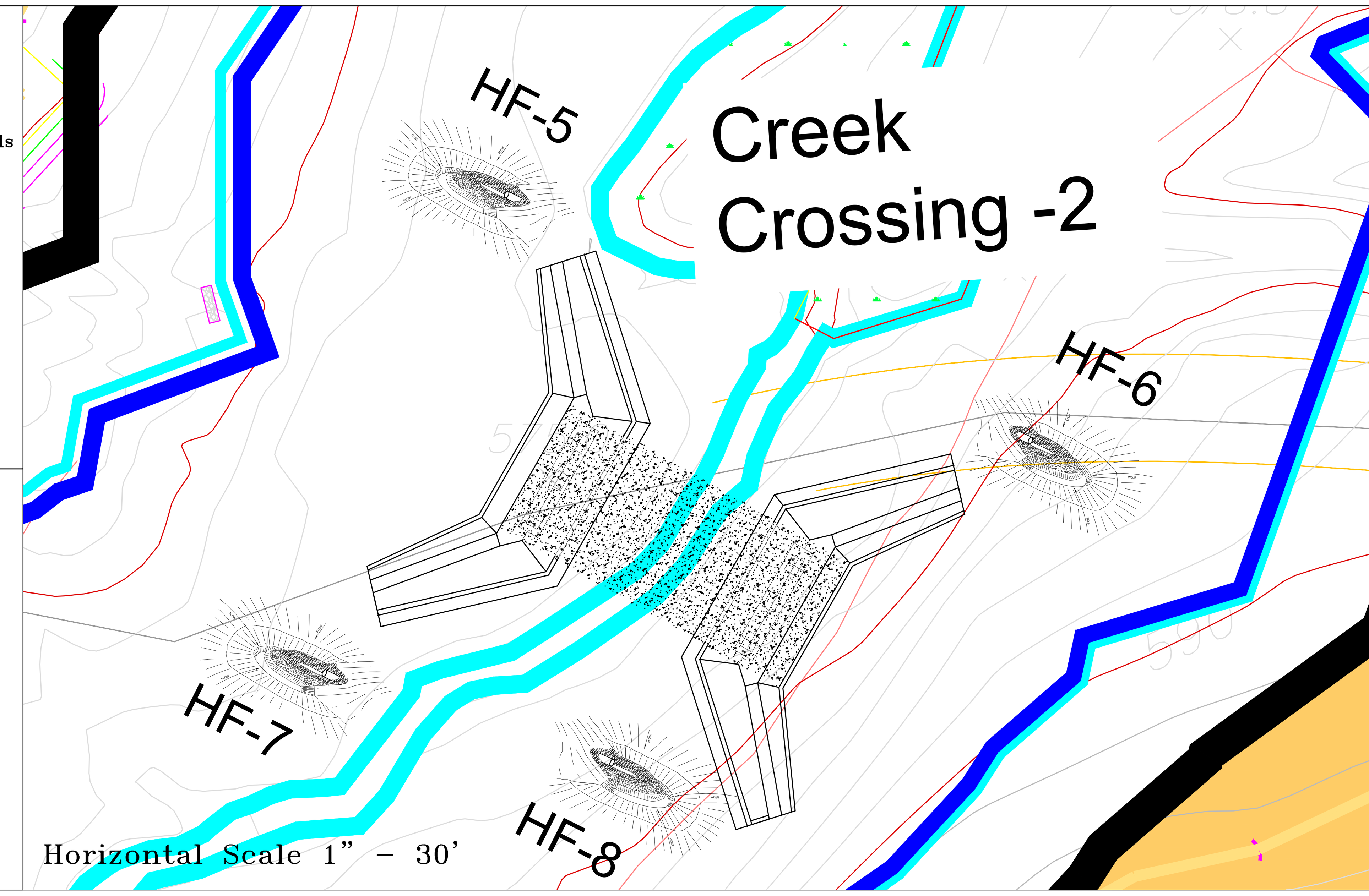




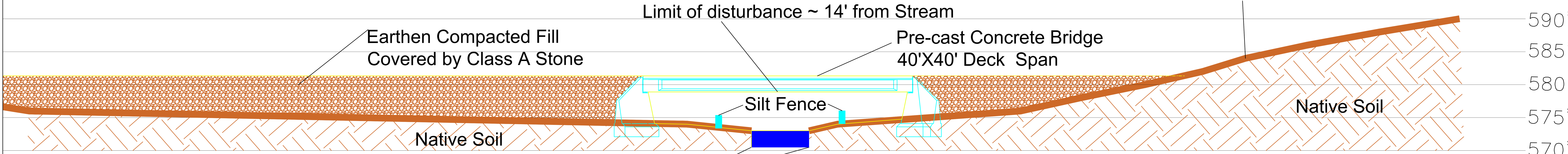
V-SHAPED
(SHAPED BY MOTOR GRADER)

TABLE

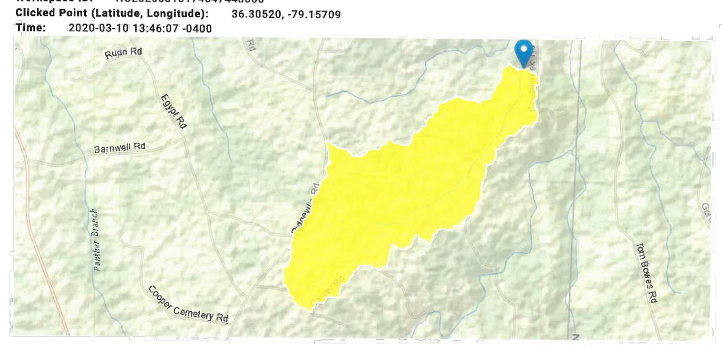
d MAX	STONE CLASSIFICATION	RIP RAP DEPTH
8"	A	12"
12"	B	18"
18"	CLASS 1	27"
24"	CLASS 2	36"



Creek Crossing 2 Cross-Section and Details



Note: Bridge structural design to be completed by a licensed bridge engineer following NCDOT approved structures design manual



3/10/2020 StreamStats

StreamStats Report

Region ID: NC
Workspace ID: NC20200310174547443000
Clicked Point (Latitude, Longitude): 36.30520, -79.15709
Time: 2020-03-10 13:46:07 -0400

Basin Characteristics

https://streamstats.usgs.gov/ss/ 1/6

3/10/2020 StreamStats

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	1.05	square miles
PCTREG1	Percentage of drainage area located in Region 1	100	percent
PCTREG2	Percentage of drainage area located in Region 2	0	percent
PCTREG3	Percentage of drainage area located in Region 3	0	percent
PCTREG4	Percentage of drainage area located in Region 4	0	percent
PCTREG5	Percentage of drainage area located in Region 5	0	percent
LC06IMP	Percentage of impervious area determined from NLCD 2006 impervious dataset	0.72	percent
BASINPERIM	Perimeter of the drainage basin as defined in SIR 2004-5262	7.47	miles
BSLDEM30FT	Mean basin slope, based on slope percent grid	6.63	percent
CSL10_85fm	Change in elevation between points 10 and 85 percent of length along main channel to basin divide divided by length between points ft per mi	58.39	feet per mi
ELEV	Mean Basin Elevation	644	feet
ELEVMAX	Maximum basin elevation	715	feet
I24H50Y	Maximum 24-hour precipitation that occurs on average once in 50 years	6.55	inches
LC01BARE	Percentage of area barren land, NLCD 2001 category 31	0.167	percent
LC01CRPHAY	Percentage of cultivated crops and hay, classes 81 and 82, from NLCD 2001	31.423	percent
LC01DEV	Percentage of land-use from NLCD 2001 classes 21-24	3.874	percent
LC01FOREST	Percentage of forest from NLCD 2001 classes 41-43	34.362	percent
LC01HERB	Percentage of herbaceous upland from NLCD 2001 class 71	9.083	percent
LC01IMP	Percent imperviousness of basin area 2001 NLCD	0.72	percent
LC01SHRUB	Percent of area covered by shrubland using 2001 NLCD	20.862	percent

https://streamstats.usgs.gov/ss/ 2/6

3/10/2020 StreamStats

Parameter Code	Parameter Description	Value	Unit
LC01WATER	Percentage of open water, class 11, from NLCD 2001	0	percent
LC01WETLND	Percentage of wetlands, classes 90 and 95, from NLCD 2001	0.228	percent
LC06BARE	Percent of area covered by barren rock using 2006 NLCD	0.167	percent
LC06DEV	Percentage of land-use from NLCD 2006 classes 21-24	3.874	percent
LC06FOREST	Percentage of forest from NLCD 2006 classes 41-43	38.23	percent
LC06GRASS	Percent of area covered by grassland/herbaceous using 2006 NLCD	8.479	percent
LC06PLANT	Percent of area in cultivation using 2006 NLCD	31.192	percent
LC06SHRUB	Percent of area covered by shrubland using 2006 NLCD	17.83	percent
LC06WATER	Percent of open water, class 11, from NLCD 2006	0	percent
LC06WETLND	Percent of area covered by wetland using 2006 NLCD	0.228	percent
LC11BARE	Percentage of barren from NLCD 2011 class 31	0.167	percent
LC11CRPHAY	Percentage of cultivated crops and hay, classes 81 and 82, from NLCD 2011	31.192	percent
LC11DEV	Percentage of developed (urban) land from NLCD 2011 classes 21-24	3.87	percent
LC11FOREST	Percentage of forest from NLCD 2011 classes 41-43	42.925	percent
LC11GRASS	Percent of area covered by grassland/herbaceous using 2011 NLCD	7.495	percent
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	0.72	percent
LC11SHRUB	Percent of area covered by shrubland using 2011 NLCD	14.12	percent
LC11WATER	Percent of open water, class 11, from NLCD 2011	0	percent
LC11WETLND	Percentage of wetlands, classes 90 and 95, from NLCD 2011	0.228	percent
LC92FOREST	Percentage of forest from NLCD 1992 classes 41-43	76.371	percent
LFPLENGTH	Length of longest flow path	2.577	miles
LU92BARE	Percent of area covered by barren rock using 1992 NLCD	0	percent

https://streamstats.usgs.gov/ss/ 3/6

3/10/2020 StreamStats

Parameter Code	Parameter Description	Value	Unit
LU92DEV	Percent of area covered by all densities of developed land using 1992 NLCD	0	percent
LU92PLANT	Percent of area in cultivation using 1992 NLCD	23.493	percent
LU92WATER	Percent of area covered by water using 1992 NLCD	0.136	percent
LU92WETLN	Percent of area covered by wetland using 1992 NLCD	0	percent
MINBELEV	Minimum basin elevation	541	feet
OUTLETELEV	Elevation of the stream outlet in thousands of feet above NAVD88.	541	feet
PRECIP	Mean Annual Precipitation	46.6	inches
PROTECTED	Percent of area of protected Federal and State owned land	0	percent
SSURGOA	Percentage of area of Hydrologic Soil Type A from SSURGO	0	percent
SSURGOB	Percentage of area of Hydrologic Soil Type B from SSURGO	0	percent
SSURGOC	Percentage of area of Hydrologic Soil Type C from SSURGO	100	percent
SSURGOD	Percentage of area of Hydrologic Soil Type D from SSURGO	0	percent

Peak-Flow Statistics Parameters[Peak Southeast US over 1 sqmi 2009 5158]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	1.05	square miles	1	9000
PCTREG1	Percent Area in Region 1	100	percent	0	100
PCTREG2	Percent Area in Region 2	0	percent	0	100
PCTREG3	Percent Area in Region 3	0	percent	0	100
PCTREG4	Percent Area in Region 4	0	percent	0	100

https://streamstats.usgs.gov/ss/ 4/6

3/10/2020 StreamStats

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
PCTREG5	Percent Area in Region 5	0	percent	0	100

Peak-Flow Statistics Flow Report[Peak Southeast US over 1 sqmi 2009 5158]

PII: Prediction Interval-Lower, Plu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PII	Plu	SEp
2 Year Peak Flood	164	ft^3/s	93.9	285	34.5
5 Year Peak Flood	304	ft^3/s	176	526	34
10 Year Peak Flood	410	ft^3/s	233	722	35.1
25 Year Peak Flood	553	ft^3/s	303	1010	37.5
50 Year Peak Flood	680	ft^3/s	361	1280	39.6
100 Year Peak Flood	799	ft^3/s	410	1560	41.9
200 Year Peak Flood	917	ft^3/s	455	1850	44.3
500 Year Peak Flood	1100	ft^3/s	520	2340	47.7

Peak-Flow Statistics Citations

Weaver, J.C., Feaster, T.D., and Gotvald, A.J.,2009, Magnitude and frequency of rural floods in the Southeastern United States, through 2006—Volume 2, North Carolina: U.S. Geological Survey Scientific Investigations Report 2009–5158, 111 p. (http://pubs.usgs.gov/sir/2009/5158/)

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https://streamstats.usgs.gov/ss/ 5/6

General Notes

- Property Line
- 100' Undisturbed Buffer
- 100' Disturbed Buffer No Excavation
- 100' Perennial Undisturbed Stream Buffer
- 50' intermittent Stream and Wetland Undisturbed Buffer
- Stream
- 100 Year Flood Plain
- Future Ultimate Pit Boundary upon appropriate State & Federal Approvals have been Obtained
- Open Pit Crest
- Open Pit Mid–Bench
- Open Pit Bench Toe
- 2' Contour Interval
- 10' Contour Interval
- Temp Basin #32 Sheet C3.06 — Planned Sed. Basin See Supplied Detail Drawling's from Timmons Group
- Storm Water Swales See Supplied Detail Drawings from Timmons Group
- ~ Silt Fence Location Silt fence to be adjusted as need See Supplied Detail Drawings from Timmons Group
- ~ Silt Fence Outlet See Supplied Detail Drawling's from Timmons Group
- Storm Water Divide
- Non–owned Structure
- Adjoining Property Boundary
- Power Pole

Adjoining Property
John B. Drumwright Estate
25.91 ac.
Record # 379

- Monitoring Well Location

Note: **Crossings are for internal facility use only**

No.	Revision/Issue	Date

Firm Name and Address

SUNROCK
CAROLINA SUNROCK LLC

200 HORIZON DRIVE, SUITE 100
RALEIGH, NC 27615

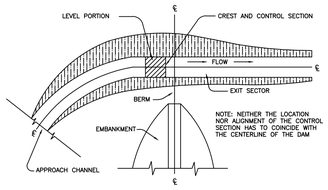
Project Name and Address

Prospect Hill Quarry & Distribution Center

Creek Crossing – 2 Details

Drawn By: S Martino

Project	Sheet
PLANT	7F
Date: 04–20–2020	
Scale: As Shown	

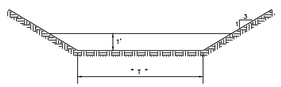


PLAN

NOTE:

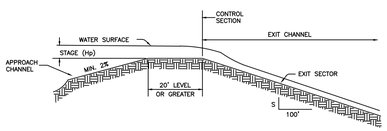
UPON FINAL STABILIZATION OF DISTURBED AREAS, ALL SEDIMENT ACCUMULATED DURING CONSTRUCTION SHALL BE REMOVED TO THE BOTTOM ELEVATION OF THE PERMANENT SEDIMENT STORAGE SHOWN.

THE MAXIMUM OF HEIGHT OF DAMS SHALL NOT EXCEED 14.5' AS MEASURED FROM THE TOE OF SLOPE ON THE DOWNSTREAM FACE OF THE DAM TO THE TOP OF THE DAM.



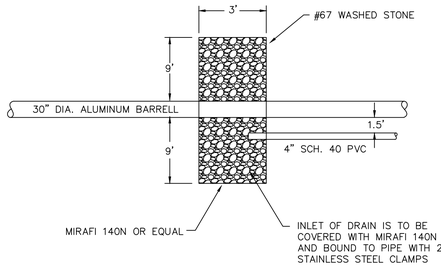
CROSS–SECTION AT CONTROL SECTION

EMERGENCY SPILLWAY DIMENSIONS
TRAPEZOIDAL CHANNEL
"O" d50 RIPRAP "R" THICK W/ 6" OF #67 FILTER STONE
CHANNEL SLOPE = "S"
BOTTOM WIDTH = "T"
SIDE SLOPE = 3:1

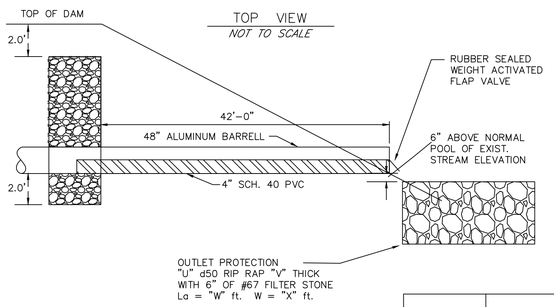


PROFILE ALONG CENTERLINE

EMERGENCY SPILLWAY

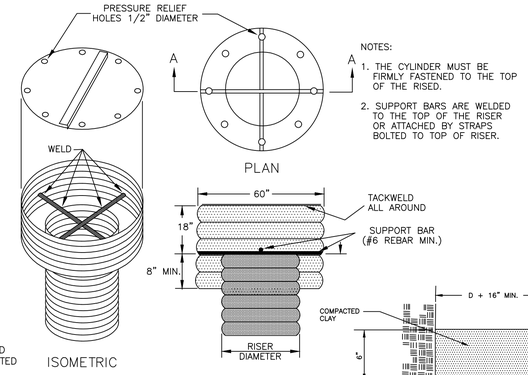


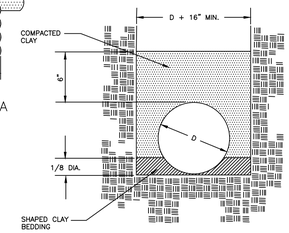
TOP VIEW
NOT TO SCALE



SIDE VIEW
NOT TO SCALE

TOE DRAIN





BARREL DETAIL

DIMENSION CHART

De–Watering Ponds	DAM ELEVATIONS						PIPE DIAMETERS			ANTI–FLOTATION		EMERGENCY SPILLWAY				OUTLET PROTECTION			
	A	B	C	E	F	G	H	I	J	O , O*	P	Q	R	S	T	U	V	W	X
Pond	620'	618'	617'	612.0'	610.0'	608'	60"	36"	48"	5.0,5.0	1.5'	CLASS B	22"	3%	36'	22"	CLASS B	24'	24'

CALCULATIONS FOR Pit De–Watering Pond
A=Area (Ac.) tc=TIME of Concentration (5 Minutes Min.)
c=Runoff Coefficient I50=Rainfall Intensity
Q50=50 Year Storm Runoff (cf50)

Q=c*I*A

Pond	A	C	I50	Q50
Pond	56	0.41	7.0	161

SEDIMENT TRAP CALCULATIONS

TST	Inflow	Required Surface Area	Length* (ft)	Width (ft)	Actual Surface Area	Comments
Pond	161	70,115	275	255	70,125	OK

TST	Disturbed Area	Storage Required (cf)	Length* (ft)	Width (ft)	Depth (ft)	Actual Storage (cf)	Baffle Spacing	Faircloth Skimmer
Pond	56	201,600	275	255	4.00	280,500	62'	8"

STORAGE VOLUMES
Required Storage = 3,600 cubic feet/acre (minimum)

CALCULATE FAIRCLOTH SKIMMER® SIZE

Basic volume in cubic feet	Days to Drain
460552	7

Volume is the actual or provided volume the you intend to drain, usually not the required volume which is often smaller. If a pool of water is to be maintained between storms, do not include that volume. In some cases a sediment basin may be larger than required because it will be used as a permanent stormwater pond.

Number of Days to drain is usually determined by local or state regulations. Where there is no requirement 3 days is recommended. Keep in mind the quicker the basin is to drain the larger the skimmer required. In NC, assume 3 days to drain.

SKIMMER SIZE	ORIFICE RADIUS	ORIFICE DIAMETER
8.0 inches	3.2 inches	6.5 inches

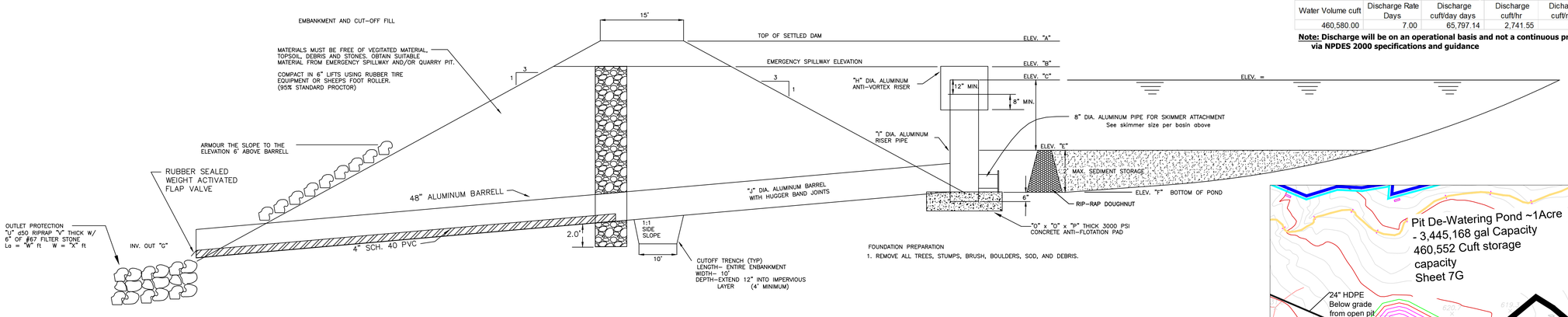
FLOW CAPACITIES (IN FT ^{3}) FOR THE FAIRCLOTH SKIMMER®

Skimmer size	1.5"	2"	2.5"	3"	4"	5"	6"	8"
24 hours	1,728	3,283	6,234	9,774	20,109	32,832	51,840	97,978
2 day	3,456	6,566	12,468	19,548	40,218	65,664	103,680	195,956
3 day	5,184	9,849	18,702	29,322	60,327	98,496	155,520	293,934
4 day	6,912	13,132	24,936	39,096	80,436	131,328	207,360	391,912
5 day	8,640	16,415	31,170	48,870	100,545	164,160	259,200	489,890
6 day	10,368	19,698	37,404	58,644	120,654	196,992	311,040	587,868
7 day	12,096	22,981	43,638	68,418	140,763	229,824	362,880	685,846

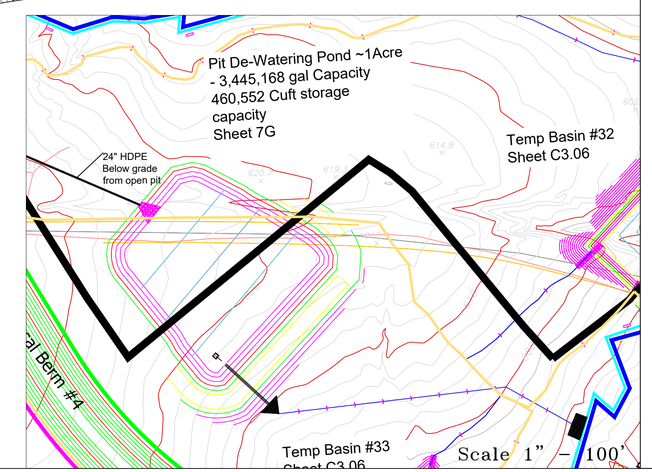
Anticipated Dicharge Flow Rates

Water Volume cuft	Discharge Rate Days	Discharge cuft/day days	Discharge cuft/hr	Dicharger cuft/min	Discharge cuft/sec
460,580.00	7.00	65,797.14	2,741.55	45.69	0.76

Note: Discharge will be on an operational basis and not a continuous process and conducted via NPDES 2000 specifications and guidance



FOUNDATION PREPARATION
1. REMOVE ALL TREES, STUMPS, BRUSH, BOULDERS, SOD, AND DEBRIS.



Note: Installation and Maintainance details please see S&E plan by Timmons Group sheets C4.00–C4.40

General Notes

- Property Line
- 100' Undisturbed Buffer
- 100' Disturbed Buffer No Excavation
- 100' Perennial Undisturbed Stream Buffer
- 50' intermittent Stream and Wetland Undisturbed Buffer
- Stream
- 100 Year Flood Plain
- Future Ultimate Pit Boundary upon appropriate State & Federal Approvals have been Obtained
- Open Pit Crest
- Open Pit Mid–Bench
- Open Pit Bench Toe
- 2' Contour Interval
- 10' Contour Interval
- Temp Basin #32 Sheet C3.06 — Planned Sed. Basin See Supplied Detail Drawling's from Timmons Group
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- Non–owned Structure
- Adjoining Property Boundary
- Power Pole
- Adjoining Property John B. Drumwright Estate 25.91 ac. Record # 379
- Monitoring Well Location

No.	Revision/Issue	Date

Firm Name and Address

SUNROCK CAROLINA SUNROCK LLC
200 HORIZON DRIVE, SUITE 100
RALEIGH, NC 27615

Project Name and Address

Prospect Hill Quarry & Distribution Center

Pit De–watering Pond Details

Drawn By: S Martino

Project: PLANT

Date: 04–20–2020

Scale: As Shown

Sheet: 7G

PROSPECT HILL QUARRY AND DISTRIBUTION CENTER

CONSTRUCTION DRAWINGS FOR SEDIMENT AND EROSION CONTROL

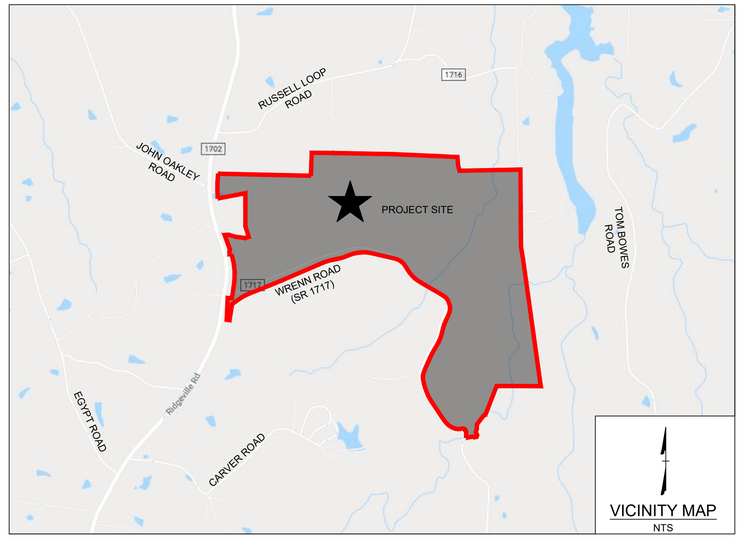
PROSPECT HILL, CASWELL COUNTY, NORTH CAROLINA
PARCEL ID: 0133 002, 0133 075, 0133 005, 0133 045, 0148 002

SITE DATA TABLE

PROJECT NAME:	PROSPECT HILL QUARRY AND DISTRIBUTION CENTER
TOWNSHIP:	HIGHTOWERS
ZONING:	NONE
CURRENT USE:	VACANT/AGRICULTURE
PROPOSED USE:	QUARRY AND DISTRIBUTION CENTER
RIVER BASIN:	ROANOKE
SWC:	WS-II; HIGH QUALITY WATER
WATERSHED:	SUGAR TREE CREEK
TOTAL PROJECT AREA:	630.17 AC
TOTAL DISTURBED AREA:	409.2 AC

PROPERTY OWNER INFORMATION

NAME:	OWNER ADDRESS:	TID:	PROPERTY ADDRESS:	PROPERTY ACREAGE:	DEED / PAGE:
ETREE LLC	P.O. BOX 850 BURLINGTON, NC 27216	0133 002	2856 RIDGEVILLE ROAD PROSPECT HILL, NC 27314	46.13	584 / 1301
		0133 075	0 RIDGEVILLE ROAD PROSPECT HILL, NC 27314	30.00	604 / 816
		0133 005	0 WRENN ROAD PROSPECT HILL, NC 27314	488.71	604 / 816
		0133 045	1238 WRENN ROAD PROSPECT HILL, NC 27314	280.45	604 / 816
		0148 002	0 WRENN ROAD PROSPECT HILL, NC 27314	236.00	604 / 816



VICINITY MAP
NTS

CLIENT:
CAROLINA SUNROCK LLC
SCOTT MARTINO
200 HORIZON DRIVE, SUITE 100
RALEIGH, NC 27615
PH: (919) 747-6336
SMARTINO@THESUNROCKGROUP.COM

CIVIL ENGINEER:
TIMMONS GROUP
RICK BAKER, P.E.
5410 TRINITY ROAD; SUITE 102
RALEIGH, NC 27607
PH: (919) 866-4939
RICK.BAKER@TIMMONS.COM

Sheet List Table

Sheet Number	Sheet Title
C0.00	COVER SHEET
C1.00	EXISTING CONDITIONS PLAN
C2.00	EROSION CONTROL PLAN OVERVIEW
C2.01	EROSION CONTROL PLAN ENLARGEMENT
C2.02	EROSION CONTROL PLAN ENLARGEMENT
C2.03	EROSION CONTROL PLAN ENLARGEMENT
C2.04	EROSION CONTROL PLAN ENLARGEMENT
C2.05	EROSION CONTROL PLAN ENLARGEMENT
C2.06	EROSION CONTROL PLAN ENLARGEMENT
C2.07	EROSION CONTROL PLAN ENLARGEMENT
C2.08	EROSION CONTROL PLAN ENLARGEMENT
C2.09	EROSION CONTROL PLAN ENLARGEMENT
C2.10	EROSION CONTROL PLAN ENLARGEMENT
C2.11	EROSION CONTROL PLAN ENLARGEMENT
C3.00	SEDIMENT BASINS OVERVIEW
C3.01	SEDIMENT BASIN ENLARGEMENTS
C3.02	SEDIMENT BASIN ENLARGEMENTS
C3.03	SEDIMENT BASIN ENLARGEMENTS
C3.04	SEDIMENT BASIN ENLARGEMENTS
C3.05	SEDIMENT BASIN ENLARGEMENTS
C3.06	SEDIMENT BASIN ENLARGEMENTS
C3.07	SEDIMENT BASIN ENLARGEMENTS
C3.08	SEDIMENT BASIN ENLARGEMENTS
C3.09	SEDIMENT BASIN ENLARGEMENTS
C3.10	SEDIMENT BASIN ENLARGEMENTS
C4.00	NCDEQ NCG01 SPECIFICATIONS
C4.10	NOTES AND DETAILS
C4.20	NOTES AND DETAILS
C4.30	NOTES AND DETAILS
C4.40	NOTES AND DETAILS
DA1.0	SEDIMENT BASIN DRAINAGE AREA MAP

GENERAL NOTES:

1. **REFER TO MINE PERMIT PLANS AND DOCUMENTS FOR PHASING AND DETAILED PROJECT INFORMATION.**

PRELIMINARY - NOT RELEASED FOR CONSTRUCTION

ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH CASWELL COUNTY, NCDEQ AND NCDOT STANDARDS, SPECIFICATIONS, AND DETAILS

NORTH CAROLINA PROFESSIONAL SEAL 022530 ENGINEER RICHARD W. BAKER, III
04/24/2020

THIS DRAWING PREPARED AT THE **RALEIGH OFFICE**
5410 Trinity Road, Suite 102 | Raleigh, NC 27607
TEL 919.866.4951 FAX 919.833.8124 www.timmons.com

YOUR VISION ACHIEVED THROUGH OURS.

REVISION	DESCRIPTION	DATE
	ADDRESSED NCDEQ COMMENTS	04/24/2020

DATE 2019-08-22
DRAWN BY A. MAY
DESIGNED BY S. MOORE
CHECKED BY R. BAKER
SCALE AS SHOWN

TIMMONS GROUP
NORTH CAROLINA LICENSE NO. C-1652

PROSPECT HILL QUARRY AND DISTRIBUTION CENTER
PROSPECT HILL - CASWELL COUNTY - NORTH CAROLINA
COVER SHEET

JOB NO. 44089.001
SHEET NO. C0.00

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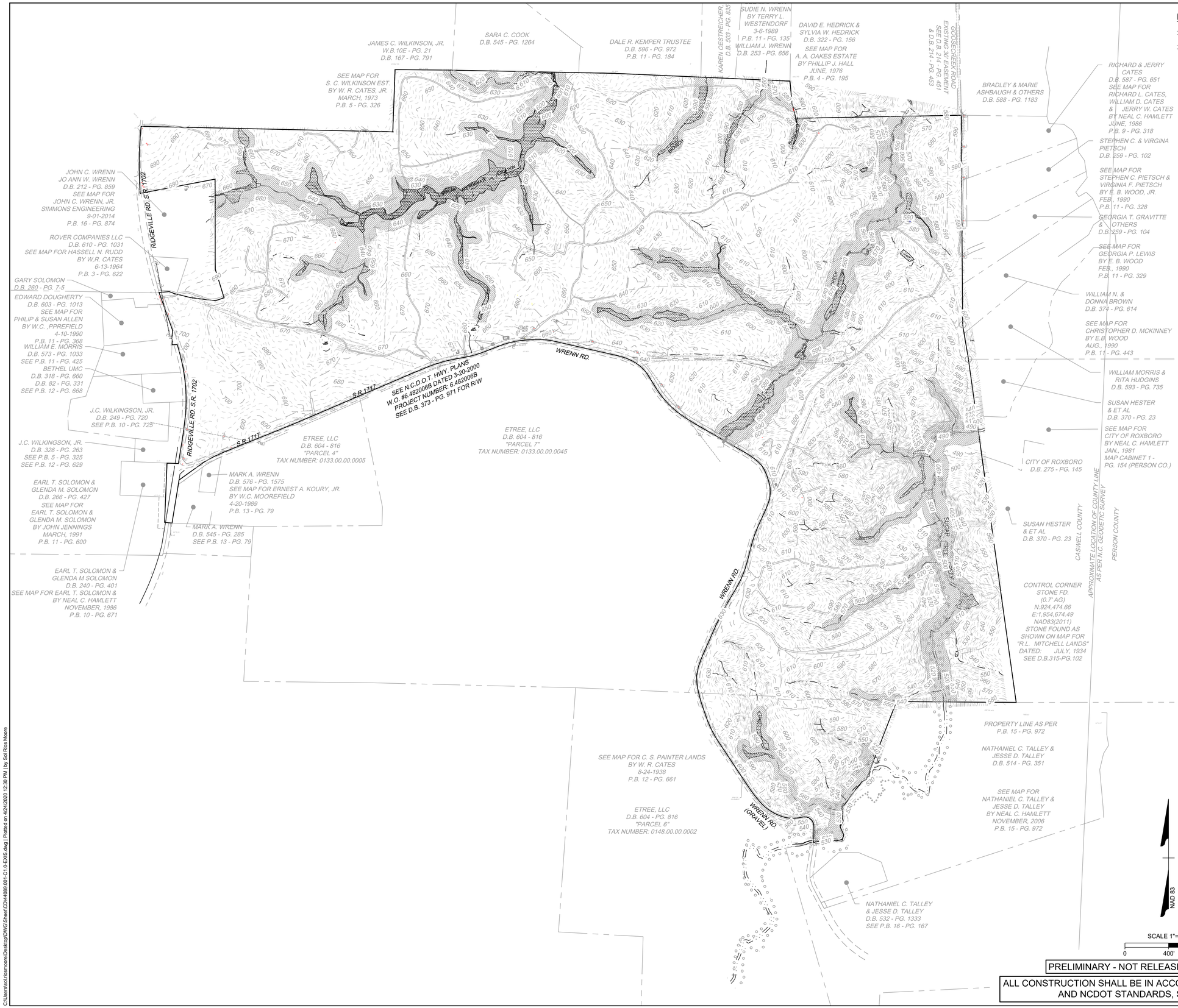

NOTES:

1. EXISTING CONDITIONS SHOW ARE BASED ON FIELD SURVEY DATA PROVIDED BY CAROLINA SUNROCK LLC.
2. PROPERTY DOES NOT LIE IN A FEMA SPECIAL FLOOD HAZARD AREA PER FEMA FIRM MAP PANEL NO. 3710995200K AND 3710994200J DATES 09/28/2007.

PRELIMINARY - NOT RELEASED FOR CONSTRUCTION

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NORTH CAROLINA PROFESSIONAL SEAL 022530 ENGINEER RICHARD W. BAKER, III

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REVISION	DESCRIPTION
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DATE
04/24/2020

DATE	2019-08-22
DRAWN BY	A. MAY
DESIGNED BY	S. MOORE
CHECKED BY	R. BAKER
SCALE	AS SHOWN

TIMMONS GROUP

NORTH CAROLINA LICENSE NO. C-1652

PROSPECT HILL QUARRY AND DISTRIBUTION CENTER

PROSPECT HILL - CASWELL COUNTY - NORTH CAROLINA

EXISTING CONDITIONS PLAN

JOB NO. 44089.001

SHEET NO. C1.00

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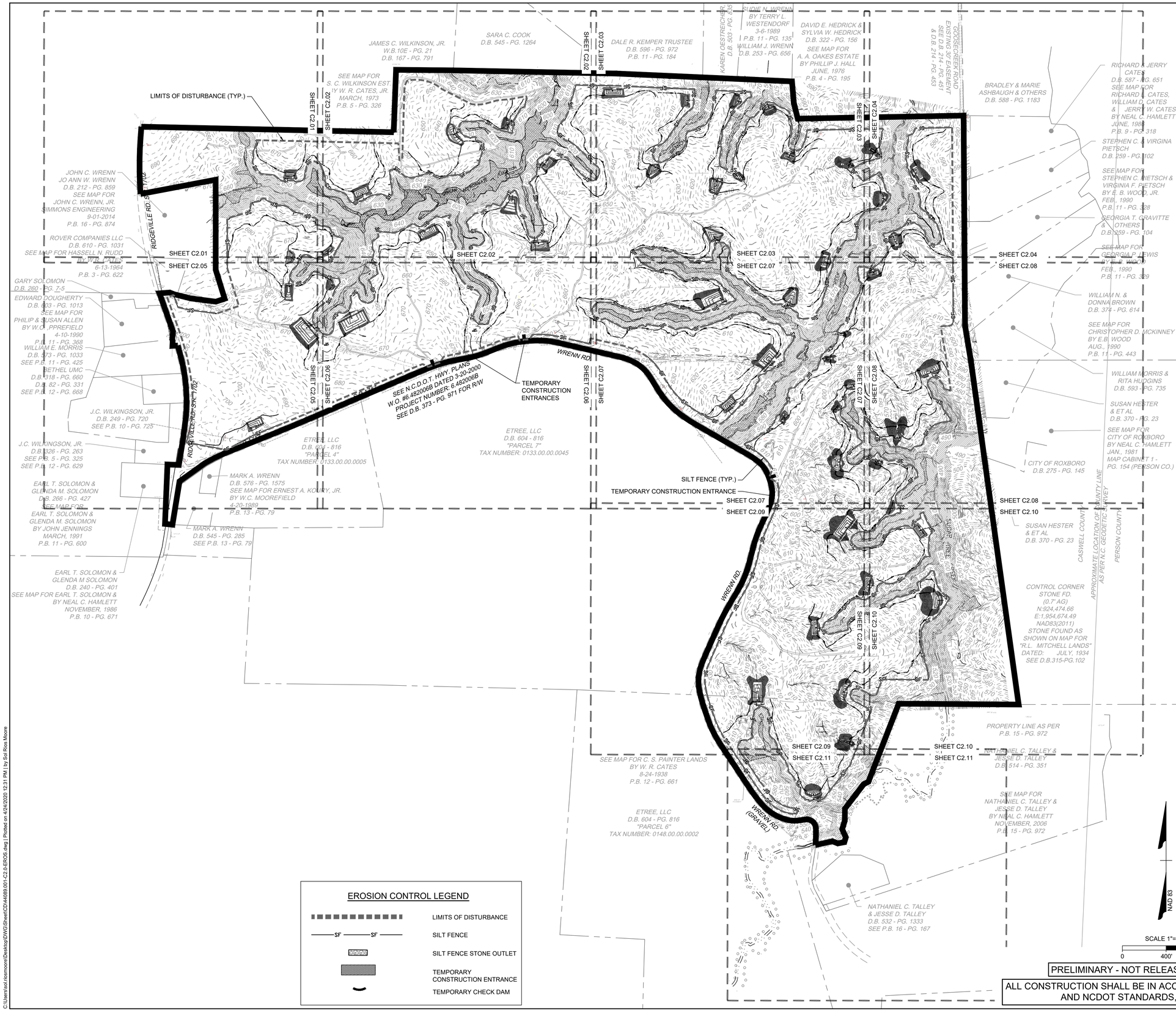

EROSION CONTROL LEGEND

- LIMITS OF DISTURBANCE
- SILT FENCE
- SILT FENCE STONE OUTLET
- TEMPORARY CONSTRUCTION ENTRANCE
- TEMPORARY CHECK DAM

EROSION CONTROL NOTES:

1. **TOTAL DISTURBED AREA = 409.2 ACRES**
2. **REFER TO MINE PERMIT PLANS AND DOCUMENTS FOR PHASING AND DETAILED PROJECT INFORMATION.**
3. MAINTENANCE: SUFFICIENT EROSION CONTROL PRACTICES MUST BE INSTALLED AND MAINTAINED TO RETAIN SEDIMENT WITHIN THE BOUNDARIES OF THE SITE. INSTALL ADDITIONAL MEASURES AS NEEDED TO PREVENT SEDIMENT RUNOFF.
4. ALL EROSION AND SEDIMENT CONTROL PRACTICES SHALL BE INSPECTED WEEKLY AND AFTER EVERY RUNOFF PRODUCING RAINFALL EVENT. NECESSARY REPAIRS SHALL BE MADE IMMEDIATELY.

CONSTRUCTION SEQUENCE:

1. OBTAIN NCDEQ PERMIT/ APPROVAL TO PROCEED.
2. SCHEDULE A PRE-CONSTRUCTION MEETING WITH NCDEQ DIVISION OF LAND QUALITY (336) 776-9800. FAILURE TO PERFORM THIS STEP BEFORE PERFORMING LAND DISTURBING ACTIVITIES MAY RESULT IN A NOTICE OF VIOLATION OR FINES.
3. LOCATE ALL EXISTING UTILITIES WITHIN THE PROJECT AREA (PUBLIC AND PRIVATE).
4. STAKE LIMITS OF DISTURBANCE.
5. INSTALL TEMPORARY CONSTRUCTION ENTRANCE, SILT FENCE, SILT FENCE STONE OUTLETS, SEDIMENT BASINS, CHECK DAMS AND TEMPORARY DIVERSION DITCHES AS SHOWN ON APPROVED PLANS. ADJUST SILT FENCE STONE OUTLET LOCATION PER FIELD CONDITIONS.
6. CALL NCDEQ DIVISION OF LAND QUALITY FOR INSPECTION (336) 776-9800.
7. UPON APPROVAL, COMMENCE PERMITTED LAND DISTURBING ACTIVITIES AS SHOWN ON APPROVED PLANS.
8. STABILIZE SITE AS AREAS ARE BROUGHT UP TO FINISHED GRADE. STABILIZATION IS REQUIRED PER NCDEQ REQUIREMENTS AFTER COMPLETION OF ANY PHASE OF GRADING OR INACTIVITY ON ANY PROJECT.
9. MAINTAIN POSITIVE DRAINAGE AT ALL TIMES.
10. MAINTAIN EROSION CONTROL MEASURES THROUGHOUT CONSTRUCTION.
11. UPON COMPLETION OF CONSTRUCTION, SEED AND STABILIZE ALL REMAINING DISTURBED AREAS.
12. CALL NCDEQ FOR INSPECTION.
13. REMOVE SILT FENCING AND SEDIMENT BASINS ONLY AFTER A GOOD STAND OF GRASS HAS BECOME ESTABLISHED AND ONLY WITH SPECIFIC APPROVAL OF NCDEQ DIVISION OF LAND QUALITY. REFER TO SEDIMENT BASIN REMOVAL SEQUENCE.
14. SEED RESULTING DISTURBED AREAS.

SEDIMENT BASIN REMOVAL SEQUENCE:

1. ONCE A GOOD STAND OF GRASS HAS BEEN ESTABLISHED AND APPROVAL FROM NCDEQ HAS BEEN OBTAINED, SEDIMENT BASINS SHALL BE REMOVED.
2. DEWATER BASINS USING A DEWATERING SOCK.
3. REMOVE SKIMMER DEVICE, SEDIMENT, PVC/HDPE PIPING, RISER OUTLET STRUCTURE, COIR FIBER BAFFLES AND RIPRAP APRONS.
4. BREACH DAMS AND USE DAM MATERIAL AND ASSOCIATED STOCKPILE TO FILL IN THE BASIN. GRADE THE BASIN AREA TO FINISHED GRADE AS SHOWN ON APPROVED PLANS. MAINTAIN POSITIVE DRAINAGE AT ALL TIMES.
5. SEED AND STABILIZE BASIN BOTTOM, SLOPES AND ALL DISTURBED AREAS IMMEDIATELY.

PRELIMINARY - NOT RELEASED FOR CONSTRUCTION

ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH CASWELL COUNTY, NCDEQ AND NCDOT STANDARDS, SPECIFICATIONS, AND DETAILS

NORTH CAROLINA PROFESSIONAL SEAL 022530 ENGINEER RICHARD W. BAKER, III
04/24/2020

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5410 Trinity Road, Suite 102 | Raleigh, NC 27607
TEL 919.866.4951 FAX 919.833.8124 www.timmons.com

YOUR VISION ACHIEVED THROUGH OURS.

REVISION DESCRIPTION	DATE
ADDRESSED NCDEQ COMMENTS	04/24/2020

DATE	2019-08-22
DRAWN BY	T. DAEKE
DESIGNED BY	S. MOORE
CHECKED BY	R. BAKER
SCALE	AS SHOWN

TIMMONS GROUP
NORTH CAROLINA LICENSE NO. C-1652

PROSPECT HILL QUARRY AND DISTRIBUTION CENTER
PROSPECT HILL - CASWELL COUNTY - NORTH CAROLINA

EROSION CONTROL PLAN OVERVIEW

JOB NO. 44089.001

SHEET NO. C2.00

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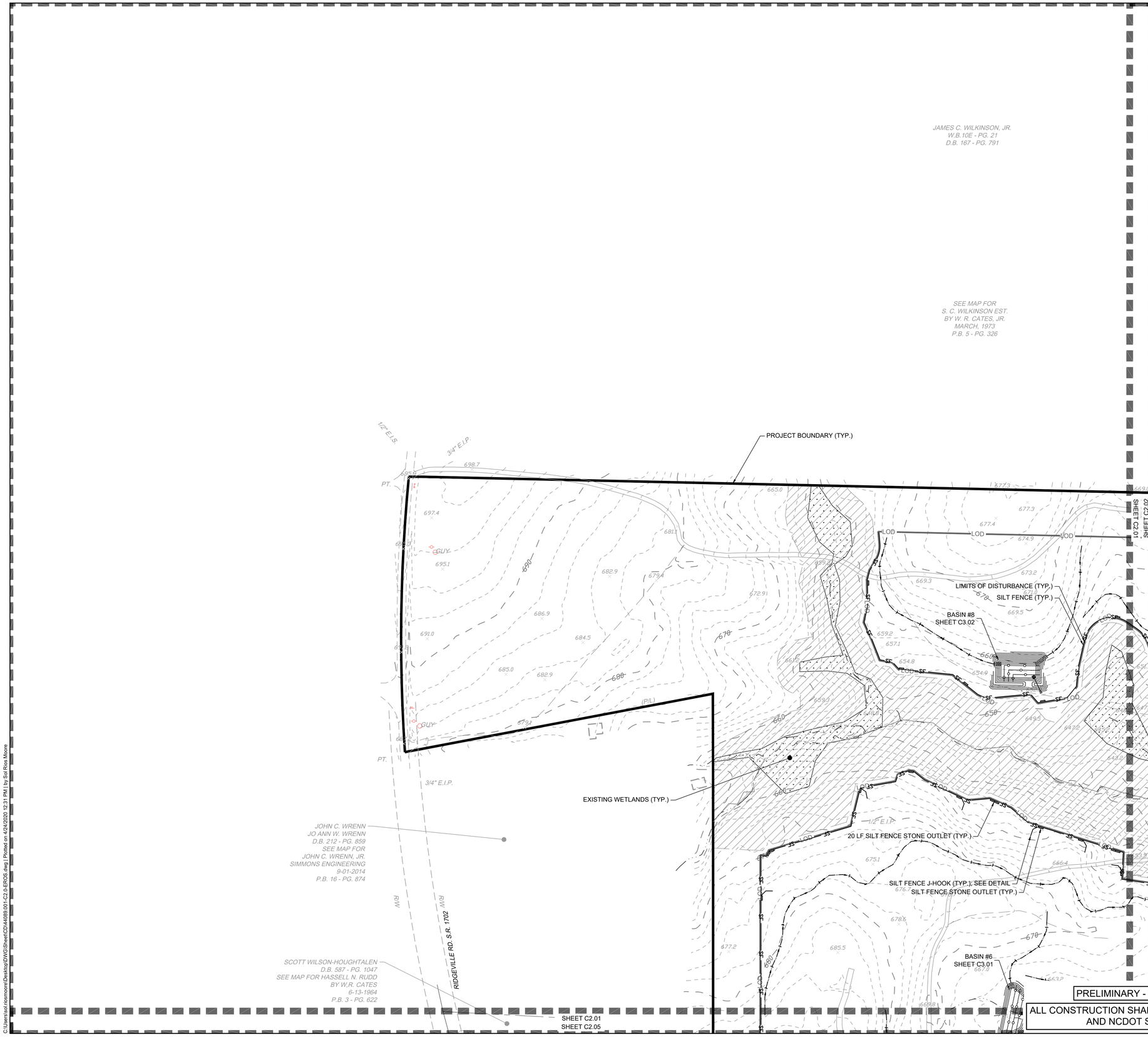
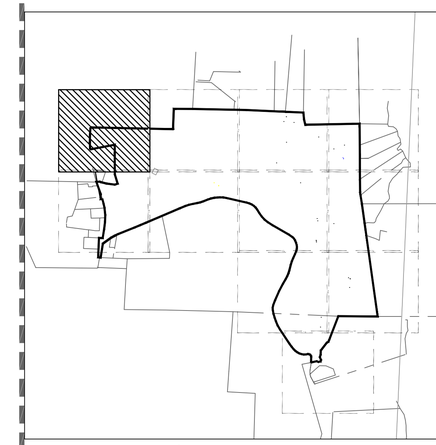


EROSION CONTROL LEGEND

LOD	LIMITS OF DISTURBANCE
SF	SILT FENCE
	SILT FENCE STONE OUTLET
	TEMPORARY CONSTRUCTION ENTRANCE
	TEMPORARY CHECK DAM



PROJECT KEY
N.T.S.

PRELIMINARY - NOT RELEASED FOR CONSTRUCTION

ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH CASWELL COUNTY, NCDEQ AND NCDOT STANDARDS, SPECIFICATIONS, AND DETAILS

NORTH CAROLINA PROFESSIONAL SEAL 022530 ENGINEER RICHARD W. BAKER, III
04/24/2020

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DATE	REVISION DESCRIPTION
04/24/2020	ADDRESSED NCDEQ COMMENTS

DATE: 2019-08-22
DRAWN BY: T. DAEKE
DESIGNED BY: S. MOORE
CHECKED BY: R. BAKER
SCALE: AS SHOWN

TIMMONS GROUP

NORTH CAROLINA LICENSE NO. C-1652

PROSPECT HILL QUARRY AND DISTRIBUTION CENTER

PROSPECT HILL - CASWELL COUNTY - NORTH CAROLINA

EROSION CONTROL PLAN ENLARGEMENT # 1

JOB NO. 44089.001
SHEET NO. C2.01

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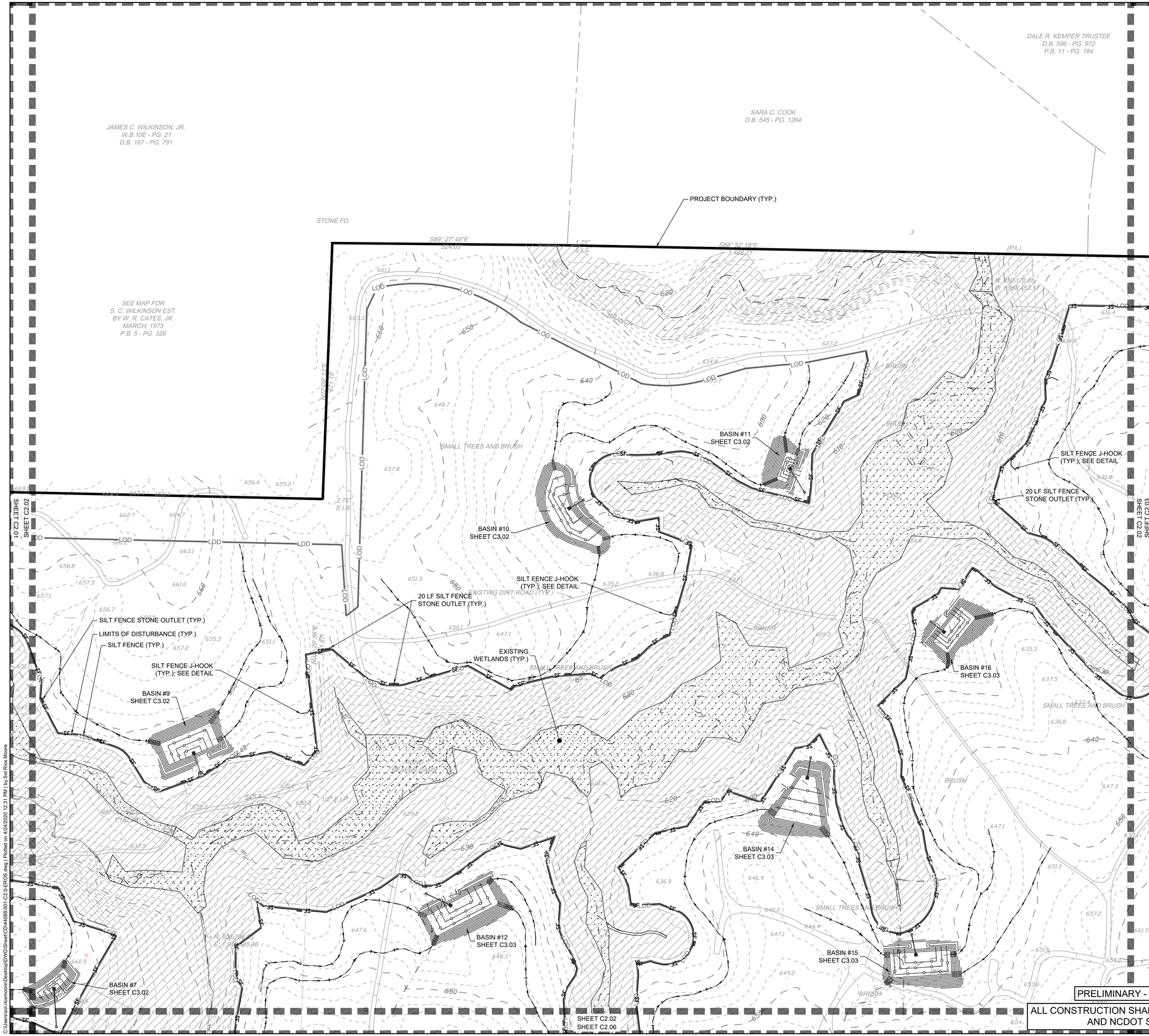
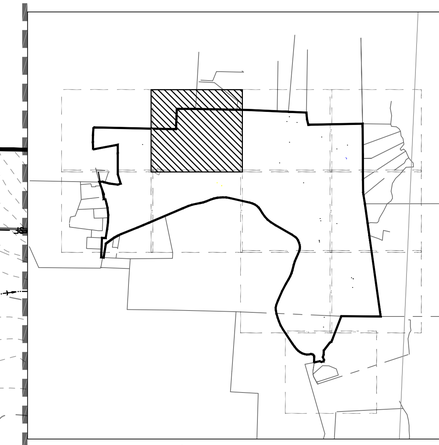


EROSION CONTROL LEGEND

LOD	LIMITS OF DISTURBANCE
SF	SILT FENCE
	SILT FENCE STONE OUTLET
	TEMPORARY CONSTRUCTION ENTRANCE
	TEMPORARY CHECK DAM



PROJECT KEY
N.T.S.

PRELIMINARY - NOT RELEASED FOR CONSTRUCTION

ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH CASWELL COUNTY, NCDEQ AND NCDOT STANDARDS, SPECIFICATIONS, AND DETAILS

NORTH CAROLINA PROFESSIONAL SEAL 022530 ENGINEER RICHARD W. BAKER, III
04/24/2020

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DATE	REVISION DESCRIPTION
04/24/2020	ADDRESSED NCDEQ COMMENTS

DATE	2019-08-22
DRAWN BY	T. DAEKE
DESIGNED BY	S. MOORE
CHECKED BY	R. BAKER
SCALE	AS SHOWN

TIMMONS GROUP
NORTH CAROLINA LICENSE NO. C-1652

PROSPECT HILL QUARRY AND DISTRIBUTION CENTER
PROSPECT HILL - CASWELL COUNTY - NORTH CAROLINA

EROSION CONTROL PLAN ENLARGEMENT #2

JOB NO. 44089.001

SHEET NO. C2.02

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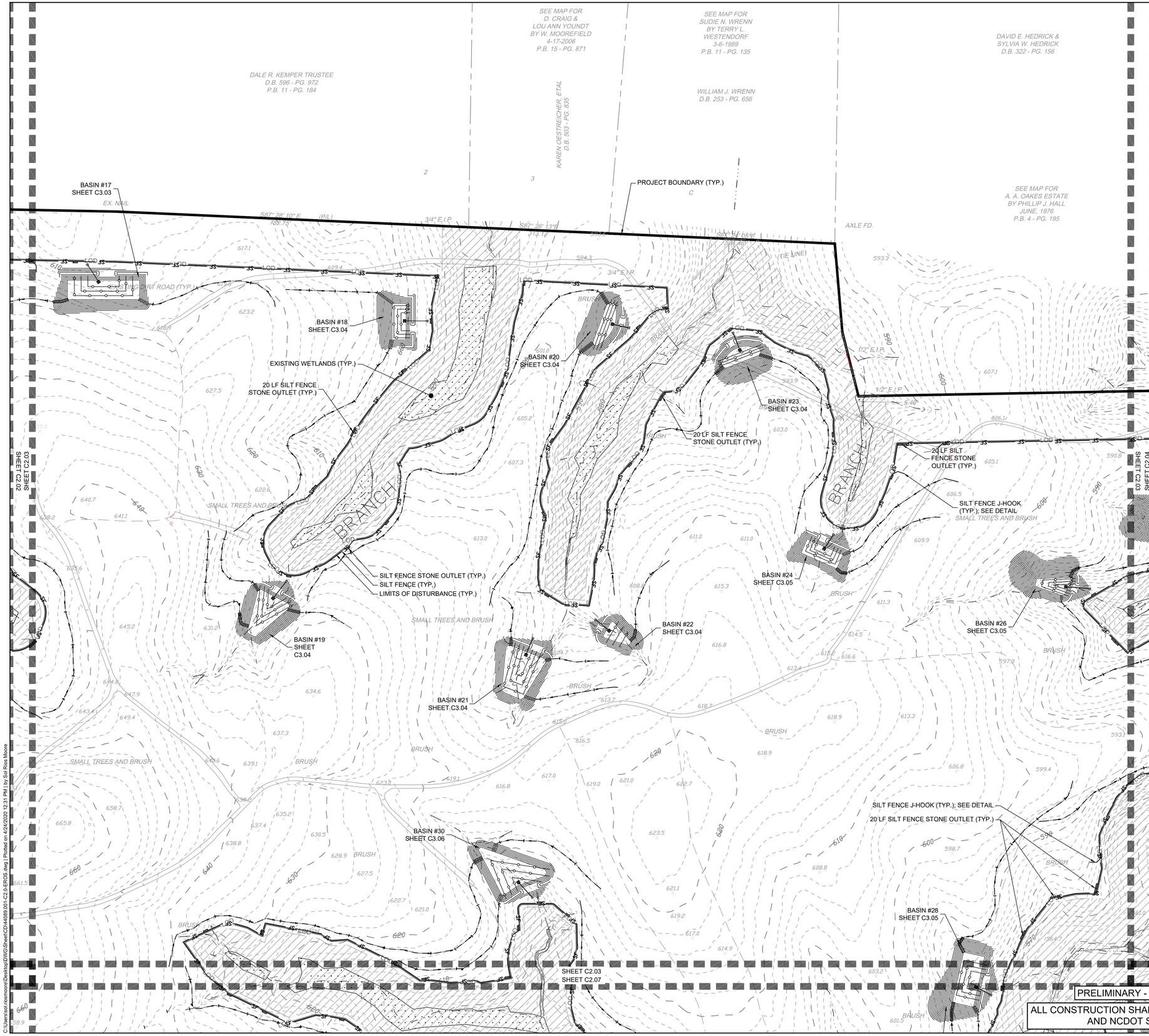

PRELIMINARY - NOT RELEASED FOR CONSTRUCTION

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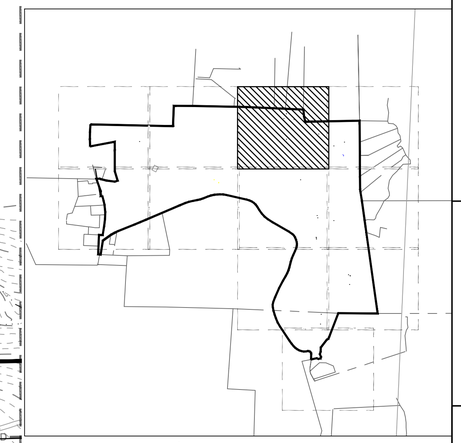
EROSION CONTROL LEGEND

LOD	LIMITS OF DISTURBANCE
SF	SILT FENCE
	SILT FENCE STONE OUTLET
	TEMPORARY CONSTRUCTION ENTRANCE
	TEMPORARY CHECK DAM



PROJECT KEY
N.T.S.

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DATE	2019-08-22
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CHECKED BY	R. BAKER
SCALE	AS SHOWN

TIMMONS GROUP

NORTH CAROLINA LICENSE NO. C-1652

PROSPECT HILL QUARRY AND DISTRIBUTION CENTER

PROSPECT HILL - CASWELL COUNTY - NORTH CAROLINA

EROSION CONTROL PLAN ENLARGEMENT #3

JOB NO. 44089.001

SHEET NO. C2.03

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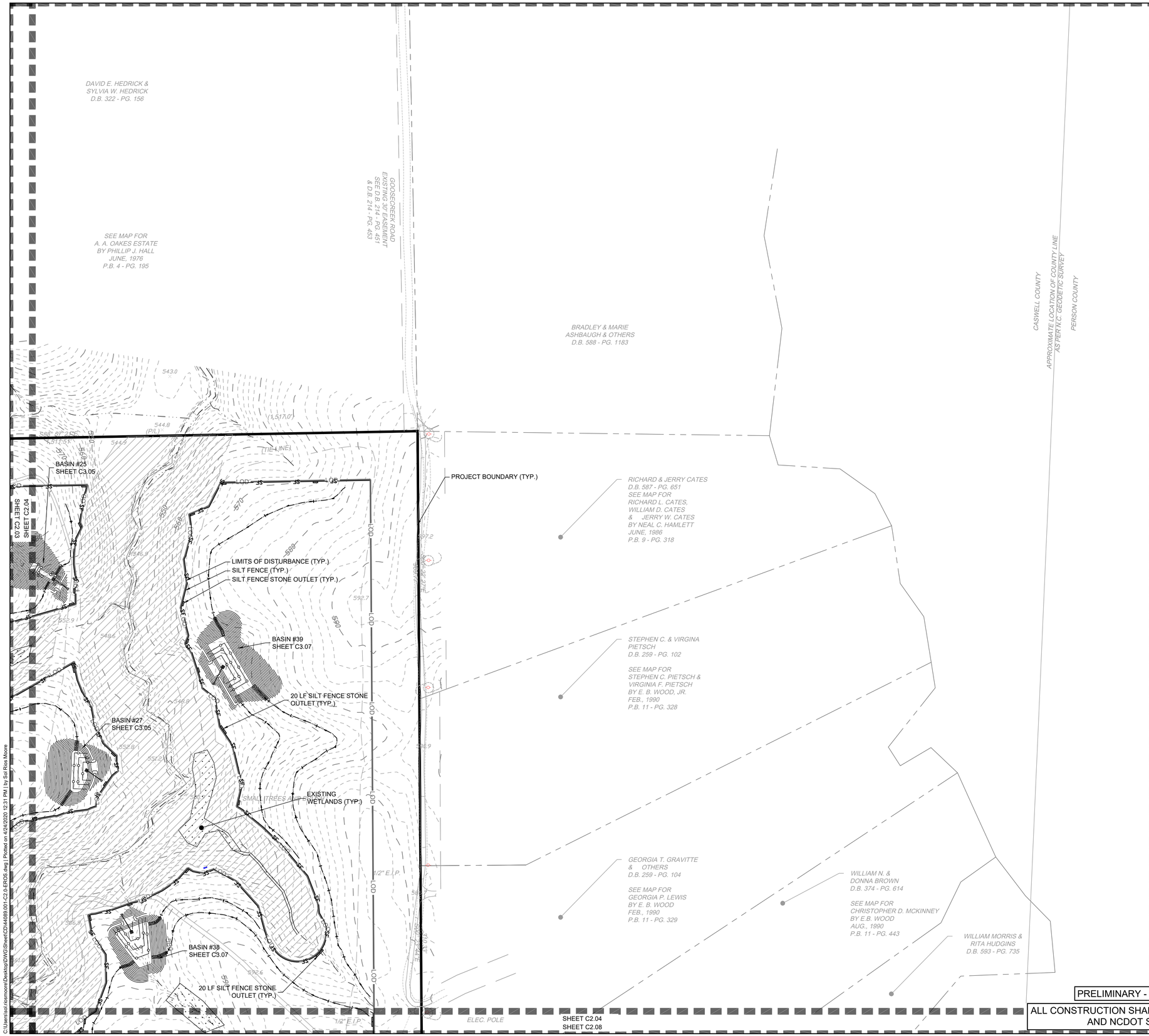
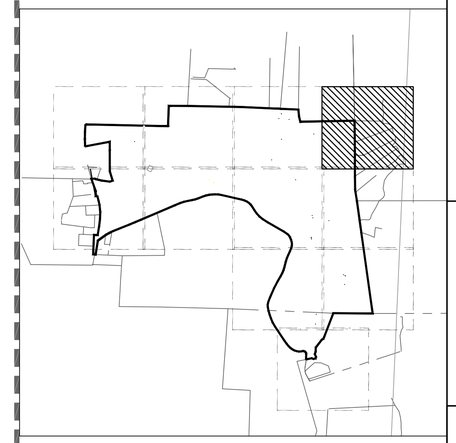


EROSION CONTROL LEGEND

LOD	LIMITS OF DISTURBANCE
SF	SILT FENCE
	SILT FENCE STONE OUTLET
	TEMPORARY CONSTRUCTION ENTRANCE
	TEMPORARY CHECK DAM



PROJECT KEY
N.T.S.

PRELIMINARY - NOT RELEASED FOR CONSTRUCTION

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SCALE	AS SHOWN

TIMMONS GROUP

NORTH CAROLINA LICENSE NO. C-1652

PROSPECT HILL QUARRY AND DISTRIBUTION CENTER

PROSPECT HILL - CASWELL COUNTY - NORTH CAROLINA

EROSION CONTROL PLAN ENLARGEMENT #4

JOB NO. 44089.001

SHEET NO. C2.04

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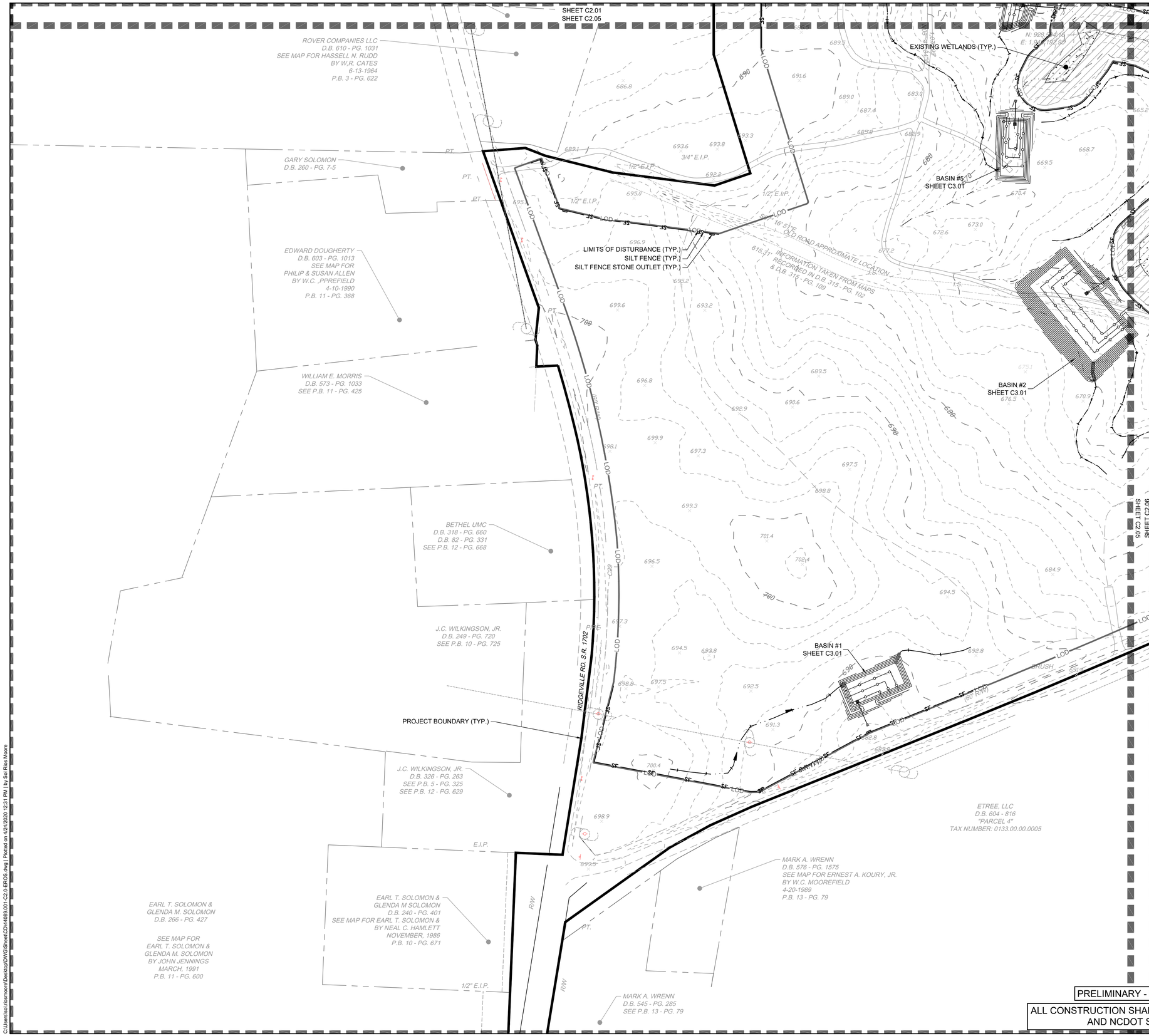
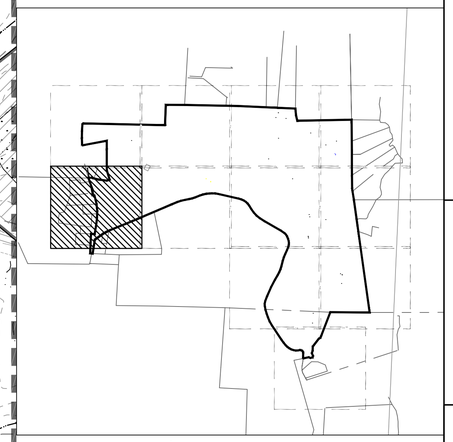


EROSION CONTROL LEGEND

LOD	LIMITS OF DISTURBANCE
SF SF	SILT FENCE
	SILT FENCE STONE OUTLET
	TEMPORARY CONSTRUCTION ENTRANCE
	TEMPORARY CHECK DAM



PROJECT KEY
N.T.S.

PRELIMINARY - NOT RELEASED FOR CONSTRUCTION

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DATE: 2019-08-22
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DESIGNED BY: S. MOORE
CHECKED BY: R. BAKER
SCALE: AS SHOWN

TIMMONS GROUP

NORTH CAROLINA LICENSE NO. C-1652

PROSPECT HILL QUARRY AND DISTRIBUTION CENTER

PROSPECT HILL - CASWELL COUNTY - NORTH CAROLINA

EROSION CONTROL PLAN ENLARGEMENT #5

JOB NO. 44089.001

SHEET NO. C2.05

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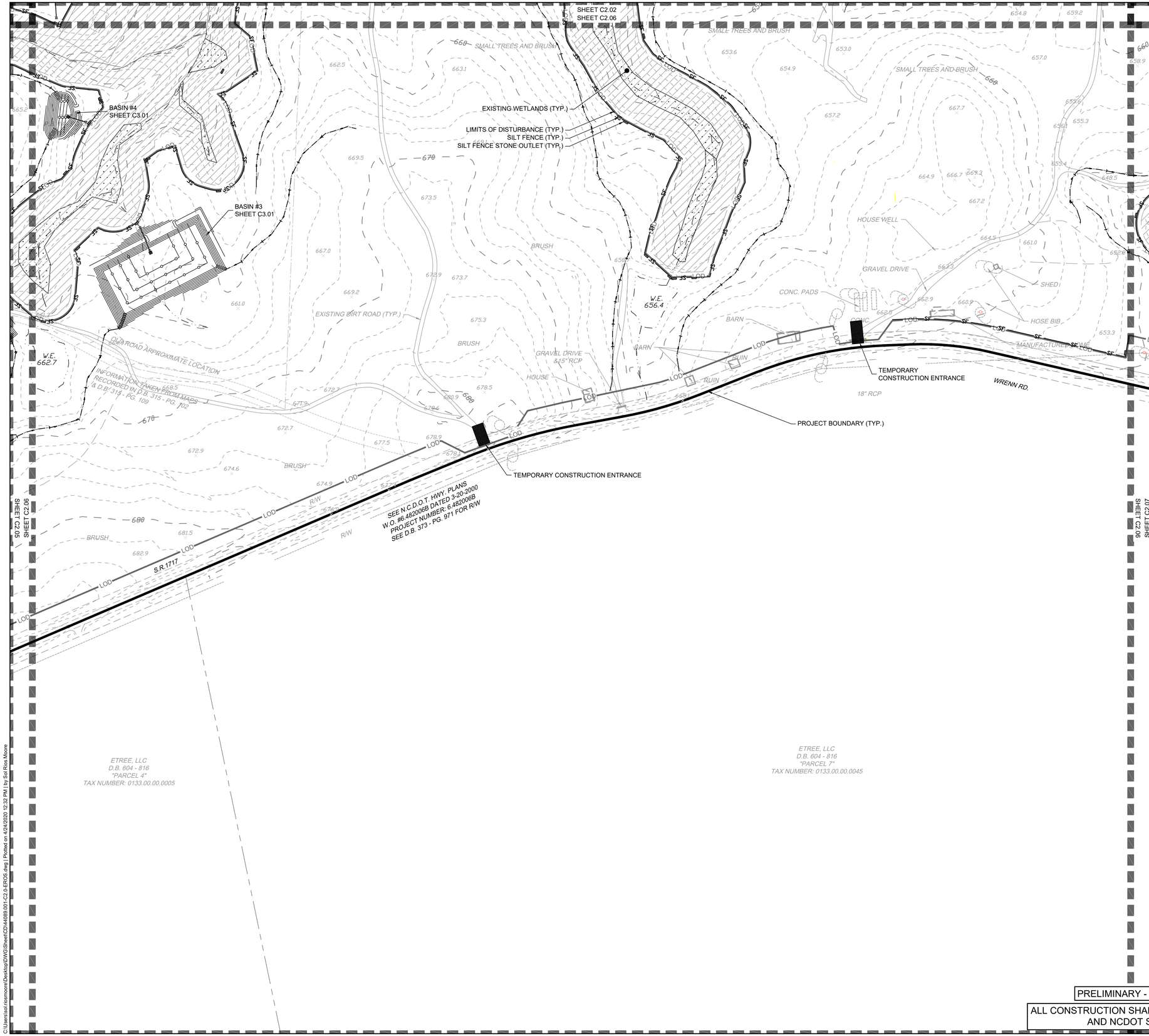
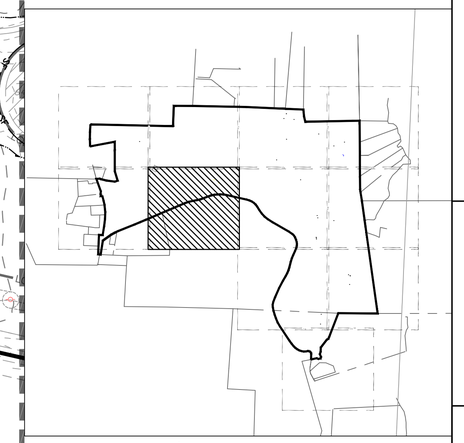


EROSION CONTROL LEGEND

LOD	LIMITS OF DISTURBANCE
SF	SILT FENCE
	SILT FENCE STONE OUTLET
	TEMPORARY CONSTRUCTION ENTRANCE
	TEMPORARY CHECK DAM



PROJECT KEY
N.T.S.

NAD 83

SCALE 1"=100'
0 100' 200'

PRELIMINARY - NOT RELEASED FOR CONSTRUCTION

ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH CASWELL COUNTY, NCDEQ AND NCDOT STANDARDS, SPECIFICATIONS, AND DETAILS

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REVISION	DESCRIPTION
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DATE
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DATE	2019-08-22
DRAWN BY	T. DAEKE
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CHECKED BY	R. BAKER
SCALE	AS SHOWN

TIMMONS GROUP
NORTH CAROLINA LICENSE NO. C-1652

PROSPECT HILL QUARRY AND DISTRIBUTION CENTER
PROSPECT HILL - CASWELL COUNTY - NORTH CAROLINA
EROSION CONTROL PLAN ENLARGEMENT #6

JOB NO. 44089.001
SHEET NO. C2.06

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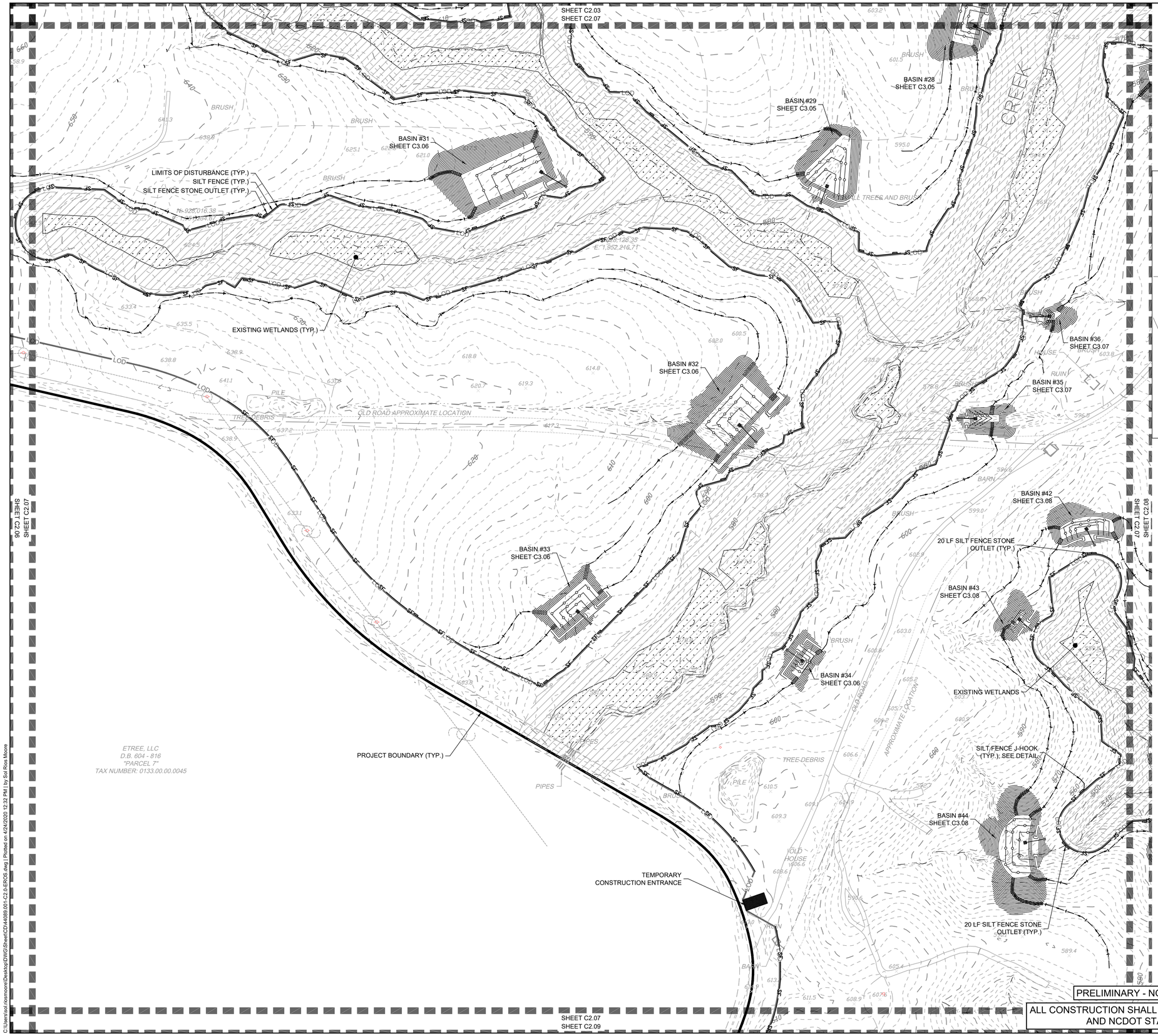
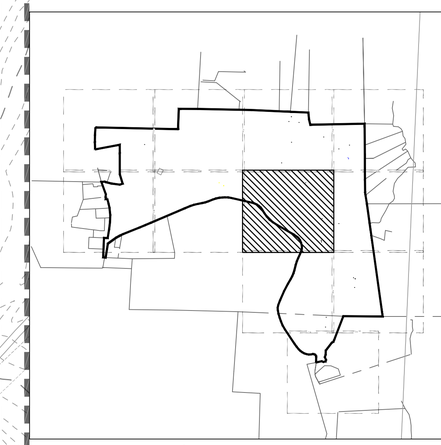


EROSION CONTROL LEGEND

LOD	LIMITS OF DISTURBANCE
SF	SILT FENCE
	SILT FENCE STONE OUTLET
	TEMPORARY CONSTRUCTION ENTRANCE
	TEMPORARY CHECK DAM



PROJECT KEY
N.T.S.

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DESIGNED BY	S. MOORE
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SCALE	AS SHOWN

TIMMONS GROUP

NORTH CAROLINA LICENSE NO. C-1652

PROSPECT HILL QUARRY AND DISTRIBUTION CENTER

PROSPECT HILL - CASWELL COUNTY - NORTH CAROLINA

EROSION CONTROL PLAN ENLARGEMENT #7

JOB NO. 44089.001

SHEET NO. C2.07

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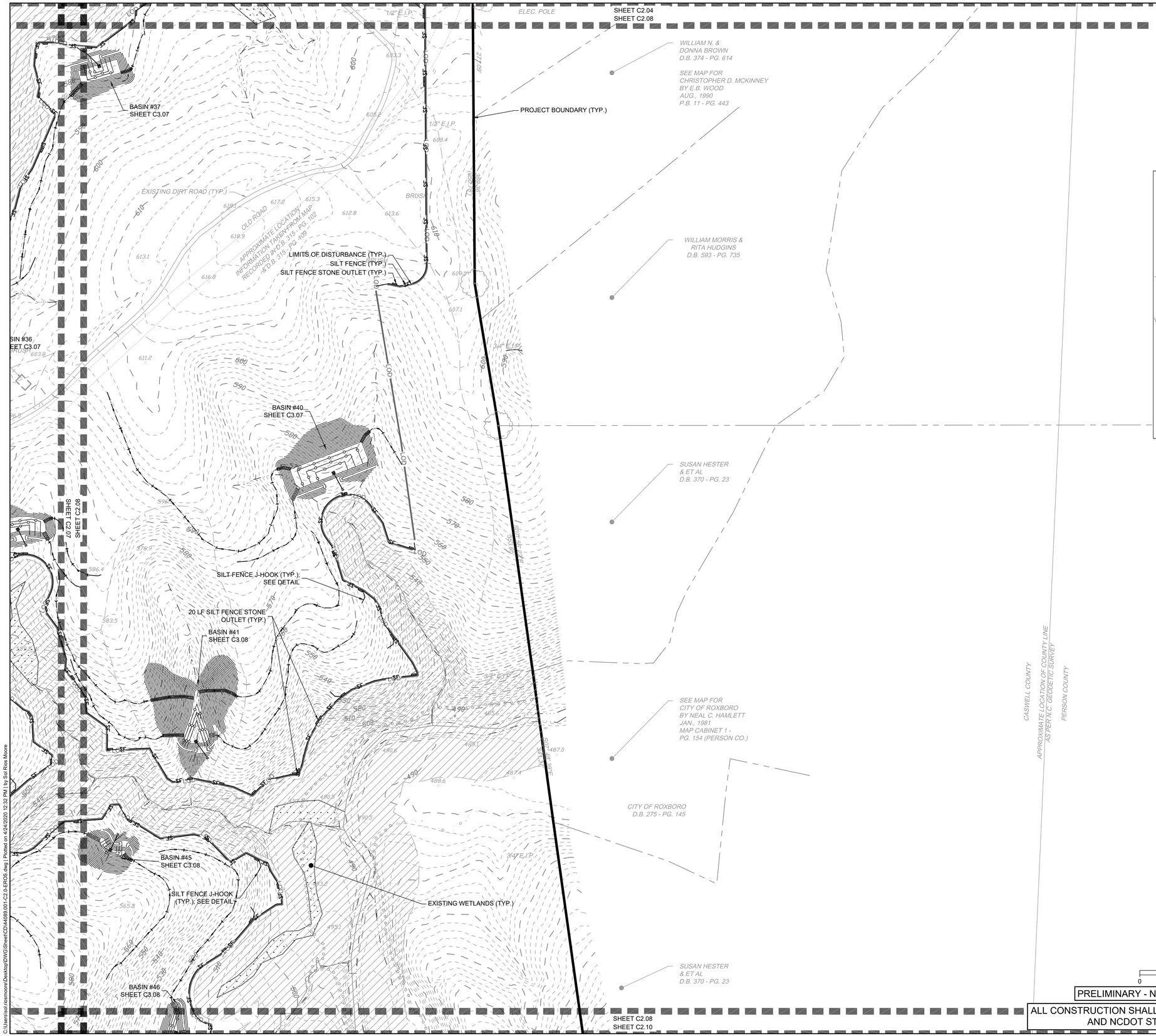
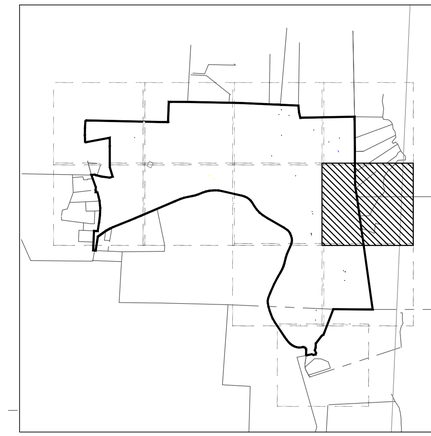


EROSION CONTROL LEGEND

LOD	LIMITS OF DISTURBANCE
SF	SILT FENCE
	SILT FENCE STONE OUTLET
	TEMPORARY CONSTRUCTION ENTRANCE
	TEMPORARY CHECK DAM



PROJECT KEY
N.T.S.

PRELIMINARY - NOT RELEASED FOR CONSTRUCTION

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DESIGNED BY S. MOORE
CHECKED BY R. BAKER
SCALE AS SHOWN

TIMMONS GROUP

NORTH CAROLINA LICENSE NO. C-1652

PROSPECT HILL QUARRY AND DISTRIBUTION CENTER

PROSPECT HILL - CASWELL COUNTY - NORTH CAROLINA

EROSION CONTROL PLAN ENLARGEMENT #8

JOB NO. 44089.001
SHEET NO. C2.08

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SHEET C2.07
SHEET C2.09

ETREE, LLC
D.B. 604 - 816
"PARCEL 7"
TAX NUMBER: 0133.00.00.0045

WRENN RD.

BASIN #46
SHEET C3.08

BASIN #47
SHEET C3.09

EXISTING WETLANDS (TYP.)

BASIN #49
SHEET C3.09

BASIN #50
SHEET C3.09

SHEET C2.09
SHEET C2.10

20 LF SILT FENCE STONE OUTLET (TYP.)

EXISTING DIRT ROAD (TYP.)

BASIN #55
SHEET C3.10

BASIN #52
SHEET C3.10

20 LF SILT FENCE STONE OUTLET (TYP.)
SILT FENCE J-HOOK (TYP.); SEE DETAIL

SILT FENCE (TYP.)
LIMITS OF DISTURBANCE (TYP.)
SILT FENCE STONE OUTLET (TYP.)

20 LF SILT FENCE STONE OUTLET (TYP.)

BASIN #53
SHEET C3.10

PROJECT BOUNDARY (TYP.)

SEE MAP FOR C. S. PAINTER LANDS
BY W. R. CATES
8-24-1938
P.B. 12 - PG. 661

ETREE, LLC
D.B. 604 - PG. 816
"PARCEL 6"
TAX NUMBER: 0148.00.00.0002

(PAVED)

SHEET C2.09
SHEET C2.11

EROSION CONTROL LEGEND

LOD	LIMITS OF DISTURBANCE
SF	SILT FENCE
	SILT FENCE STONE OUTLET
	TEMPORARY CONSTRUCTION ENTRANCE
	TEMPORARY CHECK DAM

PROJECT KEY
N.T.S.

NAD 83

SCALE 1"=100'
0 100' 200'

PRELIMINARY - NOT RELEASED FOR CONSTRUCTION

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NORTH CAROLINA PROFESSIONAL SEAL 022530 ENGINEER RICHARD W. BAKER, III
04/24/2020

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DATE	2019-08-22
DRAWN BY	T. DAEKE
DESIGNED BY	S. MOORE
CHECKED BY	R. BAKER
SCALE	AS SHOWN

TIMMONS GROUP
NORTH CAROLINA LICENSE NO. C-1652

PROSPECT HILL QUARRY AND DISTRIBUTION CENTER

PROSPECT HILL - CASWELL COUNTY - NORTH CAROLINA

EROSION CONTROL PLAN ENLARGEMENT #9

JOB NO. 44089.001

SHEET NO. C2.09

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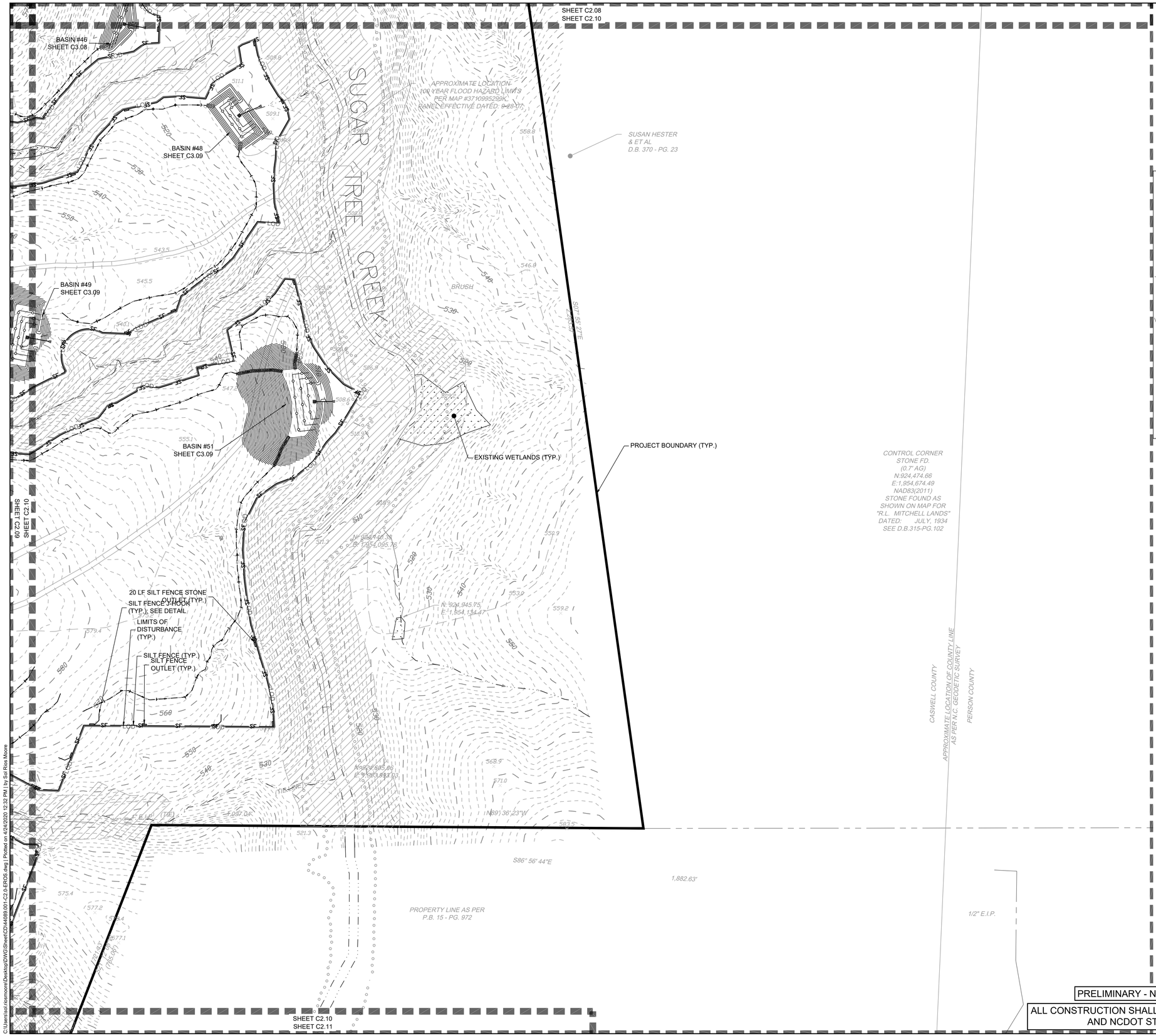
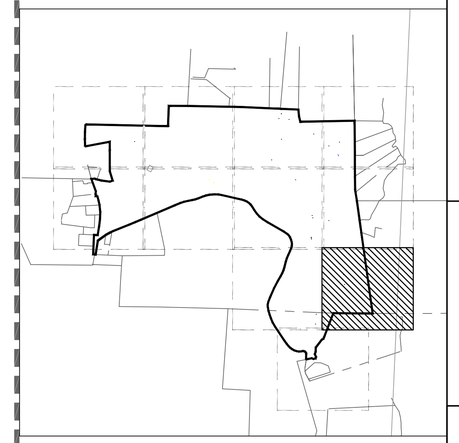


EROSION CONTROL LEGEND

LOD	LIMITS OF DISTURBANCE
SF	SILT FENCE
	SILT FENCE STONE OUTLET
	TEMPORARY CONSTRUCTION ENTRANCE
	TEMPORARY CHECK DAM



PROJECT KEY
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ADDRESSED NCDEQ COMMENTS	04/24/2020

DATE: 2019-08-22
DRAWN BY: T. DAEKE
DESIGNED BY: S. MOORE
CHECKED BY: R. BAKER
SCALE: AS SHOWN

TIMMONS GROUP

NORTH CAROLINA LICENSE NO. C-1652

PROSPECT HILL QUARRY AND DISTRIBUTION CENTER

PROSPECT HILL - CASWELL COUNTY - NORTH CAROLINA

EROSION CONTROL PLAN ENLARGEMENT #10

JOB NO. 44089.001
SHEET NO. C2.10

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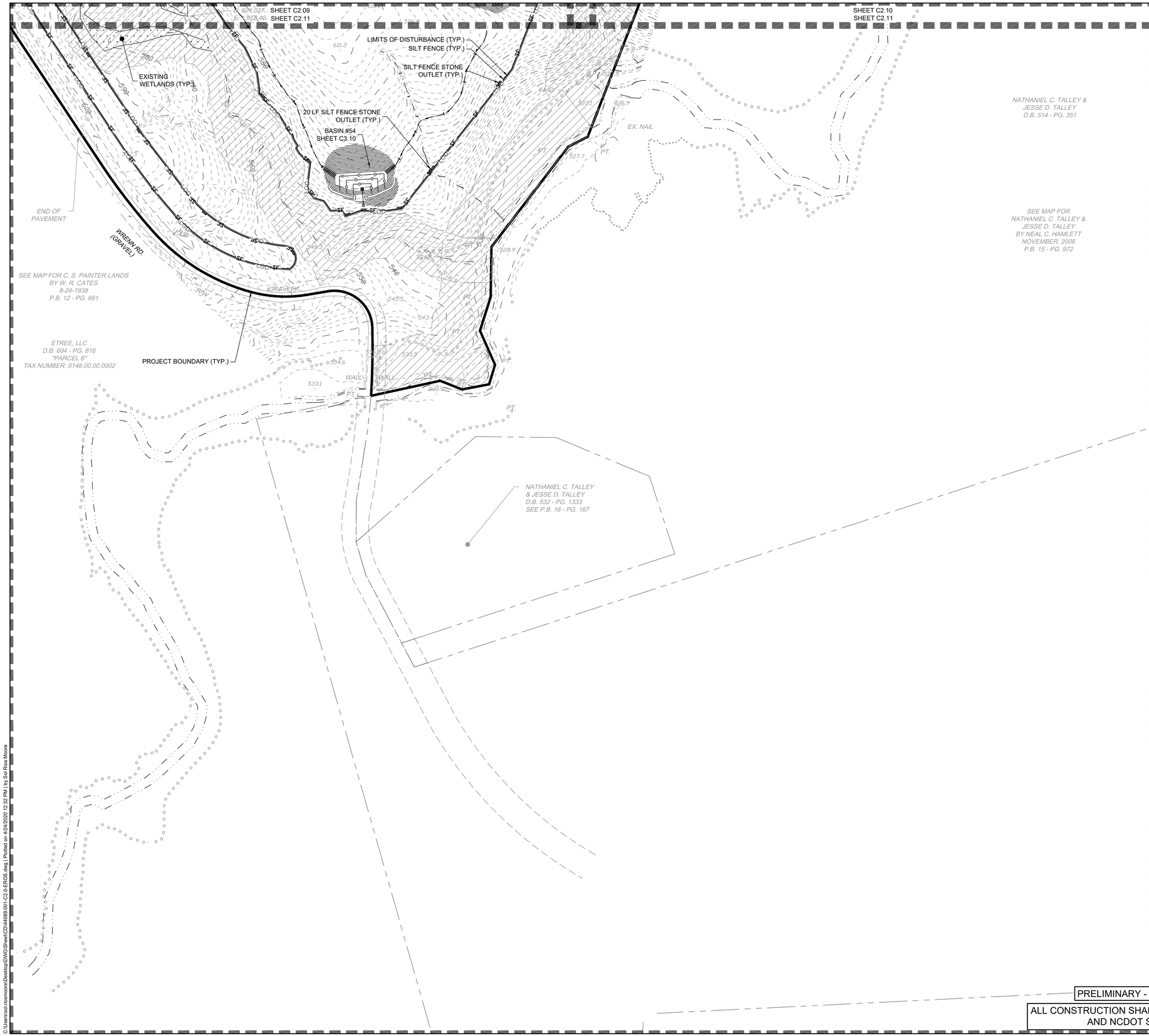
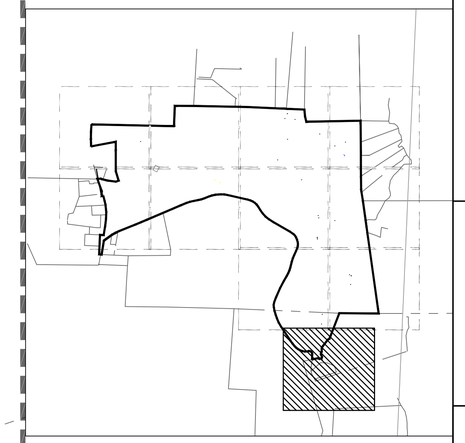


EROSION CONTROL LEGEND

LOD	LIMITS OF DISTURBANCE
SF	SILT FENCE
	SILT FENCE STONE OUTLET
	TEMPORARY CONSTRUCTION ENTRANCE
	TEMPORARY CHECK DAM



PROJECT KEY
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DESIGNED BY: S. MOORE
CHECKED BY: R. BAKER
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PROSPECT HILL QUARRY AND DISTRIBUTION CENTER
PROSPECT HILL - CASWELL COUNTY - NORTH CAROLINA
EROSION CONTROL PLAN ENLARGEMENT #11

JOB NO. 44089.001
SHEET NO. C2.11

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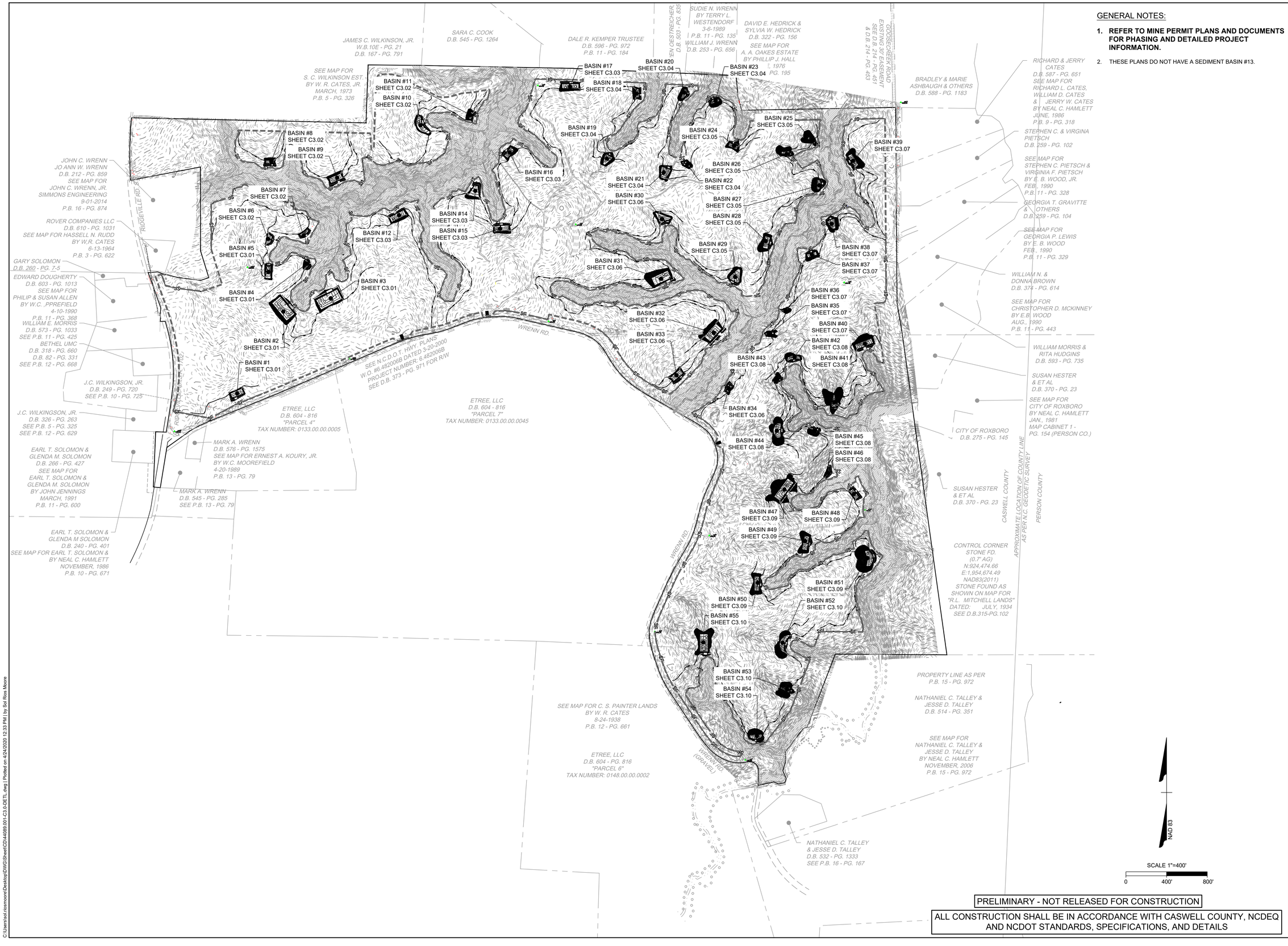

GENERAL NOTES:

1. **REFER TO MINE PERMIT PLANS AND DOCUMENTS FOR PHASING AND DETAILED PROJECT INFORMATION.**
2. THESE PLANS DO NOT HAVE A SEDIMENT BASIN #13.

PRELIMINARY - NOT RELEASED FOR CONSTRUCTION

ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH CASWELL COUNTY, NCDEQ AND NCDOT STANDARDS, SPECIFICATIONS, AND DETAILS

NORTH CAROLINA PROFESSIONAL SEAL 022530 ENGINEER RICHARD W. BAKER, III

04/24/2020

THIS DRAWING PREPARED AT THE
RALEIGH OFFICE
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REVISION DESCRIPTION	DATE
ADDRESSED NCDEQ COMMENTS	04/24/2020

DATE	2019-08-22
DRAWN BY	T. DAEKE
DESIGNED BY	S. MOORE
CHECKED BY	R. BAKER
SCALE	AS SHOWN

TIMMONS GROUP

NORTH CAROLINA LICENSE NO. C-1652

PROSPECT HILL QUARRY AND DISTRIBUTION CENTER

PROSPECT HILL - CASWELL COUNTY - NORTH CAROLINA

SEDIMENT BASINS OVERVIEW

JOB NO. 44089.001

SHEET NO. C3.00

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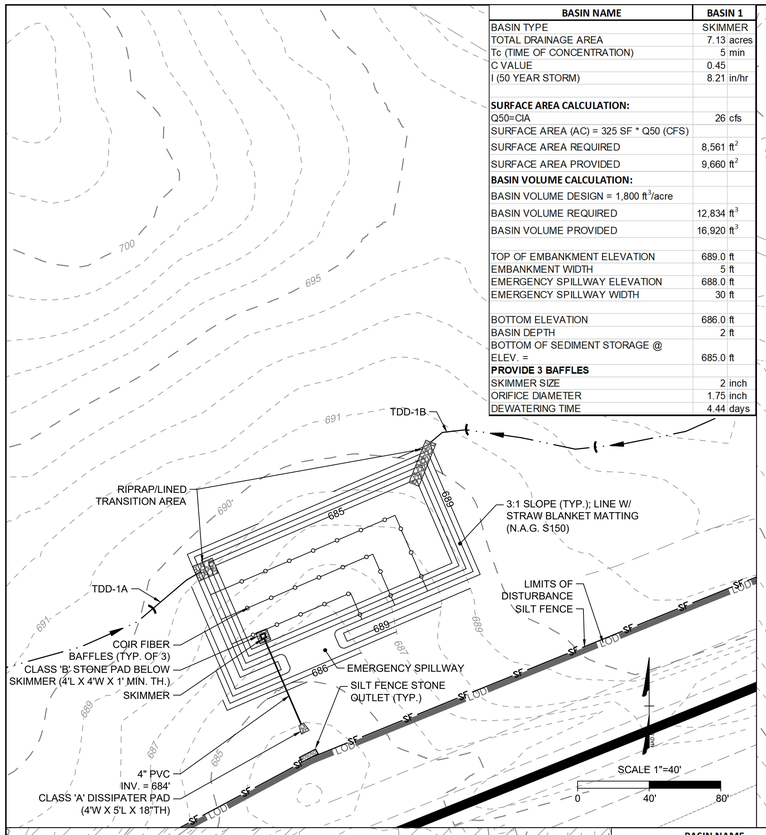
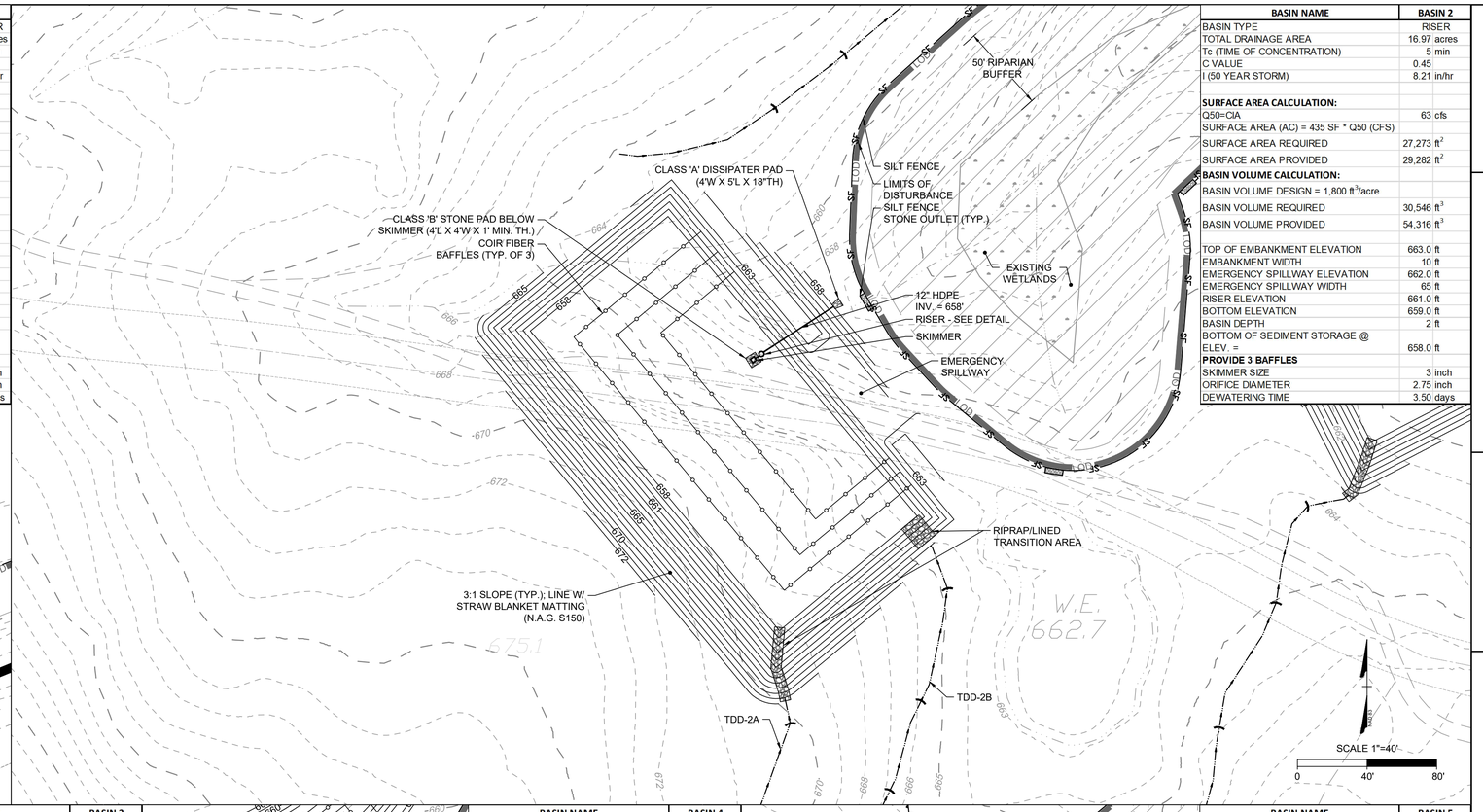
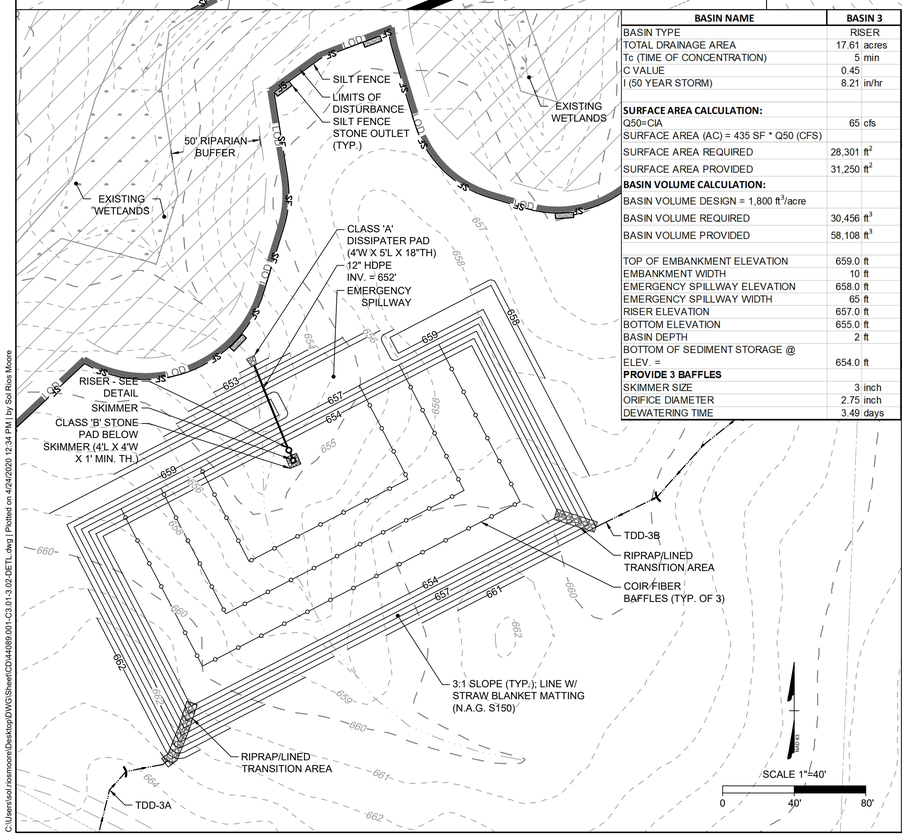
BASIN NAME	BASIN 1
BASIN TYPE	SKIMMER
TOTAL DRAINAGE AREA	7.13 acres
Tc (TIME OF CONCENTRATION)	5 min
C VALUE	0.45
I (50 YEAR STORM)	8.21 in/hr
SURFACE AREA CALCULATION:	
Q50=CIA	26 cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)	
SURFACE AREA REQUIRED	8,561 ft^2
SURFACE AREA PROVIDED	9,660 ft^2
BASIN VOLUME CALCULATION:	
BASIN VOLUME DESIGN = 1,800 ft^3/acre	
BASIN VOLUME REQUIRED	12,834 ft^3
BASIN VOLUME PROVIDED	16,920 ft^3
TOP OF EMBANKMENT ELEVATION	689.0 ft
EMBANKMENT WIDTH	5 ft
EMERGENCY SPILLWAY ELEVATION	688.0 ft
EMERGENCY SPILLWAY WIDTH	30 ft
BOTTOM ELEVATION	686.0 ft
BASIN DEPTH	2 ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	685.0 ft
PROVIDE 3 BAFFLES	
SKIMMER SIZE	2 inch
ORIFICE DIAMETER	1.75 inch
DEWATERING TIME	4.44 days



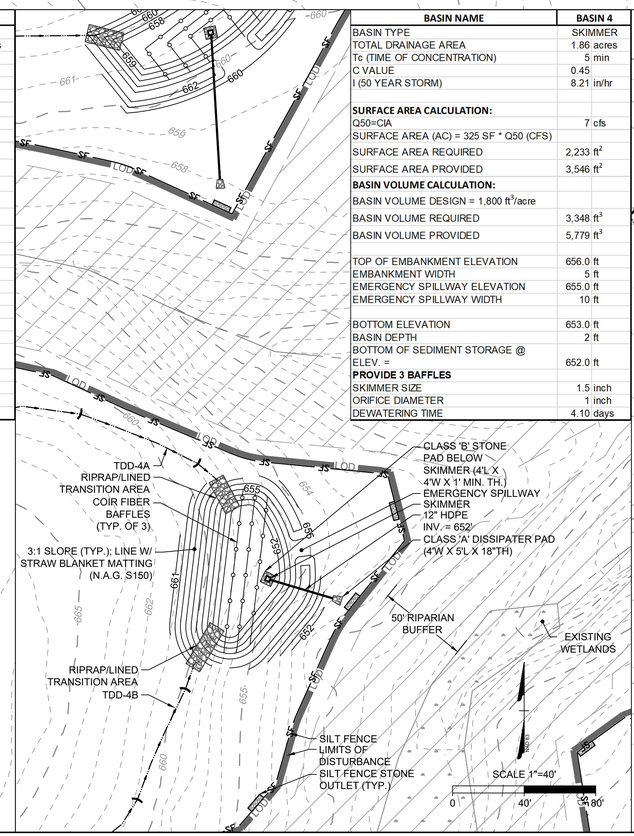
BASIN NAME	BASIN 2
BASIN TYPE	RISER
TOTAL DRAINAGE AREA	16.97 acres
Tc (TIME OF CONCENTRATION)	5 min
C VALUE	0.45
I (50 YEAR STORM)	8.21 in/hr
SURFACE AREA CALCULATION:	
Q50=CIA	63 cfs
SURFACE AREA (AC) = 435 SF * Q50 (CFS)	
SURFACE AREA REQUIRED	27,273 ft^2
SURFACE AREA PROVIDED	29,282 ft^2
BASIN VOLUME CALCULATION:	
BASIN VOLUME DESIGN = 1,800 ft^3/acre	
BASIN VOLUME REQUIRED	30,546 ft^3
BASIN VOLUME PROVIDED	54,316 ft^3
TOP OF EMBANKMENT ELEVATION	663.0 ft
EMBANKMENT WIDTH	10 ft
EMERGENCY SPILLWAY ELEVATION	662.0 ft
EMERGENCY SPILLWAY WIDTH	65 ft
RISER ELEVATION	661.0 ft
BOTTOM ELEVATION	659.0 ft
BASIN DEPTH	2 ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	658.0 ft
PROVIDE 3 BAFFLES	
SKIMMER SIZE	3 inch
ORIFICE DIAMETER	2.75 inch
DEWATERING TIME	3.50 days



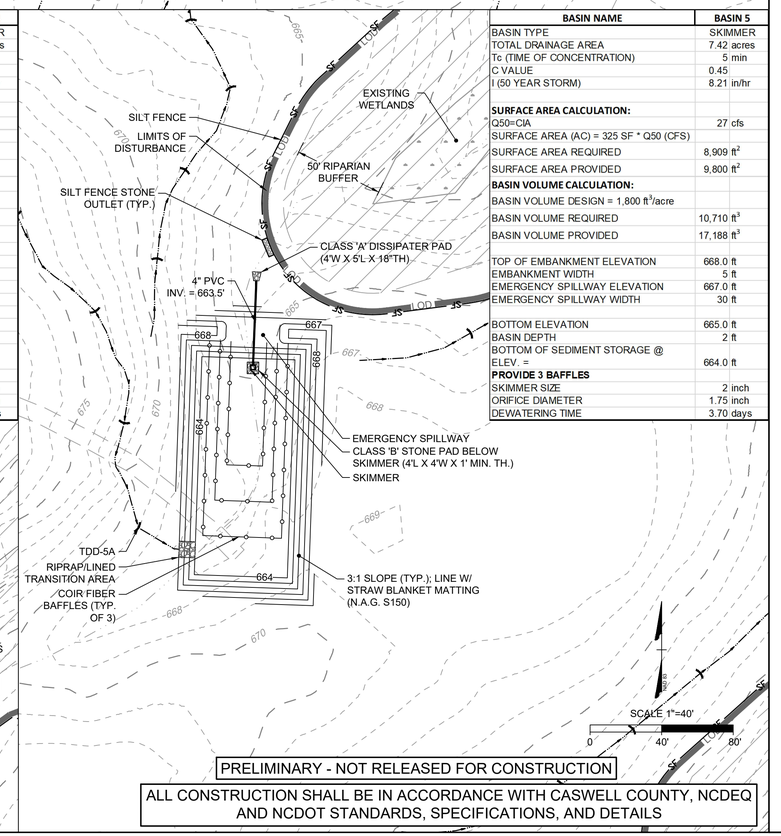
BASIN NAME	BASIN 3
BASIN TYPE	RISER
TOTAL DRAINAGE AREA	17.61 acres
Tc (TIME OF CONCENTRATION)	5 min
C VALUE	0.45
I (50 YEAR STORM)	8.21 in/hr
SURFACE AREA CALCULATION:	
Q50=CIA	65 cfs
SURFACE AREA (AC) = 435 SF * Q50 (CFS)	
SURFACE AREA REQUIRED	28,301 ft^2
SURFACE AREA PROVIDED	31,250 ft^2
BASIN VOLUME CALCULATION:	
BASIN VOLUME DESIGN = 1,800 ft^3/acre	
BASIN VOLUME REQUIRED	30,456 ft^3
BASIN VOLUME PROVIDED	58,108 ft^3
TOP OF EMBANKMENT ELEVATION	659.0 ft
EMBANKMENT WIDTH	10 ft
EMERGENCY SPILLWAY ELEVATION	658.0 ft
EMERGENCY SPILLWAY WIDTH	65 ft
RISER ELEVATION	657.0 ft
BOTTOM ELEVATION	655.0 ft
BASIN DEPTH	2 ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	654.0 ft
PROVIDE 3 BAFFLES	
SKIMMER SIZE	3 inch
ORIFICE DIAMETER	2.75 inch
DEWATERING TIME	3.49 days



BASIN NAME	BASIN 4
BASIN TYPE	SKIMMER
TOTAL DRAINAGE AREA	1.86 acres
Tc (TIME OF CONCENTRATION)	5 min
C VALUE	0.45
I (50 YEAR STORM)	8.21 in/hr
SURFACE AREA CALCULATION:	
Q50=CIA	7 cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)	
SURFACE AREA REQUIRED	2,233 ft^2
SURFACE AREA PROVIDED	3,546 ft^2
BASIN VOLUME CALCULATION:	
BASIN VOLUME DESIGN = 1,800 ft^3/acre	
BASIN VOLUME REQUIRED	3,348 ft^3
BASIN VOLUME PROVIDED	5,779 ft^3
TOP OF EMBANKMENT ELEVATION	656.0 ft
EMBANKMENT WIDTH	5 ft
EMERGENCY SPILLWAY ELEVATION	655.0 ft
EMERGENCY SPILLWAY WIDTH	10 ft
BOTTOM ELEVATION	653.0 ft
BASIN DEPTH	2 ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	652.0 ft
PROVIDE 3 BAFFLES	
SKIMMER SIZE	1.5 inch
ORIFICE DIAMETER	1 inch
DEWATERING TIME	4.10 days



BASIN NAME	BASIN 5
BASIN TYPE	SKIMMER
TOTAL DRAINAGE AREA	7.42 acres
Tc (TIME OF CONCENTRATION)	5 min
C VALUE	0.45
I (50 YEAR STORM)	8.21 in/hr
SURFACE AREA CALCULATION:	
Q50=CIA	27 cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)	
SURFACE AREA REQUIRED	8,909 ft^2
SURFACE AREA PROVIDED	9,800 ft^2
BASIN VOLUME CALCULATION:	
BASIN VOLUME DESIGN = 1,800 ft^3/acre	
BASIN VOLUME REQUIRED	10,710 ft^3
BASIN VOLUME PROVIDED	17,188 ft^3
TOP OF EMBANKMENT ELEVATION	668.0 ft
EMBANKMENT WIDTH	5 ft
EMERGENCY SPILLWAY ELEVATION	667.0 ft
EMERGENCY SPILLWAY WIDTH	30 ft
BOTTOM ELEVATION	665.0 ft
BASIN DEPTH	2 ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	664.0 ft
PROVIDE 3 BAFFLES	
SKIMMER SIZE	2 inch
ORIFICE DIAMETER	1.75 inch
DEWATERING TIME	3.70 days



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NORTH CAROLINA PROFESSIONAL SEAL 022530 ENGINEER RICHARD W. BAKER, III

04/24/2020

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DESIGNED BY	S. MOORE
CHECKED BY	R. BAKER
SCALE	AS SHOWN

TIMMONS GROUP

NORTH CAROLINA LICENSE NO. C-1652

PROSPECT HILL QUARRY AND DISTRIBUTION CENTER

PROSPECT HILL - CASWELL COUNTY - NORTH CAROLINA

SEDIMENT BASIN ENLARGEMENTS

JOB NO. 44089.001

SHEET NO. C3.01

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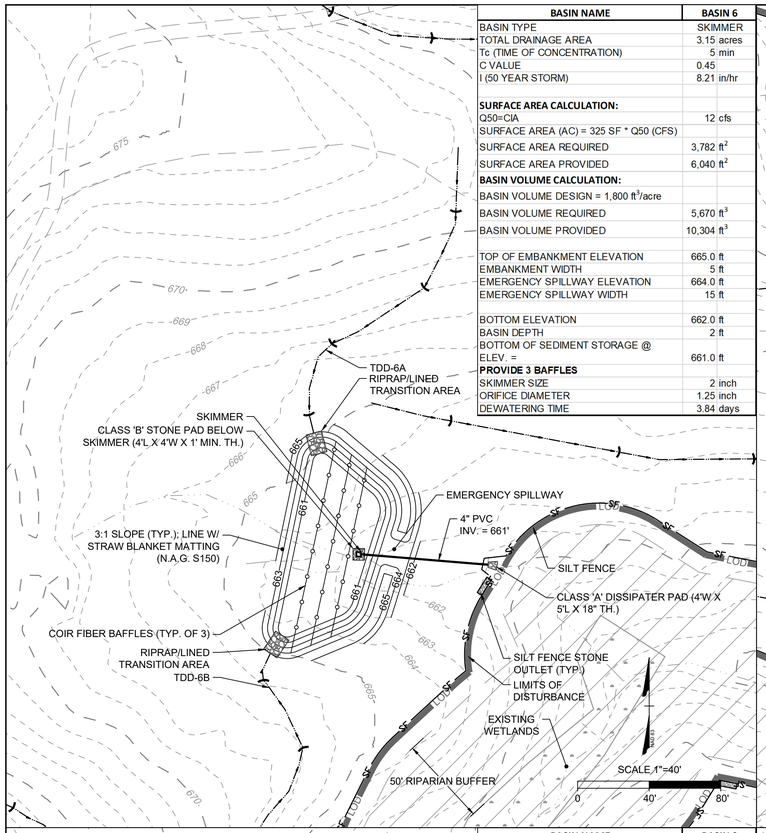
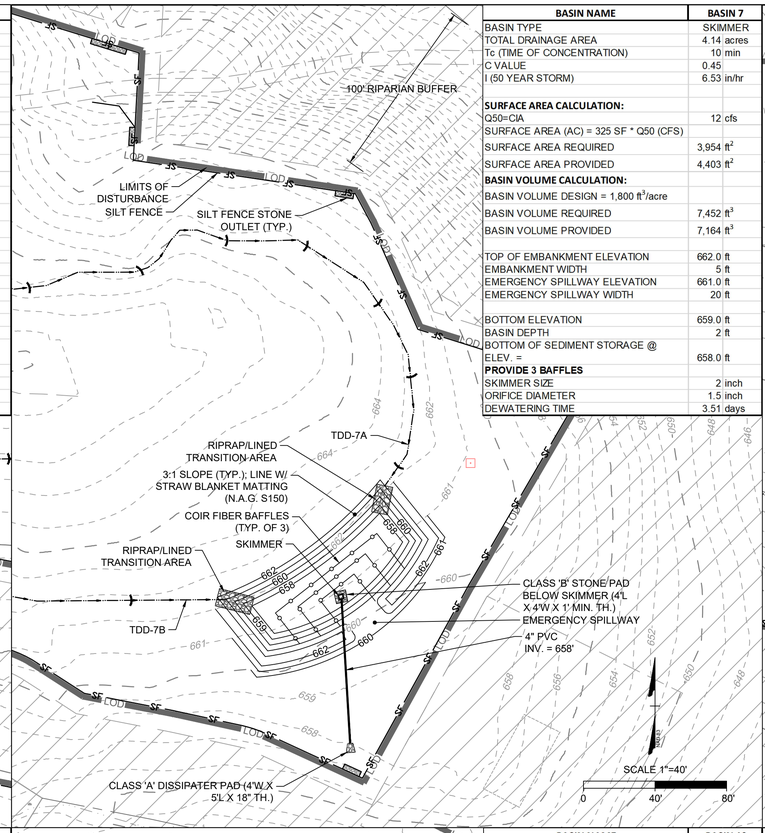
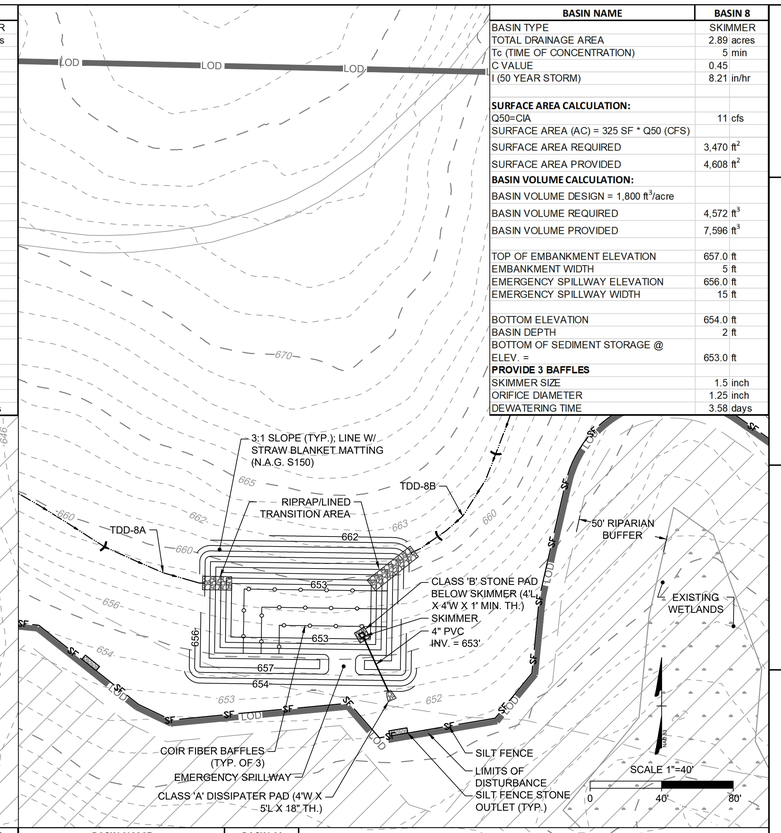
BASIN NAME	BASIN 6
BASIN TYPE	SKIMMER
TOTAL DRAINAGE AREA	3.15 acres
Tc (TIME OF CONCENTRATION)	5 min
C VALUE	0.45
I (50 YEAR STORM)	8.21 in/hr
SURFACE AREA CALCULATION:	
Q50=CIA	12 cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)	
SURFACE AREA REQUIRED	3,782 ft^2
SURFACE AREA PROVIDED	6,040 ft^2
BASIN VOLUME CALCULATION:	
BASIN VOLUME DESIGN = 1,800 ft^3/acre	
BASIN VOLUME REQUIRED	5,670 ft^3
BASIN VOLUME PROVIDED	10,304 ft^3
TOP OF EMBANKMENT ELEVATION	665.0 ft
EMBANKMENT WIDTH	5 ft
EMERGENCY SPILLWAY ELEVATION	664.0 ft
EMERGENCY SPILLWAY WIDTH	15 ft
BOTTOM ELEVATION	662.0 ft
BASIN DEPTH	2 ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	661.0 ft
PROVIDE 3 BAFFLES	
SKIMMER SIZE	2 inch
ORIFICE DIAMETER	1.25 inch
DEWATERING TIME	3.84 days



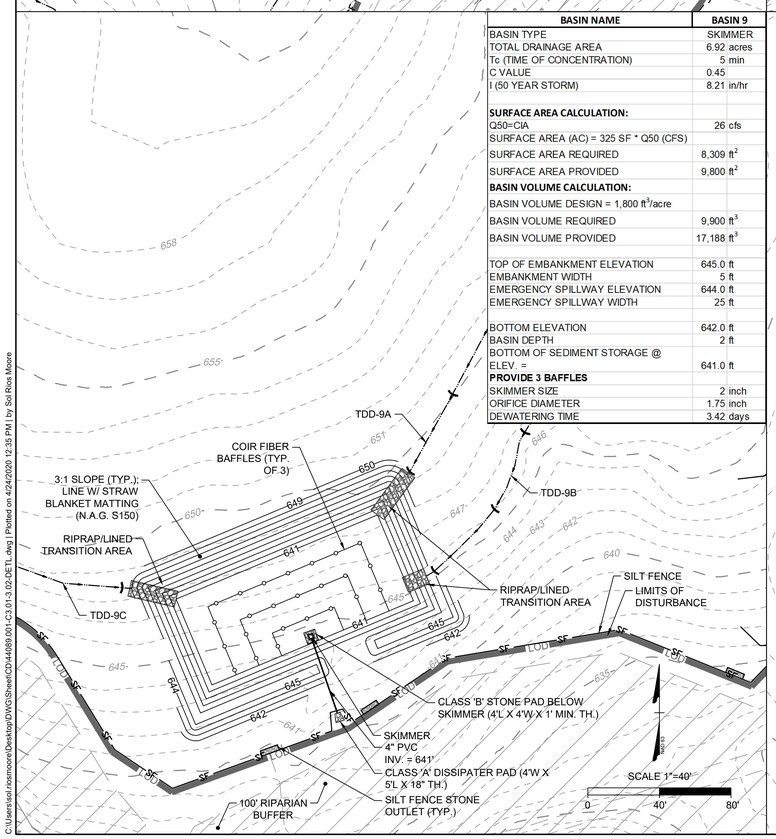
BASIN NAME	BASIN 7
BASIN TYPE	SKIMMER
TOTAL DRAINAGE AREA	4.14 acres
Tc (TIME OF CONCENTRATION)	10 min
C VALUE	0.45
I (50 YEAR STORM)	6.53 in/hr
SURFACE AREA CALCULATION:	
Q50=CIA	12 cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)	
SURFACE AREA REQUIRED	3,954 ft^2
SURFACE AREA PROVIDED	4,403 ft^2
BASIN VOLUME CALCULATION:	
BASIN VOLUME DESIGN = 1,800 ft^3/acre	
BASIN VOLUME REQUIRED	7,452 ft^3
BASIN VOLUME PROVIDED	7,164 ft^3
TOP OF EMBANKMENT ELEVATION	662.0 ft
EMBANKMENT WIDTH	5 ft
EMERGENCY SPILLWAY ELEVATION	661.0 ft
EMERGENCY SPILLWAY WIDTH	20 ft
BOTTOM ELEVATION	659.0 ft
BASIN DEPTH	2 ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	658.0 ft
PROVIDE 3 BAFFLES	
SKIMMER SIZE	2 inch
ORIFICE DIAMETER	1.5 inch
DEWATERING TIME	3.51 days



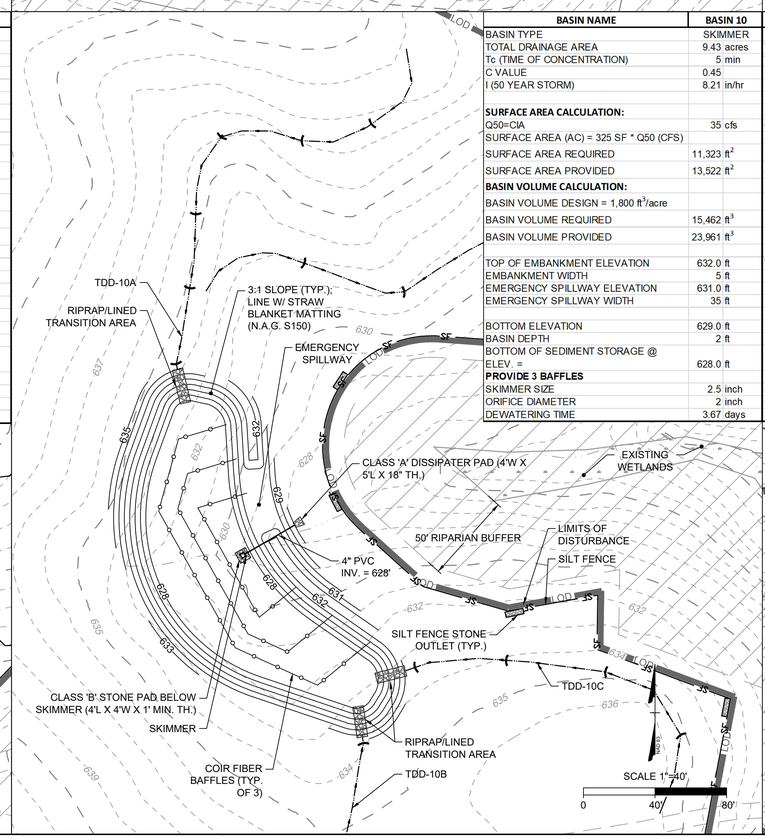
BASIN NAME	BASIN 8
BASIN TYPE	SKIMMER
TOTAL DRAINAGE AREA	2.89 acres
Tc (TIME OF CONCENTRATION)	5 min
C VALUE	0.45
I (50 YEAR STORM)	8.21 in/hr
SURFACE AREA CALCULATION:	
Q50=CIA	11 cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)	
SURFACE AREA REQUIRED	3,470 ft^2
SURFACE AREA PROVIDED	4,608 ft^2
BASIN VOLUME CALCULATION:	
BASIN VOLUME DESIGN = 1,800 ft^3/acre	
BASIN VOLUME REQUIRED	4,572 ft^3
BASIN VOLUME PROVIDED	7,596 ft^3
TOP OF EMBANKMENT ELEVATION	657.0 ft
EMBANKMENT WIDTH	5 ft
EMERGENCY SPILLWAY ELEVATION	656.0 ft
EMERGENCY SPILLWAY WIDTH	15 ft
BOTTOM ELEVATION	654.0 ft
BASIN DEPTH	2 ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	653.0 ft
PROVIDE 3 BAFFLES	
SKIMMER SIZE	1.5 inch
ORIFICE DIAMETER	1.25 inch
DEWATERING TIME	3.58 days



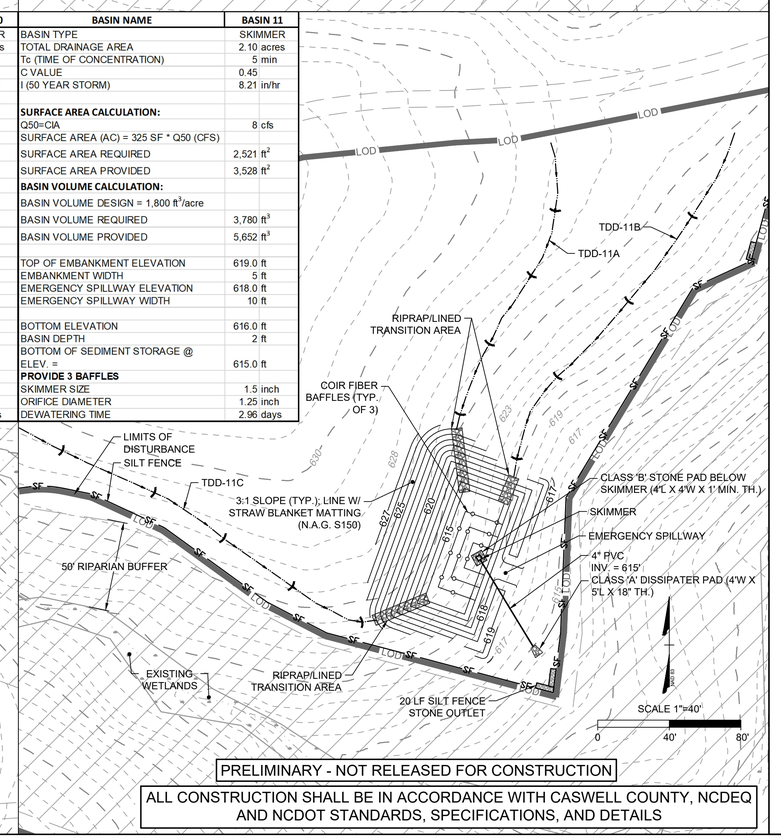
BASIN NAME	BASIN 9
BASIN TYPE	SKIMMER
TOTAL DRAINAGE AREA	6.92 acres
Tc (TIME OF CONCENTRATION)	5 min
C VALUE	0.45
I (50 YEAR STORM)	8.21 in/hr
SURFACE AREA CALCULATION:	
Q50=CIA	26 cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)	
SURFACE AREA REQUIRED	8,309 ft^2
SURFACE AREA PROVIDED	9,800 ft^2
BASIN VOLUME CALCULATION:	
BASIN VOLUME DESIGN = 1,800 ft^3/acre	
BASIN VOLUME REQUIRED	9,900 ft^3
BASIN VOLUME PROVIDED	17,188 ft^3
TOP OF EMBANKMENT ELEVATION	645.0 ft
EMBANKMENT WIDTH	5 ft
EMERGENCY SPILLWAY ELEVATION	644.0 ft
EMERGENCY SPILLWAY WIDTH	25 ft
BOTTOM ELEVATION	642.0 ft
BASIN DEPTH	2 ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	641.0 ft
PROVIDE 3 BAFFLES	
SKIMMER SIZE	2 inch
ORIFICE DIAMETER	1.75 inch
DEWATERING TIME	3.42 days



BASIN NAME	BASIN 10
BASIN TYPE	SKIMMER
TOTAL DRAINAGE AREA	9.43 acres
Tc (TIME OF CONCENTRATION)	5 min
C VALUE	0.45
I (50 YEAR STORM)	8.21 in/hr
SURFACE AREA CALCULATION:	
Q50=CIA	35 cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)	
SURFACE AREA REQUIRED	11,323 ft^2
SURFACE AREA PROVIDED	13,522 ft^2
BASIN VOLUME CALCULATION:	
BASIN VOLUME DESIGN = 1,800 ft^3/acre	
BASIN VOLUME REQUIRED	15,462 ft^3
BASIN VOLUME PROVIDED	23,961 ft^3
TOP OF EMBANKMENT ELEVATION	632.0 ft
EMBANKMENT WIDTH	5 ft
EMERGENCY SPILLWAY ELEVATION	631.0 ft
EMERGENCY SPILLWAY WIDTH	35 ft
BOTTOM ELEVATION	629.0 ft
BASIN DEPTH	2 ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	628.0 ft
PROVIDE 3 BAFFLES	
SKIMMER SIZE	2.5 inch
ORIFICE DIAMETER	2 inch
DEWATERING TIME	3.67 days



BASIN NAME	BASIN 11
BASIN TYPE	SKIMMER
TOTAL DRAINAGE AREA	2.10 acres
Tc (TIME OF CONCENTRATION)	5 min
C VALUE	0.45
I (50 YEAR STORM)	8.21 in/hr
SURFACE AREA CALCULATION:	
Q50=CIA	8 cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)	
SURFACE AREA REQUIRED	2,521 ft^2
SURFACE AREA PROVIDED	3,528 ft^2
BASIN VOLUME CALCULATION:	
BASIN VOLUME DESIGN = 1,800 ft^3/acre	
BASIN VOLUME REQUIRED	3,780 ft^3
BASIN VOLUME PROVIDED	5,652 ft^3
TOP OF EMBANKMENT ELEVATION	619.0 ft
EMBANKMENT WIDTH	5 ft
EMERGENCY SPILLWAY ELEVATION	618.0 ft
EMERGENCY SPILLWAY WIDTH	10 ft
BOTTOM ELEVATION	616.0 ft
BASIN DEPTH	2 ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	615.0 ft
PROVIDE 3 BAFFLES	
SKIMMER SIZE	1.5 inch
ORIFICE DIAMETER	1.25 inch
DEWATERING TIME	2.96 days



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DRAWN BY	T. DAEKE
DESIGNED BY	S. MOORE
CHECKED BY	R. BAKER
SCALE	AS SHOWN

TIMMONS GROUP

NORTH CAROLINA LICENSE NO. C-1652

PROSPECT HILL QUARRY AND DISTRIBUTION CENTER

PROSPECT HILL - CASWELL COUNTY - NORTH CAROLINA

SEDIMENT BASIN ENLARGEMENTS

JOB NO. 44089.001

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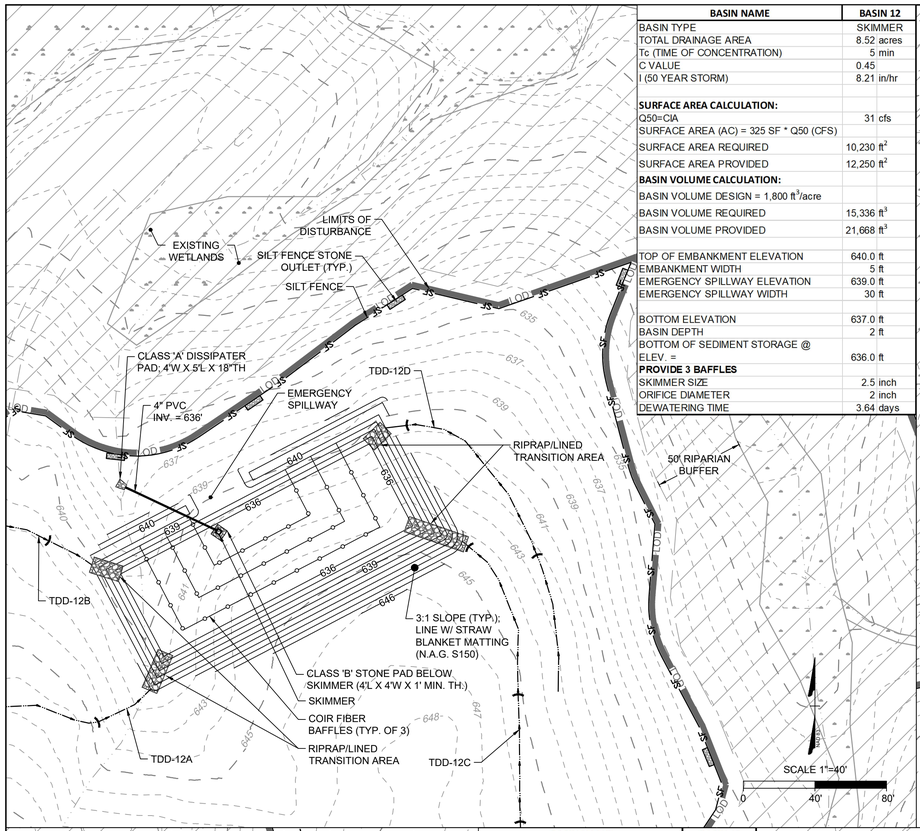
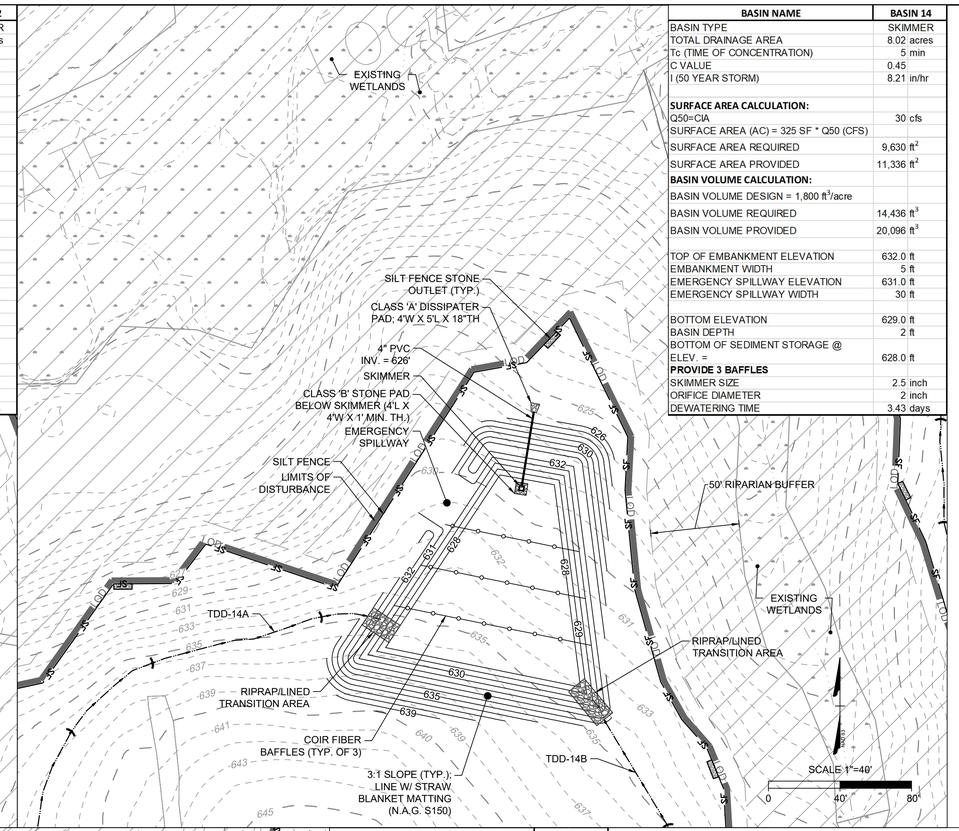
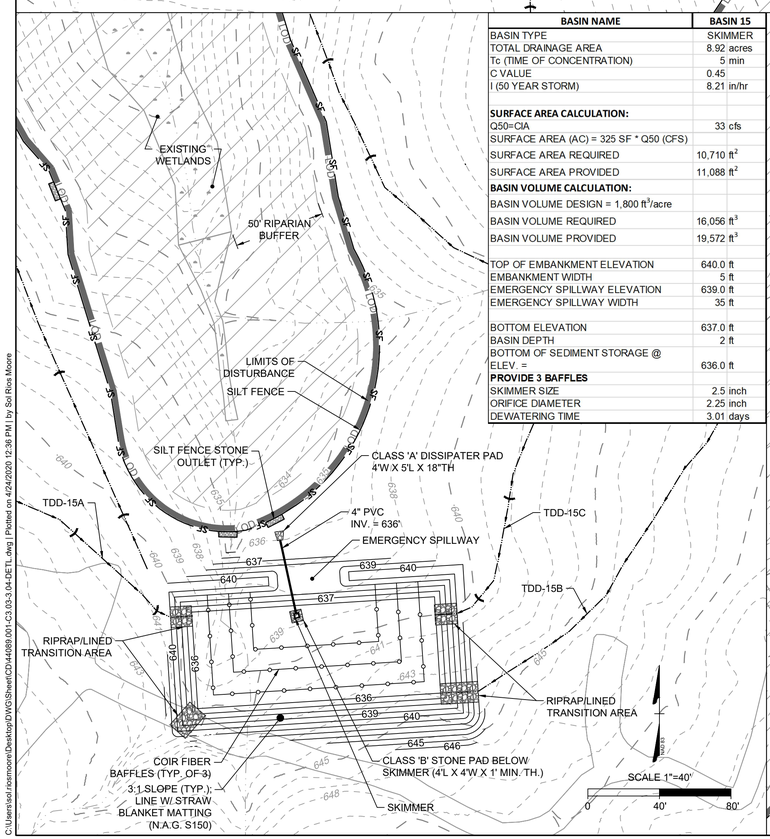


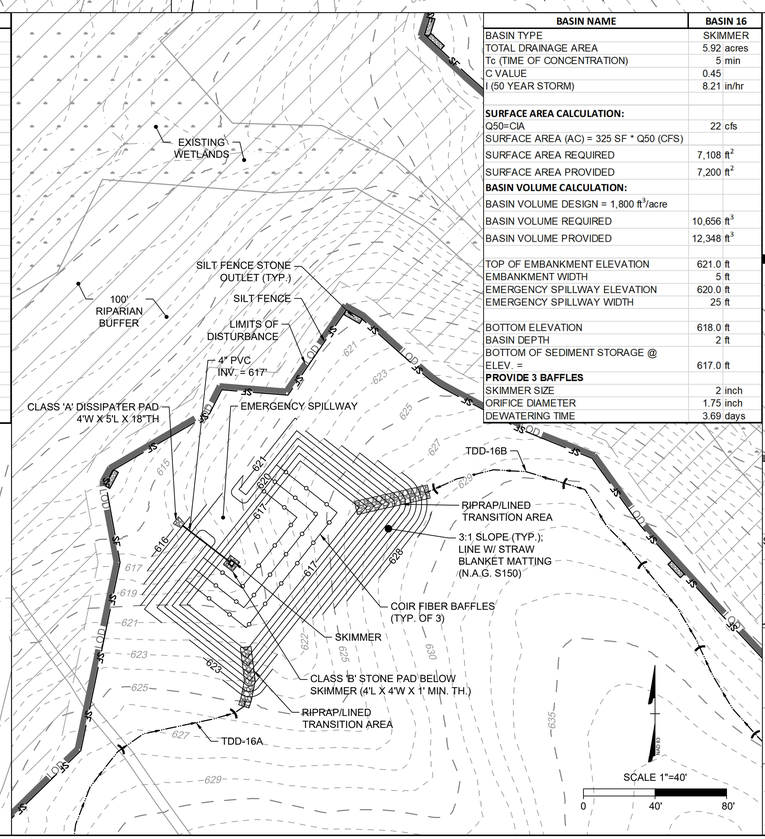
BASIN NAME	BASIN 12
BASIN TYPE	SKIMMER
TOTAL DRAINAGE AREA	8.52 acres
Tc (TIME OF CONCENTRATION)	5 min
C VALUE	0.45
I (50 YEAR STORM)	8.21 in/hr
SURFACE AREA CALCULATION:	
Q50=CIA	31 cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)	
SURFACE AREA REQUIRED	10,230 ft^2
SURFACE AREA PROVIDED	12,250 ft^2
BASIN VOLUME CALCULATION:	
BASIN VOLUME DESIGN = 1,800 ft^3/acre	
BASIN VOLUME REQUIRED	15,336 ft^3
BASIN VOLUME PROVIDED	21,668 ft^3
TOP OF EMBANKMENT ELEVATION	640.0 ft
EMBANKMENT WIDTH	5 ft
EMERGENCY SPILLWAY ELEVATION	639.0 ft
EMERGENCY SPILLWAY WIDTH	30 ft
BOTTOM ELEVATION	637.0 ft
BASIN DEPTH	2 ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	636.0 ft
PROVIDE 3 BAFFLES	
SKIMMER SIZE	2.5 inch
ORIFICE DIAMETER	2 inch
DEWATERING TIME	3.64 days



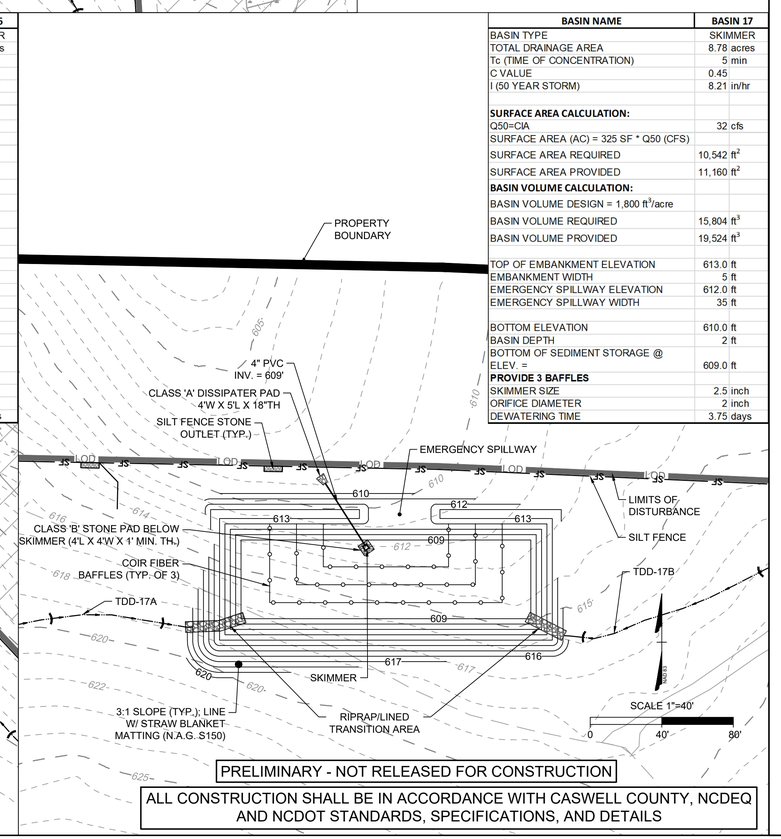
BASIN NAME	BASIN 14
BASIN TYPE	SKIMMER
TOTAL DRAINAGE AREA	8.02 acres
Tc (TIME OF CONCENTRATION)	5 min
C VALUE	0.45
I (50 YEAR STORM)	8.21 in/hr
SURFACE AREA CALCULATION:	
Q50=CIA	30 cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)	
SURFACE AREA REQUIRED	9,630 ft^2
SURFACE AREA PROVIDED	11,336 ft^2
BASIN VOLUME CALCULATION:	
BASIN VOLUME DESIGN = 1,800 ft^3/acre	
BASIN VOLUME REQUIRED	14,436 ft^3
BASIN VOLUME PROVIDED	20,096 ft^3
TOP OF EMBANKMENT ELEVATION	632.0 ft
EMBANKMENT WIDTH	5 ft
EMERGENCY SPILLWAY ELEVATION	631.0 ft
EMERGENCY SPILLWAY WIDTH	30 ft
BOTTOM ELEVATION	629.0 ft
BASIN DEPTH	2 ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	628.0 ft
PROVIDE 3 BAFFLES	
SKIMMER SIZE	2.5 inch
ORIFICE DIAMETER	2 inch
DEWATERING TIME	3.43 days



BASIN NAME	BASIN 15
BASIN TYPE	SKIMMER
TOTAL DRAINAGE AREA	8.92 acres
Tc (TIME OF CONCENTRATION)	5 min
C VALUE	0.45
I (50 YEAR STORM)	8.21 in/hr
SURFACE AREA CALCULATION:	
Q50=CIA	33 cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)	
SURFACE AREA REQUIRED	10,710 ft^2
SURFACE AREA PROVIDED	11,088 ft^2
BASIN VOLUME CALCULATION:	
BASIN VOLUME DESIGN = 1,800 ft^3/acre	
BASIN VOLUME REQUIRED	16,056 ft^3
BASIN VOLUME PROVIDED	19,572 ft^3
TOP OF EMBANKMENT ELEVATION	640.0 ft
EMBANKMENT WIDTH	5 ft
EMERGENCY SPILLWAY ELEVATION	639.0 ft
EMERGENCY SPILLWAY WIDTH	35 ft
BOTTOM ELEVATION	637.0 ft
BASIN DEPTH	2 ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	636.0 ft
PROVIDE 3 BAFFLES	
SKIMMER SIZE	2.5 inch
ORIFICE DIAMETER	2.25 inch
DEWATERING TIME	3.01 days



BASIN NAME	BASIN 16
BASIN TYPE	SKIMMER
TOTAL DRAINAGE AREA	5.92 acres
Tc (TIME OF CONCENTRATION)	5 min
C VALUE	0.45
I (50 YEAR STORM)	8.21 in/hr
SURFACE AREA CALCULATION:	
Q50=CIA	22 cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)	
SURFACE AREA REQUIRED	7,108 ft^2
SURFACE AREA PROVIDED	7,200 ft^2
BASIN VOLUME CALCULATION:	
BASIN VOLUME DESIGN = 1,800 ft^3/acre	
BASIN VOLUME REQUIRED	10,656 ft^3
BASIN VOLUME PROVIDED	12,348 ft^3
TOP OF EMBANKMENT ELEVATION	621.0 ft
EMBANKMENT WIDTH	5 ft
EMERGENCY SPILLWAY ELEVATION	620.0 ft
EMERGENCY SPILLWAY WIDTH	25 ft
BOTTOM ELEVATION	618.0 ft
BASIN DEPTH	2 ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	617.0 ft
PROVIDE 3 BAFFLES	
SKIMMER SIZE	2 inch
ORIFICE DIAMETER	1.75 inch
DEWATERING TIME	3.69 days



BASIN NAME	BASIN 17
BASIN TYPE	SKIMMER
TOTAL DRAINAGE AREA	8.78 acres
Tc (TIME OF CONCENTRATION)	5 min
C VALUE	0.45
I (50 YEAR STORM)	8.21 in/hr
SURFACE AREA CALCULATION:	
Q50=CIA	32 cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)	
SURFACE AREA REQUIRED	10,542 ft^2
SURFACE AREA PROVIDED	11,160 ft^2
BASIN VOLUME CALCULATION:	
BASIN VOLUME DESIGN = 1,800 ft^3/acre	
BASIN VOLUME REQUIRED	15,804 ft^3
BASIN VOLUME PROVIDED	19,524 ft^3
TOP OF EMBANKMENT ELEVATION	613.0 ft
EMBANKMENT WIDTH	5 ft
EMERGENCY SPILLWAY ELEVATION	612.0 ft
EMERGENCY SPILLWAY WIDTH	35 ft
BOTTOM ELEVATION	610.0 ft
BASIN DEPTH	2 ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	609.0 ft
PROVIDE 3 BAFFLES	
SKIMMER SIZE	2.5 inch
ORIFICE DIAMETER	2 inch
DEWATERING TIME	3.75 days

PRELIMINARY - NOT RELEASED FOR CONSTRUCTION

ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH CASWELL COUNTY, NCDEQ AND NCDOT STANDARDS, SPECIFICATIONS, AND DETAILS

NORTH CAROLINA PROFESSIONAL SEAL 022530 ENGINEER RICHARD W. BAKER, III
04/24/2020

THIS DRAWING PREPARED AT THE
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DATE	REVISION DESCRIPTION
04/24/2020	ADDRESSED NCDEQ COMMENTS

DATE	2019-08-22
DRAWN BY	T. DAEKE
DESIGNED BY	S. MOORE
CHECKED BY	R. BAKER
SCALE	AS SHOWN

TIMMONS GROUP

NORTH CAROLINA LICENSE NO. C-1652

PROSPECT HILL QUARRY AND DISTRIBUTION CENTER

PROSPECT HILL - CASWELL COUNTY - NORTH CAROLINA

SEDIMENT BASIN ENLARGEMENTS

JOB NO. 44089.001

SHEET NO. C3.03

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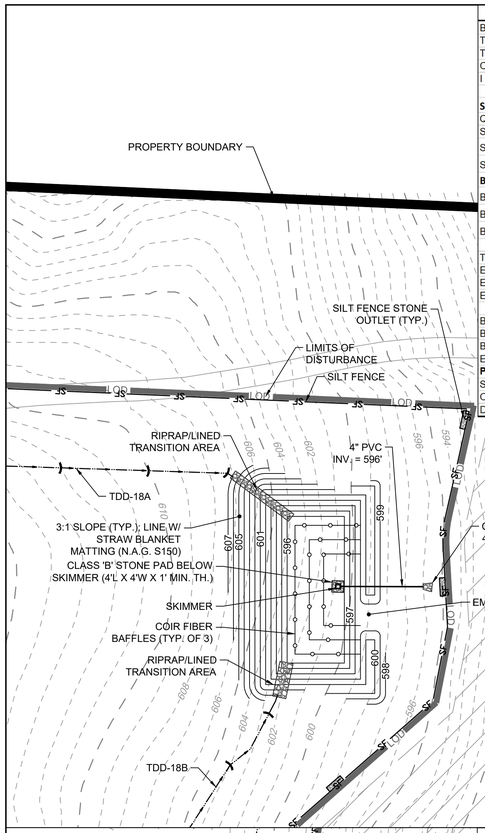
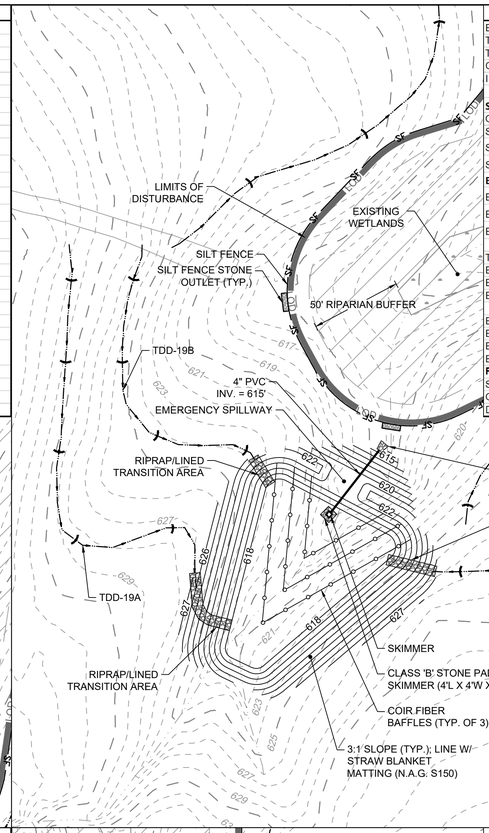
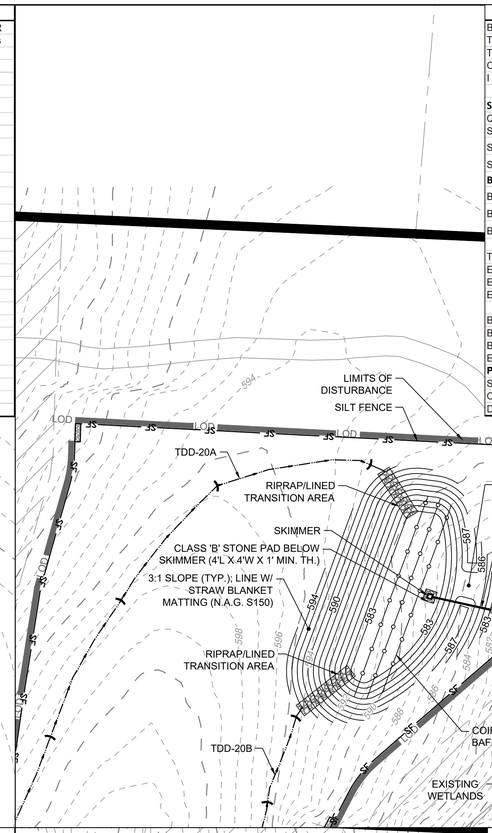


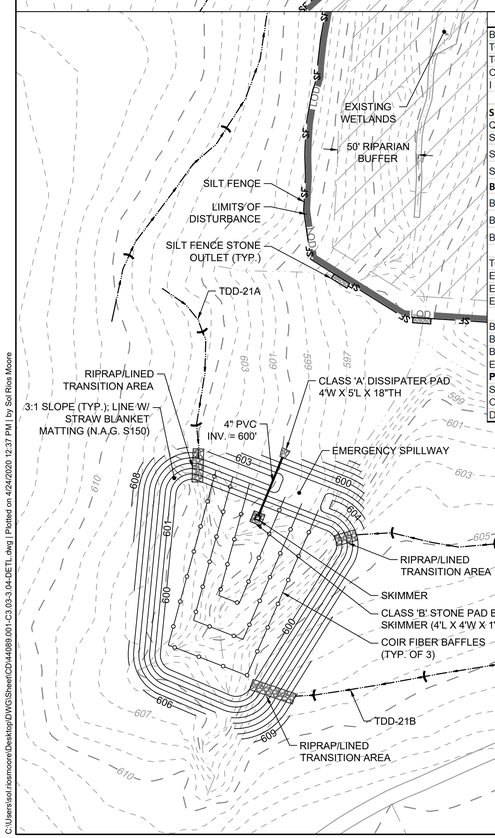
BASIN NAME	BASIN 18
BASIN TYPE	SKIMMER
TOTAL DRAINAGE AREA	3.88 acres
Tc (TIME OF CONCENTRATION)	5 min
C VALUE	0.45
I (50 YEAR STORM)	8.21 in/hr
SURFACE AREA CALCULATION:	
Q50=CIA	14 cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)	
SURFACE AREA REQUIRED	4,659 ft^2
SURFACE AREA PROVIDED	5,000 ft^2
BASIN VOLUME CALCULATION:	
BASIN VOLUME DESIGN = 1,800 ft^3/acre	
BASIN VOLUME REQUIRED	6,984 ft^3
BASIN VOLUME PROVIDED	8,308 ft^3
TOP OF EMBANKMENT ELEVATION	600.0 ft
EMBANKMENT WIDTH	5 ft
EMERGENCY SPILLWAY ELEVATION	599.0 ft
EMERGENCY SPILLWAY WIDTH	15 ft
BOTTOM ELEVATION	597.0 ft
BASIN DEPTH	2 ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	596.0 ft
PROVIDE 3 BAFFLES	
SKIMMER SIZE	2 inch
ORIFICE DIAMETER	1.5 inch
DEWATERING TIME	3.29 days



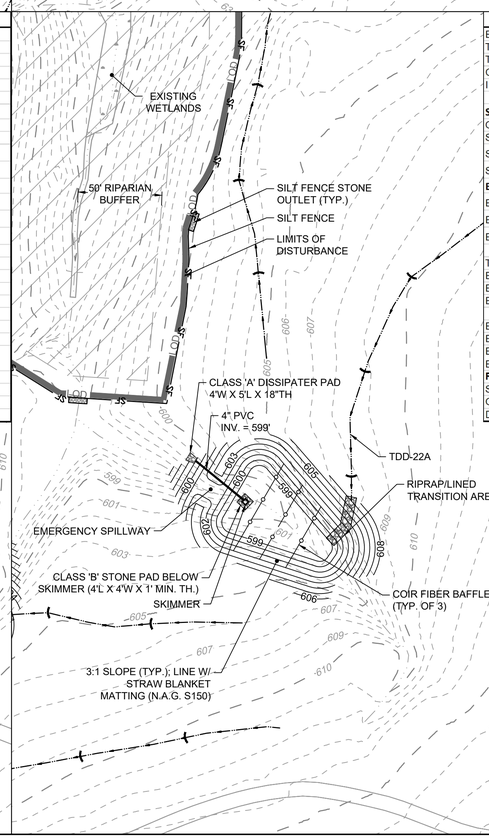
BASIN NAME	BASIN 19
BASIN TYPE	SKIMMER
TOTAL DRAINAGE AREA	4.73 acres
Tc (TIME OF CONCENTRATION)	5 min
C VALUE	0.45
I (50 YEAR STORM)	8.21 in/hr
SURFACE AREA CALCULATION:	
Q50=CIA	17 cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)	
SURFACE AREA REQUIRED	5,679 ft^2
SURFACE AREA PROVIDED	8,399 ft^2
BASIN VOLUME CALCULATION:	
BASIN VOLUME DESIGN = 1,800 ft^3/acre	
BASIN VOLUME REQUIRED	8,514 ft^3
BASIN VOLUME PROVIDED	14,713 ft^3
TOP OF EMBANKMENT ELEVATION	622.0 ft
EMBANKMENT WIDTH	5 ft
EMERGENCY SPILLWAY ELEVATION	621.0 ft
EMERGENCY SPILLWAY WIDTH	20 ft
BOTTOM ELEVATION	619.0 ft
BASIN DEPTH	2 ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	618.0 ft
PROVIDE 3 BAFFLES	
SKIMMER SIZE	2 inch
ORIFICE DIAMETER	1.75 inch
DEWATERING TIME	2.95 days



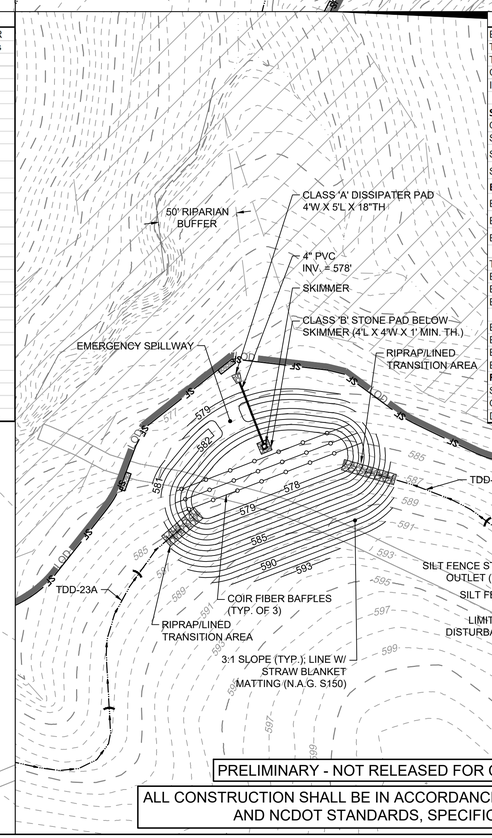
BASIN NAME	BASIN 20
BASIN TYPE	SKIMMER
TOTAL DRAINAGE AREA	3.96 acres
Tc (TIME OF CONCENTRATION)	5 min
C VALUE	0.45
I (50 YEAR STORM)	8.21 in/hr
SURFACE AREA CALCULATION:	
Q50=CIA	15 cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)	
SURFACE AREA REQUIRED	4,755 ft^2
SURFACE AREA PROVIDED	5,074 ft^2
BASIN VOLUME CALCULATION:	
BASIN VOLUME DESIGN = 1,800 ft^3/acre	
BASIN VOLUME REQUIRED	7,128 ft^3
BASIN VOLUME PROVIDED	8,487 ft^3
TOP OF EMBANKMENT ELEVATION	587.0 ft
EMBANKMENT WIDTH	5 ft
EMERGENCY SPILLWAY ELEVATION	586.0 ft
EMERGENCY SPILLWAY WIDTH	15 ft
BOTTOM ELEVATION	584.0 ft
BASIN DEPTH	2 ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	583.0 ft
PROVIDE 3 BAFFLES	
SKIMMER SIZE	2 inch
ORIFICE DIAMETER	1.5 inch
DEWATERING TIME	3.36 days



BASIN NAME	BASIN 21
BASIN TYPE	SKIMMER
TOTAL DRAINAGE AREA	6.63 acres
Tc (TIME OF CONCENTRATION)	5 min
C VALUE	0.45
I (50 YEAR STORM)	8.21 in/hr
SURFACE AREA CALCULATION:	
Q50=CIA	24 cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)	
SURFACE AREA REQUIRED	7,961 ft^2
SURFACE AREA PROVIDED	11,177 ft^2
BASIN VOLUME CALCULATION:	
BASIN VOLUME DESIGN = 1,800 ft^3/acre	
BASIN VOLUME REQUIRED	11,934 ft^3
BASIN VOLUME PROVIDED	20,010 ft^3
TOP OF EMBANKMENT ELEVATION	604.0 ft
EMBANKMENT WIDTH	5 ft
EMERGENCY SPILLWAY ELEVATION	603.0 ft
EMERGENCY SPILLWAY WIDTH	25 ft
BOTTOM ELEVATION	601.0 ft
BASIN DEPTH	2 ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	600.0 ft
PROVIDE 3 BAFFLES	
SKIMMER SIZE	2 inch
ORIFICE DIAMETER	1.75 inch
DEWATERING TIME	4.13 days



BASIN NAME	BASIN 22
BASIN TYPE	SKIMMER
TOTAL DRAINAGE AREA	1.90 acres
Tc (TIME OF CONCENTRATION)	5 min
C VALUE	0.45
I (50 YEAR STORM)	8.21 in/hr
SURFACE AREA CALCULATION:	
Q50=CIA	7 cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)	
SURFACE AREA REQUIRED	2,281 ft^2
SURFACE AREA PROVIDED	3,258 ft^2
BASIN VOLUME CALCULATION:	
BASIN VOLUME DESIGN = 1,800 ft^3/acre	
BASIN VOLUME REQUIRED	3,420 ft^3
BASIN VOLUME PROVIDED	5,626 ft^3
TOP OF EMBANKMENT ELEVATION	603.0 ft
EMBANKMENT WIDTH	5 ft
EMERGENCY SPILLWAY ELEVATION	602.0 ft
EMERGENCY SPILLWAY WIDTH	10 ft
BOTTOM ELEVATION	600.0 ft
BASIN DEPTH	2 ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	599.0 ft
PROVIDE 3 BAFFLES	
SKIMMER SIZE	1.5 inch
ORIFICE DIAMETER	1 inch
DEWATERING TIME	4.19 days



BASIN NAME	BASIN 23
BASIN TYPE	SKIMMER
TOTAL DRAINAGE AREA	3.95 acres
Tc (TIME OF CONCENTRATION)	5 min
C VALUE	0.45
I (50 YEAR STORM)	8.21 in/hr
SURFACE AREA CALCULATION:	
Q50=CIA	15 cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)	
SURFACE AREA REQUIRED	4,743 ft^2
SURFACE AREA PROVIDED	4,651 ft^2
BASIN VOLUME CALCULATION:	
BASIN VOLUME DESIGN = 1,800 ft^3/acre	
BASIN VOLUME REQUIRED	7,110 ft^3
BASIN VOLUME PROVIDED	7,757 ft^3
TOP OF EMBANKMENT ELEVATION	582.0 ft
EMBANKMENT WIDTH	5 ft
EMERGENCY SPILLWAY ELEVATION	581.0 ft
EMERGENCY SPILLWAY WIDTH	15 ft
BOTTOM ELEVATION	579.0 ft
BASIN DEPTH	2 ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	578.0 ft
PROVIDE 3 BAFFLES	
SKIMMER SIZE	2 inch
ORIFICE DIAMETER	1.5 inch
DEWATERING TIME	3.35 days

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NORTH CAROLINA PROFESSIONAL SEAL 022530 ENGINEER RICHARD W. BAKER, III
04/24/2020

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REVISION	DESCRIPTION
	ADDRESSED NCDEQ COMMENTS

DATE
04/24/2020

DATE	2019-08-22
DRAWN BY	T. DAEKE
DESIGNED BY	S. MOORE
CHECKED BY	R. BAKER
SCALE	AS SHOWN

TIMMONS GROUP
NORTH CAROLINA LICENSE NO. C-1652

PROSPECT HILL QUARRY AND DISTRIBUTION CENTER
PROSPECT HILL - CASWELL COUNTY - NORTH CAROLINA

SEDIMENT BASIN ENLARGEMENTS

JOB NO. 44089.001

SHEET NO. C3.04

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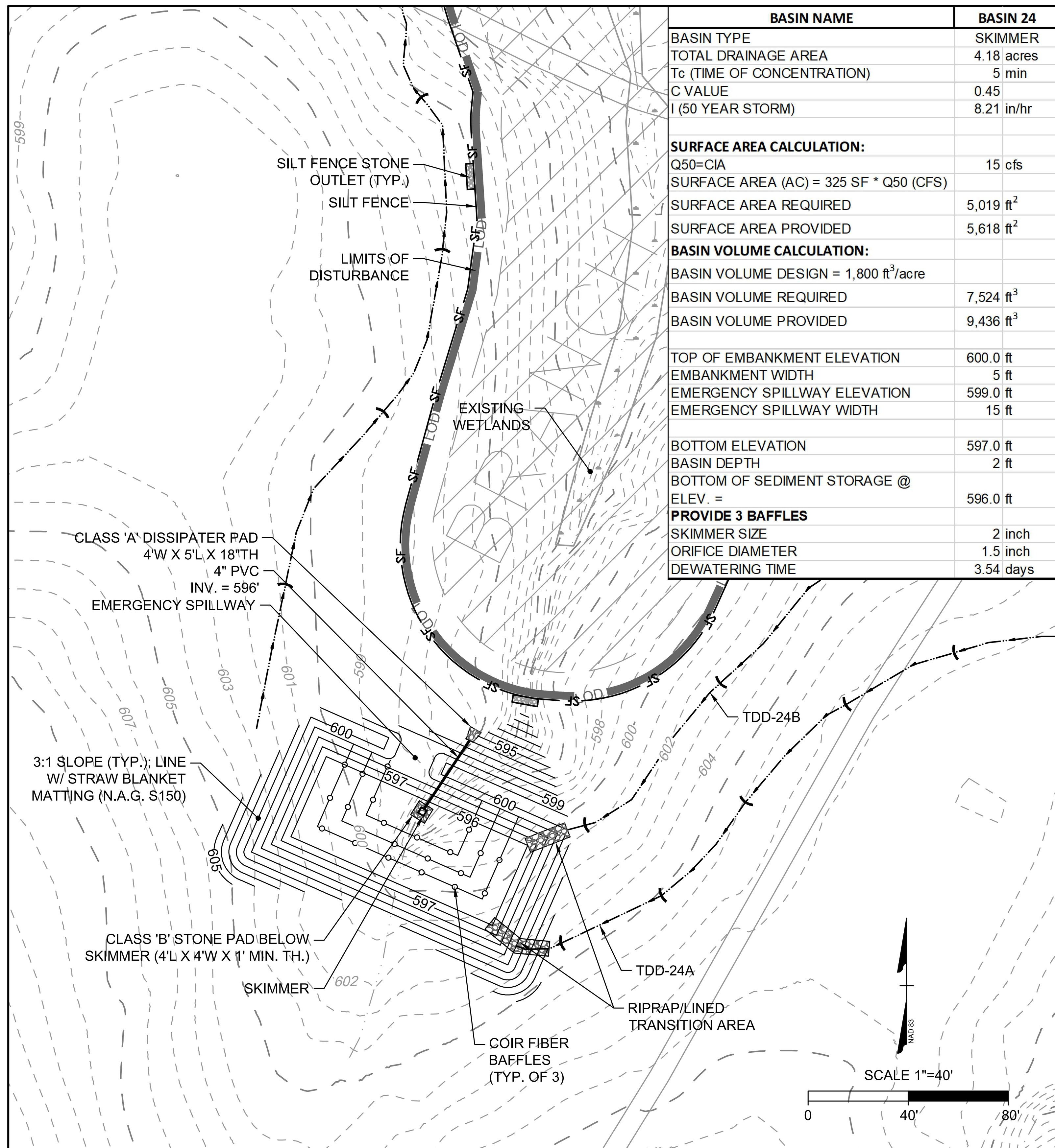
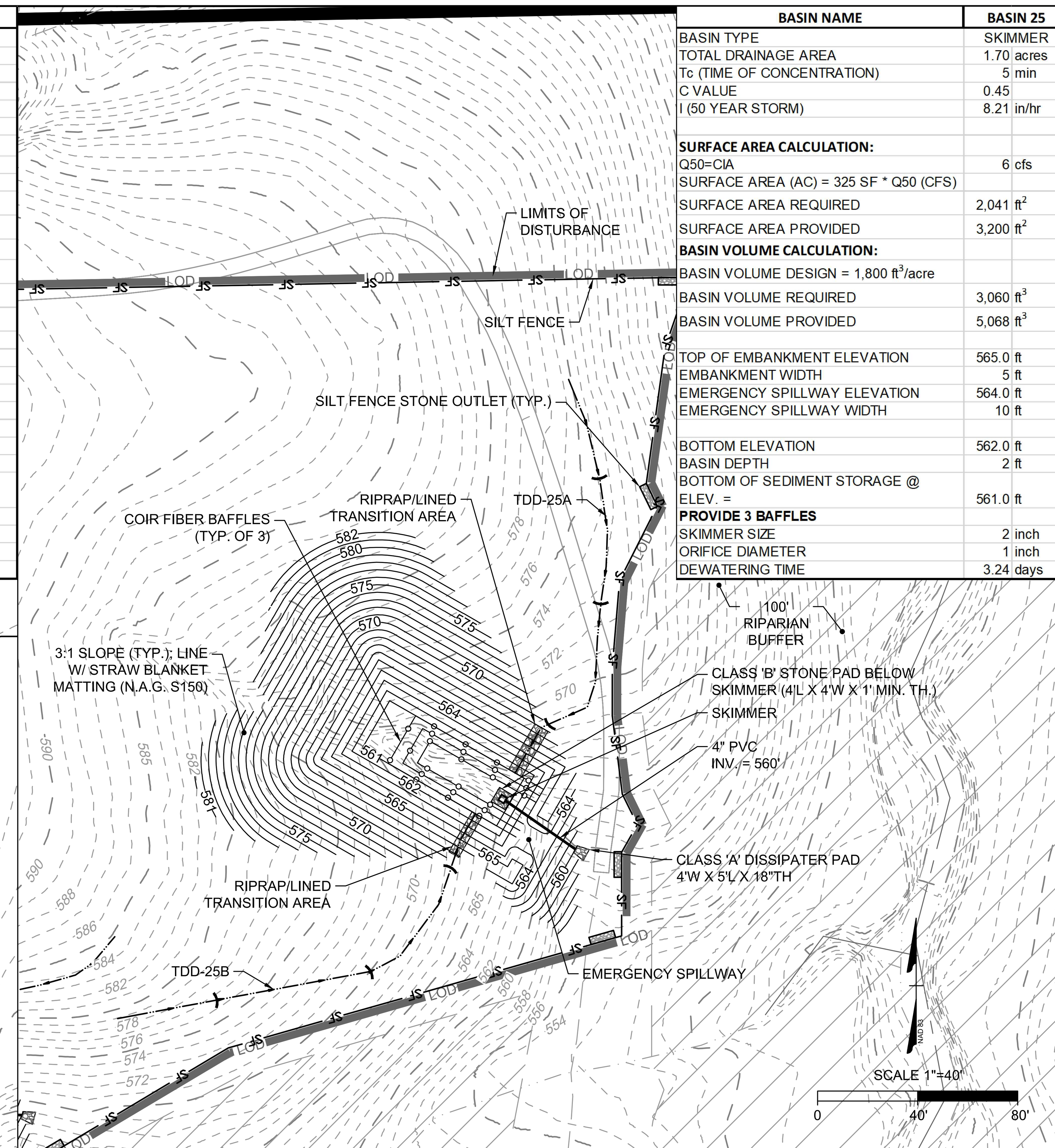
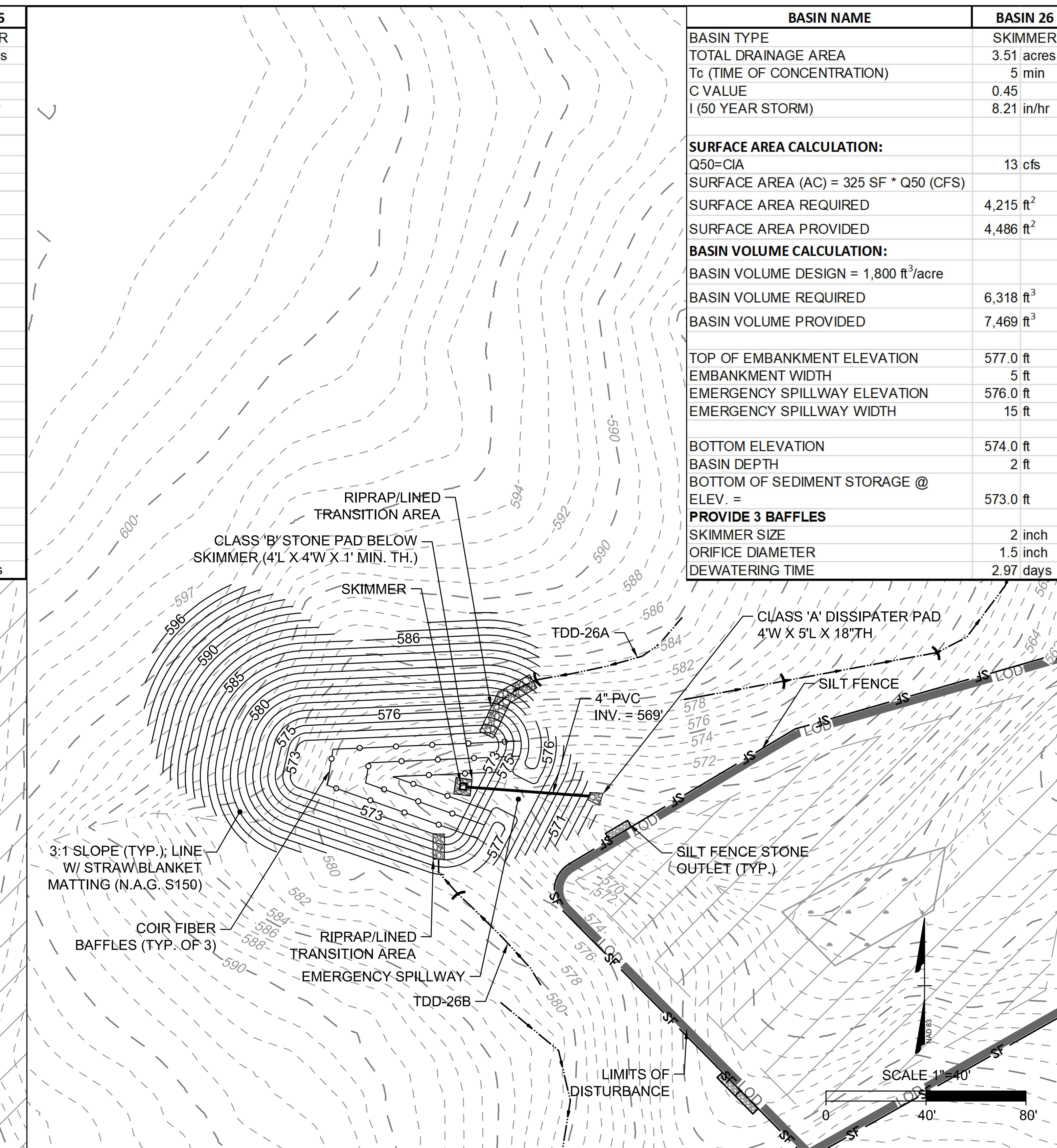


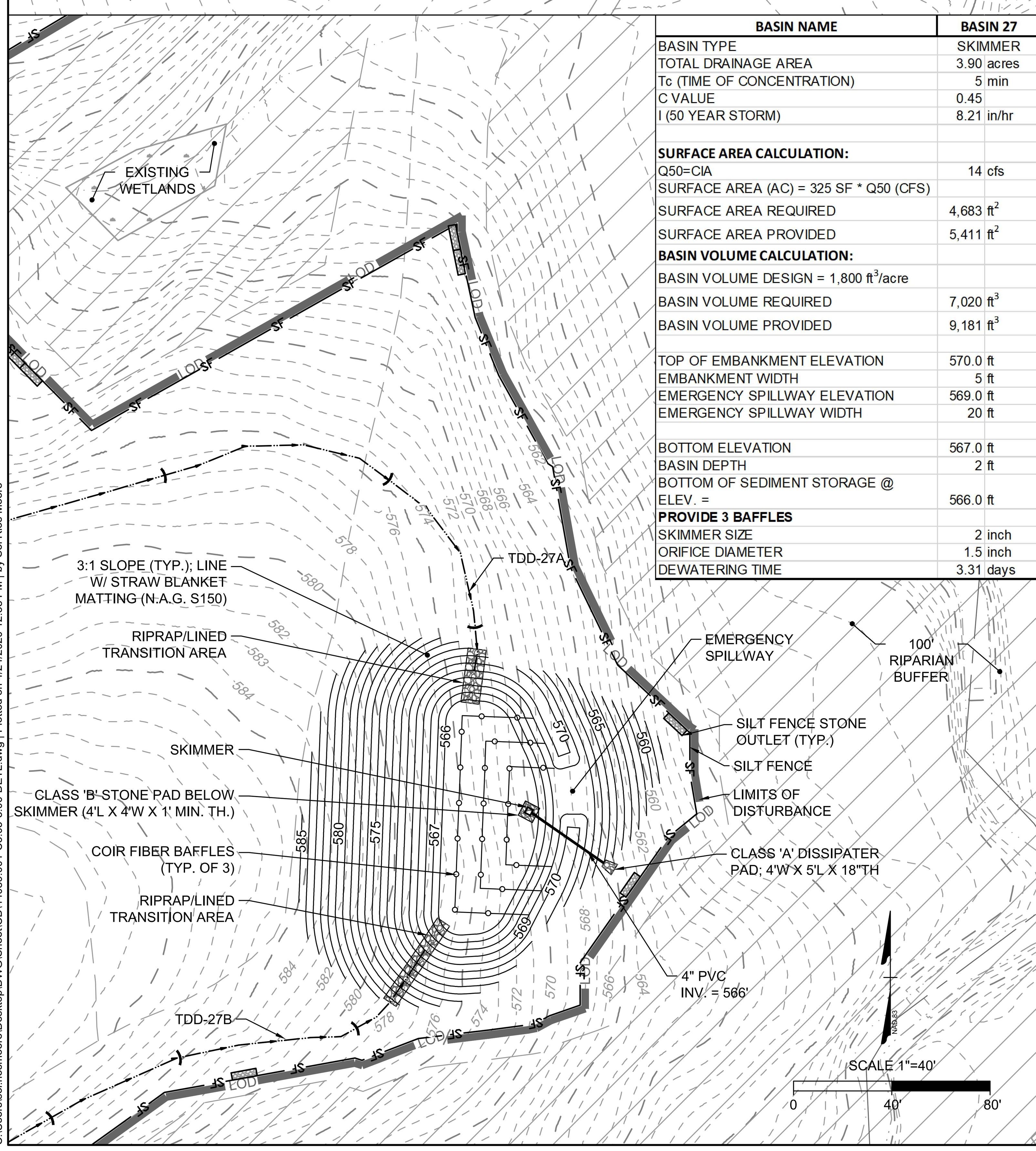
BASIN NAME	BASIN 24	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	4.18	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	15	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	5,019	ft^2
SURFACE AREA PROVIDED	5,618	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	7,524	ft^3
BASIN VOLUME PROVIDED	9,436	ft^3
TOP OF EMBANKMENT ELEVATION	600.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	599.0	ft
EMERGENCY SPILLWAY WIDTH	15	ft
BOTTOM ELEVATION	597.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	596.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2	inch
ORIFICE DIAMETER	1.5	inch
DEWATERING TIME	3.54	days



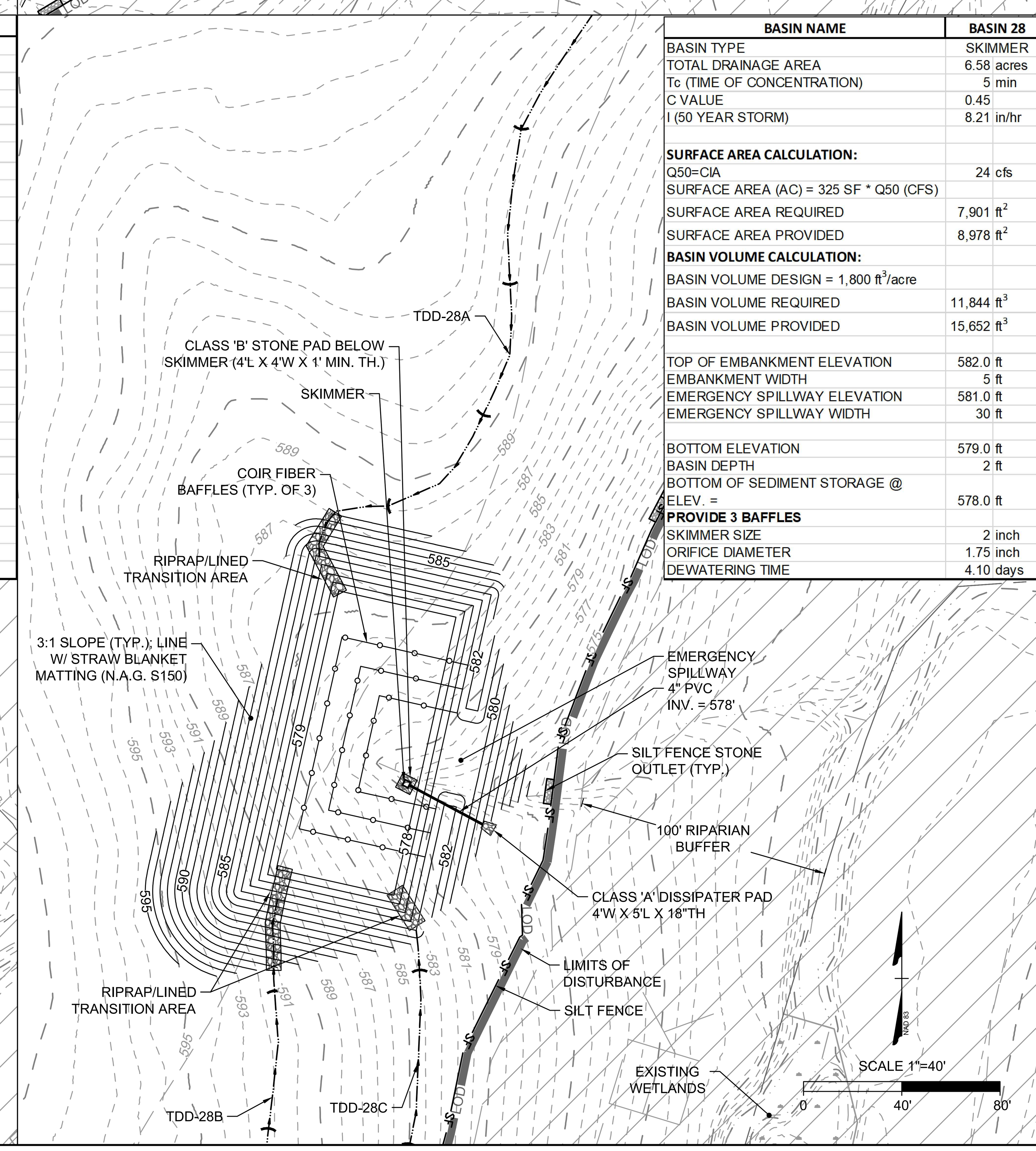
BASIN NAME	BASIN 25	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	1.70	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	6	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	2,041	ft^2
SURFACE AREA PROVIDED	3,200	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	3,060	ft^3
BASIN VOLUME PROVIDED	5,068	ft^3
TOP OF EMBANKMENT ELEVATION	565.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	564.0	ft
EMERGENCY SPILLWAY WIDTH	10	ft
BOTTOM ELEVATION	562.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	561.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2	inch
ORIFICE DIAMETER	1	inch
DEWATERING TIME	3.24	days



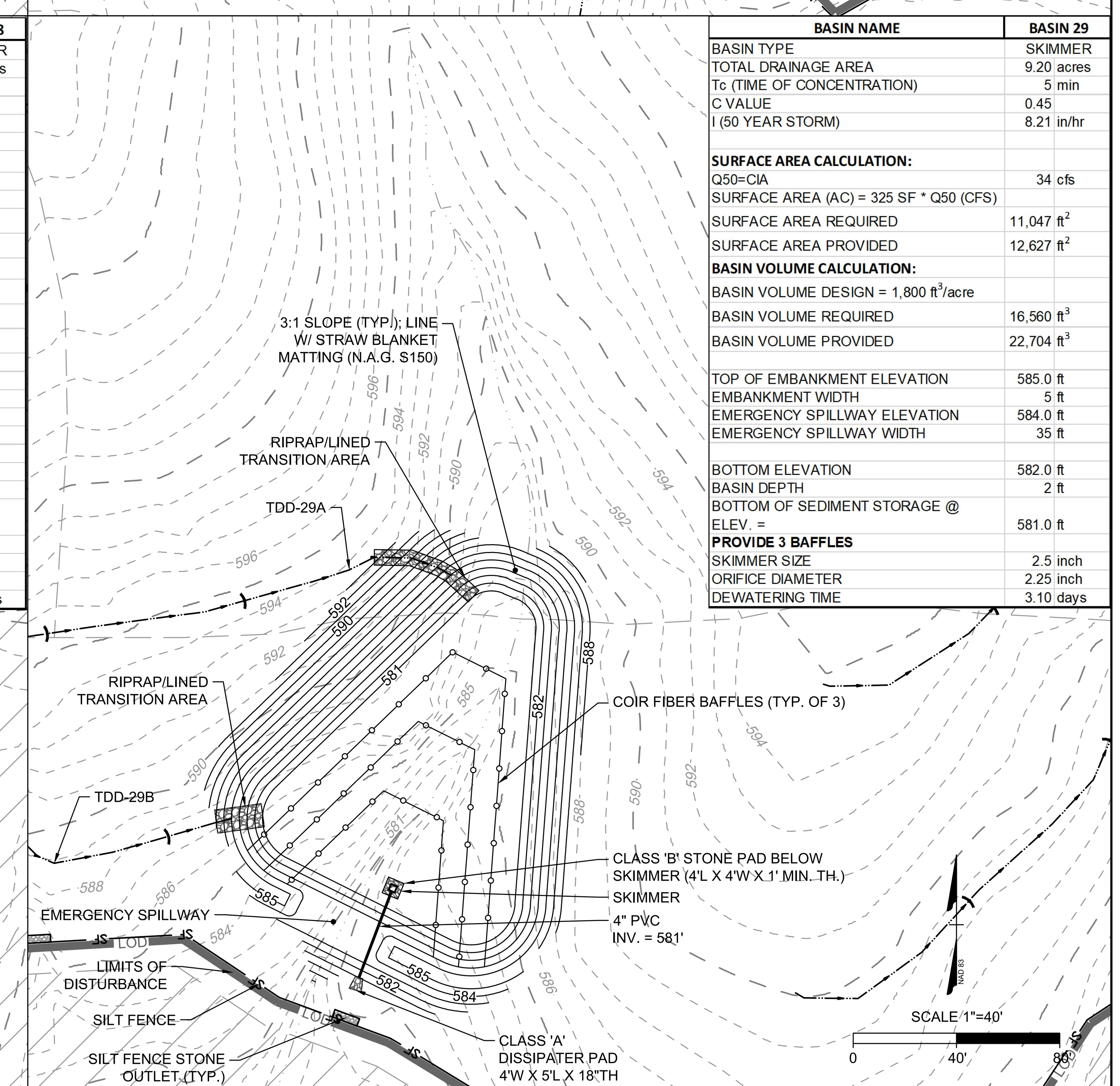
BASIN NAME	BASIN 26	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	3.51	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	13	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	4,215	ft^2
SURFACE AREA PROVIDED	4,486	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	6,318	ft^3
BASIN VOLUME PROVIDED	7,469	ft^3
TOP OF EMBANKMENT ELEVATION	577.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	576.0	ft
EMERGENCY SPILLWAY WIDTH	15	ft
BOTTOM ELEVATION	574.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	573.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2	inch
ORIFICE DIAMETER	1.5	inch
DEWATERING TIME	2.97	days



BASIN NAME	BASIN 27	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	3.90	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	14	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	4,683	ft^2
SURFACE AREA PROVIDED	5,411	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	7,020	ft^3
BASIN VOLUME PROVIDED	9,181	ft^3
TOP OF EMBANKMENT ELEVATION	570.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	569.0	ft
EMERGENCY SPILLWAY WIDTH	20	ft
BOTTOM ELEVATION	567.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	566.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2	inch
ORIFICE DIAMETER	1.5	inch
DEWATERING TIME	3.31	days



BASIN NAME	BASIN 28	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	6.58	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	24	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	7,901	ft^2
SURFACE AREA PROVIDED	8,978	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	11,844	ft^3
BASIN VOLUME PROVIDED	15,652	ft^3
TOP OF EMBANKMENT ELEVATION	582.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	581.0	ft
EMERGENCY SPILLWAY WIDTH	30	ft
BOTTOM ELEVATION	579.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	578.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2	inch
ORIFICE DIAMETER	1.75	inch
DEWATERING TIME	4.10	days



BASIN NAME	BASIN 29	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	9.20	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	34	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	11,047	ft^2
SURFACE AREA PROVIDED	12,627	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	16,560	ft^3
BASIN VOLUME PROVIDED	22,704	ft^3
TOP OF EMBANKMENT ELEVATION	585.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	584.0	ft
EMERGENCY SPILLWAY WIDTH	35	ft
BOTTOM ELEVATION	582.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	581.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2.5	inch
ORIFICE DIAMETER	2.25	inch
DEWATERING TIME	3.10	days

PRELIMINARY - NOT RELEASED FOR CONSTRUCTION

ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH CASWELL COUNTY, NCDEQ AND NCDOT STANDARDS, SPECIFICATIONS, AND DETAILS

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 022530 RICHARD W. BAKER, III
04/24/2020

THIS DRAWING PREPARED AT THE
RALEIGH OFFICE
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DATE	REVISION DESCRIPTION
04/24/2020	ADDRESSED NCDEQ COMMENTS

YOUR VISION ACHIEVED THROUGH OURS.

DATE
2019-08-22
DRAWN BY
T. DAEKE
DESIGNED BY
S. MOORE
CHECKED BY
R. BAKER
SCALE
AS SHOWN

TIMMONS GROUP

NORTH CAROLINA LICENSE NO. C-1652

PROSPECT HILL QUARRY AND DISTRIBUTION CENTER

PROSPECT HILL - CASWELL COUNTY - NORTH CAROLINA

SEDIMENT BASIN ENLARGEMENTS

JOB NO.
44089.001
SHEET NO.
C3.05

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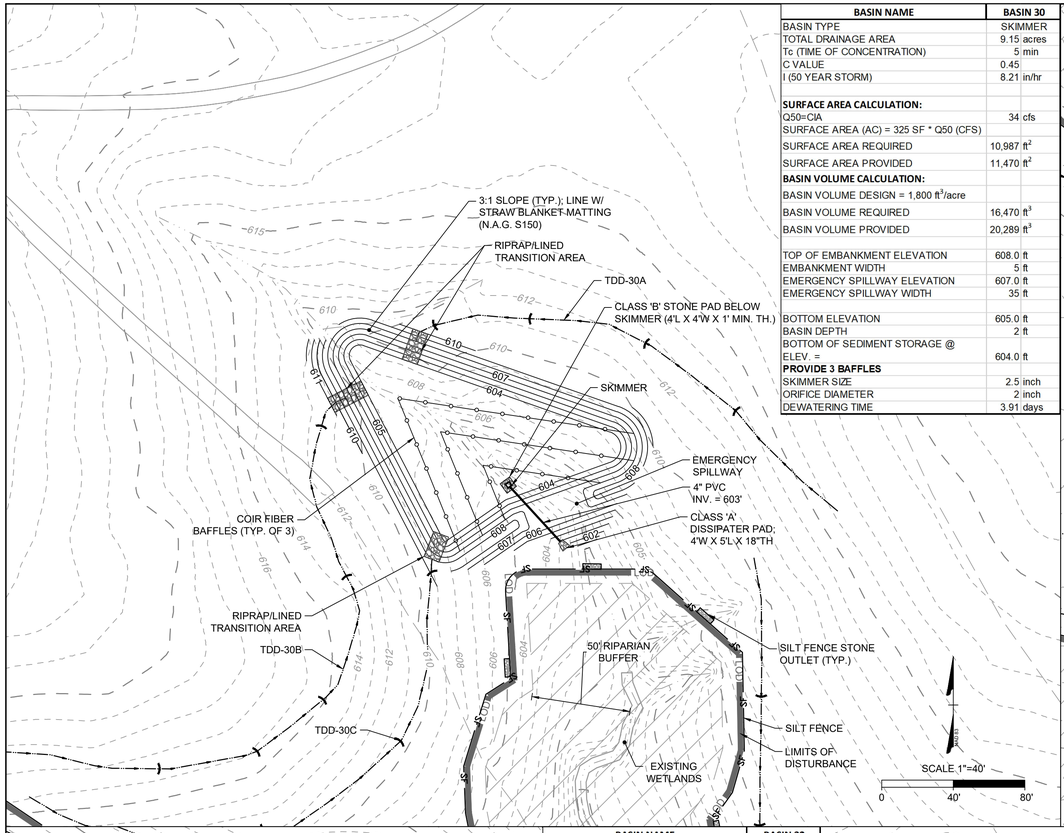
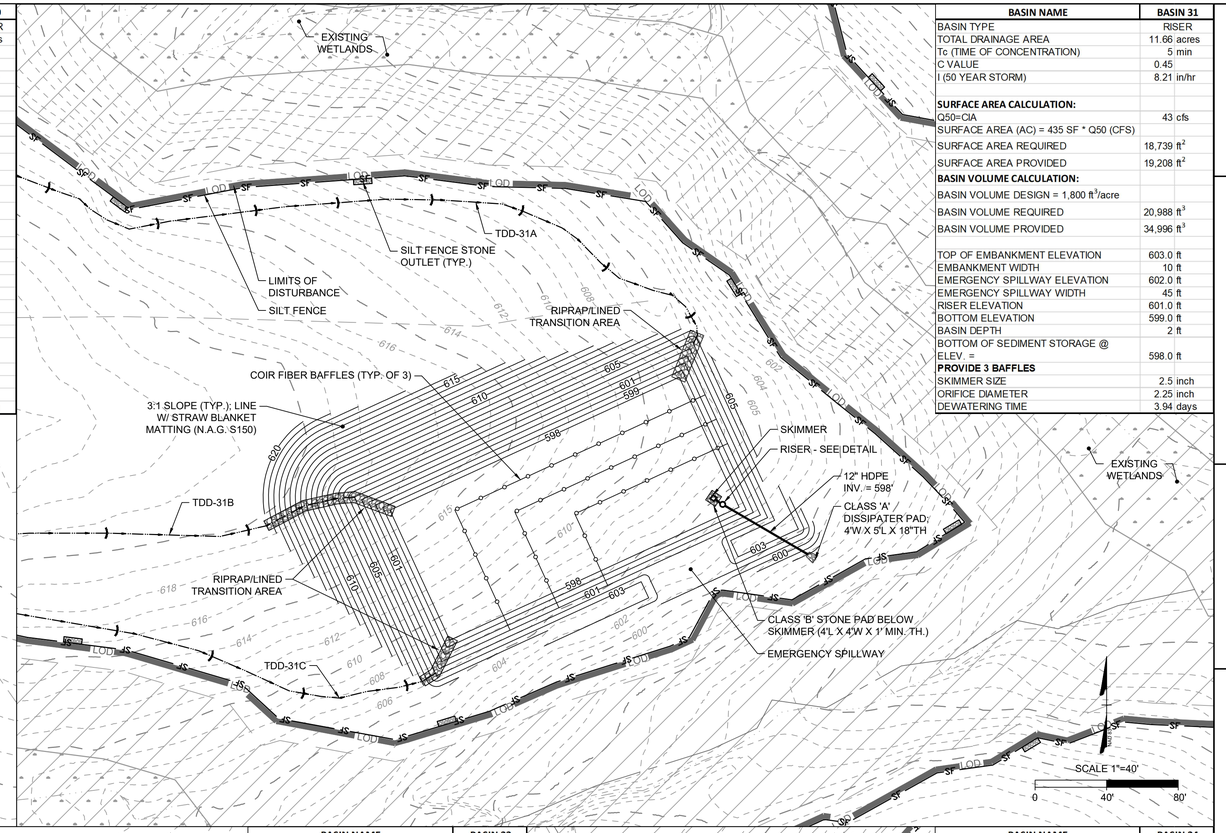
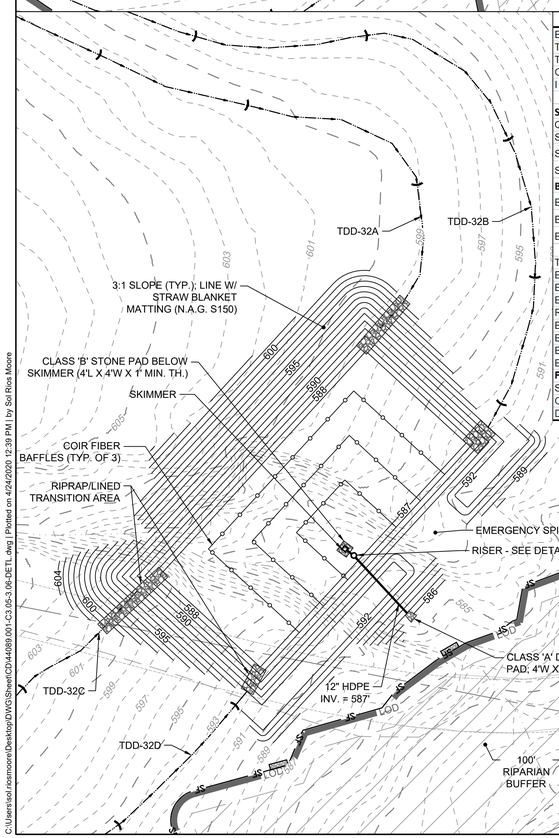


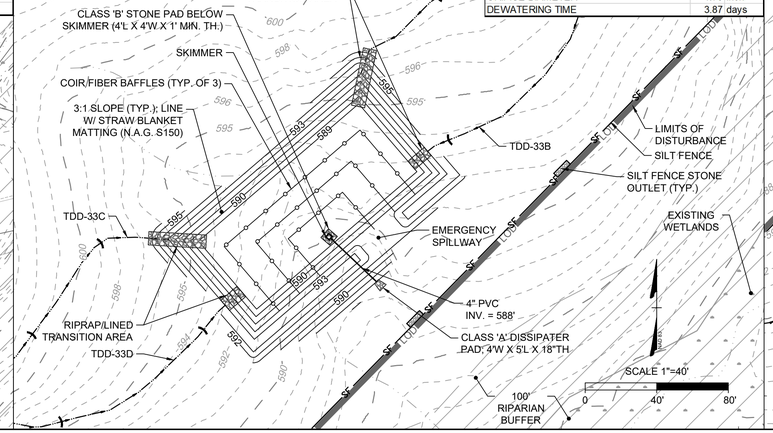
BASIN NAME	BASIN 30
BASIN TYPE	SKIMMER
TOTAL DRAINAGE AREA	9.15 acres
Tc (TIME OF CONCENTRATION)	5 min
C VALUE	0.45
I (50 YEAR STORM)	8.21 in/hr
SURFACE AREA CALCULATION:	
Q50=CIA	34 cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)	
SURFACE AREA REQUIRED	10,987 ft^2
SURFACE AREA PROVIDED	11,470 ft^2
BASIN VOLUME CALCULATION:	
BASIN VOLUME DESIGN = 1,800 ft^3/acre	
BASIN VOLUME REQUIRED	16,470 ft^3
BASIN VOLUME PROVIDED	20,289 ft^3
TOP OF EMBANKMENT ELEVATION	608.0 ft
EMBANKMENT WIDTH	5 ft
EMERGENCY SPILLWAY ELEVATION	607.0 ft
EMERGENCY SPILLWAY WIDTH	35 ft
BOTTOM ELEVATION	605.0 ft
BASIN DEPTH	2 ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	604.0 ft
PROVIDE 3 BAFFLES	
SKIMMER SIZE	2.5 inch
ORIFICE DIAMETER	2 inch
DEWATERING TIME	3.91 days



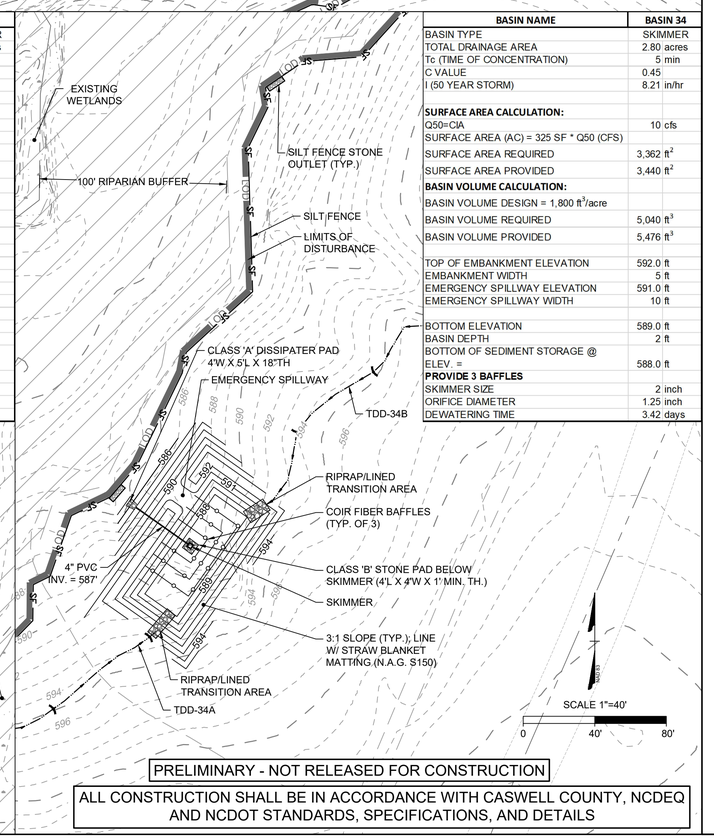
BASIN NAME	BASIN 31
BASIN TYPE	RISER
TOTAL DRAINAGE AREA	11.66 acres
Tc (TIME OF CONCENTRATION)	5 min
C VALUE	0.45
I (50 YEAR STORM)	8.21 in/hr
SURFACE AREA CALCULATION:	
Q50=CIA	43 cfs
SURFACE AREA (AC) = 435 SF * Q50 (CFS)	
SURFACE AREA REQUIRED	18,739 ft^2
SURFACE AREA PROVIDED	19,208 ft^2
BASIN VOLUME CALCULATION:	
BASIN VOLUME DESIGN = 1,800 ft^3/acre	
BASIN VOLUME REQUIRED	20,988 ft^3
BASIN VOLUME PROVIDED	34,996 ft^3
TOP OF EMBANKMENT ELEVATION	603.0 ft
EMBANKMENT WIDTH	10 ft
EMERGENCY SPILLWAY ELEVATION	602.0 ft
EMERGENCY SPILLWAY WIDTH	45 ft
RISER ELEVATION	601.0 ft
BOTTOM ELEVATION	599.0 ft
BASIN DEPTH	2 ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	598.0 ft
PROVIDE 3 BAFFLES	
SKIMMER SIZE	2.5 inch
ORIFICE DIAMETER	2.25 inch
DEWATERING TIME	3.94 days



BASIN NAME	BASIN 32
BASIN TYPE	RISER
TOTAL DRAINAGE AREA	12.17 acres
Tc (TIME OF CONCENTRATION)	10 min
C VALUE	0.45
I (50 YEAR STORM)	6.53 in/hr
SURFACE AREA CALCULATION:	
Q50=CIA	36 cfs
SURFACE AREA (AC) = 435 SF * Q50 (CFS)	
SURFACE AREA REQUIRED	15,556 ft^2
SURFACE AREA PROVIDED	17,672 ft^2
BASIN VOLUME CALCULATION:	
BASIN VOLUME DESIGN = 1,800 ft^3/acre	
BASIN VOLUME REQUIRED	20,754 ft^3
BASIN VOLUME PROVIDED	32,068 ft^3
TOP OF EMBANKMENT ELEVATION	592.0 ft
EMBANKMENT WIDTH	10 ft
EMERGENCY SPILLWAY ELEVATION	591.0 ft
EMERGENCY SPILLWAY WIDTH	40 ft
RISER ELEVATION	590.0 ft
BOTTOM ELEVATION	588.0 ft
BASIN DEPTH	2 ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	587.0 ft
PROVIDE 3 BAFFLES	
SKIMMER SIZE	2.5 inch
ORIFICE DIAMETER	2.25 inch
DEWATERING TIME	3.89 days



BASIN NAME	BASIN 33
BASIN TYPE	SKIMMER
TOTAL DRAINAGE AREA	6.93 acres
Tc (TIME OF CONCENTRATION)	5 min
C VALUE	0.45
I (50 YEAR STORM)	8.21 in/hr
SURFACE AREA CALCULATION:	
Q50=CIA	26 cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)	
SURFACE AREA REQUIRED	8,321 ft^2
SURFACE AREA PROVIDED	9,248 ft^2
BASIN VOLUME CALCULATION:	
BASIN VOLUME DESIGN = 1,800 ft^3/acre	
BASIN VOLUME REQUIRED	12,474 ft^3
BASIN VOLUME PROVIDED	16,156 ft^3
TOP OF EMBANKMENT ELEVATION	593.0 ft
EMBANKMENT WIDTH	5 ft
EMERGENCY SPILLWAY ELEVATION	592.0 ft
EMERGENCY SPILLWAY WIDTH	25 ft
BOTTOM ELEVATION	590.0 ft
BASIN DEPTH	2 ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	589.0 ft
PROVIDE 3 BAFFLES	
SKIMMER SIZE	2.5 inch
ORIFICE DIAMETER	1.75 inch
DEWATERING TIME	3.87 days



BASIN NAME	BASIN 34
BASIN TYPE	SKIMMER
TOTAL DRAINAGE AREA	2.80 acres
Tc (TIME OF CONCENTRATION)	5 min
C VALUE	0.45
I (50 YEAR STORM)	8.21 in/hr
SURFACE AREA CALCULATION:	
Q50=CIA	10 cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)	
SURFACE AREA REQUIRED	3,362 ft^2
SURFACE AREA PROVIDED	3,440 ft^2
BASIN VOLUME CALCULATION:	
BASIN VOLUME DESIGN = 1,800 ft^3/acre	
BASIN VOLUME REQUIRED	5,040 ft^3
BASIN VOLUME PROVIDED	5,476 ft^3
TOP OF EMBANKMENT ELEVATION	592.0 ft
EMBANKMENT WIDTH	5 ft
EMERGENCY SPILLWAY ELEVATION	591.0 ft
EMERGENCY SPILLWAY WIDTH	10 ft
BOTTOM ELEVATION	589.0 ft
BASIN DEPTH	2 ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	588.0 ft
PROVIDE 3 BAFFLES	
SKIMMER SIZE	2 inch
ORIFICE DIAMETER	1.25 inch
DEWATERING TIME	3.42 days

PRELIMINARY - NOT RELEASED FOR CONSTRUCTION

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NORTH CAROLINA PROFESSIONAL SEAL 022530 ENGINEER RICHARD W. BAKER, III
04/24/2020

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REVISION	DESCRIPTION
	ADDRESSED NCDEQ COMMENTS

DATE	
04/24/2020	

DATE: 2019-08-22
DRAWN BY: T. DAEKE
DESIGNED BY: S. MOORE
CHECKED BY: R. BAKER
SCALE: AS SHOWN

TIMMONS GROUP

NORTH CAROLINA LICENSE NO. C-1652

PROSPECT HILL QUARRY AND DISTRIBUTION CENTER

PROSPECT HILL - CASWELL COUNTY - NORTH CAROLINA

SEDIMENT BASIN ENLARGEMENTS

JOB NO. 44089.001

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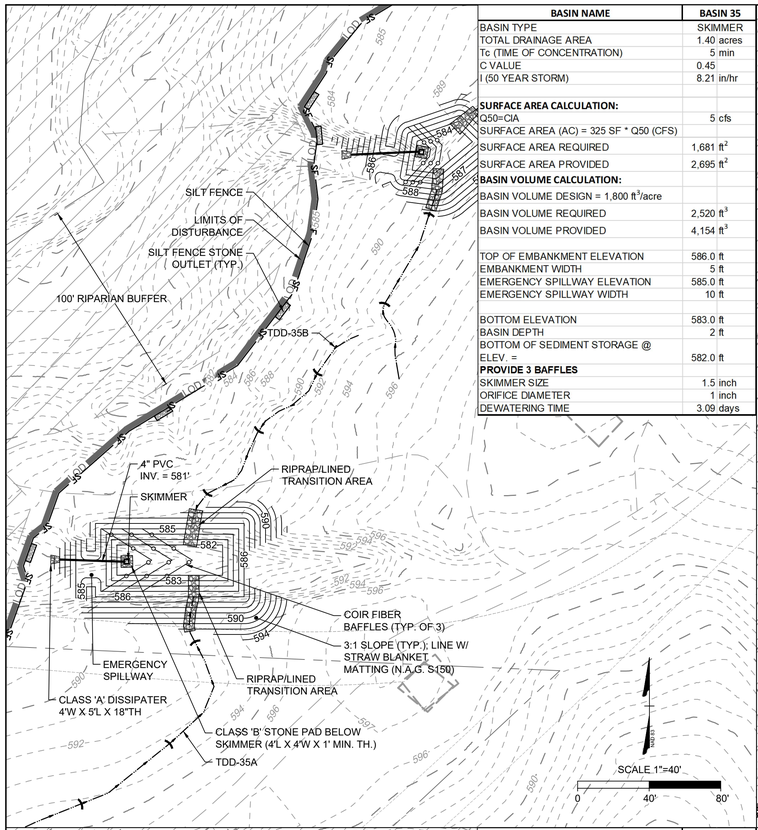
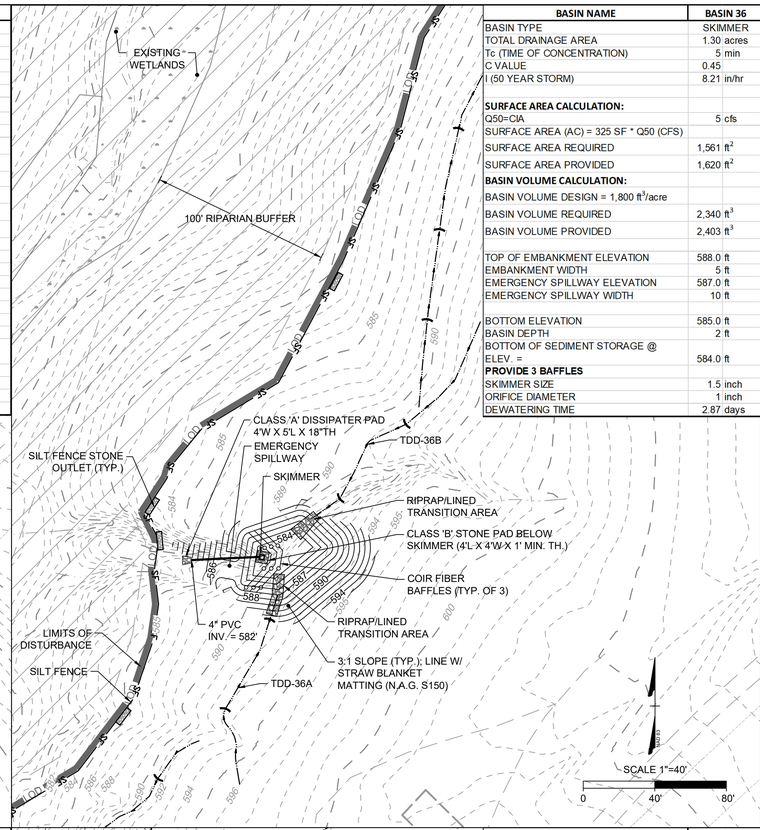
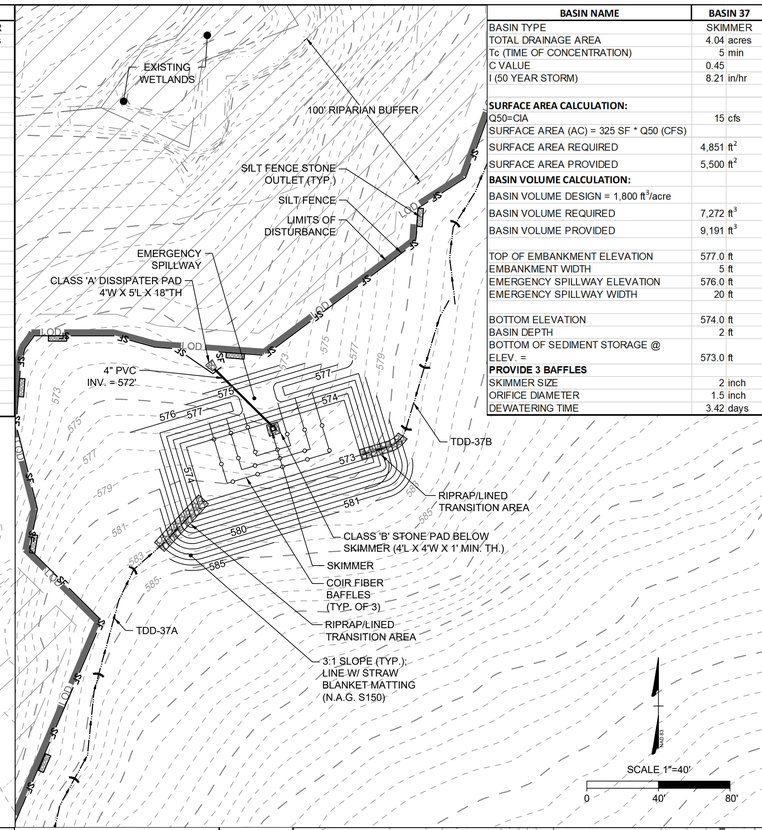


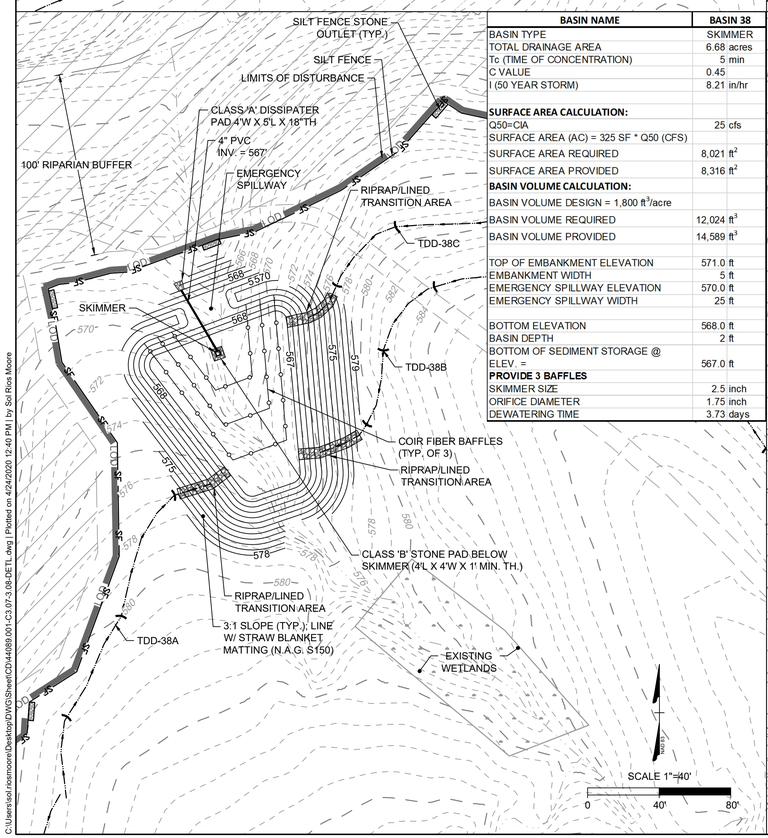
BASIN NAME	BASIN 35
BASIN TYPE	SKIMMER
TOTAL DRAINAGE AREA	1.40 acres
Tc (TIME OF CONCENTRATION)	5 min
C VALUE	0.45
I (50 YEAR STORM)	8.21 in/hr
SURFACE AREA CALCULATION:	
Q50=CIA	5 cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)	
SURFACE AREA REQUIRED	1,681 ft^2
SURFACE AREA PROVIDED	2,695 ft^2
BASIN VOLUME CALCULATION:	
BASIN VOLUME DESIGN = 1,800 ft^3/acre	
BASIN VOLUME REQUIRED	2,520 ft^3
BASIN VOLUME PROVIDED	4,154 ft^3
TOP OF EMBANKMENT ELEVATION	586.0 ft
EMBANKMENT WIDTH	5 ft
EMERGENCY SPILLWAY ELEVATION	585.0 ft
EMERGENCY SPILLWAY WIDTH	10 ft
BOTTOM ELEVATION	583.0 ft
BASIN DEPTH	2 ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	582.0 ft
PROVIDE 3 BAFFLES	
SKIMMER SIZE	1.5 inch
ORIFICE DIAMETER	1 inch
DEWATERING TIME	3.09 days



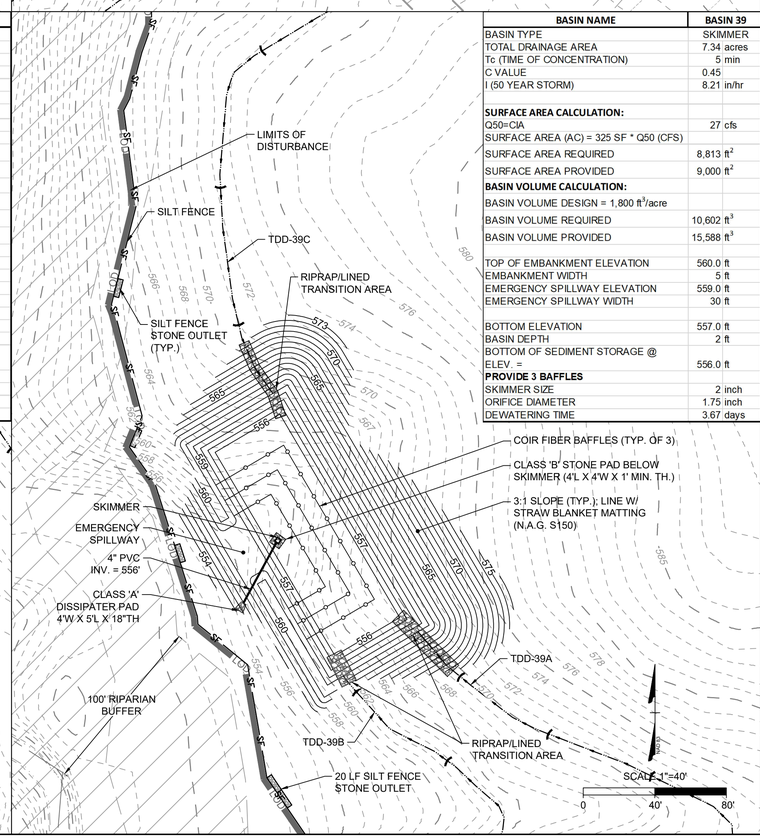
BASIN NAME	BASIN 36
BASIN TYPE	SKIMMER
TOTAL DRAINAGE AREA	1.30 acres
Tc (TIME OF CONCENTRATION)	5 min
C VALUE	0.45
I (50 YEAR STORM)	8.21 in/hr
SURFACE AREA CALCULATION:	
Q50=CIA	5 cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)	
SURFACE AREA REQUIRED	1,561 ft^2
SURFACE AREA PROVIDED	1,620 ft^2
BASIN VOLUME CALCULATION:	
BASIN VOLUME DESIGN = 1,800 ft^3/acre	
BASIN VOLUME REQUIRED	2,340 ft^3
BASIN VOLUME PROVIDED	2,403 ft^3
TOP OF EMBANKMENT ELEVATION	588.0 ft
EMBANKMENT WIDTH	5 ft
EMERGENCY SPILLWAY ELEVATION	587.0 ft
EMERGENCY SPILLWAY WIDTH	10 ft
BOTTOM ELEVATION	585.0 ft
BASIN DEPTH	2 ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	584.0 ft
PROVIDE 3 BAFFLES	
SKIMMER SIZE	1.5 inch
ORIFICE DIAMETER	1 inch
DEWATERING TIME	2.87 days



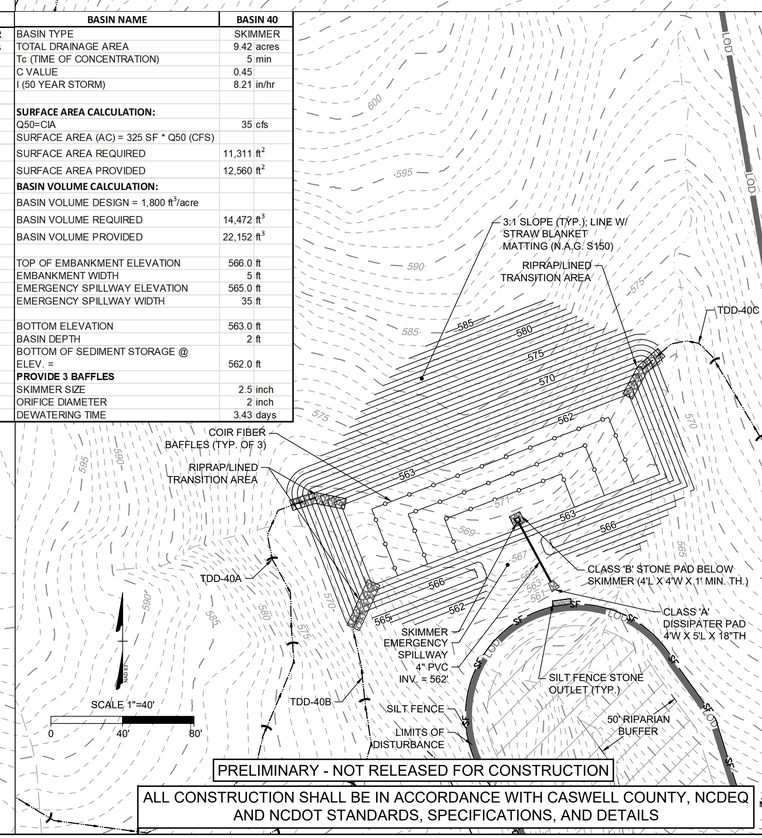
BASIN NAME	BASIN 37
BASIN TYPE	SKIMMER
TOTAL DRAINAGE AREA	4.04 acres
Tc (TIME OF CONCENTRATION)	5 min
C VALUE	0.45
I (50 YEAR STORM)	8.21 in/hr
SURFACE AREA CALCULATION:	
Q50=CIA	15 cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)	
SURFACE AREA REQUIRED	4,851 ft^2
SURFACE AREA PROVIDED	5,500 ft^2
BASIN VOLUME CALCULATION:	
BASIN VOLUME DESIGN = 1,800 ft^3/acre	
BASIN VOLUME REQUIRED	7,272 ft^3
BASIN VOLUME PROVIDED	9,191 ft^3
TOP OF EMBANKMENT ELEVATION	577.0 ft
EMBANKMENT WIDTH	5 ft
EMERGENCY SPILLWAY ELEVATION	576.0 ft
EMERGENCY SPILLWAY WIDTH	20 ft
BOTTOM ELEVATION	574.0 ft
BASIN DEPTH	2 ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	573.0 ft
PROVIDE 3 BAFFLES	
SKIMMER SIZE	2 inch
ORIFICE DIAMETER	1.5 inch
DEWATERING TIME	3.42 days



BASIN NAME	BASIN 38
BASIN TYPE	SKIMMER
TOTAL DRAINAGE AREA	6.68 acres
Tc (TIME OF CONCENTRATION)	5 min
C VALUE	0.45
I (50 YEAR STORM)	8.21 in/hr
SURFACE AREA CALCULATION:	
Q50=CIA	25 cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)	
SURFACE AREA REQUIRED	8,021 ft^2
SURFACE AREA PROVIDED	8,316 ft^2
BASIN VOLUME CALCULATION:	
BASIN VOLUME DESIGN = 1,800 ft^3/acre	
BASIN VOLUME REQUIRED	12,024 ft^3
BASIN VOLUME PROVIDED	14,589 ft^3
TOP OF EMBANKMENT ELEVATION	571.0 ft
EMBANKMENT WIDTH	5 ft
EMERGENCY SPILLWAY ELEVATION	570.0 ft
EMERGENCY SPILLWAY WIDTH	25 ft
BOTTOM ELEVATION	568.0 ft
BASIN DEPTH	2 ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	567.0 ft
PROVIDE 3 BAFFLES	
SKIMMER SIZE	2.5 inch
ORIFICE DIAMETER	1.75 inch
DEWATERING TIME	3.73 days



BASIN NAME	BASIN 39
BASIN TYPE	SKIMMER
TOTAL DRAINAGE AREA	7.34 acres
Tc (TIME OF CONCENTRATION)	5 min
C VALUE	0.45
I (50 YEAR STORM)	8.21 in/hr
SURFACE AREA CALCULATION:	
Q50=CIA	27 cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)	
SURFACE AREA REQUIRED	8,813 ft^2
SURFACE AREA PROVIDED	9,000 ft^2
BASIN VOLUME CALCULATION:	
BASIN VOLUME DESIGN = 1,800 ft^3/acre	
BASIN VOLUME REQUIRED	10,602 ft^3
BASIN VOLUME PROVIDED	15,588 ft^3
TOP OF EMBANKMENT ELEVATION	560.0 ft
EMBANKMENT WIDTH	5 ft
EMERGENCY SPILLWAY ELEVATION	559.0 ft
EMERGENCY SPILLWAY WIDTH	30 ft
BOTTOM ELEVATION	557.0 ft
BASIN DEPTH	2 ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	556.0 ft
PROVIDE 3 BAFFLES	
SKIMMER SIZE	2 inch
ORIFICE DIAMETER	1.75 inch
DEWATERING TIME	3.67 days



BASIN NAME	BASIN 40
BASIN TYPE	SKIMMER
TOTAL DRAINAGE AREA	9.42 acres
Tc (TIME OF CONCENTRATION)	5 min
C VALUE	0.45
I (50 YEAR STORM)	8.21 in/hr
SURFACE AREA CALCULATION:	
Q50=CIA	35 cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)	
SURFACE AREA REQUIRED	11,311 ft^2
SURFACE AREA PROVIDED	12,560 ft^2
BASIN VOLUME CALCULATION:	
BASIN VOLUME DESIGN = 1,800 ft^3/acre	
BASIN VOLUME REQUIRED	14,472 ft^3
BASIN VOLUME PROVIDED	22,152 ft^3
TOP OF EMBANKMENT ELEVATION	566.0 ft
EMBANKMENT WIDTH	5 ft
EMERGENCY SPILLWAY ELEVATION	565.0 ft
EMERGENCY SPILLWAY WIDTH	35 ft
BOTTOM ELEVATION	563.0 ft
BASIN DEPTH	2 ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	562.0 ft
PROVIDE 3 BAFFLES	
SKIMMER SIZE	2.5 inch
ORIFICE DIAMETER	2 inch
DEWATERING TIME	3.43 days

PRELIMINARY - NOT RELEASED FOR CONSTRUCTION

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NORTH CAROLINA PROFESSIONAL SEAL 022530 ENGINEER RICHARD W. BAKER, III
04/24/2020

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REVISION DESCRIPTION
ADDRESSED NCDEQ COMMENTS

DATE
04/24/2020

DATE
2019-08-22
DRAWN BY T. DAEKE
DESIGNED BY S. MOORE
CHECKED BY R. BAKER
SCALE AS SHOWN

TIMMONS GROUP

NORTH CAROLINA LICENSE NO. C-1652

PROSPECT HILL QUARRY AND DISTRIBUTION CENTER

PROSPECT HILL - CASWELL COUNTY - NORTH CAROLINA

SEDIMENT BASIN ENLARGEMENTS

JOB NO. 44089.001

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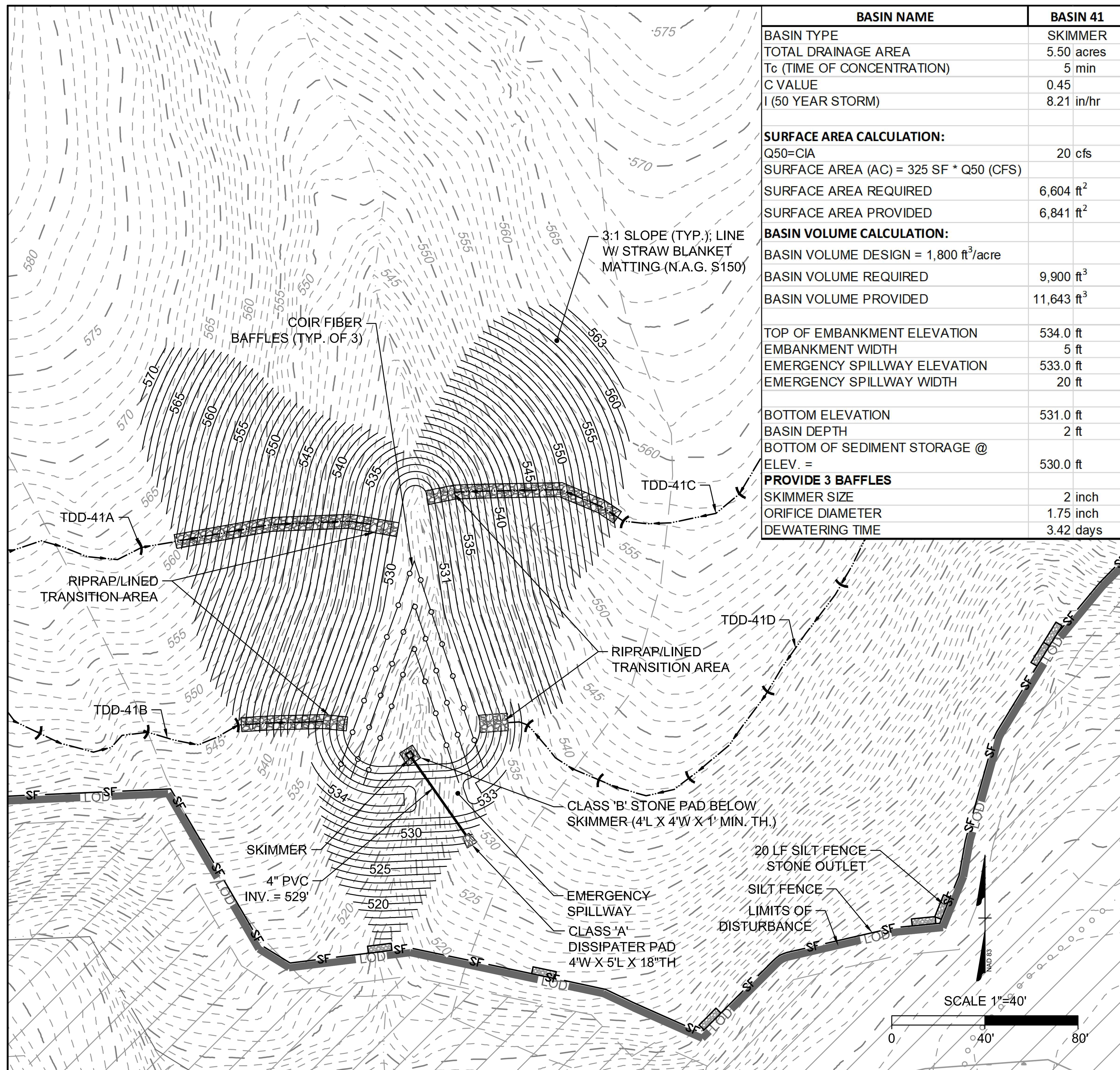
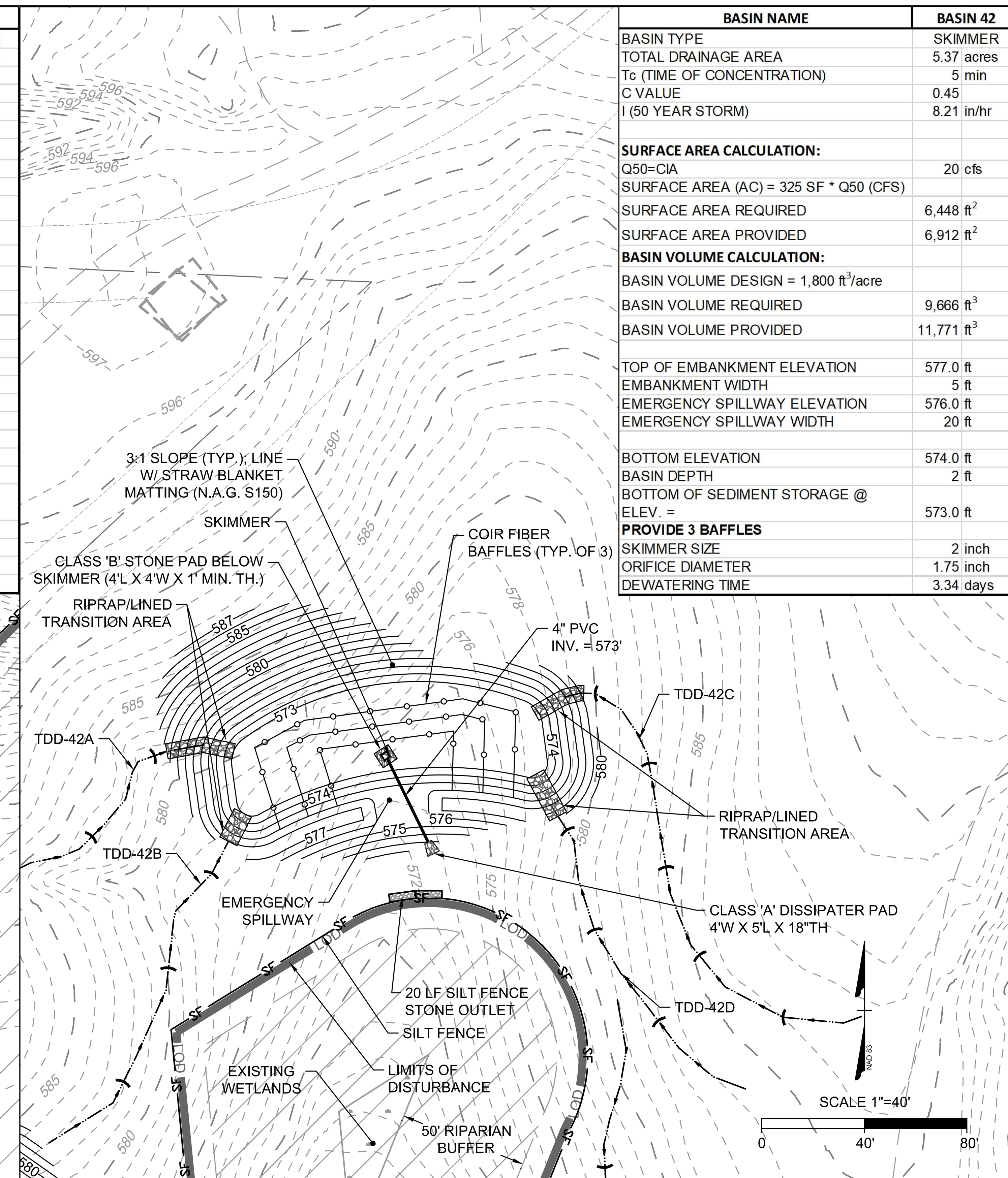
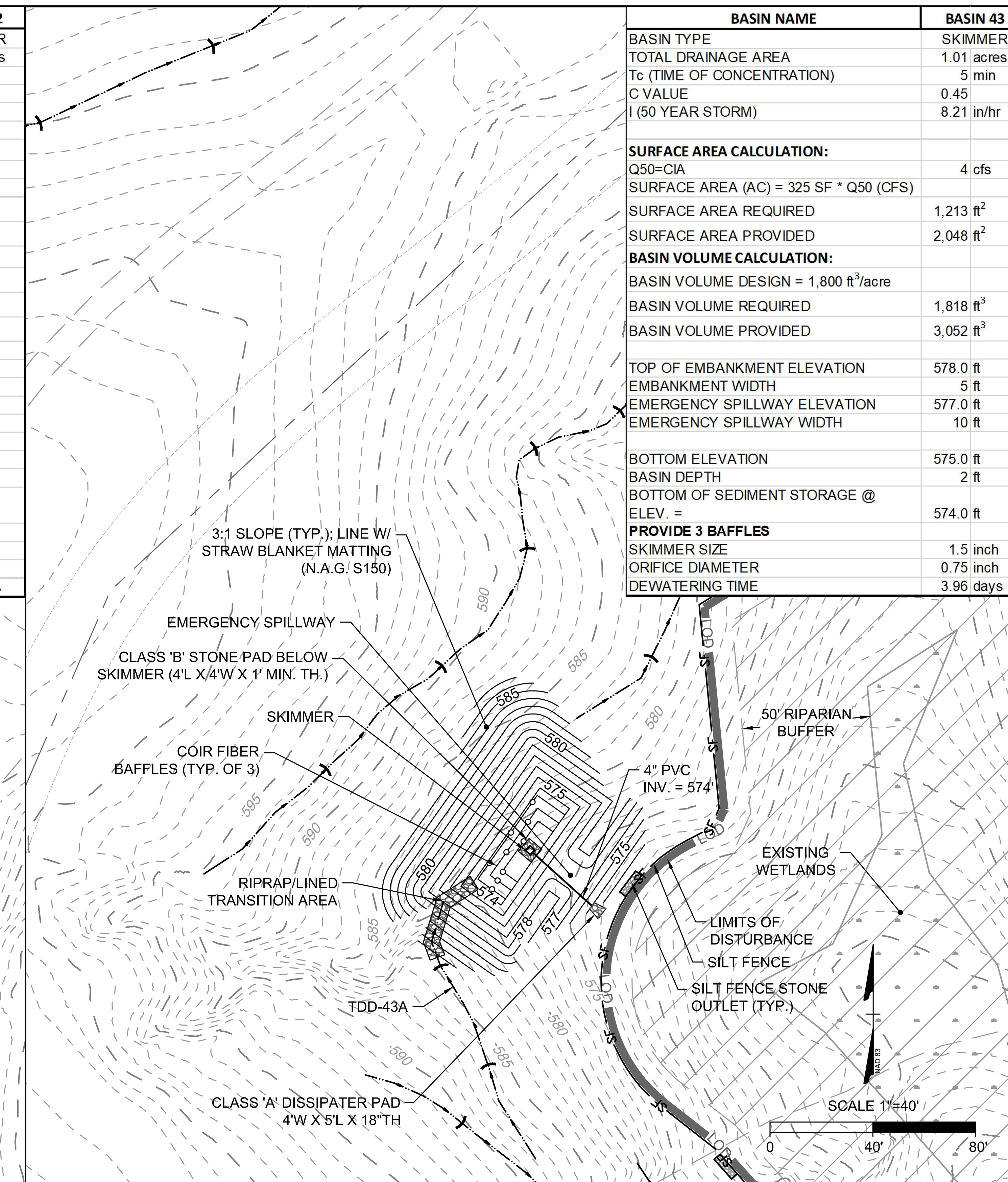


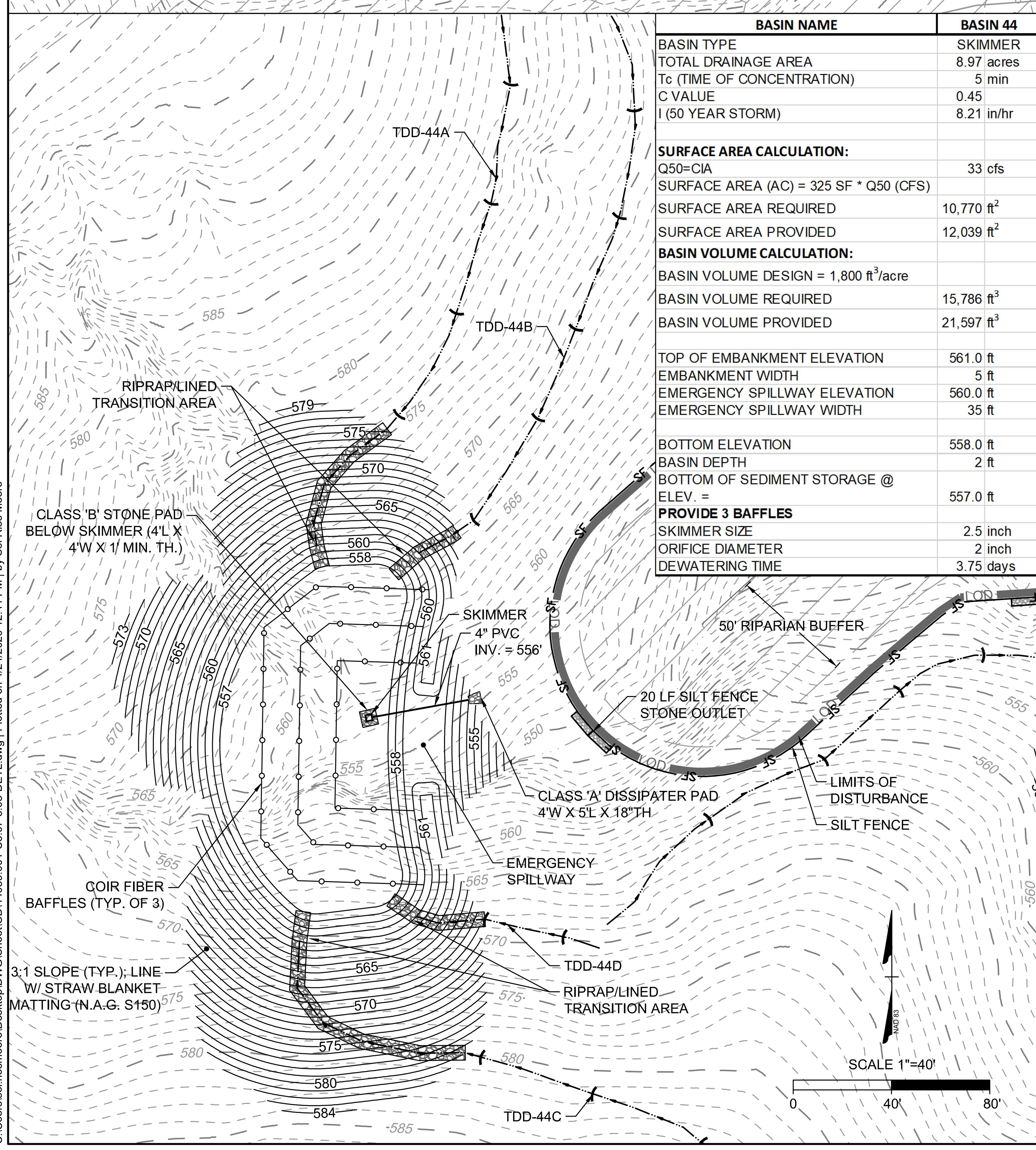
BASIN NAME	BASIN 41	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	5.50	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	20	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	6,604	ft^2
SURFACE AREA PROVIDED	6,841	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	9,900	ft^3
BASIN VOLUME PROVIDED	11,643	ft^3
TOP OF EMBANKMENT ELEVATION	534.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	533.0	ft
EMERGENCY SPILLWAY WIDTH	20	ft
BOTTOM ELEVATION	531.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	530.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2	inch
ORIFICE DIAMETER	1.75	inch
DEWATERING TIME	3.42	days



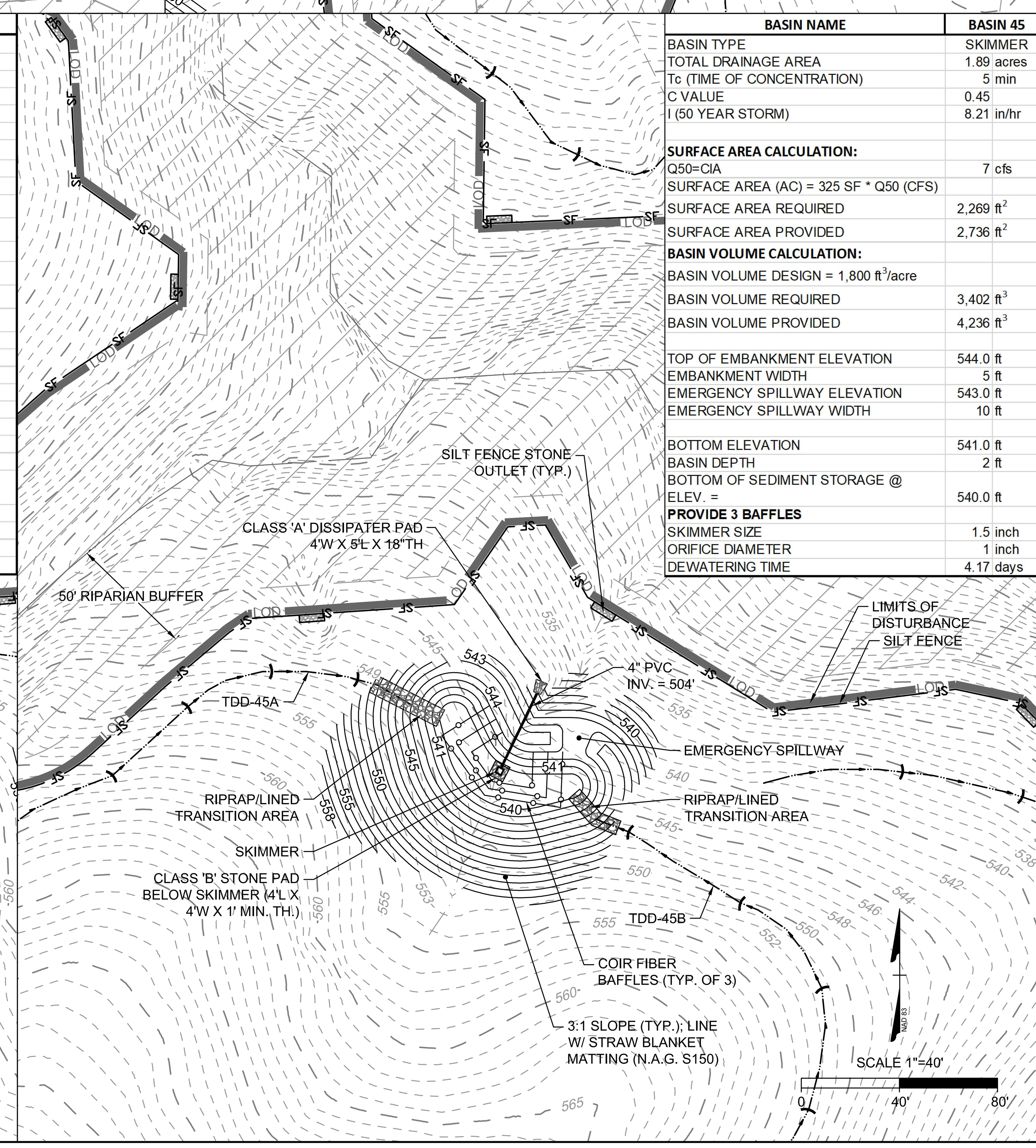
BASIN NAME	BASIN 42	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	5.37	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	20	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	6,448	ft^2
SURFACE AREA PROVIDED	6,912	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	9,666	ft^3
BASIN VOLUME PROVIDED	11,771	ft^3
TOP OF EMBANKMENT ELEVATION	577.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	576.0	ft
EMERGENCY SPILLWAY WIDTH	20	ft
BOTTOM ELEVATION	574.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	573.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2	inch
ORIFICE DIAMETER	1.75	inch
DEWATERING TIME	3.34	days



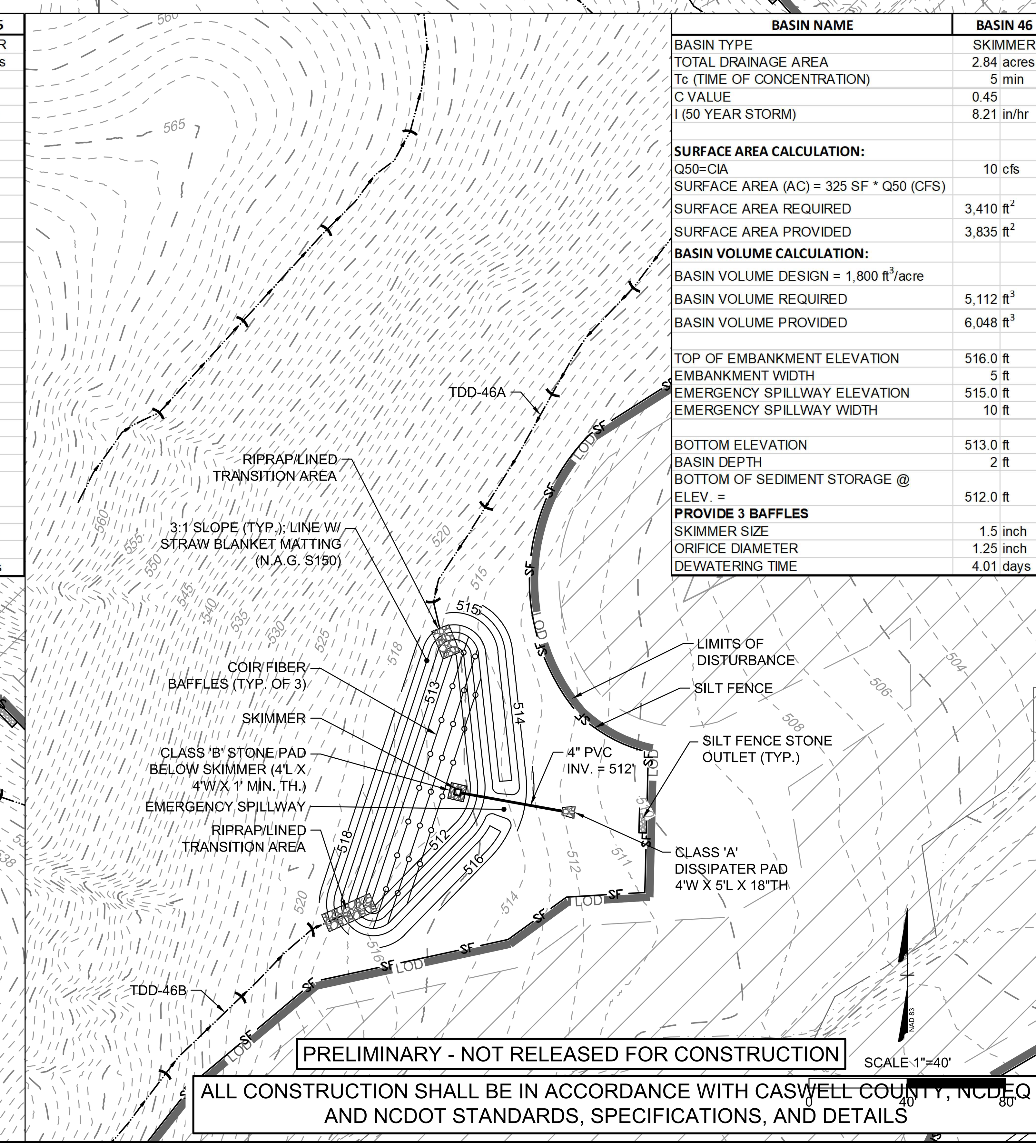
BASIN NAME	BASIN 43	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	1.01	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	4	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	1,213	ft^2
SURFACE AREA PROVIDED	2,048	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	1,818	ft^3
BASIN VOLUME PROVIDED	3,052	ft^3
TOP OF EMBANKMENT ELEVATION	578.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	577.0	ft
EMERGENCY SPILLWAY WIDTH	10	ft
BOTTOM ELEVATION	575.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	574.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	1.5	inch
ORIFICE DIAMETER	0.75	inch
DEWATERING TIME	3.96	days



BASIN NAME	BASIN 44	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	8.97	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	33	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	10,770	ft^2
SURFACE AREA PROVIDED	12,039	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	15,786	ft^3
BASIN VOLUME PROVIDED	21,597	ft^3
TOP OF EMBANKMENT ELEVATION	561.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	560.0	ft
EMERGENCY SPILLWAY WIDTH	35	ft
BOTTOM ELEVATION	558.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	557.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2.5	inch
ORIFICE DIAMETER	2	inch
DEWATERING TIME	3.75	days



BASIN NAME	BASIN 45	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	1.89	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	7	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	2,269	ft^2
SURFACE AREA PROVIDED	2,736	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	3,402	ft^3
BASIN VOLUME PROVIDED	4,236	ft^3
TOP OF EMBANKMENT ELEVATION	544.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	543.0	ft
EMERGENCY SPILLWAY WIDTH	10	ft
BOTTOM ELEVATION	541.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	540.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	1.5	inch
ORIFICE DIAMETER	1	inch
DEWATERING TIME	4.17	days



BASIN NAME	BASIN 46	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	2.84	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	10	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	3,410	ft^2
SURFACE AREA PROVIDED	3,835	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	5,112	ft^3
BASIN VOLUME PROVIDED	6,048	ft^3
TOP OF EMBANKMENT ELEVATION	516.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	515.0	ft
EMERGENCY SPILLWAY WIDTH	10	ft
BOTTOM ELEVATION	513.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	512.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	1.5	inch
ORIFICE DIAMETER	1.25	inch
DEWATERING TIME	4.01	days

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04/24/2020	ADDRESSED NCDEQ COMMENTS

DATE	2019-08-22
DRAWN BY	T. DAEKE
DESIGNED BY	S. MOORE
CHECKED BY	R. BAKER
SCALE	AS SHOWN

TIMMONS GROUP

NORTH CAROLINA LICENSE NO. C-1652

PROSPECT HILL QUARRY AND DISTRIBUTION CENTER

PROSPECT HILL - CASWELL COUNTY - NORTH CAROLINA

SEDIMENT BASIN ENLARGEMENTS

JOB NO.	44089.001
SHEET NO.	C3.08

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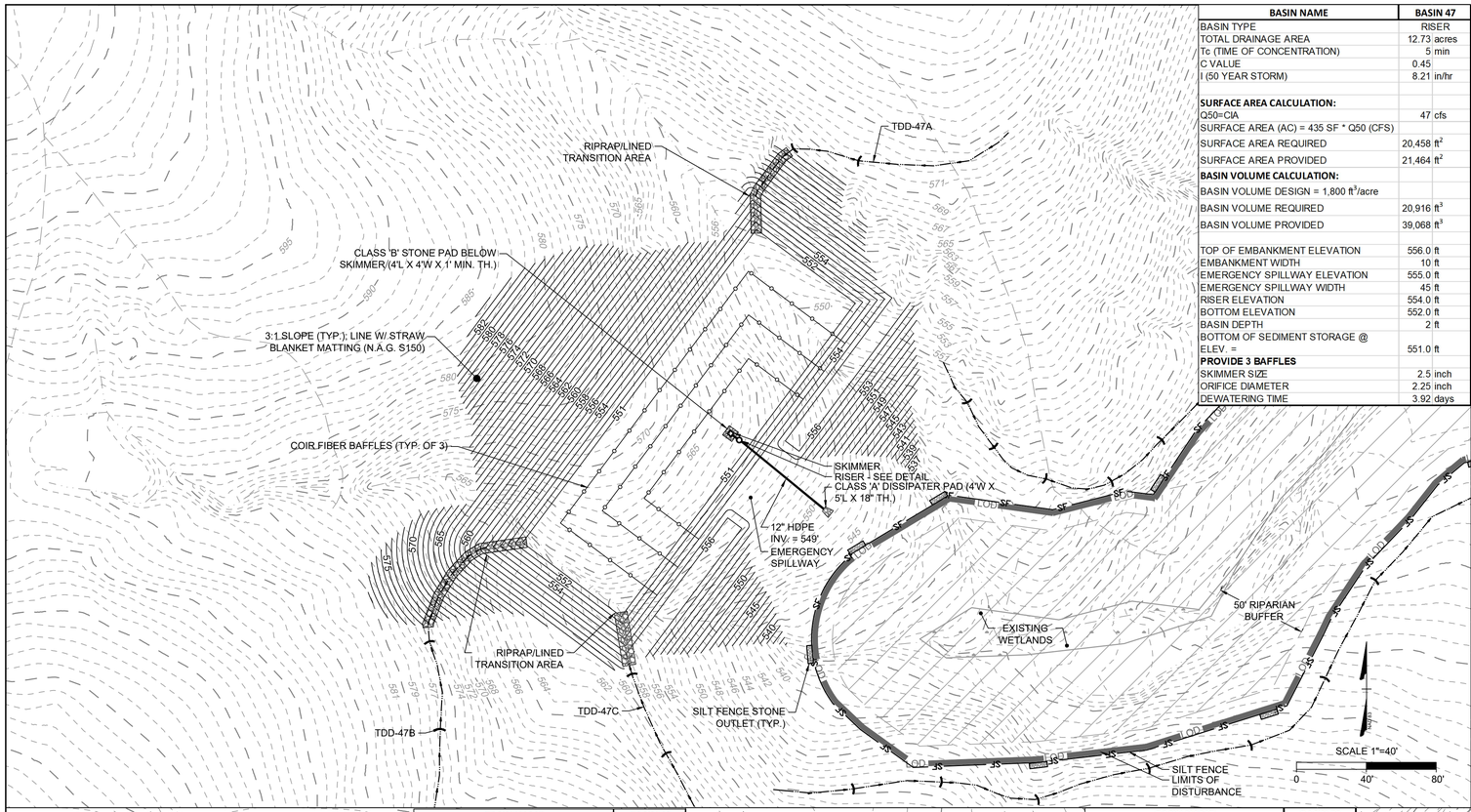
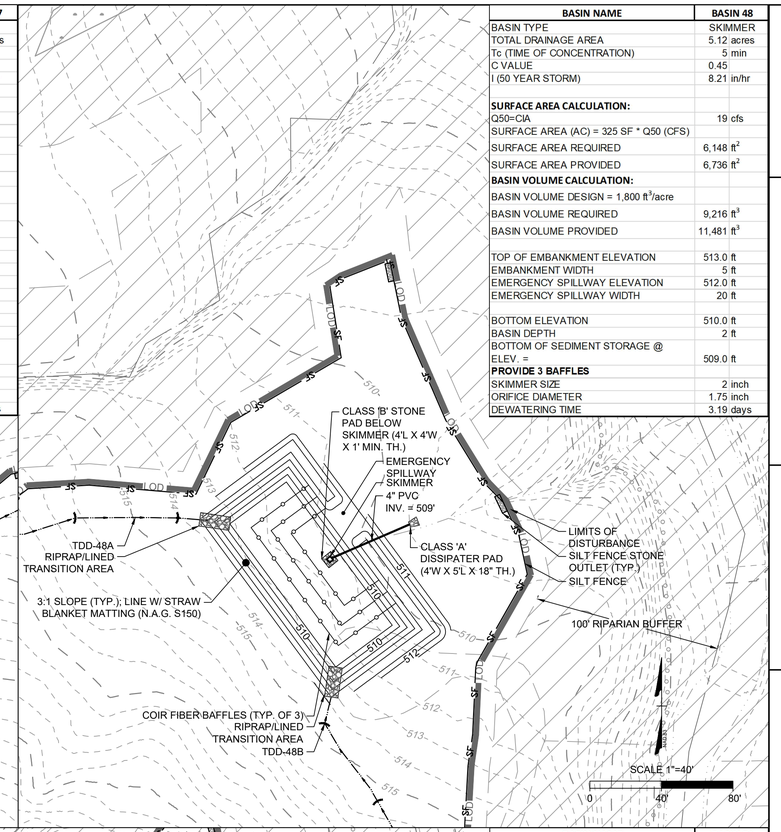
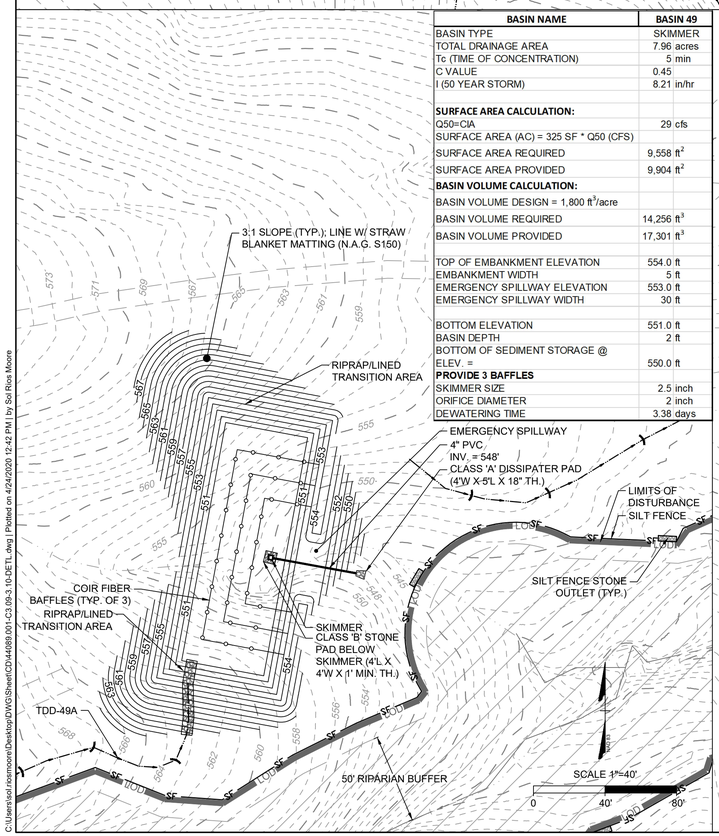


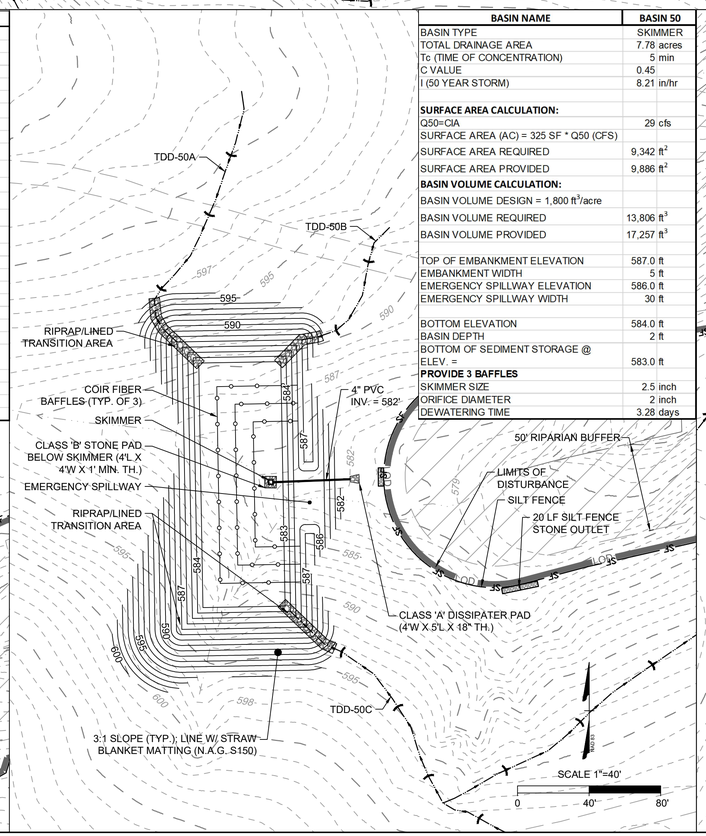
BASIN NAME	BASIN 47	
BASIN TYPE	RISER	
TOTAL DRAINAGE AREA	12.73	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	47	cfs
SURFACE AREA (AC) = 435 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	20,458	ft^2
SURFACE AREA PROVIDED	21,464	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	20,916	ft^3
BASIN VOLUME PROVIDED	39,068	ft^3
TOP OF EMBANKMENT ELEVATION	556.0	ft
EMBANKMENT WIDTH	10	ft
EMERGENCY SPILLWAY ELEVATION	555.0	ft
EMERGENCY SPILLWAY WIDTH	45	ft
RISER ELEVATION	554.0	ft
BOTTOM ELEVATION	552.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	551.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2.5	inch
ORIFICE DIAMETER	2.25	inch
DEWATERING TIME	3.92	days



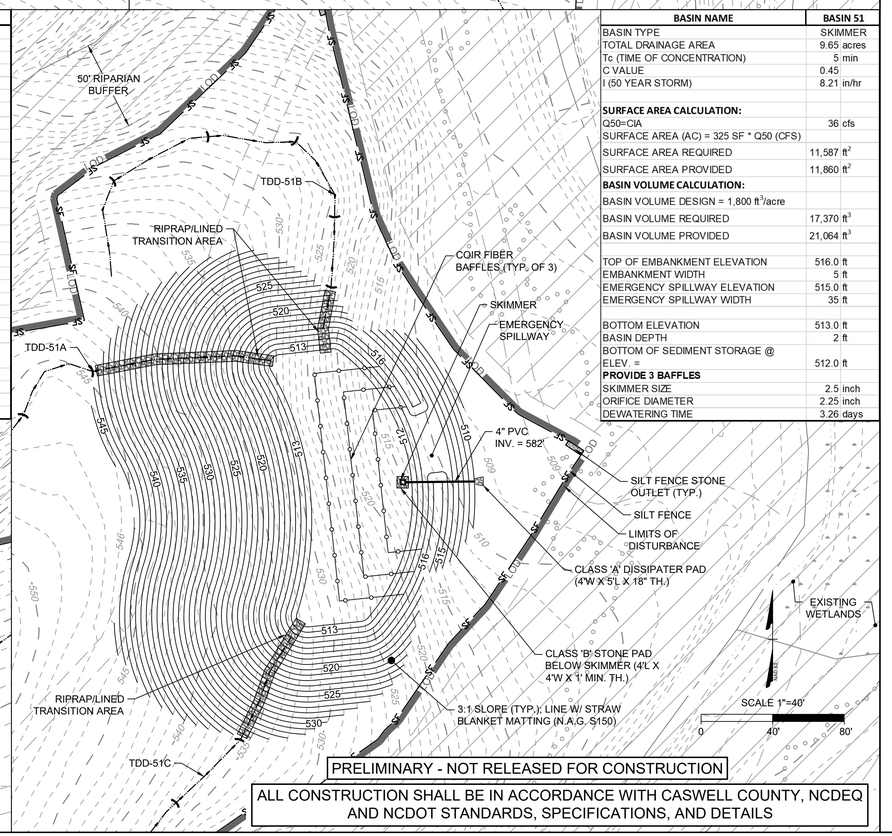
BASIN NAME	BASIN 48	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	5.12	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	19	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	6,148	ft^2
SURFACE AREA PROVIDED	6,736	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	9,216	ft^3
BASIN VOLUME PROVIDED	11,481	ft^3
TOP OF EMBANKMENT ELEVATION	513.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	512.0	ft
EMERGENCY SPILLWAY WIDTH	20	ft
BOTTOM ELEVATION	510.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	509.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2	inch
ORIFICE DIAMETER	1.75	inch
DEWATERING TIME	3.19	days



BASIN NAME	BASIN 49	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	7.96	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	29	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	9,558	ft^2
SURFACE AREA PROVIDED	9,904	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	14,256	ft^3
BASIN VOLUME PROVIDED	17,301	ft^3
TOP OF EMBANKMENT ELEVATION	554.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	553.0	ft
EMERGENCY SPILLWAY WIDTH	30	ft
BOTTOM ELEVATION	551.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	550.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2.5	inch
ORIFICE DIAMETER	2	inch
DEWATERING TIME	3.38	days



BASIN NAME	BASIN 50	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	7.78	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	29	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	9,342	ft^2
SURFACE AREA PROVIDED	9,886	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	13,806	ft^3
BASIN VOLUME PROVIDED	17,257	ft^3
TOP OF EMBANKMENT ELEVATION	587.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	586.0	ft
EMERGENCY SPILLWAY WIDTH	30	ft
BOTTOM ELEVATION	584.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	583.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2.5	inch
ORIFICE DIAMETER	2	inch
DEWATERING TIME	3.28	days



BASIN NAME	BASIN 51	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	9.65	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	36	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	11,587	ft^2
SURFACE AREA PROVIDED	11,860	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	17,370	ft^3
BASIN VOLUME PROVIDED	21,064	ft^3
TOP OF EMBANKMENT ELEVATION	516.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	515.0	ft
EMERGENCY SPILLWAY WIDTH	35	ft
BOTTOM ELEVATION	513.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	512.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2.5	inch
ORIFICE DIAMETER	2.25	inch
DEWATERING TIME	3.26	days

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NORTH CAROLINA PROFESSIONAL SEAL 022530 ENGINEER RICHARD W. BAKER, III
04/24/2020

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DRAWN BY	T. DAEKE
DESIGNED BY	S. MOORE
CHECKED BY	R. BAKER
SCALE	AS SHOWN

TIMMONS GROUP
NORTH CAROLINA LICENSE NO. C-1652

PROSPECT HILL QUARRY AND DISTRIBUTION CENTER
PROSPECT HILL - CASWELL COUNTY - NORTH CAROLINA

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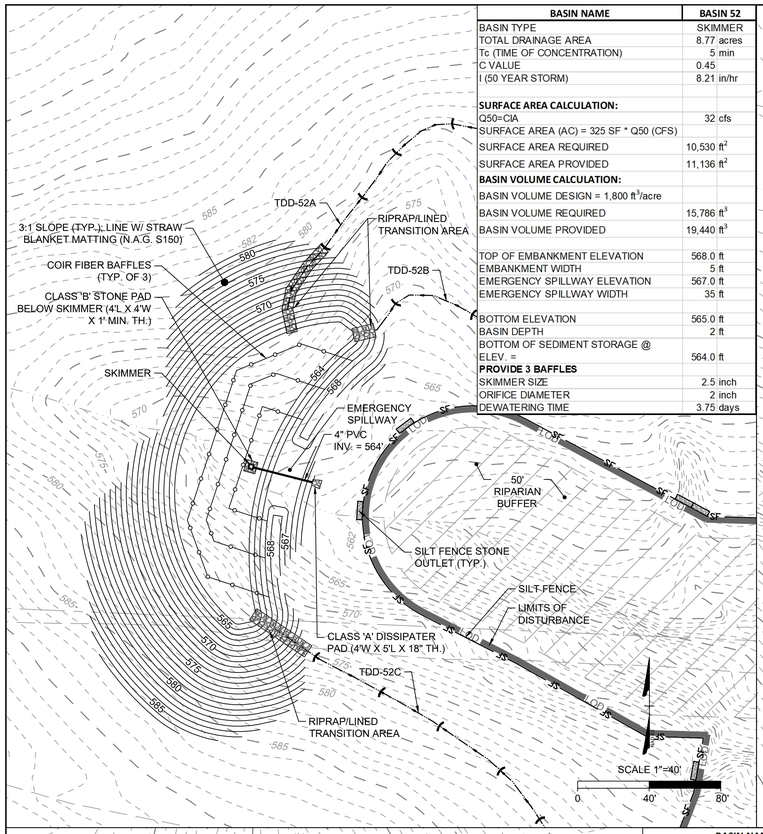
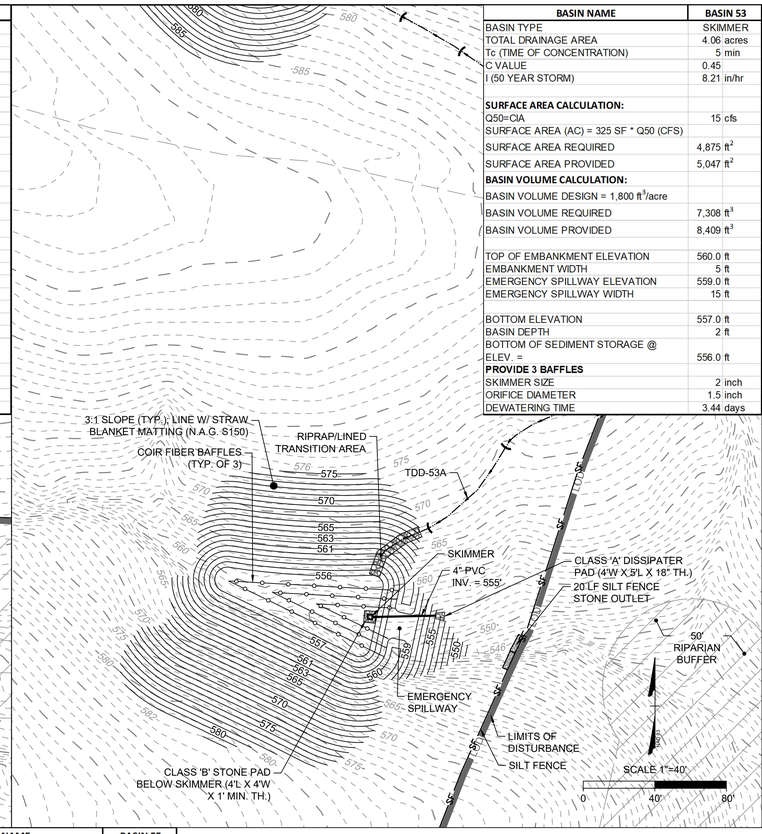
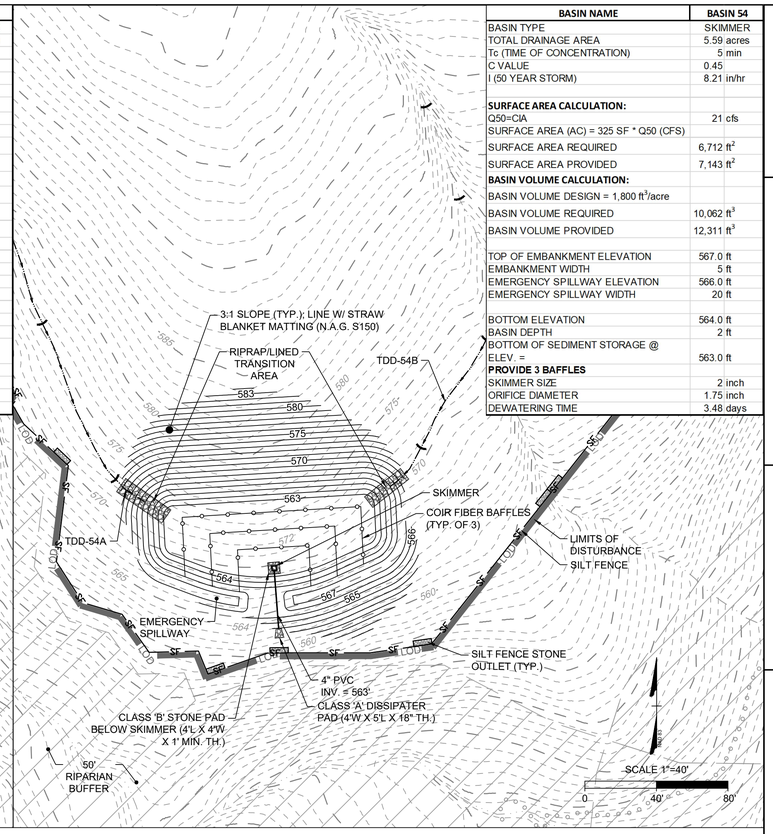


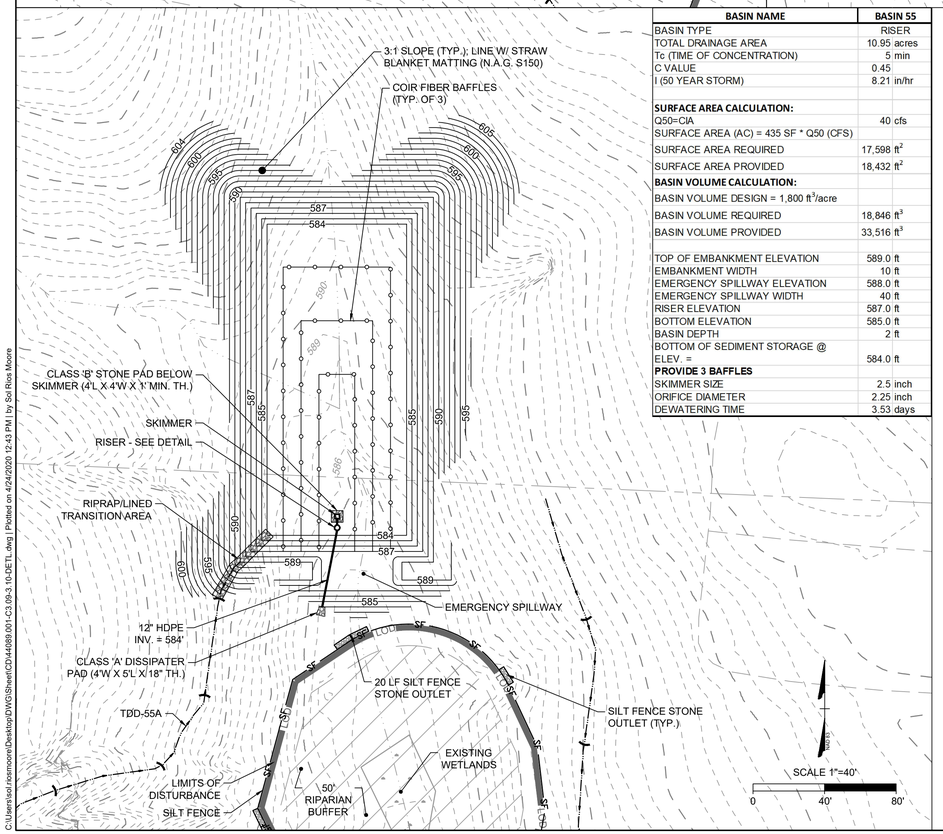
BASIN NAME	BASIN 52
BASIN TYPE	SKIMMER
TOTAL DRAINAGE AREA	8.77 acres
Tc (TIME OF CONCENTRATION)	5 min
C VALUE	0.45
I (50 YEAR STORM)	8.21 in/hr
SURFACE AREA CALCULATION:	
Q50=CIA	32 cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)	
SURFACE AREA REQUIRED	10,530 ft^2
SURFACE AREA PROVIDED	11,136 ft^2
BASIN VOLUME CALCULATION:	
BASIN VOLUME DESIGN = 1,800 ft^3/acre	
BASIN VOLUME REQUIRED	15,786 ft^3
BASIN VOLUME PROVIDED	19,440 ft^3
TOP OF EMBANKMENT ELEVATION	568.0 ft
EMBANKMENT WIDTH	5 ft
EMERGENCY SPILLWAY ELEVATION	567.0 ft
EMERGENCY SPILLWAY WIDTH	35 ft
BOTTOM ELEVATION	565.0 ft
BASIN DEPTH	2 ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	564.0 ft
PROVIDE 3 BAFFLES	
SKIMMER SIZE	2.5 inch
ORIFICE DIAMETER	2 inch
DEWATERING TIME	3.75 days



BASIN NAME	BASIN 53
BASIN TYPE	SKIMMER
TOTAL DRAINAGE AREA	4.06 acres
Tc (TIME OF CONCENTRATION)	5 min
C VALUE	0.45
I (50 YEAR STORM)	8.21 in/hr
SURFACE AREA CALCULATION:	
Q50=CIA	15 cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)	
SURFACE AREA REQUIRED	4,875 ft^2
SURFACE AREA PROVIDED	5,047 ft^2
BASIN VOLUME CALCULATION:	
BASIN VOLUME DESIGN = 1,800 ft^3/acre	
BASIN VOLUME REQUIRED	7,308 ft^3
BASIN VOLUME PROVIDED	8,409 ft^3
TOP OF EMBANKMENT ELEVATION	560.0 ft
EMBANKMENT WIDTH	5 ft
EMERGENCY SPILLWAY ELEVATION	559.0 ft
EMERGENCY SPILLWAY WIDTH	15 ft
BOTTOM ELEVATION	557.0 ft
BASIN DEPTH	2 ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	556.0 ft
PROVIDE 3 BAFFLES	
SKIMMER SIZE	2 inch
ORIFICE DIAMETER	1.5 inch
DEWATERING TIME	3.44 days



BASIN NAME	BASIN 54
BASIN TYPE	SKIMMER
TOTAL DRAINAGE AREA	5.59 acres
Tc (TIME OF CONCENTRATION)	5 min
C VALUE	0.45
I (50 YEAR STORM)	8.21 in/hr
SURFACE AREA CALCULATION:	
Q50=CIA	21 cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)	
SURFACE AREA REQUIRED	6,712 ft^2
SURFACE AREA PROVIDED	7,143 ft^2
BASIN VOLUME CALCULATION:	
BASIN VOLUME DESIGN = 1,800 ft^3/acre	
BASIN VOLUME REQUIRED	10,062 ft^3
BASIN VOLUME PROVIDED	12,311 ft^3
TOP OF EMBANKMENT ELEVATION	567.0 ft
EMBANKMENT WIDTH	5 ft
EMERGENCY SPILLWAY ELEVATION	566.0 ft
EMERGENCY SPILLWAY WIDTH	20 ft
BOTTOM ELEVATION	564.0 ft
BASIN DEPTH	2 ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	563.0 ft
PROVIDE 3 BAFFLES	
SKIMMER SIZE	2 inch
ORIFICE DIAMETER	1.75 inch
DEWATERING TIME	3.48 days



BASIN NAME	BASIN 55
BASIN TYPE	RISER
TOTAL DRAINAGE AREA	10.95 acres
Tc (TIME OF CONCENTRATION)	5 min
C VALUE	0.45
I (50 YEAR STORM)	8.21 in/hr
SURFACE AREA CALCULATION:	
Q50=CIA	40 cfs
SURFACE AREA (AC) = 435 SF * Q50 (CFS)	
SURFACE AREA REQUIRED	17,598 ft^2
SURFACE AREA PROVIDED	18,432 ft^2
BASIN VOLUME CALCULATION:	
BASIN VOLUME DESIGN = 1,800 ft^3/acre	
BASIN VOLUME REQUIRED	18,846 ft^3
BASIN VOLUME PROVIDED	33,516 ft^3
TOP OF EMBANKMENT ELEVATION	589.0 ft
EMBANKMENT WIDTH	10 ft
EMERGENCY SPILLWAY ELEVATION	588.0 ft
EMERGENCY SPILLWAY WIDTH	40 ft
RISER ELEVATION	587.0 ft
BOTTOM ELEVATION	585.0 ft
BASIN DEPTH	2 ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	584.0 ft
PROVIDE 3 BAFFLES	
SKIMMER SIZE	2.5 inch
ORIFICE DIAMETER	2.25 inch
DEWATERING TIME	3.53 days

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04/24/2020

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DATE	2019-08-22
DRAWN BY	T. DAEKE
DESIGNED BY	S. MOORE
CHECKED BY	R. BAKER
SCALE	AS SHOWN

TIMMONS GROUP

NORTH CAROLINA LICENSE NO. C-1652

PROSPECT HILL QUARRY AND DISTRIBUTION CENTER

PROSPECT HILL - CASWELL COUNTY - NORTH CAROLINA

SEDIMENT BASIN ENLARGEMENTS

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GROUND STABILIZATION AND MATERIALS HANDLING PRACTICES FOR COMPLIANCE WITH THE NCG01 CONSTRUCTION GENERAL PERMIT

Implementing the details and specifications on this plan sheet will result in the construction activity being considered compliant with the Ground Stabilization and Materials Handling sections of the NCG01 Construction General Permit (Sections E and F, respectively). The permittee shall comply with the Erosion and Sediment Control plan approved by the delegated authority having jurisdiction. All details and specifications shown on this sheet may not apply depending on site conditions and the delegated authority having jurisdiction.

SECTION E: GROUND STABILIZATION

Required Ground Stabilization Timeframes		
Site Area Description	**Stabilize within this many calendar days after ceasing land disturbance**	**Timeframe variations**
(a) Perimeter dikes, swales, ditches, and perimeter slopes	7	None
(b) High Quality Water (HQW) Zones	7	None
(c) Slopes steeper than 3:1	7	If slopes are 10' or less in length and are not steeper than 2:1, 14 days are allowed
(d) Slopes 3:1 to 4:1	14	-7 days for slopes greater than 50' in length and with slopes steeper than 4:1 -7 days for perimeter dikes, swales, ditches, perimeter slopes and HQW Zones -10 days for Falls Lake Watershed
(e) Areas with slopes flatter than 4:1	14	-7 days for perimeter dikes, swales, ditches, perimeter slopes and HQW Zones -10 days for Falls Lake Watershed unless there is zero slope

Note: After the permanent cessation of construction activities, any areas with temporary ground stabilization shall be converted to permanent ground stabilization as soon as practicable but in no case longer than 90 calendar days after the last land disturbing activity. Temporary ground stabilization shall be maintained in a manner to render the surface stable against accelerated erosion until permanent ground stabilization is achieved.

GROUND STABILIZATION SPECIFICATION

Stabilize the ground sufficiently so that rain will not dislodge the soil. Use one of the techniques in the table below:

Temporary Stabilization	Permanent Stabilization
• Temporary grass seed covered with straw or other mulches and tackifiers • Hydroseeding • Rolled erosion control products with or without temporary grass seed • Appropriately applied straw or other mulch • Plastic sheeting	• Permanent grass seed covered with straw or other mulches and tackifiers • Geotextile fabrics such as permanent soil reinforcement matting • Hydroseeding • Shrubs or other permanent plantings covered with mulch • Uniform and evenly distributed ground cover sufficient to restrain erosion • Structural methods such as concrete, asphalt or retaining walls • Rolled erosion control products with grass seed

POLYACRYLAMIDES (PAMS) AND FLOCCULANTS

1. Select flocculants that are appropriate for the soils being exposed during construction, selecting from the *NC DWR List of Approved PAMS/Flocculants*.
2. Apply flocculants at or before the inlets to Erosion and Sediment Control Measures.
3. Apply flocculants at the concentrations specified in the *NC DWR List of Approved PAMS/Flocculants* and in accordance with the manufacturer's instructions.
4. Provide ponding area for containment of treated Stormwater before discharging offsite.
5. Store flocculants in leak-proof containers that are kept under storm-resistant cover or surrounded by secondary containment structures.

EQUIPMENT AND VEHICLE MAINTENANCE

1. Maintain vehicles and equipment to prevent discharge of fluids.
2. Provide drip pans under any stored equipment.
3. Identify leaks and repair as soon as feasible, or remove leaking equipment from the project.
4. Collect all spent fluids, store in separate containers and properly dispose as hazardous waste (recycle when possible).
5. Remove leaking vehicles and construction equipment from service until the problem has been corrected.
6. Bring used fuels, lubricants, coolants, hydraulic fluids and other petroleum products to a recycling or disposal center that handles these materials.

LITTER, BUILDING MATERIAL AND LAND CLEARING WASTE

1. Never bury or burn waste. Place litter and debris in approved waste containers.
2. Provide a sufficient number and size of waste containers (e.g dumpster, trash receptacle) on site to contain construction and domestic wastes.
3. Locate waste containers at least 50 feet away from storm drain inlets and surface waters unless no other alternatives are reasonably available.
4. Locate waste containers on areas that do not receive substantial amounts of runoff from upland areas and does not drain directly to a storm drain, stream or wetland.
5. Cover waste containers at the end of each workday and before storm events or provide secondary containment. Repair or replace damaged waste containers.
6. Anchor all lightweight items in waste containers during times of high winds.
7. Empty waste containers as needed to prevent overflow. Clean up immediately if containers overflow.
8. Dispose waste off-site at an approved disposal facility.
9. On business days, clean up and dispose of waste in designated waste containers.

PAINT AND OTHER LIQUID WASTE

1. Do not dump paint and other liquid waste into storm drains, streams or wetlands.
2. Locate paint washouts at least 50 feet away from storm drain inlets and surface waters unless no other alternatives are reasonably available.
3. Contain liquid wastes in a controlled area.
4. Containment must be labeled, sized and placed appropriately for the needs of site.
5. Prevent the discharge of soaps, solvents, detergents and other liquid wastes from construction sites.

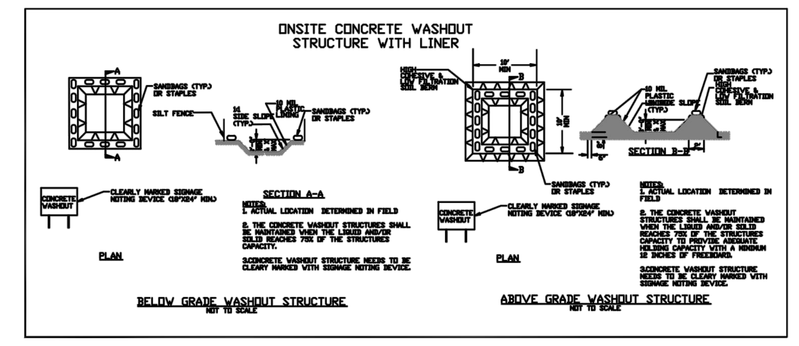
PORTABLE TOILETS

1. Install portable toilets on level ground, at least 50 feet away from storm drains, streams or wetlands unless there is no alternative reasonably available. If 50 foot offset is not attainable, provide relocation of portable toilet behind silt fence or place on a gravel pad and surround with sand bags.
2. Provide staking or anchoring of portable toilets during periods of high winds or in high foot traffic areas.
3. Monitor portable toilets for leaking and properly dispose of any leaked material. Utilize a licensed sanitary waste hauler to remove leaking portable toilets and replace with properly operating unit.

EARTHEN STOCKPILE MANAGEMENT

1. Show stockpile locations on plans. Locate earthen-material stockpile areas at least 50 feet away from storm drain inlets, sediment basins, perimeter sediment controls and surface waters unless it can be shown no other alternatives are reasonably available.
2. Protect stockpile with silt fence installed along toe of slope with a minimum offset of five feet from the toe of stockpile.
3. Provide stable stone access point when feasible.
4. Stabilize stockpile within the timeframes provided on this sheet and in accordance with the approved plan and any additional requirements. Soil stabilization is defined as vegetative, physical or chemical coverage techniques that will restrain accelerated erosion on disturbed soils for temporary or permanent control needs.

NORTH CAROLINA Environmental Quality



CONCRETE WASHOUTS

1. Do not discharge concrete or cement slurry from the site.
2. Dispose of, or recycle settled, hardened concrete residue in accordance with local and state solid waste regulations and at an approved facility.
3. Manage washout from mortar mixers in accordance with the above item and in addition place the mixer and associated materials on impervious barrier and within lot perimeter silt fence.
4. Install temporary concrete washouts per local requirements, where applicable. If an alternate method or product is to be used, contact your approval authority for review and approval. If local standard details are not available, use one of the two types of temporary concrete washouts provided on this detail.
5. Do not use concrete washouts for dewatering or storing defective curb or sidewalk sections. Stormwater accumulated within the washout may not be pumped into or discharged to the storm drain system or receiving surface waters. Liquid waste must be pumped out and removed from project.
6. Locate washouts at least 50 feet from storm drain inlets and surface waters unless it can be shown that no other alternatives are reasonably available. At a minimum, install protection of storm drain inlet(s) closest to the washout which could receive spills or overflow.
7. Locate washouts in an easily accessible area, on level ground and install a stone entrance pad in front of the washout. Additional controls may be required by the approving authority.
8. Install at least one sign directing concrete trucks to the washout within the project limits. Post signage on the washout itself to identify this location.
9. Remove leavings from the washout when at approximately 75% capacity to limit overflow events. Replace the tarp, sand bags or other temporary structural components when no longer functional. When utilizing alternative or proprietary products, follow manufacturer's instructions.
10. At the completion of the concrete work, remove remaining leavings and dispose of in an approved disposal facility. Fill pit, if applicable, and stabilize any disturbance caused by removal of washout.

HERBICIDES, PESTICIDES AND RODENTICIDES

1. Store and apply herbicides, pesticides and rodenticides in accordance with label restrictions.
2. Store herbicides, pesticides and rodenticides in their original containers with the label, which lists directions for use, ingredients and first aid steps in case of accidental poisoning.
3. Do not store herbicides, pesticides and rodenticides in areas where flooding is possible or where they may spill or leak into wells, stormwater drains, ground water or surface water. If a spill occurs, clean area immediately.
4. Do not stockpile these materials onsite.

HAZARDOUS AND TOXIC WASTE

1. Create designated hazardous waste collection areas on-site.
2. Place hazardous waste containers under cover or in secondary containment.
3. Do not store hazardous chemicals, drums or bagged materials directly on the ground.

NCG01 GROUND STABILIZATION AND MATERIALS HANDLING

EFFECTIVE: 04/01/19

GENERAL NOTES:

1. THIS PROJECT IS SUBJECT TO GENERAL PERMIT NCG02 FOR MINING AND QUARRYING ACTIVITIES; HOWEVER, ALL CONSTRUCTION ACTIVITIES SHALL FOLLOW NCG01 PERMIT GUIDELINES ON GROUND STABILIZATION AND MATERIALS HANDLING.
2. REFER TO MINE PERMIT PLANS AND DOCUMENTS FOR PHASING AND DETAILED PROJECT INFORMATION.

PRELIMINARY - NOT RELEASED FOR CONSTRUCTION

ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH CASWELL COUNTY, NCDEQ AND NCDOT STANDARDS, SPECIFICATIONS, AND DETAILS

NORTH CAROLINA PROFESSIONAL SEAL 022530 ENGINEER RICHARD W. BAKER, III
04/24/2020

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DATE	REVISION DESCRIPTION
04/24/2020	ADDRESSED NCDEQ COMMENTS

DATE: 2019-08-22
DRAWN BY: T. DAEKE
DESIGNED BY: S. MOORE
CHECKED BY: R. BAKER
SCALE: AS SHOWN

TIMMONS GROUP
NORTH CAROLINA LICENSE NO. C-1652

PROSPECT HILL QUARRY AND DISTRIBUTION CENTER
PROSPECT HILL - CASWELL COUNTY - NORTH CAROLINA
NCDEQ NCG01 SPECIFICATIONS

JOB NO. 44089.001
SHEET NO. C4.00

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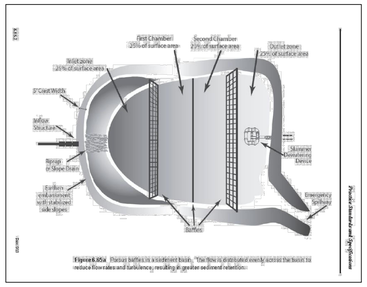

Figure 6.85a Porous baffles in a sediment basin. The flow is distributed evenly across the basin to reduce flow rates and turbulence, resulting in greater sediment retention.

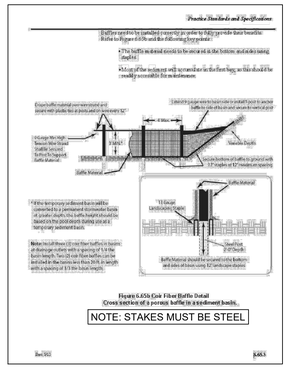

Figure 6.65b Coir Fiber Baffle Detail
Cross section of a porous baffle in a sediment basin.

NOTE: STAKES MUST BE STEEL

MATERIALS
(POROUS BAFFLES)

1. Use matting made of 100% coconut fiber (coir) twine woven into high strength matrix with the properties shown in table 6.6.5a.
2. Staples should be made of 0.125 inch diameter new steel wire formed into a "U" shape not less than 12 inches in length with a throat of 1 inch in width. The staples anchor the porous baffles into the sides and bottom of the basin.
3. Ensure that steel post form porous baffles area of a sufficient height to support baffles at desired height. Post should be approximately 1-3/8" wide measured parallel to the fence, and have a minimum weight of 1.25 lb/linear ft. The posts must be equipped with an anchor plate having a minimum area of 14.0 square inches and be of the self-fastener angle steel type to have a means of retaining wire and coir fiber mat in the desired position without displacement.
4. Use 9-gauge high tension wire for support wire.

Coir Fiber Material Property Requirements	
Thickness	0.30 in. minimum
Tensile Strength (Wet)	900 x 680 lb/ft minimum
Elongation (Wet)	69% x 34% maximum
Flow Velocity	10-12 ft/sec
Weight	20 oz/SY (680 g/m^2) minimum
Minimum Width	6.5 feet
Open Area	50% maximum

Table 6.65a Specifications for Porous Baffle Material

CONSTRUCTION SPECIFICATIONS
(POROUS BAFFLES)

1. Grade the basin so that the bottom is level front to back and side to side.
2. Install the coir fiber baffles immediately upon excavation of the basins.
3. Install posts across the width of the sediment trap (Practice 6.62, Sediment Fence).
4. Steel posts should be driven to a depth of 24 inches and spaced a maximum of 4 feet apart. The top of the fabric should be a minimum of 2 inches lower than the top of the earthen embankment.
5. Install at least three rows of baffles between the inlet and outlet discharge point. Basins less than 20 feet in length may use 2 baffles.
6. Attach a 9 gauge high tension wire stand to the steel post at a height of 6 inches above the spillway elevation with plastic ties or wire fasteners to prevent sagging. If the temporary sediment basin will be converted to a permanent stormwater basin of a greater depth, the baffle height should be based on the pool depth during use as a temporary sediment basin.
7. Extend 9 gauge minimum high tension wire strand to side of basin or install steel T-post to anchor baffle to side of basin and secure to vertical end posts as shown in Figure 6.65b.
8. Drape the coir fiber mat over the wire stand mounted at a height of 6 inches above the spillway elevation. Secure the coir fiber mat to the wire strand with plastic ties or wire fasteners. Anchor the matting to the sides and floor of the basin with 12 inch wire staples, approximately 1 ft apart, along the bottom and side slopes of the basin.
9. Do not splice the fabric, but use a continuous piece across the basin.
10. Adjustments may be required in the stapling requirements to fit individual site conditions.

MAINTENANCE SPECIFICATIONS
(POROUS BAFFLES)

1. Inspect baffles at least once a week and after each rainfall. Make any required repairs immediately.
2. Be sure to maintain access to the baffles. Should the fabric of a baffle collapse, tear, decompose, or become ineffective, replace it promptly.
3. Remove sediment deposits when it reaches half full to provide adequate storage volume for the next rain and to reduce pressure on the baffles. Take care to avoid damaging the baffles during cleanout, and replace if damaged during cleanout operations. Sediment depth should never exceed half the designed storage depth.
4. After the contributing drainage area has been properly stabilized, remove all baffle materials and unstable sediment deposits, bring the area to grade, and stabilize it.

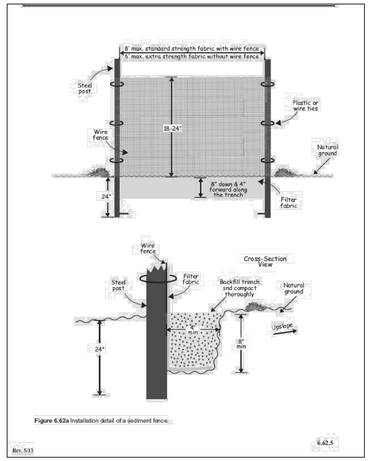

Figure 6.62a Installation detail of a sediment fence.

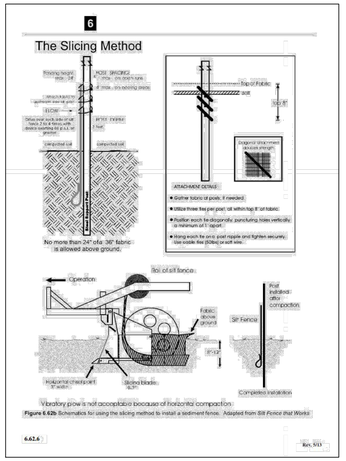

Figure 6.62b Schematics for using the slicing method to install a sediment fence. Adapted from *Silt Fence that Works*

MATERIALS
(SEDIMENT FENCE)

1. Use a synthetic filter fabric of at least 95% by weight of polyolefins or polyester, which is certified by the manufacturer or supplier as conforming to the requirements in astm d 6461, which is shown in part in table 6.62b.
2. Synthetic filter fabric should contain ultraviolet ray inhibitors and stabilizers to provide a minimum of 6 months of expected usable construction life at a temperature range of 0 to 120° f.
3. Ensure that post for sediment fences are 1.25 lb/linear ft minimum steel with a minimum length of 5 feet. Make sure that steel posts have projections to facilitate fastening the fabric.
4. For reinforcement of standard strength filter fabric, use wire fence with a minimum 14 gauge and a maximum mesh spacing of 6 inches.

Table 6.62b Specifications For Sediment Fence Fabric

Temporary Silt Fence Material Property Requirements					
	Test Material	Units	Supported[1] Silt Fence	Un-Supported[1] Silt Fence	Type of Value
Grab Strength	ASTM D 4632	N (lbs)			
Machine Direction			400	550	MARV
			(90)	(90)	
X-Machine Direction			400	450	MARV
			(90)	(90)	
Permittivity[2]	ASTM D 4491	sec-1	0.05	0.05	MARV
Apparent Opening Size[2]	ASTM D 4751	mm	0.60	0.60	Max. ARV[3]
		(US Sieve #)	(30)	(30)	
Ultraviolet Stability	ASTM D 4355	% Retained Strength	70% after 500h of exposure	70% after 500h of exposure	Typical

[1] Silt Fence support shall consist of 14 gage steel wire with a mesh spacing of 150 mm (6 inches), or prefabricated poylmer mesh of equivalent strength.
[2] These default values are based on empirical evidence with a variety of sediment. For environmentally sensitive areas, a review of previous experience and/or site or regionally specific geotextile tests in accordance with Test Method D 5141 should be performed by the agency to confirm suitability of these requirements.
[3] As measured in accordance with Test Method D 4632.

CONSTRUCTION SPECIFICATIONS
(SEDIMENT FENCE)

1. Construct the sediment barrier of standard strength or extra strength synthetic filter fabrics.
2. Ensure that the height of the sediment fence does not exceed 24 inches above the ground surface. (Higher fences may impound volumes of water sufficient to cause failure of the structure.)
3. Construct the filter fabric from a continuous roll cut to the length of the barrier to avoid joints. When joints are necessary, securely fasten the filter cloth only at a support post with 4 feet minimum overlap to the next post.
4. Support standard strength filter fabric by wire mesh fastened securely to the **upslope** side of the posts. Extend the wire mesh support to the bottom of the trench. Fasten the wire reinforcement, then fabric on the upslope side of the fence post. Wire or plastic zip ties should have minimum 50 pound tensile strength.
5. When a wire mesh support fence is used, space posts a maximum of 8 feet apart. Support posts should be driven securely into the ground a minimum of 24 inches.
6. Extra strength filter fabric with 6 feet post spacing does not require wire mesh support fence. Securely fasten the filter fabric directly to posts. Wire or plastic zip ties should have minimum 50 pound tensile strength.
7. Excavate a trench approximately 4 inches wide and 8 inches deep along the proposed line of posts and upslope from the barrier (Figure 6.62a).
8. Place 12 inches of the fabric along the bottom and side of the trench.
9. Backfill the trench with soil placed over the filter fabric and compact. Thorough compaction of the backfill is critical to silt fence performance.
10. Do not attach filter fabric to existing trees.

SEDIMENT FENCE INSTALLATION USINGTHE SLICING METHOD

Instead of excavating a trench, placing fabric and then backfilling trench, sediment fence may be installed using specially designed equipment that inserts the fabric into a cut sliced in the ground with a disc (Figure 6.62b).

Installation Specifications

1. The base of both end posts should be at least one foot higher than the middle of the fence. Check with a level if necessary.
2. Install posts 4 feet apart in critical areas and 6 feet apart on standard applications.
3. Install posts 2 feet deep on the downstream side of the silt fence, and as close as possible to the fabric, enabling posts to support the fabric from upstream water pressure.
4. Install posts with the nipples facing away from the silt fabric.
5. Attach the fabric to each post with three ties, all spaced within the top 8 inches of the fabric. Attach each tie diagonally 45 degrees through the fabric, with each puncture at least 1 inch vertically apart. Also, each tie should be positioned to hang on a post nipple when tightened to prevent sagging.
6. Wrap approximately 6 inches of fabric around the end posts and secure with 3 ties.
7. No more than 24 inches of a 36 inch fabric is allowed above ground level.
8. The installation should be checked and corrected for any deviations before compaction.
9. Compaction is vitally important for effective results. Compact the soil immediately next to the silt fence fabric with the front wheel of the tractor, skid steer, or roller exerting at least 60 pounds per square inch. Compact the upstream side first, and then each side twice for a total of 4 trips.

MAINTENANCE SPECIFICATIONS
(SEDIMENT FENCE)

1. Inspect sediment fences at least once a week and after each rainfall. Make any required repairs immediately.
2. Should the fabric of a sediment fence collapse, tear, decompose or become ineffective, replace it promptly.
3. Remove sediment deposits as necessary to provide adequate storage volume for the next rain and to reduce pressure on the fence. Take care to avoid undermining the fence during cleanout.
4. Remove all fencing materials and unstable sediment deposits and bring the area to grade and stabilize it after the contributing drainage area has been properly stabilized.

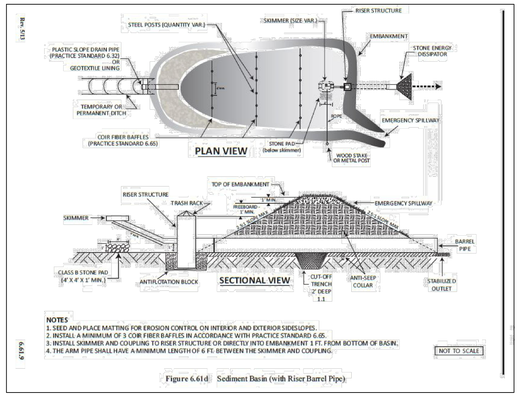

Figure 6.61d Sediment Basin (with Riser Barrel Pipe).

CONSTRUCTION SPECIFICATIONS
(SEDIMENT BASIN WITH RISER BARREL PIPE)

1. Site preparations- Clear, grub, and strip topsoil from areas under the embankment to remove trees, vegetation, roots, and other objectionable material. Delay clearing the pool area until the dam is complete and then remove brush, trees, and other objectionable materials to facilitate sediment cleanout. Stockpile all topsoil or soil containing organic matter for use on the outer shell of the embankment to facilitate vegetative establishment. Place temporary sediment control measures below the basin as needed.
2. Cut-off trench- Excavate a cut-off trench along the center line of the earth fill embankment. Cut the trench to stable soil material, but in no case make it less than 2 feet deep. The cut-off trench must extend into both abutments to at least the elevation of the riser crest. Make the minimum bottom width wide enough to permit operation of excavation and compaction equipment, but in no case less than 2 feet. Make side slopes of the trench no steeper than 1:1. Compaction requirements are the same as those for the embankment. Keep the trench dry during backfilling and compaction operations.
3. Embankment- Take fill material from the approved areas shown on the plans. It should be clean mineral soil, free of roots, woody vegetation, rocks, and other objectionable material. Scarify areas on which fill is to be placed before placing fill. The fill material must contain sufficient moisture so it can be formed by hand into a ball without crumbling. If water can be squeezed out of the ball, it is too wet for proper compaction. Place fill material in 6 to 8 inch continuous layers over the entire length of the fill area and compact it. Compaction may be obtained by routing the construction hauling equipment over the fill so that the entire surface of each layer is traversed by at least one wheel or tread track of heavy equipment, or a compactor may be used. Construct the embankment to an elevation 10 percent higher than the design height to allow for settling.
4. Conduit spillways- Securely attach the riser to the barrel or barrel stub to make a watertight structural connection. Secure all connections between barrel sections by approved watertight assemblies. Place the barrel and riser on a firm, smooth foundation of impervious soil. Do not use pervious material such as sand, gravel, or crushed stone as backfill around the pipe or anti-seep collars. Place the fill material around the pipe spillway in 4-inch layers, and compact it under and around the pipe to at least the same density as the adjacent embankment. **Care must be taken not to raise the pipe from firm contact with its foundation when compacting under the pipe haunches.** Place a minimum depth of 2 feet of compacted backfill over the pipe spillway before crossing it with construction equipment. Anchor the riser in place by concrete or other satisfactory means to prevent flotation. In no case should the pipe conduit be installed by cutting a trench through the dam after the embankment is complete.
5. Emergency spillway- Install the emergency spillway in undisturbed soil. The achievement of planned elevations, grade, design width, and entrance and exit channel slopes are critical to the successful operation of the emergency spillway.
6. Inlets- Discharge water into the basin in a manner to prevent erosion. Use diversions with outlet protection to divert sediment-laden water to the upper end of the pool area to improve basin trap efficiency (*References: Runoff Control Measures and Outlet Protection*).
7. Erosion control- Construct the structure so that the disturbed area is minimized. Divert surface water away from bare areas. Complete the embankment before the area is cleared. Stabilize the emergency spillway embankment and all other disturbed areas above the crest of the principal spillway immediately after construction (*References: Surface Stabilization*).
8. Install porous baffles as specified in Practice 6.65, Porous Baffles.
9. Safety- Sediment basins may attract children and can be dangerous. Avoid steep side slopes, and fence and mark basins with warning signs if trespassing is likely. **Follow all state and local requirements**

MAINTENANCE SPECIFICATIONS
(SEDIMENT BASIN WITH RISER BARREL PIPE)

1. Inspect temporary sediment basins at least weekly and after each significant (1/2 inch or greater) rainfall event and repair immediately. Remove sediment and restore the basin to its original dimensions when it accumulates to one-half the design depth. Place removed sediment in an area with sediment controls.
2. Check the embankment, spillways, and outlet for erosion damage, and inspect the embankment for piping and settlement. Make all necessary repairs immediately. Remove all trash and other debris from the riser and pool area.

PRELIMINARY - NOT RELEASED FOR CONSTRUCTION

ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH CASWELL COUNTY, NCDEQ AND NCDOT STANDARDS, SPECIFICATIONS, AND DETAILS

NORTH CAROLINA PROFESSIONAL SEAL 022530 ENGINEER RICHARD W. BAKER, III
04/24/2020

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REVISION DESCRIPTION	DATE
ADDRESSED NCDEQ COMMENTS	04/24/2020

DATE	2019-08-22
DRAWN BY	T. DAEKE
DESIGNED BY	S. MOORE
CHECKED BY	R. BAKER
SCALE	AS SHOWN

TIMMONS GROUP
NORTH CAROLINA LICENSE NO. C-1652

PROSPECT HILL QUARRY AND DISTRIBUTION CENTER
PROSPECT HILL - CASWELL COUNTY - NORTH CAROLINA
NOTES AND DETAILS

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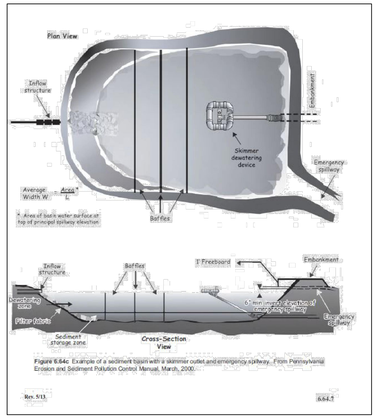

Figure 6.64c Example of a sediment basin with a skimmer outlet and emergency spillway. (From Pennsylvania Erosion and Sediment Pollution Control Manual, March, 2000.

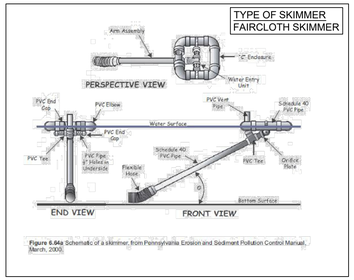

Figure 6.64a Schematic of a skimmer, from Pennsylvania Erosion and Sediment Pollution Control Manual, March, 2000.

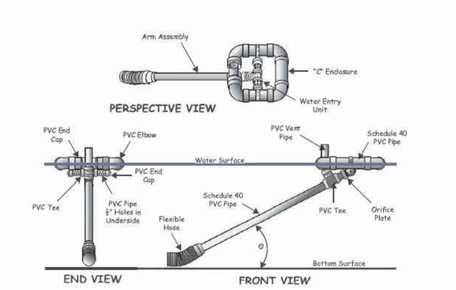

Figure 6.64a Schematic of a skimmer, from Pennsylvania Erosion and Sediment Pollution Control Manual, March, 2000.

CONSTRUCTION SPECIFICATIONS
(SKIMMER SEDIMENT BASIN)

1. Clear, grub and strip the area under the embankment of all vegetation and root mat. Remove all surface soil containing high amounts of organic matter and stockpile or dispose of it properly. Haul all objectionable material to the designated disposal area. place temporary sediment control measures below basin as needed.
2. Ensure that fill material for the embankment is free of roots, woody vegetation, organic matter, and other objectionable material. place the file in lifts not to exceed 9 inches, and machine compact it. Over fill the embankment 6 inches to allow for settlement.
3. Shape the basin to the specified dimensions. Prevent the skimming device from settling into the mud by excavating a shallow pit under the skimmer or providing a low support under the skimmer of stone or timber.
4. Place the barrel (typically 4-inch schedule 40 pvc pipe) on a firm, smooth foundation of impervious soil. Do not use pervious material such as sand, gravel, or crushed stone as backfill around the pipe. Place the fill material around the pipe spillway in 4-inch layers and compact it sunder and around the pipe to at least the same density as the adjacent embankment. Care must be taken not to raise the pipe from the firm contact with its foundation when compacting under the pipe haunches.
5. Assemble the skimmer following the manufacturers instructions, or as designed.
6. Lay the assembled skimmer on the bottom of the basin with the flexible joint at the inlet of the barrel pipe. Attach the flexible joint to the barrel pipe and position the skimmer over the excavated pit or support. Be sure to attach a rope to the skimmer and anchor it to the side of the basin. this will be used to pull the skimmer to the side for maintenance.
7. Earthen spillways - install the spillway in undisturbed soil to the greatest extent possible. The achievement of planned elevations, grade, design width, and entrance and exit channel slopes are critical to the successful operation of the spillway. The spillway should be lined with laminated plastic or impermeable geotextile fabric. the fabric must be wide and long enough to cover the bottom and sides and extend onto the top of the dam for anchoring in a trench. The edges may be secured with 8-inch staples or pines. The fabric must be long enough to extend down the slope and exit onto stable ground. The width of the fabric must be one piece, not joined or spliced; otherwise water can get under the fabric. If the length of the fabric is insufficient for the entire length of the spillway, multiple sections, spanning the complete width, may be used. The upper section(s) should overlap the lower section(s) so that water cannot flow under the fabric. Secure the upper edge and sides of the fabric in a trench with staples or pines. (Adapted from "A Manual for Designing, Installing and Maintaining Skimmer Sediment Basins." February, 1999.J. Faircloth & Son.).
8. Inlets - discharge water into the basin in a manner to prevent erosion. Use temporary slope drains or diversions with outlet protection to divert sediment laden water to the upper end of the pool area to improve basin trap efficiency (References: Runoff Control Measures and Outlet Protection).
9. Erosion control - construct the structure so that the disturbed area is minimized. Divert surface water away from bare spots. Compete the embankment before the area is cleared. Stabilize the emergency spillway embankment and all other disturbed areas above the crest of the principal spillway immediately after construction (References: Surface Stabilization).
10. Install porous baffles as specified in practice 6.65, porous baffles.
11. After all the sediment-produing areas have been permanently stabilized, remove the structure and all the unstable sediment. smooth the area to blend with the adjoining areas and stabilized properly. (References: Surface Stabilization).

MAINTENANCE SPECIFICATIONS
(SKIMMER SEDIMENT BASIN)

1. Inspect skimmer sediment basins at least weekly and after each significant (one-half inch or greater) rainfall event and repair immediately. Remove sediment and restore the basin to its original dimensions when sediment accumulates to one-half the height of the first baffle. Pull the skimmer to one side so that the sediment underneath it can be excavated. Excavate the sediment from the entire basin, not just around the skimmer or the first cell. Make sure vegetation growing in the bottom of the basin does not hold down the skimmer.
2. Repair the baffles if they are damaged. Re-anchor the baffles if water is flowing underneath or around them.
3. If the skimmer is clogged with trash and there is water in the basin, usually jerking on the rope will make the skimmer bob up and down and dislodge the debris and restore flow. If this does not work, pull the skimmer over to the side of the basin and remove the debris. Also check the orifice inside the skimmer to see if it is clogged; if so remove the debris.
4. If the skimmer arm or barrel pipe is clogged, the orifice can be removed and the obstruction cleared with a plumber's snake or by flushing with water. Be sure and replace the orifice before repositioning the skimmer.
5. Check the fabric lined spillway for damage and make any required repairs with fabric that spaces the full width of the spillway. Check the embankment, spillways, and outlet for erosion damage, and inspect the embankment for piping and settlement. Make all necessary repairs immediately. Remove all trash and other debris from the skimmer and pool areas.
6. Freezing weather can result in ice forming in the basin. Some special precautions should be taken in the winter to prevent the skimmer from plugging with ice.

INSTALLATION SPECIFICATIONS
(SKIMMER)

1. Prevent the skimming device from settling into the mud by excavating a shallow pit under the skimmer or providing a low support under the skimmer of stone or timber.
2. Assemble the skimmer following the manufacturers instructions, or as designed.
3. Lay the assembled skimmer on the bottom of the basin with the flexible joint at the inlet of the barrel pipe. Attach the flexible joint to the barrel pipe and position the skimmer over the excavated pit or support. Be sure to attach a rope to the skimmer and anchor it to the side of the basin. This will be used to pull the skimmer to the side for maintenance.

MAINTENANCE SPECIFICATIONS
(SKIMMER)

1. Inspect skimmer sediment basins at least weekly and after each significant (one-half inch or greater) rainfall event and repair immediately. Remove sediment and restore the basin to its original dimensions when sediment accumulates to one-half the height of the first baffle. Pull the skimmer to one side so that the sediment underneath it can be excavated. Excavate the sediment from the entire basin, not just around the skimmer or the first cell. Make sure vegetation growing in the bottom of the basin does not hold down the skimmer.
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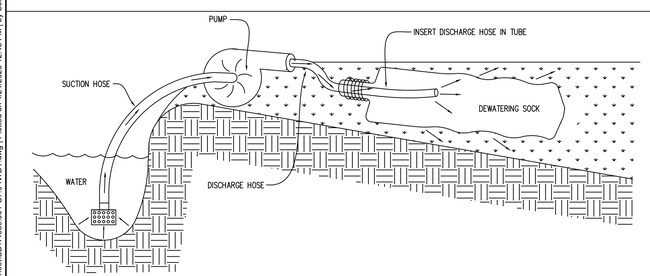
4. Freezing weather can result in ice forming in the basin. Some special precautions should be taken in the winter to prevent the skimmer from plugging with ice.

INSTALLATION SPECIFICATIONS
(SEDIMENT BASIN BAFFLES)

1. Grade the basin so that the bottom is level front to back and side to side.
2. Install posts or saw horses across the width of the sediment trap (Practice 6.62, *Sediment Fence*).
3. Steel posts should be driven to a depth of 24 inches, spaced a maximum of 4 feet apart, and installed up the sides of the basin as well. The top of the fabric should be 6 inches higher than the invert of the spillway. Tops of baffles should be 2 inches lower than the top of the berms.
4. Install at least three rows of baffles between the inlet and outlet discharge point. Basins less than 20 feet in length may use 2 baffles.
5. When using posts, add a support wire or rope across the top of the measure to prevent sagging.
6. Wrap porous material, like jute backed by coir material, over a sawhorse or the top wire. Hammer rebar into the sawhorse legs for anchoring. The fabric should have five to ten percent openings in the weave. Attach fabric to a rope and a support structure with zip ties, wire, or staples.
7. The bottom and sides of the fabric should be anchored in a trench or pinned with 8-inch erosion control matting staples.
8. Do not splice the fabric, but use a continuous piece across the basin.

MAINTENANCE SPECIFICATIONS
(SEDIMENT BASIN BAFFLES)

1. Inspect baffles at least once a week and after each rainfall. Make any required repairs immediately.
2. Be sure to maintain access to the baffles. Should the fabric of a baffle collapse, tear, decompose, or become ineffective, replace it promptly.
3. Remove sediment deposits when it reaches half full to provide adequate storage volume for the next rain and to reduce pressure on the baffles. Take care to avoid damaging the baffles during cleanout. Sediment depth should never exceed half the designed storage depth.
4. After the contributing drainage area has been properly stabilized, remove all baffle materials and unstable sediment deposits, bring the area to grade, and stabilize it.

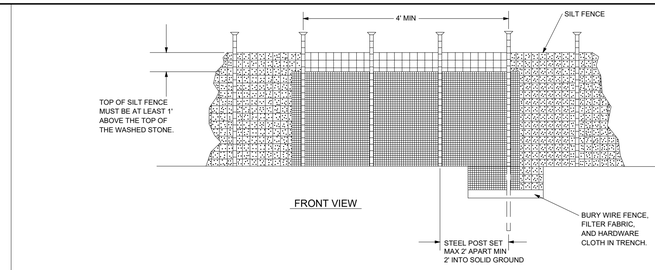


MAINTENANCE:

1. FOLLOW ALL MANUFACTURER RECOMMENDATIONS FOR INSPECTION AND MAINTENANCE GUIDELINES. REPLACE DEWATERING BAGS WHEN TRAPPED SEDIMENT HAS ACCUMULATED TO 50% OF THE BAG CAPACITY OR IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.

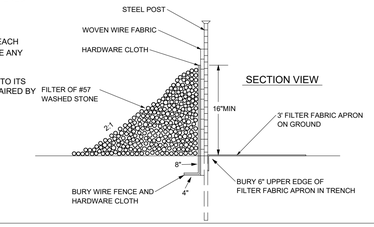
   DEWATERING BAGS ARE FULL WHEN THEY NO LONGER EFFICIENTLY FILTER SEDIMENT OR PASS WATER AT A REASONABLE RATE. INCOMING FLOW RATES WILL VARY DEPENDING ON THE SIZE OF THE DEWATERING BAG, THE TYPE AND AMOUNT OF SEDIMENT DISCHARGED INTO THE DEWATERING BAG, THE PERMEABILITY OF THE UNDERLYING AGGREGATE, AND THE DEGREE OF SLOPE ON WHICH THE BAG LIES.

DEWATERING SOCK
N.T.S.

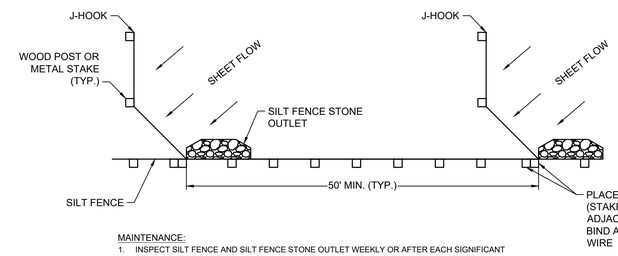


NOTES:
1. REMOVE SEDIMENT WHEN HALF OF STONE OUTLET IS COVERED.
2. REPLACE STONE AS NEEDED TO ENSURE DEWATERING.

MAINTENANCE:
1. INSPECT SILT FENCE STONE OUTLET WEEKLY OR AFTER EACH SIGNIFICANT RAINFALL EVENT (½ INCH OR GREATER). MAKE ANY REQUIRED REPAIRS IMMEDIATELY.
2. REMOVE SEDIMENT DEPOSITS AS NECESSARY, RESTORE TO ITS ORIGINAL DIMENSIONS AND REPLACE STONE THAT IS IMPAIRED BY SEDIMENT.



SILT FENCE STONE OUTLET
N.T.S



MAINTENANCE:
1. INSPECT SILT FENCE AND SILT FENCE STONE OUTLET WEEKLY OR AFTER EACH SIGNIFICANT RAINFALL EVENT (½ INCH OR GREATER). MAKE ANY REQUIRED REPAIRS IMMEDIATELY.
2. REMOVE SEDIMENT DEPOSITS AS NECESSARY, RESTORE TO ITS ORIGINAL DIMENSIONS AND REPLACE STONE THAT IS IMPAIRED BY SEDIMENT.
3. SHOULD THE FABRIC OF A SEDIMENT FENCE COLLAPSE, TEAR, DECOMPOSE OR BECOME INEFFECTIVE, REPLACE IT PROMPTLY.

SILT FENCE J-HOOK
N.T.S.

PRELIMINARY - NOT RELEASED FOR CONSTRUCTION

ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH CASWELL COUNTY, NCDEQ AND NCDOT STANDARDS, SPECIFICATIONS, AND DETAILS

NORTH CAROLINA PROFESSIONAL SEAL 022530 ENGINEER RICHARD W. BAKER, III
04/24/2020

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REVISION DESCRIPTION	DATE
ADDRESSED NCDEQ COMMENTS	04/24/2020

DATE	2019-08-22
DRAWN BY	T. DAEKE
DESIGNED BY	S. MOORE
CHECKED BY	R. BAKER
SCALE	AS SHOWN

TIMMONS GROUP
NORTH CAROLINA LICENSE NO. C-1652

PROSPECT HILL QUARRY AND DISTRIBUTION CENTER
PROSPECT HILL - CASWELL COUNTY - NORTH CAROLINA
NOTES AND DETAILS

JOB NO. 44089.001
SHEET NO. C4.20

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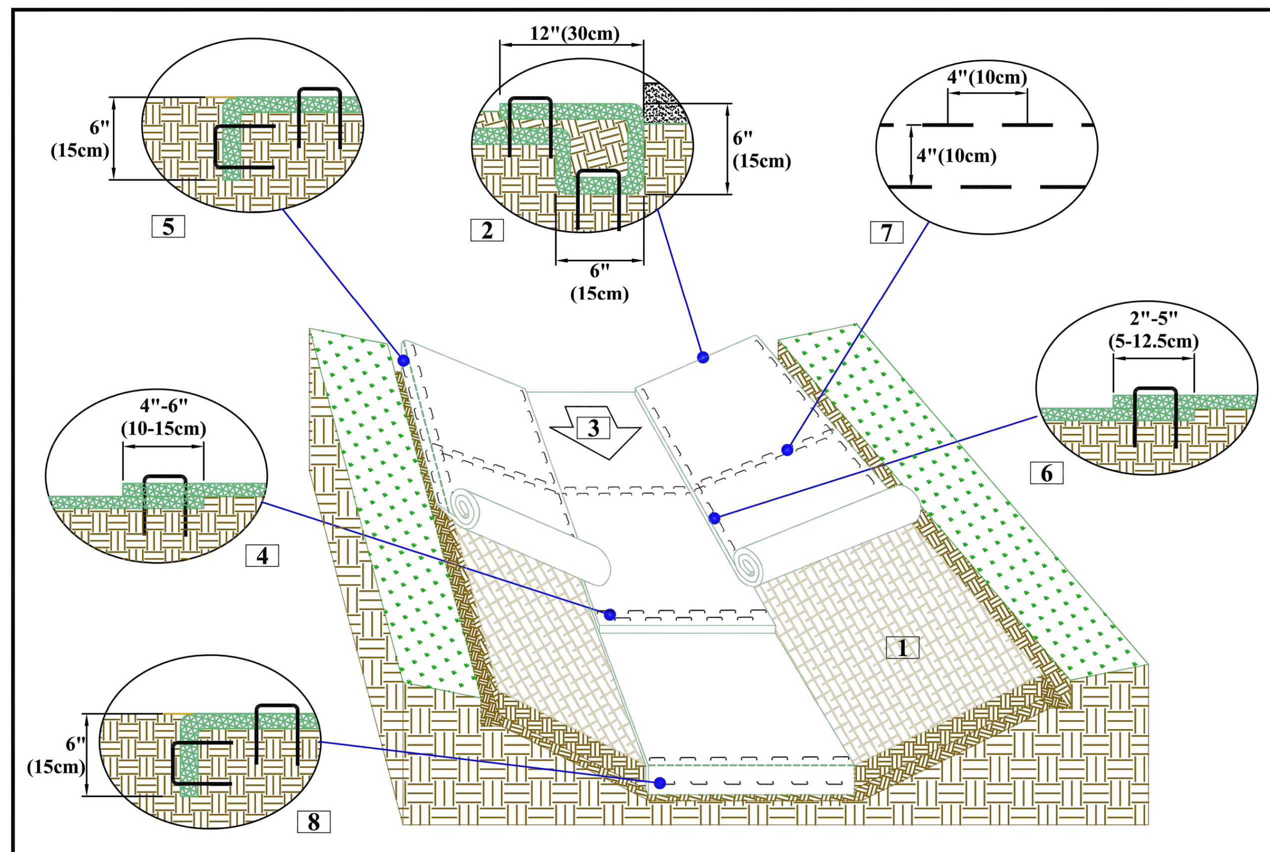
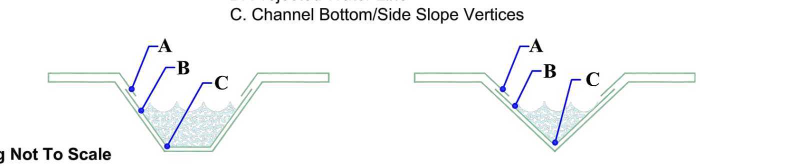


CRITICAL POINTS
A. Overlaps and Seams
B. Projected Water Line
C. Channel Bottom/Side Slope Vertices



NOTES:
*Horizontal staple spacing should be altered if necessary to allow staples to secure the critical points along the channel surface.

**In loose soil conditions, the use of staple or stake lengths greater than 6"(15cm) may be necessary to properly secure the RECP's.

Drawing Not To Scale

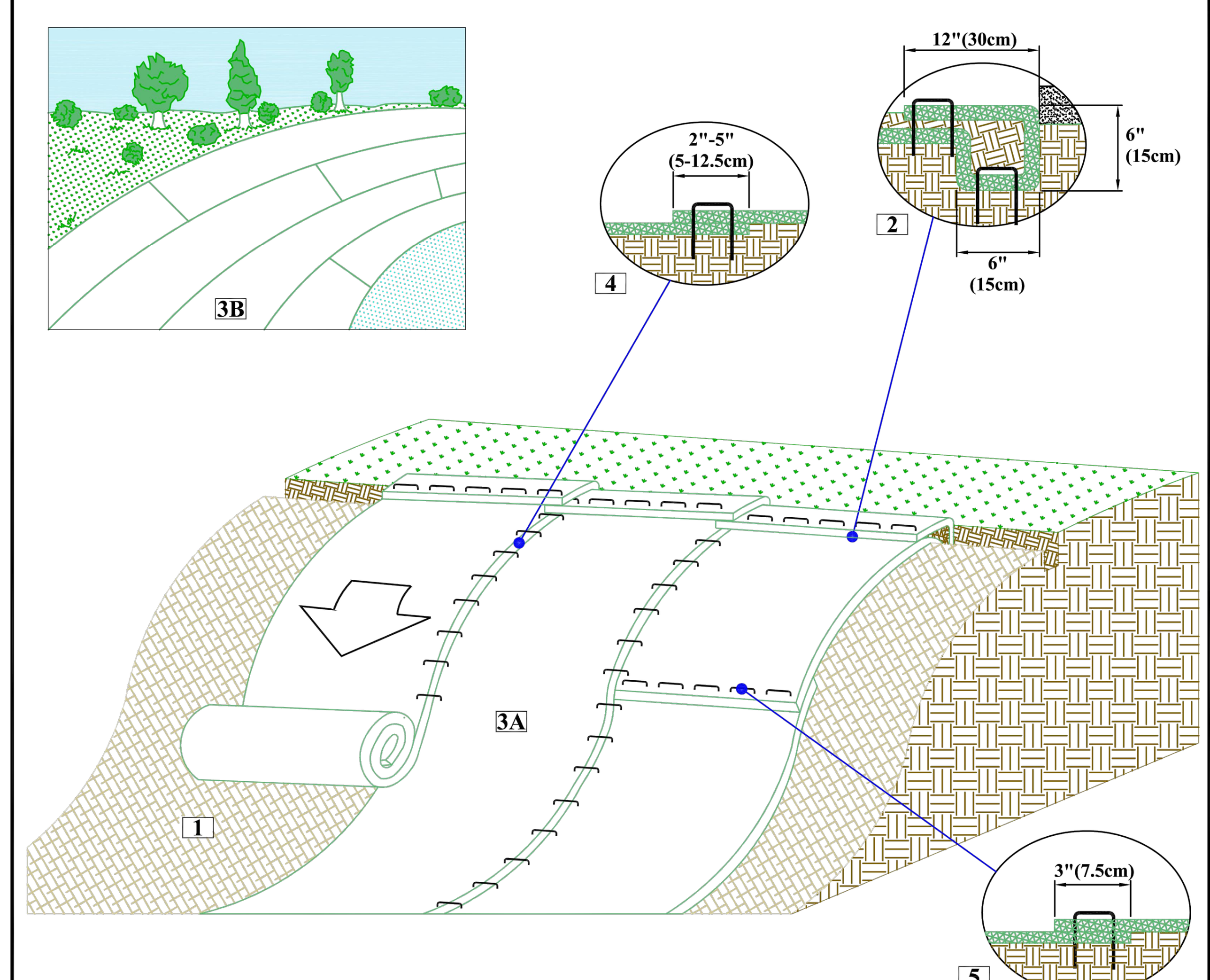
NORTH AMERICAN GREEN
5401 St. Wendel - Cynthiana Rd. Poseyville, IN 47633
PH: 800-722-2040 www.nagreen.com

Disclaimer:
The information presented herein is general design information only. For specific applications, consult an independent professional for further design guidance.

Drawn on: 5-4-17

CHANNEL INSTALLATION DETAIL

1. Prepare soil before installing rolled erosion control products (RECPs), including any necessary application of lime, fertilizer, and seed.
2. Begin at the top of the channel by anchoring the RECPs in a 6"(15cm) deep X 6"(15cm) wide trench with approximately 12"(30cm) of RECPs extended beyond the up-slope portion of the trench. Use ShoreMax mat at the channel/culvert outlet as supplemental scour protection as needed. Anchor the RECPs with a row of staples/stakes approximately 12"(30cm) apart in the bottom of the trench. Backfill and compact the trench after stapling. Apply seed to the compacted soil and fold the remaining 12"(30cm) portion of RECPs back over the seed and compacted soil. Secure RECPs over compacted soil with a row of staples/stakes spaced approximately 12" apart across the width of the RECPs.
3. Roll center RECPs in direction of water flow in bottom of channel. RECPs will unroll with appropriate side against the soil surface. All RECPs must be securely fastened to soil surface by placing staples/stakes in appropriate locations as shown in the staple pattern guide.
4. Place consecutive RECPs end-over-end (Shingle style) with a 4"-6" overlap. Use a double row of staples staggered 4" apart and 4" on center to secure RECPs.
5. Full length edge of RECPs at top of side slopes must be anchored with a row of staples/stakes approximately 12"(30cm) apart in a 6"(15cm) deep X 6"(15cm) wide trench. Backfill and compact the trench after stapling.
6. Adjacent RECPs must be overlapped approximately 2"-5" (5-12.5cm) (Depending on RECPs type) and stapled.
7. In high flow channel applications a staple check slot is recommended at 30 to 40 foot (9 -12m) intervals. Use a double row of staples staggered 4"(10cm) apart and 4"(10cm) on center over entire width of the channel.
8. The terminal end of the RECPs must be anchored with a row of staples/stakes approximately 12" (30cm) apart in a 6"(15cm) deep X 6"(15cm) wide trench. Backfill and compact the trench after stapling.



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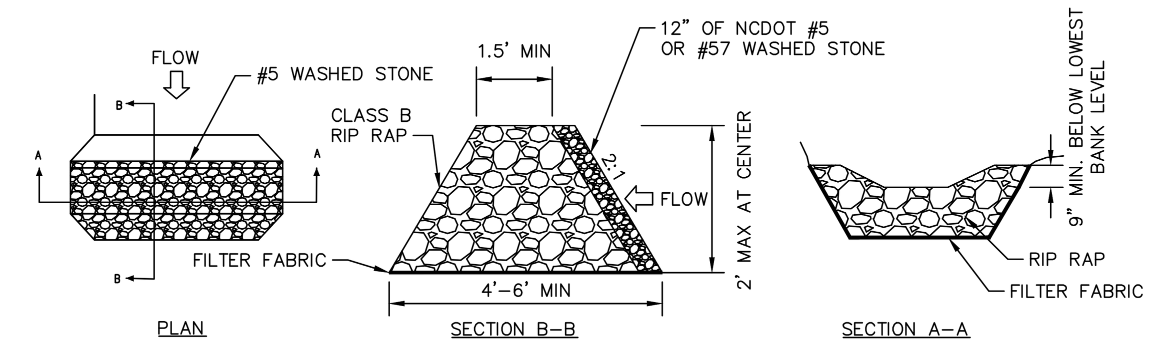
Drawn on: 5-4-17

SLOPE INSTALLATION DETAIL

1. Prepare soil before installing rolled erosion control products (RECPs), including any necessary application of lime, fertilizer, and seed.
2. Begin at the top of the slope by anchoring the RECPs in a 6"(15cm) deep X 6"(15cm) wide trench with approximately 12" (30cm) of RECPs extended beyond the up-slope portion of the trench. Anchor the RECPs with a row of staples/stakes approximately 12" (30cm) apart in the bottom of the trench. Backfill and compact the trench after stapling. Apply seed to the compacted soil and fold the remaining 12"(30cm) portion of RECPs back over the seed and compacted soil. Secure RECPs over compacted soil with a row of staples/stakes spaced approximately 12"(30cm) apart across the width of the RECPs.
3. Roll the RECPs (A) down or (B) horizontally across the slope. RECPs will unroll with appropriate side against the soil surface. All RECPs must be securely fastened to soil surface by placing staples/stakes in appropriate locations as shown in the staple pattern guide.
4. The edges of parallel RECPs must be stapled with approximately 2" - 5" (5-12.5cm) overlap depending on the RECPs type.
5. Consecutive RECPs spliced down the slope must be end over end (Shingle style) with an approximate 3"(7.5cm) overlap. Staple through overlapped area, approximately 12"(30cm) apart across entire RECPs width.

*NOTE:
In loose soil conditions, the use of staple or stake lengths greater than 6"(15cm) may be necessary to properly secure the RECP's.



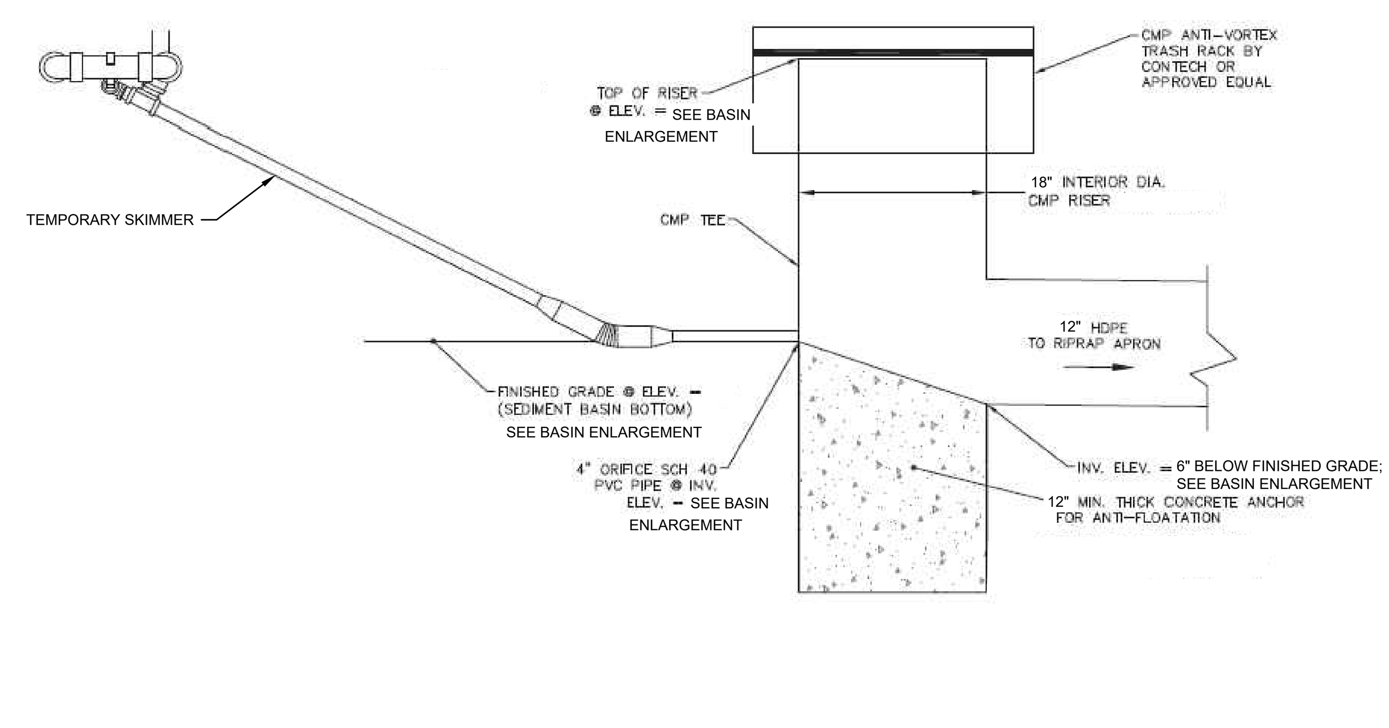
CONSTRUCTION SPECIFICATIONS:

1. PLACE STONE TO THE LINES AND DIMENSIONS SHOWN IN THE PLAN ON A FILTER FABRIC FOUNDATION.
2. KEEP THE CENTER STONE SECTION AT LEAST 1 FOOT BELOW NATURAL GROUND LEVEL WHERE THE DAM ABUTS THE CHANNEL BANKS.
3. EXTEND STONE AT LEAST 1.5 FEET BEYOND BEYOND THE DITCH BANK TO KEEP WATER FROM CUTTING AROUND THE ENDS OF THE CHECK DAM.
4. SET SPACING BETWEEN DAMS TO ASSURE THAT THE ELEVATION AT THE TOP OF THE LOWER DAM IS THE SAME AS THE TOE ELEVATION OF THE UPPER DAM.
5. PROTECT THE CHANNEL AFTER THE LOWEST CHECK DAM FROM HEAVY FLOW THAT COULD CAUSE EROSION.
6. MAKE SURE THAT THE CHANNEL REACH ABOVE THE MOST UPSTREAM DAM IS STABLE.
7. ENSURE THAT OTHER AREAS OF THE CHANNEL, SUCH AS CULVERT ENTRANCES BELOW THE CHECK DAMS, ARE NOT SUBJECT TO DAMAGE OR BLOCKAGE FROM DISPLACED STONES.

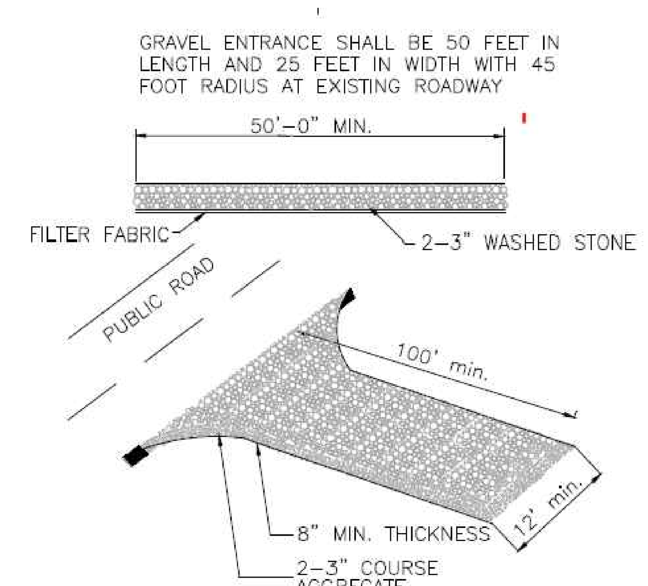
MAINTENANCE NOTES:

1. INSPECT CHECK DAMS AND CHANNELS AT LEAST WEEKLY AND AFTER EACH SIGNIFICANT (1/2 INCH OR GREATER) RAINFALL EVENT AND REPAIR IMMEDIATELY. CLEAN OUT SEDIMENT, STRAW, LIMBS, OR OTHER DEBRIS THAT COULD CLOG THE CHANNEL WHEN NEEDED.
2. ANTICIPATE SUBMERGENCE AND DEPOSITION ABOVE THE CHECK DAM AND EROSION FROM HIGH FLOWS AROUND THE EDGES OF THE DAM. CORRECT ALL DAMAGE IMMEDIATELY. IF SIGNIFICANT EROSION OCCURS BETWEEN DAMS, ADDITIONAL MEASURES CAN BE TAKEN SUCH AS, INSTALLING A PROTECTIVE RIPRAP LINER IN THAT PORTION OF THE CHANNEL.
3. REMOVE SEDIMENT ACCUMULATED BEHIND THE DAMS AS NEEDED TO PREVENT DAMAGE TO CHANNEL VEGETATION, ALLOW THE CHANNEL TO DRAIN THROUGH THE STONE CHECK DAM, AND PREVENT LARGE FLOWS FROM CARRYING SEDIMENT OVER THE DAM. ADD STONES TO DAMS AS NEEDED TO MAINTAIN DESIGN HEIGHT AND CROSS SECTION.

ROCK CHECK DAM
N.T.S



CMP RISER DETAIL
N.T.S.



DESIGN CRITERIA
AGGREGATE SIZE – USE 2–3 INCH WASHED STONE
DIMENSION OF GRAVEL PAD
THICKNESS – 8 INCHES MINIMUM
WIDTH – 12 FT. MINIMUM OR FULL WIDTH AT ACCESS POINTS OF THE VEHICULAR ENTRANCE AND EXIT AREA, WHICHEVER IS GREATER
LENGTH – 100 FT. MINIMUM.

LOCATION – LOCATE CONSTRUCTION ENTRANCES AND EXITS TO LIMIT SEDIMENT FROM LEAVING THE SITE AND TO PROVIDE FOR MAXIMUM UTILITY BY ALL CONSTRUCTION VEHICLES. AVOID STEEP GRADES AND ENTRANCES AT CURVES IN PUBLIC ROADS.

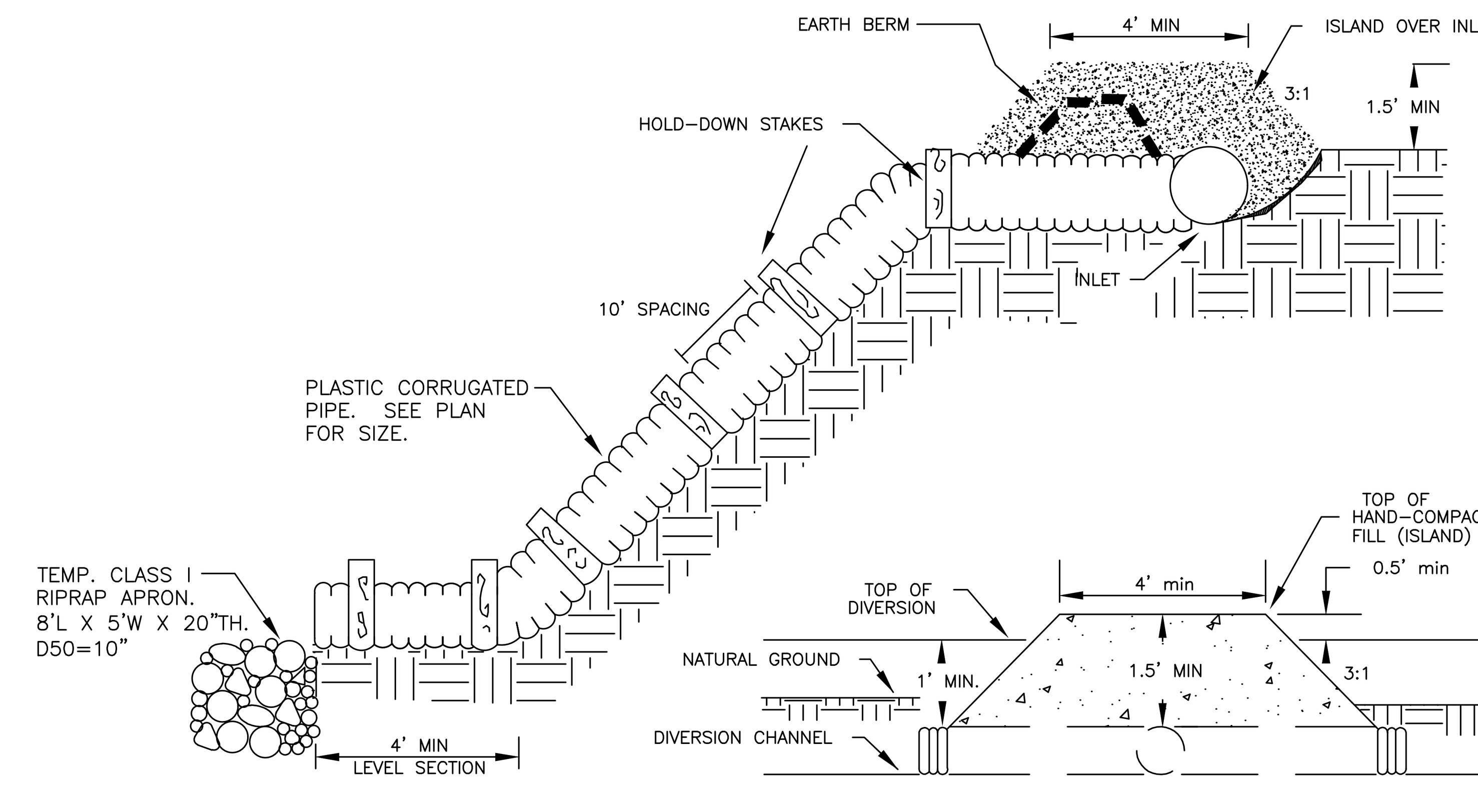
CONTRACTOR SHALL INSTALL ADDITIONAL GRAVEL CONSTRUCTION ENTRANCES NOT INDICATED ON THE PLANS REQUIRED FOR STAGING AND/OR BORROW AREAS AND MAINTAIN AT NO ADDITIONAL EXPENSE TO THE OWNER.

CONTRACTOR SHALL SUPPLEMENT AND MAINTAIN GRAVEL CONSTRUCTION ENTRANCES AT HIS EXPENSE UNTIL FINAL ACCEPTANCE.

MAINTENANCE:

MAINTAIN THE GRAVEL PAD IN A CONDITION TO PREVENT MUD OR SEDIMENT FROM LEAVING THE CONSTRUCTION SITE. THIS MAY REQUIRE PERIODIC TOPDRESSING WITH 2–INCH STONE. AFTER EACH RAINFALL, INSPECT ANY STRUCTURE USED TO TRAP SEDIMENT AND CLEAN IT OUT AS NECESSARY. IMMEDIATELY REMOVE ALL OBJECTIONABLE MATERIALS SPILLED, WASHED, OR TRACKED ONTO PUBLIC ROADWAYS.

TEMPORARY CONSTRUCTION ENTRANCE
N.T.S.



MAINTENANCE:

INSPECT THE SLOPE DRAIN AND UPSTREAM DIVERSION AFTER EVERY RAINFALL, AND PROMPTLY MAKE NECESSARY REPAIRS. ONCE THE THE PROTECTED AREA HAS BEEN PERMANENTLY STABILIZED, TEMPORARY MEASURES MAY BE REMOVED, MATERIALS DISPOSED OF PROPERLY, AND ALL DISTURBED AREAS STABILIZED APPROPRIATELY.

STANDARD TEMPORARY SLOPE DRAIN
N.T.S.

SEEDBED PREPARATION

1. CHISEL COMPACTED AREAS AND SPREAD TOPSOIL 3 INCHES DEEP OVER ADVERSE SOIL CONDITIONS, IF APPLICABLE.
2. RIP THE ENTIRE AREA TO 6 INCHES DEEP.
3. REMOVE ALL LOOSE ROCK, ROOTS, AND OTHER OBSTRUCTIONS LEAVING SURFACE REASONABLY SMOOTH AND UNIFORM.
4. APPLY AGRICULTURAL LIME, FERTILIZER, AND SUPERPHOSPHATE UNIFORMLY AND MIX WITH SOIL (SEE BELOW*).
5. CONTINUE TILLAGE UNTIL WELL PULVERIZED, FIRM, REASONABLY UNIFORM SEEDBED IS PREPARED 4 TO 6 INCHES DEEP.
6. SEED ON FRESHLY PREPARED SEEDBED AND COVER SEED LIGHTLY WITH SEEDING EQUIPMENT OR CULTIPACK AFTER SEEDING.
7. MULCH IMMEDIATELY AFTER SEEDING AND ANCHOR MULCH.
8. INSPECT ALL SEEDED AREAS AND MAKE NECESSARY REPAIRS OR RESEEDINGS WITHIN THE PLANTING SEASON, IF POSSIBLE. IF STAND SHOULD BE OVER 60% DAMAGED, REESTABLISH FOLLOWING ORIGINAL LIME, FERTILIZER AND SEEDING RATES.

* APPLY: AGRICULTURAL LIMESTONE – 2 TONS/AC (3 TONS/AC IN CLAY SOILS)
FERTILIZER – 1,000 LBS/ACRE – 10–10–10
SUPERPHOSPHATE – 500 LBS/ACRE – 20% ANALYSIS
MULCH – 2 TONS/ACRE – SMALL GRAIN STRAW
ANCHOR – ASPHALT EMULSION @ 400 GALS/ACRE

TEMPORARY SEEDING SCHEDULE

DATE	SEED TYPE	PLANTING RATE
APR 1 – JUL 31	BLACKJACK BERMUDA & BROWNTOP MILLET	25 LBS/ACRE 50 LBS/ACRE
AUG 1 – MAR 31	GERMAN MILLET & ABRUZZI RYE	25 LBS/ACRE 50 LBS/ACRE

PERMANENT SEEDING SCHEDULE

DATE	SEED TYPE	PLANTING RATE
APR 1 – JUL 31	BLACKJACK BERMUDA	40 LBS/ACRE
SEP 1 – MAR 1	TALL FESCUE	50 LBS/ACRE

PRELIMINARY - NOT RELEASED FOR CONSTRUCTION

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NORTH CAROLINA PROFESSIONAL SEAL 022530 ENGINEER RICHARD W. BAKER, III
04/24/2020

THIS DRAWING PREPARED AT THE **RALEIGH OFFICE**
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TEL 919.866.4951 FAX 919.833.8124 www.timmons.com

YOUR VISION ACHIEVED THROUGH OURS.

DATE	REVISION DESCRIPTION
04/24/2020	ADDRESSED NCDEQ COMMENTS

DATE 2019-08-22
DRAWN BY T. DAEKE
DESIGNED BY S. MOORE
CHECKED BY R. BAKER
SCALE AS SHOWN

TIMMONS GROUP
NORTH CAROLINA LICENSE NO. C-1652

PROSPECT HILL QUARRY AND DISTRIBUTION CENTER
PROSPECT HILL - CASWELL COUNTY - NORTH CAROLINA

NOTES AND DETAILS

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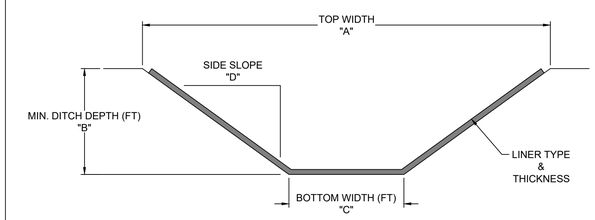
DITCH NAME	TOP WIDTH "A"	MIN. DITCH DEPTH (FT) "B"	BOTTOM WIDTH (FT) "C"	SIDE SLOPE "D"	LINER TYPE & THICKNESS
TDD 1A	10.2 FT	1.7 FT	0	3:1	North American Green, SC150
TDD 1B	5.4 FT	0.9 FT	0	3:1	North American Green, S75
TDD 2A	10 FT	1.5 FT	1	3:1	North American Green, S75
TDD 2B	6 FT	1 FT	0	3:1	North American Green, S75
TDD 3A	7.8 FT	1.3 FT	0	3:1	North American Green, S75
TDD 3B	10 FT	1.5 FT	1	3:1	North American Green, S75
TDD 4A	6 FT	1 FT	0	3:1	North American Green, S75
TDD 4B	7.2 FT	1.2 FT	0	3:1	North American Green, S75
TDD 5A	7.2 FT	1.2 FT	0	3:1	North American Green, S75
TDD 6A	5.4 FT	0.9 FT	0	3:1	North American Green, S75
TDD 6B	5.4 FT	0.9 FT	0	3:1	North American Green, S75
TDD 7A	9 FT	1.5 FT	0	3:1	North American Green, S75
TDD 7B	6.6 FT	1.1 FT	0	3:1	North American Green, S75
TDD 8A	7.8 FT	1.3 FT	0	3:1	North American Green, S75
TDD 8B	6.6 FT	1.1 FT	0	3:1	North American Green, S75
TDD 9A	7.2 FT	1.2 FT	0	3:1	North American Green, S75
TDD 9B	6 FT	1 FT	0	3:1	North American Green, S75
TDD 9C	10 FT	1.5 FT	1	3:1	North American Green, S75
TDD 10A	10 FT	1.5 FT	1	3:1	North American Green, S75
TDD 10B	6.6 FT	1.1 FT	0	3:1	North American Green, S75
TDD 10C	5.4 FT	0.9 FT	0	3:1	North American Green, S75
TDD 11A	6 FT	1 FT	0	3:1	North American Green, S75
TDD 11B	5.4 FT	0.9 FT	0	3:1	North American Green, S75
TDD 11C	7.2 FT	1.2 FT	0	3:1	North American Green, S75
TDD 12A	10 FT	1.5 FT	1	3:1	North American Green, S75
TDD 12B	6 FT	1 FT	0	3:1	North American Green, S75
TDD 12C	8.4 FT	1.4 FT	0	3:1	North American Green, S75
TDD 12D	4.8 FT	0.8 FT	0	3:1	Jute Net
TDD 14A	11.2 FT	1.7 FT	1	3:1	North American Green, S75
TDD 14B	6.6 FT	1.1 FT	0	3:1	North American Green, S75
TDD 15A	6.6 FT	1.1 FT	0	3:1	North American Green, S75
TDD 15B	6.6 FT	1.4 FT	0	3:1	North American Green, S75
TDD 15C	6.6 FT	1.1 FT	0	3:1	North American Green, S75
TDD 16A	7.2 FT	1.2 FT	0	3:1	North American Green, S75
TDD 16B	7.2 FT	1.2 FT	0	3:1	North American Green, S75
TDD 17A	10.6 FT	1.6 FT	1	3:1	North American Green, S75
TDD 17B	8.4 FT	1.4 FT	0	3:1	North American Green, S75
TDD 18A	5.4 FT	0.9 FT	0	3:1	North American Green, S75
TDD 18B	8.8 FT	1.3 FT	1	3:1	North American Green, SC150
TDD 19A	7.2 FT	1.2 FT	0	3:1	North American Green, S75
TDD 19B	5.4 FT	0.9 FT	0	3:1	North American Green, S75
TDD 19C	4.8 FT	0.8 FT	0	3:1	North American Green, S75
TDD 20A	7.8 FT	1.3 FT	0	3:1	North American Green, S150
TDD 20B	7.2 FT	1.2 FT	0	3:1	North American Green, S75
TDD 21A	5.4 FT	0.9 FT	0	3:1	North American Green, S75
TDD 21B	6.6 FT	1.1 FT	0	3:1	North American Green, S150
TDD 21C	5.4 FT	0.9 FT	0	3:1	North American Green, S75
TDD 22A	6 FT	1 FT	0	3:1	North American Green, S75
TDD 23A	8.4 FT	1.4 FT	0	3:1	North American Green, C125
TDD 23B	6.6 FT	1.1 FT	0	3:1	North American Green, S150
TDD 24A	6 FT	1 FT	0	3:1	North American Green, S75
TDD 24B	5.4 FT	0.9 FT	0	3:1	North American Green, S75
TDD 25A	5.4 FT	0.9 FT	0	3:1	North American Green, S75
TDD 25B	4.8 FT	0.8 FT	0	3:1	North American Green, S150
TDD 26A	4.8 FT	0.8 FT	0	3:1	North American Green, S75
TDD 26B	4.8 FT	0.8 FT	0	3:1	North American Green, S75
TDD 27A	8.4 FT	1.4 FT	0	3:1	North American Green, S150
TDD 27B	5.4 FT	0.9 FT	0	3:1	North American Green, S150
TDD 28A	7.2 FT	1.2 FT	0	3:1	North American Green, S75
TDD 28B	6 FT	1 FT	0	3:1	North American Green, S75
TDD 29A	9 FT	1.5 FT	0	3:1	North American Green, SC150
TDD 29B	5.4 FT	0.9 FT	0	3:1	North American Green, S75
TDD 30A	7.2 FT	1.2 FT	0	3:1	North American Green, S75
TDD 30B	9.4 FT	1.4 FT	1	3:1	North American Green, SC150
TDD 30C	5.4 FT	0.9 FT	0	3:1	North American Green, S75
TDD 31A	8.8 FT	1.3 FT	1	3:1	North American Green, SC150
TDD 31B	10 FT	1.5 FT	1	3:1	North American Green, P300
TDD 31C	5.4 FT	0.9 FT	0	3:1	North American Green, S150
TDD 32A	10.6 FT	1.6 FT	1	3:1	North American Green, SC150
TDD 32B	6 FT	1 FT	0	3:1	North American Green, S75
TDD 32C	5.4 FT	0.9 FT	0	3:1	North American Green, S150
TDD 32D	6 FT	1 FT	0	3:1	North American Green, S75
TDD 33A	5.4 FT	0.9 FT	0	3:1	North American Green, S75
TDD 33B	5.4 FT	0.9 FT	0	3:1	North American Green, S75
TDD 33C	5.4 FT	0.9 FT	0	3:1	North American Green, SC150
TDD 33D	4.8 FT	0.8 FT	0	3:1	North American Green, S75
TDD 34A	6.6 FT	1.1 FT	0	3:1	North American Green, S75
TDD 34B	6.6 FT	1.1 FT	0	3:1	North American Green, S75
TDD 35A	6.6 FT	1.1 FT	0	3:1	North American Green, S75
TDD 35B	5.4 FT	0.9 FT	0	3:1	North American Green, S75
TDD 36A	5.4 FT	0.9 FT	0	3:1	North American Green, S75
TDD 36B	6.6 FT	1.1 FT	0	3:1	North American Green, S75
TDD 37A	7.8 FT	1.3 FT	0	3:1	North American Green, S150
TDD 37B	6 FT	1 FT	0	3:1	North American Green, SC150
TDD 38A	6 FT	1 FT	0	3:1	North American Green, SC150
TDD 38B	6.6 FT	1.1 FT	0	3:1	North American Green, S75
TDD 38C	4.8 FT	0.8 FT	0	3:1	North American Green, S75
TDD 39A	8.4 FT	1.4 FT	0	3:1	North American Green, SC150
TDD 39B	6 FT	1 FT	0	3:1	North American Green, S75
TDD 39C	7.8 FT	1.3 FT	0	3:1	North American Green, SC150
TDD 40A	6.6 FT	1.1 FT	0	3:1	North American Green, SC150
TDD 40B	4.8 FT	0.8 FT	0	3:1	North American Green, S75
TDD 40C	8.4 FT	1.4 FT	0	3:1	North American Green, P300
TDD 41A	6 FT	1 FT	0	3:1	North American Green, P300
TDD 41B	4.8 FT	0.8 FT	0	3:1	North American Green, SC150
TTD 41C	6.6 FT	1.1 FT	0	3:1	North American Green, C125
TTD 41D	6 FT	1 FT	0	3:1	North American Green, S75
TTD 42A	6.6 FT	1.1 FT	0	3:1	North American Green, C125
TTD 42B	4.8 FT	0.8 FT	0	3:1	North American Green, S75
TTD 42C	5.4 FT	0.9 FT	0	3:1	North American Green, S75
TTD 42D	4.8 FT	0.8 FT	0	3:1	North American Green, S75
TTD 43A	5.8 FT	0.8 FT	1	3:1	North American Green, SC150
TTD 44A	6.4 FT	0.9 FT	1	3:1	North American Green, SC150
TTD 44B	5.4 FT	0.9 FT	0	3:1	North American Green, S75
TTD 44C	5.4 FT	0.9 FT	0	3:1	North American Green, SC150
TTD 44D	4.2 FT	0.7 FT	0	3:1	North American Green, S150
TTD 45A	5.8 FT	0.8 FT	1	3:1	North American Green, SC150
TTD 45B	6 FT	1 FT	0	3:1	North American Green, S150
TTD 46A	6.6 FT	1.1 FT	0	3:1	North American Green, S150
TTD 46B	5.8 FT	0.8 FT	1	3:1	North American Green, SC150
TTD 47A	5.2 FT	0.7 FT	1	3:1	North American Green, S75
TTD 47B	6.6 FT	1.1 FT	0	3:1	North American Green, P300
TTD 47C	4.8 FT	0.8 FT	0	3:1	North American Green, S75
TTD 48A	7.6 FT	1.1 FT	1	3:1	North American Green, C125
TTD 48B	6.6 FT	1.1 FT	0	3:1	North American Green, C125
TTD 49A	6 FT	1 FT	0	3:1	North American Green, C125
TTD 50A	4.8 FT	0.8 FT	0	3:1	North American Green, SC150
TTD 50B	4.8 FT	0.8 FT	0	3:1	North American Green, S150
TTD 50C	5.4 FT	0.9 FT	0	3:1	North American Green, S150
TTD 51A	8 FT	1 FT	2	3:1	North American Green, C125
TTD 51B	4.8 FT	0.8 FT	0	3:1	North American Green, S150
TTD 51C	9.4 FT	1.4 FT	1	3:1	Class I (12"@22"THK)
TTD 52A	6.6 FT	1.1 FT	0	3:1	North American Green, SC150
TTD 52B	6 FT	1 FT	0	3:1	North American Green, S75
TTD 52C	5.4 FT	0.9 FT	0	3:1	North American Green, S150
TTD 53A	5.4 FT	0.9 FT	0	3:1	North American Green, SC150
TTD 54A	9 FT	1.5 FT	0	3:1	North American Green, C125
TTD 55A	6 FT	1 FT	0	3:1	Class B (8"@18"THK)



MAINTENANCE FOR CHANNEL LINING/DITCH SECTION
DURING THE ESTABLISHMENT PERIOD, CHECK BLANKET-LINED CHANNELS AFTER EVERY RAINFALL. AFTER GRASS IS ESTABLISHED, PERIODICALLY CHECK THE CHANNEL; CHECK IT AFTER EVERY HEAVY RAINFALL EVENT. IMMEDIATELY MAKE REPAIRS. IT IS PARTICULARLY IMPORTANT TO CHECK THE CHANNEL OUTLET AND ALL ROAD/TRAIL CROSSINGS FOR BANK STABILITY AND EVIDENCE OF PIPING OR SCOUR HOLES. REMOVE ALL SIGNIFICANT SEDIMENT ACCUMULATIONS TO MAINTAIN THE DESIGNED CARRYING CAPACITY. KEEP THE GRASS IN A HEALTHY, VIGOROUS CONDITION AT ALL TIMES, SINCE IT IS THE PRIMARY EROSION PROTECTION FOR THE CHANNEL.

CHANNEL LINING / DITCH SECTION SCHEDULE
N.T.S

PRELIMINARY - NOT RELEASED FOR CONSTRUCTION

ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH CASWELL COUNTY, NCDEQ AND NCDOT STANDARDS, SPECIFICATIONS, AND DETAILS

NORTH CAROLINA PROFESSIONAL SEAL 022530 ENGINEER RICHARD W. BAKER, III
04/24/2020

THIS DRAWING PREPARED AT THE
RALEIGH OFFICE
5410 Trinity Road, Suite 102 | Raleigh, NC 27607
TEL 919.866.4951 FAX 919.833.8124 www.timmons.com

YOUR VISION ACHIEVED THROUGH OURS.

REVISION DESCRIPTION	DATE
ADDRESSED NCDEQ COMMENTS	04/24/2020

DATE
2019-08-22
DRAWN BY
T. DAEKE
DESIGNED BY
S. MOORE
CHECKED BY
R. BAKER
SCALE
AS SHOWN

TIMMONS GROUP

NORTH CAROLINA LICENSE NO. C-1652

PROSPECT HILL QUARRY AND DISTRIBUTION CENTER
PROSPECT HILL - CASWELL COUNTY - NORTH CAROLINA
NOTES AND DETAILS

JOB NO.
44089.001
SHEET NO.
C4.40

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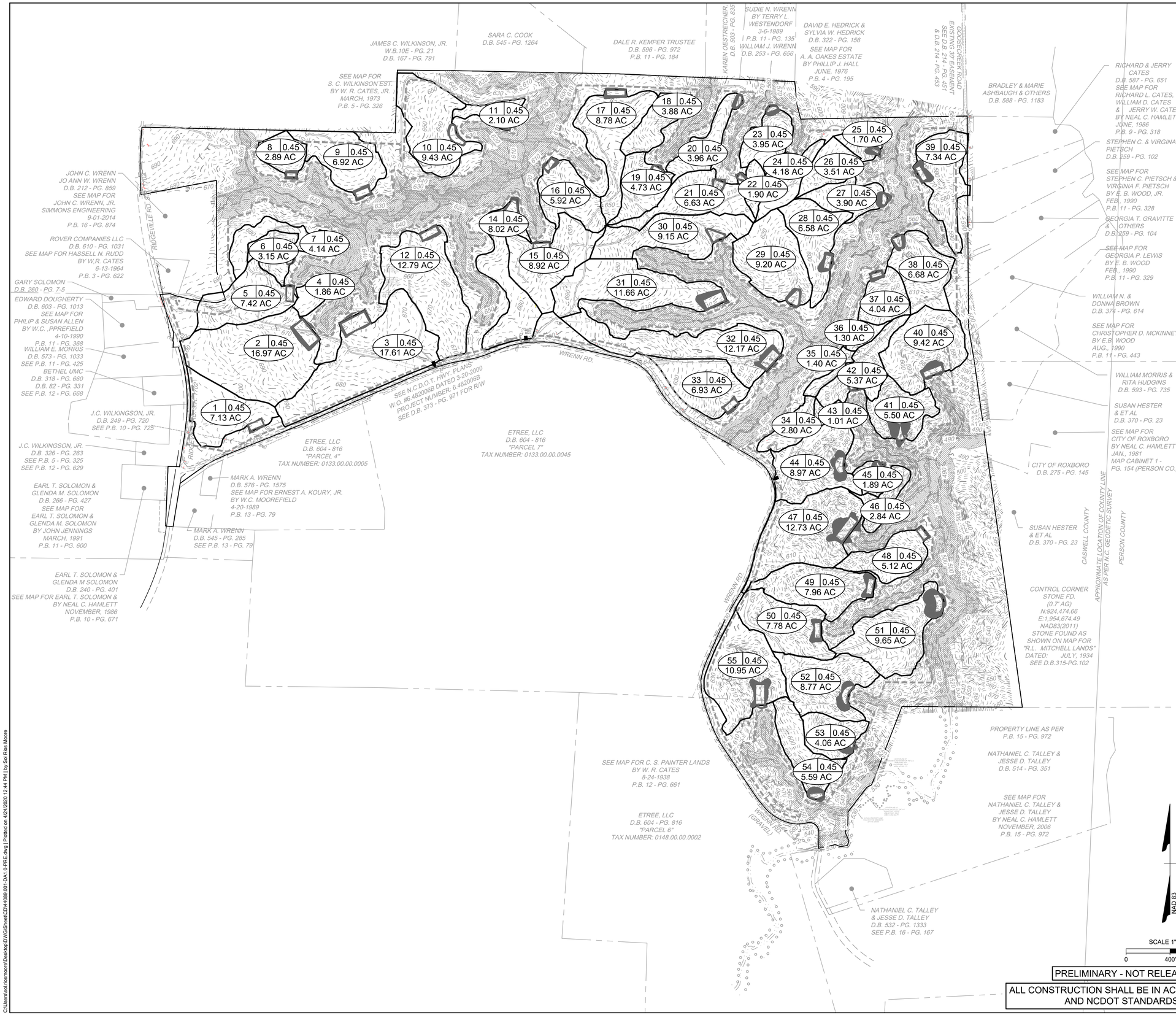

NOTE:

1. **REFER TO MINE PERMIT PLANS AND DOCUMENTS FOR PHASING AND DETAILED PROJECT INFORMATION.**

LABEL LEGEND

##	C
AREA	

##: BASIN/ DRAINAGE AREA NUMBER
C: C-VALUE - C
AREA: DRAINAGE AREA IN ACRES

PRELIMINARY - NOT RELEASED FOR CONSTRUCTION

ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH CASWELL COUNTY, NCDEQ AND NCDOT STANDARDS, SPECIFICATIONS, AND DETAILS

NORTH CAROLINA PROFESSIONAL SEAL 022530 ENGINEER RICHARD W. BAKER, III
04/24/2020

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YOUR VISION ACHIEVED THROUGH OURS.

REVISION DESCRIPTION	DATE
ADDRESSED NCDEQ COMMENTS	04/24/2020

DATE	2019-08-22
DRAWN BY	T. DAEKE
DESIGNED BY	S. MOORE
CHECKED BY	R. BAKER
SCALE	AS SHOWN

TIMMONS GROUP

NORTH CAROLINA LICENSE NO. C-1652

PROSPECT HILL QUARRY AND DISTRIBUTION CENTER

PROSPECT HILL - CASWELL COUNTY - NORTH CAROLINA

SEDIMENT BASIN DRAINAGE AREA MAP

JOB NO. 44089.001

SHEET NO. DA1.0

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TIMMONS GROUP

YOUR VISION ACHIEVED THROUGH OURS.

Sediment & Erosion Control Report

Project: Prospect Hill Quarry & Distribution Center
Wrenn Road, Prospect Hill
Caswell County, NC

PROJECT No.: 44089

NORTH CAROLINA PROFESSIONAL SEAL 022530 ENGINEER RICHARD W. BAKER, III

8/28/2019

REVISIONS:

4/24/2020

Timmons Group
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Sediment & Erosion Control Narrative

Sediment & Erosion Control Narrative

Existing Conditions Description

The proposed quarry and distribution center project is located northeast of the intersection of Ridgeville Road and Wrenn Road in Prospect Hill, Caswell County, NC. The parcel identification numbers are as follows: 0133 002; 0133 005; 0133 045; 0133 075; 0148 002. The site consists approximately 630 acres of mainly of agricultural fields and wooded land. Jurisdictional streams and wetlands are located throughout the site. The existing soils are Louisburg coarse sandy loam "LoC/ LoD/ LoE" in the Hydrologic Soils Group "A"; Chewacla loam "ChA", Cullen clay loam "CuB2", Riverview loam "RvA", and Rowan-Poindexter complex "RxE" in the Hydrologic Soils Group "B/D" and "B"; Enon sandy loam "EnB/ EnC/ EnD" and Vance sandy loam in the Hydrologic Soils Group "C"; and Helena sandy loam "HeB/ HeC" in the Hydrologic Soils Group "D". The majority of the site drains east toward Sugartree Creek and South Hyco Creek in the Roanoke River Basin. The surface water classification is WS-II; HQW. FIRM Panels 3710994200J and 3710995200K indicate the site does not lie within a special flood hazard area.

Erosion Control Summary

This project proposes a quarry and distribution center. Approximately 409 acres of land will be disturbed. Temporary sediment basins will be installed throughout the site to treat the majority of the disturbed area. The remainder of the disturbed area will be protected by silt fence with silt fence stone outlets. As the quarry and distribution center are developed, the site will be stabilized per NCDEQ requirements.

Erosion control measures for this site have been designed in accordance with NCDEQ standards and specifications.

NPDES/NCG01 Plan

Although this project is subject to General Permit NCG02 for Mining and Quarrying activities, all construction activities shall comply NCG01 permit guidelines on ground stabilization and materials handling.

Sediment & Erosion Control Calculations

BASIN NAME		PROJECT NAME
BASIN 1	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 1

Modified Rational

Highest Elevation =	698	feet
Inlet Elevation =	688	feet
Difference =	10	feet
Travel Length =	845	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc	=Time of Concentration (min)
H	=Height of the most remote point on the watershed above the outlet (ft)
L	=Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	7.73	min
T_C =	5	min
Intensity 50 year =	8.21	in/hr
C =	0.45	
Disturbed Area =	7.13	acres
Additional Drainage Area =	0.00	acres
Total Drainage Area=	7.13	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **26.34** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 1	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		**PROJECT NUMBER**
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 1 TYPE OF BASIN: SKIMMER

Disturbed Area:	7.13	ac
Additional Drainage Area:	0.00	ac
Total Drainage Area:	7.13	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	8.21	in/hr
50-yr Discharge [Q10]:	**26.34**	cfs

Sizing of Basin

12834	Required Volume ft^3	(Disturbed Area x 1800 cf/ac)	
8561	Required Surface Area ft^2	**(Q50 x 325)**	
65.4	Suggested Width ft		
130.9	Suggested Length ft		
69	Width at Surface Area (ft)		
140	Length at Surface Area (ft)	L/W Ratio = 2.0	**Okay**
3	Side Slope Ratio Z:1		
2	Depth (ft)		
57	Target Bottom Width (ft)		
128	Target Bottom Length (ft)		
7296	Target Bottom Area ($ft^{2)}$		
16908	Target Volume (ft^3)	**Okay**	
9660	Target Surface Area (ft^2)	**Okay**	
16920	Provided Volume (ft^3)		
9660	Provided Surface Area (ft^2)		
30	Emergency Spillway Width (ft)		
0.5	Depth of Flow (ft)		
31.8	Spillway Capacity (cfs)	**Okay**	
2	Skimmer Size (in)		
0.167	Head on Skimmer (ft)		
1.75	Orifice Size (1/4 inch increments)		
4.44	Dewatering Time (days)		
	Suggest about 3 days		

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
686.00	**7296**	0.00	0	0
687.00	**8442**	1.00	7869	7869
688.00	**9660**	2.00	9051	16920
689.00		3.00	4830	21750

Top of Embankment Elevation:	689.00	ft
Emergency Spillway Elevation:	688.00	ft
Embankment Width:	**5**	ft
Bottom Elevation:	686.00	ft
Sediment Storage Elevation:	685.00	ft

BASIN NAME	BASIN 1	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	7.13	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	26	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	8,561	ft^2
SURFACE AREA PROVIDED	9,660	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	12,834	ft^3
BASIN VOLUME PROVIDED	16,920	ft^3
TOP OF EMBANKMENT ELEVATION	689.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	688.0	ft
EMERGENCY SPILLWAY WIDTH	30	ft
BOTTOM ELEVATION	686.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	685.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2	inch
ORIFICE DIAMETER	1.75	inch
DEWATERING TIME	4.44	days

BASIN NAME		PROJECT NAME
BASIN 2	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 2

Modified Rational

Highest Elevation =	702	feet
Inlet Elevation =	661	feet
Difference =	41	feet
Travel Length =	1,147	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc =Time of Concentration (min)

H =Height of the most remote point on the watershed above the outlet (ft)

L =Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	6.39	min
T_C =	5	min
Intensity 50 year =	8.21	in/hr
C =	0.45	
Disturbed Area =	16.97	acres
Additional Drainage Area =	0.00	acres
Total Drainage Area=	16.97	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **62.70** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 2	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 2 TYPE OF BASIN: RISER

Disturbed Area:	16.97	ac
Additional Drainage Area:	0.00	ac
Total Drainage Area:	16.97	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	8.21	in/hr
50-yr Discharge [Q10]:	**62.70**	cfs

Sizing of Basin

30546	Required Volume ft^3	(Disturbed Area x 1800 cf/ac)		
27273	Required Surface Area ft^2	**(Q50 x 435)**		
116.8	Suggested Width ft			
233.5	Suggested Length ft			
121	Width at Surface Area (ft)			
242	Length at Surface Area (ft)	L/W Ratio =	2.0	**Okay**
3	Side Slope Ratio Z:1			
2	Depth (ft)			
109	Target Bottom Width (ft)			
230	Target Bottom Length (ft)			
25070	Target Bottom Area (ft$^{2)}$			
54304	Target Volume (ft^3)	**Okay**		
29282	Target Surface Area (ft^2)	**Okay**		

54316	Provided Volume (ft^3)
29282	Provided Surface Area (ft^2)

65	Emergency Spillway Width (ft)	
0.5	Depth of Flow (ft)	
68.9	Spillway Capacity (cfs)	**Okay**
3	Skimmer Size (in)	
0.25	Head on Skimmer (ft)	
2.75	Orifice Size (1/4 inch increments)	
3.50	Dewatering Time (days)	
	Suggest about 3 days	

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
659.00	**25070**	0.00	0	0
660.00	**27140**	1.00	26105	26105
661.00	**29282**	2.00	28211	54316
662.00		3.00	14641	68957

Top of Embankment Elevation:	663.00	ft
Emergency Spillway Elevation:	662.00	ft
Embankment Width:	**10**	ft
Riser Elevation:	661.00	ft
Bottom Elevation:	659.00	ft
Sediment Storage Elevation:	658.00	ft

Sizing of Barrel & Riser

12	Barrel Size (in)	
48	Barrel Length (LF)	
659	Upstream Barrel Invert Elevation	
658	Downstream Barrel Invert Elevation	
2.08%	Slope of Barrel (%)	
HDPE	Barrel Pipe Material	
CMP	Riser Material	
18	Riser Size (in)	**Okay (Riser = 1.5 Barrel Size)**

Anti-Flotation Device (Only use for circular riser)

1.5	Riser Diameter (ft)	
3.0	Height (ft)	
		Area Riser x Ht Riser x Density Water x Safety Factor
380	Buoyant Force (lbs)	(.25)(pi)(Diameter)2 x (Height) x 62.4 pcf x 1.15 FS
2.5	Volume Required (cf)	Buoyant force / Density Of Concrete (150 pcf)
1.6	Square Root of Volume (ft)	(Assume 1 ft thick concrete footing)
2.0	Length of Concrete Footing	
2.0	Width of Concrete Footing	
1.0	Height of Concrete Footing (Thickness)	
4	Volume Provided (cf)	

***RED IS USER INPUT**

BASIN NAME	BASIN 2	
BASIN TYPE	RISER	
TOTAL DRAINAGE AREA	16.97	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	63	cfs
SURFACE AREA (AC) = 435 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	27,273	ft^2
SURFACE AREA PROVIDED	29,282	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	30,546	ft^3
BASIN VOLUME PROVIDED	54,316	ft^3
TOP OF EMBANKMENT ELEVATION	663.0	ft
EMBANKMENT WIDTH	10	ft
EMERGENCY SPILLWAY ELEVATION	662.0	ft
EMERGENCY SPILLWAY WIDTH	65	ft
RISER ELEVATION	661.0	ft
BOTTOM ELEVATION	659.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	658.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	3	inch
ORIFICE DIAMETER	2.75	inch
DEWATERING TIME	3.50	days

BASIN NAME		PROJECT NAME
BASIN 3	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 3

Modified Rational

Highest Elevation =	694	feet
Inlet Elevation =	657	feet
Difference =	37	feet
Travel Length =	1,054	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc =Time of Concentration (min)

H =Height of the most remote point on the watershed above the outlet (ft)

L =Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	6.03	min
T_C =	5	min
Intensity 50 year =	8.21	in/hr
C =	0.45	
Disturbed Area =	16.92	acres
Additional Drainage Area =	0.69	acres
Total Drainage Area=	17.61	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **65.06** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 3	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 3 TYPE OF BASIN: RISER

Disturbed Area:	16.92	ac
Additional Drainage Area:	0.69	ac
Total Drainage Area:	17.61	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	8.21	in/hr
50-yr Discharge [Q10]:	**65.06**	cfs

Sizing of Basin

30456	Required Volume ft^3	(Disturbed Area x 1800 cf/ac)	
28301	Required Surface Area ft^2	**(Q50 x 435)**	
119.0	Suggested Width ft		
237.9	Suggested Length ft		
125	Width at Surface Area (ft)		
250	Length at Surface Area (ft)	L/W Ratio = 2.0	**Okay**
3	Side Slope Ratio Z:1		
2	Depth (ft)		
113	Target Bottom Width (ft)		
238	Target Bottom Length (ft)		
26894	Target Bottom Area ($ft^{2)}$		
58096	Target Volume (ft^3)	**Okay**	
31250	Target Surface Area (ft^2)	**Okay**	
58108	Provided Volume (ft^3)		
31250	Provided Surface Area (ft^2)		
65	Emergency Spillway Width (ft)		
0.5	Depth of Flow (ft)		
68.9	Spillway Capacity (cfs)	**Okay**	
3	Skimmer Size (in)		
0.25	Head on Skimmer (ft)		
2.75	Orifice Size (1/4 inch increments)		
3.49	Dewatering Time (days)		
	Suggest about 3 days		

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
655.00	**26894**	0.00	0	0
656.00	**29036**	1.00	27965	27965
657.00	**31250**	2.00	30143	58108
658.00		3.00	15625	73733

Top of Embankment Elevation:	659.00	ft
Emergency Spillway Elevation:	658.00	ft
Embankment Width:	**10**	ft
Riser Elevation:	657.00	ft
Bottom Elevation:	655.00	ft
Sediment Storage Elevation:	654.00	ft

Sizing of Barrel & Riser

12	Barrel Size (in)	
50	Barrel Length (LF)	
655	Upstream Barrel Invert Elevation	
652	Downstream Barrel Invert Elevation	
6.00%	Slope of Barrel (%)	
HDPE	Barrel Pipe Material	
CMP	Riser Material	
18	Riser Size (in)	**Okay (Riser = 1.5 Barrel Size)**

Anti-Flotation Device (Only use for circular riser)

1.5	Riser Diameter (ft)	
3.0	Height (ft)	
		Area Riser x Ht Riser x Density Water x Safety Factor
380	Buoyant Force (lbs)	(.25)(pi)(Diameter)2 x (Height) x 62.4 pcf x 1.15 FS
2.5	Volume Required (cf)	Buoyant force / Density Of Concrete (150 pcf)
1.6	Square Root of Volume (ft)	(Assume 1 ft thick concrete footing)
2.0	Length of Concrete Footing	
2.0	Width of Concrete Footing	
1.0	Height of Concrete Footing (Thickness)	
4	Volume Provided (cf)	

***RED IS USER INPUT**

BASIN NAME	BASIN 3	
BASIN TYPE	RISER	
TOTAL DRAINAGE AREA	17.61	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	65	cfs
SURFACE AREA (AC) = 435 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	28,301	ft^2
SURFACE AREA PROVIDED	31,250	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	30,456	ft^3
BASIN VOLUME PROVIDED	58,108	ft^3
TOP OF EMBANKMENT ELEVATION	659.0	ft
EMBANKMENT WIDTH	10	ft
EMERGENCY SPILLWAY ELEVATION	658.0	ft
EMERGENCY SPILLWAY WIDTH	65	ft
RISER ELEVATION	657.0	ft
BOTTOM ELEVATION	655.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	654.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	3	inch
ORIFICE DIAMETER	2.75	inch
DEWATERING TIME	3.49	days

BASIN NAME		PROJECT NAME
BASIN 4	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 4

Modified Rational

Highest Elevation =	670	feet
Inlet Elevation =	655	feet
Difference =	15	feet
Travel Length =	492	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc =Time of Concentration (min)

H =Height of the most remote point on the watershed above the outlet (ft)

L =Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	3.54	min
T_C =	5	min
Intensity 50 year =	8.21	in/hr
C =	0.45	
Disturbed Area =	1.86	acres
Additional Drainage Area =	0.00	acres
Total Drainage Area=	1.86	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **6.87** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 4	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		**PROJECT NUMBER**
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 4 TYPE OF BASIN: SKIMMER

Disturbed Area:	1.86	ac
Additional Drainage Area:	0.00	ac
Total Drainage Area:	1.86	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	8.21	in/hr
50-yr Discharge [Q10]:	**6.87**	cfs

Sizing of Basin

3348	Required Volume ft^3	(Disturbed Area x 1800 cf/ac)	
2233	Required Surface Area ft^2	**(Q50 x 325)**	
33.4	Suggested Width ft		
66.8	Suggested Length ft		
45	Width at Surface Area (ft)		
90	Length at Surface Area (ft)	L/W Ratio = 2.0	**Okay**
3	Side Slope Ratio Z:1		
2	Depth (ft)		
33	Target Bottom Width (ft)		
78	Target Bottom Length (ft)		
2574	Target Bottom Area ($ft^{2)}$		
6576	Target Volume (ft^3)	**Okay**	
4050	Target Surface Area (ft^2)	**Okay**	
5779	Provided Volume (ft^3)		
3546	Provided Surface Area (ft^2)		
10	Emergency Spillway Width (ft)		
0.5	Depth of Flow (ft)		
10.6	Spillway Capacity (cfs)	**Okay**	
1.5	Skimmer Size (in)		
0.125	Head on Skimmer (ft)		
1	Orifice Size (1/4 inch increments)		
4.10	Dewatering Time (days)		
	Suggest about 3 days		

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
653.00	**2261**	0.00	0	0
654.00	**2875**	1.00	2568	2568
655.00	**3546**	2.00	3211	5779
656.00		3.00	1773	7552

Top of Embankment Elevation:	656.00	ft
Emergency Spillway Elevation:	655.00	ft
Embankment Width:	**5**	ft
Bottom Elevation:	653.00	ft
Sediment Storage Elevation:	652.00	ft

BASIN NAME	BASIN 4	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	1.86	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	7	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	2,233	ft^2
SURFACE AREA PROVIDED	3,546	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	3,348	ft^3
BASIN VOLUME PROVIDED	5,779	ft^3
TOP OF EMBANKMENT ELEVATION	656.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	655.0	ft
EMERGENCY SPILLWAY WIDTH	10	ft
BOTTOM ELEVATION	653.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	652.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	1.5	inch
ORIFICE DIAMETER	1	inch
DEWATERING TIME	4.10	days

BASIN NAME		PROJECT NAME
BASIN 5	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 5

Modified Rational

Highest Elevation =	699	feet
Inlet Elevation =	667	feet
Difference =	32	feet
Travel Length =	933	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc =Time of Concentration (min)

H =Height of the most remote point on the watershed above the outlet (ft)

L =Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	5.54	min
T_C =	5	min
Intensity 50 year =	8.21	in/hr
C =	0.45	
Disturbed Area =	5.95	acres
Additional Drainage Area =	1.47	acres
Total Drainage Area=	7.42	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **27.41** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 5	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		**PROJECT NUMBER**
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 5 TYPE OF BASIN: SKIMMER

Disturbed Area:	5.95	ac
Additional Drainage Area:	1.47	ac
Total Drainage Area:	7.42	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	8.21	in/hr
50-yr Discharge [Q10]:	**27.41**	cfs

Sizing of Basin

10710	Required Volume ft^3	(Disturbed Area x 1800 cf/ac)
8909	Required Surface Area ft^2	**(Q50 x 325)**
66.7	Suggested Width ft	
133.5	Suggested Length ft	
70	Width at Surface Area (ft)	
140	Length at Surface Area (ft)	L/W Ratio = 2.0 **Okay**
3	Side Slope Ratio Z:1	
2	Depth (ft)	
58	Target Bottom Width (ft)	
128	Target Bottom Length (ft)	
7424	Target Bottom Area ($ft^{2)}$	
17176	Target Volume (ft^3)	**Okay**
9800	Target Surface Area (ft^2)	**Okay**
17188	Provided Volume (ft^3)	
9800	Provided Surface Area (ft^2)	
30	Emergency Spillway Width (ft)	
0.5	Depth of Flow (ft)	
31.8	Spillway Capacity (cfs)	**Okay**
2	Skimmer Size (in)	
0.167	Head on Skimmer (ft)	
1.75	Orifice Size (1/4 inch increments)	
3.70	Dewatering Time (days)	
	Suggest about 3 days	

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
665.00	**7424**	0.00	0	0
666.00	**8576**	1.00	8000	8000
667.00	**9800**	2.00	9188	17188
668.00		3.00	4900	22088

Top of Embankment Elevation:	668.00	ft
Emergency Spillway Elevation:	667.00	ft
Embankment Width:	**5**	ft
Bottom Elevation:	665.00	ft
Sediment Storage Elevation:	664.00	ft

BASIN NAME	BASIN 5	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	7.42	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	27	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	8,909	ft^2
SURFACE AREA PROVIDED	9,800	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	10,710	ft^3
BASIN VOLUME PROVIDED	17,188	ft^3
TOP OF EMBANKMENT ELEVATION	668.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	667.0	ft
EMERGENCY SPILLWAY WIDTH	30	ft
BOTTOM ELEVATION	665.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	664.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2	inch
ORIFICE DIAMETER	1.75	inch
DEWATERING TIME	3.70	days

BASIN NAME		PROJECT NAME
BASIN 6	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 6

Modified Rational

Highest Elevation =	688	feet
Inlet Elevation =	664	feet
Difference =	24	feet
Travel Length =	490	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc =Time of Concentration (min)

H =Height of the most remote point on the watershed above the outlet (ft)

L =Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	2.94	min
T_C =	5	min
Intensity 50 year =	8.21	in/hr
C =	0.45	
Disturbed Area =	3.15	acres
Additional Drainage Area =	0.00	acres
Total Drainage Area=	3.15	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **11.64** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 6	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		**PROJECT NUMBER**
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 6 TYPE OF BASIN: SKIMMER

Disturbed Area:	3.15	ac
Additional Drainage Area:	0.00	ac
Total Drainage Area:	3.15	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	8.21	in/hr
50-yr Discharge [Q10]:	**11.64**	cfs

Sizing of Basin

5670	Required Volume ft^3	(Disturbed Area x 1800 cf/ac)
3782	Required Surface Area ft^2	**(Q50 x 325)**
43.5	Suggested Width ft	
87.0	Suggested Length ft	
50	Width at Surface Area (ft)	
100	Length at Surface Area (ft)	L/W Ratio = 2.0 **Okay**
3	Side Slope Ratio Z:1	
2	Depth (ft)	
38	Target Bottom Width (ft)	
88	Target Bottom Length (ft)	
3344	Target Bottom Area ($ft^{2)}$	
8296	Target Volume (ft^3)	**Okay**
5000	Target Surface Area (ft^2)	**Okay**
10304	Provided Volume (ft^3)	
6040	Provided Surface Area (ft^2)	
15	Emergency Spillway Width (ft)	
0.5	Depth of Flow (ft)	
15.9	Spillway Capacity (cfs)	**Okay**
2	Skimmer Size (in)	
0.167	Head on Skimmer (ft)	
1.25	Orifice Size (1/4 inch increments)	
3.84	Dewatering Time (days)	
	Suggest about 3 days	

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
662.00	**4292**	0.00	0	0
663.00	**5138**	1.00	4715	4715
664.00	**6040**	2.00	5589	10304
665.00		3.00	3020	13324

Top of Embankment Elevation:	665.00	ft
Emergency Spillway Elevation:	664.00	ft
Embankment Width:	**5**	ft
Bottom Elevation:	662.00	ft
Sediment Storage Elevation:	661.00	ft

BASIN NAME	BASIN 6	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	3.15	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	12	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	3,782	ft^2
SURFACE AREA PROVIDED	6,040	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	5,670	ft^3
BASIN VOLUME PROVIDED	10,304	ft^3
TOP OF EMBANKMENT ELEVATION	665.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	664.0	ft
EMERGENCY SPILLWAY WIDTH	15	ft
BOTTOM ELEVATION	662.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	661.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2	inch
ORIFICE DIAMETER	1.25	inch
DEWATERING TIME	3.84	days

BASIN NAME		PROJECT NAME
BASIN 7	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 7

Modified Rational

Highest Elevation =	692	feet
Inlet Elevation =	661	feet
Difference =	31	feet
Travel Length =	1,653	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc =Time of Concentration (min)

H =Height of the most remote point on the watershed above the outlet (ft)

L =Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	10.86	min
T_C =	10	min
Intensity 50 year =	6.53	in/hr
C =	0.45	
Disturbed Area =	4.14	acres
Additional Drainage Area =	0.00	acres
Total Drainage Area=	4.14	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **12.17** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 7	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		**PROJECT NUMBER**
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 7 TYPE OF BASIN: SKIMMER

Disturbed Area:	4.14	ac
Additional Drainage Area:	0.00	ac
Total Drainage Area:	4.14	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	6.53	in/hr
50-yr Discharge [Q10]:	**12.17**	cfs

Sizing of Basin

7452	Required Volume ft^3	(Disturbed Area x 1800 cf/ac)	
3954	Required Surface Area ft^2	**(Q50 x 325)**	
44.5	Suggested Width ft		
88.9	Suggested Length ft		
50	Width at Surface Area (ft)		
100	Length at Surface Area (ft)	L/W Ratio = 2.0	**Okay**
3	Side Slope Ratio Z:1		
2	Depth (ft)		
38	Target Bottom Width (ft)		
88	Target Bottom Length (ft)		
3344	Target Bottom Area ($ft^{2)}$		
8296	Target Volume (ft^3)	**Okay**	
5000	Target Surface Area (ft^2)	**Okay**	
7164	Provided Volume (ft^3)		
4403	Provided Surface Area (ft^2)		
20	Emergency Spillway Width (ft)		
0.5	Depth of Flow (ft)		
21.2	Spillway Capacity (cfs)	**Okay**	
2	Skimmer Size (in)		
0.167	Head on Skimmer (ft)		
1.5	Orifice Size (1/4 inch increments)		
3.51	Dewatering Time (days)		
	Suggest about 3 days		

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
659.00	**2797**	0.00	0	0
660.00	**3564**	1.00	3181	3181
661.00	**4403**	2.00	3984	7164
662.00		3.00	2202	9366

Top of Embankment Elevation:	662.00	ft
Emergency Spillway Elevation:	661.00	ft
Embankment Width:	**5**	ft
Bottom Elevation:	659.00	ft
Sediment Storage Elevation:	658.00	ft

BASIN NAME	BASIN 7	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	4.14	acres
Tc (TIME OF CONCENTRATION)	10	min
C VALUE	0.45	
I (50 YEAR STORM)	6.53	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	12	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	3,954	ft^2
SURFACE AREA PROVIDED	4,403	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	7,452	ft^3
BASIN VOLUME PROVIDED	7,164	ft^3
TOP OF EMBANKMENT ELEVATION	662.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	661.0	ft
EMERGENCY SPILLWAY WIDTH	20	ft
BOTTOM ELEVATION	659.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	658.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2	inch
ORIFICE DIAMETER	1.5	inch
DEWATERING TIME	3.51	days

BASIN NAME		PROJECT NAME
BASIN 8	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 8

Modified Rational

Highest Elevation =	678	feet
Inlet Elevation =	656	feet
Difference =	22	feet
Travel Length =	391	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc =Time of Concentration (min)

H =Height of the most remote point on the watershed above the outlet (ft)

L =Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	2.34	min
T_C =	5	min
Intensity 50 year =	8.21	in/hr
C =	0.45	
Disturbed Area =	2.54	acres
Additional Drainage Area =	0.35	acres
Total Drainage Area=	2.89	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **10.68** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 8	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		**PROJECT NUMBER**
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 8 TYPE OF BASIN: SKIMMER

Disturbed Area:	2.54	ac
Additional Drainage Area:	0.35	ac
Total Drainage Area:	2.89	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	8.21	in/hr
50-yr Discharge [Q10]:	**10.68**	cfs

Sizing of Basin

4572	Required Volume ft^3	(Disturbed Area x 1800 cf/ac)	
3470	Required Surface Area ft^2	**(Q50 x 325)**	
41.7	Suggested Width ft		
83.3	Suggested Length ft		
48	Width at Surface Area (ft)		
96	Length at Surface Area (ft)	L/W Ratio = 2.0	**Okay**
3	Side Slope Ratio Z:1		
2	Depth (ft)		
36	Target Bottom Width (ft)		
84	Target Bottom Length (ft)		
3024	Target Bottom Area ($ft^{2)}$		
7584	Target Volume (ft^3)	**Okay**	
4608	Target Surface Area (ft^2)	**Okay**	
7596	Provided Volume (ft^3)		
4608	Provided Surface Area (ft^2)		
15	Emergency Spillway Width (ft)		
0.5	Depth of Flow (ft)		
15.9	Spillway Capacity (cfs)	**Okay**	
1.5	Skimmer Size (in)		
0.125	Head on Skimmer (ft)		
1.25	Orifice Size (1/4 inch increments)		
3.58	Dewatering Time (days)		
	Suggest about 3 days		

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
654.00	**3024**	0.00	0	0
655.00	**3780**	1.00	3402	3402
656.00	**4608**	2.00	4194	7596
657.00		3.00	2304	9900

Top of Embankment Elevation:	657.00	ft
Emergency Spillway Elevation:	656.00	ft
Embankment Width:	**5**	ft
Bottom Elevation:	654.00	ft
Sediment Storage Elevation:	653.00	ft

BASIN NAME	BASIN 8	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	2.89	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	11	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	3,470	ft^2
SURFACE AREA PROVIDED	4,608	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	4,572	ft^3
BASIN VOLUME PROVIDED	7,596	ft^3
TOP OF EMBANKMENT ELEVATION	657.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	656.0	ft
EMERGENCY SPILLWAY WIDTH	15	ft
BOTTOM ELEVATION	654.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	653.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	1.5	inch
ORIFICE DIAMETER	1.25	inch
DEWATERING TIME	3.58	days

BASIN NAME		PROJECT NAME
BASIN 9	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 9

Modified Rational

Highest Elevation =	678	feet
Inlet Elevation =	644	feet
Difference =	34	feet
Travel Length =	910	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc =Time of Concentration (min)

H =Height of the most remote point on the watershed above the outlet (ft)

L =Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	5.26	min
T_C =	5	min
Intensity 50 year =	8.21	in/hr
C =	0.45	
Disturbed Area =	5.50	acres
Additional Drainage Area =	1.42	acres
Total Drainage Area=	6.92	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **25.57** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 9	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		**PROJECT NUMBER**
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 9 TYPE OF BASIN: SKIMMER

Disturbed Area:	5.50	ac
Additional Drainage Area:	1.42	ac
Total Drainage Area:	6.92	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	8.21	in/hr
50-yr Discharge [Q10]:	**25.57**	cfs

Sizing of Basin

9900	Required Volume ft^3	(Disturbed Area x 1800 cf/ac)
8309	Required Surface Area ft^2	**(Q50 x 325)**
64.5	Suggested Width ft	
128.9	Suggested Length ft	
70	Width at Surface Area (ft)	
140	Length at Surface Area (ft)	L/W Ratio = 2.0 **Okay**
3	Side Slope Ratio Z:1	
2	Depth (ft)	
58	Target Bottom Width (ft)	
128	Target Bottom Length (ft)	
7424	Target Bottom Area ($ft^{2)}$	
17176	Target Volume (ft^3)	**Okay**
9800	Target Surface Area (ft^2)	**Okay**
17188	Provided Volume (ft^3)	
9800	Provided Surface Area (ft^2)	
25	Emergency Spillway Width (ft)	
0.5	Depth of Flow (ft)	
26.5	Spillway Capacity (cfs)	**Okay**
2	Skimmer Size (in)	
0.167	Head on Skimmer (ft)	
1.75	Orifice Size (1/4 inch increments)	
3.42	Dewatering Time (days)	
	Suggest about 3 days	

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
642.00	**7424**	0.00	0	0
643.00	**8576**	1.00	8000	8000
644.00	**9800**	2.00	9188	17188
645.00		3.00	4900	22088

Top of Embankment Elevation:	645.00	ft
Emergency Spillway Elevation:	644.00	ft
Embankment Width:	**5**	ft
Bottom Elevation:	642.00	ft
Sediment Storage Elevation:	641.00	ft

BASIN NAME	BASIN 9	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	6.92	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	26	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	8,309	ft^2
SURFACE AREA PROVIDED	9,800	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	9,900	ft^3
BASIN VOLUME PROVIDED	17,188	ft^3
TOP OF EMBANKMENT ELEVATION	645.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	644.0	ft
EMERGENCY SPILLWAY WIDTH	25	ft
BOTTOM ELEVATION	642.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	641.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2	inch
ORIFICE DIAMETER	1.75	inch
DEWATERING TIME	3.42	days

BASIN NAME		PROJECT NAME
BASIN 10	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 10

Modified Rational

Highest Elevation =	666	feet
Inlet Elevation =	631	feet
Difference =	35	feet
Travel Length =	756	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc =Time of Concentration (min)

H =Height of the most remote point on the watershed above the outlet (ft)

L =Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	4.20	min
T_C =	5	min
Intensity 50 year =	8.21	in/hr
C =	0.45	
Disturbed Area =	8.59	acres
Additional Drainage Area =	0.84	acres
Total Drainage Area=	9.43	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **34.84** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 10	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		**PROJECT NUMBER**
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 10 TYPE OF BASIN: SKIMMER

Disturbed Area:	8.59	ac
Additional Drainage Area:	0.84	ac
Total Drainage Area:	9.43	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	8.21	in/hr
50-yr Discharge [Q10]:	**34.84**	cfs

Sizing of Basin

15462	Required Volume ft^3	(Disturbed Area x 1800 cf/ac)	
11323	Required Surface Area ft^2	**(Q50 x 325)**	
75.2	Suggested Width ft		
150.5	Suggested Length ft		
82	Width at Surface Area (ft)		
164	Length at Surface Area (ft)	L/W Ratio = 2.0	**Okay**
3	Side Slope Ratio Z:1		
2	Depth (ft)		
70	Target Bottom Width (ft)		
152	Target Bottom Length (ft)		
10640	Target Bottom Area ($ft^{2)}$		
24040	Target Volume (ft^3)	**Okay**	
13448	Target Surface Area (ft^2)	**Okay**	
23961	Provided Volume (ft^3)		
13522	Provide Surface Area (ft^2)		
35	Emergency Spillway Width (ft)		
0.5	Depth of Flow (ft)		
37.1	Spillway Capacity (cfs)	**Okay**	
2.5	Skimmer Size (in)		
0.208	Head on Skimmer (ft)		
2	Orifice Size (1/4 inch increments)		
3.67	Dewatering Time (days)		
	Suggest about 3 days		

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
629.00	**10467**	0.00	0	0
630.00	**11966**	1.00	11217	11217
631.00	**13522**	2.00	12744	23961
632.00		3.00	6761	30722

Top of Embankment Elevation:	632.00	ft
Emergency Spillway Elevation:	631.00	ft
Embankment Width:	**5**	ft
Bottom Elevation:	629.00	ft
Sediment Storage Elevation:	628.00	ft

BASIN NAME	BASIN 10	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	9.43	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	35	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	11,323	ft^2
SURFACE AREA PROVIDED	13,522	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	15,462	ft^3
BASIN VOLUME PROVIDED	23,961	ft^3
TOP OF EMBANKMENT ELEVATION	632.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	631.0	ft
EMERGENCY SPILLWAY WIDTH	35	ft
BOTTOM ELEVATION	629.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	628.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2.5	inch
ORIFICE DIAMETER	2	inch
DEWATERING TIME	3.67	days

BASIN NAME		PROJECT NAME
BASIN 11	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 11

Modified Rational

Highest Elevation =	639	feet
Inlet Elevation =	618	feet
Difference =	21	feet
Travel Length =	453	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc	=Time of Concentration (min)
H	=Height of the most remote point on the watershed above the outlet (ft)
L	=Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	2.83	min
T_C =	5	min
Intensity 50 year =	8.21	in/hr
C =	0.45	
Disturbed Area =	2.10	acres
Additional Drainage Area =	0.00	acres
Total Drainage Area=	2.10	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **7.76** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 11	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		**PROJECT NUMBER**
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 11 TYPE OF BASIN: SKIMMER

Disturbed Area:	2.10	ac
Additional Drainage Area:	0.00	ac
Total Drainage Area:	2.10	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	8.21	in/hr
50-yr Discharge [Q10]:	**7.76**	cfs

Sizing of Basin

3780	Required Volume ft^3	(Disturbed Area x 1800 cf/ac)
2521	Required Surface Area ft^2	**(Q50 x 325)**
35.5	Suggested Width ft	
71.0	Suggested Length ft	
42	Width at Surface Area (ft)	
84	Length at Surface Area (ft)	L/W Ratio = 2.0 **Okay**
3	Side Slope Ratio Z:1	
2	Depth (ft)	
30	Target Bottom Width (ft)	
72	Target Bottom Length (ft)	
2160	Target Bottom Area ($ft^{2)}$	
5640	Target Volume (ft^3)	**Okay**
3528	Target Surface Area (ft^2)	**Okay**
5652	Provided Volume (ft^3)	
3528	Provided Surface Area (ft^2)	
10	Emergency Spillway Width (ft)	
0.5	Depth of Flow (ft)	
10.6	Spillway Capacity (cfs)	**Okay**
1.5	Skimmer Size (in)	
0.125	Head on Skimmer (ft)	
1.25	Orifice Size (1/4 inch increments)	
2.96	Dewatering Time (days)	
	Suggest about 3 days	

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
616.00	**2160**	0.00	0	0
617.00	**2808**	1.00	2484	2484
618.00	**3528**	2.00	3168	5652
619.00		3.00	1764	7416

Top of Embankment Elevation:	619.00	ft
Emergency Spillway Elevation:	618.00	ft
Embankment Width:	**5**	ft
Bottom Elevation:	616.00	ft
Sediment Storage Elevation:	615.00	ft

BASIN NAME	BASIN 11	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	2.10	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	8	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	2,521	ft^2
SURFACE AREA PROVIDED	3,528	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	3,780	ft^3
BASIN VOLUME PROVIDED	5,652	ft^3
TOP OF EMBANKMENT ELEVATION	619.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	618.0	ft
EMERGENCY SPILLWAY WIDTH	10	ft
BOTTOM ELEVATION	616.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	615.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	1.5	inch
ORIFICE DIAMETER	1.25	inch
DEWATERING TIME	2.96	days

BASIN NAME		PROJECT NAME
BASIN 12	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 12

Modified Rational

Highest Elevation =	672	feet
Inlet Elevation =	639	feet
Difference =	33	feet
Travel Length =	716	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc =Time of Concentration (min)

H =Height of the most remote point on the watershed above the outlet (ft)

L =Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	4.03	min
T_C =	5	min
Intensity 50 year =	8.21	in/hr
C =	0.45	
Disturbed Area =	8.52	acres
Additional Drainage Area =	0.00	acres
Total Drainage Area=	8.52	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **31.48** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 12	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		**PROJECT NUMBER**
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 12 TYPE OF BASIN: SKIMMER

Disturbed Area:	8.52	ac
Additional Drainage Area:	0.00	ac
Total Drainage Area:	8.52	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	8.21	in/hr
50-yr Discharge [Q10]:	**31.48**	cfs

Sizing of Basin

15336	Required Volume ft^3	(Disturbed Area x 1800 cf/ac)	
10230	Required Surface Area ft^2	**(Q50 x 325)**	
71.5	Suggested Width ft		
143.0	Suggested Length ft		
70	Width at Surface Area (ft)		
175	Length at Surface Area (ft)	L/W Ratio = 2.5	**Okay**
3	Side Slope Ratio Z:1		
2	Depth (ft)		
58	Target Bottom Width (ft)		
163	Target Bottom Length (ft)		
9454	Target Bottom Area ($ft^{2)}$		
21656	Target Volume (ft^3)	**Okay**	
12250	Target Surface Area (ft^2)	**Okay**	
21668	Provided Volume (ft^3)		
12250	Provided Surface Area (ft^2)		
30	Emergency Spillway Width (ft)		
0.5	Depth of Flow (ft)		
31.8	Spillway Capacity (cfs)	**Okay**	
2.5	Skimmer Size (in)		
0.208	Head on Skimmer (ft)		
2	Orifice Size (1/4 inch increments)		
3.64	Dewatering Time (days)		
	Suggest about 3 days		

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
637.00	**9454**	0.00	0	0
638.00	**10816**	1.00	10135	10135
639.00	**12250**	2.00	11533	21668
640.00		3.00	6125	27793

Top of Embankment Elevation:	640.00	ft
Emergency Spillway Elevation:	639.00	ft
Embankment Width:	**5**	ft
Bottom Elevation:	637.00	ft
Sediment Storage Elevation:	636.00	ft

BASIN NAME	BASIN 12	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	8.52	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	31	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	10,230	ft^2
SURFACE AREA PROVIDED	12,250	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	15,336	ft^3
BASIN VOLUME PROVIDED	21,668	ft^3
TOP OF EMBANKMENT ELEVATION	640.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	639.0	ft
EMERGENCY SPILLWAY WIDTH	30	ft
BOTTOM ELEVATION	637.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	636.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2.5	inch
ORIFICE DIAMETER	2	inch
DEWATERING TIME	3.64	days

BASIN NAME		PROJECT NAME
BASIN 14	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 14

Modified Rational

Highest Elevation =	666	feet
Inlet Elevation =	631	feet
Difference =	35	feet
Travel Length =	1,579	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc =Time of Concentration (min)

H =Height of the most remote point on the watershed above the outlet (ft)

L =Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	9.83	min
T_C =	5	min
Intensity 50 year =	8.21	in/hr
C =	0.45	
Disturbed Area =	8.02	acres
Additional Drainage Area =	0.00	acres
Total Drainage Area=	8.02	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **29.63** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 14	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		**PROJECT NUMBER**
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 14 TYPE OF BASIN: SKIMMER

Disturbed Area:	8.02	ac
Additional Drainage Area:	0.00	ac
Total Drainage Area:	8.02	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	8.21	in/hr
50-yr Discharge [Q10]:	**29.63**	cfs

Sizing of Basin

14436	Required Volume ft^3	(Disturbed Area x 1800 cf/ac)
9630	Required Surface Area ft^2	**(Q50 x 325)**
69.4	Suggested Width ft	
138.8	Suggested Length ft	
70	Width at Surface Area (ft)	
140	Length at Surface Area (ft)	L/W Ratio = 2.0 **Okay**
3	Side Slope Ratio Z:1	
2	Depth (ft)	
58	Target Bottom Width (ft)	
128	Target Bottom Length (ft)	
7424	Target Bottom Area ($ft^{2)}$	
17176	Target Volume (ft^3)	**Okay**
9800	Target Surface Area (ft^2)	**Okay**
20096	Provided Volume (ft^3)	
11336	Provided Surface Area (ft^2)	
30	Emergency Spillway Width (ft)	
0.5	Depth of Flow (ft)	
31.8	Spillway Capacity (cfs)	**Okay**
2.5	Skimmer Size (in)	
0.208	Head on Skimmer (ft)	
2	Orifice Size (1/4 inch increments)	
3.43	Dewatering Time (days)	
	Suggest about 3 days	

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
629.00	**8798**	0.00	0	0
630.00	**10029**	1.00	9414	9414
631.00	**11336**	2.00	10683	20096
632.00		3.00	5668	25764

Top of Embankment Elevation:	632.00	ft
Emergency Spillway Elevation:	631.00	ft
Embankment Width:	**5**	ft
Bottom Elevation:	629.00	ft
Sediment Storage Elevation:	628.00	ft

BASIN NAME	BASIN 14	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	8.02	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	30	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	9,630	ft^2
SURFACE AREA PROVIDED	11,336	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	14,436	ft^3
BASIN VOLUME PROVIDED	20,096	ft^3
TOP OF EMBANKMENT ELEVATION	632.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	631.0	ft
EMERGENCY SPILLWAY WIDTH	30	ft
BOTTOM ELEVATION	629.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	628.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2.5	inch
ORIFICE DIAMETER	2	inch
DEWATERING TIME	3.43	days

BASIN NAME		PROJECT NAME
BASIN 15	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 15

Modified Rational

Highest Elevation =	666	feet
Inlet Elevation =	639	feet
Difference =	27	feet
Travel Length =	736	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc	=Time of Concentration (min)
H	=Height of the most remote point on the watershed above the outlet (ft)
L	=Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	4.50	min
T_C =	5	min
Intensity 50 year =	8.21	in/hr
C =	0.45	
Disturbed Area =	8.92	acres
Additional Drainage Area =	0.00	acres
Total Drainage Area=	8.92	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **32.95** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 15	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		**PROJECT NUMBER**
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 15 TYPE OF BASIN: SKIMMER

Disturbed Area:	8.92	ac
Additional Drainage Area:	0.00	ac
Total Drainage Area:	8.92	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	8.21	in/hr
50-yr Discharge [Q10]:	**32.95**	cfs

Sizing of Basin

16056	Required Volume ft^3	(Disturbed Area x 1800 cf/ac)	
10710	Required Surface Area ft^2	**(Q50 x 325)**	
73.2	Suggested Width ft		
146.4	Suggested Length ft		
72	Width at Surface Area (ft)		
154	Length at Surface Area (ft)	L/W Ratio = 2.1	**Okay**
3	Side Slope Ratio Z:1		
2	Depth (ft)		
60	Target Bottom Width (ft)		
142	Target Bottom Length (ft)		
8520	Target Bottom Area ($ft^{2)}$		
19560	Target Volume (ft^3)	**Okay**	
11088	Target Surface Area (ft^2)	**Okay**	

19572	Provided Volume (ft^3)
11088	Provided Surface Area (ft^2)

35	Emergency Spillway Width (ft)	
0.5	Depth of Flow (ft)	
37.1	Spillway Capacity (cfs)	**Okay**
2.5	Skimmer Size (in)	
0.208	Head on Skimmer (ft)	
2.25	Orifice Size (1/4 inch increments)	
3.01	Dewatering Time (days)	
	Suggest about 3 days	

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
637.00	**8520**	0.00	0	0
638.00	**9768**	1.00	9144	9144
639.00	**11088**	2.00	10428	19572
640.00		3.00	5544	25116

Top of Embankment Elevation:	640.00	ft
Emergency Spillway Elevation:	639.00	ft
Embankment Width:	**5**	ft
Bottom Elevation:	637.00	ft
Sediment Storage Elevation:	636.00	ft

BASIN NAME	BASIN 15	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	8.92	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	33	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	10,710	ft^2
SURFACE AREA PROVIDED	11,088	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	16,056	ft^3
BASIN VOLUME PROVIDED	19,572	ft^3
TOP OF EMBANKMENT ELEVATION	640.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	639.0	ft
EMERGENCY SPILLWAY WIDTH	35	ft
BOTTOM ELEVATION	637.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	636.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2.5	inch
ORIFICE DIAMETER	2.25	inch
DEWATERING TIME	3.01	days

BASIN NAME		PROJECT NAME
BASIN 16	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 16

Modified Rational

Highest Elevation =	666	feet
Inlet Elevation =	620	feet
Difference =	46	feet
Travel Length =	757	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc =Time of Concentration (min)

H =Height of the most remote point on the watershed above the outlet (ft)

L =Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	3.78	min
T_C =	5	min
Intensity 50 year =	8.21	in/hr
C =	0.45	
Disturbed Area =	5.92	acres
Additional Drainage Area =	0.00	acres
Total Drainage Area=	5.92	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **21.87** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 16	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		**PROJECT NUMBER**
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 16 TYPE OF BASIN: SKIMMER

Disturbed Area:	5.92	ac
Additional Drainage Area:	0.00	ac
Total Drainage Area:	5.92	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	8.21	in/hr
50-yr Discharge [Q10]:	**21.87**	cfs

Sizing of Basin

10656	Required Volume ft^3	(Disturbed Area x 1800 cf/ac)	
7108	Required Surface Area ft^2	**(Q50 x 325)**	
59.6	Suggested Width ft		
119.2	Suggested Length ft		
60	Width at Surface Area (ft)		
120	Length at Surface Area (ft)	L/W Ratio = 2.0	**Okay**
3	Side Slope Ratio Z:1		
2	Depth (ft)		
48	Target Bottom Width (ft)		
108	Target Bottom Length (ft)		
5184	Target Bottom Area ($ft^{2)}$		
12336	Target Volume (ft^3)	**Okay**	
7200	Target Surface Area (ft^2)	**Okay**	

12348	Provided Volume (ft^3)
7200	Provided Surface Area (ft^2)

25	Emergency Spillway Width (ft)	
0.5	Depth of Flow (ft)	
26.5	Spillway Capacity (cfs)	**Okay**
2	Skimmer Size (in)	
0.167	Head on Skimmer (ft)	
1.75	Orifice Size (1/4 inch increments)	
3.69	Dewatering Time (days)	
	Suggest about 3 days	

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
618.00	**5184**	0.00	0	0
619.00	**6156**	1.00	5670	5670
620.00	**7200**	2.00	6678	12348
621.00		3.00	3600	15948

Top of Embankment Elevation:	621.00	ft
Emergency Spillway Elevation:	620.00	ft
Embankment Width:	**5**	ft
Bottom Elevation:	618.00	ft
Sediment Storage Elevation:	617.00	ft

BASIN NAME	BASIN 16	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	5.92	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	22	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	7,108	ft^2
SURFACE AREA PROVIDED	7,200	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	10,656	ft^3
BASIN VOLUME PROVIDED	12,348	ft^3
TOP OF EMBANKMENT ELEVATION	621.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	620.0	ft
EMERGENCY SPILLWAY WIDTH	25	ft
BOTTOM ELEVATION	618.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	617.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2	inch
ORIFICE DIAMETER	1.75	inch
DEWATERING TIME	3.69	days

BASIN NAME		PROJECT NAME
BASIN 17	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 17

Modified Rational

Highest Elevation =	666	feet
Inlet Elevation =	612	feet
Difference =	54	feet
Travel Length =	1,550	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc =Time of Concentration (min)

H =Height of the most remote point on the watershed above the outlet (ft)

L =Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	8.14	min
T_C =	5	min
Intensity 50 year =	8.21	in/hr
C =	0.45	
Disturbed Area =	8.78	acres
Additional Drainage Area =	0.00	acres
Total Drainage Area=	8.78	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **32.44** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 17	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		**PROJECT NUMBER**
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 17 TYPE OF BASIN: SKIMMER

Disturbed Area:	8.78	ac
Additional Drainage Area:	0.00	ac
Total Drainage Area:	8.78	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	8.21	in/hr
50-yr Discharge [Q10]:	**32.44**	cfs

Sizing of Basin

15804	Required Volume ft^3	(Disturbed Area x 1800 cf/ac)	
10542	Required Surface Area ft^2	**(Q50 x 325)**	
72.6	Suggested Width ft		
145.2	Suggested Length ft		
62	Width at Surface Area (ft)		
180	Length at Surface Area (ft)	L/W Ratio = 2.9	**Okay**
3	Side Slope Ratio Z:1		
2	Depth (ft)		
50	Target Bottom Width (ft)		
168	Target Bottom Length (ft)		
8400	Target Bottom Area ($ft^{2)}$		
19512	Target Volume (ft^3)	**Okay**	
11160	Target Surface Area (ft^2)	**Okay**	
19524	Provided Volume (ft^3)		
11160	Provided Surface Area (ft^2)		
35	Emergency Spillway Width (ft)		
0.5	Depth of Flow (ft)		
37.1	Spillway Capacity (cfs)	**Okay**	
2.5	Skimmer Size (in)		
0.208	Head on Skimmer (ft)		
2	Orifice Size (1/4 inch increments)		
3.75	Dewatering Time (days)		
	Suggest about 3 days		

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
610.00	**8400**	0.00	0	0
611.00	**9744**	1.00	9072	9072
612.00	**11160**	2.00	10452	19524
613.00		3.00	5580	25104

Top of Embankment Elevation:	613.00	ft
Emergency Spillway Elevation:	612.00	ft
Embankment Width:	**5**	ft
Bottom Elevation:	610.00	ft
Sediment Storage Elevation:	609.00	ft

BASIN NAME	BASIN 17	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	8.78	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	32	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	10,542	ft^2
SURFACE AREA PROVIDED	11,160	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	15,804	ft^3
BASIN VOLUME PROVIDED	19,524	ft^3
TOP OF EMBANKMENT ELEVATION	613.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	612.0	ft
EMERGENCY SPILLWAY WIDTH	35	ft
BOTTOM ELEVATION	610.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	609.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2.5	inch
ORIFICE DIAMETER	2	inch
DEWATERING TIME	3.75	days

BASIN NAME		PROJECT NAME
BASIN 18	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 18

Modified Rational

Highest Elevation =	641	feet
Inlet Elevation =	599	feet
Difference =	42	feet
Travel Length =	760	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc =Time of Concentration (min)

H =Height of the most remote point on the watershed above the outlet (ft)

L =Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	3.94	min
T_C =	5	min
Intensity 50 year =	8.21	in/hr
C =	0.45	
Disturbed Area =	3.88	acres
Additional Drainage Area =	0.00	acres
Total Drainage Area=	3.88	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **14.33** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 18	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		**PROJECT NUMBER**
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 18 TYPE OF BASIN: SKIMMER

Disturbed Area:	3.88	ac
Additional Drainage Area:	0.00	ac
Total Drainage Area:	3.88	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	8.21	in/hr
50-yr Discharge [Q10]:	**14.33**	cfs

Sizing of Basin

6984	Required Volume ft^3	(Disturbed Area x 1800 cf/ac)	
4659	Required Surface Area ft^2	**(Q50 x 325)**	
48.3	Suggested Width ft		
96.5	Suggested Length ft		
50	Width at Surface Area (ft)		
100	Length at Surface Area (ft)	L/W Ratio = 2.0	**Okay**
3	Side Slope Ratio Z:1		
2	Depth (ft)		
38	Target Bottom Width (ft)		
88	Target Bottom Length (ft)		
3344	Target Bottom Area ($ft^{2)}$		
8296	Target Volume (ft^3)	**Okay**	
5000	Target Surface Area (ft^2)	**Okay**	
8308	Provided Volume (ft^3)		
5000	Provided Surface Area (ft^2)		
15	Emergency Spillway Width (ft)		
0.5	Depth of Flow (ft)		
15.9	Spillway Capacity (cfs)	**Okay**	
2	Skimmer Size (in)		
0.167	Head on Skimmer (ft)		
1.5	Orifice Size (1/4 inch increments)		
3.29	Dewatering Time (days)		
	Suggest about 3 days		

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
597.00	**3344**	0.00	0	0
598.00	**4136**	1.00	3740	3740
599.00	**5000**	2.00	4568	8308
600.00		3.00	2500	10808

Top of Embankment Elevation:	600.00	ft
Emergency Spillway Elevation:	599.00	ft
Embankment Width:	**5**	ft
Bottom Elevation:	597.00	ft
Sediment Storage Elevation:	596.00	ft

BASIN NAME	BASIN 18	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	3.88	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	14	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	4,659	ft^2
SURFACE AREA PROVIDED	5,000	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	6,984	ft^3
BASIN VOLUME PROVIDED	8,308	ft^3
TOP OF EMBANKMENT ELEVATION	600.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	599.0	ft
EMERGENCY SPILLWAY WIDTH	15	ft
BOTTOM ELEVATION	597.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	596.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2	inch
ORIFICE DIAMETER	1.5	inch
DEWATERING TIME	3.29	days

BASIN NAME		PROJECT NAME
BASIN 19	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 19

Modified Rational

Highest Elevation =	666	feet
Inlet Elevation =	621	feet
Difference =	45	feet
Travel Length =	716	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc =Time of Concentration (min)

H =Height of the most remote point on the watershed above the outlet (ft)

L =Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	3.58	min
T_C =	5	min
Intensity 50 year =	8.21	in/hr
C =	0.45	
Disturbed Area =	4.73	acres
Additional Drainage Area =	0.00	acres
Total Drainage Area=	4.73	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **17.47** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 19	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		**PROJECT NUMBER**
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 19 TYPE OF BASIN: SKIMMER

Disturbed Area:	4.73	ac
Additional Drainage Area:	0.00	ac
Total Drainage Area:	4.73	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	8.21	in/hr
50-yr Discharge [Q10]:	**17.47**	cfs

Sizing of Basin

8514	Required Volume ft^3	(Disturbed Area x 1800 cf/ac)
5679	Required Surface Area ft^2	**(Q50 x 325)**
53.3	Suggested Width ft	
106.6	Suggested Length ft	
65	Width at Surface Area (ft)	
130	Length at Surface Area (ft)	L/W Ratio = 2.0 **Okay**
3	Side Slope Ratio Z:1	
2	Depth (ft)	
53	Target Bottom Width (ft)	
118	Target Bottom Length (ft)	
6254	Target Bottom Area ($ft^{2)}$	
14656	Target Volume (ft^3)	**Okay**
8450	Target Surface Area (ft^2)	**Okay**
14713	Provided Volume (ft^3)	
8399	Provided Surface Area (ft^2)	
20	Emergency Spillway Width (ft)	
0.5	Depth of Flow (ft)	
21.2	Spillway Capacity (cfs)	**Okay**
2	Skimmer Size (in)	
0.167	Head on Skimmer (ft)	
1.75	Orifice Size (1/4 inch increments)	
2.95	Dewatering Time (days)	
	Suggest about 3 days	

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
619.00	**6342**	0.00	0	0
620.00	**7342**	1.00	6842	6842
621.00	**8399**	2.00	7871	14713
622.00		3.00	4200	18912

Top of Embankment Elevation:	622.00	ft
Emergency Spillway Elevation:	621.00	ft
Embankment Width:	**5**	ft
Bottom Elevation:	619.00	ft
Sediment Storage Elevation:	618.00	ft

BASIN NAME	BASIN 19	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	4.73	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	17	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	5,679	ft^2
SURFACE AREA PROVIDED	8,399	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	8,514	ft^3
BASIN VOLUME PROVIDED	14,713	ft^3
TOP OF EMBANKMENT ELEVATION	622.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	621.0	ft
EMERGENCY SPILLWAY WIDTH	20	ft
BOTTOM ELEVATION	619.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	618.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2	inch
ORIFICE DIAMETER	1.75	inch
DEWATERING TIME	2.95	days

BASIN NAME		PROJECT NAME
BASIN 20	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 20

Modified Rational

Highest Elevation =	634	feet
Inlet Elevation =	586	feet
Difference =	48	feet
Travel Length =	1,123	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc =Time of Concentration (min)

H =Height of the most remote point on the watershed above the outlet (ft)

L =Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	5.87	min
T_C =	5	min
Intensity 50 year =	8.21	in/hr
C =	0.45	
Disturbed Area =	3.96	acres
Additional Drainage Area =	0.00	acres
Total Drainage Area=	3.96	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **14.63** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 20	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		**PROJECT NUMBER**
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 20 TYPE OF BASIN: SKIMMER

Disturbed Area:	3.96	ac
Additional Drainage Area:	0.00	ac
Total Drainage Area:	3.96	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	8.21	in/hr
50-yr Discharge [Q10]:	**14.63**	cfs

Sizing of Basin

7128	Required Volume ft^3	(Disturbed Area x 1800 cf/ac)
4755	Required Surface Area ft^2	**(Q50 x 325)**
48.8	Suggested Width ft	
97.5	Suggested Length ft	
52	Width at Surface Area (ft)	
125	Length at Surface Area (ft)	L/W Ratio = 2.4 **Okay**
3	Side Slope Ratio Z:1	
2	Depth (ft)	
40	Target Bottom Width (ft)	
113	Target Bottom Length (ft)	
4520	Target Bottom Area ($ft^{2)}$	
10972	Target Volume (ft^3)	**Okay**
6500	Target Surface Area (ft^2)	**Okay**
8487	Provided Volume (ft^3)	
5074	Provided Surface Area (ft^2)	
15	Emergency Spillway Width (ft)	
0.5	Depth of Flow (ft)	
15.9	Spillway Capacity (cfs)	**Okay**
2	Skimmer Size (in)	
0.167	Head on Skimmer (ft)	
1.5	Orifice Size (1/4 inch increments)	
3.36	Dewatering Time (days)	
	Suggest about 3 days	

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
584.00	**3441**	0.00	0	0
585.00	**4229**	1.00	3835	3835
586.00	**5074**	2.00	4652	8487
587.00		3.00	2537	11024

Top of Embankment Elevation:	587.00	ft
Emergency Spillway Elevation:	586.00	ft
Embankment Width:	**5**	ft
Bottom Elevation:	584.00	ft
Sediment Storage Elevation:	583.00	ft

BASIN NAME	BASIN 20	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	3.96	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	15	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	4,755	ft^2
SURFACE AREA PROVIDED	5,074	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	7,128	ft^3
BASIN VOLUME PROVIDED	8,487	ft^3
TOP OF EMBANKMENT ELEVATION	587.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	586.0	ft
EMERGENCY SPILLWAY WIDTH	15	ft
BOTTOM ELEVATION	584.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	583.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2	inch
ORIFICE DIAMETER	1.5	inch
DEWATERING TIME	3.36	days

BASIN NAME		PROJECT NAME
BASIN 21	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 21

Modified Rational

Highest Elevation =	665	feet
Inlet Elevation =	603	feet
Difference =	62	feet
Travel Length =	1,145	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc =Time of Concentration (min)

H =Height of the most remote point on the watershed above the outlet (ft)

L =Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	5.44	min
T_C =	5	min
Intensity 50 year =	8.21	in/hr
C =	0.45	
Disturbed Area =	6.63	acres
Additional Drainage Area =	0.00	acres
Total Drainage Area=	6.63	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **24.49** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 21	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		**PROJECT NUMBER**
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 21 TYPE OF BASIN: SKIMMER

Disturbed Area:	6.63	ac
Additional Drainage Area:	0.00	ac
Total Drainage Area:	6.63	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	8.21	in/hr
50-yr Discharge [Q10]:	**24.49**	cfs

Sizing of Basin

11934	Required Volume ft^3	(Disturbed Area x 1800 cf/ac)	
7961	Required Surface Area ft^2	**(Q50 x 325)**	
63.1	Suggested Width ft		
126.2	Suggested Length ft		
64	Width at Surface Area (ft)		
128	Length at Surface Area (ft)	L/W Ratio = 2.0	**Okay**
3	Side Slope Ratio Z:1		
2	Depth (ft)		
52	Target Bottom Width (ft)		
116	Target Bottom Length (ft)		
6032	Target Bottom Area ($ft^{2)}$		
14176	Target Volume (ft^3)	**Okay**	
8192	Target Surface Area (ft^2)	**Okay**	
20010	Provided Volume (ft^3)		
11177	Provided Surface Area (ft^2)		
25	Emergency Spillway Width (ft)		
0.5	Depth of Flow (ft)		
26.5	Spillway Capacity (cfs)	**Okay**	
2	Skimmer Size (in)		
0.167	Head on Skimmer (ft)		
1.75	Orifice Size (1/4 inch increments)		
4.13	Dewatering Time (days)		
	Suggest about 3 days		

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
601.00	**8861**	0.00	0	0
602.00	**9991**	1.00	9426	9426
603.00	**11177**	2.00	10584	20010
604.00		3.00	5589	25599

Top of Embankment Elevation:	604.00	ft
Emergency Spillway Elevation:	603.00	ft
Embankment Width:	**5**	ft
Bottom Elevation:	601.00	ft
Sediment Storage Elevation:	600.00	ft

BASIN NAME	BASIN 21	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	6.63	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	24	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	7,961	ft^2
SURFACE AREA PROVIDED	11,177	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	11,934	ft^3
BASIN VOLUME PROVIDED	20,010	ft^3
TOP OF EMBANKMENT ELEVATION	604.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	603.0	ft
EMERGENCY SPILLWAY WIDTH	25	ft
BOTTOM ELEVATION	601.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	600.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2	inch
ORIFICE DIAMETER	1.75	inch
DEWATERING TIME	4.13	days

BASIN NAME		PROJECT NAME
BASIN 22	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 22

Modified Rational

Highest Elevation =	623	feet
Inlet Elevation =	602	feet
Difference =	21	feet
Travel Length =	400	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc =Time of Concentration (min)

H =Height of the most remote point on the watershed above the outlet (ft)

L =Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	2.45	min
T_C =	5	min
Intensity 50 year =	8.21	in/hr
C =	0.45	
Disturbed Area =	1.90	acres
Additional Drainage Area =	0.00	acres
Total Drainage Area=	1.90	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **7.02** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 22	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		**PROJECT NUMBER**
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 22 TYPE OF BASIN: SKIMMER

Disturbed Area:	1.90	ac
Additional Drainage Area:	0.00	ac
Total Drainage Area:	1.90	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	8.21	in/hr
50-yr Discharge [Q10]:	**7.02**	cfs

Sizing of Basin

3420	Required Volume ft^3	(Disturbed Area x 1800 cf/ac)
2281	Required Surface Area ft^2	**(Q50 x 325)**
33.8	Suggested Width ft	
67.5	Suggested Length ft	
40	Width at Surface Area (ft)	
80	Length at Surface Area (ft)	L/W Ratio = 2.0 **Okay**
3	Side Slope Ratio Z:1	
2	Depth (ft)	
28	Target Bottom Width (ft)	
68	Target Bottom Length (ft)	
1904	Target Bottom Area ($ft^{2)}$	
5056	Target Volume (ft^3)	**Okay**
3200	Target Surface Area (ft^2)	**Okay**
5626	Provided Volume (ft^3)	
3258	Provided Surface Area (ft^2)	
10	Emergency Spillway Width (ft)	
0.5	Depth of Flow (ft)	
10.6	Spillway Capacity (cfs)	**Okay**
1.5	Skimmer Size (in)	
0.125	Head on Skimmer (ft)	
1	Orifice Size (1/4 inch increments)	
4.19	Dewatering Time (days)	
	Suggest about 3 days	

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
600.00	**2261**	0.00	0	0
601.00	**2866**	1.00	2564	2564
602.00	**3258**	2.00	3062	5626
603.00		3.00	1629	7255

Top of Embankment Elevation:	603.00	ft
Emergency Spillway Elevation:	602.00	ft
Embankment Width:	**5**	ft
Bottom Elevation:	600.00	ft
Sediment Storage Elevation:	599.00	ft

BASIN NAME	BASIN 22	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	1.90	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	7	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	2,281	ft^2
SURFACE AREA PROVIDED	3,258	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	3,420	ft^3
BASIN VOLUME PROVIDED	5,626	ft^3
TOP OF EMBANKMENT ELEVATION	603.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	602.0	ft
EMERGENCY SPILLWAY WIDTH	10	ft
BOTTOM ELEVATION	600.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	599.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	1.5	inch
ORIFICE DIAMETER	1	inch
DEWATERING TIME	4.19	days

BASIN NAME		PROJECT NAME
BASIN 23	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 23

Modified Rational

Highest Elevation =	616	feet
Inlet Elevation =	581	feet
Difference =	35	feet
Travel Length =	765	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc =Time of Concentration (min)

H =Height of the most remote point on the watershed above the outlet (ft)

L =Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	4.26	min
T_C =	5	min
Intensity 50 year =	8.21	in/hr
C =	0.45	
Disturbed Area =	3.95	acres
Additional Drainage Area =	0.00	acres
Total Drainage Area=	3.95	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **14.59** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 23	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		**PROJECT NUMBER**
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 23 TYPE OF BASIN: SKIMMER

Disturbed Area:	3.95	ac
Additional Drainage Area:	0.00	ac
Total Drainage Area:	3.95	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	8.21	in/hr
50-yr Discharge [Q10]:	**14.59**	cfs

Sizing of Basin

7110 Required Volume ft^3 (Disturbed Area x 1800 cf/ac)
4743 Required Surface Area ft^2 **(Q50 x 325)**
48.7 Suggested Width ft
97.4 Suggested Length ft

51 Width at Surface Area (ft)
110 Length at Surface Area (ft) L/W Ratio = 2.2 **Okay**
3 Side Slope Ratio Z:1
2 Depth (ft)
39 Target Bottom Width (ft)
98 Target Bottom Length (ft)
3822 Target Bottom Area ($ft^{2)}$
9384 Target Volume (ft^3) **Okay**
5610 Target Surface Area (ft^2) **Okay**

7757 Provided Volume (ft3)
4651 Provided Surface Area (ft2)

15 Emergency Spillway Width (ft)
0.5 Depth of Flow (ft)
15.9 Spillway Capacity (cfs) **Okay**

2 Skimmer Size (in)
0.167 Head on Skimmer (ft)
1.5 Orifice Size (1/4 inch increments)
3.35 Dewatering Time (days)
Suggest about 3 days

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
579.00	**3135**	0.00	0	0
580.00	**3864**	1.00	3500	3500
581.00	**4651**	2.00	4258	7757
582.00		3.00	2326	10083

Top of Embankment Elevation:	582.00	ft
Emergency Spillway Elevation:	581.00	ft
Embankment Width:	**5**	ft
Bottom Elevation:	579.00	ft
Sediment Storage Elevation:	578.00	ft

BASIN NAME	BASIN 23	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	3.95	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	15	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	4,743	ft^2
SURFACE AREA PROVIDED	4,651	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	7,110	ft^3
BASIN VOLUME PROVIDED	7,757	ft^3
TOP OF EMBANKMENT ELEVATION	582.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	581.0	ft
EMERGENCY SPILLWAY WIDTH	15	ft
BOTTOM ELEVATION	579.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	578.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2	inch
ORIFICE DIAMETER	1.5	inch
DEWATERING TIME	3.35	days

BASIN NAME		PROJECT NAME
BASIN 24	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 24

Modified Rational

Highest Elevation =	623	feet
Inlet Elevation =	599	feet
Difference =	24	feet
Travel Length =	687	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc =Time of Concentration (min)

H =Height of the most remote point on the watershed above the outlet (ft)

L =Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	4.35	min
T_C =	5	min
Intensity 50 year =	8.21	in/hr
C =	0.45	
Disturbed Area =	4.18	acres
Additional Drainage Area =	0.00	acres
Total Drainage Area=	4.18	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **15.44** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 24	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		**PROJECT NUMBER**
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 24 TYPE OF BASIN: SKIMMER

Disturbed Area:	4.18	ac
Additional Drainage Area:	0.00	ac
Total Drainage Area:	4.18	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	8.21	in/hr
50-yr Discharge [Q10]:	**15.44**	cfs

Sizing of Basin

7524	Required Volume ft^3	(Disturbed Area x 1800 cf/ac)
5019	Required Surface Area ft^2	**(Q50 x 325)**
50.1	Suggested Width ft	
100.2	Suggested Length ft	
53	Width at Surface Area (ft)	
106	Length at Surface Area (ft)	L/W Ratio = 2.0 **Okay**
3	Side Slope Ratio Z:1	
2	Depth (ft)	
41	Target Bottom Width (ft)	
94	Target Bottom Length (ft)	
3854	Target Bottom Area ($ft^{2)}$	
9424	Target Volume (ft^3)	**Okay**
5618	Target Surface Area (ft^2)	**Okay**
9436	Provided Volume (ft^3)	
5618	Provided Surface Area (ft^2)	
15	Emergency Spillway Width (ft)	
0.5	Depth of Flow (ft)	
15.9	Spillway Capacity (cfs)	**Okay**
2	Skimmer Size (in)	
0.167	Head on Skimmer (ft)	
1.5	Orifice Size (1/4 inch increments)	
3.54	Dewatering Time (days)	
	Suggest about 3 days	

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
597.00	**3854**	0.00	0	0
598.00	**4700**	1.00	4277	4277
599.00	**5618**	2.00	5159	9436
600.00		3.00	2809	12245

Top of Embankment Elevation:	600.00	ft
Emergency Spillway Elevation:	599.00	ft
Embankment Width:	**5**	ft
Bottom Elevation:	597.00	ft
Sediment Storage Elevation:	596.00	ft

BASIN NAME	BASIN 24	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	4.18	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	15	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	5,019	ft^2
SURFACE AREA PROVIDED	5,618	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	7,524	ft^3
BASIN VOLUME PROVIDED	9,436	ft^3
TOP OF EMBANKMENT ELEVATION	600.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	599.0	ft
EMERGENCY SPILLWAY WIDTH	15	ft
BOTTOM ELEVATION	597.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	596.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2	inch
ORIFICE DIAMETER	1.5	inch
DEWATERING TIME	3.54	days

BASIN NAME		PROJECT NAME
BASIN 25	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 25

Modified Rational

Highest Elevation =	605	feet
Inlet Elevation =	564	feet
Difference =	41	feet
Travel Length =	366	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc	=Time of Concentration (min)
H	=Height of the most remote point on the watershed above the outlet (ft)
L	=Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	1.71	min
T_C =	5	min
Intensity 50 year =	8.21	in/hr
C =	0.45	
Disturbed Area =	1.70	acres
Additional Drainage Area =	0.00	acres
Total Drainage Area=	1.70	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **6.28** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 25	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		**PROJECT NUMBER**
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 25 TYPE OF BASIN: SKIMMER

Disturbed Area:	1.70	ac
Additional Drainage Area:	0.00	ac
Total Drainage Area:	1.70	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	8.21	in/hr
50-yr Discharge [Q10]:	**6.28**	cfs

Sizing of Basin

3060	Required Volume ft^3	(Disturbed Area x 1800 cf/ac)
2041	Required Surface Area ft^2	**(Q50 x 325)**
31.9	Suggested Width ft	
63.9	Suggested Length ft	
40	Width at Surface Area (ft)	
80	Length at Surface Area (ft)	L/W Ratio = 2.0 **Okay**
3	Side Slope Ratio Z:1	
2	Depth (ft)	
28	Target Bottom Width (ft)	
68	Target Bottom Length (ft)	
1904	Target Bottom Area ($ft^{2)}$	
5056	Target Volume (ft^3)	**Okay**
3200	Target Surface Area (ft^2)	**Okay**
5068	Provided Volume (ft^3)	
3200	Provided Surface Area (ft^2)	
10	Emergency Spillway Width (ft)	
0.5	Depth of Flow (ft)	
10.6	Spillway Capacity (cfs)	**Okay**
2	Skimmer Size (in)	
0.167	Head on Skimmer (ft)	
1	Orifice Size (1/4 inch increments)	
3.24	Dewatering Time (days)	
	Suggest about 3 days	

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
562.00	**1904**	0.00	0	0
563.00	**2516**	1.00	2210	2210
564.00	**3200**	2.00	2858	5068
565.00		3.00	1600	6668

Top of Embankment Elevation:	565.00	ft
Emergency Spillway Elevation:	564.00	ft
Embankment Width:	**5**	ft
Bottom Elevation:	562.00	ft
Sediment Storage Elevation:	561.00	ft

BASIN NAME	BASIN 25	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	1.70	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	6	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	2,041	ft^2
SURFACE AREA PROVIDED	3,200	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	3,060	ft^3
BASIN VOLUME PROVIDED	5,068	ft^3
TOP OF EMBANKMENT ELEVATION	565.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	564.0	ft
EMERGENCY SPILLWAY WIDTH	10	ft
BOTTOM ELEVATION	562.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	561.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2	inch
ORIFICE DIAMETER	1	inch
DEWATERING TIME	3.24	days

BASIN NAME		PROJECT NAME
BASIN 26	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 26

Modified Rational

Highest Elevation =	618	feet
Inlet Elevation =	576	feet
Difference =	42	feet
Travel Length =	626	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc =Time of Concentration (min)

H =Height of the most remote point on the watershed above the outlet (ft)

L =Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	3.15	min
T_C =	5	min
Intensity 50 year =	8.21	in/hr
C =	0.45	
Disturbed Area =	3.51	acres
Additional Drainage Area =	0.00	acres
Total Drainage Area=	3.51	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **12.97** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 26	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		**PROJECT NUMBER**
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 26 TYPE OF BASIN: SKIMMER

Disturbed Area:	3.51	ac
Additional Drainage Area:	0.00	ac
Total Drainage Area:	3.51	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	8.21	in/hr
50-yr Discharge [Q10]:	**12.97**	cfs

Sizing of Basin

6318	Required Volume ft^3	(Disturbed Area x 1800 cf/ac)
4215	Required Surface Area ft^2	**(Q50 x 325)**
45.9	Suggested Width ft	
91.8	Suggested Length ft	
50	Width at Surface Area (ft)	
100	Length at Surface Area (ft)	L/W Ratio = 2.0 **Okay**
3	Side Slope Ratio Z:1	
2	Depth (ft)	
38	Target Bottom Width (ft)	
88	Target Bottom Length (ft)	
3344	Target Bottom Area ($ft^{2)}$	
8296	Target Volume (ft^3)	**Okay**
5000	Target Surface Area (ft^2)	**Okay**
7469	Provided Volume (ft^3)	
4486	Provided Surface Area (ft^2)	
15	Emergency Spillway Width (ft)	
0.5	Depth of Flow (ft)	
15.9	Spillway Capacity (cfs)	**Okay**
2	Skimmer Size (in)	
0.167	Head on Skimmer (ft)	
1.5	Orifice Size (1/4 inch increments)	
2.97	Dewatering Time (days)	
	Suggest about 3 days	

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
574.00	**3011**	0.00	0	0
575.00	**3720**	1.00	3366	3366
576.00	**4486**	2.00	4103	7469
577.00		3.00	2243	9712

Top of Embankment Elevation:	577.00	ft
Emergency Spillway Elevation:	576.00	ft
Embankment Width:	**5**	ft
Bottom Elevation:	574.00	ft
Sediment Storage Elevation:	573.00	ft

BASIN NAME	BASIN 26	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	3.51	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	13	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	4,215	ft^2
SURFACE AREA PROVIDED	4,486	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	6,318	ft^3
BASIN VOLUME PROVIDED	7,469	ft^3
TOP OF EMBANKMENT ELEVATION	577.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	576.0	ft
EMERGENCY SPILLWAY WIDTH	15	ft
BOTTOM ELEVATION	574.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	573.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2	inch
ORIFICE DIAMETER	1.5	inch
DEWATERING TIME	2.97	days

BASIN NAME		PROJECT NAME
BASIN 27	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 27

Modified Rational

Highest Elevation =	618	feet
Inlet Elevation =	569	feet
Difference =	49	feet
Travel Length =	953	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc	=Time of Concentration (min)
H	=Height of the most remote point on the watershed above the outlet (ft)
L	=Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	4.82	min
T_C =	5	min
Intensity 50 year =	8.21	in/hr
C =	0.45	
Disturbed Area =	3.90	acres
Additional Drainage Area =	0.00	acres
Total Drainage Area=	3.90	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **14.41** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 27	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		**PROJECT NUMBER**
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 27 TYPE OF BASIN: SKIMMER

Disturbed Area:	3.90	ac
Additional Drainage Area:	0.00	ac
Total Drainage Area:	3.90	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	8.21	in/hr
50-yr Discharge [Q10]:	**14.41**	cfs

Sizing of Basin

7020	Required Volume ft^3	(Disturbed Area x 1800 cf/ac)
4683	Required Surface Area ft^2	**(Q50 x 325)**
48.4	Suggested Width ft	
96.8	Suggested Length ft	
56	Width at Surface Area (ft)	
113	Length at Surface Area (ft)	L/W Ratio = 2.0 **Okay**
3	Side Slope Ratio Z:1	
2	Depth (ft)	
44	Target Bottom Width (ft)	
101	Target Bottom Length (ft)	
4444	Target Bottom Area ($ft^{2)}$	
10724	Target Volume (ft^3)	**Okay**
6328	Target Surface Area (ft^2)	**Okay**
9181	Provided Volume (ft^3)	
5411	Provided Surface Area (ft^2)	
20	Emergency Spillway Width (ft)	
0.5	Depth of Flow (ft)	
21.2	Spillway Capacity (cfs)	**Okay**
2	Skimmer Size (in)	
0.167	Head on Skimmer (ft)	
1.5	Orifice Size (1/4 inch increments)	
3.31	Dewatering Time (days)	
	Suggest about 3 days	

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
567.00	**3798**	0.00	0	0
568.00	**4576**	1.00	4187	4187
569.00	**5411**	2.00	4994	9181
570.00		3.00	2706	11886

Top of Embankment Elevation:	570.00	ft
Emergency Spillway Elevation:	569.00	ft
Embankment Width:	**5**	ft
Bottom Elevation:	567.00	ft
Sediment Storage Elevation:	566.00	ft

BASIN NAME	BASIN 27	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	3.90	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	14	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	4,683	ft^2
SURFACE AREA PROVIDED	5,411	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	7,020	ft^3
BASIN VOLUME PROVIDED	9,181	ft^3
TOP OF EMBANKMENT ELEVATION	570.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	569.0	ft
EMERGENCY SPILLWAY WIDTH	20	ft
BOTTOM ELEVATION	567.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	566.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2	inch
ORIFICE DIAMETER	1.5	inch
DEWATERING TIME	3.31	days

BASIN NAME		PROJECT NAME
BASIN 28	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 28

Modified Rational

Highest Elevation =	619	feet
Inlet Elevation =	581	feet
Difference =	38	feet
Travel Length =	640	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc =Time of Concentration (min)

H =Height of the most remote point on the watershed above the outlet (ft)

L =Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	3.36	min
T_C =	5	min
Intensity 50 year =	8.21	in/hr
C =	0.45	
Disturbed Area =	6.58	acres
Additional Drainage Area =	0.00	acres
Total Drainage Area=	6.58	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **24.31** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 28	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		**PROJECT NUMBER**
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 28 TYPE OF BASIN: SKIMMER

Disturbed Area:	6.58	ac
Additional Drainage Area:	0.00	ac
Total Drainage Area:	6.58	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	8.21	in/hr
50-yr Discharge [Q10]:	**24.31**	cfs

Sizing of Basin

11844	Required Volume ft^3	(Disturbed Area x 1800 cf/ac)	
7901	Required Surface Area ft^2	**(Q50 x 325)**	
62.9	Suggested Width ft		
125.7	Suggested Length ft		
67	Width at Surface Area (ft)		
134	Length at Surface Area (ft)	L/W Ratio = 2.0	**Okay**
3	Side Slope Ratio Z:1		
2	Depth (ft)		
55	Target Bottom Width (ft)		
122	Target Bottom Length (ft)		
6710	Target Bottom Area ($ft^{2)}$		
15640	Target Volume (ft^3)	**Okay**	
8978	Target Surface Area (ft^2)	**Okay**	

15652	Provided Volume (ft^3)
8978	Provided Surface Area (ft^2)

30	Emergency Spillway Width (ft)	
0.5	Depth of Flow (ft)	
31.8	Spillway Capacity (cfs)	**Okay**
2	Skimmer Size (in)	
0.167	Head on Skimmer (ft)	
1.75	Orifice Size (1/4 inch increments)	
4.10	Dewatering Time (days)	
	Suggest about 3 days	

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
579.00	**6710**	0.00	0	0
580.00	**7808**	1.00	7259	7259
581.00	**8978**	2.00	8393	15652
582.00		3.00	4489	20141

Top of Embankment Elevation:	582.00	ft
Emergency Spillway Elevation:	581.00	ft
Embankment Width:	**5**	ft
Bottom Elevation:	579.00	ft
Sediment Storage Elevation:	578.00	ft

BASIN NAME	BASIN 28	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	6.58	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	24	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	7,901	ft^2
SURFACE AREA PROVIDED	8,978	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	11,844	ft^3
BASIN VOLUME PROVIDED	15,652	ft^3
TOP OF EMBANKMENT ELEVATION	582.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	581.0	ft
EMERGENCY SPILLWAY WIDTH	30	ft
BOTTOM ELEVATION	579.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	578.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2	inch
ORIFICE DIAMETER	1.75	inch
DEWATERING TIME	4.10	days

BASIN NAME		PROJECT NAME
BASIN 29	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 29

Modified Rational

Highest Elevation =	623	feet
Inlet Elevation =	584	feet
Difference =	39	feet
Travel Length =	824	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc =Time of Concentration (min)

H =Height of the most remote point on the watershed above the outlet (ft)

L =Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	4.45	min
T_C =	5	min
Intensity 50 year =	8.21	in/hr
C =	0.45	
Disturbed Area =	9.20	acres
Additional Drainage Area =	0.00	acres
Total Drainage Area=	9.20	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **33.99** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 29	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		**PROJECT NUMBER**
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 29 TYPE OF BASIN: SKIMMER

Disturbed Area:	9.20	ac
Additional Drainage Area:	0.00	ac
Total Drainage Area:	9.20	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	8.21	in/hr
50-yr Discharge [Q10]:	**33.99**	cfs

Sizing of Basin

16560	Required Volume ft^3	(Disturbed Area x 1800 cf/ac)
11047	Required Surface Area ft^2	**(Q50 x 325)**
74.3	Suggested Width ft	
148.6	Suggested Length ft	
75	Width at Surface Area (ft)	
150	Length at Surface Area (ft)	L/W Ratio = 2.0 **Okay**
3	Side Slope Ratio Z:1	
2	Depth (ft)	
63	Target Bottom Width (ft)	
138	Target Bottom Length (ft)	
8694	Target Bottom Area ($ft^{2)}$	
19896	Target Volume (ft^3)	**Okay**
11250	Target Surface Area (ft^2)	**Okay**
22704	Provided Volume (ft^3)	
12627	Provided Surface Area (ft^2)	
35	Emergency Spillway Width (ft)	
0.5	Depth of Flow (ft)	
37.1	Spillway Capacity (cfs)	**Okay**
2.5	Skimmer Size (in)	
0.208	Head on Skimmer (ft)	
2.25	Orifice Size (1/4 inch increments)	
3.10	Dewatering Time (days)	
	Suggest about 3 days	

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
582.00	**10105**	0.00	0	0
583.00	**11338**	1.00	10722	10722
584.00	**12627**	2.00	11983	22704
585.00		3.00	6314	29018

Top of Embankment Elevation:	585.00	ft
Emergency Spillway Elevation:	584.00	ft
Embankment Width:	**5**	ft
Bottom Elevation:	582.00	ft
Sediment Storage Elevation:	581.00	ft

BASIN NAME	BASIN 29	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	9.20	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	34	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	11,047	ft^2
SURFACE AREA PROVIDED	12,627	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	16,560	ft^3
BASIN VOLUME PROVIDED	22,704	ft^3
TOP OF EMBANKMENT ELEVATION	585.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	584.0	ft
EMERGENCY SPILLWAY WIDTH	35	ft
BOTTOM ELEVATION	582.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	581.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2.5	inch
ORIFICE DIAMETER	2.25	inch
DEWATERING TIME	3.10	days

BASIN NAME		PROJECT NAME
BASIN 30	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 30

Modified Rational

Highest Elevation =	661	feet
Inlet Elevation =	607	feet
Difference =	54	feet
Travel Length =	1,297	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc =Time of Concentration (min)

H =Height of the most remote point on the watershed above the outlet (ft)

L =Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	6.63	min
T_C =	5	min
Intensity 50 year =	8.21	in/hr
C =	0.45	
Disturbed Area =	9.15	acres
Additional Drainage Area =	0.00	acres
Total Drainage Area=	9.15	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **33.80** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 30	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		**PROJECT NUMBER**
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 30 TYPE OF BASIN: SKIMMER

Disturbed Area:	9.15	ac
Additional Drainage Area:	0.00	ac
Total Drainage Area:	9.15	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	8.21	in/hr
50-yr Discharge [Q10]:	**33.80**	cfs

Sizing of Basin

16470	Required Volume ft^3	(Disturbed Area x 1800 cf/ac)
10987	Required Surface Area ft^2	**(Q50 x 325)**
74.1	Suggested Width ft	
148.2	Suggested Length ft	
70	Width at Surface Area (ft)	
160	Length at Surface Area (ft)	L/W Ratio = 2.3 **Okay**
3	Side Slope Ratio Z:1	
2	Depth (ft)	
58	Target Bottom Width (ft)	
148	Target Bottom Length (ft)	
8584	Target Bottom Area ($ft^{2)}$	
19736	Target Volume (ft^3)	**Okay**
11200	Target Surface Area (ft^2)	**Okay**
20289	Provided Volume (ft^3)	
11470	Provided Surface Area (ft^2)	
35	Emergency Spillway Width (ft)	
0.5	Depth of Flow (ft)	
37.1	Spillway Capacity (cfs)	**Okay**
2.5	Skimmer Size (in)	
0.208	Head on Skimmer (ft)	
2	Orifice Size (1/4 inch increments)	
3.91	Dewatering Time (days)	
	Suggest about 3 days	

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
605.00	**8847**	0.00	0	0
606.00	**10130**	1.00	9489	9489
607.00	**11470**	2.00	10800	20289
608.00		3.00	5735	26024

Top of Embankment Elevation:	608.00	ft
Emergency Spillway Elevation:	607.00	ft
Embankment Width:	**5**	ft
Bottom Elevation:	605.00	ft
Sediment Storage Elevation:	604.00	ft

BASIN NAME	BASIN 30	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	9.15	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	34	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	10,987	ft^2
SURFACE AREA PROVIDED	11,470	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	16,470	ft^3
BASIN VOLUME PROVIDED	20,289	ft^3
TOP OF EMBANKMENT ELEVATION	608.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	607.0	ft
EMERGENCY SPILLWAY WIDTH	35	ft
BOTTOM ELEVATION	605.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	604.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2.5	inch
ORIFICE DIAMETER	2	inch
DEWATERING TIME	3.91	days

BASIN NAME		PROJECT NAME
BASIN 31	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 31

Modified Rational

Highest Elevation =	669	feet
Inlet Elevation =	601	feet
Difference =	68	feet
Travel Length =	1,385	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc =Time of Concentration (min)

H =Height of the most remote point on the watershed above the outlet (ft)

L =Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	6.54	min
T_C =	5	min
Intensity 50 year =	8.21	in/hr
C =	0.45	
Disturbed Area =	11.66	acres
Additional Drainage Area =	0.00	acres
Total Drainage Area=	11.66	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **43.08** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 31	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 31 TYPE OF BASIN: RISER

Disturbed Area:	11.66	ac
Additional Drainage Area:	0.00	ac
Total Drainage Area:	11.66	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	8.21	in/hr
50-yr Discharge [Q10]:	**43.08**	cfs

Sizing of Basin

20988	Required Volume ft^3	(Disturbed Area x 1800 cf/ac)	
18739	Required Surface Area ft^2	**(Q50 x 435)**	
96.8	Suggested Width ft		
193.6	Suggested Length ft		
98	Width at Surface Area (ft)		
196	Length at Surface Area (ft)	L/W Ratio = 2.0	**Okay**
3	Side Slope Ratio Z:1		
2	Depth (ft)		
86	Target Bottom Width (ft)		
184	Target Bottom Length (ft)		
15824	Target Bottom Area (ft$^{2)}$		
34984	Target Volume (ft^3)	**Okay**	
19208	Target Surface Area (ft^2)	**Okay**	
34996	Provided Volume (ft^3)		
19208	Provided Surface Area (ft^2)		
45	Emergency Spillway Width (ft)		
0.5	Depth of Flow (ft)		
47.7	Spillway Capacity (cfs)	**Okay**	
2.5	Skimmer Size (in)		
0.208	Head on Skimmer (ft)		
2.25	Orifice Size (1/4 inch increments)		
3.94	Dewatering Time (days)		
	Suggest about 3 days		

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
599.00	**15824**	0.00	0	0
600.00	**17480**	1.00	16652	16652
601.00	**19208**	2.00	18344	34996
602.00		3.00	9604	44600

Top of Embankment Elevation:	603.00	ft
Emergency Spillway Elevation:	602.00	ft
Embankment Width:	**10**	ft
Riser Elevation:	601.00	ft
Bottom Elevation:	599.00	ft
Sediment Storage Elevation:	598.00	ft

Sizing of Barrel & Riser

12	Barrel Size (in)	
54	Barrel Length (LF)	
599	Upstream Barrel Invert Elevation	
598	Downstream Barrel Invert Elevation	
1.85%	Slope of Barrel (%)	
HDPE	Barrel Pipe Material	
CMP	Riser Material	
18	Riser Size (in)	**Okay (Riser = 1.5 Barrel Size)**

Anti-Flotation Device (Only use for circular riser)

1.5	Riser Diameter (ft)	
3.0	Height (ft)	
380	Buoyant Force (lbs)	Area Riser x Ht Riser x Density Water x Safety Factor (.25)(pi)(Diameter)2 x (Height) x 62.4 pcf x 1.15 FS
2.5	Volume Required (cf)	Buoyant force / Density Of Concrete (150 pcf)
1.6	Square Root of Volume (ft)	(Assume 1 ft thick concrete footing)
2.0	Length of Concrete Footing	
2.0	Width of Concrete Footing	
1.0	Height of Concrete Footing (Thickness)	
4	Volume Provided (cf)	

***RED IS USER INPUT**

BASIN NAME	BASIN 31	
BASIN TYPE	RISER	
TOTAL DRAINAGE AREA	11.66	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	43	cfs
SURFACE AREA (AC) = 435 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	18,739	ft^2
SURFACE AREA PROVIDED	19,208	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	20,988	ft^3
BASIN VOLUME PROVIDED	34,996	ft^3
TOP OF EMBANKMENT ELEVATION	603.0	ft
EMBANKMENT WIDTH	10	ft
EMERGENCY SPILLWAY ELEVATION	602.0	ft
EMERGENCY SPILLWAY WIDTH	45	ft
RISER ELEVATION	601.0	ft
BOTTOM ELEVATION	599.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	598.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2.5	inch
ORIFICE DIAMETER	2.25	inch
DEWATERING TIME	3.94	days

BASIN NAME		PROJECT NAME
BASIN 32	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 32

Modified Rational

Highest Elevation =	664	feet
Inlet Elevation =	590	feet
Difference =	74	feet
Travel Length =	2,332	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc =Time of Concentration (min)

H =Height of the most remote point on the watershed above the outlet (ft)

L =Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	11.56	min
T_C =	10	min
Intensity 50 year =	6.53	in/hr
C =	0.45	
Disturbed Area =	11.53	acres
Additional Drainage Area =	0.64	acres
Total Drainage Area=	12.17	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **35.76** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 32	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		**PROJECT NUMBER**
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 32 TYPE OF BASIN: RISER

Disturbed Area:	11.53	ac
Additional Drainage Area:	0.64	ac
Total Drainage Area:	12.17	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	6.53	in/hr
50-yr Discharge [Q10]:	**35.76**	cfs

Sizing of Basin

20754	Required Volume ft^3	(Disturbed Area x 1800 cf/ac)		
15556	Required Surface Area ft^2	**(Q50 x 435)**		
88.2	Suggested Width ft			
176.4	Suggested Length ft			
94	Width at Surface Area (ft)			
188	Length at Surface Area (ft)	L/W Ratio =	2.0	**Okay**
3	Side Slope Ratio Z:1			
2	Depth (ft)			
82	Target Bottom Width (ft)			
176	Target Bottom Length (ft)			
14432	Target Bottom Area ($ft^{2)}$			
32056	Target Volume (ft^3)	**Okay**		
17672	Target Surface Area (ft^2)	**Okay**		

32068	Provided Volume (ft^3)
17672	Provided Surface Area (ft^2)

40	Emergency Spillway Width (ft)	
0.5	Depth of Flow (ft)	
42.4	Spillway Capacity (cfs)	**Okay**
2.5	Skimmer Size (in)	
0.208	Head on Skimmer (ft)	
2.25	Orifice Size (1/4 inch increments)	
3.89	Dewatering Time (days)	
	Suggest about 3 days	

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
588.00	**14432**	0.00	0	0
589.00	**16016**	1.00	15224	15224
590.00	**17672**	2.00	16844	32068
591.00		3.00	8836	40904

Top of Embankment Elevation:	592.00	ft
Emergency Spillway Elevation:	591.00	ft
Embankment Width:	**10**	ft
Riser Elevation:	590.00	ft
Bottom Elevation:	588.00	ft
Sediment Storage Elevation:	587.00	ft

Sizing of Barrel & Riser

12	Barrel Size (in)	
42	Barrel Length (LF)	
588	Upstream Barrel Invert Elevation	
587	Downstream Barrel Invert Elevation	
2.38%	Slope of Barrel (%)	
HDPE	Barrel Pipe Material	
CMP	Riser Material	
18	Riser Size (in)	**Okay (Riser = 1.5 Barrel Size)**

Anti-Flotation Device (Only use for circular riser)

1.5	Riser Diameter (ft)	
3.0	Height (ft)	
		Area Riser x Ht Riser x Density Water x Safety Factor
380	Buoyant Force (lbs)	(.25)(pi)(Diameter)2 x (Height) x 62.4 pcf x 1.15 FS
2.5	Volume Required (cf)	Buoyant force / Density Of Concrete (150 pcf)
1.6	Square Root of Volume (ft)	(Assume 1 ft thick concrete footing)
2.0	Length of Concrete Footing	
2.0	Width of Concrete Footing	
1.0	Height of Concrete Footing (Thickness)	
4	Volume Provided (cf)	

***RED IS USER INPUT**

BASIN NAME	BASIN 32	
BASIN TYPE	RISER	
TOTAL DRAINAGE AREA	12.17	acres
Tc (TIME OF CONCENTRATION)	10	min
C VALUE	0.45	
I (50 YEAR STORM)	6.53	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	36	cfs
SURFACE AREA (AC) = 435 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	15,556	ft^2
SURFACE AREA PROVIDED	17,672	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	20,754	ft^3
BASIN VOLUME PROVIDED	32,068	ft^3
TOP OF EMBANKMENT ELEVATION	592.0	ft
EMBANKMENT WIDTH	10	ft
EMERGENCY SPILLWAY ELEVATION	591.0	ft
EMERGENCY SPILLWAY WIDTH	40	ft
RISER ELEVATION	590.0	ft
BOTTOM ELEVATION	588.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	587.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2.5	inch
ORIFICE DIAMETER	2.25	inch
DEWATERING TIME	3.89	days

BASIN NAME		PROJECT NAME
BASIN 33	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 33

Modified Rational

Highest Elevation =	642	feet
Inlet Elevation =	592	feet
Difference =	50	feet
Travel Length =	1,000	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc =Time of Concentration (min)

H =Height of the most remote point on the watershed above the outlet (ft)

L =Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	5.05	min
T_C =	5	min
Intensity 50 year =	8.21	in/hr
C =	0.45	
Disturbed Area =	6.93	acres
Additional Drainage Area =	0.00	acres
Total Drainage Area=	6.93	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **25.60** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 33	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		**PROJECT NUMBER**
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 33 TYPE OF BASIN: SKIMMER

Disturbed Area:	6.93	ac
Additional Drainage Area:	0.00	ac
Total Drainage Area:	6.93	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	8.21	in/hr
50-yr Discharge [Q10]:	**25.60**	cfs

Sizing of Basin

12474	Required Volume ft^3	(Disturbed Area x 1800 cf/ac)
8321	Required Surface Area ft^2	**(Q50 x 325)**
64.5	Suggested Width ft	
129.0	Suggested Length ft	
68	Width at Surface Area (ft)	
136	Length at Surface Area (ft)	L/W Ratio = 2.0 **Okay**
3	Side Slope Ratio Z:1	
2	Depth (ft)	
56	Target Bottom Width (ft)	
124	Target Bottom Length (ft)	
6944	Target Bottom Area ($ft^{2)}$	
16144	Target Volume (ft^3)	**Okay**
9248	Target Surface Area (ft^2)	**Okay**
16156	Provided Volume (ft^3)	
9248	Provided Surface Area (ft^2)	
25	Emergency Spillway Width (ft)	
0.5	Depth of Flow (ft)	
26.5	Spillway Capacity (cfs)	**Okay**
2.5	Skimmer Size (in)	
0.208	Head on Skimmer (ft)	
1.75	Orifice Size (1/4 inch increments)	
3.87	Dewatering Time (days)	
	Suggest about 3 days	

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
590.00	**6944**	0.00	0	0
591.00	**8060**	1.00	7502	7502
592.00	**9248**	2.00	8654	16156
593.00		3.00	4624	20780

Top of Embankment Elevation:	593.00	ft
Emergency Spillway Elevation:	592.00	ft
Embankment Width:	**5**	ft
Bottom Elevation:	590.00	ft
Sediment Storage Elevation:	589.00	ft

BASIN NAME	BASIN 33	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	6.93	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	26	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	8,321	ft^2
SURFACE AREA PROVIDED	9,248	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	12,474	ft^3
BASIN VOLUME PROVIDED	16,156	ft^3
TOP OF EMBANKMENT ELEVATION	593.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	592.0	ft
EMERGENCY SPILLWAY WIDTH	25	ft
BOTTOM ELEVATION	590.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	589.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2.5	inch
ORIFICE DIAMETER	1.75	inch
DEWATERING TIME	3.87	days

BASIN NAME		PROJECT NAME
BASIN 34	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 34

Modified Rational

Highest Elevation =	617	feet
Inlet Elevation =	591	feet
Difference =	26	feet
Travel Length =	505	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc	=Time of Concentration (min)
H	=Height of the most remote point on the watershed above the outlet (ft)
L	=Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	2.95	min
T_C =	5	min
Intensity 50 year =	8.21	in/hr
C =	0.45	
Disturbed Area =	2.80	acres
Additional Drainage Area =	0.00	acres
Total Drainage Area=	2.80	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **10.34** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 34	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		**PROJECT NUMBER**
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 34 TYPE OF BASIN: SKIMMER

Disturbed Area:	2.80	ac
Additional Drainage Area:	0.00	ac
Total Drainage Area:	2.80	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	8.21	in/hr
50-yr Discharge [Q10]:	**10.34**	cfs

Sizing of Basin

5040 Required Volume ft^3 (Disturbed Area x 1800 cf/ac)
3362 Required Surface Area ft^2 **(Q50 x 325)**
41.0 Suggested Width ft
82.0 Suggested Length ft

40 Width at Surface Area (ft)
86 Length at Surface Area (ft) L/W Ratio = 2.2 **Okay**
3 Side Slope Ratio Z:1
2 Depth (ft)
28 Target Bottom Width (ft)
74 Target Bottom Length (ft)
2072 Target Bottom Area ($ft^{2)}$
5464 Target Volume (ft^3) **Okay**
3440 Target Surface Area (ft^2) **Okay**

5476 Provided Volume (ft^3)
3440 Provided Surface Area (ft^2)

10 Emergency Spillway Width (ft)
0.5 Depth of Flow (ft)
10.6 Spillway Capacity (cfs) **Okay**

2 Skimmer Size (in)
0.167 Head on Skimmer (ft)
1.25 Orifice Size (1/4 inch increments)
3.42 Dewatering Time (days)
Suggest about 3 days

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
589.00	**2072**	0.00	0	0
590.00	**2720**	1.00	2396	2396
591.00	**3440**	2.00	3080	5476

Top of Embankment Elevation:	592.00	ft
Emergency Spillway Elevation:	591.00	ft
Embankment Width:	**5**	ft
Bottom Elevation:	589.00	ft
Sediment Storage Elevation:	588.00	ft

BASIN NAME	BASIN 34	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	2.80	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	10	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	3,362	ft^2
SURFACE AREA PROVIDED	3,440	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	5,040	ft^3
BASIN VOLUME PROVIDED	5,476	ft^3
TOP OF EMBANKMENT ELEVATION	592.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	591.0	ft
EMERGENCY SPILLWAY WIDTH	10	ft
BOTTOM ELEVATION	589.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	588.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2	inch
ORIFICE DIAMETER	1.25	inch
DEWATERING TIME	3.42	days

BASIN NAME		PROJECT NAME
BASIN 35	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 35

Modified Rational

Highest Elevation =	604	feet
Inlet Elevation =	585	feet
Difference =	19	feet
Travel Length =	492	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc	=Time of Concentration (min)
H	=Height of the most remote point on the watershed above the outlet (ft)
L	=Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	3.23	min
T_C =	5	min
Intensity 50 year =	8.21	in/hr
C =	0.45	
Disturbed Area =	1.40	acres
Additional Drainage Area =	0.00	acres
Total Drainage Area=	1.40	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **5.17** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 35	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		**PROJECT NUMBER**
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 35 TYPE OF BASIN: SKIMMER

Disturbed Area:	1.40	ac
Additional Drainage Area:	0.00	ac
Total Drainage Area:	1.40	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	8.21	in/hr
50-yr Discharge [Q10]:	**5.17**	cfs

Sizing of Basin

2520	Required Volume ft^3	(Disturbed Area x 1800 cf/ac)	
1681	Required Surface Area ft^2	**(Q50 x 325)**	
29.0	Suggested Width ft		
58.0	Suggested Length ft		
35	Width at Surface Area (ft)		
77	Length at Surface Area (ft)	L/W Ratio = 2.2	**Okay**
3	Side Slope Ratio Z:1		
2	Depth (ft)		
23	Target Bottom Width (ft)		
65	Target Bottom Length (ft)		
1495	Target Bottom Area ($ft^{2)}$		
4142	Target Volume (ft^3)	**Okay**	
2695	Target Surface Area (ft^2)	**Okay**	
4154	Provided Volume (ft^3)		
2695	Provided Surface Area (ft^2)		
10	Emergency Spillway Width (ft)		
0.5	Depth of Flow (ft)		
10.6	Spillway Capacity (cfs)	**Okay**	
1.5	Skimmer Size (in)		
0.125	Head on Skimmer (ft)		
1	Orifice Size (1/4 inch increments)		
3.09	Dewatering Time (days)		
	Suggest about 3 days		

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
583.00	**1495**	0.00	0	0
584.00	**2059**	1.00	1777	1777
585.00	**2695**	2.00	2377	4154

Top of Embankment Elevation:	586.00	ft
Emergency Spillway Elevation:	585.00	ft
Embankment Width:	**5**	ft
Bottom Elevation:	583.00	ft
Sediment Storage Elevation:	582.00	ft

BASIN NAME	BASIN 35	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	1.40	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	5	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	1,681	ft^2
SURFACE AREA PROVIDED	2,695	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	2,520	ft^3
BASIN VOLUME PROVIDED	4,154	ft^3
TOP OF EMBANKMENT ELEVATION	586.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	585.0	ft
EMERGENCY SPILLWAY WIDTH	10	ft
BOTTOM ELEVATION	583.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	582.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	1.5	inch
ORIFICE DIAMETER	1	inch
DEWATERING TIME	3.09	days

BASIN NAME		PROJECT NAME
BASIN 36	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 36

Modified Rational

Highest Elevation =	614.5	feet
Inlet Elevation =	587	feet
Difference =	27.5	feet
Travel Length =	448	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc =Time of Concentration (min)

H =Height of the most remote point on the watershed above the outlet (ft)

L =Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	2.52	min
T_C =	5	min
Intensity 50 year =	8.21	in/hr
C =	0.45	
Disturbed Area =	1.30	acres
Additional Drainage Area =	0.00	acres
Total Drainage Area=	1.30	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q = Peak flow from the drainage area (cfs)

C = Coefficient of runoff (dimensionless)

I = Rainfall intensity for a given time to peak (in/hr)

A = Drainage area (acres)

Q50= **4.80** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 36	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		**PROJECT NUMBER**
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 36 TYPE OF BASIN: SKIMMER

Disturbed Area:	1.30	ac
Additional Drainage Area:	0.00	ac
Total Drainage Area:	1.30	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	8.21	in/hr
50-yr Discharge [Q10]:	**4.80**	cfs

Sizing of Basin

2340	Required Volume ft^3	(Disturbed Area x 1800 cf/ac)
1561	Required Surface Area ft^2	**(Q50 x 325)**
27.9	Suggested Width ft	
55.9	Suggested Length ft	
30	Width at Surface Area (ft)	
62	Length at Surface Area (ft)	L/W Ratio = 2.1 **Okay**
3	Side Slope Ratio Z:1	
2	Depth (ft)	
18	Target Bottom Width (ft)	
50	Target Bottom Length (ft)	
900	Target Bottom Area ($ft^{2)}$	
2712	Target Volume (ft^3)	**Okay**
1860	Target Surface Area (ft^2)	**Okay**
2403	Provided Volume (ft^3)	
1620	Provided Surface Area (ft^2)	
10	Emergency Spillway Width (ft)	
0.5	Depth of Flow (ft)	
10.6	Spillway Capacity (cfs)	**Okay**
1.5	Skimmer Size (in)	
0.125	Head on Skimmer (ft)	
1	Orifice Size (1/4 inch increments)	
2.87	Dewatering Time (days)	
	Suggest about 3 days	

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
585.00	**811**	0.00	0	0
586.00	**1187**	1.00	999	999
587.00	**1620**	2.00	1404	2403

Top of Embankment Elevation:	588.00	ft
Emergency Spillway Elevation:	587.00	ft
Embankment Width:	**5**	ft
Bottom Elevation:	585.00	ft
Sediment Storage Elevation:	584.00	ft

BASIN NAME	BASIN 36	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	1.30	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	5	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	1,561	ft^2
SURFACE AREA PROVIDED	1,620	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	2,340	ft^3
BASIN VOLUME PROVIDED	2,403	ft^3
TOP OF EMBANKMENT ELEVATION	588.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	587.0	ft
EMERGENCY SPILLWAY WIDTH	10	ft
BOTTOM ELEVATION	585.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	584.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	1.5	inch
ORIFICE DIAMETER	1	inch
DEWATERING TIME	2.87	days

BASIN NAME		PROJECT NAME
BASIN 37	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 37

Modified Rational

Highest Elevation =	**619**	feet
Inlet Elevation =	**576**	feet
Difference =	43	feet
Travel Length =	**458**	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc	=Time of Concentration (min)
H	=Height of the most remote point on the watershed above the outlet (ft)
L	=Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	2.17	min
T_C =	**5**	min
Intensity 50 year =	**8.21**	in/hr
C =	**0.45**	
Disturbed Area =	**4.04**	acres
Additional Drainage Area =	**0.00**	acres
Total Drainage Area=	4.04	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **14.93** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 37	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		**PROJECT NUMBER**
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 37 TYPE OF BASIN: SKIMMER

Disturbed Area:	4.04	ac
Additional Drainage Area:	0.00	ac
Total Drainage Area:	4.04	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	8.21	in/hr
50-yr Discharge [Q10]:	**14.93**	cfs

Sizing of Basin

7272	Required Volume ft^3	(Disturbed Area x 1800 cf/ac)	
4851	Required Surface Area ft^2	**(Q50 x 325)**	
49.2	Suggested Width ft		
98.5	Suggested Length ft		
50	Width at Surface Area (ft)		
110	Length at Surface Area (ft)	L/W Ratio = 2.2	**Okay**
3	Side Slope Ratio Z:1		
2	Depth (ft)		
38	Target Bottom Width (ft)		
98	Target Bottom Length (ft)		
3724	Target Bottom Area ($ft^{2)}$		
9176	Target Volume (ft^3)	**Okay**	
5500	Target Surface Area (ft^2)	**Okay**	
9191	Provided Volume (ft^3)		
5500	Provided Surface Area (ft^2)		
20	Emergency Spillway Width (ft)		
0.5	Depth of Flow (ft)		
21.2	Spillway Capacity (cfs)	**Okay**	
2	Skimmer Size (in)		
0.167	Head on Skimmer (ft)		
1.5	Orifice Size (1/4 inch increments)		
3.42	Dewatering Time (days)		
	Suggest about 3 days		

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
574.00	**3724**	0.00	0	0
575.00	**4579**	1.00	4152	4152
576.00	**5500**	2.00	5040	9191

Top of Embankment Elevation:	577.00	ft
Emergency Spillway Elevation:	576.00	ft
Embankment Width:	**5**	ft
Bottom Elevation:	574.00	ft
Sediment Storage Elevation:	573.00	ft

BASIN NAME	BASIN 37	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	4.04	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	15	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	4,851	ft^2
SURFACE AREA PROVIDED	5,500	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	7,272	ft^3
BASIN VOLUME PROVIDED	9,191	ft^3
TOP OF EMBANKMENT ELEVATION	577.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	576.0	ft
EMERGENCY SPILLWAY WIDTH	20	ft
BOTTOM ELEVATION	574.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	573.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2	inch
ORIFICE DIAMETER	1.5	inch
DEWATERING TIME	3.42	days

BASIN NAME		PROJECT NAME
BASIN 38	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 38

Modified Rational

Highest Elevation =	614	feet
Inlet Elevation =	570	feet
Difference =	44	feet
Travel Length =	756	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc =Time of Concentration (min)

H =Height of the most remote point on the watershed above the outlet (ft)

L =Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	3.84	min
T_C =	5	min
Intensity 50 year =	8.21	in/hr
C =	0.45	
Disturbed Area =	6.68	acres
Additional Drainage Area =	0.00	acres
Total Drainage Area=	6.68	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **24.68** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 38	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		**PROJECT NUMBER**
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 38 TYPE OF BASIN: SKIMMER

Disturbed Area:	6.68	ac
Additional Drainage Area:	0.00	ac
Total Drainage Area:	6.68	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	8.21	in/hr
50-yr Discharge [Q10]:	**24.68**	cfs

Sizing of Basin

12024	Required Volume ft^3	(Disturbed Area x 1800 cf/ac)	
8021	Required Surface Area ft^2	**(Q50 x 325)**	
63.3	Suggested Width ft		
126.7	Suggested Length ft		
65	Width at Surface Area (ft)		
130	Length at Surface Area (ft)	L/W Ratio = 2.0	**Okay**
3	Side Slope Ratio Z:1		
2	Depth (ft)		
53	Target Bottom Width (ft)		
118	Target Bottom Length (ft)		
6254	Target Bottom Area ($ft^{2)}$		
14656	Target Volume (ft^3)	**Okay**	
8450	Target Surface Area (ft^2)	**Okay**	
14589	Provided Volume (ft^3)		
8316	Provided Surface Area (ft^2)		
25	Emergency Spillway Width (ft)		
0.5	Depth of Flow (ft)		
26.5	Spillway Capacity (cfs)	**Okay**	
2.5	Skimmer Size (in)		
0.208	Head on Skimmer (ft)		
1.75	Orifice Size (1/4 inch increments)		
3.73	Dewatering Time (days)		
	Suggest about 3 days		

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
568.00	**6301**	0.00	0	0
569.00	**7280**	1.00	6791	6791
570.00	**8316**	2.00	7798	14589

Top of Embankment Elevation:	571.00	ft
Emergency Spillway Elevation:	570.00	ft
Embankment Width:	**5**	ft
Bottom Elevation:	568.00	ft
Sediment Storage Elevation:	567.00	ft

BASIN NAME	BASIN 38	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	6.68	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	25	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	8,021	ft^2
SURFACE AREA PROVIDED	8,316	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	12,024	ft^3
BASIN VOLUME PROVIDED	14,589	ft^3
TOP OF EMBANKMENT ELEVATION	571.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	570.0	ft
EMERGENCY SPILLWAY WIDTH	25	ft
BOTTOM ELEVATION	568.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	567.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2.5	inch
ORIFICE DIAMETER	1.75	inch
DEWATERING TIME	3.73	days

BASIN NAME		PROJECT NAME
BASIN 39	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 39

Modified Rational

Highest Elevation =	594	feet
Inlet Elevation =	559	feet
Difference =	35	feet
Travel Length =	934	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc	=Time of Concentration (min)
H	=Height of the most remote point on the watershed above the outlet (ft)
L	=Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	5.36	min
T_C =	5	min
Intensity 50 year =	8.21	in/hr
C =	0.45	
Disturbed Area =	5.89	acres
Additional Drainage Area =	1.45	acres
Total Drainage Area=	7.34	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **27.12** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 39	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		**PROJECT NUMBER**
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 39 TYPE OF BASIN: SKIMMER

Disturbed Area:	5.89	ac
Additional Drainage Area:	1.45	ac
Total Drainage Area:	7.34	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	8.21	in/hr
50-yr Discharge [Q10]:	**27.12**	cfs

Sizing of Basin

10602	Required Volume ft^3	(Disturbed Area x 1800 cf/ac)	
8813	Required Surface Area ft^2	**(Q50 x 325)**	
66.4	Suggested Width ft		
132.8	Suggested Length ft		
60	Width at Surface Area (ft)		
150	Length at Surface Area (ft)	L/W Ratio = 2.5	**Okay**
3	Side Slope Ratio Z:1		
2	Depth (ft)		
48	Target Bottom Width (ft)		
138	Target Bottom Length (ft)		
6624	Target Bottom Area ($ft^{2)}$		
15576	Target Volume (ft^3)	**Okay**	
9000	Target Surface Area (ft^2)	**Okay**	
15588	Provided Volume (ft^3)		
9000	Provided Surface Area (ft^2)		
30	Emergency Spillway Width (ft)		
0.5	Depth of Flow (ft)		
31.8	Spillway Capacity (cfs)	**Okay**	
2	Skimmer Size (in)		
0.167	Head on Skimmer (ft)		
1.75	Orifice Size (1/4 inch increments)		
3.67	Dewatering Time (days)		
	Suggest about 3 days		

Skimmer Size
(Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
557.00	**6624**	0.00	0	0
558.00	**7776**	1.00	7200	7200
559.00	**9000**	2.00	8388	15588

Top of Embankment Elevation:	560.00	ft
Emergency Spillway Elevation:	559.00	ft
Embankment Width:	**5**	ft
Bottom Elevation:	557.00	ft
Sediment Storage Elevation:	556.00	ft

BASIN NAME	BASIN 39	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	7.34	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	27	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	8,813	ft^2
SURFACE AREA PROVIDED	9,000	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	10,602	ft^3
BASIN VOLUME PROVIDED	15,588	ft^3
TOP OF EMBANKMENT ELEVATION	560.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	559.0	ft
EMERGENCY SPILLWAY WIDTH	30	ft
BOTTOM ELEVATION	557.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	556.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2	inch
ORIFICE DIAMETER	1.75	inch
DEWATERING TIME	3.67	days

BASIN NAME		PROJECT NAME
BASIN 40	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 40

Modified Rational

Highest Elevation =	618	feet
Inlet Elevation =	565	feet
Difference =	53	feet
Travel Length =	627	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc =Time of Concentration (min)

H =Height of the most remote point on the watershed above the outlet (ft)

L =Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	2.88	min
T_C =	5	min
Intensity 50 year =	8.21	in/hr
C =	0.45	
Disturbed Area =	8.04	acres
Additional Drainage Area =	1.38	acres
Total Drainage Area=	9.42	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **34.80** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 40	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		**PROJECT NUMBER**
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 40 TYPE OF BASIN: SKIMMER

Disturbed Area:	8.04	ac
Additional Drainage Area:	1.38	ac
Total Drainage Area:	9.42	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	8.21	in/hr
50-yr Discharge [Q10]:	**34.80**	cfs

Sizing of Basin

14472	Required Volume ft^3	(Disturbed Area x 1800 cf/ac)	
11311	Required Surface Area ft^2	**(Q50 x 325)**	
75.2	Suggested Width ft		
150.4	Suggested Length ft		
66	Width at Surface Area (ft)		
190	Length at Surface Area (ft)	L/W Ratio = 2.9	**Okay**
3	Side Slope Ratio Z:1		
2	Depth (ft)		
54	Target Bottom Width (ft)		
178	Target Bottom Length (ft)		
9612	Target Bottom Area ($ft^{2)}$		
22104	Target Volume (ft^3)	**Okay**	
12540	Target Surface Area (ft^2)	**Okay**	
22152	Provided Volume (ft^3)		
12560	Provided Surface Area (ft^2)		
35	Emergency Spillway Width (ft)		
0.5	Depth of Flow (ft)		
37.1	Spillway Capacity (cfs)	**Okay**	
2.5	Skimmer Size (in)		
0.208	Head on Skimmer (ft)		
2	Orifice Size (1/4 inch increments)		
3.43	Dewatering Time (days)		
	Suggest about 3 days		

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
563.00	**9628**	0.00	0	0
564.00	**11058**	1.00	10343	10343
565.00	**12560**	2.00	11809	22152

Top of Embankment Elevation:	566.00	ft
Emergency Spillway Elevation:	565.00	ft
Embankment Width:	**5**	ft
Bottom Elevation:	563.00	ft
Sediment Storage Elevation:	562.00	ft

BASIN NAME	BASIN 40	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	9.42	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	35	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	11,311	ft^2
SURFACE AREA PROVIDED	12,560	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	14,472	ft^3
BASIN VOLUME PROVIDED	22,152	ft^3
TOP OF EMBANKMENT ELEVATION	566.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	565.0	ft
EMERGENCY SPILLWAY WIDTH	35	ft
BOTTOM ELEVATION	563.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	562.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2.5	inch
ORIFICE DIAMETER	2	inch
DEWATERING TIME	3.43	days

BASIN NAME		PROJECT NAME
BASIN 41	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 41

Modified Rational

Highest Elevation =	600	feet
Inlet Elevation =	533	feet
Difference =	67	feet
Travel Length =	505	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc =Time of Concentration (min)

H =Height of the most remote point on the watershed above the outlet (ft)

L =Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	2.05	min
T_C =	5	min
Intensity 50 year =	8.21	in/hr
C =	0.45	
Disturbed Area =	5.50	acres
Additional Drainage Area =	0.00	acres
Total Drainage Area=	5.50	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **20.32** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 41	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		**PROJECT NUMBER**
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 41 TYPE OF BASIN: SKIMMER

Disturbed Area:	5.50	ac
Additional Drainage Area:	0.00	ac
Total Drainage Area:	5.50	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	8.21	in/hr
50-yr Discharge [Q10]:	**20.32**	cfs

Sizing of Basin

9900	Required Volume ft^3	(Disturbed Area x 1800 cf/ac)
6604	Required Surface Area ft^2	**(Q50 x 325)**
57.5	Suggested Width ft	
114.9	Suggested Length ft	
50	Width at Surface Area (ft)	
138	Length at Surface Area (ft)	L/W Ratio = 2.8 **Okay**
3	Side Slope Ratio Z:1	
2	Depth (ft)	
38	Target Bottom Width (ft)	
126	Target Bottom Length (ft)	
4788	Target Bottom Area ($ft^{2)}$	
11640	Target Volume (ft^3)	**Okay**
6900	Target Surface Area (ft^2)	**Okay**
11643	Provided Volume (ft^3)	
6841	Provided Surface Area (ft^2)	
20	Emergency Spillway Width (ft)	
0.5	Depth of Flow (ft)	
21.2	Spillway Capacity (cfs)	**Okay**
2	Skimmer Size (in)	
0.167	Head on Skimmer (ft)	
1.75	Orifice Size (1/4 inch increments)	
3.42	Dewatering Time (days)	
	Suggest about 3 days	

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
531.00	**4830**	0.00	0	0
532.00	**5807**	1.00	5319	5319
533.00	**6841**	2.00	6324	11643

Top of Embankment Elevation:	534.00	ft
Emergency Spillway Elevation:	533.00	ft
Embankment Width:	**5**	ft
Bottom Elevation:	531.00	ft
Sediment Storage Elevation:	530.00	ft

BASIN NAME	BASIN 41	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	5.50	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	20	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	6,604	ft^2
SURFACE AREA PROVIDED	6,841	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	9,900	ft^3
BASIN VOLUME PROVIDED	11,643	ft^3
TOP OF EMBANKMENT ELEVATION	534.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	533.0	ft
EMERGENCY SPILLWAY WIDTH	20	ft
BOTTOM ELEVATION	531.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	530.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2	inch
ORIFICE DIAMETER	1.75	inch
DEWATERING TIME	3.42	days

BASIN NAME		PROJECT NAME
BASIN 42	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 42

Modified Rational

Highest Elevation =	618	feet
Inlet Elevation =	576	feet
Difference =	42	feet
Travel Length =	872	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc =Time of Concentration (min)

H =Height of the most remote point on the watershed above the outlet (ft)

L =Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	4.61	min
T_C =	5	min
Intensity 50 year =	8.21	in/hr
C =	0.45	
Disturbed Area =	5.37	acres
Additional Drainage Area =	0.00	acres
Total Drainage Area=	5.37	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **19.84** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 42	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		**PROJECT NUMBER**
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 42 TYPE OF BASIN: SKIMMER

Disturbed Area:	5.37	ac
Additional Drainage Area:	0.00	ac
Total Drainage Area:	5.37	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	8.21	in/hr
50-yr Discharge [Q10]:	**19.84**	cfs

Sizing of Basin

9666	Required Volume ft^3	(Disturbed Area x 1800 cf/ac)	
6448	Required Surface Area ft^2	**(Q50 x 325)**	
56.8	Suggested Width ft		
113.6	Suggested Length ft		
52	Width at Surface Area (ft)		
142	Length at Surface Area (ft)	L/W Ratio = 2.7	**Okay**
3	Side Slope Ratio Z:1		
2	Depth (ft)		
40	Target Bottom Width (ft)		
130	Target Bottom Length (ft)		
5200	Target Bottom Area ($ft^{2)}$		
12536	Target Volume (ft^3)	**Okay**	
7384	Target Surface Area (ft^2)	**Okay**	
11771	Provided Volume (ft^3)		
6912	Provided Surface Area (ft^2)		
20	Emergency Spillway Width (ft)		
0.5	Depth of Flow (ft)		
21.2	Spillway Capacity (cfs)	**Okay**	
2	Skimmer Size (in)		
0.167	Head on Skimmer (ft)		
1.75	Orifice Size (1/4 inch increments)		
3.34	Dewatering Time (days)		
	Suggest about 3 days		

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
574.00	**4887**	0.00	0	0
575.00	**5871**	1.00	5379	5379
576.00	**6912**	2.00	6392	11771

Top of Embankment Elevation:	577.00	ft
Emergency Spillway Elevation:	576.00	ft
Embankment Width:	**5**	ft
Bottom Elevation:	574.00	ft
Sediment Storage Elevation:	573.00	ft

BASIN NAME	BASIN 42	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	5.37	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	20	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	6,448	ft^2
SURFACE AREA PROVIDED	6,912	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	9,666	ft^3
BASIN VOLUME PROVIDED	11,771	ft^3
TOP OF EMBANKMENT ELEVATION	577.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	576.0	ft
EMERGENCY SPILLWAY WIDTH	20	ft
BOTTOM ELEVATION	574.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	573.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2	inch
ORIFICE DIAMETER	1.75	inch
DEWATERING TIME	3.34	days

BASIN NAME		PROJECT NAME
BASIN 43	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 43

Modified Rational

Highest Elevation =	606	feet
Inlet Elevation =	577	feet
Difference =	29	feet
Travel Length =	302	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc	=Time of Concentration (min)
H	=Height of the most remote point on the watershed above the outlet (ft)
L	=Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	1.56	min
T_C =	5	min
Intensity 50 year =	8.21	in/hr
C =	0.45	
Disturbed Area =	1.01	acres
Additional Drainage Area =	0.00	acres
Total Drainage Area=	1.01	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **3.73** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 43	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		**PROJECT NUMBER**
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 43 TYPE OF BASIN: SKIMMER

Disturbed Area:	1.01	ac
Additional Drainage Area:	0.00	ac
Total Drainage Area:	1.01	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	8.21	in/hr
50-yr Discharge [Q10]:	**3.73**	cfs

Sizing of Basin

1818	Required Volume ft^3	(Disturbed Area x 1800 cf/ac)	
1213	Required Surface Area ft^2	**(Q50 x 325)**	
24.6	Suggested Width ft		
49.2	Suggested Length ft		
32	Width at Surface Area (ft)		
64	Length at Surface Area (ft)	L/W Ratio = 2.0	**Okay**
3	Side Slope Ratio Z:1		
2	Depth (ft)		
20	Target Bottom Width (ft)		
52	Target Bottom Length (ft)		
1040	Target Bottom Area ($ft^{2)}$		
3040	Target Volume (ft^3)	**Okay**	
2048	Target Surface Area (ft^2)	**Okay**	
3052	Provided Volume (ft^3)		
2048	Provided Surface Area (ft^2)		
10	Emergency Spillway Width (ft)		
0.5	Depth of Flow (ft)		
10.6	Spillway Capacity (cfs)	**Okay**	
1.5	Skimmer Size (in)		
0.125	Head on Skimmer (ft)		
0.75	Orifice Size (1/4 inch increments)		
3.96	Dewatering Time (days)		
	Suggest about 3 days		

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
575.00	**1040**	0.00	0	0
576.00	**1508**	1.00	1274	1274
577.00	**2048**	2.00	1778	3052

Top of Embankment Elevation:	578.00	ft
Emergency Spillway Elevation:	577.00	ft
Embankment Width:	**5**	ft
Bottom Elevation:	575.00	ft
Sediment Storage Elevation:	574.00	ft

BASIN NAME	BASIN 43	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	1.01	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	4	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	1,213	ft^2
SURFACE AREA PROVIDED	2,048	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	1,818	ft^3
BASIN VOLUME PROVIDED	3,052	ft^3
TOP OF EMBANKMENT ELEVATION	578.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	577.0	ft
EMERGENCY SPILLWAY WIDTH	10	ft
BOTTOM ELEVATION	575.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	574.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	1.5	inch
ORIFICE DIAMETER	0.75	inch
DEWATERING TIME	3.96	days

BASIN NAME		PROJECT NAME
BASIN 44	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 44

Modified Rational

Highest Elevation =	**616**	feet
Inlet Elevation =	**560**	feet
Difference =	56	feet
Travel Length =	**722**	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc =Time of Concentration (min)

H =Height of the most remote point on the watershed above the outlet (ft)

L =Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	3.32	min
T_C =	**5**	min
Intensity 50 year =	**8.21**	in/hr
C =	**0.45**	
Disturbed Area =	**8.77**	acres
Additional Drainage Area =	**0.20**	acres
Total Drainage Area=	8.97	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **33.14** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 44	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		**PROJECT NUMBER**
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 44 TYPE OF BASIN: SKIMMER

Disturbed Area:	8.77	ac
Additional Drainage Area:	0.20	ac
Total Drainage Area:	8.97	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	8.21	in/hr
50-yr Discharge [Q10]:	**33.14**	cfs

Sizing of Basin

15786	Required Volume ft^3	(Disturbed Area x 1800 cf/ac)	
10770	Required Surface Area ft^2	**(Q50 x 325)**	
73.4	Suggested Width ft		
146.8	Suggested Length ft		
85	Width at Surface Area (ft)		
170	Length at Surface Area (ft)	L/W Ratio = 2.0	**Okay**
3	Side Slope Ratio Z:1		
2	Depth (ft)		
73	Target Bottom Width (ft)		
158	Target Bottom Length (ft)		
11534	Target Bottom Area ($ft^{2)}$		
25936	Target Volume (ft^3)	**Okay**	
14450	Target Surface Area (ft^2)	**Okay**	
21597	Provided Volume (ft^3)		
12039	Provided Surface Area (ft^2)		
35	Emergency Spillway Width (ft)		
0.5	Depth of Flow (ft)		
37.1	Spillway Capacity (cfs)	**Okay**	
2.5	Skimmer Size (in)		
0.208	Head on Skimmer (ft)		
2	Orifice Size (1/4 inch increments)		
3.75	Dewatering Time (days)		
	Suggest about 3 days		

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
558.00	**9586**	0.00	0	0
559.00	**10784**	1.00	10185	10185
560.00	**12039**	2.00	11412	21597

Top of Embankment Elevation:	561.00	ft
Emergency Spillway Elevation:	560.00	ft
Embankment Width:	**5**	ft
Bottom Elevation:	558.00	ft
Sediment Storage Elevation:	557.00	ft

BASIN NAME	BASIN 44	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	8.97	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	33	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	10,770	ft^2
SURFACE AREA PROVIDED	12,039	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	15,786	ft^3
BASIN VOLUME PROVIDED	21,597	ft^3
TOP OF EMBANKMENT ELEVATION	561.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	560.0	ft
EMERGENCY SPILLWAY WIDTH	35	ft
BOTTOM ELEVATION	558.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	557.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2.5	inch
ORIFICE DIAMETER	2	inch
DEWATERING TIME	3.75	days

BASIN NAME		PROJECT NAME
BASIN 45	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 45

Modified Rational

Highest Elevation =	**587**	feet
Inlet Elevation =	**543**	feet
Difference =	44	feet
Travel Length =	**293**	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc =Time of Concentration (min)

H =Height of the most remote point on the watershed above the outlet (ft)

L =Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	1.29	min
T_C =	**5**	min
Intensity 50 year =	**8.21**	in/hr
C =	**0.45**	
Disturbed Area =	**1.89**	acres
Additional Drainage Area =	**0.00**	acres
Total Drainage Area=	1.89	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **6.98** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 45	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		**PROJECT NUMBER**
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 45 TYPE OF BASIN: SKIMMER

Disturbed Area:	1.89	ac
Additional Drainage Area:	0.00	ac
Total Drainage Area:	1.89	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	8.21	in/hr
50-yr Discharge [Q10]:	**6.98**	cfs

Sizing of Basin

3402	Required Volume ft^3	(Disturbed Area x 1800 cf/ac)
2269	Required Surface Area ft^2	**(Q50 x 325)**
33.7	Suggested Width ft	
67.4	Suggested Length ft	
34	Width at Surface Area (ft)	
68	Length at Surface Area (ft)	L/W Ratio = 2.0 **Okay**
3	Side Slope Ratio Z:1	
2	Depth (ft)	
22	Target Bottom Width (ft)	
56	Target Bottom Length (ft)	
1232	Target Bottom Area ($ft^{2)}$	
3496	Target Volume (ft^3)	**Okay**
2312	Target Surface Area (ft^2)	**Okay**
4236	Provided Volume (ft^3)	
2736	Provided Surface Area (ft^2)	
10	Emergency Spillway Width (ft)	
0.5	Depth of Flow (ft)	
10.6	Spillway Capacity (cfs)	**Okay**
1.5	Skimmer Size (in)	
0.125	Head on Skimmer (ft)	
1	Orifice Size (1/4 inch increments)	
4.17	Dewatering Time (days)	
	Suggest about 3 days	

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
541.00	**1528**	0.00	0	0
542.00	**2104**	1.00	1816	1816
543.00	**2736**	2.00	2420	4236

Top of Embankment Elevation:	544.00	ft
Emergency Spillway Elevation:	543.00	ft
Embankment Width:	**5**	ft
Bottom Elevation:	541.00	ft
Sediment Storage Elevation:	540.00	ft

BASIN NAME	BASIN 45	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	1.89	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	7	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	2,269	ft^2
SURFACE AREA PROVIDED	2,736	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	3,402	ft^3
BASIN VOLUME PROVIDED	4,236	ft^3
TOP OF EMBANKMENT ELEVATION	544.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	543.0	ft
EMERGENCY SPILLWAY WIDTH	10	ft
BOTTOM ELEVATION	541.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	540.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	1.5	inch
ORIFICE DIAMETER	1	inch
DEWATERING TIME	4.17	days

BASIN NAME		PROJECT NAME
BASIN 46	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 46

Modified Rational

Highest Elevation =	**551**	feet
Inlet Elevation =	**515**	feet
Difference =	36	feet
Travel Length =	**575**	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc =Time of Concentration (min)

H =Height of the most remote point on the watershed above the outlet (ft)

L =Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	3.03	min
T_C =	**5**	min
Intensity 50 year =	**8.21**	in/hr
C =	**0.45**	
Disturbed Area =	**2.84**	acres
Additional Drainage Area =	**0.00**	acres
Total Drainage Area=	2.84	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **10.49** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 46	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		**PROJECT NUMBER**
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 46 TYPE OF BASIN: SKIMMER

Disturbed Area:	2.84	ac
Additional Drainage Area:	0.00	ac
Total Drainage Area:	2.84	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	8.21	in/hr
50-yr Discharge [Q10]:	**10.49**	cfs

Sizing of Basin

5112	Required Volume ft^3	(Disturbed Area x 1800 cf/ac)	
3410	Required Surface Area ft^2	**(Q50 x 325)**	
41.3	Suggested Width ft		
82.6	Suggested Length ft		
32	Width at Surface Area (ft)		
125	Length at Surface Area (ft)	L/W Ratio = 3.9	**Okay**
3	Side Slope Ratio Z:1		
2	Depth (ft)		
20	Target Bottom Width (ft)		
113	Target Bottom Length (ft)		
2260	Target Bottom Area ($ft^{2)}$		
6212	Target Volume (ft^3)	**Okay**	
4000	Target Surface Area (ft^2)	**Okay**	
6048	Provided Volume (ft^3)		
3835	Provided Surface Area (ft^2)		
10	Emergency Spillway Width (ft)		
0.5	Depth of Flow (ft)		
10.6	Spillway Capacity (cfs)	**Okay**	
1.5	Skimmer Size (in)		
0.125	Head on Skimmer (ft)		
1.25	Orifice Size (1/4 inch increments)		
4.01	Dewatering Time (days)		
	Suggest about 3 days		

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
513.00	**2241**	0.00	0	0
514.00	**3010**	1.00	2626	2626
515.00	**3835**	2.00	3423	6048

Top of Embankment Elevation:	516.00	ft
Emergency Spillway Elevation:	515.00	ft
Embankment Width:	**5**	ft
Bottom Elevation:	513.00	ft
Sediment Storage Elevation:	512.00	ft

BASIN NAME	BASIN 46	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	2.84	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	10	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	3,410	ft^2
SURFACE AREA PROVIDED	3,835	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	5,112	ft^3
BASIN VOLUME PROVIDED	6,048	ft^3
TOP OF EMBANKMENT ELEVATION	516.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	515.0	ft
EMERGENCY SPILLWAY WIDTH	10	ft
BOTTOM ELEVATION	513.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	512.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	1.5	inch
ORIFICE DIAMETER	1.25	inch
DEWATERING TIME	4.01	days

BASIN NAME		PROJECT NAME
BASIN 47	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 47

Modified Rational

Highest Elevation =	632	feet
Inlet Elevation =	554	feet
Difference =	78	feet
Travel Length =	1,227	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc =Time of Concentration (min)

H =Height of the most remote point on the watershed above the outlet (ft)

L =Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	5.39	min
T_C =	5	min
Intensity 50 year =	8.21	in/hr
C =	0.45	
Disturbed Area =	11.62	acres
Additional Drainage Area =	1.11	acres
Total Drainage Area=	12.73	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **47.03** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 47	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 47 TYPE OF BASIN: RISER

Disturbed Area:	11.62	ac
Additional Drainage Area:	1.11	ac
Total Drainage Area:	12.73	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	8.21	in/hr
50-yr Discharge [Q10]:	**47.03**	cfs

Sizing of Basin

20916	Required Volume ft^3	(Disturbed Area x 1800 cf/ac)		
20458	Required Surface Area ft^2	**(Q50 x 435)**		
101.1	Suggested Width ft			
202.3	Suggested Length ft			
89	Width at Surface Area (ft)			
242	Length at Surface Area (ft)	L/W Ratio =	2.7	**Okay**
3	Side Slope Ratio Z:1			
2	Depth (ft)			
77	Target Bottom Width (ft)			
230	Target Bottom Length (ft)			
17710	Target Bottom Area ($ft^{2)}$			
39200	Target Volume (ft^3)	**Okay**		
21538	Target Surface Area (ft^2)	**Okay**		

39068	Provided Volume (ft^3)
21464	Provided Surface Area (ft^2)

45	Emergency Spillway Width (ft)	
0.5	Depth of Flow (ft)	
47.7	Spillway Capacity (cfs)	**Okay**
2.5	Skimmer Size (in)	
0.208	Head on Skimmer (ft)	
2.25	Orifice Size (1/4 inch increments)	
3.92	Dewatering Time (days)	
	Suggest about 3 days	

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
552.00	**17640**	0.00	0	0
553.00	**19516**	1.00	18578	18578
554.00	**21464**	2.00	20490	39068

Top of Embankment Elevation:	556.00	ft
Emergency Spillway Elevation:	555.00	ft
Embankment Width:	**10**	ft
Riser Elevation:	554.00	ft
Bottom Elevation:	552.00	ft
Sediment Storage Elevation:	551.00	ft

Sizing of Barrel & Riser

12	Barrel Size (in)	
62	Barrel Length (LF)	
552	Upstream Barrel Invert Elevation	
549	Downstream Barrel Invert Elevation	
4.84%	Slope of Barrel (%)	
HDPE	Barrel Pipe Material	
CMP	Riser Material	
18	Riser Size (in)	**Okay (Riser = 1.5 Barrel Size)**

Anti-Flotation Device (Only use for circular riser)

1.5	Riser Diameter (ft)	
3.0	Height (ft)	
		Area Riser x Ht Riser x Density Water x Safety Factor
380	Buoyant Force (lbs)	(.25)(pi)(Diameter)2 x (Height) x 62.4 pcf x 1.15 FS
2.5	Volume Required (cf)	Buoyant force / Density Of Concrete (150 pcf)
1.6	Square Root of Volume (ft)	(Assume 1 ft thick concrete footing)
2.0	Length of Concrete Footing	
2.0	Width of Concrete Footing	
1.0	Height of Concrete Footing (Thickness)	
4	Volume Provided (cf)	

***RED IS USER INPUT**

BASIN NAME	BASIN 47	
BASIN TYPE	RISER	
TOTAL DRAINAGE AREA	12.73	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	47	cfs
SURFACE AREA (AC) = 435 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	20,458	ft^2
SURFACE AREA PROVIDED	21,464	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	20,916	ft^3
BASIN VOLUME PROVIDED	39,068	ft^3
TOP OF EMBANKMENT ELEVATION	556.0	ft
EMBANKMENT WIDTH	10	ft
EMERGENCY SPILLWAY ELEVATION	555.0	ft
EMERGENCY SPILLWAY WIDTH	45	ft
RISER ELEVATION	554.0	ft
BOTTOM ELEVATION	552.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	551.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2.5	inch
ORIFICE DIAMETER	2.25	inch
DEWATERING TIME	3.92	days

BASIN NAME		PROJECT NAME
BASIN 48	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 48

Modified Rational

Highest Elevation =	590.5	feet
Inlet Elevation =	512	feet
Difference =	78.5	feet
Travel Length =	905	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc =Time of Concentration (min)

H =Height of the most remote point on the watershed above the outlet (ft)

L =Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	3.79	min
T_C =	5	min
Intensity 50 year =	8.21	in/hr
C =	0.45	
Disturbed Area =	5.12	acres
Additional Drainage Area =	0.00	acres
Total Drainage Area=	5.12	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **18.92** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 48	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		**PROJECT NUMBER**
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 48 TYPE OF BASIN: SKIMMER

Disturbed Area:	5.12	ac
Additional Drainage Area:	0.00	ac
Total Drainage Area:	5.12	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	8.21	in/hr
50-yr Discharge [Q10]:	**18.92**	cfs

Sizing of Basin

9216	Required Volume ft^3	(Disturbed Area x 1800 cf/ac)
6148	Required Surface Area ft^2	**(Q50 x 325)**
55.4	Suggested Width ft	
110.9	Suggested Length ft	
57	Width at Surface Area (ft)	
117	Length at Surface Area (ft)	L/W Ratio = 2.1 **Okay**
3	Side Slope Ratio Z:1	
2	Depth (ft)	
45	Target Bottom Width (ft)	
105	Target Bottom Length (ft)	
4725	Target Bottom Area ($ft^{2)}$	
11346	Target Volume (ft^3)	**Okay**
6669	Target Surface Area (ft^2)	**Okay**
11481	Provided Volume (ft^3)	
6736	Provided Surface Area (ft^2)	
20	Emergency Spillway Width (ft)	
0.5	Depth of Flow (ft)	
21.2	Spillway Capacity (cfs)	**Okay**
2	Skimmer Size (in)	
0.167	Head on Skimmer (ft)	
1.75	Orifice Size (1/4 inch increments)	
3.19	Dewatering Time (days)	
	Suggest about 3 days	

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
510.00	**4781**	0.00	0	0
511.00	**5722**	1.00	5252	5252
512.00	**6736**	2.00	6229	11481

Top of Embankment Elevation:	513.00	ft
Emergency Spillway Elevation:	512.00	ft
Embankment Width:	**5**	ft
Bottom Elevation:	510.00	ft
Sediment Storage Elevation:	509.00	ft

BASIN NAME	BASIN 48	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	5.12	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	19	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	6,148	ft^2
SURFACE AREA PROVIDED	6,736	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	9,216	ft^3
BASIN VOLUME PROVIDED	11,481	ft^3
TOP OF EMBANKMENT ELEVATION	513.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	512.0	ft
EMERGENCY SPILLWAY WIDTH	20	ft
BOTTOM ELEVATION	510.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	509.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2	inch
ORIFICE DIAMETER	1.75	inch
DEWATERING TIME	3.19	days

BASIN NAME		PROJECT NAME
BASIN 49	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 49

Modified Rational

Highest Elevation =	632	feet
Inlet Elevation =	553	feet
Difference =	79	feet
Travel Length =	1,284	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc =Time of Concentration (min)

H =Height of the most remote point on the watershed above the outlet (ft)

L =Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	5.66	min
T_C =	5	min
Intensity 50 year =	8.21	in/hr
C =	0.45	
Disturbed Area =	7.92	acres
Additional Drainage Area =	0.04	acres
Total Drainage Area=	7.96	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **29.41** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 49	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		**PROJECT NUMBER**
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 49 TYPE OF BASIN: SKIMMER

Disturbed Area:	7.92	ac
Additional Drainage Area:	0.04	ac
Total Drainage Area:	7.96	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	8.21	in/hr
50-yr Discharge [Q10]:	**29.41**	cfs

Sizing of Basin

14256	Required Volume ft^3	(Disturbed Area x 1800 cf/ac)	
9558	Required Surface Area ft^2	**(Q50 x 325)**	
69.1	Suggested Width ft		
138.3	Suggested Length ft		
64	Width at Surface Area (ft)		
153	Length at Surface Area (ft)	L/W Ratio = 2.4	**Okay**
3	Side Slope Ratio Z:1		
2	Depth (ft)		
52	Target Bottom Width (ft)		
141	Target Bottom Length (ft)		
7332	Target Bottom Area ($ft^{2)}$		
17076	Target Volume (ft^3)	**Okay**	
9792	Target Surface Area (ft^2)	**Okay**	
17301	Provided Volume (ft^3)		
9904	Provided Surface Area (ft^2)		
30	Emergency Spillway Width (ft)		
0.5	Depth of Flow (ft)		
31.8	Spillway Capacity (cfs)	**Okay**	
2.5	Skimmer Size (in)		
0.208	Head on Skimmer (ft)		
2	Orifice Size (1/4 inch increments)		
3.38	Dewatering Time (days)		
	Suggest about 3 days		

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
551.00	**7433**	0.00	0	0
552.00	**8632**	1.00	8033	8033
553.00	**9904**	2.00	9268	17301

Top of Embankment Elevation:	554.00	ft
Emergency Spillway Elevation:	553.00	ft
Embankment Width:	**5**	ft
Bottom Elevation:	551.00	ft
Sediment Storage Elevation:	550.00	ft

BASIN NAME	BASIN 49	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	7.96	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	29	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	9,558	ft^2
SURFACE AREA PROVIDED	9,904	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	14,256	ft^3
BASIN VOLUME PROVIDED	17,301	ft^3
TOP OF EMBANKMENT ELEVATION	554.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	553.0	ft
EMERGENCY SPILLWAY WIDTH	30	ft
BOTTOM ELEVATION	551.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	550.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2.5	inch
ORIFICE DIAMETER	2	inch
DEWATERING TIME	3.38	days

BASIN NAME		PROJECT NAME
BASIN 50	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 50

Modified Rational

Highest Elevation =	632	feet
Inlet Elevation =	586	feet
Difference =	46	feet
Travel Length =	748	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc =Time of Concentration (min)

H =Height of the most remote point on the watershed above the outlet (ft)

L =Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	3.73	min
T_C =	5	min
Intensity 50 year =	8.21	in/hr
C =	0.45	
Disturbed Area =	7.67	acres
Additional Drainage Area =	0.11	acres
Total Drainage Area=	7.78	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **28.74** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 50	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		**PROJECT NUMBER**
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 50 TYPE OF BASIN: SKIMMER

Disturbed Area:	7.67	ac
Additional Drainage Area:	0.11	ac
Total Drainage Area:	7.78	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	8.21	in/hr
50-yr Discharge [Q10]:	**28.74**	cfs

Sizing of Basin

13806	Required Volume ft^3	(Disturbed Area x 1800 cf/ac)	
9342	Required Surface Area ft^2	**(Q50 x 325)**	
68.3	Suggested Width ft		
136.7	Suggested Length ft		
64	Width at Surface Area (ft)		
154	Length at Surface Area (ft)	L/W Ratio = 2.4	**Okay**
3	Side Slope Ratio Z:1		
2	Depth (ft)		
52	Target Bottom Width (ft)		
142	Target Bottom Length (ft)		
7384	Target Bottom Area ($ft^{2)}$		
17192	Target Volume (ft^3)	**Okay**	
9856	Target Surface Area (ft^2)	**Okay**	
17257	Provided Volume (ft^3)		
9886	Provided Surface Area (ft^2)		
30	Emergency Spillway Width (ft)		
0.5	Depth of Flow (ft)		
31.8	Spillway Capacity (cfs)	**Okay**	
2.5	Skimmer Size (in)		
0.208	Head on Skimmer (ft)		
2	Orifice Size (1/4 inch increments)		
3.28	Dewatering Time (days)		
	Suggest about 3 days		

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
584.00	**7407**	0.00	0	0
585.00	**8610**	1.00	8009	8009
586.00	**9886**	2.00	9248	17257

Top of Embankment Elevation:	587.00	ft
Emergency Spillway Elevation:	586.00	ft
Embankment Width:	**5**	ft
Bottom Elevation:	584.00	ft
Sediment Storage Elevation:	583.00	ft

BASIN NAME	BASIN 50	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	7.78	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	29	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	9,342	ft^2
SURFACE AREA PROVIDED	9,886	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	13,806	ft^3
BASIN VOLUME PROVIDED	17,257	ft^3
TOP OF EMBANKMENT ELEVATION	587.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	586.0	ft
EMERGENCY SPILLWAY WIDTH	30	ft
BOTTOM ELEVATION	584.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	583.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2.5	inch
ORIFICE DIAMETER	2	inch
DEWATERING TIME	3.28	days

BASIN NAME		PROJECT NAME
BASIN 51	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 51

Modified Rational

Highest Elevation =	602	feet
Inlet Elevation =	515	feet
Difference =	87	feet
Travel Length =	1,228	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc =Time of Concentration (min)

H =Height of the most remote point on the watershed above the outlet (ft)

L =Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	5.18	min
T_C =	5	min
Intensity 50 year =	8.21	in/hr
C =	0.45	
Disturbed Area =	9.65	acres
Additional Drainage Area =	0.00	acres
Total Drainage Area=	9.65	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **35.65** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 51	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		**PROJECT NUMBER**
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 51 TYPE OF BASIN: SKIMMER

Disturbed Area:	9.65	ac
Additional Drainage Area:	0.00	ac
Total Drainage Area:	9.65	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	8.21	in/hr
50-yr Discharge [Q10]:	**35.65**	cfs

Sizing of Basin

17370	Required Volume ft^3	(Disturbed Area x 1800 cf/ac)
11587	Required Surface Area ft^2	**(Q50 x 325)**
76.1	Suggested Width ft	
152.2	Suggested Length ft	
74	Width at Surface Area (ft)	
158	Length at Surface Area (ft)	L/W Ratio = 2.1 **Okay**
3	Side Slope Ratio Z:1	
2	Depth (ft)	
62	Target Bottom Width (ft)	
146	Target Bottom Length (ft)	
9052	Target Bottom Area ($ft^{2)}$	
20696	Target Volume (ft^3)	**Okay**
11692	Target Surface Area (ft^2)	**Okay**
21064	Provided Volume (ft^3)	
11860	Provided Surface Area (ft^2)	
35	Emergency Spillway Width (ft)	
0.5	Depth of Flow (ft)	
37.1	Spillway Capacity (cfs)	**Okay**
2.5	Skimmer Size (in)	
0.208	Head on Skimmer (ft)	
2.25	Orifice Size (1/4 inch increments)	
3.26	Dewatering Time (days)	
	Suggest about 3 days	

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
513.00	**9232**	0.00	0	0
514.00	**10518**	1.00	9875	9875
515.00	**11860**	2.00	11189	21064

Top of Embankment Elevation:	516.00	ft
Emergency Spillway Elevation:	515.00	ft
Embankment Width:	**5**	ft
Bottom Elevation:	513.00	ft
Sediment Storage Elevation:	512.00	ft

BASIN NAME	BASIN 51	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	9.65	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	36	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	11,587	ft^2
SURFACE AREA PROVIDED	11,860	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	17,370	ft^3
BASIN VOLUME PROVIDED	21,064	ft^3
TOP OF EMBANKMENT ELEVATION	516.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	515.0	ft
EMERGENCY SPILLWAY WIDTH	35	ft
BOTTOM ELEVATION	513.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	512.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2.5	inch
ORIFICE DIAMETER	2.25	inch
DEWATERING TIME	3.26	days

BASIN NAME		PROJECT NAME
BASIN 52	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 52

Modified Rational

Highest Elevation =	622	feet
Inlet Elevation =	567	feet
Difference =	55	feet
Travel Length =	799	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc	=Time of Concentration (min)
H	=Height of the most remote point on the watershed above the outlet (ft)
L	=Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	3.76	min
T_C =	5	min
Intensity 50 year =	8.21	in/hr
C =	0.45	
Disturbed Area =	8.77	acres
Additional Drainage Area =	0.00	acres
Total Drainage Area=	8.77	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **32.40** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 52	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		**PROJECT NUMBER**
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 52 TYPE OF BASIN: SKIMMER

Disturbed Area:	8.77	ac
Additional Drainage Area:	0.00	ac
Total Drainage Area:	8.77	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	8.21	in/hr
50-yr Discharge [Q10]:	**32.40**	cfs

Sizing of Basin

15786	Required Volume ft^3	(Disturbed Area x 1800 cf/ac)	
10530	Required Surface Area ft^2	**(Q50 x 325)**	
72.6	Suggested Width ft		
145.1	Suggested Length ft		
65	Width at Surface Area (ft)		
214	Length at Surface Area (ft)	L/W Ratio = 3.3	**Okay**
3	Side Slope Ratio Z:1		
2	Depth (ft)		
53	Target Bottom Width (ft)		
202	Target Bottom Length (ft)		
10706	Target Bottom Area ($ft^{2)}$		
24568	Target Volume (ft^3)	**Okay**	
13910	Target Surface Area (ft^2)	**Okay**	
19440	Provided Volume (ft^3)		
11136	Provided Surface Area (ft^2)		
35	Emergency Spillway Width (ft)		
0.5	Depth of Flow (ft)		
37.1	Spillway Capacity (cfs)	**Okay**	
2.5	Skimmer Size (in)		
0.208	Head on Skimmer (ft)		
2	Orifice Size (1/4 inch increments)		
3.75	Dewatering Time (days)		
	Suggest about 3 days		

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
565.00	**8332**	0.00	0	0
566.00	**9706**	1.00	9019	9019
567.00	**11136**	2.00	10421	19440

Top of Embankment Elevation:	568.00	ft
Emergency Spillway Elevation:	567.00	ft
Embankment Width:	**5**	ft
Bottom Elevation:	565.00	ft
Sediment Storage Elevation:	564.00	ft

BASIN NAME	BASIN 52	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	8.77	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	32	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	10,530	ft^2
SURFACE AREA PROVIDED	11,136	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	15,786	ft^3
BASIN VOLUME PROVIDED	19,440	ft^3
TOP OF EMBANKMENT ELEVATION	568.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	567.0	ft
EMERGENCY SPILLWAY WIDTH	35	ft
BOTTOM ELEVATION	565.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	564.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2.5	inch
ORIFICE DIAMETER	2	inch
DEWATERING TIME	3.75	days

BASIN NAME		PROJECT NAME
BASIN 53	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 53

Modified Rational

Highest Elevation =	610	feet
Inlet Elevation =	559	feet
Difference =	51	feet
Travel Length =	498	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc =Time of Concentration (min)

H =Height of the most remote point on the watershed above the outlet (ft)

L =Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	2.24	min
T_C =	5	min
Intensity 50 year =	8.21	in/hr
C =	0.45	
Disturbed Area =	4.06	acres
Additional Drainage Area =	0.00	acres
Total Drainage Area=	4.06	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **15.00** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 53	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		**PROJECT NUMBER**
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 53 TYPE OF BASIN: SKIMMER

Disturbed Area:	4.06	ac
Additional Drainage Area:	0.00	ac
Total Drainage Area:	4.06	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	8.21	in/hr
50-yr Discharge [Q10]:	**15.00**	cfs

Sizing of Basin

7308	Required Volume ft^3	(Disturbed Area x 1800 cf/ac)	
4875	Required Surface Area ft^2	**(Q50 x 325)**	
49.4	Suggested Width ft		
98.7	Suggested Length ft		
47	Width at Surface Area (ft)		
110	Length at Surface Area (ft)	L/W Ratio = 2.3	**Okay**
3	Side Slope Ratio Z:1		
2	Depth (ft)		
35	Target Bottom Width (ft)		
98	Target Bottom Length (ft)		
3430	Target Bottom Area ($ft^{2)}$		
8552	Target Volume (ft^3)	**Okay**	
5170	Target Surface Area (ft^2)	**Okay**	
8409	Provided Volume (ft^3)		
5047	Provided Surface Area (ft^2)		
15	Emergency Spillway Width (ft)		
0.5	Depth of Flow (ft)		
15.9	Spillway Capacity (cfs)	**Okay**	
2	Skimmer Size (in)		
0.167	Head on Skimmer (ft)		
1.5	Orifice Size (1/4 inch increments)		
3.44	Dewatering Time (days)		
	Suggest about 3 days		

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
557.00	**3390**	0.00	0	0
558.00	**4190**	1.00	3790	3790
559.00	**5047**	2.00	4619	8409

Top of Embankment Elevation:	560.00	ft
Emergency Spillway Elevation:	559.00	ft
Embankment Width:	**5**	ft
Bottom Elevation:	557.00	ft
Sediment Storage Elevation:	556.00	ft

BASIN NAME	BASIN 53	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	4.06	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	15	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	4,875	ft^2
SURFACE AREA PROVIDED	5,047	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	7,308	ft^3
BASIN VOLUME PROVIDED	8,409	ft^3
TOP OF EMBANKMENT ELEVATION	560.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	559.0	ft
EMERGENCY SPILLWAY WIDTH	15	ft
BOTTOM ELEVATION	557.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	556.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2	inch
ORIFICE DIAMETER	1.5	inch
DEWATERING TIME	3.44	days

BASIN NAME		PROJECT NAME
BASIN 54	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 54

Modified Rational

Highest Elevation =	613	feet
Inlet Elevation =	566	feet
Difference =	47	feet
Travel Length =	1,003	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc =Time of Concentration (min)

H =Height of the most remote point on the watershed above the outlet (ft)

L =Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	5.19	min
T_C =	5	min
Intensity 50 year =	8.21	in/hr
C =	0.45	
Disturbed Area =	5.59	acres
Additional Drainage Area =	0.00	acres
Total Drainage Area=	5.59	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **20.65** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 54	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		**PROJECT NUMBER**
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 54 TYPE OF BASIN: SKIMMER

Disturbed Area:	5.59	ac
Additional Drainage Area:	0.00	ac
Total Drainage Area:	5.59	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	8.21	in/hr
50-yr Discharge [Q10]:	**20.65**	cfs

Sizing of Basin

10062	Required Volume ft^3	(Disturbed Area x 1800 cf/ac)
6712	Required Surface Area ft^2	**(Q50 x 325)**
57.9	Suggested Width ft	
115.9	Suggested Length ft	
60	Width at Surface Area (ft)	
120	Length at Surface Area (ft)	L/W Ratio = 2.0 **Okay**
3	Side Slope Ratio Z:1	
2	Depth (ft)	
48	Target Bottom Width (ft)	
108	Target Bottom Length (ft)	
5184	Target Bottom Area ($ft^{2)}$	
12336	Target Volume (ft^3)	**Okay**
7200	Target Surface Area (ft^2)	**Okay**
12311	Provided Volume (ft^3)	
7143	Provided Surface Area (ft^2)	
20	Emergency Spillway Width (ft)	
0.5	Depth of Flow (ft)	
21.2	Spillway Capacity (cfs)	**Okay**
2	Skimmer Size (in)	
0.167	Head on Skimmer (ft)	
1.75	Orifice Size (1/4 inch increments)	
3.48	Dewatering Time (days)	
	Suggest about 3 days	

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
564.00	**5196**	0.00	0	0
565.00	**6141**	1.00	5669	5669
566.00	**7143**	2.00	6642	12311

Top of Embankment Elevation:	567.00	ft
Emergency Spillway Elevation:	566.00	ft
Embankment Width:	**5**	ft
Bottom Elevation:	564.00	ft
Sediment Storage Elevation:	563.00	ft

BASIN NAME	BASIN 54	
BASIN TYPE	SKIMMER	
TOTAL DRAINAGE AREA	5.59	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	21	cfs
SURFACE AREA (AC) = 325 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	6,712	ft^2
SURFACE AREA PROVIDED	7,143	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	10,062	ft^3
BASIN VOLUME PROVIDED	12,311	ft^3
TOP OF EMBANKMENT ELEVATION	567.0	ft
EMBANKMENT WIDTH	5	ft
EMERGENCY SPILLWAY ELEVATION	566.0	ft
EMERGENCY SPILLWAY WIDTH	20	ft
BOTTOM ELEVATION	564.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	563.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2	inch
ORIFICE DIAMETER	1.75	inch
DEWATERING TIME	3.48	days

BASIN NAME		PROJECT NAME
BASIN 55	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
April Blye		44089.001

Time of Concentration Calculation

BASIN NAME: BASIN 55

Modified Rational

Highest Elevation =	630	feet
Inlet Elevation =	587	feet
Difference =	43	feet
Travel Length =	759	feet

Equation 2.3 Kirpich Equation

$$Tc = \frac{(L^3 / H)^{0.385}}{128}$$

Where :

Tc =Time of Concentration (min)

H =Height of the most remote point on the watershed above the outlet (ft)

L =Length of flow from the most remote point on the watershed to the outlet (ft)

(Civil Engineering, Vol. 10, No. 6,June 1940,p.362.)

A graph of the Kirpich Equation also appears in Figure 2.4.

T_C =	3.90	min
T_C =	5	min
Intensity 50 year =	8.21	in/hr
C =	0.45	
Disturbed Area =	10.47	acres
Additional Drainage Area =	0.48	acres
Total Drainage Area=	10.95	acres

Equation 2.1 Rational Equation

$$Q = C\ I\ A$$

Where:

Q	=	Peak flow from the drainage area (cfs)
C	=	Coefficient of runoff (dimensionless)
I	=	Rainfall intensity for a given time to peak (in/hr)
A	=	Drainage area (acres)

Q50= **40.45** cfs

*RED IS USER INPUT

BASIN NAME		PROJECT NAME
BASIN 55	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Sediment Basin Design

Basin Name: BASIN 55 TYPE OF BASIN: RISER

Disturbed Area:	10.47	ac
Additional Drainage Area:	0.48	ac
Total Drainage Area:	10.95	ac
Runoff Coeff [Cc]:	0.45	
50-yr Rainfall Intensity [I]:	8.21	in/hr
50-yr Discharge [Q10]:	**40.45**	cfs

Sizing of Basin

18846	Required Volume ft^3	(Disturbed Area x 1800 cf/ac)	
17598	Required Surface Area ft^2	**(Q50 x 435)**	
93.8	Suggested Width ft		
187.6	Suggested Length ft		
96	Width at Surface Area (ft)		
192	Length at Surface Area (ft)	L/W Ratio = 2.0	**Okay**
3	Side Slope Ratio Z:1		
2	Depth (ft)		
84	Target Bottom Width (ft)		
180	Target Bottom Length (ft)		
15120	Target Bottom Area ($ft^{2)}$		
33504	Target Volume (ft^3)	**Okay**	
18432	Target Surface Area (ft^2)	**Okay**	

33516	Provided Volume (ft^3)
18432	Provided Surface Area (ft^2)

40	Emergency Spillway Width (ft)	
0.5	Depth of Flow (ft)	
42.4	Spillway Capacity (cfs)	**Okay**
2.5	Skimmer Size (in)	
0.208	Head on Skimmer (ft)	
2.25	Orifice Size (1/4 inch increments)	
3.53	Dewatering Time (days)	
	Suggest about 3 days	

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Elevation	Area(sf)	Depth(ft)	Incr. Vol. (cf)	Cumulative Volume (cf)
585.00	**15120**	0.00	0	0
586.00	**16740**	1.00	15930	15930
587.00	**18432**	2.00	17586	33516

Top of Embankment Elevation:	589.00	ft
Emergency Spillway Elevation:	588.00	ft
Embankment Width:	**10**	ft
Riser Elevation:	587.00	ft
Bottom Elevation:	585.00	ft
Sediment Storage Elevation:	584.00	ft

Sizing of Barrel & Riser

12	Barrel Size (in)	
44	Barrel Length (LF)	
585	Upstream Barrel Invert Elevation	
584	Downstream Barrel Invert Elevation	
2.27%	Slope of Barrel (%)	
HDPE	Barrel Pipe Material	
CMP	Riser Material	
18	Riser Size (in)	**Okay (Riser = 1.5 Barrel Size)**

Anti-Flotation Device (Only use for circular riser)

1.5	Riser Diameter (ft)	
3.0	Height (ft)	
		Area Riser x Ht Riser x Density Water x Safety Factor
380	Buoyant Force (lbs)	(.25)(pi)(Diameter)2 x (Height) x 62.4 pcf x 1.15 FS
2.5	Volume Required (cf)	Buoyant force / Density Of Concrete (150 pcf)
1.6	Square Root of Volume (ft)	(Assume 1 ft thick concrete footing)
2.0	Length of Concrete Footing	
2.0	Width of Concrete Footing	
1.0	Height of Concrete Footing (Thickness)	
4	Volume Provided (cf)	

***RED IS USER INPUT**

BASIN NAME	BASIN 55	
BASIN TYPE	RISER	
TOTAL DRAINAGE AREA	10.95	acres
Tc (TIME OF CONCENTRATION)	5	min
C VALUE	0.45	
I (50 YEAR STORM)	8.21	in/hr
SURFACE AREA CALCULATION:		
Q50=CIA	40	cfs
SURFACE AREA (AC) = 435 SF * Q50 (CFS)		
SURFACE AREA REQUIRED	17,598	ft^2
SURFACE AREA PROVIDED	18,432	ft^2
BASIN VOLUME CALCULATION:		
BASIN VOLUME DESIGN = 1,800 ft^3/acre		
BASIN VOLUME REQUIRED	18,846	ft^3
BASIN VOLUME PROVIDED	33,516	ft^3
TOP OF EMBANKMENT ELEVATION	589.0	ft
EMBANKMENT WIDTH	10	ft
EMERGENCY SPILLWAY ELEVATION	588.0	ft
EMERGENCY SPILLWAY WIDTH	40	ft
RISER ELEVATION	587.0	ft
BOTTOM ELEVATION	585.0	ft
BASIN DEPTH	2	ft
BOTTOM OF SEDIMENT STORAGE @ ELEV. =	584.0	ft
PROVIDE 3 BAFFLES		
SKIMMER SIZE	2.5	inch
ORIFICE DIAMETER	2.25	inch
DEWATERING TIME	3.53	days

DITCH NAME		PROJECT NAME
TDD 1A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 1A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	5.41	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	**20.0**	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	470 LF
Slope =	0.023	(ft/ft)	Highest Elevation =	700
Z Required =	2.63	Ratio	Lowest Elevation =	689
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	1.20	ft	14.4	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.75 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

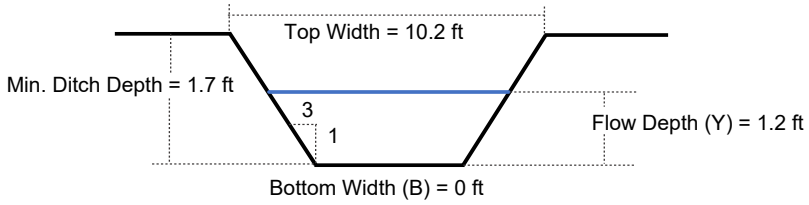
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	4.32	SF		
New P =	7.59	Wetted perimeter		
New R =	0.57	Hydraulic radius		
Z Actual =	**2.97**	Must be greater than z required=>	**2.63**	**Okay**
New V =	5.22	fps		

Minimum Design Geometry

Liner: North American Green, SC150 **2.10** LB/SF > 1.76 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.70	0.00	1.20	10.2	3:1

Ditch Liner
North American Green, SC150

*RED IS USER INPUT

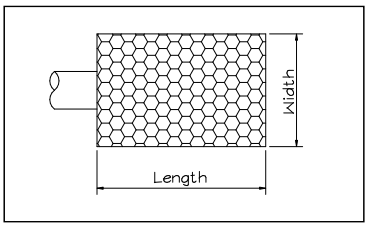
CALCULATED BY		PROJECT NAME
April Blye	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
		44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 1A

Velocity =	5.22	fps	From Fig. 8.06.c:	ZONE =	2
Top Width =	10.2	ft			
Ditch Area =	4.32	sf	Rip Rap Class =	B	
Equivalent Pipe Diameter =	28.14	in	Apron Thickness =	18	in
Equivalent Pipe Diameter =	30	in	Apron Length =	15.0	ft
			Apron Width = Top Width.=	10.2	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 1A
TOP WIDTH "A"	10.2 FT
MIN. DITCH DEPTH (FT) "B"	1.7 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, SC150

DITCH NAME		PROJECT NAME
TDD 1B	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 1B

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.28	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	1.0	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)			
Manning n =	0.030	(Dimensionless)	Ditch Length =	165	LF
Slope =	0.021	(ft/ft)	Highest Elevation =	693.5	
Z Required =	0.14	Ratio	Lowest Elevation =	690	
Side Slope (M) =	3	:1			

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.40	ft	4.8	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 0.53 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

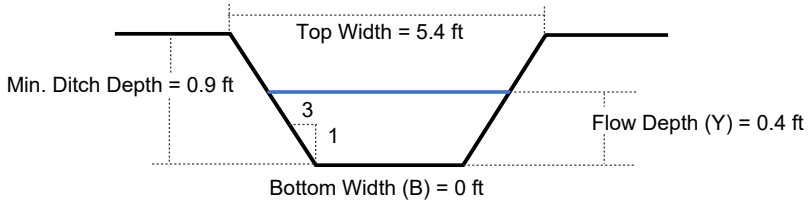
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.48	SF		
New P =	2.53	Wetted perimeter		
New R =	0.19	Hydraulic radius		
Z Actual =	0.16	Must be greater than z required=>	0.14	Okay
New V =	2.39	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 0.53 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
0.90	0.00	0.40	5.4	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

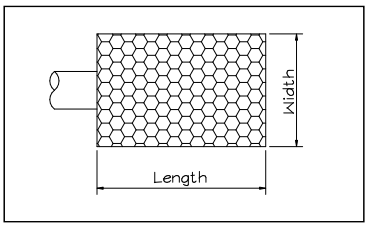
CALCULATED BY		PROJECT NAME
April Blye	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
		44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 1B

Velocity =	2.39	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	5.4	ft			
Ditch Area =	0.48	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	9.38	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	12	in	Apron Length =	4.0	ft
			Apron Width = Top Width.=	5.4	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 1B
TOP WIDTH "A"	5.4 FT
MIN. DITCH DEPTH (FT) "B"	0.9 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 2A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 2A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	4.23	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	**15.6**	(cfs)

Known Quantities

Line channel with:	6	" rip-rap	(Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)		Ditch Length =	253 LF
Slope =	0.018	(ft/ft)		Highest Elevation =	673.5
Z Required =	2.36	Ratio		Lowest Elevation =	669
Side Slope (M) =	3	:1			

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	1.00	ft	12.0	in
Bottom Width (B) =	1.00	ft	12.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.11 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

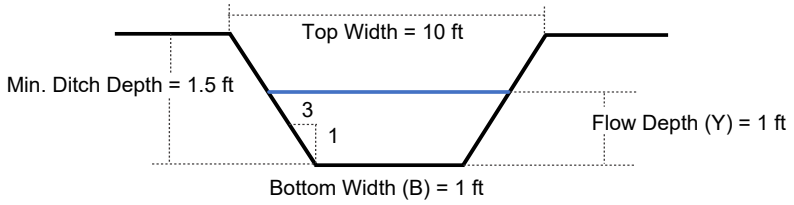
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	4.00	SF		
New P =	7.32	Wetted perimeter		
New R =	0.55	Hydraulic radius		
Z Actual =	**2.67**	Must be greater than z required=>	**2.36**	**Okay**
New V =	4.43	fps		

Minimum Design Geometry

Liner: North American Green, S75 **1.55** LB/SF > 1.11 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.50	1.00	1.00	10	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

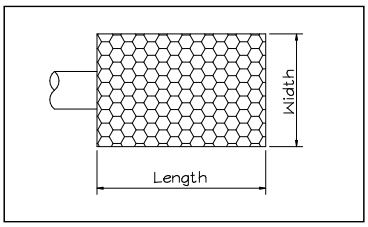
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 2A

Velocity =	4.43	fps	From Fig. 8.06.c:	ZONE =	**2**
Top Width =	10	ft			
Ditch Area =	4	sf	Rip Rap Class =	B	
Equivalent Pipe Diameter =	27.08	in	Apron Thickness =	18	in
Equivalent Pipe Diameter =	**30**	in	Apron Length =	15.0	ft
			Apron Width = Top Width.=	10.0	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 2A
TOP WIDTH "A"	10 FT
MIN. DITCH DEPTH (FT) "B"	1.5 FT
BOTTOM WIDTH (FT) "C"	1.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 2B	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 2B

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.45	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	1.7	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	270 LF
Slope =	0.020	(ft/ft)	Highest Elevation =	669.5
Z Required =	0.23	Ratio	Lowest Elevation =	664
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.50	ft	6.0	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 0.64 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

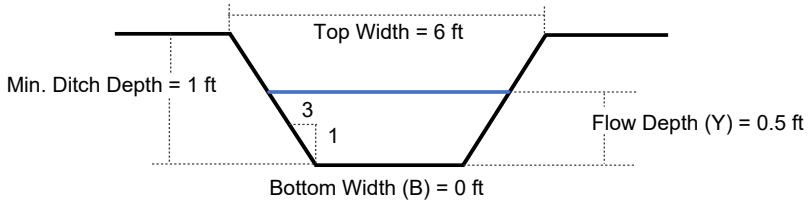
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.75	SF		
New P =	3.16	Wetted perimeter		
New R =	0.24	Hydraulic radius		
Z Actual =	0.29	Must be greater than z required=>	0.23	Okay
New V =	2.72	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 0.64 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.00	0.00	0.50	6	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

CALCULATED BY	April Blye
PROJECT NAME	Carolina Sunrock
PROJECT NUMBER	44089.001

TIMMONS GROUP
ENGINEERING | DESIGN | TECHNOLOGY

Ditch Outlet Protection (NYDOT Method)

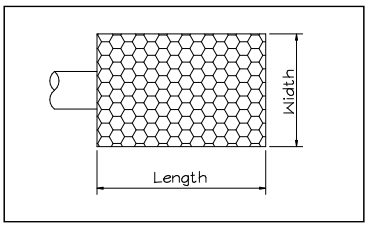
Ditch Name: TDD 2B

Velocity =	2.72	fps
Top Width =	6	ft
Ditch Area =	0.75	sf
Equivalent Pipe Diameter =	11.73	in
Equivalent Pipe Diameter =	**12**	in

From Fig. 8.06.c: ZONE = **1**

Rip Rap Class =	A	
Apron Thickness =	12	in
Apron Length =	4.0	ft
Apron Width = Top Width.=	6.0	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 2B
TOP WIDTH "A"	6 FT
MIN. DITCH DEPTH (FT) "B"	1 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 3A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 3A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	1.39	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	5.1	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	442 LF
Slope =	0.017	(ft/ft)	Highest Elevation =	670.5
Z Required =	0.79	Ratio	Lowest Elevation =	663
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.80	ft	9.6	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 0.85 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

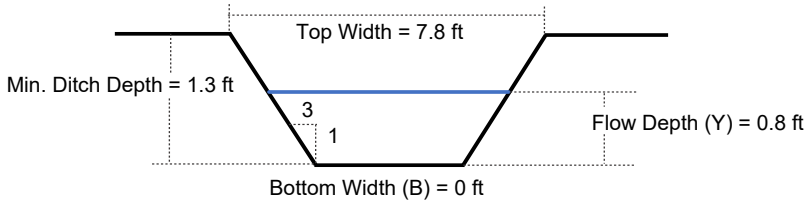
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	1.92	SF		
New P =	5.06	Wetted perimeter		
New R =	0.38	Hydraulic radius		
Z Actual =	1.01	Must be greater than z required=>	0.79	Okay
New V =	3.39	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 0.85 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.30	0.00	0.80	7.8	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

CALCULATED BY	April Blye
PROJECT NAME	Carolina Sunrock
PROJECT NUMBER	44089.001

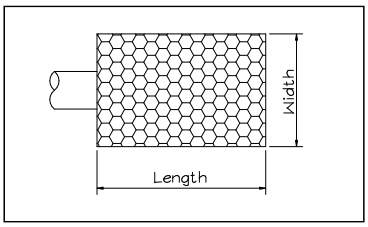
TIMMONS GROUP
ENGINEERING | DESIGN | TECHNOLOGY

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 3A

Velocity =	3.39	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	7.8	ft			
Ditch Area =	1.92	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	18.76	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	24	in	Apron Length =	8.0	ft
			Apron Width = Top Width.=	7.8	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 3A
TOP WIDTH "A"	7.8 FT
MIN. DITCH DEPTH (FT) "B"	1.3 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 3B	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 3B

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	4.28	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	15.8	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	464 LF
Slope =	0.019	(ft/ft)	Highest Elevation =	668
Z Required =	2.29	Ratio	Lowest Elevation =	659
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	1.00	ft	12.0	in
Bottom Width (B) =	1.00	ft	12.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.21 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

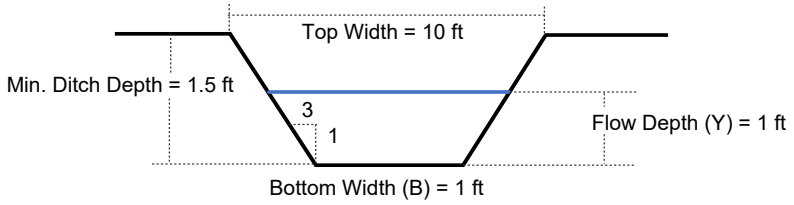
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	4.00	SF		
New P =	7.32	Wetted perimeter		
New R =	0.55	Hydraulic radius		
Z Actual =	2.67	Must be greater than z required=>	2.29	Okay
New V =	4.62	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 1.22 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.50	1.00	1.00	10	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

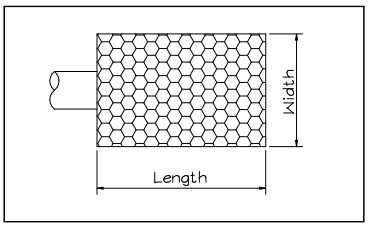
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 3B

Velocity =	4.62	fps	From Fig. 8.06.c:	ZONE =	**2**
Top Width =	10	ft			
Ditch Area =	4	sf	Rip Rap Class =	B	
Equivalent Pipe Diameter =	27.08	in	Apron Thickness =	18	in
Equivalent Pipe Diameter =	**30**	in	Apron Length =	15.0	ft
			Apron Width = Top Width.=	10.0	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 3B
TOP WIDTH "A"	10 FT
MIN. DITCH DEPTH (FT) "B"	1.5 FT
BOTTOM WIDTH (FT) "C"	1.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 4A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 4A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.59	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	2.2	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	349 LF
Slope =	0.026	(ft/ft)	Highest Elevation =	667
Z Required =	0.27	Ratio	Lowest Elevation =	658
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.50	ft	6.0	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 0.80 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

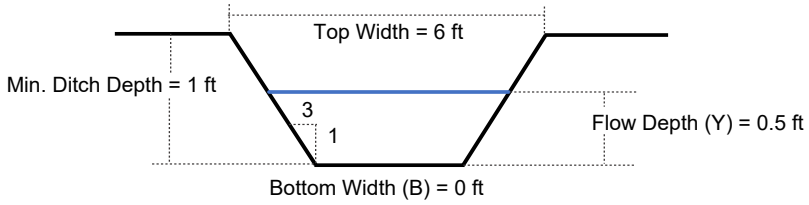
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.75	SF		
New P =	3.16	Wetted perimeter		
New R =	0.24	Hydraulic radius		
Z Actual =	0.29	Must be greater than z required=>	0.27	Okay
New V =	3.06	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 0.81 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.00	0.00	0.50	6	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

CALCULATED BY	April Blye
PROJECT NAME	Carolina Sunrock
PROJECT NUMBER	44089.001

TIMMONS GROUP
ENGINEERING | DESIGN | TECHNOLOGY

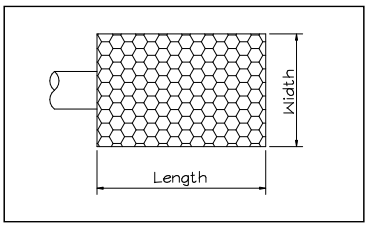
Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 4A

Velocity =	3.06	fps
Top Width =	6	ft
Ditch Area =	0.75	sf
Equivalent Pipe Diameter =	11.73	in
Equivalent Pipe Diameter =	**12**	in

From Fig. 8.06.c: ZONE =	**1**	
Rip Rap Class =	A	
Apron Thickness =	12	in
Apron Length =	4.0	ft
Apron Width = Top Width.=	6.0	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 4A
TOP WIDTH "A"	6 FT
MIN. DITCH DEPTH (FT) "B"	1 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 4B	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 4B

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.99	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	3.7	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	370 LF
Slope =	0.016	(ft/ft)	Highest Elevation =	665
Z Required =	0.58	Ratio	Lowest Elevation =	659
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.70	ft	8.4	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 0.71 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

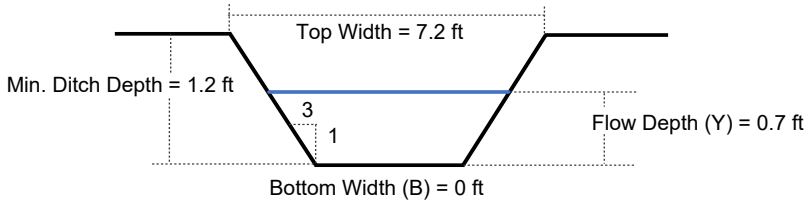
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	1.47	SF		
New P =	4.43	Wetted perimeter		
New R =	0.33	Hydraulic radius		
Z Actual =	**0.70**	Must be greater than z required=>	**0.58**	**Okay**
New V =	3.03	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 0.71 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.20	0.00	0.70	7.2	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

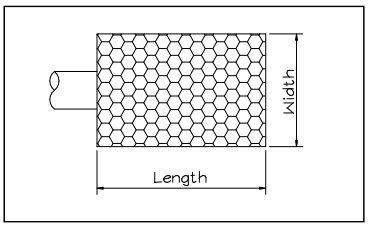
CALCULATED BY		PROJECT NAME
April Blye	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
		44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 4B

Velocity =	3.03	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	7.2	ft			
Ditch Area =	1.47	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	16.42	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	18	in	Apron Length =	6.0	ft
			Apron Width = Top Width.=	7.2	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 4B
TOP WIDTH "A"	7.2 FT
MIN. DITCH DEPTH (FT) "B"	1.2 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 5A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 5A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	1.53	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	5.7	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	492 LF
Slope =	0.029	(ft/ft)	Highest Elevation =	681.5
Z Required =	0.66	Ratio	Lowest Elevation =	667
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.70	ft	8.4	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.29 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

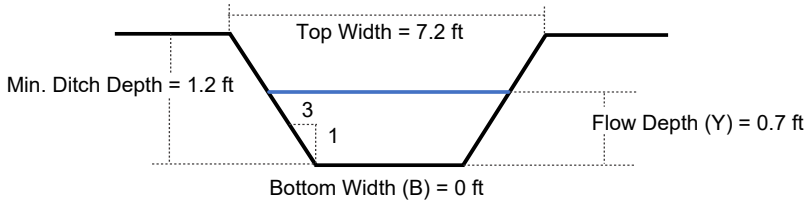
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	1.47	SF		
New P =	4.43	Wetted perimeter		
New R =	0.33	Hydraulic radius		
Z Actual =	0.70	Must be greater than z required=>	0.66	Okay
New V =	4.09	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 1.29 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.20	0.00	0.70	7.2	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

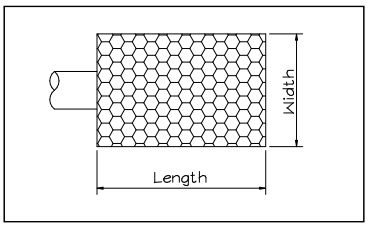
CALCULATED BY		PROJECT NAME
April Blye	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
		44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 5A

Velocity =	4.09	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	7.2	ft			
Ditch Area =	1.47	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	16.42	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	18	in	Apron Length =	6.0	ft
			Apron Width = Top Width.=	7.2	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 5A
TOP WIDTH "A"	7.2 FT
MIN. DITCH DEPTH (FT) "B"	1.2 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 6A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 6A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.31	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	1.1	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	197 LF
Slope =	0.036	(ft/ft)	Highest Elevation =	672
Z Required =	0.12	Ratio	Lowest Elevation =	665
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.40	ft	4.8	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 0.89 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

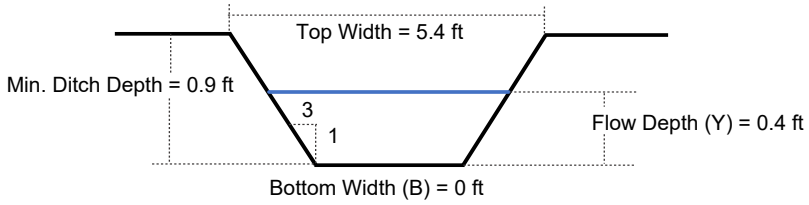
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.48	SF		
New P =	2.53	Wetted perimeter		
New R =	0.19	Hydraulic radius		
Z Actual =	0.16	Must be greater than z required=>	0.12	Okay
New V =	3.09	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 0.89 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
0.90	0.00	0.40	5.4	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

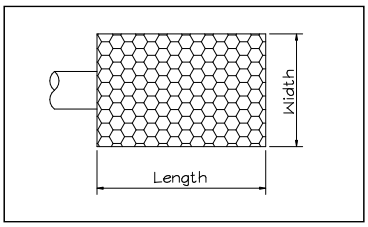
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 6A

Velocity =	3.09	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	5.4	ft			
Ditch Area =	0.48	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	9.38	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	12	in	Apron Length =	4.0	ft
			Apron Width = Top Width.=	5.4	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 6A
TOP WIDTH "A"	5.4 FT
MIN. DITCH DEPTH (FT) "B"	0.9 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 6B	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 6B

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.24	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	0.9	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	210 LF
Slope =	0.024	(ft/ft)	Highest Elevation =	670
Z Required =	0.12	Ratio	Lowest Elevation =	665
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.40	ft	4.8	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 0.59 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

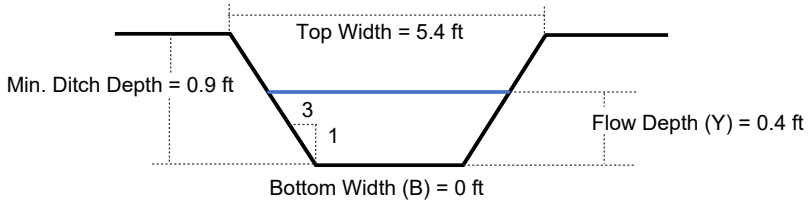
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.48	SF		
New P =	2.53	Wetted perimeter		
New R =	0.19	Hydraulic radius		
Z Actual =	0.16	Must be greater than z required=>	0.12	Okay
New V =	2.53	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 0.6 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
0.90	0.00	0.40	5.4	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

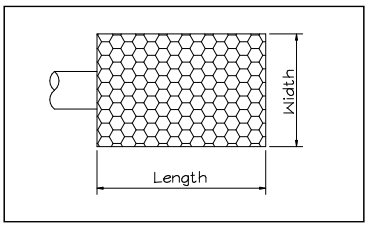
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 6B

Velocity =	2.53	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	5.4	ft			
Ditch Area =	0.48	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	9.38	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	12	in	Apron Length =	4.0	ft
			Apron Width = Top Width.=	5.4	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 6B
TOP WIDTH "A"	5.4 FT
MIN. DITCH DEPTH (FT) "B"	0.9 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 7A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 7A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	3.10	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	6.53	(in/hr)
Flow (Q_{10}) =	9.1	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	1408 LF
Slope =	0.017	(ft/ft)	Highest Elevation =	686
Z Required =	1.40	Ratio	Lowest Elevation =	662
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	1.00	ft	12.0	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.06 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

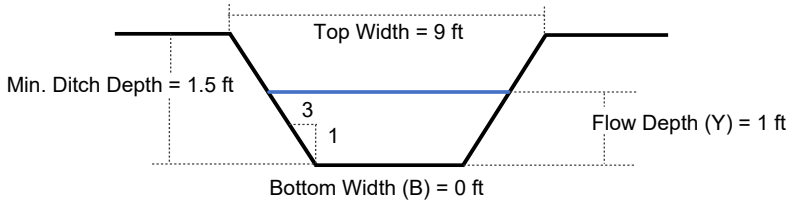
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	3.00	SF		
New P =	6.32	Wetted perimeter		
New R =	0.47	Hydraulic radius		
Z Actual =	1.82	Must be greater than z required=>	1.40	Okay
New V =	3.94	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 1.07 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.50	0.00	1.00	9	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

CALCULATED BY	April Blye
PROJECT NAME	Carolina Sunrock
PROJECT NUMBER	44089.001

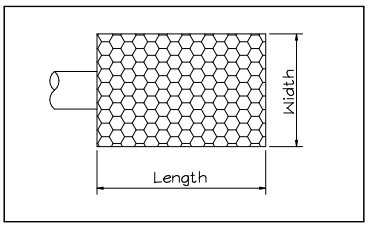
TIMMONS GROUP
ENGINEERING | DESIGN | TECHNOLOGY

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 7A

Velocity =	3.94	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	9	ft			
Ditch Area =	3	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	23.45	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	24	in	Apron Length =	8.0	ft
			Apron Width = Top Width.=	9.0	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 7A
TOP WIDTH "A"	9 FT
MIN. DITCH DEPTH (FT) "B"	1.5 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 7B	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 7B

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.63	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	6.53	(in/hr)
Flow (Q_{10}) =	1.9	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	270 LF
Slope =	0.011	(ft/ft)	Highest Elevation =	665
Z Required =	0.35	Ratio	Lowest Elevation =	662
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.60	ft	7.2	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 0.42 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

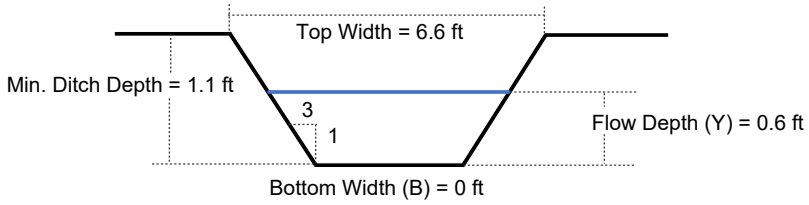
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	1.08	SF		
New P =	3.79	Wetted perimeter		
New R =	0.28	Hydraulic radius		
Z Actual =	0.47	Must be greater than z required=>	0.35	Okay
New V =	2.27	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 0.42 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.10	0.00	0.60	6.6	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

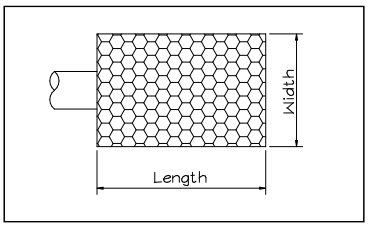
CALCULATED BY		PROJECT NAME
April Blye	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
		44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 7B

Velocity =	2.27	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	6.6	ft			
Ditch Area =	1.08	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	14.07	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	15	in	Apron Length =	5.0	ft
			Apron Width = Top Width.=	6.6	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 7B
TOP WIDTH "A"	6.6 FT
MIN. DITCH DEPTH (FT) "B"	1.1 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 8A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 8A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	1.77	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	6.5	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	428 LF
Slope =	0.021	(ft/ft)	Highest Elevation =	667
Z Required =	0.91	Ratio	Lowest Elevation =	658
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.80	ft	9.6	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.05 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

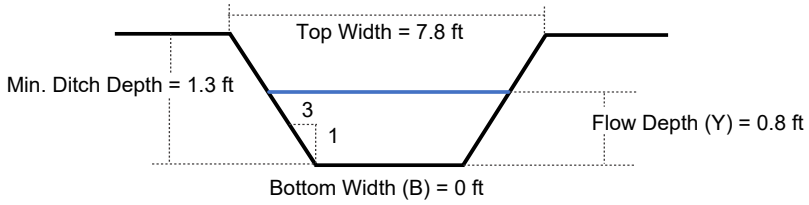
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	1.92	SF		
New P =	5.06	Wetted perimeter		
New R =	0.38	Hydraulic radius		
Z Actual =	1.01	Must be greater than z required=>	0.91	Okay
New V =	3.78	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 1.05 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.30	0.00	0.80	7.8	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

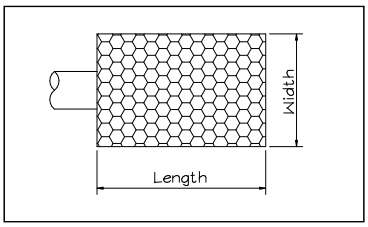
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 8A

Velocity =	3.78	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	7.8	ft			
Ditch Area =	1.92	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	18.76	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	24	in	Apron Length =	8.0	ft
			Apron Width = Top Width.=	7.8	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 8A
TOP WIDTH "A"	7.8 FT
MIN. DITCH DEPTH (FT) "B"	1.3 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 8B	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 8B

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.76	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	2.8	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)			
Manning n =	0.030	(Dimensionless)	Ditch Length =	271	LF
Slope =	0.015	(ft/ft)	Highest Elevation =	665	
Z Required =	0.47	Ratio	Lowest Elevation =	661	
Side Slope (M) =	3	:1			

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.60	ft	7.2	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 0.55 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

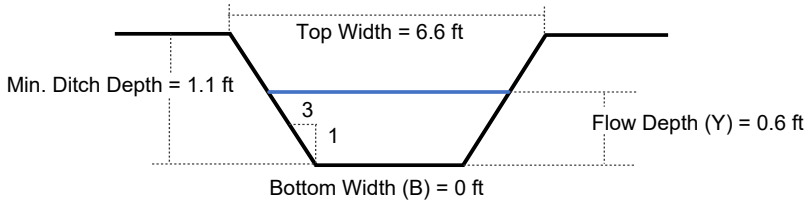
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	1.08	SF		
New P =	3.79	Wetted perimeter		
New R =	0.28	Hydraulic radius		
Z Actual =	**0.47**	Must be greater than z required=>	**0.47**	**Okay**
New V =	2.61	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 0.56 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.10	0.00	0.60	6.6	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

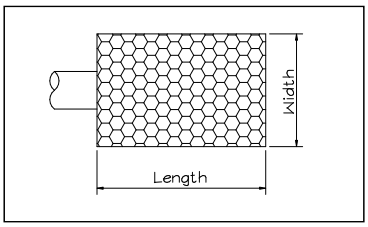
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 8B

Velocity =	2.61	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	6.6	ft			
Ditch Area =	1.08	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	14.07	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	15	in	Apron Length =	5.0	ft
			Apron Width = Top Width.=	6.6	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 8B
TOP WIDTH "A"	6.6 FT
MIN. DITCH DEPTH (FT) "B"	1.1 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 9A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 9A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	1.21	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	4.5	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	410 LF
Slope =	0.015	(ft/ft)	Highest Elevation =	655
Z Required =	0.74	Ratio	Lowest Elevation =	649
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.70	ft	8.4	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 0.64 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

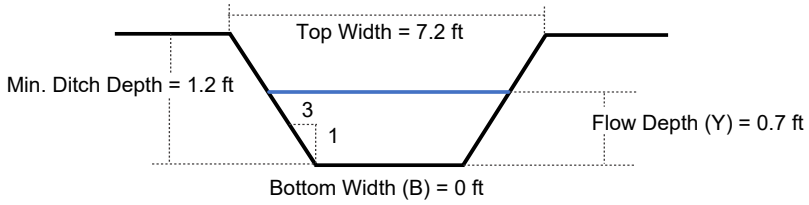
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	1.47	SF		
New P =	4.43	Wetted perimeter		
New R =	0.33	Hydraulic radius		
Z Actual =	0.70	Must be greater than z required=>	0.74	Resize
New V =	2.88	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 0.64 LB/SF **Okay**



Ditch Geometry

Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.20	0.00	0.70	7.2	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

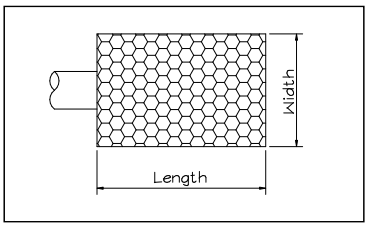
CALCULATED BY		PROJECT NAME
April Blye	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
		44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 9A

Velocity =	2.88	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	7.2	ft			
Ditch Area =	1.47	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	16.42	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	18	in	Apron Length =	6.0	ft
			Apron Width = Top Width.=	7.2	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 9A
TOP WIDTH "A"	7.2 FT
MIN. DITCH DEPTH (FT) "B"	1.2 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 9B	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 9B

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.40	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	1.5	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	446 LF
Slope =	0.018	(ft/ft)	Highest Elevation =	652
Z Required =	0.22	Ratio	Lowest Elevation =	644
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.50	ft	6.0	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 0.56 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

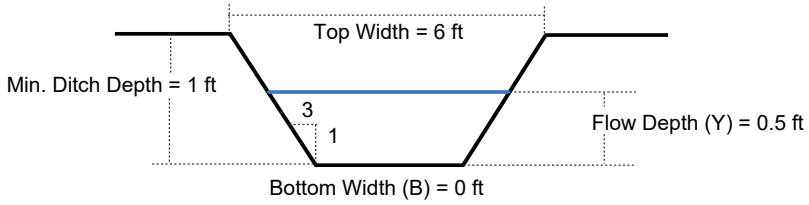
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.75	SF		
New P =	3.16	Wetted perimeter		
New R =	0.24	Hydraulic radius		
Z Actual =	0.29	Must be greater than z required=>	0.22	Okay
New V =	2.55	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 0.56 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.00	0.00	0.50	6	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

CALCULATED BY	April Blye
PROJECT NAME	Carolina Sunrock
PROJECT NUMBER	44089.001

TIMMONS GROUP
ENGINEERING | DESIGN | TECHNOLOGY

Ditch Outlet Protection (NYDOT Method)

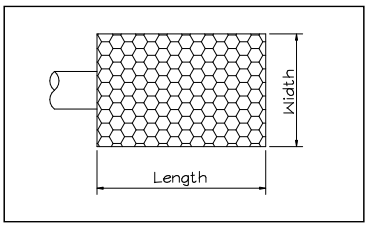
Ditch Name: TDD 9B

Velocity =	2.55	fps
Top Width =	6	ft
Ditch Area =	0.75	sf
Equivalent Pipe Diameter =	11.73	in
Equivalent Pipe Diameter =	**12**	in

From Fig. 8.06.c: ZONE = **1**

Rip Rap Class =	A	
Apron Thickness =	12	in
Apron Length =	4.0	ft
Apron Width = Top Width.=	6.0	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 9B
TOP WIDTH "A"	6 FT
MIN. DITCH DEPTH (FT) "B"	1 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 9C	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 9C

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	4.42	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	16.3	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	614 LF
Slope =	0.020	(ft/ft)	Highest Elevation =	660
Z Required =	2.35	Ratio	Lowest Elevation =	648
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	1.00	ft	12.0	in
Bottom Width (B) =	1.00	ft	12.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.22 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

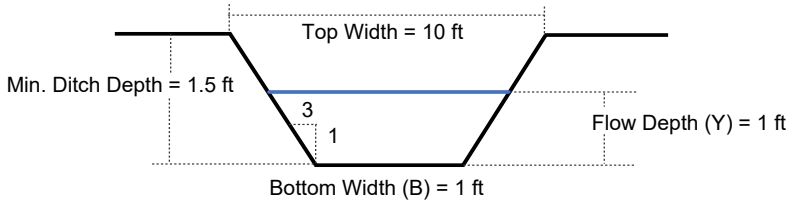
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	4.00	SF		
New P =	7.32	Wetted perimeter		
New R =	0.55	Hydraulic radius		
Z Actual =	2.67	Must be greater than z required=>	2.35	Okay
New V =	4.64	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 1.22 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.50	1.00	1.00	10	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

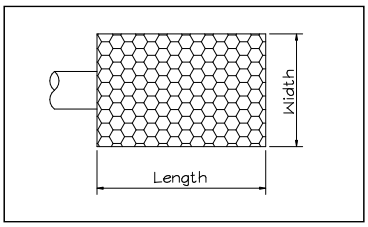
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 9C

Velocity =	4.64	fps	From Fig. 8.06.c:	ZONE =	**2**
Top Width =	10	ft			
Ditch Area =	4	sf	Rip Rap Class =	B	
Equivalent Pipe Diameter =	27.08	in	Apron Thickness =	18	in
Equivalent Pipe Diameter =	**30**	in	Apron Length =	15.0	ft
			Apron Width = Top Width.=	10.0	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 9C
TOP WIDTH "A"	10 FT
MIN. DITCH DEPTH (FT) "B"	1.5 FT
BOTTOM WIDTH (FT) "C"	1.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 10A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 10A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	4.18	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	**15.4**	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	275 LF
Slope =	0.018	(ft/ft)	Highest Elevation =	639
Z Required =	2.31	Ratio	Lowest Elevation =	634
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	1.00	ft	12.0	in
Bottom Width (B) =	1.00	ft	12.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.13 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

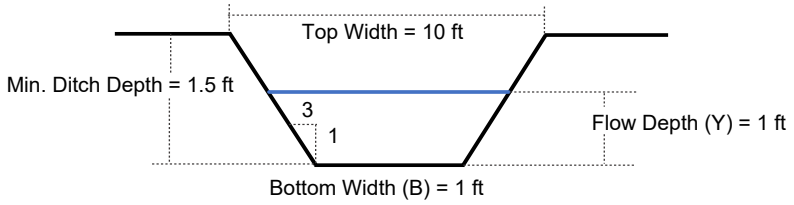
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	4.00	SF		
New P =	7.32	Wetted perimeter		
New R =	0.55	Hydraulic radius		
Z Actual =	**2.67**	Must be greater than z required=>	**2.31**	**Okay**
New V =	4.47	fps		

Minimum Design Geometry

Liner: North American Green, S75 **1.55** LB/SF > 1.14 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.50	1.00	1.00	10	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

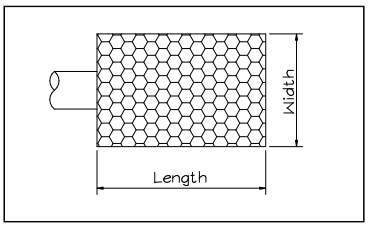
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 10A

Velocity =	4.47	fps	From Fig. 8.06.c:	ZONE =	**2**
Top Width =	10	ft			
Ditch Area =	4	sf	Rip Rap Class =	B	
Equivalent Pipe Diameter =	27.08	in	Apron Thickness =	18	in
Equivalent Pipe Diameter =	**30**	in	Apron Length =	15.0	ft
			Apron Width = Top Width.=	10.0	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 10A
TOP WIDTH "A"	10 FT
MIN. DITCH DEPTH (FT) "B"	1.5 FT
BOTTOM WIDTH (FT) "C"	1.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 10B	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 10B

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.87	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	3.2	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	776 LF
Slope =	0.023	(ft/ft)	Highest Elevation =	651
Z Required =	0.42	Ratio	Lowest Elevation =	633
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.60	ft	7.2	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 0.87 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

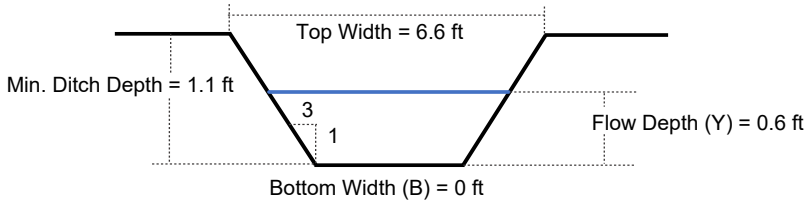
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	1.08	SF		
New P =	3.79	Wetted perimeter		
New R =	0.28	Hydraulic radius		
Z Actual =	0.47	Must be greater than z required=>	0.42	Okay
New V =	3.27	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 0.87 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.10	0.00	0.60	6.6	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

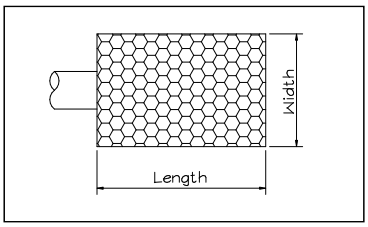
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 10B

Velocity =	3.27	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	6.6	ft			
Ditch Area =	1.08	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	14.07	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	15	in	Apron Length =	5.0	ft
			Apron Width = Top Width.=	6.6	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 10B
TOP WIDTH "A"	6.6 FT
MIN. DITCH DEPTH (FT) "B"	1.1 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 10C	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 10C

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.20	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	0.7	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	217 LF
Slope =	0.014	(ft/ft)	Highest Elevation =	636
Z Required =	0.13	Ratio	Lowest Elevation =	633
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.40	ft	4.8	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 0.35 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

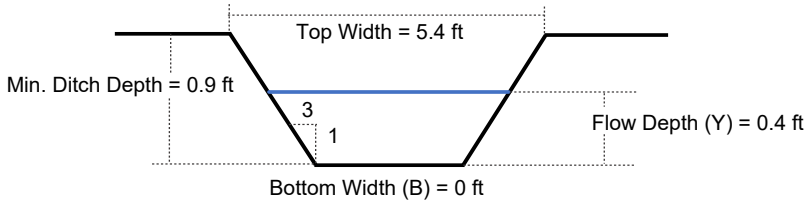
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.48	SF		
New P =	2.53	Wetted perimeter		
New R =	0.19	Hydraulic radius		
Z Actual =	0.16	Must be greater than z required=>	0.13	Okay
New V =	1.93	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 0.35 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
0.90	0.00	0.40	5.4	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

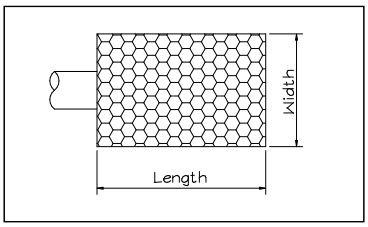
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 10C

Velocity =	1.93	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	5.4	ft			
Ditch Area =	0.48	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	9.38	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	12	in	Apron Length =	4.0	ft
			Apron Width = Top Width.=	5.4	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 10C
TOP WIDTH "A"	5.4 FT
MIN. DITCH DEPTH (FT) "B"	0.9 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 11A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 11A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.54	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	2.0	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	174 LF
Slope =	0.020	(ft/ft)	Highest Elevation =	628.5
Z Required =	0.28	Ratio	Lowest Elevation =	625
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.50	ft	6.0	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 0.63 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

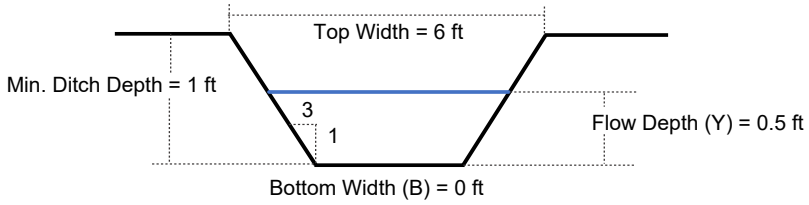
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.75	SF		
New P =	3.16	Wetted perimeter		
New R =	0.24	Hydraulic radius		
Z Actual =	0.29	Must be greater than z required=>	0.28	Okay
New V =	2.70	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 0.63 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.00	0.00	0.50	6	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

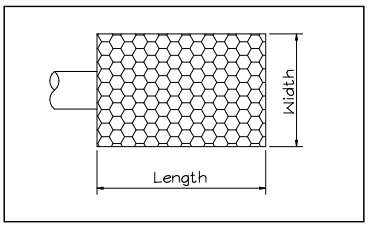
CALCULATED BY		PROJECT NAME
April Blye	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
		44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 11A

Velocity =	2.70	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	6	ft			
Ditch Area =	0.75	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	11.73	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	12	in	Apron Length =	4.0	ft
			Apron Width = Top Width.=	6.0	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 11A
TOP WIDTH "A"	6 FT
MIN. DITCH DEPTH (FT) "B"	1 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 11B	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 11B

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.27	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	1.0	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	233 LF
Slope =	0.021	(ft/ft)	Highest Elevation =	625
Z Required =	0.14	Ratio	Lowest Elevation =	620
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.40	ft	4.8	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 0.54 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

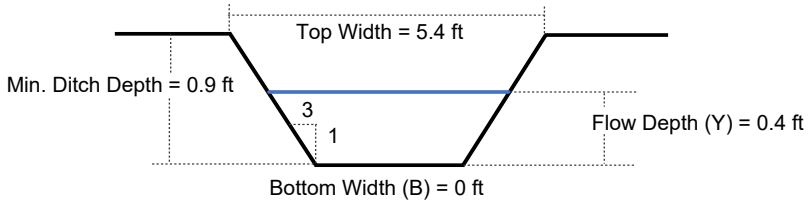
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.48	SF		
New P =	2.53	Wetted perimeter		
New R =	0.19	Hydraulic radius		
Z Actual =	0.16	Must be greater than z required=>	0.14	Okay
New V =	2.40	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 0.54 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
0.90	0.00	0.40	5.4	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

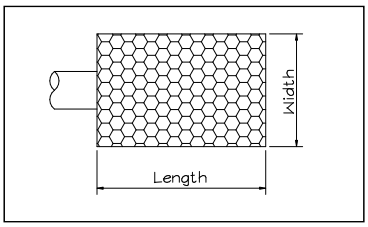
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 11B

Velocity =	2.40	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	5.4	ft			
Ditch Area =	0.48	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	9.38	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	12	in	Apron Length =	4.0	ft
			Apron Width = Top Width.=	5.4	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 11B
TOP WIDTH "A"	5.4 FT
MIN. DITCH DEPTH (FT) "B"	0.9 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 11C	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 11C

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	1.06	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	3.9	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	514 LF
Slope =	0.021	(ft/ft)	Highest Elevation =	634
Z Required =	0.54	Ratio	Lowest Elevation =	623
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.70	ft	8.4	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 0.93 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

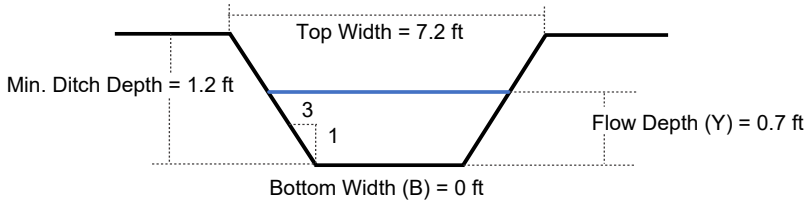
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	1.47	SF		
New P =	4.43	Wetted perimeter		
New R =	0.33	Hydraulic radius		
Z Actual =	**0.70**	Must be greater than z required=>	**0.54**	**Okay**
New V =	3.48	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 0.94 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.20	0.00	0.70	7.2	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

CALCULATED BY	April Blye
PROJECT NAME	Carolina Sunrock
PROJECT NUMBER	44089.001

TIMMONS GROUP
ENGINEERING | DESIGN | TECHNOLOGY

Ditch Outlet Protection (NYDOT Method)

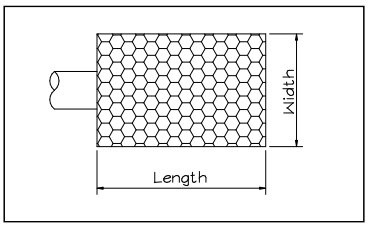
Ditch Name: TDD 11C

Velocity =	3.48	fps
Top Width =	7.2	ft
Ditch Area =	1.47	sf
Equivalent Pipe Diameter =	16.42	in
Equivalent Pipe Diameter =	**18**	in

From Fig. 8.06.c: ZONE = **1**

Rip Rap Class =	A	
Apron Thickness =	12	in
Apron Length =	6.0	ft
Apron Width = Top Width.=	7.2	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 11C
TOP WIDTH "A"	7.2 FT
MIN. DITCH DEPTH (FT) "B"	1.2 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 12A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 12A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	5.17	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	19.1	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	900 LF
Slope =	0.021	(ft/ft)	Highest Elevation =	660
Z Required =	2.65	Ratio	Lowest Elevation =	641
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	1.00	ft	12.0	in
Bottom Width (B) =	1.00	ft	12.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.32 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

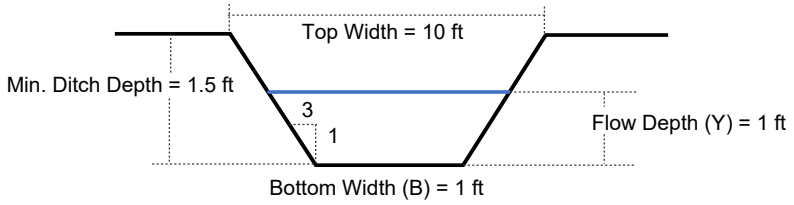
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	4.00	SF		
New P =	7.32	Wetted perimeter		
New R =	0.55	Hydraulic radius		
Z Actual =	2.67	Must be greater than z required=>	2.65	Okay
New V =	4.82	fps		

Minimum Design Geometry

Liner: North American Green, S75 **1.55** LB/SF > 1.32 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.50	1.00	1.00	10	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

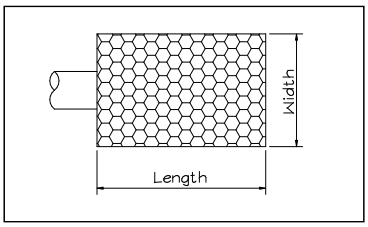
CALCULATED BY		PROJECT NAME
April Blye	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
		44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 12A

Velocity =	4.82	fps	From Fig. 8.06.c:	ZONE =	2
Top Width =	10	ft			
Ditch Area =	4	sf	Rip Rap Class =	B	
Equivalent Pipe Diameter =	27.08	in	Apron Thickness =	18	in
Equivalent Pipe Diameter =	30	in	Apron Length =	15.0	ft
			Apron Width = Top Width.=	10.0	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 12A
TOP WIDTH "A"	10 FT
MIN. DITCH DEPTH (FT) "B"	1.5 FT
BOTTOM WIDTH (FT) "C"	1.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 12B	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 12B

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.53	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	2.0	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	513 LF
Slope =	0.021	(ft/ft)	Highest Elevation =	651
Z Required =	0.27	Ratio	Lowest Elevation =	640
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.50	ft	6.0	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 0.67 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

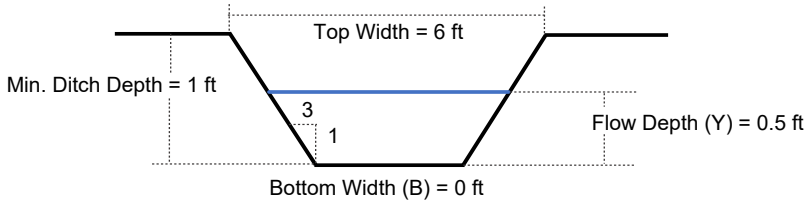
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.75	SF		
New P =	3.16	Wetted perimeter		
New R =	0.24	Hydraulic radius		
Z Actual =	0.29	Must be greater than z required=>	0.27	Okay
New V =	2.79	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 0.67 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.00	0.00	0.50	6	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

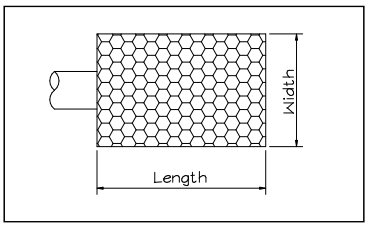
CALCULATED BY		PROJECT NAME
April Blye	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
		44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 12B

Velocity =	2.79	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	6	ft			
Ditch Area =	0.75	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	11.73	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	12	in	Apron Length =	4.0	ft
			Apron Width = Top Width.=	6.0	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 12B
TOP WIDTH "A"	6 FT
MIN. DITCH DEPTH (FT) "B"	1 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 12C	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 12C

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	2.05	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	7.6	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	669 LF
Slope =	0.015	(ft/ft)	Highest Elevation =	654
Z Required =	1.25	Ratio	Lowest Elevation =	644
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.90	ft	10.8	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 0.84 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

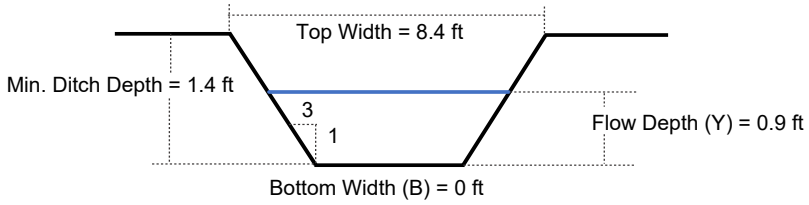
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	2.43	SF		
New P =	5.69	Wetted perimeter		
New R =	0.43	Hydraulic radius		
Z Actual =	1.38	Must be greater than z required=>	1.25	Okay
New V =	3.44	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 0.84 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.40	0.00	0.90	8.4	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

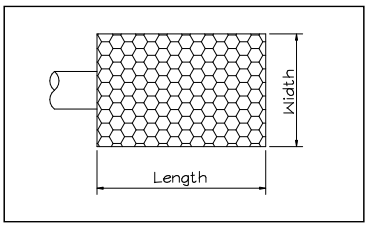
CALCULATED BY		PROJECT NAME
April Blye	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
		44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 12C

Velocity =	3.44	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	8.4	ft			
Ditch Area =	2.43	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	21.11	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	24	in	Apron Length =	8.0	ft
			Apron Width = Top Width.=	8.4	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 12C
TOP WIDTH "A"	8.4 FT
MIN. DITCH DEPTH (FT) "B"	1.4 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 12D	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 12D

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.10	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	0.4	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	200 LF
Slope =	0.018	(ft/ft)	Highest Elevation =	643.5
Z Required =	0.06	Ratio	Lowest Elevation =	640
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.30	ft	3.6	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 0.33 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

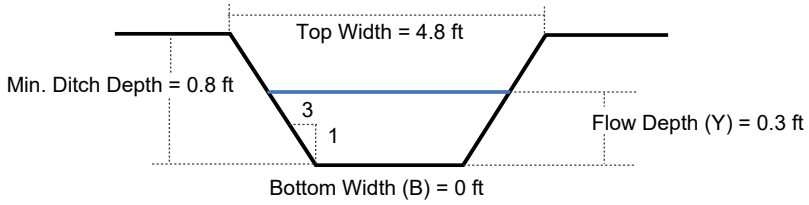
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.27	SF		
New P =	1.90	Wetted perimeter		
New R =	0.14	Hydraulic radius		
Z Actual =	0.07	Must be greater than z required=>	0.06	Okay
New V =	1.79	fps		

Minimum Design Geometry

Liner: Jute Net — **0.45** LB/SF > 0.33 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
0.80	0.00	0.30	4.8	3:1

Ditch Liner
Jute Net

*RED IS USER INPUT

CALCULATED BY	April Blye
PROJECT NAME	Carolina Sunrock
PROJECT NUMBER	44089.001

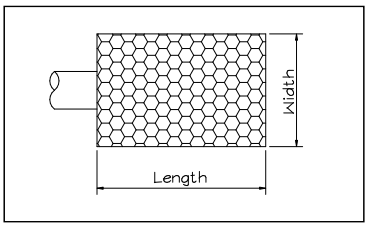
TIMMONS GROUP
ENGINEERING | DESIGN | TECHNOLOGY

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 12D

Velocity =	1.79	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	4.8	ft			
Ditch Area =	0.27	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	7.04	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	8	in	Apron Length =	2.7	ft
			Apron Width = Top Width.=	4.8	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 12D
TOP WIDTH "A"	4.8 FT
MIN. DITCH DEPTH (FT) "B"	0.8 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	Jute Net

DITCH NAME		PROJECT NAME
TDD 14A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 14A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	6.83	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	**25.2**	(cfs)

Known Quantities

Line channel with:	6	" rip-rap	(Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)		Ditch Length =	1777 LF
Slope =	0.016	(ft/ft)		Highest Elevation =	663
Z Required =	3.98	Ratio		Lowest Elevation =	634
Side Slope (M) =	3	:1			

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	1.20	ft	14.4	in
Bottom Width (B) =	1.00	ft	12.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.22 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

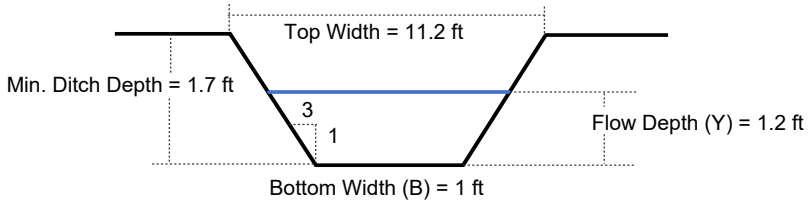
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	5.52	SF		
New P =	8.59	Wetted perimeter		
New R =	0.64	Hydraulic radius		
Z Actual =	**4.11**	Must be greater than z required=>	**3.98**	**Okay**
New V =	4.73	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 1.23 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.70	1.00	1.20	11.2	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

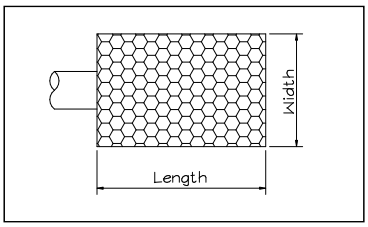
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 14A

Velocity =	4.73	fps	From Fig. 8.06.c:	ZONE =	2
Top Width =	11.2	ft			
Ditch Area =	5.52	sf	Rip Rap Class =	B	
Equivalent Pipe Diameter =	31.81	in	Apron Thickness =	18	in
Equivalent Pipe Diameter =	36	in	Apron Length =	18.0	ft
			Apron Width = Top Width.=	11.2	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 14A
TOP WIDTH "A"	11.2 FT
MIN. DITCH DEPTH (FT) "B"	1.7 FT
BOTTOM WIDTH (FT) "C"	1.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 14B	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 14B

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.68	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	2.5	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	277 LF
Slope =	0.022	(ft/ft)	Highest Elevation =	640
Z Required =	0.34	Ratio	Lowest Elevation =	634
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.60	ft	7.2	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 0.81 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

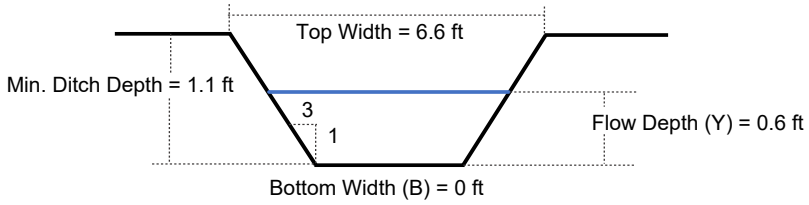
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	1.08	SF		
New P =	3.79	Wetted perimeter		
New R =	0.28	Hydraulic radius		
Z Actual =	0.47	Must be greater than z required=>	0.34	Okay
New V =	3.16	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 0.82 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.10	0.00	0.60	6.6	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

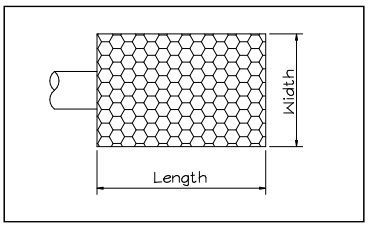
CALCULATED BY		PROJECT NAME
April Blye	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
		44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 14B

Velocity =	3.16	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	6.6	ft			
Ditch Area =	1.08	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	14.07	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	15	in	Apron Length =	5.0	ft
			Apron Width = Top Width.=	6.6	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 14B
TOP WIDTH "A"	6.6 FT
MIN. DITCH DEPTH (FT) "B"	1.1 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 15A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 15A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.75	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	2.8	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	223 LF
Slope =	0.018	(ft/ft)	Highest Elevation =	644
Z Required =	0.42	Ratio	Lowest Elevation =	640
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.60	ft	7.2	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 0.67 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

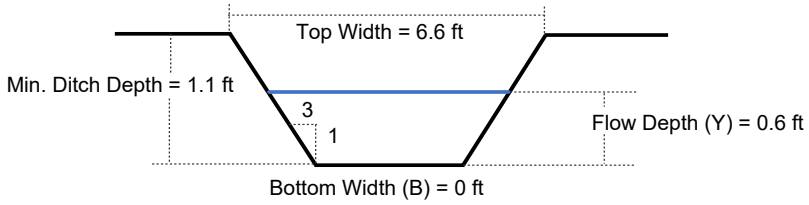
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	1.08	SF		
New P =	3.79	Wetted perimeter		
New R =	0.28	Hydraulic radius		
Z Actual =	0.47	Must be greater than z required=>	0.42	Okay
New V =	2.88	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 0.68 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.10	0.00	0.60	6.6	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

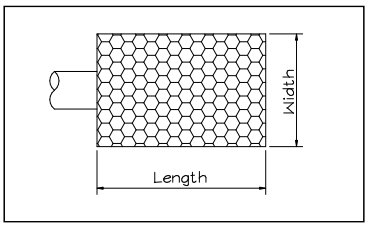
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 15A

Velocity =	2.88	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	6.6	ft			
Ditch Area =	1.08	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	14.07	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	15	in	Apron Length =	5.0	ft
			Apron Width = Top Width.=	6.6	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 15A
TOP WIDTH "A"	6.6 FT
MIN. DITCH DEPTH (FT) "B"	1.1 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 15B	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 15B

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	2.38	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	8.8	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	373 LF
Slope =	0.020	(ft/ft)	Highest Elevation =	650.5
Z Required =	1.25	Ratio	Lowest Elevation =	643
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.90	ft	10.8	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.13 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

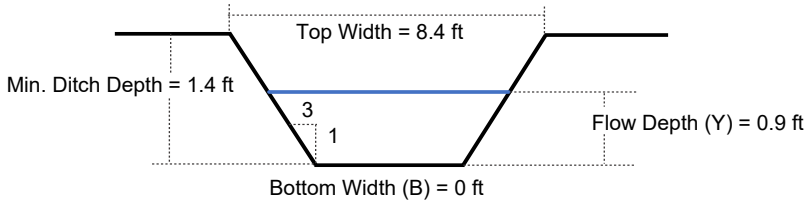
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	2.43	SF		
New P =	5.69	Wetted perimeter		
New R =	0.43	Hydraulic radius		
Z Actual =	1.38	Must be greater than z required=>	1.25	Okay
New V =	3.99	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 1.13 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.40	0.00	0.90	8.4	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

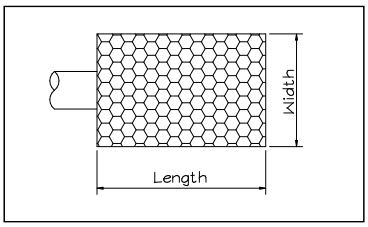
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 15B

Velocity =	3.99	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	8.4	ft			
Ditch Area =	2.43	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	21.11	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	24	in	Apron Length =	8.0	ft
			Apron Width = Top Width.=	8.4	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 15B
TOP WIDTH "A"	8.4 FT
MIN. DITCH DEPTH (FT) "B"	1.4 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 15C	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 15C

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.66	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	2.4	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	319 LF
Slope =	0.019	(ft/ft)	Highest Elevation =	646
Z Required =	0.36	Ratio	Lowest Elevation =	640
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.60	ft	7.2	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 0.70 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

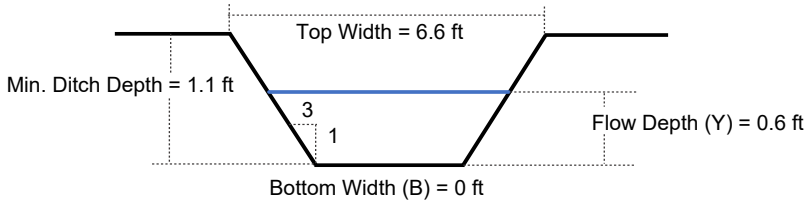
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	1.08	SF		
New P =	3.79	Wetted perimeter		
New R =	0.28	Hydraulic radius		
Z Actual =	0.47	Must be greater than z required=>	0.36	Okay
New V =	2.95	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 0.71 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.10	0.00	0.60	6.6	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

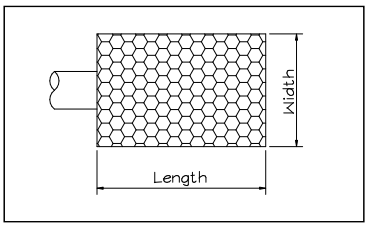
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 15C

Velocity =	2.95	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	6.6	ft			
Ditch Area =	1.08	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	14.07	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	15	in	Apron Length =	5.0	ft
			Apron Width = Top Width.=	6.6	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 15C
TOP WIDTH "A"	6.6 FT
MIN. DITCH DEPTH (FT) "B"	1.1 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 16A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 16A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	1.47	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	5.4	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	622 LF
Slope =	0.029	(ft/ft)	Highest Elevation =	642
Z Required =	0.64	Ratio	Lowest Elevation =	624
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.70	ft	8.4	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.26 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

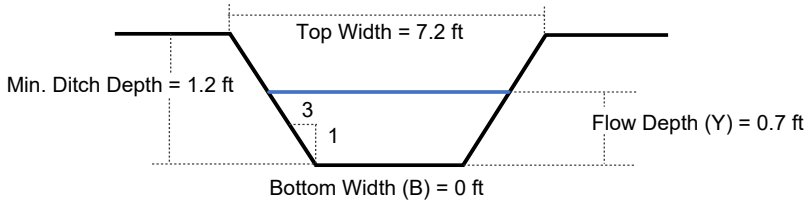
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	1.47	SF		
New P =	4.43	Wetted perimeter		
New R =	0.33	Hydraulic radius		
Z Actual =	0.70	Must be greater than z required=>	0.64	Okay
New V =	4.05	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 1.27 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.20	0.00	0.70	7.2	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

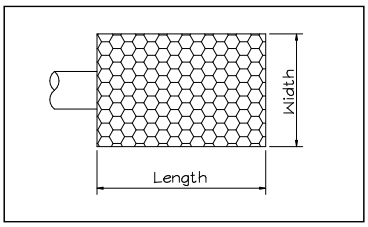
CALCULATED BY		PROJECT NAME
April Blye	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
		44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 16A

Velocity =	4.05	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	7.2	ft			
Ditch Area =	1.47	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	16.42	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	18	in	Apron Length =	6.0	ft
			Apron Width = Top Width.=	7.2	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 16A
TOP WIDTH "A"	7.2 FT
MIN. DITCH DEPTH (FT) "B"	1.2 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 16B	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 16B

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	1.11	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	4.1	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	551 LF
Slope =	0.022	(ft/ft)	Highest Elevation =	640
Z Required =	0.56	Ratio	Lowest Elevation =	628
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.70	ft	8.4	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 0.95 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

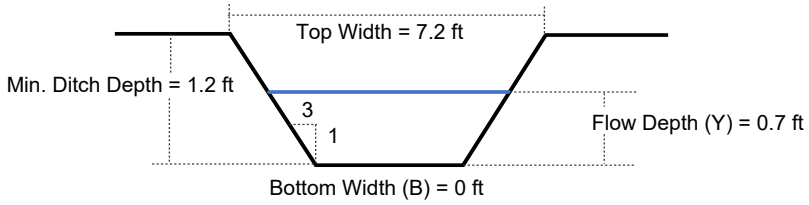
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	1.47	SF		
New P =	4.43	Wetted perimeter		
New R =	0.33	Hydraulic radius		
Z Actual =	0.70	Must be greater than z required=>	0.56	Okay
New V =	3.51	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 0.96 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.20	0.00	0.70	7.2	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

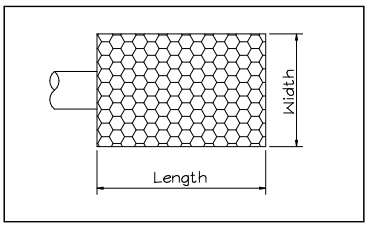
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 16B

Velocity =	3.51	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	7.2	ft			
Ditch Area =	1.47	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	16.42	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	18	in	Apron Length =	6.0	ft
			Apron Width = Top Width.=	7.2	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 16B
TOP WIDTH "A"	7.2 FT
MIN. DITCH DEPTH (FT) "B"	1.2 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 17A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 17A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	4.75	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	17.5	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	1275 LF
Slope =	0.017	(ft/ft)	Highest Elevation =	639.5
Z Required =	2.72	Ratio	Lowest Elevation =	618
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	1.10	ft	13.2	in
Bottom Width (B) =	1.00	ft	12.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.16 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

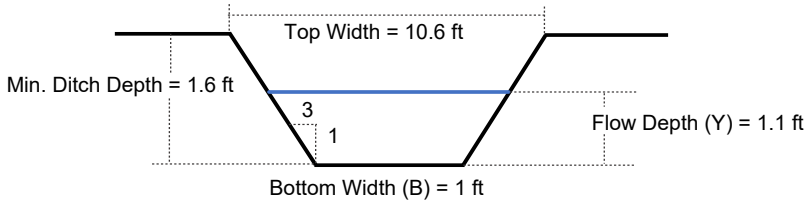
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	4.73	SF		
New P =	7.96	Wetted perimeter		
New R =	0.59	Hydraulic radius		
Z Actual =	3.34	Must be greater than z required=>	2.72	Okay
New V =	4.56	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 1.16 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.60	1.00	1.10	10.6	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

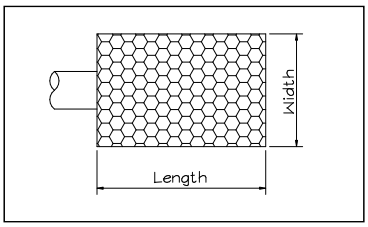
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 17A

Velocity =	4.56	fps	From Fig. 8.06.c:	ZONE =	**2**
Top Width =	10.6	ft			
Ditch Area =	4.73	sf	Rip Rap Class =	B	
Equivalent Pipe Diameter =	29.45	in	Apron Thickness =	18	in
Equivalent Pipe Diameter =	**30**	in	Apron Length =	15.0	ft
			Apron Width = Top Width.=	10.6	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 17A
TOP WIDTH "A"	10.6 FT
MIN. DITCH DEPTH (FT) "B"	1.6 FT
BOTTOM WIDTH (FT) "C"	1.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 17B	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 17B

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	2.37	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	8.8	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	321 LF
Slope =	0.019	(ft/ft)	Highest Elevation =	621
Z Required =	1.29	Ratio	Lowest Elevation =	615
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.90	ft	10.8	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.05 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

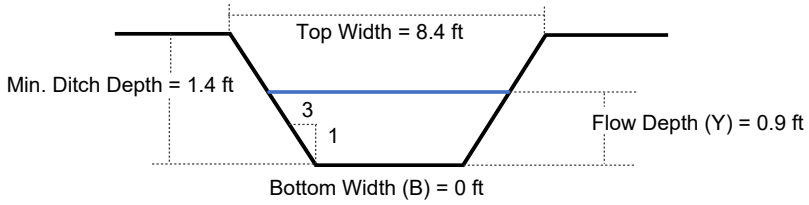
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	2.43	SF		
New P =	5.69	Wetted perimeter		
New R =	0.43	Hydraulic radius		
Z Actual =	1.38	Must be greater than z required=>	1.29	Okay
New V =	3.85	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 1.05 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.40	0.00	0.90	8.4	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

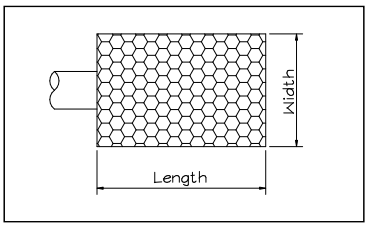
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 17B

Velocity =	3.85	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	8.4	ft			
Ditch Area =	2.43	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	21.11	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	24	in	Apron Length =	8.0	ft
			Apron Width = Top Width.=	8.4	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 17B
TOP WIDTH "A"	8.4 FT
MIN. DITCH DEPTH (FT) "B"	1.4 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 18A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 18A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.25	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	0.9	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	207 LF
Slope =	0.053	(ft/ft)	Highest Elevation =	618
Z Required =	0.08	Ratio	Lowest Elevation =	607
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.40	ft	4.8	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.33 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

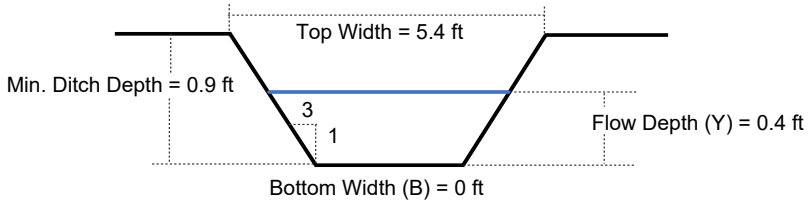
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.48	SF		
New P =	2.53	Wetted perimeter		
New R =	0.19	Hydraulic radius		
Z Actual =	0.16	Must be greater than z required=>	0.08	Okay
New V =	3.78	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 1.33 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
0.90	0.00	0.40	5.4	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

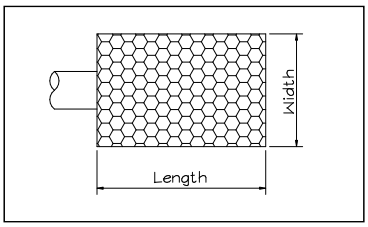
CALCULATED BY		PROJECT NAME
April Blye	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
		44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 18A

Velocity =	3.78	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	5.4	ft			
Ditch Area =	0.48	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	9.38	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	12	in	Apron Length =	4.0	ft
			Apron Width = Top Width.=	5.4	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 18A
TOP WIDTH "A"	5.4 FT
MIN. DITCH DEPTH (FT) "B"	0.9 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 18B	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 18B

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	3.18	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	11.7	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	608 LF
Slope =	0.038	(ft/ft)	Highest Elevation =	625
Z Required =	1.22	Ratio	Lowest Elevation =	602
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.80	ft	9.6	in
Bottom Width (B) =	1.00	ft	12.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.89 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

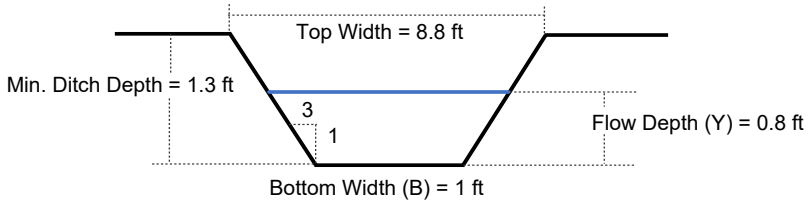
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	2.72	SF		
New P =	6.06	Wetted perimeter		
New R =	0.45	Hydraulic radius		
Z Actual =	1.59	Must be greater than z required=>	1.22	Okay
New V =	5.66	fps		

Minimum Design Geometry

Liner: North American Green, SC150 **2.10** LB/SF > 1.89 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.30	1.00	0.80	8.8	3:1

Ditch Liner
North American Green, SC150

*RED IS USER INPUT

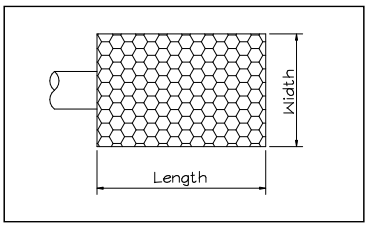
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 18B

Velocity =	5.66	fps	From Fig. 8.06.c:	ZONE =	**2**
Top Width =	8.8	ft			
Ditch Area =	2.72	sf	Rip Rap Class =	B	
Equivalent Pipe Diameter =	22.33	in	Apron Thickness =	18	in
Equivalent Pipe Diameter =	**24**	in	Apron Length =	12.0	ft
			Apron Width = Top Width.=	8.8	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 18B
TOP WIDTH "A"	8.8 FT
MIN. DITCH DEPTH (FT) "B"	1.3 FT
BOTTOM WIDTH (FT) "C"	1.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, SC150

DITCH NAME		PROJECT NAME
TDD 19A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 19A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	1.14	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	4.2	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	269 LF
Slope =	0.024	(ft/ft)	Highest Elevation =	632.5
Z Required =	0.55	Ratio	Lowest Elevation =	626
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.70	ft	8.4	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.06 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

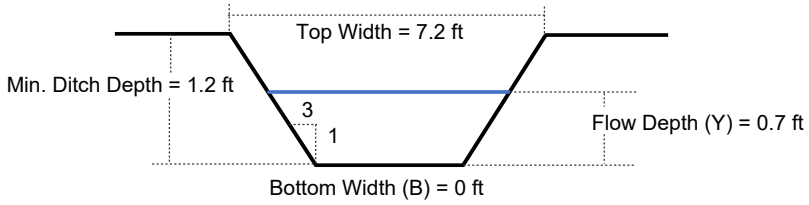
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	1.47	SF		
New P =	4.43	Wetted perimeter		
New R =	0.33	Hydraulic radius		
Z Actual =	0.70	Must be greater than z required=>	0.55	Okay
New V =	3.70	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 1.06 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.20	0.00	0.70	7.2	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

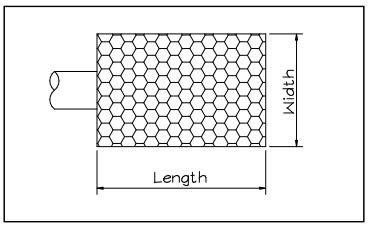
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 19A

Velocity =	3.70	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	7.2	ft			
Ditch Area =	1.47	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	16.42	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	18	in	Apron Length =	6.0	ft
			Apron Width = Top Width.=	7.2	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 19A
TOP WIDTH "A"	7.2 FT
MIN. DITCH DEPTH (FT) "B"	1.2 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 19B	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 19B

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.19	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	0.7	(cfs)

Known Quantities

Line channel with:	6	" rip-rap	(Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)		Ditch Length =	175 LF
Slope =	0.029	(ft/ft)		Highest Elevation =	628
Z Required =	0.08	Ratio		Lowest Elevation =	623
Side Slope (M) =	3	:1			

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.40	ft	4.8	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 0.71 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

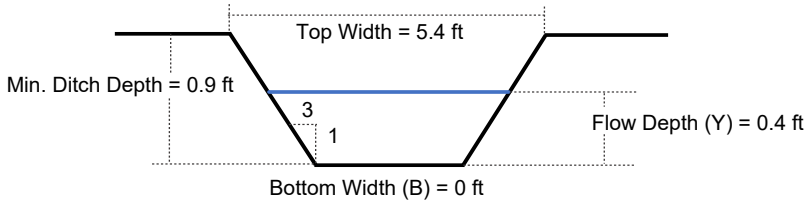
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.48	SF		
New P =	2.53	Wetted perimeter		
New R =	0.19	Hydraulic radius		
Z Actual =	0.16	Must be greater than z required=>	0.08	Okay
New V =	2.77	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 0.72 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
0.90	0.00	0.40	5.4	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

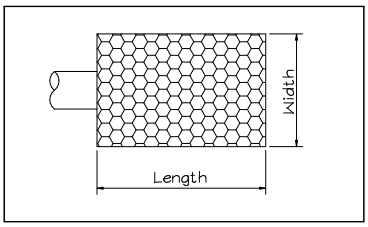
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 19B

Velocity =	2.77	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	5.4	ft			
Ditch Area =	0.48	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	9.38	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	12	in	Apron Length =	4.0	ft
			Apron Width = Top Width.=	5.4	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 19B
TOP WIDTH "A"	5.4 FT
MIN. DITCH DEPTH (FT) "B"	0.9 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 19C	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 19C

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.15	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	0.6	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	107 LF
Slope =	0.037	(ft/ft)	Highest Elevation =	630
Z Required =	0.06	Ratio	Lowest Elevation =	626
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.30	ft	3.6	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 0.70 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

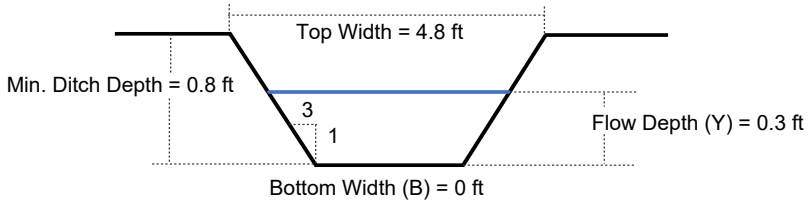
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.27	SF		
New P =	1.90	Wetted perimeter		
New R =	0.14	Hydraulic radius		
Z Actual =	0.07	Must be greater than z required=>	0.06	Okay
New V =	2.62	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 0.7 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
0.80	0.00	0.30	4.8	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

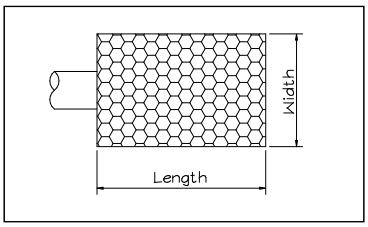
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 19C

Velocity =	2.62	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	4.8	ft			
Ditch Area =	0.27	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	7.04	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	8	in	Apron Length =	2.7	ft
			Apron Width = Top Width.=	4.8	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 19C
TOP WIDTH "A"	4.8 FT
MIN. DITCH DEPTH (FT) "B"	0.8 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 20A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 20A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	2.29	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	8.5	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	1073 LF
Slope =	0.031	(ft/ft)	Highest Elevation =	625.5
Z Required =	0.96	Ratio	Lowest Elevation =	592
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.80	ft	9.6	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.56 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

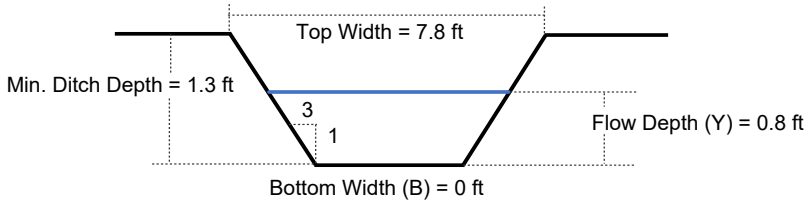
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	1.92	SF		
New P =	5.06	Wetted perimeter		
New R =	0.38	Hydraulic radius		
Z Actual =	1.01	Must be greater than z required=>	0.96	Okay
New V =	4.60	fps		

Minimum Design Geometry

Liner: North American Green, S150 — **1.75** LB/SF > 1.56 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.30	0.00	0.80	7.8	3:1

Ditch Liner
North American Green, S150

*RED IS USER INPUT

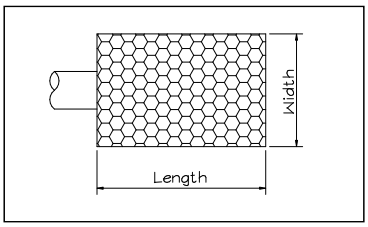
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 20A

Velocity =	4.60	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	7.8	ft			
Ditch Area =	1.92	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	18.76	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	24	in	Apron Length =	8.0	ft
			Apron Width = Top Width.=	7.8	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 20A
TOP WIDTH "A"	7.8 FT
MIN. DITCH DEPTH (FT) "B"	1.3 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S150

DITCH NAME		PROJECT NAME
TDD 20B	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 20B

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	1.27	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	4.7	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	611 LF
Slope =	0.027	(ft/ft)	Highest Elevation =	610.5
Z Required =	0.57	Ratio	Lowest Elevation =	594
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.70	ft	8.4	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.18 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

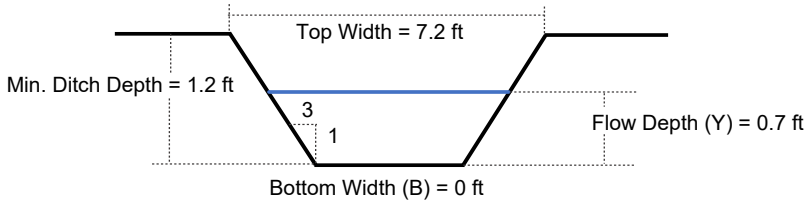
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	1.47	SF		
New P =	4.43	Wetted perimeter		
New R =	0.33	Hydraulic radius		
Z Actual =	0.70	Must be greater than z required=>	0.57	Okay
New V =	3.91	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 1.18 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.20	0.00	0.70	7.2	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

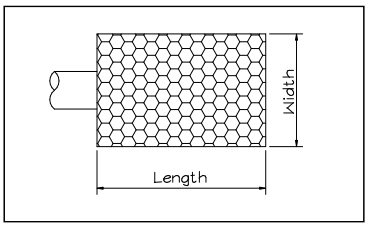
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 20B

Velocity =	3.91	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	7.2	ft			
Ditch Area =	1.47	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	16.42	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	18	in	Apron Length =	6.0	ft
			Apron Width = Top Width.=	7.2	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 20B
TOP WIDTH "A"	7.2 FT
MIN. DITCH DEPTH (FT) "B"	1.2 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 21A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 21A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.28	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	1.0	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)			
Manning n =	0.030	(Dimensionless)	Ditch Length =	105	LF
Slope =	0.043	(ft/ft)	Highest Elevation =	607.5	
Z Required =	0.10	Ratio	Lowest Elevation =	603	
Side Slope (M) =	3	:1			

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.40	ft	4.8	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.07 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

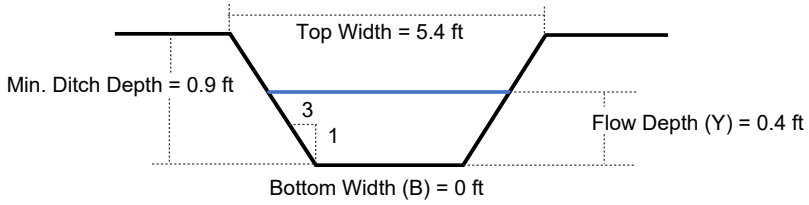
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.48	SF		
New P =	2.53	Wetted perimeter		
New R =	0.19	Hydraulic radius		
Z Actual =	0.16	Must be greater than z required=>	0.10	Okay
New V =	3.40	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 1.07 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
0.90	0.00	0.40	5.4	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

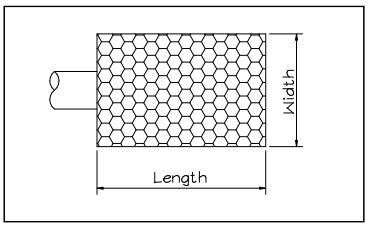
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 21A

Velocity =	3.40	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	5.4	ft			
Ditch Area =	0.48	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	9.38	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	12	in	Apron Length =	4.0	ft
			Apron Width = Top Width.=	5.4	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 21A
TOP WIDTH "A"	5.4 FT
MIN. DITCH DEPTH (FT) "B"	0.9 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 21B	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 21B

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	1.05	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	3.9	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	199 LF
Slope =	0.043	(ft/ft)	Highest Elevation =	611.5
Z Required =	0.38	Ratio	Lowest Elevation =	603
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.60	ft	7.2	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.60 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

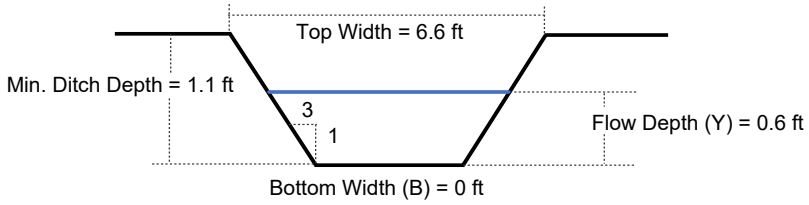
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	1.08	SF		
New P =	3.79	Wetted perimeter		
New R =	0.28	Hydraulic radius		
Z Actual =	0.47	Must be greater than z required=>	0.38	Okay
New V =	4.44	fps		

Minimum Design Geometry

Liner: North American Green, S150 — **1.75** LB/SF > 1.6 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.10	0.00	0.60	6.6	3:1

Ditch Liner
North American Green, S150

*RED IS USER INPUT

CALCULATED BY	April Blye
PROJECT NAME	Carolina Sunrock
PROJECT NUMBER	44089.001

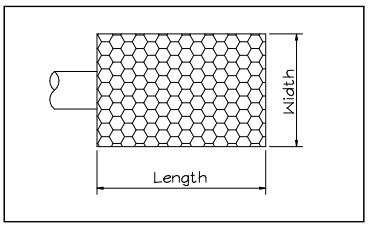
TIMMONS GROUP
ENGINEERING | DESIGN | TECHNOLOGY

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 21B

Velocity =	4.44	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	6.6	ft			
Ditch Area =	1.08	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	14.07	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	15	in	Apron Length =	5.0	ft
			Apron Width = Top Width.=	6.6	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 21B
TOP WIDTH "A"	6.6 FT
MIN. DITCH DEPTH (FT) "B"	1.1 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S150

DITCH NAME		PROJECT NAME
TDD 21C	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 21C

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.18	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	0.7	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	129 LF
Slope =	0.023	(ft/ft)	Highest Elevation =	606
Z Required =	0.09	Ratio	Lowest Elevation =	603
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.40	ft	4.8	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 0.58 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

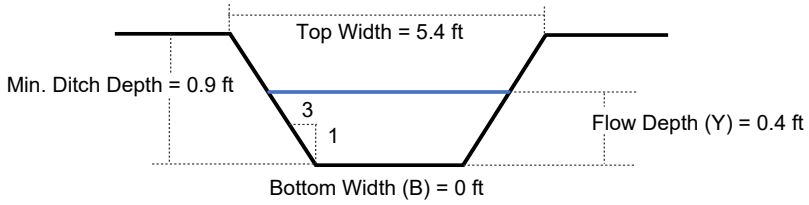
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.48	SF		
New P =	2.53	Wetted perimeter		
New R =	0.19	Hydraulic radius		
Z Actual =	0.16	Must be greater than z required=>	0.09	Okay
New V =	2.50	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 0.59 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
0.90	0.00	0.40	5.4	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

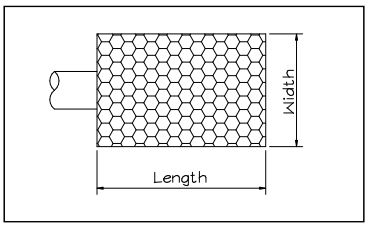
CALCULATED BY		PROJECT NAME
April Blye	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
		44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 21C

Velocity =	2.50	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	5.4	ft			
Ditch Area =	0.48	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	9.38	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	12	in	Apron Length =	4.0	ft
			Apron Width = Top Width.=	5.4	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 21C
TOP WIDTH "A"	5.4 FT
MIN. DITCH DEPTH (FT) "B"	0.9 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 22A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 22A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.52	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	1.9	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	199 LF
Slope =	0.043	(ft/ft)	Highest Elevation =	610.5
Z Required =	0.19	Ratio	Lowest Elevation =	602
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.50	ft	6.0	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.33 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

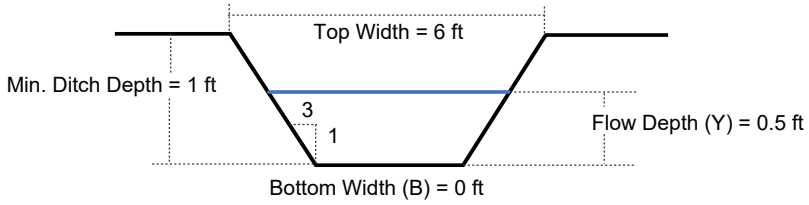
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.75	SF		
New P =	3.16	Wetted perimeter		
New R =	0.24	Hydraulic radius		
Z Actual =	0.29	Must be greater than z required=>	0.19	Okay
New V =	3.93	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 1.34 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.00	0.00	0.50	6	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

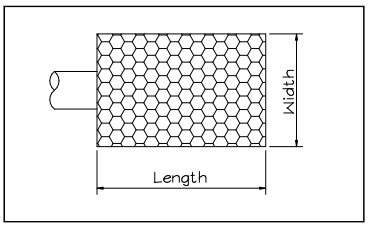
CALCULATED BY		PROJECT NAME
April Blye	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
		44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 22A

Velocity =	3.93	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	6	ft			
Ditch Area =	0.75	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	11.73	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	12	in	Apron Length =	4.0	ft
			Apron Width = Top Width.=	6.0	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 22A
TOP WIDTH "A"	6 FT
MIN. DITCH DEPTH (FT) "B"	1 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 23A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 23A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	2.64	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	9.8	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	632 LF
Slope =	0.038	(ft/ft)	Highest Elevation =	605
Z Required =	1.01	Ratio	Lowest Elevation =	581
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.90	ft	10.8	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 2.13 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

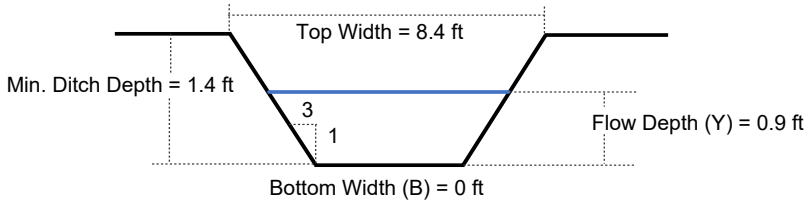
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	2.43	SF		
New P =	5.69	Wetted perimeter		
New R =	0.43	Hydraulic radius		
Z Actual =	1.38	Must be greater than z required=>	1.01	Okay
New V =	5.49	fps		

Minimum Design Geometry

Liner: North American Green, C125 **2.25** LB/SF > 2.14 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.40	0.00	0.90	8.4	3:1

Ditch Liner
North American Green, C125

*RED IS USER INPUT

CALCULATED BY	April Blye
PROJECT NAME	Carolina Sunrock
PROJECT NUMBER	44089.001

TIMMONS GROUP
ENGINEERING | DESIGN | TECHNOLOGY

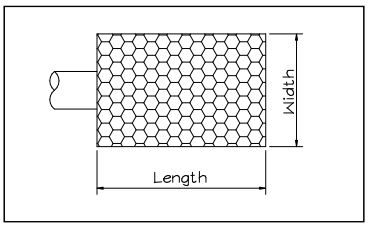
Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 23A

Velocity =	5.49	fps
Top Width =	8.4	ft
Ditch Area =	2.43	sf
Equivalent Pipe Diameter =	21.11	in
Equivalent Pipe Diameter =	**24**	in

From Fig. 8.06.c: ZONE =	**2**	
Rip Rap Class =	B	
Apron Thickness =	18	in
Apron Length =	12.0	ft
Apron Width = Top Width.=	8.4	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 23A
TOP WIDTH "A"	8.4 FT
MIN. DITCH DEPTH (FT) "B"	1.4 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, C125

DITCH NAME		PROJECT NAME
TDD 23B	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 23B

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.95	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	3.5	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)			
Manning n =	0.030	(Dimensionless)	Ditch Length =	491	LF
Slope =	0.044	(ft/ft)	Highest Elevation =	602.5	
Z Required =	0.34	Ratio	Lowest Elevation =	581	
Side Slope (M) =	3	:1			

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.60	ft	7.2	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.64 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

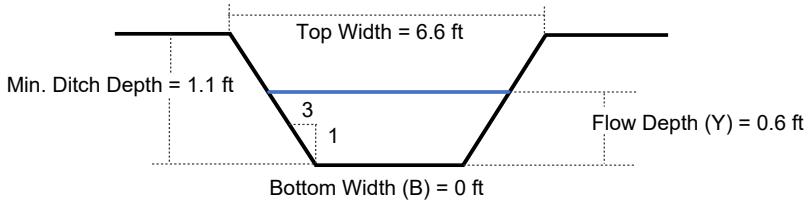
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	1.08	SF		
New P =	3.79	Wetted perimeter		
New R =	0.28	Hydraulic radius		
Z Actual =	0.47	Must be greater than z required=>	0.34	Okay
New V =	4.50	fps		

Minimum Design Geometry

Liner: North American Green, S150 — **1.75** LB/SF > 1.64 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.10	0.00	0.60	6.6	3:1

Ditch Liner
North American Green, S150

*RED IS USER INPUT

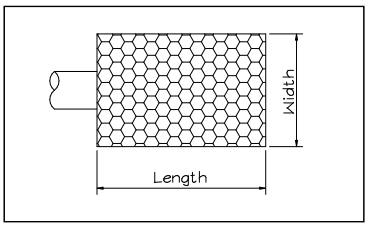
CALCULATED BY		PROJECT NAME
April Blye	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
		44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 23B

Velocity =	4.50	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	6.6	ft			
Ditch Area =	1.08	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	14.07	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	15	in	Apron Length =	5.0	ft
			Apron Width = Top Width.=	6.6	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 23B
TOP WIDTH "A"	6.6 FT
MIN. DITCH DEPTH (FT) "B"	1.1 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S150

DITCH NAME		PROJECT NAME
TDD 24A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 24A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.44	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	1.6	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	265 LF
Slope =	0.034	(ft/ft)	Highest Elevation =	608
Z Required =	0.18	Ratio	Lowest Elevation =	599
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.50	ft	6.0 in
Bottom Width (B) =	0.00	ft	0.0 in
Freeboard =	0.50	ft	6.0 in

Compute Tractive Force

T=YxDxS

T = 1.06 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

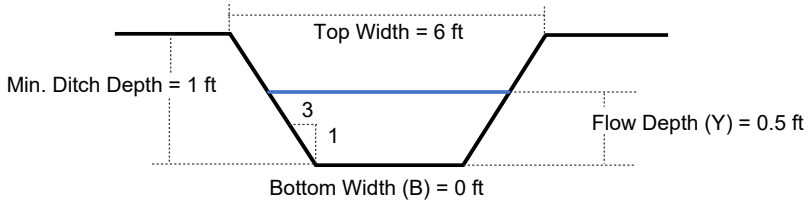
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.75	SF		
New P =	3.16	Wetted perimeter		
New R =	0.24	Hydraulic radius		
Z Actual =	0.29	Must be greater than z required=>	0.18	Okay
New V =	3.51	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 1.06 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.00	0.00	0.50	6	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

CALCULATED BY	April Blye
PROJECT NAME	Carolina Sunrock
PROJECT NUMBER	44089.001

TIMMONS GROUP
ENGINEERING | DESIGN | TECHNOLOGY

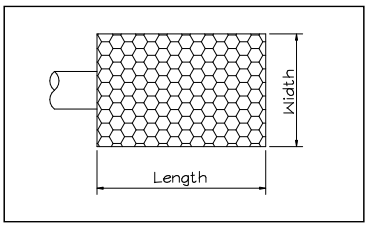
Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 24A

Velocity =	3.51	fps
Top Width =	6	ft
Ditch Area =	0.75	sf
Equivalent Pipe Diameter =	11.73	in
Equivalent Pipe Diameter =	**12**	in

From Fig. 8.06.c: ZONE =	**1**	
Rip Rap Class =	A	
Apron Thickness =	12	in
Apron Length =	4.0	ft
Apron Width = Top Width.=	6.0	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 24A
TOP WIDTH "A"	6 FT
MIN. DITCH DEPTH (FT) "B"	1 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 24B	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 24B

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.31	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	1.1	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	303 LF
Slope =	0.023	(ft/ft)	Highest Elevation =	606
Z Required =	0.15	Ratio	Lowest Elevation =	599
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.40	ft	4.8	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 0.58 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

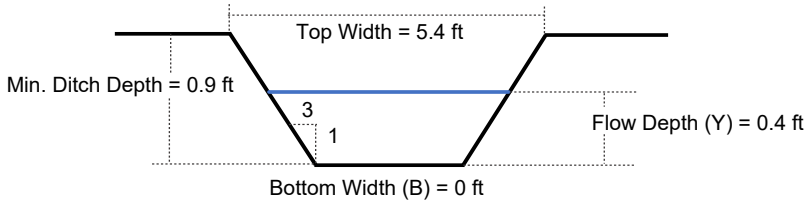
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.48	SF		
New P =	2.53	Wetted perimeter		
New R =	0.19	Hydraulic radius		
Z Actual =	0.16	Must be greater than z required=>	0.15	Okay
New V =	2.49	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 0.58 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
0.90	0.00	0.40	5.4	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

CALCULATED BY	April Blye
PROJECT NAME	Carolina Sunrock
PROJECT NUMBER	44089.001

TIMMONS GROUP
ENGINEERING | DESIGN | TECHNOLOGY

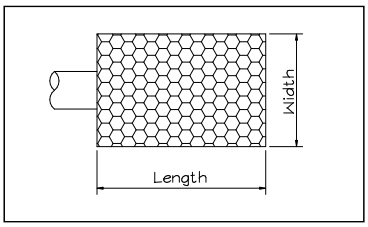
Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 24B

Velocity =	2.49	fps
Top Width =	5.4	ft
Ditch Area =	0.48	sf
Equivalent Pipe Diameter =	9.38	in
Equivalent Pipe Diameter =	**12**	in

From Fig. 8.06.c: ZONE =	**1**	
Rip Rap Class =	A	
Apron Thickness =	12	in
Apron Length =	4.0	ft
Apron Width = Top Width.=	5.4	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 24B
TOP WIDTH "A"	5.4 FT
MIN. DITCH DEPTH (FT) "B"	0.9 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 25A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 25A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.23	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	0.8	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	176 LF
Slope =	0.040	(ft/ft)	Highest Elevation =	575
Z Required =	0.09	Ratio	Lowest Elevation =	568
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.40	ft	4.8	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 0.99 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

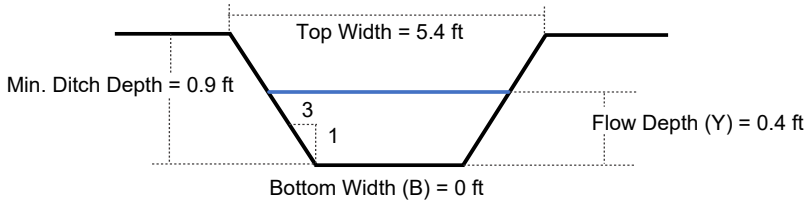
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.48	SF		
New P =	2.53	Wetted perimeter		
New R =	0.19	Hydraulic radius		
Z Actual =	0.16	Must be greater than z required=>	0.09	Okay
New V =	3.27	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 1 LB/SF — **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
0.90	0.00	0.40	5.4	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

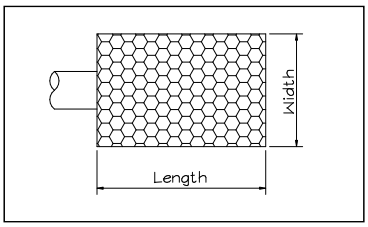
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 25A

Velocity =	3.27	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	5.4	ft			
Ditch Area =	0.48	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	9.38	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	12	in	Apron Length =	4.0	ft
			Apron Width = Top Width.=	5.4	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 25A
TOP WIDTH "A"	5.4 FT
MIN. DITCH DEPTH (FT) "B"	0.9 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 25B	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 25B

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.21	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	0.8	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	181 LF
Slope =	0.066	(ft/ft)	Highest Elevation =	579
Z Required =	0.06	Ratio	Lowest Elevation =	567
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.30	ft	3.6	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.24 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

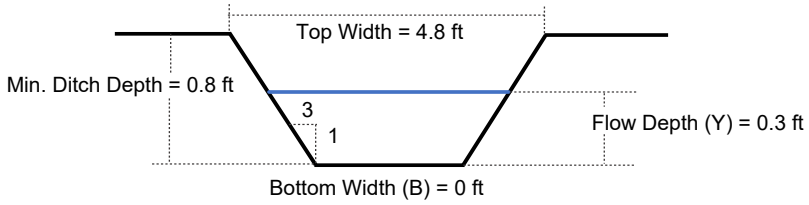
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.27	SF		
New P =	1.90	Wetted perimeter		
New R =	0.14	Hydraulic radius		
Z Actual =	0.07	Must be greater than z required=>	0.06	Okay
New V =	3.49	fps		

Minimum Design Geometry

Liner: North American Green, S150 — **1.75** LB/SF > 1.25 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
0.80	0.00	0.30	4.8	3:1

Ditch Liner
North American Green, S150

*RED IS USER INPUT

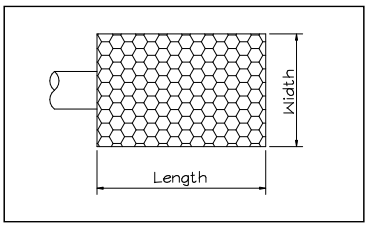
CALCULATED BY		PROJECT NAME
April Blye	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
		44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 25B

Velocity =	3.49	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	4.8	ft			
Ditch Area =	0.27	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	7.04	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	8	in	Apron Length =	2.7	ft
			Apron Width = Top Width.=	4.8	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 25B
TOP WIDTH "A"	4.8 FT
MIN. DITCH DEPTH (FT) "B"	0.8 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S150

DITCH NAME		PROJECT NAME
TDD 26A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 26A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.08	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	0.3	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	84 LF
Slope =	0.036	(ft/ft)	Highest Elevation =	585
Z Required =	0.03	Ratio	Lowest Elevation =	582
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.30	ft	3.6	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 0.67 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

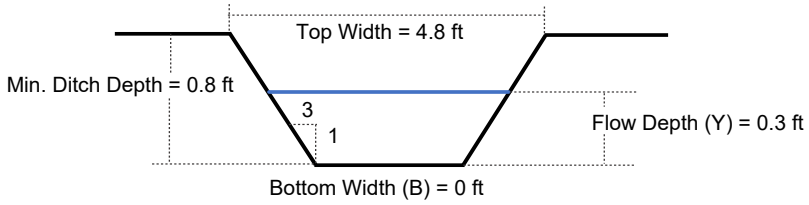
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.27	SF		
New P =	1.90	Wetted perimeter		
New R =	0.14	Hydraulic radius		
Z Actual =	0.07	Must be greater than z required=>	0.03	Okay
New V =	2.56	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 0.67 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
0.80	0.00	0.30	4.8	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

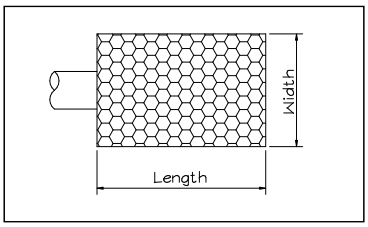
CALCULATED BY		PROJECT NAME
April Blye	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
		44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 26A

Velocity =	2.56	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	4.8	ft			
Ditch Area =	0.27	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	7.04	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	8	in	Apron Length =	2.7	ft
			Apron Width = Top Width.=	4.8	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 26A
TOP WIDTH "A"	4.8 FT
MIN. DITCH DEPTH (FT) "B"	0.8 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 26B	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 26B

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.09	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	0.3	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	66 LF
Slope =	0.038	(ft/ft)	Highest Elevation =	580.5
Z Required =	0.03	Ratio	Lowest Elevation =	578
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.30	ft	3.6	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 0.71 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

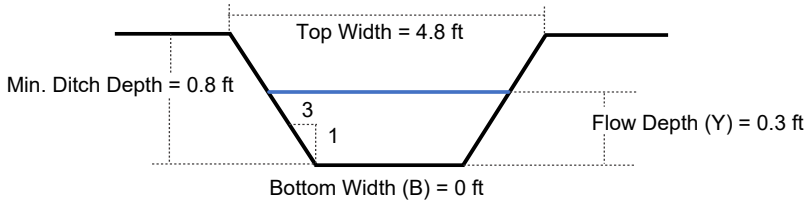
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.27	SF		
New P =	1.90	Wetted perimeter		
New R =	0.14	Hydraulic radius		
Z Actual =	0.07	Must be greater than z required=>	0.03	Okay
New V =	2.63	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 0.71 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
0.80	0.00	0.30	4.8	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

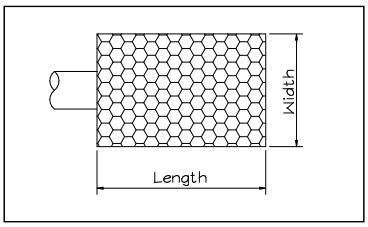
CALCULATED BY		PROJECT NAME
April Blye	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
		44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 26B

Velocity =	2.63	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	4.8	ft			
Ditch Area =	0.27	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	7.04	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	8	in	Apron Length =	2.7	ft
			Apron Width = Top Width.=	4.8	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 26B
TOP WIDTH "A"	4.8 FT
MIN. DITCH DEPTH (FT) "B"	0.8 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 27A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 27A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	3.01	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	11.1	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	454 LF
Slope =	0.030	(ft/ft)	Highest Elevation =	582.5
Z Required =	1.30	Ratio	Lowest Elevation =	569
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.90	ft	10.8	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.67 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

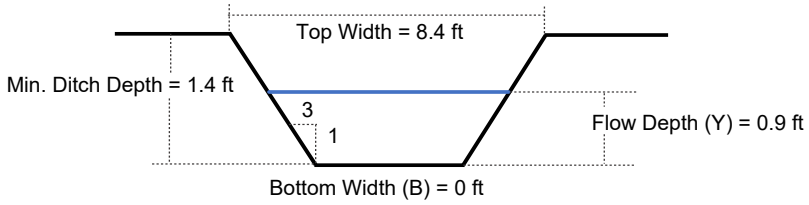
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	2.43	SF		
New P =	5.69	Wetted perimeter		
New R =	0.43	Hydraulic radius		
Z Actual =	1.38	Must be greater than z required=>	1.30	Okay
New V =	4.86	fps		

Minimum Design Geometry

Liner: North American Green, S150 — **1.75** LB/SF > 1.67 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.40	0.00	0.90	8.4	3:1

Ditch Liner
North American Green, S150

*RED IS USER INPUT

CALCULATED BY	April Blye
PROJECT NAME	Carolina Sunrock
PROJECT NUMBER	44089.001

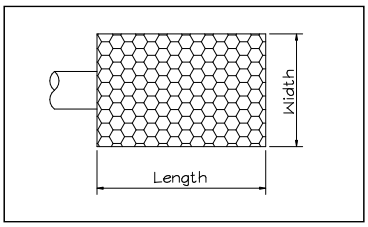
TIMMONS GROUP
ENGINEERING | DESIGN | TECHNOLOGY

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 27A

Velocity =	4.86	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	8.4	ft			
Ditch Area =	2.43	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	21.11	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	24	in	Apron Length =	8.0	ft
			Apron Width = Top Width.=	8.4	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 27A
TOP WIDTH "A"	8.4 FT
MIN. DITCH DEPTH (FT) "B"	1.4 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S150

DITCH NAME		PROJECT NAME
TDD 27B	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 27B

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.50	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	1.8	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	385 LF
Slope =	0.065	(ft/ft)	Highest Elevation =	594
Z Required =	0.15	Ratio	Lowest Elevation =	569
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.40	ft	4.8	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.62 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

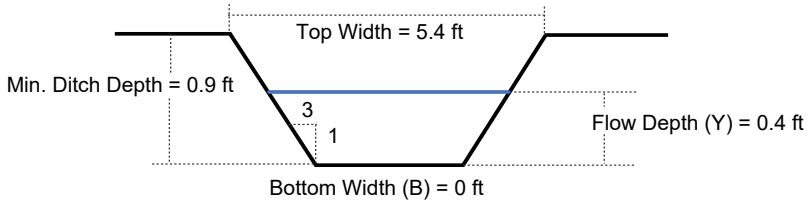
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.48	SF		
New P =	2.53	Wetted perimeter		
New R =	0.19	Hydraulic radius		
Z Actual =	0.16	Must be greater than z required=>	0.15	Okay
New V =	4.18	fps		

Minimum Design Geometry

Liner: North American Green, S150 — **1.75** LB/SF > 1.63 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
0.90	0.00	0.40	5.4	3:1

Ditch Liner
North American Green, S150

*RED IS USER INPUT

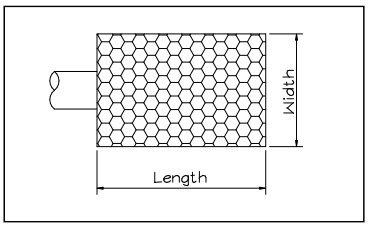
CALCULATED BY		PROJECT NAME
April Blye	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
		44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 27B

Velocity =	4.18	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	5.4	ft			
Ditch Area =	0.48	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	9.38	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	12	in	Apron Length =	4.0	ft
			Apron Width = Top Width.=	5.4	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 27B
TOP WIDTH "A"	5.4 FT
MIN. DITCH DEPTH (FT) "B"	0.9 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S150

DITCH NAME		PROJECT NAME
TDD 28A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 28A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	1.13	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	4.2	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	480 LF
Slope =	0.032	(ft/ft)	Highest Elevation =	596.5
Z Required =	0.47	Ratio	Lowest Elevation =	581
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.70	ft	8.4	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.41 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

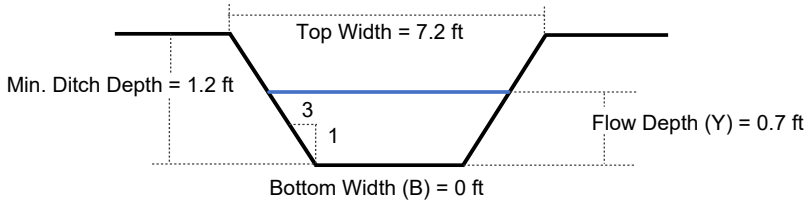
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	1.47	SF		
New P =	4.43	Wetted perimeter		
New R =	0.33	Hydraulic radius		
Z Actual =	0.70	Must be greater than z required=>	0.47	Okay
New V =	4.28	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 1.42 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.20	0.00	0.70	7.2	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

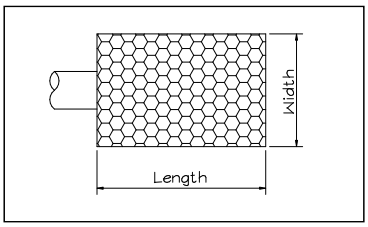
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 28A

Velocity =	4.28	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	7.2	ft			
Ditch Area =	1.47	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	16.42	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	18	in	Apron Length =	6.0	ft
			Apron Width = Top Width.=	7.2	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 28A
TOP WIDTH "A"	7.2 FT
MIN. DITCH DEPTH (FT) "B"	1.2 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 28B	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 28B

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.48	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	1.8	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	288 LF
Slope =	0.049	(ft/ft)	Highest Elevation =	595
Z Required =	0.16	Ratio	Lowest Elevation =	581
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.50	ft	6.0	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.52 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

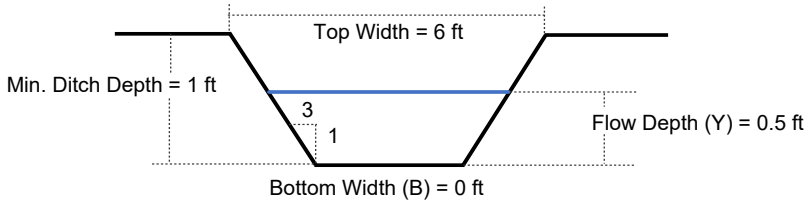
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.75	SF		
New P =	3.16	Wetted perimeter		
New R =	0.24	Hydraulic radius		
Z Actual =	0.29	Must be greater than z required=>	0.16	Okay
New V =	4.20	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 1.52 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.00	0.00	0.50	6	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

CALCULATED BY	April Blye
PROJECT NAME	Carolina Sunrock
PROJECT NUMBER	44089.001

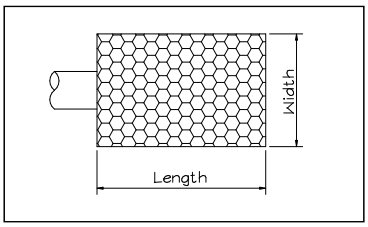
TIMMONS GROUP
ENGINEERING | DESIGN | TECHNOLOGY

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 28B

Velocity =	4.20	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	6	ft			
Ditch Area =	0.75	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	11.73	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	12	in	Apron Length =	4.0	ft
			Apron Width = Top Width.=	6.0	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 28B
TOP WIDTH "A"	6 FT
MIN. DITCH DEPTH (FT) "B"	1 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 28C	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 28C

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.53	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	2.0	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	419 LF
Slope =	0.021	(ft/ft)	Highest Elevation =	590
Z Required =	0.27	Ratio	Lowest Elevation =	581
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.50	ft	6.0	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 0.67 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

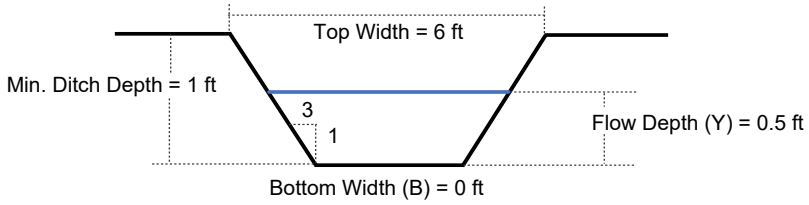
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.75	SF		
New P =	3.16	Wetted perimeter		
New R =	0.24	Hydraulic radius		
Z Actual =	0.29	Must be greater than z required=>	0.27	Okay
New V =	2.79	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 0.68 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.00	0.00	0.50	6	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

CALCULATED BY	April Blye
PROJECT NAME	Carolina Sunrock
PROJECT NUMBER	44089.001

TIMMONS GROUP
ENGINEERING | DESIGN | TECHNOLOGY

Ditch Outlet Protection (NYDOT Method)

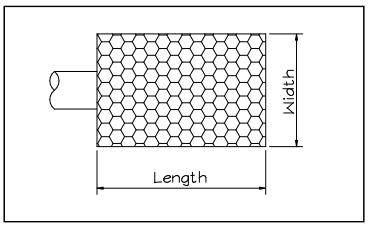
Ditch Name: TDD 28C

Velocity =	2.79	fps
Top Width =	6	ft
Ditch Area =	0.75	sf
Equivalent Pipe Diameter =	11.73	in
Equivalent Pipe Diameter =	**12**	in

From Fig. 8.06.c: ZONE = **1**

Rip Rap Class =	A	
Apron Thickness =	12	in
Apron Length =	4.0	ft
Apron Width = Top Width.=	6.0	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 28C
TOP WIDTH "A"	6 FT
MIN. DITCH DEPTH (FT) "B"	1 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 29A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 29A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	3.49	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	**12.9**	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	863 LF
Slope =	0.031	(ft/ft)	Highest Elevation =	610.5
Z Required =	1.48	Ratio	Lowest Elevation =	584
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	1.00	ft	12.0	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.92 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

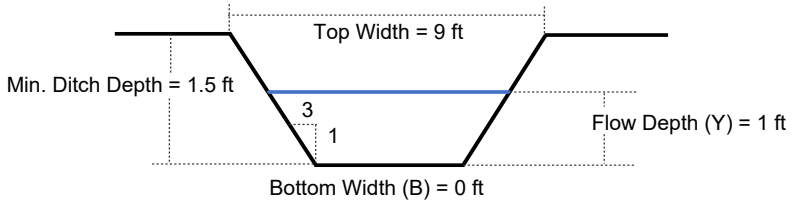
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	3.00	SF		
New P =	6.32	Wetted perimeter		
New R =	0.47	Hydraulic radius		
Z Actual =	**1.82**	Must be greater than z required=>	**1.48**	**Okay**
New V =	5.29	fps		

Minimum Design Geometry

Liner: North American Green, SC150 **2.10** LB/SF > 1.92 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.50	0.00	1.00	9	3:1

Ditch Liner
North American Green, SC150

*RED IS USER INPUT

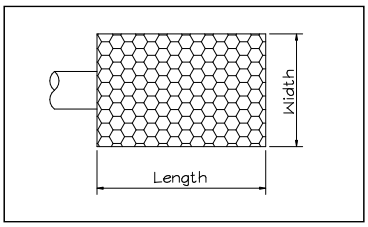
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 29A

Velocity =	5.29	fps	From Fig. 8.06.c:	ZONE =	**2**
Top Width =	9	ft			
Ditch Area =	3	sf	Rip Rap Class =	B	
Equivalent Pipe Diameter =	23.45	in	Apron Thickness =	18	in
Equivalent Pipe Diameter =	**24**	in	Apron Length =	12.0	ft
			Apron Width = Top Width.=	9.0	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 29A
TOP WIDTH "A"	9 FT
MIN. DITCH DEPTH (FT) "B"	1.5 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, SC150

DITCH NAME		PROJECT NAME
TDD 29B	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 29B

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.36	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	1.3	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	406 LF
Slope =	0.034	(ft/ft)	Highest Elevation =	598
Z Required =	0.14	Ratio	Lowest Elevation =	584
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.40	ft	4.8	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 0.86 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

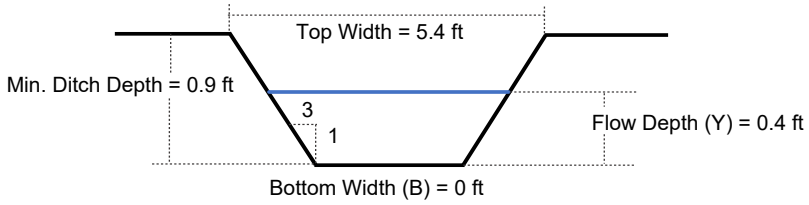
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.48	SF		
New P =	2.53	Wetted perimeter		
New R =	0.19	Hydraulic radius		
Z Actual =	0.16	Must be greater than z required=>	0.14	Okay
New V =	3.05	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 0.87 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
0.90	0.00	0.40	5.4	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

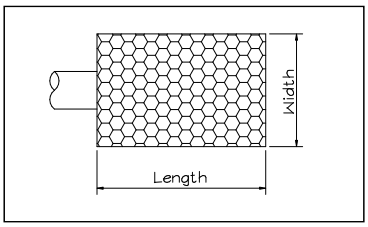
CALCULATED BY		PROJECT NAME
April Blye	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
		44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 29B

Velocity =	3.05	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	5.4	ft			
Ditch Area =	0.48	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	9.38	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	12	in	Apron Length =	4.0	ft
			Apron Width = Top Width.=	5.4	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 29B
TOP WIDTH "A"	5.4 FT
MIN. DITCH DEPTH (FT) "B"	0.9 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 30A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 30A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	1.24	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	4.6	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	279 LF
Slope =	0.022	(ft/ft)	Highest Elevation =	616
Z Required =	0.63	Ratio	Lowest Elevation =	610
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.70	ft	8.4	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 0.94 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

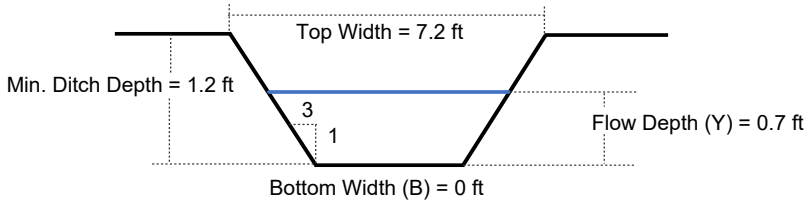
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	1.47	SF		
New P =	4.43	Wetted perimeter		
New R =	0.33	Hydraulic radius		
Z Actual =	0.70	Must be greater than z required=>	0.63	Okay
New V =	3.49	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 0.94 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.20	0.00	0.70	7.2	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

CALCULATED BY	April Blye
PROJECT NAME	Carolina Sunrock
PROJECT NUMBER	44089.001

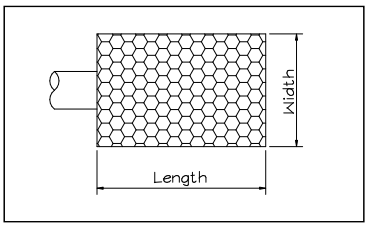
TIMMONS GROUP
ENGINEERING | DESIGN | TECHNOLOGY

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 30A

Velocity =	3.49	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	7.2	ft			
Ditch Area =	1.47	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	16.42	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	18	in	Apron Length =	6.0	ft
			Apron Width = Top Width.=	7.2	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 30A
TOP WIDTH "A"	7.2 FT
MIN. DITCH DEPTH (FT) "B"	1.2 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 30B	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 30B

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	4.93	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	18.2	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	955 LF
Slope =	0.031	(ft/ft)	Highest Elevation =	641
Z Required =	2.07	Ratio	Lowest Elevation =	611
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.90	ft	10.8	in
Bottom Width (B) =	1.00	ft	12.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.76 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

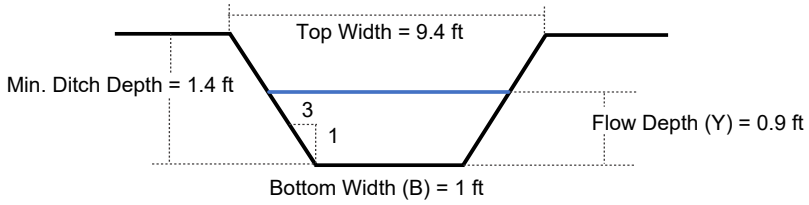
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	3.33	SF		
New P =	6.69	Wetted perimeter		
New R =	0.50	Hydraulic radius		
Z Actual =	2.09	Must be greater than z required=>	2.07	Okay
New V =	5.53	fps		

Minimum Design Geometry

Liner: North American Green, SC150 **2.10** LB/SF > 1.77 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.40	1.00	0.90	9.4	3:1

Ditch Liner
North American Green, SC150

*RED IS USER INPUT

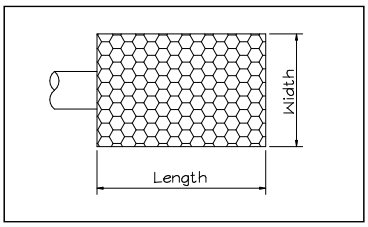
CALCULATED BY		PROJECT NAME
April Blye	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
		44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 30B

Velocity =	5.53	fps	From Fig. 8.06.c:	ZONE =	2
Top Width =	9.4	ft			
Ditch Area =	3.33	sf	Rip Rap Class =	B	
Equivalent Pipe Diameter =	24.71	in	Apron Thickness =	18	in
Equivalent Pipe Diameter =	30	in	Apron Length =	15.0	ft
			Apron Width = Top Width.=	9.4	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 30B
TOP WIDTH "A"	9.4 FT
MIN. DITCH DEPTH (FT) "B"	1.4 FT
BOTTOM WIDTH (FT) "C"	1.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, SC150

DITCH NAME		PROJECT NAME
TDD 30C	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 30C

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.27	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	1.0	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)			
Manning n =	0.030	(Dimensionless)	Ditch Length =	334	LF
Slope =	0.024	(ft/ft)	Highest Elevation =	616	
Z Required =	0.13	Ratio	Lowest Elevation =	608	
Side Slope (M) =	3	:1			

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.40	ft	4.8	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 0.60 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

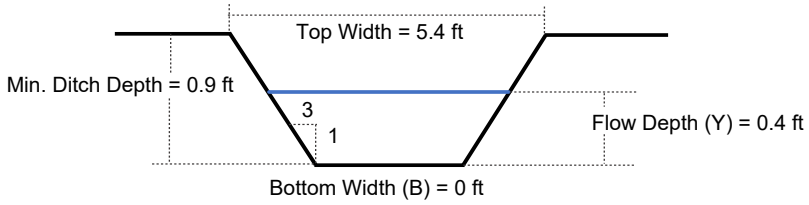
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.48	SF		
New P =	2.53	Wetted perimeter		
New R =	0.19	Hydraulic radius		
Z Actual =	0.16	Must be greater than z required=>	0.13	Okay
New V =	2.54	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 0.6 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
0.90	0.00	0.40	5.4	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

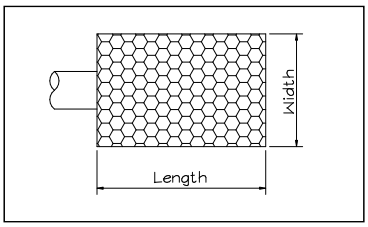
CALCULATED BY		PROJECT NAME
April Blye	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
		44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 30C

Velocity =	2.54	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	5.4	ft			
Ditch Area =	0.48	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	9.38	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	12	in	Apron Length =	4.0	ft
			Apron Width = Top Width.=	5.4	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 30C
TOP WIDTH "A"	5.4 FT
MIN. DITCH DEPTH (FT) "B"	0.9 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 31A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 31A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	3.77	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	13.9	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	926 LF
Slope =	0.040	(ft/ft)	Highest Elevation =	638
Z Required =	1.40	Ratio	Lowest Elevation =	601
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.80	ft	9.6	in
Bottom Width (B) =	1.00	ft	12.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.99 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

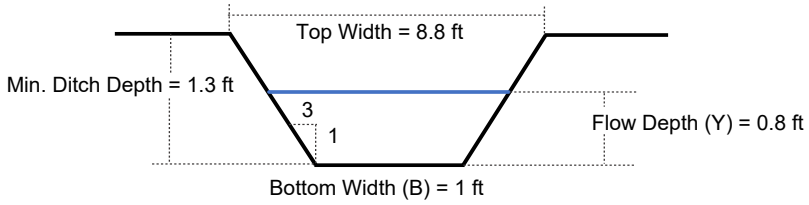
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	2.72	SF		
New P =	6.06	Wetted perimeter		
New R =	0.45	Hydraulic radius		
Z Actual =	1.59	Must be greater than z required=>	1.40	Okay
New V =	5.82	fps		

Minimum Design Geometry

Liner: North American Green, SC150 **2.10** LB/SF > 2 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.30	1.00	0.80	8.8	3:1

Ditch Liner
North American Green, SC150

*RED IS USER INPUT

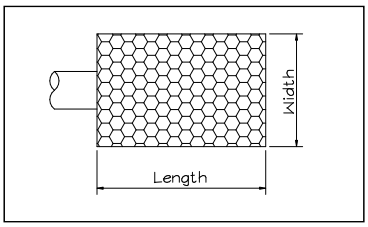
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 31A

Velocity =	5.82	fps	From Fig. 8.06.c:	ZONE =	**2**
Top Width =	8.8	ft			
Ditch Area =	2.72	sf	Rip Rap Class =	B	
Equivalent Pipe Diameter =	22.33	in	Apron Thickness =	18	in
Equivalent Pipe Diameter =	**24**	in	Apron Length =	12.0	ft
			Apron Width = Top Width.=	8.8	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 31A
TOP WIDTH "A"	8.8 FT
MIN. DITCH DEPTH (FT) "B"	1.3 FT
BOTTOM WIDTH (FT) "C"	1.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, SC150

DITCH NAME		PROJECT NAME
TDD 31B	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 31B

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	6.73	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	**24.9**	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	1270 LF
Slope =	0.043	(ft/ft)	Highest Elevation =	656
Z Required =	2.41	Ratio	Lowest Elevation =	601
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	1.00	ft	12.0	in
Bottom Width (B) =	1.00	ft	12.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 2.70 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

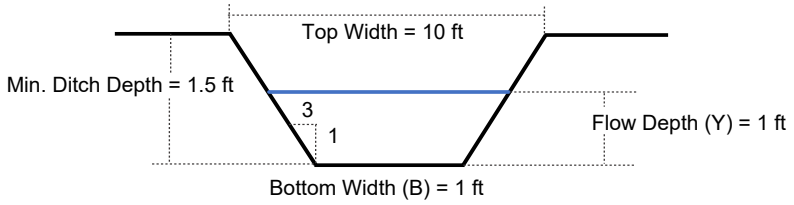
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	4.00	SF		
New P =	7.32	Wetted perimeter		
New R =	0.55	Hydraulic radius		
Z Actual =	**2.67**	Must be greater than z required=>	**2.41**	**Okay**
New V =	6.91	fps		

Minimum Design Geometry

Liner: North American Green, P300 **8.00** LB/SF > 2.71 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.50	1.00	1.00	10	3:1

Ditch Liner
North American Green, P300

*RED IS USER INPUT

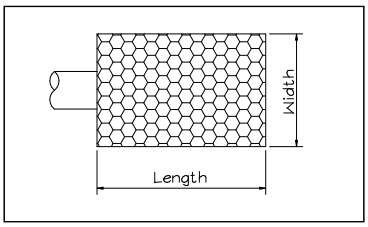
CALCULATED BY		PROJECT NAME
April Blye	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
		44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 31B

Velocity =	6.91	fps	From Fig. 8.06.c:	ZONE =	2
Top Width =	10	ft			
Ditch Area =	4	sf	Rip Rap Class =	B	
Equivalent Pipe Diameter =	27.08	in	Apron Thickness =	18	in
Equivalent Pipe Diameter =	30	in	Apron Length =	15.0	ft
			Apron Width = Top Width.=	10.0	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 31B
TOP WIDTH "A"	10 FT
MIN. DITCH DEPTH (FT) "B"	1.5 FT
BOTTOM WIDTH (FT) "C"	1.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, P300

DITCH NAME		PROJECT NAME
TDD 31C	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 31C

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.33	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	1.2	(cfs)

Known Quantities

Line channel with:	6	" rip-rap	(Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)		Ditch Length =	317 LF
Slope =	0.068	(ft/ft)		Highest Elevation =	622.5
Z Required =	0.09	Ratio		Lowest Elevation =	601
Side Slope (M) =	3	:1			

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.40	ft	4.8	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.69 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

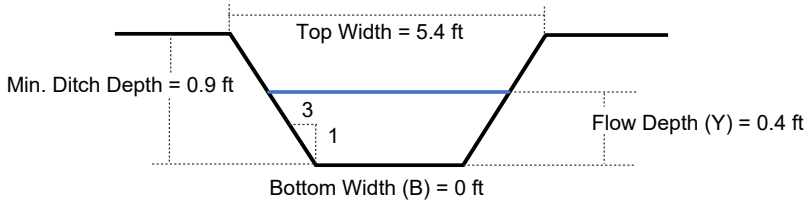
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.48	SF		
New P =	2.53	Wetted perimeter		
New R =	0.19	Hydraulic radius		
Z Actual =	0.16	Must be greater than z required=>	0.09	Okay
New V =	4.27	fps		

Minimum Design Geometry

Liner: North American Green, S150 — **1.75** LB/SF > 1.7 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
0.90	0.00	0.40	5.4	3:1

Ditch Liner
North American Green, S150

*RED IS USER INPUT

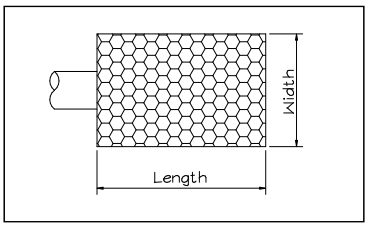
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 31C

Velocity =	4.27	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	5.4	ft			
Ditch Area =	0.48	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	9.38	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	12	in	Apron Length =	4.0	ft
			Apron Width = Top Width.=	5.4	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 31C
TOP WIDTH "A"	5.4 FT
MIN. DITCH DEPTH (FT) "B"	0.9 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S150

DITCH NAME		PROJECT NAME
TDD 32A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 32A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	8.41	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	6.53	(in/hr)
Flow (Q_{10}) =	**24.7**	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	2163 LF
Slope =	0.030	(ft/ft)	Highest Elevation =	654
Z Required =	2.89	Ratio	Lowest Elevation =	590
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	1.10	ft	13.2	in
Bottom Width (B) =	1.00	ft	12.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 2.03 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

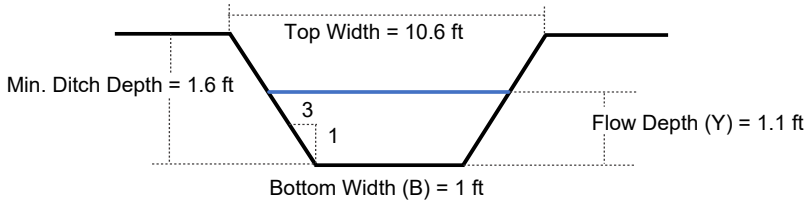
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	4.73	SF		
New P =	7.96	Wetted perimeter		
New R =	0.59	Hydraulic radius		
Z Actual =	**3.34**	Must be greater than z required=>	**2.89**	**Okay**
New V =	6.04	fps		

Minimum Design Geometry

Liner: North American Green, SC150 **2.10** LB/SF > 2.04 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.60	1.00	1.10	10.6	3:1

Ditch Liner
North American Green, SC150

*RED IS USER INPUT

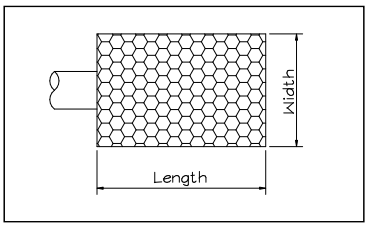
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 32A

Velocity =	6.04	fps	From Fig. 8.06.c:	ZONE =	**2**
Top Width =	10.6	ft			
Ditch Area =	4.73	sf	Rip Rap Class =	B	
Equivalent Pipe Diameter =	29.45	in	Apron Thickness =	18	in
Equivalent Pipe Diameter =	**30**	in	Apron Length =	15.0	ft
			Apron Width = Top Width.=	10.6	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 32A
TOP WIDTH "A"	10.6 FT
MIN. DITCH DEPTH (FT) "B"	1.6 FT
BOTTOM WIDTH (FT) "C"	1.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, SC150

DITCH NAME		PROJECT NAME
TDD 32B	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 32B

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.49	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	6.53	(in/hr)
Flow (Q_{10}) =	1.4	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	613 LF
Slope =	0.020	(ft/ft)	Highest Elevation =	602
Z Required =	0.21	Ratio	Lowest Elevation =	590
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.50	ft	6.0	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 0.61 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

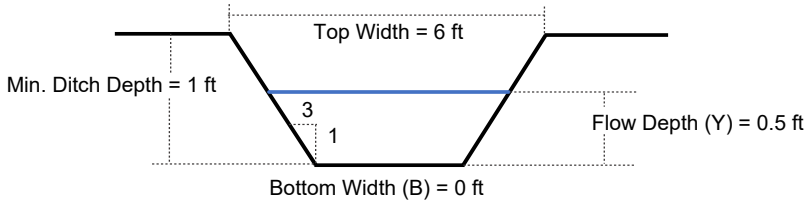
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.75	SF		
New P =	3.16	Wetted perimeter		
New R =	0.24	Hydraulic radius		
Z Actual =	0.29	Must be greater than z required=>	0.21	Okay
New V =	2.66	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 0.62 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.00	0.00	0.50	6	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

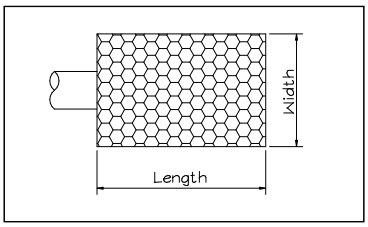
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 32B

Velocity =	2.66	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	6	ft			
Ditch Area =	0.75	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	11.73	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	12	in	Apron Length =	4.0	ft
			Apron Width = Top Width.=	6.0	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 32B
TOP WIDTH "A"	6 FT
MIN. DITCH DEPTH (FT) "B"	1 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 32C	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 32C

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.60	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	6.53	(in/hr)
Flow (Q_{10}) =	1.8	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	236 LF
Slope =	0.064	(ft/ft)	Highest Elevation =	605
Z Required =	0.14	Ratio	Lowest Elevation =	590
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.40	ft	4.8	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.59 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

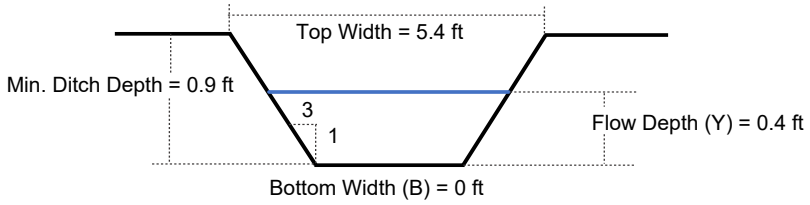
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.48	SF		
New P =	2.53	Wetted perimeter		
New R =	0.19	Hydraulic radius		
Z Actual =	0.16	Must be greater than z required=>	0.14	Okay
New V =	4.13	fps		

Minimum Design Geometry

Liner: North American Green, S150 — **1.75** LB/SF > 1.59 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
0.90	0.00	0.40	5.4	3:1

Ditch Liner
North American Green, S150

*RED IS USER INPUT

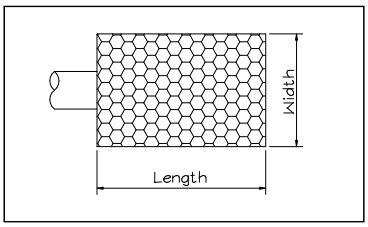
CALCULATED BY		PROJECT NAME
April Blye	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
		44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 32C

Velocity =	4.13	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	5.4	ft			
Ditch Area =	0.48	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	9.38	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	12	in	Apron Length =	4.0	ft
			Apron Width = Top Width.=	5.4	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 32C
TOP WIDTH "A"	5.4 FT
MIN. DITCH DEPTH (FT) "B"	0.9 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S150

DITCH NAME		PROJECT NAME
TDD 32D	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 32D

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.46	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	6.53	(in/hr)
Flow (Q_{10}) =	1.4	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	224 LF
Slope =	0.029	(ft/ft)	Highest Elevation =	596.5
Z Required =	0.16	Ratio	Lowest Elevation =	590
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.50	ft	6.0	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 0.91 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

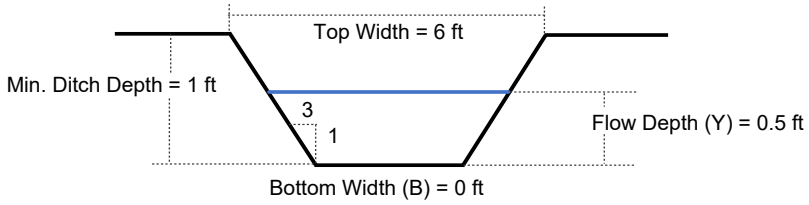
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.75	SF		
New P =	3.16	Wetted perimeter		
New R =	0.24	Hydraulic radius		
Z Actual =	0.29	Must be greater than z required=>	0.16	Okay
New V =	3.24	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 0.91 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.00	0.00	0.50	6	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

CALCULATED BY	April Blye
PROJECT NAME	Carolina Sunrock
PROJECT NUMBER	44089.001

TIMMONS GROUP
ENGINEERING | DESIGN | TECHNOLOGY

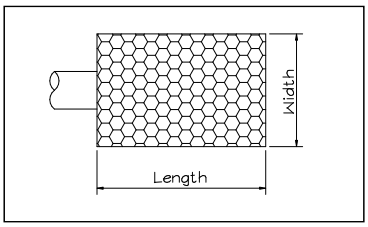
Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 32D

Velocity =	3.24	fps
Top Width =	6	ft
Ditch Area =	0.75	sf
Equivalent Pipe Diameter =	11.73	in
Equivalent Pipe Diameter =	**12**	in

From Fig. 8.06.c: ZONE =	**1**	
Rip Rap Class =	A	
Apron Thickness =	12	in
Apron Length =	4.0	ft
Apron Width = Top Width.=	6.0	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 32D
TOP WIDTH "A"	6 FT
MIN. DITCH DEPTH (FT) "B"	1 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 33A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 33A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.26	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	1.0	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	144 LF
Slope =	0.056	(ft/ft)	Highest Elevation =	600
Z Required =	0.08	Ratio	Lowest Elevation =	592
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.40	ft	4.8	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.39 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

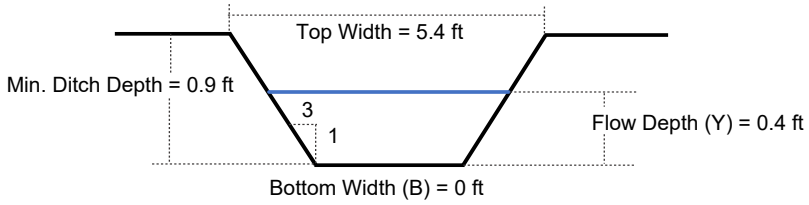
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.48	SF		
New P =	2.53	Wetted perimeter		
New R =	0.19	Hydraulic radius		
Z Actual =	0.16	Must be greater than z required=>	0.08	Okay
New V =	3.87	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 1.39 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
0.90	0.00	0.40	5.4	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

CALCULATED BY	April Blye
PROJECT NAME	Carolina Sunrock
PROJECT NUMBER	44089.001

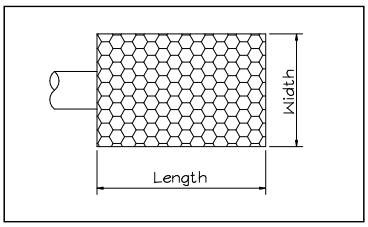
TIMMONS GROUP
ENGINEERING | DESIGN | TECHNOLOGY

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 33A

Velocity =	3.87	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	5.4	ft			
Ditch Area =	0.48	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	9.38	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	12	in	Apron Length =	4.0	ft
			Apron Width = Top Width.=	5.4	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 33A
TOP WIDTH "A"	5.4 FT
MIN. DITCH DEPTH (FT) "B"	0.9 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 33B	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 33B

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.21	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	0.8	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	167 LF
Slope =	0.024	(ft/ft)	Highest Elevation =	596
Z Required =	0.10	Ratio	Lowest Elevation =	592
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.40	ft	4.8	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 0.60 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

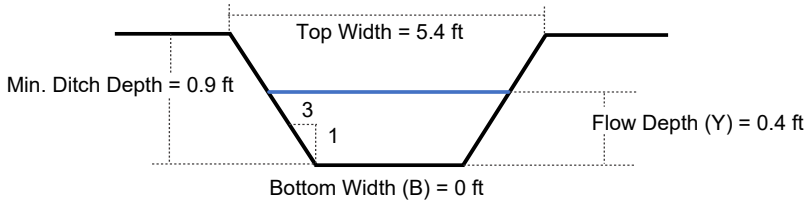
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.48	SF		
New P =	2.53	Wetted perimeter		
New R =	0.19	Hydraulic radius		
Z Actual =	0.16	Must be greater than z required=>	0.10	Okay
New V =	2.54	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 0.6 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
0.90	0.00	0.40	5.4	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

CALCULATED BY	April Blye
PROJECT NAME	Carolina Sunrock
PROJECT NUMBER	44089.001

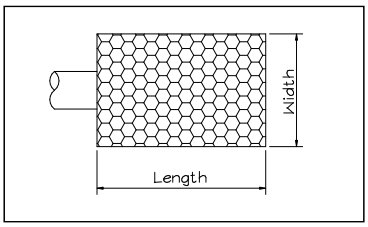
TIMMONS GROUP
ENGINEERING | DESIGN | TECHNOLOGY

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 33B

Velocity =	2.54	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	5.4	ft			
Ditch Area =	0.48	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	9.38	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	12	in	Apron Length =	4.0	ft
			Apron Width = Top Width.=	5.4	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 33B
TOP WIDTH "A"	5.4 FT
MIN. DITCH DEPTH (FT) "B"	0.9 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 33C	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 33C

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.32	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	1.2	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	204 LF
Slope =	0.074	(ft/ft)	Highest Elevation =	607
Z Required =	0.09	Ratio	Lowest Elevation =	592
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.40	ft	4.8	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.84 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

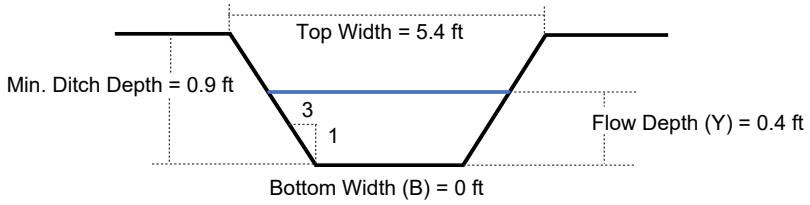
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.48	SF		
New P =	2.53	Wetted perimeter		
New R =	0.19	Hydraulic radius		
Z Actual =	0.16	Must be greater than z required=>	0.09	Okay
New V =	4.45	fps		

Minimum Design Geometry

Liner: North American Green, SC150 **2.10** LB/SF > 1.84 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
0.90	0.00	0.40	5.4	3:1

Ditch Liner
North American Green, SC150

*RED IS USER INPUT

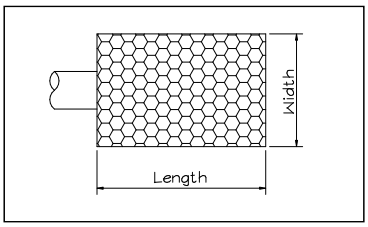
CALCULATED BY		PROJECT NAME
April Blye	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
		44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 33C

Velocity =	4.45	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	5.4	ft			
Ditch Area =	0.48	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	9.38	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	12	in	Apron Length =	4.0	ft
			Apron Width = Top Width.=	5.4	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 33C
TOP WIDTH "A"	5.4 FT
MIN. DITCH DEPTH (FT) "B"	0.9 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, SC150

DITCH NAME		PROJECT NAME
TDD 33D	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 33D

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.18	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	0.7	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	188 LF
Slope =	0.059	(ft/ft)	Highest Elevation =	603
Z Required =	0.06	Ratio	Lowest Elevation =	592
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.30	ft	3.6	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.10 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

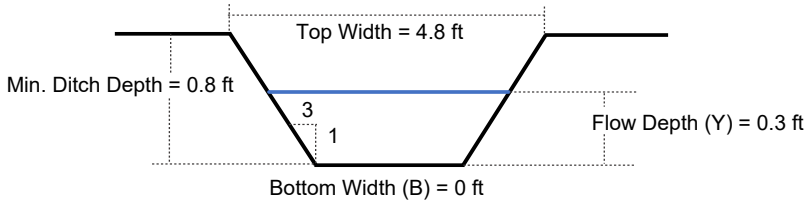
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.27	SF		
New P =	1.90	Wetted perimeter		
New R =	0.14	Hydraulic radius		
Z Actual =	0.07	Must be greater than z required=>	0.06	Okay
New V =	3.27	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 1.1 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
0.80	0.00	0.30	4.8	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

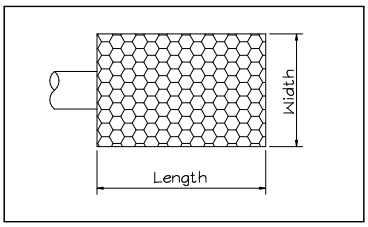
CALCULATED BY		PROJECT NAME
April Blye	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
		44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 33D

Velocity =	3.27	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	4.8	ft			
Ditch Area =	0.27	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	7.04	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	8	in	Apron Length =	2.7	ft
			Apron Width = Top Width.=	4.8	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 33D
TOP WIDTH "A"	4.8 FT
MIN. DITCH DEPTH (FT) "B"	0.8 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 34A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 34A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.93	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	3.4	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	376 LF
Slope =	0.035	(ft/ft)	Highest Elevation =	604
Z Required =	0.37	Ratio	Lowest Elevation =	591
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.60	ft	7.2	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.29 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

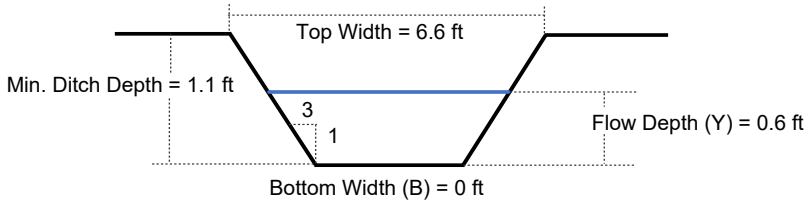
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	1.08	SF		
New P =	3.79	Wetted perimeter		
New R =	0.28	Hydraulic radius		
Z Actual =	0.47	Must be greater than z required=>	0.37	Okay
New V =	4.00	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 1.3 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.10	0.00	0.60	6.6	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

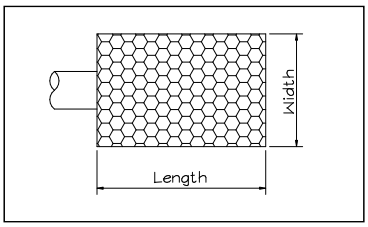
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 34A

Velocity =	4.00	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	6.6	ft			
Ditch Area =	1.08	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	14.07	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	15	in	Apron Length =	5.0	ft
			Apron Width = Top Width.=	6.6	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 34A
TOP WIDTH "A"	6.6 FT
MIN. DITCH DEPTH (FT) "B"	1.1 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 34B	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 34B

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.90	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	3.3	(cfs)

Known Quantities

Line channel with:	6	" rip-rap	(Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)		Ditch Length =	252 LF
Slope =	0.034	(ft/ft)		Highest Elevation =	599.5
Z Required =	0.36	Ratio		Lowest Elevation =	591
Side Slope (M) =	3	:1			

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.60	ft	7.2	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.26 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

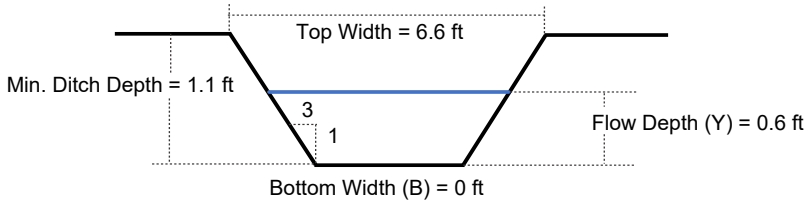
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	1.08	SF		
New P =	3.79	Wetted perimeter		
New R =	0.28	Hydraulic radius		
Z Actual =	0.47	Must be greater than z required=>	0.36	Okay
New V =	3.95	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 1.27 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.10	0.00	0.60	6.6	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

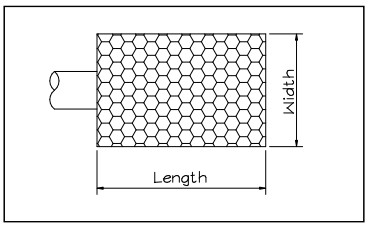
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 34B

Velocity =	3.95	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	6.6	ft			
Ditch Area =	1.08	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	14.07	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	15	in	Apron Length =	5.0	ft
			Apron Width = Top Width.=	6.6	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 34B
TOP WIDTH "A"	6.6 FT
MIN. DITCH DEPTH (FT) "B"	1.1 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 35A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 35A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.81	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	3.0	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	453 LF
Slope =	0.029	(ft/ft)	Highest Elevation =	598
Z Required =	0.36	Ratio	Lowest Elevation =	585
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.60	ft	7.2	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.07 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

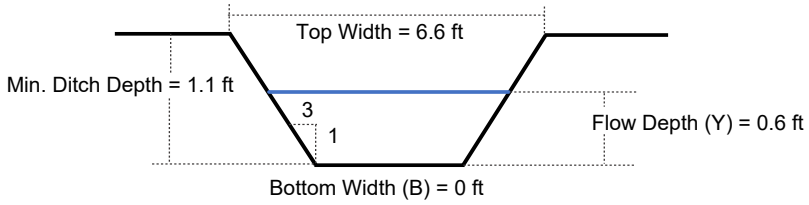
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	1.08	SF		
New P =	3.79	Wetted perimeter		
New R =	0.28	Hydraulic radius		
Z Actual =	0.47	Must be greater than z required=>	0.36	Okay
New V =	3.64	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 1.08 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.10	0.00	0.60	6.6	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

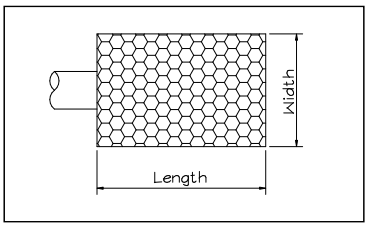
CALCULATED BY		PROJECT NAME
April Blye	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
		44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 35A

Velocity =	3.64	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	6.6	ft			
Ditch Area =	1.08	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	14.07	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	15	in	Apron Length =	5.0	ft
			Apron Width = Top Width.=	6.6	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 35A
TOP WIDTH "A"	6.6 FT
MIN. DITCH DEPTH (FT) "B"	1.1 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 35B	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 35B

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.26	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	1.0	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)			
Manning n =	0.030	(Dimensionless)	Ditch Length =	146	LF
Slope =	0.051	(ft/ft)	Highest Elevation =	592.5	
Z Required =	0.09	Ratio	Lowest Elevation =	585	
Side Slope (M) =	3	:1			

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.40	ft	4.8	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.28 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

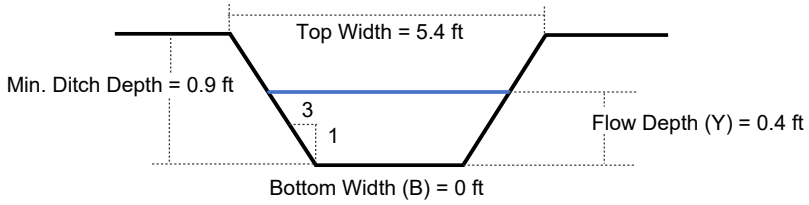
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.48	SF		
New P =	2.53	Wetted perimeter		
New R =	0.19	Hydraulic radius		
Z Actual =	0.16	Must be greater than z required=>	0.09	Okay
New V =	3.72	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 1.29 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
0.90	0.00	0.40	5.4	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

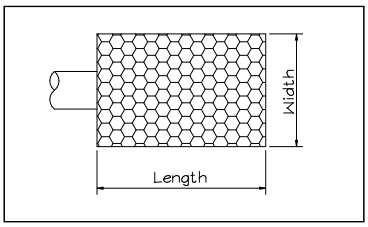
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 35B

Velocity =	3.72	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	5.4	ft			
Ditch Area =	0.48	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	9.38	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	12	in	Apron Length =	4.0	ft
			Apron Width = Top Width.=	5.4	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 35B
TOP WIDTH "A"	5.4 FT
MIN. DITCH DEPTH (FT) "B"	0.9 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 36A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 36A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.26	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	1.0	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	114 LF
Slope =	0.044	(ft/ft)	Highest Elevation =	596
Z Required =	0.09	Ratio	Lowest Elevation =	591
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.40	ft	4.8	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.09 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

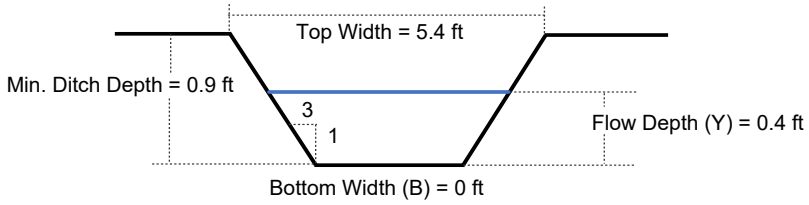
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.48	SF		
New P =	2.53	Wetted perimeter		
New R =	0.19	Hydraulic radius		
Z Actual =	0.16	Must be greater than z required=>	0.09	Okay
New V =	3.43	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 1.1 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
0.90	0.00	0.40	5.4	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

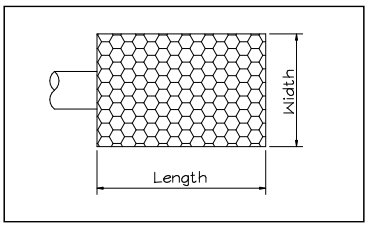
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 36A

Velocity =	3.43	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	5.4	ft			
Ditch Area =	0.48	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	9.38	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	12	in	Apron Length =	4.0	ft
			Apron Width = Top Width.=	5.4	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 36A
TOP WIDTH "A"	5.4 FT
MIN. DITCH DEPTH (FT) "B"	0.9 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 36B	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 36B

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.78	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	2.9	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)			
Manning n =	0.030	(Dimensionless)	Ditch Length =	151	LF
Slope =	0.036	(ft/ft)	Highest Elevation =	593.5	
Z Required =	0.30	Ratio	Lowest Elevation =	588	
Side Slope (M) =	3	:1			

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.60	ft	7.2	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.36 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

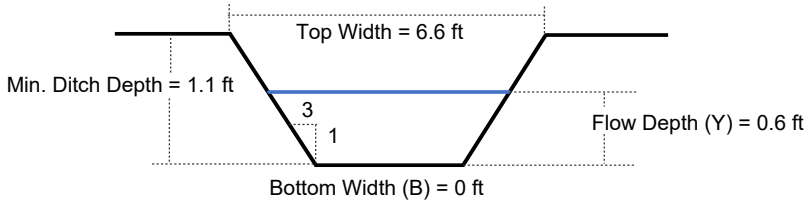
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	1.08	SF		
New P =	3.79	Wetted perimeter		
New R =	0.28	Hydraulic radius		
Z Actual =	0.47	Must be greater than z required=>	0.30	Okay
New V =	4.10	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 1.37 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.10	0.00	0.60	6.6	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

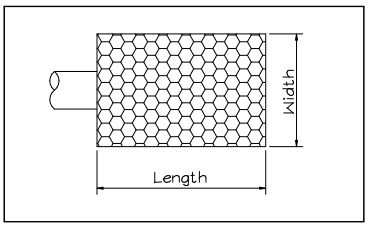
CALCULATED BY		PROJECT NAME
April Blye	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
		44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 36B

Velocity =	4.10	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	6.6	ft			
Ditch Area =	1.08	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	14.07	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	15	in	Apron Length =	5.0	ft
			Apron Width = Top Width.=	6.6	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 36B
TOP WIDTH "A"	6.6 FT
MIN. DITCH DEPTH (FT) "B"	1.1 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 37A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 37A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	1.90	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	7.0	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	455 LF
Slope =	0.034	(ft/ft)	Highest Elevation =	591.5
Z Required =	0.77	Ratio	Lowest Elevation =	576
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.80	ft	9.6	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.70 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

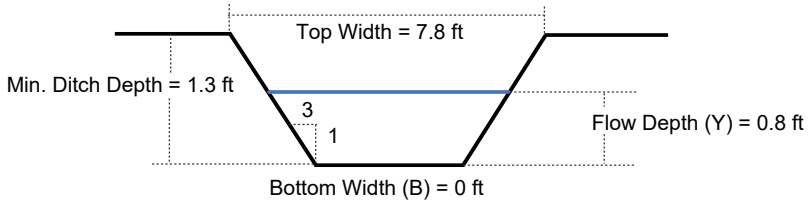
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	1.92	SF		
New P =	5.06	Wetted perimeter		
New R =	0.38	Hydraulic radius		
Z Actual =	1.01	Must be greater than z required=>	0.77	Okay
New V =	4.80	fps		

Minimum Design Geometry

Liner: North American Green, S150 — **1.75** LB/SF > 1.71 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.30	0.00	0.80	7.8	3:1

Ditch Liner
North American Green, S150

*RED IS USER INPUT

CALCULATED BY	April Blye
PROJECT NAME	Carolina Sunrock
PROJECT NUMBER	44089.001

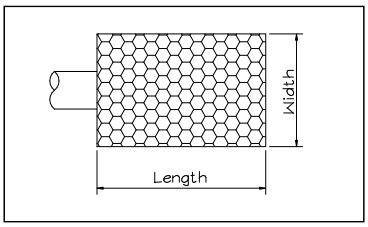
TIMMONS GROUP
ENGINEERING | DESIGN | TECHNOLOGY

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 37A

Velocity =	4.80	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	7.8	ft			
Ditch Area =	1.92	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	18.76	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	24	in	Apron Length =	8.0	ft
			Apron Width = Top Width.=	7.8	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 37A
TOP WIDTH "A"	7.8 FT
MIN. DITCH DEPTH (FT) "B"	1.3 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S150

DITCH NAME		PROJECT NAME
TDD 37B	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 37B

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.61	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	2.3	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	107 LF
Slope =	0.061	(ft/ft)	Highest Elevation =	582.5
Z Required =	0.18	Ratio	Lowest Elevation =	576
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.50	ft	6.0	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.90 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

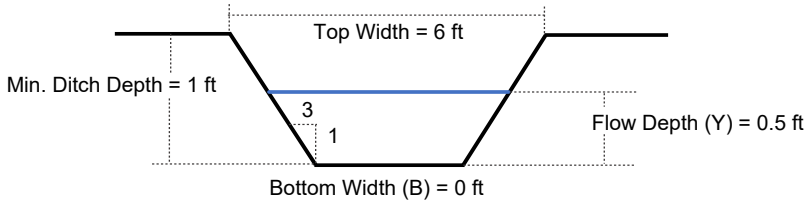
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.75	SF		
New P =	3.16	Wetted perimeter		
New R =	0.24	Hydraulic radius		
Z Actual =	0.29	Must be greater than z required=>	0.18	Okay
New V =	4.69	fps		

Minimum Design Geometry

Liner: North American Green, SC150 **2.10** LB/SF > 1.9 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.00	0.00	0.50	6	3:1

Ditch Liner
North American Green, SC150

*RED IS USER INPUT

CALCULATED BY	April Blye
PROJECT NAME	Carolina Sunrock
PROJECT NUMBER	44089.001

TIMMONS GROUP
ENGINEERING | DESIGN | TECHNOLOGY

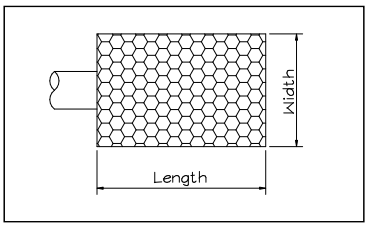
Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 37B

Velocity =	4.69	fps
Top Width =	6	ft
Ditch Area =	0.75	sf
Equivalent Pipe Diameter =	11.73	in
Equivalent Pipe Diameter =	**12**	in

From Fig. 8.06.c: ZONE =	**1**	
Rip Rap Class =	A	
Apron Thickness =	12	in
Apron Length =	4.0	ft
Apron Width = Top Width.=	6.0	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 37B
TOP WIDTH "A"	6 FT
MIN. DITCH DEPTH (FT) "B"	1 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, SC150

DITCH NAME		PROJECT NAME
TDD 38A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 38A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.62	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	2.3	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	205 LF
Slope =	0.061	(ft/ft)	Highest Elevation =	582.5
Z Required =	0.19	Ratio	Lowest Elevation =	570
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.50	ft	6.0	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.90 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

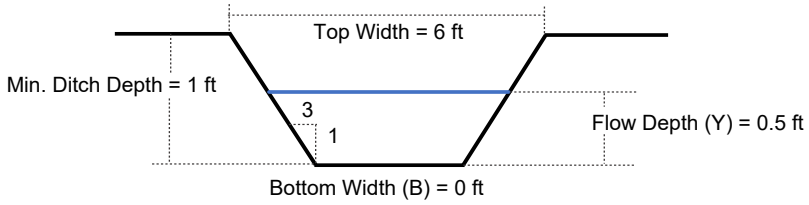
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.75	SF		
New P =	3.16	Wetted perimeter		
New R =	0.24	Hydraulic radius		
Z Actual =	0.29	Must be greater than z required=>	0.19	Okay
New V =	4.70	fps		

Minimum Design Geometry

Liner: North American Green, SC150 **2.10** LB/SF > 1.91 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.00	0.00	0.50	6	3:1

Ditch Liner
North American Green, SC150

*RED IS USER INPUT

CALCULATED BY	April Blye
PROJECT NAME	Carolina Sunrock
PROJECT NUMBER	44089.001

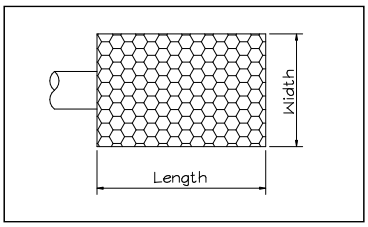
TIMMONS GROUP
ENGINEERING | DESIGN | TECHNOLOGY

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 38A

Velocity =	4.70	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	6	ft			
Ditch Area =	0.75	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	11.73	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	12	in	Apron Length =	4.0	ft
			Apron Width = Top Width.=	6.0	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 38A
TOP WIDTH "A"	6 FT
MIN. DITCH DEPTH (FT) "B"	1 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, SC150

DITCH NAME		PROJECT NAME
TDD 38B	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 38B

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	1.05	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	3.9	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)			
Manning n =	0.030	(Dimensionless)	Ditch Length =	618	LF
Slope =	0.036	(ft/ft)	Highest Elevation =	592.5	
Z Required =	0.41	Ratio	Lowest Elevation =	570	
Side Slope (M) =	3	:1			

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.60	ft	7.2	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.36 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

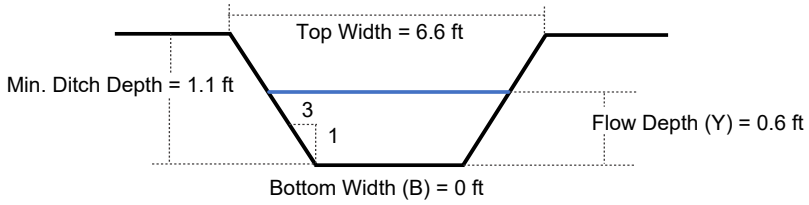
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	1.08	SF		
New P =	3.79	Wetted perimeter		
New R =	0.28	Hydraulic radius		
Z Actual =	0.47	Must be greater than z required=>	0.41	Okay
New V =	4.10	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 1.37 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.10	0.00	0.60	6.6	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

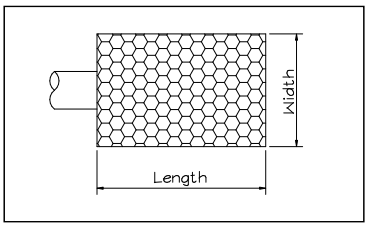
CALCULATED BY		PROJECT NAME
April Blye	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
		44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 38B

Velocity =	4.10	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	6.6	ft			
Ditch Area =	1.08	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	14.07	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	15	in	Apron Length =	5.0	ft
			Apron Width = Top Width.=	6.6	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 38B
TOP WIDTH "A"	6.6 FT
MIN. DITCH DEPTH (FT) "B"	1.1 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 38C	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 38C

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.17	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	0.6	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	285 LF
Slope =	0.049	(ft/ft)	Highest Elevation =	584
Z Required =	0.06	Ratio	Lowest Elevation =	570
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.30	ft	3.6	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 0.92 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

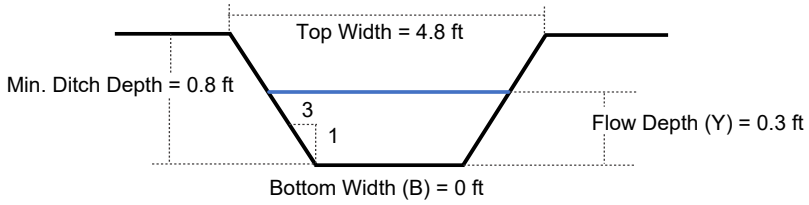
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.27	SF		
New P =	1.90	Wetted perimeter		
New R =	0.14	Hydraulic radius		
Z Actual =	0.07	Must be greater than z required=>	0.06	Okay
New V =	3.00	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 0.92 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
0.80	0.00	0.30	4.8	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

CALCULATED BY	April Blye
PROJECT NAME	Carolina Sunrock
PROJECT NUMBER	44089.001

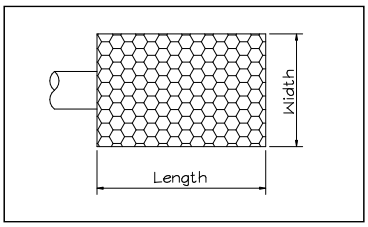
TIMMONS GROUP
ENGINEERING | DESIGN | TECHNOLOGY

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 38C

Velocity =	3.00	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	4.8	ft			
Ditch Area =	0.27	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	7.04	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	8	in	Apron Length =	2.7	ft
			Apron Width = Top Width.=	4.8	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 38C
TOP WIDTH "A"	4.8 FT
MIN. DITCH DEPTH (FT) "B"	0.8 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 39A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 39A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	3.04	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	11.2	(cfs)

Known Quantities

Line channel with:	6	" rip-rap	(Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)		Ditch Length =	877 LF
Slope =	0.034	(ft/ft)		Highest Elevation =	588.5
Z Required =	1.23	Ratio		Lowest Elevation =	559
Side Slope (M) =	3	:1			

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.90	ft	10.8	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.89 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

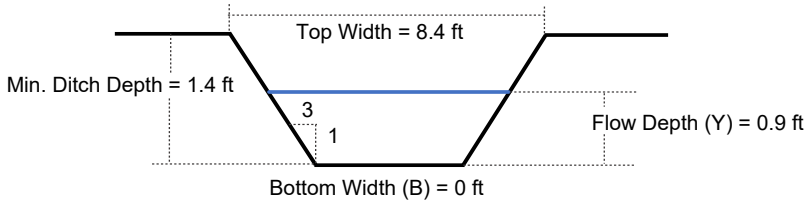
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	2.43	SF		
New P =	5.69	Wetted perimeter		
New R =	0.43	Hydraulic radius		
Z Actual =	1.38	Must be greater than z required=>	1.23	Okay
New V =	5.16	fps		

Minimum Design Geometry

Liner: North American Green, SC150 **2.10** LB/SF > 1.89 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.40	0.00	0.90	8.4	3:1

Ditch Liner
North American Green, SC150

*RED IS USER INPUT

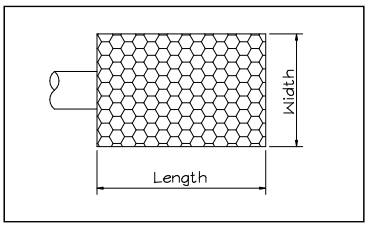
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 39A

Velocity =	5.16	fps	From Fig. 8.06.c:	ZONE =	**2**
Top Width =	8.4	ft			
Ditch Area =	2.43	sf	Rip Rap Class =	B	
Equivalent Pipe Diameter =	21.11	in	Apron Thickness =	18	in
Equivalent Pipe Diameter =	**24**	in	Apron Length =	12.0	ft
			Apron Width = Top Width.=	8.4	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 39A
TOP WIDTH "A"	8.4 FT
MIN. DITCH DEPTH (FT) "B"	1.4 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, SC150

DITCH NAME		PROJECT NAME
TDD 39B	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 39B

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.65	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	2.4	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	435 LF
Slope =	0.039	(ft/ft)	Highest Elevation =	576
Z Required =	0.24	Ratio	Lowest Elevation =	559
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.50	ft	6.0	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.22 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

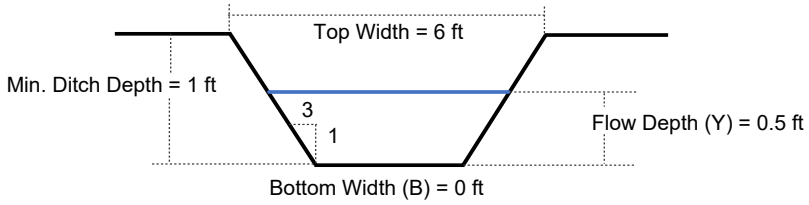
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.75	SF		
New P =	3.16	Wetted perimeter		
New R =	0.24	Hydraulic radius		
Z Actual =	0.29	Must be greater than z required=>	0.24	Okay
New V =	3.76	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 1.22 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.00	0.00	0.50	6	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

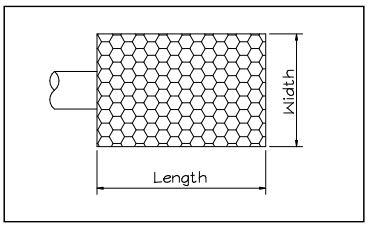
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 39B

Velocity =	3.76	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	6	ft			
Ditch Area =	0.75	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	11.73	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	12	in	Apron Length =	4.0	ft
			Apron Width = Top Width.=	6.0	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 39B
TOP WIDTH "A"	6 FT
MIN. DITCH DEPTH (FT) "B"	1 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 39C	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 39C

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	2.14	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	7.9	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	521 LF
Slope =	0.036	(ft/ft)	Highest Elevation =	578
Z Required =	0.83	Ratio	Lowest Elevation =	559
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.80	ft	9.6	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.82 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

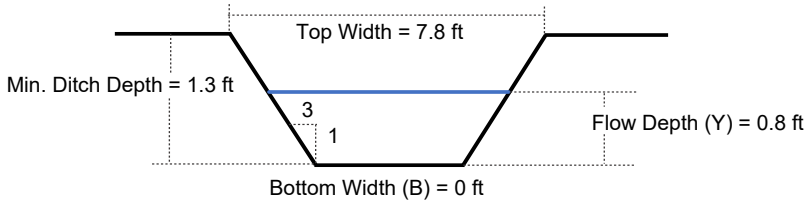
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	1.92	SF		
New P =	5.06	Wetted perimeter		
New R =	0.38	Hydraulic radius		
Z Actual =	1.01	Must be greater than z required=>	0.83	Okay
New V =	4.97	fps		

Minimum Design Geometry

Liner: North American Green, SC150 — **2.10** LB/SF > 1.83 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.30	0.00	0.80	7.8	3:1

Ditch Liner
North American Green, SC150

*RED IS USER INPUT

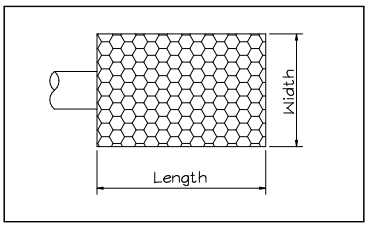
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 39C

Velocity =	4.97	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	7.8	ft			
Ditch Area =	1.92	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	18.76	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	24	in	Apron Length =	8.0	ft
			Apron Width = Top Width.=	7.8	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 39C
TOP WIDTH "A"	7.8 FT
MIN. DITCH DEPTH (FT) "B"	1.3 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, SC150

DITCH NAME		PROJECT NAME
TDD 40A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 40A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	1.42	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	5.2	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	736 LF
Slope =	0.056	(ft/ft)	Highest Elevation =	606
Z Required =	0.45	Ratio	Lowest Elevation =	565
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.60	ft	7.2	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 2.09 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

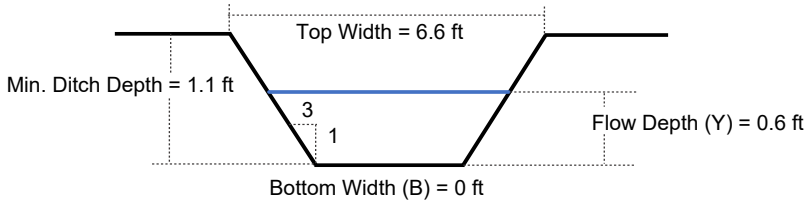
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	1.08	SF		
New P =	3.79	Wetted perimeter		
New R =	0.28	Hydraulic radius		
Z Actual =	0.47	Must be greater than z required=>	0.45	Okay
New V =	5.07	fps		

Minimum Design Geometry

Liner: North American Green, SC150 **2.10** LB/SF > 2.09 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.10	0.00	0.60	6.6	3:1

Ditch Liner
North American Green, SC150

*RED IS USER INPUT

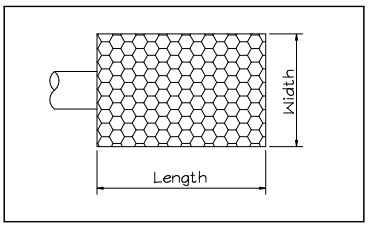
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 40A

Velocity =	5.07	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	6.6	ft			
Ditch Area =	1.08	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	14.07	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	15	in	Apron Length =	5.0	ft
			Apron Width = Top Width.=	6.6	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 40A
TOP WIDTH "A"	6.6 FT
MIN. DITCH DEPTH (FT) "B"	1.1 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, SC150

DITCH NAME		PROJECT NAME
TDD 40B	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 40B

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.17	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	0.6	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	236 LF
Slope =	0.072	(ft/ft)	Highest Elevation =	582
Z Required =	0.05	Ratio	Lowest Elevation =	565
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.30	ft	3.6	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.35 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

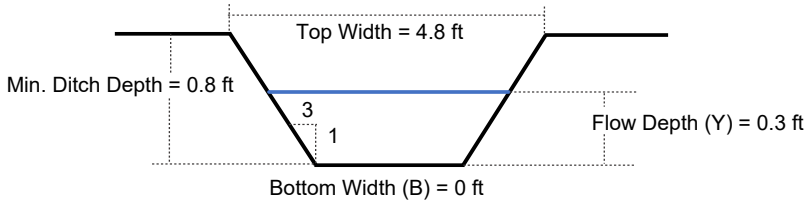
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.27	SF		
New P =	1.90	Wetted perimeter		
New R =	0.14	Hydraulic radius		
Z Actual =	0.07	Must be greater than z required=>	0.05	Okay
New V =	3.63	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 1.35 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
0.80	0.00	0.30	4.8	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

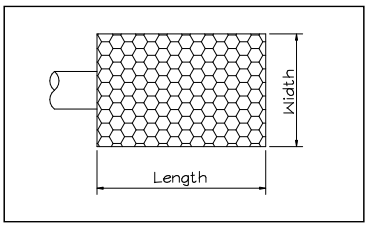
CALCULATED BY		PROJECT NAME
April Blye	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
		44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 40B

Velocity =	3.63	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	4.8	ft			
Ditch Area =	0.27	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	7.04	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	8	in	Apron Length =	2.7	ft
			Apron Width = Top Width.=	4.8	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 40B
TOP WIDTH "A"	4.8 FT
MIN. DITCH DEPTH (FT) "B"	0.8 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 40C	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 40C

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	4.20	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	**15.5**	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	132 LF
Slope =	0.091	(ft/ft)	Highest Elevation =	577
Z Required =	1.04	Ratio	Lowest Elevation =	565
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.90	ft	10.8	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 5.11 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

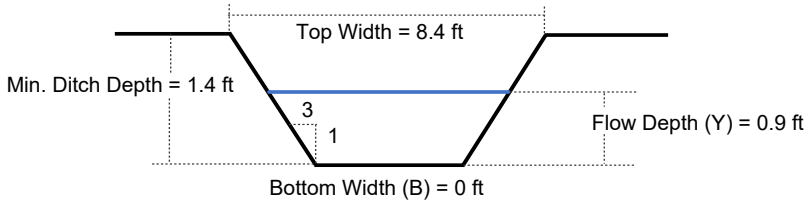
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	2.43	SF		
New P =	5.69	Wetted perimeter		
New R =	0.43	Hydraulic radius		
Z Actual =	**1.38**	Must be greater than z required=>	**1.04**	**Okay**
New V =	8.49	fps		

Minimum Design Geometry

Liner: North American Green, P300 **8.00** LB/SF > 5.11 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.40	0.00	0.90	8.4	3:1

Ditch Liner
North American Green, P300

*RED IS USER INPUT

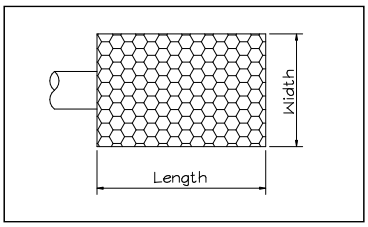
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 40C

Velocity =	8.49	fps	From Fig. 8.06.c:	ZONE =	**2**
Top Width =	8.4	ft			
Ditch Area =	2.43	sf	Rip Rap Class =	B	
Equivalent Pipe Diameter =	21.11	in	Apron Thickness =	18	in
Equivalent Pipe Diameter =	**24**	in	Apron Length =	12.0	ft
			Apron Width = Top Width.=	8.4	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 40C
TOP WIDTH "A"	8.4 FT
MIN. DITCH DEPTH (FT) "B"	1.4 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, P300

DITCH NAME		PROJECT NAME
TDD 41A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 41A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.68	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	2.5	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	504 LF
Slope =	0.095	(ft/ft)	Highest Elevation =	581
Z Required =	0.16	Ratio	Lowest Elevation =	533
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.50	ft	6.0	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 2.97 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

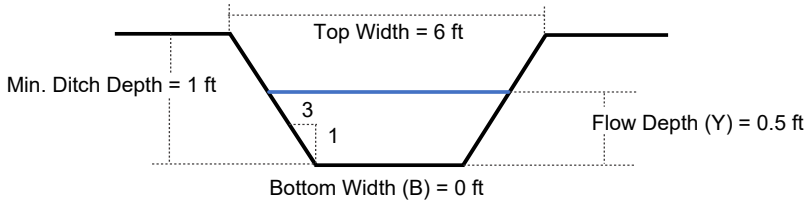
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.75	SF		
New P =	3.16	Wetted perimeter		
New R =	0.24	Hydraulic radius		
Z Actual =	0.29	Must be greater than z required=>	0.16	Okay
New V =	5.87	fps		

Minimum Design Geometry

Liner: North American Green, P300 — **8.00** LB/SF > 2.98 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.00	0.00	0.50	6	3:1

Ditch Liner
North American Green, P300

*RED IS USER INPUT

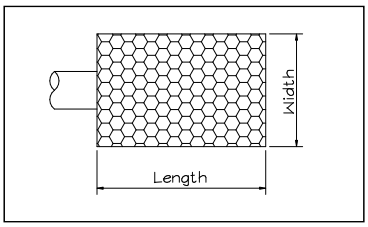
CALCULATED BY		PROJECT NAME
April Blye	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
		44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 41A

Velocity =	5.87	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	6	ft			
Ditch Area =	0.75	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	11.73	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	12	in	Apron Length =	4.0	ft
			Apron Width = Top Width.=	6.0	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 41A
TOP WIDTH "A"	6 FT
MIN. DITCH DEPTH (FT) "B"	1 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, P300

DITCH NAME		PROJECT NAME
TDD 41B	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 41B

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.25	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	0.9	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	346 LF
Slope =	0.103	(ft/ft)	Highest Elevation =	568.5
Z Required =	0.06	Ratio	Lowest Elevation =	533
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.30	ft	3.6	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.92 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

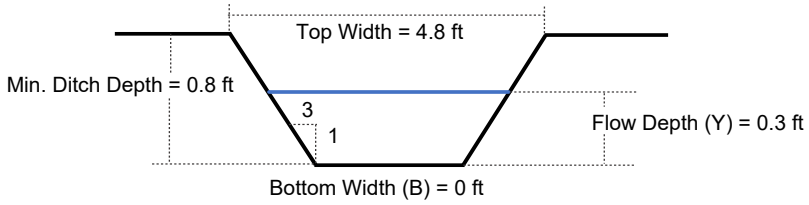
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.27	SF		
New P =	1.90	Wetted perimeter		
New R =	0.14	Hydraulic radius		
Z Actual =	0.07	Must be greater than z required=>	0.06	Okay
New V =	4.34	fps		

Minimum Design Geometry

Liner: North American Green, SC150 **2.10** LB/SF > 1.93 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
0.80	0.00	0.30	4.8	3:1

Ditch Liner
North American Green, SC150

*RED IS USER INPUT

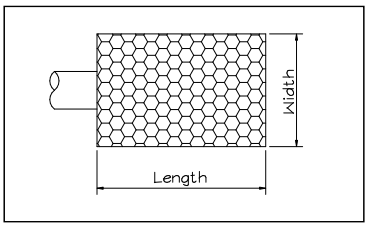
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 41B

Velocity =	4.34	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	4.8	ft			
Ditch Area =	0.27	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	7.04	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	8	in	Apron Length =	2.7	ft
			Apron Width = Top Width.=	4.8	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 41B
TOP WIDTH "A"	4.8 FT
MIN. DITCH DEPTH (FT) "B"	0.8 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, SC150

DITCH NAME		PROJECT NAME
TDD 41C	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 41C

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.96	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	3.5	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	614 LF
Slope =	0.059	(ft/ft)	Highest Elevation =	569.5
Z Required =	0.29	Ratio	Lowest Elevation =	533
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.60	ft	7.2	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 2.23 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

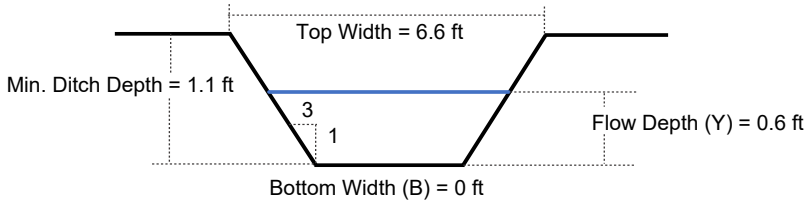
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	1.08	SF		
New P =	3.79	Wetted perimeter		
New R =	0.28	Hydraulic radius		
Z Actual =	0.47	Must be greater than z required=>	0.29	Okay
New V =	5.24	fps		

Minimum Design Geometry

Liner: North American Green, C125 — **2.25** LB/SF > 2.23 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.10	0.00	0.60	6.6	3:1

Ditch Liner
North American Green, C125

*RED IS USER INPUT

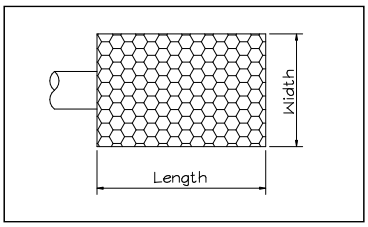
CALCULATED BY		PROJECT NAME
April Blye	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
		44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 41C

Velocity =	5.24	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	6.6	ft			
Ditch Area =	1.08	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	14.07	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	15	in	Apron Length =	5.0	ft
			Apron Width = Top Width.=	6.6	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 41C
TOP WIDTH "A"	6.6 FT
MIN. DITCH DEPTH (FT) "B"	1.1 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, C125

DITCH NAME		PROJECT NAME
TDD 41D	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 41D

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.63	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	2.3	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	525 LF
Slope =	0.050	(ft/ft)	Highest Elevation =	559
Z Required =	0.21	Ratio	Lowest Elevation =	533
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.50	ft	6.0	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.55 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

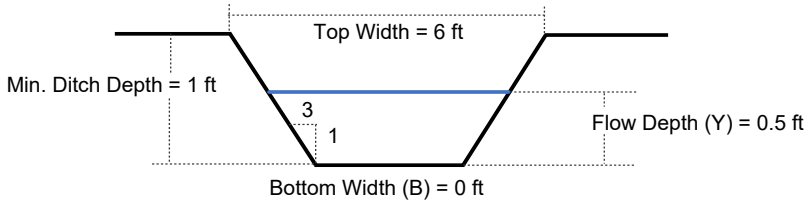
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.75	SF		
New P =	3.16	Wetted perimeter		
New R =	0.24	Hydraulic radius		
Z Actual =	0.29	Must be greater than z required=>	0.21	Okay
New V =	4.23	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 1.55 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.00	0.00	0.50	6	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

CALCULATED BY	April Blye
PROJECT NAME	Carolina Sunrock
PROJECT NUMBER	44089.001

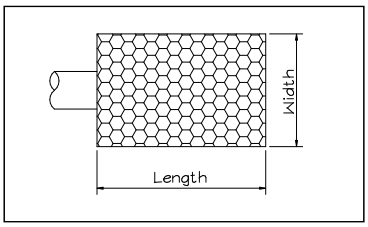
TIMMONS GROUP
ENGINEERING | DESIGN | TECHNOLOGY

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 41D

Velocity =	4.23	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	6	ft			
Ditch Area =	0.75	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	11.73	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	12	in	Apron Length =	4.0	ft
			Apron Width = Top Width.=	6.0	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 41D
TOP WIDTH "A"	6 FT
MIN. DITCH DEPTH (FT) "B"	1 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 42A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 42A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	1.12	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	4.1	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	323 LF
Slope =	0.059	(ft/ft)	Highest Elevation =	595
Z Required =	0.34	Ratio	Lowest Elevation =	576
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.60	ft	7.2	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 2.20 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

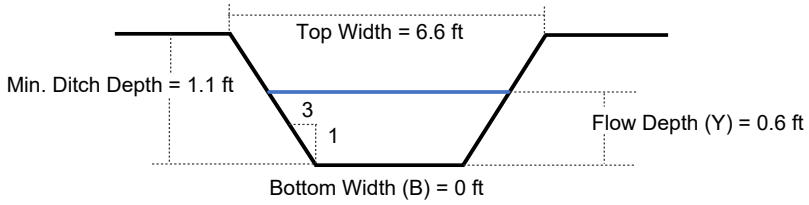
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	1.08	SF		
New P =	3.79	Wetted perimeter		
New R =	0.28	Hydraulic radius		
Z Actual =	0.47	Must be greater than z required=>	0.34	Okay
New V =	5.21	fps		

Minimum Design Geometry

Liner: North American Green, C125 — **2.25** LB/SF > 2.21 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.10	0.00	0.60	6.6	3:1

Ditch Liner
North American Green, C125

*RED IS USER INPUT

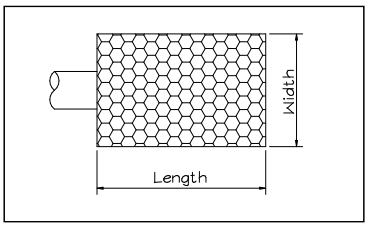
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 42A

Velocity =	5.21	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	6.6	ft			
Ditch Area =	1.08	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	14.07	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	15	in	Apron Length =	5.0	ft
			Apron Width = Top Width.=	6.6	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 42A
TOP WIDTH "A"	6.6 FT
MIN. DITCH DEPTH (FT) "B"	1.1 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, C125

DITCH NAME		PROJECT NAME
TDD 42B	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 42B

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.17	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	0.6	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	144 LF
Slope =	0.049	(ft/ft)	Highest Elevation =	583
Z Required =	0.06	Ratio	Lowest Elevation =	576
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.30	ft	3.6	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 0.91 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

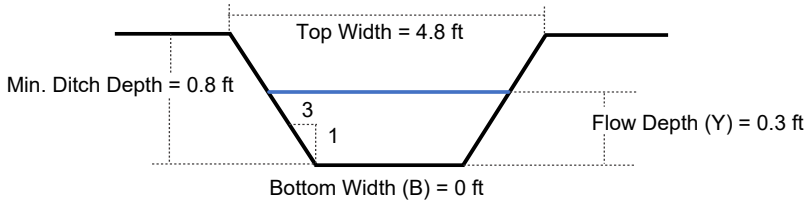
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.27	SF		
New P =	1.90	Wetted perimeter		
New R =	0.14	Hydraulic radius		
Z Actual =	0.07	Must be greater than z required=>	0.06	Okay
New V =	2.98	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 0.91 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
0.80	0.00	0.30	4.8	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

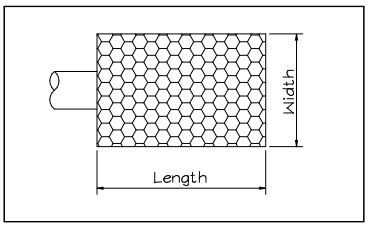
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 42B

Velocity =	2.98	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	4.8	ft			
Ditch Area =	0.27	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	7.04	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	8	in	Apron Length =	2.7	ft
			Apron Width = Top Width.=	4.8	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 42B
TOP WIDTH "A"	4.8 FT
MIN. DITCH DEPTH (FT) "B"	0.8 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 42C	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 42C

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.35	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	1.3	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	199 LF
Slope =	0.055	(ft/ft)	Highest Elevation =	587
Z Required =	0.11	Ratio	Lowest Elevation =	576
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.40	ft	4.8	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.38 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

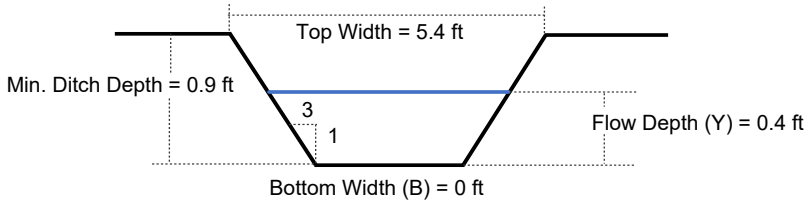
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.48	SF		
New P =	2.53	Wetted perimeter		
New R =	0.19	Hydraulic radius		
Z Actual =	0.16	Must be greater than z required=>	0.11	Okay
New V =	3.86	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 1.38 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
0.90	0.00	0.40	5.4	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

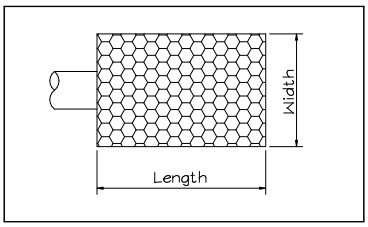
CALCULATED BY		PROJECT NAME
April Blye	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
		44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 42C

Velocity =	3.86	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	5.4	ft			
Ditch Area =	0.48	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	9.38	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	12	in	Apron Length =	4.0	ft
			Apron Width = Top Width.=	5.4	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 42C
TOP WIDTH "A"	5.4 FT
MIN. DITCH DEPTH (FT) "B"	0.9 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 42D	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 42D

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.09	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	0.3	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	140 LF
Slope =	0.061	(ft/ft)	Highest Elevation =	584.5
Z Required =	0.03	Ratio	Lowest Elevation =	576
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.30	ft	3.6	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.14 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

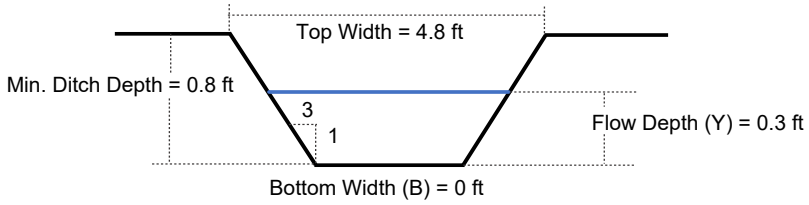
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.27	SF		
New P =	1.90	Wetted perimeter		
New R =	0.14	Hydraulic radius		
Z Actual =	0.07	Must be greater than z required=>	0.03	Okay
New V =	3.34	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 1.14 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
0.80	0.00	0.30	4.8	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

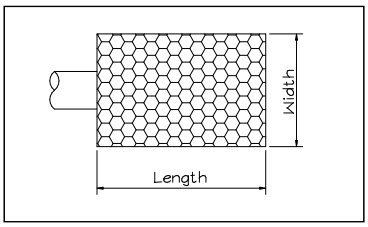
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 42D

Velocity =	3.34	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	4.8	ft			
Ditch Area =	0.27	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	7.04	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	8	in	Apron Length =	2.7	ft
			Apron Width = Top Width.=	4.8	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 42D
TOP WIDTH "A"	4.8 FT
MIN. DITCH DEPTH (FT) "B"	0.8 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 43A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 43A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.76	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	2.8	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	110 LF
Slope =	0.100	(ft/ft)	Highest Elevation =	588
Z Required =	0.18	Ratio	Lowest Elevation =	577
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.30	ft	3.6	in
Bottom Width (B) =	1.00	ft	12.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.87 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

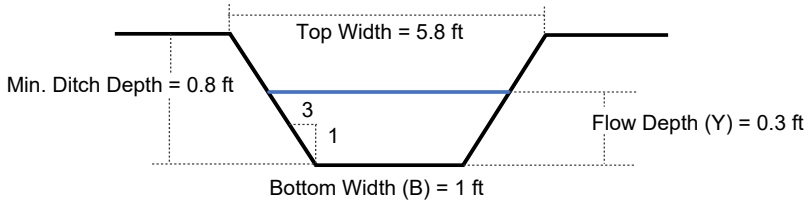
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.57	SF		
New P =	2.90	Wetted perimeter		
New R =	0.20	Hydraulic radius		
Z Actual =	0.19	Must be greater than z required=>	0.18	Okay
New V =	5.31	fps		

Minimum Design Geometry

Liner: North American Green, SC150 **2.10** LB/SF > 1.88 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
0.80	1.00	0.30	5.8	3:1

Ditch Liner
North American Green, SC150

*RED IS USER INPUT

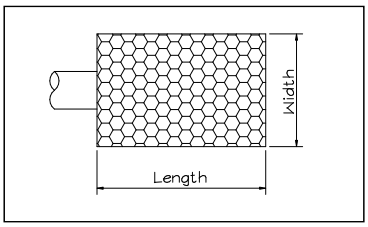
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 43A

Velocity =	5.31	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	5.8	ft			
Ditch Area =	0.57	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	10.22	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	12	in	Apron Length =	4.0	ft
			Apron Width = Top Width.=	5.8	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 43A
TOP WIDTH "A"	5.8 FT
MIN. DITCH DEPTH (FT) "B"	0.8 FT
BOTTOM WIDTH (FT) "C"	1.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, SC150

DITCH NAME		PROJECT NAME
TDD 44A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 44A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.81	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	3.0	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)			
Manning n =	0.030	(Dimensionless)	Ditch Length =	431	LF
Slope =	0.074	(ft/ft)	Highest Elevation =	592	
Z Required =	0.22	Ratio	Lowest Elevation =	560	
Side Slope (M) =	3	:1			

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.40	ft	4.8	in
Bottom Width (B) =	1.00	ft	12.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.85 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

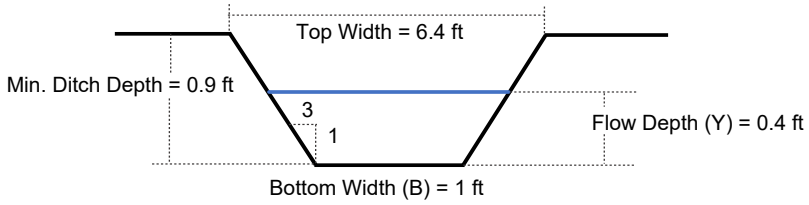
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.88	SF		
New P =	3.53	Wetted perimeter		
New R =	0.25	Hydraulic radius		
Z Actual =	0.35	Must be greater than z required=>	0.22	Okay
New V =	5.36	fps		

Minimum Design Geometry

Liner: North American Green, SC150 **2.10** LB/SF > 1.86 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
0.90	1.00	0.40	6.4	3:1

Ditch Liner
North American Green, SC150

*RED IS USER INPUT

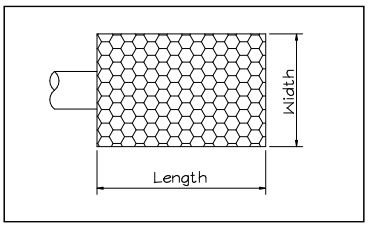
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 44A

Velocity =	5.36	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	6.4	ft			
Ditch Area =	0.88	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	12.70	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	15	in	Apron Length =	5.0	ft
			Apron Width = Top Width.=	6.4	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 44A
TOP WIDTH "A"	6.4 FT
MIN. DITCH DEPTH (FT) "B"	0.9 FT
BOTTOM WIDTH (FT) "C"	1.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, SC150

DITCH NAME		PROJECT NAME
TDD 44B	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 44B

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.31	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	1.1	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	366 LF
Slope =	0.055	(ft/ft)	Highest Elevation =	580
Z Required =	0.10	Ratio	Lowest Elevation =	560
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.40	ft	4.8	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.36 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

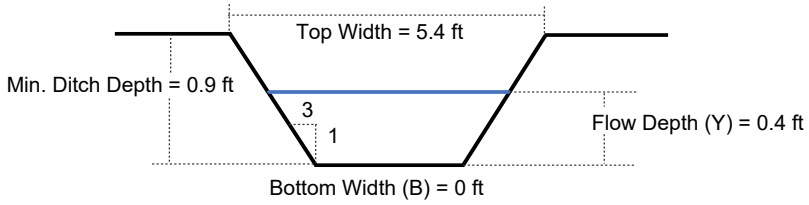
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.48	SF		
New P =	2.53	Wetted perimeter		
New R =	0.19	Hydraulic radius		
Z Actual =	0.16	Must be greater than z required=>	0.10	Okay
New V =	3.83	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 1.37 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
0.90	0.00	0.40	5.4	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

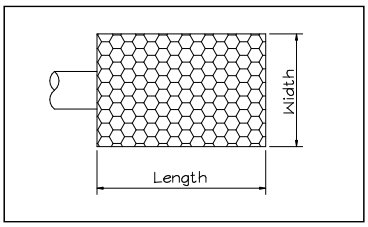
CALCULATED BY		PROJECT NAME
April Blye	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
		44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 44B

Velocity =	3.83	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	5.4	ft			
Ditch Area =	0.48	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	9.38	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	12	in	Apron Length =	4.0	ft
			Apron Width = Top Width.=	5.4	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 44B
TOP WIDTH "A"	5.4 FT
MIN. DITCH DEPTH (FT) "B"	0.9 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 44C	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 44C

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.46	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	1.7	(cfs)

Known Quantities

Line channel with:	6	" rip-rap	(Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)		Ditch Length =	325 LF
Slope =	0.082	(ft/ft)		Highest Elevation =	586.5
Z Required =	0.12	Ratio		Lowest Elevation =	560
Side Slope (M) =	3	:1			

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.40	ft	4.8	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 2.04 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

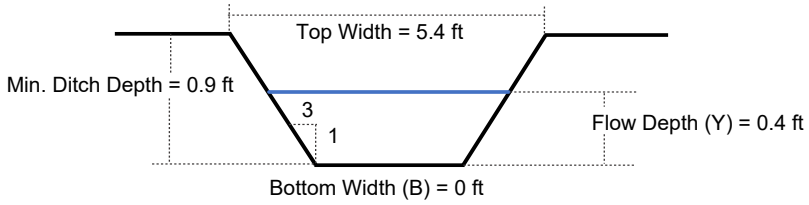
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.48	SF		
New P =	2.53	Wetted perimeter		
New R =	0.19	Hydraulic radius		
Z Actual =	0.16	Must be greater than z required=>	0.12	Okay
New V =	4.68	fps		

Minimum Design Geometry

Liner: North American Green, SC150 **2.10** LB/SF > 2.04 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
0.90	0.00	0.40	5.4	3:1

Ditch Liner
North American Green, SC150

*RED IS USER INPUT

CALCULATED BY	April Blye
PROJECT NAME	Carolina Sunrock
PROJECT NUMBER	44089.001

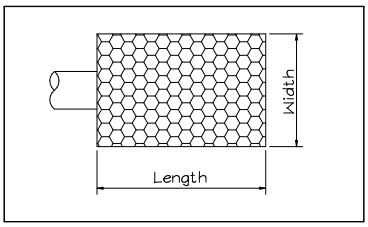
TIMMONS GROUP
ENGINEERING | DESIGN | TECHNOLOGY

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 44C

Velocity =	4.68	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	5.4	ft			
Ditch Area =	0.48	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	9.38	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	12	in	Apron Length =	4.0	ft
			Apron Width = Top Width.=	5.4	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 44C
TOP WIDTH "A"	5.4 FT
MIN. DITCH DEPTH (FT) "B"	0.9 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, SC150

DITCH NAME		PROJECT NAME
TDD 44D	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 44D

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.10	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	0.4	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	77 LF
Slope =	0.136	(ft/ft)	Highest Elevation =	570.5
Z Required =	0.02	Ratio	Lowest Elevation =	560
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.20	ft	2.4	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.70 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

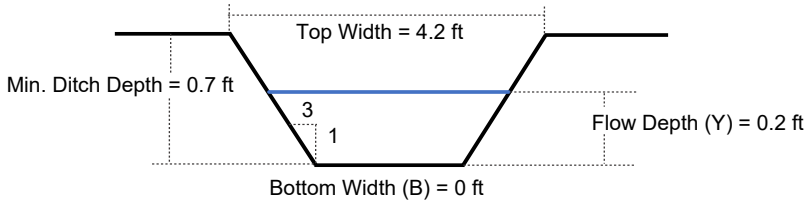
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.12	SF		
New P =	1.26	Wetted perimeter		
New R =	0.09	Hydraulic radius		
Z Actual =	0.02	Must be greater than z required=>	0.02	Okay
New V =	3.82	fps		

Minimum Design Geometry

Liner: North American Green, S150 — **1.75** LB/SF > 1.71 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
0.70	0.00	0.20	4.2	3:1

Ditch Liner
North American Green, S150

*RED IS USER INPUT

CALCULATED BY	April Blye
PROJECT NAME	Carolina Sunrock
PROJECT NUMBER	44089.001

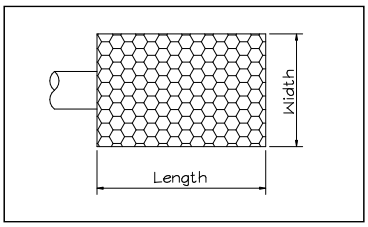
TIMMONS GROUP
ENGINEERING | DESIGN | TECHNOLOGY

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 44D

Velocity =	3.82	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	4.2	ft			
Ditch Area =	0.12	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	4.69	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	8	in	Apron Length =	2.7	ft
			Apron Width = Top Width.=	4.2	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 44D
TOP WIDTH "A"	4.2 FT
MIN. DITCH DEPTH (FT) "B"	0.7 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S150

DITCH NAME		PROJECT NAME
TDD 45A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 45A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.35	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	1.3	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	253 LF
Slope =	0.101	(ft/ft)	Highest Elevation =	568.5
Z Required =	0.08	Ratio	Lowest Elevation =	543
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.30	ft	3.6	in
Bottom Width (B) =	1.00	ft	12.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.89 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

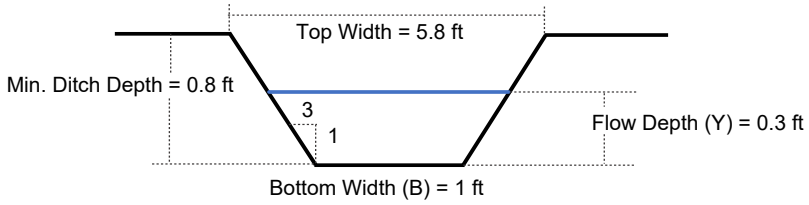
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.57	SF		
New P =	2.90	Wetted perimeter		
New R =	0.20	Hydraulic radius		
Z Actual =	0.19	Must be greater than z required=>	0.08	Okay
New V =	5.33	fps		

Minimum Design Geometry

Liner: North American Green, SC150 **2.10** LB/SF > 1.89 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
0.80	1.00	0.30	5.8	3:1

Ditch Liner
North American Green, SC150

*RED IS USER INPUT

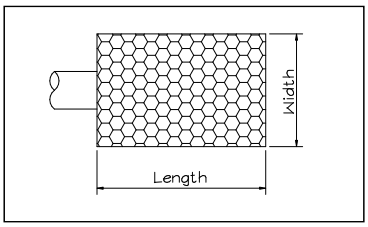
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 45A

Velocity =	5.33	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	5.8	ft			
Ditch Area =	0.57	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	10.22	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	12	in	Apron Length =	4.0	ft
			Apron Width = Top Width.=	5.8	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 45A
TOP WIDTH "A"	5.8 FT
MIN. DITCH DEPTH (FT) "B"	0.8 FT
BOTTOM WIDTH (FT) "C"	1.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, SC150

DITCH NAME		PROJECT NAME
TDD 45B	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 45B

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.54	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	2.0	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	374 LF
Slope =	0.053	(ft/ft)	Highest Elevation =	563
Z Required =	0.17	Ratio	Lowest Elevation =	543
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.50	ft	6.0	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.67 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

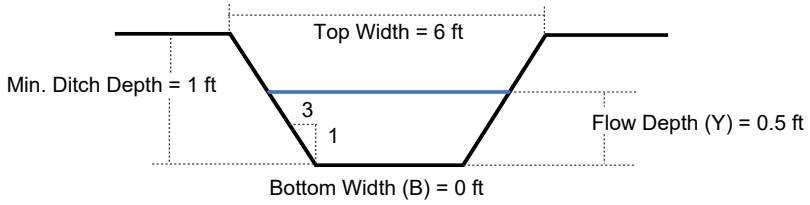
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.75	SF		
New P =	3.16	Wetted perimeter		
New R =	0.24	Hydraulic radius		
Z Actual =	0.29	Must be greater than z required=>	0.17	Okay
New V =	4.40	fps		

Minimum Design Geometry

Liner: North American Green, S150 — **1.75** LB/SF > 1.67 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.00	0.00	0.50	6	3:1

Ditch Liner
North American Green, S150

*RED IS USER INPUT

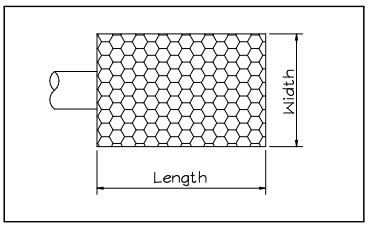
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 45B

Velocity =	4.40	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	6	ft			
Ditch Area =	0.75	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	11.73	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	12	in	Apron Length =	4.0	ft
			Apron Width = Top Width.=	6.0	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 45B
TOP WIDTH "A"	6 FT
MIN. DITCH DEPTH (FT) "B"	1 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S150

DITCH NAME		PROJECT NAME
TDD 46A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 46A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	1.04	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	3.8	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	525 LF
Slope =	0.046	(ft/ft)	Highest Elevation =	539
Z Required =	0.36	Ratio	Lowest Elevation =	515
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.60	ft	7.2	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.71 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

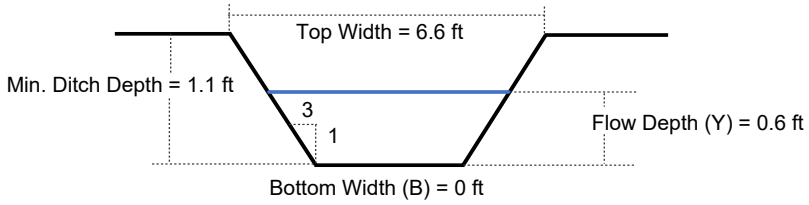
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	1.08	SF		
New P =	3.79	Wetted perimeter		
New R =	0.28	Hydraulic radius		
Z Actual =	0.47	Must be greater than z required=>	0.36	Okay
New V =	4.59	fps		

Minimum Design Geometry

Liner: North American Green, S150 — **1.75** LB/SF > 1.72 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.10	0.00	0.60	6.6	3:1

Ditch Liner
North American Green, S150

*RED IS USER INPUT

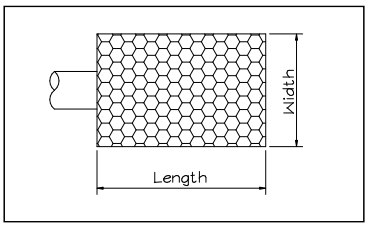
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 46A

Velocity =	4.59	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	6.6	ft			
Ditch Area =	1.08	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	14.07	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	15	in	Apron Length =	5.0	ft
			Apron Width = Top Width.=	6.6	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 46A
TOP WIDTH "A"	6.6 FT
MIN. DITCH DEPTH (FT) "B"	1.1 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S150

DITCH NAME		PROJECT NAME
TDD 46B	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 46B

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.81	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	3.0	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	354 LF
Slope =	0.099	(ft/ft)	Highest Elevation =	550
Z Required =	0.19	Ratio	Lowest Elevation =	515
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.30	ft	3.6	in
Bottom Width (B) =	1.00	ft	12.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.85 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

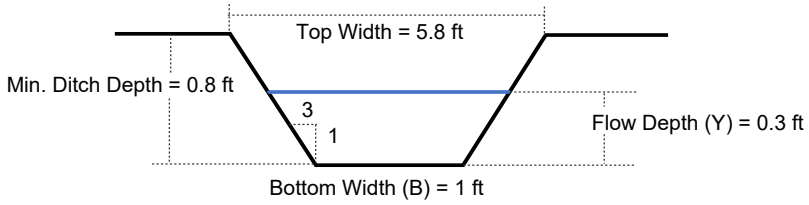
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.57	SF		
New P =	2.90	Wetted perimeter		
New R =	0.20	Hydraulic radius		
Z Actual =	0.19	Must be greater than z required=>	0.19	Okay
New V =	5.28	fps		

Minimum Design Geometry

Liner: North American Green, SC150 **2.10** LB/SF > 1.86 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
0.80	1.00	0.30	5.8	3:1

Ditch Liner
North American Green, SC150

*RED IS USER INPUT

CALCULATED BY	April Blye
PROJECT NAME	Carolina Sunrock
PROJECT NUMBER	44089.001

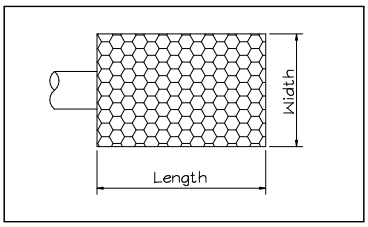
TIMMONS GROUP
ENGINEERING | DESIGN | TECHNOLOGY

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 46B

Velocity =	5.28	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	5.8	ft			
Ditch Area =	0.57	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	10.22	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	12	in	Apron Length =	4.0	ft
			Apron Width = Top Width.=	5.8	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 46B
TOP WIDTH "A"	5.8 FT
MIN. DITCH DEPTH (FT) "B"	0.8 FT
BOTTOM WIDTH (FT) "C"	1.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, SC150

DITCH NAME		PROJECT NAME
TDD 47A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 47A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.21	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	0.8	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	165 LF
Slope =	0.121	(ft/ft)	Highest Elevation =	574
Z Required =	0.04	Ratio	Lowest Elevation =	554
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.20	ft	2.4	in
Bottom Width (B) =	1.00	ft	12.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.51 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

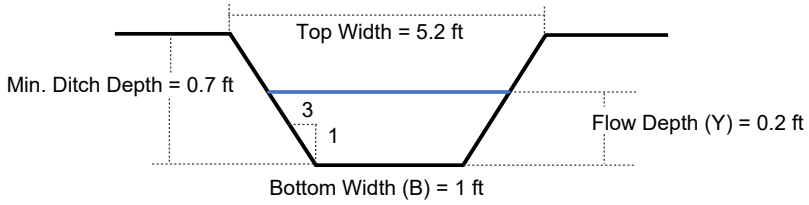
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.32	SF		
New P =	2.26	Wetted perimeter		
New R =	0.14	Hydraulic radius		
Z Actual =	0.09	Must be greater than z required=>	0.04	Okay
New V =	4.69	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 1.52 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
0.70	1.00	0.20	5.2	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

CALCULATED BY	April Blye
PROJECT NAME	Carolina Sunrock
PROJECT NUMBER	44089.001

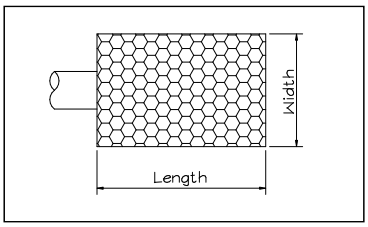
TIMMONS GROUP
ENGINEERING | DESIGN | TECHNOLOGY

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 47A

Velocity =	4.69	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	5.2	ft			
Ditch Area =	0.32	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	7.66	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	8	in	Apron Length =	2.7	ft
			Apron Width = Top Width.=	5.2	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 47A
TOP WIDTH "A"	5.2 FT
MIN. DITCH DEPTH (FT) "B"	0.7 FT
BOTTOM WIDTH (FT) "C"	1.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 47B	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 47B

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	1.30	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	4.8	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	292 LF
Slope =	0.106	(ft/ft)	Highest Elevation =	585
Z Required =	0.30	Ratio	Lowest Elevation =	554
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.60	ft	7.2	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 3.97 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

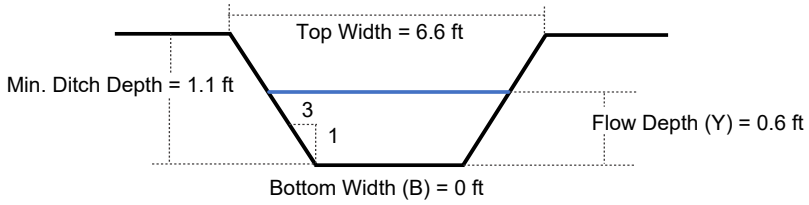
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	1.08	SF		
New P =	3.79	Wetted perimeter		
New R =	0.28	Hydraulic radius		
Z Actual =	0.47	Must be greater than z required=>	0.30	Okay
New V =	7.00	fps		

Minimum Design Geometry

Liner: North American Green, P300 — **8.00** LB/SF > 3.98 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.10	0.00	0.60	6.6	3:1

Ditch Liner
North American Green, P300

*RED IS USER INPUT

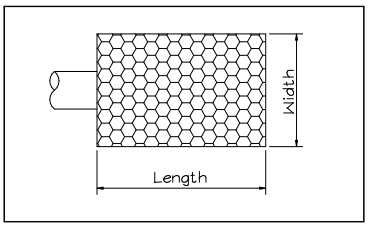
CALCULATED BY		PROJECT NAME
April Blye	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
		44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 47B

Velocity =	7.00	fps	From Fig. 8.06.c:	ZONE =	2
Top Width =	6.6	ft			
Ditch Area =	1.08	sf	Rip Rap Class =	B	
Equivalent Pipe Diameter =	14.07	in	Apron Thickness =	18	in
Equivalent Pipe Diameter =	15	in	Apron Length =	7.5	ft
			Apron Width = Top Width.=	6.6	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 47B
TOP WIDTH "A"	6.6 FT
MIN. DITCH DEPTH (FT) "B"	1.1 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, P300

DITCH NAME		PROJECT NAME
TDD 47C	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 47C

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.22	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	0.8	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	124 LF
Slope =	0.081	(ft/ft)	Highest Elevation =	564
Z Required =	0.06	Ratio	Lowest Elevation =	554
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.30	ft	3.6	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.51 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

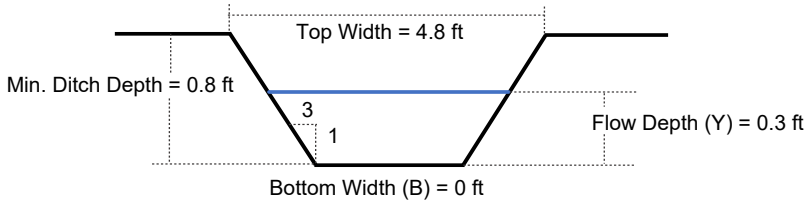
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.27	SF		
New P =	1.90	Wetted perimeter		
New R =	0.14	Hydraulic radius		
Z Actual =	0.07	Must be greater than z required=>	0.06	Okay
New V =	3.84	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 1.51 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
0.80	0.00	0.30	4.8	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

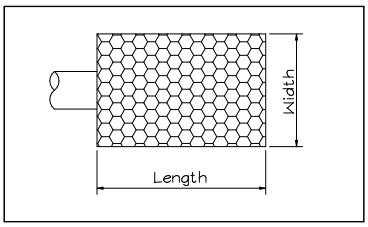
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 47C

Velocity =	3.84	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	4.8	ft			
Ditch Area =	0.27	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	7.04	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	8	in	Apron Length =	2.7	ft
			Apron Width = Top Width.=	4.8	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 47C
TOP WIDTH "A"	4.8 FT
MIN. DITCH DEPTH (FT) "B"	0.8 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 48A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 48A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	2.07	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	7.6	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	670 LF
Slope =	0.059	(ft/ft)	Highest Elevation =	551.5
Z Required =	0.63	Ratio	Lowest Elevation =	512
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.60	ft	7.2	in
Bottom Width (B) =	1.00	ft	12.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 2.21 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

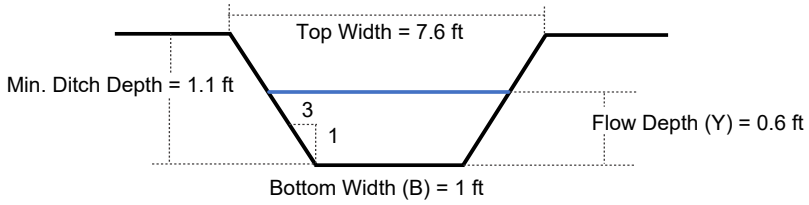
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	1.68	SF		
New P =	4.79	Wetted perimeter		
New R =	0.35	Hydraulic radius		
Z Actual =	0.83	Must be greater than z required=>	0.63	Okay
New V =	5.99	fps		

Minimum Design Geometry

Liner: North American Green, C125 — **2.25** LB/SF > 2.21 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.10	1.00	0.60	7.6	3:1

Ditch Liner
North American Green, C125

*RED IS USER INPUT

CALCULATED BY	April Blye
PROJECT NAME	Carolina Sunrock
PROJECT NUMBER	44089.001

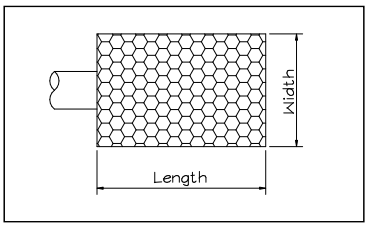
TIMMONS GROUP
ENGINEERING | DESIGN | TECHNOLOGY

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 48A

Velocity =	5.99	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	7.6	ft			
Ditch Area =	1.68	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	17.55	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	18	in	Apron Length =	6.0	ft
			Apron Width = Top Width.=	7.6	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 48A
TOP WIDTH "A"	7.6 FT
MIN. DITCH DEPTH (FT) "B"	1.1 FT
BOTTOM WIDTH (FT) "C"	1.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, C125

DITCH NAME		PROJECT NAME
TDD 48B	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 48B

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	1.05	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	3.9	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	683 LF
Slope =	0.059	(ft/ft)	Highest Elevation =	552
Z Required =	0.32	Ratio	Lowest Elevation =	512
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.60	ft	7.2	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 2.19 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

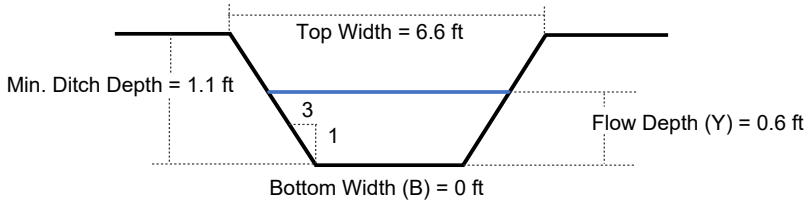
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	1.08	SF		
New P =	3.79	Wetted perimeter		
New R =	0.28	Hydraulic radius		
Z Actual =	0.47	Must be greater than z required=>	0.32	Okay
New V =	5.20	fps		

Minimum Design Geometry

Liner: North American Green, C125 — **2.25** LB/SF > 2.2 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.10	0.00	0.60	6.6	3:1

Ditch Liner
North American Green, C125

*RED IS USER INPUT

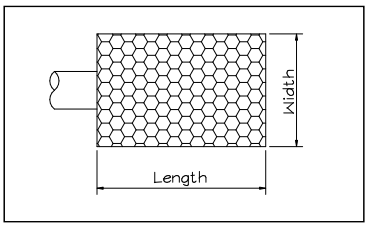
CALCULATED BY		PROJECT NAME
April Blye	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
		44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 48B

Velocity =	5.20	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	6.6	ft			
Ditch Area =	1.08	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	14.07	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	15	in	Apron Length =	5.0	ft
			Apron Width = Top Width.=	6.6	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 48B
TOP WIDTH "A"	6.6 FT
MIN. DITCH DEPTH (FT) "B"	1.1 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, C125

DITCH NAME		PROJECT NAME
TDD 49A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 49A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.72	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	2.7	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	445 LF
Slope =	0.072	(ft/ft)	Highest Elevation =	585
Z Required =	0.20	Ratio	Lowest Elevation =	553
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.50	ft	6.0	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 2.24 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

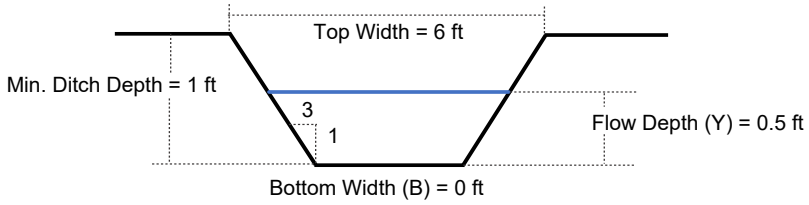
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.75	SF		
New P =	3.16	Wetted perimeter		
New R =	0.24	Hydraulic radius		
Z Actual =	0.29	Must be greater than z required=>	0.20	Okay
New V =	5.10	fps		

Minimum Design Geometry

Liner: North American Green, C125 — **2.25** LB/SF > 2.25 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.00	0.00	0.50	6	3:1

Ditch Liner
North American Green, C125

*RED IS USER INPUT

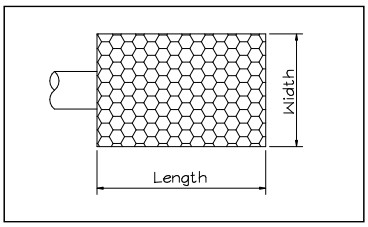
CALCULATED BY		PROJECT NAME
April Blye	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
		44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 49A

Velocity =	5.10	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	6	ft			
Ditch Area =	0.75	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	11.73	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	12	in	Apron Length =	4.0	ft
			Apron Width = Top Width.=	6.0	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 49A
TOP WIDTH "A"	6 FT
MIN. DITCH DEPTH (FT) "B"	1 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, C125

DITCH NAME		PROJECT NAME
TDD 50A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 50A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.22	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	0.8	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)			
Manning n =	0.030	(Dimensionless)	Ditch Length =	157	LF
Slope =	0.099	(ft/ft)	Highest Elevation =	601.5	
Z Required =	0.05	Ratio	Lowest Elevation =	586	
Side Slope (M) =	3	:1			

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.30	ft	3.6	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.85 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

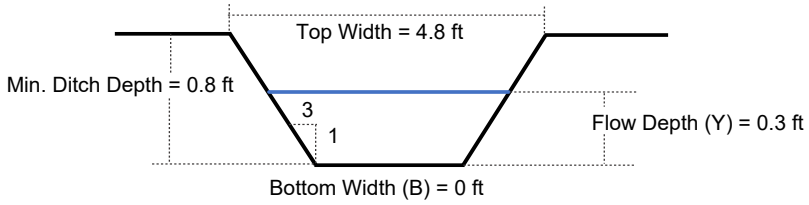
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.27	SF		
New P =	1.90	Wetted perimeter		
New R =	0.14	Hydraulic radius		
Z Actual =	0.07	Must be greater than z required=>	0.05	Okay
New V =	4.25	fps		

Minimum Design Geometry

Liner: North American Green, SC150 **2.10** LB/SF > 1.85 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
0.80	0.00	0.30	4.8	3:1

Ditch Liner
North American Green, SC150

*RED IS USER INPUT

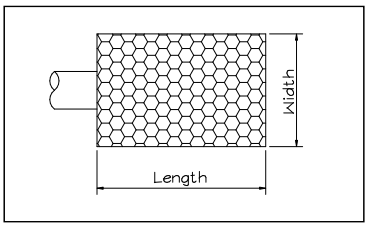
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 50A

Velocity =	4.25	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	4.8	ft			
Ditch Area =	0.27	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	7.04	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	8	in	Apron Length =	2.7	ft
			Apron Width = Top Width.=	4.8	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 50A
TOP WIDTH "A"	4.8 FT
MIN. DITCH DEPTH (FT) "B"	0.8 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, SC150

DITCH NAME		PROJECT NAME
TDD 50B	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 50B

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.16	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	0.6	(cfs)

Known Quantities

Line channel with:	6	" rip-rap	(Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)		Ditch Length =	87 LF
Slope =	0.086	(ft/ft)		Highest Elevation =	593.5
Z Required =	0.04	Ratio		Lowest Elevation =	586
Side Slope (M) =	3	:1			

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.30	ft	3.6	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.61 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

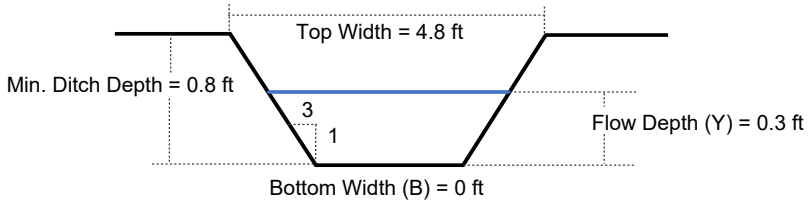
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.27	SF		
New P =	1.90	Wetted perimeter		
New R =	0.14	Hydraulic radius		
Z Actual =	0.07	Must be greater than z required=>	0.04	Okay
New V =	3.97	fps		

Minimum Design Geometry

Liner: North American Green, S150 — **1.75** LB/SF > 1.62 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
0.80	0.00	0.30	4.8	3:1

Ditch Liner
North American Green, S150

*RED IS USER INPUT

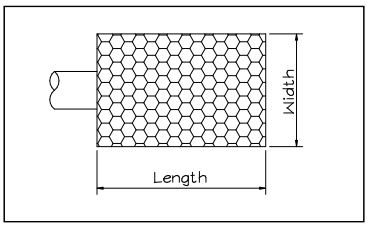
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 50B

Velocity =	3.97	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	4.8	ft			
Ditch Area =	0.27	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	7.04	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	8	in	Apron Length =	2.7	ft
			Apron Width = Top Width.=	4.8	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 50B
TOP WIDTH "A"	4.8 FT
MIN. DITCH DEPTH (FT) "B"	0.8 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S150

DITCH NAME		PROJECT NAME
TDD 50C	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 50C

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.46	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	1.7	(cfs)

Known Quantities

Line channel with:	6	" rip-rap	(Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)		Ditch Length =	211 LF
Slope =	0.066	(ft/ft)		Highest Elevation =	600
Z Required =	0.13	Ratio		Lowest Elevation =	586
Side Slope (M) =	3	:1			

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.40	ft	4.8	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.66 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

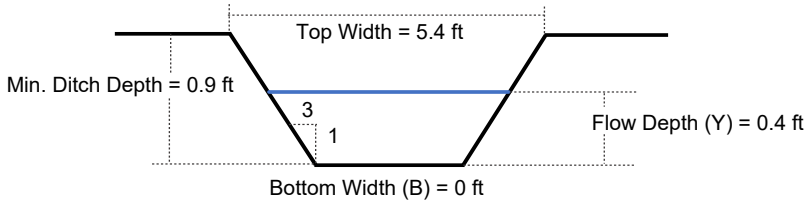
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.48	SF		
New P =	2.53	Wetted perimeter		
New R =	0.19	Hydraulic radius		
Z Actual =	0.16	Must be greater than z required=>	0.13	Okay
New V =	4.22	fps		

Minimum Design Geometry

Liner: North American Green, S150 — **1.75** LB/SF > 1.66 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
0.90	0.00	0.40	5.4	3:1

Ditch Liner
North American Green, S150

*RED IS USER INPUT

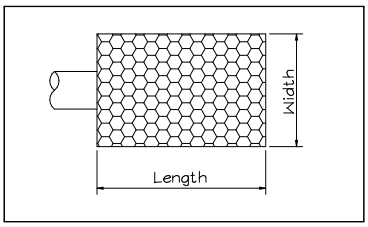
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 50C

Velocity =	4.22	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	5.4	ft			
Ditch Area =	0.48	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	9.38	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	12	in	Apron Length =	4.0	ft
			Apron Width = Top Width.=	5.4	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 50C
TOP WIDTH "A"	5.4 FT
MIN. DITCH DEPTH (FT) "B"	0.9 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S150

DITCH NAME		PROJECT NAME
TDD 51A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 51A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	2.86	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	**10.6**	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	1180 LF
Slope =	0.070	(ft/ft)	Highest Elevation =	597.5
Z Required =	0.80	Ratio	Lowest Elevation =	515
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.50	ft	6.0	in
Bottom Width (B) =	2.00	ft	24.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 2.18 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

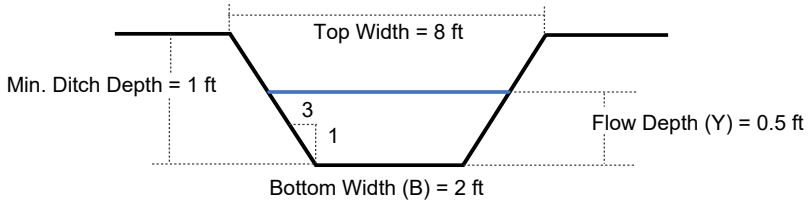
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	1.75	SF		
New P =	5.16	Wetted perimeter		
New R =	0.34	Hydraulic radius		
Z Actual =	**0.85**	Must be greater than z required=>	**0.80**	**Okay**
New V =	6.38	fps		

Minimum Design Geometry

Liner: North American Green, C125 **2.25** LB/SF > 2.19 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.00	2.00	0.50	8	3:1

Ditch Liner
North American Green, C125

*RED IS USER INPUT

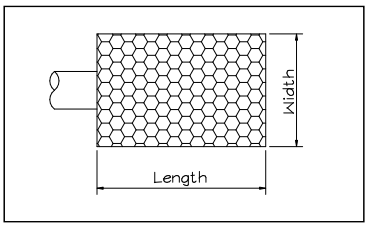
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 51A

Velocity =	6.38	fps	From Fig. 8.06.c:	ZONE =	**2**
Top Width =	8	ft			
Ditch Area =	1.75	sf	Rip Rap Class =	B	
Equivalent Pipe Diameter =	17.91	in	Apron Thickness =	18	in
Equivalent Pipe Diameter =	**18**	in	Apron Length =	9.0	ft
			Apron Width = Top Width.=	8.0	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 51A
TOP WIDTH "A"	8 FT
MIN. DITCH DEPTH (FT) "B"	1 FT
BOTTOM WIDTH (FT) "C"	2.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, C125

DITCH NAME		PROJECT NAME
TDD 51B	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 51B

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.21	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	0.8	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	276 LF
Slope =	0.083	(ft/ft)	Highest Elevation =	538
Z Required =	0.05	Ratio	Lowest Elevation =	515
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.30	ft	3.6	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.56 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

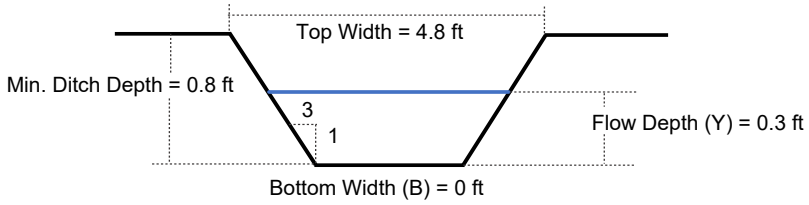
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.27	SF		
New P =	1.90	Wetted perimeter		
New R =	0.14	Hydraulic radius		
Z Actual =	0.07	Must be greater than z required=>	0.05	Okay
New V =	3.91	fps		

Minimum Design Geometry

Liner: North American Green, S150 — **1.75** LB/SF > 1.56 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
0.80	0.00	0.30	4.8	3:1

Ditch Liner
North American Green, S150

*RED IS USER INPUT

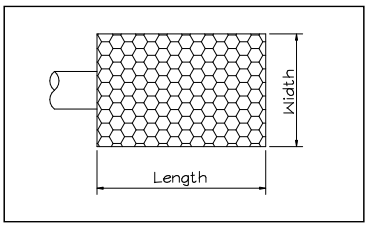
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 51B

Velocity =	3.91	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	4.8	ft			
Ditch Area =	0.27	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	7.04	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	8	in	Apron Length =	2.7	ft
			Apron Width = Top Width.=	4.8	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 51B
TOP WIDTH "A"	4.8 FT
MIN. DITCH DEPTH (FT) "B"	0.8 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S150

DITCH NAME		PROJECT NAME
TDD 51C	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 51C

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	5.47	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	**20.2**	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	899 LF
Slope =	0.063	(ft/ft)	Highest Elevation =	572
Z Required =	1.62	Ratio	Lowest Elevation =	515
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.90	ft	10.8	in
Bottom Width (B) =	1.00	ft	12.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 3.56 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

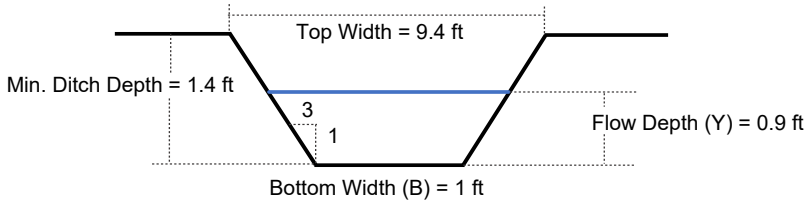
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	3.33	SF		
New P =	6.69	Wetted perimeter		
New R =	0.50	Hydraulic radius		
Z Actual =	**2.09**	Must be greater than z required=>	**1.62**	**Okay**
New V =	7.85	fps		

Minimum Design Geometry

Liner: Class I (12"@22"THK) **5.00** LB/SF > 3.57 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.40	1.00	0.90	9.4	3:1

Ditch Liner
Class I (12"@22"THK)

*RED IS USER INPUT

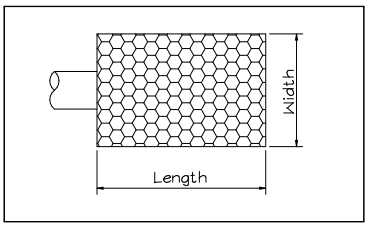
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 51C

Velocity =	7.85	fps	From Fig. 8.06.c:	ZONE =	**2**
Top Width =	9.4	ft			
Ditch Area =	3.33	sf	Rip Rap Class =	B	
Equivalent Pipe Diameter =	24.71	in	Apron Thickness =	18	in
Equivalent Pipe Diameter =	**30**	in	Apron Length =	15.0	ft
			Apron Width = Top Width.=	9.4	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 51C
TOP WIDTH "A"	9.4 FT
MIN. DITCH DEPTH (FT) "B"	1.4 FT
BOTTOM WIDTH (FT) "C"	1.0
SIDE SLOPE "D"	3:1
LINER TYPE	Class I (12"@22"THK)

DITCH NAME		PROJECT NAME
TDD 52A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 52A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	1.22	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	**4.5**	(cfs)

Known Quantities

Line channel with:	6	" rip-rap	(Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)		Ditch Length =	314 LF
Slope =	0.053	(ft/ft)		Highest Elevation =	583.5
Z Required =	0.40	Ratio		Lowest Elevation =	567
Side Slope (M) =	3	:1			

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.60	ft	7.2	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.97 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

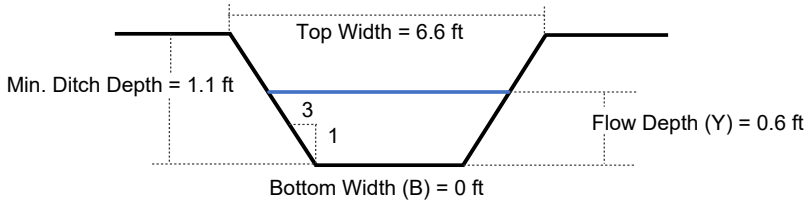
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	1.08	SF		
New P =	3.79	Wetted perimeter		
New R =	0.28	Hydraulic radius		
Z Actual =	**0.47**	Must be greater than z required=>	**0.40**	**Okay**
New V =	4.93	fps		

Minimum Design Geometry

Liner: North American Green, SC150 **2.10** LB/SF > 1.97 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.10	0.00	0.60	6.6	3:1

Ditch Liner
North American Green, SC150

*RED IS USER INPUT

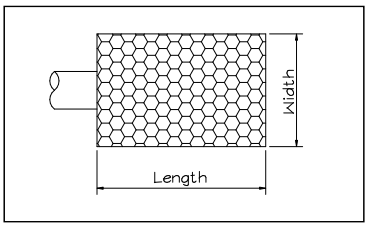
CALCULATED BY		PROJECT NAME
April Blye	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
		44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 52A

Velocity =	4.93	fps	From Fig. 8.06.c:	ZONE =	2
Top Width =	6.6	ft			
Ditch Area =	1.08	sf	Rip Rap Class =	B	
Equivalent Pipe Diameter =	14.07	in	Apron Thickness =	18	in
Equivalent Pipe Diameter =	15	in	Apron Length =	7.5	ft
			Apron Width = Top Width.=	6.6	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 52A
TOP WIDTH "A"	6.6 FT
MIN. DITCH DEPTH (FT) "B"	1.1 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, SC150

DITCH NAME		PROJECT NAME
TDD 52B	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 52B

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.53	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	2.0	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	300 LF
Slope =	0.035	(ft/ft)	Highest Elevation =	577.5
Z Required =	0.21	Ratio	Lowest Elevation =	567
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.50	ft	6.0	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.09 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

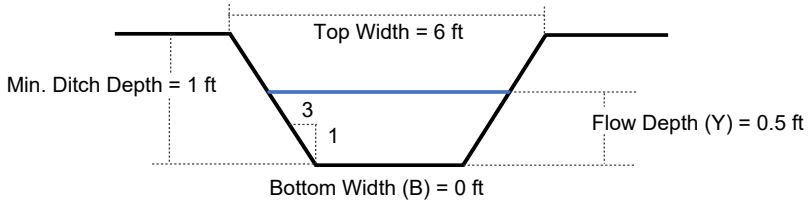
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.75	SF		
New P =	3.16	Wetted perimeter		
New R =	0.24	Hydraulic radius		
Z Actual =	0.29	Must be greater than z required=>	0.21	Okay
New V =	3.56	fps		

Minimum Design Geometry

Liner: North American Green, S75 — **1.55** LB/SF > 1.1 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.00	0.00	0.50	6	3:1

Ditch Liner
North American Green, S75

*RED IS USER INPUT

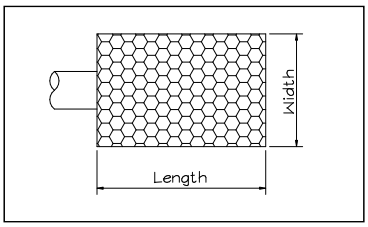
CALCULATED BY		PROJECT NAME
April Blye	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
		PROJECT NUMBER
		44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 52B

Velocity =	3.56	fps	From Fig. 8.06.c:	ZONE =	2
Top Width =	6	ft			
Ditch Area =	0.75	sf	Rip Rap Class =	B	
Equivalent Pipe Diameter =	11.73	in	Apron Thickness =	18	in
Equivalent Pipe Diameter =	12	in	Apron Length =	6.0	ft
			Apron Width = Top Width.=	6.0	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 52B
TOP WIDTH "A"	6 FT
MIN. DITCH DEPTH (FT) "B"	1 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S75

DITCH NAME		PROJECT NAME
TDD 52C	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 52C

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.36	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	1.3	(cfs)

Known Quantities

Line channel with:	6	" rip-rap	(Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)		Ditch Length =	227 LF
Slope =	0.064	(ft/ft)		Highest Elevation =	581.5
Z Required =	0.11	Ratio		Lowest Elevation =	567
Side Slope (M) =	3	:1			

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.40	ft	4.8	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.59 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

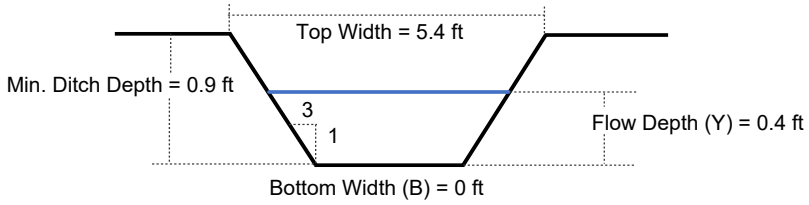
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.48	SF		
New P =	2.53	Wetted perimeter		
New R =	0.19	Hydraulic radius		
Z Actual =	0.16	Must be greater than z required=>	0.11	Okay
New V =	4.14	fps		

Minimum Design Geometry

Liner: North American Green, S150 — **1.75** LB/SF > 1.6 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
0.90	0.00	0.40	5.4	3:1

Ditch Liner
North American Green, S150

*RED IS USER INPUT

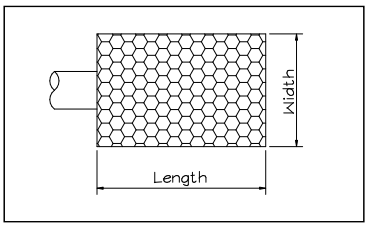
	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	**PROJECT NAME** Carolina Sunrock
CALCULATED BY April Blye		**PROJECT NUMBER** 44089.001

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 52C

Velocity =	4.14	fps	From Fig. 8.06.c:	ZONE =	2
Top Width =	5.4	ft			
Ditch Area =	0.48	sf	Rip Rap Class =	B	
Equivalent Pipe Diameter =	9.38	in	Apron Thickness =	18	in
Equivalent Pipe Diameter =	12	in	Apron Length =	6.0	ft
			Apron Width = Top Width.=	5.4	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 52C
TOP WIDTH "A"	5.4 FT
MIN. DITCH DEPTH (FT) "B"	0.9 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, S150

DITCH NAME		PROJECT NAME
TDD 53A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 53A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.46	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	1.7	(cfs)

Known Quantities

Line channel with:	6	" rip-rap	(Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)		Ditch Length =	242 LF
Slope =	0.081	(ft/ft)		Highest Elevation =	578.5
Z Required =	0.12	Ratio		Lowest Elevation =	559
Side Slope (M) =	3	:1			

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.40	ft	4.8	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 2.01 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

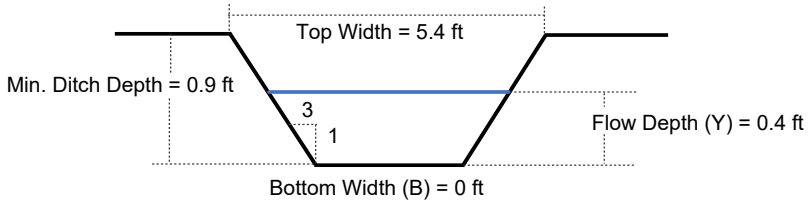
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.48	SF		
New P =	2.53	Wetted perimeter		
New R =	0.19	Hydraulic radius		
Z Actual =	0.16	Must be greater than z required=>	0.12	Okay
New V =	4.66	fps		

Minimum Design Geometry

Liner: North American Green, SC150 **2.10** LB/SF > 2.02 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
0.90	0.00	0.40	5.4	3:1

Ditch Liner
North American Green, SC150

*RED IS USER INPUT

CALCULATED BY	April Blye
PROJECT NAME	Carolina Sunrock
PROJECT NUMBER	44089.001

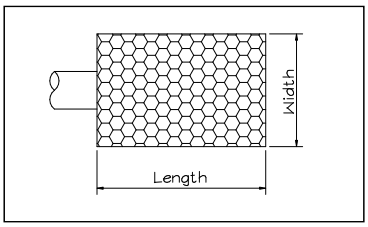
TIMMONS GROUP
ENGINEERING | DESIGN | TECHNOLOGY

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 53A

Velocity =	4.66	fps	From Fig. 8.06.c:	ZONE =	2
Top Width =	5.4	ft			
Ditch Area =	0.48	sf	Rip Rap Class =	B	
Equivalent Pipe Diameter =	9.38	in	Apron Thickness =	18	in
Equivalent Pipe Diameter =	12	in	Apron Length =	6.0	ft
			Apron Width = Top Width.=	5.4	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 53A
TOP WIDTH "A"	5.4 FT
MIN. DITCH DEPTH (FT) "B"	0.9 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, SC150

DITCH NAME		PROJECT NAME
TDD 54A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 54A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	3.60	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	13.3	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	922 LF
Slope =	0.036	(ft/ft)	Highest Elevation =	599
Z Required =	1.42	Ratio	Lowest Elevation =	566
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	1.00	ft	12.0	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 2.23 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

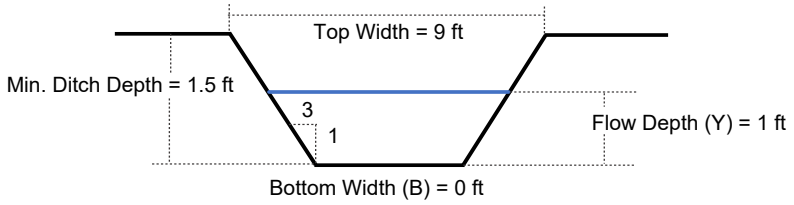
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	3.00	SF		
New P =	6.32	Wetted perimeter		
New R =	0.47	Hydraulic radius		
Z Actual =	1.82	Must be greater than z required=>	1.42	Okay
New V =	5.72	fps		

Minimum Design Geometry

Liner: North American Green, C125 **2.25** LB/SF > 2.24 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.50	0.00	1.00	9	3:1

Ditch Liner
North American Green, C125

*RED IS USER INPUT

CALCULATED BY	April Blye
PROJECT NAME	Carolina Sunrock
PROJECT NUMBER	44089.001

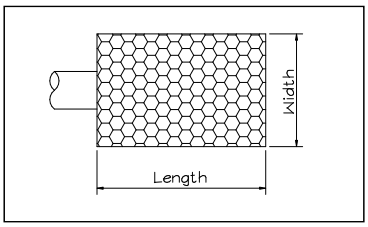
TIMMONS GROUP
ENGINEERING | DESIGN | TECHNOLOGY

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 54A

Velocity =	5.72	fps	From Fig. 8.06.c:	ZONE =	2
Top Width =	9	ft			
Ditch Area =	3	sf	Rip Rap Class =	B	
Equivalent Pipe Diameter =	23.45	in	Apron Thickness =	18	in
Equivalent Pipe Diameter =	24	in	Apron Length =	12.0	ft
			Apron Width = Top Width.=	9.0	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 54A
TOP WIDTH "A"	9 FT
MIN. DITCH DEPTH (FT) "B"	1.5 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, C125

DITCH NAME		PROJECT NAME
TDD 54B	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 54B

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	1.55	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	5.7	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	396 LF
Slope =	0.042	(ft/ft)	Highest Elevation =	582.5
Z Required =	0.56	Ratio	Lowest Elevation =	566
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.70	ft	8.4	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 1.82 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

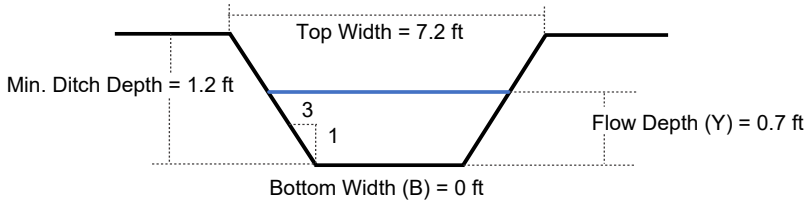
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	1.47	SF		
New P =	4.43	Wetted perimeter		
New R =	0.33	Hydraulic radius		
Z Actual =	0.70	Must be greater than z required=>	0.56	Okay
New V =	4.86	fps		

Minimum Design Geometry

Liner: North American Green, SC150 **2.10** LB/SF > 1.82 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.20	0.00	0.70	7.2	3:1

Ditch Liner
North American Green, SC150

*RED IS USER INPUT

CALCULATED BY	April Blye
PROJECT NAME	Carolina Sunrock
PROJECT NUMBER	44089.001

TIMMONS GROUP
ENGINEERING | DESIGN | TECHNOLOGY

Ditch Outlet Protection (NYDOT Method)

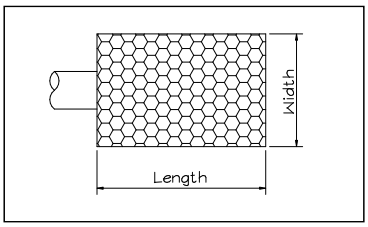
Ditch Name: TDD 54B

Velocity =	4.86	fps
Top Width =	7.2	ft
Ditch Area =	1.47	sf
Equivalent Pipe Diameter =	16.42	in
Equivalent Pipe Diameter =	**18**	in

From Fig. 8.06.c: ZONE = **1**

Rip Rap Class =	A	
Apron Thickness =	12	in
Apron Length =	6.0	ft
Apron Width = Top Width.=	7.2	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 54B
TOP WIDTH "A"	7.2 FT
MIN. DITCH DEPTH (FT) "B"	1.2 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	North American Green, SC150

DITCH NAME		PROJECT NAME
TDD 55A	TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY	Carolina Sunrock
CALCULATED BY		PROJECT NUMBER
April Blye		44089.001

Drainage Ditch Design (Velocity Constraint)

TEMPORARY DIVERSION DITCH: TDD 55A

This worksheet is designed to determine channel lining based on flow and ditch geometry (base width, side slope, & channel slope). This program determines depth of flow, velocity and tractive force assuming n=0.03 for grass or rip rap (n can be varied if desired). (Vary depth until z actual equals z required; v & t will be correct; select appropriate lining based on tractive force)

Watershed Data

Area (A) =	0.79	(Acres)
Coef. (C) =	0.45	(Dimensionless)
Inte. (I) =	8.21	(in/hr)
Flow (Q_{10}) =	2.9	(cfs)

Known Quantities

Line channel with:	6	" rip-rap (Assume 6" even if using grass)		
Manning n =	0.030	(Dimensionless)	Ditch Length =	403 LF
Slope =	0.084	(ft/ft)	Highest Elevation =	621
Z Required =	0.20	Ratio	Lowest Elevation =	587
Side Slope (M) =	3	:1		

Variable Quantities (Ditch Width & Depth)

Flow Depth (Y) =	0.50	ft	6.0	in
Bottom Width (B) =	0.00	ft	0.0	in
Freeboard =	0.50	ft	6.0	in

Compute Tractive Force

T=YxDxS

T = 2.63 LB/SF

Y = Weight of water (62.4 LB/CUFT)
D=Depth of flow in channel (ft)
S=Slope of channel (ft/ft)

General Lining	LB/SF
Jute Net	0.45
Curled Mat	1.55
Class A (4"@9"THK)	2.00
Class B (8"@18"THK)	3.50
Class I (12"@22"THK)	5.00
Class II (18"@30"THK)	7.50

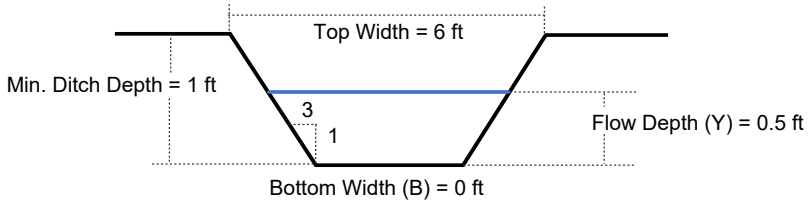
North American Green Lining	LB/SF
S75	1.55
S150	1.75
SC150	2.10
C125	2.25
P300	8.00

Determine If Z Actual Is Greater Than Z Required

New A =	0.75	SF		
New P =	3.16	Wetted perimeter		
New R =	0.24	Hydraulic radius		
Z Actual =	0.29	Must be greater than z required=>	0.20	Okay
New V =	5.53	fps		

Minimum Design Geometry

Liner: Class B (8"@18"THK) 3.50 LB/SF > 2.64 LB/SF **Okay**



Ditch Geometry				
Min. Ditch Depth (ft)	Bottom Width (ft)	Flow Depth (ft)	Top Width (ft)	Side Slope
1.00	0.00	0.50	6	3:1

Ditch Liner
Class B (8"@18"THK)

*RED IS USER INPUT

CALCULATED BY	April Blye
PROJECT NAME	Carolina Sunrock
PROJECT NUMBER	44089.001

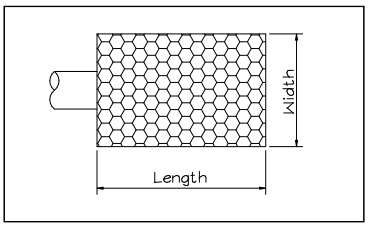
TIMMONS GROUP
ENGINEERING | DESIGN | TECHNOLOGY

Ditch Outlet Protection (NYDOT Method)

Ditch Name: TDD 55A

Velocity =	5.53	fps	From Fig. 8.06.c:	ZONE =	1
Top Width =	6	ft			
Ditch Area =	0.75	sf	Rip Rap Class =	A	
Equivalent Pipe Diameter =	11.73	in	Apron Thickness =	12	in
Equivalent Pipe Diameter =	12	in	Apron Length =	4.0	ft
			Apron Width = Top Width.=	6.0	ft

From Fig. 8.06.e:



DITCH NAME	TEMPORARY DIVERSION DITCH: TDD 55A
TOP WIDTH "A"	6 FT
MIN. DITCH DEPTH (FT) "B"	1 FT
BOTTOM WIDTH (FT) "C"	0.0
SIDE SLOPE "D"	3:1
LINER TYPE	Class B (8"@18"THK)

NOAA Atlas 14, Volume 2, Version 3
Location name: Prospect Hill, North Carolina, USA*
Latitude: 36.2998°, Longitude: -79.1735°
Elevation: 662.84 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	4.60 (4.20-5.02)	5.46 (4.99-5.96)	6.37 (5.82-6.96)	7.02 (6.40-7.66)	7.74 (7.02-8.42)	8.21 (7.42-8.94)	8.65 (7.78-9.42)	9.00 (8.05-9.83)	9.41 (8.34-10.3)	9.67 (8.52-10.6)
10-min	3.67 (3.35-4.01)	4.37 (3.99-4.77)	5.11 (4.66-5.58)	5.61 (5.12-6.12)	6.17 (5.60-6.71)	6.53 (5.91-7.12)	6.87 (6.18-7.48)	7.14 (6.38-7.79)	7.44 (6.60-8.12)	7.61 (6.71-8.33)
15-min	3.06 (2.79-3.34)	3.66 (3.34-4.00)	4.31 (3.93-4.70)	4.73 (4.32-5.16)	5.21 (4.73-5.68)	5.52 (4.99-6.00)	5.79 (5.21-6.30)	6.00 (5.37-6.55)	6.24 (5.54-6.82)	6.37 (5.62-6.97)
30-min	2.10 (1.91-2.29)	2.53 (2.31-2.76)	3.06 (2.79-3.34)	3.43 (3.13-3.74)	3.86 (3.50-4.20)	4.15 (3.75-4.52)	4.43 (3.99-4.83)	4.67 (4.18-5.10)	4.97 (4.41-5.42)	5.16 (4.55-5.64)
60-min	1.31 (1.19-1.43)	1.59 (1.45-1.73)	1.96 (1.79-2.14)	2.23 (2.04-2.44)	2.57 (2.33-2.80)	2.82 (2.54-3.06)	3.05 (2.75-3.33)	3.28 (2.93-3.58)	3.56 (3.16-3.89)	3.77 (3.32-4.12)
2-hr	0.776 (0.709-0.849)	0.942 (0.860-1.03)	1.17 (1.07-1.28)	1.35 (1.23-1.47)	1.57 (1.42-1.71)	1.75 (1.57-1.90)	1.92 (1.71-2.09)	2.09 (1.85-2.27)	2.31 (2.03-2.51)	2.48 (2.16-2.70)
3-hr	0.554 (0.507-0.605)	0.673 (0.617-0.735)	0.839 (0.767-0.916)	0.967 (0.882-1.05)	1.13 (1.02-1.23)	1.26 (1.13-1.37)	1.39 (1.24-1.50)	1.51 (1.34-1.64)	1.68 (1.48-1.82)	1.81 (1.57-1.97)
6-hr	0.338 (0.311-0.371)	0.410 (0.376-0.450)	0.511 (0.467-0.560)	0.591 (0.539-0.646)	0.698 (0.632-0.762)	0.784 (0.705-0.854)	0.873 (0.778-0.949)	0.963 (0.849-1.05)	1.09 (0.946-1.18)	1.19 (1.02-1.29)
12-hr	0.201 (0.185-0.221)	0.244 (0.224-0.268)	0.306 (0.279-0.335)	0.356 (0.324-0.390)	0.426 (0.385-0.464)	0.483 (0.433-0.525)	0.544 (0.482-0.590)	0.608 (0.532-0.658)	0.699 (0.601-0.756)	0.773 (0.653-0.837)
24-hr	0.119 (0.110-0.128)	0.143 (0.133-0.154)	0.178 (0.166-0.192)	0.206 (0.191-0.222)	0.243 (0.225-0.262)	0.273 (0.252-0.295)	0.304 (0.278-0.328)	0.335 (0.306-0.363)	0.378 (0.343-0.410)	0.412 (0.371-0.448)
2-day	0.070 (0.065-0.075)	0.084 (0.078-0.090)	0.103 (0.097-0.111)	0.119 (0.110-0.127)	0.139 (0.129-0.149)	0.155 (0.143-0.166)	0.171 (0.157-0.184)	0.187 (0.172-0.202)	0.209 (0.191-0.226)	0.226 (0.205-0.246)
3-day	0.049 (0.046-0.053)	0.059 (0.055-0.063)	0.073 (0.068-0.078)	0.083 (0.077-0.089)	0.097 (0.090-0.104)	0.109 (0.100-0.117)	0.120 (0.110-0.129)	0.132 (0.121-0.142)	0.147 (0.134-0.160)	0.160 (0.145-0.173)
4-day	0.039 (0.036-0.042)	0.046 (0.043-0.050)	0.057 (0.053-0.061)	0.065 (0.061-0.070)	0.077 (0.071-0.082)	0.085 (0.079-0.092)	0.095 (0.087-0.102)	0.104 (0.095-0.112)	0.116 (0.106-0.126)	0.126 (0.114-0.137)
7-day	0.025 (0.024-0.027)	0.030 (0.028-0.032)	0.037 (0.034-0.039)	0.042 (0.039-0.045)	0.049 (0.046-0.052)	0.054 (0.050-0.058)	0.060 (0.055-0.064)	0.066 (0.060-0.071)	0.073 (0.067-0.079)	0.080 (0.072-0.086)
10-day	0.020 (0.019-0.021)	0.024 (0.023-0.026)	0.029 (0.027-0.031)	0.033 (0.031-0.035)	0.038 (0.035-0.040)	0.042 (0.039-0.045)	0.046 (0.043-0.049)	0.050 (0.046-0.054)	0.056 (0.051-0.060)	0.060 (0.055-0.065)
20-day	0.013 (0.013-0.014)	0.016 (0.015-0.017)	0.019 (0.018-0.020)	0.021 (0.020-0.022)	0.024 (0.023-0.026)	0.027 (0.025-0.029)	0.029 (0.027-0.031)	0.032 (0.030-0.034)	0.036 (0.033-0.038)	0.038 (0.035-0.041)
30-day	0.011 (0.011-0.012)	0.013 (0.012-0.014)	0.015 (0.014-0.016)	0.017 (0.016-0.018)	0.019 (0.018-0.020)	0.021 (0.019-0.022)	0.022 (0.021-0.024)	0.024 (0.022-0.026)	0.026 (0.024-0.028)	0.028 (0.026-0.030)
45-day	0.009 (0.009-0.010)	0.011 (0.010-0.012)	0.013 (0.012-0.013)	0.014 (0.013-0.015)	0.016 (0.015-0.016)	0.017 (0.016-0.018)	0.018 (0.017-0.019)	0.019 (0.018-0.020)	0.021 (0.020-0.022)	0.022 (0.021-0.024)
60-day	0.008 (0.008-0.009)	0.010 (0.009-0.010)	0.011 (0.011-0.012)	0.012 (0.012-0.013)	0.013 (0.013-0.014)	0.014 (0.014-0.015)	0.015 (0.014-0.016)	0.016 (0.015-0.017)	0.017 (0.016-0.018)	0.018 (0.017-0.019)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

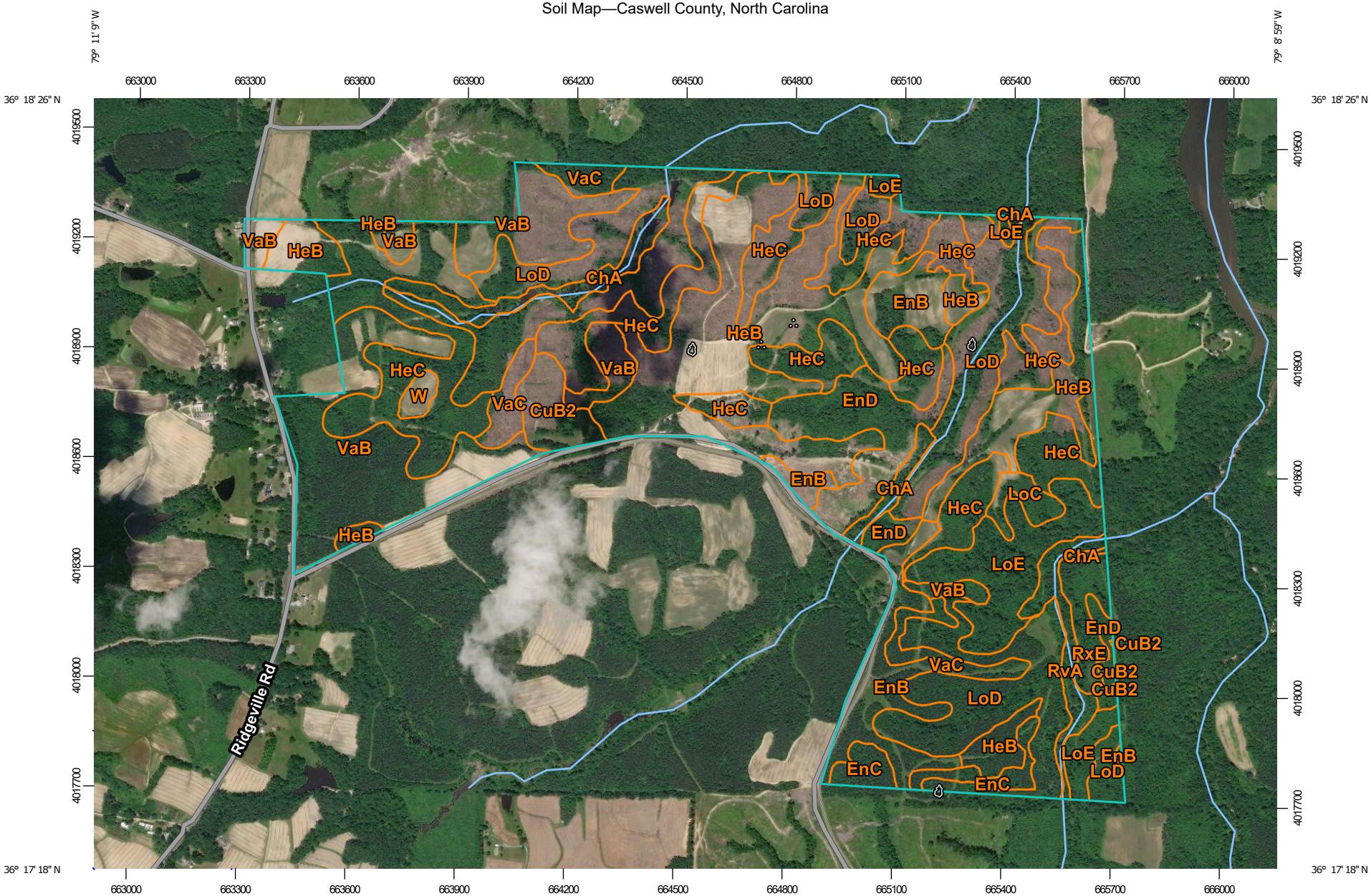
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Back to Top

PF graphical

Maps



Map Scale: 1:14,800 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 200 400 800 1200

Feet: 0 500 1000 2000 3000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Caswell County, North Carolina
Survey Area Data: Version 9, Sep 10, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

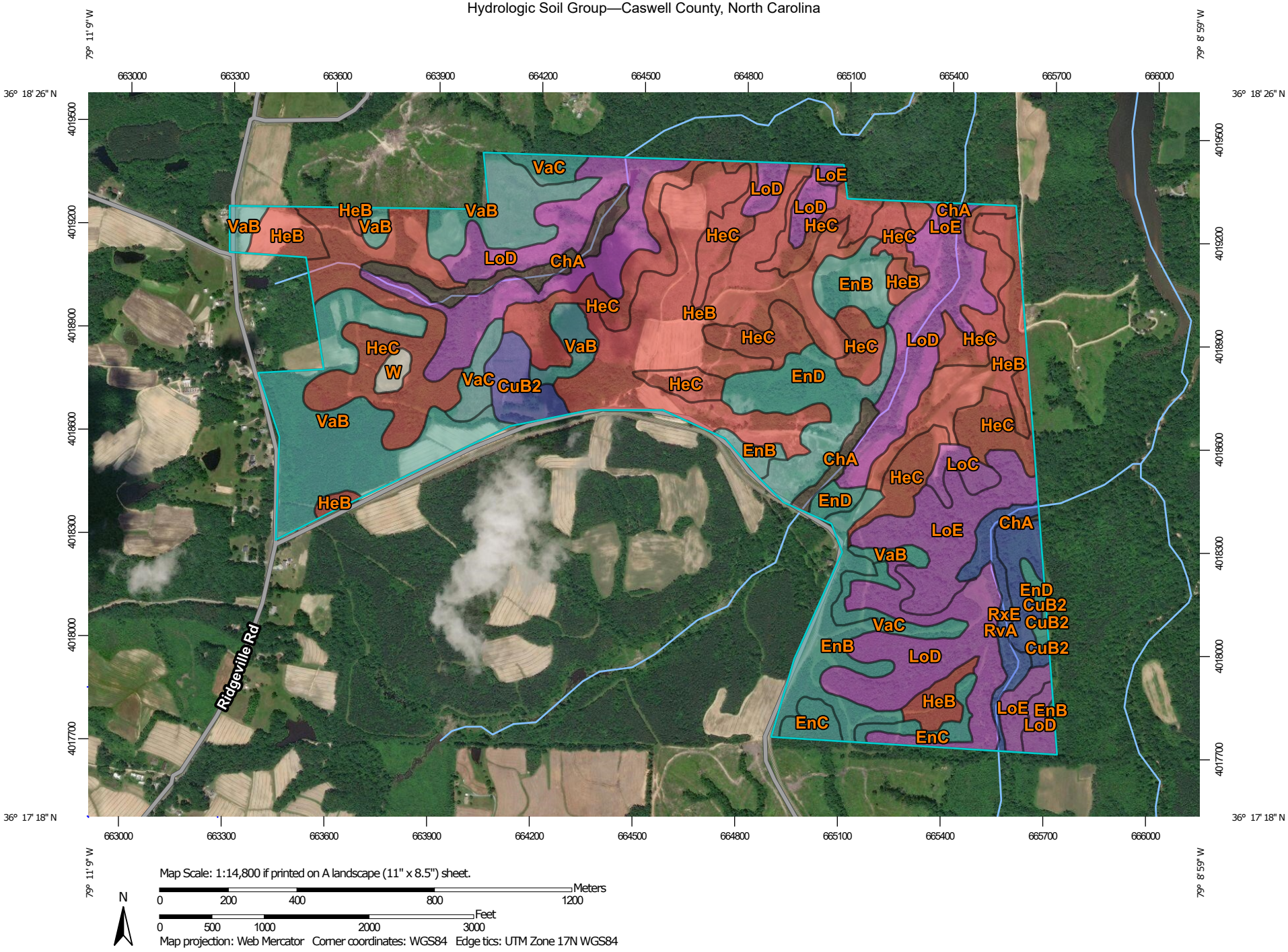
Date(s) aerial images were photographed: Nov 12, 2015—Nov 26, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
ChA	Chewacla loam, 0 to 2 percent slopes, frequently flooded	13.8	2.4%
CuB2	Cullen clay loam, 2 to 6 percent slopes, moderately eroded	9.3	1.6%
EnB	Enon sandy loam, 2 to 6 percent slopes	31.2	5.5%
EnC	Enon sandy loam, 6 to 10 percent slopes	8.6	1.5%
EnD	Enon sandy loam, 10 to 15 percent slopes	28.5	5.0%
HeB	Helena sandy loam, 2 to 6 percent slopes	109.1	19.1%
HeC	Helena sandy loam, 6 to 10 percent slopes	117.4	20.5%
LoC	Louisburg coarse sandy loam, 6 to 10 percent slopes	4.6	0.8%
LoD	Louisburg coarse sandy loam, 10 to 15 percent slopes	111.6	19.5%
LoE	Louisburg coarse sandy loam, 15 to 45 percent slopes	30.2	5.3%
RvA	Riverview loam, 0 to 2 percent slopes, occasionally flooded	9.0	1.6%
RxE	Rowan-Poindexter complex, 15 to 45 percent slopes	8.8	1.5%
VaB	Vance sandy loam, 2 to 6 percent slopes	73.2	12.8%
VaC	Vance sandy loam, 6 to 10 percent slopes	14.7	2.6%
W	Water	2.3	0.4%
Totals for Area of Interest		**572.4**	**100.0%**

Hydrologic Soil Group—Caswell County, North Carolina



Map Scale: 1:14,800 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 200 400 800 1200

Feet: 0 500 1000 2000 3000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Caswell County, North Carolina
Survey Area Data: Version 9, Sep 10, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

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Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
ChA	Chewacla loam, 0 to 2 percent slopes, frequently flooded	B/D	13.8	2.4%
CuB2	Cullen clay loam, 2 to 6 percent slopes, moderately eroded	B	9.3	1.6%
EnB	Enon sandy loam, 2 to 6 percent slopes	C	31.2	5.5%
EnC	Enon sandy loam, 6 to 10 percent slopes	C	8.6	1.5%
EnD	Enon sandy loam, 10 to 15 percent slopes	C	28.5	5.0%
HeB	Helena sandy loam, 2 to 6 percent slopes	D	109.1	19.1%
HeC	Helena sandy loam, 6 to 10 percent slopes	D	117.4	20.5%
LoC	Louisburg coarse sandy loam, 6 to 10 percent slopes	A	4.6	0.8%
LoD	Louisburg coarse sandy loam, 10 to 15 percent slopes	A	111.6	19.5%
LoE	Louisburg coarse sandy loam, 15 to 45 percent slopes	A	30.2	5.3%
RvA	Riverview loam, 0 to 2 percent slopes, occasionally flooded	B	9.0	1.6%
RxE	Rowan-Poindexter complex, 15 to 45 percent slopes	B	8.8	1.5%
VaB	Vance sandy loam, 2 to 6 percent slopes	C	73.2	12.8%
VaC	Vance sandy loam, 6 to 10 percent slopes	C	14.7	2.6%
W	Water		2.3	0.4%
Totals for Area of Interest			**572.4**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

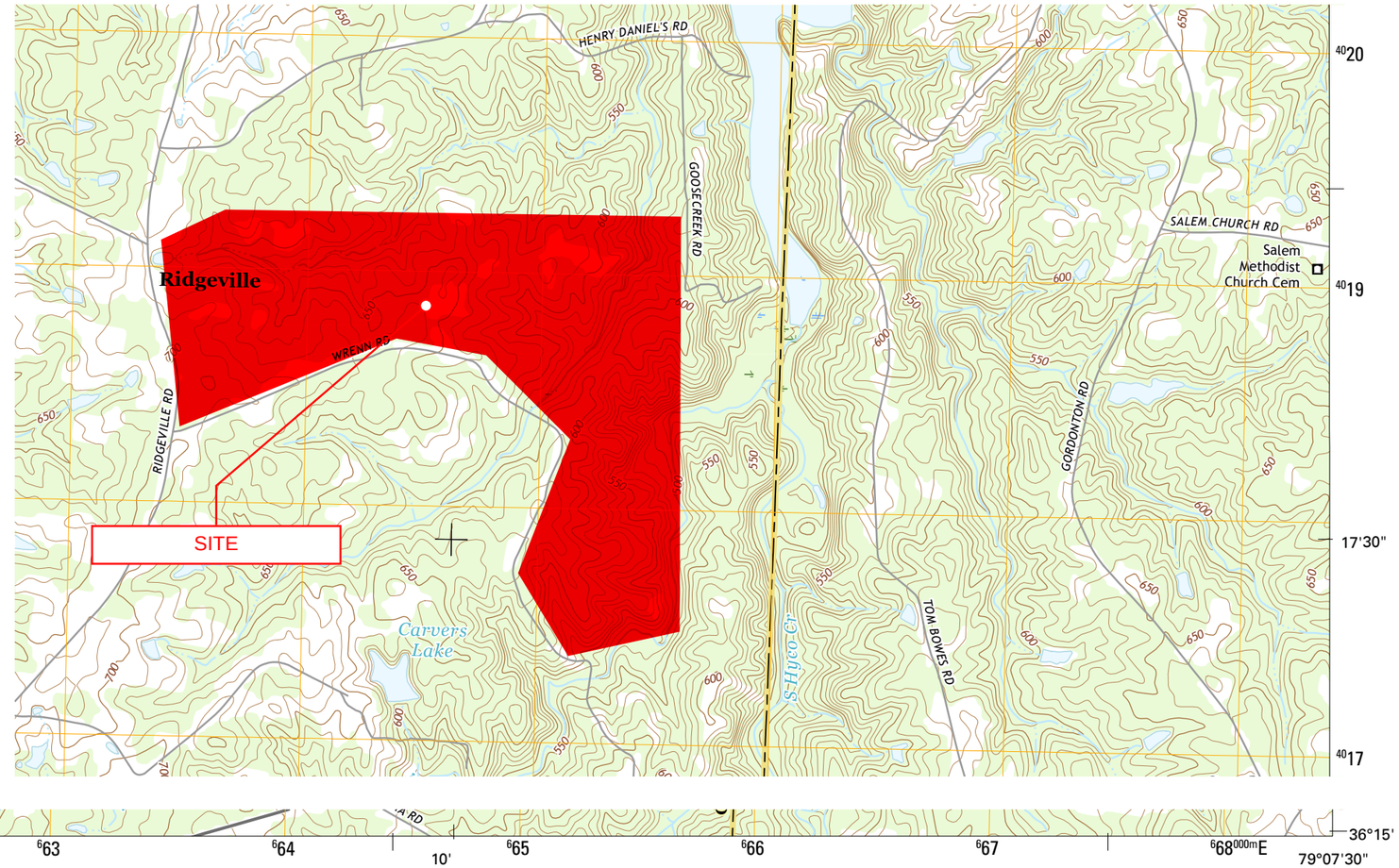
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher



SCALE 1:24 000

KILOMETERS: 1 0.5 0 1 2

METERS: 1000 500 0 1000 2000

MILES: 1 0.5 0 1

FEET: 1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000

CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the
National Geospatial Program US Topo Product Standard, 2011.
A metadata file associated with this product is draft version 0.6.19

QUADRANGLE LOCATION

1	2	3
4		5
6	7	8

1 Yanceyville
2 Leasburg
3 Olive Hill
4 Anderson
5 Hurdle Mills
6 Burlington NE
7 Cedar Grove
8 Caldwell

ADJOINING QUADRANGLES

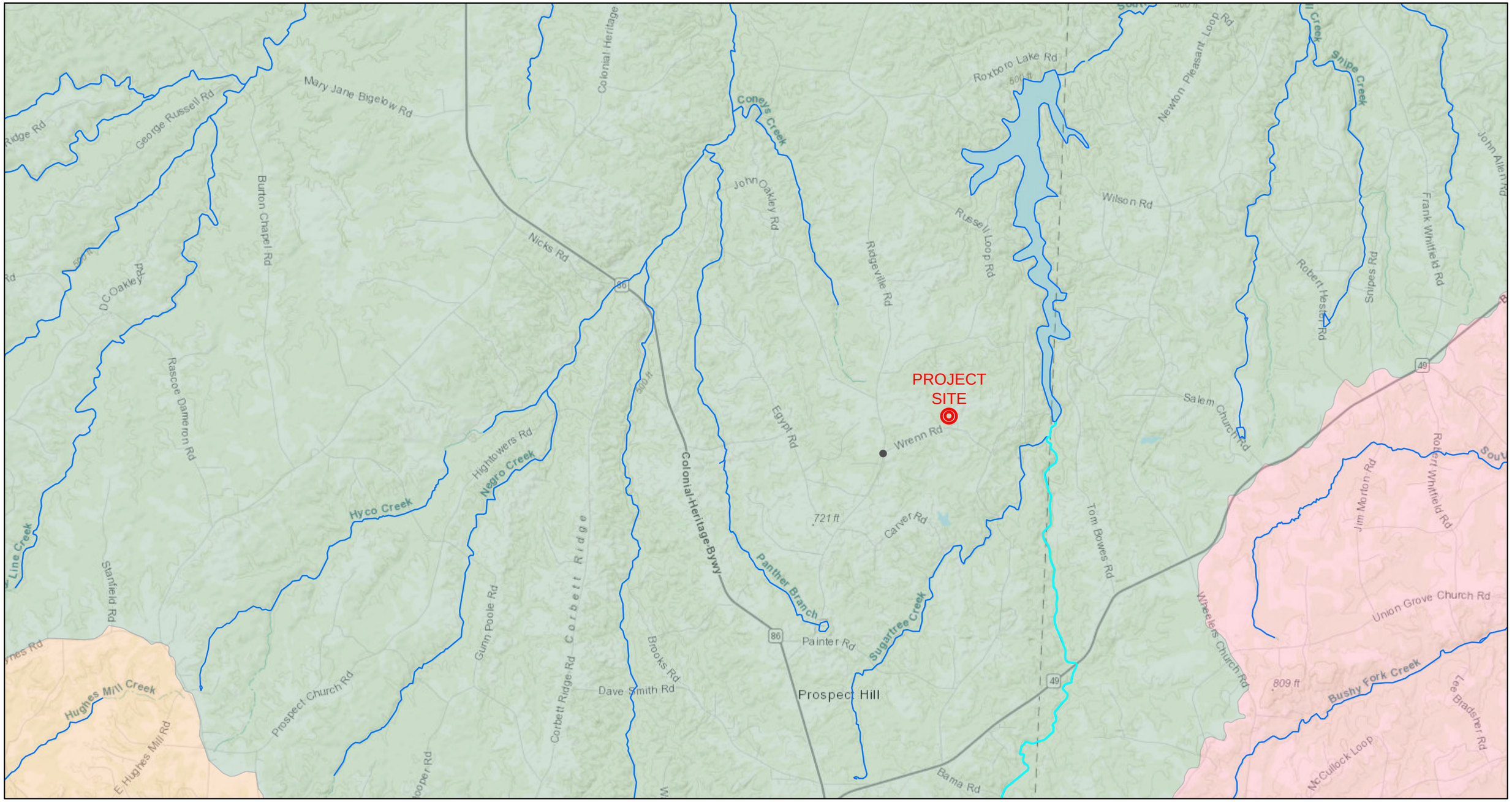
ROAD CLASSIFICATION

Expressway
Secondary Hwy
Ramp
Local Connector
Local Road
4WD
Interstate Route
US Route
State Route

RIDGEVILLE, NC

2016

NC Surface Water Classification



8/28/2019 10:24:50 AM

Surface Water Classifications

River Basins

- CPF
- NEU
- ROA

Stream Index: 22-58-4-(0.5)
Stream Name: South Hyco Creek
Description: From source to backwaters of Lake Roxboro
Classification: WS-II;HQW
Date of Class.: August 2, 1992
River Basin: Roanoke

1:72,224

0 0.75 1.5 3 mi

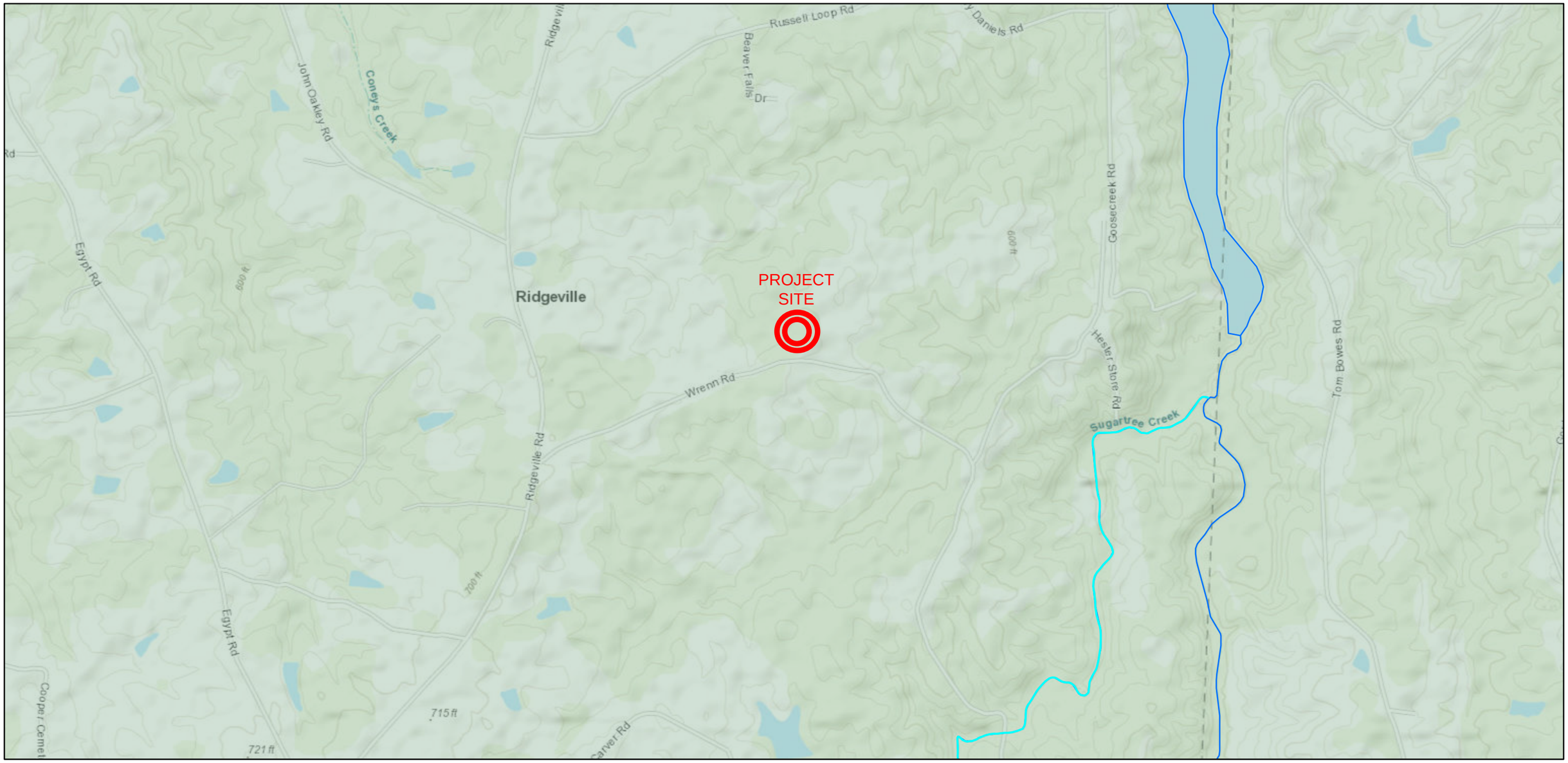
0 1 2 4 km

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

NCDENR Div. Water Resources

State of North Carolina DOT, Esri, HERE, Garmin, INCREMENT P, USGS, METI/NASA, NGA, EPA, USDA | NCDENR - Division of Water Resources |

NC Surface Water Classification



7/24/2019, 11:25:44 AM

Surface Water Classifications

River Basins

ROA

Stream Index: 22-58-4-1
Stream Name: Sugartree Creek
Description: From source to South Hyco Creek
Classification: WS-II;HQW
Date of Class.: August 2, 1992
River Basin: Roanoke

1:18,056

0 0.17 0.35 0.7 mi

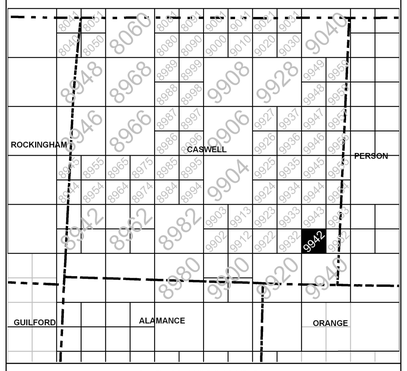
0 0.28 0.55 1.1 km

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

NCDENR Div. Water Resources

State of North Carolina DOT, Esri, HERE, Garmin, INCREMENT P, USGS, METI/NASA, EPA, USDA | NCDENR - Division of Water Resources |

STATE OF NORTH CAROLINA FIRM PANEL LOCATOR DIAGRAM



DATUM INFORMATION

The **projection** used in the preparation of this map was the North Carolina State Plane (FIPSZONE 3200). The **horizontal datum** was the North American Datum of 1983, GRS80 ellipsoid. Differences in datum, ellipsoid, projection, or Universal Transverse Mercator zones used in the production of FIRMS for adjacent jurisdictions may result in slight positional differences in map features across jurisdictional boundaries. These differences do not affect the accuracy of this FIRM. All coordinates on this map are in U.S. Survey Feet, where
1 U.S. Survey Foot = 1200/3937 Meters.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988 (NAVD 88). These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. An average offset between NAVD 88 and the National Geodetic Vertical Datum of 1929 (NGVD 29) has been computed for each North Carolina county. This offset was then applied to the NGVD 29 flood elevations that were not revised during the creation of this statewide format FIRM. The offsets for each county shown on this FIRM panel are shown in the vertical datum offset table below. Where a county boundary and a flooding source with unrevised NGVD 29 flood elevations are coincident, an individual offset has been calculated and applied during the creation of this statewide format FIRM. See Section 6.1 of the accompanying Flood Insurance Study report to obtain further information on the conversion of elevations between NAVD 88 and NGVD 29. To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the North Carolina Geodetic Survey at the address shown below. You may also contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit its website at http://www.ngs.noaa.gov.

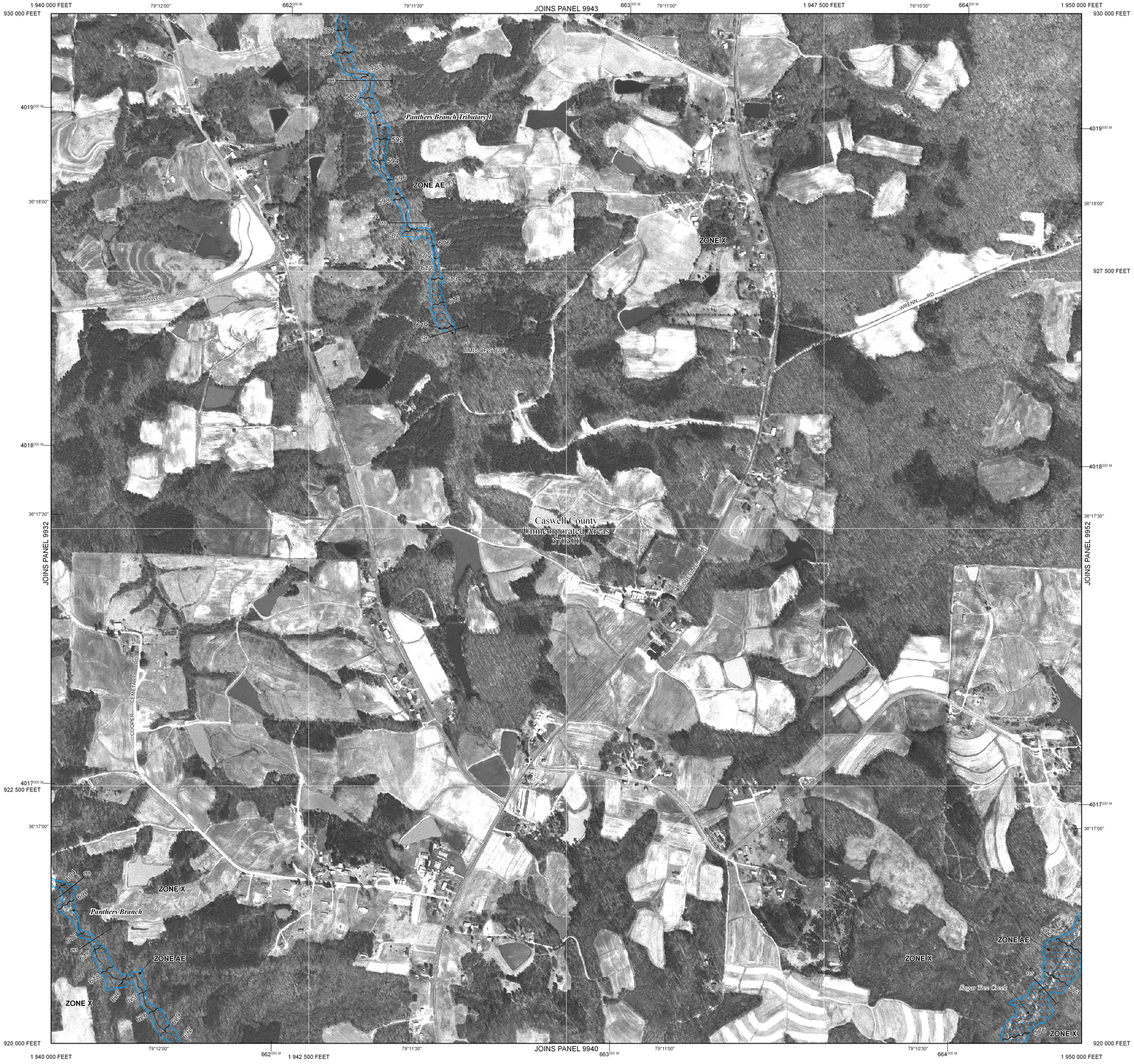
North Carolina Geodetic Survey
121 West Jones Street
Raleigh, NC 27601
(919) 733-3836
http://www.ncgs.state.nc.us

County Average Vertical Datum Offset Table

County	Vertical Datum Offset (ft)
CASWELL	-0.77

Example: NAVD 88 = NGVD 29 + (-0.77)

All streams listed in the **Flood Hazard Data Table** below were studied by detailed methods using field survey. Other flood hazard data shown on this map may have been derived using either a coastal analysis or limited detailed Riverine analysis. More information on the flooding sources studied by these analyses is contained in the Flood Insurance Study report.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevation determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Areas to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary
0.2% annual chance floodplain boundary
Floodway boundary
Zone D boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.

513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

512	Cross section line
23 — 23	Transect line
97°07'30", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4275000 M	1000-meter Universal Transverse Mercator grid ticks, zone 17
1 477 500 FEET	2500-foot grid values: North Carolina State Plane coordinate system (FIPSZONE 3200, State Plane NAD 83 feet)
BM5510	North Carolina Geodetic Survey bench mark (for more information visit http://www.ncgs.state.nc.us)
BM5510	National Geodetic Survey bench mark (for more information visit http://www.ngs.noaa.gov)
BM5510	NGS-58 GPS 2-5 cm Vertical Control Marks or Contractor-Established NCFMP Bench Marks (for more information visit http://www.ncgs.state.nc.us)
● M1.5	River Mile

GRID NORTH

MAP SCALE 1" = 500' (1 : 6,000)

250 0 250 500 750 1,000 FEET

150 0 150 300 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 9942J

FIRM

FLOOD INSURANCE RATE MAP

NORTH CAROLINA

PANEL 9942

(SEE LOCATOR DIAGRAM OR MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	CID No.	PANEL	SUFFIX
CASWELL COUNTY	370300	9942	J

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

EFFECTIVE DATE
SEPTEMBER 28, 2007

MAP NUMBER
3710994200J

State of North Carolina
Federal Emergency Management Agency

NORTH CAROLINA Cooperating Technical State
FEMA'S COOPERATING TECHNICAL PARTNER

This digital Flood Insurance Rate Map (FIRM) was produced through a unique cooperative partnership between the State of North Carolina and the Federal Emergency Management Agency (FEMA). The State of North Carolina has implemented a long term approach of floodplain management to decrease the costs associated with flooding. This is demonstrated by the State's commitment to map floodplain areas at the local level. As a part of this effort, the state of North Carolina has joined in a Cooperating Technical State agreement with FEMA to produce and maintain this digital FIRM.

www.ncfloodmaps.com

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles, Floodway Data, Limited Detailed Flood Hazard Data, and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Boundaries of **regulatory floodways** shown on the FIRM for flooding sources studied by detailed methods were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data for flooding sources studied by detailed methods as well as **non-encroachment widths** for flooding sources studied by limited detailed methods are provided in the Flood Insurance Study (FIS) report for this jurisdiction. The FIS report also provides instructions for determining a floodway using non-encroachment widths for flooding sources studied by limited detailed methods.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 4.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures in this jurisdiction.

Base map information and geospatial data used to develop this FIRM were obtained from various organizations, including the participating local community(ies), state and federal agencies, and/or other sources. The primary base for this FIRM is aerial imagery acquired by Caswell County. The time period of collection for the imagery is 2004. Information and geospatial data supplied by the local community(ies) that met FEMA base map specifications were considered the preferred source for development of the base map. See geospatial metadata for the associated digital FIRM for additional information about base map preparation.

Base map features shown on this map, such as **corporate limits**, are based on the most up-to-date data available at the time of publication. **Changes in the corporate limits may have occurred since this map was published**. Map users should consult the appropriate community official or website to verify current conditions of jurisdictional boundaries and base map features. This map may contain roads that were not considered in the hydraulic analysis of streams where no new hydraulic model was created during the production of this statewide format FIRM.

This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels, community map repository addresses, and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

If you have **questions about this map**, or questions concerning the National Flood Insurance Program in general, please call **1 – 877 – FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov.

An accompanying Flood Insurance Study report, Letter of Map Revision (LOMR) or Letter of Map Amendment (LOMA) revising portions of this panel, and digital versions of this FIRM may be available. Visit the **North Carolina Floodplain Mapping Program** website at http://www.ncfloodmaps.com, or contact the **FEMA Map Service Center** at 1-800-358-9616 for information on all related products associated with this FIRM. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://www.msc.fema.gov.

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index or visit http://www.ncfloodmaps.com.

EFFECTIVE DATE OF FLOOD INSURANCE RATE MAP PANEL
SEPTEMBER 28, 2007

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

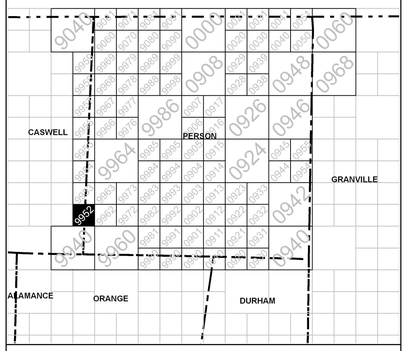
For community map revision history prior to statewide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent, the North Carolina Division of Emergency Management or the National Flood Insurance Program at the following phone numbers or websites:

NC Division of Emergency Management
(919) 715-8000 http://www.nccrimecontrol.org/nfip

National Flood Insurance Program
1-800-638-6620 http://www.fema.gov/nfip

STATE OF NORTH CAROLINA FIRM PANEL LOCATOR DIAGRAM



DATUM INFORMATION

The **projection** used in the preparation of this map was the North Carolina State Plane (FIPSZONE 3200). The **horizontal datum** was the North American Datum of 1983, GRS80 ellipsoid. Differences in datum, ellipsoid, projection, or Universal Transverse Mercator zones used in the production of FIRMS for adjacent jurisdictions may result in slight positional differences in map features across jurisdictional boundaries. These differences do not affect the accuracy of this FIRM. All coordinates on this map are in U.S. Survey Feet, where
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North Carolina Geodetic Survey
121 West Jones Street
Raleigh, NC 27601
(919) 733-3836
http://www.ncgs.state.nc.us

County Average Vertical Datum Offset Table

County	Vertical Datum Offset (ft)
CASWELL	-0.77
PERSON	-0.86

Example: NAVD 88 = NGVD 29 + (-0.77)

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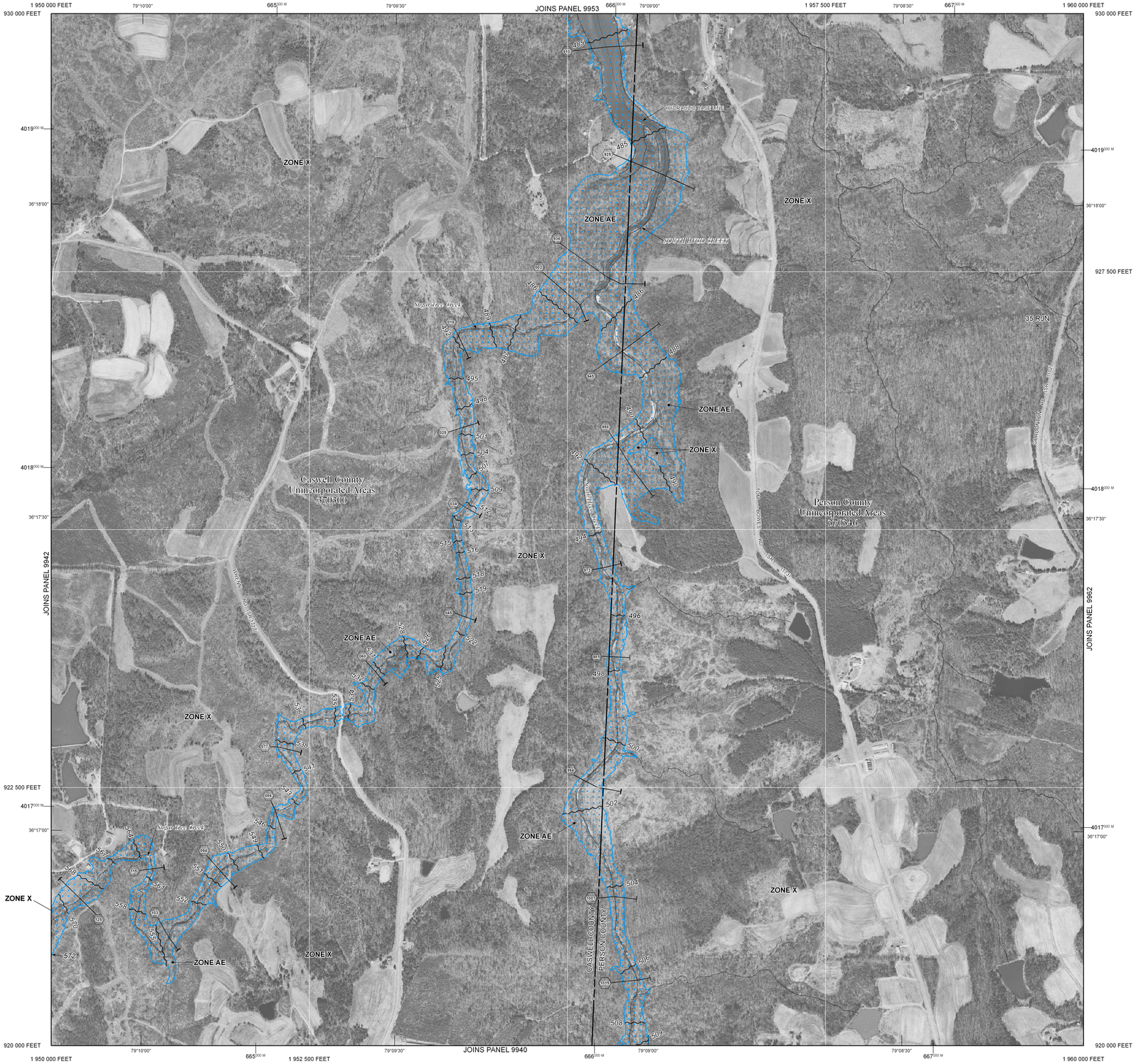

LEGEND

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The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevation determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Areas to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

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1% annual chance floodplain boundary
0.2% annual chance floodplain boundary
Floodway boundary
Zone D boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.

513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

012	Cross section line
23 — 23	Transect line
97°07'30", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4275000 M	1000-meter Universal Transverse Mercator grid ticks, zone 17
1 477 500 FEET	2500-foot grid values: North Carolina State Plane coordinate system (FIPSZONE 3200, State Plane NAD 83 feet)
BM5510	North Carolina Geodetic Survey bench mark (for more information visit http://www.ncgs.state.nc.us)
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● M1.5	River Mile

GRID NORTH
MAP SCALE 1" = 500' (1 : 6,000)
250 0 250 500 750 1,000 FEET
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Base map information and geospatial data used to develop this FIRM were obtained from various organizations, including the participating local community(ies), state and federal agencies, and/or other sources. The primary base for this FIRM is aerial imagery acquired by Caswell County and Person County. The time period of collection for the Caswell imagery is 2004. The time period of collection for the Person imagery is 2004. Information and geospatial data supplied by the local community(ies) that met FEMA base map specifications were considered the preferred source for development of the base map. See geospatial metadata for the associated digital FIRM for additional information about base map preparation.

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MAP REPOSITORY
Refer to listing of Map Repositories on Map Index or visit http://www.ncfloodmaps.com.

EFFECTIVE DATE OF FLOOD INSURANCE RATE MAP PANEL
JUNE 4, 2007

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
SEPTEMBER 28, 2007

For community map revision history prior to statewide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent, the North Carolina Division of Emergency Management or the National Flood Insurance Program at the following phone numbers or websites:

NC Division of Emergency Management
(919) 715-8000 http://www.nccrimecontrol.org/nfip

National Flood Insurance Program
1-800-638-6620 http://www.fema.gov/nfip

NORTH CAROLINA Cooperating Technical State
FEMA'S COOPERATING TECHNICAL PARTNER

This digital Flood Insurance Rate Map (FIRM) was produced through a unique cooperative partnership between the State of North Carolina and the Federal Emergency Management Agency (FEMA). The State of North Carolina has implemented a long term approach of floodplain management to decrease the costs associated with flooding. This is demonstrated by the State's commitment to map floodplain areas at the local level. As a part of this effort, the state of North Carolina has joined in a Cooperating Technical State agreement with FEMA to produce and maintain this digital FIRM.

www.ncfloodmaps.com

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 9952K

FIRM
FLOOD INSURANCE RATE MAP
NORTH CAROLINA

PANEL 9952
(SEE LOCATOR DIAGRAM OR MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	CID No.	PANEL	SUFFIX
CASWELL COUNTY	370300	9952	K
PERSON COUNTY	370346	9952	K

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP REVISED
SEPTEMBER 28, 2007

MAP NUMBER
371099520K

State of North Carolina
Federal Emergency Management Agency