

**PROJECT SPECIAL PROVISION**

(10-18-95)

Z-1

**PERMITS**

The Contractor's attention is directed to the following permits, which have been issued to the Department of Transportation by the authority granting the permit.

<b><u>PERMIT</u></b>	<b><u>AUTHORITY GRANTING THE PERMIT</u></b>
Dredge and Fill and/or Work in Navigable Waters (404)	U. S. Army Corps of Engineers
Water Quality (401)	Division of Environmental Management, DENR State of North Carolina
Buffer Certification	Division of Environmental Management, DENR State of North Carolina

The Contractor shall comply with all applicable permit conditions during construction of this project. Those conditions marked by \* are the responsibility of the department and the Contractor has no responsibility in accomplishing those conditions.

Agents of the permitting authority will periodically inspect the project for adherence to the permits.

The Contractor's attention is also directed to Articles 107-10 and 107-14 of the *Standard Specifications* and the following:

Should the Contractor propose to utilize construction methods (such as temporary structures or fill in waters and/or wetlands for haul roads, work platforms, cofferdams, etc.) not specifically identified in the permit (individual, general, or nationwide) authorizing the project it shall be the Contractor's responsibility to coordinate with the Engineer to determine what, if any, additional permit action is required. The Contractor shall also be responsible for initiating the request for the authorization of such construction method by the permitting agency. The request shall be submitted through the Engineer. The Contractor shall not utilize the construction method until it is approved by the permitting agency. The request normally takes approximately 60 days to process; however, no extensions of time or additional compensation will be granted for delays resulting from the Contractor's request for approval of construction methods not specifically identified in the permit.

**Where construction moratoriums are contained in a permit condition which restricts the Contractor's activities to certain times of the year, those moratoriums will apply only to the portions of the work taking place in the waters or wetlands provided that activities outside those areas is done in such a manner as to not affect the waters or wetlands.**

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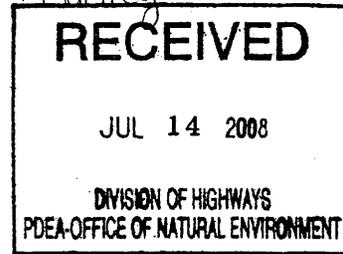


IN REPLY REFER TO

DEPARTMENT OF THE ARMY  
WILMINGTON DISTRICT, CORPS OF ENGINEERS

Washington Regulatory Field Office  
Post Office Box 1000  
Washington, North Carolina 27889-1000

July 10, 2008



Regulatory Division

Action ID. SAW 2008-00252

Gregory J. Thorpe, Ph.D.  
Environmental Manager Director  
Project Development and Environmental Analysis Branch  
N.C. Department of Transportation  
1548 Mail Service Center  
Raleigh, North Carolina 27699-1548

Dear Dr. Thorpe,

In accordance with your written request of January 6, 2008, and the ensuing administrative record, enclosed are two copies of a permit to relocate and widen approximately 20 miles of US Highway 70 Goldsboro Bypass (TIP R-2554), starting from Aulander Road (NCSR 1381) west of Goldsboro, in Wayne County and ending east of Promise Land Road (NCSR 1323) southwest of LaGrange, in Lenoir County, North Carolina.

You should acknowledge that you accept the terms and conditions of the enclosed permit by signing and dating each copy in the spaces provided ("Permittee" on page 3). Your signature, as permittee, indicates that, as consideration for the issuance of this permit, you voluntarily accept and agree to comply with all of the terms and conditions of this permit. All pages of both copies of the signed permit with drawings should then be returned to this office for final authorization. A self-addressed envelope is enclosed for your convenience.

This correspondence contains an initial proffered permit for the above described activity. If you object to this decision or the enclosed special conditions you may request that the District Commander reconsider his decision. Enclosed you will find a Notification of Appeal Process (NAP) fact sheet and request for appeal (RFA) form. If you request to appeal this decision you must submit a completed RFA form to the District Commander, Wilmington District Corps of Engineers at the following address:

Col. John E. Pulliam, Jr., District Commander  
US Army Corps of Engineers, Wilmington District  
Post Office Box 1890  
Wilmington, NC 28402-1890

In order for an RFA to be accepted by the Corps, the Corps must determine that it is complete and that it has been received by the District Office within 60 days of the date of the NAP. Should you decide to submit an RFA form, it must be received at the above address by September 8, 2008.

**\*\*It is not necessary to submit an RFA form to the District Office if you do not object to the decision in contained in this correspondence.\*\***

After the permit is authorized in this office, the original copy will be returned to you; the duplicate copy will be permanently retained in this office. If you have questions, please contact William Wescott at the Washington Regulatory Field Office, telephone 252-975-1616 ext. 31.

Sincerely,

A handwritten signature in black ink, appearing to read "David M. Lekson". The signature is fluid and cursive, with a long horizontal stroke at the end.

David M. Lekson, P.W.S.  
Chief, Washington Regulatory Field Office

Enclosures

X Perform work in or affecting navigable waters of the United States, upon recommendation of the Chief of Engineers, pursuant to SECTION 10 of the Rivers and Harbor Act of March 3, 1899

X Discharge dredged or fill material into waters of the United States upon the issuance of a permit from the Secretary of the Army acting through the Chief of Engineers pursuant to Section 404 of the Clean Water Act

    Transport dredged material for the purpose of dumping it into ocean waters upon the issuance of a permit from the Secretary of the Army acting through the Chief of Engineers pursuant to Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972

## DEPARTMENT OF THE ARMY PERMIT

Permittee **North Carolina Department of Transportation, Gregory J. Thorpe, Ph.D.**

Permit No. **SAW 2008-00252**

Issuing Office **CESAW-RG-W**

NOTE: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate district or division office of the Corps of Engineers having jurisdiction over the permitted activity or the appropriate official of that office acting under the authority of the commanding officer.

You are authorized to perform work in accordance with the terms and conditions specified below.

**Project Description:** The proposed T.I.P. project R-2554 involves constructing a divided multi-lane, full control of access freeway, interchanges at locations with major traffic movements, and grade separations at minor crossroads and railroads. The project is approximately 20 miles long and proposes to construct on new location US Highway 70 north of Goldsboro. The T.I.P. R-2554 project would permanently impact 27.62 acres of jurisdictional wetlands and 13,153 linear feet of stream. The project would temporarily impact 0.24 acres of jurisdictional wetlands and 488 linear feet of stream.

**Project Location:** This project involves the construction of a new US Highway 70 Goldsboro Bypass starting from Aulander Road (NCSR 1381) west of Goldsboro, in Wayne County and ending east of Promise Land Road (NCSR 1323) southwest of LaGrange, in Lenoir County, North Carolina .

**Permit Conditions:**

**General Conditions:**

1. The time limit for completing the work authorized ends on **December 31, 2013**. If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least one month before the above date is reached.
2. You must maintain the activity authorized by this permit in good condition and in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party in compliance with General Condition 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.
3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and state coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

4. If you sell the property associated with this permit, you must obtain the signature of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.
5. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit. For your convenience, a copy of the certification is attached if it contains such conditions.
6. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit,

Special Conditions:

**SEE ATTACHED SPECIAL CONDITIONS**

Further Information:

1. Congressional Authorities: You have been authorized to undertake the activity described above pursuant to:
  - ( X ) Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403).
  - ( X ) Section 404 of the Clean Water Act (33 U.S.C. 1344).
  - ( ) Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (33 U.S.C. 1413).
2. Limits of this authorization.
  - a. This permit does not obviate the need to obtain other Federal, state, or local authorizations required by law.
  - b. This permit does not grant any property rights or exclusive privileges.
  - c. This permit does not authorize any injury to the property or rights of others.
  - d. This permit does not authorize interference with any existing or proposed Federal project.
3. Limits of Federal Liability. In issuing this permit, the Federal Government does not assume any liability for the following:
  - a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.
  - b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United States in the public interest.
  - c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.
  - d. Design or construction deficiencies associated with the permitted work.

- e. Damage claims associated with any future modification, suspension, or revocation of this permit.
4. Reliance on Applicant's Data: The determination of this office that issuance of this permit is not contrary to the public interest was made in reliance on the information you provided.
5. Reevaluation of Permit Decision. This office may reevaluate its decision on this permit at any time the circumstances warrant. Circumstances that could require a reevaluation include, but are not limited to, the following:
- a. You fail to comply with the terms and conditions of this permit.
  - b. The information provided by you in support of your permit application proves to have been false, incomplete, or inaccurate (See 4 above).
  - c. Significant new information surfaces which this office did not consider in reaching the original public interest decision.

Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 CFR 325.7 or enforcement procedures such as those contained in 33 CFR 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring you to comply with the terms and conditions of your permit and for the initiation of legal action where appropriate. You will be required to pay for any corrective measures ordered by this office, and if you fail to comply with such directive, this office may in certain situations (such as those specified in 33 CFR 209.170) accomplish the corrective measures by contract or otherwise and bill you for the cost.

6. Extensions. General condition 1 establishes a time limit for the completion of the activity authorized by this permit, Unless there are circumstances requiring either a prompt completion of the authorized activity or a reevaluation of the public interest decision, the Corps will normally give favorable consideration to a request for an extension of this time limit.

Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

E. L. Lewis for Gregory Thorne, PhD July 14, 2008  
 (PERMITTEE) North Carolina Department of Transportation (DATE)

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

John E. Pulliam, Jr. 7/21/08  
 (DISTRICT ENGINEER) JOHN E. PULLIAM, JR., COLONEL (DATE)

When the structures or work authorized by this permit are still in existence at the time the property is transferred, the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. To validate the transfer of this permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below.

\_\_\_\_\_  
 (TRANSFeree) (DATE)

**SPECIAL CONDITIONS (Action ID. SAW 2008-00252; NCDOT/TIP R-2554)**

## COMPLIANCE WITH PLANS

- a) This authorization is only for R-2554 section BA. Construction on R-2554 sections A, BB and C shall not commence until final designs have been completed and plans have been approved by the District Engineer.
- b) All work must be performed in strict compliance with the attached plans, which are a part of this permit. Any modification to the permit plans must be approved by the USACE prior to implementation.

## ACTIVITIES NOT AUTHORIZED

- c) Except as authorized by this permit or any USACE approved modification to this permit, no excavation, fill, or mechanized land-clearing activities shall take place at any time in the construction or maintenance of this project, within waters or wetlands, nor shall any activities take place that cause the degradation of waters or wetlands. In addition, except as specified in the plans attached to this permit, no excavation, fill or mechanized land-clearing activities shall take place at any time in the construction or maintenance of this project, in such a manner as to impair normal flows and circulation patterns within, into, or out of waters or wetlands or to reduce the reach of waters or wetlands.

This permit does not authorize temporary placement or double handling of excavated or fill material within jurisdictional waters, including wetlands, outside the permitted area. Additionally, no construction materials or equipment will be placed or stored within jurisdictional waters, including wetlands.

## CONSTRUCTION PLANS

- d) The Permittee will ensure that the construction design plans for this project do not deviate from the permit plans attached to this authorization. Written verification shall be provided that the final construction drawings comply with the attached permit drawings prior to any active construction in waters of the United States, including wetlands. Any deviation in the construction design plans will be brought to the attention of the Corps of Engineers, Washington Regulatory Field Office prior to any active construction in waters or wetlands.
- e) Prior to commencing construction within jurisdictional waters of the United States for any portion of the proposed project, the Permittee shall forward the latest version of project construction drawings to the Corps of Engineers, Washington Regulatory Field Office NCDOT Regulatory Project Manager. Half-size drawings will be acceptable.

## POLLUTION SPILLS

- f) All mechanized equipment will be regularly inspected and maintained to prevent contamination of waters and wetlands from fuels, lubricants, hydraulic fluids, or other toxic materials. No equipment staging or storage of construction material will occur in wetlands. Hydro-seeding equipment will not be discharged or washed out into any surface waters or wetlands. In the event of a spill of petroleum products or any other hazardous waste, the Permittee shall immediately report it to the N.C. Division of Water Quality at (919) 733-5083 or (800) 662-7956 and provisions of the North Carolina Oil Pollution and Hazardous Substances Control Act will be followed.

## NOTIFICATION

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g) The Permittee shall advise the Corps in writing at least two weeks prior to beginning the work authorized by this permit and again upon completion of the work authorized by this permit.

## CLEAN FILL MATERIAL

h) Unless otherwise authorized by this permit, all fill material placed in waters or wetlands shall be generated from an upland source and will be clean and free of any pollutants except in trace quantities. Metal products, organic materials (including debris from land clearing activities), or unsightly debris will not be used.

## CONTRACTOR COMPLIANCE

i) The Permittee shall require its contractors and/or agents to comply with the terms and conditions of this permit in the construction and maintenance of this project, and shall provide each of its contractors and/or agents associated with the construction or maintenance of this project with a copy of this permit, and any authorized modifications. A copy of this permit, and any authorized modifications, including all conditions, shall be available at the project site during construction and maintenance of this project.

## SEDIMENTATION AND EROSION CONTROL MEASURES

j) The Permittee shall use appropriate sediment and erosion control practices which equal or exceed those outlined in the most recent version of the "North Carolina Sediment and Erosion Control Planning and Design Manual" to assure compliance with the appropriate turbidity water quality standard. Erosion and sediment control practices must be in full compliance with all specifications governing the proper design, installation and operation and maintenance of such Best Management Practices in order to assure compliance with the appropriate turbidity water quality standards. Additionally, the project must remain in full compliance with all aspects of the Sedimentation Pollution Control Act of 1973 (North Carolina General Statutes Chapter 113A Article 4).

Adequate sedimentation and erosion control measures must be implemented prior to any ground disturbing activities to minimize impacts to aquatic resources. These measures must be inspected and maintained regularly, especially following rainfall events. All fill material must be adequately stabilized at the earliest practicable date to prevent sediment from entering into adjacent waters or wetlands.

The Permittee shall remove all sediment and erosion control measures placed in wetlands or waters, and shall restore natural grades in those areas, prior to project completion.

No fill or excavation for the purposes of sedimentation and erosion control shall occur within jurisdictional waters, including wetlands, unless it is included on the plan drawings and specifically authorized by this permit.

## REPORTING OF VIOLATIONS

k) The Permittee will report any violation of these conditions or violations of Section 404 of the Clean Water Act or Section 10 of the Rivers and Harbors Act in writing to the Corps of Engineers, Washington Regulatory Field Office NCDOT Regulatory Project Manager, within 24 hours of the Permittee's discovery of the violation.

## COMPLIANCE WITH SPECIAL CONDITIONS

l) Failure to institute and carry out the details of these special conditions, will result in a directive to cease all ongoing and permitted work within waters and/or wetlands associated with the permitted project, or such other remedies and/or fines as the District Engineer or his authorized representatives may seek.

## PRECONSTRUCTION MEETING

- \* m) The Permittee shall schedule a preconstruction meeting between its representatives, the contractor's representatives, and the Corps of Engineers, Washington Regulatory Field Office, NCDOT Regulatory Project Manager, prior to any work within jurisdictional waters and wetlands to ensure that there is a mutual understanding of all of the terms and conditions contained within this Department of the Army Permit. The Permittee shall provide the Corps of Engineers, Washington Regulatory Field Office, NCDOT Regulatory Project Manager, with a copy of the final plans at least two weeks prior to the preconstruction meeting along with a description of any changes that have been made to the project's design, construction methodology or construction timeframe. The Permittee shall schedule the preconstruction meeting for a time when the Corps of Engineers and North Carolina Division of Water Quality (NCDWQ) Project Managers can attend. The Permittee shall invite the Corps and NCDWQ Project Managers a minimum of thirty (30) days in advance of the scheduled meeting in order to provide those individuals with ample opportunity to schedule and participate in the required meeting.

## BORROW AND WASTE

n) To ensure that all borrow and waste activities occur on high ground and do not result in the degradation of adjacent wetlands and streams, except as authorized by this permit, the Permittee shall require its contractors and/or agents to identify all areas to be used to borrow material, or to dispose of dredged, fill, or waste material. The Permittee shall provide the Corps of Engineers with appropriate maps indicating the locations of proposed borrow or waste sites as soon as the Permittee has that information. The Permittee will coordinate with the Corps of Engineers before approving any borrow or waste sites that are within 400 feet of any streams or wetlands. All jurisdictional wetland boundaries on borrow and waste sites shall be verified by the Corps of Engineers and shown on the approved reclamation plans. The Permittee shall ensure that all such areas comply with Special Condition b) of this permit, and shall require and maintain documentation of the location and characteristics of all borrow and disposal sites associated with this project. This information will include data regarding soils, vegetation and hydrology sufficient to clearly demonstrate compliance with the Special Condition b). All information will be available to the Corps of Engineers upon request. NCDOT shall require its contractors to complete and execute reclamation plans for each waste and borrow site and provide written documentation that the reclamation plans have been implemented and all work is completed. This documentation will be provided to the Corps of Engineers within 30 days of the completion of the reclamation work.

## MITIGATION

o) Compensatory mitigation for the unavoidable impacts to 27.62 acres of wetlands and 13,153 linear feet of streams associated with the proposed project shall be provided as outlined in the permit application and drawings with the following modifications.

- R-2554 C directly impacts Bear Creek-Mill Branch Mitigation Bank (Bank). The mitigation banking instrument, conservation easement and available credits for the Bank shall be modified to reflect the impacts resulting from R-2554 C prior to the authorization of Sections A, BB or C.
- Stream mitigation sites and wetland mitigation sites shall be monitored annually for five years or until

success criteria are satisfied, whichever is longer.

- Vegetation success shall be achieved by documenting the survival of 320, 3-year old planted stems/acre at year three (3) and 260, 5-year old planted stems/acre at year five (5).
- For wetland mitigation Site 8, hydrologic success shall be achieved by documenting the inundation or saturation of the soils within 12 inches of the ground surface for at least 12.5 percent of the growing season.



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Michael F. Easley, Governor  
William G. Ross Jr., Secretary  
North Carolina Department of Environment and Natural Resources

Coleen Sullins, Director  
Division of Water Quality

*manley*

RECEIVED

May 16, 2008

Dr. Greg Thorpe, PhD., Manager  
Planning and Environmental Branch  
North Carolina Department of Transportation  
1548 Mail Service Center  
Raleigh, North Carolina, 27699-1548

MAY 22 2008

DIVISION OF HIGHWAYS  
PDEA-OFFICE OF NATURAL ENVIRONMENT

Subject: 401 Water Quality Certification Pursuant to Section 401 of the Federal Clean Water Act and NEUSE BUFFER RULES, with ADDITIONAL CONDITIONS for Proposed construction of US 70 Goldsboro Bypass in Wayne and Lenoir Counties, Federal Aid Project No. F-56-2(28), State Project No. 8.T330801, TIP No. R-2554, DWQ Project No. 20080570.

Dear Dr. Thorpe:

Attached hereto is a copy of Certification No. 3740 issued to The North Carolina Department of Transportation dated May 16, 2008.

If we can be of further assistance, do not hesitate to contact us.

Sincerely,

Coleen Sullins,  
Director

Attachments

cc: William Wescott, US Army Corps of Engineers, Washington Field Office  
Chris Manley, NCDOT NEU  
Chad Coggins, Division 4 Environmental Officer  
Jay Johnson, Division 2 Environmental Officer  
Kathy Matthews, Environmental Protection Agency  
Travis Wilson, NC Wildlife Resources Commission  
Beth Harmon, Ecosystem Enhancement Program  
DWQ Washington Regional Office  
File Copy



**401 Water Quality Certification Pursuant to Section 401 of the Federal Clean Water Act and NEUSE  
BUFFER RULES, with ADDITIONAL CONDITIONS**

**THIS CERTIFICATION** is issued in conformity with the requirements of Section 401 Public Laws 92-500 and 95-217 of the United States and subject to the North Carolina Division of Water Quality (DWQ) Regulations in 15 NCAC 2H .0500 and 15A NCAC 2B.0233. This certification authorizes the NCDOT to impact 31.42 acres of jurisdictional wetlands, 13,640 linear feet of jurisdictional streams and 1,622,079 square feet of protected riparian buffers in Wayne and Lenoir Counties. The project shall be constructed pursuant to the application dated received March 28, 2008. The authorized impacts are as described below:

**Section BA Stream Impacts in the Neuse River Basin**

Site	Permanent Fill in Intermittent Stream (linear ft)	Temporary Fill in Intermittent Stream (linear ft)	Permanent Fill in Perennial Stream (linear ft)	Temporary Fill in Perennial Stream (linear ft)	Total Stream Impact (linear ft)	Stream Impacts Requiring Mitigation (linear ft)
1	0	0	142	22	164	142
2	0	0	24	22	46	24
3	0	0	1048	31	1079	1048
4	115	0	1058	84	1257	1058
5	0	0	541	34	575	541
8	0	0	0	30	30	0
11	0	0	831	20	851	831
14	0	0	128	11	139	128
<b>Total</b>	<b>115</b>	<b>0</b>	<b>3772</b>	<b>254</b>	<b>4141</b>	<b>3772</b>

**Total Stream Impact for Section BA: 4,141 linear feet**

**Preliminary Section A Stream Impacts in the Neuse River Basin\***

Site	Permanent Fill in (Perennial)* Stream (linear ft)	Temporary Fill in (Perennial)* Stream (linear ft)	Total Stream Impact (linear ft)	Stream Impacts Requiring Mitigation* (linear ft)
1	246	0	246	246
3	276	0	276	276
4	204	0	204	204
5	223	0	223	223
<b>Total</b>	<b>949</b>	<b>0</b>	<b>949</b>	<b>949</b>

**Total Preliminary Stream Impact for Section A: 949 linear feet**

*\*Phased Project: impacts for this section are preliminary and will be modified (including possible temporary impacts and mitigation adjustments) in future certifications prior to construction of this section. For purposes of these preliminary impact calculations, all stream impacts will be assumed to be Perennial and cumulative, and thus require mitigation by DWQ, until applicant specifies otherwise in the final calculations for the modification.*



**Preliminary Section BB Stream Impacts in the Neuse River Basin\***

Site	Permanent Fill in (Perennial)* Stream (linear ft)	Temporary Fill in (Perennial)* Stream (linear ft)	Total Stream Impact (linear ft)	Stream Impacts Requiring Mitigation* (linear ft)
3	1149	55	1204	1149
4	952	48	1000	952
9	1556	90	1646	1556
10	19	10	29	19
12	133	20	153	133
13	92	10	102	92
<b>Total</b>	<b>3901</b>	<b>233</b>	<b>4134</b>	<b>3901</b>

**Total Preliminary Stream Impact for Section BB: 4,134 linear feet**

*\*Phased Project: impacts for this section are preliminary and will be modified (including possible temporary impacts and mitigation adjustments) in future certifications prior to construction of this section. For purposes of these preliminary impact calculations, all stream impacts will be assumed to be Perennial and cumulative, and thus require mitigation by DWQ, until applicant specifies otherwise in the final calculations for the modification.*

**Preliminary Section C Stream Impacts in the Neuse River Basin\***

Site	Permanent Fill in (Perennial)* Stream (linear ft)	Temporary Fill in (Perennial)* Stream (linear ft)	Total Stream Impact (linear ft)	Stream Impacts Requiring Mitigation* (linear ft)
1	1395	0	1395	1395
3	660	0	660	660
4	378	0	378	378
5	328	0	328	328
10	338	0	338	338
11	427	0	427	427
12	483	0	483	483
14	407	0	407	407
<b>Total</b>	<b>4416</b>	<b>0</b>	<b>4416</b>	<b>4416</b>

**Total Preliminary Stream Impact for Section C: 4,416 linear feet**

*\*Phased Project: impacts for this section are preliminary and will be modified (including possible temporary impacts and mitigation adjustments) in future certifications prior to construction of this section. For purposes of these preliminary impact calculations, all stream impacts will be assumed to be Perennial and cumulative, and thus require mitigation by DWQ, until applicant specifies otherwise in the final calculations for the modification.*

**Section BA Wetland Impacts in the Neuse River Basin**

Site	Fill (ac)	Fill (temporary) (ac)	Mechanized Clearing (ac)	Hand Clearing (ac)	Total Wetland Impact (ac)	Wetland Impacts Requiring Mitigation (ac)
3	1.57	0	0.07	0	1.64	1.64
5	0.06	0	0.01	0	0.07	0.07
6	0	0	0.03	0	0.03	0.03
7	0	0	0.01	0.72	0.73	0.01
8	0	0	0	0.04	0.04	0
9	0.12	0	0.03	1.42	1.57	0.15
10	2.65	0	0.31	0	2.96	2.96
11	0.10	0	0.03	0	0.13	0.13
12	0.75	0	0.04	0	0.79	0.79
<b>Total</b>	<b>5.25</b>	<b>0</b>	<b>0.53</b>	<b>2.18</b>	<b>7.96</b>	<b>5.78</b>

**Total Wetland Impact for Section BA: 7.96 acres.**



**Preliminary Section A Wetland Impacts in the Neuse River Basin \***

Site	Fill (ac)	Fill (temporary) (ac)	Mechanized Clearing (ac)	Hand Clearing (ac)	Total Wetland Impact (ac)	Wetland Impacts Requiring Mitigation (ac)
1	0.85	0	0.10	0	0.95	0.95
2	0.14	0	0.04	0	0.18	0.18
3	0.10	0	0.02	0	0.12	0.12
4	0.62	0	0.04	0	0.66	0.66
5	0.18	0	0.02	0	0.20	0.20
6	0	0	0	0.95	0.95	0
7	0.04	0	0.04	0	0.08	0.08
8	0	0.24	0.06	0	0.30	0.06
<b>Total</b>	<b>1.93</b>	<b>0.24</b>	<b>0.32</b>	<b>0.95</b>	<b>3.44</b>	<b>2.25</b>

**Total Preliminary Wetland Impact for Section A: 3.44 acres.**

*\*Phased Project: impacts for this section are preliminary and will be modified (including possible temporary impacts and mitigation adjustments) in future certifications prior to construction of this section.*

**Preliminary Section BB Wetland Impacts in the Neuse River Basin \***

Site	Fill (ac)	Fill (temporary) (ac)	Mechanized Clearing (ac)	Hand Clearing (ac)	Total Wetland Impact (ac)	Wetland Impacts Requiring Mitigation (ac)
1	0	0	0	0.44	0.44	0
6	0.16	0	0	0	0.16	0.16
7	0.20	0	0.06	0	0.26	0.26
10	0	0	0.02	0	0.02	0.02
<b>Total</b>	<b>0.36</b>	<b>0</b>	<b>0.08</b>	<b>0.44</b>	<b>0.88</b>	<b>0.44</b>

**Total Preliminary Wetland Impact for Section BB: 0.88 acres.**

*\*Phased Project: impacts for this section are preliminary and will be modified (including possible temporary impacts and mitigation adjustments) in future certifications prior to construction of this section.*

**Preliminary Section C Wetland Impacts in the Neuse River Basin \***

Site	Fill (ac)	Fill (temporary) (ac)	Excavation (ac)	Mechanized Clearing (ac)	Total Wetland Impact (ac)	Wetland Impacts Requiring Mitigation (ac)
4	0.30	0	0	0	0.30	0.30
6	1.71	0	0	0.10	1.81	1.81
7	3.09	0	0	0.25	3.34	3.34
8	0.22	0	0.01	0.06	0.29	0.29
9	1.97	0	0	0.13	2.10	2.10
10	1.09	0	0	0.14	1.23	1.23
11	1.66	0	0	0.18	1.84	1.84
12	4.65	0	0	0.55	5.20	5.20
13	0.62	0	0	0.22	0.84	0.84
14	2.03	0	0	0.16	2.19	2.19
<b>Total</b>	<b>17.34</b>	<b>0</b>	<b>0.01</b>	<b>1.79</b>	<b>19.14</b>	<b>19.14</b>

**Total Preliminary Wetland Impact for Section C: 19.14 acres.**

*\*Phased Project: impacts for this section are preliminary and will be modified (including possible temporary impacts and mitigation adjustments) in future certifications prior to construction of this section.*



**Section BA Neuse Riparian Buffer Impacts**

Site	Zone 1 Impact (sq ft)	minus Wetlands in Zone 1 (sq ft)	= Zone 1 Buffers (not wetlands) (sq ft)	Zone 1 Buffer Impacts Requiring Mitigation (sq ft)	Zone 2 Impact (sq ft)	minus Wetlands in Zone 2 (sq ft)	= Zone 2 Buffers (not wetlands) (sq ft)	Zone 2 Buffer Impacts Requiring Mitigation (sq ft)
1	9909	0	9909	9909	5820	0	5820	5820
2	2671	0	2671	0	1639	0	1639	0
3	60642	37903	22739	22739	37274	15780	21494	21494
4	68271	0	68271	68271	42177	0	42177	42177
5	131027	2569	128458	128458	89077	539	88538	88538
7	9396	6745	2651	0	7149	1392	5757	0
8	1929	706	1223	0	555	250	305	0
9	8763	5785	2978	0	5887	2796	3091	0
11	51025	2398	48627	48627	32871	1224	31647	31647
13	5490	0	5490	5490	4512	0	4512	4512
14	7383	0	7383	0	4875	0	4875	0
<b>Totals</b>	<b>356506</b>	<b>56106</b>	<b>300400</b>	<b>283494</b>	<b>231836</b>	<b>21981</b>	<b>209855</b>	<b>194188</b>

Total Buffer Impact for Section BA: 588,342 square feet.

**Section BA Neuse Buffer Onsite Restoration**

Site	Zone 1 Restoration (sq ft)	Zone 2 Restoration (sq ft)	Total Buffer Restoration (sq ft)
4	59609	35530	95139
5	34199	21760	55959
8	4459	3333	7792
<b>Totals</b>	<b>98267</b>	<b>60623</b>	<b>158890</b>

**Section BA Remaining Buffer Mitigation Requirements**

Zone	Buffer Impacts Requiring Mitigation (sq ft)	Minus Onsite Buffer Restoration (sq ft)	= Buffer Impacts Using Offsite Mitigation (sq ft)	Times Multiplier	= Offsite Buffer Mitigation Requirements (sq ft)
1	283494	98267	185227	3	555681
2	194188	60623	133565	1.5	200348
<b>Total</b>	<b>477682</b>	<b>158890</b>	<b>318792</b>		<b>756029</b>



**Preliminary Section A Neuse Riparian Buffer Impacts\***

Site	Zone 1 Impact (sq ft)	minus Wetlands in Zone 1 (sq ft)	= Zone 1 Buffers (not wetlands) (sq ft)	Zone 1 Buffer Impacts Requiring Mitigation (sq ft)	Zone 2 Impact (sq ft)	minus Wetlands in Zone 2 (sq ft)	= Zone 2 Buffers (not wetlands) (sq ft)	Zone 2 Buffer Impacts Requiring Mitigation (sq ft)
1	15048	9690	5358	5358	9871	4973	4898	4898
2	9160	5468	3692	3692	6146	1281	4865	4865
3	12335	7987	4348	4348	7955	4036	3919	3919
4	10054	0	10054	0	6631	0	6631	0
5	10613	0	10613	0	3746	0	3746	0
<b>Totals</b>	<b>57210</b>	<b>23145</b>	<b>34065</b>	<b>13398</b>	<b>34349</b>	<b>10290</b>	<b>24059</b>	<b>13682</b>

**Total Preliminary Buffer Impact for Section A: 91,559 square feet.**

*\*Phased Project: impacts for this section are preliminary and will be modified (including possible temporary impacts and mitigation adjustments) in future certifications prior to construction of this section.*

**Preliminary Section A Buffer Mitigation Requirements\***

Zone	Buffer Impacts Requiring Mitigation (sq ft)	Minus Onsite Buffer Restoration (sq ft)	= Buffer Impacts Using Offsite Mitigation (sq ft)	Times Multiplier	= Offsite Buffer Mitigation Requirements (sq ft)
1	13398	0	13398	3	40194
2	13682	0	13682	1.5	20523
<b>Total</b>	<b>27080</b>	<b>0</b>	<b>27080</b>		<b>60714</b>

**Preliminary Section BB Neuse Riparian Buffer Impacts\***

Site	Zone 1 Impact (sq ft)	minus Wetlands in Zone 1 (sq ft)	= Zone 1 Buffers (not wetlands) (sq ft)	Zone 1 Buffer Impacts Requiring Mitigation (sq ft)	Zone 2 Impact (sq ft)	minus Wetlands in Zone 2 (sq ft)	= Zone 2 Buffers (not wetlands) (sq ft)	Zone 2 Buffer Impacts Requiring Mitigation (sq ft)
1	10728	0	10728	0	7354	0	7354	0
2	16252	0	16252	16252	10102	0	10102	10102
3	70928	0	70928	70928	48382	0	48382	48382
4	53102	0	53102	53102	30716	0	30716	30716
5	7000	0	7000	0	4409	0	4409	0
8	29446	0	29446	29446	20993	0	20993	20993
9	74010	0	74010	74010	50947	0	50947	50947
10	18562	805	17757	17757	13332	0	13332	13332
11	1381	0	1381	0	901	0	901	0
12	8966	0	8966	8966	5054	0	5054	5054
13	5892	0	5892	0	3597	0	3597	0
<b>Totals</b>	<b>296267</b>	<b>805</b>	<b>295462</b>	<b>270461</b>	<b>195787</b>	<b>0</b>	<b>195787</b>	<b>179526</b>

**Total Preliminary Buffer Impact for Section BB: 492,054 square feet.**

*\*Phased Project: impacts for this section are preliminary and will be modified (including possible temporary impacts and mitigation adjustments) in future certifications prior to construction of this section.*



**Section BB Neuse Buffer Onsite Restoration\***

Site	Zone 1 Restoration (sq ft)	Zone 2 Restoration (sq ft)	Total Buffer Restoration (sq ft)
9	74108	46713	120821
<b>Totals</b>	<b>74108</b>	<b>46713</b>	<b>120821</b>

**Preliminary Section BB Remaining Buffer Mitigation Requirements\***

Zone	Buffer Impacts Requiring Mitigation (sq ft)	Minus Onsite Buffer Restoration (sq ft)	= Buffer Impacts Using Offsite Mitigation (sq ft)	Times Multiplier	= Offsite Buffer Mitigation Requirements (sq ft)
1	270461	74108	196353	3	589059
2	179526	46713	132813	1.5	199220
<b>Total</b>	<b>449987</b>	<b>120821</b>	<b>329166</b>		<b>788279</b>

**Preliminary Section C Neuse Riparian Buffer Impacts\***

Site	Zone 1 Impact (sq ft)	minus Wetlands in Zone 1 (sq ft)	= Zone 1 Buffers (not wetlands) (sq ft)	Zone 1 Buffer Impacts Requiring Mitigation (sq ft)	Zone 2 Impact (sq ft)	minus Wetlands in Zone 2 (sq ft)	= Zone 2 Buffers (not wetlands) (sq ft)	Zone 2 Buffer Impacts Requiring Mitigation (sq ft)
1	85786	0	85786	85786	34248	0	34248	34248
2	40922	0	40922	40922	26910	0	26910	26910
3	37580	6129	31451	14635	26288	0	26288	13770
4	21036	0	21036	21036	12116	0	12116	12116
5	20328	20328	0	0	12951	12360	591	591
6	25438	12401	13037	13037	17377	8424	8953	8953
7	29006	7158	21848	21848	18411	4429	13982	13982
8	27808	23507	4301	4301	13919	11729	2190	2190
<b>Totals</b>	<b>287904</b>	<b>69523</b>	<b>218381</b>	<b>201565</b>	<b>162220</b>	<b>36942</b>	<b>125278</b>	<b>112760</b>

**Total Preliminary Buffer Impact for Section C: 450,124 square feet.**

*\*Phased Project: impacts for this section are preliminary and will be modified (including possible temporary impacts and mitigation adjustments) in future certifications prior to construction of this section.*

**Section C Neuse Buffer Onsite Restoration**

Site	Zone 1 Restoration (sq ft)	Zone 2 Restoration (sq ft)	Total Buffer Restoration (sq ft)
3	73181	48787	121968
<b>Totals</b>	<b>73181</b>	<b>48787</b>	<b>121968</b>

**Preliminary Section C Remaining Buffer Mitigation Requirements\***

Zone	Buffer Impacts Requiring Mitigation (sq ft)	Minus Onsite Buffer Restoration (sq ft)	= Buffer Impacts Using Offsite Mitigation (sq ft)	Times Multiplier	= Offsite Buffer Mitigation Requirements (sq ft)
1	201565	73181	128384	3	385152
2	112760	48787	63973	1.5	95960
<b>Total</b>	<b>314325</b>	<b>121968</b>	<b>192357</b>		<b>481112</b>



The application provides adequate assurance that the discharge of fill material into the waters of the Neuse River Basin in conjunction with the proposed development will not result in a violation of applicable Water Quality Standards and discharge guidelines. Therefore, the State of North Carolina certifies that this activity will not violate the applicable portions of Sections 301, 302, 303, 306, 307 of PL 92-500 and PL 95-217 if conducted in accordance with the application and conditions hereinafter set forth.

This approval is only valid for the purpose and design that you submitted in your application dated received March 28, 2008. Should your project change, you are required to notify the DWQ and submit a new application. If the property is sold, the new owner must be given a copy of this Certification and approval letter, and is thereby responsible for complying with all the conditions. If any additional wetland impacts, or stream impacts, for this project (now or in the future) exceed one acre or 150 linear feet, respectively, additional compensatory mitigation may be required as described in 15A NCAC 2H .0506 (h) (6) and (7). For this approval to remain valid, you are required to comply with all the conditions listed below. In addition, you should obtain all other federal, state or local permits before proceeding with your project including (but not limited to) Sediment and Erosion control, Coastal Stormwater, Non-discharge and Water Supply watershed regulations. This Certification shall expire on the same day as the expiration date of the corresponding Corps of Engineers Permit.

**Conditions of Certification:**

1. When final design plans are completed for R-2554 Sections A, BB, and C, a modification to the 401 Water Quality Certification and the Neuse River Riparian Buffer Authorization shall be submitted with applicable fees to the NC Division of Water Quality. Final designs shall reflect all appropriate avoidance, minimization, and mitigation for impacts to wetlands, streams, surface waters, and buffers. No construction activities that impact any wetlands, streams, surface waters, or buffers located in R-2554 Sections A, BB, and C shall begin until after the permittee applies for, and receives a written modification of the 401 Water Quality Certification and the Neuse River Riparian Buffer Authorization from the NC Division of Water Quality.
2. Compensatory mitigation for impacts to 13,038 linear feet of streams is required. As stated in your application, compensatory mitigation for impacts to jurisdictional streams shall be provided by 12,900 linear feet of onsite stream restorations plus 691 feet of onsite stream preservation. The stream mitigations will occur as follows:

Section	Site	Restoration (linear feet)	Preservation (linear feet)
A	Claridge Nursery	8716	0
BA	4	1083	0
BA	5	561	0
BA	8	61	691
BB	9	1236	0
C	UT West Bear Creek	1243	0
<b>Totals</b>	-	<b>12,900</b>	<b>691</b>

The onsite stream relocations shall be constructed in accordance with the design submitted in your March 28, 2008 application. Please be reminded that as-builts for the completed streams shall be submitted to the North Carolina Division of Water Quality 401 Wetlands Unit with the as-builts for the rest of the project. If the parameters of this condition are not met, then the permittee shall supply additional stream mitigation for these impacts. All channel relocations will be constructed in a dry work area, will be completed and stabilized, and must be approved on site by DWQ staff, prior to diverting water into the new channel. Whenever possible, channel relocations shall be allowed to stabilize for an entire growing season. All stream relocations and restorations shall have a 50-foot wide native wooded buffer planted on both sides of the stream unless otherwise authorized by this Certification. A transitional phase incorporating rolled erosion control product (RECP) and appropriate temporary ground cover is allowable.



3. The stream mitigation site shall be monitored annually for five years or until success criteria are satisfied. Monitoring protocols shall follow the Monitoring Level I outlined in the Stream Mitigation Guidelines, April 2003.
4. Compensatory mitigation for impacts to 27.61 acres of wetlands is required. As stated in your application, compensatory mitigation for these wetlands shall be provided by 27.17 acres of onsite wetland restoration plus 2.37 acres of onsite wetland preservation. The wetland mitigations will occur as follows:
  - a.) Section BA: 0.37 acres of wetland restoration at Site 8; and 2.37 acres of wetland preservation at Site 8.
  - b.) Section C: 26.84 acres of wetland restoration at Site 12.The permittee shall comply with the on-site wetland mitigation plan submitted with the application on March 28, 2008.
5. For the onsite wetland mitigation sites, the permittee shall plant 680 stems/acre. Vegetation success shall be measured by survivability over a 5-year monitoring period. Survivability will be based on 320 stems/acre after three (3) years and 260 stems after five (5) years. A survey of vegetation during the growing season shall be conducted annually over the five-year monitoring period and submitted to the NC Division of Water Quality. If the surviving vegetation densities are below the required thresholds after the five-year monitoring period, the site may still be declared successful at the discretion of and with written approval from the NC Division of Water Quality.
6. For the onsite wetland mitigation sites, hydrologic success of the sites will be attained by restoration of a hydrologic regime that results in inundation or saturation of the soils within 12 inches of the ground surface for at least 12.5 percent of the growing season. The hydrologic monitoring shall persist for a total of five (5) years. After the five-year monitoring period, if the monitoring requirements are not met, the site may still be declared successful at the discretion of and with written approval from the NC Division of Water Quality.
7. Compensatory mitigation for impacts to 768,918 square feet of protected riparian buffers in Zone 1 and 500,156 square feet of protected riparian buffers in Zone 2 shall be required. As stated in your applications compensatory mitigation for these riparian buffers shall be provided partially by onsite buffer restorations listed in the impact tables above. These onsite restorations will mitigate for 245,556 square feet of Zone 1 and 156,123 square feet of Zone 2 impacts. In accordance with 15A NCAC 02B.0242(9) riparian vegetation reestablishment shall include a minimum of at least 2 native hardwood tree species planted at a density sufficient to provide 320 trees per acre at maturity. The mitigation area shall be placed under a perpetual conservation easement that will provide for protection of the property's nutrient removal efficiencies.
8. Using a 3:1 ratio for Zone 1 Buffer impacts and a 1.5:1 ration for Zone 2 Buffer impacts, the remaining mitigation requirements for this project is 2,086,134 square feet of Neuse Riparian Buffer. As stated in your application, 1,393,920 square feet of buffer restoration will be used from the Claridge Nursery Stream Mitigation Site.
9. For the remaining 692,214 square feet of Neuse Buffer Mitigation required, we understand that you have chosen use of the North Carolina Ecosystem Enhancement Program (EEP). Mitigation for unavoidable impacts to Neuse Riparian Buffers shall be provided in the Neuse River Basin and done in accordance with 15A NCAC 2B.0233. EEP has indicated in a letter dated April 9, 2008 that they will assume responsibility for satisfying the compensatory mitigation requirements for the above-referenced project, in accordance with the Tri-Party MOA signed on July 22, 2003 and the Dual-Party MOA signed on April 12, 2004.
10. For the onsite buffer mitigation sites, the permittee shall monitor the sites. An annual report shall be submitted to the DWQ for a period of 5 years showing monitoring results, survival rate/ success of tree and vegetation establishment, and that diffuse flow through the riparian buffer has been maintained. The first annual report shall be submitted within one year of final planting. Failure to achieve a buffer density of 320 trees per acre after 5 years will require the annual report to provide appropriate remedial actions to be implemented and a schedule for implementation. Approval of the final annual report, and a formal "close out" of the mitigation site by the DWQ is required.



- \* 11. A copy of the final construction drawings shall be furnished to NCDWQ Central Office prior to the pre-construction meeting. The permittee shall provide written verification that the final construction drawings comply with the permit drawings contained in the application dated March 28, 2008. Any deviations from the approved drawings are not authorized unless approved by the NC Division of Water Quality.
12. The post-construction removal of any temporary bridge structures must return the project site to its preconstruction contours and elevations. The impacted areas shall be revegetated with appropriate native species.
13. Bridge deck drains shall not discharge directly into the stream. Stormwater shall be directed across the bridge and pre-treated through site-appropriate means (grassed swales, pre-formed scour holes, vegetated buffers, etc.) before entering the stream. Please refer to the most current version of *Stormwater Best Management Practices*.
14. Placement of culverts and other structures in waters, streams, and wetlands shall be placed below the elevation of the streambed by one foot for all culverts with a diameter greater than 48 inches, and 20 percent of the culvert diameter for culverts having a diameter less than 48 inches, to allow low flow passage of water and aquatic life. Design and placement of culverts and other structures including temporary erosion control measures shall not be conducted in a manner that may result in dis-equilibrium of wetlands or streambeds or banks, adjacent to or upstream and down stream of the above structures. The applicant is required to provide evidence that the equilibrium is being maintained if requested in writing by DWQ. If this condition is unable to be met due to bedrock or other limiting features encountered during construction, please contact the NC DWQ for guidance on how to proceed and to determine whether or not a permit modification will be required.
15. If multiple pipes or barrels are required, they shall be designed to mimic natural stream cross section as closely as possible including pipes or barrels at flood plain elevation and/or sills where appropriate. Widening the stream channel should be avoided. Stream channel widening at the inlet or outlet end of structures typically decreases water velocity causing sediment deposition that requires increased maintenance and disrupts aquatic life passage.
16. Riprap shall not be placed in the active thalweg channel or placed in the streambed in a manner that precludes aquatic life passage. Bioengineering boulders or structures should be properly designed, sized and installed.
17. For all streams being impacted due to site dewatering activities, the site shall be graded to its preconstruction contours and revegetated with appropriate native species.
18. All stormwater runoff shall be directed as sheetflow through stream buffers at nonerosive velocities, unless otherwise approved by this certification.
19. All riparian buffers impacted by the placement of temporary fill or clearing activities shall be restored to the preconstruction contours and revegetated. Maintained buffers shall be permanently revegetated with non-woody species by the end of the growing season following completion of construction. For the purpose of this condition, maintained buffer areas are defined as areas within the transportation corridor that will be subject to regular DOT maintenance activities including mowing. The area with non-maintained buffers shall be permanently revegetated, with native woody species before the next growing season following completion of construction.
20. Pursuant to NCAC15A 2B.0233(6), sediment and erosion control devices shall not be placed in Zone 1 of any Neuse Buffer without prior approval by the NCDWQ. At this time, the NCDWQ has approved no sediment and erosion control devices in Zone 1, outside of the approved project impacts, anywhere on this project. Moreover, sediment and erosion control devices shall be allowed in Zone 2 of the buffers provided that Zone 1 is not compromised and that discharge is released as diffuse flow.
21. If concrete is used during construction, a dry work area shall be maintained to prevent direct contact between curing concrete and stream water. Water that inadvertently contacts uncured concrete shall not be discharged to surface waters due to the potential for elevated pH and possible aquatic life and fish kills.



22. During the construction of the project, no staging of equipment of any kind is permitted in waters of the U.S., or protected riparian buffers.
23. The dimension, pattern and profile of the stream above and below the crossing shall not be modified. Disturbed floodplains and streams shall be restored to natural geomorphic conditions.
24. The use of rip-rap above the Normal High Water Mark shall be minimized. Any rip-rap placed for stream stabilization shall be placed in stream channels in such a manner that it does not impede aquatic life passage.
- \* 25. The Permittee shall ensure that the final design drawings adhere to the permit and to the permit drawings submitted for approval.
26. All work in or adjacent to stream waters shall be conducted in a dry work area. Approved BMP measures from the most current version of NCDOT Construction and Maintenance Activities manual such as sandbags, rock berms, cofferdams and other diversion structures shall be used to prevent excavation in flowing water.
27. Heavy equipment shall be operated from the banks rather than in the stream channel in order to minimize sedimentation and reduce the introduction of other pollutants into the stream.
28. All mechanized equipment operated near surface waters must be regularly inspected and maintained to prevent contamination of stream waters from fuels, lubricants, hydraulic fluids, or other toxic materials.
29. No rock, sand or other materials shall be dredged from the stream channel except where authorized by this certification.
30. Discharging hydroseed mixtures and washing out hydroseeders and other equipment in or adjacent to surface waters is prohibited.
31. The permittee and its authorized agents shall conduct its activities in a manner consistent with State water quality standards (including any requirements resulting from compliance with §303(d) of the Clean Water Act) and any other appropriate requirements of State and Federal law. If DWQ determines that such standards or laws are not being met (including the failure to sustain a designated or achieved use) or that State or federal law is being violated, or that further conditions are necessary to assure compliance, DWQ may reevaluate and modify this certification.
32. All fill slopes located in jurisdictional wetlands shall be placed at slopes no flatter than 3:1, unless otherwise authorized by this certification..
33. A copy of this Water Quality Certification shall be maintained on site at the construction site at all times. In addition, the Water Quality Certification and all subsequent modifications, if any, shall be maintained with the Division Engineer and the on-site project manager.
34. The outside buffer, wetland or water boundary located within the construction corridor approved by this authorization shall be clearly marked by highly visible fencing prior to any land disturbing activities. Impacts to areas within the fencing are prohibited unless otherwise authorized by this certification.
35. The issuance of this certification does not exempt the Permittee from complying with any and all statutes, rules, regulations, or ordinances that may be imposed by other government agencies (i.e. local, state, and federal) having jurisdiction, including but not limited to applicable buffer rules, stormwater management rules, soil erosion and sedimentation control requirements, etc.
36. The Permittee shall report any violations of this certification to the Division of Water Quality within 24 hours of discovery.



- \* 37. Upon completion of the project (including any impacts at associated borrow or waste site), the NCDOT Division Engineer shall complete and return the enclosed "Certification of Completion Form" to notify DWQ when all work included in the 401 Certification has been completed.
38. Native woody riparian vegetation (i.e., trees and shrubs native to your geographic region) must be reestablished within the construction limits of the project by the end of the growing season following completion of construction.
39. There shall be no excavation from, or waste disposal into, jurisdictional wetlands or waters associated with this permit without appropriate modification. Should waste or borrow sites, or access roads to waste or borrow sites, be located in wetlands or streams, compensatory mitigation will be required since that is a direct impact from road construction activities.
40. Erosion and sediment control practices must be in full compliance with all specifications governing the proper design, installation and operation and maintenance of such Best Management Practices in order to protect surface waters standards:
- a. The erosion and sediment control measures for the project must be designed, installed, operated, and maintained in accordance with the most recent version of the *North Carolina Sediment and Erosion Control Planning and Design Manual*.
  - b. The design, installation, operation, and maintenance of the sediment and erosion control measures must be such that they equal, or exceed, the requirements specified in the most recent version of the *North Carolina Sediment and Erosion Control Manual*. The devices shall be maintained on all construction sites, borrow sites, and waste pile (spoil) projects, including contractor-owned or leased borrow pits associated with the project.
  - c. For borrow pit sites, the erosion and sediment control measures must be designed, installed, operated, and maintained in accordance with the most recent version of the *North Carolina Surface Mining Manual*.
  - d. The reclamation measures and implementation must comply with the reclamation in accordance with the requirements of the Sedimentation Pollution Control Act.
41. Sediment and erosion control measures shall not be placed in wetlands or waters unless otherwise approved by this Certification.
42. The onsite project manager shall schedule regular review meetings, at least once per two months, once construction on impact areas begins. These meetings will be scheduled with DWQ and other interested resource agencies (USCOE, WRC, USFWS, NCDOT, etc). At the agencies' discretion, these meetings may be more or less frequent as needed based on impact activities and/or project progression.

Violations of any condition herein set forth may result in revocation of this Certification and may result in criminal and/or civil penalties. This Certification shall become null and void unless the above conditions are made conditions of the Federal 404 and/or Coastal Area Management Act Permit. This Certification shall expire upon the expiration of the 404 or CAMA permit.



William G. Ross Jr., Secretary  
North Carolina Department of Environment and Natural Resources

Coleen Sullins, Director  
Division of Water Quality

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If this Certification is unacceptable to you have the right to an adjudicatory hearing upon written request within sixty (60) days following receipt of this Certification. This request must be in the form of a written petition conforming to Chapter 150B of the North Carolina General Statutes and filed with the Office of Administrative Hearings, 6714 Mail Service Center, Raleigh, N.C. 27699-6714. If modifications are made to an original Certification, you have the right to an adjudicatory hearing on the modifications upon written request within sixty (60) days following receipt of the Certification. Unless such demands are made, this Certification shall be final and binding.

This the 16th day of May 2008

DIVISION OF WATER QUALITY

A handwritten signature in black ink, appearing to read "C. Sullins", is written over the printed name and title.

Coleen Sullins  
Director

WQC No. 3740



DWQ Project No.: \_\_\_\_\_ County: \_\_\_\_\_

Applicant: \_\_\_\_\_

Project Name: \_\_\_\_\_

Date of Issuance of 401 Water Quality Certification: \_\_\_\_\_

**\*Certificate of Completion**

Upon completion of all work approved within the 401 Water Quality Certification or applicable Buffer Rules, and any subsequent modifications, the applicant is required to return this certificate to the 401 Transportation Permitting Unit, North Carolina Division of Water Quality, 1650 Mail Service Center, Raleigh, NC, 27699-1650. This form may be returned to DWQ by the applicant, the applicant's authorized agent, or the project engineer. It is not necessary to send certificates from all of these.

**Applicant's Certification**

I, \_\_\_\_\_, hereby state that, to the best of my abilities, due care and diligence was used in the observation of the construction such that the construction was observed to be built within substantial compliance and intent of the 401 Water Quality Certification and Buffer Rules, the approved plans and specifications, and other supporting materials.

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

**Agent's Certification**

I, \_\_\_\_\_, hereby state that, to the best of my abilities, due care and diligence was used in the observation of the construction such that the construction was observed to be built within substantial compliance and intent of the 401 Water Quality Certification and Buffer Rules, the approved plans and specifications, and other supporting materials.

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

**Engineer's Certification**

\_\_\_\_\_ Partial \_\_\_\_\_ Final

I, \_\_\_\_\_, as a duly registered Professional Engineer in the State of North Carolina, having been authorized to observe (periodically, weekly, full time) the construction of the project, for the Permittee hereby state that, to the best of my abilities, due care and diligence was used in the observation of the construction such that the construction was observed to be built within substantial compliance and intent of the 401 Water Quality Certification and Buffer Rules, the approved plans and specifications, and other supporting materials.

Signature \_\_\_\_\_ Registration No. \_\_\_\_\_

Date \_\_\_\_\_



April 9, 2008

Mr. Brian Wrenn  
N. C. Division of Water Quality  
Mail Service Center 1650  
Raleigh, North Carolina 27699-1650

Dear Mr. Wrenn:

Subject: EEP Mitigation Acceptance Letter:

**R-2554BB and C, US 70 (Goldsboro Bypass), Wayne County,  
Neuse River Basin (Cataloging Unit 03020202)**

The purpose of this letter is to notify you that the Ecosystem Enhancement Program (EEP) will provide the buffer mitigation required for the subject project. The buffer impacts associated with this project are located in Cataloging Unit 03020202 of the Neuse River Basin. As indicated in the NCDOT's mitigation request dated February 13, 2008, the project will impact buffers only. The buffer impacts are 417,339 square feet in Zone 1 and 377,770 square feet in Zone 2. If the buffer impacts or the amount of mitigation required from EEP increases or decreases for this project, then this mitigation acceptance letter will no longer be valid and a new mitigation acceptance letter will be required. All buffer mitigation requests and approvals are administrated through the Riparian Restoration Buffer Fund (Fund 2982).

The NCDOT will be responsible to ensure that the appropriate compensation for the buffer mitigation will be provided in the agreed upon method of fund transfer. Upon receipt of the NCDWQ's Buffer Authorization Certification, EEP will transfer funds from Fund 2984 (Tri-Party MOA Account) into Fund 2982 and commit to provide the appropriate buffer mitigation to offset the impacts associated with this project.

*Restoring... Enhancing... Protecting Our State*



North Carolina Ecosystem Enhancement Program, 1652 Mail Service Center, Raleigh, NC 27699-1652 / 919-715-0476 / [www.nceep.net](http://www.nceep.net)

301

If you have any questions or need additional information, please contact Ms. Beth Harmon at (919) 715-1929.

Sincerely,

  
William D. Gilmore, P.E.  
EEP Director

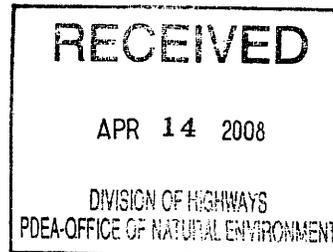
cc: Mr. Gregory J. Thorpe, P.E., PDEA, NCDOT  
Mr. William Wescott, USACE – Washington  
File: R-2554



302

April 9, 2008

Mr. Gregory J. Thorpe, Ph.D.  
Environmental Management Director  
Project Development and Environmental Analysis Branch  
North Carolina Department of Transportation  
1548 Mail Service Center  
Raleigh, North Carolina 27699-1548



Dear Dr. Thorpe:

Subject: EEP Mitigation Acceptance Letter:

**R-2554BB and C, US 70 (Goldsboro Bypass), Wayne County**

The purpose of this letter is to notify you that the Ecosystem Enhancement Program (EEP) will provide the buffer mitigation for the subject project. Based on the information supplied by you on February 13, 2008, the impacts are located in CU 03020202 of the Neuse River Basin in the Northern Inner Coastal Plain (NICP) Eco-Region, and are as follows:

Buffer Zone 1:	417,339 square feet
Buffer Zone 2:	377,770 square feet

All buffer mitigation requests and approvals are administrated through the Riparian Restoration Buffer Fund. The NCDOT will be responsible to ensure that appropriate compensation for the buffer mitigation will be provided in the agreed upon method of fund transfer. Upon receipt of the NCDWQ's Buffer Authorization Certification, EEP will transfer funds from Tri-Party MOA Fund into the Riparian Restoration Buffer Fund. Upon completion of transfer payment, NCDOT will have completed its riparian buffer mitigation responsibility for TIP R-2554. Subsequently, EEP will conduct a review of current MOA mitigation projects in the river basin to determine if available buffer mitigation credits exist. If there are buffer mitigation credits available, then the Riparian Restoration Buffer Fund will purchase the appropriate amount of buffer mitigation credits from Tri-Party MOA Fund.

*Restoring... Enhancing... Protecting Our State*



North Carolina Ecosystem Enhancement Program, 1652 Mail Service Center, Raleigh, NC 27699-1652 / 919-715-0476 / [www.nceep.net](http://www.nceep.net)

If you have any questions or need additional information, please contact Ms. Beth Harmon at 919-715-1929.

Sincerely,



William D. Gilmore, P.E.  
EEP Director

cc: Mr. William Wescott, USACE – Washington  
Mr. Brian Wrenn, Division of Water Quality, Wetlands/401 Unit  
File: R-2554

**Draft Technical Memorandum**

**Project:** Claridge Nursery On-site Mitigation      **Prepared By:** Baker Engineering  
**Subject:** Mitigation Summary      **Prepared For:** NCDOT  
**Date:** December 18, 2007 (revision 1)

The purpose of this document is to describe the proposed design approach for the Claridge Nursery On-Site Stream Mitigation Project. The project is located in Wayne County, near Goldsboro, in DWQ sub-basin 03-04-06 and within HU 03020201, on land that is owned by the North Carolina Division of Forest Resources. The purpose of the project is to provide on-site stream mitigation for TIP R-2554 (US 70, Goldsboro Bypass).

The site contains an unnamed main stem reach (M1) and two unnamed tributaries (UT1 and UT2) that empty into the main stem (see Exhibit 1). All stream reaches have been channelized and straightened in the past to reduce flooding and provide drainage for the adjacent fields. Land use within the watershed is primarily agriculture and forestry. Existing stream lengths, drainage areas, and jurisdictional status are summarized in Table 1.

**Table 1. Summary of Existing Stream Lengths and Drainage Areas.**

Stream Reach	Existing Length (LF)	Drainage Area (sq mi)	Intermittent/Perennial Status
M1	6,400	1.80	NCDWQ Form Score = > 30 Stream reach already considered perennial by agencies during impact assessments. Status = <u>Perennial</u>
UT1	740	0.13	NCDWQ Form Score = 19.75 Stream is shown as intermittent on USGS map. Stream is not shown on County soils, but hydric soils indicate the presence of a channel. Status = <u>Intermittent</u>
UT2	2,530	0.25	NCDWQ Form Score = 24.75 Stream is shown as intermittent on USGS map. Stream is shown on County soils. Status = <u>Intermittent</u>

**Stream Restoration (Braided Channel) - UT1 and UT2**

A braided channel restoration approach is proposed for the two smaller tributaries (UT1 and UT2) due to the small drainage areas of the two streams and their low slopes. It is likely that in their undisturbed condition, these two systems existed as headwater wetland/stream complexes, exhibiting diffuse flows and wetland plant communities within a narrow valley of hydric soils. Lumbee sandy loam soils are mapped along the corridors of the proposed stream restoration reaches. Lumbee soils are hydric soils mapped along shallow drainage ways, were formed in stream sediments, and are commonly found along stream channels in the area surrounding Goldsboro.

Restoration of these systems will follow the guidance provided by the US Army Corps of Engineers (USACE) in "*Information Regarding Stream Restoration with Emphasis on the Coastal Plain - April 4, 2007*". Project reaches UT1 and UT2 will be designed as "riparian headwater systems", as described in the guidance. For the proposed reaches, watershed sizes are 85 and 160 acres, respectively. Soils, topography, and morphology data indicate that these reaches once supported a headwater wetland system. Restoration will seek to restore hydrology and connection of surface flows to a defined floodplain, thereby restoring diffuse surface flows and wetland hydrology. The stream type for this design approach is best described as a Rosgen "DA" stream channel.

Specific restoration techniques for reaches UT1 and UT2 will involve the grading and widening of a floodplain at the approximate elevation of the existing channel bottoms. Floodplain widths will generally range from 30 to 40 feet, and the valleys will be graded to support diffuse flow toward reach M1. The microtopography of the floodplain will be left rough, to promote diffuse flows and a diversity of riparian wetland vegetation.

#### **Stream Restoration (Single-Thread Channel) – Reach M1**

The main stem through the site, reach M1, will be restored using natural channel design approaches to restore a single-thread channel. Reference reach data and past project experience support the design of a single-thread channel for M1, due to its watershed size, slope, and sediment transport competency (stream power). The design will involve a Rosgen Priority Level II approach in which a new meandering single-thread channel (E stream type) will be constructed through a floodplain excavated at a lower elevation. Channel dimensions and pattern are based on regional curve relationships, reference reach information, and past project experience. In-stream structures (not shown at this concept level) will consist of log and wooden structures. The stream banks and adjacent floodplain wetland areas will be planted with native vegetation that are moderately to highly tolerant of flooded conditions.

The vegetation plan for the site will include the planting of bare-root trees in riparian buffer areas adjacent to all three restored streams. A minimum buffer width of 50 feet will be maintained on all restored streams with wider buffers in most areas. Tree species planted across the site will include a mixture of no less than six native species adapted to site conditions, such as river birch (*Betula nigra*), sugarberry (*Celtis laevigata*), green ash (*Fraxinus pennsylvanica*), swamp tupelo (*Nyssa sylvatica var. biflora*), sycamore (*Platanus occidentalis*), overcup oak (*Quercus lyrata*), swamp chestnut oak (*Quercus michauxii*), and bald cypress (*Taxodium distichum*).

#### **Site Considerations**

Several existing culverted road crossings will be incorporated into the restoration designs for the three stream reaches. In some locations, existing culverts will need to be replaced to provide increased capacity, promote connection with the restored floodplain, and set culvert inverts to appropriate elevations. An existing irrigation line crosses the proposed design for M1 at approximate station 49+00; this crossing will not be placed in an easement in case future maintenance is required for the irrigation line. An existing water line that crosses M1 near station 19+00 will be relocated to cross at the upstream culverted road crossing.

**Table 2. Restoration Approaches and Proposed Mitigation Amounts.**

Mitigation Area	Size	Potential Credits	Restoration Approach
Stream Reach M1	7,600 LF*	7,600 (1:1 ratio)	Restoration will consist of a Rosgen Priority Level II approach. A new floodplain will be excavated at a lower elevation, and a stable meandering channel restored through the new floodplain. (E stream type)
Stream Reach UT1	690 LF*	690 (1:1 ratio)	Restoration will consist of grading a floodplain and promoting diffuse surface flows toward M1. The system will be allowed to form on its own as a braided channel headwater stream. (DA stream type)
Stream Reach UT2	2,430 LF*	2,430 (1:1 ratio)	Restoration will consist of grading a floodplain and promoting diffuse surface flows toward M1. The system will be allowed to form on its own as a braided channel headwater stream. (DA stream type)
Riparian Buffer Restoration	32 acres	32 (1:1 ratio)	Restoration will include the planting of 50 foot riparian buffers on both sides of the restored stream segments.
<b>Totals</b>	<b>10,720 LF</b> <b>32 acres</b>	<b>10,720 (stream)</b> <b>32 (buffer)</b>	

\* Stream lengths exclude the sections of channel which will flow through culverted crossings or lie outside of the protected right-of-way boundaries.



**Legend**

- Proposed Streams
- Existing Streams
- Riparian Buffer Restoration
- Culvert Crossing
- Proposed Nursery Road

**Baker**

Baker Engineering NY, Inc.  
8000 Regency Parkway  
Suite 200  
Cary, North Carolina 27518  
Phone: 919.483.5488  
Fax: 919.483.5480

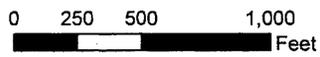


Exhibit 1  
Mitigation Concept  
Claridge Nursery Site

## **Appendix A.**

### Geomorphology Tables

Typical Design Cross-sections (Reaches M1, UT1, and UT2)

Design Profile (Reach M1)

NCDWQ Stream Identification Forms (Reaches UT1 and UT2)

## MORPHOLOGICAL MEASUREMENTS TABLE

### Claridge Nursery On-Site Mitigation Project - Reach M1

	Variables	Existing Channel	Proposed Design	Notes
1.	stream type	G5c	E5	design stream type based on reference reach information and past project experience
2.	drainage area (sq. mi)	1.80	1.80	
3.	bankfull width (ft)	mean: 17.6 range: 14.4 - 20.4	mean: 11.0 range: ---- - ----	design width = A / design depth
4.	bankfull mean depth (ft)	mean: 1.88 range: 1.25 - 2.34	mean: 1.10 range: ---- - ----	design depth = (A/(W/D)) <sup>0.5</sup>
5.	width/depth ratio	mean: 9.7 range: 6.6 - 12.9	mean: 10 range: ---- - ----	design (W/D) selected based on past project experience.
6.	bankfull cross-sectional area (sq. ft)	mean: 33.3 range: 20.4 - 42.9	mean: 12 range: ---- - ----	existing XSEC area enlarged due to past dredging. design area (A) selected from regional curve since no apparent bankfull indicators.
7.	bankfull mean velocity (ft/sec)	mean: 0.9 range: ---- - ----	mean: 0.9 range: ---- - ----	estimated from Manning's equation.
8.	bankfull discharge (cfs)	mean: 11.1 range: ---- - ----	mean: 11.1 range: ---- - ----	estimated from Manning's equation.
9.	bankfull max depth (ft)	mean: 2.77 range: 1.78 - 3.43	mean: 1.53 range: ---- - ----	design max depth based on typical reference reach ratios
10.	width of floodprone area (ft)	mean: 25.8 range: 19.5 - 41.3	mean: 62 range: ---- - ----	design value based on width of floodplain to be excavated.
11.	entrenchment ratio	mean: 1.5 range: 1.3 - 2.3	mean: 5.7 range: -	design value based on width of floodplain to be excavated.
12.	meander length (ft)	mean: NA range: ---- - ----	mean: 110 range: 88 - 131	existing channel displays no natural stream pattern.
13.	ratio of meander length to bankfull width	mean: NA range: ---- - ----	mean: 10 range: 8 - 12	design based on reference reach information and past projects.
14.	radius of curvature (ft)	mean: NA range: ---- - ----	mean: 33 range: 27 - 38	existing channel displays no natural stream pattern.
15.	ratio of radius of curvature to bankfull width	mean: NA range: ---- - ----	mean: 3 range: 2.5 - 3.5	design based on reference reach information and past projects.
16.	belt width (ft)	mean: NA range: ---- - ----	mean: 44 range: 33 - 55	existing channel displays no natural stream pattern.
17.	meander width ratio	mean: NA range: ---- - ----	mean: 4 range: 3 - 5	design based on reference reach information and past projects.
18.	sinuosity (stream length/valley length)	mean: 1.23 range: ---- - ----	mean: 1.41 range: ---- - ----	
19.	valley slope (ft/ft)	mean: 0.0009 range: ---- - ----	mean: 0.0008 range: ---- - ----	
20.	average slope (ft/ft)	mean: 0.0007 range: ---- - ----	mean: 0.0006 range: ---- - ----	
21.	Pool slope (ft/ft)	mean: 0 range: ---- - ----	mean: 0 range: ---- - ----	pool slope not measurable due to low overall slope.
22.	Ratio of pool slope to average slope	mean: NA range: ---- - ----	mean: NA range: ---- - ----	
23.	maximum pool depth (ft)	mean: 3 range: ---- - ----	mean: 2.7 range: ---- - ----	
24.	ratio of pool depth to average bankfull depth	mean: 1.60 range: ---- - ----	mean: 2.5 range: ---- - ----	design based on reference reach information and past projects.
25.	pool width (ft)	mean: 18 range: ---- - ----	mean: 16.4 range: ---- - ----	
26.	ratio of pool width to bankfull width	mean: 1.0 range: ---- - ----	mean: 1.5 range: ---- - ----	design based on reference reach information and past projects.
27.	pool to pool spacing (ft) *	mean: NM range: ---- - ----	mean: 55 range: 44 - 66	
28.	ratio of pool to pool spacing to bankfull width *	mean: NM range: ---- - ----	mean: 5 range: 4 - 6	pool-pool spacing based on 1/2 meander wavelength.
29.	ratio of lowest bank height to bankfull height (or max bankfull depth)	mean: 2.2 range: 1.6 - 3.4	mean: 1.00 range: 1.00 - 1.20	design should achieve BHR of approximately 1.0.

NA = not applicable      NM = not measured

Note: Sections of the stream reach experience backwater from culvert crossings and past dredging. Bankfull parameters were calculated by adding bankfull areas predicted from the regional curve to the area backwatered at baseflow conditions. Stream system is highly modified, therefore, existing geomorphic parameters may be misleading.

MORPHOLOGICAL MEASUREMENTS TABLE

Claridge Nursery On-Site Mitigation Project - Reach UT1

Variables	Existing Channel	Proposed Design	Notes
1. stream type	F5/G5c	DA	design stream type based on reference reach information and past project experience
2. drainage area (sq. mi)	0.13	0.13	
3. bankfull width (ft)	mean: 7.9 range: 6.3 - 9.4	mean: 10.2 range: ---- - ----	design width = A / design depth
4. bankfull mean depth (ft)	mean: 0.55 range: 0.46 - 0.65	mean: 0.41 range: ---- - ----	design depth = (A/(W/D))^0.5
5. width/depth ratio	mean: 15.2 range: 9.8 - 20.6	mean: 25 range: ---- - ----	design (W/D) approximated based on reference reach information.
6. bankfull cross-sectional area (sq. ft)	mean: 4.2 range: ---- - ----	mean: 4.2 range: ---- - ----	existing area based on regional curves since no bankfull indicators. design area (A) selected from regional curve since no apparent bankfull indicators.
7. bankfull mean velocity (ft/sec)	mean: 1.9 range: ---- - ----	mean: 0.5 range: ---- - ----	estimated from Manning's equation.
8. bankfull discharge (cfs)	mean: 8.1 range: ---- - ----	mean: 8.1 range: ---- - ----	estimated from Manning's equation.
9. bankfull max depth (ft)	mean: 0.85 range: 0.77 - 0.92	mean: 0.57 range: ---- - ----	design max depth based on typical reference reach ratios
10. width of floodprone area (ft)	mean: 10.0 range: 8.2 - 11.8	mean: 36 range: ---- - ----	design value based on width of floodplain to be excavated.
11. entrenchment ratio	mean: 1.3 range: 1.3 - 1.3	mean: 3.5 range: -	design value based on width of floodplain to be excavated.
12. meander length (ft)	mean: NA range: ---- - ----	mean: NA range: ---- - ----	existing channel displays no natural stream pattern. pattern will be allowed to form on its own.
13. ratio of meander length to bankfull width	mean: NA range: ---- - ----	mean: NA range: ---- - ----	existing channel displays no natural stream pattern. pattern will be allowed to form on its own.
14. radius of curvature (ft)	mean: NA range: ---- - ----	mean: NA range: ---- - ----	existing channel displays no natural stream pattern. pattern will be allowed to form on its own.
15. ratio of radius of curvature to bankfull width	mean: NA range: ---- - ----	mean: NA range: ---- - ----	existing channel displays no natural stream pattern. pattern will be allowed to form on its own.
16. belt width (ft)	mean: NA range: ---- - ----	mean: NA range: ---- - ----	existing channel displays no natural stream pattern. pattern will be allowed to form on its own.
17. meander width ratio	mean: NA range: ---- - ----	mean: NA range: ---- - ----	existing channel displays no natural stream pattern. pattern will be allowed to form on its own.
18. sinuosity (stream length/valley length)	mean: 1.00 range: ---- - ----	mean: 1.00 range: ---- - ----	sinuosity is measured straight along the fall of the valley.
19. valley slope (ft/ft)	mean: 0.0061 range: ---- - ----	mean: 0.003 range: ---- - ----	slope will be lowered to promote diffuse flow conditions and reduce stream power.
20. average slope (ft/ft)	mean: 0.0061 range: ---- - ----	mean: 0.003 range: ---- - ----	slope will be lowered to promote diffuse flow conditions and reduce stream power.
21. Pool slope (ft/ft)	mean: 0 range: ---- - ----	mean: 0 range: ---- - ----	pool slope not measurable due to low overall slope.
22. Ratio of pool slope to average slope	mean: NA range: ---- - ----	mean: NA range: ---- - ----	
23. maximum pool depth (ft)	mean: 0.8 range: ---- - ----	mean: NA range: ---- - ----	pools will not be designed but allowed to form naturally as a function of debris and local scour. Pools are not common for DA systems.
24. ratio of pool depth to average bankfull depth	mean: 1.45 range: ---- - ----	mean: NA range: ---- - ----	pools will not be designed but allowed to form naturally as a function of debris and local scour. Pools are not common for DA systems.
25. pool width (ft)	mean: 8 range: ---- - ----	mean: NA range: ---- - ----	pools will not be designed but allowed to form naturally as a function of debris and local scour. Pools are not common for DA systems.
26. ratio of pool width to bankfull width	mean: 1.0 range: ---- - ----	mean: NA range: ---- - ----	pools will not be designed but allowed to form naturally as a function of debris and local scour. Pools are not common for DA systems.
27. pool to pool spacing (ft) *	mean: NM range: ---- - ----	mean: NA range: 41 - 61	pools will not be designed but allowed to form naturally as a function of debris and local scour. Pools are not common for DA systems.
28. ratio of pool to pool spacing to bankfull width *	mean: NM range: ---- - ----	mean: 5 range: 4 - 6	pools will not be designed but allowed to form naturally as a function of debris and local scour. Pools are not common for DA systems.
29. ratio of lowest bank height to bankfull height (or max bankfull depth)	mean: 5.5 range: 5.5 - 5.5	mean: 1.00 range: 1.00 - 1.20	design should achieve BHR of approximately 1.0.

NA = not applicable      NM = not measured

## MORPHOLOGICAL MEASUREMENTS TABLE

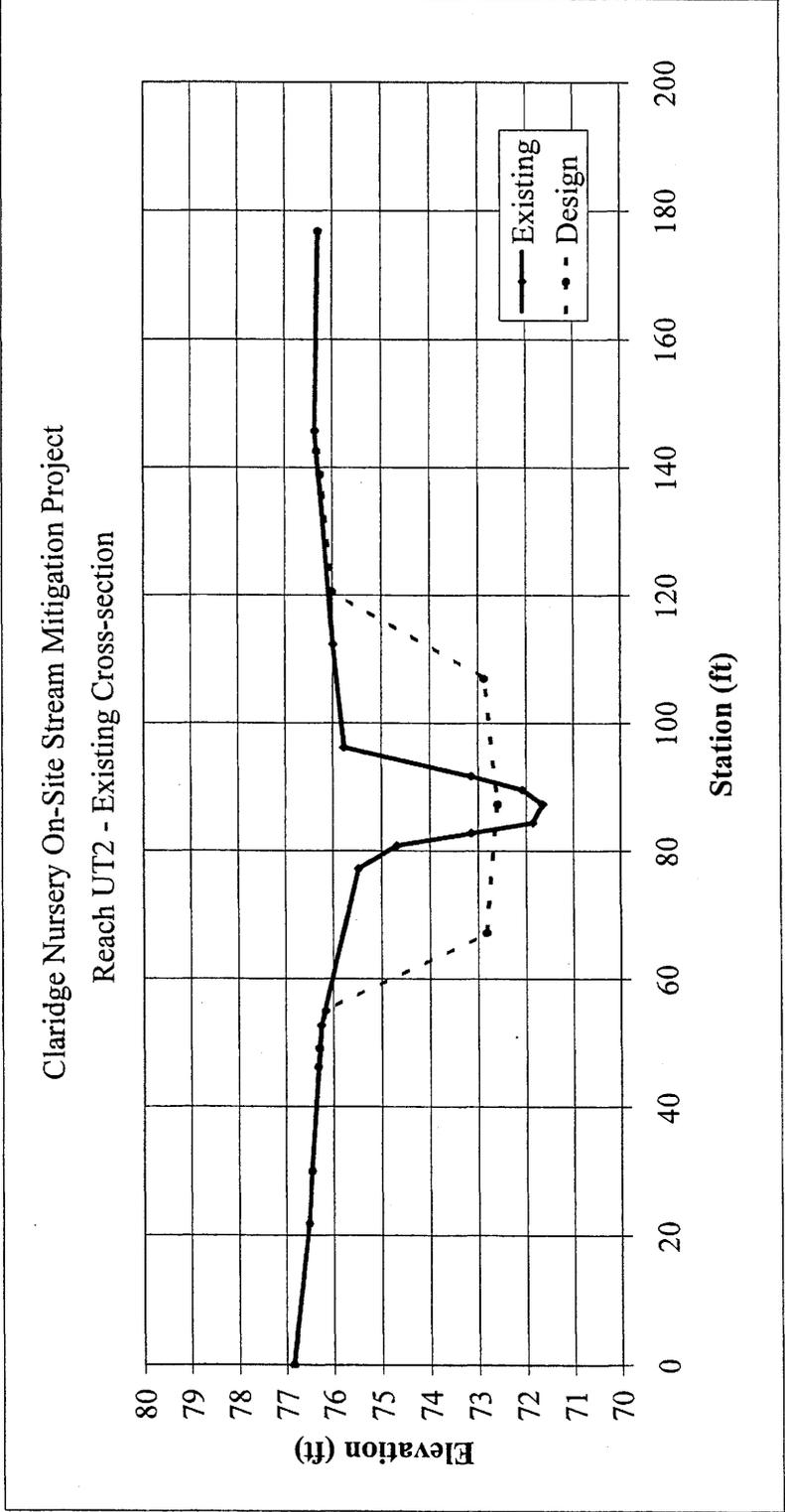
## Claridge Nursery On-Site Mitigation Project - Reach UT2

Variables	Existing Channel	Proposed Design	Notes
1. stream type	G5c	DA	design stream type based on reference reach information and past project experience
2. drainage area (sq. mi)	0.25	0.25	
3. bankfull width (ft)	mean: 8.9 range: 8.2 - 9.6	mean: 12.2 range: ---- - ----	design width = A / design depth
4. bankfull mean depth (ft)	mean: 1.0 range: 0.8 - 1.2	mean: 0.49 range: ---- - ----	design depth = (A/(WD))^0.5
5. width/depth ratio	mean: 9.0 range: 6.6 - 12.0	mean: 25 range: ---- - ----	design (WD) approximated based on reference reach information.
6. bankfull cross-sectional area (sq. ft)	mean: 8.9 range: 7.6 - 10.1	mean: 6 range: ---- - ----	existing XSEC area enlarged due to past dredging. design area (A) selected from regional curve since no apparent bankfull indicators.
7. bankfull mean velocity (ft/sec)	mean: 0.4 range: ---- - ----	mean: 0.2 range: ---- - ----	estimated from Manning's equation.
8. bankfull discharge (cfs)	mean: 2.4 range: ---- - ----	mean: 2.4 range: ---- - ----	estimated from Manning's equation.
9. bankfull max depth (ft)	mean: 1.5 range: 1.1 - 2	mean: 0.69 range: ---- - ----	design max depth based on typical reference reach ratios
10. width of floodprone area (ft)	mean: 14 range: 13 - 15	mean: 45 range: ---- - ----	design value based on width of floodplain to be excavated.
11. entrenchment ratio	mean: 1.6 range: 1.5 - 1.9	mean: 3.7 range: ---- - ----	design value based on width of floodplain to be excavated.
12. meander length (ft)	mean: NA range: ---- - ----	mean: NA range: ---- - ----	existing channel displays no natural stream pattern. pattern will be allowed to form on its own.
13. ratio of meander length to bankfull width	mean: NA range: ---- - ----	mean: NA range: ---- - ----	existing channel displays no natural stream pattern. pattern will be allowed to form on its own.
14. radius of curvature (ft)	mean: NA range: ---- - ----	mean: NA range: ---- - ----	existing channel displays no natural stream pattern. pattern will be allowed to form on its own.
15. ratio of radius of curvature to bankfull width	mean: NA range: ---- - ----	mean: NA range: ---- - ----	existing channel displays no natural stream pattern. pattern will be allowed to form on its own.
16. belt width (ft)	mean: NA range: ---- - ----	mean: NA range: ---- - ----	existing channel displays no natural stream pattern. pattern will be allowed to form on its own.
17. meander width ratio	mean: NA range: ---- - ----	mean: NA range: ---- - ----	existing channel displays no natural stream pattern. pattern will be allowed to form on its own.
18. sinuosity (stream length/valley length)	mean: 1.09 range: ---- - ----	mean: 1.09 range: ---- - ----	sinuosity is measured straight along the fall of the valley.
19. valley slope (ft/ft)	mean: 0.0003 range: ---- - ----	mean: 0.0003 range: ---- - ----	
20. average slope (ft/ft)	mean: 0.0002 range: ---- - ----	mean: 0.0002 range: ---- - ----	
21. Pool slope (ft/ft)	mean: 0 range: ---- - ----	mean: 0 range: ---- - ----	pool slope not measurable due to low overall slope.
22. Ratio of pool slope to average slope	mean: NA range: ---- - ----	mean: NA range: ---- - ----	pools will not be designed but allowed to form naturally as a function of debris and local scour. Pools are not common for DA systems.
23. maximum pool depth (ft)	mean: 2.4 range: ---- - ----	mean: NA range: ---- - ----	pools will not be designed but allowed to form naturally as a function of debris and local scour. Pools are not common for DA systems.
24. ratio of pool depth to average bankfull depth	mean: 2.40 range: ---- - ----	mean: NA range: ---- - ----	pools will not be designed but allowed to form naturally as a function of debris and local scour. Pools are not common for DA systems.
25. pool width (ft)	mean: 8.9 range: ---- - ----	mean: NA range: ---- - ----	pools will not be designed but allowed to form naturally as a function of debris and local scour. Pools are not common for DA systems.
26. ratio of pool width to bankfull width	mean: 1.0 range: ---- - ----	mean: NA range: ---- - ----	pools will not be designed but allowed to form naturally as a function of debris and local scour. Pools are not common for DA systems.
27. pool to pool spacing (ft) *	mean: NM range: ---- - ----	mean: NA range: ---- - ----	pools will not be designed but allowed to form naturally as a function of debris and local scour. Pools are not common for DA systems.
28. ratio of pool to pool spacing to bankfull width *	mean: NM range: ---- - ----	mean: NA range: ---- - ----	pools will not be designed but allowed to form naturally as a function of debris and local scour. Pools are not common for DA systems.
29. ratio of lowest bank height to bankfull height (or max bankfull depth)	mean: 2.4 range: 2.1 - 2.6	mean: 1.00 range: 1.00 - 1.20	design should achieve BHR of approximately 1.0.

NA = not applicable NM = not measured

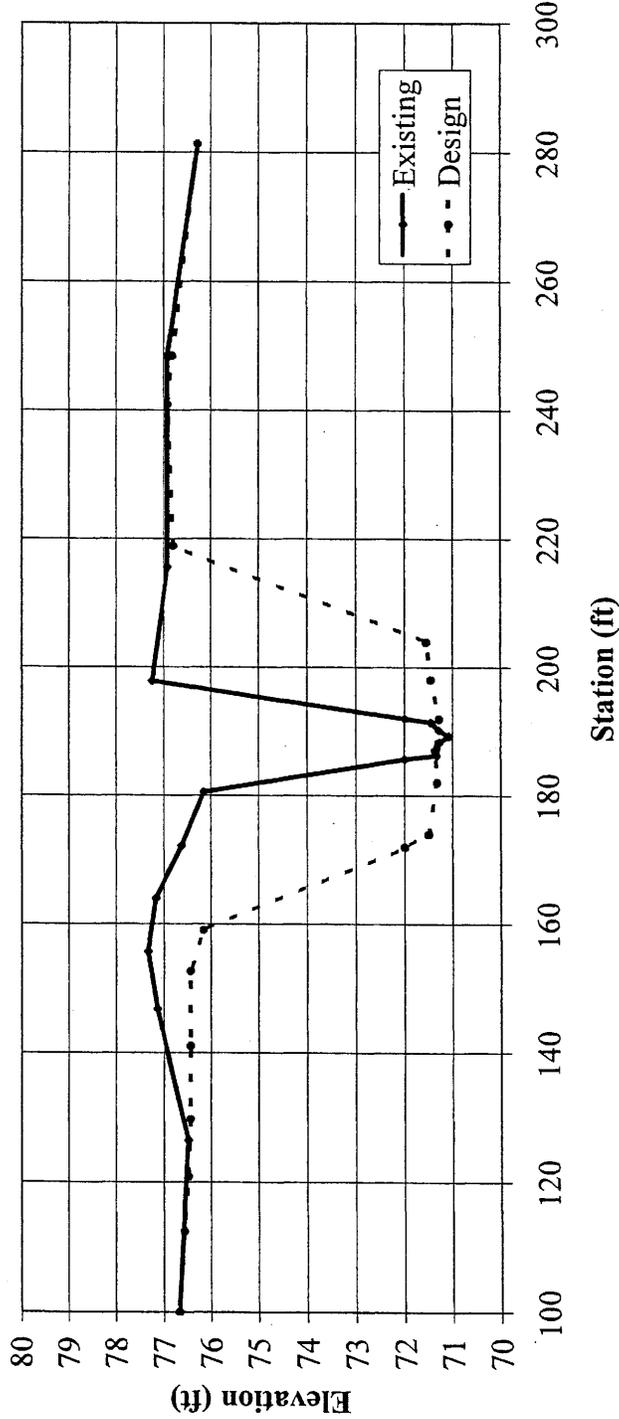
Note: Entire stream reach experiences backwater from culvert crossings and past dredging. Bankfull parameters were calculated by adding bankfull areas predicted from the regional curve to the area backwatered at baseflow conditions. Stream system is highly modified, therefore, existing geomorphic parameters may be misleading.

15+21	Feature	Type	Wfpa	LBKF	RBKF	ELbkf	Wbkf	Dbkf	W/D	Abkf	Dmax	ER	BHR
Existing	Pool	G5c	13.5	82.8	91.7	73.15	8.8	1.0	8.6	9.1	1.5	1.5	2.6
Design	Run	DA	45	81.0	94.0	73.00	12.2	0.5	25.0	6.0	0.7	3.7	1.0

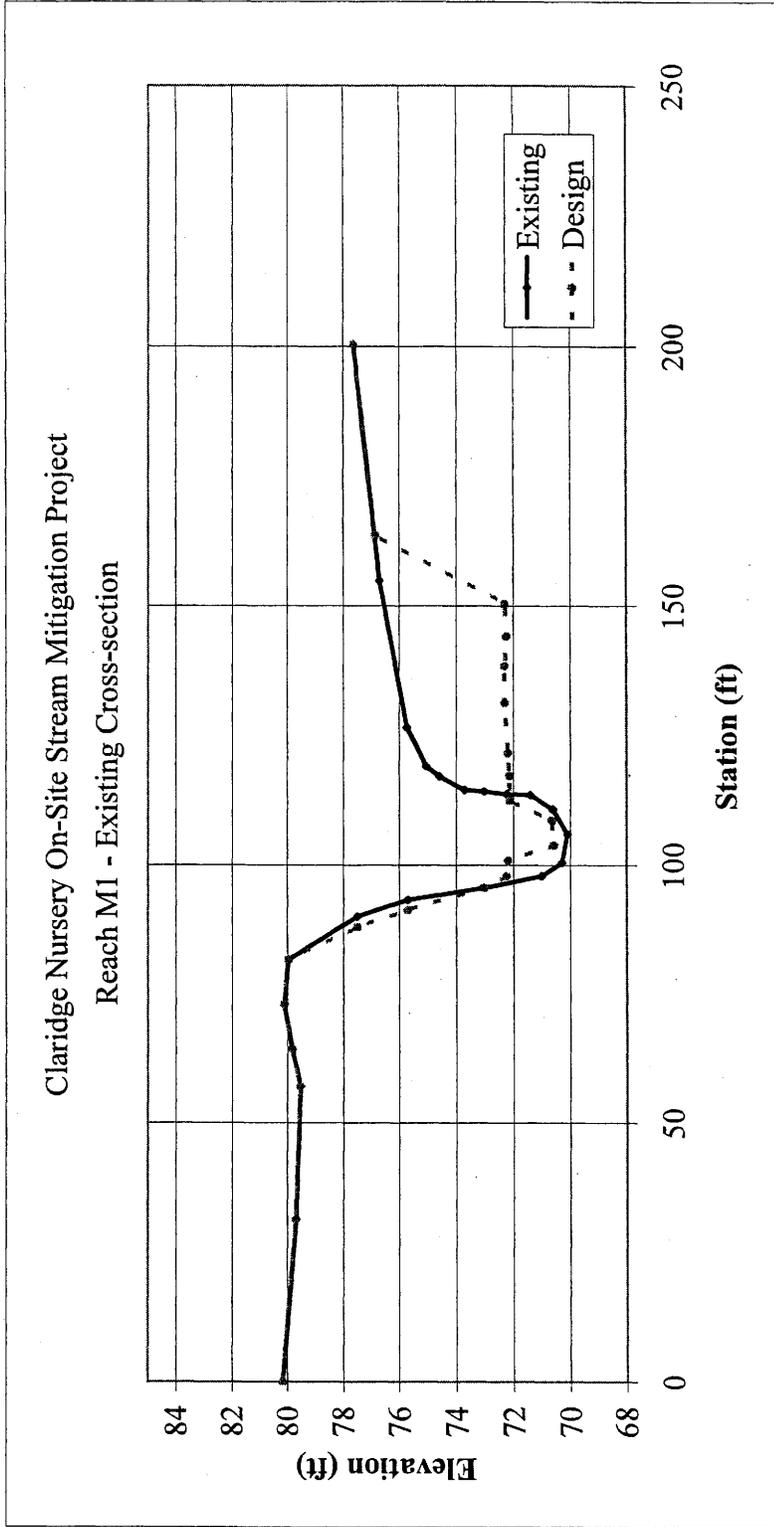


16+79	Feature	Type	Wfpa	LBKF	RBKF	ELbkf	Wbkf	Dbkf	W/D	Abkf	Dmax	ER	BHR
Existing	Run	G5c	8.2	185.7	192.0	72.00	6.3	0.6	9.8	4.1	0.9	1.3	5.5
Design	Run	DA	36	172.0	204.0	71.50	10.2	0.4	25.0	4.1	0.5	3.5	1.0

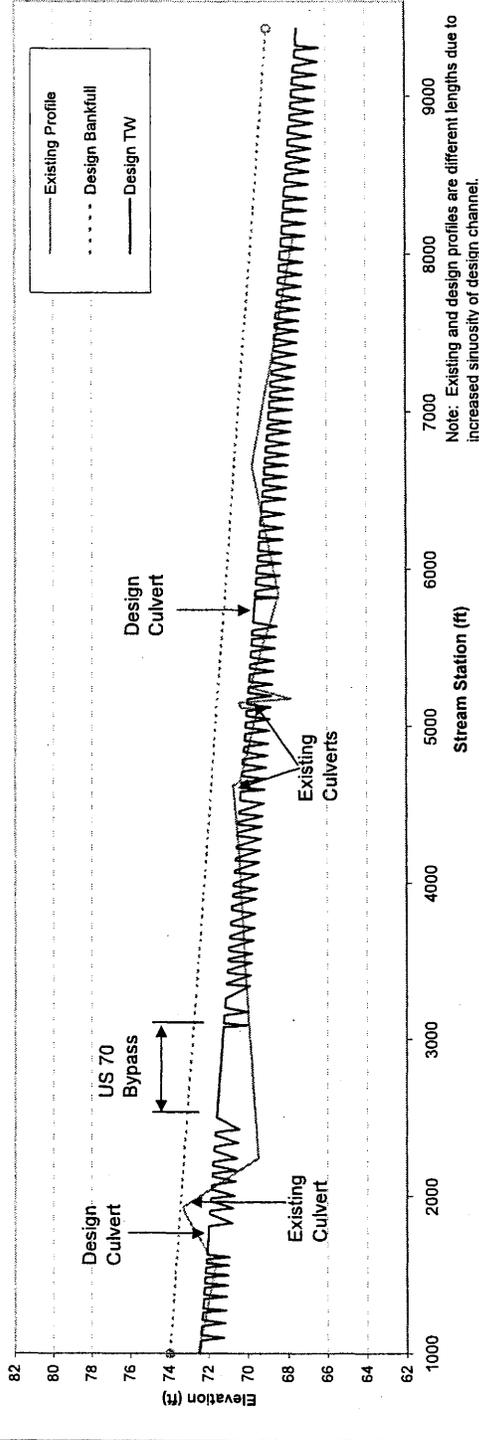
Claridge Nursery On-Site Stream Mitigation Project  
 Reach UT1 - Existing Cross-section 16+79



33+93	Feature	Type	Wfpa	LBKF	RBKF	ELbkf	Wbkf	Dbkf	W/D	Abkf	Dmax	ER	BHR
Existing	Run	E	41.3	95.6	114.2	73.05	18.3	2.3	7.8	42.9	2.9	2.3	1.7
Design	Run	E	62	100.9	112.7	72.15	11.0	1.1	10.0	12.4	1.5	5.6	3.4



### Preliminary Design Profile - Reach M1



North Carolina Division of Water Quality - Stream Identification Form; Version 3.1

Date: 7-26-07	Project: Claridge Nursery	Latitude:
Evaluator: Tweedy	Site: UTI - short small trib	Longitude:
Total Points: Stream is at least intermittent if ≥ 19 or perennial if ≥ 30	19.75	County: Wayne
		Other e.g. Quad Name:

A. Geomorphology (Subtotal = 6.5)

	Absent	Weak	Moderate	Strong
1 <sup>a</sup> . Continuous bed and bank	0	1	2	3
2. Sinuosity	0	1	2	3
3. In-channel structure: riffle-pool sequence	0	1	2	3
4. Soil texture or stream substrate sorting	0	1	2	3
5. Active/relic floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Braided channel	0	1	2	3
8. Recent alluvial deposits	0	1	2	3
9 <sup>a</sup> Natural levees	0	1	2	3
10. Headcuts	0	1	2	3
11. Grade controls	0	0.5	1	1.5
12. Natural valley or drainageway	0	0.5	1	1.5
13. Second or greater order channel on existing USGS or NRCS map or other documented evidence.	No = 0		Yes = 3	

<sup>a</sup> Man-made ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 7)

14. Groundwater flow/discharge	0	1	2	3
15. Water in channel and > 48 hrs since rain, or Water in channel -- dry or growing season	0	1	2	3
16. Leaf litter	1.5	1	0.5	0
17. Sediment on plants or debris	0	0.5	1	1.5
18. Organic debris lines or piles (Wreck lines)	0	0.5	1	1.5
19. Hydric soils (redoximorphic features) present?	No = 0		Yes = 1.5	

C. Biology (Subtotal = 6.25)

20 <sup>a</sup> . Fibrous roots in channel	3	2	1	0
21 <sup>a</sup> . Rooted plants in channel	3	2	1	0
22. Crayfish	0	0.5	1	1.5
23. Bivalves	0	1	2	3
24. Fish	0	0.5	1	1.5
25. Amphibians	0	0.5	1	1.5
26. Macroinvertebrates (note diversity and abundance)	0	0.5	1	1.5
27. Filamentous algae; periphyton	0	1	2	3
28. Iron oxidizing bacteria/fungus.	0	0.5	1	1.5
29 <sup>b</sup> . Wetland plants in streambed	FAC = 0.5; FACW = 0.75; OBL = 1.5; SAV = 2.0; Other = 0			

<sup>a</sup> Items 20 and 21 focus on the presence of upland plants, Item 29 focuses on the presence of aquatic or wetland plants.

Notes: (use back side of this form for additional notes.)

Sketch:

assessment done during dry conditions.  
Stream is shown on USGS, but not soils, but hydric  
soils indicate a valley.  
LIDAR indicates valley.

North Carolina Division of Water Quality – Stream Identification Form; Version 3.1

Date: 7-26-07	Project: Claridge Nursery	Latitude:
Evaluator: Taxedy	Site: UTZ- large + tributary	Longitude:
Total Points: Stream is at least intermittent if $\geq 19$ or perennial if $\geq 30$	24.75	County: Wayne
		Other e.g. Quad Name:

A. Geomorphology (Subtotal = 7)

	Absent	Weak	Moderate	Strong
1 <sup>a</sup> . Continuous bed and bank	0	1	2	3
2. Sinuosity	0	1	2	3
3. In-channel structure: riffle-pool sequence	0	1	2	3
4. Soil texture or stream substrate sorting	0	1	2	3
5. Active/relic floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Braided channel	0	1	2	3
8. Recent alluvial deposits	0	1	2	3
9 <sup>a</sup> . Natural levees	0	1	2	3
10. Headcuts	0	1	2	3
11. Grade controls	0	0.5	1	1.5
12. Natural valley or drainageway	0	0.5	1	1.5
13. Second or greater order channel on existing USGS or NRCS map or other documented evidence.	No = 0		Yes = 3	

<sup>a</sup> Man-made ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 8.5)

14. Groundwater flow/discharge	0	1	2	3
15. Water in channel and > 48 hrs since rain, or Water in channel -- dry or growing season	0	1	2	3
16. Leaf litter	1.5	1	0.5	0
17. Sediment on plants or debris	0	0.5	1	1.5
18. Organic debris lines or piles (Wrack lines)	0	0.5	1	1.5
19. Hydric soils (redoximorphic features) present?	No = 0		Yes = 1.5	

C. Biology (Subtotal = 9.25)

20 <sup>b</sup> . Fibrous roots in channel	3	2	1	0
21 <sup>b</sup> . Rooted plants in channel	3	2	1	0
22. Crayfish	0	0.5	1	1.5
23. Bivalves	0	1	2	3
24. Fish	0	0.5	1	1.5
25. Amphibians	0	0.5	1	1.5
26. Macroinvertebrates (note diversity and abundance)	0	0.5	1	1.5
27. Filamentous algae; periphyton	0	1	2	3
28. Iron oxidizing bacteria/fungus.	0	0.5	1	1.5
29 <sup>b</sup> . Wetland plants in streambed	FAC = 0.5; FACV = 0.75; DBL = 1.5 SAV = 2.0; Other = 0			

<sup>b</sup> Items 20 and 21 focus on the presence of upland plants, Item 29 focuses on the presence of aquatic or wetland plants.

Notes: (use back side of this form for additional notes.)

Sketch:

assessment done during dry conditions.  
Stream is shown on USGS map and on soil map.  
LIDAR indicates valley

**UT West Bear Creek Mitigation Plan  
Wayne County**

**R-2554C  
WBS Element: 34461.1**

**December 20, 2007**

NCDOT will perform on-site mitigation to offset unavoidable stream and wetland impacts associated with Transportation Improvement Program (TIP) R-2554C. The mitigation is located within the NCDOT right-of-way within NCDWQ sub-basin 03-04-05 and within HU 03020202. The site totals 19.36 acres and contains approximately 600 ft of an unnamed tributary to West Bear Creek as well as approximately 800 ft of West Bear Creek. It is located on the La Grange USGS quad map and on sheets 11-13 of the preliminary plans from Sta. 250+60 to Sta. 256.

At this site, both the unnamed tributary as well as West Bear Creek will be impacted by R-2554C (Site 4). The proposed mitigation involves relocating these stream channels into an adjacent agricultural field within the NCDOT right-of-way. NCDOT proposes to restore approximately 1243 linear feet of stream and 2.8 acres of riparian buffer at a ratio of 1:1.

**Existing Conditions**

West Bear Creek is a tributary to Bear Creek. Bear Creek runs just west of La Grange and is a tributary to the Neuse River. The UT to West Bear Creek begins, within this site, at the outfall of a large residential pond. The outfall pipe is perched and a large scour hole has formed at this location. The UT flows from here in a southwesterly direction along the edge of an agricultural field. The riparian buffer is sparse and ranges from approximately 0-10 ft. The channel is incised with high, unstable banks for the majority of its length within the site. The confluence with West Bear Creek occurs at a 90-degree angle at the corner of the agricultural field. From this point, West Bear Creek flows in an easterly direction along the field. It continues to have a sparse riparian buffer and exhibits evidence of past straightening.

**Proposed Conditions**

NCDOT proposes to restore 1243 linear feet of UT West Bear Creek by re-establishing the correct pattern, profile and dimensions of the channel within the adjacent farm field. A riparian buffer of at least 50 ft will be planted along each bank of the new channel with a mix of bare root saplings at a rate of 680 trees per acre. (Table 2) Final stream design plans will be submitted with final roadway plans for Section C of the TIP R-2554.

**Success Criteria and Monitoring Plan**

The following monitoring will be performed each year of the 3-year monitoring period on the restoration areas: reference photos, plant survival (i.e., identify specific problems areas (missing, stressed, damaged or dead plantings), estimated causes and proposed/required remedial action), visual inspection of channel stability. Physical measurements of channel stability/morphology will not be performed. A monitoring report will be submitted within sixty (60) days after completing the monitoring.

Type	Quantity	Credits
Stream Restoration	1243 ft	1243 ft
Buffer Restoration	121968 sq. ft	121968 sq ft

Common Name	Scientific Name	Percent Planted by Species
<b>Type II Streambank Reforestation – Bare Root Plantings</b>		
River Birch	<i>Betula nigra</i>	30%
Sycamore	<i>Platanus occidentalis</i>	30%
Overcup Oak	<i>Quercus lyrata</i>	20%
Swamp Chestnut Oak	<i>Quercus michauxii</i>	20%
<b>Type I Streambank Reforestation - Live Stakes</b>		
Black willow	<i>Salix nigra</i>	50%
Silky Dogwood	<i>Cornus amomum</i>	50%

**Tommy's Road Mitigation Plan  
Wayne County**

**R-2554BA  
WBS Element: 34461.1.1**

**December 3, 2007**

NCDOT will perform on-site mitigation to offset unavoidable stream and wetland impacts associated with Transportation Improvement Program (TIP) R-2554BA. The mitigation is located within the NCDOT right-of-way and an NCDOT conservation easement area adjacent to this TIP within NCDWQ sub-basin 03-04-05 and within HU 03020202. This site contains 3.91 acres of which 2.79 acres is NCDOT right-of-way and 1.12 acres is a NCDOT conservation easement along Howell's Branch. Tommy's Road currently bisects the site.

At this site, the proposed mitigation will include stream and wetland preservation as well as wetland and buffer restoration. NCDOT proposes to preserve 691 linear feet of Howell's Branch as well as 2.37 acres of adjacent riverine wetlands. This will be used as onsite mitigation at a ratio of 5:1. As part of the R-2554BA project, NCDOT also plans to remove a section of Tommy's Road and the culvert for Howell's Branch between Sta. 21+20 and Sta. 21+80 as shown on plan sheet 10 at Site 8. This will enhance the existing riverine and wetland system as well as provide 61 ft of stream restoration, 0.33 acres of riverine wetland restoration and 7792 sq. feet of buffer restoration. NCDOT plans to use this as onsite mitigation at a ratio of 1:1. (See Table 1)

**Existing Conditions**

Howell's Branch is a tributary to Stoney Creek. The Stoney Creek watershed drains approximately 30 square miles from the Goldsboro/Wayne Airport to the Neuse River. Howell Branch flows through the site in a north to south direction for 752 linear ft. Existing wetlands adjacent to the stream on the eastern side, north of Tommy's Road, total 1.12 acres. Existing wetlands along the western side of the stream, north of Tommy's Rd. total 0.48 acres. There is also a 0.2 acre pond along the western side that NCDOT has acquired as a Permanent Drainage Easement (PDE) within its conservation easement area. The site is bisected by Tommy's Rd. which is a two lane paved road with a 2400 mm culvert through which Howell Branch currently flows. An area south of Tommy's Rd. has also been acquired as NCDOT right-of-way and has 0.77 acres total of wetlands associated with Howell Branch.

**Proposed Conditions**

NCDOT plans to restore 61 linear ft of Howell Branch, 0.33 acre of riverine wetlands and 7792 square ft. of riparian buffer through removal of the existing pavement and fill material associated with Tommy's Rd as well as removal of the 2400 mm culvert that

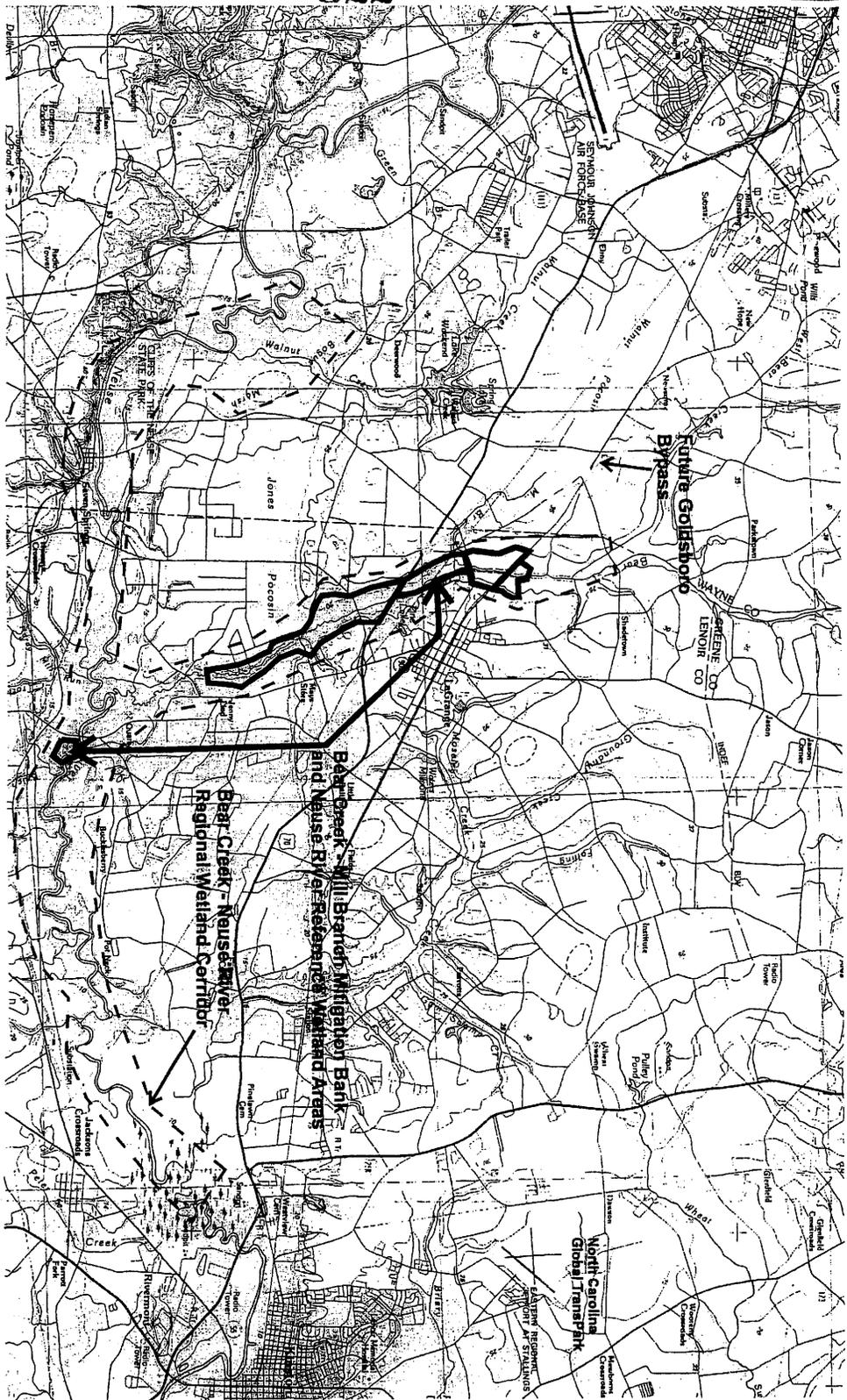
Howell Branch currently flows through. NCDOT will excavate the existing roadbed to the existing wetland elevation and match the base width of the existing culvert (See Detail V, sheet 2-T and Sheets x-242 & x-243). These restored areas will be planted with a mix of bare root saplings as described in Table 2 at a rate of 680 trees per acre. This area will be protected through fencing of the entire site.

**Success Criteria and Monitoring Plan**

The following monitoring will be performed each year of the 3-year monitoring period on the restoration areas: reference photos, plant survival (i.e., identify specific problems areas (missing, stressed, damaged or dead plantings), estimated causes and proposed/required remedial action), visual inspection of channel stability. Physical measurements of channel stability/morphology will not be performed. A monitoring report will be submitted within sixty (60) days after completing the monitoring.

Type	Quantity	Credits
Stream Preservation	691 ft	138.2 ft
Stream Restoration	61 ft	61 ft.
Wetland Preservation	2.37 ac	0.47 ac
Wetland Restoration	0.33 ac	0.33 ac
Buffer Restoration	7792 sq. ft	7792 sq. ft

Common Name	Scientific Name	Percent Planted by Species
<b>Type II Streambank Reforestation – Bare Root Plantings</b>		
River Birch	<i>Betula nigra</i>	30%
Sycamore	<i>Platanus occidentalis</i>	30%
Overcup Oak	<i>Quercus lyrata</i>	20%
Swamp Chestnut Oak	<i>Quercus michauxii</i>	20%
<b>Type I Streambank Reforestation - Live Stakes</b>		
Black willow	<i>Salix nigra</i>	50%
Silky Dogwood	<i>Cornus amomum</i>	50%



Restoration Systems  
 1101 Haynes Street,  
 Suite 107  
 Raleigh, N.C. 27604

**Site Location**  
 Bear Creek - Mill Branch Mitigation Site  
 Lenoir County, North Carolina

Dwn. by:	JN
Scale:	1 in=1400 ft
Date:	December 2003
Project:	04-2677

FIGURE  
 1

323

**ANNUAL WETLAND MONITORING REPORT**  
**YEAR 2005 (YEAR 4)**

**BEAR CREEK - MILL BRANCH WETLAND MITIGATION BANK**  
**LENOIR COUNTY, NORTH CAROLINA**



Natural Resources  
Restoration & Conservation

**RESTORATION SYSTEMS, LLC**  
**1101 Haynes Street, Suite 107**  
**Raleigh, North Carolina 27604**  
**restorationsystems.com**  
**(919) 755-9490**

**October 2005**

**EXECUTIVE SUMMARY**

Restoration Systems, a private sector mitigation company, has established the Bear Creek-Mill Branch mitigation site (Site) approximately 5 miles from confluence with the Neuse River, in western Lenoir County. The Site is composed of approximately 145 acres within the floodplain of Bear Creek, and supports stream flows from Mill Branch and two unnamed tributaries at confluence with the river. This Site offers opportunities for riverine (stream-side) wetland restoration, Neuse River basin riparian buffer establishment, and Neuse River nitrogen reduction.

This mitigation plan details restoration and enhancement procedures for riverine wetland restoration. The Site historically serviced a watershed of approximately 54 square miles. The objective of this plan is to restore watershed functions associated with water quality and to restore a regional wildlife corridor extending from the Neuse River. The Site will be coupled with approximately 300 acres of riverine wetland preservation within the watershed to ensure that a viable wetland refuge is established in the region.

Under existing conditions, the river floodplain has been ditched, leveled, and drained to support agricultural and silvicultural activities. Streams and the river have been dredged, straightened, and levees constructed to further impede surface water impacts to alternative land uses. Based on surface water models, river flooding onto the former floodplain has been effectively reduced to a 100-year return interval due to constructed levees. This plan includes removal of a section of the river levee; consequently, flooding from the river may be restored to a 5-year return interval, a 95-year increase in return interval relative to existing conditions.

Under existing conditions, nitrogen loading into the Neuse River from the Bear Creek and Mill Branch watersheds is projected to total 2,575,000 pounds per year, representing a seven-fold increase in nutrient loads discharged into the River due to land uses in the watershed. River dredging and levee construction throughout the Bear Creek watershed has most likely exacerbated the water quality problems. Nutrient recycling functions associated with riverine wetlands and floodplains is expected to be diminished or negated throughout the region. Therefore, wetland restoration plans have been designed specifically to maximize nutrient cycling functions at this Site. The effort includes: 1) restoration of overbank flooding from the river as described above; 2) maximizing the amount of groundwater recharge across the floodplain from auxiliary watersheds; 3) establishment of backwater sloughs, cypress-tupelo swamps, and bottomland hardwood forests in flow pathways; and 4) diversion of treated stream flows back into historic channels, located approximately 3000 feet down-valley from the existing ditch outlets. Based on preliminary studies, this wetland restoration project exhibits potential to provide up to a 5 percent reduction in nitrogen loads for the 54-square mile Bear Creek region, or an 80 percent reduction in nitrogen loads for the 3-square mile, Mill Branch watershed.

Site alterations to restore groundwater, surface flow dynamics, and wetland function include: 1) ditch backfilling; 2) ditch outlet plugs; 3) river levee removal; 4) embankment construction; 5) Mill Branch channel repair; 6) wetland surface scarification; 7) seasonal pool construction; 8) woody debris deposition; and 9) tree planting. The alterations will serve to: 1) establish a backwater cypress-tupelo swamp; 2) provide a perennial source for groundwater recharge

through restored bottomland hardwood forest; 3) allow diversion of Mill Branch back into the historic stream channel; and 4) facilitate nutrient reduction goals in the Neuse River basin. The wetland design has been prepared to mimic riverine wetland attributes measured in regional reference wetlands (carbon copy method for wetland restoration). A total of 34,750 characteristic trees will be planted within the restored wetland systems.

Mill Branch will be diverted from inter-field ditches into exiting forested areas. In the forested area, the stream will be allowed to re-develop primarily through passive processes. Braiding, ponding, and anastomosed conditions will occur, mimicking reference streams in the region. Reference streams often exhibit braided (alluvial fan), backwater, or anastomosed features at the confluence with large river floodplains. The outlet for Mill Branch will be established approximately 3000 feet down-valley from the existing outfall, providing approximately 1710 feet in additional valley length relative to existing, straightened conditions (restored sinuosity not included). The increased length of stream corridor will allow for the restoration and maintenance of in-stream aquatic habitat relative to existing conditions. In addition, nutrient reduction in surface water flows will be maximized.

A Monitoring Plan has been prepared that consists of a comparison between regional reference wetlands along with evaluation of jurisdictional wetland criteria. Monitoring will entail analysis of wetland hydrology, soil, and vegetation for 5 years or until success criteria are fulfilled.

Restoration Systems intends to immediately transfer the land deed and conservation easements for the Site and regional wetland preservation areas to the North Carolina Wildlife Habitat Foundation (Eddie C. Bridges, Executive Director). Immediate transfer to the conservation organization will ensure that the 445-acre land area remains protected and managed as a regional wetland refuge in perpetuity.

Restoration plans will re-introduce surface water flood hydrodynamics from a 54 square mile watershed. The plan includes establishment of an array of riverine communities, including levee forest, bottomland hardwood forests, riverine swamp forests, and backwater cypress-gum swamps. Therefore, riverine hydrodynamic and biogeochemical functions will be restored, including pollutant removal, organic carbon export, sediment retention, nutrient cycling, flood storage, and energy dissipation. Physical wetland functions typically associated with water quality will be replaced within the Neuse River basin.

Biological functions associated with the riverine system will also be restored including in-stream aquatic habitat, structural floodplain habitat, and interspersed and connectivity between the restored stream, floodplain, and adjacent uplands.

Based on restoration plans, the area includes approximately 88 acres of riverine wetland restoration, 34 acres of wetland enhancement, 300 acres of wetland preservation, and 23 acres of upland buffer restoration. Based on Environmental Protection Agency guidelines, the plan provides 88 wetland mitigation credits for bottomland hardwood and swamp forest wetlands on riverine floodplains (5th order streams or less). In addition, the Site provides for 3390 linear feet of riparian buffer credit and a conservative estimate of 100,000 pounds per year of nitrogen removal in the Neuse River Basin. The project is scheduled for completion in December, 2000.

### 3.0 CONCLUSIONS AND SUMMARY OF RESULTS FOR YEARS 1 THROUGH 5

The restoration site exhibits hydrological characteristics that are very similar to the reference wetlands. Community patterns continue to develop in a clumped distribution, with a variety of tree seedlings surviving in local niches along the hydrology gradient. Areas that are characterized primarily by shrub/emergent assemblages contain an abundance of young, swamp forest species including water tupelo (*Nyssa aquatica*), swamp tupelo (*Nyssa biflora*), and bald cypress (*Taxodium distichum*). As these trees/forests mature throughout the years and the canopy closes, the emergent species are expected to be shaded out as the cypress-tupelo swamp develops with interspersed pockets of permanent inundation similar to that of other swamp forests throughout the region.

Several beaver dams were observed and removed within the site between 2004 and 2006. Beaver are present and active within reference wetland areas and have become a part of bottomland hardwood and swamp forest ecosystems throughout the Neuse River watershed. In addition, river otter (*Lutra canadensis*) populations that are likely present within the site and adjacent areas may be threatened by beaver removal programs.

Chinese privet (*Ligustrum sinense*) is present along mature forest edges and within established bottomland hardwoods located in the southeast portion of the site. The density of Chinese privet stems has decreased within bottomland hardwoods from 229 stems per acre in year 4 (2005) to 86 stems per acre in year 5 (2006). This is likely due to increased saturation/inundation of the site and an intolerance of this species to endure prolonged periods of saturation/inundation. Drier conditions during earlier monitoring years may have encouraged proliferation of this species within the site. During field investigation in late July and early August of 2006, many of the more mature, established stems of Chinese privet were dead or dying, most likely resulting from continual saturation/inundation. In addition, Chinese privet was present within the reference forest used to design this site and the species has become naturalized within bottomland hardwood and swamp forests throughout the Neuse River watershed. It is not recommended that measures to control this species should be taken. This species is extremely difficult to control due to propagation from root and stump sprouts, production of numerous fruits that are easily dispersed by area wildlife (mostly birds) and moving water, and tolerance of drought conditions.

In summary, the restoration site achieved success criteria for hydrology and vegetation in the Fifth Monitoring Year. In addition, the site is highly successful having achieved success criteria for hydrology and vegetation over the entire 5-year monitoring period. Tables 5 and 6 below summarize hydrology and vegetation data gathered each of the five monitoring years.

**Table 5. Summary of Groundwater Gauge Results for Years 1 through 5**

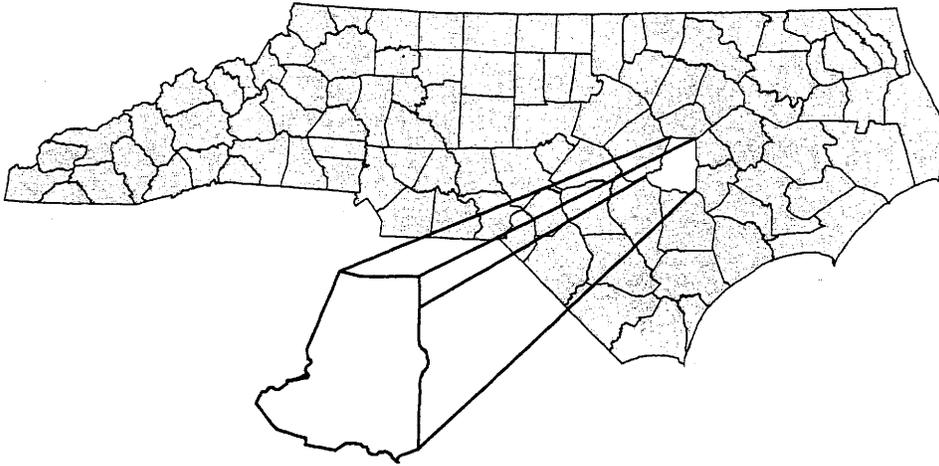
Gauge	Success Criteria Achieved (Max Consecutive Days Saturated During Growing Season)				
	Year 1 (2002)	Year 2 (2003)	Year 3 (2004)	Year 4 (2005)	Year 5 (2006)
BH1	Yes (27 days)	Yes (135 days)	Yes (217 days)	Yes (119 days)	Yes (249 days)
BH2	Yes (49 days)	Yes (136 days)	Yes (207 days)	Yes (100 days)*	Yes (167 days)
BH3	Yes (59 days)	Yes (249 days)	Yes (249 days)	Yes (114 days)*	Yes (167 days)
BH4	Yes (59 days)	Yes (249 days)	Yes (249 days)	Yes (102 days)	Yes (196 days)
BH5	Yes (152days)	Yes (249days)	Yes (249 days)	Yes (225 days)*	Yes (249 days)
BH6	Yes (154 days)	Yes (249 days)	Yes (249 days)	Yes (157 days)*	Yes (249 days)
Ref BH100	Yes (64 days)	Yes (249 days)	Yes (166 days)	malfunctioned	Yes (86 days)
SF1	Yes (43 days)	Yes (249 days)	Yes (249 days)	Yes (249 days)	Yes (133 days)
SF2	Yes (249 days)	Yes (249 days)	Yes (249 days)	Yes (177 days)	Yes (249 days)
SF3	Yes (56 days)	Yes (249 days)	Yes (249 days)	Yes (103 days)*	Yes (247 days)
SF4	Yes (249 days)	Yes (249days)	Yes (249 days)	Yes (130 days)*	Yes (249 days)
SF5	Yes (220 days)	Yes (249 days)	Yes (249 days)	Yes (249 days)	Yes (249 days)
Ref SF100	Yes (130 days)	Yes (249 days)	Yes (249 days)	Yes (249 days)	Yes (249 days)

\* Gauge malfunctioned for a portion of the growing season.

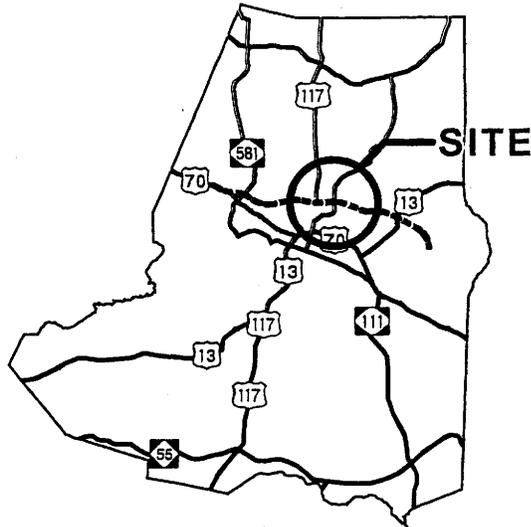
**Table 6. Summary of Vegetation Plot Results for Years 1 through 5**

Community	Total Stems/Acre Counting Toward Success Criteria				
	Year 1 (2002)	Year 2 (2003)	Year 3 (2004)	Year 4 (2005)	Year 5 (2006)
Bottomland Hardwood	361	842	904	1554	1128
Riverine Swamp Forest	490	876	1028	1534	1282

# NORTH CAROLINA



# WAYNE



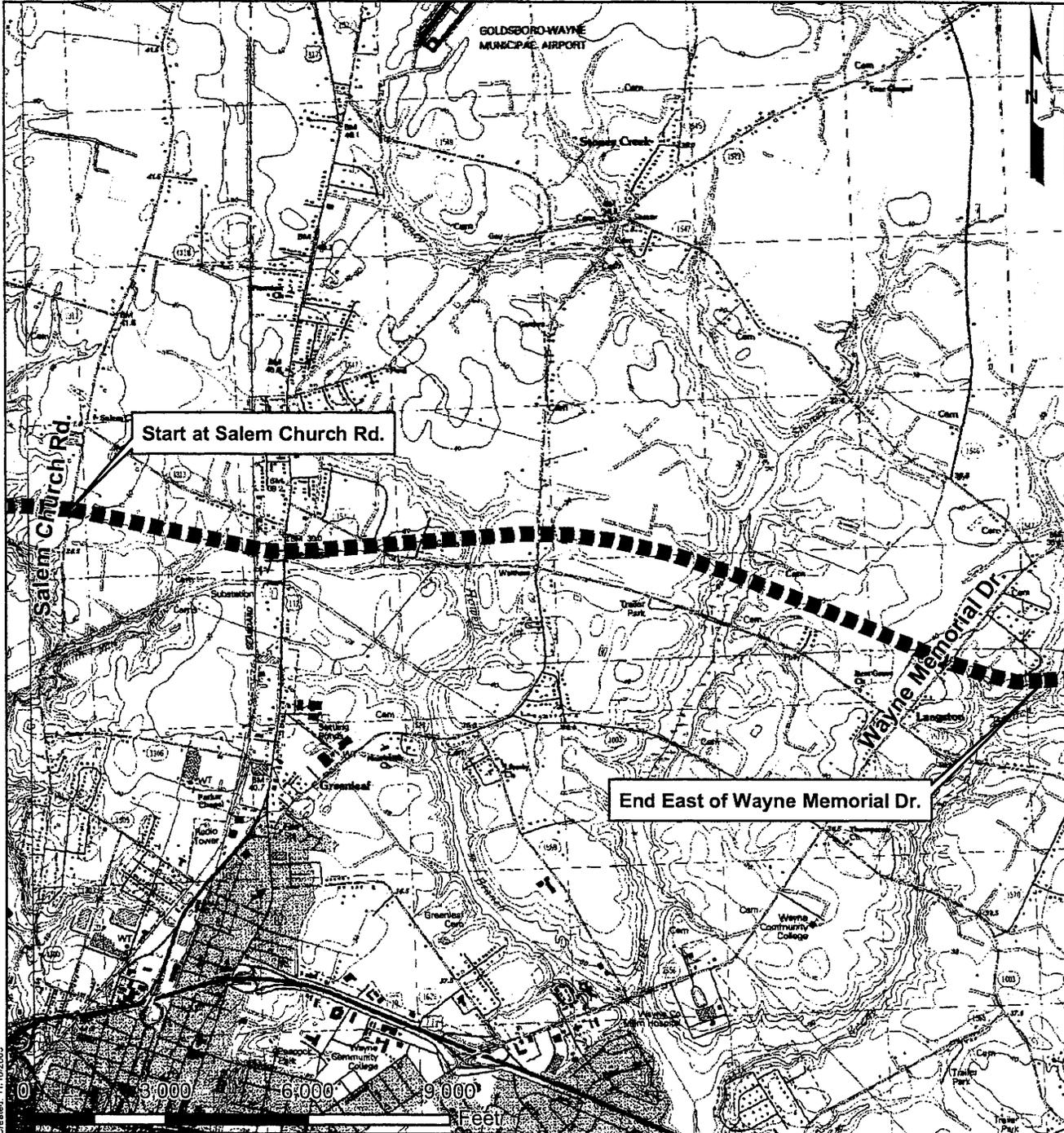
# VICINITY MAPS

NCDOT

DIVISION OF HIGHWAYS  
WAYNE COUNTY  
PROJECT: 34461.1.3 (R-2554BA)  
US 70 BYPASS

Permit Drawing  
Sheet 1 of 111

10/17/07



Start at Salem Church Rd.

End East of Wayne Memorial Dr.

1 inch equals 3,000 feet

# LOCATION

## NCDOT

DIVISION OF HIGHWAYS  
 WAYNE COUNTY  
 PROJECT: 34461.1.3 (R-2554BA)  
 US 70 BYPASS

Permit Drawing  
 Sheet 2 of 111

10/17/07

D:\21796105E\_Maps\12-25-10\Bentley\12-25-10 USGS.mxd Creation: 11/16/2007

WETLAND PERMIT IMPACT SUMMARY															
Site No.	Station (From/To)	Structure Size / Type	WETLAND IMPACTS					SURFACE WATER IMPACTS							
			Permanent Fill In Wetlands (ha)	Temp. Fill In Wetlands (ha)	Excavation in Wetlands (ha)	Mechanized Clearing in Wetlands (ha)	Hand Clearing in Wetlands (ha)	Permanent SW impacts (ha)	Temp. SW impacts (ha)	Existing Channel Impacts Permanent (m)	Existing Channel Impacts Temp. (m)	Natural Stream Design (m)			
1	-L2RPBD- 4+25 +/-	Roadway									0.005	0.001	43.4	6.7	
2	-L2- 92+00 +/-	Roadway									0.001	0.001	7.3	6.7	
3	-L- 94+40 +/-	Roadway	0.636			0.028					0.040	0.001	319.1	9.4	
4	-L- 98+60 +/-	Roadway									0.078	0.011	357.2	25.7	329.8
5	-L- 102+64 - 109+19 +/-	Roadway	0.024			0.005					0.142	0.001	164.8	10.3	170.9
6	-SR5- 17+60 +/-	Roadway				0.012									
7	-L- 114+80 +/-	Bridge	0.002			0.004		0.292			0.001				
8	-SR5- 21+60 +/-	Roadway			0.008	0.021									
9	-L- 132+00 +/-	Bridge	0.047			0.012		0.573							
10	-L- 141+00 +/-	Roadway	1.073			0.125									
11	-L- 148+60 +/-	Roadway	0.041			0.013					0.132	0.002	253.1	6.2	
12	-L- 153+00 +/-	Bridge	0.305			0.015									
14	-Y2- 12+60 +/-	Roadway									0.006	0.001	38.9	3.2	
<b>TOTALS:</b>			<b>2.128</b>	<b>0.000</b>	<b>0.008</b>	<b>0.235</b>	<b>0.865</b>	<b>0.405</b>	<b>0.018</b>	<b>1183.8</b>	<b>68.2</b>	<b>500.7</b>			

Impacts due to piers in wetlands and streams at Site 7= 11sqm  
 Impacts due to piers in wetlands and streams at Site 9= 22sqm

Proposed wetland restoration due to existing road removal (Site 6)= 0.129ha

JMD Revised 2/03/05  
 R:\z-misc\hydro\Permit\New\_wetland\_Summary.xls

NC DEPARTMENT OF TRANSPORTATION  
 DIVISION OF HIGHWAYS

WAYNE COUNTY  
 WBS - 34461.1.3 (R-2554BA)

10/17/2007

Permit Drawing  
 Sheet 3 of 11



**WETLAND PERMIT IMPACT SUMMARY**

Site No.	Station (From/To)	Structure Size / Type	WETLAND IMPACTS					SURFACE WATER IMPACTS							
			Permanent Fill In Wetlands (ha)	Temp. Fill In Wetlands (ha)	Excavation in Wetlands (ha)	Mechanized Clearing in Wetlands (ha)	Hand Clearing in Wetlands (ha)	Permanent SW impacts (ha)	Temp. SW impacts (ha)	Existing Channel Impacts Permanent (m)	Existing Channel Impacts Temp. (m)	Natural Stream Design (m)			
1	-L2RPBD- 4+25 +/-	Roadway									0.001	0.001	43.4	6.7	
2	-L2- 92+00 +/-	Roadway									0.001	0.001	7.3	6.7	
3	-L- 94+40 +/-	Roadway	0.636			0.028					0.040	0.001	319.1	9.4	
4	-L- 98+60 +/-	Roadway									0.078	0.011	357.2	25.7	329.8
5	-L- 102+64 - 109+19 +/-	Roadway	0.024			0.005					0.142	0.001	164.8	10.3	170.9
6	-SR5- 17+60 +/-	Roadway				0.012									
7	-L- 114+80 +/-	Bridge	0.002			0.004		0.292			0.001				
8	-SR5- 21+60 +/-	Roadway						0.018						* 9.1	* 18.6
9	-L- 132+00 +/-	Bridge	0.047			0.012		0.573							
10	-L- 141+00 +/-	Roadway	1.073			0.125									
11	-L- 148+60 +/-	Roadway	0.041			0.013					0.132	0.002	253.1	6.2	
12	-L- 153+00 +/-	Bridge	0.305			0.015									
14	-Y2- 12+60 +/-	Roadway									0.006	0.001	38.9	3.2	
<b>TOTALS:</b>			2.128	0.000	0.000	0.214	0.883	0.405	0.020	1183.8	77.3	519.7			

Impacts due to piers in wetlands and streams at Site 7= 11 sqm  
 Impacts due to piers in wetlands and streams at Site 9= 22sqm

Proposed wetland restoration due to existing road removal (Site 8)= 0.135ha  
 \* Impacts due to removal of existing culvert on Tommy's Road. See Mitigation Plans.

Permit Drawing  
 Sheet 5 of 11

NC DEPARTMENT OF TRANSPORTATION  
 DIVISION OF HIGHWAYS

WAYNE COUNTY  
 WBS - 34461.1.3 (R-2554BA)

12/4/2007

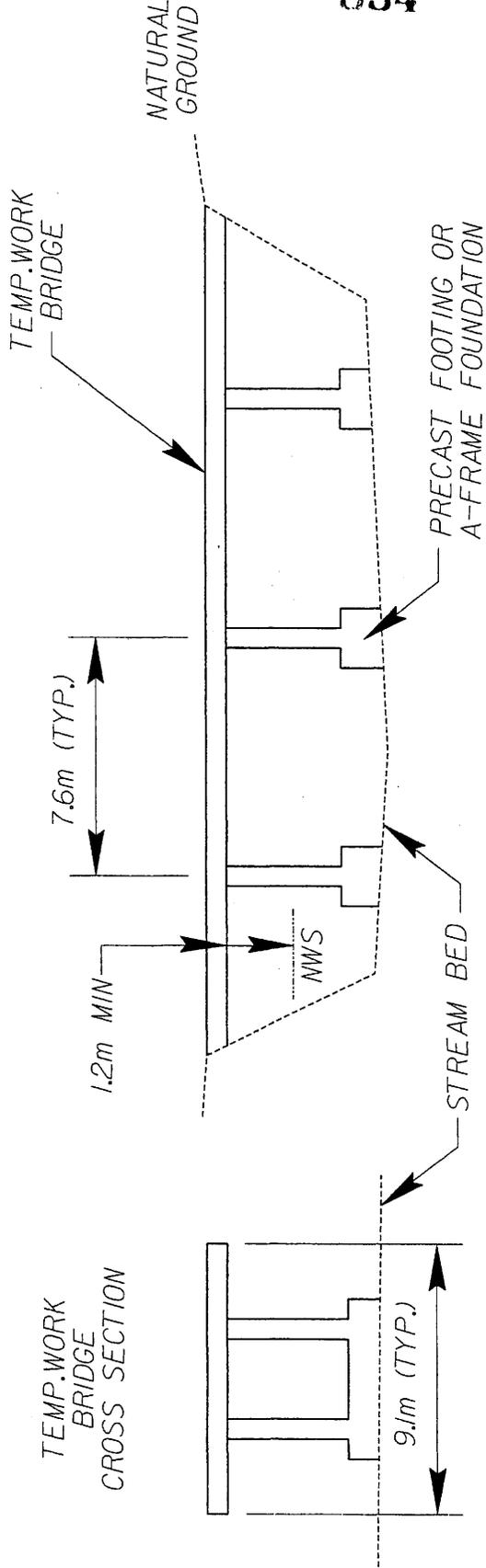
PROP. NO.	PROPERTY OWNER NAME	PROP. OWNER ADDRESS
1A 1	NCDOT (PREVIOUSLY LANE FARMS, INC.) DAN R. CASEY	DB 350 PG. 13 DB 335 PG 397 DB 350 PG. 54 DB 1541 PG 198
2	NORFAM, LLC	DB 1486 PG 432 DB 439 PG 320 DB 1037 PG 181 DB 1193 PG 737 UNKNOWN
9	EMILY W. PRIVOTT	E 03E PG 667
14	HELEN R. GODWIN	DB 1171 PG 405
16	ANDREWS FARMS OF WAYNE CO. INC	ESTATE FILE 02E-245
17	WILLIAM WHITE	WB 1930 PG 169
20	JOHN M. MERRITT	DB 1621 PG 708
26	JAMES W. HUBBLE	DB 1744 PG 533
26A	CAROLYN B. MORRIS, W. THOMAS BARDIN	DB 582 PG 536
27	PATRICIA GABRIEL	DB 1534 PG 253
28	CAREY R. HAM	DB 854 PG 681
30	NCDOT	DB 648 PG 95
31	HUBERT C. MATHEWS	DB 1424 PG 773
32	SHERMAN E. BEST	DB 823 PG 873
35	GEORGE MEADE BEST	DB 648 PG 416
36	KENNETH L. WIGGINS	DB 937 PG 807
38	NORA F. SMITH	DB 1044 PG 849
41	DAVID KENNEDY	DB 728 PG 105
43	MALCOLM E. GURLEY	DB 834 PG 484
43A	JETHO H. HARE	DB 1472 PG 411
47	ROBERT R. EARNEST	
901	NCDOT	

N.C. DEPT. OF TRANSPORTATION  
DIVISION OF HIGHWAYS

WAYNE COUNTY  
PROJECT: 34461.1.3 (R-2554BA)

10/17/2007

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WORK BRIDGE LAYOUT IS ESTIMATED.  
 ACTUAL LAYOUT MAY VARY  
 ACCORDING TO CONTRACTOR.

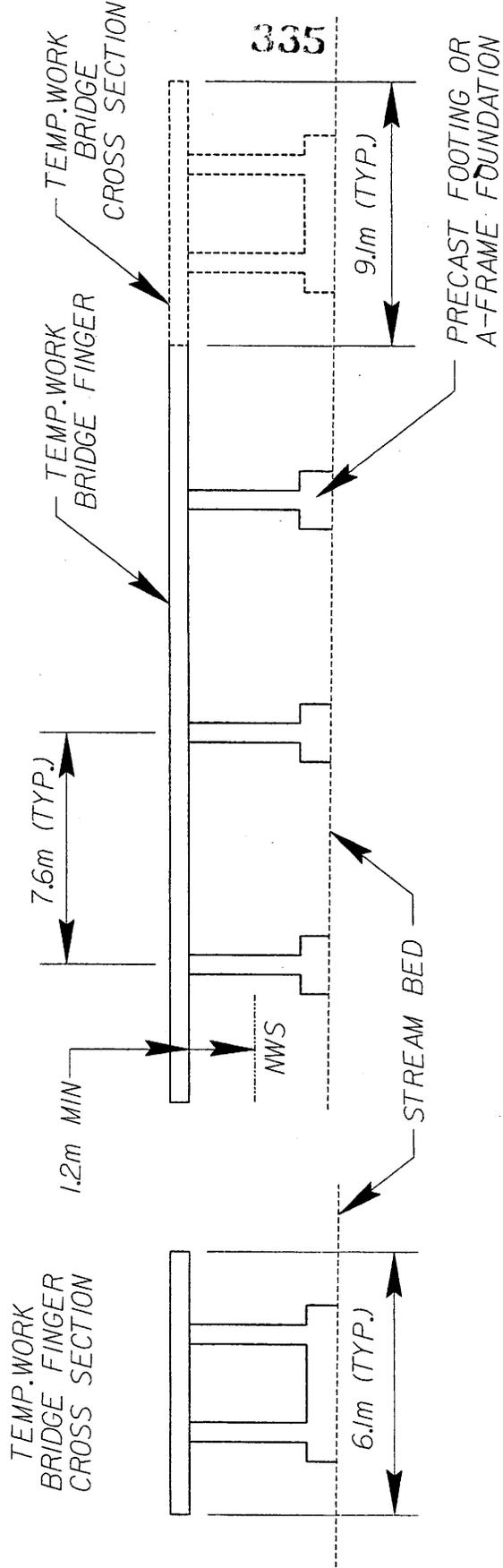
NOT TO SCALE

**TEMPORARY WORK BRIDGE  
 DETAIL**  
 (FOR PROP. BRIDGE CONSTRUCTION)

N.C. DEPT. OF TRANSPORTATION  
 DIVISION OF HIGHWAYS  
 WAYNE COUNTY  
 PROJECT 34461.1.3 (R-2554BA)

Permit Drawing  
 Sheet 2 of 11

10/17/07



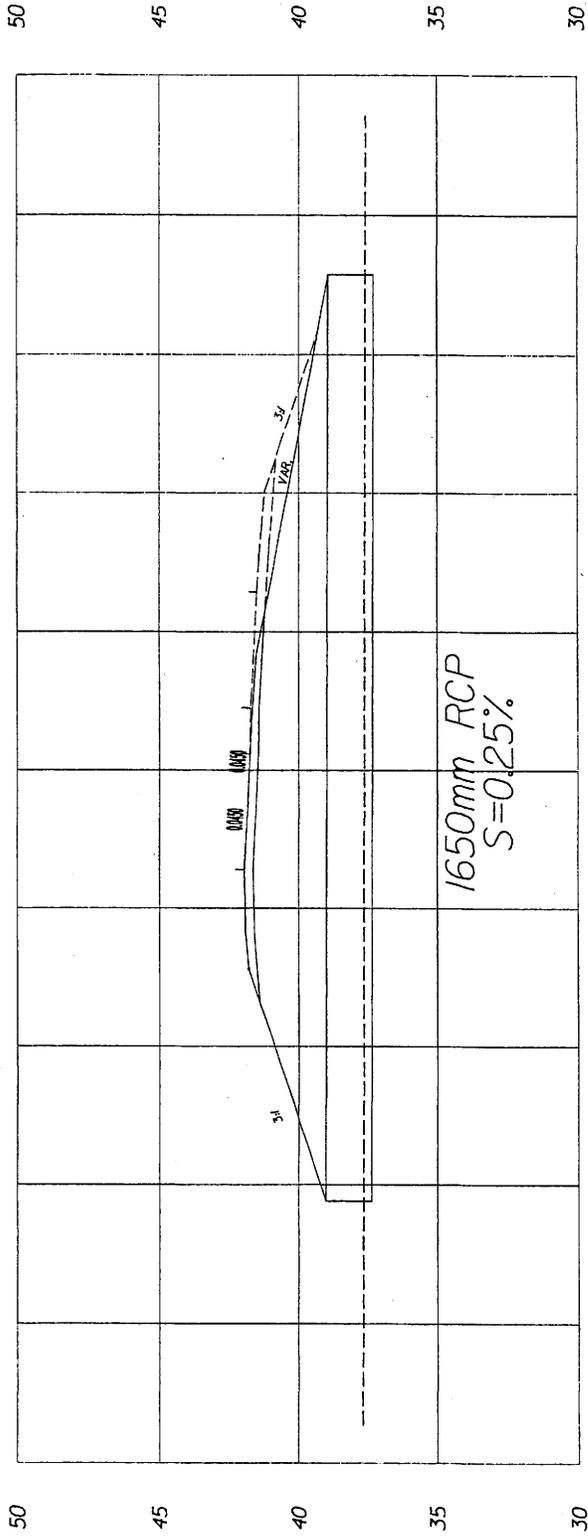
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**TEMPORARY WORK BRIDGE  
FINGER DETAIL  
(FOR PROP. BRIDGE CONSTRUCTION)**

N.C. DEPT. OF TRANSPORTATION  
DIVISION OF HIGHWAYS

WAYNE COUNTY  
PROJECT 34461.1.3 (R-2554BA)

Permit Drawing  
Sheet 2 of 11 10/17/07



Permit Drawing  
Sheet 9 of 111

N.C. DEPT. OF TRANSPORTATION  
DIVISION OF HIGHWAYS  
WAYNE COUNTY

PROJECT 34461.1.3 (R-2554BA)

US 70 BYPASS 10/17/07

SITE 1  
-L2RPBD- STA. 4 + 24

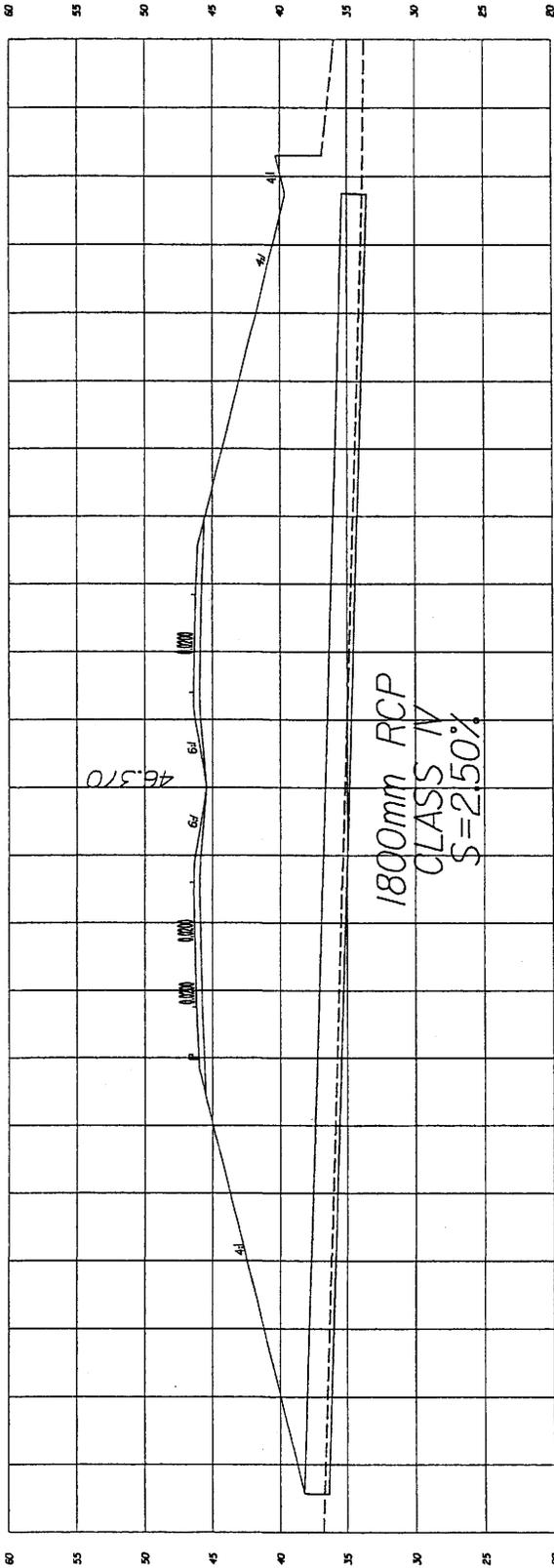


HORIZONTAL



VERTICAL

337



Permit Drawing  
Sheet 12 of 111

N.C. DEPT. OF TRANSPORTATION  
DIVISION OF HIGHWAYS  
WAYNE COUNTY  
PROJECT 34461.13 (R-2554BA)  
US 70 BYPASS 10/17/07

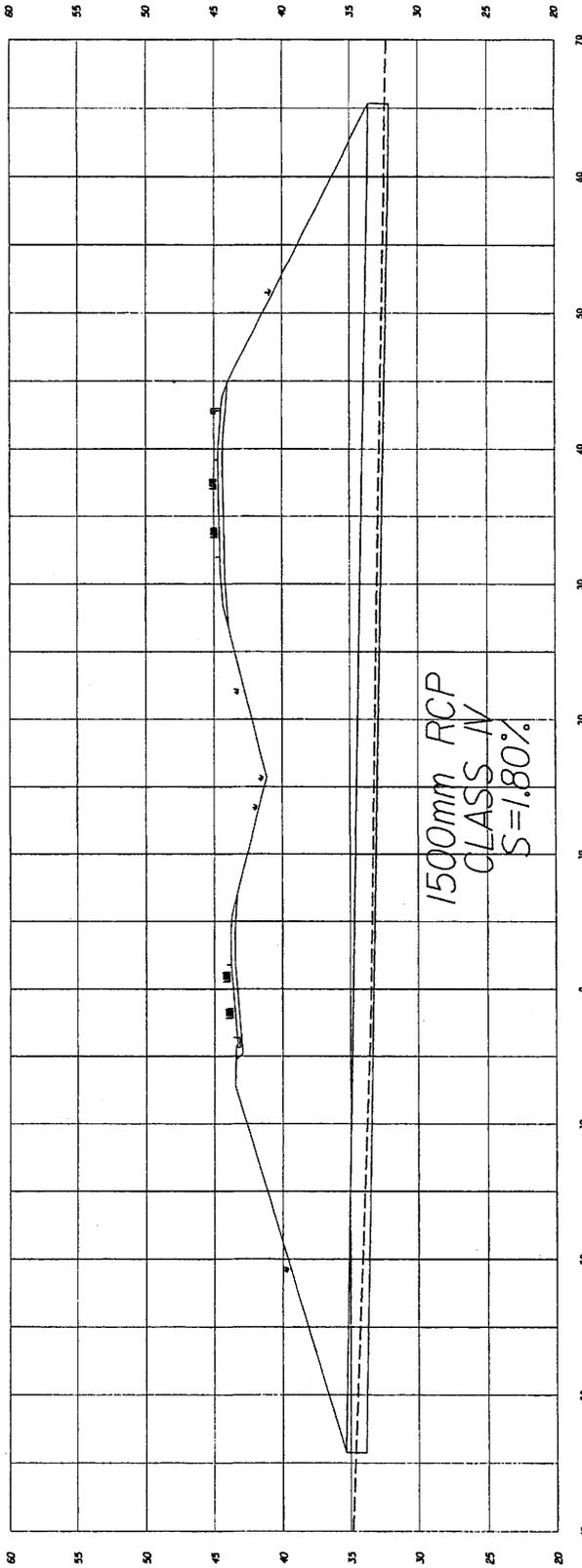
SITE 3  
-L- STA. 94+73



HORIZONTAL



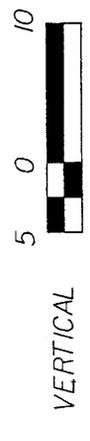
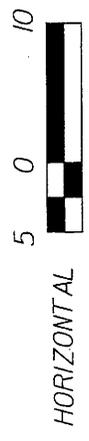
VERTICAL

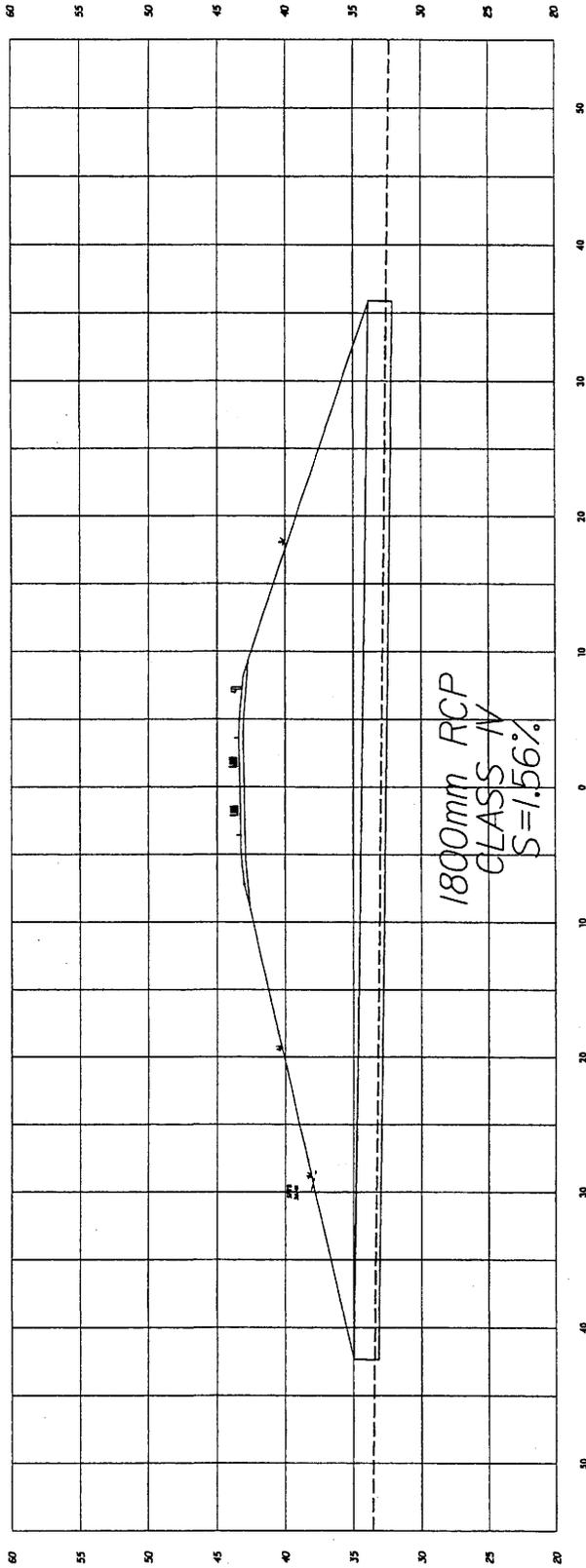


Permit Drawing  
Sheet 14 of 111

N.C. DEPT. OF TRANSPORTATION  
DIVISION OF HIGHWAYS  
WAYNE COUNTY  
PROJECT 3446113 (R-2554BA)  
US 70 BYPASS 10/17/07

SITE 3  
-L2LPD- STA. 2 + 20





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Permit Drawing  
Sheet 12 of 111

N.C. DEPT. OF TRANSPORTATION  
DIVISION OF HIGHWAYS  
WAYNE COUNTY

PROJECT 34461.1.3 (R-2554BA)

US 70 BYPASS 10/17/07

SITE 3  
-L2RPPBD- STA. 14+23

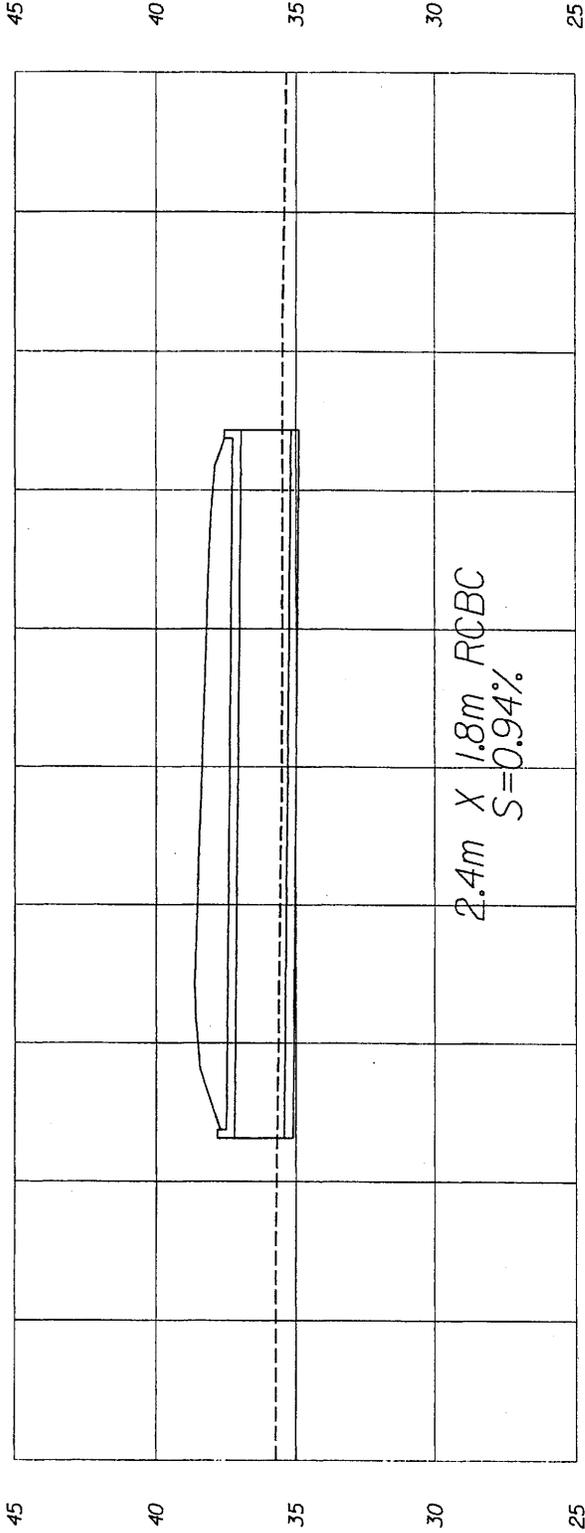


HORIZONTAL



VERTICAL





Permit Drawing  
Sheet 12 of 111

N.C. DEPT. OF TRANSPORTATION  
DIVISION OF HIGHWAYS  
WAYNE COUNTY

PROJECT 34461.13 (R-2554BA)

US 70 BYPASS 10/17/07

SITE 14  
-Y2- STA. 12+60



HORIZONTAL



VERTICAL

**PROJECT #:** R-2554BA

**COUNTY:** Wayne

**DESCRIPTION:** Construction of US Highway 70 in Goldsboro, NC

**STREAM:** Unnamed tributary to Smith Mill Run

**NATURAL CHANNEL DESIGN: SITE 3**

**Sta 97+21.286 to 99+66.856 -L- (RT)**

(Rev. October 10<sup>th</sup>, 2007)

The construction of the US Highway 70 bypass in northern Goldsboro, NC will result in numerous impacts to stream channels and other waters of the United States. In order to mitigate some of these impacts, on behalf of the North Carolina Department of Transportation (NCDOT), Rummel, Klepper, and Kahl (RK&K), LLP proposes stream restoration at Site 3, located immediately south of the Highway 70 right-of-way, south of SR 1313 (Belfast Road) in Goldsboro, NC.

Portions of two tributaries will be restored: a longer, southwest-flowing reach and a shorter tributary that flows into the longer reach from the north. The impacted stream channels are unnamed tributaries to the Smith Mill Run, which is in the Neuse River Basin, and are subject to the Neuse River Riparian Buffer Rules (15A NCAC 2B.0233). The channels are located in the upper coastal plain physiographic province. Land use within the channels' watershed is primarily agricultural, forested, and low-density residential.

In their existing conditions, both channels have been conspicuously channelized (i.e. straightened and dredged). The channel flowing from the north has incised considerably within its banks and represents a G-type channel (per Rosgen). The channels intersect just north of the proposed US 70 bypass footprint. Downstream of the confluence of the two channels, beaver activity has caused water to pond within the banks of the existing channel. The deepness of the water in ponded areas within the channel rendered existing conditions survey work infeasible. However, the Rosgen classification of the channel in this area is likely an F-type channel due to its very high width-to-depth ratio and high degree of incision.

In each of the streams, channel substrate consists of fine to very coarse sands. Along the channel flowing coming from the north, which flows through an agricultural field, the riparian corridor has been mowed and maintained and consists of fescue (*Festuca* spp.) and other grasses. Along the channel flowing towards the southwest and downstream of the confluence of the two channels, a well-developed riparian corridor is present, though relatively narrow (30-50 ft. off both the right and left banks of the channel). Vegetation consists mainly of loblolly pine (*Pinus taeda*), sweetgum (*Liquidambar styraciflua*), blackberry (*Rubus* spp.), yellow-poplar (*Liriodendron tulipifera*), devil's walking stick (*Aralia spinosa*), and greenbrier (*Smilax rotundifolia*).

Using existing stream channel conditions survey information (where possible), general site survey information, North Carolina Stream Restoration Institute bankfull hydraulic relationship data for the coastal plain (Doll et al., unpublished), and reference reach data, the natural channel design process (per Rosgen) was used to design a stable C-type stream channel with a narrow bankfull width-to-depth ratio at Site 3. It has been suggested by Rosgen (via personal correspondence) that in order to restore a channel to an E-type classification, it is best to design a C-type channel with the narrowest possible with-to-depth ratio as to not compromise stream bank stability. The reference reach used to guide the design of the proposed channel's pattern, profile, and dimension is an E5-type channel in Craven County, NC (see Table 1 for reference reach morphological variables). Proposed channel morphological variables are displayed in Table 1. The existing channels will be conveyed under US 70 and its associated filled slopes through 1350-mm diameter RCP culverts. The longer, main channel will start immediately below the culvert's outlet protection and flow towards the west for approximately 930 linear feet until its confluence with its existing downstream reach that will not be impacted by construction (see attached plan sheets). The smaller tributary to the north will flow for approximately 155 linear feet until its confluence with the longer stream to the south.

Due to the existing land grade and other constraints in the vicinity of the culvert outlets of both channels, a priority one restoration (per Rosgen), in which the restored channel's bankfull elevation is consistent with the existing floodplain elevation, is not possible. Thus, a priority two restoration is proposed, in which a bankfull bench is excavated adjacent to both banks of the restored channel. The bench's minimum width will be 23 ft. The bench should be planted with appropriate native tree and shrub species.

Furthermore, the 50-ft. Neuse River Buffer will be re-established adjacent to both sides of the restored bankfull channel and will be contained within the proposed right-of-way for the US 70 project. The re-established buffer areas should be replanted in accordance with North Carolina Ecosystem Enhancement Program (EEP, formerly WRP) buffer restoration guidelines.

Due to the relatively high difference in elevations between the proposed culvert's outfall and the existing stream channel thalweg, and the limited amount of space to route the designed stream channel to gradually dissipate slope, rock cross-vane grade control structures will be used to step the proposed channel's elevation down to its confluence with the existing channel. In order to ensure vertical channel stability and prevent creating a barrier to potential fish migration upstream, cross-vanes will result in no more than one-foot difference between the channel thalweg elevations upstream and downstream of the structure. Rock vanes will be placed on the outside of proposed meander bends to provide additional stream bank stability. Restored stream banks should be matted with coir matting (CF-7 or other similar material) and live staked with black willow (*Salix nigra*) and silky dogwood (*Cornus amomum*) to enhance bank stability. Refer to the attached plan sheets for cross-vane, coir matting, and rock vane details.

Channel substrate consists of fine to very coarse sands. Shear stresses and sediment transport analyses of the reference reach and the proposed restoration reaches were compared to ensure, to the maximum extent possible, that the restored stream will function properly. The shear stresses were calculated based on the velocity and flow depth results of the HEC-RAS analysis of the proposed restoration and the velocity and flow depth of the reference reach. These results were compared to the maximum permissible velocities in HDS-3 Table 2 and permissible shear stress for non-cohesive soils in HEC-15 Chart 1. The Shields Diagram was used to determine the particle size moved by each stream. The comparison of the proposed restoration reach data to the reference reach data indicates the restoration design is within acceptable velocity, shear stress and particle entrainment limits that will allow proper sediment transport under bankfull conditions.

Table 1. Rosgen Stream Channel Parameters

Parameter	Reference Reach	Proposed Upper Channel	Proposed Lower Channel
Rosgen channel type	E5	C5	C5
Drainage area (mi. <sup>2</sup> )	0.38	0.084	0.15
Bankfull discharge, $Q_{BKF}$ (cfs)	8.3	2.8	4.2
Bankfull cross-sectional area, riffle $A_{BKF} - \text{riffle}$ (ft. <sup>2</sup> )	6.5	3.0	5.6
Bankfull cross-sectional area, pool $A_{BKF} - \text{pool}$ (ft. <sup>2</sup> )	6.2-11.3	6.8	11.6
Bankfull width, $W_{BKF}$ (ft.)	7.1-12.0	6.0	8.0
Bankfull mean depth, $d_{BKF}$ (ft.)	0.9	0.5	0.7
Maximum bankfull depth, $d_{max}$ riffle (ft.)	1.0-1.6	0.65	1.0
Ratio of max. riffle bankfull depth to mean bankfull depth, $d_{max}$ riffle/ $d_{BKF}$	1.1-1.8	1.3	1.7
Maximum bankfull depth, pool $d_{max}$ pool (ft.)	1.7-2.0	1.5	2.0
Ratio of max. pool bankfull depth to mean bankfull depth, $d_{max}$ pool/ $d_{BKF}$	1.9-2.2	3.0*	2.9*
Average bankfull slope, S	0.0012	0.0017	0.0017
Bankfull width-to-depth ratio	7.9	12.0	11.4
Hydraulic radius, R (ft.)	0.73	0.43	0.60
Average bankfull velocity, u (ft./s)	1.28	0.93	0.75
$D_{50}$ (mm)	0.25	0.5 (estimated)	0.5 (estimated)
Shear Stress (lbs/ft. <sup>2</sup> )	0.055	0.046	0.064
Particle size entrained by shear stress per Shields diagram (mm)	4.0	3.6	4.5
Stream Power (lbs/ft. <sup>3</sup> ·s)	0.07	0.043	0.048
Entrenchment ratio ( $W_{fpa}/W_{BKF}$ )	14	14.8-16.8	7.9-11.9
Width of flood-prone area, $W_{fpa}$ (ft.)	102	89-101	62-95
Bank Height Ratio, TOB (top of bank elevation)/ $d_{max}$	1.0	1.0	1.0
Pool-to-pool spacing (ft.)	42-90	35.4-45	47-60
Ratio of pool-to-pool spacing to $W_{BKF}$	5.9-7.5	5.9-7.5	5.9-7.5
Meander length, $L_m$ (ft.)	75-120	60	80
Ratio of meander length to $W_{BKF}$	10-10.6	10	10
Sinuosity, K	1.6	1.15	1.16
Radius of curvature, $R_c$ (ft.)	3.8-35.8	≥15	≥20
$R_c$ ratio (radius of curvature/ $W_{BKF}$ )	0.5-3.0	≥2.5	≥2.5

\*The North Carolina Stream Restoration Institute (NCSRI) has recommended that pools be excavated slightly deeper than indicated by reference reach data because they have a tendency to partially fill in with fine sediment immediately following channel construction. Thus, the ratio of maximum pool depth to average bankfull depth of the proposed channel is higher than that of the reference reach.

**PROJECT #:** R-2554BA

**COUNTY:** Wayne

**DESCRIPTION:** Construction of US Highway 70 in Goldsboro, NC

**STREAM:** Unnamed tributary to Howell Branch

**NATURAL CHANNEL DESIGN: SITE 5**

**Sta. 13+73.949 -SR5- (Rt.) to Sta. 15+26.859 -SR5- (Rt.)**

(Rev. October 10<sup>th</sup> 2007)

The construction of the US Highway 70 bypass in northern Goldsboro, NC will result in numerous impacts to stream channels and other waters of the United States. In order to mitigate some of these impacts, on behalf of the North Carolina Department of Transportation (NCDOT), Rummel, Klepper, and Kahl (RK&K), LLP proposes stream restoration at Site 5, located immediately south of SR 1571 (Tommys Road) in Goldsboro, NC.

The impacted stream channel is an unnamed tributary to the Howell Branch, which is in the Neuse River Basin, and is subject to the Neuse River Riparian Buffer Rules (15A NCAC 2B.0233). The channel is located in the upper coastal plain physiographic province. Land use within the channel's watershed is primarily agricultural, forested, and low-density residential.

In its existing condition, the channel appears to have been straightened and modified. Channel bed form is generally poor with few riffle/pool sequences present. Cross-sectional surveys were performed at two riffles, yielding bankfull cross-sectional areas of 5.9-6.5 ft.<sup>2</sup>. Channel substrate consists of medium to coarse sands. The Rosgen classification of the existing channel is F5. Prior to past disturbance, the channel was probably classified as a C or E channel type in its natural state. As the channel was straightened, its slope was increased, resulting in higher shear stress. The higher shear stress caused the channel to incise within its bed, which confined bankfull (channel-forming) and other high volume flows within its banks. The increased stress on the

stream banks induced by bankfull and greater volume flows caused bank erosion, which cause the channel to widen to its present unstable dimensions.

The riparian corridor along the channel is highly variable in width, ranging from less than 10 ft. (generally in areas further upstream) to greater than 50 ft. on the channel's north side midway through the reach to be restored. Vegetation consists mainly of loblolly pine (*Pinus taeda*), sweetgum (*Liquidambar styraciflua*), blackberry (*Rubus* spp.), green ash (*Fraxinus pennsylvanica*), and greenbrier (*Smilax rotundifolia*).

Using existing stream channel conditions survey information (where possible), general site survey information, North Carolina Stream Restoration Institute bankfull hydraulic relationship data for the coastal plain (Doll et al., unpublished), and reference reach data, the natural channel design process (per Rosgen) was used to design a stable C-type stream channel with a narrow bankfull width-to-depth ratio at Site 5. It has been suggested by Rosgen (via personal correspondence) that in order to restore a channel to an E-type classification, it is best to design a C-type channel with the narrowest possible width-to-depth ratio as to not compromise stream bank stability. The reference reach used to guide the design of the proposed channel's pattern, profile, and dimension is an E5-type channel in Craven County, NC (see Table 1 for reference reach morphological variables). Proposed channel morphological variables are displayed in Table 1. The proposed channel will be conveyed under Tommys Road through a single RCP culvert and flow to the east for approximately 560 linear feet until its confluence with its existing downstream reach that will not be impacted by construction (see attached plan sheets).

Due to the existing land grade and other constraints, a priority one restoration (per Rosgen), in which the restored channel's bankfull elevation is consistent with the existing floodplain elevation, is not possible. Thus, a priority two restoration is proposed, in which a bankfull bench is excavated adjacent to both banks of the restored channel. The bench's minimum width will be 23 ft. The bench will be planted with appropriate native tree and shrub species. Furthermore, the 50-ft. Neuse River Buffer will be re-established adjacent to both sides of the restored bankfull channel and will be contained within the proposed right-of-way for the US 70 project. The re-established buffer areas will be replanted in accordance with North Carolina Ecosystem Enhancement Program (EEP, formerly WRP) buffer restoration guidelines.

Due to the relatively high difference in elevations between the proposed culvert's outfall and the existing stream channel thalweg, and the limited amount of space to route the designed stream channel to gradually dissipate slope, rock cross-vane grade control structures will be used to step the proposed channel's elevation down to its confluence with the existing channel. In order to ensure vertical channel stability and prevent creating a barrier to potential fish migration upstream, cross-vanes will result in no more than one-foot difference between the channel thalweg elevations upstream and downstream of the structure. Rock vanes will be placed on the outside of proposed meander bends to provide additional stream bank stability. Restored stream banks will be matted with coir matting (CF-7 or other similar material) and live staked with black willow (*Salix nigra*) and silky dogwood (*Cornus amomum*) to enhance bank stability. Refer to the attached plan sheets for cross-vane, coir matting, and rock vane details.

Channel substrate consists of fine to very coarse sands. Shear stresses and sediment transport analyses of the reference reach and the proposed restoration reaches were compared to ensure, to the maximum extent possible, that the restored stream will function properly. The shear stresses were calculated based on the velocity and flow depth results of the HEC-RAS analysis of the proposed restoration and the velocity and flow depth of the reference reach. These results were compared to the maximum permissible velocities in HDS-3 Table 2 and permissible shear stress for non-cohesive soils in HEC-15 Chart 1. The Shields Diagram was used to determine the particle size moved by each stream. The comparison of the proposed restoration reach data to the reference reach data indicates the restoration design is within acceptable velocity, shear stress and particle entrainment limits that will allow proper sediment transport under bankfull conditions.

Table 1. Rosgen Stream Channel Parameters

Parameter	Reference Reach	Proposed Channel
Rosgen channel type	E5	C5
Drainage area (mi. <sup>2</sup> )	0.38	0.17
Bankfull discharge, $Q_{BKF}$ (cfs)	8.3	4.6
Bankfull cross-sectional area, riffle $A_{BKF}$ - riffle (ft. <sup>2</sup> )	6.5	6.3
Bankfull cross-sectional area, $A_{BKF}$ - pool (ft. <sup>2</sup> )	6.2-11.3	13.9
Bankfull width, $W_{BKF}$ (ft.)	7.1-12.0	9.0
Bankfull mean depth, $d_{BKF}$ (ft.)	0.9	0.7
Maximum bankfull depth, $d_{max}$ riffle (ft.)	1.0-1.6	1.0
Ratio of max. riffle bankfull depth to mean bankfull depth, $d_{max}$ riffle/ $d_{BKF}$	1.1-1.8	1.8
Maximum bankfull depth, pool $d_{max}$ pool (ft.)	1.7-2.0	2.0
Ratio of max. pool bankfull depth to mean bankfull depth, $d_{max}$ pool/ $d_{BKF}$	1.9-2.2	2.9*
Average bankfull slope, S	0.0012	0.0017
Bankfull width-to-depth ratio	7.9	12.9
Hydraulic radius, R (ft.)	0.73	0.68
Average bankfull velocity, u (ft./s)	1.28	0.64
$D_{50}$ (mm)	0.25	0.5 (estimated)
Shear Stress (lbs/ft. <sup>2</sup> )	0.055	0.072
Particle size entrained by shear stress per Shields diagram (mm)	4.0	4.8
Stream Power (lbs/ft. <sup>3</sup> .s)	0.07	0.046
Entrenchment ratio ( $W_{fpa}/W_{BKF}$ )	14	9.0-17.2
Width of flood-prone area, $W_{fpa}$ (ft.)	102	72-155
Bank Height Ratio, TOB (top of bank elevation)/ $d_{max}$	1.0	1.0
Pool-to-pool spacing (ft.)	42-90	53-68
Ratio of pool-to-pool spacing to $W_{BKF}$	5.9-7.5	5.9-7.5
Meander length, $L_m$ (ft.)	75-120	90
Ratio of meander length to $W_{BKF}$	10-10.6	10
Sinuosity, K	1.6	1.24
Radius of curvature, $R_c$ (ft.)	3.8-35.8	≥22.5
$R_c$ ratio (radius of curvature/ $W_{BKF}$ )	0.5-3.0	≥2.5

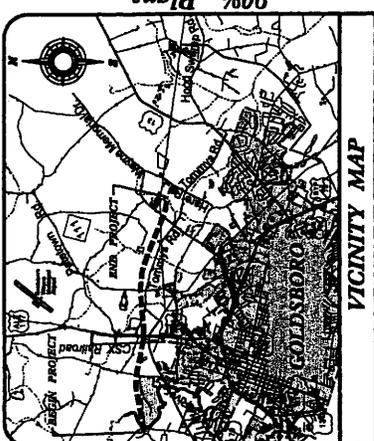
\*The North Carolina Stream Restoration Institute (NCSRI) has recommended that pools be excavated slightly deeper than indicated by reference reach data because they have a tendency to partially fill in with fine sediment immediately following channel construction. Thus, the ratio of maximum pool depth to average bankfull depth of the proposed channel is higher than that of the reference reach.

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Permit Drawing  
Sheet 21 of 111

# CONTRACT: C201818 T.I.P. PROJ: R-2554BA

See Sheet 1-A For Index of Sheets  
See Sheet 1-B For Conventional Symbols

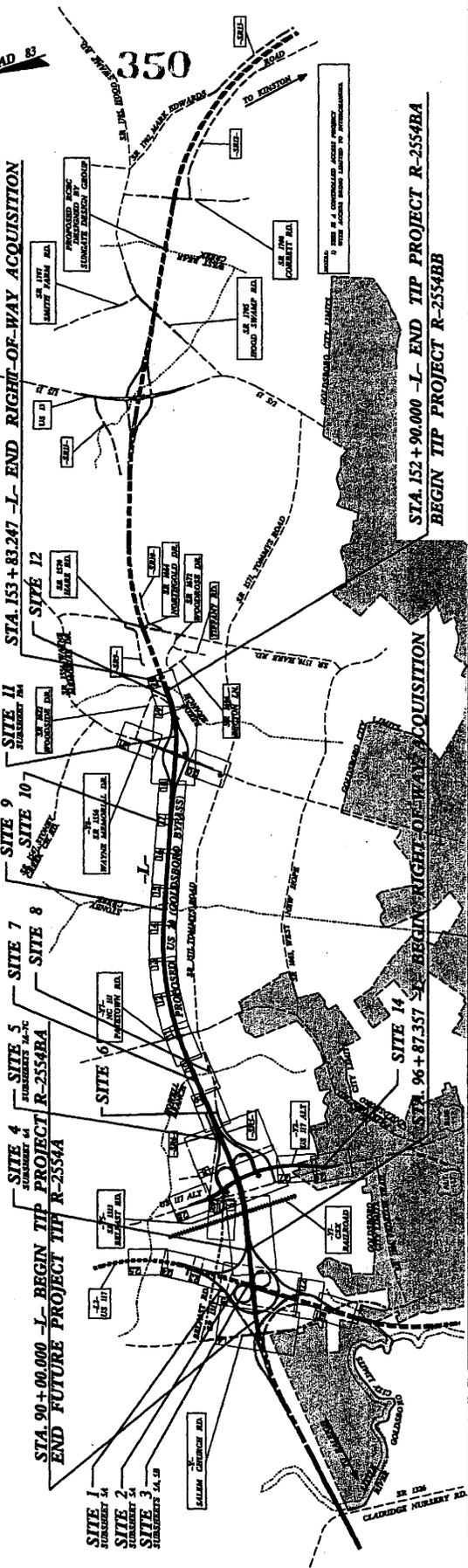


## STATE OF NORTH CAROLINA DIVISION OF HIGHWAYS **WAYNE COUNTY**

**LOCATION: US 70 (GOLDSBORO BYPASS)  
FROM EAST OF SR 1300 (SALEM CHURCH ROAD)  
TO EAST OF SR 1556 (WAYNE MEMORIAL DRIVE)**

**TYPE OF WORK: GRADING, PAVING, DRAINAGE,  
STRUCTURES, CULVERTS, SIGNING, AND SIGNALS**

<b>PROJECT NUMBER</b>	<b>1</b>
<b>STATE</b>	<b>N.C.</b>
<b>PROJECT TITLE</b>	<b>R-2554BA</b>
<b>DESIGNER</b>	<b>PER</b>
<b>DATE</b>	<b>MM &amp; UNTL</b>
<b>CONTRACT</b>	<b>CONST.</b>



**GRAPHIC SCALE**

PLANS: 1" = 10'

PROFILE (HORIZONTAL): 1" = 10'

PROFILE (VERTICAL): 1" = 2'

**DESIGN DATA**

ADT 2008 = 20,728  
ADT 2028 = 29,048

DHV = 10 %  
D = 55 %  
T = 10 %  
V = 110 km/h

**FUNCTIONAL CLASSIFICATION: FREEWAY**

\* TIST 6% DUAL 4%

**PROJECT LENGTH**

Length Roadway TIP Project R-245BA ..... 5.802 km

\*Length Structure TIP Project R-245BA ..... 0.489 km

**TOTAL LENGTH TIP Project R-245BA ..... 6.290 km (3.91 MILES)**

\*USED EBL -L- STATIONS FOR STRUCTURE LENGTHS

**PLANS PREPARED BY:**  
MICHAEL T. MERRITT, P.E.  
PROJECT DESIGN ENGINEER

**RIGHT OF WAY DATE:**  
MAY 18, 2005

**LETTING DATE:**  
APRIL 15, 2008

**FOR:**  
DIVISION OF HIGHWAYS

**PROJECT ENGINEER:**  
MICHAEL T. MERRITT, P.E.

**SCHEMATIC DEVELOPER:**  
Scott Blomquist, P.E.  
Engineering Coordinator - Roadway Design

**HYDRAULICS ENGINEER:** \_\_\_\_\_

**ROADWAY DESIGN:** \_\_\_\_\_

**DIVISION OF HIGHWAYS**  
STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
FEDERAL HIGHWAY ADMINISTRATION

Permit Drawing  
Sheet 23 of 11

**STA. 152 + 90.000 -L- END TIP PROJECT R-2554BA  
BEGIN TIP PROJECT R-2554BB**



PROJECT REFERENCE NO. **R-25248A** SHEET NO. **2-7**

ROADWAY DESIGN ENGINEER

CONST. BY

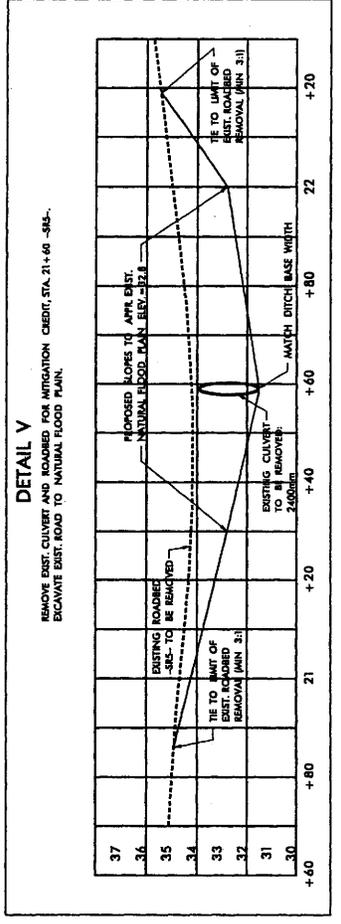
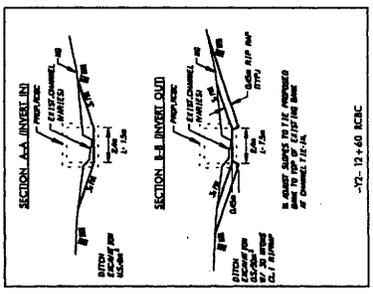
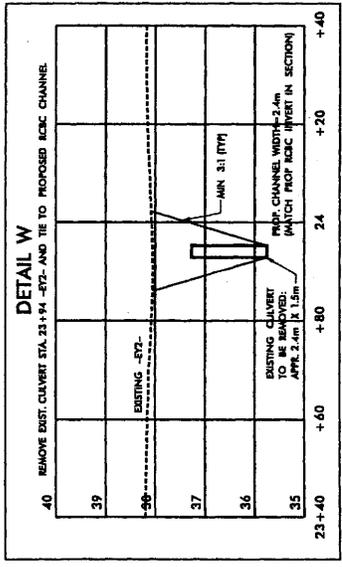
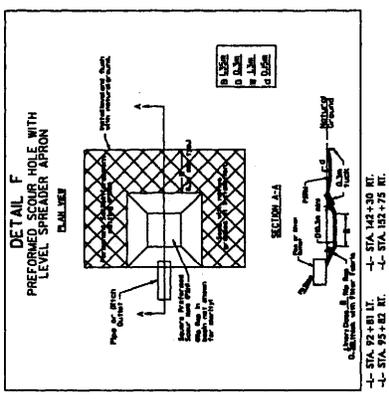
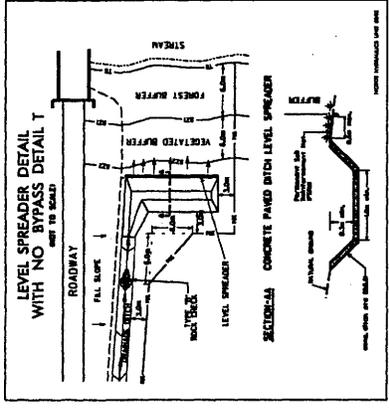
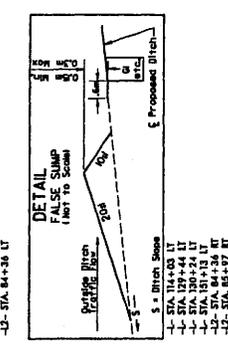
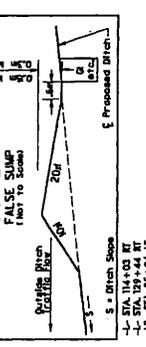
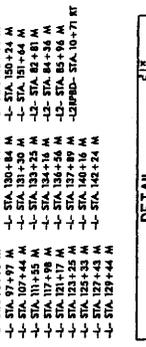
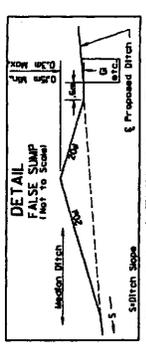
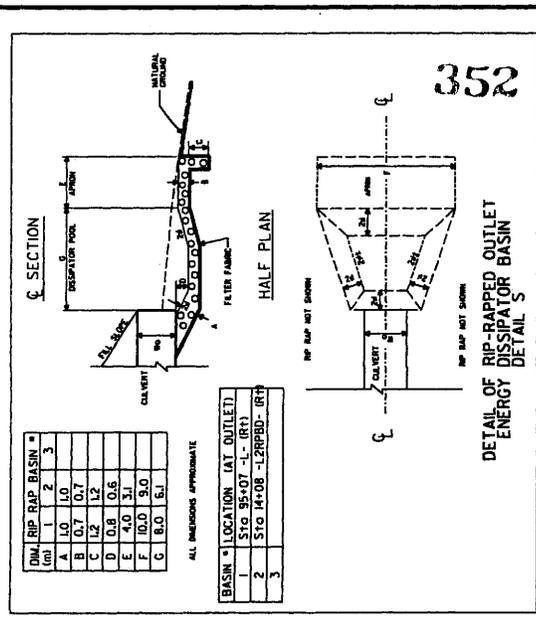
DATE

SCALE

PROJANUCES ENGINEERING

352

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Permit Drawing Sheet 25 of 111

PLANS PREPARED BY: RUMBLE & KLEPPER & KATH, LLP CONSULTING ENGINEERS 800 HUNTERS LANE, SUITE 200 FALLEN LEAF, NORTH CAROLINA 27609-3900 FOR DIVISION OF HIGHWAYS







CONST. REV.  
R/W REV.

PROJECT REFERENCE NO.	SHEET
B-255/ABA	2
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULIC ENGINEER

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# MORPHOLOGICAL MEASUREMENTS TABLE

US 70 (GOLDBORO BYPASS)  
 -STRM03- (LOWER) Sta. 10+00.000 to Sta. 11+29.346  
 -STRM03- (UPPER) Sta. 11+29.346 to Sta. 12+83.130

Variables	Existing Channel	Proposed Upper Reach	Proposed Lower Reach	Reference Reach
	F	C5	C5	E5
1. Stream type				
2. Drainage area (sq.mi.)	0.15	0.084	0.15	0.38
3. Bankfull width (ft)	11.5	6.0	8.0	7.1-12.0
4. Bankfull mean depth (ft)	0.4	0.5	0.7	0.9
5. Width/depth ratio	28.0	12.0	11.4	7.9
6. Bankfull cross-sectional area (sq.ft)	5.6	3.0	5.6	6.5
7. Bankfull mean velocity (ft/s)	*	0.93	0.75	1.28
8. Bankfull discharge (cfs)	*	2.8	4.2	8.3
9. Bankfull max depth (ft)	*	0.65	1.0	1.0-1.6
10. Width of floodprone area (ft)	*	88-101	62-95	102
11. Entrenchment ratio	*	14.8-16.8	7.9-11.9	14
12. Meander length (ft) (average)	*	60	80	75-120
13. Ratio of meander length to bankfull width	*	10	10	10.0-10.6
14. Radius of curvature (ft)	*	>15	>20	3.8-35.8
15. Ratio of radius of curvature to bankfull width	*	>2.5	>2.5	0.5-3.0
16. Belt width (ft)	43	37	40	*
17. Meander width ratio	3.7	6.2	5.0	*
18. Sinuosity (stream length/valley length)	1.14	1.15	1.16	1.6
19. Valley slope (ft/ft)	*	0.0085	.0020	*
20. Average slope (ft/ft)	*	0.0017	.0017	0.0012
21. Pool slope(ft/ft)	*	0.0	0.0	*
22. Ratio of pool slope to average slope	*	0.0	0.0	*
23. Maximum pool depth (ft)	*	1.5	2.0	1.7-2.0
24. Ratio of pool depth to average bankfull depth	*	3.0	2.9	1.9-2.2
25. Pool width (ft)	*	2.0	1.6	*
26. Ratio of pool width to bankfull width	*	0.33	0.2	*
27. Pool to pool spacing (ft) (average)	*	35.4-45.0	47-60	42-90
28. Ratio of pool to pool spacing to bankfull width	*	5.9-7.5	5.9-7.5	5.9-7.5
29. Ratio of lowest bank height to bankfull height (or max bankfull depth)	*	1.0	1.0	1.0

\* = NOT MEASURED

NOTE: ENGLISH UNITS WERE USED FOR ALL VARIABLES IN THE MORPHOLOGICAL MEASUREMENTS TABLE.

PLANS PREPARED BY :  
**RUMMEL • KLEPPER & KUEHL**  
 CONSULTING ENGINEERS  
 3000 W. GARDNER BLVD.  
 RALEIGH, NORTH CAROLINA 27603-31  
 19191 878-5560  
 FOR  
 DIVISION OF HIGHWAYS

Permit Drawing  
 Sheet 23 of 111

PROJECT REFERENCE NO. P-255-00A  
 SHEET NO. 2  
 ROADWAY DESIGN ENGINEER  
 HYDRAULIC ENGINEER



CONST. REV.  
 1/4" = 1' REV.

STATIONS	TANGENT/ CURVE NO.	POINT DESCRIPTION	NORTHING	EASTING	TANGENT BEARING	TANGENT CHORD LENGTH	CHORD BEARING	CURVE LENGTH	DELTA ANGLE	RADIUS
10+00.000	T1	PC	186353.291	701637.058	S 77° 47' 28.29" E	13.089m	14.241m	14.241m	81° 35' 38.01" RH	10.000m
10+14.841	C17	PT	186353.437	701648.024						
10+14.841	T18	PC	186353.618	701653.859	N 81° 24' 43.71" E	6.847m	6.847m	6.847m	N/A	N/A
10+20.888	T18	CC	186345.276	701653.205	N 82° 42' 8.24" E	6.898m	7.060m	7.060m	42° 34' 43.08" RHT	9.500m
10+27.948	T19	PT	186354.485	701662.502						
10+32.948	T19	CC	186353.296	701667.353	S 76° 00' 31.22" E	5.000m	5.000m	5.000m	N/A	N/A
10+40.940	T20	PT	186354.483	701674.74	N 80° 47' 45.12" E	7.484m	7.692m	7.692m	48° 23' 27.32" RH	9.500m
10+46.940	T20	CC	186351.888	701679.808	N 37° 36' 1.47" E	6.000m	6.000m	6.000m	N/A	N/A

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PLANS PREPARED BY:  
 RUMKEL, BLEPPER & KAHLE, INC.  
 605 HICKORY DRIVE, SUITE 204  
 RALPHA, NORTH CAROLINA 27803-2  
 919-888-8888  
 FOR

Permit Drawing  
 Sheet 21 of 21

STRM03 (LOWER)										
STATIONS	TANGENT/ CURVE NO.	POINT DESCRIPTION	NORTHING	EASTING	TANGENT BEARING	TANGENT CHORD LENGTH	CHORD BEARING	CURVE LENGTH	DELTA ANGLE	RADIUS
10+00.000	T1	PC	186353.414	701530.092	N 81° 32' 50.35" E	5.000m	5.000m	5.000m	N/A	N/A
10+06.620	C1	CC	186376.655	701537.18	S 84° 02' 13.47" E	11.869m	12.638m	12.638m	88° 57' 47.97" RH	10.500m
10+18.238	T2	PT	186352.03	701548.317	S 29° 31' 21.51" E	5.200m	5.200m	5.200m	N/A	N/A
10+23.438	T2	CC	186377.505	701548.08	S 69° 19' 34.99" E	11.383m	12.266m	12.266m	77° 36' 30.91" RH	9.500m
10+35.643	T3	PT	186372.934	701559.304	N 79° 52' 7.59" E	5.200m	5.200m	5.200m	N/A	N/A
10+40.843	C3	CC	186374.116	701564.385	S 83° 34' 38.79" E	11.462m	12.426m	12.426m	78° 02' 27.77" RH	9.000m
10+52.269	T4	PT	186358.015	701574.051	S 24° 01' 23.15" E	5.200m	5.200m	5.200m	N/A	N/A
10+58.469	T4	CC	186384.266	701578.75	S 72° 16' 19.05" E	14.175m	18.000m	18.000m	66° 29' 47.83" RH	9.500m
10+74.469	T5	PT	186352.662	701594.804	N 59° 29' 47.07" E	5.400m	5.400m	5.400m	N/A	N/A
10+83.646	T5	CC	186358.815	701607.059	S 32° 42' 32.28" E	5.000m	5.000m	5.000m	N/A	N/A
10+98.646	T6	PT	186358.015	701607.059	S 76° 28' 2.43" E	11.026m	12.188m	12.188m	87° 08' 48.30" RH	8.000m
11+10.814	T7	PT	186353.017	701620.468	N 60° 02' 34.42" E	5.500m	5.500m	5.500m	N/A	N/A
11+16.314	T7	CC	186355.783	701625.232	N 60° 02' 34.42" E	5.500m	5.500m	5.500m	N/A	N/A
11+25.346	T7	CC	186347.566	701628.728	S 79° 28' 32.84" E	11.922m	13.022m	13.022m	82° 57' 45.30" RHT	9.000m
11+29.346	T7	PT	186353.381	701638.114						
11+29.346	T8	PT	186353.381	701638.114	S 39° 59' 49.28" E	5.000m	5.000m	5.000m	N/A	N/A
11+43.346	C8	CC	186348.388	701638.025	S 88° 39' 31.74" E	10.479m	11.030m	11.030m	85° 11' 42.82" RH	10.000m
11+48.376	T9	PT	186348.388	701648.073	N 79° 48' 38.89" E	5.000m	5.000m	5.000m	N/A	N/A
11+50.376	T9	CC	186346.448	701654.8	S 89° 34' 4.30" E	9.413m	9.976m	9.976m	87° 14' 37.81" RHT	8.500m
11+60.351	T10	PT	186342.704	701663.297	S 32° 59' 45.49" E	5.200m	5.200m	5.200m	N/A	N/A
11+65.551	T10	CC	186338.341	701664.095	S 79° 57' 24.77" E	12.256m	13.461m	13.461m	85° 48' 18.79" RH	9.000m
11+70.022	T11	PT	186332.348	701671.849	N 61° 12' 53.85" E	5.400m	5.400m	5.400m	N/A	N/A
11+84.432	T11	CC	186337.945	701682.682	S 82° 06' 42.72" E	12.527m	13.422m	13.422m	75° 14' 42.87" RHT	10.500m
11+97.855	T12	PT	186338.233	701685.092	S 49° 31' 21.29" E	5.000m	5.000m	5.000m	N/A	N/A
12+02.855	T12	CC	186332.73	701688.05	S 49° 52' 31.57" E	5.000m	5.000m	5.000m	N/A	N/A
12+16.224	T13	PT	186331.837	701701.92	S 87° 59' 34.89" E	10.020m	10.672m	10.672m	67° 59' 16.34" RH	9.000m
12+21.424	T13	CC	186334.005	701713.119	N 13° 59' 51.57" E	5.200m	5.200m	5.200m	N/A	N/A
12+33.165	T14	PT	186334.246	701725.844	S 89° 30' 50.07" E	10.465m	11.781m	11.781m	79° 16' 36.98" RHT	8.500m
12+38.185	T14	CC	186330.828	701728.893	S 49° 52' 31.57" E	5.000m	5.000m	5.000m	N/A	N/A
12+48.897	T15	PT	186337.395	701738.745	S 87° 59' 34.89" E	10.020m	10.672m	10.672m	67° 59' 16.34" RH	9.000m
12+54.057	T15	CC	186331.41	701744.242	N 69° 11' 12.19" E	5.200m	5.200m	5.200m	N/A	N/A
12+60.799	T16	PT	186332.045	701752.027	S 76° 11' 21.44" E	5.200m	5.200m	5.200m	N/A	N/A
12+65.989	T16	CC	186330.802	701755.076	N 79° 05' 16.30" E	10.701m	11.311m	11.311m	59° 27' 22.86" RH	11.500m
12+77.130	T17	PT	186333.375	701768.264	N 49° 21' 54.97" E	6.000m	6.000m	6.000m	N/A	N/A
12+83.130	T17	CC	186337.361	701770.748						

STRM03 (UPPER)





PROJECT REFERENCE NO. R-2556A  
 R/W SHEET NO. 2-42  
 ROADWAY DESIGN ENGINEER  
 HYDRAULICS ENGINEER



CONTR. REV.  
 R/W REV.

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# MORPHOLOGICAL MEASUREMENTS TABLE

US 70 (GOLDBORO BYPASS)  
 -STRM05- Sta. 10+00.000 to Sta. 15+26.859

Variables	Existing Channel F5	Proposed Reach C5	Reference Reach E5
1. Stream type			
2. Drainage area (sq. mi.)	0.17	0.17	0.38
3. Bankfull width (ft)	*	9.0	7.1-12.0
4. Bankfull mean depth (ft)	0.5	0.7	0.9
5. Width/depth ratio	21.6	12.9	7.9
6. Bankfull cross-sectional area (sq. ft)	6.3	6.3	6.5
7. Bankfull mean velocity (ft/s)	*	0.64	1.28
8. Bankfull discharge (cfs)	*	4.6	8.3
9. Bankfull max depth (ft)	*	1.0	1.0-1.6
10. Width of floodprone area (ft)	*	72-155	102
11. Entrenchment ratio	*	9.0-17.2	14
12. Meander length (ft) (average)	*	90	75-120
13. Ratio of meander length to bankfull width	*	10	10.0-10.6
14. Radius of curvature (ft)	*	>22.5	3.8-35.8
15. Ratio of radius of curvature to bankfull width	*	>2.5	0.5-3.0
16. Belt width (ft)	*	45	*
17. Meander width ratio	*	5	*
18. Sinuosity (stream length/valley length)	1.0	1.2	1.6
19. Valley slope (ft/ft)	0.000	0.0035	*
20. Average slope (ft/ft)	*	0.0017	0.0012
21. Pool slope (ft/ft)	*	0.0	*
22. Ratio of pool slope to average slope	*	0.0	*
23. Maximum pool depth (ft)	*	2.0	1.7-2.0
24. Ratio of pool depth to average bankfull depth	*	2.9	1.9-2.2
25. Pool width (ft)	*	3.1	*
26. Ratio of pool width to bankfull width	*	0.34	*
27. Pool to pool spacing (ft) (average)	*	53-68	42-90
28. Ratio of pool to pool spacing to bankfull width	*	5.9-7.5	5.9-7.5
29. Ratio of lowest bank height to bankfull height (or max bankfull depth)	0.9	1.0	1.0

\* = NOT MEASURED

NOTE: ENGLISH UNITS WERE USED FOR ALL VARIABLES IN THE MORPHOLOGICAL MEASUREMENTS TABLE.

Permit Drawing  
 Sheet 21 of 31



PLANS PREPARED BY:  
 RUNNEL & KLEPPER & KAHN, LLP  
 CONSULTING ENGINEERS  
 900 RIDGEFIELD DRIVE SUITE 250  
 RALEIGH, NORTH CAROLINA 27608-3860  
 919.876.9980  
 FOR  
 DIVISION OF HIGHWAYS



PROJECT REFERENCE NO. SHEET NO.  
R-25543A 2-26  
E/W SHEET NO.  
ROADWAY DESIGN HYDRAULICS  
ENGINEER



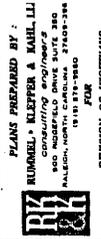
CONTR. REV.  
E/W REV.

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**STRM05**

STATIONS	TANGENT/ CURVE NO.	POINT DESCRIPTOR	NORTHING	EASTING	TANGENT / CHORD BEARING	TANGENT / CHORD LENGTH	CURVE LENGTH	DELTA ANGLE	RADIUS
10+00.000		PT	186,202.353	702,515.476					
10+06.100	T1	PC	186,200.787	702,521.374	S 75° 13' 22.10" E	6.100m	N/A	N/A	N/A
10+16.672	C1	CC	186,210.950	702,524.052	N 75° 56' 2.31" E	10.131m	10.572m	57° 41' 11.18" left	10,500m
10+22.072	T2	PT	186,203.280	702,531.201	N 47° 05' 28.73" E	5.400m	N/A	N/A	N/A
10+32.246	C2	CC	186,206.936	702,535.198	N 79° 28' 32.64" E	9.641m	10.174m	64° 48' 11.83" right	9,000m
10+37.446	T3	PT	186,208.697	702,544.835	S 68° 08' 21.44" E	5.200m	N/A	N/A	N/A
10+48.131	C3	CC	186,214.186	702,552.440	N 70° 00' 55.53" E	10.674m	11.665m	83° 41' 26.05" left	8,000m
10+54.131	T4	PT	186,210.409	702,559.492	N 28° 10' 12.51" E	5.000m	N/A	N/A	N/A
10+66.927	C4	CC	186,214.817	702,561.853	N 71° 17' 50.15" E	11.622m	12.766m	88° 15' 15.28" right	8,500m
10+71.727	T5	PT	186,218.543	702,572.981	S 65° 34' 32.21" E	4.800m	N/A	N/A	N/A
10+88.827	C5	CC	186,218.559	702,577.231	N 63° 37' 24.03" E	11.624m	13.300m	101° 38' 7.51" left	7,500m
11+01.645	T6	PT	186,221.723	702,587.845	N 12° 49' 20.28" E	4.800m	N/A	N/A	N/A
11+06.945	C6	CC	186,226.403	702,588.710	N 52° 39' 16.48" E	10.889m	11.818m	78° 39' 52.40" right	8,500m
11+21.713	T7	PT	186,233.009	702,597.367	S 87° 30' 47.33" E	5.300m	N/A	N/A	N/A
11+26.713	C7	CC	186,232.779	702,602.662	N 45° 28' 45.86" E	13.168m	14.768m	94° 00' 53.62" left	9,000m
11+42.417	T8	PT	186,241.770	702,612.050	N 01° 31' 40.95" W	5.000m	N/A	N/A	N/A
11+47.717	C8	CC	186,247.262	702,621.413	N 45° 49' 40.48" E	13.976m	15.704m	94° 42' 42.85" right	9,500m
11+58.191	T9	PT	186,256.747	702,621.940	S 86° 48' 58.10" E	5.300m	N/A	N/A	N/A
11+63.491	C9	CC	186,256.453	702,627.232	N 59° 40' 35.34" E	9.742m	10.474m	75° 00' 53.11" left	8,000m
11+70.931	T10	PT	186,261.946	702,635.278	N 18° 10' 8.79" E	5.300m	N/A	N/A	N/A
		PC	186,266.982	702,636.930					
		CC	186,264.409	702,644.769	N 44° 00' 18.48" E	7.191m	7.440m	51° 40' 19.38" right	8,250m
		PT	186,272.154	702,641.926					

Permit Drawing  
Sheet 32 of 111



PLANS PREPARED BY:  
KUNDEL, KLEPPER & KAHN, L.L.C.  
CONSULTING ENGINEERS  
300 WINDFELDER DRIVE SUITE 200  
FLEMING, MISSOURI 64501  
PHONE: 417-873-2810  
FAX: 417-873-2810  
FOR  
DIVISION OF HIGHWAYS







PROJECT NUMBER: 100-100-100-100  
 DRAWING NUMBER: 100-100-100-100  
 DATE: 10/10/10  
 SCALE: AS SHOWN  
 PROJECT: 100-100-100-100  
 DRAWING: 100-100-100-100  
 SHEET: 100-100-100-100

**ATRIC**  
 CONSULTING ENGINEERS  
 100-100-100-100  
 100-100-100-100  
 100-100-100-100

**PERMITS**  
 100-100-100-100  
 100-100-100-100  
 100-100-100-100

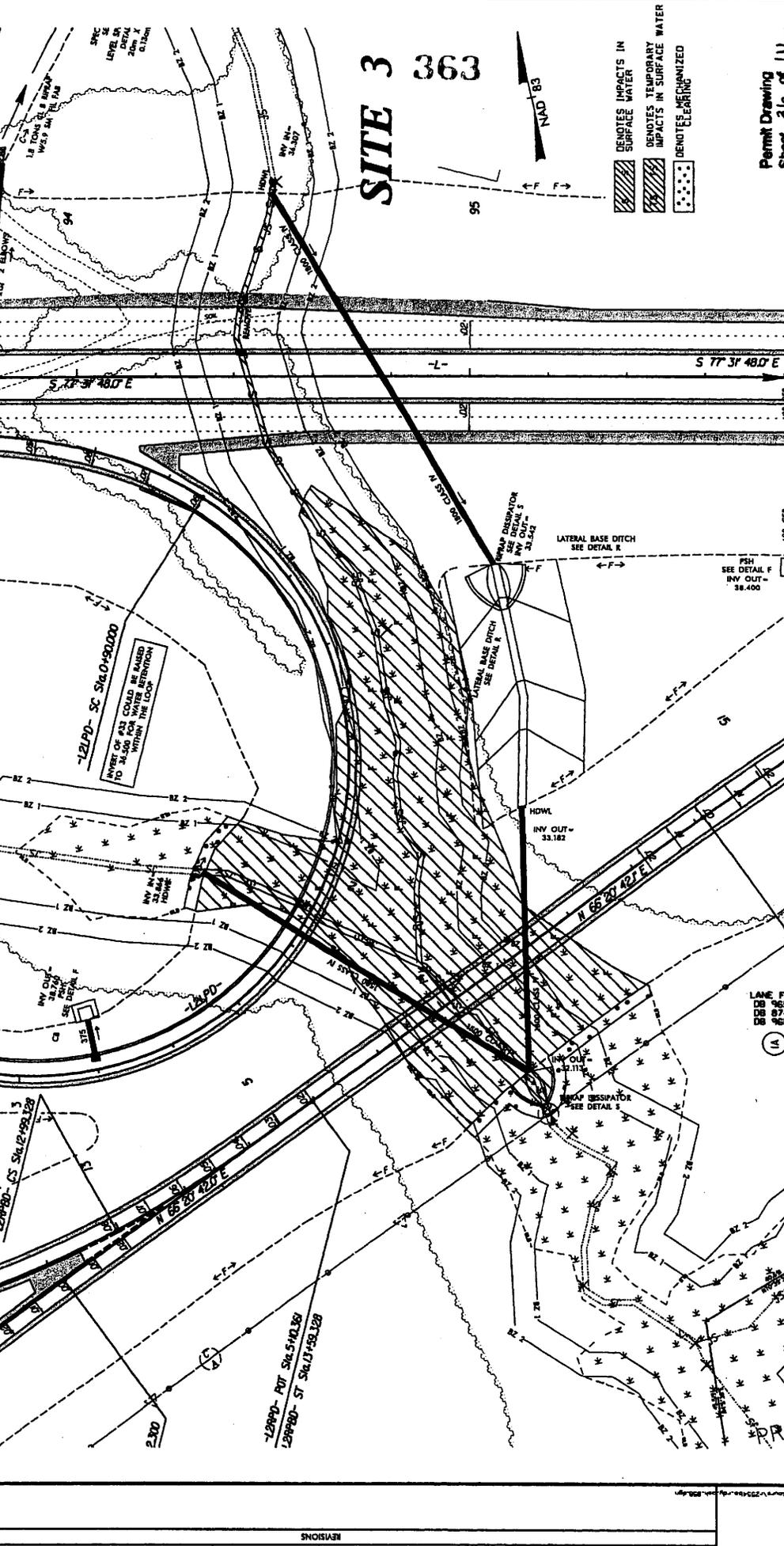
**CONTRACT**  
 100-100-100-100  
 100-100-100-100  
 100-100-100-100

**REVISIONS**  
 100-100-100-100  
 100-100-100-100  
 100-100-100-100

**PROPERTY**  
 100-100-100-100  
 100-100-100-100  
 100-100-100-100

**SCALE**  
 100-100-100-100  
 100-100-100-100  
 100-100-100-100

**DATE**  
 100-100-100-100  
 100-100-100-100  
 100-100-100-100



**SITE 3 363**



- DENOTES IMPACTS IN SURFACE WATER
- DENOTES TEMPORARY IMPACTS IN SURFACE WATER
- DENOTES PERMANENT CLEARING

Permit Drawing  
 Sheet 36 of 111

PLANS PREPARED BY:  
**RUNNEL • KLEFFER & KASH LLP**  
 Consulting Engineers  
 100-100-100-100  
 100-100-100-100  
 100-100-100-100

FOR  
**DIVISION OF HIGHWAYS**

MATCHLINE -L- STA. 93+60  
 & -L2IPD- STA. 0+15

MATCHLINE -L2IPD- STA. 3+24  
 & -L2RPBD- STA. 12+45

MATCHLINE -L2RPD- STA. 3+86  
 & -L2RPBD- STA. 12+45

MATCHLINE -L- STA. 96+03

MATCHLINE -L2RPBD- STA. 15+35

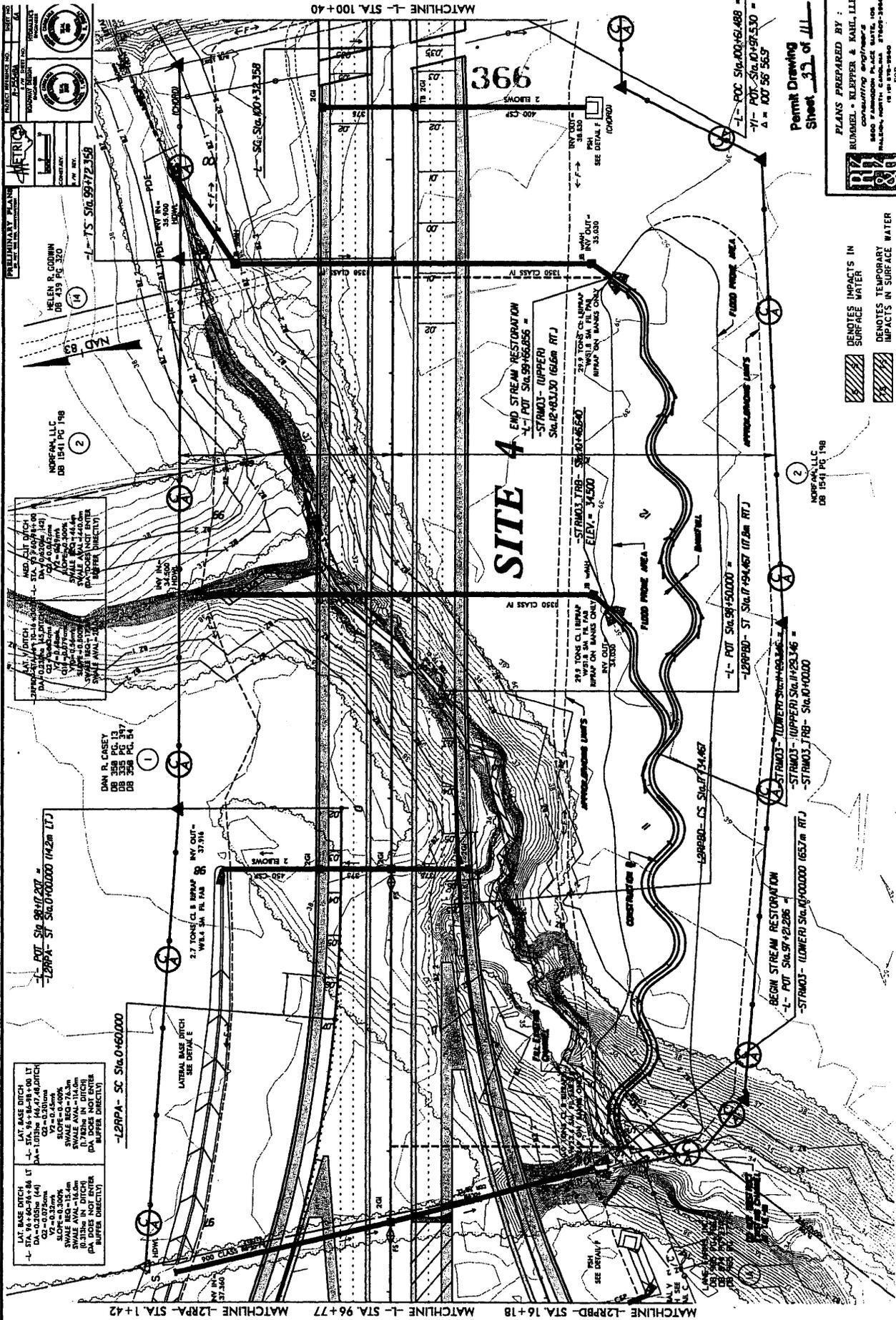
LANE FARMS, INC.  
 DB 965 PG 766  
 DB 874 PG 877  
 DB 655 PG 877

PROPERTY  
 1/4 MI

REVISIONS







LAT. BASE DITCH  
 STA. 0+60.00 TO STA. 1+42  
 DA = 0.075m  
 CS = 0.300m  
 SLOPE = 0.400%  
 SWALE REQ = 76.3m  
 1.75m IN DITCH  
 DA DOES NOT ENTER  
 BUFFER DIRECTLY

LAT. BASE DITCH  
 STA. 1+42 TO STA. 12+28.5  
 DA = 0.105m  
 CS = 0.300m  
 SLOPE = 0.400%  
 SWALE REQ = 76.3m  
 1.75m IN DITCH  
 DA DOES NOT ENTER  
 BUFFER DIRECTLY

DAN R. CASEY  
 DB 358 PG. 13  
 DB 355 PG. 347  
 DB 358 PG. 54

2.7 TONS CL. BRAP  
 W/LL SA. RL. PAI 8  
 37.316

29.9 TONS CL. BRAP  
 W/LL SA. RL. PAI 8  
 BRAP ON BANKS ONLY

29.9 TONS CL. BRAP  
 W/LL SA. RL. PAI 8  
 BRAP ON BANKS ONLY

NEED CUT DITCH  
 STA. 17+46.77 TO STA. 18+00  
 DA = 0.075m  
 CS = 0.300m  
 SLOPE = 0.400%  
 SWALE REQ = 76.3m  
 1.75m IN DITCH  
 DA DOES NOT ENTER  
 BUFFER DIRECTLY

HELEN R. CODRIN  
 DB 439 PG. 370

NORPEAK LLC  
 DB 1541 PG. 198

PRELIMINARY PLAN  
 SHEET NO. 123456  
 PROJECT NO. 123456  
 DATE: 12/15/2023

MATCHLINE -12RPA- STA. 16+78  
 MATCHLINE -12RPA- STA. 1+42  
 MATCHLINE -12RPA- STA. 100+40

366

**SITE 4**  
 END STREAM RESTORATION  
 -1- POT Sta. 99+66.855 =  
 -STRM03- (UPPER)  
 Sta. 12+60.00 (62.6m RTJ)

BEGIN STREAM RESTORATION  
 -1- POT Sta. 99+21.285 =  
 -STRM03- (LOWER) Sta. 10+00.00 (65.7m RTJ)

-1- POT Sta. 99+50.000 =  
 -L2RPA- ST Sta. 17+46.77 (17.2m RTJ)

-1- POT Sta. 100+61.488 =  
 -1- POT Sta. 101+51.530 =  
 Δ = 00' 56' 56.9"

PLANS PREPARED BY:  
 RUMBLE & KLEPPER & KAHL LLP  
 CONSULTING ENGINEERS  
 4800 FARMERS ROAD, SUITE 100  
 BOSTON, MASSACHUSETTS 02116  
 617-552-1000  
 FOR

**Permit Drawing**  
 Sheet 35 of 111

**DIVISION OF HIGHWAYS**

RENOTES IMPACTS IN SURFACE WATER

RENOTES TEMPORARY IMPACTS IN SURFACE WATER

REVISIONS







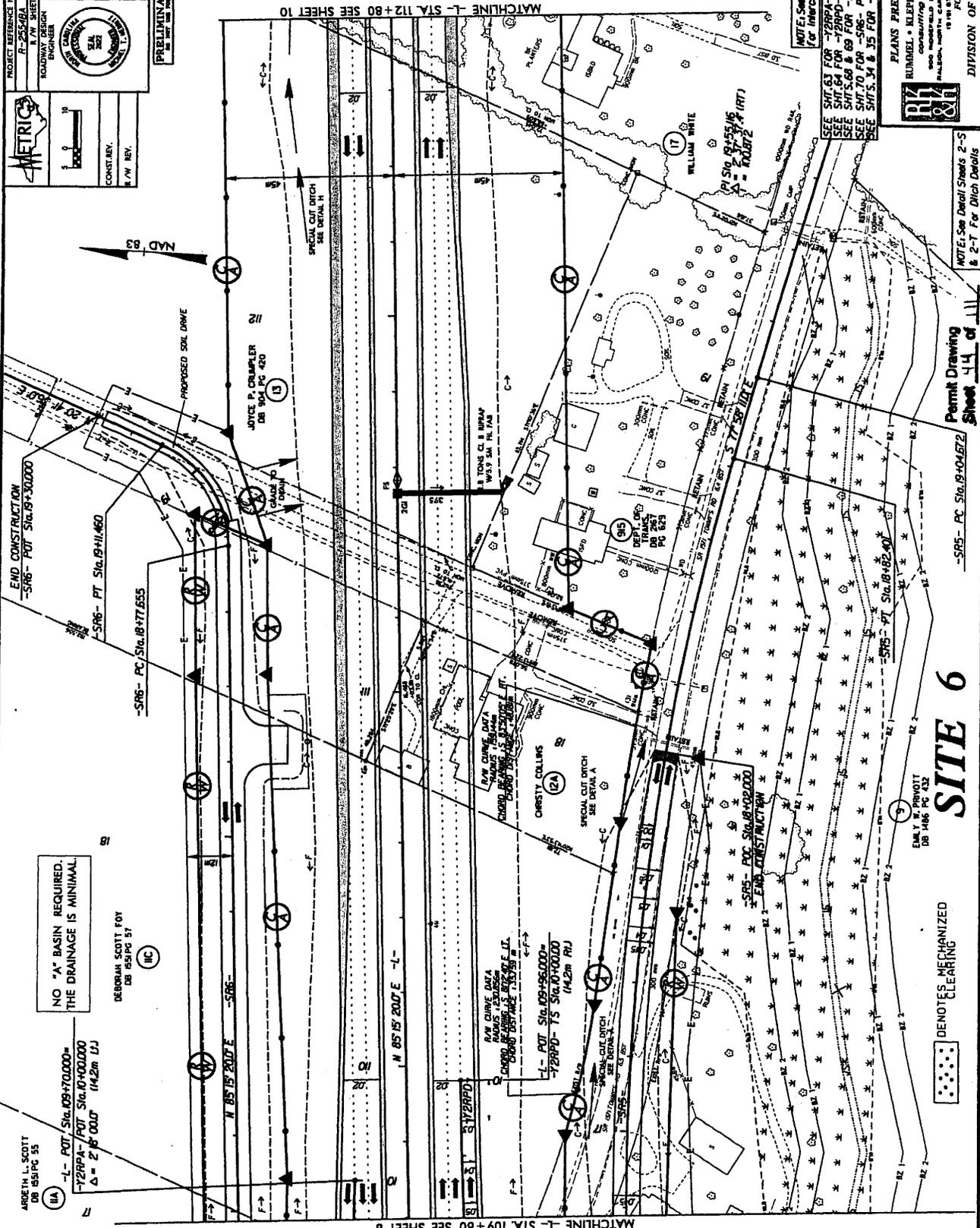


PROJECT REFERENCE NO. SHEET NO. 9  
 R. 25643  
 R/W SHEET NO. 9  
 HYDRAULICS ENGINEER  
 ROADWAY DESIGN ENGINEER

**METRICS**  
 CONSULTING ENGINEERS  
 1000 N. W. 11th St.  
 Ft. Lauderdale, FL 33304  
 TEL: (954) 571-1111  
 FAX: (954) 571-1112

**PRELIMINARY PLANS**  
 FOR THE INTERCHANGE CURVE DATA

371



NO "A" BASIN REQUIRED.  
 THE DRAINAGE IS MINIMAL.

ARDETH L. SCOTT  
 DB 658 PC 55  
 (MA)  
 L- POT STA. 09+70.000 =  
 7299A- POT STA. 10+00.000  
 Δ = 2' 8" 0.00' (14.2m UJ)

DEBORAH SCOTT FOT  
 DB 658 PC 57  
 (MC)

R/W CURVE DATA  
 CHORD BEARING IS 232°05'11.11"  
 CHORD DISTANCE IS 153.758 m  
 L- POT STA. 09+98.000 =  
 7299D- TS STA. 10+00.000  
 (14.2m RJU)

**SITE 6**

EMILY M. BRADY  
 DB 146 PC 43

PERMIT DRAWING  
 SHEET 44 OF 111

END CONSTRUCTION  
 -S76- POT STA. 19+30.000  
 -S76- PT STA. 19+11.460  
 -S76- PC STA. 18+77.655

PROPOSED SOIL DRIVE  
 JOYCE P. CHAMBLER  
 DB 904 PC 420

CHRISTY COLLINS  
 CHORD BEARING IS 232°05'11.11"  
 CHORD DISTANCE IS 153.758 m  
 SPECIAL CUT DITCH  
 SEE DETAIL A

WILLIAM WHITE  
 STA. 19+55.16  
 A = 14.0272

REVISIONS  
 R/W REVISION 11/15/05: CHANGED PARCEL 1170 TO R/W PARCEL 13  
 R/W REVISION 2/21/06: REVISED PROPOSED C/A FOR PARCELS 13 AND 12 ADJACENT TO -S76-  
 R/W REVISION 3/10/08: REVISED PROPOSED C/A FOR PARCELS 13 AND 12 ADJACENT TO -S76-  
 CHANGES MADE PER INITIAL NOTES.

NOTE: See Detail Sheet 2-5  
 for Interchange Curve Data.  
 SEE SHIT 63 FOR 7299A- PROFILE  
 SEE SHIT 64 FOR 7299D- PROFILE  
 SEE SHIT 68 & 69 FOR -S76- PROFILE  
 SEE SHIT 70 FOR -S76- PROFILE  
 SEE SHIT 34 & 35 FOR -L- PROFILE

PLANS PREPARED BY:  
 RUNDEL, KLEPPER & KAHN, LLP  
 consulting engineers  
 1000 N. W. 11th St.  
 Ft. Lauderdale, FL 33304  
 TEL: (954) 571-1111  
 FOR DIVISION OF HIGHWAYS

NOTE: See Detail Sheets 2-5  
 & 2-T For Ditch Details

-S76- PC STA. 19+04.572

END CONSTRUCTION  
 -S76- POT STA. 19+30.000  
 -S76- PT STA. 19+11.460  
 -S76- PC STA. 18+77.655

PROPOSED SOIL DRIVE  
 JOYCE P. CHAMBLER  
 DB 904 PC 420

CHRISTY COLLINS  
 CHORD BEARING IS 232°05'11.11"  
 CHORD DISTANCE IS 153.758 m  
 SPECIAL CUT DITCH  
 SEE DETAIL A

WILLIAM WHITE  
 STA. 19+55.16  
 A = 14.0272

EMILY M. BRADY  
 DB 146 PC 43

PERMIT DRAWING  
 SHEET 44 OF 111

END CONSTRUCTION  
 -S76- POT STA. 19+30.000  
 -S76- PT STA. 19+11.460  
 -S76- PC STA. 18+77.655





PROJECT NO. 100-100000  
 SHEET NO. 8  
 DATE: 10/15/05  
 DRAWN BY: J. CRUMPLER  
 CHECKED BY: J. CRUMPLER  
 APPROVED BY: J. CRUMPLER

PRELIMINARY PLANS  
 DENOTES HAND CLEARING  
 DENOTES MECHANIZED CLEARING  
 DENOTES TEMPORARY IMPACTS IN SURFACE WATER

SP. CUT DITCH  
 L- STA. 112+40-114+00 FT  
 DA = 0.2125%  
 SWALE W/VA = 48.00m  
 SWALE W/VA = 48.00m  
 (DRAINAGE DIRECTION)

SP. CUT DITCH  
 L- STA. 113+40-114+00 FT  
 DA = 0.2125%  
 SWALE W/VA = 48.00m  
 SWALE W/VA = 48.00m  
 (DRAINAGE DIRECTION)

SP. CUT DITCH  
 L- STA. 114+40-114+00 FT  
 DA = 0.2125%  
 SWALE W/VA = 48.00m  
 SWALE W/VA = 48.00m  
 (DRAINAGE DIRECTION)

SP. CUT DITCH  
 L- STA. 115+40-114+00 FT  
 DA = 0.2125%  
 SWALE W/VA = 48.00m  
 SWALE W/VA = 48.00m  
 (DRAINAGE DIRECTION)

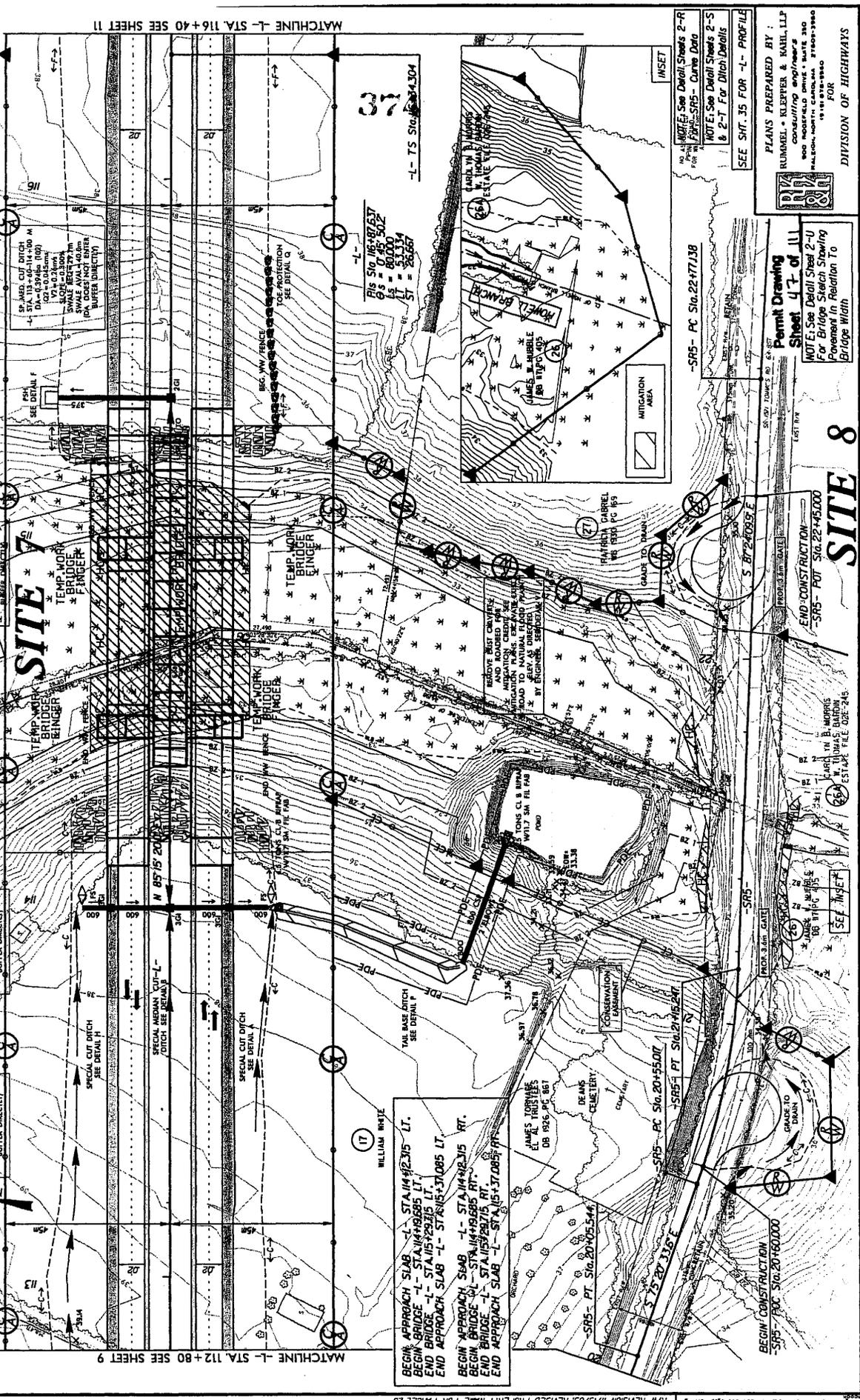
SP. CUT DITCH  
 L- STA. 116+40-114+00 FT  
 DA = 0.2125%  
 SWALE W/VA = 48.00m  
 SWALE W/VA = 48.00m  
 (DRAINAGE DIRECTION)

SP. CUT DITCH  
 L- STA. 117+40-114+00 FT  
 DA = 0.2125%  
 SWALE W/VA = 48.00m  
 SWALE W/VA = 48.00m  
 (DRAINAGE DIRECTION)

SP. CUT DITCH  
 L- STA. 118+40-114+00 FT  
 DA = 0.2125%  
 SWALE W/VA = 48.00m  
 SWALE W/VA = 48.00m  
 (DRAINAGE DIRECTION)

SP. CUT DITCH  
 L- STA. 119+40-114+00 FT  
 DA = 0.2125%  
 SWALE W/VA = 48.00m  
 SWALE W/VA = 48.00m  
 (DRAINAGE DIRECTION)

SP. CUT DITCH  
 L- STA. 120+40-114+00 FT  
 DA = 0.2125%  
 SWALE W/VA = 48.00m  
 SWALE W/VA = 48.00m  
 (DRAINAGE DIRECTION)



REVISIONS  
 R/W REVISION CORRECTION OF SOME PARCEL NAMES AND CREATION OF PARCEL 25A  
 R/W REVISION CHANGES MADE PER INITIAL CONTACT  
 R/W REVISION 11/15/05 REVISED PROPERTY MAP FOR PARCEL 25

PERMIT DRAWING  
 SHEET 47 OF 111  
 NOTE: See Detail Sheet 2-U For Bridge Sketch Showing Pavement in Relation To Bridge Width

PLANS PREPARED BY:  
 RUMMEL, KLEPPER & KAIL, LLP  
 CONSULTING ENGINEERS, P.C.  
 1000 W. HARRIS BLVD.  
 WILSON, NORTH CAROLINA 27150-2800  
 10/15/05  
 DIVISION OF HIGHWAYS





PROJECT REFERENCE NO. R-2552A  
 SHEET NO. 7  
 ROADWAY DESIGNER  
 METRICS  
 CONSULTANT  
 7/11/83

PRELIMINARY PLANS  
 FOR THE STATE HIGHWAY  
 DIVISION OF HIGHWAYS

NO "A" BASIN REQUIRED.  
 THE DRAINAGE IS MINIMAL.

REGEN HAMILTON  
 DB 548 PG 23

ACCLINTON BEST  
 DB 854 PG 670

ACCLINTON BEST  
 DB 854 PG 670

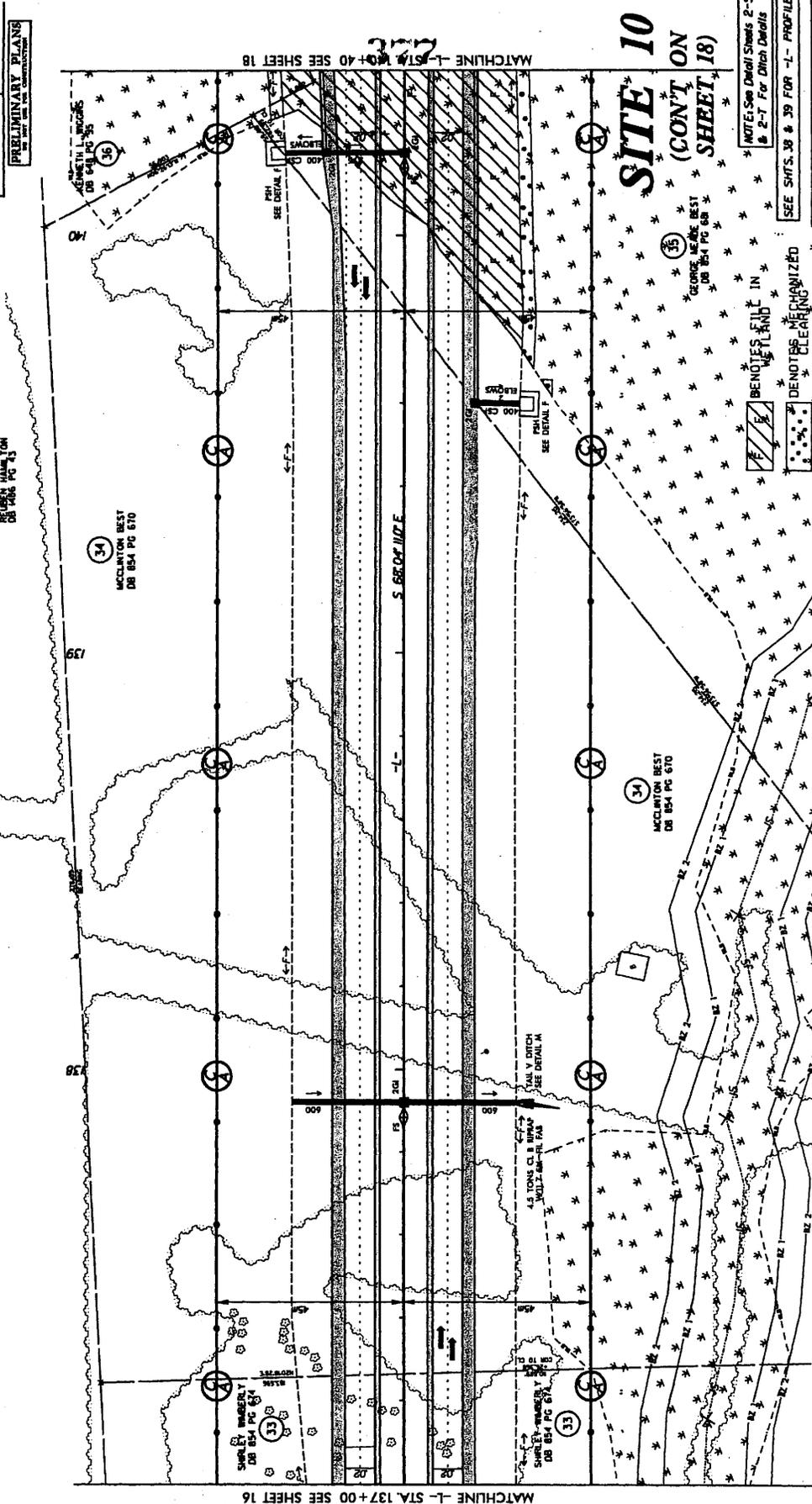
SHIRLEY WARELY  
 DB 854 PG 671

SHIRLEY WARELY  
 DB 854 PG 671

4.5 TONS CL. 1.5  
 MULT. 6-11.5 TON

SHIRLEY WARELY  
 DB 854 PG 671

SHIRLEY WARELY  
 DB 854 PG 671



MATCHLINE -L- STA. 137+00 SEE SHEET 16

MATCHLINE -L- STA. 140+00 SEE SHEET 18

**SITE 10**  
 (CONT. ON  
 SHEET 18)

NOTE: See Detail Sheets 2-5  
 & 2-7 For Ditch Details  
 SEE SHW'S 38 & 39 FOR "L" PROFILE

PLANS PREPARED BY:  
 RUMMEL, KLEPPER & KAHL, LLP  
 CONSULTING ENGINEERS  
 400 MONROE DRIVE, SUITE 300  
 BIRMINGHAM, ALABAMA 35202  
 PHONE: 205-978-1800  
 FAX: 205-978-1800

Permit Drawing  
 Sheet 52 of 111

DIVISION OF HIGHWAYS

REVISIONS

07/15/83







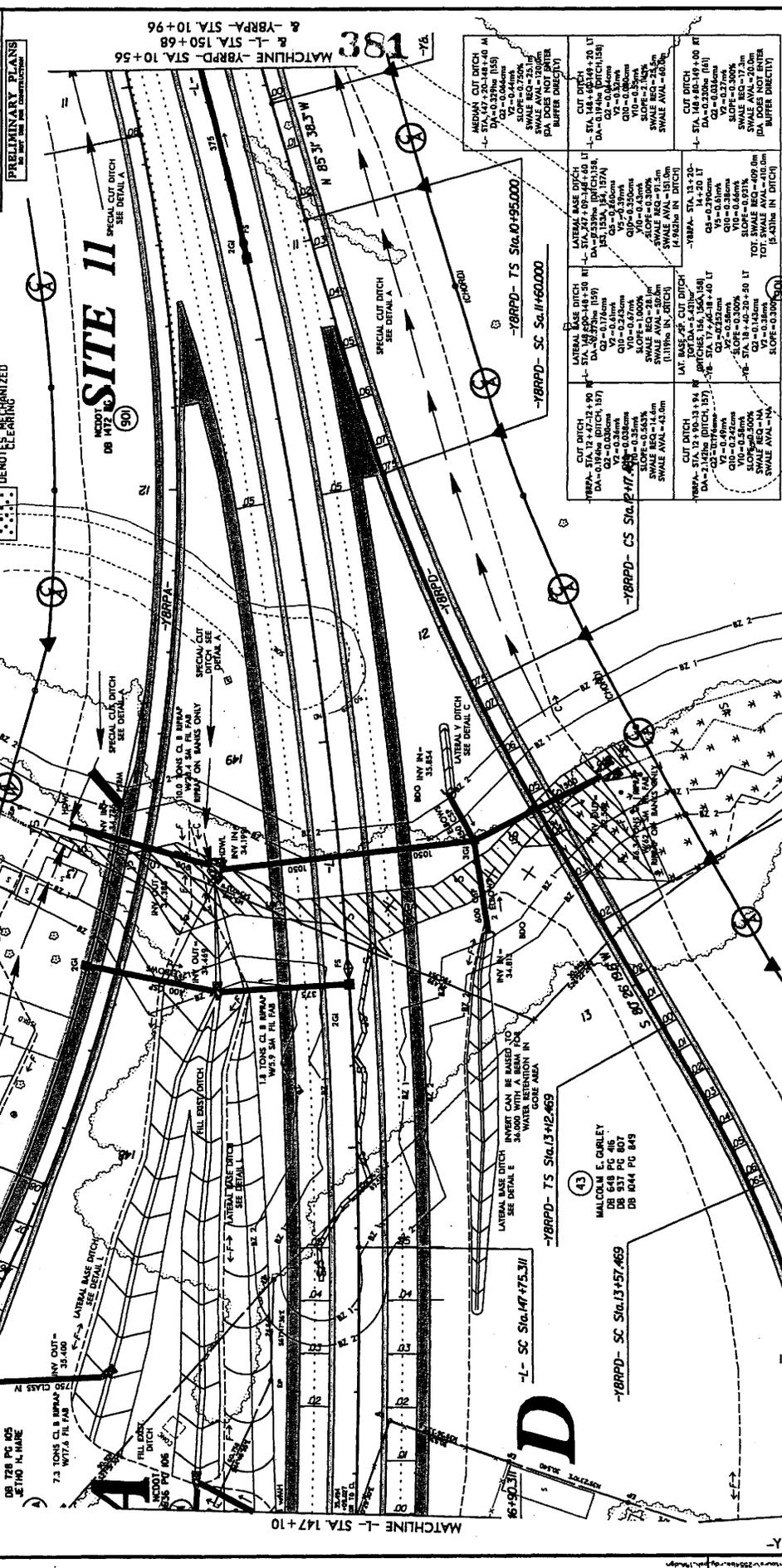
PROJECT REFERENCE NO. **J-2558A**  
 ROADWAY DESIGN ENGINEER  
 METRIC ENGINEERING

SHEET NO. **51A**

PRELIMINARY PLANS  
 AS SHOWN ON THESE DRAWINGS

CONSTRY. S/W REV.

DENOTES IMPACTS IN SURFACE WATER  
 DENOTES TEMPORARY IMPACTS IN SURFACE WATER  
 DENOTES FILL IN  
 DENOTES MECHANIZED CLEARING



PLANS PREPARED BY:  
**R/K** RUMMED, KLEPPER & KAHL, LLP  
 Consulting Engineers  
 1000 W. WISCONSIN AVENUE, SUITE 200  
 MILWAUKEE, WISCONSIN 53233-1000  
 TEL: 414-336-8888 FAX: 414-336-8880

DIVISION OF HIGHWAYS

MODIFY BY PG 41

GRADING ONLY

Permit Drawing  
 Sheet 51 of 111

MATCHLINE -L- STA. 147+10

MATCHLINE -YBRPD- STA. 14+40

REVISIONS

PROJECT REFERENCE NO. **F-25548A**  
 SHEET NO. **17** OF SHEET NO. **18**  
 CONTRACTOR: **TRC**  
 ENGINEER: **TRC**  
 DESIGNER: **TRC**  
 CHECKER: **TRC**  
 DATE: **10/18/2000**

**METRIC**  
 1" = 10'  
 1" = 30.48m

CONSTRY: **USA**  
 P/W REV: **1**

**PRELIMINARY PLANS**  
 TO BE USED FOR CONSTRUCTION



PLANS PREPARED BY:  
**RUMMEL & KELLER, LLP**  
 consulting engineer's  
 3800 Pennsylvania Place, Suite 200  
 Dallas, Texas 75246-1100  
 972.353.1800  
 FOR  
**DIVISION OF HIGHWAYS**

MDOT  
 DB M12 PG 4

Permit Drawing  
 Sheet **55** of **111** GRADING ONLY

MATCHLINE - STA. 14+50  
 YBRPD - STA. 14+50

MATCHLINE - STA. 17+50  
 YBRPD - STA. 17+50

MATCHLINE - STA. 14+40  
 YBRPD - STA. 14+40

REVISIONS



PROJECT REFERENCE NO. R-25548A  
 SHEET NO. 20  
 ROADWAY DESIGN ENGINEER  
 METRICS  
 PRELIMINARY PLANS  
 FOR THE USE OF THE CONTRACTOR

CONST. BY: [Blank]  
 P.W. REV. [Blank]

US  
 $Q_c = 0.07mm$   
 $V_c = 0.23mm$

170  
 $Q_c = 0.09mm$   
 $V_c = 0.33mm$

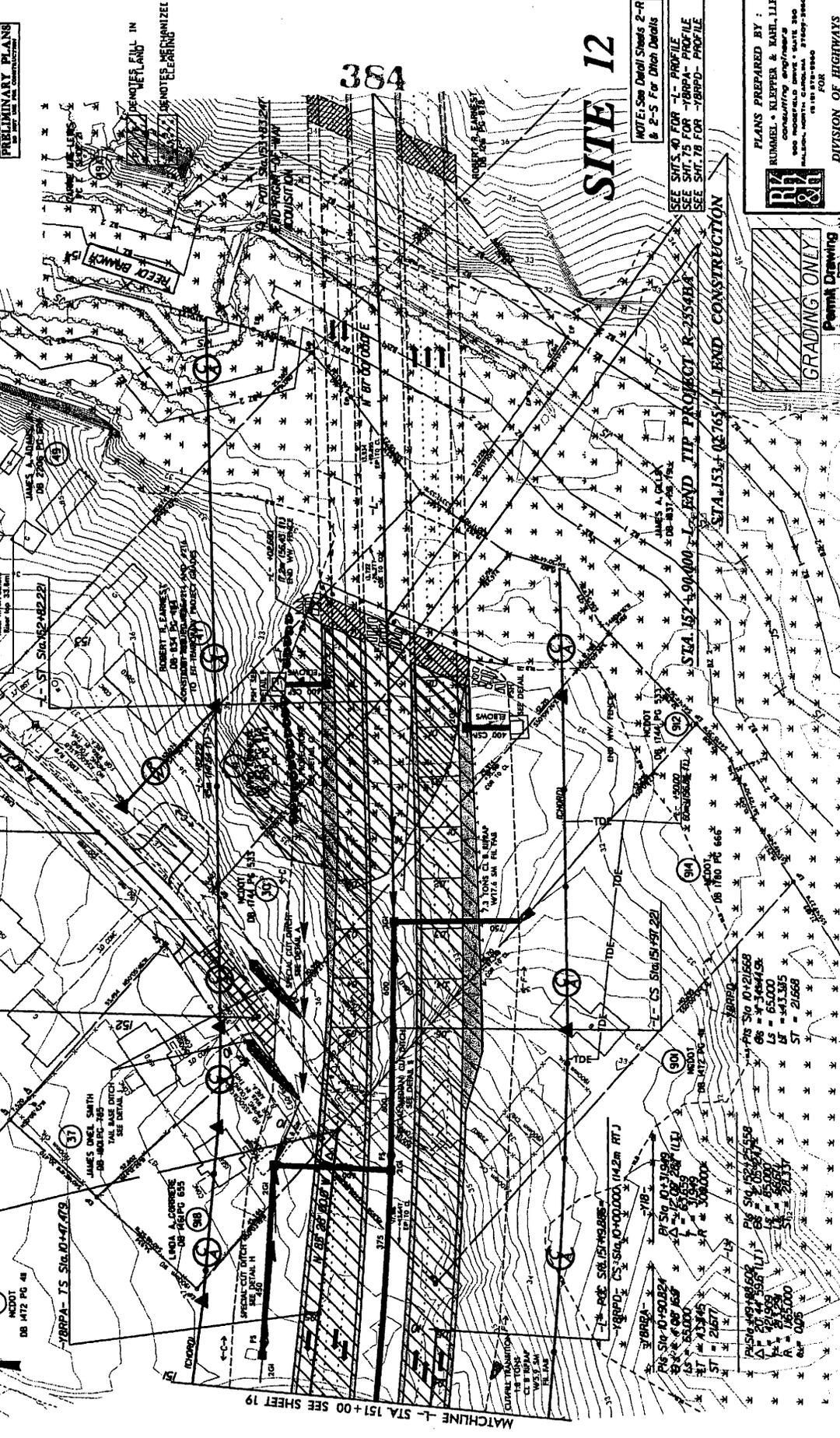
175  
 $Q_c = 0.09mm$   
 $V_c = 0.33mm$

-Y18- POT STA. 14+25.925  
 A. EAGN, P&I  
 SUMMARY DATA  
 Drainage Area: 1.848ha  
 Peak Flow: 1.23m³/s  
 Proposed Structure: 2.0m x 2.0m  
 Proposed Surface Area: 401.77m²  
 Proposed Slope: 1:1.5  
 Embankment Top: 2.0m  
 Embankment Base: 2.0m  
 Embankment Length: 22.3m  
 Water Top: 33.3m

-Y18- PT STA. 10+61.659  
 A. EAGN, P&I  
 SUMMARY DATA  
 Drainage Area: 1.848ha  
 Peak Flow: 1.23m³/s  
 Proposed Structure: 2.0m x 2.0m  
 Proposed Surface Area: 401.77m²  
 Proposed Slope: 1:1.5  
 Embankment Top: 2.0m  
 Embankment Base: 2.0m  
 Embankment Length: 22.3m  
 Water Top: 33.3m

-L- POC STA. 15+70.000  
 -Y18- POT STA. 10+00.000 (142m RTJ)  
 -Y18- PCS STA. 10+00.000 (153m RTJ)  
 ALBERT OUEL SMITH  
 DB BPT PG 742

-Y18- POC STA. 15+70.000  
 -Y18- POT STA. 10+00.000 (142m RTJ)  
 -Y18- PCS STA. 10+00.000 (153m RTJ)  
 ALBERT OUEL SMITH  
 DB BPT PG 742



# SITE 12

NOTES: See Detail Sheets 2-R & 2-S For Ditch Details  
 SEE SHIT. 40 FOR -L- PROFILE  
 SEE SHIT. 75 FOR -Y18- PROFILE  
 SEE SHIT. 78 FOR -Y18- PROFILE

PLANS PREPARED BY:  
 RUMMEL, KLEPPER & KAHN, LLP  
 Consulting Engineers  
 1000 W. WISCONSIN ST., SUITE 200  
 MILWAUKEE, WI 53233  
 1988-1990  
 DIVISION OF HIGHWAYS

GRADING ONLY  
 Permit Drawing  
 Sheet 17 of 11

MATCHLINE -L- STA 15+00 SEE SHEET 19  
 REVISIONS  
 R/W REVISION  
 CHANGES MADE PER INITIAL CONTACTS  
 R/W REVISION  
 REVISED DEED REFERENCE ON PARCEL 49

PROJECT REFERENCE NO. **F-25248A**  
 SHEET NO. **26**  
 ROADWAY PLAN SHEET NO. **26**  
 METRICS  
 ROADWAY ENGINEER  
 HYDRAULICS ENGINEER  
 CIVIL ENGINEER  
 SEAL  
 CIVIL ENGINEER  
 SEAL  
 CIVIL ENGINEER  
 SEAL

**PRELIMINARY PLANS**  
 FOR THE PROPOSED CONSTRUCTION  
 DENOTES IMPACTS IN SURFACE WATER  
 DENOTES TEMPORARY IMPACTS IN SURFACE WATER

CONTRACT NO. **P.W. 87.**  
 COUNTY, **WISCONSIN**  
 CITY, **WISCONSIN**

**CUT DITCH**  
 -Y2- STA. 12+48.12+42.00 LT  
 DA=0.07% (DITCH)  
 Q10=0.015cfs  
 Q100=0.015cfs  
 SLOPE=0.300%  
 SWALE REQ.=3.0m  
 SWALE AVAL.=38.0m

**LATERAL V. DITCH**  
 -Y2- STA. 12+42.13+30.00 LT  
 DA=0.39% (DITCH)  
 Q10=0.015cfs  
 Q100=0.015cfs  
 SLOPE=0.300%  
 SWALE REQ.=3.0m  
 SWALE AVAL.=38.0m

**CUT DITCH**  
 -Y2- STA. 10+90.12+00 RT  
 DA=0.21% (DITCH)  
 Q10=0.015cfs  
 Q100=0.015cfs  
 SLOPE=0.300%  
 SWALE REQ.=3.0m  
 SWALE AVAL.=38.0m  
 (DA DOES NOT ENTER BUFFER DIRECTLY)

**LATERAL V. DITCH**  
 -Y2- STA. 12+42.13+30.00 LT  
 DA=0.39% (DITCH)  
 Q10=0.015cfs  
 Q100=0.015cfs  
 SLOPE=0.300%  
 SWALE REQ.=3.0m  
 SWALE AVAL.=38.0m

**LATERAL V. DITCH**  
 -Y2- STA. 12+42.13+30.00 LT  
 DA=0.39% (DITCH)  
 Q10=0.015cfs  
 Q100=0.015cfs  
 SLOPE=0.300%  
 SWALE REQ.=3.0m  
 SWALE AVAL.=38.0m

**LATERAL V. DITCH**  
 -Y2- STA. 12+42.13+30.00 LT  
 DA=0.39% (DITCH)  
 Q10=0.015cfs  
 Q100=0.015cfs  
 SLOPE=0.300%  
 SWALE REQ.=3.0m  
 SWALE AVAL.=38.0m

**LATERAL V. DITCH**  
 -Y2- STA. 12+42.13+30.00 LT  
 DA=0.39% (DITCH)  
 Q10=0.015cfs  
 Q100=0.015cfs  
 SLOPE=0.300%  
 SWALE REQ.=3.0m  
 SWALE AVAL.=38.0m

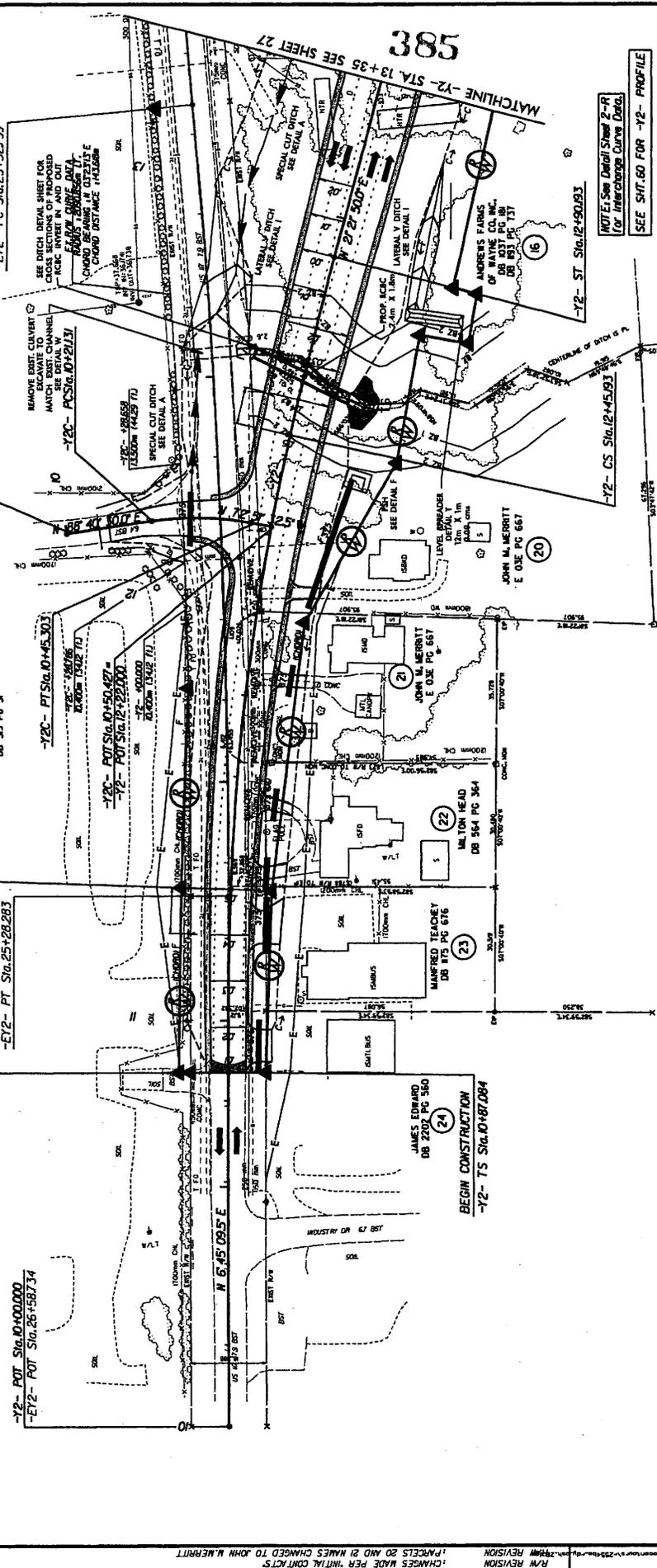
**LATERAL V. DITCH**  
 -Y2- STA. 12+42.13+30.00 LT  
 DA=0.39% (DITCH)  
 Q10=0.015cfs  
 Q100=0.015cfs  
 SLOPE=0.300%  
 SWALE REQ.=3.0m  
 SWALE AVAL.=38.0m

**LATERAL V. DITCH**  
 -Y2- STA. 12+42.13+30.00 LT  
 DA=0.39% (DITCH)  
 Q10=0.015cfs  
 Q100=0.015cfs  
 SLOPE=0.300%  
 SWALE REQ.=3.0m  
 SWALE AVAL.=38.0m

**LATERAL V. DITCH**  
 -Y2- STA. 12+42.13+30.00 LT  
 DA=0.39% (DITCH)  
 Q10=0.015cfs  
 Q100=0.015cfs  
 SLOPE=0.300%  
 SWALE REQ.=3.0m  
 SWALE AVAL.=38.0m

**LATERAL V. DITCH**  
 -Y2- STA. 12+42.13+30.00 LT  
 DA=0.39% (DITCH)  
 Q10=0.015cfs  
 Q100=0.015cfs  
 SLOPE=0.300%  
 SWALE REQ.=3.0m  
 SWALE AVAL.=38.0m

**LATERAL V. DITCH**  
 -Y2- STA. 12+42.13+30.00 LT  
 DA=0.39% (DITCH)  
 Q10=0.015cfs  
 Q100=0.015cfs  
 SLOPE=0.300%  
 SWALE REQ.=3.0m  
 SWALE AVAL.=38.0m



PLANS PREPARED BY:  
 RUMMEL + KLEPPER & RAHL, LLP  
 300 WASHINGTON STREET, SUITE 200  
 MILWAUKEE, WISCONSIN 53102-1900  
 PHONE: 414.224.8800  
 FAX: 414.224.8801  
 DIVISION OF HIGHWAYS

**SITE 14**  
 Permit Drawing  
 Sheet 5 of 11  
 NOTE: See Detail Sheets 2-S & 2-T For Ditch Details

SEE SHIT. 60 FOR -Y2- PROFILE

NOTE: See Detail Sheet 2-R for Interchange Curve Data.

NOTE: All Proposed Drive Pipes are 375 mm.

NOTE: 240m Uniform Transition -Y2- Sta. 10+90 (2 lanes) to Sta. 13+30 (5 lanes).

NOTE: See Detail Sheets 2-S & 2-T For Ditch Details

NOTE: See Detail Sheet 2-R for Interchange Curve Data.

SEE SHIT. 60 FOR -Y2- PROFILE

NOTE: See Detail Sheet 2-R for Interchange Curve Data.

SEE SHIT. 60 FOR -Y2- PROFILE

NOTE: See Detail Sheet 2-R for Interchange Curve Data.

SEE SHIT. 60 FOR -Y2- PROFILE

REVISIONS  
 R/W REVISION  
 R/W REVISION  
 R/W REVISION  
 CHANGES MADE PER INITIAL CONTACT  
 PARCELS 20 AND 21 NAMES CHANGED TO JOHN M. MERRITT

PROJECT REFERENCE NO. 17-00000000  
 PLAN SHEET NO. 25  
 HYDRAULIC DESIGN ENGINEER  
 METRIC ENGINEERING, INC.  
 1111 W. 11th St., Suite 100  
 Lincoln, NE 68502  
 (402) 441-1111  
 FAX (402) 441-1112

CONST. BY: R/W REV.

PRELIMINARY PLANS  
 NOT FOR CONSTRUCTION

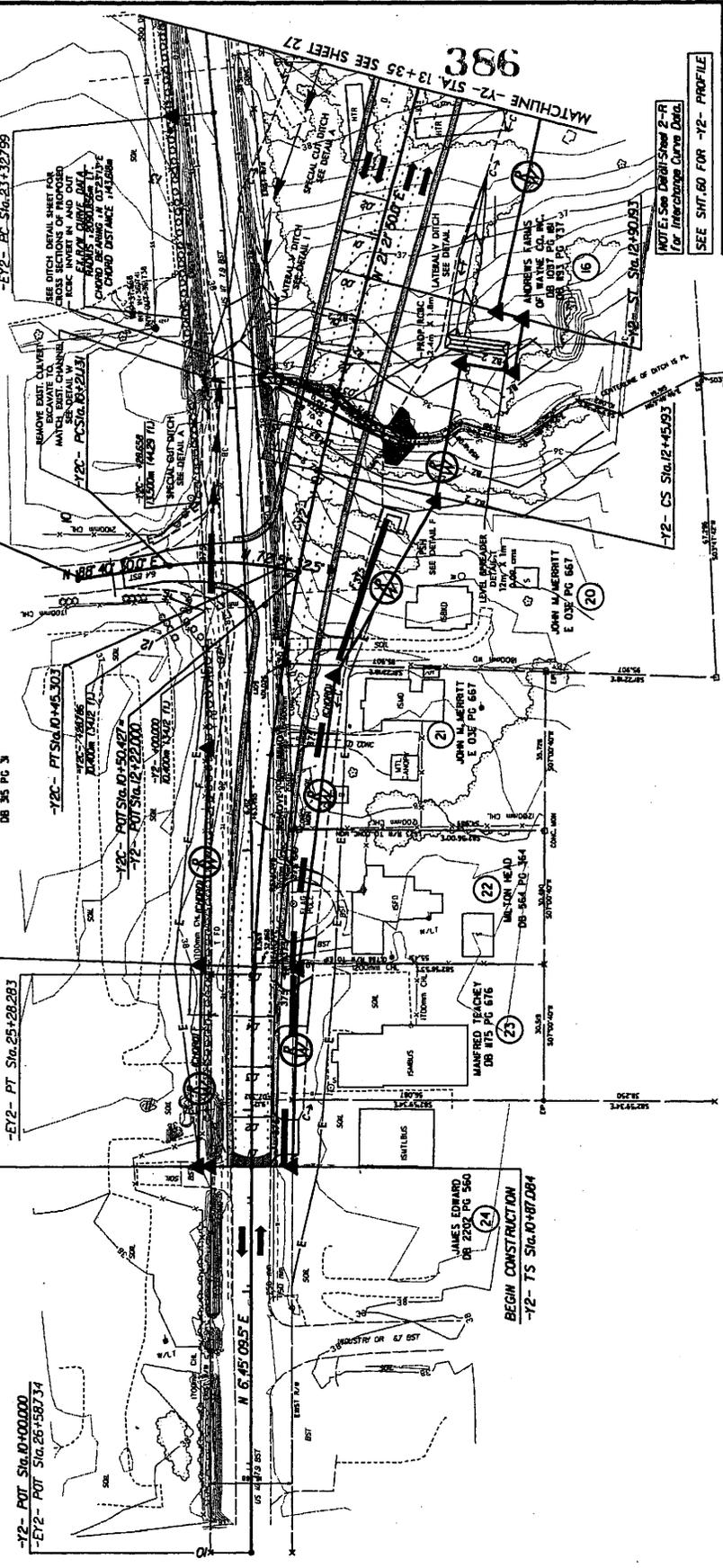
DEMOTES IMPACTS IN SURFACE WATER  
 DEMOTES TEMPORARY IMPACTS IN SURFACE WATER

NO "A" BASIN REQUIRED.  
 THE DRAINAGE IS MINIMAL.

CUT DITCH  
 -Y2- STA. 12+45.12-45.12 (11)  
 DA = 0.072m  
 CS = 0.072m  
 V2 = 0.49m  
 SLOPE = 4.00%  
 SWALE AVAL = 22.0m

LATERAL V DITCH  
 -Y2- STA. 12+45.12-45.12 (11)  
 DA = 0.072m  
 CS = 0.072m  
 V2 = 0.49m  
 SLOPE = 4.00%  
 SWALE AVAL = 22.0m

CUT DITCH  
 -Y2- STA. 10+00.00-10.00 (11)  
 DA = 0.072m  
 CS = 0.072m  
 V2 = 0.49m  
 SLOPE = 4.00%  
 SWALE AVAL = 22.0m



PLANS PREPARED BY:  
 RUMBLE • KLIPPER & KAHIL, LLP  
 CONSULTING ENGINEERS  
 900 MIDFIELD DRIVE • SUITE 200  
 MALESCA, NORTH CAROLINA 27603-9900  
 (919) 885-8800  
 FOR THE  
 DIVISION OF HIGHWAYS

**SITE 14**

Permit Drawing Sheet 54 of 111

NOTE: See Detail Sheets 2-5 & 2-T For Ditch Details

NOTE: All Proposed Drive Pipes are 375 mm.

NOTE: 240m Uniform Transition -Y2- Sta. 10+90 (12 lanes) to Sta. 13+30 (5 lanes).

REVISIONS

1. ADDED R/W CURVE DATA REVISED EASEMENT FOR PARCELS 2, 22, 23 & 24

2. CHANGES MADE PER INITIAL CONTACTS

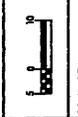
3. PARCELS 20 AND 21 NAMES CHANGED TO JOHN M. ABERNETHY

REVISIONS

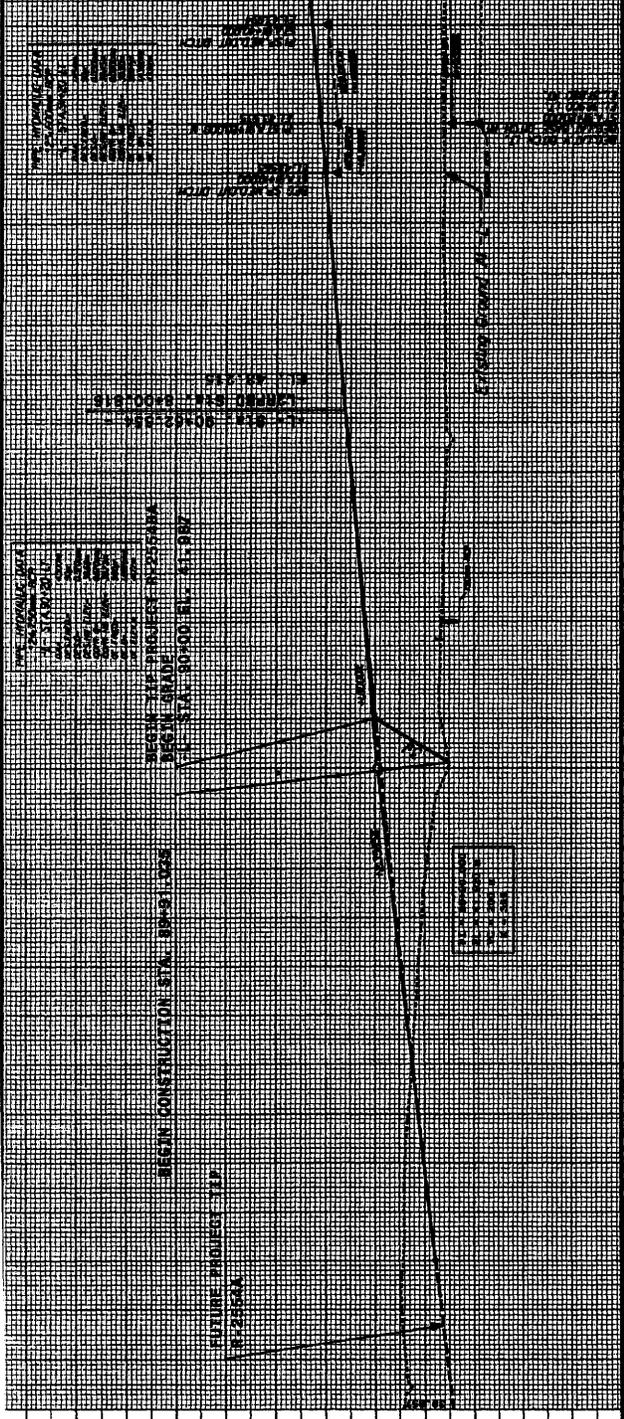
1. ADDED R/W CURVE DATA REVISED EASEMENT FOR PARCELS 2, 22, 23 & 24

2. CHANGES MADE PER INITIAL CONTACTS

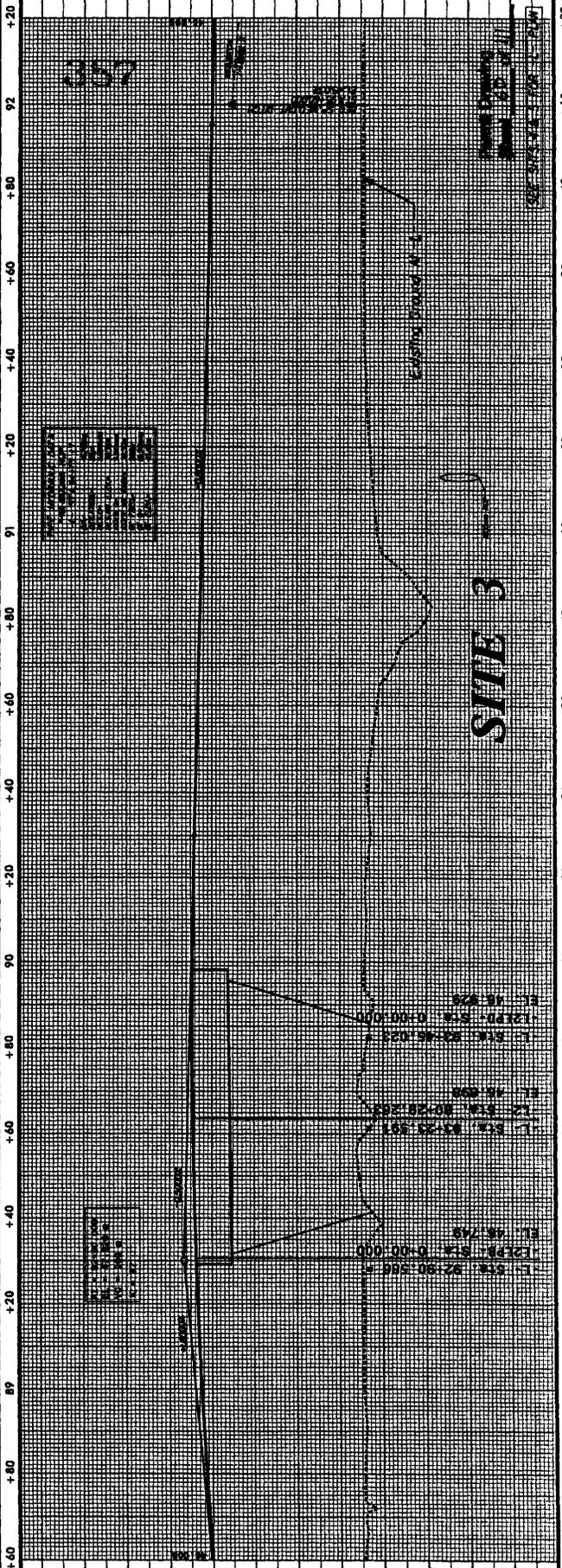
3. PARCELS 20 AND 21 NAMES CHANGED TO JOHN M. ABERNETHY



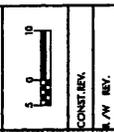
CONSTR. REV.  
 P. W. REV.



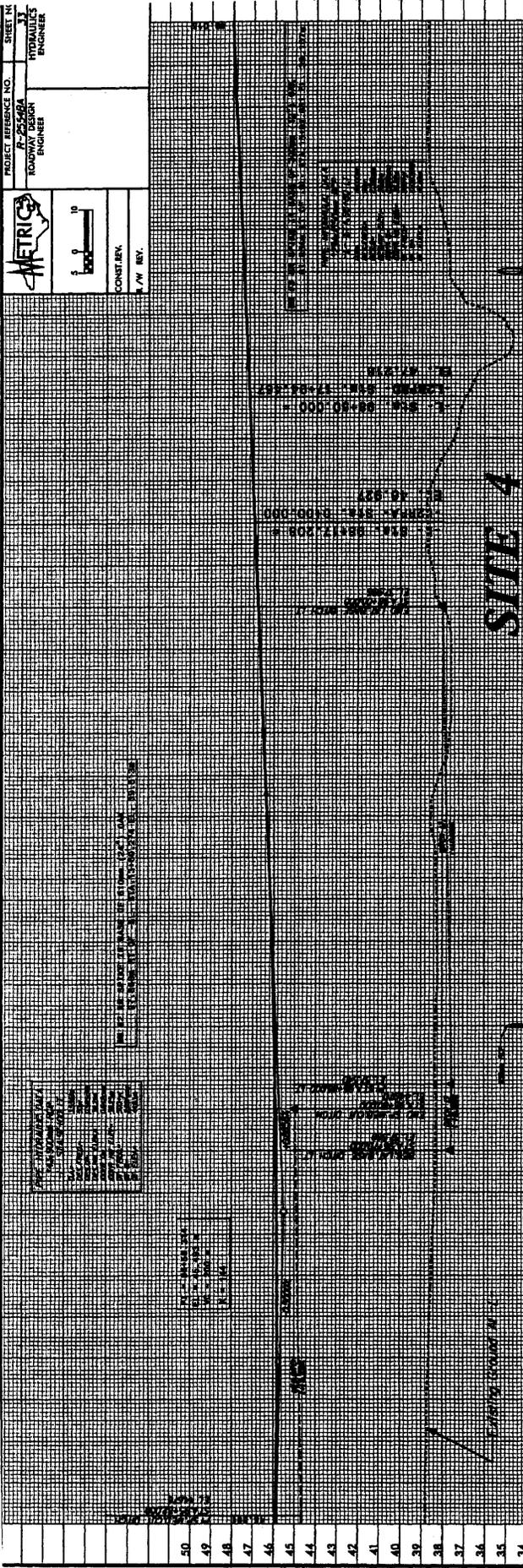
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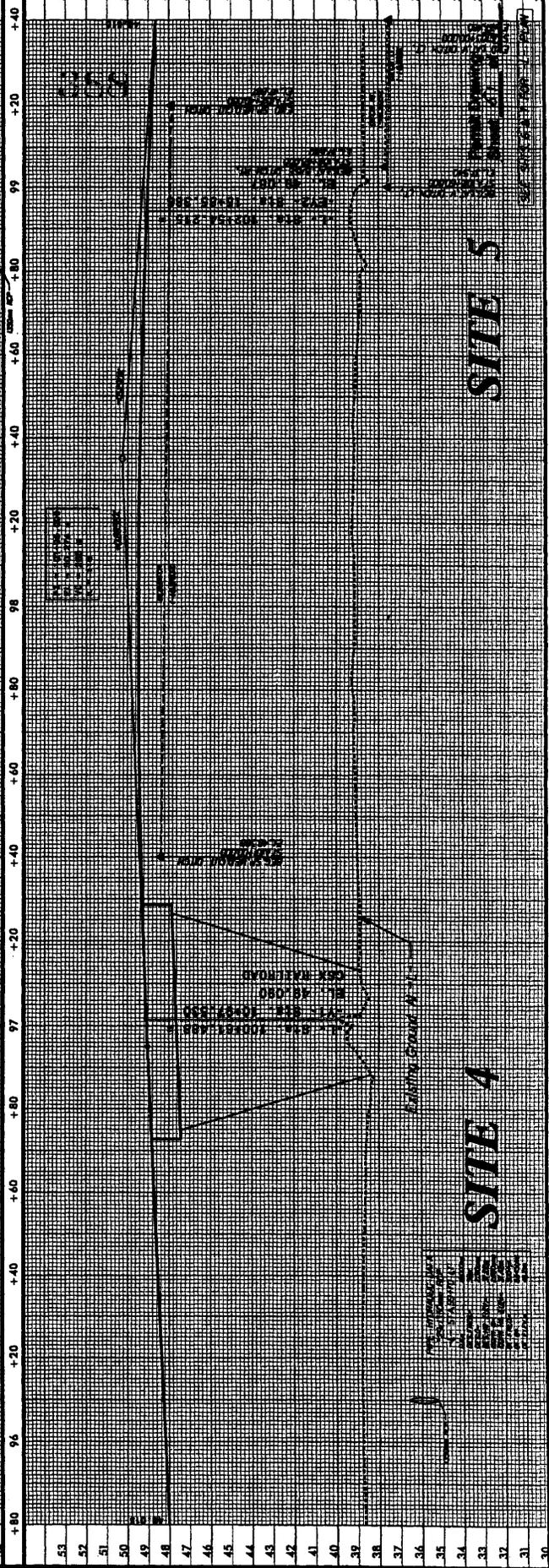


CONST. BY:  
 DATE:



**SITE 4**

50	+80
49	+80
48	+80
47	+80
46	+80
45	+80
44	+80
43	+80
42	+80
41	+80
40	+80
39	+80
38	+80
37	+80
36	+80
35	+80
34	+80



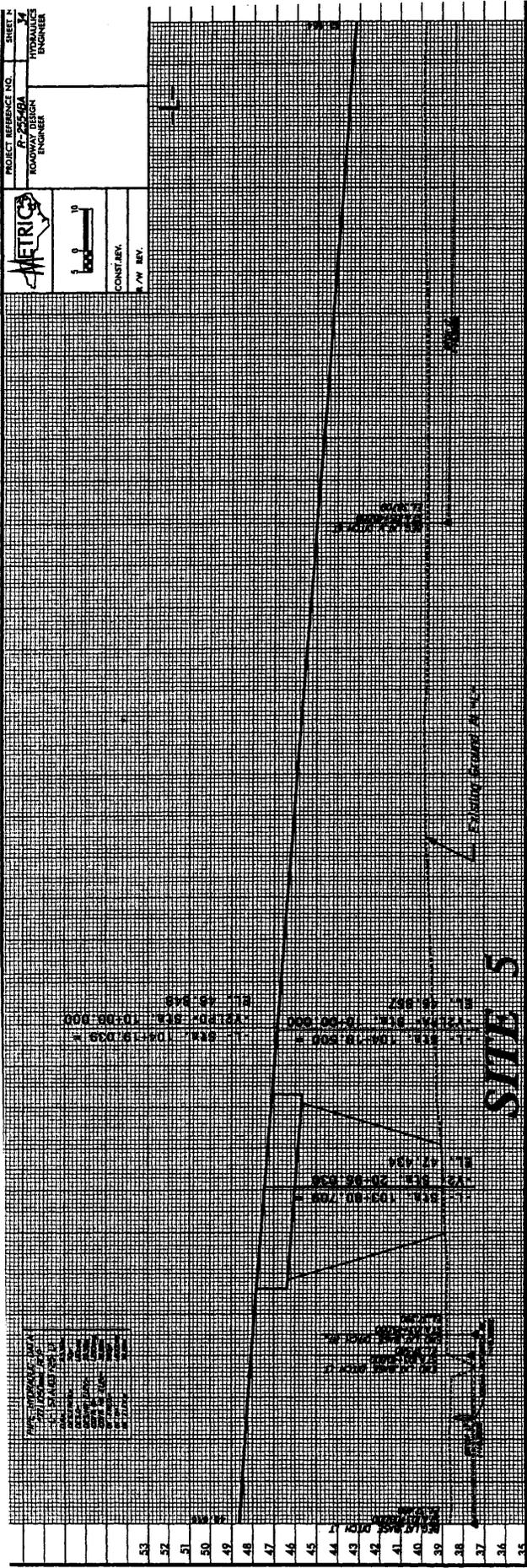
**SITE 5**

53	+80
52	+80
51	+80
50	+80
49	+80
48	+80
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46	+80
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44	+80
43	+80
42	+80
41	+80
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33	+80
32	+80
31	+80
30	+80

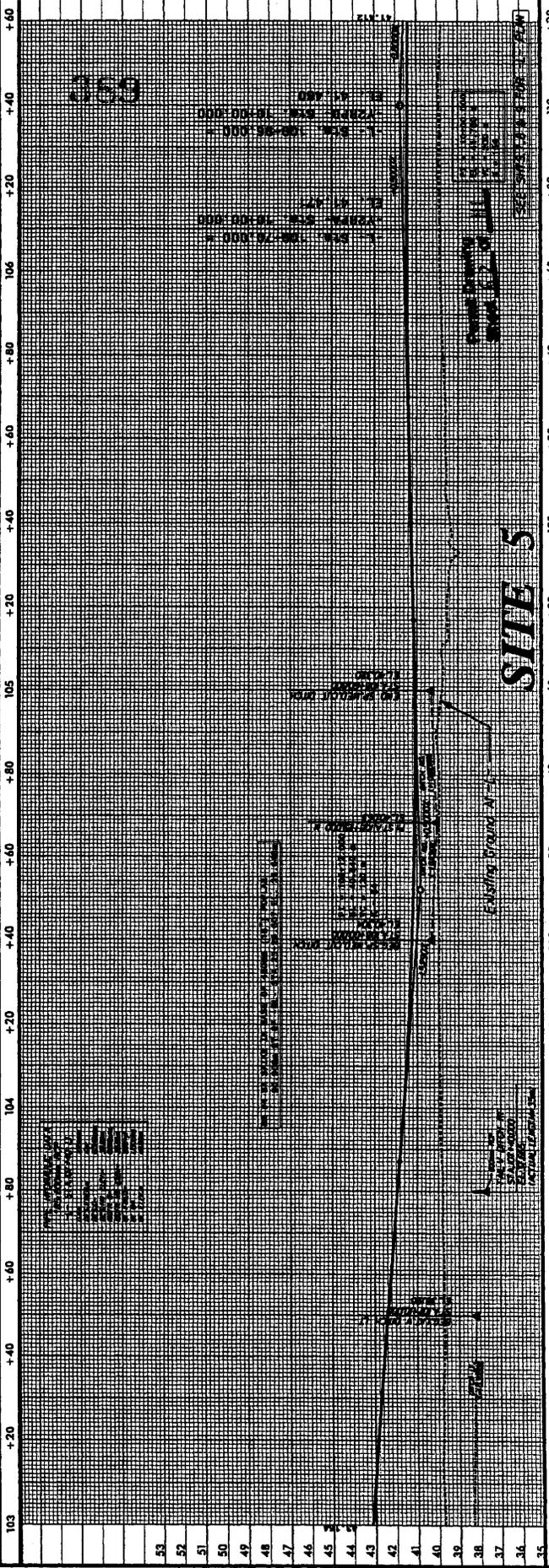
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 R-2554A 1  
 ROADWAY DESIGN HYDRAULICS  
 ENGINEER



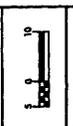
CONTRACT NO.  
 N/A REV.



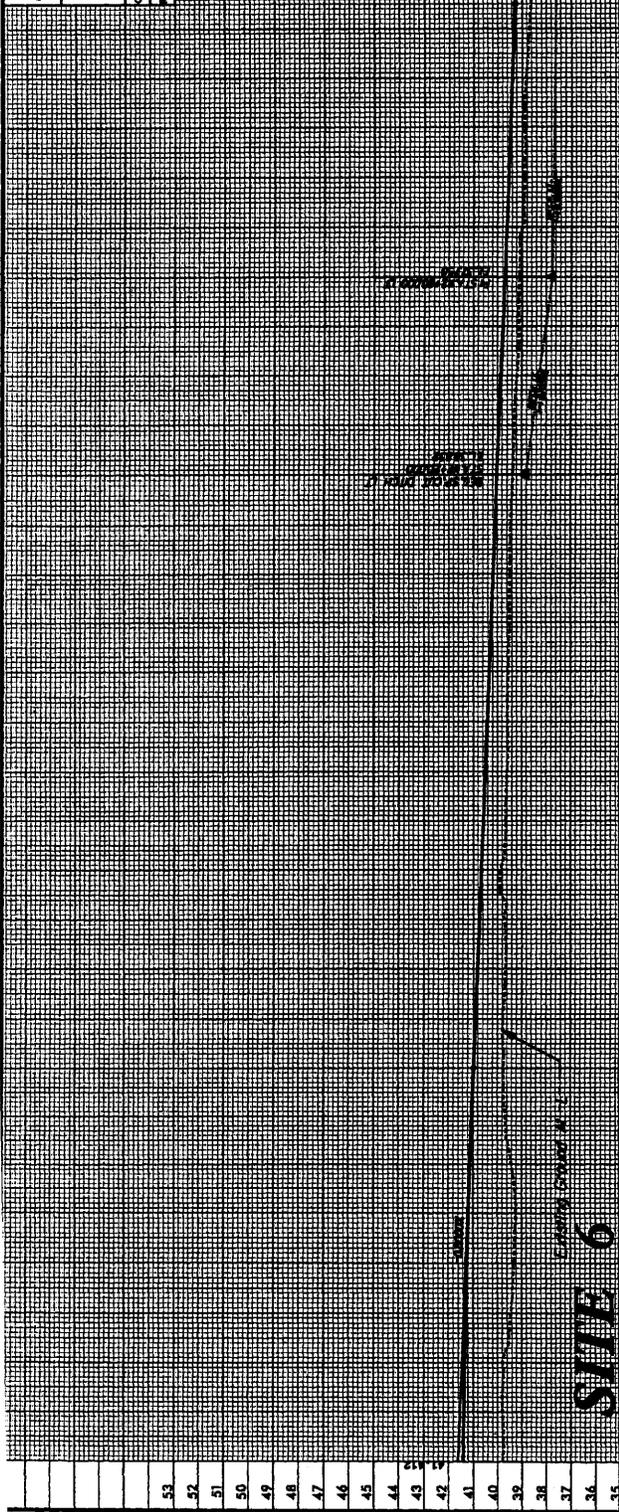
**SIDE 5**



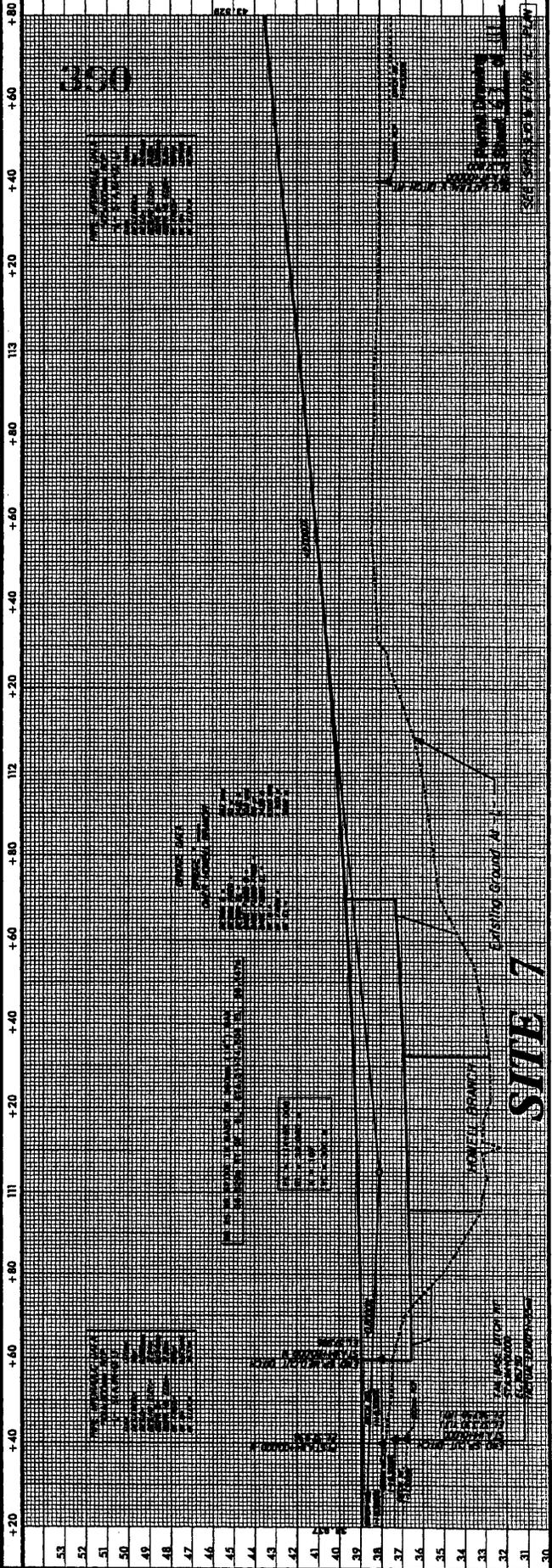
**SIDE 5**



CONST. BY: [Signature]  
 P.W. REV.:

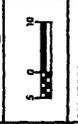


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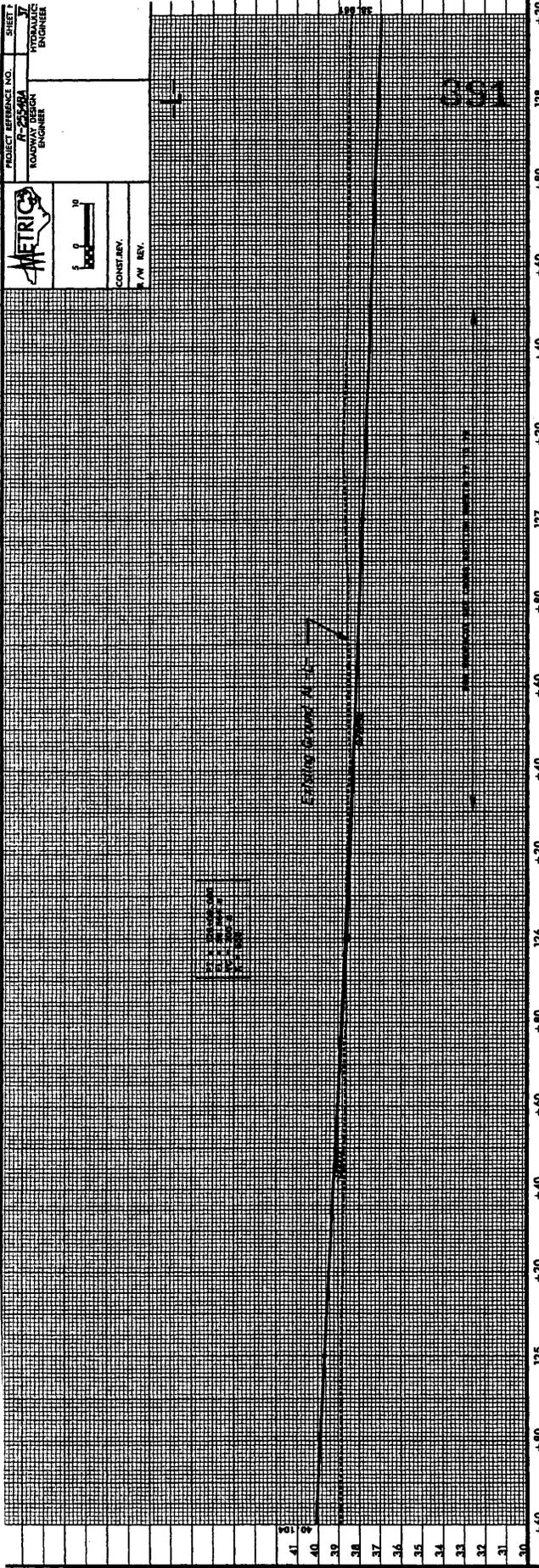


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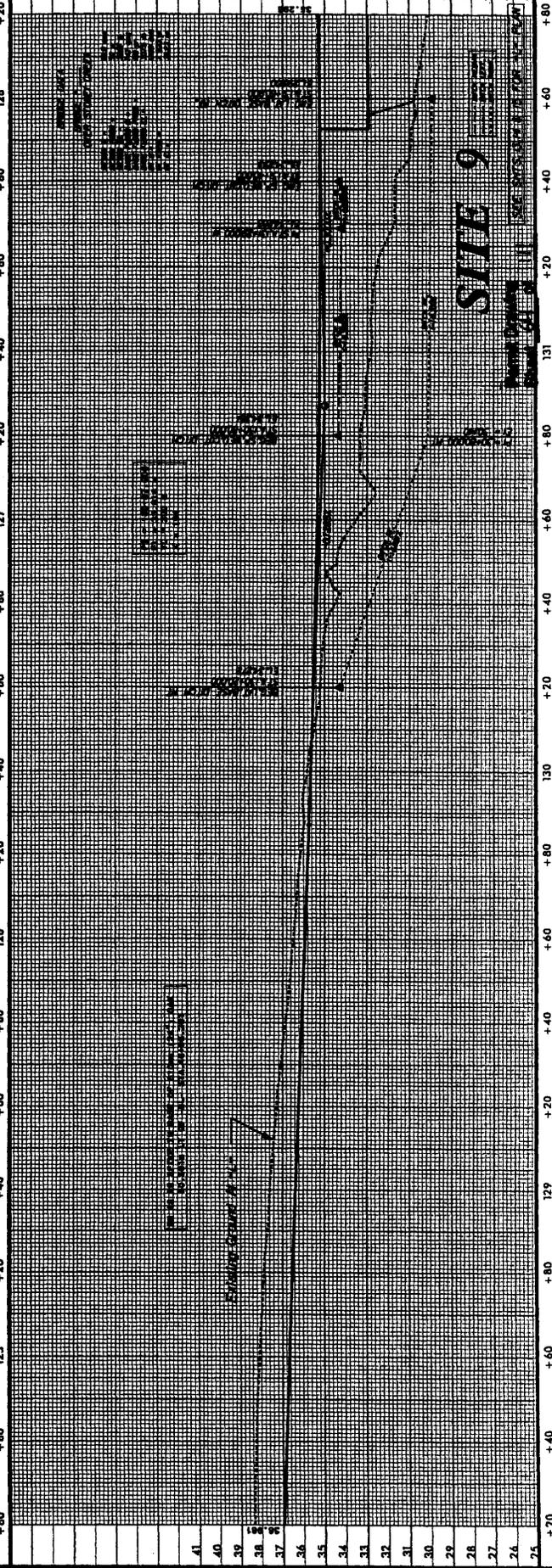
PROJECT REFERENCE NO. SHEET  
 A.C. 25548  
 ROADWAY  
 ENGINEER  
 ENGINEER



CONST. BY  
 P.M. REV.



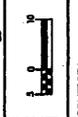
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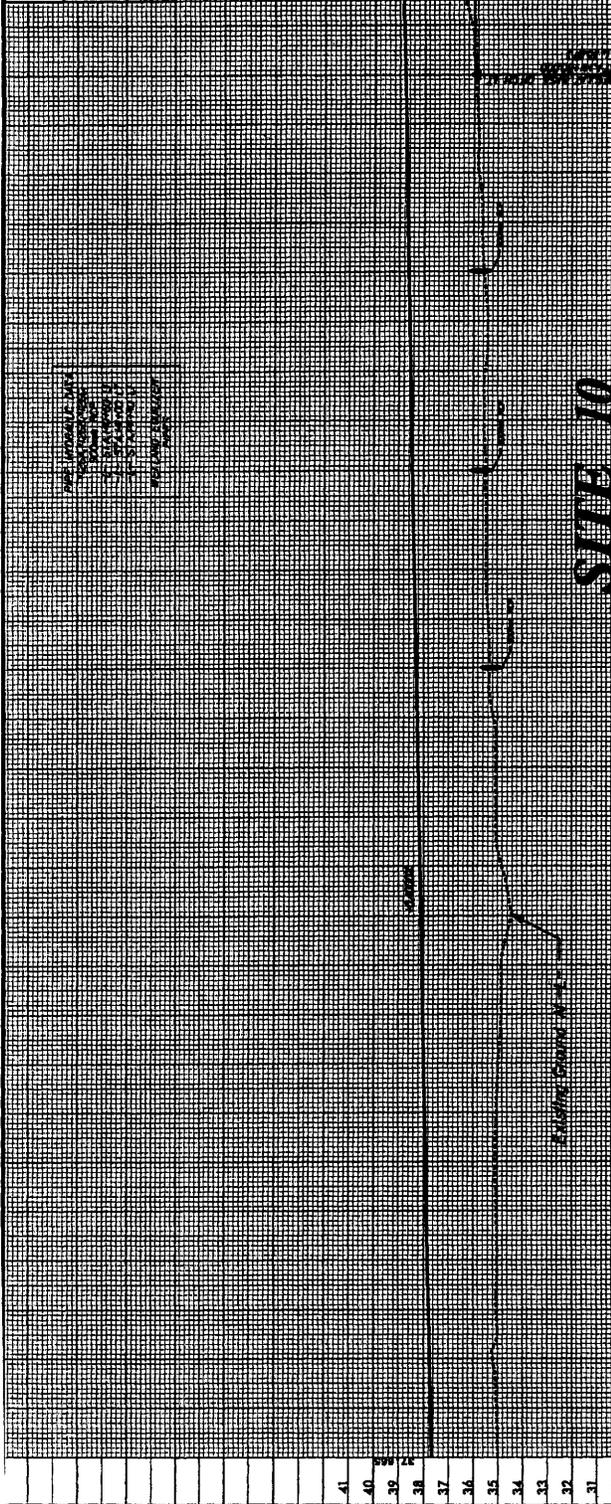
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 A-255/01 393  
 ROADWAY DESIGN  
 REGISTERED PROFESSIONAL ENGINEER



CONST. BY:  
 P. W. BRY

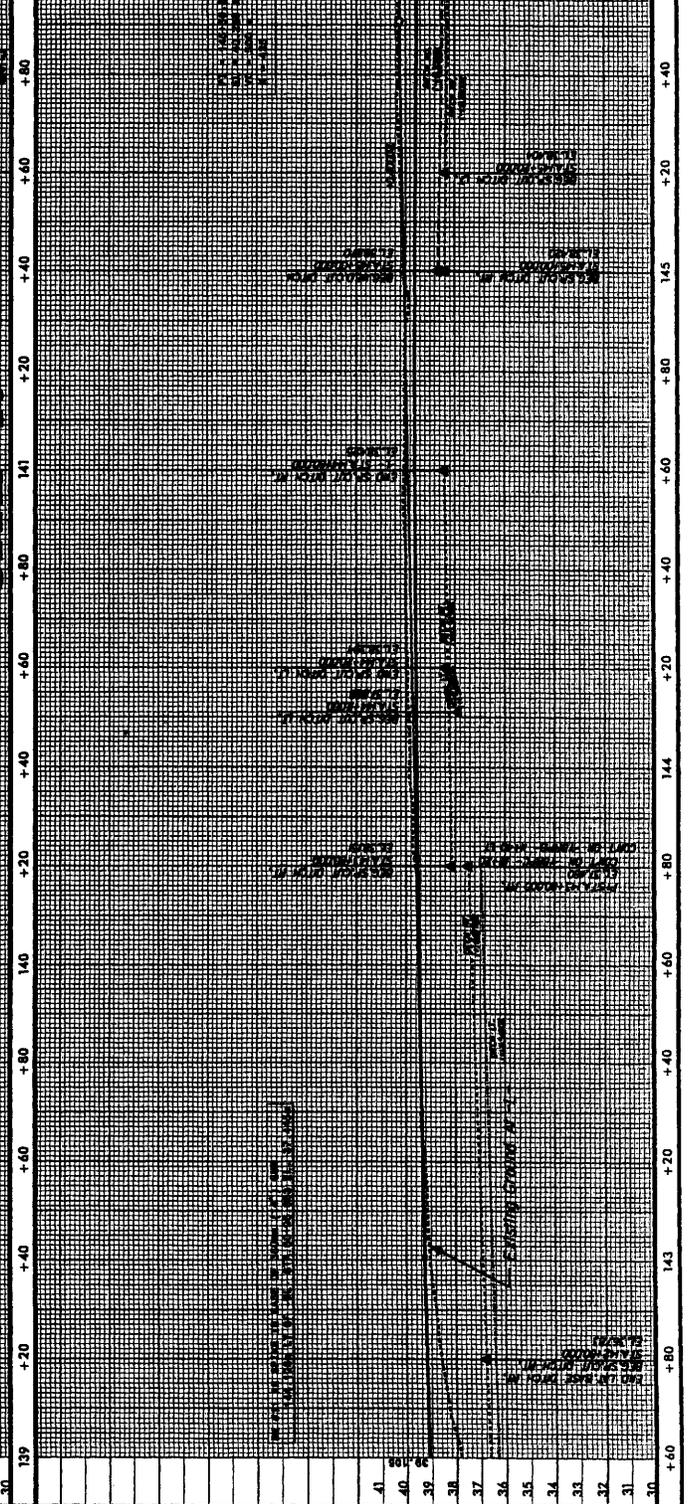
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393



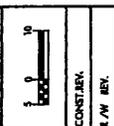
**SITE 10**

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PROJECT REFERENCE NO. SHEET  
 R-2556A 4  
 HYDRAULICS  
 ROADWAY DESIGN  
 ENGINEER

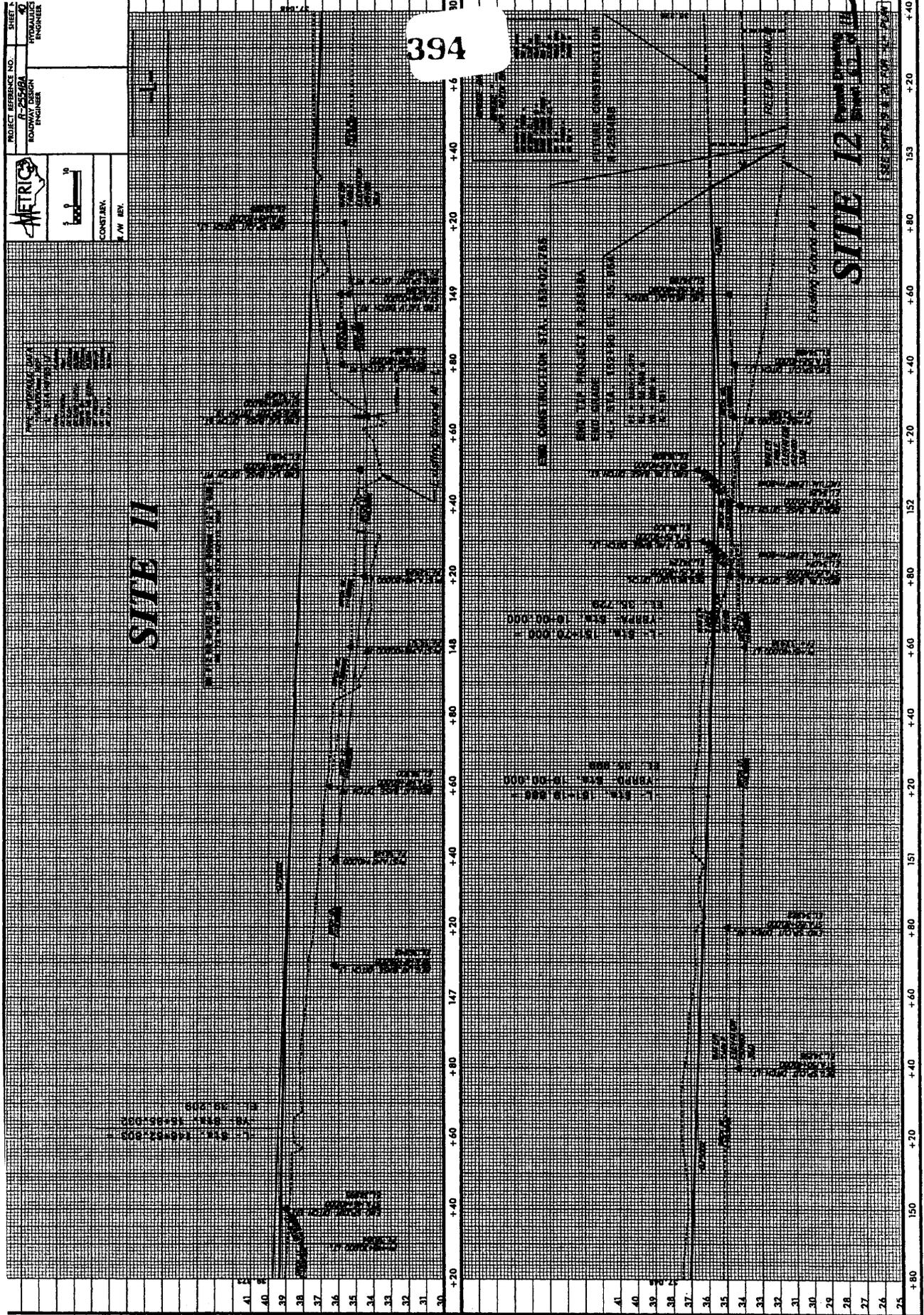


CONSTARY  
 1/4" = 100'

PREPARED BY  
 DATE  
 CHECKED BY  
 DATE

# SITE II

394



# SITE 12 DETAILS

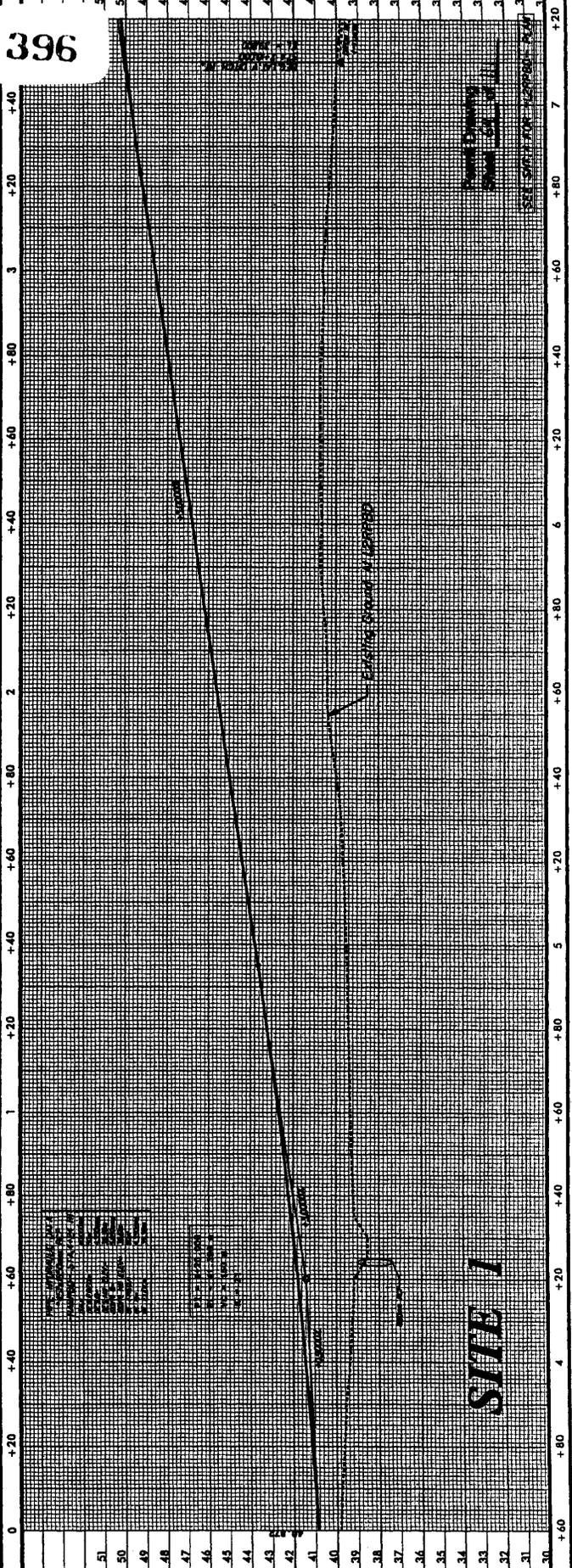
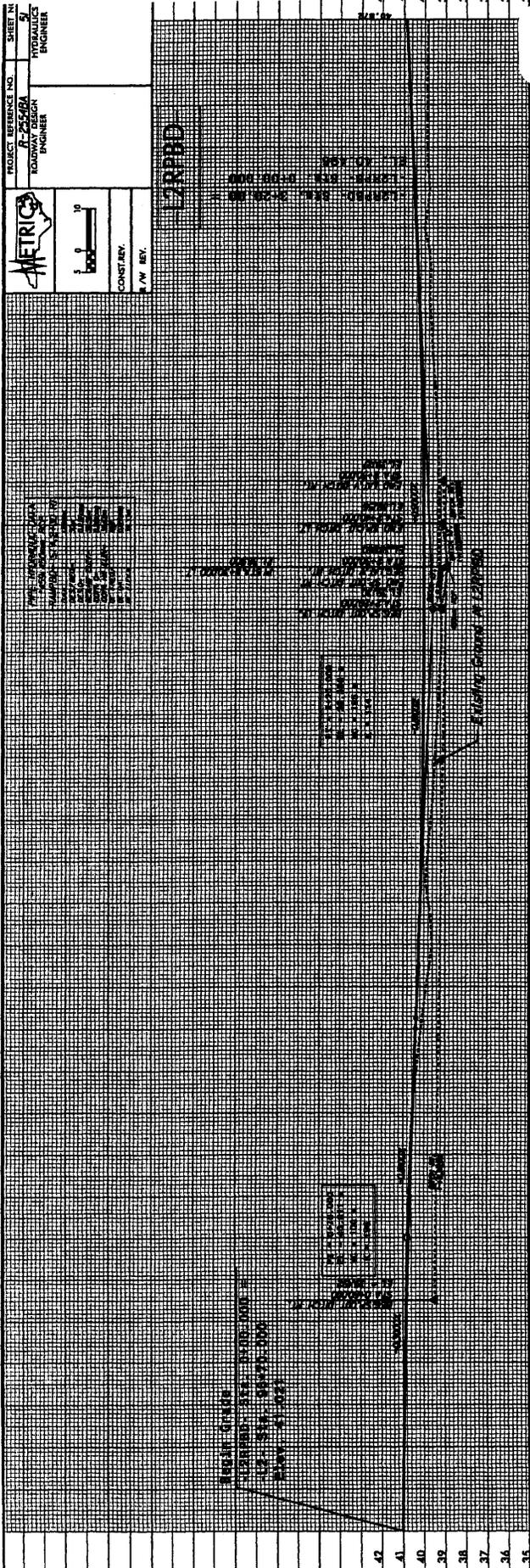
10/8/07 125748  
 R:\projects\2556a\hyd\perm\p1.dgn  
 model





CONSTRY.  
 1/4" = 10'

396



**SITE 1**

SEE SHEET FOR VERTICAL PLAN

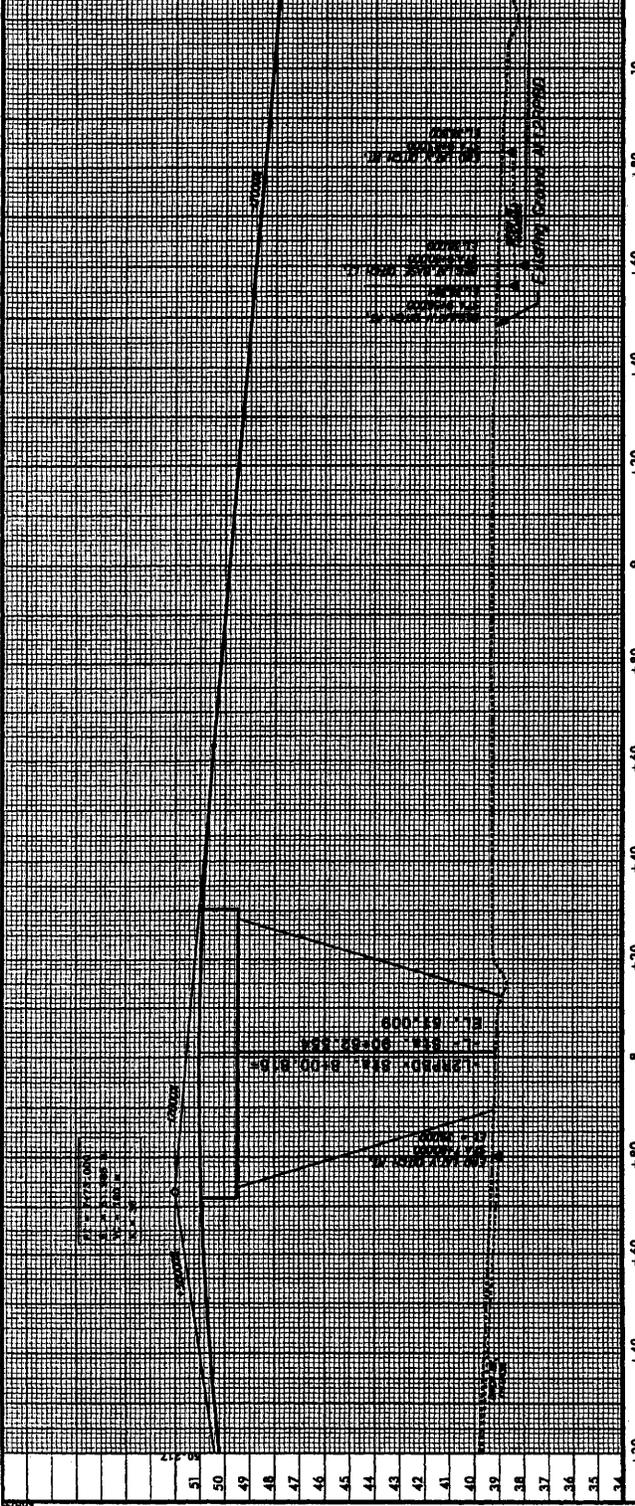
PROJECT REFERENCE NO. 10-00000000  
 J.C. GARDNER  
 LICENSED PROFESSIONAL ENGINEER

**METRICS**

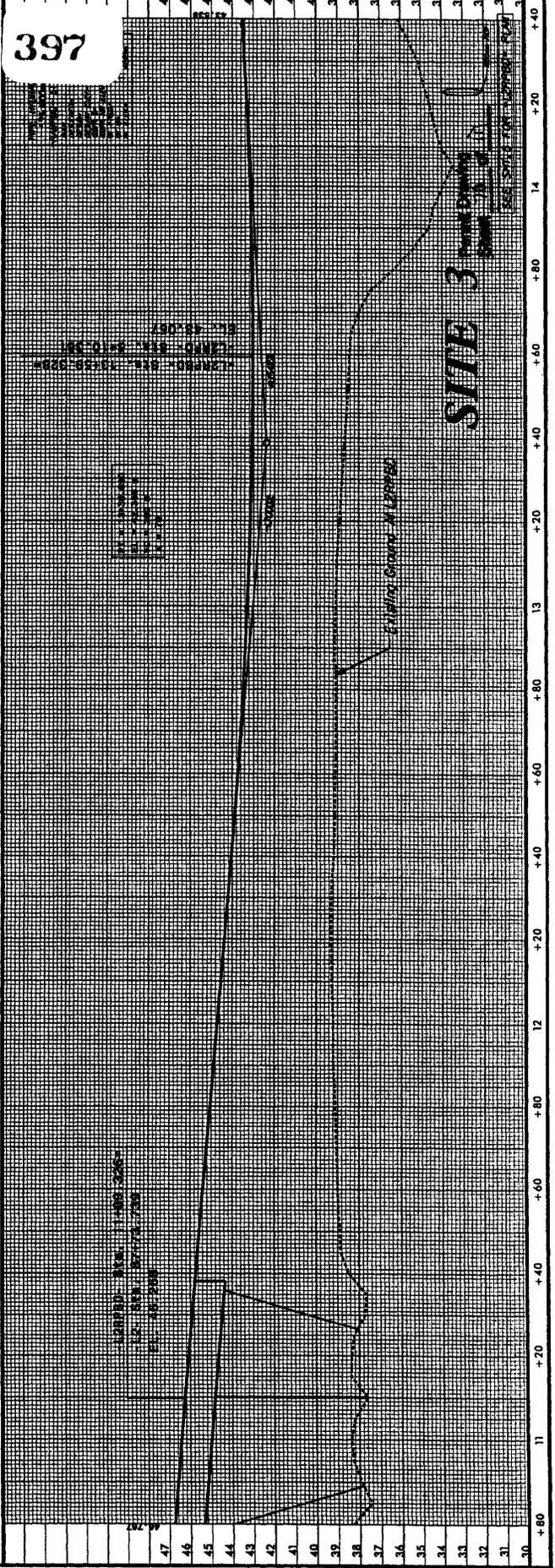
CONST. DIV.  
 PAV. DIV.

DATE: 10/15/2010

SCALE: 1" = 20'



51	8
50	9
49	10
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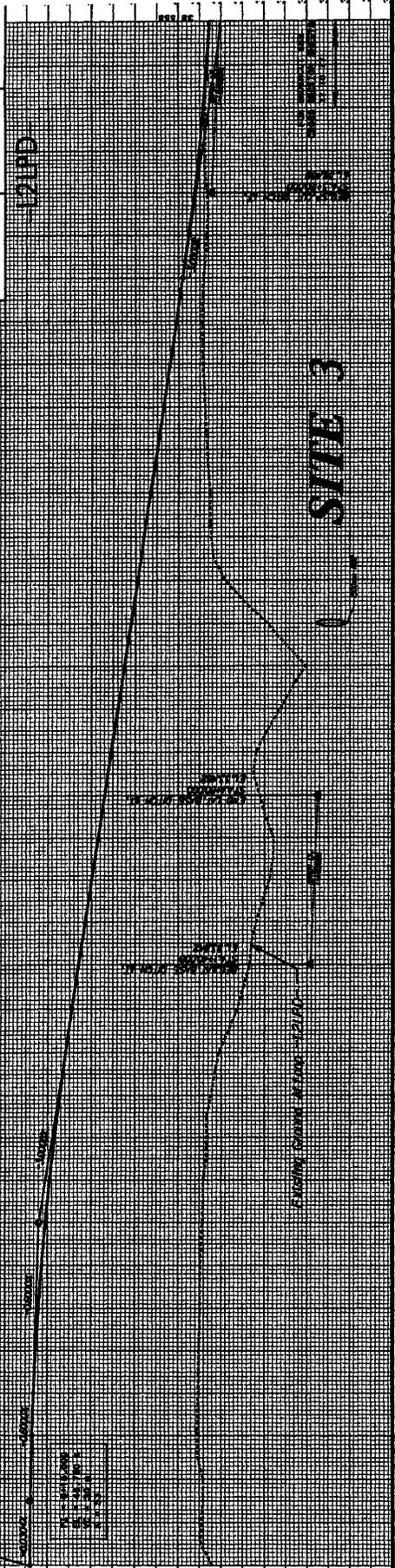
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CONTRACT NO. **10**  
 COUNTY: **LA**  
 P.W. DIST.:

THIS SURFACE GRADE  
 WAS OBTAINED FROM  
 AERIAL PHOTOGRAPHS  
 AND FIELD SURVEY  
 DATA.  
 DATE: **11/11/07**

Begin Grade  
 Stationing: **0+00 to 0+100**  
 ELEVATION: **42.50 to 46.75**  
 DATE: **11/11/07**



**SITE 3**

0 +20 +40 +60 +80 1 +20 +40 +60 +80 2 +20 +40 +60 +80 3 +20 +40 +60 +80 4 +20 +40 +60 +80

398

52  
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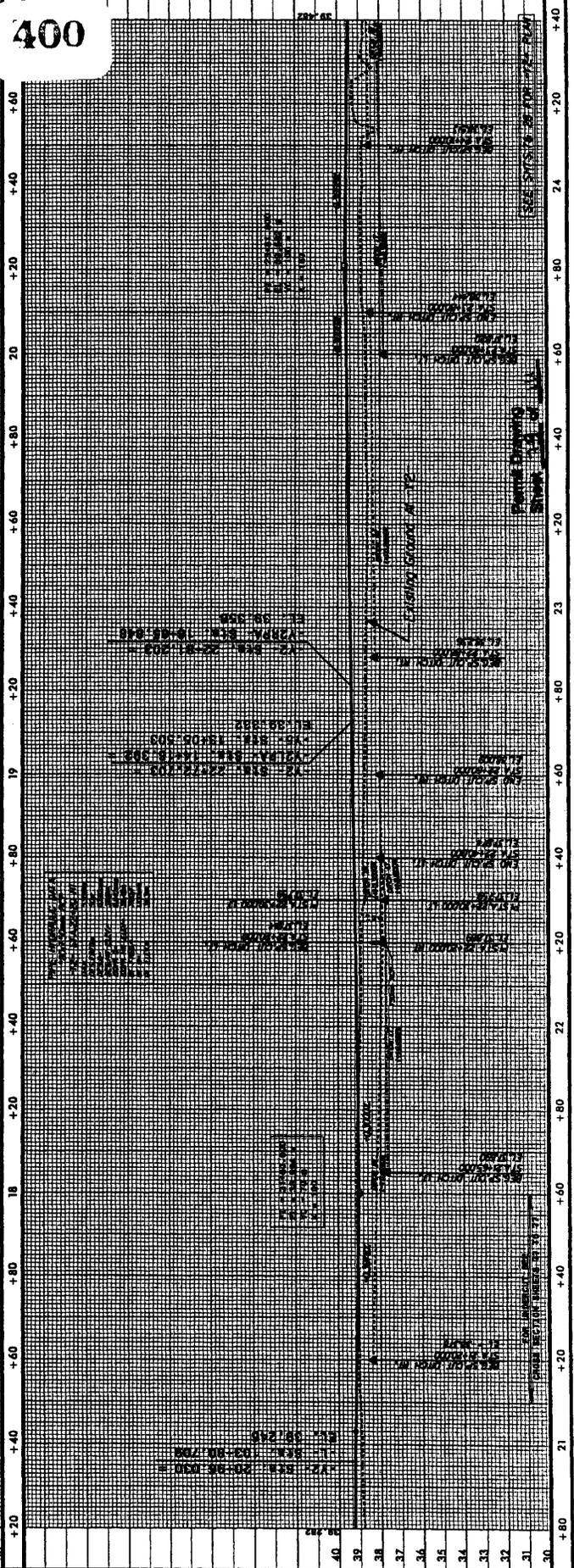
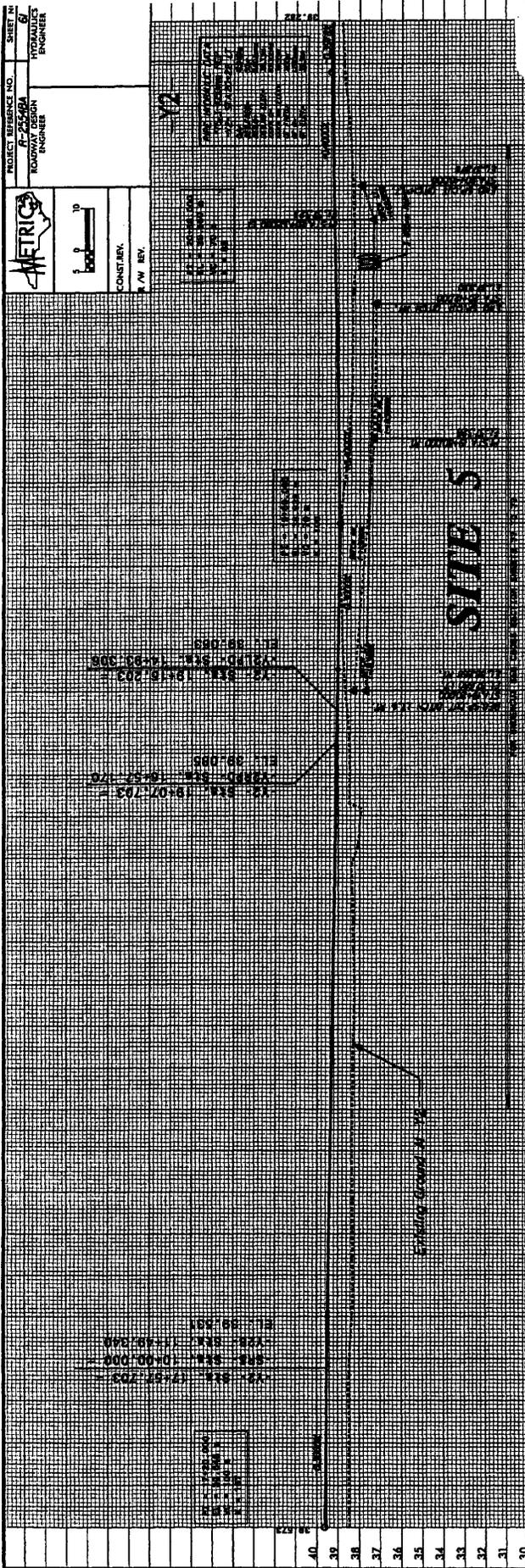
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+40 +20 +40 +60 +80 +40 +20 +40 +60 +80 +40 +20 +40 +60 +80 +40 +20 +40 +60 +80





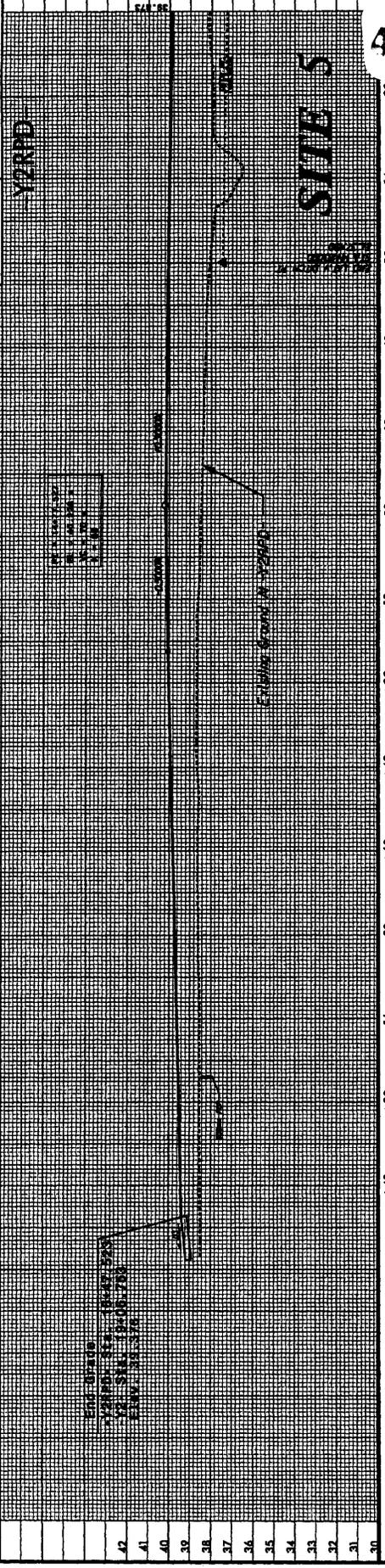
CONSTRY.  
 P. AN. BR.



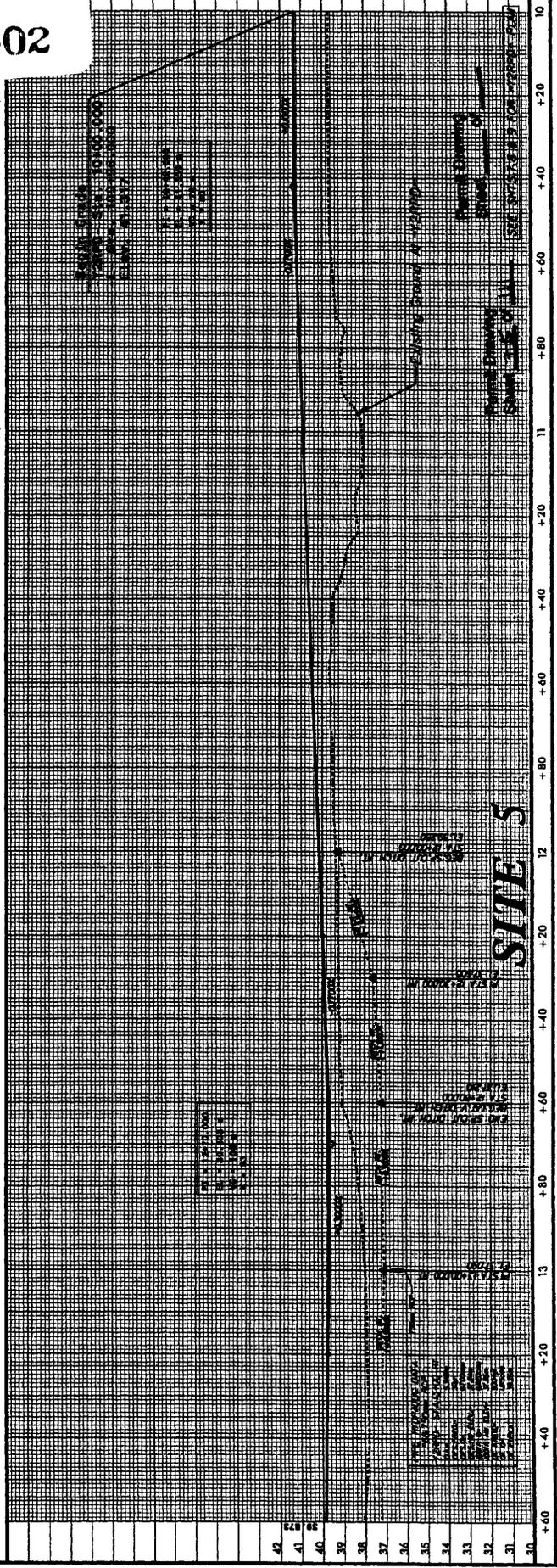


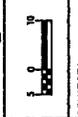


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 P/W BY.

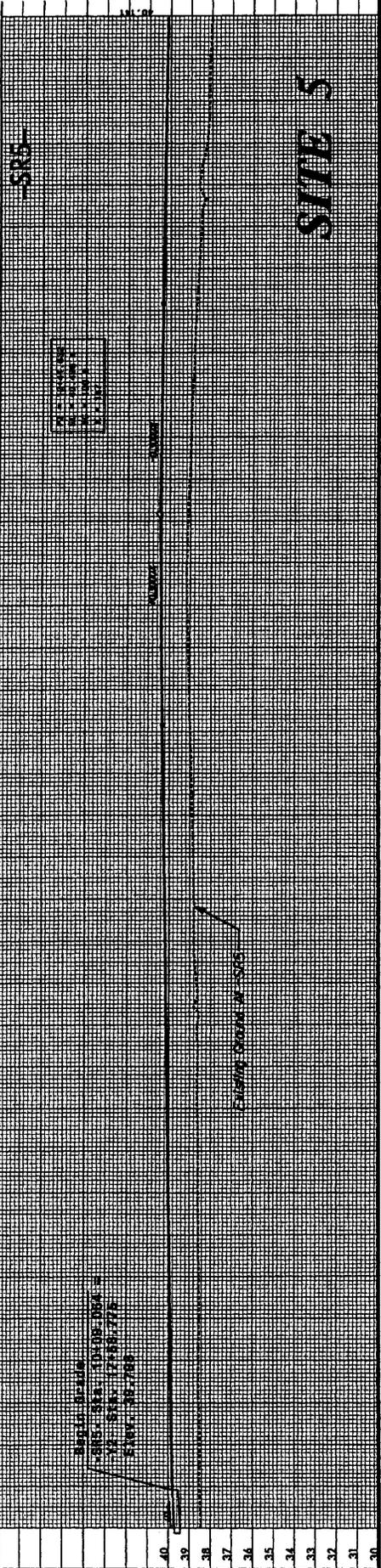


402

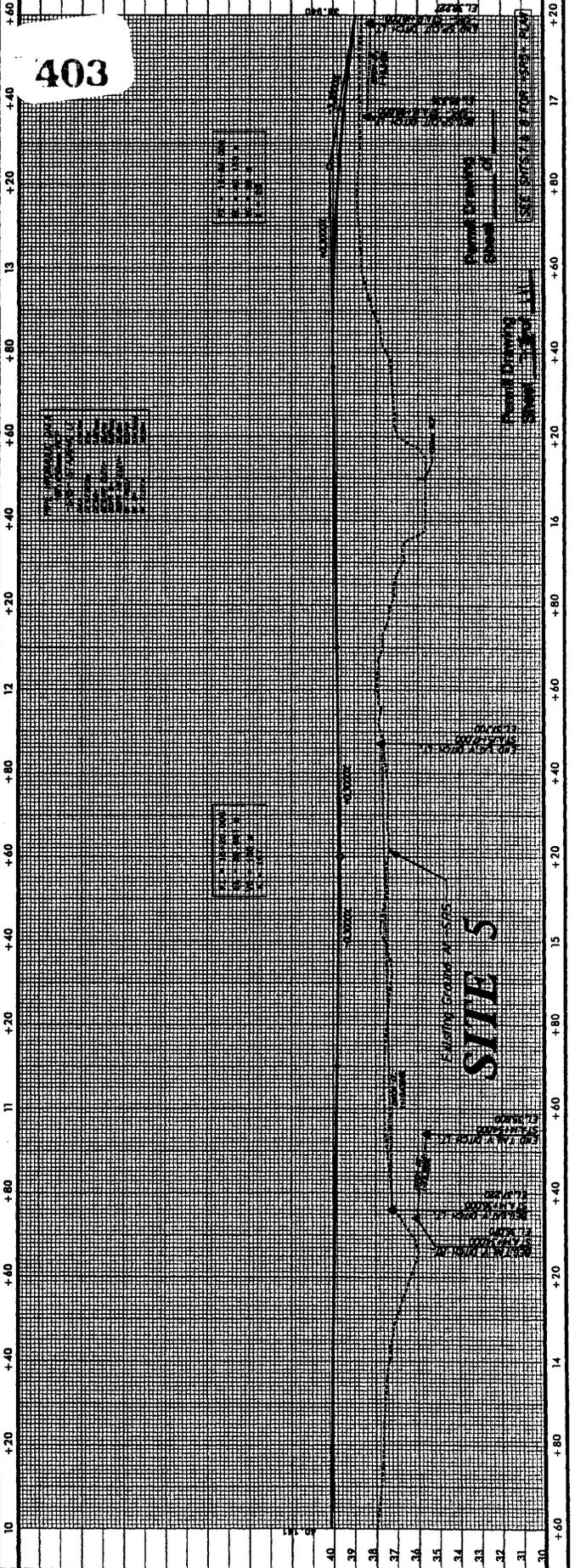




CONST. REV.  
 P. W. BRY



Vertical Curve Data:  
 PVI STA: 10+00.00  
 BVC STA: 9+50.00  
 ELEV: 95.785

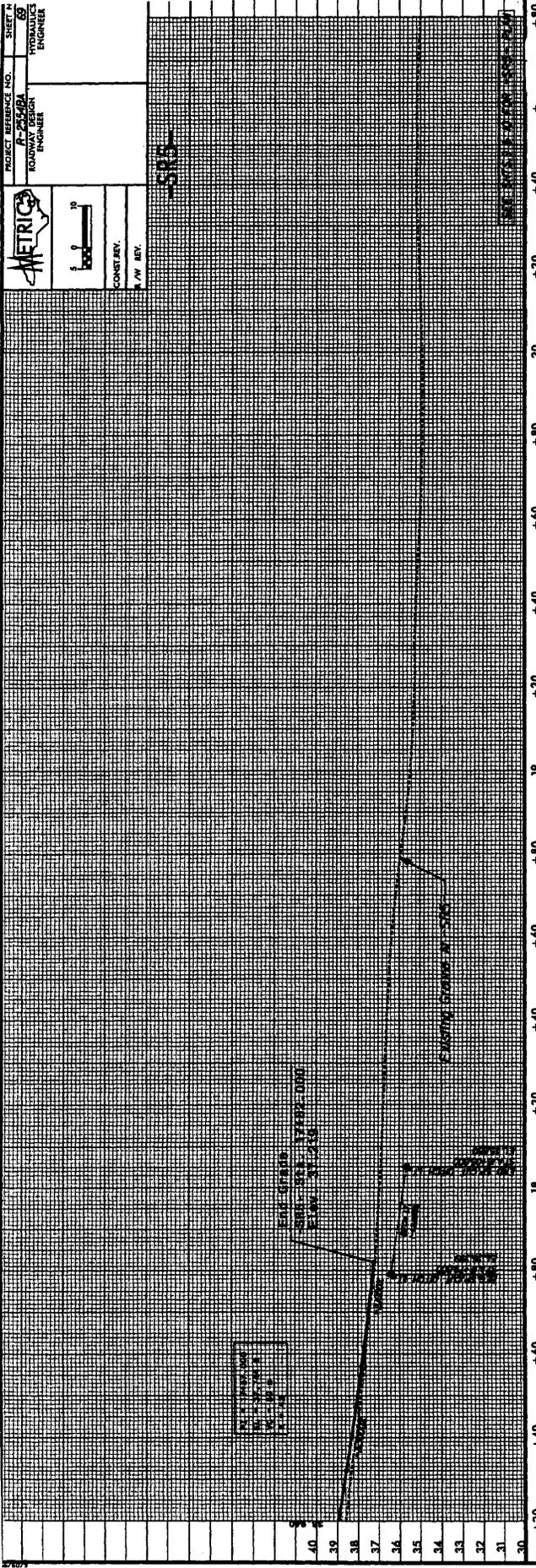




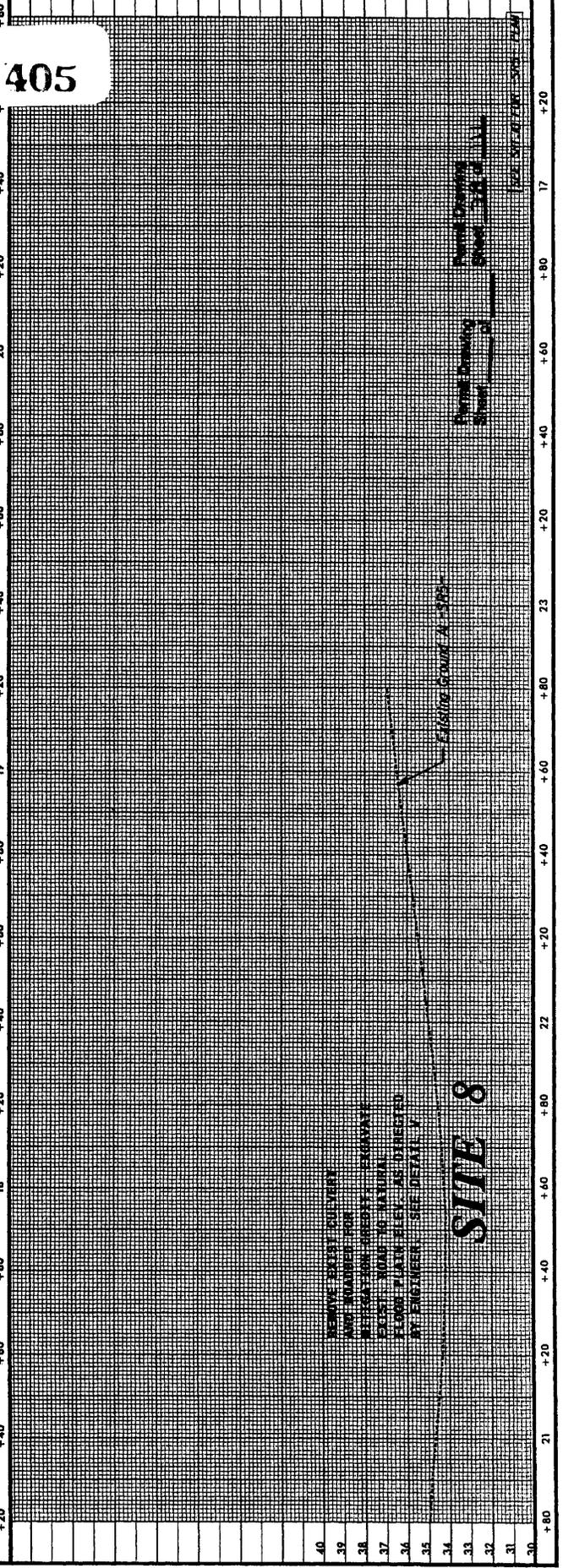


COUNTY,  
 N.W. BEV.

-SPS-



405



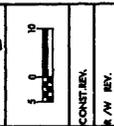
8  
**RTIS**

REMOVE EXIST. PAVEMENT  
 AND REGRADE FOR  
 REGISTRATION PURPOSES  
 FROM 18' TO 19' NATURAL  
 FLOOR SLAB ELEV. AS DIRECTED  
 BY ENGINEER. SEE DETAIL V

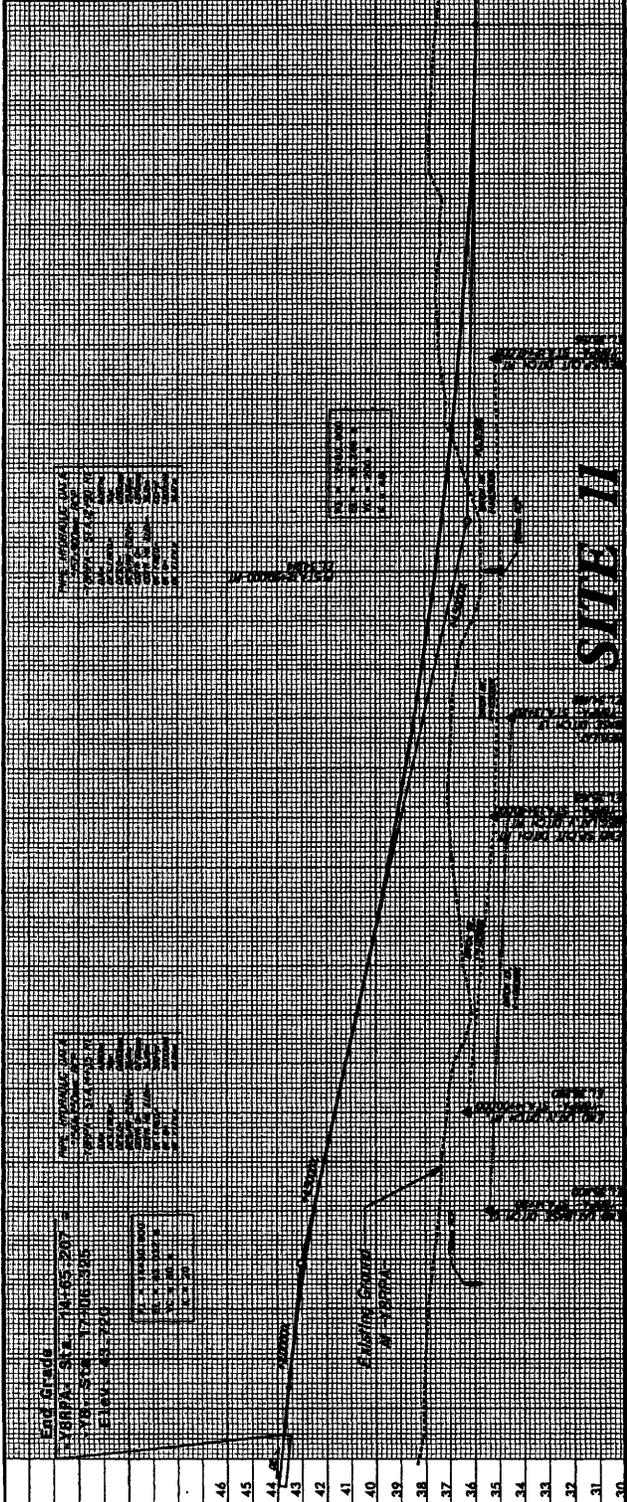
Proposed  
 Roadway  
 Elevation

Existing Ground A - SPS

PROJECT REFERENCE NO. 17-2502A  
 SHEET NO. 75  
 ROADWAY DESIGN  
 ENGINEER

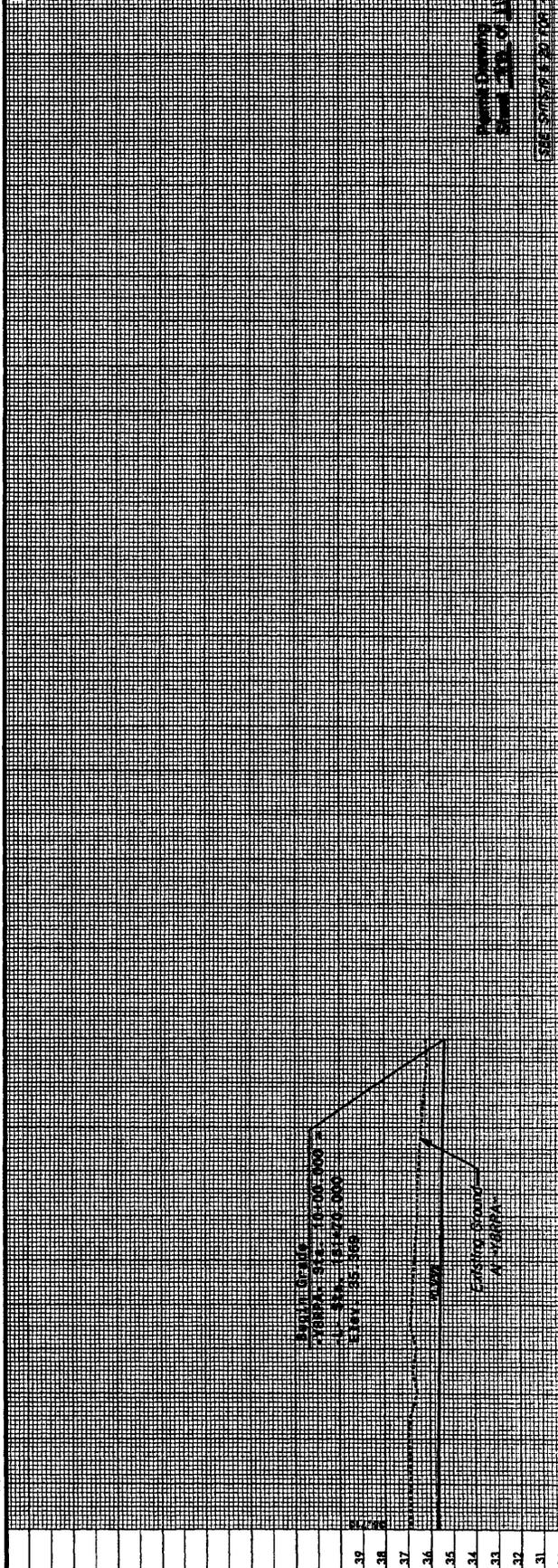


CONSTRY.  
 S. W. BY.



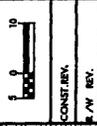
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406



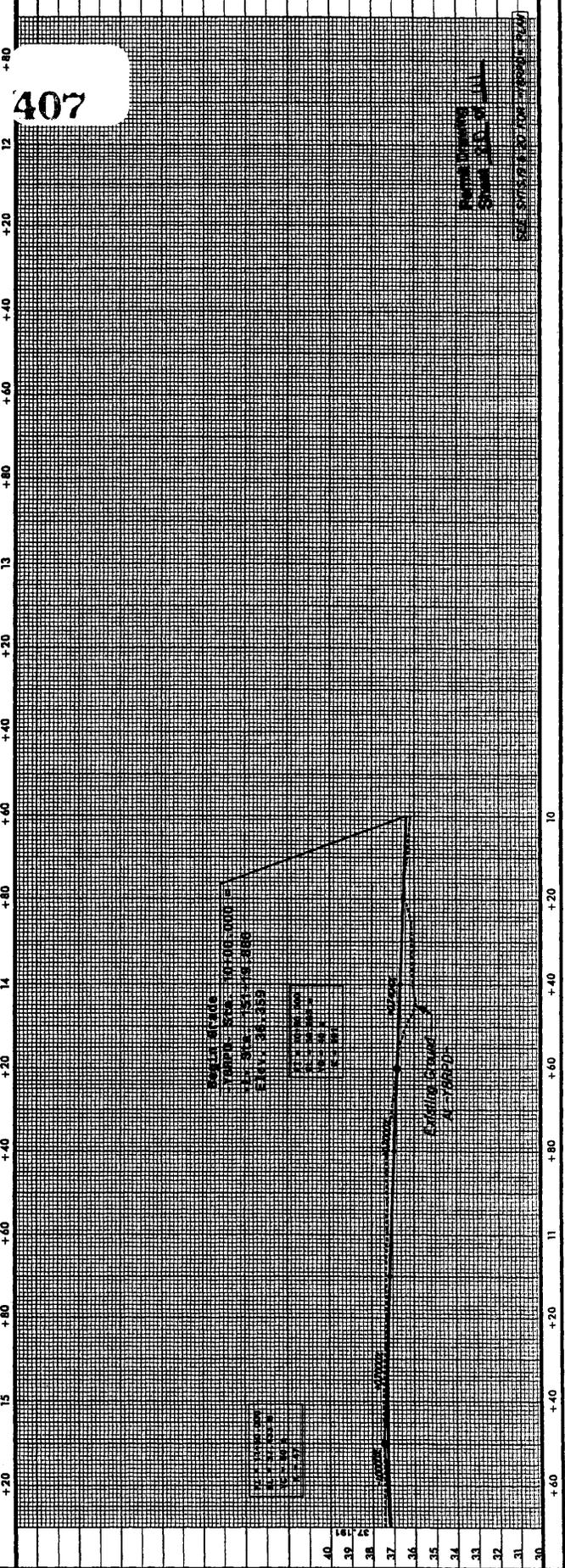
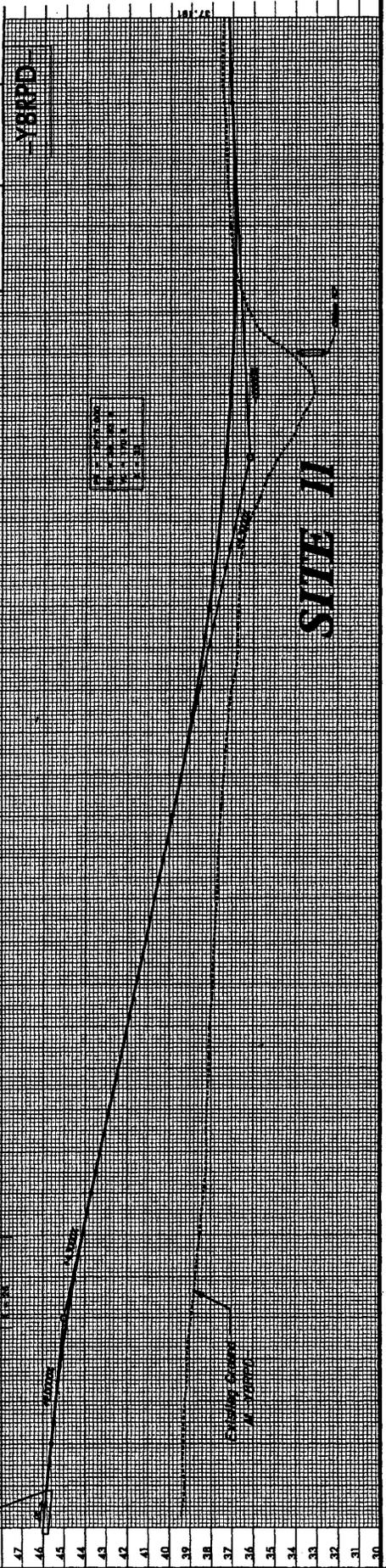
39
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11 +80 +60 +40 +20 10 0



CONST. BY  
 P.W. REV.

PROPOSED  
 1. 10' WIDE  
 2. 10' WIDE  
 3. 10' WIDE  
 4. 10' WIDE  
 5. 10' WIDE  
 6. 10' WIDE  
 7. 10' WIDE  
 8. 10' WIDE  
 9. 10' WIDE  
 10. 10' WIDE  
 11. 10' WIDE  
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 50. 10' WIDE

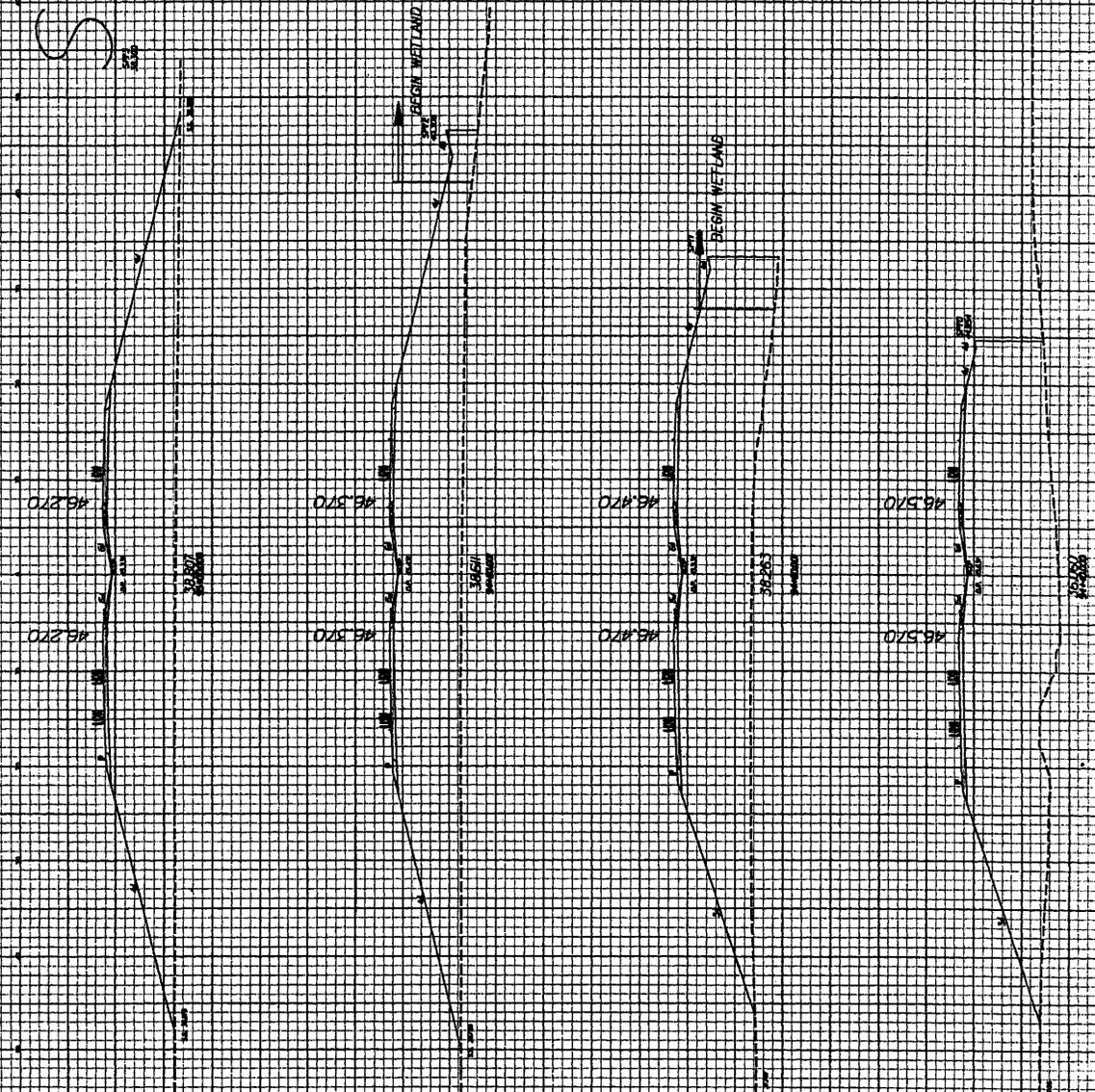


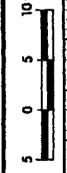




# SITE 3

409

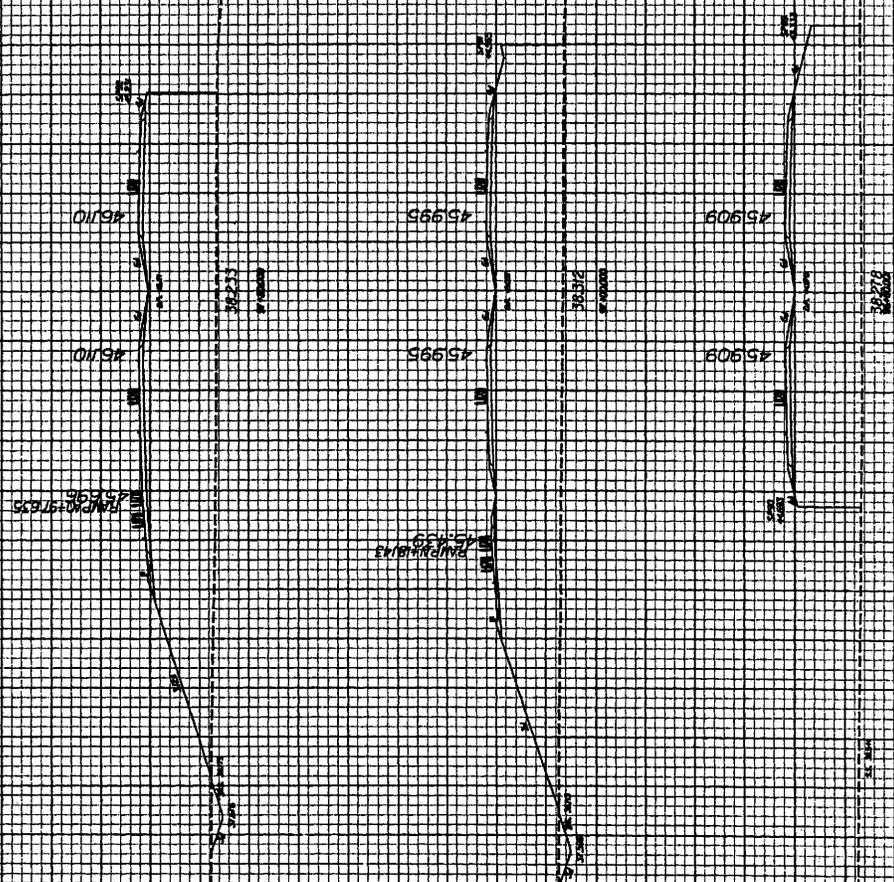




SITEL 4

410

Permit Drawing  
Sheet 24 of 111







PROJECT REFERENCE NO. B-3154A

SHEET 1

SITE 4

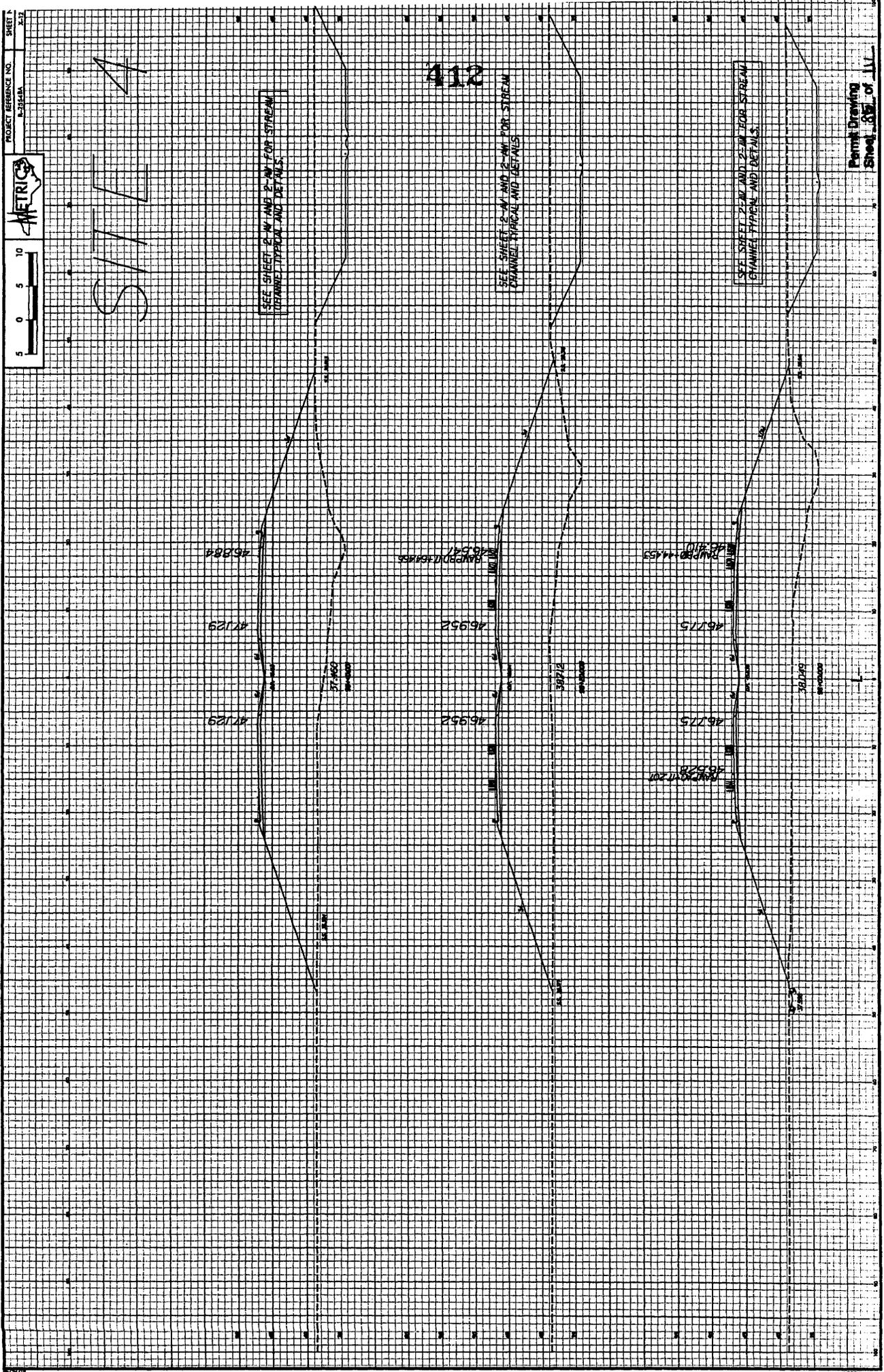
SEE SHEET B-3154A AND B-3154B FOR STREAM CHANNEL TYPICAL AND DETAILS.

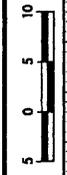
412

SEE SHEET B-3154A AND B-3154B FOR STREAM CHANNEL TYPICAL AND DETAILS.

SEE SHEET B-3154A AND B-3154B FOR STREAM CHANNEL TYPICAL AND DETAILS.

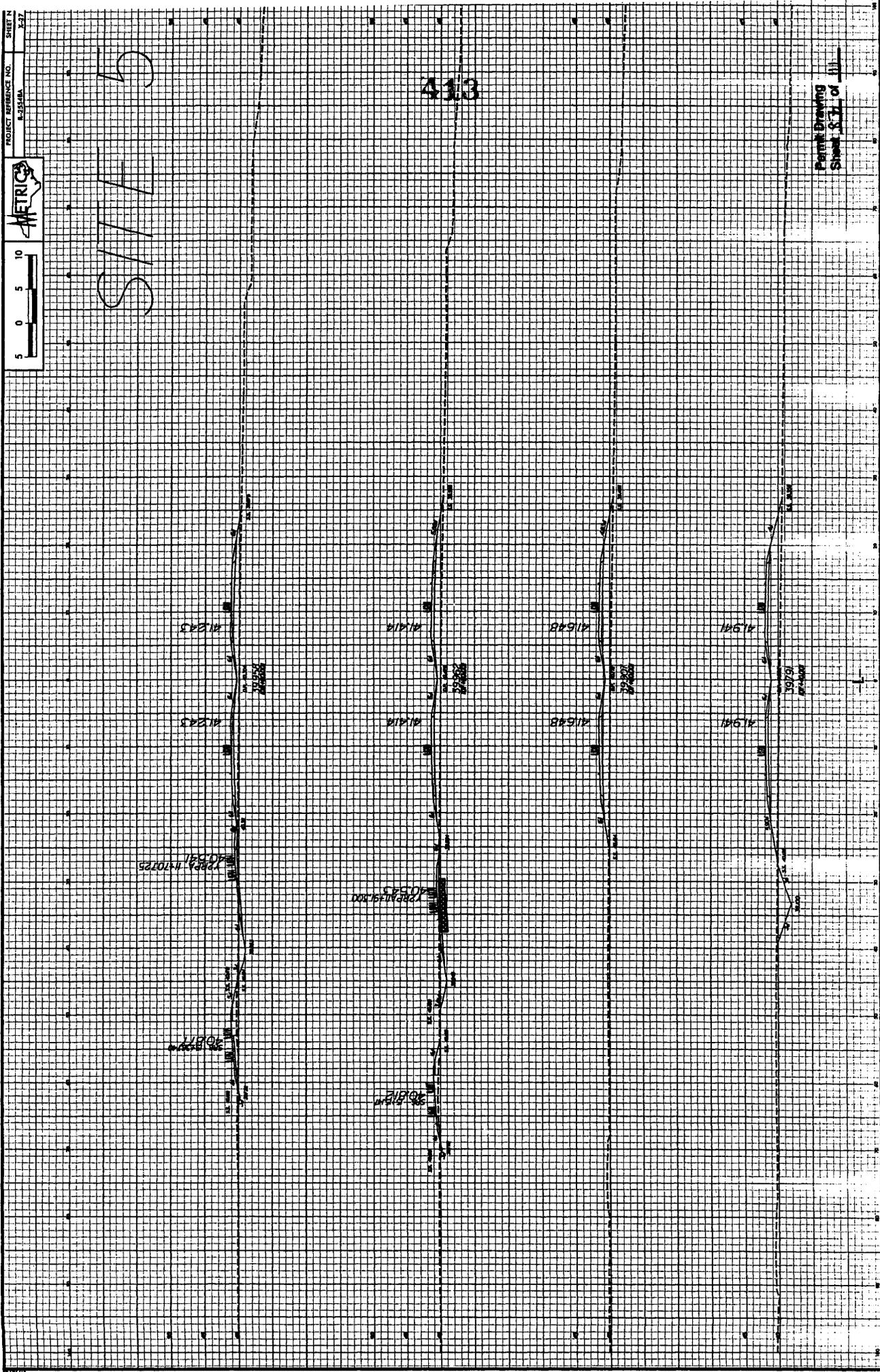
Permit Drawing Sheet 021 of 111





SITE 5

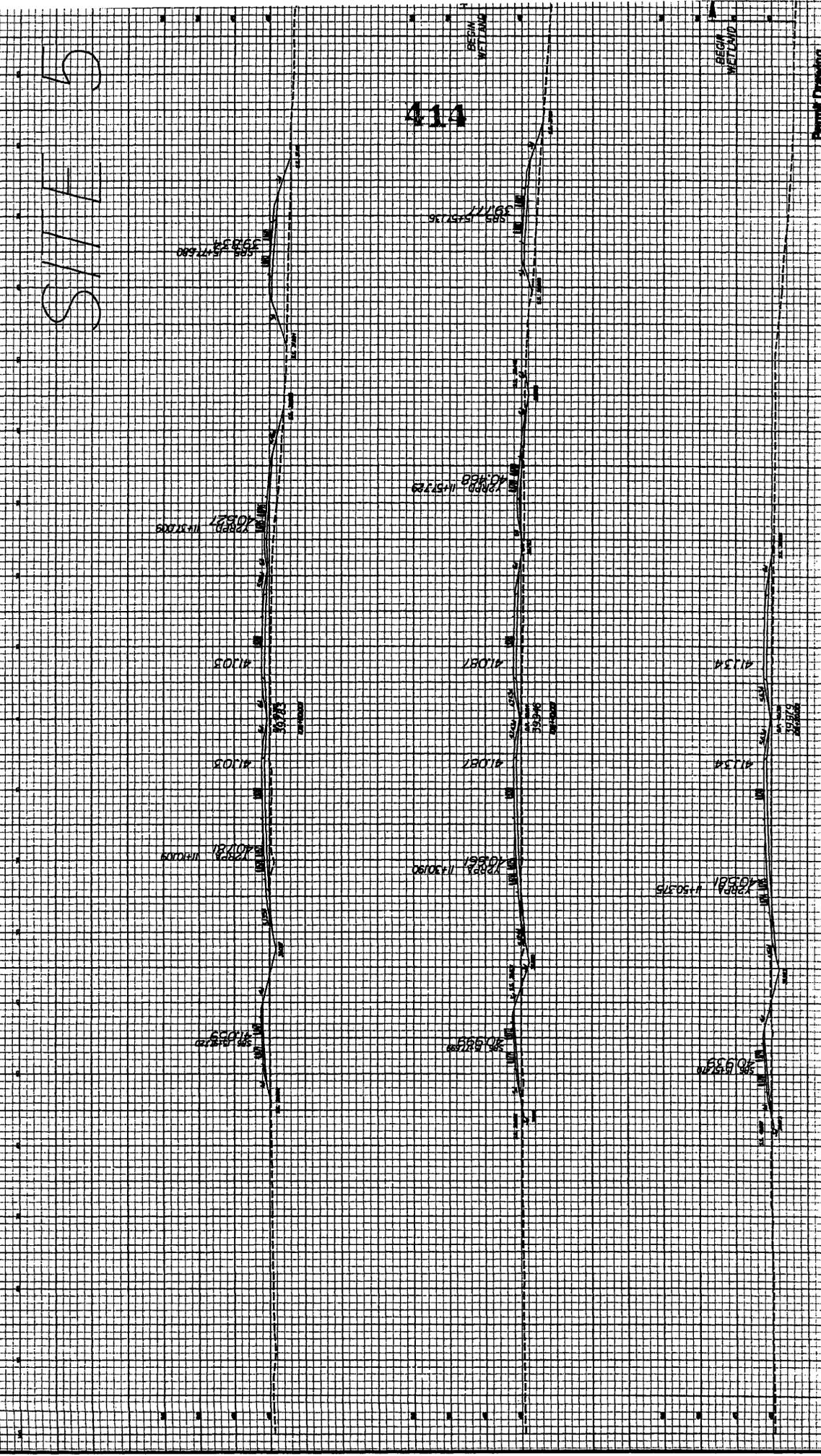
413





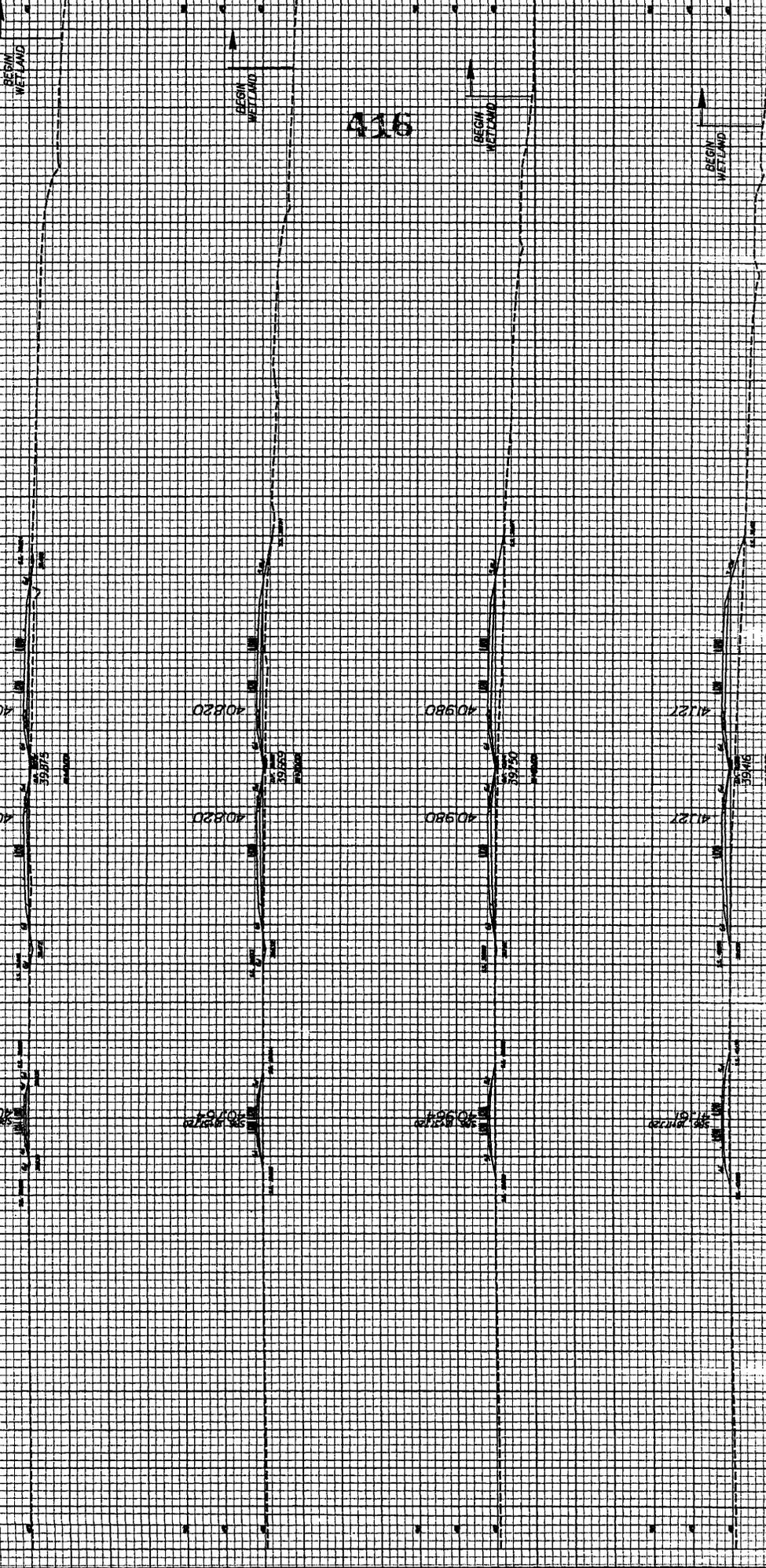
# SITE 5

## 414





# SITE 6

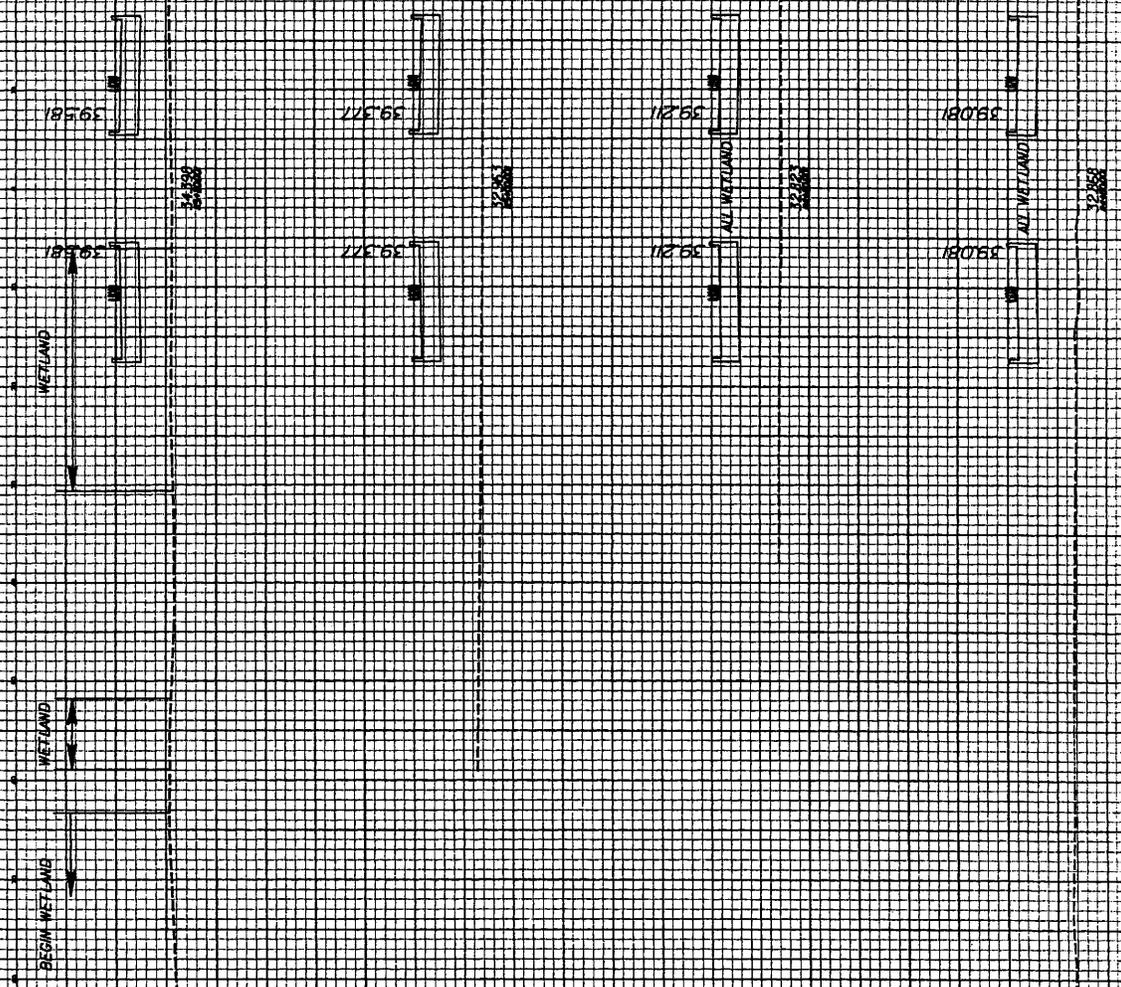






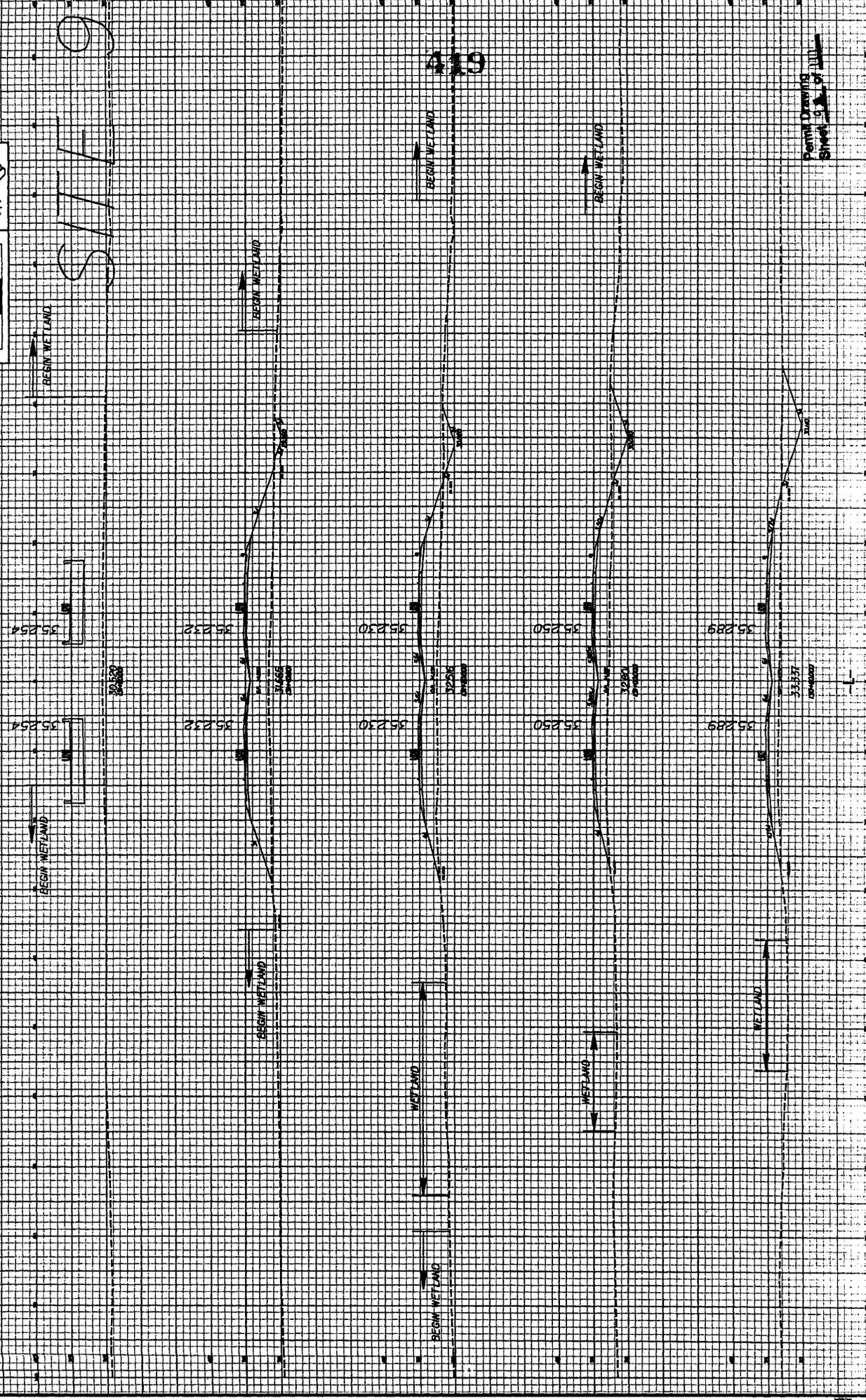
# SITE 7

418





SITE 9





# SITE 9

420



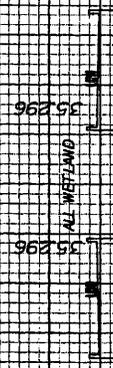
35476



35476



35356



35297

PROJECT REFERENCE NO. 8-25548A



SHEET 7  
X-37

SITE

421

Permit Drawing  
Sheet 12 of 111

36015  
36015  
255719  
04/20/20

35955  
35955  
37552  
04/20/20

35895  
35895  
35895  
04/20/20

35835  
35835  
35835  
04/20/20

35775  
35775  
35775  
04/20/20

WETLAND

WETLAND

WETLAND

WETLAND

WETLAND

WETLAND

WETLAND

DATE

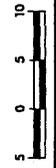
BY

SCALE

PROJECT

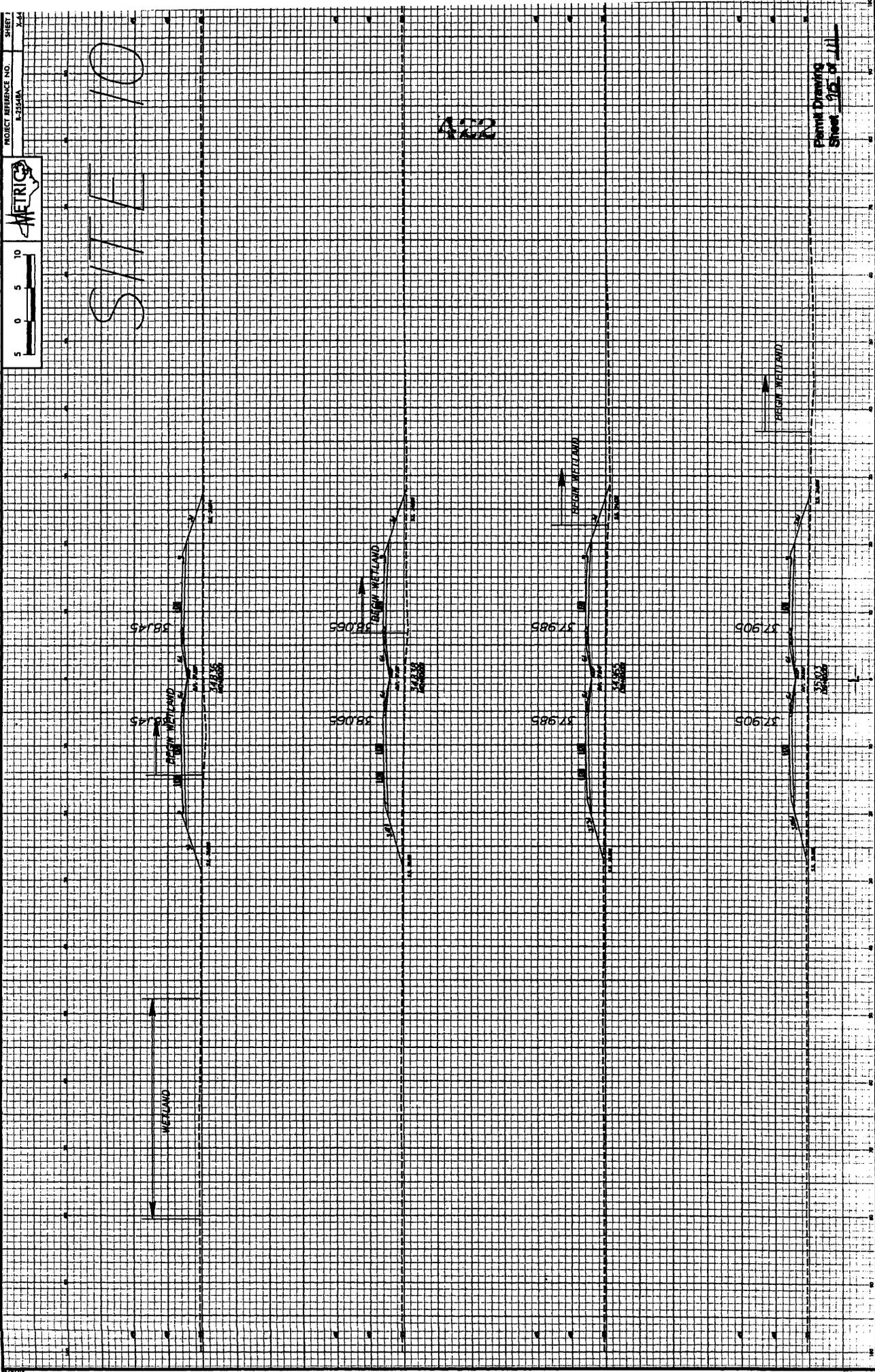
SHEET

TITLE

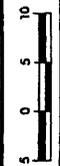


SITE 10

422



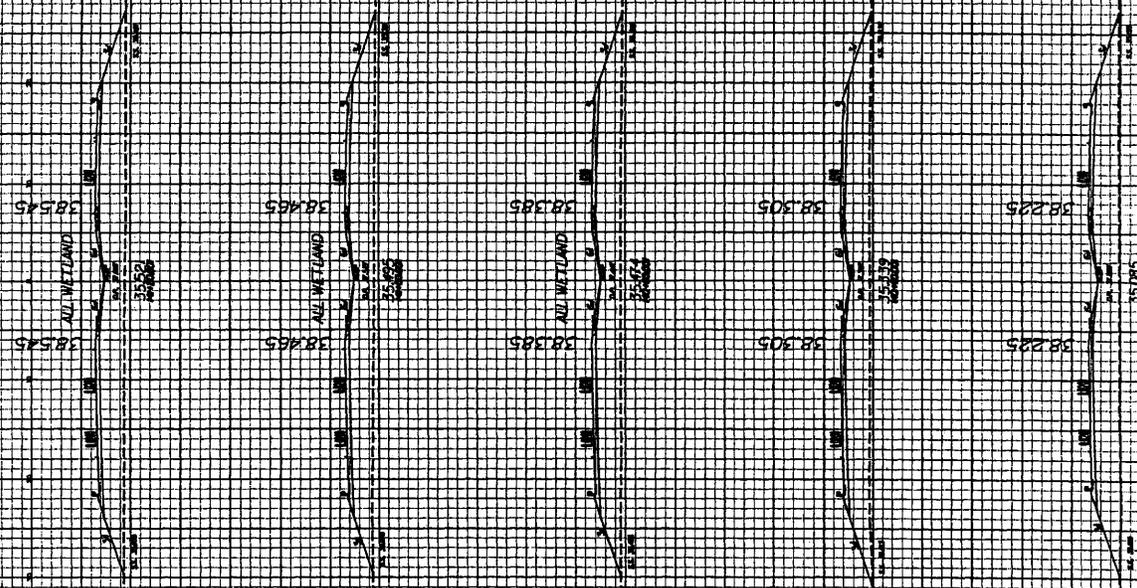
PROJECT REFERENCE NO. 1-15504A



SHEET 24

S/IF 10

423



BEGIN WETLAND

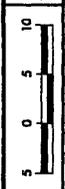
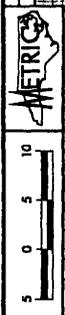
BEGIN WETLAND

Permit Drawing  
Sheet 1 of 1

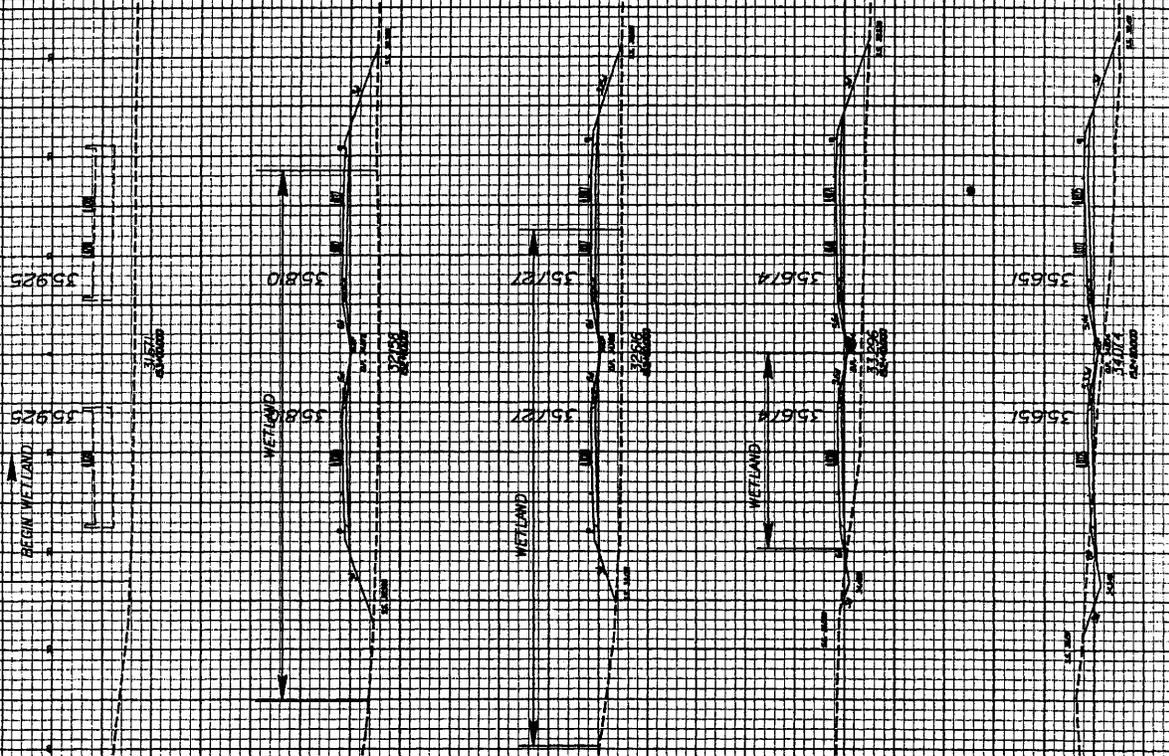


SITE //





# SITE PLAN

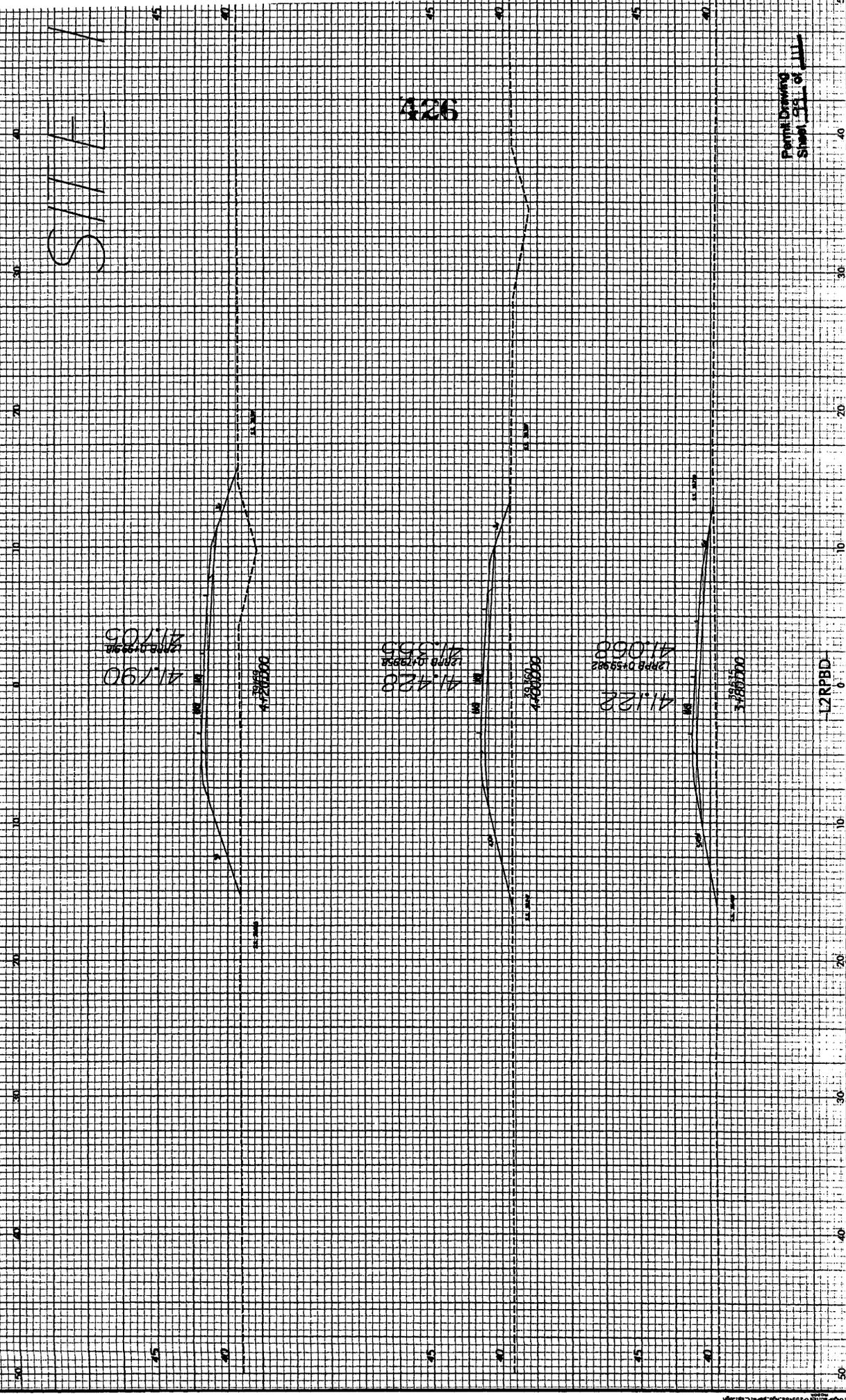


425

PROJECT REFERENCE NO. 2-3556A SHEET 5 OF 5




SITE 1



Permit Drawing  
Sheet 5 of 5

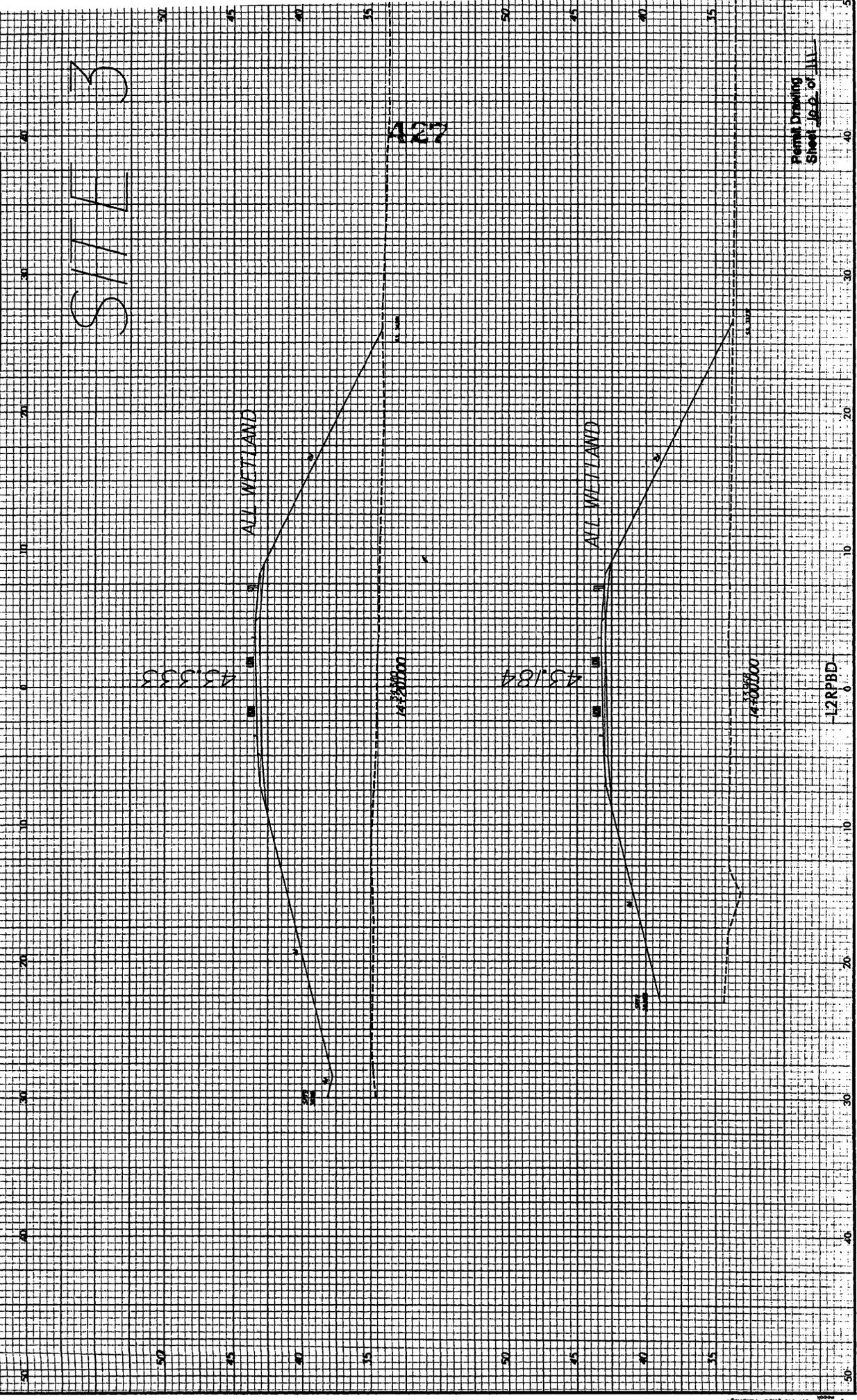
L2RPBD

PROJECT REFERENCE NO.  
E-25434



SHEET  
A-1

STILE 3

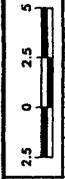


Permit Drawing  
Sheet 10 of 111

L2RPBD

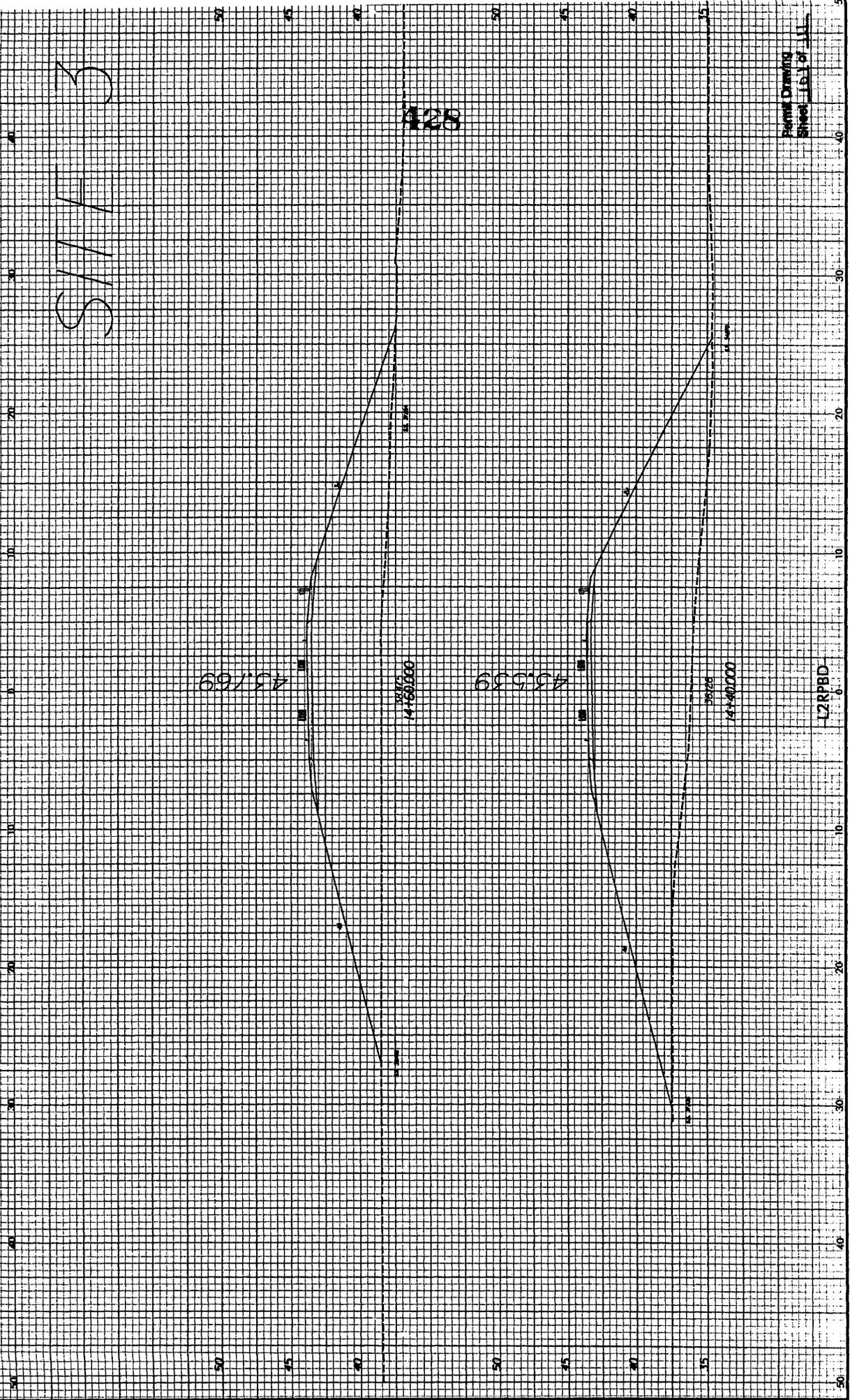
DATE: 10/11/11

PROJECT REFERENCE NO.  
R-235484



SHEET  
1-1

S/W/S



Permit Drawing  
Sheet 1.61 of 1.11

L2RPBD

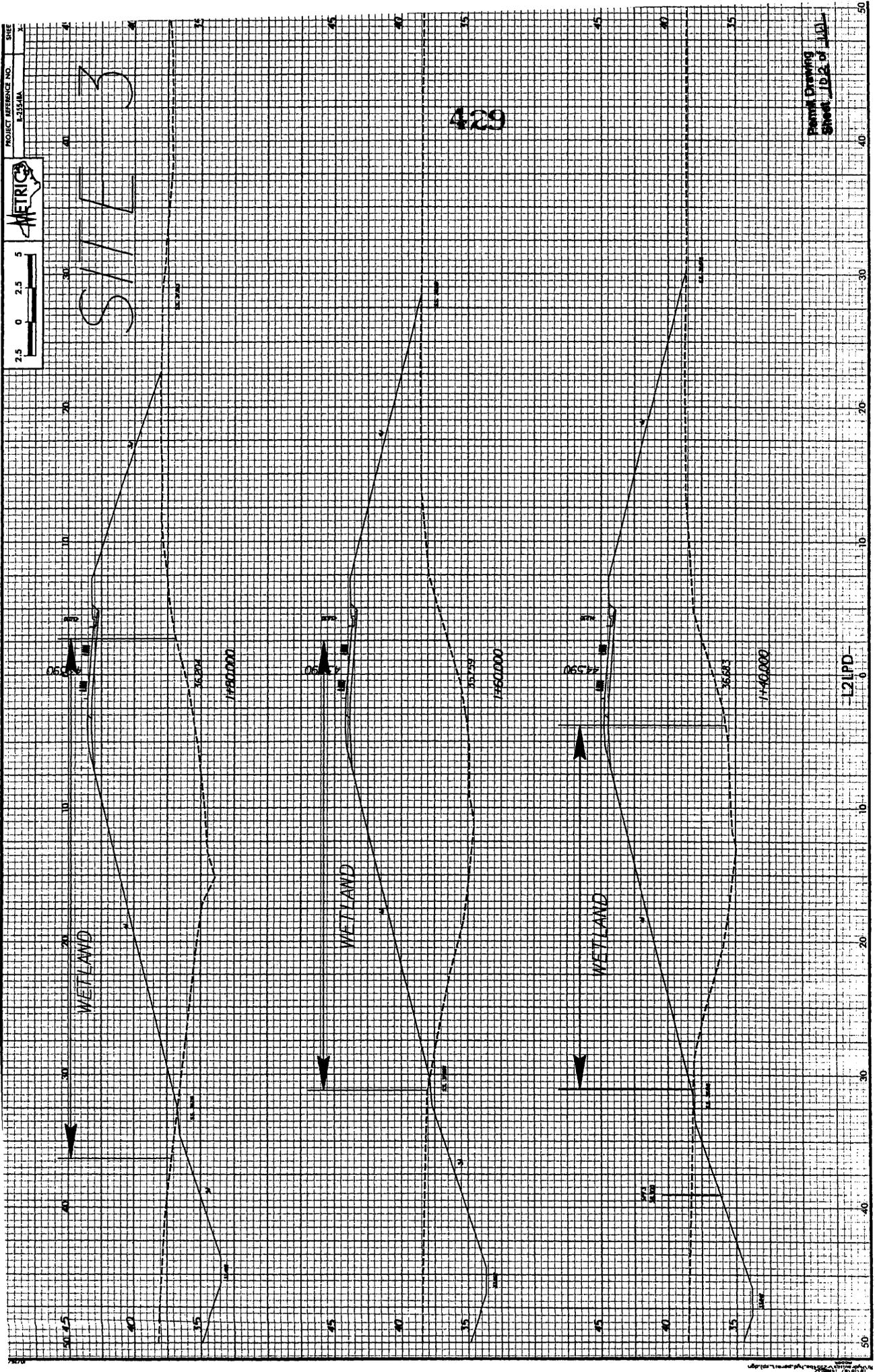
PROJECT REFERENCE NO. E-2541A  
SHEET 3



SITE 3

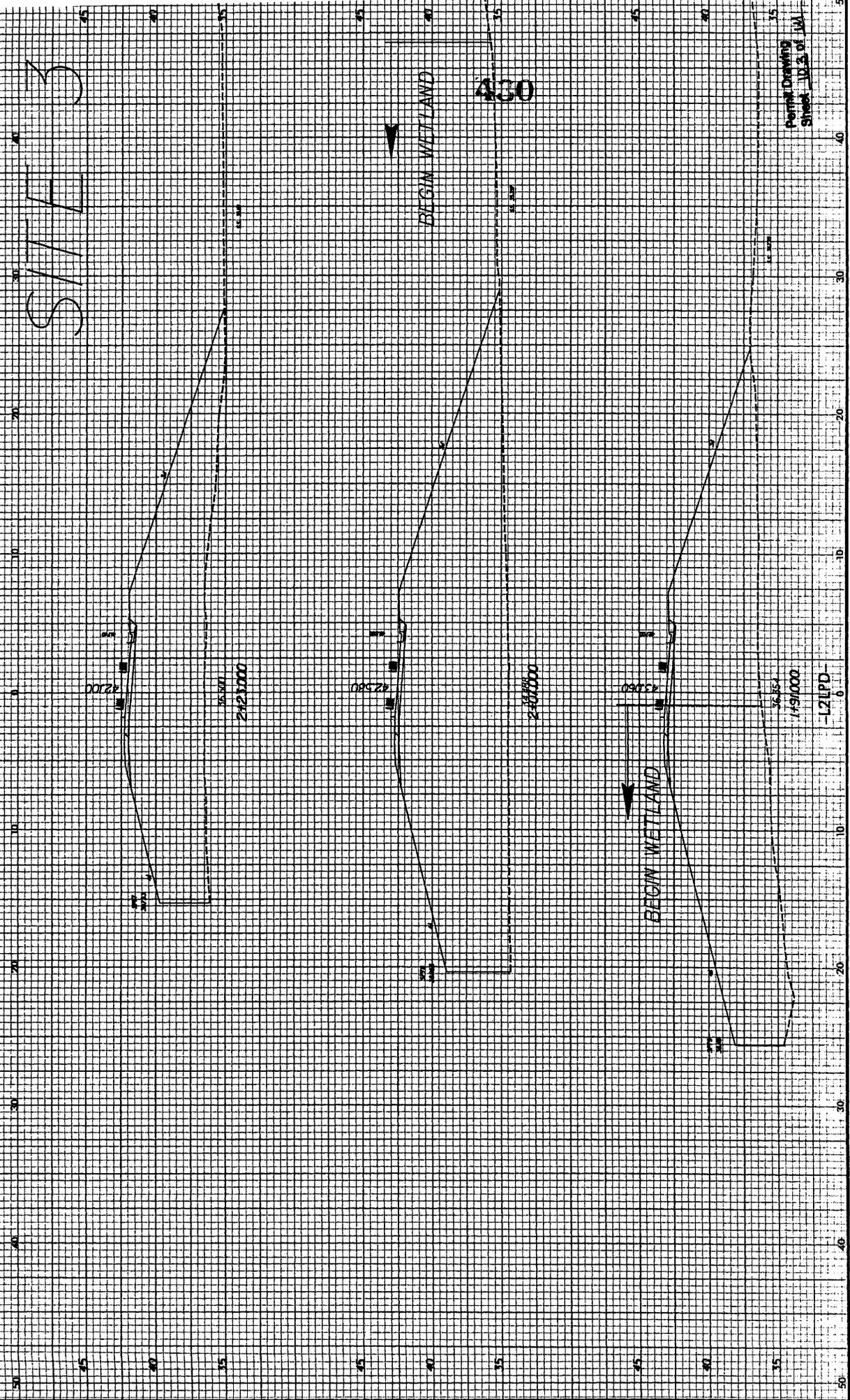
429

Permit Drawing  
Sheet 102 of 100

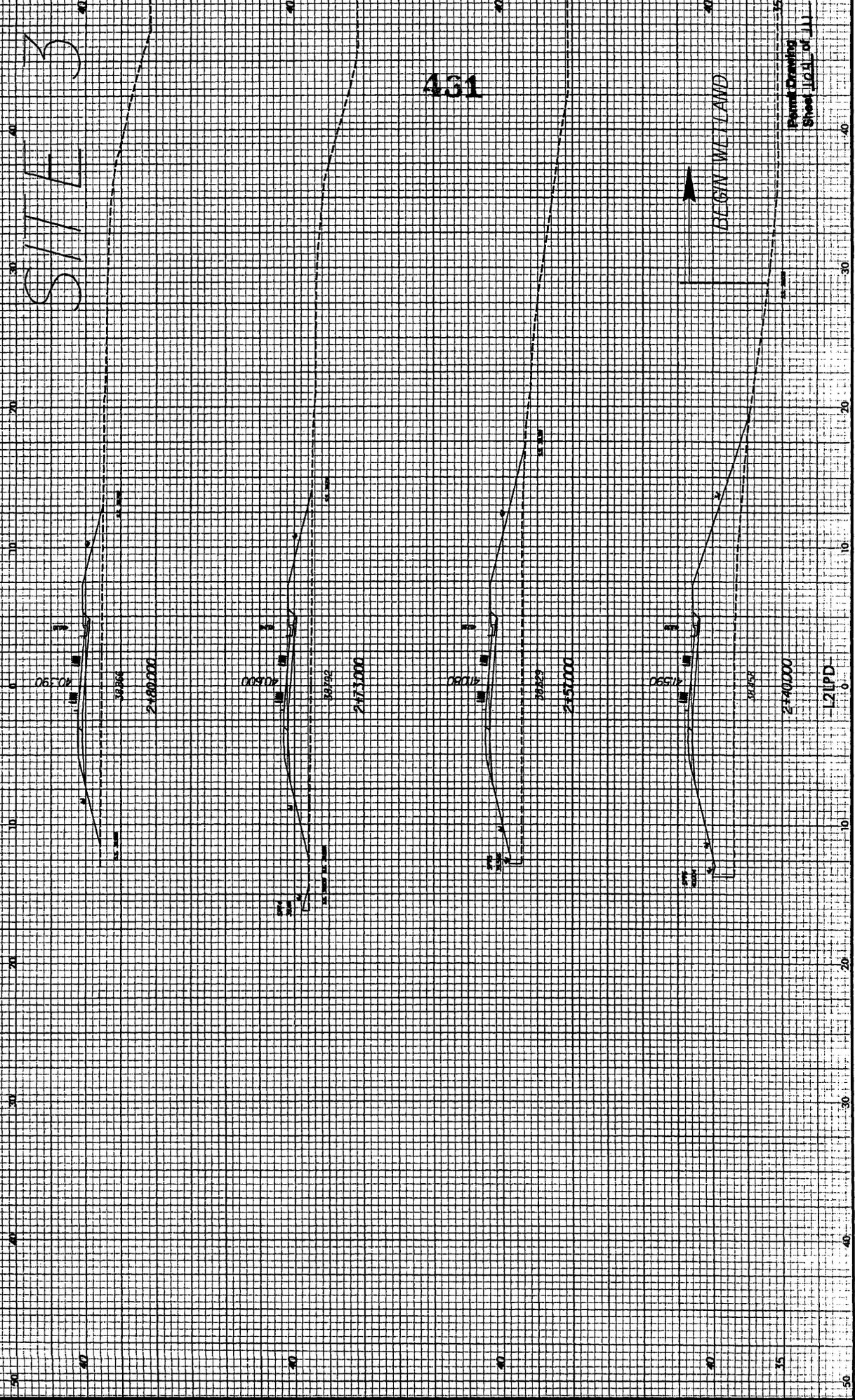


L21PD

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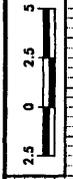


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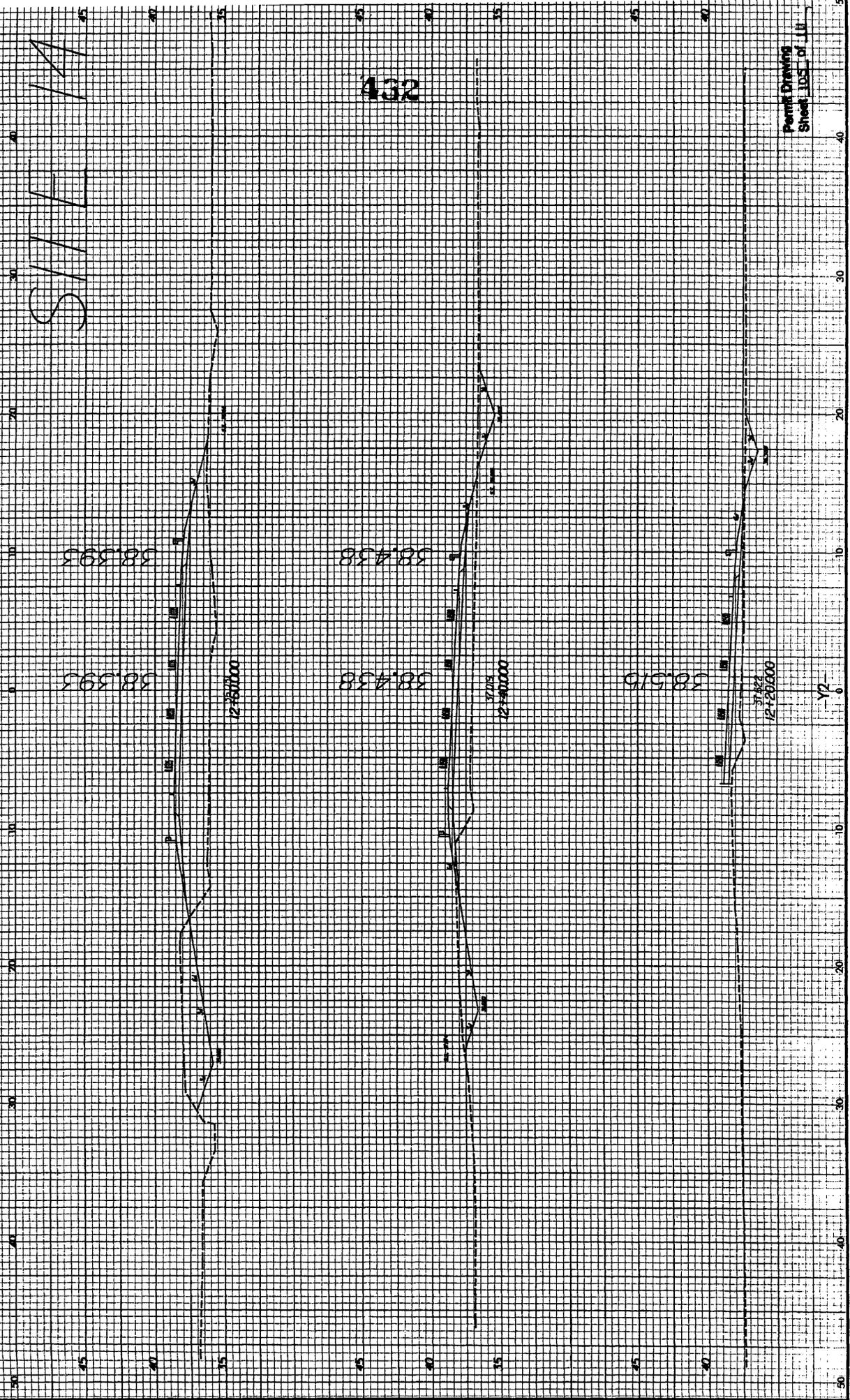
Begin Wetland  
Sheet (CAL OF 11)

L21PD



PROJECT REFERENCE NO. 12-507000  
SHEET 432

SITE PLAN



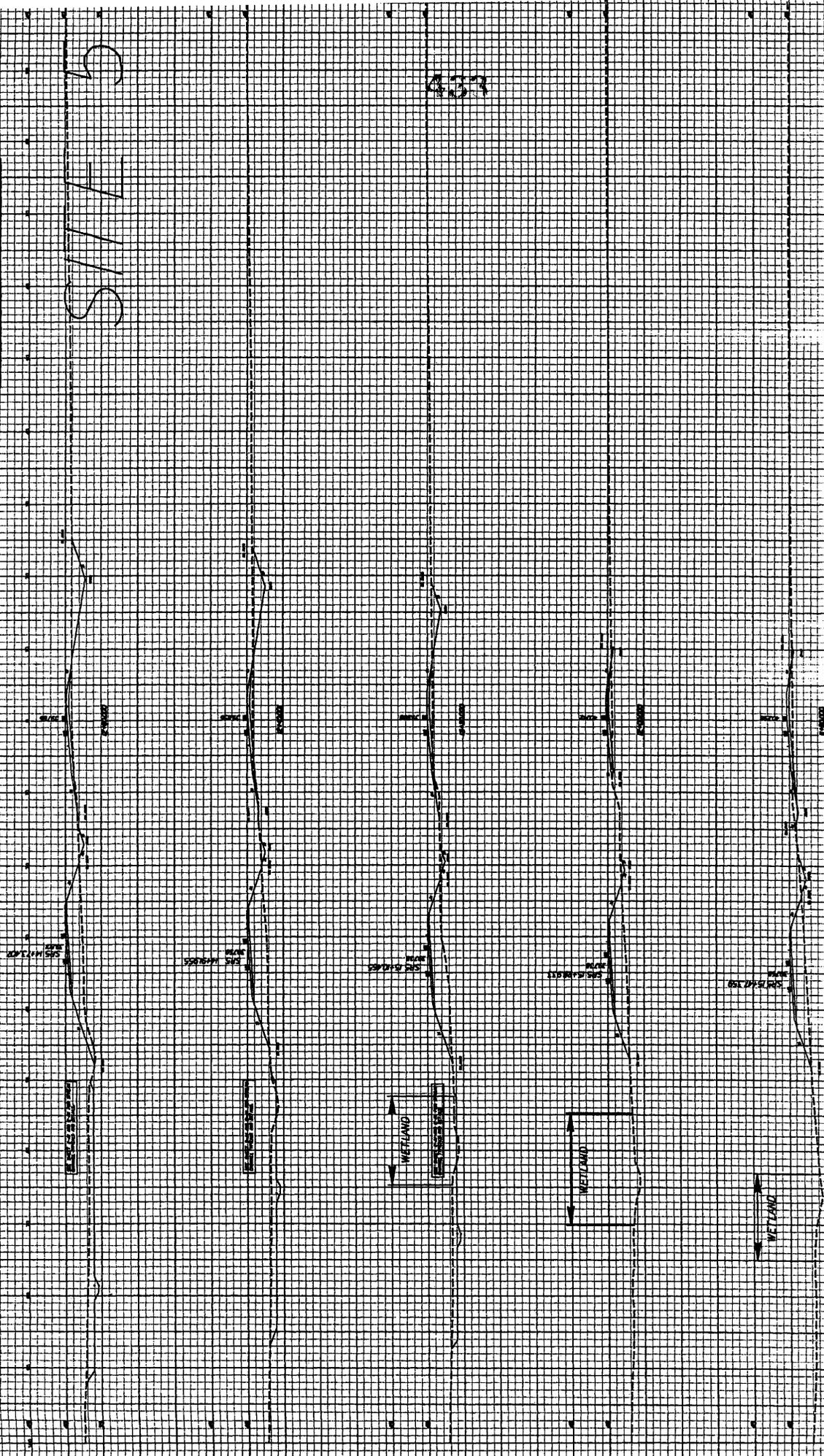
432

Permit Drawing  
Sheet 105 of 11



SITE S

433



YARD

WETLAND

WETLAND

WETLAND

WETLAND

WETLAND

WETLAND

WETLAND

WETLAND

PROJECT REFERENCE NO. R-25241A  
SHEET NO. 1-274



# SITE 5

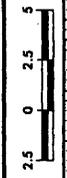
434



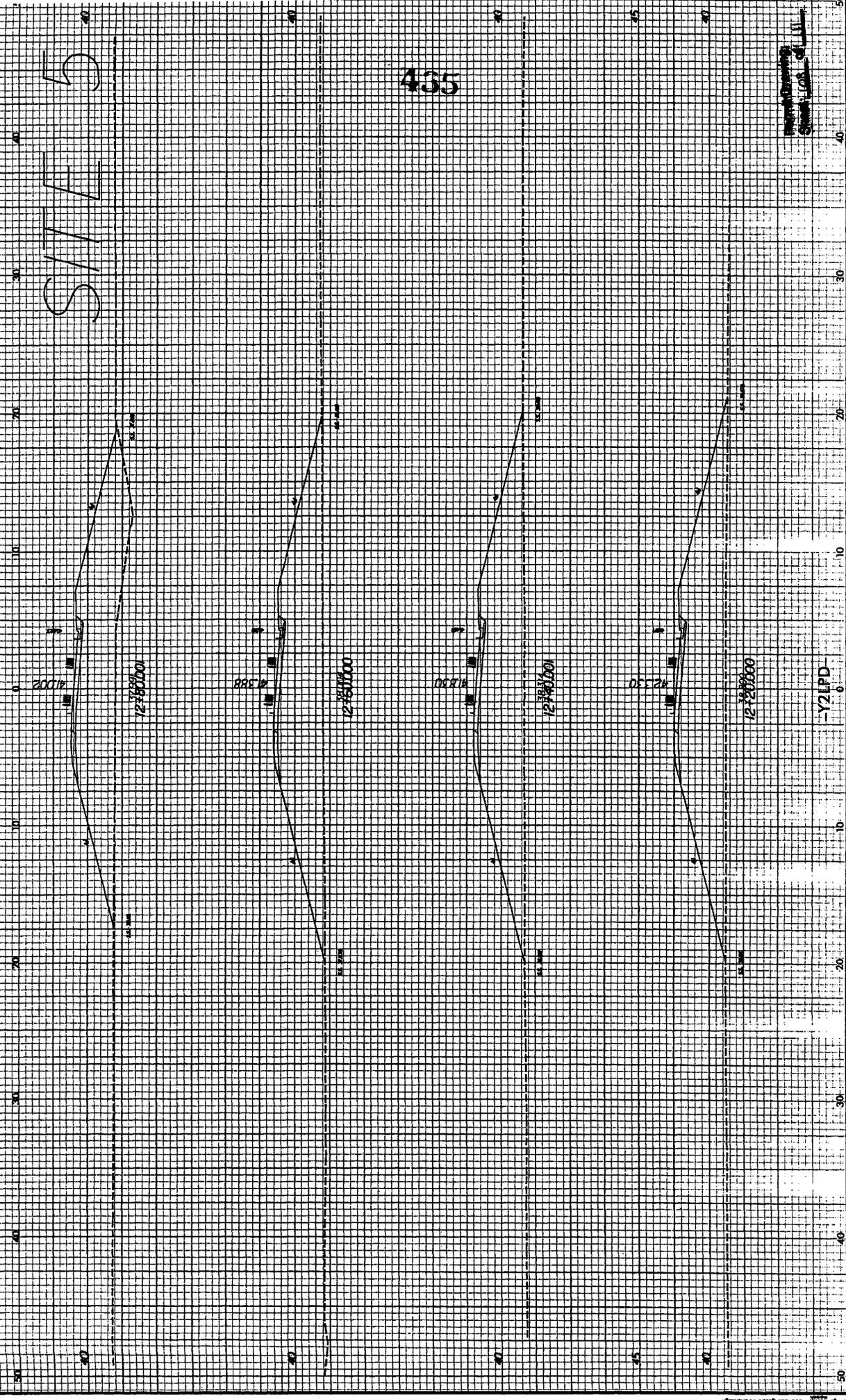
POINT DRAWING  
SCALE 1:100

1/2" = 1' RPD

PROJECT REFERENCE NO.  
E-25548



SHEET NO.  
2-33



SITE 5

435

1238000

11388

1238500

11350

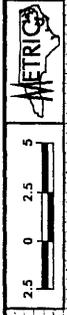
1239000

11250

1239500

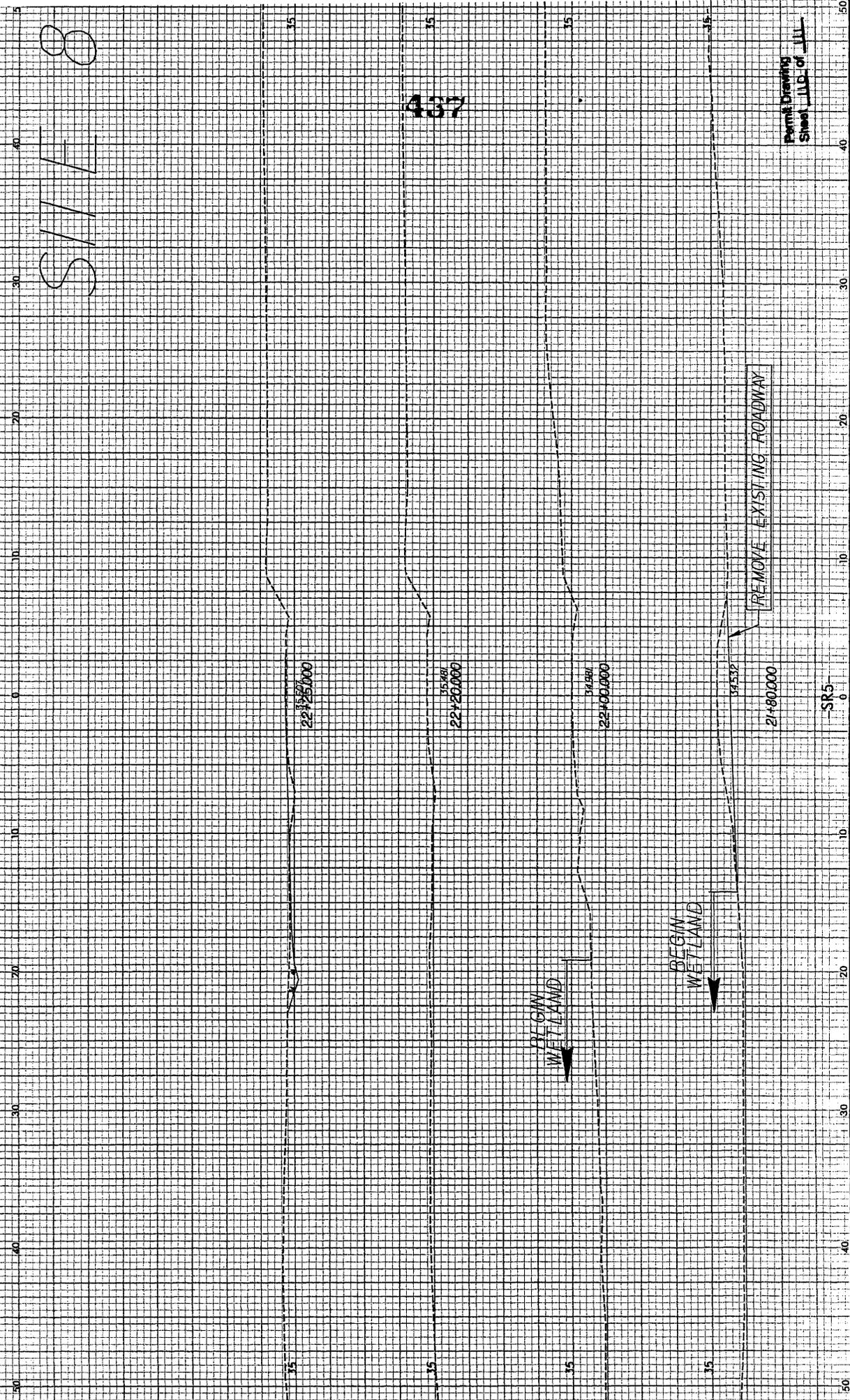
-Y2 LPD





PROJECT REFERENCE NO.  
E-2514A

SHEET NO.  
A-143

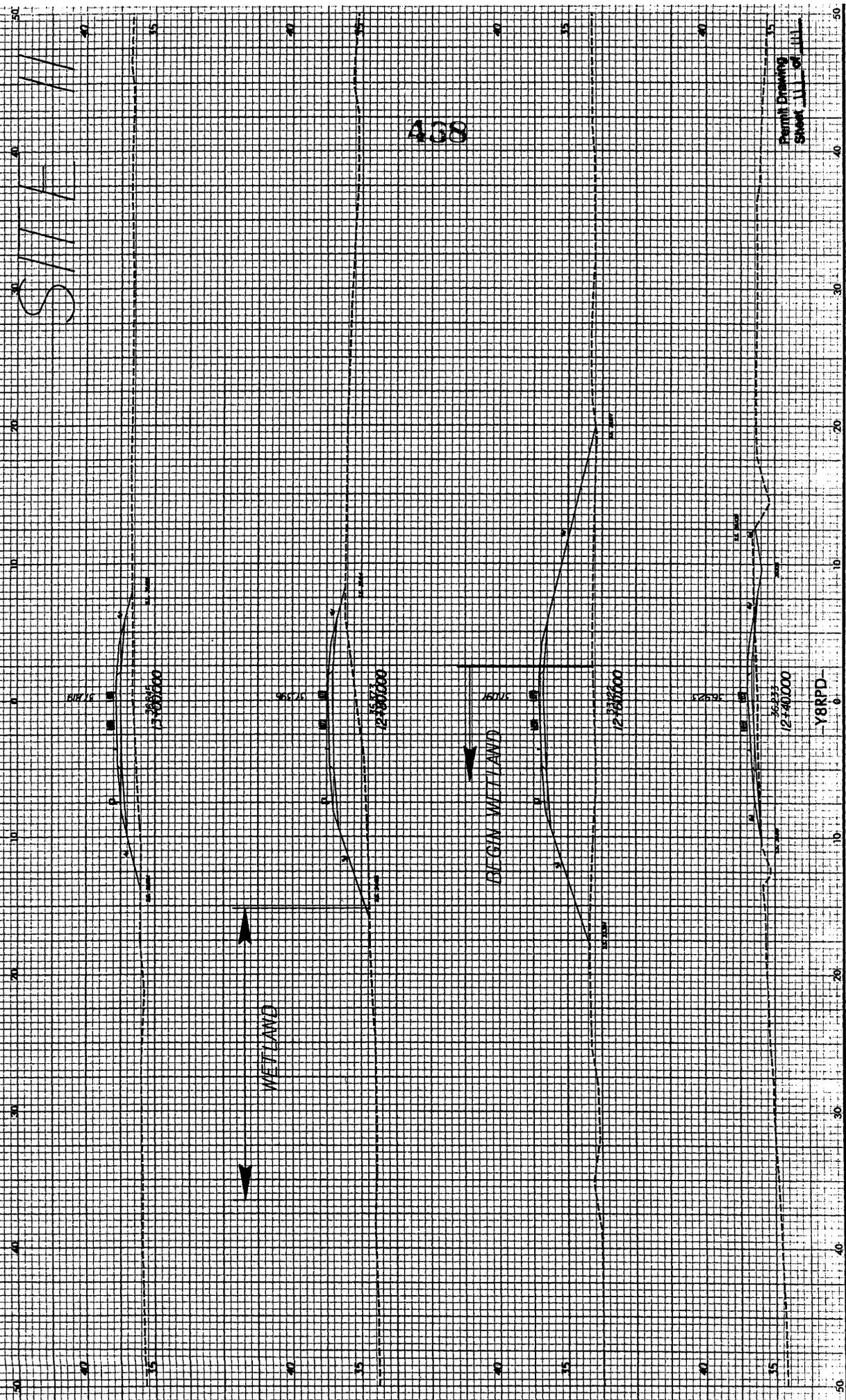


Permit Drawing  
Sheet 11.D of 111

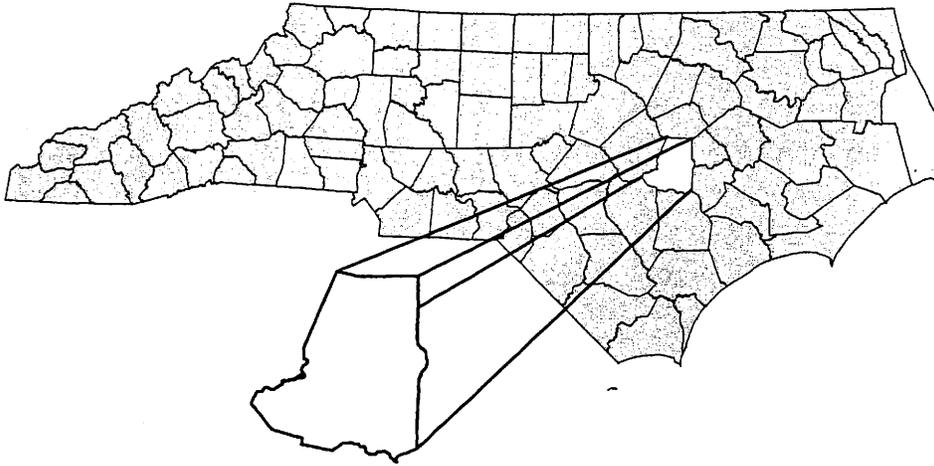
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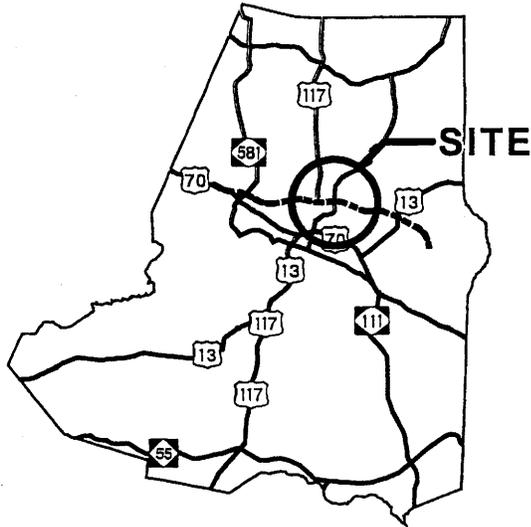
SALE //



# NORTH CAROLINA



# WAYNE

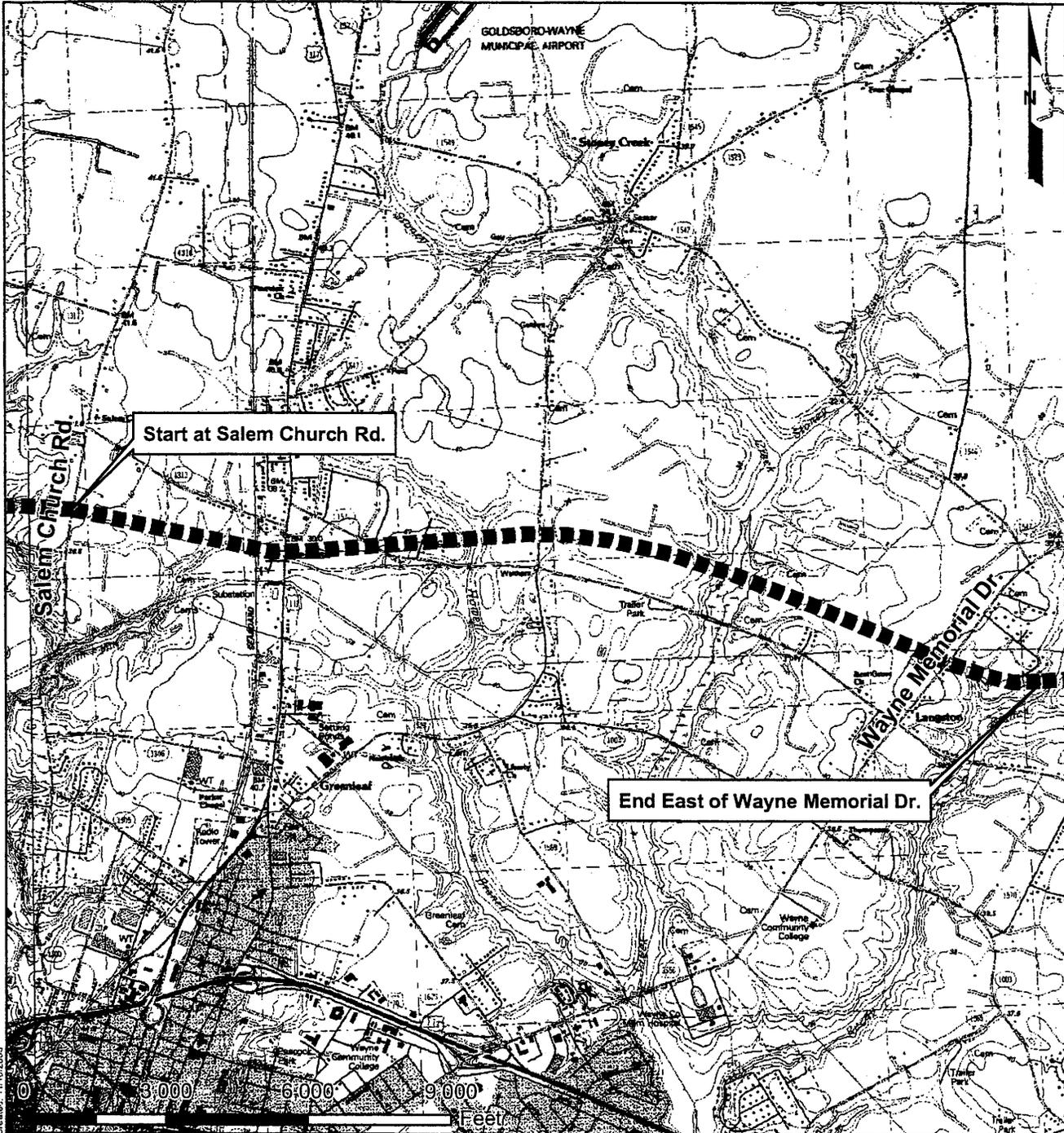


Buffer Drawing  
Sheet 1 of 44

# VICINITY MAPS

**NCDOT**  
DIVISION OF HIGHWAYS  
WAYNE COUNTY  
PROJECT: 34461.1.3 (R-2554BA)  
US 70 BYPASS

10/17/07



Start at Salem Church Rd.

End East of Wayne Memorial Dr.

1 inch equals 3,000 feet

# LOCATION

## NCDOT

DIVISION OF HIGHWAYS  
 WAYNE COUNTY  
 PROJECT: 34461.1.3 (R-2554BA)  
 US 70 BYPASS

Buffer Drawing  
 Sheet 2 of 414

10/17/07

3:\dva-2\TBRIDGE\MapaR-2510R-auforR-2510 USGS.mxd Created: 11/10/2005

**BUFFER IMPACTS SUMMARY**

SITE NO.	STRUCTURE SIZE / TYPE	STATION (FROM/TO)	IMPACT						MITIGABLE			BUFFER REPLACEMENT	
			TYPE		ALLOWABLE		TOTAL	ZONE 1 (ft <sup>2</sup> )	ZONE 2 (ft <sup>2</sup> )	TOTAL (ft <sup>2</sup> )	ZONE 1 (ft <sup>2</sup> )	ZONE 2 (ft <sup>2</sup> )	
			ROAD CROSSING	BRIDGE	PARALLEL IMPACT	ZONE 1 (ft <sup>2</sup> )							ZONE 2 (ft <sup>2</sup> )
1	Roadway	-L2RPBD- 4+25 +/-	X				9909	5820	15729				
2	Roadway	-L2- 92+00 +/-	X			2671	1639	4310					
3	Roadway	-L- 94+40 +/-	X						60642	37274	97916		
4	Roadway	-L- 98+60 +/-	X						68271	42177	110448	59609	35530
5	Roadway	-L- 102+64 - 109+19 +/-	X						131027	89077	220104	34199	21760
7	Roadway	-L- 114+20 +/-	X			598	401	1000					
	Bridge	-L- 114+80 +/-		X					8798	6748	15546		
8	Roadway	-SR5- 21+60 +/-	X			1929	555	2484				4459	3333
9	Bridge	-L- 132+00 +/-		X		8763	5887	14650					
11	Roadway	-L- 148+60 +/-	X						51025	32871	83896		
13	Roadway	-L2- 101+40 +/-			X				5490	4512	10002		
14	Roadway	-Y2- 12+60 +/-	X			7383	4875	12258					
<b>TOTAL:</b>						21344	13358	34701	335162	218479	553642	98268	60622

N.C. DEPT. OF TRANSPORTATION  
DIVISION OF HIGHWAYS

WAYNE COUNTY  
PROJECT: 34461.1:3 (R-2554BA)

December-07

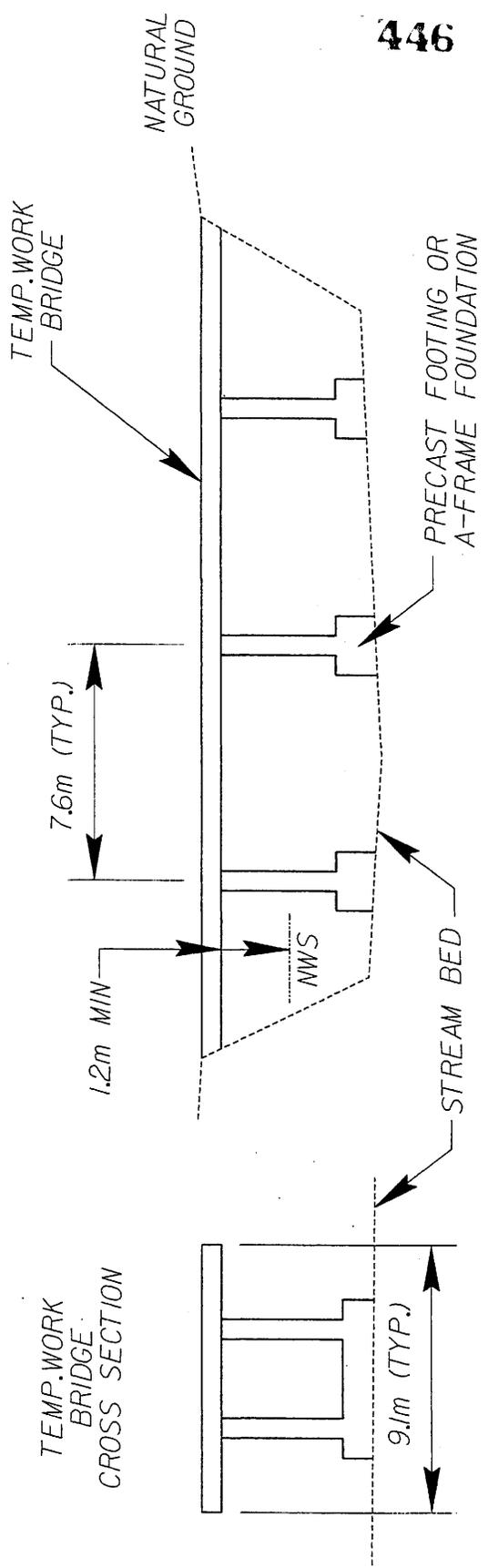
**Buffer Drawing**  
**Sheet 3 of 4**







PROP. NO.	PROPERTY OWNER NAME	PROP. OWNER ADDRESS
1A 1	NCDOT (PREVIOUSLY LANE FARMS, INC.) DAN R. CASEY	DB 350 PG. 13 DB 335 PG 397 DB 350 PG. 54 DB 1541 PG 198 DB 02E PG 506 DB 1486 PG 432 DB 439 PG 320 DB 1037 PG 181 DB 1193 PG 737 UNKNOWN E 03E PG 667 DB 1171 PG 405 ESTATE FILE 02E-245 WB 1930 PG 169
2	NORFAM, LLC	DB 1621 PG 708
7	SARAH SCOTT KIRBY & SALLY WADE SCOTT	DB 582 PG 536
9	EMILY W. PRIVOTT	DB 1534 PG 253
14	HELEN R. GODWIN	DB 648 PG 416
16	ANDREWS FARMS OF WAYNE CO. INC	DB 937 PG 807
17	WILLIAM WHITE	DB 1044 PG 849
20	JOHN M. MERRITT	DB 728 PG 105
26	JAMES W. HUBBLE	DB 1472 PG 411
26A	CAROLYN B. MORRIS, W. THOMAS BARDIN	
27	PATRICIA GABRIEL	
28	CAREY R. HAM	
31	HUBERT C. MATHEWS	
32	SHERMAN E. BEST	
43	MALCOLM E. GURLEY	
43A	JETHO H. HARE	
901	NCDOT	
N.C. DEPT. OF TRANSPORTATION DIVISION OF HIGHWAYS		WAYNE COUNTY PROJECT: 34461.1.3 (R-2554BA) 10/17/2007



446

Buffer Drawing  
Sheet 8 of 44

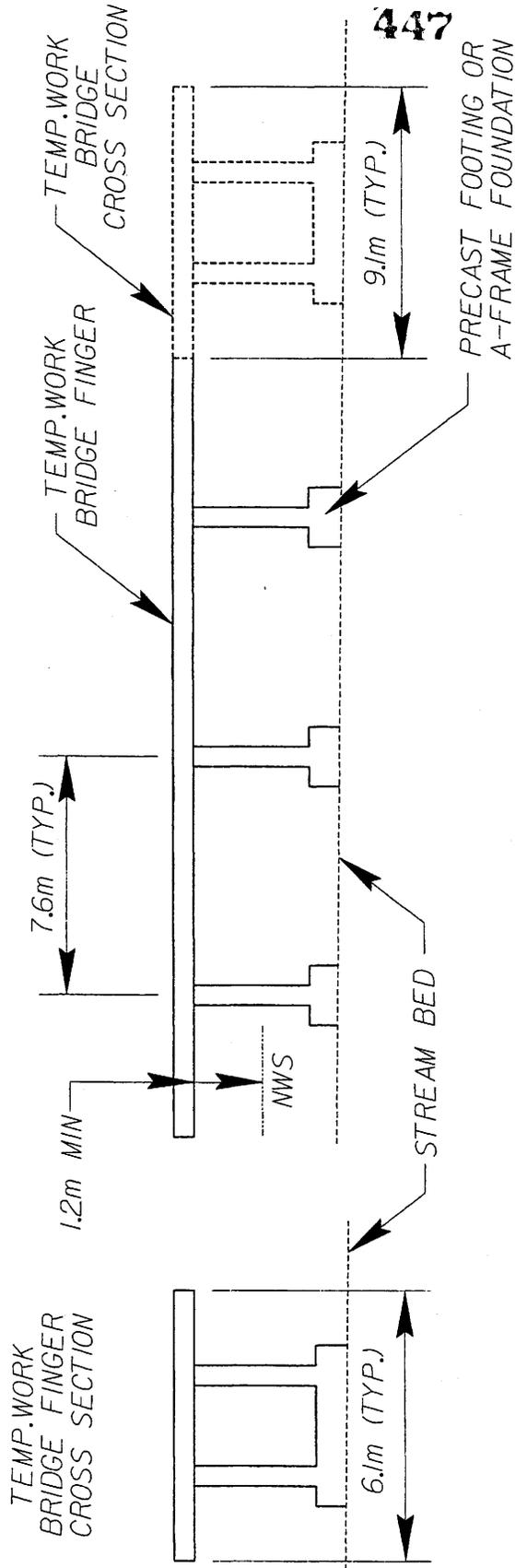
N.C. DEPT. OF TRANSPORTATION  
DIVISION OF HIGHWAYS  
WAYNE COUNTY  
PROJECT 34461.1.3 (R-2554BA)

10/17/07

WORK BRIDGE LAYOUT IS ESTIMATED.  
ACTUAL LAYOUT MAY VARY  
ACCORDING TO CONTRACTOR.

NOT TO SCALE

**TEMPORARY WORK BRIDGE  
DETAIL**  
(FOR PROP. BRIDGE CONSTRUCTION)



WORK BRIDGE FINGER LAYOUT IS ESTIMATED. ACTUAL LAYOUT MAY VARY ACCORDING TO CONTRACTOR.

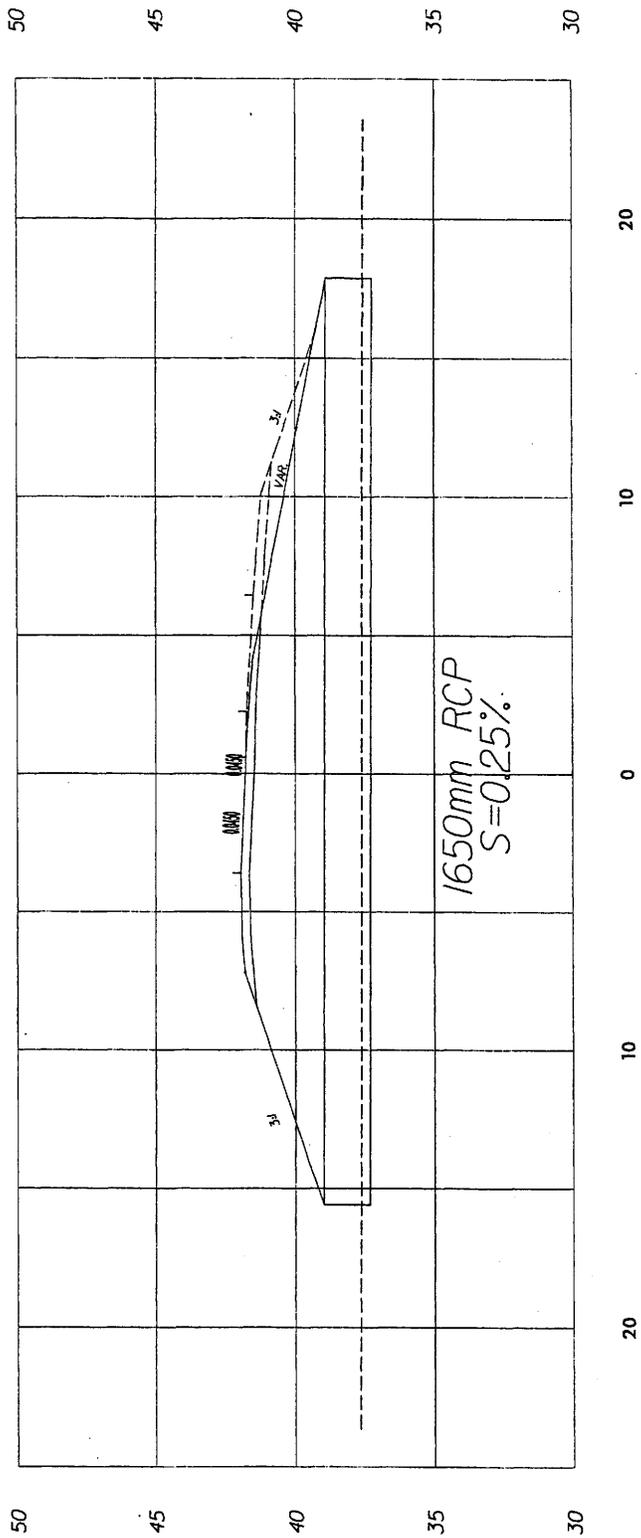
NOT TO SCALE

**TEMPORARY WORK BRIDGE  
FINGER DETAIL  
(FOR PROP. BRIDGE CONSTRUCTION)**

Buffer Drawing  
Sheet 9 of 99

N.C. DEPT. OF TRANSPORTATION  
DIVISION OF HIGHWAYS  
WAYNE COUNTY  
PROJECT 34461.13 (R-2554BA)

10/17/07



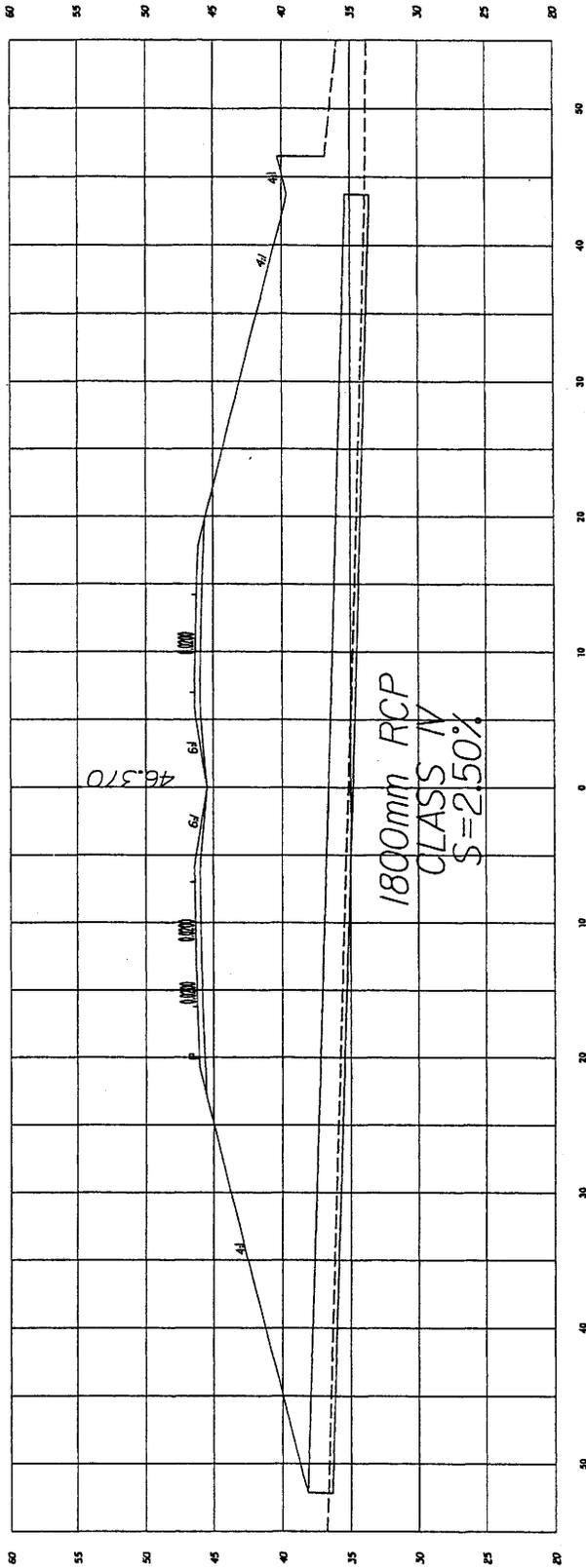
448

Buffer Drawing  
Sheet 10 of 41

N.C. DEPT. OF TRANSPORTATION  
DIVISION OF HIGHWAYS  
WAYNE COUNTY  
PROJECT 34461.1.3 (R-2554BA)  
US 70 BYPASS 10/17/07

SITE 1  
-L2RPBD- STA. 4 + 24





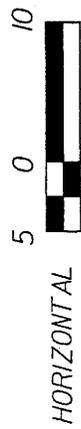
Buffer Drawing  
Sheet 11 of 44

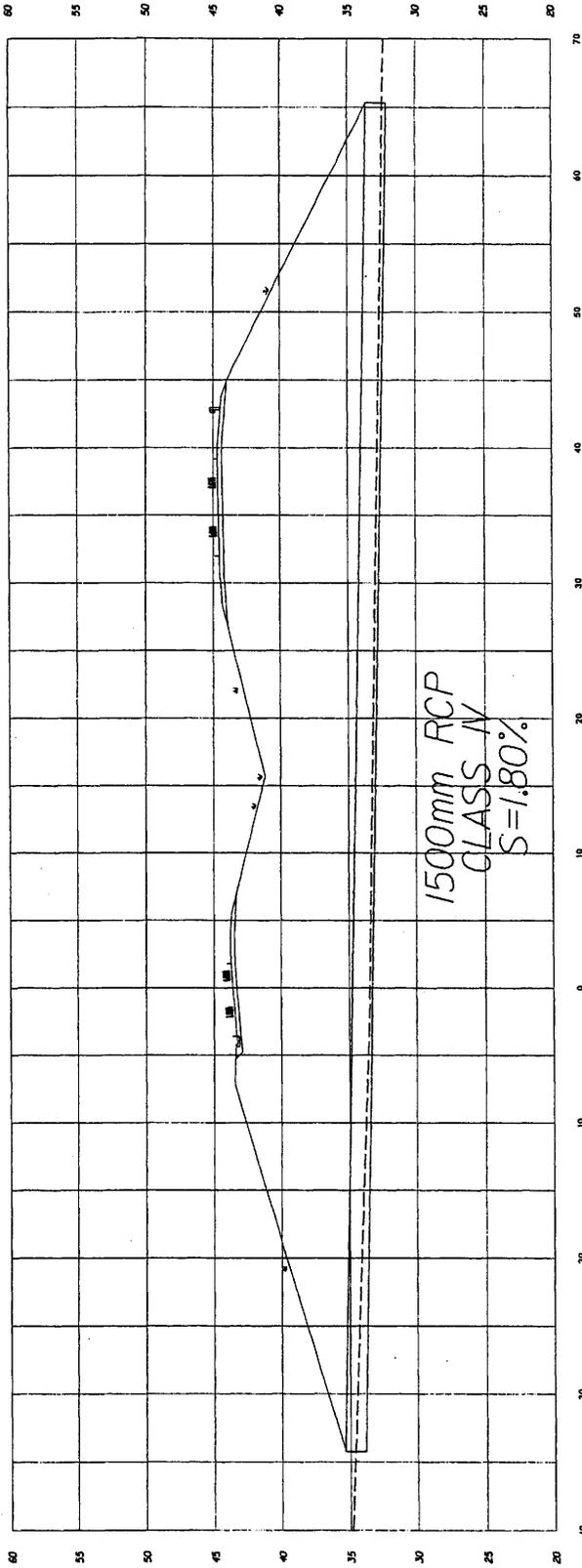
N.C. DEPT. OF TRANSPORTATION  
DIVISION OF HIGHWAYS  
WAYNE COUNTY

PROJECT 3446113 (R-2554BA)

US 70 BYPASS 10/17/07

SITE 3  
-L- STA. 94+73





450

Buffer Drawing  
Sheet 12 of 44

N.C. DEPT. OF TRANSPORTATION  
DIVISION OF HIGHWAYS  
WAYNE COUNTY  
PROJECT 34461.13 (R-2554BA)

US 70 BYPASS 10/17/07

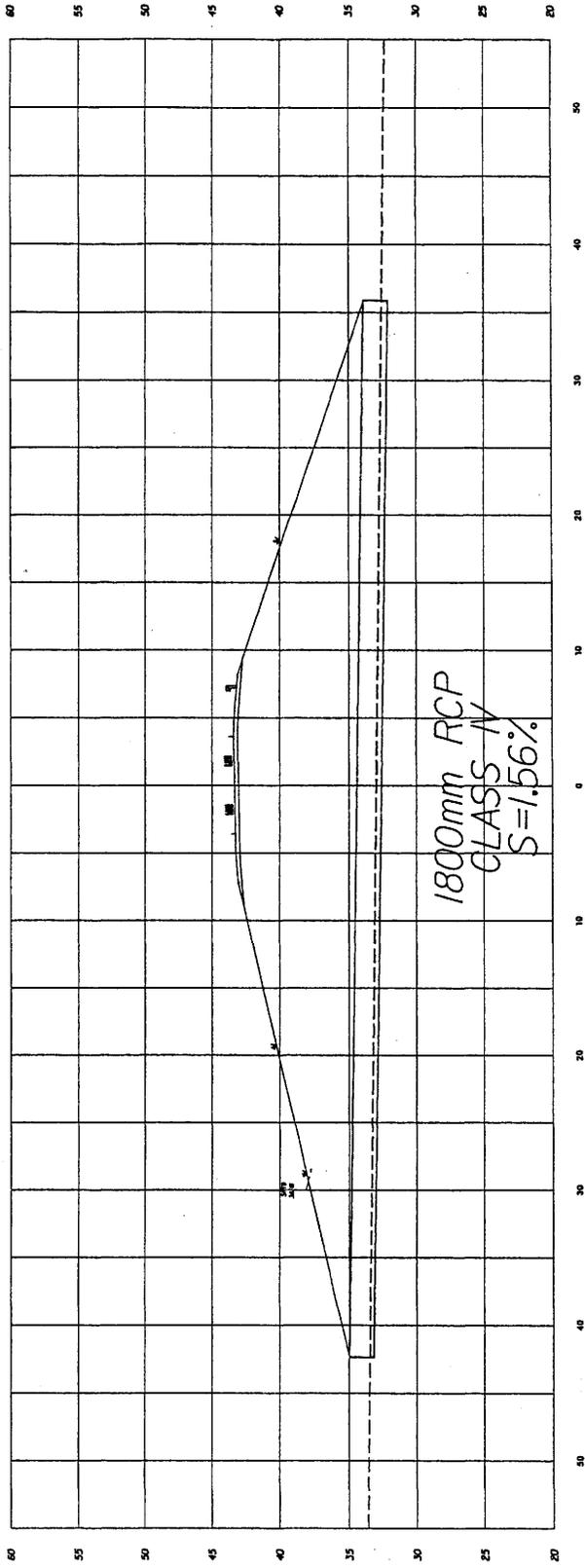
SITE 3  
-L2LPD- STA. 2 + 20



HORIZONTAL



VERTICAL



451

Buffer Drawing  
Sheet 23 of 44

N.C. DEPT. OF TRANSPORTATION  
DIVISION OF HIGHWAYS  
WAYNE COUNTY

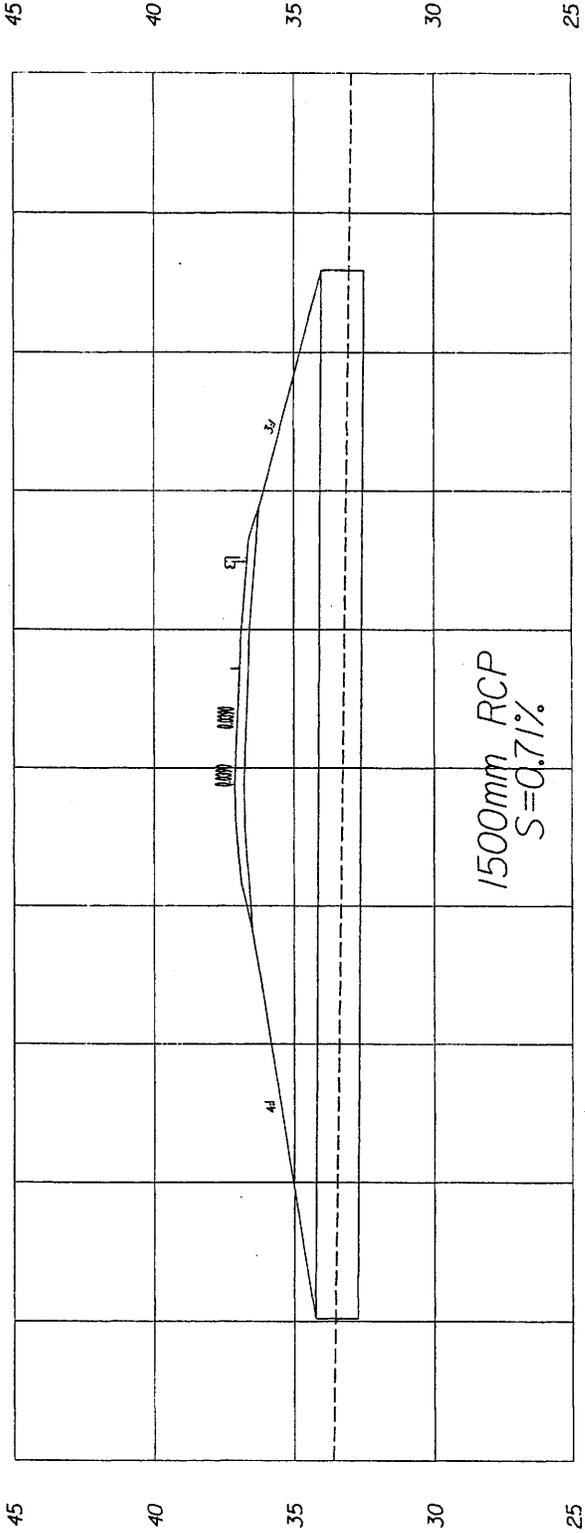
PROJECT 34461.1.3 (R-2554BA)

US 70 BYPASS

10/17/07

SITE 3  
-L2RPBD- STA. 14 + 23





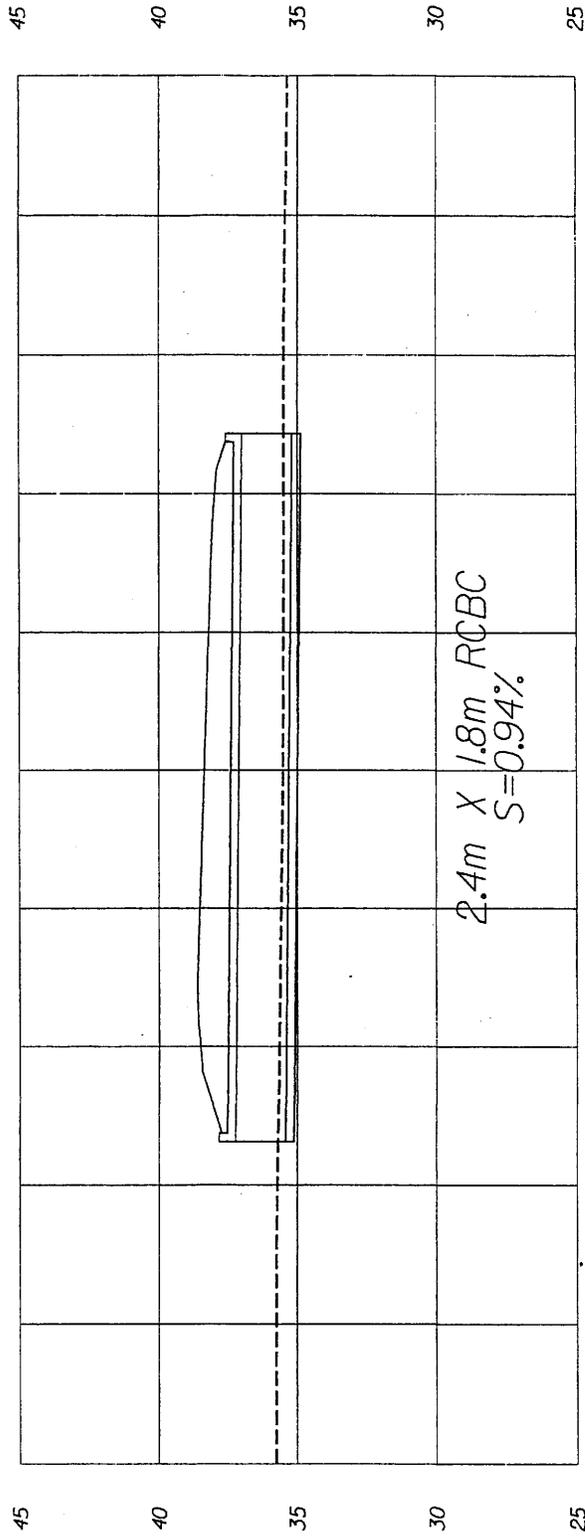
Buffer Drawing  
 Sheet 14 of 44



N.C. DEPT. OF TRANSPORTATION  
 DIVISION OF HIGHWAYS  
 WAYNE COUNTY  
 PROJECT 344611.3 (R-2554BA)

SITE 11  
 -Y8RRPD- STA. 12+51

US 70 BYPASS 10/17/07



Buffer Drawing  
Sheet 15 of 16

N.C. DEPT. OF TRANSPORTATION  
DIVISION OF HIGHWAYS  
WAYNE COUNTY

PROJECT 34461.1.3 (R-255/BA)

US 70 BYPASS

10/17/07

SITE 14  
-Y2- STA. 12+60

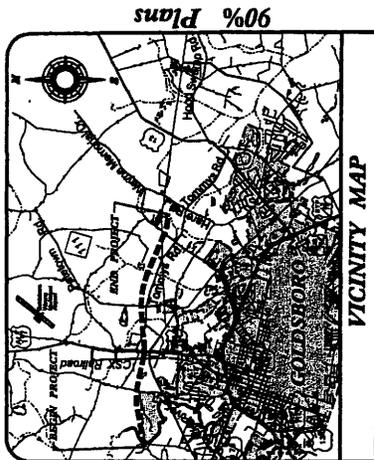


HORIZONTAL



VERTICAL

See Sheet 1-A For Index of Sheets  
See Sheet 1-B For Conventional Symbols



STATE OF NORTH CAROLINA  
DIVISION OF HIGHWAYS  
**WAYNE COUNTY**

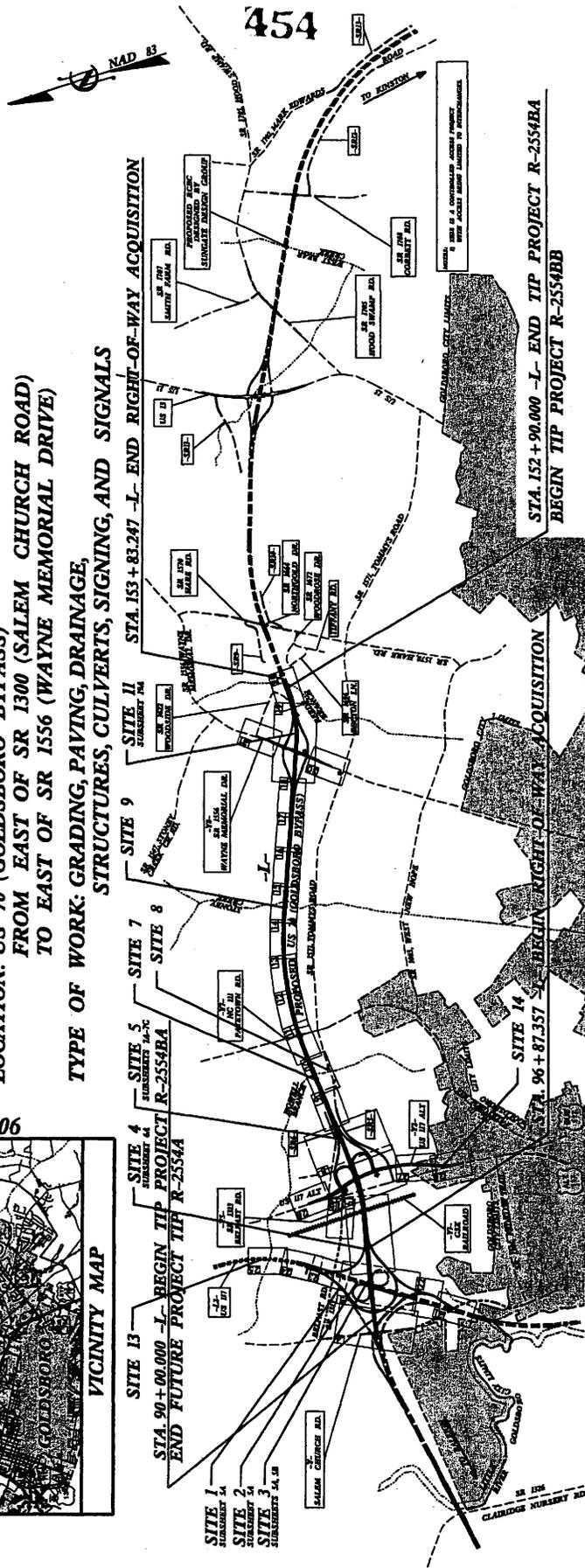
LOCATION: US 70 (GOLDSBORO BYPASS)  
FROM EAST OF SR 1300 (SALEM CHURCH ROAD)  
TO EAST OF SR 1556 (WAYNE MEMORIAL DRIVE)

TYPE OF WORK: GRADING, PAVING, DRAINAGE,  
STRUCTURES, CULVERTS, SIGNING, AND SIGNALS

N.C. R-2554BA	
34461.1.3	NHF-70(80)
34461.2.7	RW & UTIL
34461.3.GVI	NHS-70(16)
CONST.	



ALL DIMENSIONS IN THESE PLANS ARE IN METERS UNLESS OTHERWISE SHOWN



DIVISION OF HIGHWAYS STATE OF NORTH CAROLINA	
Buffer Drawing Sheet 6 of 41	
STATE PROJECT NUMBER	P.E.
APPROVED BY TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION	
APPROVED	DATE

HYDRAULICS ENGINEER	P.E.
ROADWAY DESIGN	P.E.
STRUCTURE	P.E.

PLANS PREPARED BY:  
MUMFORD & BROWN, INC.  
350 PROGRESSIVE DRIVE, SUITE 300  
RALEIGH, NORTH CAROLINA 27603  
919-876-2550

DIVISION OF HIGHWAYS  
B. KEITH SKINNER, P.E.  
PROJECT ENGINEER  
MICHAEL T. MERRITT, P.E.  
PROJECT DESIGN ENGINEER  
Scott Higgins, P.E.  
Engineering Coordinator - Roadway Design

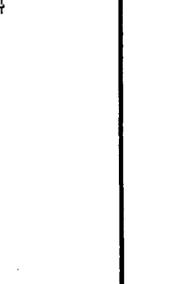
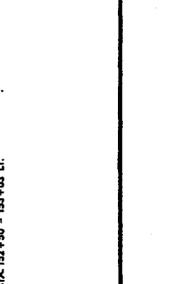
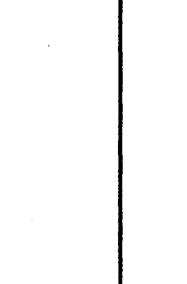
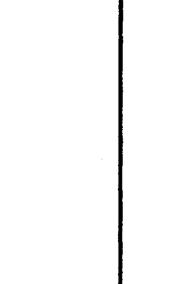
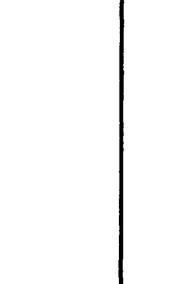
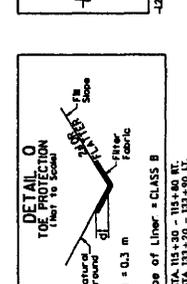
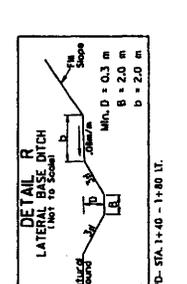
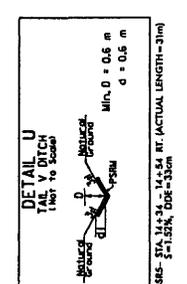
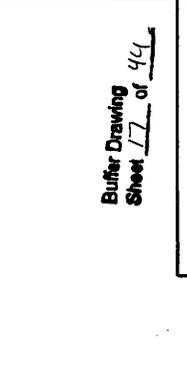
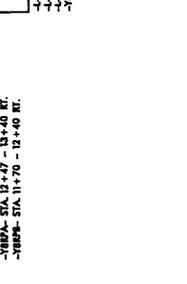
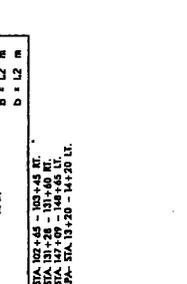
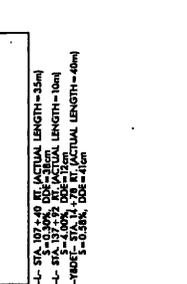
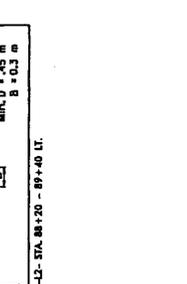
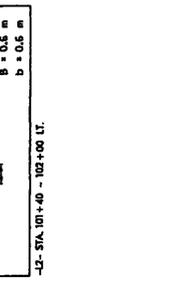
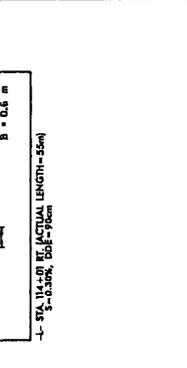
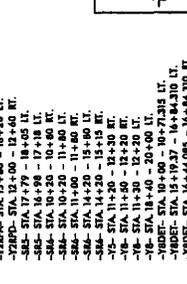
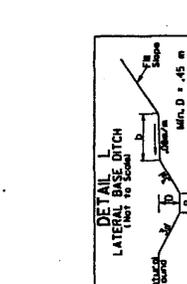
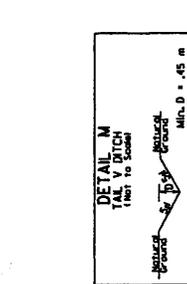
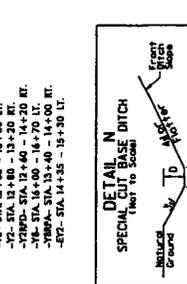
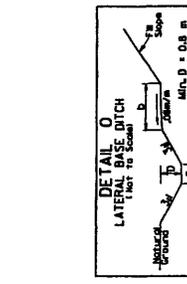
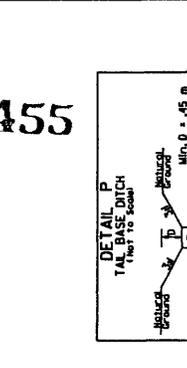
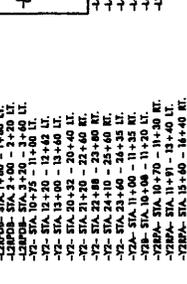
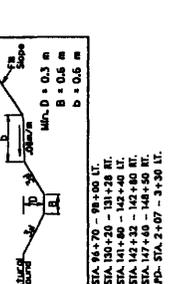
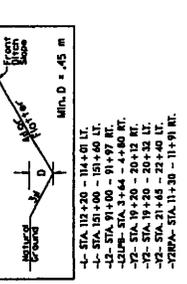
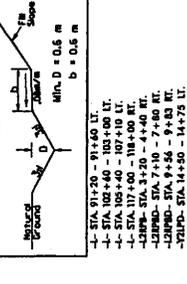
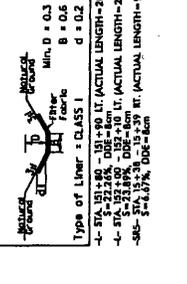
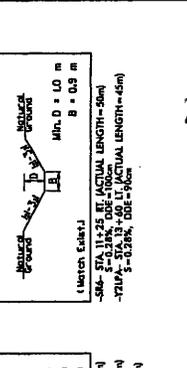
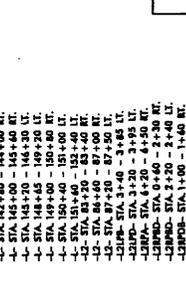
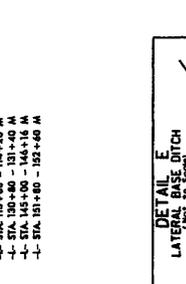
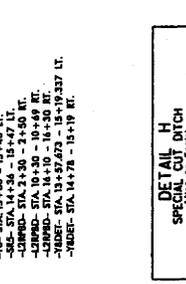
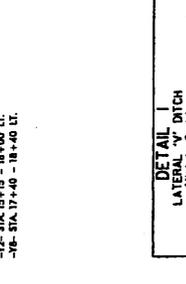
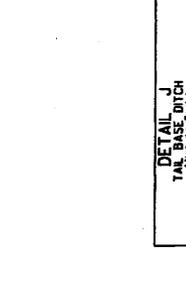
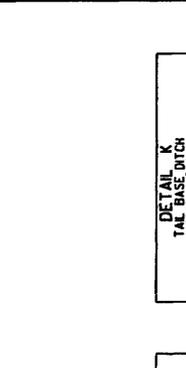
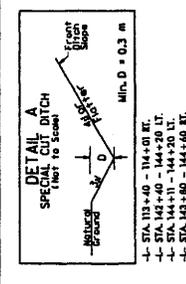
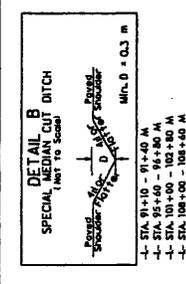
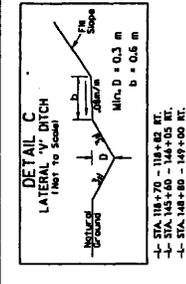
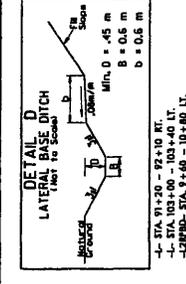
NEDOT CONTACT: Engineering

DESIGN DATA	PROJECT LENGTH
ADT 2008 = 20,728	Length Roadway TIP Project R-245BA ..... 5.802 km
ADT 2028 = 29,048	*Length Structure TIP Project R-245BA ..... 0.489 km
DHV = 10 %	TOTAL LENGTH TIP Project R-245BA ..... 6.290 km
D = 55 %	(3.91 MILES)
T = 10 %	*USED EBL -L- STATIONS FOR STRUCTURE LENGTHS
V = 110 km/h	
FUNCTIONAL CLASSIFICATION: FREEWAY	
* TTST 6% DUAL 4%	

GRAPHIC SCALE	DESIGN DATA
PLANS 1" = 10'	ADT 2008 = 20,728
PROFILE (HORIZONTAL) 1" = 10'	ADT 2028 = 29,048
PROFILE (VERTICAL) 1" = 2'	DHV = 10 %
	D = 55 %
	T = 10 %
	V = 110 km/h
	FUNCTIONAL CLASSIFICATION: FREEWAY
	* TTST 6% DUAL 4%

**CONTRACT: C201818 T.I.P. PROJ: R-2554BA**

PROJECT REFERENCE NO. **R-2554BA**  
 R/W SHEET NO. **2-5**  
 ROADWAY DESIGN ENGINEER  
 CIVIL ENGINEER  
 METRICS  
 CONST. BY  
 P/W REV.



455

Buffer Drawing  
 Sheet 17 of 44

PLANS PREPARED BY:  
**RUMMEL + KLEPPER & KAHIL LLP**  
 CONSULTING ENGINEERS  
 300 HOOVER DRIVE SUITE 200  
 PALM BEACH, FLORIDA 33410  
 (561) 845-1000  
 (561) 845-1001  
 FOR

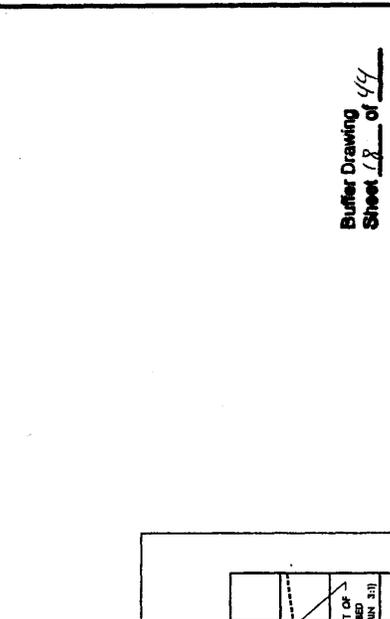
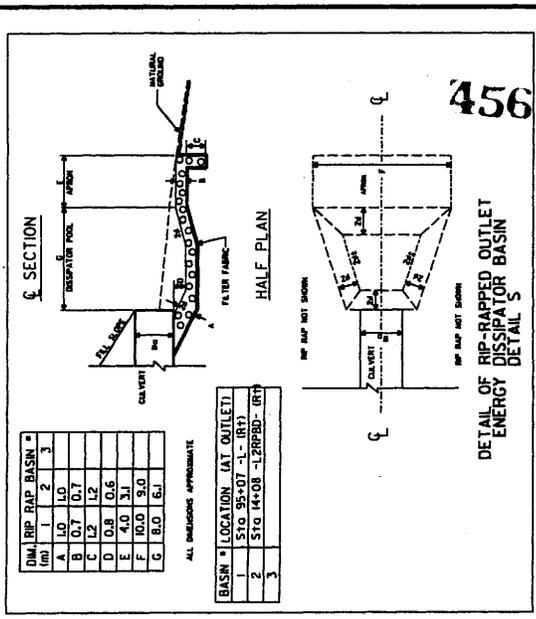
DIVISION OF HIGHWAYS

PROJECT REFERENCE NO. R-25548A  
SHEET NO. 2-7

ENGINEER: RICHARD W. METRICK, INC.  
REGISTERED PROFESSIONAL ENGINEER  
LICENSE NO. 10000  
STATE OF TEXAS

CONSULTANT: RICHARD W. METRICK, INC.  
REGISTERED PROFESSIONAL ENGINEER  
LICENSE NO. 10000  
STATE OF TEXAS

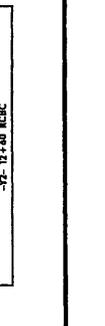
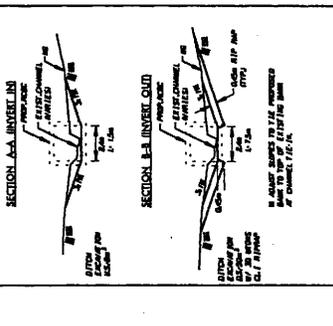
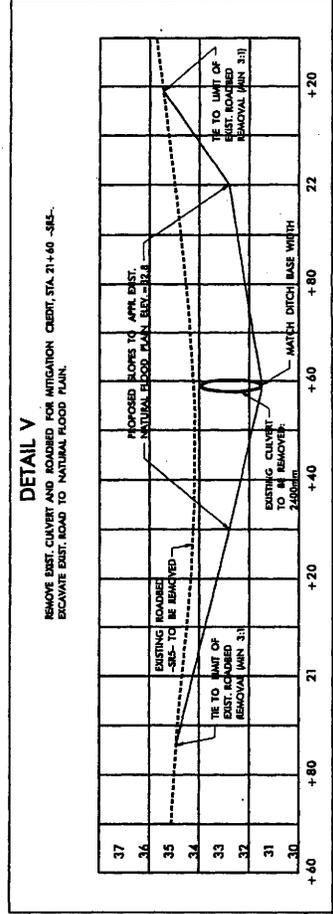
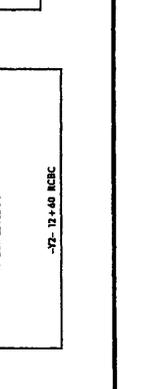
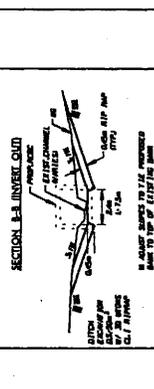
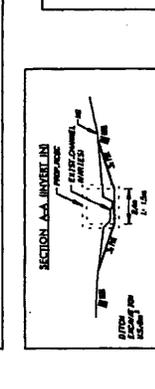
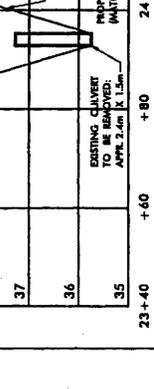
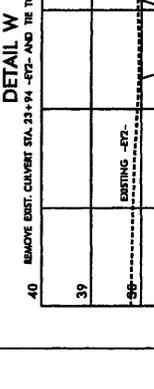
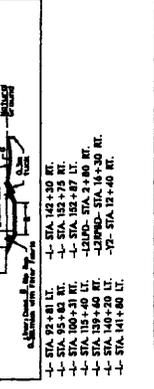
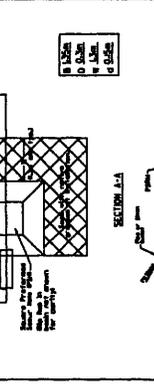
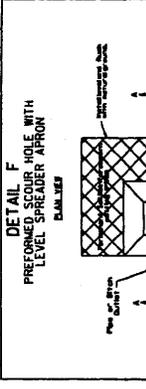
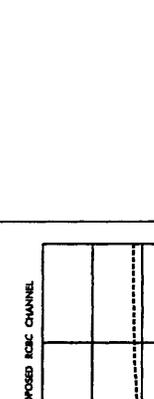
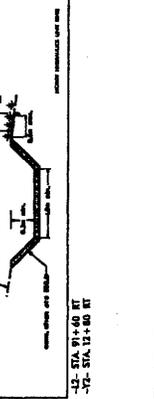
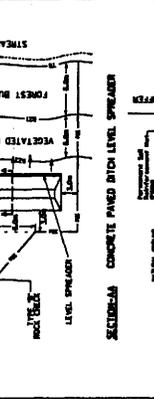
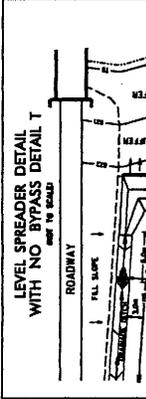
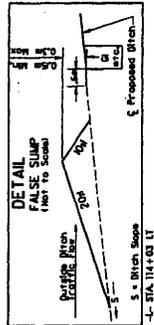
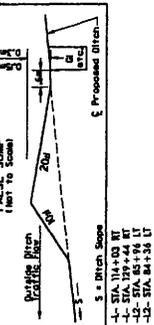
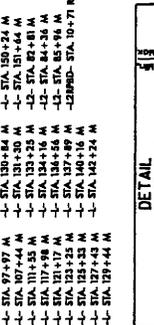
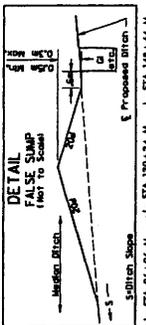
CONST. BY: \_\_\_\_\_  
DATE: \_\_\_\_\_



PLANS PREPARED BY:  
RICHARD W. METRICK, INC.  
REGISTERED PROFESSIONAL ENGINEER  
LICENSE NO. 10000  
STATE OF TEXAS

44  
Sheet 2 of 4

DIVISION OF HIGHWAYS





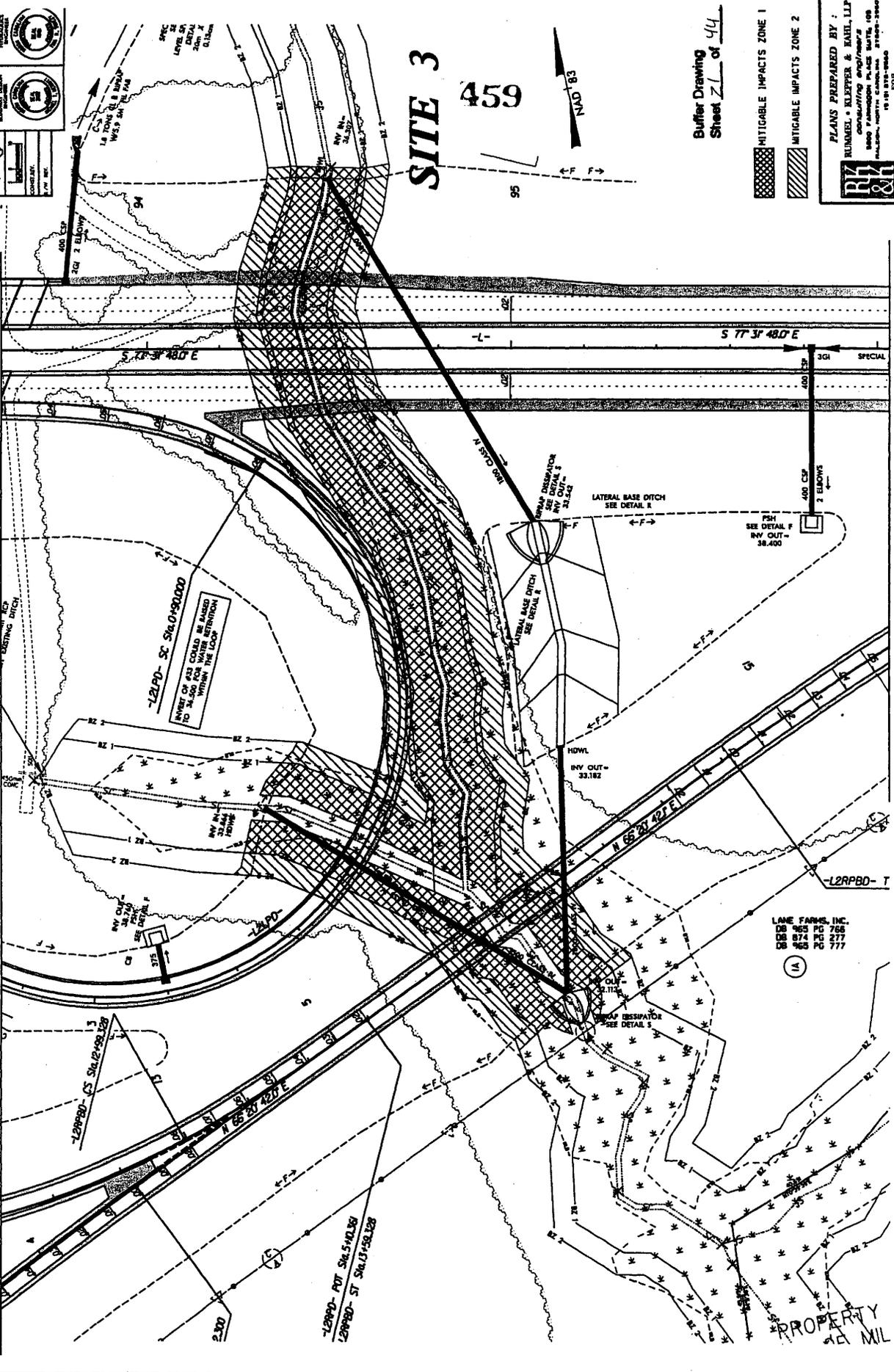


METRICS  
 SCALE: 1" = 40' (VERTICAL)  
 SCALE: 1" = 100' (HORIZONTAL)  
 NORTH ARROW  
 DATE: 10/15/03  
 DRAWN BY: [Signature]  
 CHECKED BY: [Signature]

MATCHLINE -L- STA. 93+60 & -L2RPD- STA. 0+15

MATCHLINE -L2RPD- STA. 3+24 & -L2RPBD- STA. 17+45

MATCHLINE -L2RPD- STA. 3+86 & -L2RPBD- STA. 17+45



# SITE 3 459

Buffer Drawing  
Sheet ZL of 44

- MITIGABLE IMPACTS ZONE 1
- MITIGABLE IMPACTS ZONE 2

PLANS PREPARED BY:  
 RUMMEL, KLEPPER & KAEHL LLP  
 Consulting Engineers  
 1000 ...  
 DIVISION OF HIGHWAYS

MATCHLINE -L- STA. 96+03

MATCHLINE -L2RPBD- STA. 15+35

LANE FARMS, INC.  
 908 965 PG 766  
 908 874 PG 277  
 908 965 PG 777

PROPERTY  
2.1 MIL

REVISIONS

















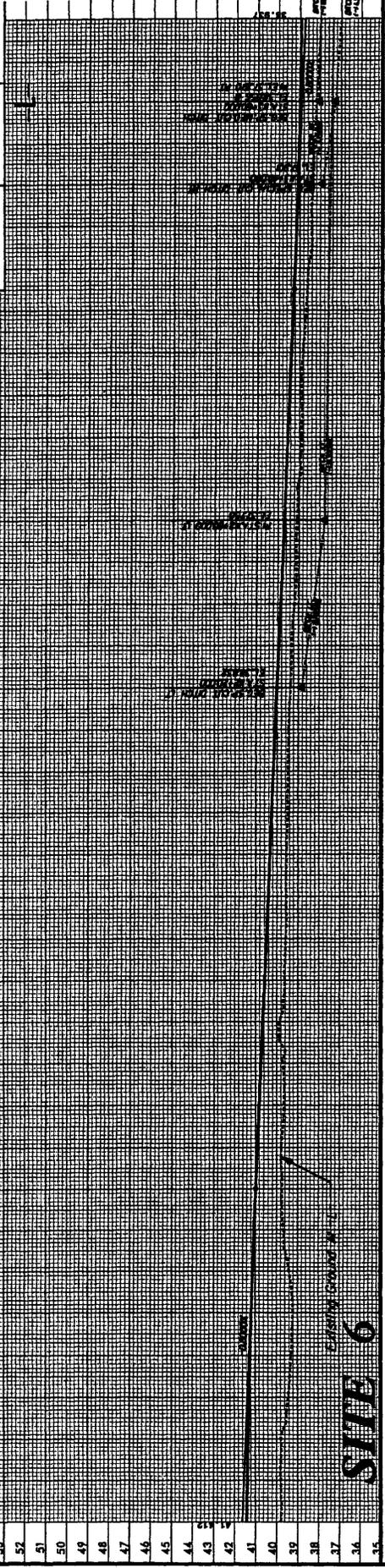
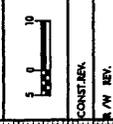




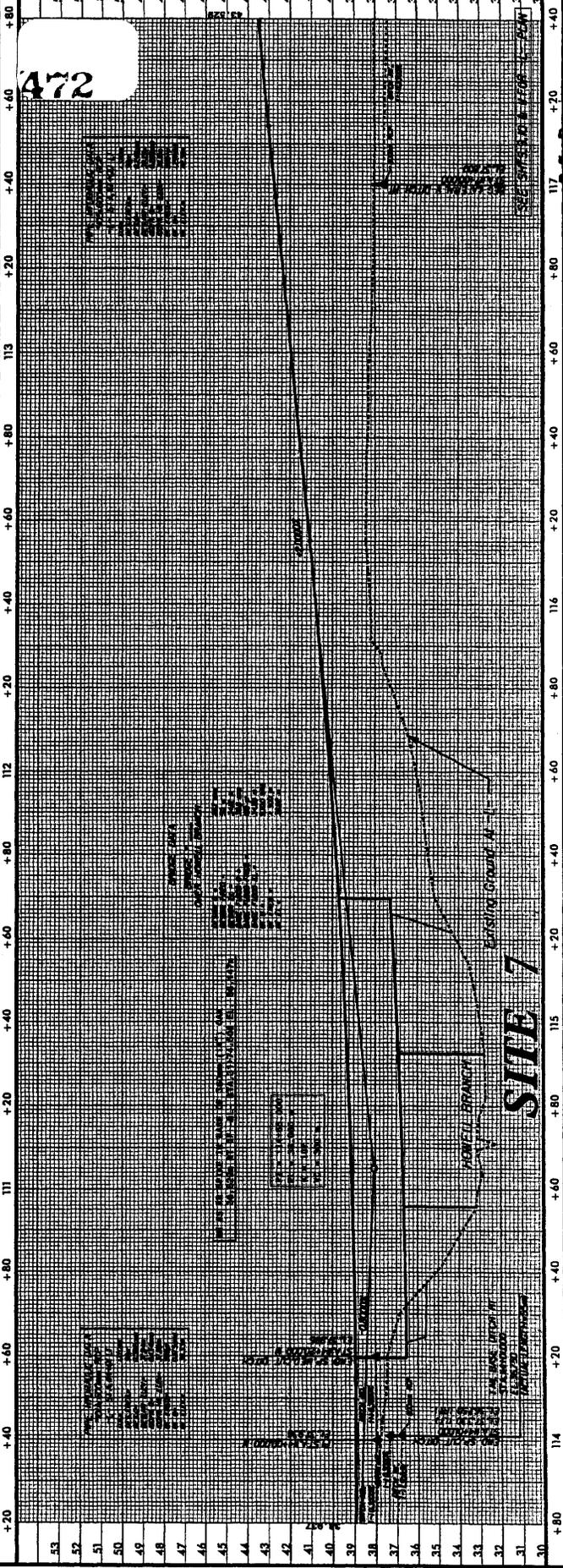




PROJECT REFERENCE NO. SHEET NO.  
 R-2534A 35  
 ROADWAY DESIGN HYDRAULICS  
 ENGINEER



**SILE 6**  
 Existing Grade



**SILE 7**  
 Existing Grade

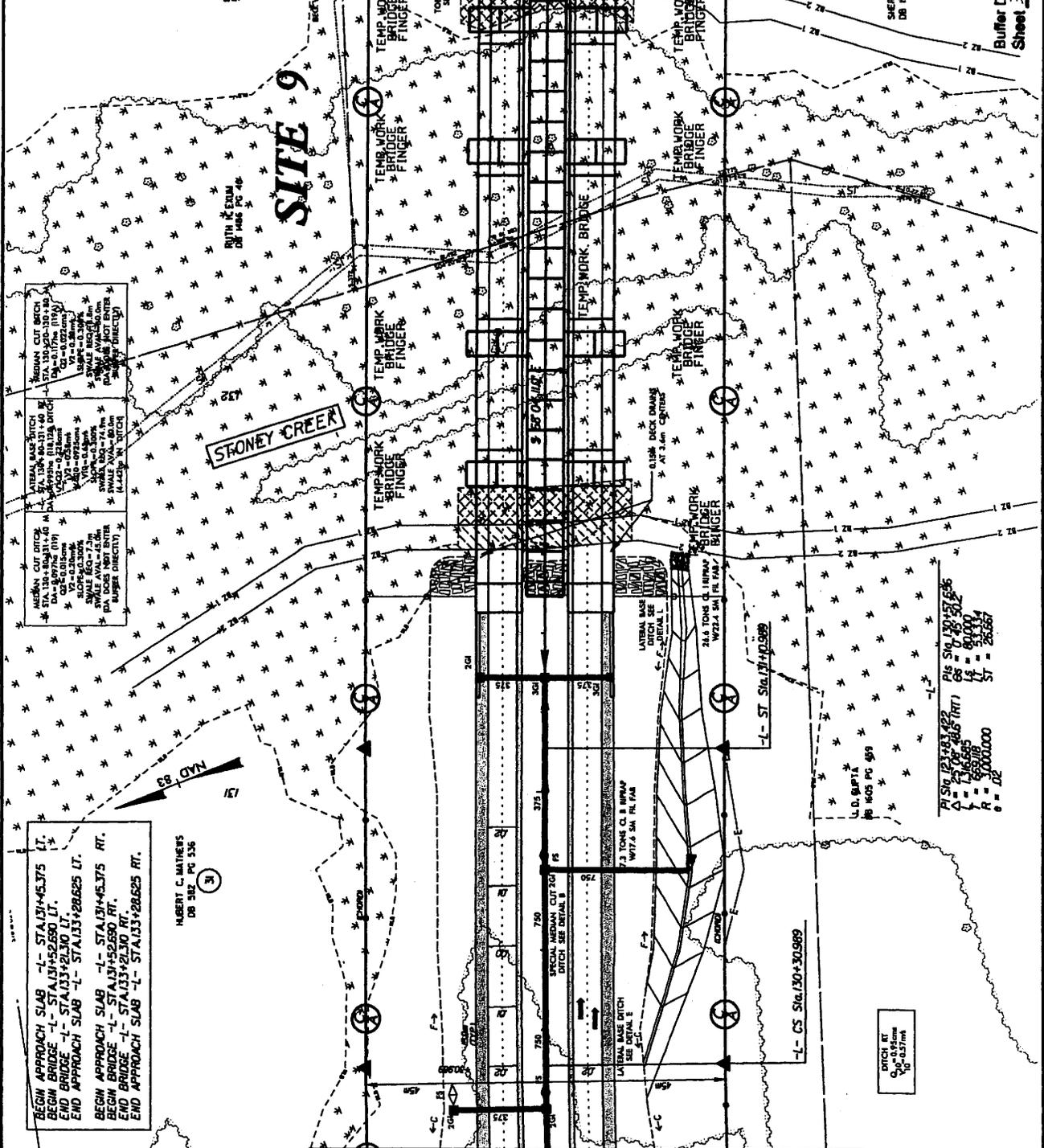
Sheet 34 of 44  
 Detail Drawing

PROJECT REFERENCE NO. SHEET NO.  
 F-255-204 12  
 ROADWAY DESIGN ENGINEER  
 HYDRAULICS ENGINEER  
 METRIC  
 CONSULTING ENGINEERS  
 1000 WEST 10TH AVENUE  
 DENVER, CO 80202  
 303.733.8800  
 1998

PRELIMINARY PLANS  
 TO BE REVIEWED AND APPROVED BY THE DISTRICT ENGINEER  
 ALLOWABLE IMPACTS ZONE 1  
 ALLOWABLE IMPACTS ZONE 2

NOTE: See Detail Sheets 2-5 & 2-7 For Ditch Details  
 NOTE: See Detail Sheet 2-7 For Bridge Sketch Showing Pavement in Relation To Bridge Width  
 SEE SHTS. 37 & 38 FOR "L" PROFILE  
 SHERMAN E. BEST  
 DB 1534 PG 233  
 (3)

PLANS PREPARED BY:  
 RUMMEL, KLEPPER & KAHL, LLP  
 CONSULTING ENGINEERS  
 1000 WEST 10TH AVENUE  
 DENVER, CO 80202  
 303.733.8800  
 1998  
 DIVISION OF HIGHWAYS  
 Buffer Drawing  
 Sheet 35 of 41



BEGIN APPROACH SLAB -L- STA. 131+45.375 LT.  
 BEGIN BRIDGE -L- STA. 131+52.650 LT.  
 END APPROACH SLAB -L- STA. 133+28.625 LT.  
 BEGIN APPROACH SLAB -R- STA. 131+45.375 RT.  
 BEGIN BRIDGE -R- STA. 131+52.650 RT.  
 END APPROACH SLAB -R- STA. 133+28.625 RT.

HUBERT C. MATHEWS  
 DB 502 PG 536  
 (3)

DITCH BY  
 10' 0.571m

LSN 124.83.422  
 A 124.83.422  
 L 124.83.422  
 R 124.83.422  
 ST 26.667  
 R = 1000.000  
 B = .02

MATCHLINE -L- STA. 130+20 SEE SHEET 14  
 MATCHLINE -L- STA. 133+60 SEE SHEET 16

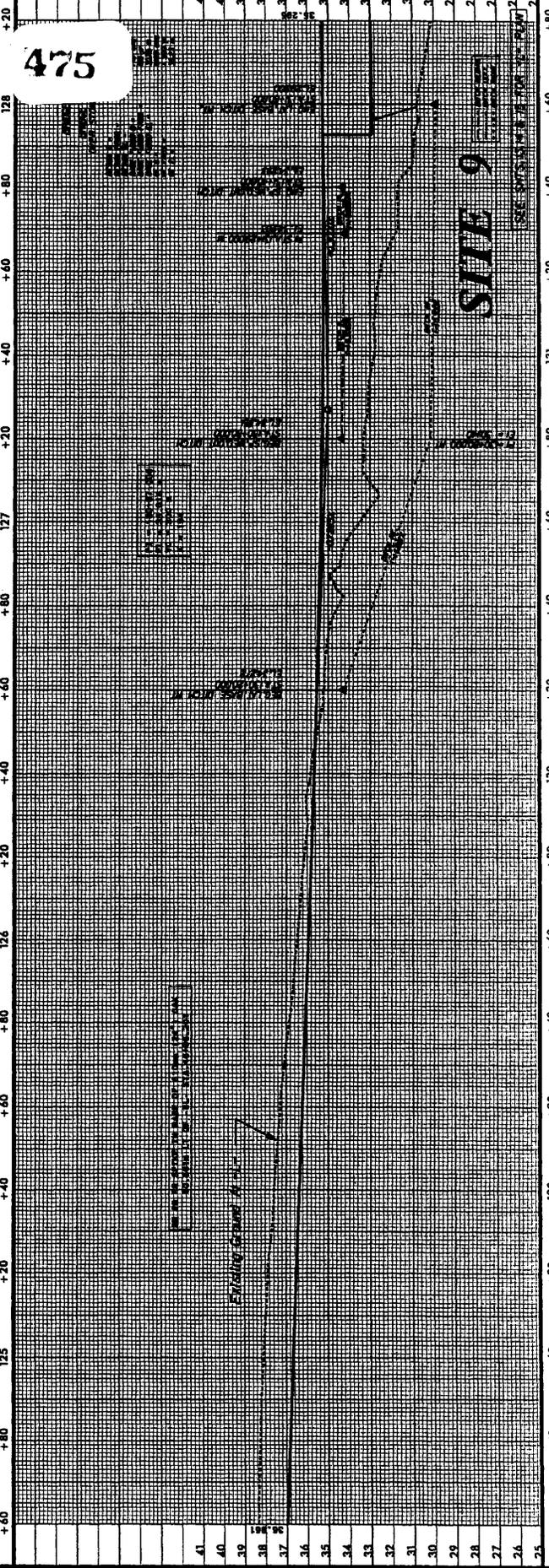
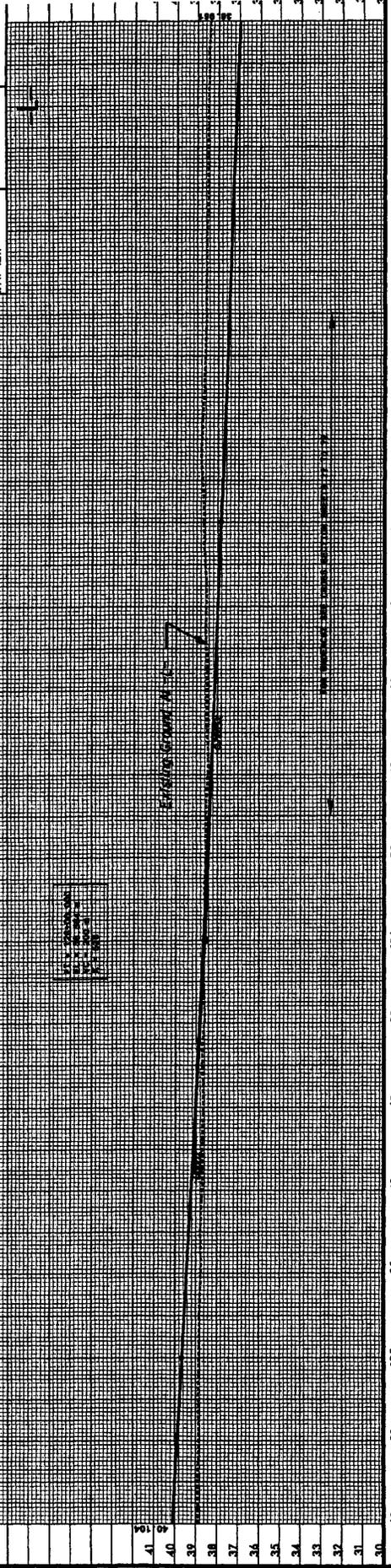
REVISIONS



PROJECT REFERENCE NO. **P-25474** SHEET NO. **37**  
 ROADWAY DESIGN ENGINEER HYDRAULICS ENGINEER



CONST. REV. **1**  
 P. W. REV.



10\18\07 13:54:48 R:\Hyd\util\ca\25474\hyd\perm\l.p.r\dgn  
 09/23/07

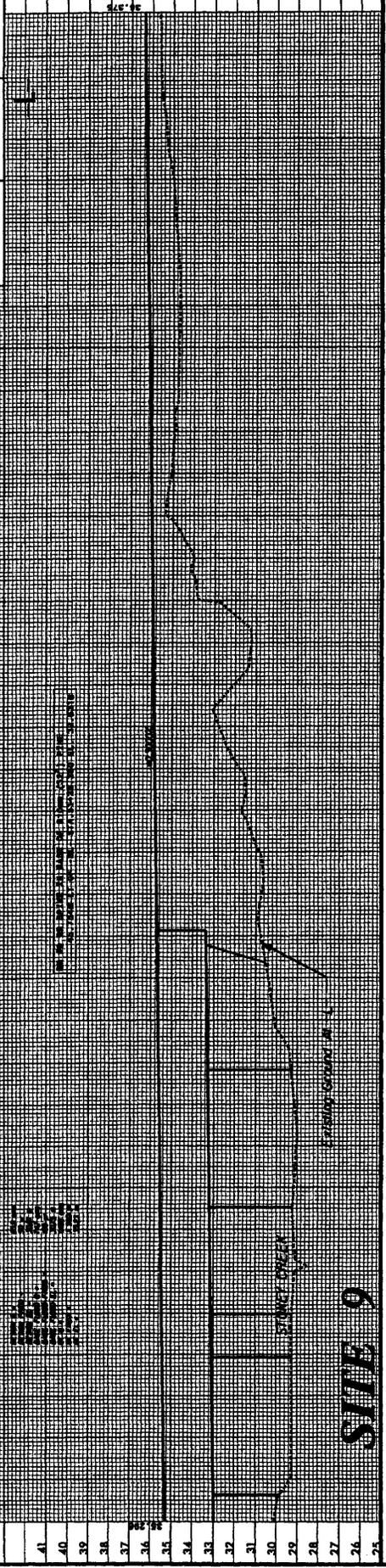
SITE 9  
 Bunker Drilling  
 Sheet 37 of 44

PROJECT REFERENCE NO. **A-2558A**  
 ROADWAY DESIGN ENGINEER

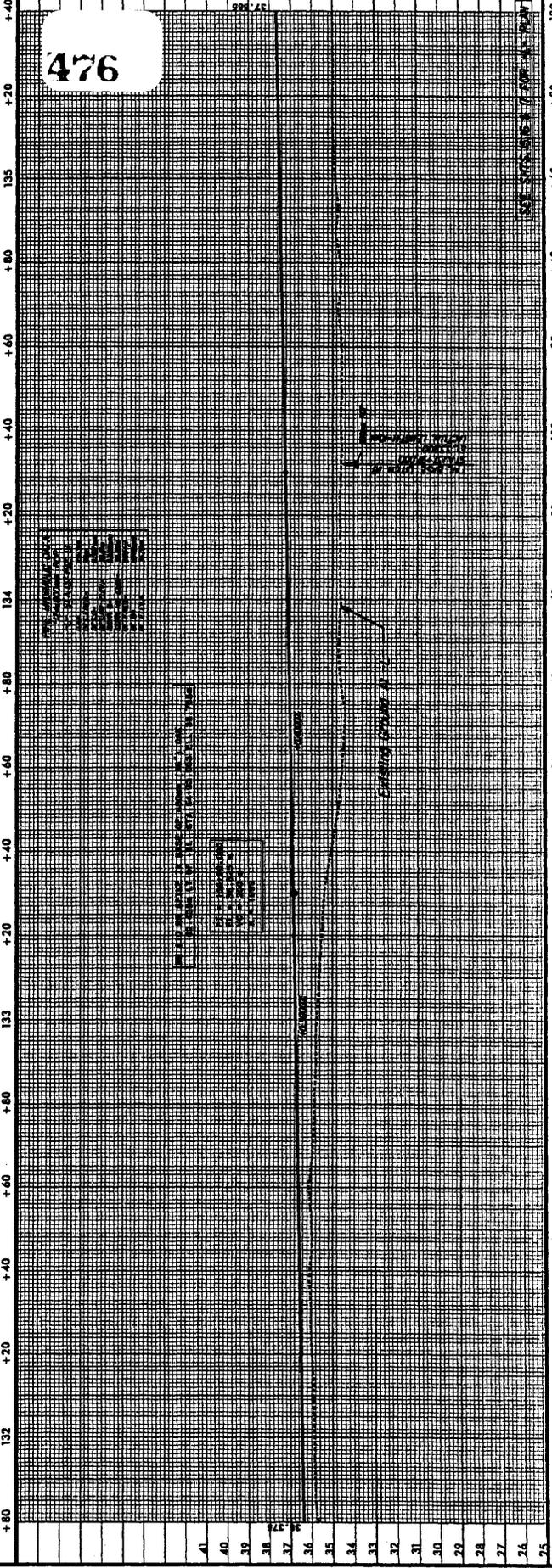


CONTRACT NO. **P/W 874**

SHEET **39**  
 HYDRAULICS ENGINEER



**SITE 9**

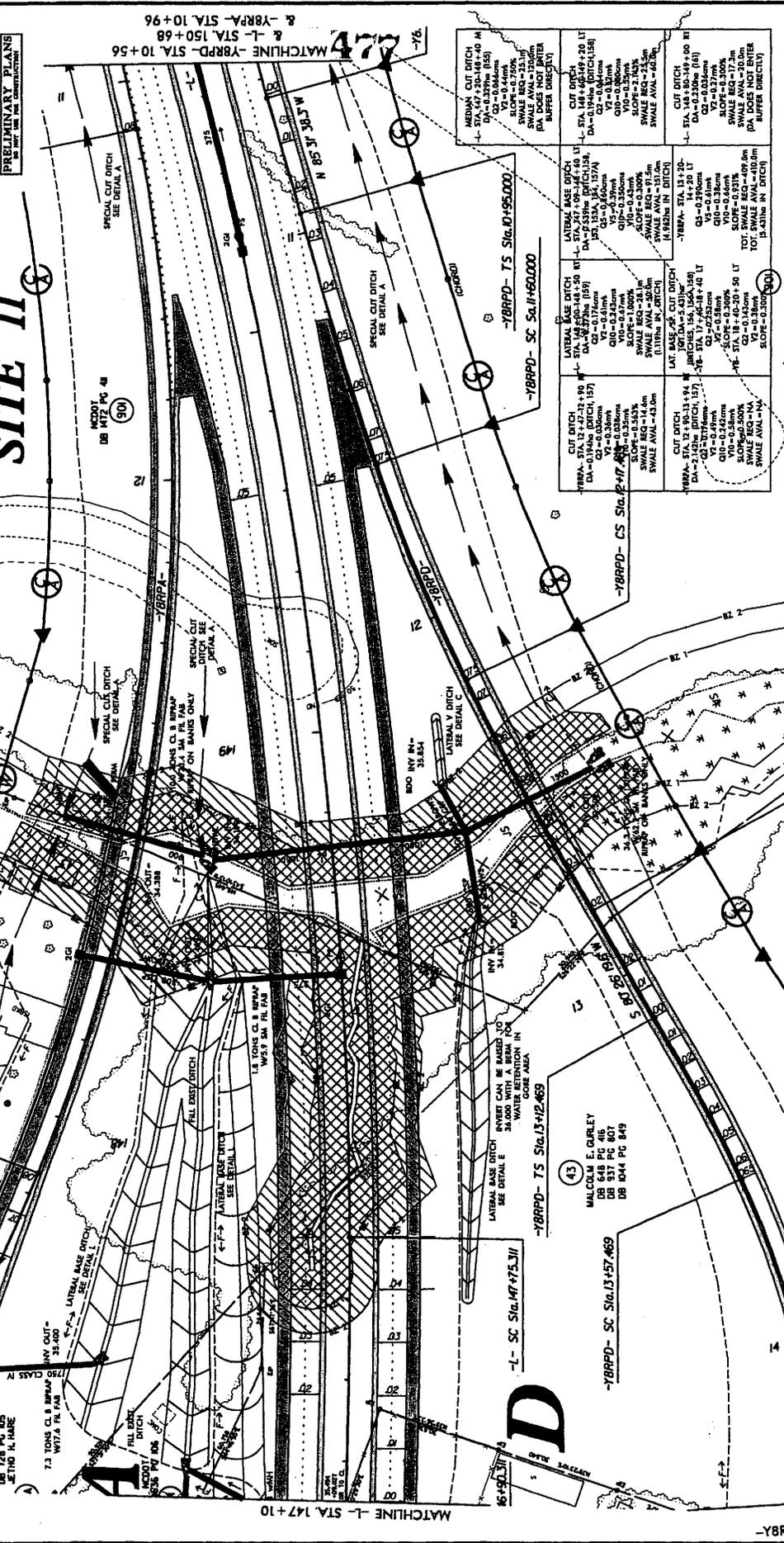


476

DATE: 10/15/07

Bunker Drawing  
 Sheet 39 of 94

PROJECT REFERENCE NO. 7-252-97A  
 SHEET NO. 8A  
 METRIC  
 CONSULTING ENGINEERS  
 1000 W. 7th Street, N.W.  
 MINNEAPOLIS, MN 55408  
 PRELIMINARY PLANS  
 FOR THE NEW CONSTRUCTION



PLANS PREPARED BY:  
 RUMMEL & KLEPPER & KAHN, LLP  
 Consulting Engineers  
 1000 W. 7th Street, N.W.  
 MINNEAPOLIS, MN 55408  
 DIVISION OF HIGHWAYS

Buffer Drawing  
 Sheet 3 of 4 of DB M72 PG 4  
 GRADING ONLY

MATCHLINE -YBRPD- STA. 14+40

REVISIONS

MITIGABLE IMPACTS ZONE 1  
 MITIGABLE IMPACTS ZONE 2

DB M72 PG 41  
 DB M72 PG 42  
 DB M72 PG 43  
 DB M72 PG 44

DB M72 PG 45  
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 DB M72 PG 410

DB M72 PG 411  
 DB M72 PG 412  
 DB M72 PG 413  
 DB M72 PG 414  
 DB M72 PG 415  
 DB M72 PG 416





PROJECT REFERENCE NO. SHEET NO.  
 7-255-02A 25

ROADWAY DESIGN ENGINEER  
 METRICS

PRELIMINARY PLANS  
 FOR THE USE OF THE CONTRACTOR

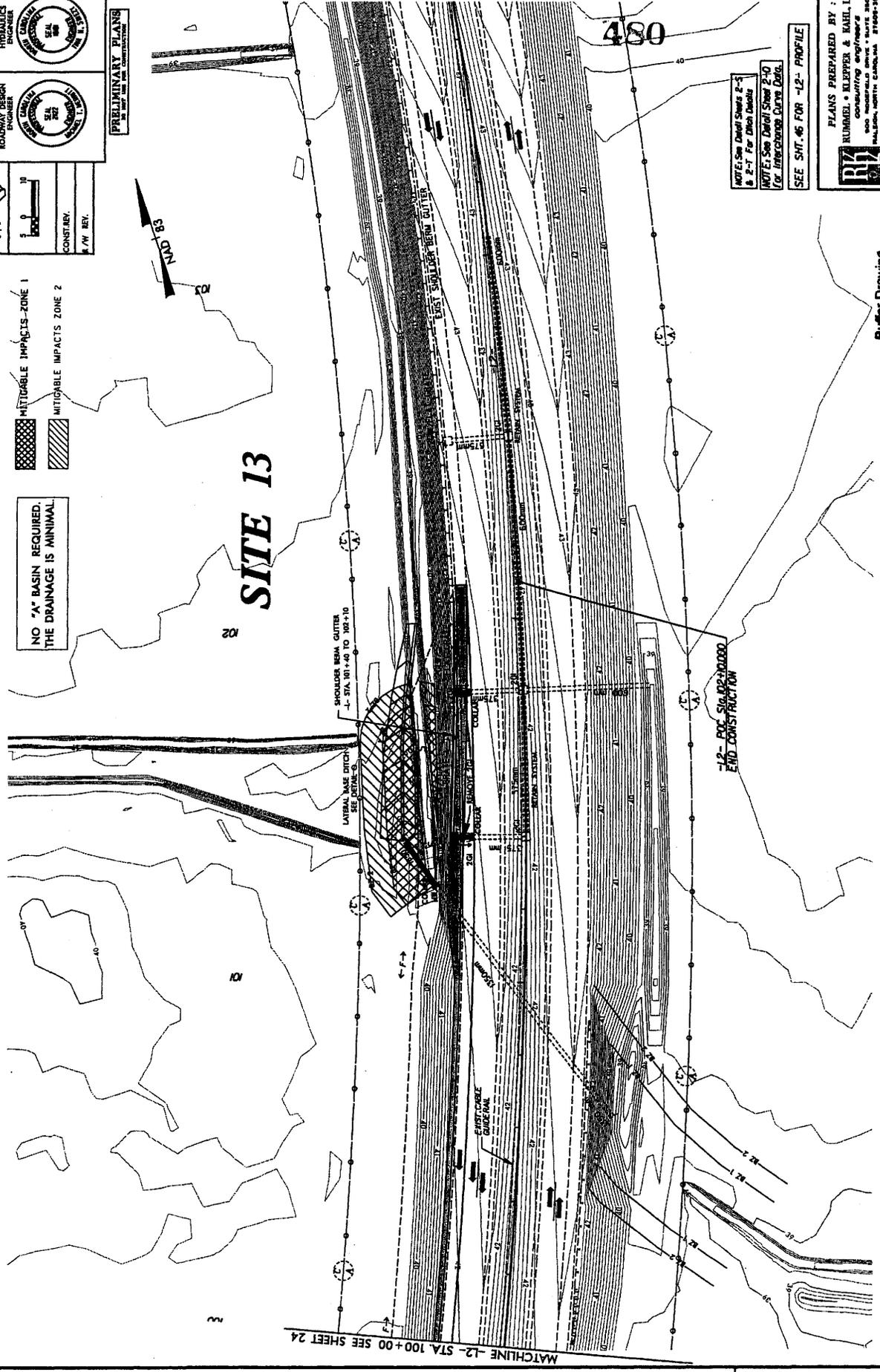
MITIGABLE IMPACTS ZONE 1  
 MITIGABLE IMPACTS ZONE 2

NO "A" BASIN REQUIRED.  
 THE DRAINAGE IS MINIMAL.



# SITE 13

MATCHLINE -12- STA. 100+00 SEE SHEET 24



NOTE: See Detail Sheets 2-3  
 & 2-4 For Drain Details

NOTE: See Detail Sheet 2-10  
 for Interchange Curve Data.

SEE SHT. 46 FOR -12- PROFILE

PLANS PREPARED BY:  
 RUMMEL & KLEPPER & KAHN, LLP  
 consulting engineers  
 1000 W. WISCONSIN ST., SUITE 200  
 MILWAUKEE, WISCONSIN 53233-1000  
 PHONE: 414-224-2000  
 FAX: 414-224-2001

DIVISION OF HIGHWAYS

Buffer Drawing  
 Sheet 12 of 11

REVISIONS


ALLOWABLE IMPACTS ZONE 1  
 ALLOWABLE IMPACTS ZONE 2

REMOVE EXIST. CURBVERT  
 MATCH EXIST. CHANNEL  
 SEE DETAIL W  
 SEE DETAIL V  
 SEE DETAIL U  
 SEE DETAIL T  
 SEE DETAIL S  
 SEE DETAIL R  
 SEE DETAIL Q  
 SEE DETAIL P  
 SEE DETAIL O  
 SEE DETAIL N  
 SEE DETAIL M  
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 SEE DETAIL H  
 SEE DETAIL G  
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 SEE DETAIL C  
 SEE DETAIL B  
 SEE DETAIL A

-E12- PC Sta. 21+327.99  
 SEE DETAIL A  
 SEE DETAIL B  
 SEE DETAIL C  
 SEE DETAIL D  
 SEE DETAIL E  
 SEE DETAIL F  
 SEE DETAIL G  
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 SEE DETAIL U  
 SEE DETAIL V  
 SEE DETAIL W  
 SEE DETAIL X  
 SEE DETAIL Y  
 SEE DETAIL Z

-E12- SC Sta. 11+320.84  
 T. A. LIVING & CO.  
 DB 316 PG 406  
 DB 316 PG 404  
 DB 316 PG 38

-E12- TS Sta. 10+87.084  
 25

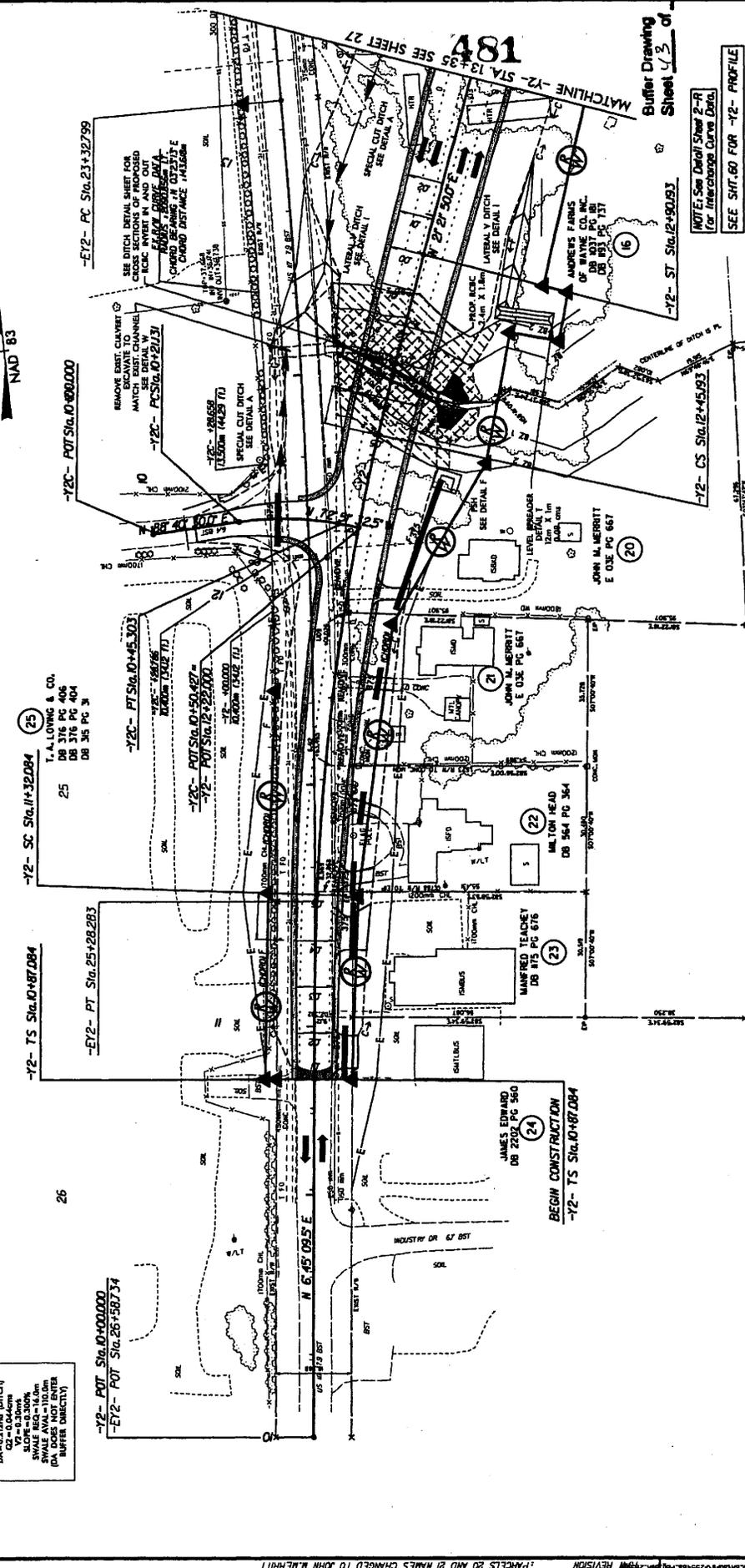
-E12- PT Sta. 25+28.283  
 26

-E12- POT Sta. 10+00.000  
 -E12- POT Sta. 26+587.34

NO "A" BASIN REQUIRED.  
 THE DRAINAGE IS MINIMAL.

NO "A" BASIN REQUIRED.  
 THE DRAINAGE IS MINIMAL.

NO "A" BASIN REQUIRED.  
 THE DRAINAGE IS MINIMAL.



PLANS PREPARED BY:  
 RUMMEL, KLEPPER & KASHLIP  
 CONSULTING ENGINEERS  
 1000 W. 10th Street, Suite 200  
 Lincoln, NE 68502  
 PHONE: (402) 441-1111  
 FAX: (402) 441-1112  
 WWW: www.rkk-engineers.com

NOTE: See Detail Sheets 2-1  
 For Increasing Curve Data  
 SEE SHT. 60 FOR -Y2- PROFILE

NOTE: See Detail Sheets 2-5  
 & 2-7 For Ditch Details

NOTE: All Proposed Drive Pipes are 375 mm.

NOTE: 2-0m Uniform Transition -Y2- Sta. 10+90 (2 lanes) to Sta. 13+30 (5 lanes).

NOTE: See Detail Sheets 2-1  
 For Increasing Curve Data  
 SEE SHT. 60 FOR -Y2- PROFILE

NOTE: See Detail Sheets 2-5  
 & 2-7 For Ditch Details

NOTE: All Proposed Drive Pipes are 375 mm.

NOTE: 2-0m Uniform Transition -Y2- Sta. 10+90 (2 lanes) to Sta. 13+30 (5 lanes).

NOTE: See Detail Sheets 2-1  
 For Increasing Curve Data  
 SEE SHT. 60 FOR -Y2- PROFILE

R/W REVISION  
 R/W REVISION  
 CHANGES MADE PER INITIAL CONTACTS  
 PARCELS 20 AND 21 NAMES CHANGED TO JOHN M. MERRITT

REVISIONS

ADDED R/W CURVE DATA REVISION EASEMENT FOR PARCELS B, E, 21, & 24

