

David Garrett & Associates

Engineering and Geology



August 12, 2010

Mr. Zi-qiang Chen, PhD
NCDENR Division of Waste Management
Solid Waste Section
1646 Mail Service Center
Raleigh, North Carolina 27699-1646

RE: Response to Regulatory Review Comments
Buffaloe LCID Landfill and Processing Facility
NCDENR Solid Waste Permit #92-O and 92-23

Dear Mr. Zi-qiang:

On behalf of the Buffaloe family and the Buffaloe LCID facility, I am pleased to present the following responses to your comments pertaining to the referenced project, which you presented in an e-mail to me dated July 20, 2010. The responses are presented in the order received.

1). Each Permit is a stand-alone document. Would you please furnish us with the facility's Deeds info? Fill in the missing parts (in red), expand the tablet below when needed.

I met with Brad Bailey of the Solid Waste Section in 2008, prior to preparing the renewal application. He had asked that a single operations plan be prepared for the facility that covered both the LCID disposal operation and the wood waste processing facility. The facilities are adjacent to each other within the facility boundary. Pursuant to Mr. Bailey's request, I combined the operations plans into one document.

The following information is from the Wake County Register of Deeds office, viewed on line at <http://maps.raleighnc.gov/imapsraleigh>. An excerpt is attached (see **Attachment 1**):

Deed Book: 09-E
Page Number: 1260
Date of Deed: 4/2/2009
Site Acreage: 197.62
PIN: 0791736482
Grantor: BUFFALOE, MARY E BUFFALOE, WILLIAM S
Grantee: BUFFALOE, MARY E BUFFALOE, WILLIAM S HEIRS

2). Please include the landfill's cross-section profiles A-A' and B-B' drawings in Attachment 1 to illustrate the landfill facility's air-space layout and capacity. Would you please provide us the electronic (PDF) file(s) of the cross-section drawings?

The cross sections are furnished electronically with the entire set of 2001 permit drawings, prepared for Wake County (see **Attachment 2**). As a point of clarification, the disposal unit (Phase 1) was originally permitted by Wake County under authority from NC DENR, while the T&P facility had a permit from NC DENR. The facility boundary for neither coincided with the property boundary. During the course of preparing the closure of Phase 1 and the expansion application for Phases 2 – 7 (both of which were approved by Wake County), the facility boundaries were combined and shown to coincide with the property boundary – see **Figure 1**, prepared by Thompson & Associates, August 2001. Following customary practice under the Solid Waste rules, the 2008 application for the permit renewal showed the property boundary as the facility boundary. Based on the older drawings, I determined the following:

Original Acreage in Permitted Facility ^a	87.25 ac
Original LCID Footprint Phase 1 (now closed)	26.22 ac
Approved LCID Expansion (Phases 2 – 7)	28.22 ac
Original Acreage in T&P Facility	3.00 ac

The following information is from my current site plan (**Figure 2**):

Existing Facility

Total Acreage in the Permitted Facility ^b	197.62 ac
Acreage in the LCID Footprint (Phase 1)	26.22 ac
Acreage in the LCID Footprint (Phase 2)	<u>14.56 ac</u>
Total LCID Footprint	40.78 ac
Acreage in the T&P Facility	3.00 ac

Proposed Future Facility

Acreage in the Approved LCID Footprint (Phase 3)	9.86 ac
Acreage in the Approved LCID Footprint (Phase 4)	6.69 ac
Acreage in the Approved LCID Footprint (Phase 5)	1.67 ac
Acreage in the Approved LCID Footprint (Phases 3 – 7)	28.22 ac
Acreage in Proposed Future Southward Expansion ^c	<u>31.87 ac</u>
Future LCID Footprint	88.31 ac

^a The original Thompson Associates drawing shows a boundary line to the south of the T&P area and the LCID that is believed to represent a facility boundary approved by Wake County during site plan approval – this line does not coincide with any current or former property boundary

^b The revised facility boundary coincides with the property boundary, in keeping with current NC DENR policies, but the previous facility boundary shown on the Thompson Associates drawing (Figure 1) will be observed until such time that a new site plan is approved by Wake County (for future southward footprint expansion)

^c The Facility Owner desires a southward expansion prior to expanding to the north and west (Phases 3 – 7) as shown on the permitted facility plan – this proposed expansion will require further approval by Wake County Planning – the T&P would be operated on top of a closed LCID unit (Phase 1)

3). Please provide a preliminary engineering calculation to demonstrate the adequacy of the total landfill capacity for the existing 27 acres and for the extension of the new phase of the facility. (capacity in cubic yard and ton).

Please refer to the attached volume calculation summary, excerpted from the original application report prepared in 2001 (see **Attachment 3**) and the original permit drawings. Based on the calculations performed in 2001, the estimated total airspace (with soil cover) between proposed base grade contours shown on Drawing E1 and proposed final contours shown on Drawings E2 and E3 is :

	Phase 2		Phases 3 - 7	
	(c.y.)	(tons)	(c.y.)	(tons)
Available total fill volume	180,652		3,237,800	
Net waste disposal capacity	159,519	31,904	2,985,127	597,025

The net waste disposal capacity was calculated by subtracting the operational cover and final cover from the total airspace. The conversion of volume to weight is based on an assumed unit weight of 400 pounds per cubic yard. The weight of the material can vary considerably with composition and moisture content, and whether or not the material is ground – currently, the Facility does grind the wastes. The foregoing numbers assume dry materials and neglects compression induced settlement – this increases density.

At this time, it appears that sufficient airspace exists in Phase 2 to last the 5-year permitting cycle. Based on the analysis, the Buffaloe LCID is projected to last 40 years, or more. Factors that will affect the operational capacity are regional economics and the success of recycling wood waste. An annual survey, required by the permit, will allow the Operator to track his progress and, when needed, the Solid Waste Section will be notified prior to beginning construction on Phase 3.

4). The north arrow on your “Facility Plan with ¼ Mile Local Area Map” points to a wrong direction.

Please refer to Figure 2, which is the same drawing (north arrow corrected), showing the approved Phases 2 – 7 and the proposed future southward expansion.

Please contact me at your earliest convenience if you have questions or comments, or if I may be of further service.



Attachments

cc: Merrick Buffaloe – Owner/Operator

Figure 1
Original Site Map Prepared by Thompson Associates, 2001

ADJACENT WOOD RECYCLING FACILITY RECEIVED SPECIAL USE APPROVAL BY WAKE COUNTY (PETITION #BA: 1814, 2/15/99), WAKE COUNTY EROSION AND SEDIMENTATION CONTROL (PERMIT #0992691, 6/3/99), AND NC DENR DIVISION OF WASTE MANAGEMENT (PERMIT #92-23, 8/2/99)

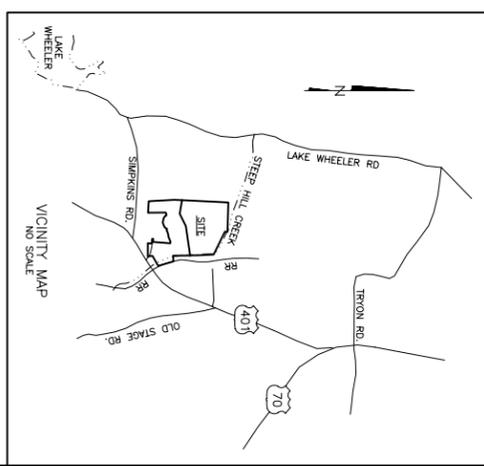
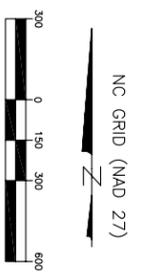
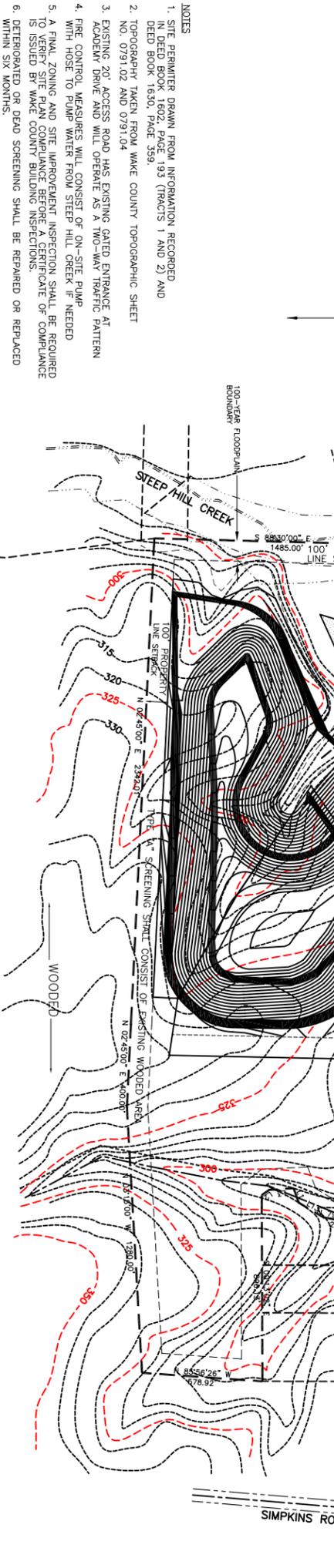
MONITORING WELL LOCATIONS ARE APPROXIMATE AND ARE BASED ON INFORMATION PROVIDED BY CRAIG TURNER, LAND MANAGEMENT GROUP, INC., (252) 452-0001, ENGINEERS - ON NOVEMBER 17, 2000.

WETLAND DELINEATION APPROVED BY TODD TUGWELL - U.S. ARMY CORPS OF ENGINEERS - ON NOVEMBER 17, 2000.
PREVIOUS SPECIAL USE APPROVAL RECEIVED ON JULY 10, 2001. AS PER ITEM 5, BA SU-1912-01.
SPECIAL USE BASIS PER SECTION 1-1-12 WAKE COUNTY ZONING ORDINANCE.
SEE ATTACHED EXISTING CONDITIONS MAP FOR FLOOD HAZARD SOILS.

LINE	BEARING	DISTANCE
L1	N. 19°56.05' W	74.28'
L2	S. 54°20.20' W	43.47'
L3	S. 86°00.29' W	117.46'
L4	S. 02°11.30' E	110.96'
L5	S. 03°30.00' W	130.00'
L6	S. 02°08.30' W	129.90'
L7	S. 30°34.40' W	119.75'
L8	N. 75°03.70' W	86.96'
L9	S. 56°00.19' W	89.46'
L10	S. 72°59.98' W	167.06'
L11	S. 75°15.23' W	96.25'
L12	S. 63°24.26' W	154.01'
L13	N. 59°03.46' W	137.51'
L14	S. 73°17.06' W	129.04'
L15	N. 86°40.40' W	89.58'
L16	S. 84°42.24' E	159.20'
L17	S. 01°55.23' E	117.93'
L18	S. 18°04.13' E	122.42'

7510OWNER:
WILLIAM S. & MARY E. BUFFALO
5525 WAKE ACADEMY ROAD
RALEIGH, NORTH CAROLINA 27603
(919) 772-4166
(919) 772-5815 FAX

SITE DATA:
ZONING DISTRICT: R-40W
ADJACENT ZONING: R-40W
LAND USE: LOD LANDFILL
HOURS OF OPERATION:
7 AM - 5 PM W-F (WINTER)
7 AM - 5:30 PM M-F (SUMMER)
8 AM - 12 NOON SATURDAYS
TOTAL EMPLOYEES: 4



- NOTES
1. SITE PERIMETER DRAWN FROM INFORMATION RECORDED IN DEED BOOK 1602, PAGE 193 (TRACTS 1 AND 2) AND DEED BOOK 1630, PAGE 359.
 2. TOPOGRAPHY TAKEN FROM WAKE COUNTY TOPOGRAPHIC SHEET NO. 0791.02 AND 0791.04
 3. EXISTING 20' ACCESS ROAD HAS EXISTING GATED ENTRANCE AT WAKE ACADEMY DRIVE AND WILL OPERATE AS A TWO-WAY TRAFFIC PATTERN WITH HOSE TO PUMP WATER FROM STEEP HILL CREEK IF NEEDED
 4. FIRE CONTROL MEASURES WILL CONSIST OF ON-SITE PUMP WITH HOSE TO PUMP WATER FROM STEEP HILL CREEK IF NEEDED
 5. A FINAL ZONING AND SITE IMPROVEMENT INSPECTION SHALL BE REQUIRED UPON COMPLETION OF CONSTRUCTION AND INSPECTION OF COMPLIANCE IS ISSUED BY WAKE COUNTY BUILDING INSPECTIONS.
 6. DETERIORATED OR DEAD SCREENING SHALL BE REPAIRED OR REPLACED WITHIN SIX MONTHS.
 7. NO PERMANENT CONSTRUCTION CAN OCCUR WITHIN BUFFER YARDS.
 8. SEPTIC TANKS AND DRAIN LINES ARE PROHIBITED IN REQUIRED BUFFER YARDS. SEPTIC TANKS AND DRAIN LINES ARE PROHIBITED IN BUFFER YARDS FOR ANY BUILDING HOUSING UTILITY COMMODITIES OR EQUIPMENT ARE ALSO PROHIBITED IN REQUIRED BUFFER YARDS.
 9. ENTIRE SITE SUBJECT TO SWIFT CREEK INTERFERIOUS SURFACE RESTRICTIONS OF NO GREATER THAN 12% TOTAL INTERFERIOUS SURFACE.
 10. ALL AREAS DETERMINED TO BE NEUSE RIVER CORRIDOR DRAINAGE AREAS AS PER DEPARTMENT OF WATER QUALITY HAVE BEEN INDICATED ON THIS PLAN. NEUSE RIVER CORRIDOR DRAINAGE AREAS ARE WELL OUTSIDE ANY NEUSE RIVER CORRIDOR DRAINAGE AREAS.
 11. NO TEMPORARY OR PERMANENT EROSION CONTROL MEASURES SHALL BE LOCATED WITHIN ANY DETERMINED NEUSE RIVER CORRIDOR DRAINAGE AREAS.
 12. ALL TREE "A" SCREENINGS SHALL CONSIST OF EXISTING WOODED AREAS CONTAINING VARIOUS TYPES OF HARDWOOD TREES AT LEAST 8 FEET IN DIAMETER AND 80-100 FEET IN HEIGHT. NO ADDITIONAL VISUAL SCREENINGS SHALL BE ADDED AROUND THE PROPOSED LANDFILL EXTENSION AREAS DUE TO NO EYE LEVEL VISIBILITY OF THE LANDFILL FROM ANY STATE MAINTAINED THOROUGHFARE. SECTION 1-1-12 PAGE 41 NUMBER 4
 13. NO HAZARDOUS MATERIALS IN REPORTABLE QUANTITIES WILL BE USED OR STORED ON-SITE. THIS PARTICULAR LANDFILL IS AN LOD CONSTRUCTION AND DEBRIS LANDFILL.

FOR EROSION CONTROL, GRADING PLAN, PHASING, AND DETAILS, SEE SHEETS 2 THROUGH 8 (OPTIONS 1 & 2)

WETLANDS MITIGATION	WETLANDS IMPACT
(TO BE MITIGATED BY NC DENR WETLANDS RESTORATION PROGRAM - WRP)	1.12 AC
EXISTING WETLANDS INFILL	2.24 AC
POTENTIAL WETLANDS MITIGATION	
② 3:1 SLOPE	
③ 2:1 MITIGATION (SEE NOT ABOVE)	

LEGEND

1. PRIVATE WELL
2. WILLAM BUFFALO - RESIDENT
3. THOMAS WILLIAMS - RESIDENT
4. WAKE CHRISTIAN ACADEMY - SCHOOL
5. WILLIAM BUFFALO - RESIDENT AND FACILITY OWNER
6. JOHN BUFFALO - RESIDENT
7. BERLIN JOHNSON - WOODED AREA
8. A.E. FINLEY - INDUSTRIAL SITE

EXACT MIN. ACREAGE TO BE DONATED TO WRP FOR WETLAND MITIGATION PURPOSES IN PROGRESS. FINAL ACREAGE DETERMINATION IN PROCESS.

THOMPSON & ASSOCIATES, P.A.
5821 HOLLY SPRINGS ROAD
RTP, NC 27617
TEL: 919 851-1709 FAX 919 858-2143

DATE: 8/01/01 SURVEYED BY: ADP
SCALE: 1"=300' DRAWN BY: VJH
REVISIONS (PREVIOUSLY SUBMITTED 3-98 FOR SPECIAL USE PERM. APPROVED FEBRUARY 9, 1999 - PERMIT NEVER ISSUED)

OVERALL SITE PLAN (OPTION #1)

OWNER: WILLIAM S. & MARY E. BUFFALO
JOB: WAKE COUNTY NORTH CAROLINA
DWG. NO.: 1
P.L.N. 0791.04-72-7647

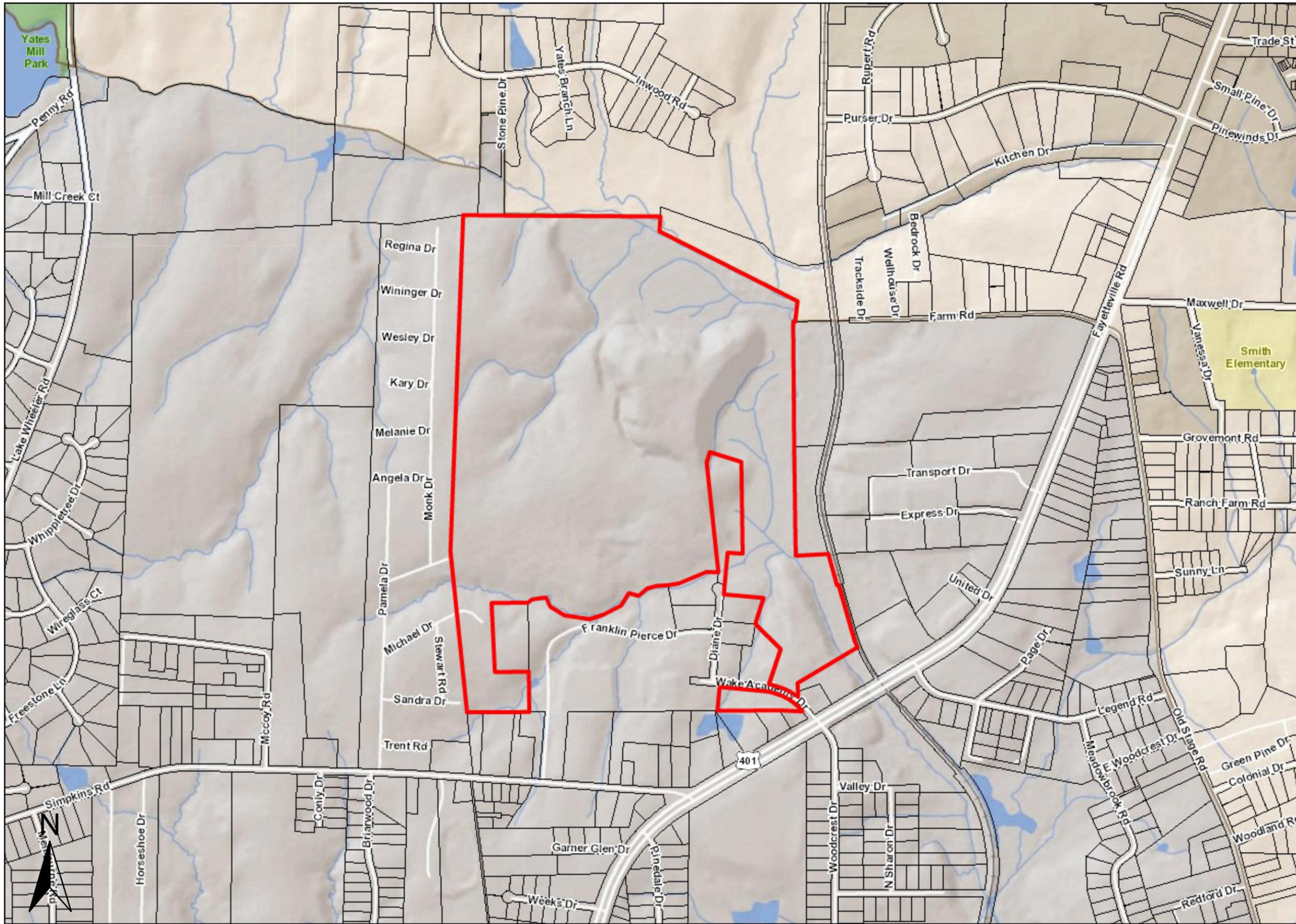
LANDFILL.C.C. DWG



ADO 07 SURVEY, DEER BEANS AREA 1/7/99 5000' WETLANDS RESTORATION PROGRAM 8/1/99

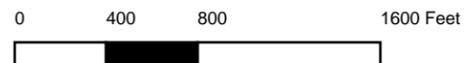
Figure 2
Facility Map Prepared by David Garrett, PE, 2001 and 2008

Attachment 1
Wake County Register of Deeds Information



Field	Value
PIN	0791736482
Real Estate ID	0009796
Map Name	079104
Owner	BUFFALOE, MARY E BUFFALOE, WILLIAM S HEIRS
Mailing Address 1	BONNIE LYNN B TILLEY
Mailing Address 2	5521 WAKE ACADEMY DR
Mailing Address 3	RALEIGH NC 27603-4119
Deed Book	09-E-
Deed Page	1260
Deed Date	04/02/2009
Deeded Acreage	197.62
Assessed Building Value	\$271,781.00
Assessed Land Value	\$6,040,680.00
Total Assessed Value	\$6,312,461.00
Billing Class	INDIVIDUAL
Property Description	ANDREWS LD
Heated Area	4106
Site Address	5525 WAKE ACADEMY DR
City	
Township	SWIFT CREEK
Year Built	1963
Total Sale Price	\$0.00
Sale Date	
Type and Use	Single Family
Design Style	Conventional
Land Class	FLORICULTURE-FARM
Old Parcel Number	679--

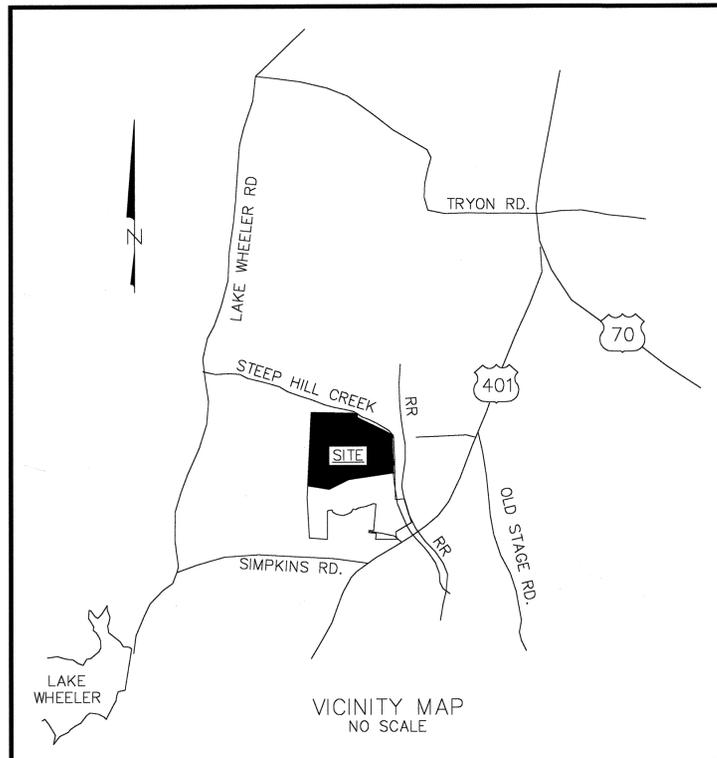
Buffaloe LCID



Attachment 2
Permit Drawings prepared for Wake County by David Garrett, PE, 2001

BUFFALO L.C.I.D. LANDFILL EXPANSION PHASES 2-7 PERMIT DRAWINGS

APRIL 2002



INDEX OF DRAWINGS

SHEET NO.	DRAWING NO.	DRAWING TITLE
1	-	TITLE/COVER SHEET
2	S1	1/4 MILE LOCAL AREA MAP
3	S2	EXISTING SITE CONDITIONS
4	S3	CONCEPTUAL FACILITY PLAN FINAL WASTE CONTOURS
5	S4	CONCEPTUAL GRADING PLAN W/ TEST BORINGS & GROUNDWATER DATA
6	G5	PHASE 2 GRADING & EROSION CONTROL
6A	G5A	PHASES 2 & 3 BASE GRADING & EROSION CONTROL
7	G6	PHASE 2 FINAL WASTE CONTOURS & EROSION CONTROL
8	G7	PHASE 3 FINAL WASTE CONTOURS & EROSION CONTROL
9	G8	PHASE 4 FINAL WASTE CONTOURS & EROSION CONTROL
10	G9	PHASE 5 FINAL WASTE CONTOURS & EROSION CONTROL
11	G10	PHASE 6 FINAL WASTE CONTOURS & EROSION CONTROL
12	G11	PHASE 7 FINAL WASTE CONTOURS & EROSION CONTROL
13	EC1	FINAL CONTOURS & EROSION CONTROL PLAN
14	EC2	EROSION AND SEDIMENTATION CONTROL DETAILS
15	EC3	EROSION AND SEDIMENTATION CONTROL DETAILS
16	EC4	EROSION AND SEDIMENTATION CONTROL DETAILS
17	EC5	EROSION AND SEDIMENTATION CONTROL NOTES
18	X1	CROSS SECTIONS
19	X2	CROSS SECTIONS

**PRELIMINARY
FOR REGULATORY REVIEW**

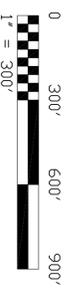
David Garrett, P.G., P.E.
Engineering and Geology

1408 Rock Drive, Raleigh, North Carolina

Telephone/Fax (919)231-1818



APPROVED PLAN
DATE 7/29/02
PERMIT NO. _____
COUNTY ENVIRONMENTAL SERVICES
EROSION, FLOOD & STORMWATER
(919) 856-7449



DATE	NO.	REVISION
8-12-2010	2	DEPICT PROPOSED FUTURE LID EXPANSION ON EAST SIDE
10-28-08	1	DEPICT CURRENT AND FUTURE SOLID WASTE MANAGEMENT UNIT BOUNDARIES

DRAWING NO. 2
SHEET NO. S1

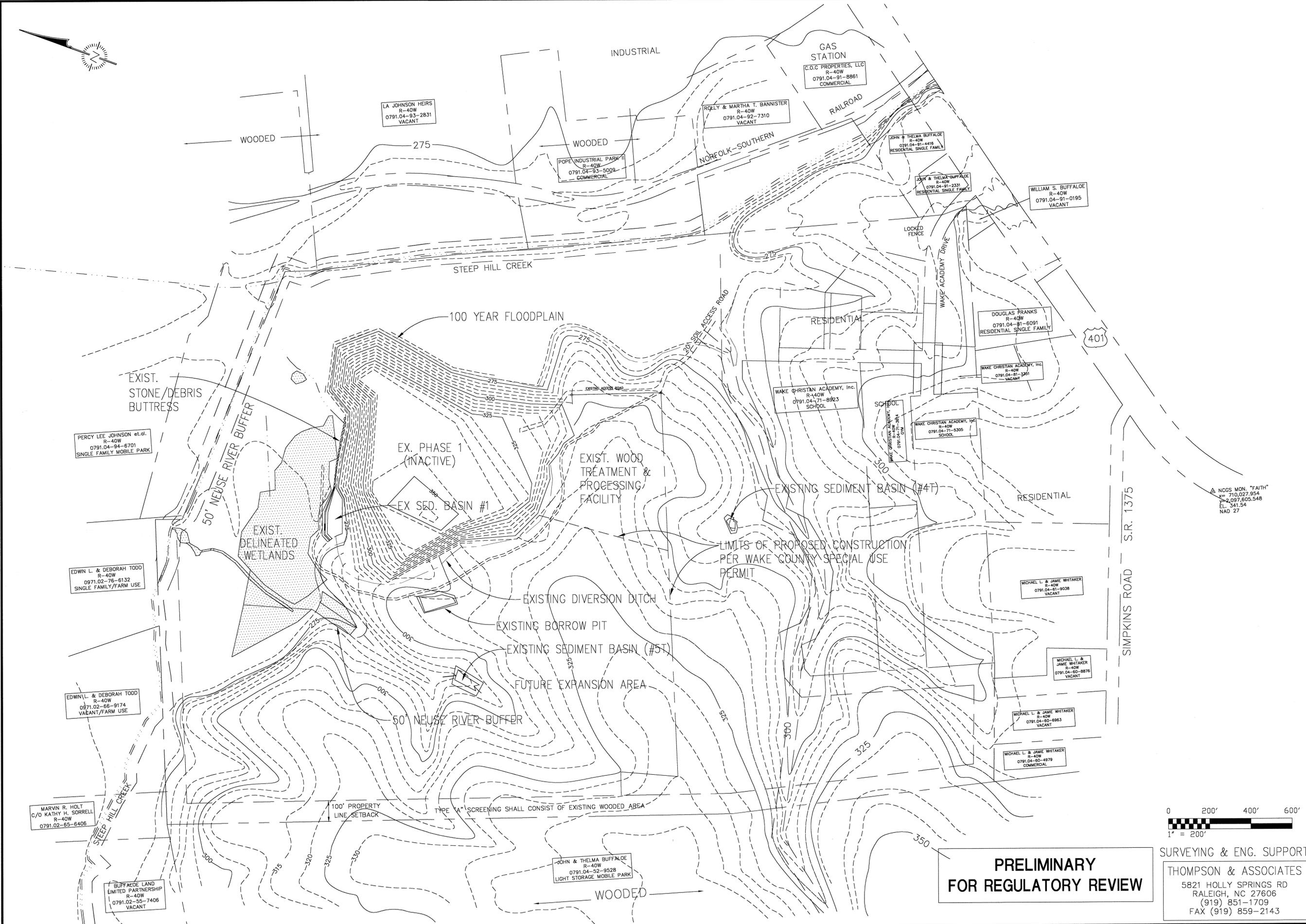
DRAWING TITLE:
**FACILITY PLAN WITH
1/4 MILE LOCAL AREA MAP**

PROJECT TITLE:
**BUFFALO L.C.I.D. LANDFILL
GARNER, NORTH CAROLINA**

SEAL

 SEAL

David Garrett, P.G., P.E.
 Engineering and Geology
 5105 HARBOUR TOWNE DRIVE RALEIGH, NORTH CAROLINA 27604
 Telephone/Fax (919)231-1818



C:\Users\CAD\OneDrive\Drawings\BUFFALO-D0006.dwg DATE: MAY 04, 2002 TIME: 6:10 PM

**PRELIMINARY
FOR REGULATORY REVIEW**



SURVEYING & ENG. SUPPORT:
THOMPSON & ASSOCIATES
5821 HOLLY SPRINGS RD
RALEIGH, NC 27606
(919) 851-1709
FAX (919) 859-2143

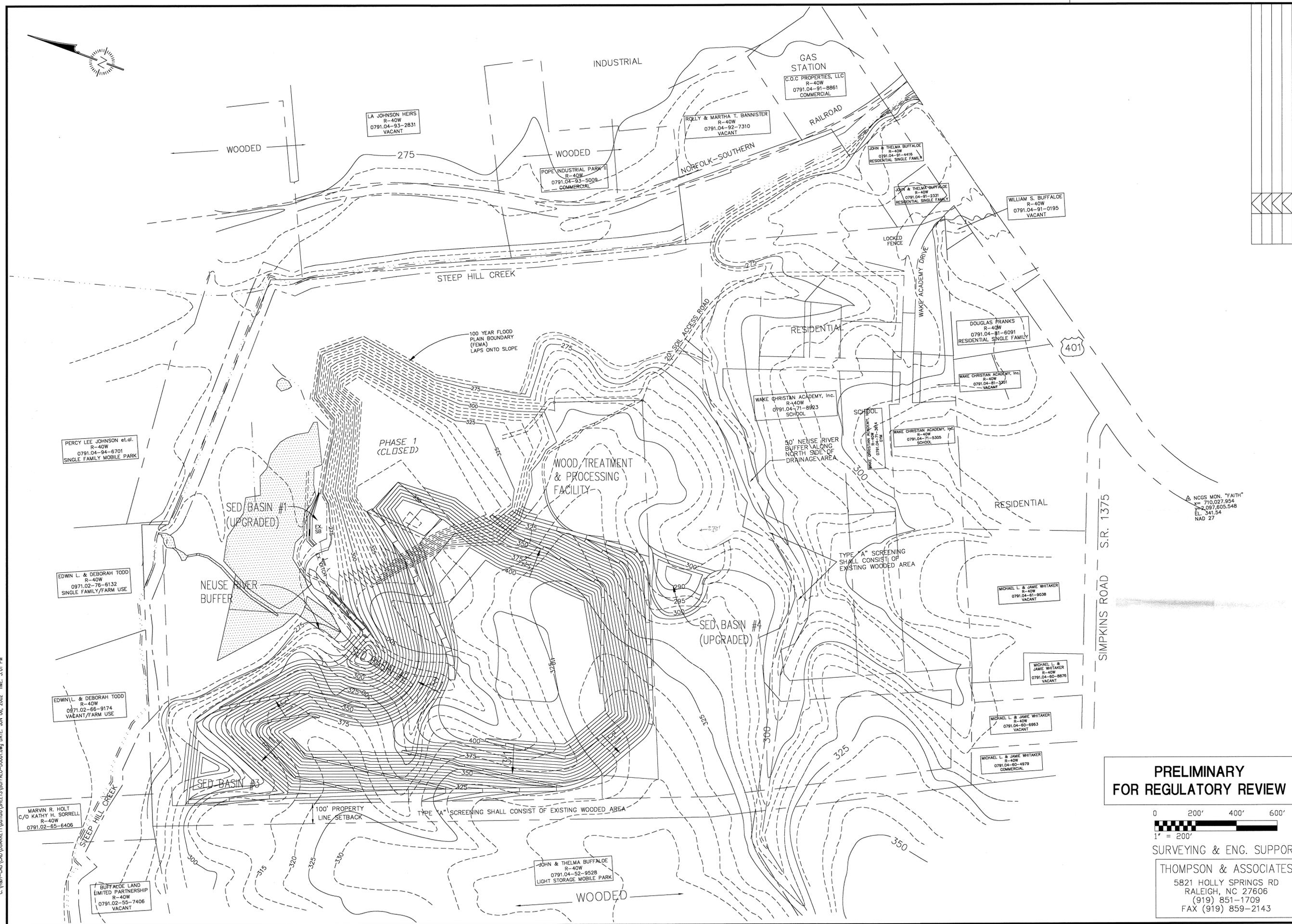
Telephone/Fax (919)231-1818

David Garrett, P.G., P.E.
Engineering and Geology
1408 Rock Drive, Raleigh, North Carolina

PROJECT TITLE:
**BUFFALO L.C.I.D. LANDFILL
GARNER, NORTH CAROLINA**

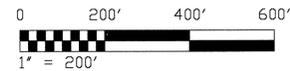
EXISTING CONDITIONS

DESIGNED BY: G.D.G.	DRAWN BY: A.W.H.
CHECKED BY: C.D.G.	PROJECT NO.: BUFFALO-1
SCALE: 1" = 200'	DATE: APRIL 2002
FILE NAME: BUFFALO-D0006	DRAWING NO.:
SHEET NO. 3	S2



C:\V\81-CAD\CAD\GARRETT\buffaloe\BUFFALO-D0001.dwg DATE: JUN 06, 2002 TIME: 3:01 PM

PRELIMINARY FOR REGULATORY REVIEW



SURVEYING & ENG. SUPPORT:

THOMPSON & ASSOCIATES
5821 HOLLY SPRINGS RD
RALEIGH, NC 27606
(919) 851-1709
FAX (919) 859-2143

NO.	DATE	REVISION

David Garrett, P.G., P.E.
Engineering and Geology
1408 Rock Drive, Raleigh, North Carolina
Telephone/Fax (919) 231-1818

PROJECT TITLE:
BUFFALO L.C.I.D. LANDFILL
GARNER, NORTH CAROLINA

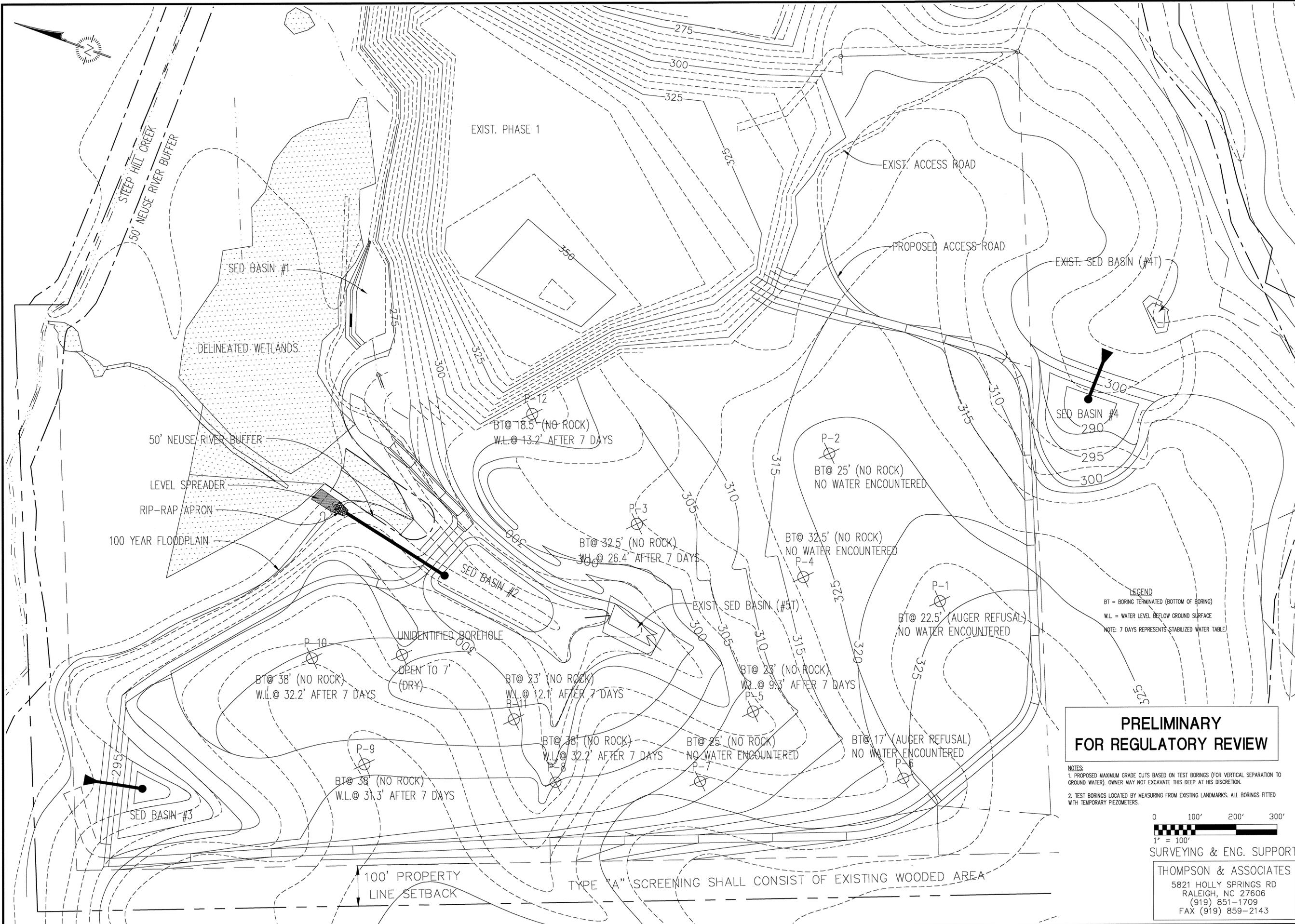
DRAWING TITLE:
CONCEPTUAL FACILITY PLAN
FINAL WASTE CONTOURS

DESIGNED BY: G.D.G.	DRAWN BY: A.W.H.
CHECKED BY: G.D.G.	PROJECT NO.: BUFFALO-1
SCALE: 1" = 200'	DATE: APRIL 2002
FILE NAME: BUFFALO-D0001	SHEET NO.:
SHEET NO. 4	DRAWING NO. S3

Professional Engineer Seal: NORTH CAROLINA PROFESSIONAL SEAL 25467 ENGINEER DAVID GARRETT

NGCS MON. "FAITH"
N= 710,027.954
E= 2,007,605.548
EL. 341.54
NAD 27

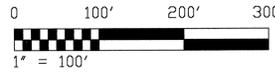
C:\VME-CAD\GARRETT\info\sheets\BUFFALO-0002.dwg DATE: JUN 05, 2002 TIME: 9:58 PM



**PRELIMINARY
FOR REGULATORY REVIEW**

NOTES:
 1. PROPOSED MAXIMUM GRADE CUTS BASED ON TEST BORINGS (FOR VERTICAL SEPARATION TO GROUND WATER). OWNER MAY NOT EXCAVATE THIS DEEP AT HIS DISCRETION.
 2. TEST BORINGS LOCATED BY MEASURING FROM EXISTING LANDMARKS. ALL BORINGS FITTED WITH TEMPORARY PIEZOMETERS.

LEGEND
 BT = BORING TERMINATED (BOTTOM OF BORING)
 W.L. = WATER LEVEL BELOW GROUND SURFACE
 NOTE: 7 DAYS REPRESENTS STABILIZED WATER TABLE.



SURVEYING & ENG. SUPPORT:

THOMPSON & ASSOCIATES
 5821 HOLLY SPRINGS RD
 RALEIGH, NC 27606
 (919) 851-1709
 FAX (919) 859-2143

David Garrett, P.G., P.E.
 Engineering and Geology
 1408 Rock Drive, Raleigh, North Carolina
 Telephone/Fax (919) 231-1818

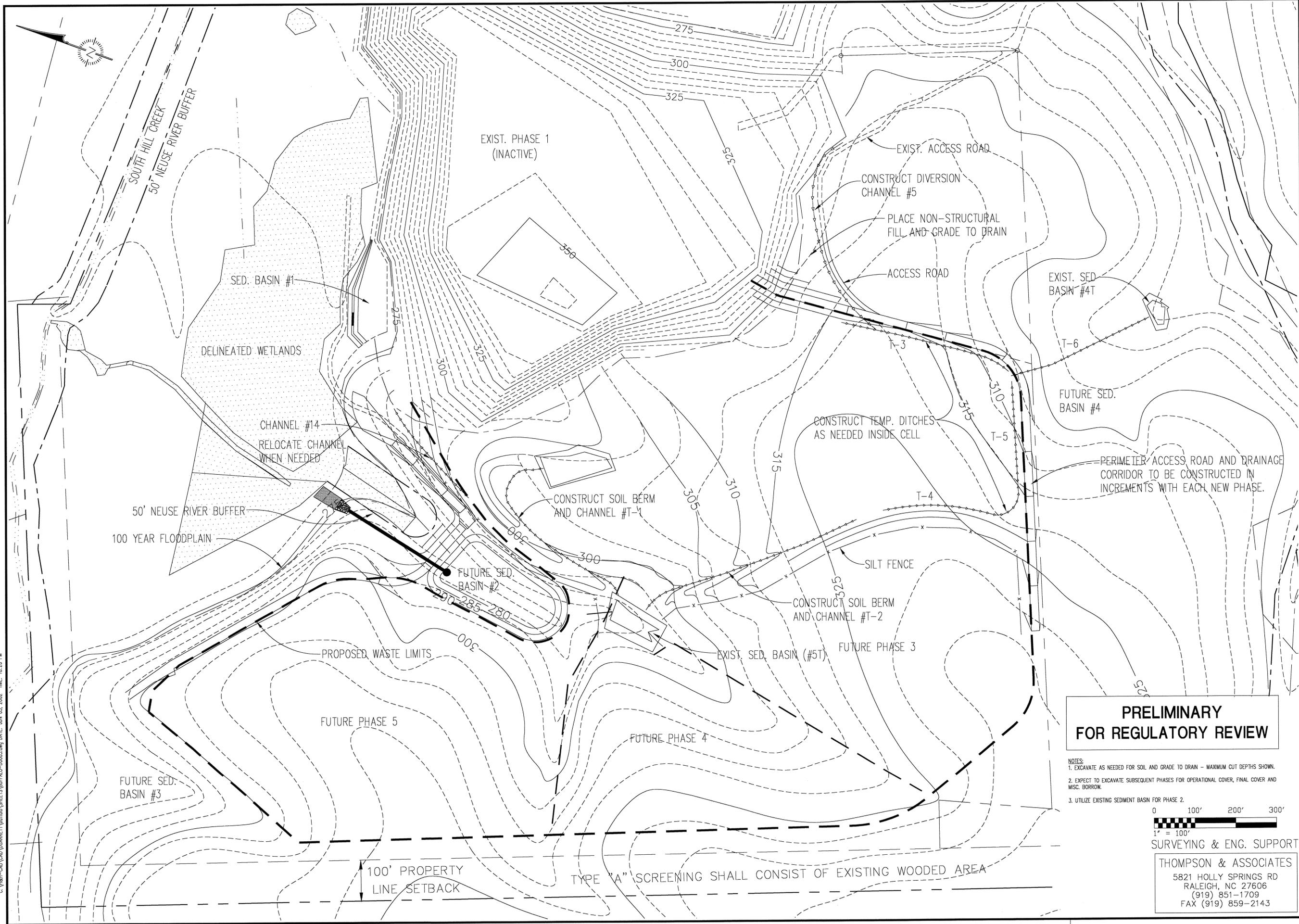
SEAL 25467
 STATE OF NORTH CAROLINA
 PROFESSIONAL ENGINEER
 CIVIL ENGINEERING

PROJECT TITLE:
 BUFFALO L.C.I.D. LANDFILL
 GARNER, NORTH CAROLINA

**CONCEPTUAL GRADING PLAN
 W/ TEST BORINGS &
 GROUNDWATER DATA**

DESIGNED BY: G.D.G.	DRAWN BY: A.W.H.
CHECKED BY: G.D.G.	PROJECT NO.: BUFFALO-1
SCALE: 1" = 100'	DATE: APRIL 2002
FILE NAME: BUFFALO-D0002	SHEET NO. DRAWING NO.
5	S4

C:\MSH-CAD\CAD\GARRETT\Buffalo\SHEETS\BUFFALO-D0003.dwg DATE: JUN 05, 2002 TIME: 10:28 PM



**PRELIMINARY
FOR REGULATORY REVIEW**

- NOTES:
1. EXCAVATE AS NEEDED FOR SOIL AND GRADE TO DRAIN - MAXIMUM CUT DEPTHS SHOWN.
 2. EXPECT TO EXCAVATE SUBSEQUENT PHASES FOR OPERATIONAL COVER, FINAL COVER AND MISC. BORROW.
 3. UTILIZE EXISTING SEDIMENT BASIN FOR PHASE 2.



SURVEYING & ENG. SUPPORT:
THOMPSON & ASSOCIATES
 5821 HOLLY SPRINGS RD
 RALEIGH, NC 27606
 (919) 851-1709
 FAX (919) 859-2143

PROJECT TITLE: **PHASE 2 GRADING & EROSION CONTROL**

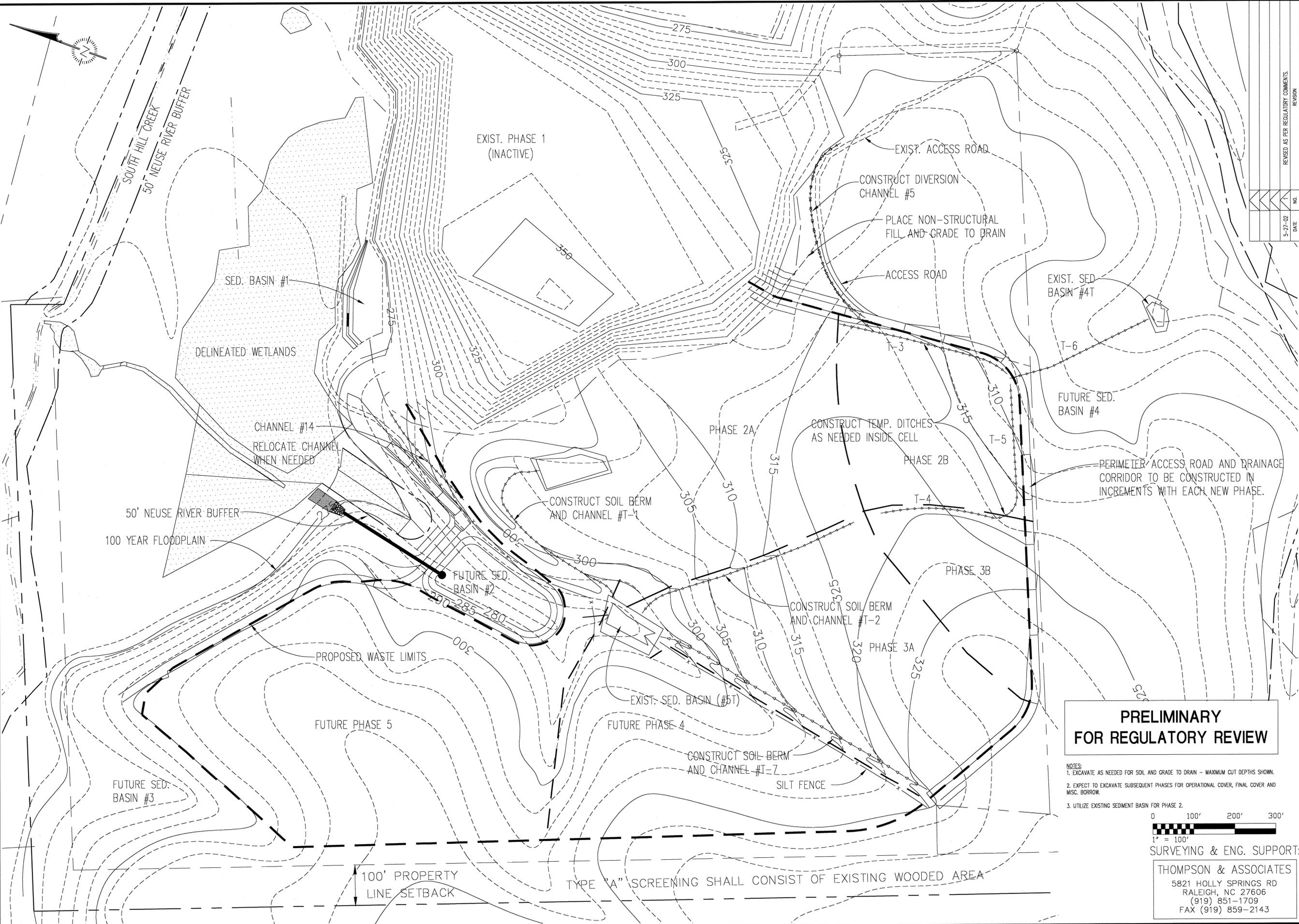
PROJECT: **BUFFALO L.C.I.D. LANDFILL GARNER, NORTH CAROLINA**

DESIGNED BY: G.D.G. DRAWN BY: A.W.H.
 CHECKED BY: G.D.G. PROJECT NO.: BUFFALO-1
 SCALE: 1" = 100' DATE: APRIL 2002
 FILE NAME: BUFFALO-D0003
 SHEET NO. 6 DRAWING NO. G5

Professional Engineer Seal: **DAVID GARRETT**, P.E., No. 25487, State of North Carolina.

David Garrett, P.G., P.E.
 Engineering and Geology
 1408 Rock Drive, Raleigh, North Carolina
 Telephone/Fax: (919) 231-1818

C:\V\44-CAD\GDG\GARRETT\Buffalo\00020.dwg DATE: JUN 05, 2002 TIME: 10:46 PM



NO.	DATE	REVISION
1	5-27-02	REVISED AS PER REGULATORY COMMENTS

David Garrett, P.G., P.E.
 Engineering and Geology
 1408 Rock Drive, Raleigh, North Carolina
 Telephone/Fax: (919) 231-1816



PROJECT TITLE:
 PHASES 2 & 3 BASE GRADING & EROSION CONTROL
 BUFFALO L.C.I.D. LANDFILL
 GARNER, NORTH CAROLINA

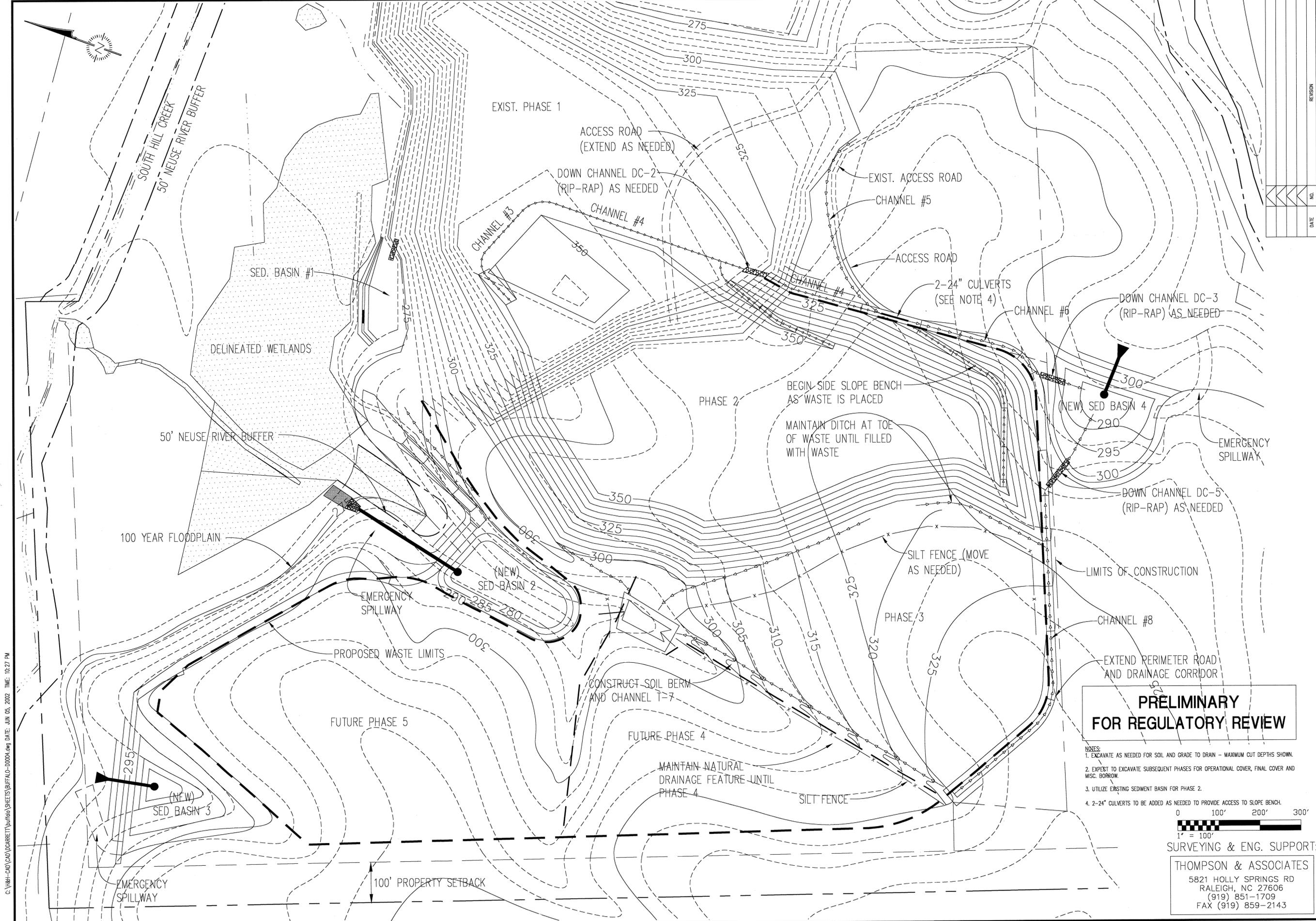
**PRELIMINARY
 FOR REGULATORY REVIEW**

- NOTES:
 1. EXCAVATE AS NEEDED FOR SOIL AND GRADE TO DRAIN - MAXIMUM CUT DEPTHS SHOWN.
 2. EXPECT TO EXCAVATE SUBSEQUENT PHASES FOR OPERATIONAL COVER, FINAL COVER AND MISC. BORROW.
 3. UTILIZE EXISTING SEDIMENT BASIN FOR PHASE 2.



SURVEYING & ENG. SUPPORT:
 THOMPSON & ASSOCIATES
 5821 HOLLY SPRINGS RD
 RALEIGH, NC 27606
 (919) 851-1709
 FAX (919) 859-2143

DESIGNED BY: G.D.G.	DRAWN BY: A.W.H.
CHECKED BY: G.D.G.	PROJECT NO.: BUFFALO-1
SCALE: 1" = 100'	DATE: MAY 2002
FILE NAME: BUFFALO-D0003	SHEET NO.: 6A
DRAWING NO.:	G5A

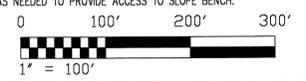


C:\V8R1-CAD\CAD\GARRETT\Buffalo\Sheets\BUFFALO-D0004.dwg DATE: JUN 05, 2002 TIME: 10:27 PM



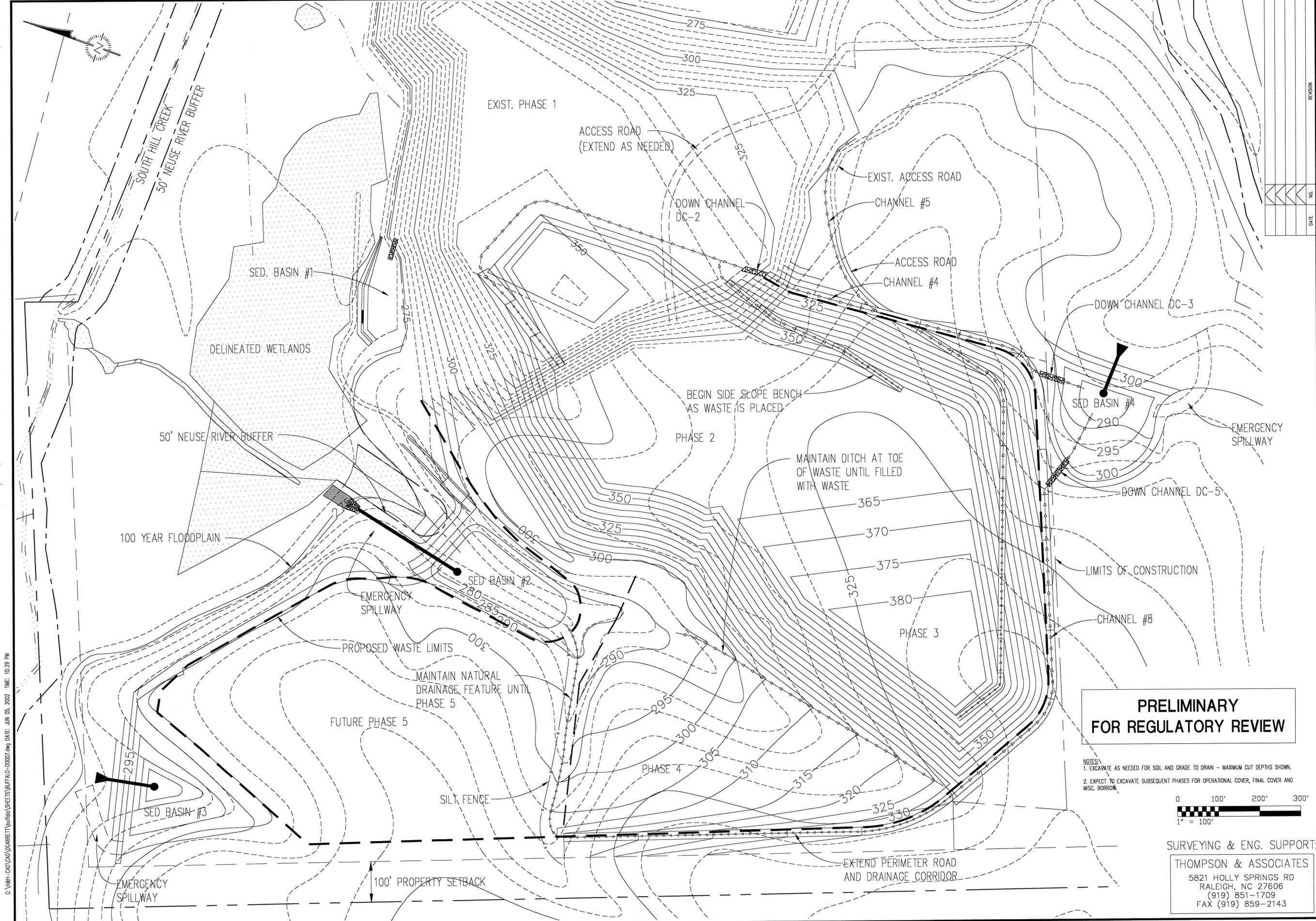
**PRELIMINARY
FOR REGULATORY REVIEW**

- NOTES:
1. EXCAVATE AS NEEDED FOR SOIL AND GRADE TO DRAIN - MAXIMUM CUT DEPTHS SHOWN.
 2. EXPECT TO EXCAVATE SUBSEQUENT PHASES FOR OPERATIONAL COVER, FINAL COVER AND MISC. BORROW.
 3. UTILIZE EXISTING SEDIMENT BASIN FOR PHASE 2.
 4. 2-24" CULVERTS TO BE ADDED AS NEEDED TO PROVIDE ACCESS TO SLOPE BENCH.



SURVEYING & ENG. SUPPORT:
THOMPSON & ASSOCIATES
5821 HOLLY SPRINGS RD
RALEIGH, NC 27606
(919) 851-1709
FAX (919) 859-2143

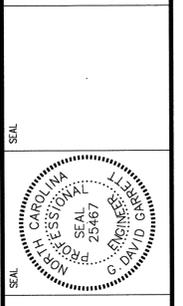
REVISION			David Garrett, P.E. Engineering and Geology 1408 Rock Drive, Raleigh, North Carolina Telephone/Fax: (919) 231-1818
DATE	NO.		
PROJECT TITLE:			PHASE 2 FINAL WASTE CONTOURS & EROSION CONTROL
DRAWING TITLE:			BUFFALO L.C.I.D. LANDFILL GARNER, NORTH CAROLINA
DESIGNED BY:	DRAWN BY:		
G.D.G.	A.W.H.		
CHECKED BY:	PROJECT NO.:		
G.D.G.	BUFFALO-1		
SCALE:	DATE:		
1" = 100'	APRIL 2002		
FILE NAME:	SHEET NO.:	DRAWING NO.:	
BUFFALO-D0004	7	G6	



C:\188H-CAD\CAD\GARRETT\Buffalo\Sheets\BUFFALO-D0007.dwg DATE: JUN 05, 2002 TIME: 10:29 PM

NO.	DATE	REVISION

David Garrett, P.G., P.E.
 Engineering and Geology
 1408 Rock Drive, Raleigh, North Carolina
 Telephone/Fax: (919) 231-1818



PROJECT TITLE:
**BUFFALO L.C.I.D. LANDFILL
 GARNER, NORTH CAROLINA**

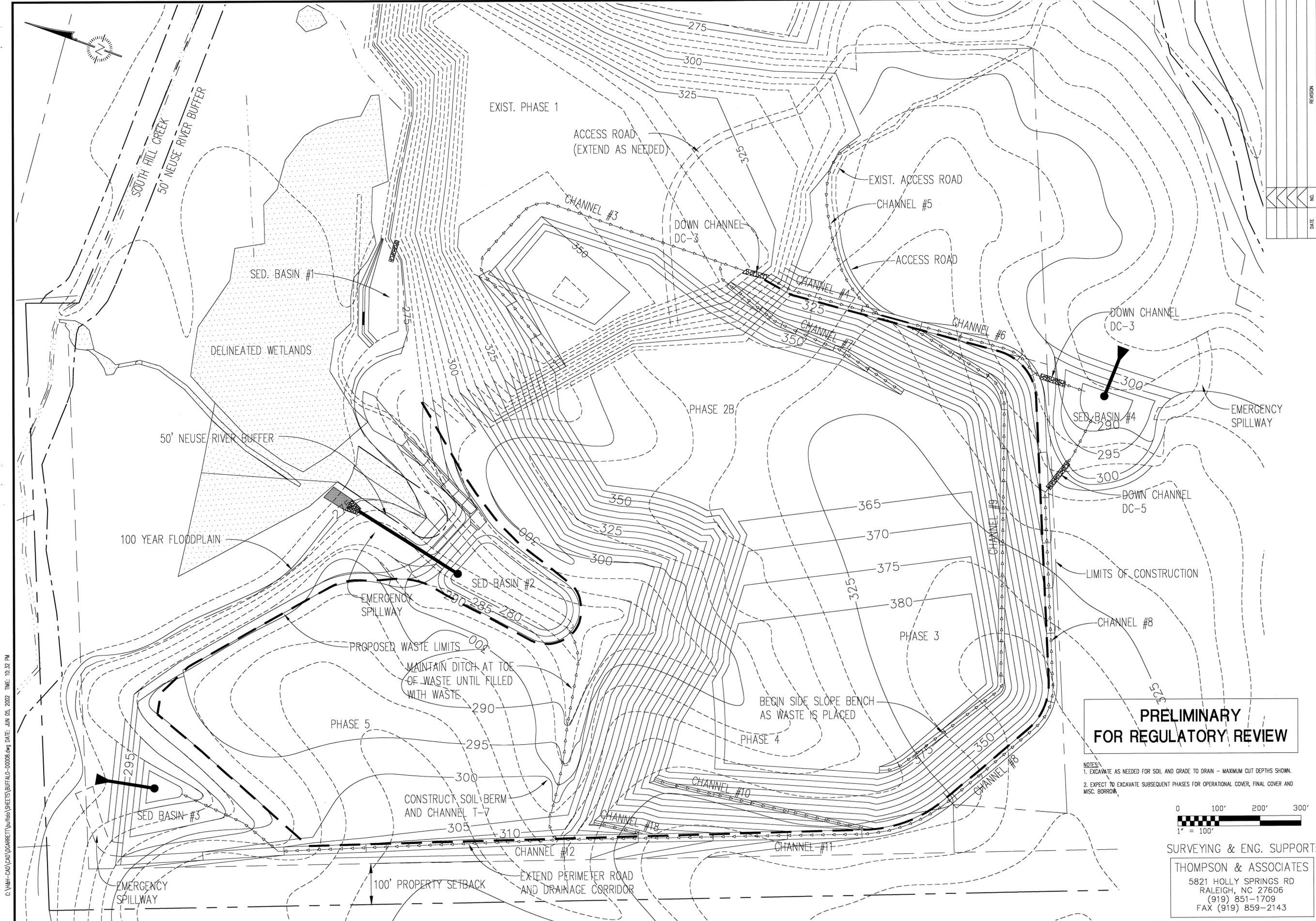
DRAWING TITLE:
**PHASE 3 FINAL WASTE
 CONTOURS &
 EROSION CONTROL**

**PRELIMINARY
 FOR REGULATORY REVIEW**



SURVEYING & ENG. SUPPORT:
THOMPSON & ASSOCIATES
 5821 HOLLY SPRINGS RD
 RALEIGH, NC 27606
 (919) 851-1709
 FAX (919) 859-2143

DESIGNED BY: G.D.G.	DRAWN BY: A.W.H.
CHECKED BY: G.D.G.	PROJECT NO.: BUFFALO-1
SCALE: 1" = 100'	DATE: APRIL 2002
FILE NAME: BUFFALO-D0007	DRAWING NO.:
SHEET NO.:	8
	G7



C:\Vahh-CAD\CAD\GARRETT\Buffalo\BUFFALO-D0008.dwg DATE: JUN 05, 2002 TIME: 10:32 PM

**PRELIMINARY
FOR REGULATORY REVIEW**

NOTES:
 1. EXCAVATE AS NEEDED FOR SOIL AND GRADE TO DRAIN - MAXIMUM CUT DEPTHS SHOWN.
 2. EXPECT TO EXCAVATE SUBSEQUENT PHASES FOR OPERATIONAL COVER, FINAL COVER AND MISC. BORROW.

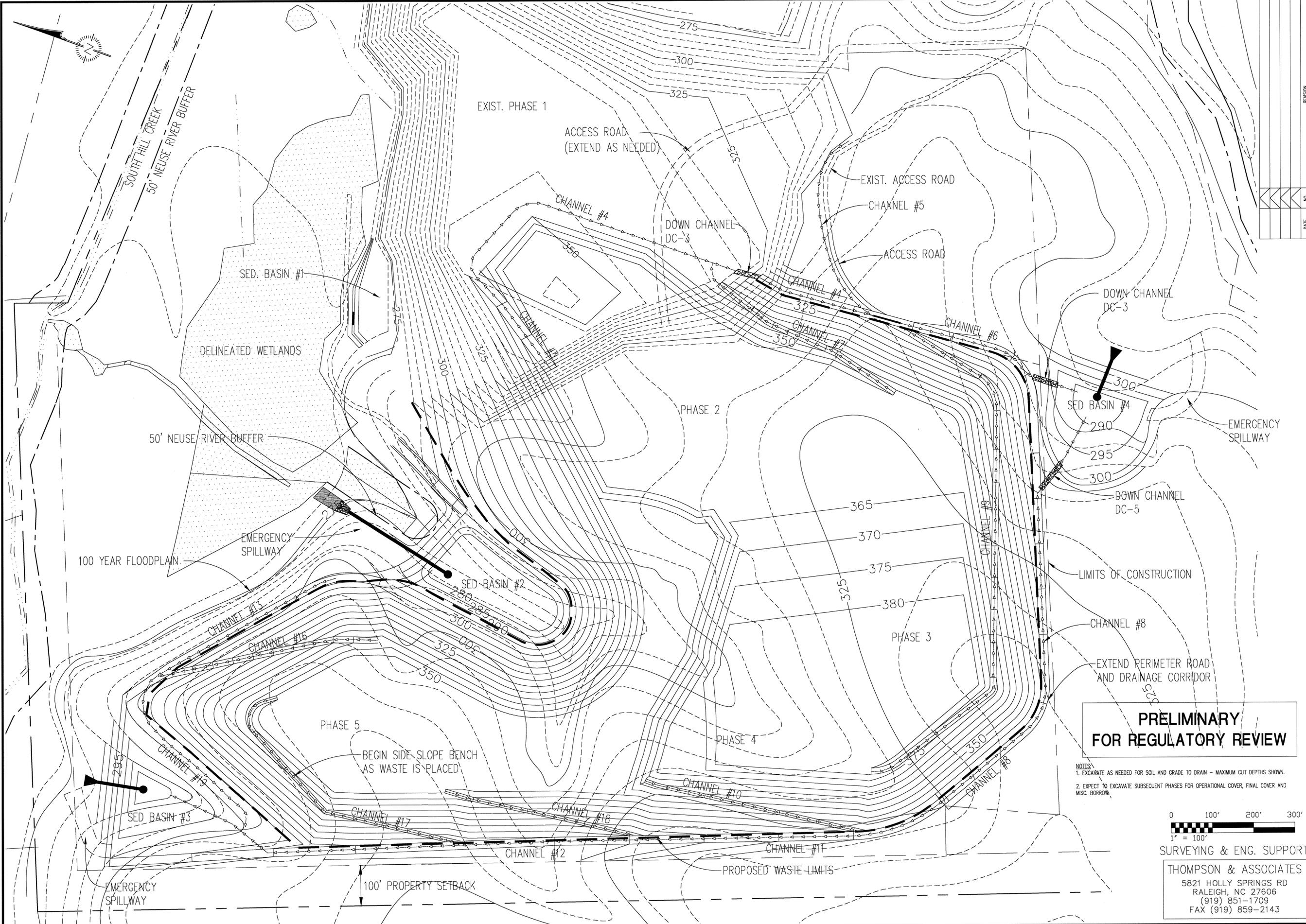


SURVEYING & ENG. SUPPORT:
THOMPSON & ASSOCIATES
 5821 HOLLY SPRINGS RD
 RALEIGH, NC 27606
 (919) 851-1709
 FAX (919) 859-2143

NO.	DATE	REVISION

	<p>David Garrett, P.E., P.E. Engineering and Geology 1408 Rock Drive, Raleigh, North Carolina Telephone/Fax (919) 231-1818</p>
<p>PROJECT TITLE: PHASE 4 FINAL WASTE CONTOURS & EROSION CONTROL</p>	<p>PROJECT TITLE: BUFFALO L.C.I.D. LANDFILL GARNER, NORTH CAROLINA</p>

C:\NORTH-CAD\CAD\GARRETT\buffalo\BUFFALO-D0009.dwg DATE: JUN 05, 2002 TIME: 10:34 PM



**PRELIMINARY
FOR REGULATORY REVIEW**

NOTES:
1. EXCAVATE AS NEEDED FOR SOIL AND GRADE TO DRAIN - MAXIMUM CUT DEPTHS SHOWN.
2. EXPECT TO EXCAVATE SUBSEQUENT PHASES FOR OPERATIONAL COVER, FINAL COVER AND MISC. BORROW.



SURVEYING & ENG. SUPPORT:

THOMPSON & ASSOCIATES
5821 HOLLY SPRINGS RD
RALEIGH, NC 27606
(919) 851-1709
FAX (919) 859-2143

NO.	DATE	REVISION

David Garrett, P.G., P.E.
Engineering and Geology
1408 Rock Drive, Raleigh, North Carolina
Telephone/Fax (919)231-1818

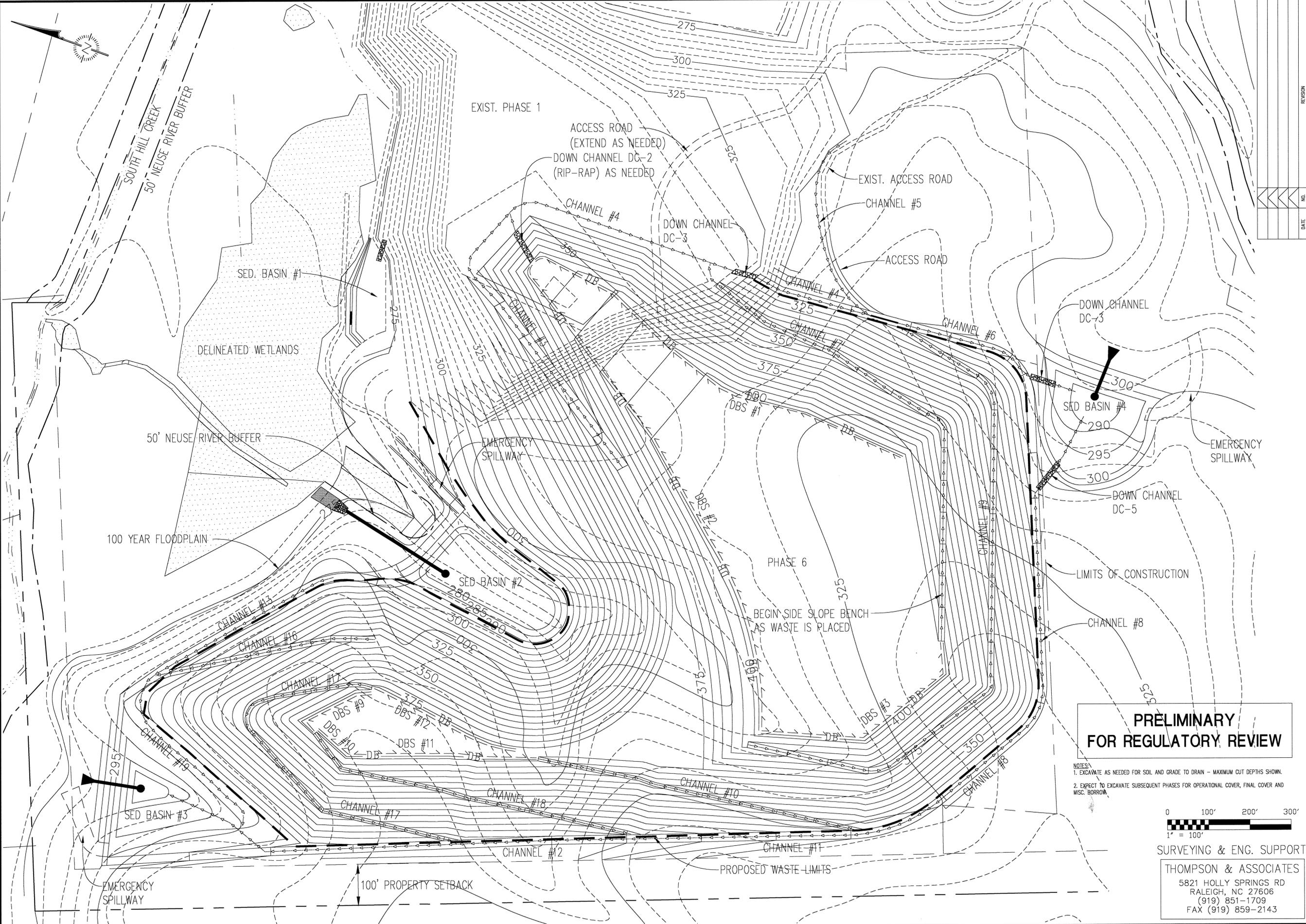


PROJECT TITLE:
**BUFFALO L.C.I.D. LANDFILL
GARNER, NORTH CAROLINA**

DRAWING TITLE:
**PHASE 5 FINAL WASTE
CONTOURS &
EROSION CONTROL**

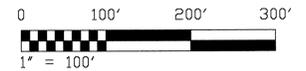
DESIGNED BY: G.D.G.	DRAWN BY: A.W.H.
CHECKED BY: G.D.G.	PROJECT NO.: BUFFALO-1
SCALE: 1" = 100'	DATE: APRIL 2002
FILE NAME: BUFFALO-D0009	SHEET NO.: 10
DRAWING NO.:	G9

C:\N&H-CAD\CAD\GARRETT\Buffalo\Sheets\BUFFALO-D0010.dwg DATE: JUN 05, 2002 TIME: 10:37 PM



**PRELIMINARY
FOR REGULATORY REVIEW**

NOTES:
1. EXCAVATE AS NEEDED FOR SOIL AND GRADE TO DRAIN - MAXIMUM CUT DEPTHS SHOWN.
2. EXPECT TO EXCAVATE SUBSEQUENT PHASES FOR OPERATIONAL COVER, FINAL COVER AND MISC. BORROW.



SURVEYING & ENG. SUPPORT:
THOMPSON & ASSOCIATES
5821 HOLLY SPRINGS RD
RALEIGH, NC 27606
(919) 851-1709
FAX (919) 859-2143

NO.	DATE	REVISION

David Garrett, P.G., P.E.
Engineering and Geology
1408 Rock Drive, Raleigh, North Carolina
Telephone/Fax (919)231-1818

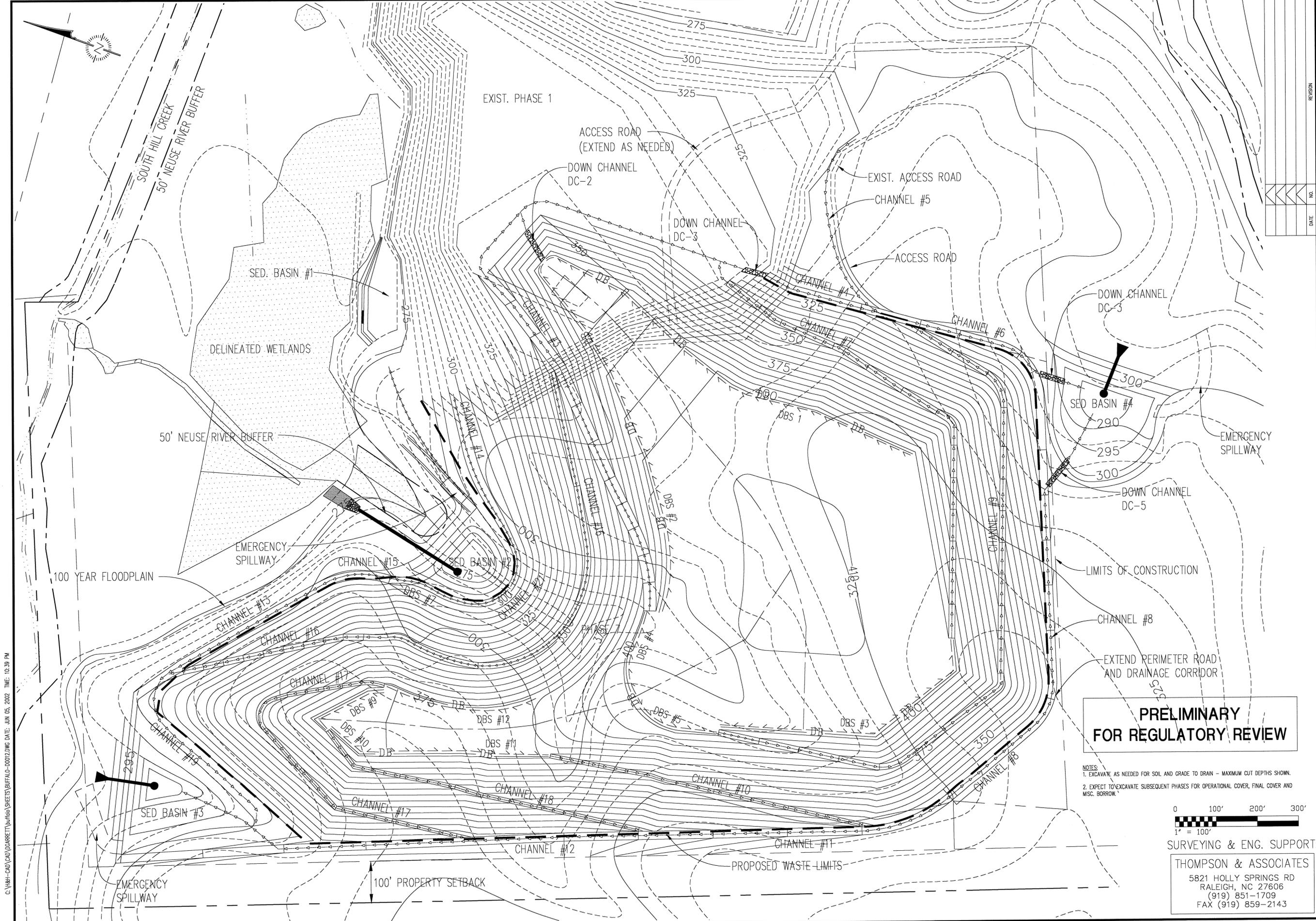
PHASE 6 FINAL WASTE
CONTOURS &
EROSION CONTROL

PROJECT TITLE:
BUFFALO L.C.I.D. LANDFILL
GARNER, NORTH CAROLINA

DRAWING TITLE:
PHASE 6 FINAL WASTE
CONTOURS &
EROSION CONTROL

DESIGNED BY: G.D.G.	DRAWN BY: A.W.H.
CHECKED BY: G.D.G.	PROJECT NO.: BUFFALO-1
SCALE: 1" = 100'	DATE: APRIL 2002
FILE NAME: BUFFALO-D0010	SHEET NO.:
SHEET NO.:	DRAWING NO.:

11 G10



C:\VIRT-CAD\CAD\CARETT\Buffalo\0012.DWG DATE: JUN 05, 2002 TIME: 10:39 PM

NO.	DATE	REVISION

David Garrett, P.G., P.E.
 Engineering and Geology
 1408 Rock Drive, Raleigh, North Carolina
 Telephone/Fax: (919) 231-1818



PROJECT TITLE:
 BUFFALO L.C.I.D. LANDFILL
 GARNER, NORTH CAROLINA

PHASE 7 FINAL WASTE
 CONTOURS &
 EROSION CONTROL

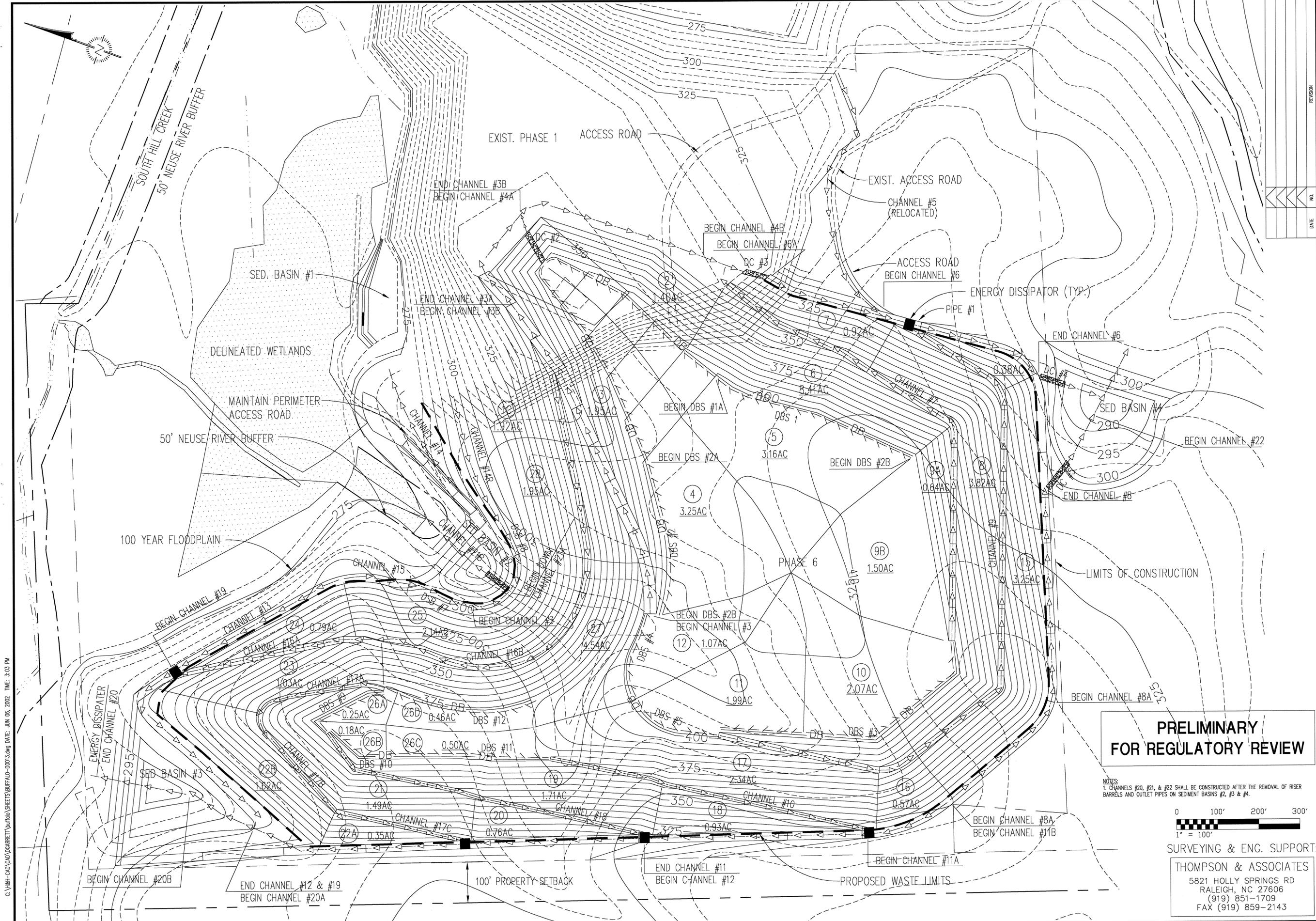
**PRELIMINARY
 FOR REGULATORY REVIEW**

- NOTES:
 1. EXCAVATE AS NEEDED FOR SOIL AND GRADE TO DRAIN - MAXIMUM CUT DEPTHS SHOWN.
 2. EXPECT TO EXCAVATE SUBSEQUENT PHASES FOR OPERATIONAL COVER, FINAL COVER AND MISC. BORROW.



SURVEYING & ENG. SUPPORT:
THOMPSON & ASSOCIATES
 5821 HOLLY SPRINGS RD
 RALEIGH, NC 27606
 (919) 851-1709
 FAX (919) 859-2143

DESIGNED BY: G.D.C.	DRAWN BY: A.W.H.
CHECKED BY: G.D.C.	PROJECT NO.: BUFFALO-1
SCALE: 1" = 100'	DATE: APRIL 2002
FILE NAME: BUFFALO-D0012	SHEET NO.: DRAWING NO.
12	G11



C:\VIRT-CAD\CAD\GARRETT\Buffalo-0001.dwg DATE: JUN 06, 2002 TIME: 3:03 PM

**PRELIMINARY
FOR REGULATORY REVIEW**

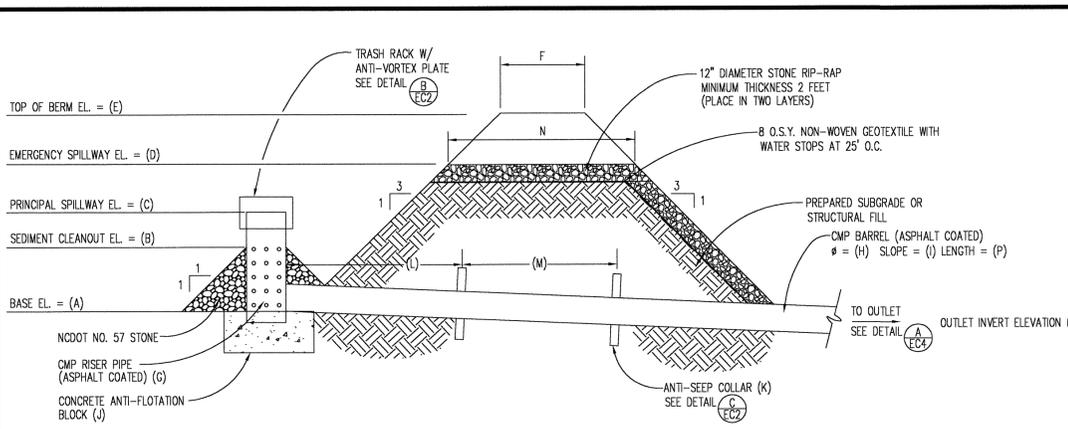
NOTES:
1. CHANNELS #20, #21, & #22 SHALL BE CONSTRUCTED AFTER THE REMOVAL OF RISER BARRELS AND OUTLET PIPES ON SEDIMENT BASINS #2, #3 & #4.



SURVEYING & ENG. SUPPORT:

THOMPSON & ASSOCIATES
5821 HOLLY SPRINGS RD
RALEIGH, NC 27606
(919) 851-1709
FAX (919) 859-2143

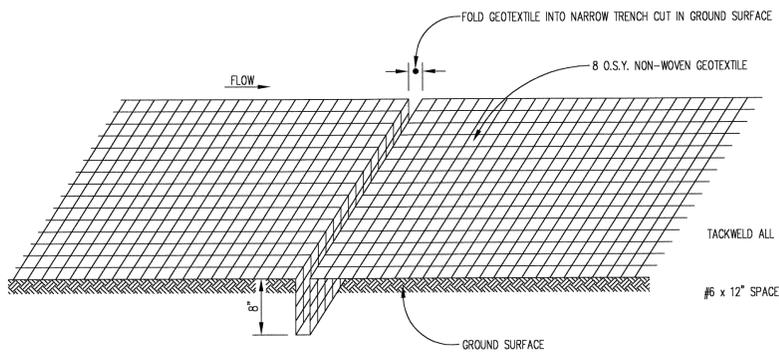
<p>DATE: _____</p> <p>NO. _____</p> <p>REVISION _____</p>	<p>Telephone/Fax (919)21-1818</p> <p>David Garrett, P.G., P.E. Engineering and Geology 1408 Rock Drive, Raleigh, North Carolina</p>
<p>FINAL CONTOURS & EROSION CONTROL PLAN</p>	
<p>BUFFALO L.C.I.D. LANDFILL GARNER, NORTH CAROLINA</p>	
<p>PROJECT TITLE:</p>	
<p>DRAWING TITLE:</p>	
<p>DESIGNED BY: G.D.G.</p> <p>CHECKED BY: G.D.G.</p> <p>SCALE: 1" = 100'</p> <p>FILE NAME: BUFFALO-00013</p> <p>SHEET NO. 13</p>	<p>DRAWN BY: A.W.H.</p> <p>PROJECT NO.: BUFFALO-1</p> <p>DATE: APRIL, 2002</p> <p>DRAWING NO. EC1</p>



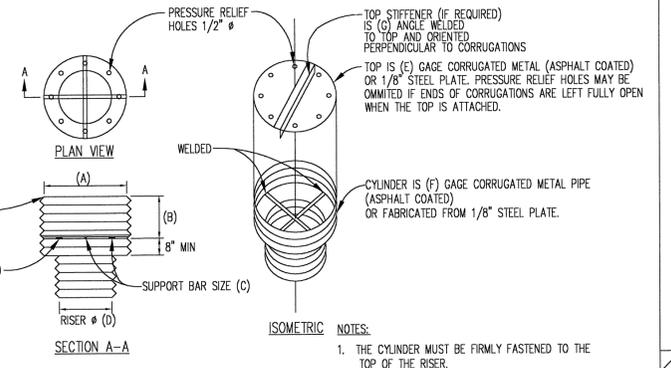
BASIN #	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
2	280.00	284.00	289.02	291.00	292.00	10'	36"	18"	0.8%	4.7' x 4.7' x 2.0' THICK	3.5' x 3.5'	2.2'	15.4'	37'	277.72	285'
3	280.00	284.00	291.02	298.00	299.00	10'	36"	18"	0.8%	5.0' x 5.0' x 2.0' THICK	6.5' x 6.5'	4.4'	30.8'	37'	279.00	125'
4	290.00	294.00	299.02	301.00	302.00	10'	36"	18"	0.8%	4.7' x 4.7' x 2.0' THICK	6.5' x 6.5'	4.4'	30.8'	31'	289.00	125'

NOTES:
1. RISER PERFORATIONS CONSIST OF 24-1/2" DIAMETER HOLES AT 2' O.C. HORIZONTAL IN A CIRCULAR PATTERN, SPACED AT 3' O.C. VERTICAL, BEGINNING 3" FROM THE BOTTOM AND ENDING JUST BELOW THE TOP

TYPICAL SEDIMENT BASIN CROSS-SECTION
DETAIL A
N.T.S. EC2

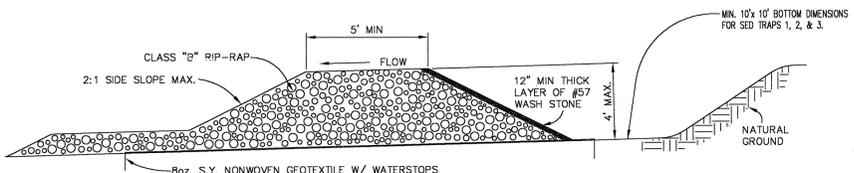


WATER STOP DETAIL
DETAIL G
N.T.S. EC2

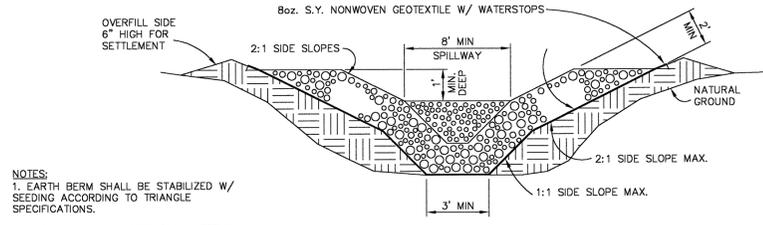


BASIN #	A	B	C	D	E	F	G
2	54"	24"	3" PIPE OR 3" x 3" x 1/4" ANGLE	36"	14	16	3"
3	54"	24"	3" PIPE OR 3" x 3" x 1/4" ANGLE	36"	14	16	3"
4	54"	24"	3" PIPE OR 3" x 3" x 1/4" ANGLE	36"	14	16	3"

NOTES:
1. THE CYLINDER MUST BE FIRMLY FASTENED TO THE TOP OF THE RISER.
2. SUPPORT BARS ARE WELDED TO THE TOP OF THE RISER OR ATTACHED BY STRAPS BOLTED TO THE TOP OF THE RISER.

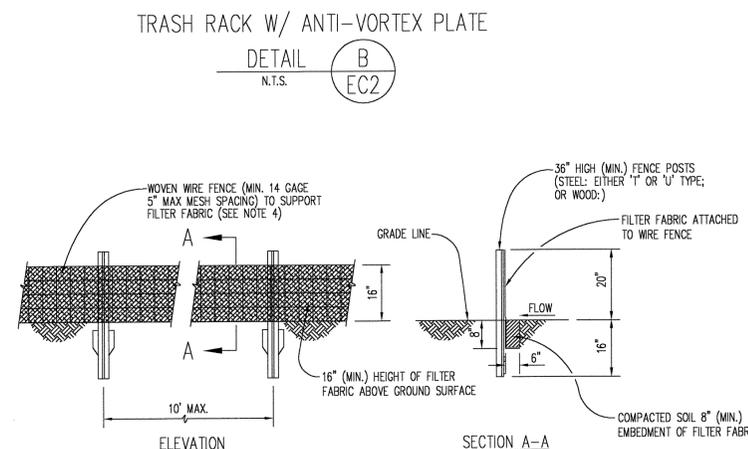


CROSS SECTION

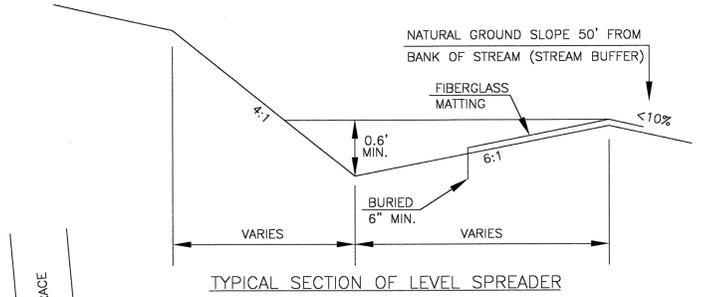


NOTES:
1. EARTH BERM SHALL BE STABILIZED W/ SEEDING ACCORDING TO TRIANGLE SPECIFICATIONS.
2. USE CLEAN COMPACTED FILL MATERIAL FOR EARTH BERM.

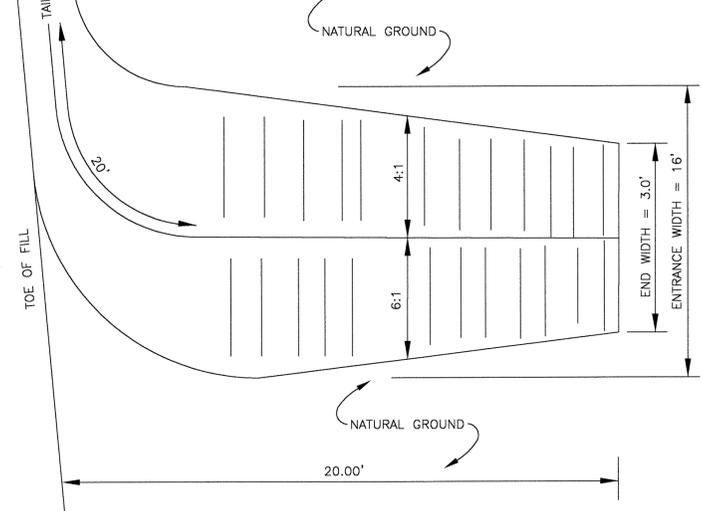
SEDIMENT TRAP AND ROCK CHECK DAM
DETAIL F
N.T.S. EC2



SILT FENCE
DETAIL E
N.T.S. EC2



TYPICAL SECTION OF LEVEL SPREADER



PLAN VIEW OF LEVEL SPREADER
W/ SLOPES < 10%

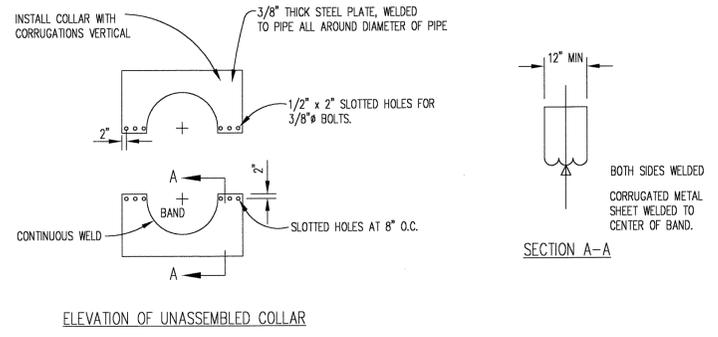
LEVEL SPREADER SCHEDULE					
PIPE	PEAK FLOW	ENTRANCE WIDTH, FT.	DEPTH	END WIDTH	LENGTH
SED. BASIN NO. 2	26 CFS	24'	0.7'	3'	30'
SED. BASIN NO. 3	34 CFS	24'	0.7'	3'	40'
SED. BASIN NO. 4	27 CFS	24'	0.7'	3'	30'

NOTES:
1. GRADE LEVEL SPREADER AT 0% ALONG THE DISCHARGE LIP. THE DISCHARGE MUST BE IN VIRGIN SOIL (NOT ON FILL). GRADE THE LAST 20' OF THE ENTRANCE CHANNEL TO TRANSITION SMOOTHLY TO THE LEVEL SPREADER. OUTLET PIPES OF SEDIMENT BASINS SHALL EMPTY INTO A CHANNEL WITH DIMENSIONS SHOWN BELOW.

TAIL RACE SCHEDULE					
PIPE	CHANNEL PROFILE	BOTTOM WIDTH, FT.	SIDE SLOPE	DEPTH FT.	TOP WIDTH FT.
SED. BASIN NO. 2	TRAPEZOIDAL	4'	3H:1V	1'	10'
SED. BASIN NO. 3	TRAPEZOIDAL	4'	3H:1V	1'	10'
SED. BASIN NO. 4	TRAPEZOIDAL	4'	3H:1V	1'	10'

NOTES:
1. LINE CHANNEL W/RIP-RAP (d50 = 12") UNDERLAIN BY GEOTEXTILE WITH WATER STOPS. MAKE RIP-RAP DEPTH 24" MINIMUM, PLACE IN TWO INTERLOCKING LAYERS. LINE LEVEL SPREADER BOTTOM W/RIP-RAP (d50 = 12") IN ONE LAYER.
2. PROTECT OVERFLOW OF LEVEL SPREADER WITH EXCELSIOR OR TRM AND VEGETATE.

LEVEL SPREADER
DETAIL H
N.T.S. EC2



ELEVATION OF UNASSEMBLED COLLAR

NOTES:
1. ALL MATERIAL TO BE IN ACCORDANCE WITH PROJECT SPECIFICATIONS.
2. ALL COLLARS ARE TO BE ASPHALT COATED.
3. UNASSEMBLED COLLARS SHALL BE MARKED BY PAINTING OR TAGGING TO IDENTIFY MATCHING PAIRS.
4. THE LAP BETWEEN THE TWO HALF SECTIONS AND BETWEEN THE PIPE AND CONNECTING BAND SHALL BE CAULKED WITH ASPHALT MASTIC AT TIME OF INSTALLATION.
5. EACH COLLAR SHALL BE FURNISHED WITH TWO 1/2" RODS WITH STANDARD TANK LUGS FOR CONNECTING COLLARS TO PIPE.

CORRUGATED METAL ANTI-SEEP COLLAR
DETAIL C
N.T.S. EC2

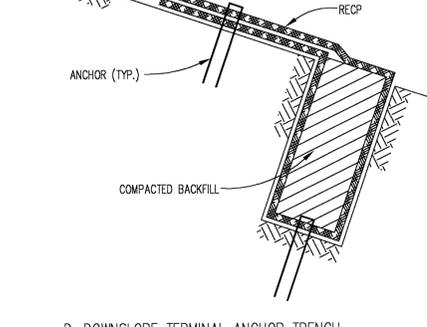
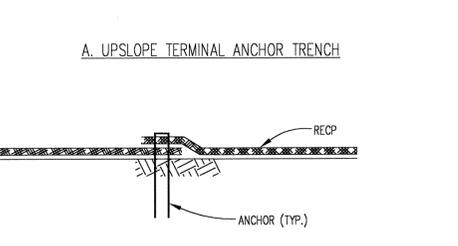
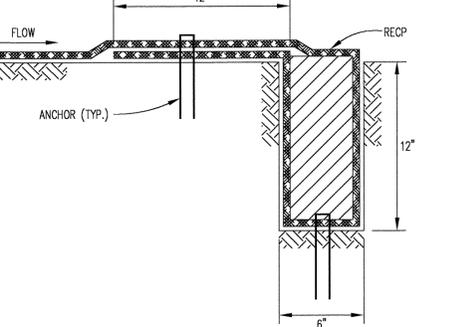
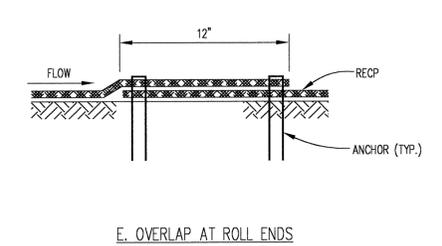
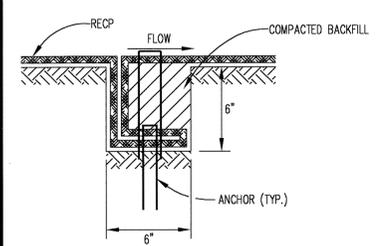
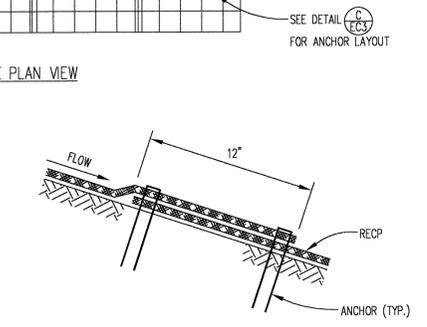
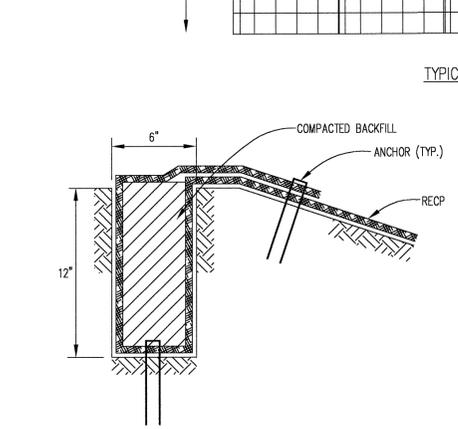
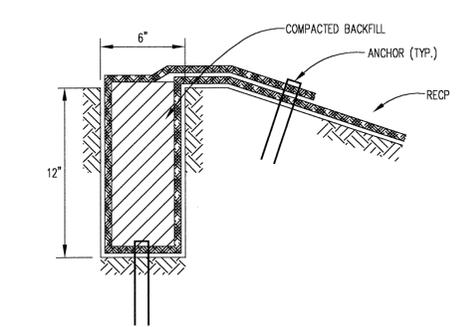
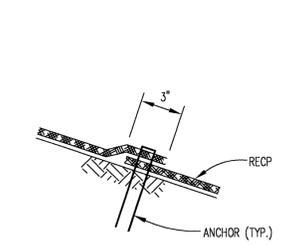
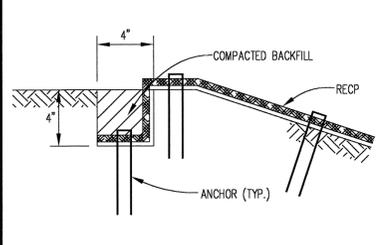
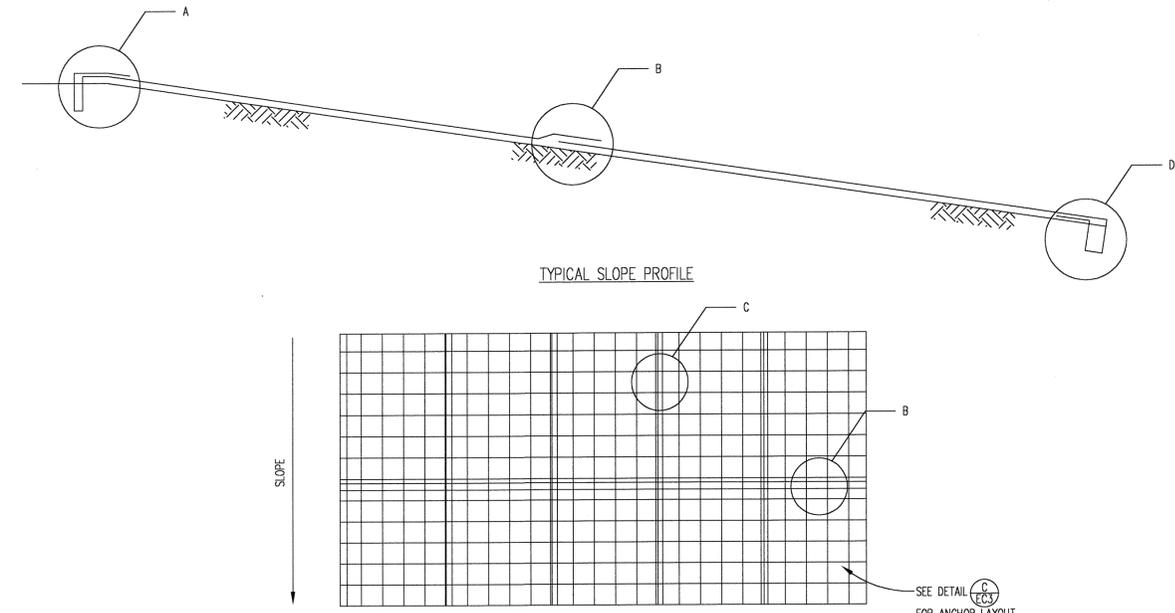
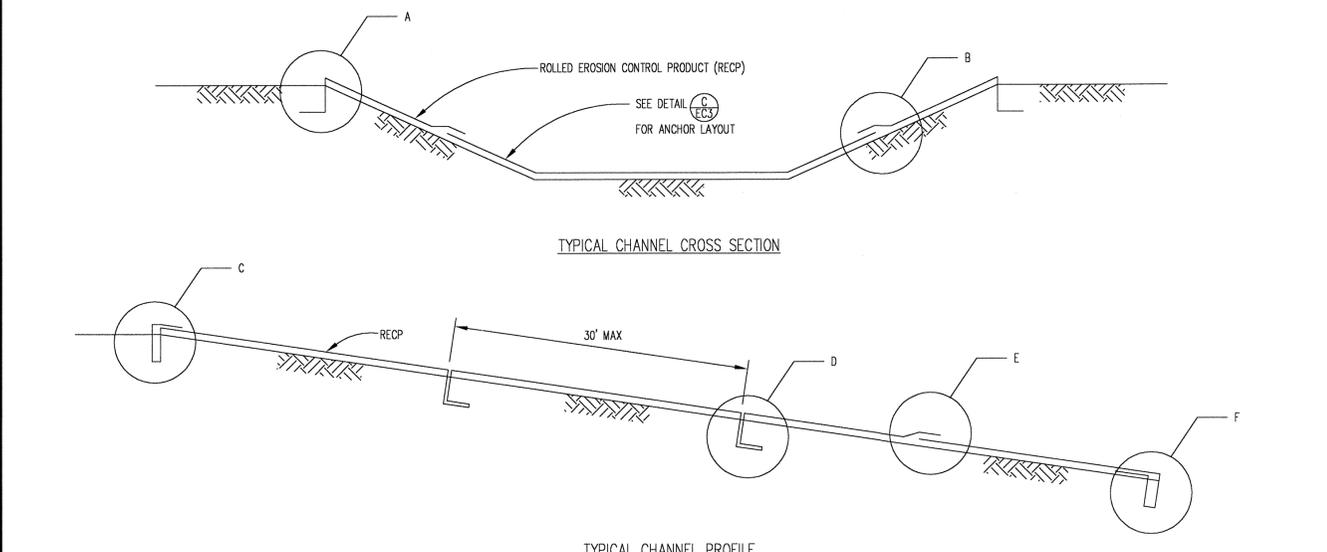
PRELIMINARY FOR REGULATORY REVIEW

C:\Vhfr-CAD\DOARRETT\Buffalo\Sheets\BUFFALO-00014.dwg DATE: JUN 05, 2002 TIME: 10:44 PM

PROJECT TITLE: **EROSION & SEDIMENTATION CONTROL DETAILS**
 PROJECT NO.: **BUFFALO-1**
 DRAWING NO.: **EC2**
 SHEET NO.: **14**
 DATE: **APRIL 2002**
 SCALE: **AS SHOWN**
 CHECKED BY: **G.D.C.**
 DESIGNED BY: **G.D.C.**
 DRAWN BY: **A.W.H.**
 PROJECT NO.: **BUFFALO-1**
 DATE: **APRIL 2002**
 FILE NAME: **BUFFALO-D0014**
 SHEET NO.: **14**
 DRAWING NO.: **EC2**

David Garrett, P.G., P.E.
Engineering and Geology
 1408 Rock Drive, Raleigh, North Carolina
 Telephone/Fax (919)231-1818

C:\Vidit-CAD\CAD\GARRETT\buffalo\BUFFALO-00015.dwg DATE: MAY 04, 2002 TIME: 6:15 PM

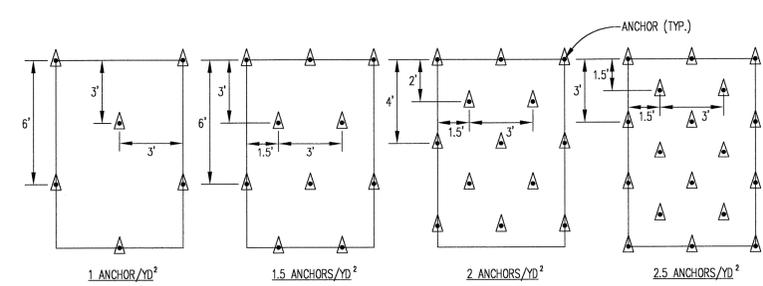


NOTES:
 1. PLACE ANCHORS AT ANCHOR TRENCHES, OVERLAPS, AND CHECK SLOTS ON 1 FOOT CENTERS. IF APPLICABLE, STAGGER ANCHOR SPACING BETWEEN MULTIPLE ROWS OF ANCHORS.

NOTES:
 1. PLACE ANCHORS AT ANCHOR TRENCHES, OVERLAPS, AND CHECK SLOTS ON 1 FOOT CENTERS. IF APPLICABLE, STAGGER ANCHOR SPACING BETWEEN MULTIPLE ROWS OF ANCHORS.

INSTALLATION OF ROLLED EROSION CONTROL PRODUCTS (CHANNELS)

DETAIL **A**
 N.T.S. EC3



ANCHOR LAYOUT
 DETAIL **C**
 N.T.S. EC3

INSTALLATION OF ROLLED EROSION CONTROL PRODUCTS (SLOPES)

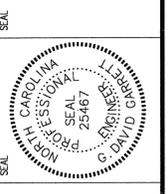
DETAIL **B**
 N.T.S. EC3

ANCHOR SPACING SCHEDULE	
LOCATION	REQUIRED ANCHOR SPACING (ANCHORS/YD ²)
ALL CHANNELS	2.5
1.5H:1V SLOPES	2.0
2H:1V SLOPES	2.0
2.5H:1V SLOPES	1.5
3H:1V SLOPES	1.5
3.5H:1V SLOPES	1.0
4H:1V SLOPES	1.0

PRELIMINARY FOR REGULATORY REVIEW

NO.	DATE	REVISION

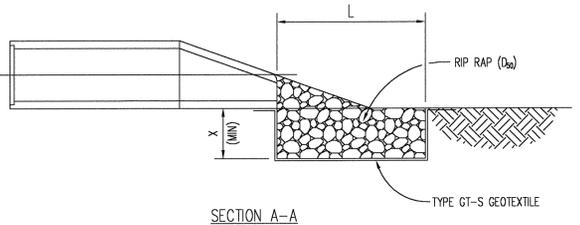
David Garrett, P.G., P.E.
 Engineering and Geology
 1408 Rock Drive, Raleigh, North Carolina
 Telephone/Fax (919)231-1818



PROJECT TITLE:
 BUFFALO L.C.I.D. LANDFILL
 GARNER, NORTH CAROLINA

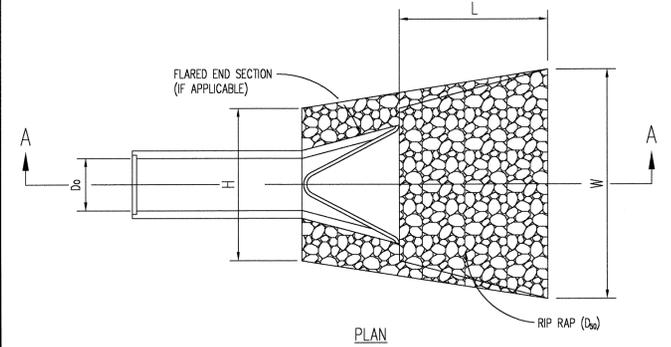
DRAWING TITLE:
 EROSION & SEDIMENTATION
 CONTROL DETAILS

DESIGNED BY: G.D.G.	DRAWN BY: A.W.H.
CHECKED BY: G.D.G.	PROJECT NO.: BUFFALO-1
SCALE: AS SHOWN	DATE: APRIL 2002
FILE NAME: BUFFALO-00015	DRAWING NO.:
SHEET NO. 15	EC3



RIP RAP OUTLET PROTECTION SCHEDULE						
PIPE	D ₀	3D ₀	L	W	X	D ₅₀
SED. BASIN NO. 2	2'	6'	20'	22'	24"	12"
SED. BASIN NO. 3	2'	6'	20'	22'	24"	12"
SED. BASIN NO. 4	2'	6'	20'	22'	24"	12"
36" CULVERT	3'	9'	50'	18'	*	*

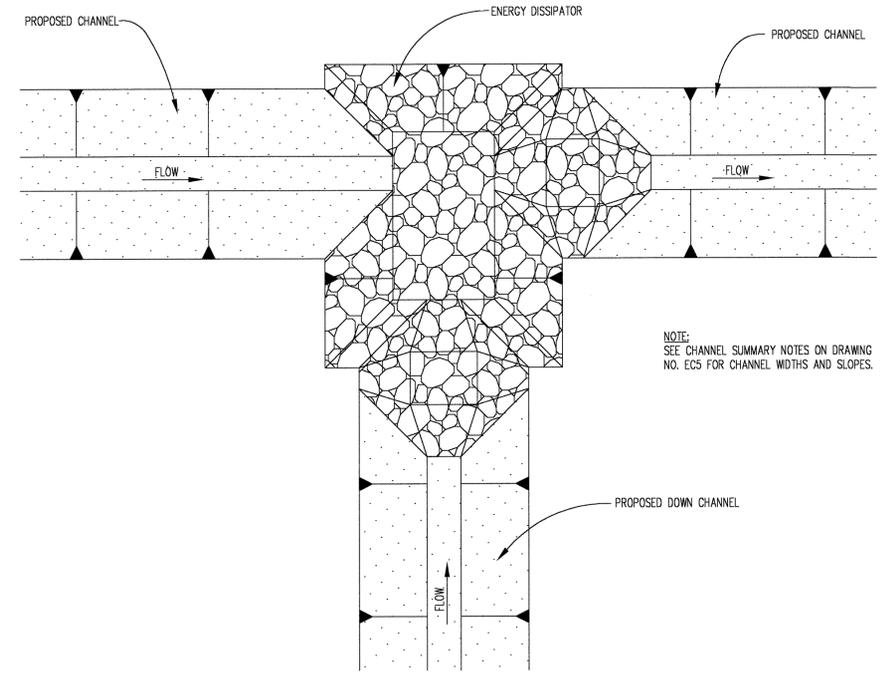
* (SAME AS CHANNEL)



**RIP RAP OUTLET PROTECTION
(OUTLET TO FLAT AREA)**



NOTE:
1. D₉₀ REFERS TO THE MINIMUM REQUIRED AVERAGE STONE SIZE



**ENERGY DISSIPATOR
DETAIL B**



NOTE:
SEE CHANNEL SUMMARY NOTES ON DRAWING NO. ECS FOR CHANNEL WIDTHS AND SLOPES.

SEEDBED PREPARATION

- CHISEL COMPACTED AREAS AND SPREAD TOPSOIL 3 INCHES DEEP OVER ADVERSE SOIL CONDITIONS, IF AVAILABLE.
- RIP THE ENTIRE AREA TO 6 INCHES DEEP.
- REMOVE ALL LOOSE ROCK, ROOTS, AND OTHER OBSTRUCTIONS LEAVING SURFACE REASONABLY SMOOTH AND UNIFORM.
- APPLY AGRICULTURAL LIME, FERTILIZER, AND SUPERPHOSPHATE UNIFORMLY AND MIX WITH SOIL (SEE BELOW*).
- CONTINUE TILLAGE UNTIL A WELL-PULVERIZED, FIRM REASONABLY UNIFORM SEEDBED IS PREPARED 4 TO 6 INCHES DEEP.
- SEED ON A FRESHLY PREPARED SEEDBED AND COVER SEED LIGHTLY WITH SEEDING EQUIPMENT OR MULTIPACK AFTER SEEDING.
- MULCH IMMEDIATELY AFTER SEEDING AND ANCHOR MULCH.
- INSPECT ALL SEEDBED 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.
- CONSULT CONSERVATION INSPECTOR ON MAINTENANCE TREATMENT AND FERTILIZATION AFTER PERMANENT COVER IS ESTABLISHED.

* APPLY: AGRICULTURAL LIMESTONE - 2 TONS/ACRE (3 TONS/ACRE IN CLAY SOILS)
FERTILIZER - 1,000 LBS./ACRE - 10-10-10
SUPERPHOSPHATE - 500 LBS./ACRE - 20% ANALYSIS
MULCH - 2 TONS/ACRE - SMALL GRAIN STRAW
ANOTHER - ASPHALT EMULSION @ 300 GALS./ACRE

SEEDING SCHEDULE

Shoulders, Side Ditches, Slopes (Max 3:1)

DATE	TYPE	PLANTING RATE
Aug 15 - Nov 1	Tall Fescue	300 lbs/acre
Nov 1 - Mar 1	Tall Fescue & Abruzzi Rye	300 lbs/acre 25 lbs/acre
Mar 1 - Apr 15	Tall Fescue	300 lbs/acre
Apr 15 - Jun 30	Hulled Common Bermudagrass	25 lbs/acre
Jul 1 - Aug 15	Tall Fescue and ***Browntop Millet ***or Sorghum-Sudan Hybrids	120 lbs/acre 35 lbs/acre 30 lbs/acre
Slopes (3:1 to 2:1)		
Mar 1 - Jun 1	Sericea Lespedeza (scarified) & (Mar 1 - Apr 15) Or Add Weeping Lovegrass (Mar 1 - Jun 30) Or Add Hulled Common Bermudagrass	50 lbs/acre 120 lbs/acre 10 lbs/acre 25 lbs/acre
Jun 1 - Sep 1	***Tall Fescue and ***Browntop Millet ***or Sorghum-Sudan Hybrids	120 lbs/acre 35 lbs/acre 30 lbs/acre
Sep 1 - Mar 1	Sericea Lespedeza (unhulled-unsscarified) and Tall Fescue	70 lbs/acre 120 lbs/acre
(Nov 1 - Mar 1)	Add Abruzzi Rye	25 lbs/acre

Consult Conservation Engineer or Soil Conservation Service for additional information concerning other alternatives for vegetation of denuded areas. The above vegetation rates are those which do well under local conditions; other seeding rate combinations are possible.

***Temporary - Reseed according to optimum season for desired permanent vegetation. Do not allow temporary cover to grow over 12" in height before mowing, otherwise fescue may be shaded out.

CHANNEL DESIGN SCHEDULE

Channel design based on Normal-Depth Procedure calculations
All channels are trapezoidal in profile with dimensions shown below (see diagram)
Refer to the Erosion Control Plan sheet for channel locations

Channel numbers correspond to the SSEC Plan sheet for final contours
Channels denoted "A" and "B" are different slope sections along the same channel

All vegetation to be installed per Seed Bed Preparation detail and Seeding Schedule shown on the Erosion Control Details sheet

Temporary channels in Phases 2 through 4:

Channel No.	Drained Area, acres	Drainage Area, acres	Channel Length, feet	Slope, ft./ft.	Manning's n-coefficient	Required Channel Dimensions			Required Lining Type	25-year Design Storm Flow Characteristics					
						Bottom Width, B, feet	Minimum Depth, D, feet	Top Width, W, feet		Peak Runoff Intensity - 25 yr, inches/hour	Peak Flow, Q ₂₅ , cfs	Normal Depth, Q ₂₅ , feet	Velocity at Q ₂₅ , ft/s	Max. Shear Stress at Q ₂₅ , psf	
T-1	4.86	35	350	2.9%	0.025	3	1	9	3H:1V	TRM with vegetation (See Note 1)	8.29	19	0.57	7.1	1.1
T-2A	4.86	35	100	10.0%	0.036	3	1	9	3H:1V	TRM with vegetation (See Note 1)	8.29	19	0.38	12.1	2.5
T-2B	400	6.3%	0.036	3	1	9	3H:1V	TRM with vegetation (See Note 1)	8.29	19	0.43	10.3	1.7		
T-3	1.72	20	400	3.8%	0.036	3	1	9	3H:1V	TRM with vegetation (See Note 1)	8.29	7	0.43	3.8	1.1
T-4	3.58	35	300	3.3%	0.025	3	1	3	3H:1V	TRM with vegetation (See Note 1)	8.29	13	0.51	5.6	1.1
T-5	5.17	30	300	3.3%	0.025	3	1	9	3H:1V	TRM with vegetation (See Note 1)	8.29	20	0.64	6.4	1.4
T-6	6.89	30	100	10.0%	0.025	4	1	10	3H:1V	TRM with vegetation (See Note 1)	8.29	26	0.48	10.0	3.1
T-7	6.11	30	700	4.3%	0.025	3	1	9	3H:1V	TRM with vegetation (See Note 1)	8.29	12	0.45	6.1	1.3
T-8	4.13	30	320	9.4%	0.036	3	1	9	3H:1V	TRM with vegetation (See Note 1)	8.29	8	0.37	5.3	2.3

Total length of temp. channels = 2970 feet

Side slope benches and perimeter channels:

Channel No.	Drained Area, acres	Drainage Area, acres	Channel Length, feet	Slope, ft./ft.	Manning's n-coefficient	Required Channel Dimensions			Required Lining Type	25-year Design Storm Flow Characteristics					
						Bottom Width, B, feet	Minimum Depth, D, feet	Top Width, W, feet		Peak Runoff Intensity - 25 yr, inches/hour	Peak Flow, Q ₂₅ , cfs	Normal Depth, Q ₂₅ , feet	Velocity at Q ₂₅ , ft/s	Max. Shear Stress at Q ₂₅ , psf	
3A	3.02	65	800	6.3%	0.036	3	1	9	3H:1V	TRM with vegetation	8.29	8	0.41	4.6	1.7
3B	250	1.0%	0.030	3	1	9	3H:1V	Grass	8.29	8	0.59	2.6	0.4		
4A	17.45	90	550	2.3%	0.025	4	2	16	3H:1V	TRM with vegetation	8.29	39	0.90	6.5	1.4
4B	100	5.0%	0.025	4	2	16	3H:1V	TRM with vegetation	8.29	39	0.73	8.6	2.4		
5R	6.04	25	400	2.0%	0.030	4	1	10	3H:1V	TRM with vegetation	8.29	12	0.55	3.9	0.7
6A	28.61	110	250	2.0%	0.025	5	2	17	3H:1V	TRM with vegetation	8.29	65	1.11	7.0	1.5
6B	500	3.0%	0.025	5	2	17	3H:1V	TRM with vegetation	8.29	65	1.00	8.1	2.0		
7A	4.55	60	500	6.7%	0.036	3	1	9	3H:1V	TRM with vegetation	8.29	12	0.50	5.3	2.2
7B	600	6.7%	0.036	3	1	9	3H:1V	TRM with vegetation	8.29	12	0.50	5.3	2.2		
8A	5.55	75	650	4.6%	0.025	3	1	9	3H:1V	TRM with vegetation	8.29	12	0.45	6.1	1.4
8B	350	1.4%	0.030	3	1	9	3H:1V	Grass	8.29	12	0.67	3.6	0.6		
9	3.82	85	1400	6.0%	0.036	3	1	9	3H:1V	TRM with vegetation	8.29	12	0.51	5.2	2.0
10	2.34	65	500	9.0%	0.036	3	1	9	3H:1V	TRM with vegetation	8.29	7	0.32	5.5	1.9
11A	9.80	80	550	2.7%	0.025	3	1	9	3H:1V	TRM with vegetation	8.29	18	0.63	5.8	1.1
11B	250	2.0%	0.025	3	1	9	3H:1V	TRM with vegetation	8.29	18	0.69	5.1	0.9		
12	22.72	56	870	17.0%	0.025	4	1	10	3H:1V	TRM with vegetation	8.29	39	0.52	13.5	5.8
13	0.79	45	460	2.0%	0.030	2	1	8	3H:1V	Grass	8.29	3	0.35	2.8	0.5
15A	2.14	56	150	6.7%	0.025	2	1	8	3H:1V	TRM with vegetation	8.29	7	0.45	4.6	2.0
15B	250	2.0%	0.030	2	1	8	3H:1V	Grass	8.29	7	0.55	3.5	0.7		
16A	5.57	65	450	10.0%	0.036	3	1	9	3H:1V	TRM with vegetation	8.29	17	0.53	7	3.5
16B	1300	1.5%	0.030	3	1	9	3H:1V	Grass	8.29	17	0.79	4	0.8		
17A	1.74	95	300	8.3%	0.036	3	1	9	3H:1V	TRM with vegetation	8.29	5	0.28	4.7	1.5
17B	350	4.3%	0.036	3	1	9	3H:1V	TRM with vegetation	8.29	5	0.35	3.5	1.0		
18A	1.89	40	470	8.5%	0.036	3	1	9	3H:1V	TRM with vegetation	8.29	6	0.32	4.7	1.8
19	17.40	70	450	10.0%	0.025	4	1	10	3H:1V	TRM with vegetation	8.29	50	0.88	8.8	0.6

Total length of perm. channels = 13120 feet

Diversion Berms/Sweles:

Channel No.	Drained Area, acres	Drainage Area, acres	Channel Length, feet	Slope, ft./ft.	Manning's n-coefficient	Required Channel Dimensions			Required Lining Type	25-year Design Storm Flow Characteristics					
						Bottom Width, B, feet	Minimum Depth, D, feet	Top Width, W, feet		Peak Runoff Intensity - 25 yr, inches/hour	Peak Flow, Q ₂₅ , cfs	Normal Depth, Q ₂₅ , feet	Velocity at Q ₂₅ , ft/s	Max. Shear Stress at Q ₂₅ , psf	
DBS-1A	3.16	15	500	5.0%	0.036	3	1	9	3H:1V	TRM with vegetation (See Note 1)	8.29	6	0.37	3.9	1.2
DBS-1B	550	1.0%	0.030	3	1	9	3H:1V	Grass	8.29	6	0.51	2.6	0.3		
DBS-2A	3.25	15	540	5.0%	0.036	3	1	9	3H:1V	TRM with vegetation (See Note 1)	8.29	6	0.37	3.9	1.2
DBS-2B	380	1.0%	0.030	3	1	9	3H:1V	Grass	8.29	6	0.52	2.5	0.3		
DBS-3	2.07	15	600	1.0%	0.030	2	1	8	3H:1V	Grass	8.29	4	0.48	2.4	0.3
DBS-4	1.95	15	200	1.0%	0.030	2	1	8	3H:1V	Grass	8.29	6	0.6	2.6	0.4

Total length of diversion berms = 2770 feet

Down-Channels:

Channel No.	Drained Area, acres	Drainage Area, acres	Channel Length, feet	Slope, ft./ft.	Manning's n-coefficient	Required Channel Dimensions			Required Lining Type	25-year Design Storm Flow Characteristics					
						Bottom Width, B, feet	Minimum Depth, D, feet	Top Width, W, feet		Peak Runoff Intensity - 25 yr, inches/hour	Peak Flow, Q ₂₅ , cfs	Normal Depth, Q ₂₅ , feet	Velocity at Q ₂₅ , ft/s	Max. Shear Stress at Q ₂₅ , psf	
DC-2	6.41	15	40	25.0%	0.036	4	2	16	3H:1V	TRM with vegetation (See Note 2)	8.29	12	0.30	8.2	4.9
DC-3	17.45	90	50	20.0%	0.025	4	2	16	3H:1V	TRM with vegetation (See Note 2)	8.29	39	0.50	14.2	6.6
DC-4	28.61	110	80	12.5%	0.025	5	2	17	3H:1V	TRM with vegetation (See Note 2)	8.29	65	0.68	13.6	5.3
DC-5	5.55	75	90	16.7%	0.036	3	2	15	3H:1V	TRM with vegetation (See Note 2)	8.29	12	0.39	7.4	4.3

Total length of down-channels = 260 feet

Permanent channels through Sediment Basins:

Channel No.	Drained Area, acres	Drainage Area, acres	Channel Length, feet	Slope, ft./ft.	Manning's n-coefficient	Required Channel Dimensions			Required Lining Type	25-year Design Storm Flow Characteristics					
						Bottom Width, B, feet	Minimum Depth, D, feet	Top Width, W, feet		Peak Runoff Intensity - 25 yr, inches/hour	Peak Flow, Q ₂₅ , cfs	Normal Depth, Q ₂₅ , feet	Velocity at Q ₂₅ , ft/s	Max. Shear Stress at Q ₂₅ , psf	
20A	38.77	120	290	8.0%	0.025	8	2	20	3H:1V	TRM with vegetation	8.29	85	0.72	11.6	3.8
20B	250	2.0%	0.025	8	2	20	3H:1V	TRM with vegetation	8.29	85	1.05	7.3	1.4		
21A	4.06	56	70	28.0%	0.036	4	1	10	3H:1V	TRM with vegetation	8.29	12	0.29	8.5	5.1
21B	230	1.0%	0.036	4	1	10	3H:1V	TRM with vegetation	8.29	12	0.6	3.4	0.4		
22	34.16	120	250	8.0%	0.025	8	2	20	3H:1V	TRM with vegetation	8.29	80	0.69	11.5	3.6

Total length of basin channels = 1090 feet

- Note 1: Due to an anticipated short duration of service, the channel liner may be omitted initially, then a field performance evaluation will determine if the liner is needed
- Note 2: Depending on vegetation cover and climatic conditions, it may be necessary to install a rip-rap liner, to be determined based on future field performance evaluation
- Note 3: Channel 21A may be required upon completion of Phase 7, to function as a down-channel, depending on the final geometry

**PRELIMINARY
FOR REGULATORY REVIEW**

C:\H&I-CAD\CAD\GARRETT\Buffalo\BUFFALO-00016.dwg DATE: MAY 09, 2002 TIME: 8:52 PM

REVISION NO. DATE

David Garrett, P.G., P.E.
Engineering and Geology
1408 Rock Drive, Raleigh, North Carolina
Telephone/Fax (919)231-1818

SEAL: NORTH CAROLINA PROFESSIONAL SEAL 25467 ENGINEER GEOLOGIST DAVID GARRETT

PROJECT TITLE: BUFFALO L.C.I.D. LANDFILL GARNER, NORTH CAROLINA

DRAWING TITLE: EROSION & SEDIMENTATION CONTROL DETAILS

DESIGNED BY: G.D.G. DRAWN BY: A.W.H.
CHECKED BY: G.D.G. PROJECT NO.: BUFFALO-1
SCALE: AS SHOWN DATE: APRIL 2002
FILE NAME: BUFFALO-00016
SHEET NO. DRAWING NO.

16 EC

EROSION AND SEDIMENTATION CONTROL PLAN NARRATIVE

GENERAL

ALL WORK SHALL CONFORM TO THE RULES AND GUIDELINES OF THE WAKE COUNTY DEPARTMENT OF ENVIRONMENTAL SERVICES AND THE NORTH CAROLINA SEDIMENTATION CONTROL LAW. PRIOR TO BEGINNING WORK IN EACH NEW PHASE, A PRE-CONSTRUCTION CONFERENCE SHALL BE HELD WITH THE DESIGNATED WAKE COUNTY ENVIRONMENTAL SERVICES REPRESENTATIVES.

ALL S&EC MEASURES SHALL BE INSPECTED AND APPROVED BY THE DESIGNATED WAKE COUNTY REPRESENTATIVE PRIOR TO OBTAINING A CERTIFICATE OF COMPLIANCE FROM THE COUNTY. ALL WORK IS TO PROCEED IN A METHODOICAL AND WORKMANLIKE MANNER. THE OWNER/OPERATOR TAKES RESPONSIBILITY FOR SECURING ANY REQUIRED LAND DISTURBING PERMITS AND PAYING ANY FEES.

THE PLAN DESCRIBES TEMPORARY AS WELL AS PERMANENT SEDIMENTATION AND EROSION CONTROL MEASURES (SILT FENCING, CHANNELS AND BASINS). DUE TO THE TIME-FRAME THAT CERTAIN TEMPORARY MEASURES WILL BE IN PLACE, SUBJECT TO WASTE STREAM REQUIREMENTS, IT MAY NOT BE NECESSARY TO INSTALL ALL THE PRESCRIBED TEMPORARY MEASURES, E.G., CHANNEL LININGS ON TEMPORARY CHANNELS, RECOMMENDED BASED ON THE FLOW CALCULATIONS, UNLESS WARRANTED BY FIELD PERFORMANCE INSPECTION.

THIS PLAN ASSUMES THAT ALL RECOMMENDED "PERMANENT" MEASURES WILL BE INSTALLED.

SEDIMENTATION AND EROSION CONTROL MEASURES ARE SUBJECT TO FIELD INSPECTION AND PERFORMANCE EVALUATION BY WAKE COUNTY. IF ANY MEASURES ARE FOUND TO BE INADEQUATE, A REVIEW OF THE MEASURES AS CONSTRUCTED SHALL BE PERFORMED TO ENSURE ADHERENCE TO THE PLANS. THEN, IF NEEDED, ADDITIONAL DESIGNS MAY BE SUBMITTED TO WAKE COUNTY FOR REVIEW, TO BE SUPPORTED BY APPROPRIATE CALCULATIONS.

SUBSTANTIAL DEVIATIONS FROM THIS PLAN SHALL BE REVIEWED BY A QUALIFIED ENGINEER IN ADVANCE OF IMPLEMENTING THE CHANGES AND MAY BE SUBJECT TO PRIOR TO APPROVAL BY WAKE COUNTY.

SEDIMENT BASINS

TWO TEMPORARY SEDIMENT BASINS, SB-4T AND SB5T, SHALL BE USED DURING THE OPERATIONS OF PHASE 2. THESE BASINS SHALL BE REPLACED BY PERMANENT SEDIMENT BASINS, SB-2 (REPLACES SB-5T) AND SB-4 (REPLACES SB-4T). A THIRD NEW BASIN, SB-3, WILL BE REQUIRED AT THE NORTH END OF THE LANDFILL (ADJACENT TO FUTURE PHASE 5). ALL NEW BASINS MUST BE CONSTRUCTED AND APPROVED BY THE COUNTY IN ORDER TO SECURE A CERTIFICATE OF COMPLIANCE FOR THE S&EC MEASURES.

AN EXISTING SEDIMENT BASIN, SB-1, LOCATED NEAR THE NORTHWEST CORNER OF THE CLOSED LANDFILL (PHASE 1), SHALL BE CLEANED OUT AND REFURBISHED IN ACCORDANCE WITH PHASE 1 CLOSURE PLAN. HOWEVER, SB-1 WILL SERVE NO LONG-TERM FUNCTION FOR THE LANDFILL EXPANSION, OTHER THAN PROVIDING SETTLING CAPACITY FOR A PORTION OF THE INACTIVE PHASE (ALBEIT, A SMALLER AREA THAN THE BASIN CURRENTLY SERVES). THIS BASIN MAY BE ABANDONED AT SOME FUTURE TIME, AS MAY ALL BASINS ON THIS PROJECT.

CONSTRUCTION SEQUENCE

SEDIMENTATION AND EROSION CONTROL MEASURES, E.G., SILT FENCES, TEMPORARY AND PERMANENT CHANNELS, AND SOIL DIVERSION BERMS (AS SHOWN IN THE CONSTRUCTION PLANS), SHALL BE CONSTRUCTED IN EACH NEW DISPOSAL AREA PRIOR TO THE PLACEMENT OF WASTE.

OTHER THAN THE SEDIMENT BASINS, A MAJORITY OF S&EC MEASURES MAY BE INSTALLED INCREMENTALLY AS THE WASTE FILL OPERATIONS PROGRESS. DURING THE PLACEMENT OF WASTE, TEMPORARY DITCHES MAY BE REQUIRED WITHIN THE WASTE DISPOSAL AREAS TO PROMOTE POSITIVE DRAINAGE. ALL DRAINAGE SHALL BE DIRECTED TOWARD A SEDIMENT BASIN.

ALL EXTERIOR SLOPES SHALL BE COVERED WITH AN APPROPRIATE THICKNESS OF SOIL AND VEGETATED AS SOON AS PRACTICAL UPON ACHIEVING FINAL GRADES. INTERIOR SLOPES WILL NOT REQUIRE VEGETATION UNLESS FURTHER WASTE PLACEMENT ACTIVITIES WILL NOT OCCUR WITHIN A GIVEN AREA FOR MORE THAN 30 DAYS.

IT MAY BE NECESSARY TO ESTABLISH A NURSE CROP OF RYE AND OTHER SHORT-TERM VEGETATION, DEPENDING ON THE TIMING OF THE CONSTRUCTION START UP, THEN OVER-SEEDING AT A MORE FAVORABLE TIME TO ESTABLISH PERMANENT VEGETATION. PLEASE REFER TO THE SEED BED PREPARATION NARRATIVE AND THE SEEDING SCHEDULE, PROVIDED ELSEWHERE IN THESE PLANS.

PHASE 2 (REFER TO CONSTRUCTION PHASE MAPS)

CONSTRUCT NEW CHANNELS T-1 THROUGH T-6, TO CONVEY SURFACE RUNOFF TO THE EXISTING SEDIMENT PONDS, IN CONJUNCTION WITH SITE GRADING ACTIVITIES. THE "T" DENOTES A TEMPORARY BASIN, AS DOES THE DESIGNATION "T" ON THE CHANNEL NUMBERS.

CHANNELS T-1 AND T-2 SHALL BE LOCATED INSIDE OF FUTURE SOIL BERMS, CONSTRUCTED FROM EXCAVATED SOILS FROM THE CHANNELS. THESE BERMS CAN BE LATER EXCAVATED WHEN GRADING FOR THE ADJACENT FUTURE PHASES IS PERFORMED.

NO PIPES ARE REQUIRED FOR THE TEMPORARY CHANNELS.

CONSTRUCT CHANNEL #14, A PERMANENT CHANNEL LEADING TO SB-1, CONCURRENTLY WITH PLACEMENT OF WASTE ALONG THE WEST SIDE OF THE CLOSED PORTION OF THE LANDFILL (PHASE 1). NOTE THAT THE FLOW TO SB-1 WILL BE REDUCED AS THE WASTE FILL PROGRESSES WESTWARD.

PERMANENT CHANNELS #4, #5R, #6, AND A PORTION OF #8, SHALL BE BUILT IN CONJUNCTION WITH THE PERIMETER BERM CONSTRUCTION (SEE PLANS). CHANNELS #4 AND #5 MERGE INTO CHANNEL #6 AND LEAD TO THE PERMANENT SEDIMENT BASIN SB-4.

DEPENDING ON THE NEED FOR LONG-TERM VEHICLE ACCESS TO THE SLOPE FROM ALONG THE PERIMETER BERM, A PIPE CULVERT MAY BE REQUIRED NEAR THIS CONFLUENCE (SEE PLANS FOR PIPE SCHEDULE).

BASED ON THE FLOW CALCULATIONS, BOTH TEMPORARY AND PERMANENT CHANNELS REQUIRE "PERMANENT" LININGS (SEE CHANNEL SCHEDULE). A LOW-COST TURF REINFORCEMENT MAT (TRM) IS RECOMMENDED. HOWEVER, THE NEED FOR LININGS ON TEMPORARY CHANNELS SHALL BE DETERMINED BASED ON FIELD PERFORMANCE, E.G., PREVAILING CLIMATIC CONDITIONS AND THE TIME OF SERVICE.

THE LINING ON PERMANENT CHANNELS SHALL BE INSTALLED AS SOON AS PRACTICAL AFTER COMPLETION OF THE FINAL COVER IN THE VICINITY OF THE CHANNEL (VEHICLE TRAFFIC SHOULD BE LIMITED AFTER THE TRM CHANNEL LININGS ARE INSTALLED).

A PERMANENT DOWN-CHANNEL, DC-3, WILL BE REQUIRED ALONG THE STEEPER PORTION OF CHANNEL 6, WHERE IT EMPTIES INTO THE BASIN SB-4. TENTATIVELY, DC-3 WILL REQUIRE A PERMANENT CHANNEL LINING OF TRM WITH VEGETATION. THE DOWN-CHANNEL MAY BE RETROFITTED WITH STONE RIP-RAP LINER (D50 = 12 INCHES), AS NEEDED, BASED ON FUTURE FIELD PERFORMANCE EVALUATION. IF STONE RIP-RAP IS UTILIZED, THE STONE SHALL BE PLACED WITH A MINIMUM OF TWO INTERLOCKING LAYERS ABOVE A GEOTEXTILE EROSION CONTROL BLANKET, WITH WATER STOPS INSTALLED AS SHOWN IN THE DETAILS. SUBJECT TO FUTURE PERFORMANCE EVALUATION, IT MAY BE NECESSARY TO GROUT THE RIP-RAP IN PLACE (PER COUNTY REQUIREMENTS).

AS THE FILL PROGRESSES ABOVE THE PERIMETER BERM, CONSTRUCTION OF PERMANENT EXTERIOR SIDE SLOPE BENCHES SHALL BE INITIATED, INCLUDING CHANNELS #7 AND #9. THESE BENCHES SHALL BE TIED INTO THE PERMANENT CHANNELS LOCATED ALONG THE PERIMETER BERM. ENERGY DISSIPATORS SHALL BE INSTALLED DURING THE FINAL CLOSURE OF THE INDIVIDUAL SLOPES.

THE BENCHES MAY DOUBLE AS TEMPORARY ACCESS FOR CONSTRUCTION EQUIPMENT FOR FINAL COVER PLACEMENT AND SLOPE MAINTENANCE. TYPICALLY, THE BENCHES ARE RELATIVELY STEEP AND WILL REQUIRE PERMANENT CHANNEL LINERS (E.G., TRM) DUE TO THE ANTICIPATED WATER VELOCITIES. POST-CLOSURE ACCESS ALONG THE BENCHES SHALL BE RESTRICTED TO PREVENT DAMAGE TO THE LINERS.

THE UPPER SURFACE OF THE LANDFILL (I.E., THE "CAP") SHALL BE GRADED TO APPROXIMATELY 5% AVERAGE SLOPES. THE CAP SHALL BE HYDRAULICALLY ISOLATED FROM THE EXTERIOR 3H:1V SIDE SLOPES WITH PERIMETER DIVERSION BERMS GRADED INTO THE CREST OF THE SIDE SLOPE (SEE DETAILS). WATER SHALL NOT BE ALLOWED TO DRAIN OVER THE CRESTS OF THE 3H:1V SLOPES FROM THE CAPS.

PHASE 3

IT IS PRESUMED THAT THE PERMANENT BASINS SB-2 AND SB-4 WILL BE IN SERVICE BY THE TIME PHASE 3 IS CONSTRUCTED.

MAINTAIN CHANNELS T-2 AND T-4, CONSTRUCTED FOR PHASE 2, UNTIL SUCH TIME THAT WASTE IS PLACED. THE SOIL BERM CONSTRUCTED BETWEEN PHASES 2 AND 3 ALONG CHANNEL T-2 MAY BE REMOVED.

CONSTRUCT TEMPORARY CHANNEL T-7, TO CONVEY RUNOFF TO SB-2, THUS PRESERVING AN EXISTING NATURAL DRAINAGE CHANNEL (AN EPHEMERAL STREAM). THE NEED FOR CHANNEL LINER SHALL BE EVALUATED IN THE FIELD.

CHANNEL #8 SHALL BE CONSTRUCTED INCREMENTALLY ALONG THE PERIMETER BERM ON THE SOUTH SIDE OF THE PHASE, AS THE FILL OPERATIONS PROGRESS WESTWARD.

AS FILL PLACEMENT PROGRESSES, CHANNELS #7 AND #9 SHALL BE EXTENDED ALONG THE RESPECTIVE SIDE SLOPE BENCHES (SEE PLANS). CHANNEL LINERS AND ENERGY DISSIPATORS SHALL BE PLACED AS PART OF THE INCREMENTAL CLOSURE ACTIVITIES.

SOIL COVER AND VEGETATION SHALL BE PLACED INCREMENTALLY ALONG THE EXTERIOR SLOPE AS THE WASTE FILL PROGRESSES WESTWARD. TEMPORARY DIVERSION BERMS SHALL BE EXTENDED ALONG THE CRESTS OF EXTERIOR SLOPES AS FINAL COVER IS PLACED.

PHASE 4

TEMPORARY CHANNEL T-8 SHALL BE ESTABLISHED ALONG THE EXISTING NATURAL DRAINAGE FEATURE TO THE NORTH OF THE PHASE. THE NATURAL DRAINAGE FEATURE CONVEYS OFF-SITE FLOW TO SB-2.

CONSTRUCT CHANNELS #11 AND #12 (PERMANENT CHANNELS LOCATED ALONG THE PERIMETER BERM THAT LEAD TOWARD SEDIMENT BASIN SB-3). THE OFF-SITE FLOW CONVEYED BY CHANNEL T-8 SHALL BE DIVERTED DOWN CHANNELS #11 AND #12 TOWARD SB-3.

AS FILL PLACEMENT PROGRESSES, CHANNELS #10 AND #18 SHALL BE EXTENDED ALONG NEW SIDE SLOPE BENCHES (SEE PLANS). CHANNEL LINERS AND ENERGY DISSIPATORS SHALL BE PLACED AS PART OF THE INCREMENTAL CLOSURE ACTIVITIES. INSTALLATION OF CHANNEL LINERS MAY BE POSTPONED UNTIL SUCH TIME THAT THE PLACEMENT OF FINAL COVER WILL NOT DAMAGE THE LINERS.

SOIL COVER AND VEGETATION SHALL BE PLACED INCREMENTALLY ALONG THE EXTERIOR SLOPE AS THE WASTE FILL PROGRESSES WESTWARD. TEMPORARY DIVERSION BERMS SHALL BE EXTENDED ALONG THE CRESTS OF EXTERIOR SLOPES AS FINAL COVER IS PLACED.

PHASES 5 AND 6

AT THIS TIME, ONLY THE REMAINING PERMANENT PERIMETER CHANNELS AND SIDE SLOPE BENCHES ARE REQUIRED (NO MORE TEMPORARY CHANNELS). THE PERMANENT CHANNELS SHALL BE DIRECTED TOWARD THE APPROPRIATE SEDIMENT BASINS AND PROTECTED WITH APPROPRIATE CHANNEL LINERS (SEE CHANNEL SCHEDULE).

INSTALLATION OF CHANNEL LINERS MAY BE POSTPONED UNTIL SUCH TIME THAT THE PLACEMENT OF WASTES AND CONSTRUCTION OF FINAL COVER WILL NOT DAMAGE THE LINERS. PRESUMABLY, FINAL COVER PLACEMENT AND VEGETATION WILL OCCUR INCREMENTALLY AS THE EXTERIOR SLOPES ARE BROUGHT TO FINAL GRADES.

AS FILL PLACEMENT PROGRESSES, CHANNELS #17 AND #16 SHALL BE EXTENDED ALONG NEW SIDE SLOPE BENCHES (SEE PLANS). CHANNEL LINERS AND ENERGY DISSIPATORS SHALL BE PLACED AS PART OF THE INCREMENTAL CLOSURE ACTIVITIES.

PERIMETER DIVERSION BERMS LOCATED AT THE CRESTS OF 3H:1V SLOPES, DBS-1 THROUGH DBS-4, SHALL BE EXTENDED AS SHOWN ON THE PLANS AS OPERATIONS PROGRESS. SOIL COVER AND VEGETATION SHALL BE PLACED INCREMENTALLY ALONG THE EXTERIOR SLOPE AS THE WASTE FILL PROGRESSES WESTWARD, THEN BACK TOWARD THE NORTH AND EAST, WORKING TOWARD SB-2.

PHASE 7

DURING THIS FINAL PHASE OF OPERATIONS, WASTE WILL BE PLACED ALONG THE CONCAVE SLOPES LEADING TOWARD BASIN SB-2. THE SEDIMENT BASIN WILL BE REDUCED IN SIZE BY PARTIALLY IN-FILLING THE BASIN WITH WASTE.

PRIOR TO IN-FILLING SB-2 WITH WASTE, THE BASIN SHALL BE CLEANED OUT (WATER REMOVED IF NEEDED), AND COMPACTED SOIL BERMS (5 FEET IN HEIGHT) SHALL BE PLACED ALONG THE PROPOSED LIMIT OF WASTE SHOWN ON THE PLANS FOR THIS PHASE.

THE IN-FILLING OF SB-2 WILL REQUIRE REALIGNING CHANNELS #15 AND #14R (WHICH REPLACES T-1 AS A PERMANENT CHANNEL).

AS WASTE PLACEMENT PROGRESSES, CHANNEL #16 SHALL BE EXTENDED ALONG NEW SIDE SLOPE BENCHES (SEE PLANS). CHANNEL LINERS SHALL BE PLACED AS PART OF THE INCREMENTAL CLOSURE ACTIVITIES.

THE BARREL AND RISER STRUCTURES WILL REMAIN IN PLACE ON SB-2 (AND ALL BASINS) UNTIL SUCH TIME AS ALL SLOPES ARE STABILIZED, AND THE BASINS ARE NO LONGER NEEDED, OR THAT MAINTAINING THE STRUCTURES IS NOT COST EFFECTIVE.

LONG-TERM MAINTENANCE

A PERFORMANCE EVALUATION SHALL BE PERFORMED AFTER EVERY SIGNIFICANT PRECIPITATION EVENT. THE OWNER/OPERATOR SHALL BE RESPONSIBLE FOR RESEEDING AND REPAIRING ANY EROSION DAMAGE TO THE COVER TO ASSURE A HEALTHY STAND OF VEGETATION.

LONG-TERM MAINTENANCE SHALL CONSIST OF PERIODIC COVER INSPECTION AND REPAIR OF EROSION DAMAGE AS REQUIRED. VEGETATION SHALL BE REPLACED AS NEEDED TO MAINTAIN A STABLE COVER.

FINAL COVER IN AREAS THAT FAIL TO ESTABLISH HEALTHY VEGETATION OR BECOME ERODED AFTER VEGETATION DEVELOPMENT SHALL BE REPLACED OR SCARIFIED, AS NEEDED, AND NEW SEED AND MULCH SHALL BE PLACED.

CHANNEL SCOUR IS A COMMON PROBLEM IN THE EARLY STAGES AFTER CONSTRUCTION. THE MEASURES PRESCRIBED TO LIMIT EROSION MUST BE INSTALLED CORRECTLY IN ORDER TO FUNCTION PROPERLY. THE OWNER/OPERATOR IS ENCOURAGED TO SEEK GUIDANCE FROM THE ENGINEER AND/OR THE MANUFACTURER'S REPRESENTATIVE FOR THE CORRECT PLACEMENT OF THE VARIOUS EROSION CONTROL MATERIALS. THESE FEATURES MUST BE PROPERLY MAINTAINED TO OPTIMIZE PERFORMANCE.

PROCEDURE FOR REMOVAL OF RISER/BARREL STRUCTURE

THE PLANNED RISER/BARREL STRUCTURES FOR ALL SEDIMENT BASINS ARE ANTICIPATED TO HAVE A OPERATIONAL LIFE OF SEVERAL DECADES. AFTER THE LANDFILL COVER HAS BEEN STABILIZED, THE OWNER/OPERATOR MAY REMOVE THE STRUCTURE TO REDUCE FURTHER MAINTENANCE REQUIREMENTS.

INITIAL BARREL/RISER REMOVAL ACTIVITIES SHALL CONSIST OF DEWATERING THE BASIN (IF NEEDED) AND REMOVING ALL SEDIMENT BUILD-UP. THE REMOVED SEDIMENT SHOULD BE STOCKPILED WITHIN THE BASIN AND ALLOWED TO DRAIN, THEN THE SEDIMENT MAY BE DISPOSED OR UTILIZED IN A MANNER THAT IS CONSISTENT WITH THE OPERATIONS PLAN. THIS WORK SHOULD BE SCHEDULED FOR A PERIOD OF NO ANTICIPATED RAINFALL, IDEALLY IN THE WARMER SEASON.

THE BARREL/RISER STRUCTURE SHALL BE REMOVED BY EXCAVATING THE STRUCTURE, INCLUDING THE CONCRETE ANCHOR BLOCK AND BARREL DRAIN, AND PERMANENTLY BREACHING THE PERIMETER DIKE.

THE EXCAVATION SHALL BE RESHAPED TO FORM ONE OR MORE TRAPEZOIDAL CHANNELS (AS NEEDED) THROUGH THE BASINS (SEE ACCOMPANYING DETAIL MAP), WITH DIMENSIONS AND LINERS INSTALLED AS SHOWN ON THE CHANNEL SCHEDULE.

THE CHANNELS SHALL BE LINED WITH TRM AND VEGETATED. THE LINER FOR THESE CHANNELS SHALL BE TIED INTO THE STONE RIP-RAP OUTLET APRON THAT WILL EXIST FOR THE BARREL OUTLET PROTECTION. THE RIP-RAP SHALL NOT BE REMOVED. NO DISTURBANCE SHALL OCCUR DOWNSTREAM OF THE RIP-RAP APRON.

IT IS ANTICIPATED THAT FUTURE FLOW TO ALL SEDIMENT BASINS WILL DECREASE DUE AS VEGETATION IS ESTABLISHED. AS SUCH, THESE PERMANENT CHANNELS ARE DESIGNED FOR THE FUTURE ANTICIPATED FLOW. FUTURE DESIGN CHANGES FOR THESE CHANNELS, IF ANY, SHALL BE SUPPORTED WITH APPROPRIATE CALCULATIONS. ALL NEW EARTHWORK IN THIS ZONE SHALL BE VEGETATED IMMEDIATELY UPON COMPLETION.

NO.	DATE	REVISION

David Garrett, P.G., P.E.
Engineering and Geology
1408 Rock Drive, Raleigh, North Carolina
Telephone/Fax: (919)231-1818



PROJECT TITLE:
BUFFALOE L.C.I.D. LANDFILL
GARNER, NORTH CAROLINA

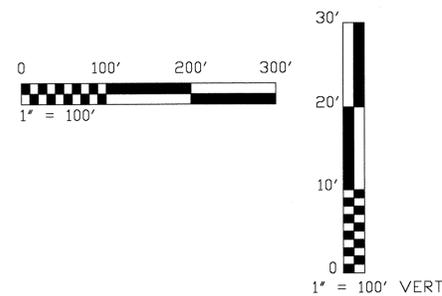
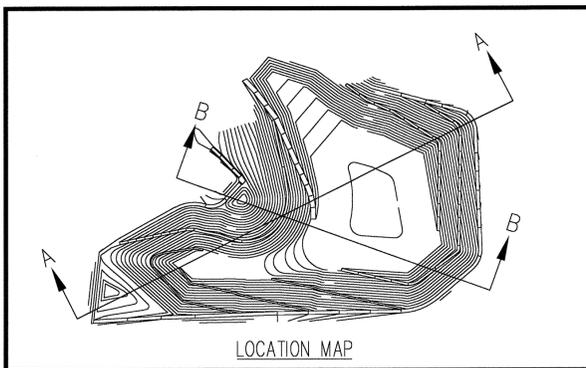
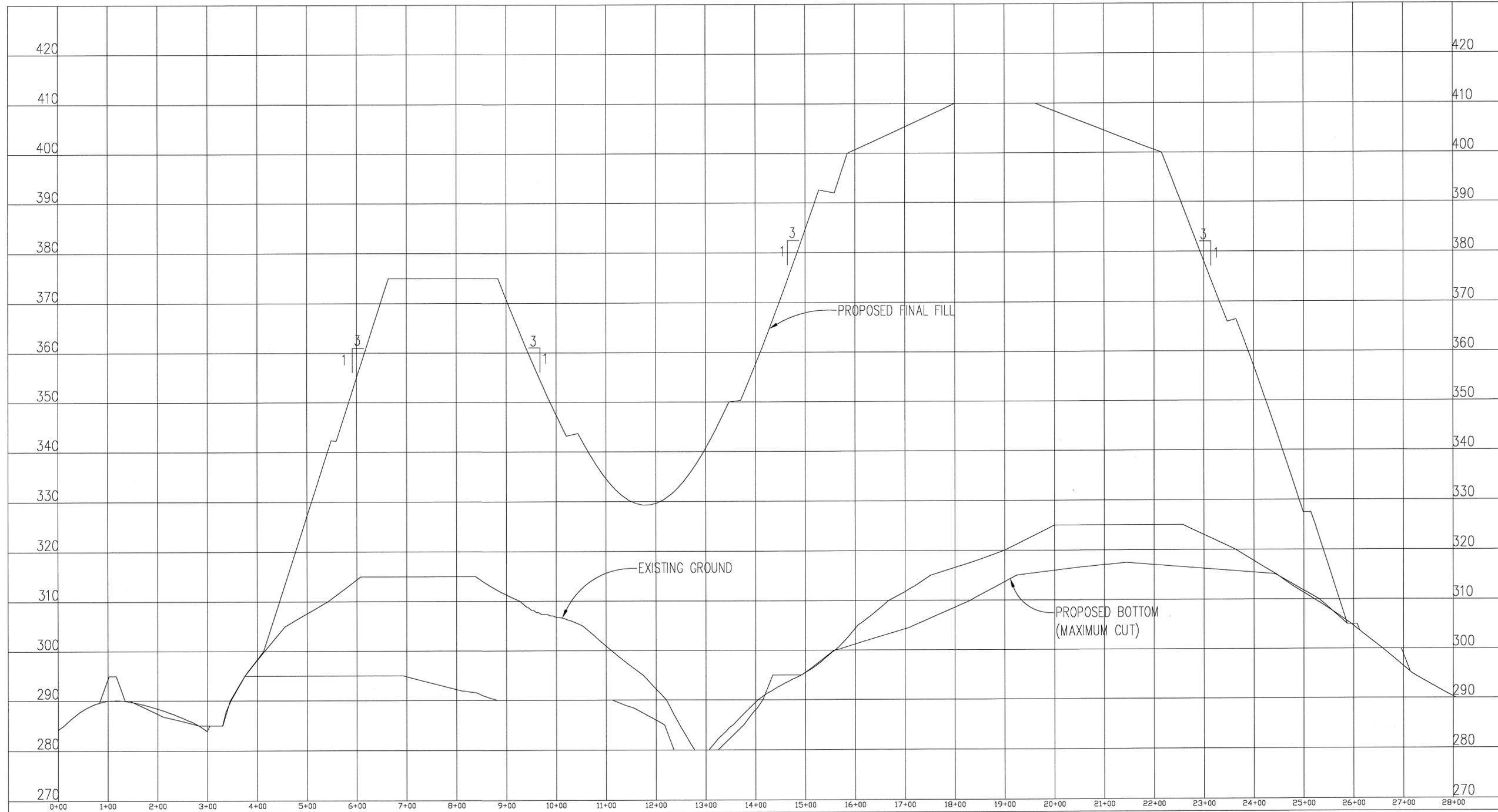
DRAWING TITLE:
EROSION & SEDIMENTATION
CONTROL NOTES

DESIGNED BY: G.D.G.	DRAWN BY: A.W.H.
CHECKED BY: G.D.G.	PROJECT: BUFFALO
SCALE: AS SHOWN	DATE: APRIL
FILE NAME: BUFFALO-DD	SHEET NO. DRA

**PRELIMINARY
FOR REGULATORY REVIEW**

C:\Vhdt-CAD\CAD\GARRETT\Buffalo\SHEETS\BUFFALO-0007.dwg DATE: JUN 03, 2002 TIME: 8:02 PM

C:\Users\CDG\Documents\Projects\Buffalo-00018.dwg DATE: MAY 07, 2002 TIME: 9:20 PM



**PRELIMINARY
FOR REGULATORY REVIEW**

Telephone/Fax (919)231-1818

David Garrett, P.G., P.E.
Engineering and Geology
1408 Rock Drive, Raleigh, North Carolina

SEAL

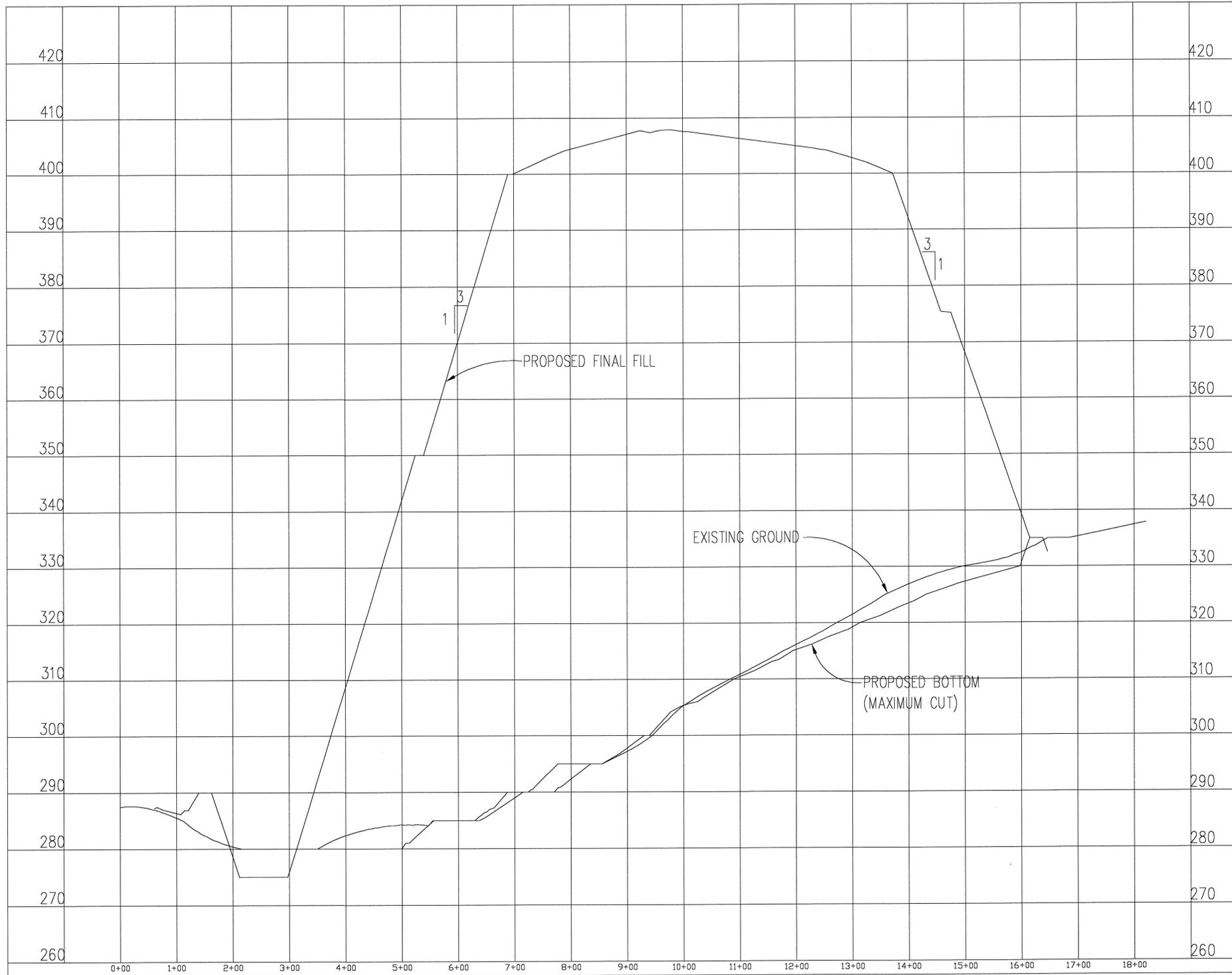
SEAL
NORTH CAROLINA
PROFESSIONAL
ENGINEERING
25467
C. GARRETT, P.E.

PROJECT TITLE:
**BUFFALO L.C.I.D. LANDFILL
GARNER, NORTH CAROLINA**

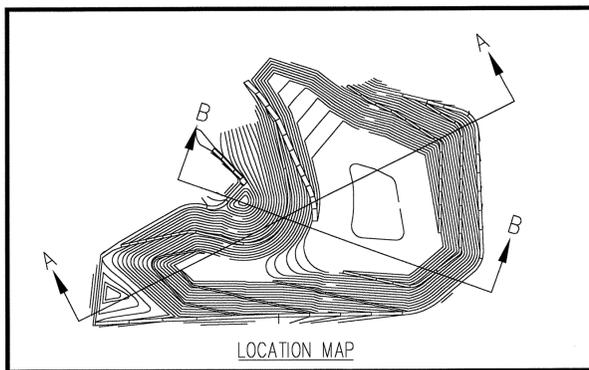
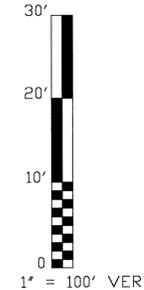
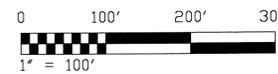
DRAWING TITLE:
CROSS SECTIONS

DESIGNED BY: G.D.G.	DRAWN BY: A.W.H.
CHECKED BY: G.D.G.	PROJECT NO.: BUFFALO-1
SCALE: AS SHOWN	DATE: APRIL 2002
FILE NAME: BUFFALO-00018	
SHEET NO. 18	DRAWING NO. X1

C:\MSR-CAD\CAD\CARRETT\Buffalo\SHEETS\BUFFALO-00019.dwg DATE: MAY 07, 2002 TIME: 9:26 PM

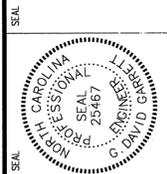


SECTION B-B
X2



**PRELIMINARY
FOR REGULATORY REVIEW**

DESIGNED BY: G.D.C.	DRAWN BY: A.W.H.
CHECKED BY: G.D.C.	PROJECT NO.: BUFFALO-1
SCALE: AS SHOWN	DATE: APRIL 2002
FILE NAME: BUFFALO-DD019	SHEET NO.: 19
DRAWING NO.:	DRAWING NO.: X2



PROJECT TITLE
BUFFALO L.C.I.D. LANDFILL
GARNER, NORTH CAROLINA

DRAWING TITLE
CROSS SECTIONS

David Garrett, P.G., P.E.
Engineering and Geology
1408 Rock Drive, Raleigh, North Carolina
Telephone/Fax (919)231-1818

Attachment 3
Volume Calculation Summary

Volumetric Calculations Summary

Volumetric calculations were prepared using the Earthworks™ computer software package that is compatible with AutoCAD 2000™. Volumes were calculated by developing a 3-dimensional surface model of the surfaces of interest (e.g., proposed base grade contours), then comparing the volume beneath this surface relative to a fixed reference plan to the volume beneath the next surface of interest (e.g., proposed final contours). Two commonly used calculations are the Prismoidal routine and the End Area Method – both routines were performed for comparison. Results generally agreed within 1% (average values shown). Please refer to the following calculations sheets.

1. Estimated earthwork cut and fill between existing topographic contours (Wake County map) and proposed base grade contours shown on Drawing E1:

	<u>Phase 2A</u>	<u>All Phases</u>
Maximum cut volume (c.y.)	158,100	613,900
Required fill volume (c.y.)	1,210	180,652

Required fill is for access roads, in-filling a swale along west side, sediment basins and miscellaneous berms and/or grade increases. The fill is proposed to be constructed in stages coinciding with the development of landfill phases. This approach spreads out the construction costs over the life of the facility. as the waste is placed in this area, to minimize the required amount of soil work and to spread the costs. Earthwork quantities shown here do not include Sediment Basin #4 required for tying the new and old landfills together during Phase 2B (see attached calculation summary).

2. Estimated total airspace (with soil cover) between proposed base grade contours shown on Drawing E1 and proposed final contours shown on Drawings E2 and E3:

	<u>Phase 2</u>	<u>All Phases</u>
Available total fill volume (c.y.)	180,652	3,237,800

3. Estimated soil cover volume (reduces total available airspace capacity) required for operational cover and final cover per NC DEHR Solid Waste Regulations:

	<u>Phase 2</u>	<u>All Phases</u>
Operational cover (5% volume)	9,032	161,890
Estimated surface area, acres	7.5	56.27
Final cover (min. 12" thickness)	12,100	90,782
Total required operational soil (c.y.)	21,132	252,672
Net waste disposal capacity (c.y.)	159,519	2,985,127

Projected Operational Life

The following calculations are based in part on operational history of the nearby LCID facilities and projected future use of the new LCID. Since the weight of the various components of the waste stream vary significantly, it is not productive to base the life expectancy calculations on unit weight. Rather, the volume of the waste stream, projected into months or years, provides a more realistic basis for determining the operational life.

A projection of the daily waste stream (subject to confirmation with gate receipts) is excerpted below to include only acceptable wastes for the LCID. These projections have been modified to reflect recent trends in the waste stream. However, it should be realized that the waste stream will be seasonal and subject to regional economic growth, as well as market-specific factors, i.e. the potential for other landfills to open or close. Thus, the **average daily waste stream** projection is:

Concrete	4	tandem-axle trucks per day	10 c.y. each	40 c.y.
Stumps	10	single-axle trucks per day	7 c.y. each	70 c.y.
Bricks	2	single-axle trucks per day	7 c.y. each	14 c.y.
Wood waste	6	single-axle trucks per day	7 c.y. each	42 c.y.
	2	tandem-axle trucks per day	10 c.y. each	20 c.y.
Brush	8	tandem-axle trucks per day	10 c.y. each	80 c.y.
Total	32	trucks per day		266 c.y./day

It is assumed that the LCID will operate 5.5 days per week, with 280 working days per year. The average daily waste stream can be converted to a conservative estimate of in-situ cubic yards by assuming the size of the trucks delivering the wastes (see table), then assuming a reduction factor of 20% for in-situ compacted volume. Typically, vegetative wastes (brush, limbs, etc.) are low density and do not initially compact well. Long-term settlement may provide more actual disposal capacity. The above assumptions yield an estimated annual airspace consumption of 74,480 cubic yards.

Based on a net waste disposal capacity of 2,985,127 cubic yards, **the projected operational life of the facility is 40 years**. Phase 2 will provide an estimated 2 years of capacity, then tying Phase 2 into the old closed landfill is anticipated to provide another 2 to 3 years of capacity, which coincides with the 5-year permit renewal cycle.¹

Alternatively, construction of Phase 3 is expected to provide at least 5 years of capacity. It appears likely that Phase 3 can be constructed using the existing sediment basin (sharing it with Phase 2), but the basin may need to be enlarged and upgraded to meet current Wake County specifications (requires an emergency overflow weir, in addition to the riser/barrel drain). The tie-in between Phase 2 and the closed landfill (Phase 1) can be constructed any time in the future, but smoother operations will result if the tie-in can be made during the first one or two operational years.

¹At the time this document was prepared in 2001, Wake County was considering making Phase 2 a separate footprint, pending closure of Phase 1. After Phase 1 was closed, Wake County allowed Phase 2 to be a contiguous expansion off the south side of Phase 1.

Subject: BUFFALO

Date: Tue, 29 Jan 2002 21:10:28 -0500

From: ANTHONY HONAKER <ahonaker41@netzero.net>

To: "David Garrett, P.G." <david_garrett_pg@mindspring.com>

DAVID

HERE ARE THE VOLUMNS FOR BUFFALO I STILL NEED TO RUN VOLS FOR A OVER ALL
FILL VOLUMNS, THOSE WILL BE COMING SOON.

ANTHONY

Site Volume Table: Unadjusted

Cut cu.yds	Fill cu.yds	Net cu.yds	Method
---------------	----------------	---------------	--------

Site: BUFFALO2

PHASE ²A BOTTOM EXCAVATION VOLUMNS

156196	909	155287	(C) Grid
157667	1387	156280	(C) Composite
160436	1336	159100	(C) Prismoidal

Σ = 158,100 c.u. *Σ = 1,210 c.u.*

PHASE ²AA AIRSPACE VOLUMNS

0	179618	179618	(F) Grid
0	181227	181227	(F) Composite
0	181111	181111	(F) Prismoidal

Σ = 180,652 c.u.

Site Volume Table: Unadjusted

Cut cu.yds	Fill cu.yds	Net cu.yds	Method
---------------	----------------	---------------	--------

Site: BASE GRADES

Stratum: base grading (all phases) exist surface base grading (all phases)

608813	28712	580101	(C) Grid
616459	32570	583888	(C) Composite
616427	33592	582835	(C) End area

Σ = 613,900 c.u. *Σ = 31,624 c.u.*

Stratum: sed basin 4 exist surface SED BASIN 4

18963	1185	17779	(C) Grid
20181	1815	18366	(C) Composite
20185	1819	18366	(C) End area

Σ = 19,776 c.u. *Σ = 1606 c.u.*

DRAFT

Subject: BUFFALO

Date: Tue, 29 Jan 2002 21:49:29 -0500

From: ANTHONY HONAKER <ahonaker41@netzero.net>

To: "David Garrett, P.G." <david_garrett_pg@mindspring.com>

DAVID

HERE ARE THE FINAL AIRSPACE VOLUMNS

Site Volume Table: Unadjusted

Cut cu.yds	Fill cu.yds	Net cu.yds	Method
---------------	----------------	---------------	--------

Site: BUFFALO

FINAL AIRSPACE VOLUMNS

0	3228657	3228657	(F) Grid
0	3241376	3241376	(F) Composite
0	3243363	3243363	(F) Prismoidal

*Σ = 3,237,800
c.u.*

DRAFT