NHDES-W-06-012

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

WETLANDS PERMIT APPLICATION

Water Division/ Wetlands Bureau
Land Resources Management

Check the status of your application: www.des.nh.gov/onestop

RSA/Rule: RSA 482-A/ Env-Wt 100-900

Administrative Use Only	Administrative Use Only	Administrative Use Only	File No.
			Check No.
			Amount:
			Initials

1. REVIEW TIME: Indicate your Review Time below. To determine review time, refer to Guidance Document A for instructions.

☒ Standard Review (Minimum, Minor or Major Impact) ☐ Expedited Review (Minimum Impact only)

2. MITIGATION REQUIREMENT:

If mitigation is required a Mitigation-Pre Application meeting must occur prior to submitting this Wetlands Permit Application. To determine if Mitigation is Required, please refer to the Determine if Mitigation is Required Frequently Asked Question.

Mitigation Pre-Application Meeting Date: Month: __ Day: __ Year: ____

☐ N/A - Mitigation is not required

3. PROJECT LOCATION:

Separate wetland permit applications must be submitted for each municipality that wetland impacts occur within.

ADDRESS: **NH Route 106** TOWN/CITY: **Loudon, NH**

TAX MAP: BLOCK: LOT: UNIT:

USGS TOPO MAP WATERBODY NAME: **Gues Meadow Brook** ☐ NA STREAM WATERSHED SIZE: **4.37 sq miles** ☐ NA

LOCATION COORDINATES (If known): **71-28-01.4, 43-20-42.9 (Sta 5472+60)** ☒

4. PROJECT DESCRIPTION:

Provide a brief description of the project outlining the scope of work. Attach additional sheets as needed to provide a detailed explanation of your project. DO NOT reply "See Attached" in the space provided below.

Widen 0.9 miles of NH 106 (from 48' wide to 60' wide), from 800' south of Mudgett Hill Rd to 1,400' north of the NH Motor Speedway's south entrance. In addition to the widening, the project includes guardrail replacement, drainage replacement and/or rehabilitation, addition of curb and a 6' grass panel on both sides of NH 106 from Clough Hill Road to the NHMS South Entrance, and construction of three stormwater treatment areas.

5. SHORELINE FRONTAGE:

☐ NA This does not have shoreline frontage. SHORELINE FRONTAGE: **200' (along Soucook River)**

Shoreline frontage is calculated by determining the average of the distances of the actual natural navigable shoreline frontage and a straight line drawn between the property lines, both of which are measured at the normal high water line.

6. RELATED NHDES LAND RESOURCES MANAGEMENT PERMIT APPLICATIONS ASSOCIATED WITH THIS PROJECT:

Please indicate if any of the following permit applications are required and, if required, the status of the application.

To determine if other Land Resources Management Permits are required, refer to the Land Resources Management Web Page.

Permit Type	Permit Required	File Number	Permit Application Status
Alteration of Terrain Permit Per RSA 485-A:17	☐ YES ☒ NO	____	☐ APPROVED ☐ PENDING ☐ DENIED
Individual Sewerage Disposal per RSA 485-A:2	☐ YES ☒ NO	____	☐ APPROVED ☐ PENDING ☐ DENIED
Subdivision Approval Per RSA 485-A	☐ YES ☒ NO	____	☐ APPROVED ☐ PENDING ☐ DENIED
Shoreland Permit Per RSA 483-B	☒ YES ☐ NO	____	☐ APPROVED ☒ PENDING ☐ DENIED

7. NATURAL HERITAGE BUREAU & DESIGNATED RIVERS:

See the Instructions & Required Attachments document for instructions to complete a & b below.

a. Natural Heritage Bureau File ID: NHB 17 - 1748

b. ☐ Designated River the project is in ¼ miles of: _____ ; and date a copy of the application was sent to the Local River Management Advisory Committee: Month: __ Day: __ Year: ____

☐ N/A

8. APPLICANT INFORMATION (Desired permit holder)

LAST NAME, FIRST NAME, M.I.: **Cota, Keith, PE**		
TRUST / COMPANY NAME: **NHDOT**	MAILING ADDRESS: **7 Hazen Drive / PO Box 483**	
TOWN/CITY: **Concord**	STATE: **NH**	ZIP CODE: **03302-0483**
EMAIL or FAX: **Bureau16@dot.nh.gov**	PHONE: **603-271-2171**	

ELECTRONIC COMMUNICATION: By initialing here: _____, I hereby authorize NHDES to communicate all matters relative to this application electronically

9. PROPERTY OWNER INFORMATION (If different than applicant)

LAST NAME, FIRST NAME, M.I.:		
TRUST / COMPANY NAME:	MAILING ADDRESS:	
TOWN/CITY:	STATE:	ZIP CODE:
EMAIL or FAX:	PHONE:	

ELECTRONIC COMMUNICATION: By initialing here _____, I hereby authorize NHDES to communicate all matters relative to this application electronically

10. AUTHORIZED AGENT INFORMATION

LAST NAME, FIRST NAME, M.I.:	COMPANY NAME:	
MAILING ADDRESS:		
TOWN/CITY:	STATE:	ZIP CODE:
EMAIL or FAX:	PHONE:	

ELECTRONIC COMMUNICATION: By initialing here _____, I hereby authorize NHDES to communicate all matters relative to this application electronically

11. PROPERTY OWNER SIGNATURE:

See the Instructions & Required Attachments document for clarification of the below statements

By signing the application, I am certifying that:

1. I authorize the applicant and/or agent indicated on this form to act in my behalf in the processing of this application, and to furnish upon request, supplemental information in support of this permit application.
2. I have reviewed and submitted information & attachments outlined in the Instructions and Required Attachment document.
3. All abutters have been identified in accordance with RSA 482-A:3, I and Env-Wt 100-900.
4. I have read and provided the required information outlined in Env-Wt 302.04 for the applicable project type.
5. I have read and understand Env-Wt 302.03 and have chosen the least impacting alternative.
6. Any structure that I am proposing to repair/replace was either previously permitted by the Wetlands Bureau or would be considered grandfathered per Env-Wt 101.47.
7. I have submitted a Request for Project Review (RPR) Form (www.nh.gov/nhdhr/review) to the NH State Historic Preservation Officer (SHPO) at the NH Division of Historical Resources to identify the presence of historical/ archeological resources while coordinating with the lead federal agency for NHPA 106 compliance.
8. I authorize NHDES and the municipal conservation commission to inspect the site of the proposed project.
9. I have reviewed the information being submitted and that to the best of my knowledge the information is true and accurate.
10. I understand that the willful submission of falsified or misrepresented information to the New Hampshire Department of Environmental Services is a criminal act, which may result in legal action.
11. I am aware that the work I am proposing may require additional state, local or federal permits which I am responsible for obtaining.
12. The mailing addresses I have provided are up to date and appropriate for receipt of NHDES correspondence. NHDES will not forward returned mail.

⇨ Property Owner Signature	JAMES A. MARSHALL Print name legibly	2/15/18 Date

FOR KEITH COTA

MUNICIPAL SIGNATURES

12. CONSERVATION COMMISSION SIGNATURE

The signature below certifies that the municipal conservation commission has reviewed this application, and:

1. Waives its right to intervene per RSA 482-A:11;
2. Believes that the application and submitted plans accurately represent the proposed project; and
3. Has no objection to permitting the proposed work.

⇨	Print name legibly	Date

DIRECTIONS FOR CONSERVATION COMMISSION

1. Expedited review ONLY requires that the conservation commission's signature is obtained in the space above.
2. Expedited review requires the Conservation Commission signature be obtained **prior** to the submittal of the original application to the Town/City Clerk for signature.
3. The Conservation Commission may refuse to sign. If the Conservation Commission does not sign this statement for any reason, the application is not eligible for expedited review and the application will reviewed in the standard review time frame.

13. TOWN / CITY CLERK SIGNATURE

As required by Chapter 482-A:3 (amended 2014), I hereby certify that the applicant has filed four application forms, four detailed plans, and four USGS location maps with the town/city indicated below.

⇨ Town/City Clerk Signature	Print name legibly	Town/City	Date

DIRECTIONS FOR TOWN/CITY CLERK:

Per RSA 482-A:3,I

1. For applications where "Expedited Review" is checked on page 1, if the Conservation Commission signature is not present, NHDES will accept the permit application, but it will NOT receive the expedited review time.
2. IMMEDIATELY sign the original application form and four copies in the signature space provided above;
3. Return the signed original application form and attachments to the applicant so that the applicant may submit the application form and attachments to NHDES by mail or hand delivery.
4. IMMEDIATELY distribute a copy of the application with one complete set of attachments to each of the following bodies: the municipal Conservation Commission, the local governing body (Board of Selectmen or Town/City Council), and the Planning Board; and
5. Retain one copy of the application form and one complete set of attachments and make them reasonably accessible for public review.

DIRECTIONS FOR APPLICANT:

1. Submit the single, original permit application form bearing the signature of the Town/ City Clerk, additional materials, and the application fee to NHDES by mail or hand delivery.

14. IMPACT AREA:
For each jurisdictional area that will be/has been impacted, provide square feet and, if applicable, linear feet of impact
Permanent: impacts that will remain after the project is complete.
Temporary: impacts not intended to remain (and will be restored to pre-construction conditions) after the project is complete.

JURISDICTIONAL AREA	PERMANENT Sq. Ft. / Lin. Ft.		TEMPORARY Sq. Ft. / Lin. Ft.	
Forested wetland	1,519	☐ ATF	3,898	☐ ATF
Scrub-shrub wetland	1,485	☐ ATF	1,824	☐ ATF
Emergent wetland	812	☐ ATF		☐ ATF
Wet meadow		☐ ATF		☐ ATF
Intermittent stream	201 / 56	☐ ATF		☐ ATF
Perennial Stream / River	3,216 / 344	☐ ATF	7,154 / 490	☐ ATF
Lake / Pond	416 / 0	☐ ATF	1,455 / 0	☐ ATF
Bank - Intermittent stream	/	☐ ATF	/	☐ ATF
Bank - Perennial stream / River	317 / 33	☐ ATF	729 / 70	☐ ATF
Bank - Lake / Pond	/	☐ ATF	/	☐ ATF
Tidal water	/	☐ ATF	/	☐ ATF
Salt marsh		☐ ATF		☐ ATF
Sand dune		☐ ATF		☐ ATF
Prime wetland		☐ ATF		☐ ATF
Prime wetland buffer		☐ ATF		☐ ATF
Undeveloped Tidal Buffer Zone (TBZ)		☐ ATF		☐ ATF
Previously-developed upland in TBZ		☐ ATF		☐ ATF
Docking - Lake / Pond		☐ ATF		☐ ATF
Docking - River		☐ ATF		☐ ATF
Docking - Tidal Water		☐ ATF		☐ ATF
TOTAL	7,966 / 433		15,060 / 560	

15. APPLICATION FEE: See the Instructions & Required Attachments document for further instruction

☐ Minimum Impact Fee: Flat fee of $ 200
☐ Minor or Major Impact Fee: Calculate using the below table below

Permanent and Temporary (non-docking) **23,026** sq. ft. X $0.20 = **$ 4,605.20**

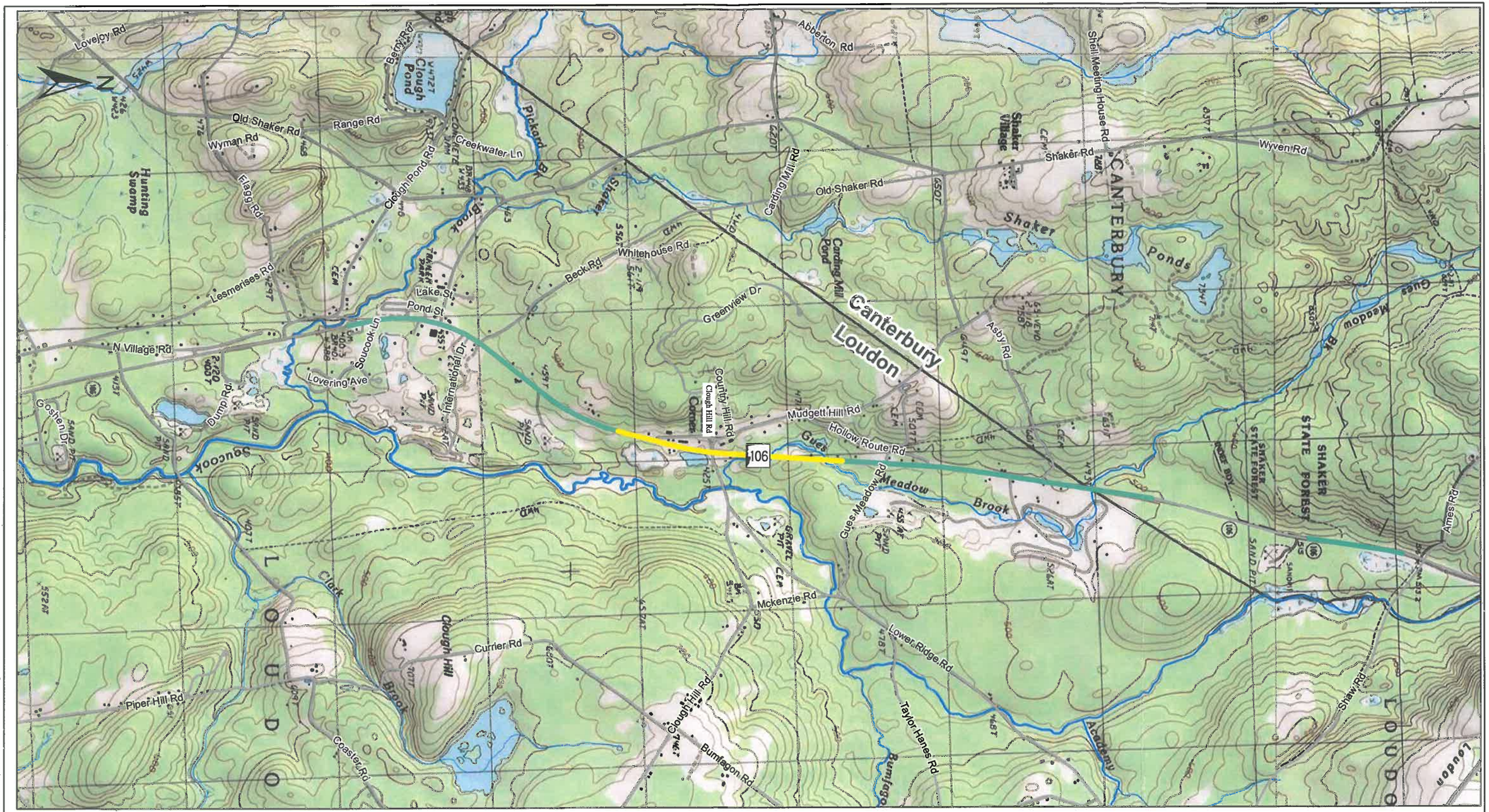
Temporary (seasonal) docking structure: _____ sq. ft. X $1.00 = $ _____

Permanent docking structure: _____ sq. ft. X $2.00 = $ _____

Projects proposing shoreline structures (including docks) add $200 = $ _____

Total = **$ 4,605.20**

The Application Fee is the above calculated Total or $200, whichever is greater = **$ 4,605.20**



Project Limits

Phase One

Phase Two

NH DEPARTMENT OF TRANSPORTATION
LOUDON-CANTERBURY 29613

LOCATION

SCALE :	DATE :	FIGURE :
1 inch = 2,000 feet	SEPTEMBER 2017	1

McFarland Johnson

\\mjcolo-dc-x64\M\18038.14 NHDOT Loudon-Canterbury 29613\Draw\GIS\NEPA Figures\Location.mxd

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

WETLANDS PERMIT APPLICATION – ATTACHMENT A
MINOR AND MAJOR - 20 QUESTIONS
Land Resources Management
Wetlands Bureau

Check the Status of your application: www.des.nh.gov/onestop

RSA/ Rule: RSA 482-A, Env-Wt 100-900

Env-Wt 302.04 Requirements for Application Evaluation - For any major or minor project, the applicant shall demonstrate by plan and example that the following factors have been considered in the project's design in assessing the impact of the proposed project to areas and environments under the department's jurisdiction. Respond with statements demonstrating:

1. The need for the proposed impact.

The need for this project and the associated impacts is evidenced by safety and operational concerns related to the high density of driveways and local roads, as well as operational demands placed on the corridor during high traffic volume events.

Safety concerns exist in areas with a high density of left and right turns at intersections and commercial driveways where turning vehicles remain in the path of through traffic. For example, between 2002 and 2009, the unsignalized intersection of NH Route 106/Clough Hill Road/Mudgett Hill Road experienced seven crashes. Over half of these were rear-end collisions where a vehicle was stopped on NH Route 106 waiting to make a left turn into the side road when the vehicle was struck from behind.Operational concerns occur primarily during major events at the New Hampshire Motor Speedway, traffic along NH Route 106 increases from approximately 11,000 vehicles per day to approximately 17,000 vehicles traveling northbound in the morning hours before the event and approximately 25,300 vehicles traveling southbound in the afternoon and early evening following the event. Lane usage along NH Route 106 is modified during these periods to accommodate the large volume of directional flow with the use of temporary signs, cones, and variable message boards. These large traffic volumes cause operational concerns relative to emergency vehicle access, pedestrian safety, and movement of local traffic. The project proposes the addition of a 12' center turn lane and 6' wide grass panels adjacent to portions of NH 106 to address the safety and operation concerns. The proposed impacts are due to fill slopes and culvert extensions necessary to accommodate the proposed widening of NH 106.

2. That the alternative proposed by the applicant is the one with the least impact to wetlands or surface waters on site.

The proposed widening is the minimum improvement needed to meet the project need. Where practical, the proposed roadway centerline has been shifted away from jurisdictional resources. For example, from Sta 5451+00 to Sta 5464+00 the roadway centerline is shifted about 9' west to minimize impacts to wetland #5. Impacts to jurisdictional areas are due to fill slopes and replacement of or modifications to stream crossings. Fill slope impacts are minimized by installing guardrail and constructing 2:1 slopes instead of unprotected 4:1 slopes . Where slopes are adjacent to Gues Meadow Brook, the fill slopes are steepened to 1.5:1 to further reduce impacts. Stream impacts are minimized by modifying existing structures where practical, extending existing structures where practical, and replacing or upsizing structures to meet hydraulic design requirements and stream crossing requirements to the maximum extent practical.

3. The type and classification of the wetlands involved.

PEM1Ex PALUSTRINE, EMERGENT, PERSISTENT, SEASONALLY FLOODED/SATURATED, EXCAVATED;

PFO1E PALUSTRINE, FORESTED, BROAD-LEAVED DECIDUOUS, SEASONALLY FLOODED/SATURATED;

PSS1E PALUSTRINE, SCRUB-SHRUB, BROAD-LEAVED DECIDUOUS, SEASONALLY FLOODED/SATURATED;

PSS1Jb PALUSTRINE, SCRUB-SHRUB, BROAD-LEAVED DECIDUOUS, INTERMITTENTLY FLOODED, BEAVER;

PUBH PALUSTRINE, UNCONSOLIDATED BOTTOM, PERMANENTLY FLOODED;

R2UB1H RIVERINE, LOWER PERENNIAL, UNCONSOLIDATED BOTTOM, COBBLE-GRAVEL, PERMANENTLY FLOODED;

R2UB1Hb RIVERINE, LOWER PERENNIAL, UNCONSOLIDATED BOTTOM, COBBLE-GRAVEL, PERMANENTLY FLOODED, BEAVER;

R4SB3J RIVERINE, INTERMITTENT, STREAMBED, COBBLE-GRAVEL, INTERMITTENTLY FLOODED; and BANK STREAM BANKS

4. The relationship of the proposed wetlands to be impacted relative to nearby wetlands and surface waters.

Gues Meadow Brook is one of several major tributaries to the Soucook River. The Brook crosses under NH 106 three times before eventually feeding into the Soucook River. The palustrine wetlands are adjacent to Gues Meadow Brook and the Soucook River. One intermittent stream crosses under NH 106 and feeds a palustrine wetland adjacent to the Soucook River.

5. The rarity of the wetland, surface water, sand dunes, or tidal buffer zone area.

The classification type of wetlands found within the project area are not considered rare.

6. The surface area of the wetlands that will be impacted.

Permanent impacts to wetlands will be 7,966 sf.

Temporary impacts to wetlands will be 15,060 sf.

7. The impact on plants, fish and wildlife including, but not limited to:
   a. Rare, special concern species;
   b. State and federally listed threatened and endangered species;
   c. Species at the extremities of their ranges;
   d. Migratory fish and wildlife;
   e. Exemplary natural communities identified by the DRED-NHB; and
   f. Vernal pools.

a.& b. The NHB identified two records for species of concern near the project limits: American Eel (Anguilla rostrata) and Wood Turtle (Glyptemys insculpta) and one record for a Sate threatened species: the Bridle Shiner (Notropis bifrenatus). Carol Henderson of NH Fish & Game was consulted (see correspondance); since the Department was addressing the perched crossings and works under the terms of minimization of impacts she did not have any concerns. Through a US Fish & Wildlife Service IPaC search two Federally listed threatened species were listed: Small Whorled pogonia (Isotria medeoloides) and the Northern long-eared Bat (Myotis septentrionalis). A survey for small whorled pogonia was performed in July 2016 in the identified location by NHB and surrounding forested habitat; the plant was not found. (See 8/17/16 Natural Resource Agency Meeting minutes and coordination with Suzi von Oettingen). In regards to the Northern long-eared Bat, an acoustic bat survey was completed to asses the potential presence. It was determined that this species is not likely to be present. The US Fish & Wildlife Service has reviewed the survey results and concurs that the project is not likely to adversly affect the Northern long-eared bat. (see copy of Range-Wide Programmatic Consultation sent to US F&W and email coordination).

c. No species at the extremities of their ranges were identified through the NHB or IPaC searches.

d. No migratory fish and wildlife species were identified through the NHB or IPaC searches.

e. No exemplary natural communities were identified by NHB.

f. No vernal pools were identified within the project limits.

8. The impact of the proposed project on public commerce, navigation and recreation.

The proposed project will improve opportunities for public commerce and recreation by improving safety and operational characteristics of NH Route 106.

The project will have no effect on navigation.

9. The extent to which a project interferes with the aesthetic interests of the general public. For example, where an applicant proposes the construction of a retaining wall on the bank of a lake, the applicant shall be required to indicate the type of material to be used and the effect of the construction of the wall on the view of other users of the lake.

The project will not significantly alter the aesthetic characteristics of the NH 106 corridor.

10. The extent to which a project interferes with or obstructs public rights of passage or access. For example, where the applicant proposes to construct a dock in a narrow channel, the applicant shall be required to document the extent to which the dock would block or interfere with the passage through this area.

The project will not interfere with or obstruct pubilc rights of way or access.

11. The impact upon abutting owners pursuant to RSA 482-A:11, II. For example, if an applicant is proposing to rip-rap a stream, the applicant shall be required to document the effect of such work on upstream and downstream abutting properties.

The project will not have a significant impact to the majority of abutters.

Parcel 35 (along the south side of Clough Hill Rd) will be impacted by the construction of a stormwater treatment pond. The owner will be compensated for property acquired and for impact to the overall value of the parcel, if any.

At Sta 5464+50 Rt to Sta 5467+50 Rt, stone fill on the slope adjacent to Gues Meadow Brook may cause a slight increase in velocity during high flow events. This will be a temporary condition, until the proposed vegetation and landscaping on the stone slope becomes established. Increased velocity, if any, will not cause an adverse impact because the channel immediatedly downstream of the project widens from about 14' to about 80' and maintains this width for nearly 300' before passing through a structure under the driveway at Clough Hill Rd Sta 104+75 Lt. This major change in channel geometry will mitigate any small change in velocity resulting from placing stone on the stream bank.

12. The benefit of a project to the health, safety, and well being of the generai public.

The proposed project will improve the safety and operational characteristics of NH Route 106, resulting in an overall benefit to the public.

13. The impact of a proposed project on quantity or quality of surface and groundwater. For example, where an applicant proposes to fill wetlands the applicant shall be required to document the impact of the proposed fill on the amount of drainage entering the site versus the amount of drainage exiting the site and the difference in the quality of water entering and exiting the site.

The project will result in increased runoff due the increased impervious area, but the scale of the increase is relatively small compared to the overall runoff generated from off-site areas. The project proposes to construct approximately 47,500 sf (1.09 acres) of new impervious area. From Streamstats, the total drainage area at a point on the Soucook River, just downstream of the project, is 34.82 sq miles, which includes about 15,319 acres of impervious area. The conversion of 1.09 acres of project site to impervious area will not have a significant effect on total runoff. (see attached Water Quantity summary & Streamstats Report).

Fill placed in wetlands is small compared to total wetland volume, so loss of storage will not affect runoff volume.

Three water quality treatment practices are proposed, which will treat approximately 321,000 sf of total impervious area (including about 149,000 sf of NH 106 pavement). This is significantly larger than the target of treating 2 times the new impervious area, resulting in no adverse impact on overall water quality. In drinking water protection areas, treatment practices will include an impervious liner.

14. The potential of a proposed project to cause or increase flooding, erosion, or sedimentation.

Stream crossings and drainage outlets are designed to maintain or improve high flow capacity, with sufficient slope to preserve low flows and prevent sedimentation, and include stone aprons as needed to dissipate enery and prevent erosion.

15. The extent to which a project that is located in surface waters reflects or redirects current or wave energy which might cause damage or hazards.

The project will not redirect current or wave energy.

16. The cumulative impact that would result if all parties owning or abutting a portion of the affected wetland or wetland complex were also permitted alterations to the wetland proportional to the extent of their property rights. For example, an applicant who owns only a portion of a wetland shall document the applicant's percentage of ownership of that wetland and the percentage of that ownership that would be impacted.

Not applicable. The project is to construct public infrastructure, which is unlikely to be proposed by abutters.

17. The impact of the proposed project on the values and functions of the total wetland or wetland complex.

There will be minor impacts to the overall functions and values of several forrested and scrub-shrub wetlands, due the propsed fill slopes and to Gues Meadow Brook and an un-named intermittent stream, due to the proposed fill slopes, pipe extensions and stone outlet protection.

Avoidance and minimization measures incorporated in the design of the project have reduced the magnitude of these impacts to the extent practical. Concurrence was reached that the project's impacts can be properly addressed through mitigation in the form of an in-lieu fee payment to the NHDES Aquatic Resources Mitigation (ARM) Fund.

18. The impact upon the value of the sites included in the latest published edition of the National Register of Natural Landmarks, or sites eligible for such publication.

None.

19. The impact upon the value of areas named in acts of Congress or presidential proclamations as national rivers, national wilderness areas, national lakeshores, and such areas as may be established under federal, state, or municipal laws for similar and related purposes such as estuarine and marine sanctuaries.

N/A

20. The degree to which a project redirects water from one watershed to another.

In general, the project maintains existing drainage patterns, except as follows:

The project will redirect 22 ac from existing culverts crossing under NH 106 at Sta 5444+50 and Sta 5448+05 to the treatment area at Mudgett Hill Rd. Outflow from the treatment area will be via two culverts crossing under NH 106 at Sta 5448+05 (high flow) and Sta 5453+85 (low flow and extreme high flow), both of which eventually flow to the same wetland as the existing culverts. This redirection allows for treatment of additional impervious area and prevents the need to extend the existing culvert at Sta 5444+50 into an existing consevation easement held by NH Fish & Game. Also see Stream Crossing information for Sta 5453+85.

The project will redirect low flows from approximately 16 acres of off-site and NH 106 pavement to the Clough Hill Treatment Pond. Most of this area outlets to wetland #5 via an 18" pipe at Clough Hill Rd Sta 100+60 Rt. The proposed design includes a diversion structure at Colugh Hill Rd Sta 100+95 Lt 51' that will send low flows to the treatment area and high flows to the existing outlet location via a new 24" pipe. Existing drainage area to the pond outlet area at the Soucook River is 2.1 acres (via overland flow). The new pond outlet is expected to add 15 cfs additional flow (10 year) and 25 cfs additional flow (50 year) to the Soucook River. The outlet includes a stone apron to prevent erosion and dissipate energy before the flow enters jurisdictional area.

Additional comments

BUREAU OF ENVIRONMENT
CONFERENCE REPORT

SUBJECT: NHDOT Monthly Natural Resource Agency Coordination Meeting
DATE OF CONFERENCE: August 17, 2016
LOCATION OF CONFERENCE: John O. Morton Building
ATTENDED BY:

NHDOT
Matt Urban
Sarah Large
Ron Crickard
Tony Weatherbee
Marc Laurin
Chris Carucco
Trent Zanes
Mike Dugas
Kirk Mudgett
Victoria Chase
Jennifer Reczek
Gerry Bedard
Rebecca Martin

Army Corps of Engineers
Michael Hicks

EPA
Mark Kern

FHWA
Jamie Sikora
Mark Hasselmann

NHDES
Gino Infascelli
Lori Sommer

NH Fish & Game
Carol Henderson
Heidi Holman

NHB/DRED
Amy Lamb

Consultants/Public Participants
Peter Pitsas
Allison Reese
Peter Walker
Christine Perron

PRESENTATIONS/ PROJECTS REVIEWED THIS MONTH:
(minutes on subsequent pages)

Finalization of June 15th 2016 Meeting Minutes....2
Conway, 40018 Main Street Infrastructure Improvements (Non-Federal)....2
Dixville, 41077 (Bridge #182/070) (Non-Federal)....3
Manchester, 16099 (I-293 Exit 6 & 7) (Non-Federal)....4
Loudon-Canterbury 29613 (X-A004(201))....7
Ossipee, 10431 (X-MGS_NHS_X_T-0271(032))....9
Manchester/ Bedford Mitigation Wildlife Habitat....11
Ossipee, 14749, X-A000(490)....12

(When viewing these minutes online, click on a project to zoom to the minutes for that project

Loudon-Canterbury 29613 (X-A004(201))

Ron Crickard started the meeting by providing a summary of how the project has evolved. In 1995, an Environmental Assessment (EA) was prepared for a project proposing to widen NH Route 106 to 5 lanes from I-393 in Concord to US Route 3 in Laconia, a distance of 21 miles. Interim improvements were also identified to address short-term needs. Since the completion of the EA, the interim improvements have been constructed as smaller, standalone projects. Traffic volumes did not increase as modeled and the 5-lane widening project was never advanced to construction.

In 2012, NHDOT reevaluated a portion of the 1995 EA study limits, extending 11 miles from I-393 in Concord north to a point 0.25 miles north of Ames Road in Canterbury. The purpose of this study was to determine if the 5-lane widening recommended in 1995 was still a valid design alternative that warranted continued consideration. This Corridor Study was completed in March 2012. Based on updated traffic growth trends, it was demonstrated that the 5-lane cross section was no longer necessary to satisfy anticipated future traffic demand in the area, and that a reduced 3-lane cross section would be appropriate. The 2012 Corridor Study identified a three-phased approach to construct improvements along the 11-mile study area.

The subject project is the first phase of the improvements identified in the 2012 Corridor Study. This project begins just south of Soucook Lane in Loudon and continues north for approximately 4.5 miles to the Ames Road/Shaw Road intersection in Canterbury. NHDOT will separate this first phase into two "child" projects, 29613A and 29613B, with two separate construction contracts.

Trent Zanes provided an overview of the conceptual design that is currently proposed. The existing roadway through the project area consists of two 12' travel lanes and two 12' shoulders. The conceptual layout that is under consideration consists of widening the roadway to accommodate an additional lane. Depending on the location within the project area, the third lane would either be a 12' center turn lane (in areas with intersections and frequent driveways) or a 14' passing lane. The northbound and southbound travel lanes and shoulders would be 12' in width. Overall widening will be either 12' or 14', with 6' to 7' of widening on each side of the existing roadway in most locations. While impacts outside existing right-of-way are anticipated, these impacts will be minimal compared to the 1995 5-lane concept.

Christine Perron provided an overview of resources in the project area. The wetland delineation was recently completed and impacts still need to be quantified. Wetland impacts are expected to be below the 3-acre threshold of the Individual Permit. The Department's preference for permitting is to apply for two separate permit applications for the two contracts under Phase 1 while providing mitigation for the overall project as needed. Gino Infascelli commented that this approach makes sense as long as impacts are considered to be cumulative. Lori Sommer noted that the Five Rivers Conservation Trust is active in Loudon and would be a good resource if mitigation is needed. Mark Kern commented that an in-lieu fee may prove to be a simpler option for mitigation. Mike Hicks asked if the Department would be establishing independent utility for Phase 2 as they did for Phase 1. Doing so would justify separate permitting efforts for each phase. R. Crickard replied that it was anticipated that Phase 2 would have independent utility, although that next phase would be sometime in the future. He would send FHWA's letter regarding independent utility for Phase 1 to M. Hicks.

There are eight stream crossings in the project area. Gues Meadow Brook flows under NH Route 106 in three locations and each crossing is a Tier 3 crossing based on watershed size. In addition to Gues Meadow Brook, four culverts in the project are Tier 1 stream crossings and one is a Tier 2. The condition of culverts has not yet been assessed; therefore proposed drainage design has not yet been developed. Initial hydraulic analysis of the Gues Meadow Brook crossings does show that all three crossings currently pass the 100-year storm, which will be one factor taken into consideration when developing design alternatives for these structures. L. Sommer noted that any work on these crossings should consider making improvements in wildlife connectivity. She recommended referring to a study that was completed for the speedway that looked at wildlife connectivity and permeability of NH Route 106.

The 2014 303(d) list includes Gues Meadow Brook as an impaired surface water due to benthic macroinvertebrate assessments and pH. Given the scope of the project and the proposed increase in impervious surface, the Department is anticipating the need for stormwater treatment. The type and location of treatment areas is currently under study.

Conservation land is located within the project area. Shaker State Forest is located on the west side of the roadway at the north end of the project. NH Fish & Game holds easements on two properties located on the east side of the roadway. These properties will be entered into design files and it will be determined if impacts on these properties can be avoided. If impacts cannot be avoided, appropriate coordination will take place. L. Sommer stated that impacts to lands under conservation easement would require coordination with the Charitable Trusts Unit of the Attorney General's Office. Carol Henderson also recommended coordinating with Rich Cook at NH Fish & Game. C. Perron replied that she had been in touch with Rich about the project and would keep him informed as the project moved forward.

State-listed species in the project area include a sensitive plant species located in Shaker State Forest approximately 300' from the roadway. Impacts at this location are unlikely but the site will be flagged in design files. There are also records of American eel, bridle shiner, and wood turtle in the vicinity of the project. Coordination with NH Fish & Game on these species will be initiated once more details are available on drainage design.

Small-whorled pogonia, a federally-listed species, was identified in the project area in 2011 (one stem). The location and surrounding forested habitat was surveyed this July and the plant was not found. As clearing limits are developed for the project, areas of proposed tree clearing will be assessed for suitable small whorled pogonia habitat and additional surveys will be carried out if necessary. Amy Lamb recommended contacting Maria Tur at the US Fish & Wildlife Service. Since the USFWS uses a larger buffer around this species, additional survey may be required near the site where it was previously identified.

An acoustic bat survey was completed to assess the potential presence of northern long-eared bat. The survey consisted of eight detector sites. Based on the data collected, it was determined that the presence of this species is not probable. The US Fish & Wildlife Service has reviewed the survey results and concurs that northern long-eared bat is not present.

Mapped 100-year floodplains are adjacent to the project area at two locations: Kimball Brook at the north end of the project and the northernmost crossing of Gues Meadow Brook. Impacts to floodplains will be assessed as design of the project progresses.

M. Hicks asked when submittal of permit applications was anticipated. R. Crickard said that the first contract for this phase was expected to advertise in 2018, so the permit application would likely be submitted by the fall of 2017.

M. Hicks asked how long the project is. T. Zanes replied that Phase 1 is about 4.5 miles in length.

This project has not been previously discussed at a Monthly Natural Resource Agency Coordination Meeting.

Ossipee, 10431 (X-MGS_NHS_X_T-0271(032))

Jon Hebert provided a brief overview of the project. He mentioned that the project has been around for around 20 years and, though the project limits have remained the same, the scope has been reduced due to a limited budget. The project has gone through several iterations, including a bypass option. The preferred alternative at this time is 3.4 miles in length and includes 3 treatment types. J. Hebert showed a concept plan for the project and explained that there are three different treatments proposed for the project.

At the southern portion of the project beginning at the intersection of Route 16 and Route 28 the project proposes signal upgrades, restriping and a pavement overlay. The treatment will extend from the intersection with Route 28 on Route 16 to the intersection with Isaac Buswell Road. There will be some drainage improvements in this area and a small amount of pavement removed (the slip ramp free right turn lane onto Route 28).

The middle portion of the project is where the major work is proposed. This section begins at around the intersection with Isaac Buswell Road and extending north to just north of Polly's Crossing Road. The proposed treatment is step box reconstruction with widening and drainage work. This section of roadway has not been improved, the northern and southern sections have been improved by previous projects. Currently, the design includes removing the concrete from the old roadway that is underneath the current roadway. The proposal is for full reconstruction of the roadway (new box and pavement) and expanding the road from 24 feet to 32 feet wide by adding 4 foot shoulders (3 feet of paved shoulder). J. Hebert described that the project will increase the impervious area in the project area by approximately 13,000 square feet.

The northern section will be from just north of Polly's Crossing Road north for around 2.1 miles to around the intersection with Route 16B, the treatment will be to cold plane 3 inches of existing pavement and put back 3 inches of HBP pavement and drainage improvements. The road work will be within the existing edge of pavement.

J. Hebert explained that the project will include some drainage work and will require some minor right-of-way purchases. At this time the locations of drainage improvements are still being field verified. Rebecca Martin and Matt Urban updated the wetland delineation for the project area.

February 20, 2018

Loudon-Canterbury, 29613

Mitigation Report

The proposed project does not permanently impact greater than 10,000 sq. ft. of wetlands. Total permanent wetland impacts are 7,966 sq. ft. As such no wetland mitigation is proposed. However, this project will permanently impact various streams within the projects limits. There are some intermittent streams that we will mitigate for the permanent impacts to channel by the linear foot. There are also some permanent impacts to perennial streams. Specifically, there is a total of 344 LF of permanent impact the channel of perennial streams, there is 56 LF of permanent impact to the channel of intermittent streams, and 33LF of permanent impact to the right bank of a perennial stream.

Using the Arm-Fund calculator for stream impacts this project will require mitigation in the amount of $106,102.32.It should be noted that the Department held a public informational meeting on November 30, 2016 and a Public Hearing on October 23, 2017. An opportunity to provide alternative mitigation proposals was given. No alternatives were received.

The Department is proposing to move forward with mitigation in the form of an In-lieu fee payment into the Arm-Fund. The Department will make a single and onetime payment into the Arm-Fund for these impacts in the amount of $106,102.32.

DES AQUATIC RESOURCE MITIGATION FUND
STREAM PAYMENT CALCULATION

INSERT LINEAR FEET OF IMPACT on BOTH BANKS AND CHANNEL	Right Bank	33.00
	Left Bank	0.0000
	Channel	400.0000
	TOTAL IMPACT	433.0000
	Stream Impact Cost:	$88,418.60
	DES Administrative cost:	
		$17,683.72
********* TOTAL ARM FUND STREAM PAYMENT********		
		$106,102.32

New Hampshire DOT Department of Transportation

PROJECT	Loudon		
PROJECT NO.	29613	ROUTE	NH 106
CALCULATED BY	cac	DATE	12/6/2017
CHECKED BY	jjn	DATE	2/13/2018
SUBJECT	Water Quantity	SHEET	1 OF 3

Project wide water quantity impact on Soucook River (Phase 1)

Analysis point - just upstream of a private bridge located approx 900' southeast of NH 106 Sta 5438+75

Latitude 43.3355 Longitude -71.4657

Data from Streamstats Report:

	Sq Miles	Acres
Drainage area	**34.82**	**1,516,759**
% wetlands	5.47	82,967
% forrest	46.72	708,630
% developed	4.13	62,642
Ave % Impervious	1.01	15,319

	cfs
2 Year Peak Flood	1000
10 Year Peak Flood	2020
50 Year Peak Flood	3080
100 Year Peak Flood	3640

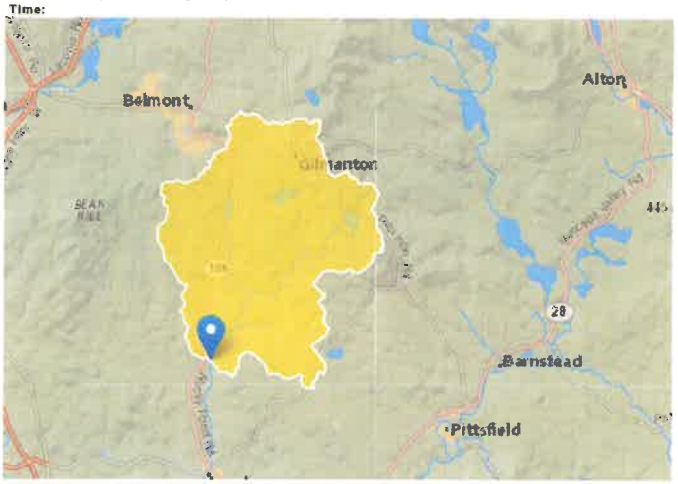
The Project will not change the drainage area area contributing to the analysis point.
The Project proposes to convert just under 10,000 sf (0.23 ac) of wetlands to grass or stone stabilized slopes and/or drainage outlet areas.
The Project proposes to convert approx 47,500 sf (1.09 ac) of existing grass roadside to impervious area (pavement).
The Project proposes to convert approx 1.8 acres of existing wooded areas to grass slopes and/or treatment areas.

Based on the scale of the proposed impacts, no measurable change in runoff at the analysis point is anticipated.

29613 Loudon Phase 1

Soucook River downstream of Phase 1

Region ID: NH
Workspace ID: NH20171205183108668000
Clicked Point (Latitude, Longitude): 43.33551, -71.46571
Time: 2017-12-05 13:31:26 -0500



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
APRAVPRE	Mean April Precipitation	3.839	inches
BSLDEM30M	Mean basin slope computed from 30 m DEM	8.053	percent
CENTROIDX	Basin centroid horizontal (x) location in state plane coordinates	1046416.1	
CENTROIDY	Basin centroid vertical (y) location in state plane units	322849.3	
CONIF	Percentage of land surface covered by coniferous forest	17.1302	percent
CSL10_85	Change in elevation divided by length between points 10 and 85 percent of distance along main channel to basin divide - main channel method not known	60.9	feet per mi
DRNAREA	Area that drains to a point on a stream	34.82	square miles
ELEVMAX	Maximum basin elevation	1458.013	feet
LC11DEV	Percentage of developed (urban) land from NLCD 2011 classes 21-24	4.13	percent
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	1.01	percent
MINTEMP_W	Mean winter minimum air temperature over basin surface area	12.993	degrees F
MIXFOR	Percentage of land area covered by mixed deciduous and coniferous forest	29.5866	percent
OUTLETX	Basin outlet horizontal (x) location in state plane coordinates	1037715	
OUTLETY	Basin outlet vertical (y) location in state plane coordinates	304575	
PREBC0103	Mean annual precipitation of basin centroid for January 1 to March 15 winter period	6.89	inches
PREBC_1112	Mean annual precipitation of basin centroid for November 1 to December 31 period	7.32	inches
PRECIPCENT	Mean Annual Precip at Basin Centroid	39.8	inches
PRECIPOUT	Mean annual precip at the stream outlet (based on annual PRISM precip data in inches from 1971-2000)	38.5	inches
PREG_03_05	Mean precipitation at gaging station location for March 16 to May 31 spring period	7.9	inches
PREG_06_10	Mean precipitation at gaging station location for June to October summer period	16.8	inches
SNOFALL	Mean Annual Snowfall	79.483	inches
TEMP	Mean Annual Temperature	44.181	degrees F
TEMP_06_10	Basinwide average temperature for June to October summer period	60.615	degrees F
WETLAND	Percentage of Wetlands	5.4715	percent

Peak-Flow Statistics Parameters [Peak Flow Statewide SIR2008 5206]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	34.82	square miles	0.7	1290
APRAVPRE	Mean April Precipitation	3.839	inches	2.79	6.23
WETLAND	Percent Wetlands	5.4715	percent	0	21.8

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
CSL10_85	Stream Slope 10 and 85 Method	60.9	feet per mi	5.43	543

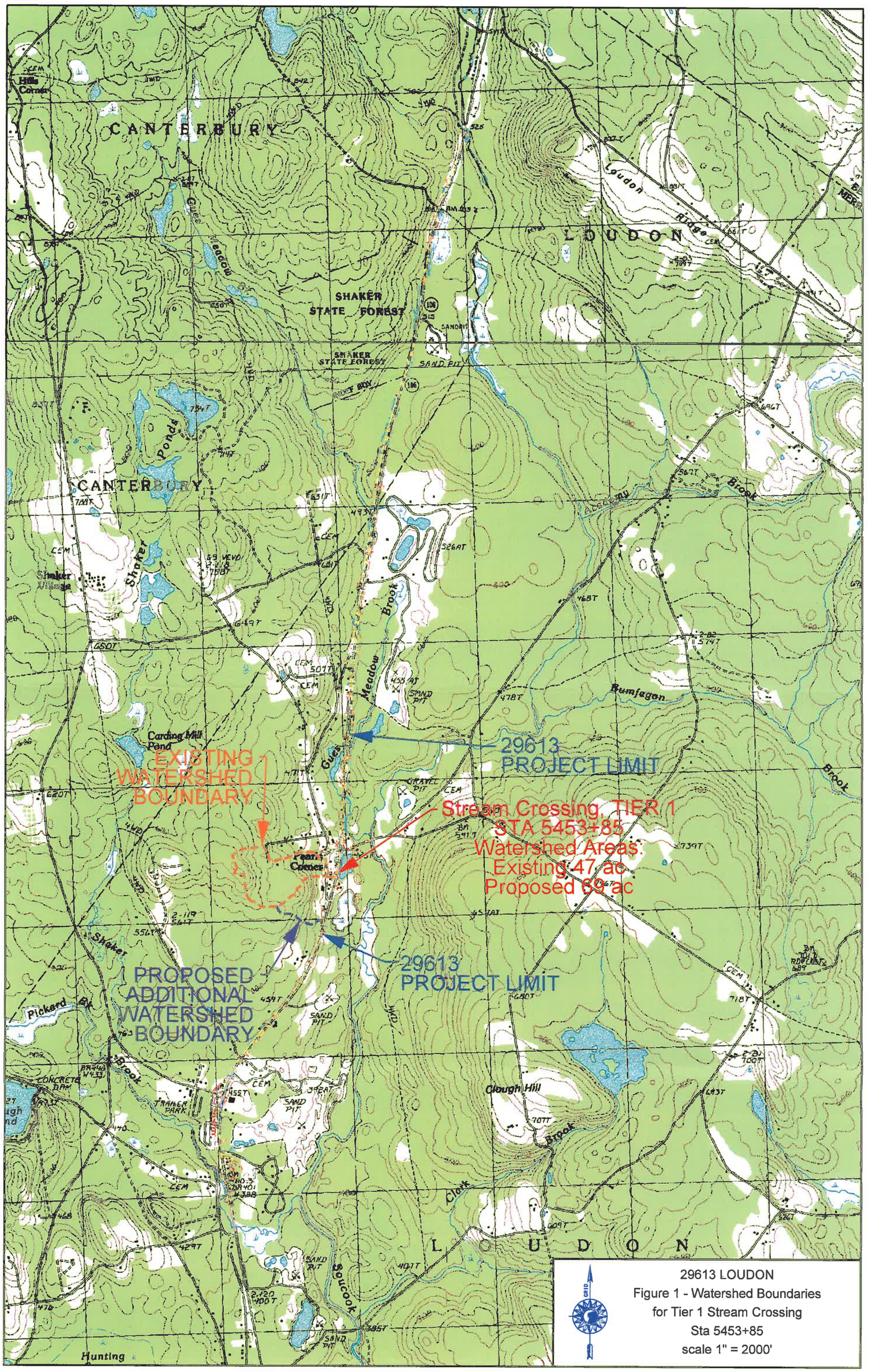
Peak-Flow Statistics Flow Report [Peak Flow Statewide SIR2008 5206]

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

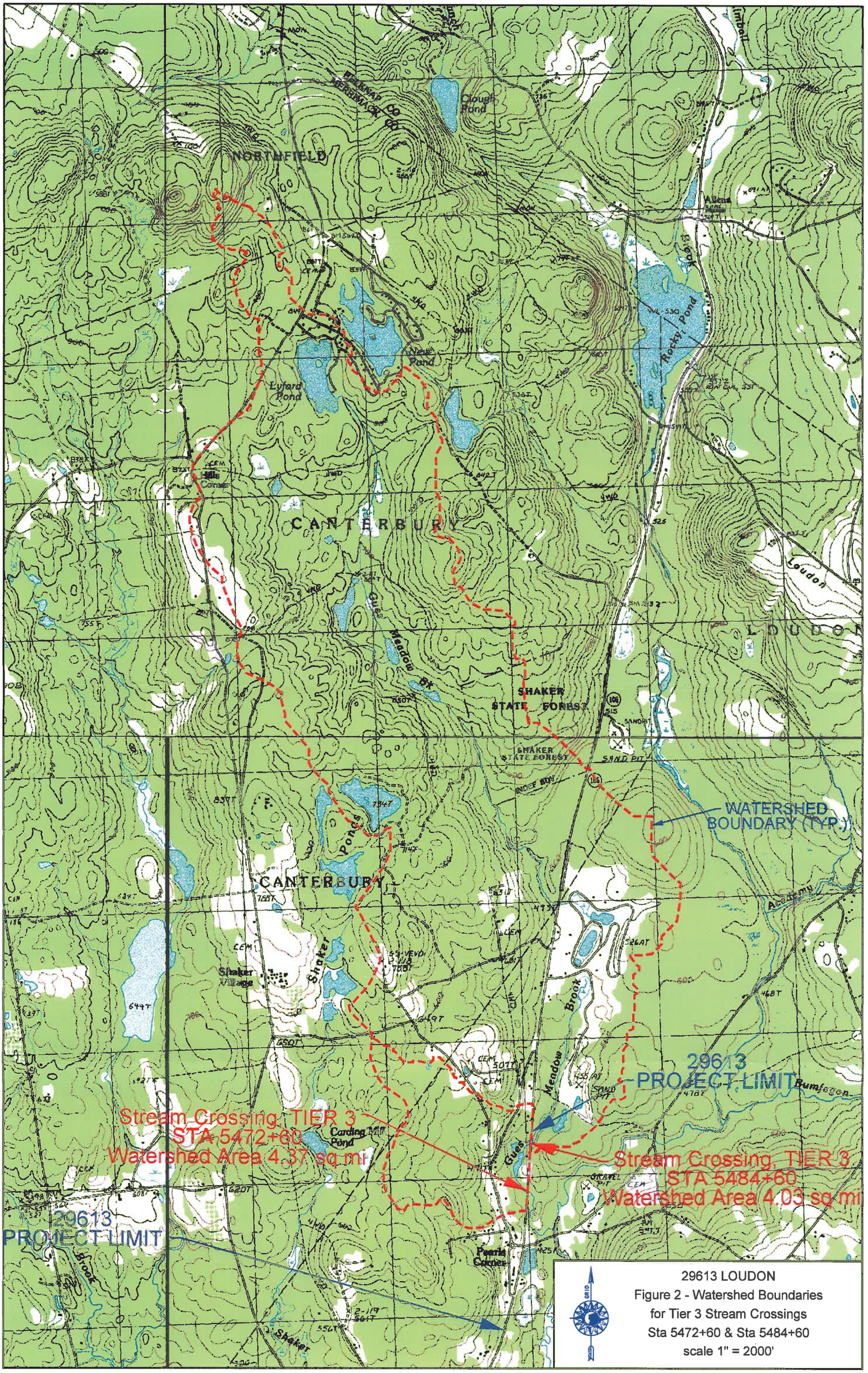
Statistic	Value	Unit	PII	PIu	SEp	Equiv. Yrs.
2 Year Peak Flood	1000	ft^3/s	620	1620	30.1	3.2
5 Year Peak Flood	1570	ft^3/s	959	2560	31.1	4.7
10 Year Peak Flood	2020	ft^3/s	1220	3360	32.3	6.2
25 Year Peak Flood	2610	ft^3/s	1520	4470	34.3	8
50 Year Peak Flood	3080	ft^3/s	1740	5430	36.4	9
100 Year Peak Flood	3640	ft^3/s	1990	6640	38.6	9.8
500 Year Peak Flood	4930	ft^3/s	2500	9730	44.1	11

Peak-Flow Statistics Citations

Olson, S.A.,2009, Estimation of flood discharges at selected recurrence intervals for streams in New Hampshire: U.S.Geological Survey Scientific Investigations Report 2008-5206, 57 p. (http://pubs.usgs.gov/sir/2008/5206/)



29613 LOUDON
Figure 1 - Watershed Boundaries
for Tier 1 Stream Crossing
Sta 5453+85
scale 1" = 2000'



29613 LOUDON
Figure 2 - Watershed Boundaries
for Tier 3 Stream Crossings
Sta 5472+60 & Sta 5484+60
scale 1" = 2000'

NH Department of Transportation
Bureau of Highway Design
Project, #29613

Crossing Location NH 106 Sta 5453+85

Env-Wt 904.02 Tier 1 Stream Crossings
New Tier 1 Crossings;
Replacement Tier 1 Crossings

Also see the attached Stream Crossing Summary information.

(1) The crossing shall meet the general design considerations specified in Env-Wt 904.01, as follows:

Env-Wt 904.01
Not be a barrier to sediment transport;

The proposed structure is a 36" concrete pipe with a slope of 3.9%, which is sufficient to maintain a self-cleaning velocity. The flowline through the crossing has no features that would trap sediment.

Prevent the restriction of high flows and maintain existing low flows;

Upsizing the existing culvert from 24" diameter to 36" diameter will increase the capacity to pass high flows. The upstream and downstream channels will match the proposed pipe inverts. The proposed design will not obstruct or substantially disrupt low flows.

Not obstruct or otherwise substantially disrupt the movement of aquatic life indigenous to the waterbody beyond the actual duration of construction;

The proposed pipe will be concrete, with headwalls and adequate channels on the upstream and downstream ends. The upstream and downstream channels will match the proposed pipe inverts. The proposed design will not obstruct or substantially disrupt the movement of aquatic life.

Not cause an increase in the frequency of flooding or overtopping of banks;

The existing pipe is a 24" diameter concrete pipe. NHDOT Hwy Maintenance has indicated there is no history of flooding or damage related to this crossing. The proposed design will upsize the pipe from 24" to 36" diameter, increasing capacity.

Preserve watercourse connectivity where it currently exists;

Connectivity currently exists on the upstream side of the crossing. The proposed channel modifications will preserve connectivity between the existing stream and new pipe invert.

Restore watercourse connectivity where: (1) Connectivity previously was disrupted as a result of human activity(ies); and (2) Restoration of connectivity will benefit aquatic life upstream or downstream of the crossing, or both;

The existing culvert discharges into a stone energy dissipator / retaining wall which is perched about 5' above the adjacent wetland. The proposed design will replace the retaining wall with a stone lined channel connecting the pipe outlet to the adjacent wetland, restoring connectivity.

Not cause erosion, aggradation, or scouring upstream or downstream of the crossing; and

Sufficient portions of the upstream and downstream channels will be lined with stone to prevent scour and erosion. As noted above, the crossing will not be a barrier to sediment transport or cause aggradation.

Not cause water quality degradation.

The proposed pipe will have no effect on water quality.

(2) The crossing shall be designed to accommodate the greater of the 50-year frequency flood or applicable federal, state, or local requirements.

The proposed culvert passes the 50 year flow at a headwater elevation of 419.5, which is 0.75' below the lowest edge of NH 106 pavement.

(3) A Tier 1 stream crossing shall be a span structure, pipe arch, open-bottom culvert, or closed-bottom culvert, with or without being embedded with stream simulation.

The proposed pipe is a 36" diameter concrete pipe, closed bottom, not embedded.

If any of the above criteria cannot be met, approval for an alternative design must be requested and a technical report (Env-Wt 904.09) must be included with the application package.

New Hampshire DOT
Department of Transportation

PROJECT	Loudon		
PROJECT NO.	29613	ROUTE	NH 106
CALCULATED BY	CAC	DATE	12/13/2017
CHECKED BY	JJN	DATE	2/13/2018
SUBJECT	Stream Crossings	SHEET	1 OF 2

Sta 5453+85 Tier 1 Crossing Wetland ID 4 & 5, Class R4SB3J

Existing Conditions:

Drainage Area	47 AC	Watershed ID = B4, B4A		
Existing Pipe	24" concrete		Upstream Inv	416.07
	Length (ft)	84	Downstream Inv	412.09
	Slope	4.7%		

The stream is not shown on the USGS Topo Map and does not appear in the Streamstats utility.

The 24" pipe was constructed by Project P2440 in the late 1950's.
Project 10672A (late 1990's) extended the pipe and added an energy dissipator at the outlet.

Inlet Conditions - Top of headwall elevation 419.6 (3.5' above invert)
NH 106 edge of pavement elevation 420.1 (at Sta 5450+50)
High flows bypass the culvert to the north via the roadside ditch, beginning at el 418.4 (2.3' above invert).
Bypass flow goes to an existing non-jurisdictional culvert at Sta 5456+81.
Both culverts outlet to the same waterbody, a ponded area delineated as wetland #5.
Field review found no erosion or sedimentation issues.

Outlet conditions - the culvert discharges into a stone energy dissipatior / retaining wall
about 20' from the east edge og NH 106, near the base of the roadway embankment.
The top of the retaining wall is 5' - 6' above the adjacent wetland (perched).
Field review found no erosion or sedimentation issues.

Hydraulic analysis of the next upstream structure (24" pipe under Mudgett Hill Rd Sta 96+60) indicates that high flows divert along the west side of Mudgett Hill Rd and flow to the southwest corner of NH 106 and Mudgett Hill Rd. From there, flows can pass under NH 106 through the culverts at Sta 5441+10 and Sta 5448+05. The following analyis only considers the flow that passes through the 24" pipe under Mudgett Hill Road and the local overland flow.

10 Year Storm runoff	21 cfs	(TR-55 Method)
50 Year Storm runoff	24 cfs	(TR-55 Method)

Analysis from HY-8:
Q10 HW Elev = 418.72 approx 20 cfs through the culvert, 1 cfs bypass
Q50 HW Elev = 418.95 approx 22 cfs through the culvert, 2 cfs bypass (HW/D = 1.4)

Q10 outlet velocity 13.5 ft/s
Q50 outlet velocity 13.8 ft/s

District Comments - No reports of flooding or damage to roadway or private property related to this crossing. It was noted that water lays in the ditch along the west side of NH 106, south of the inlet. The referenced ditch should drain to an existing non-jurisdictional culvert at Sta 5448+00.

Existing 24" RCP capacity is 18 cfs at HW elev 418.4 (just prior to bypass via the roadside ditch to the north
Maximum capacity of the crossing is 57 cfs at HW El 420.1 (lowest NH 106 E.P.)

New Hampshire DOT Department of Transportation

PROJECT	Loudon		
PROJECT NO.	29613	ROUTE	NH 106
CALCULATED BY	CAC	DATE	12/13/2017
CHECKED BY	JJN	DATE	2/13/2018
SUBJECT	Stream Crossings	SHEET	2 OF 2

Sta 5453+85 Tier 1 Crossing (continued)

Proposed Design: Drainage Area 69 AC Watershed ID = B4, B4A, B6, B7, B9, B14

The exsiting 24" concrete culvert will be replaced with a 36" concrete culvert.

10.3 ac will be shifted to the proposed treatment area at Mudgett Hill Rd (Area B7) which will connect to the stream via a 12" pipe and spillway at the new 36" culvert inlet.
Area B7 currently drains under NH106 through a 15" culvert at Sta 5444+48. This culvert will be abandoned since the Conservation Easement at the outlet does not allow for pipe extension).
Areas B6, B9, and B14 currently drain to a 15" culvert at Sta 5448+05, within the treatment area.
All areas involved drain to the same wetland, located approx 400' east of NH 106 Sta 5444+50.

As noted in the existing analysis, the next upstream structure (24" pipe Mudgett Hill Rd Sta 96+60) does not pass high flows. In the proposed condition, flow that diverts along the west side of Mudgett Hill Rd will flow into the treatment area and are accomodated by the design of the treatment area and the upsized culverts at Sta 5448+08 and 5453+85.

Low flows will be treated and discharged into the stream at the 36" culvert inlet. High flows will exit the treatment area through an outlet structure and new 24" culvert at Sta 5448+05.
For storms greater than 10 year, some flow will divert to the stream at the 36" culvert inlet.

Proposed Pipe	36" concrete		Upstream Inv	414.70
	Length (ft)	95	Downstream Inv	411.00
	Slope	3.9%		

The proposed pipe will be longer by 5' upstream and 6' downstream.
New concrete headwalls will be constructed on both ends.
The stream approach to the inlet will be regraded to match the new culvert invert.
The regraded streambed will be lined with Class B stone.
The north side ditch will continue to function as a bypass for high flows, beginning at Elev 419.5. Bypass flow will go to the culvert at Sta 5456+81.

The downstream retaining wall will be removed and replaced with a 3' wide channel at approx 15% slope. Stone lining will be required. The channel will resore connectivity to wetland #5.

Top of inlet headwall elevation 419.2 (4.5' above invert)
Lowest NH 106 proposed edge of pavement elevation 420.25 (at Sta 5451+00)
Flows greater than the 50 year will continue to bypass the culvert to the north via the roadside ditch, beginning at elev 419.5 (4.8' above invert) and draining to the culvert at Sta 5456+81.

10 Year Storm runoff	25 cfs	(TR-55 Method)
50 Year Storm runoff	55 cfs	(TR-55 Method)

Analysis from HY-8:
Q10 HW Elev = 416.95 no bypass
Q50 HW Elev = 418.59 no bypass (HW/D = 1.3)

Q10 outlet velocity 13.4 ft/s
Q50 outlet velocity 15.8 ft/s

Propoed 36" RCP capacity is 67 cfs at HW elev 419.5 (just prior to bypass via the roadside ditch to the north
Maximum capacity of the crossing is 85 cfs at HW El 420.25 (lowest NH 106 E.P.)

NH Department of Transportation
Bureau of Highway Design
Project, #29613
Env-Wt 904.09 Alternative Design
TECHNICAL REPORT

NH 106 Sta 5472+60 Existing Twin 72" RCP crossing

Env-Wt 904.09(a) - If the applicant believes that installing the structure specified in the applicable rule is not practicable, the applicant may propose an alternative design in accordance with this section.

Please explain why the structure specified in the applicable rule is not practicable (Env-Wt ~~101.69~~ 101.74 defines practicable as *available and capable of being done after taking into consideration costs, existing technology, and logistics in light of overall project purposes.)*

Assessment by McFarland Johnson indicates a bankfull with at this crossing of 18'. The Stream Crossing Guidelines recommend structure width of about 24'. Construction of a compliant structure was determined not practicable due to costs and impacts. The recommended structure would be a bridge, approximately 24' x 80', at a 20 degree skew, with a preliminary cost of $1.6 million. A raise in the NH 106 road profile would also be required resulting in increased slope, wetland, and property impacts for several hundred feet north and south of the crossing. The existing crossing has no history of flooding and the preliminary cost for the proposed design is about $75,000.

Also see the attached Stream Crossing Summary information

The proposed alternative meets the specific design criteria for Tier 2 and Tier 3 crossings to the *maximum extent practicable*, as specified below.

Env-Wt 904.05 Design Criteria for Tier 2 and Tier 3 Stream Crossings – New Tier 2 stream crossings, replacement Tier 2 crossings that do not meet the requirements of Env-Wt 904.07, and new and replacement Tier 3 crossings shall be designed and constructed:

(a) In accordance with the NH Stream Crossing Guidelines.
It is not practicable to design and construct alternatives other than the proposed modification. Since the existing capacity is adequate and the project is not significantly affecting runoff from high flow events, the additional costs and impacts associated with replacement cannot be justified.

(b) With bed forms and streambed characteristics necessary to cause water depths and velocities within the crossing structure at a variety of flows to be comparable to those found in the natural channel upstream and downstream of the stream crossing.
It is not practicable to alter water depths or velocities within the existing culvert without adversely affecting hydraulic capacity.

(c) To provide a vegetated bank on both sides of the watercourse to allow for wildlife passage.
It is not practicable to provide vegetated banks within the existing culvert without adversely affecting hydraulic capacity.

(d) To preserve the natural alignment and gradient of the stream channel, so as to accommodate natural flow regimes and the functioning of the natural floodplain.
It is not practicable to alter the existing culvert alignment or grade as part of the proposed modification treatment.

(e) To accommodate the 100-year frequency flood, to ensure that (1) there is no increase in flood stages on abutting properties; and (2) flow and sediment transport characteristics will not be affected in a manner which could adversely affect channel stability.
The proposed modification will have no significant effect on flood stages or sediment transport characteristics.

(f) To simulate a natural stream channel.
It is not practicable to simulate a natural stream channel within the existing culvert without adversely affecting hydraulic capacity.

(g) So as not to alter sediment transport competence.
The proposed modification will have no significant effect on sediment transport competence.

Env-Wt 904.09(c)(3) – The alternative design must meet the general design criteria specified in Env-Wt 904.01:

Env-Wt 904.01
(a) Not be a barrier to sediment transport;
The proposed modification will have no significant effect on sediment transport.

(b) Prevent the restriction of high flows and maintain existing low flows;
The proposed modification will have no significant effect on high or low flows.

(c) Not obstruct or otherwise substantially disrupt the movement of aquatic life indigenous to the waterbody beyond the actual duration of construction;
The proposed modification will improve opportunity for the movement of aquatic life during very dry periods by raising the water level at the outlet.

(d) Not cause an increase in the frequency of flooding or overtopping of banks;
The proposed modification will not significantly change the existing capacity and will not cause an increase in the frequency of flooding or overtopping.

(e) Preserve watercourse connectivity where it currently exists;
The proposed modification will have no effect on watercourse connectivity where it currently exists.

(f) Restore watercourse connectivity where: (1) Connectivity previously was disrupted as a result of human activity(ies); and (2) Restoration of connectivity will benefit aquatic life upstream or downstream of the crossing, or both;
The proposed modification will improve opportunity for the movement of aquatic life during very dry periods by raising the water level at the outlet.

(g) Not cause erosion, aggradation, or scouring upstream or downstream of the crossing; and
The proposed rehabilitation will not significantly change the outlet velocity. Stone lining will be added around the headwalls and wing walls to prevent scour. The proposed rehabilitation will not cause erosion or aggradation.

(h) Not cause water quality degradation.
The proposed modification will have no effect on water quality.

*****Note: An alternative design for <u>Tier 1</u> stream crossings must meet the general design criteria (Env-Wt 904.01) only to the *maximum extent practicable.***

New Hampshire DOT
Department of Transportation

PROJECT	Loudon		
PROJECT NO.	29613	ROUTE	NH 106
CALCULATED BY	CAC	DATE	12/13/2017
CHECKED BY	JJN	DATE	2/13/2018
SUBJECT	Stream Crossings	SHEET	1 OF 2

Sta 5472+60 Tier 3 Crossing **Gues Meadow Brook** Wetland ID# 6, Class R2UB1H

Existing Conditions:

Drainage Area	4.37 sq miles	(approx 2,800 ac)	Watershed ID = C	
Existing Pipe	Twin 72" concrete		Upstream Inv	419.85
	Length (ft)	65	Downstream Inv	419.30
	Slope	0.85%		

These pipes were constructed by Project P2440 in the late 1950's.
Stone headwalls have had minor repairs. No other changes / repairs known.
There is a steel & wood snowmobile bridge across the inlet adjacent to the inlet headwall.

Inlet Conditions - Top of headwall elevation 427.5 (7.65' above invert)
Approach channel about 12' wide, with forrested floodplain on the north side and a large gravel parking area on the south side about 7' higher than streambed.
At headwater depths above 427.25, excess flow will overtop the driveway just south of the inlet, and flow along the roadside ditch to an 18" culvert crossing under NH 106 at Sta 5466+35.

Field review found loose stones and cracks in the headwall and a small amount of woody debris. No evidence of erosion or sedimentation. The pipes were in good condition.

Outlet conditic Downstream channel is about 30' wide at the pipe outlet and narrows to about 14' wide.
Channel is about 3' deep with forrested floodplain on both sides. Channel slope about 0.6%.
At very low flows, the outlet is perched about 6"

Field review found the outlet channel is relatively stable, with minor erosion along the banks. Headwalls showed signs of recent repairs. Pipes were in good condition.

District Comments - No reports of flooding or damage to roadway or private property related to this crossing. It was noted that the headwalls are in need of replacement and that water ponds in the northwest corner between the brook and NH 106 during high flow events.

Design Flow:
Streamstats Q50 = 540 cfs +-36.4% (range 343 cfs to 737 cfs) Q100 = 654 cfs Q10 = 333 cfs
An alternate regression menthod (FHWA Report RD-77-159) predicts the Q50 between 672 cfs and 950 cfs
HY-8 capacity just prior to overtopping (El 427.25) = 581 cfs
Design flows will be based on the Streamstats peak flow values.

Analysis from HY-8:
Q10 HW Elev = 424.9 (HW/D = 0.84)
Q50 HW Elev = 426.81 (HW/D = 1.16)
Q100 HW Elev = 427.8 (HW/D = 1.33)

Q10 outlet velocity 11.5 ft/s
Q50 outlet velocity 13.2 ft/s
Q100 outlet velocity 13.9 ft/s

New Hampshire DOT
Department of Transportation

PROJECT	Loudon		
PROJECT NO.	29613	ROUTE	NH 106
CALCULATED BY	CAC	DATE	12/13/2017
CHECKED BY	JJN	DATE	2/13/2018
SUBJECT	Stream Crossings	SHEET	2 OF 2

Sta 5472+60 Tier 3 Crossing (continued)

Proposed Design: Drainage Area 4.37 sq miles (approx 2,800 ac) Watershed ID = C

Based on the 2005 NH Regional Hydraulic Curves, the calculated bankfull width is 25.65'.
Based on the Consultant's research and field review, bankfull width is 18'.
NH Stream Crossing Guidelines recommend a structure width of 1.2 x 18' + 2' = 23.6'

Design Flow:
From Streamstats, the average impervious area for the 2,800 ac watershed is 4.02%,
The project will not change the drainage boundary for the watershed.
The project proposes to convert approximately 0.26 ac of existing grass roadside to pavement (increasing the impervious area from 112.5 ac to 112.76 ac). Based on the scale of the proposed impact, no measurable change in runoff to the crossing is anticipated.
No change to Design flow as a result of the project. Q50 = 540 cfs (Streamstats)

Based on the condition of the existing pipes, past performance, and capacity analysis, the proposed design is to extend the pipes by 12' on each end and construct new headwalls.
The exisitng snowmobile bridge at the inlet will be removed.

Proposed Pipe	Twin 72" concrete		Upstream Inv	419.95
	Length (ft)	88	Downstream Inv	419.20
	Slope	0.85%		

The proposed change will not significantly affect capacity, headwater depth or outlet velocity.
The driveway just south of the inlet will be reconstructed and raised to El 427.5 to match the new NH 106 edge of pavement, increasing capacity prior to overtopping.

To correct the perched outlet at very low flows, a boulder weir is proposed at 45' downstream of the outlet. This will consist of bloulders, approx 3' in diameter, placed in the channel with top elevation equal to the pipe outlet elevation,
This will raise the low flow water elevation and eliminate the perch.
At high flows, the culvert operates in inlet control, so capacity is not affected by the weir.

Analysis from HY-8:
Q10 HW Elev = 425.0 (HW/D = 0.84)
Q50 HW Elev = 426.91 (HW/D = 1.16)
Q100 HW Elev = 427.96 (HW/D = 1.34)
Capacity just prior to overtopping (El 427.5) = 595 cfs

Q10 outlet velocity 11.7 ft/s
Q50 outlet velocity 13.4 ft/s
Q100 outlet velocity 14.1 ft/s

Construction of a compliant structure was considered and determined not practicable due to cost and impacts. The structure would be a bridge, approximately 24' x 80', at a 20 degree skew, with a preliminary cost of $1.6 million (1920 sf x $750 / sf +10%).
A raise in the NH 106 profile would be required, increasing slope impacts, wetland impacts and property impacts for several hundred feet north and south.
The preliminary cost for the proposed design is about $75,000.

29613 Loudon Twin 72" Pipes Sta 5472+60

StreamStats Report

Region ID: NH
Workspace ID: NH20161109144318536000
Clicked Point (Latit... 43.34530,-71.46724
Time: 2016-11-09 16:44:18 -0500

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	4.37	square miles
APRAVPRE	Mean April Precipitation	3.707	inches
WETLAND	Percentage of Wetlands	3.8252	percent
CSL10_85	Change in elevation divided by length between points 10 and 85 percent of distance along main channel to basin divide - main channel method not known	80.6	feet per mi
OUTLETX	Basin outlet horizontal (x) location in state plane coordinates	1037295	State plane coordinates
OUTLETY	Basin outlet vertical (y) location in state plane coordinates	308145	State plane coordinates
CENTROIDX	Basin centroid horizontal (x) location in state plane coordinates	1034920.8	State plane coordinates
CENTROIDY	Basin centroid vertical (y) location in state plane units	318381.3	State plane coordinates
BSLDEM30M	Mean basin slope computed from 30 m DEM	7.36	percent
ELEVMAX	Maximum basin elevation	1113.96	feet
TEMP	Mean Annual Temperature	44.416	degrees F
TEMP_06_10	Basinwide average temperature for June to October summer period	60.823	degrees F
CONIF	Percentage of land surface covered by coniferous forest	8.5044	percent
MIXFOR	Percentage of land area covered by mixed deciduous and coniferous forest	29.2491	percent
PREBC0103	Mean annual precipitation of basin centroid for January 1 to March 15 winter period	6.65	inches
PREG_06_10	Mean precipitation at gaging station location for June to October summer period	16.9	inches
PREG_03_05	Mean precipitation at gaging station location for March 16 to May 31 spring period	8	inches
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	4.02	percent
LC11DEV	Percentage of developed (urban) land from NLCD 2011 classes 21-24	7.65	percent
MINTEMP_W	Mean winter minimum air temperature over basin surface area	13.05	degrees F
PREBC_1112	Mean annual precipitation of basin centroid for November 1 to December 31 period	7.17	inches
PRECIPCENT	Mean Annual Precip at Basin Centroid	38.9	inches

Parameter Code	Parameter Description	Value	Unit
PRECIPOUT	Mean annual precip at the stream outlet (based on annual PRISM precip data in inches from 1971-2000)	38.7	inches
SNOFALL	Mean Annual Snowfall	75.855	inches

Peak-Flow Statistics Parameters [100.00 Percent Peak Flow Statewide SIR2008 5206]

Parameter	Value	Min Limit	Max Limit
Drainage Area	4.37	0.7	1290
Mean April Precipitation	3.707	2.79	6.23
Stream Slope 10 and 85 Method	80.6	5.43	543
Percent Wetlands	3.8252	0	21.8

Peak-Flow Statistics Flow Report [100.00 Percent Peak Flow Statewide SIR2008 5206]

Statistic	Value	Unit	Prediction Error
2 Year Peak Flood	151	ft^3/s	30.1
5 Year Peak Flood	250	ft^3/s	31.1
10 Year Peak Flood	333	ft^3/s	32.3
25 Year Peak Flood	446	ft^3/s	34.3
50 Year Peak Flood	540	ft^3/s	36.4
100 Year Peak Flood	654	ft^3/s	38.6
500 Year Peak Flood	931	ft^3/s	44.1

Peak-Flow Statistics Citations

Olson, S.A., 2009, Estimation of flood discharges at selected recurrence intervals for streams in New Hampshire: U.S.Geological Survey Scientific Investigations Report 2008-5206, 57 p. (http://pubs.usgs.gov/sir/2008/5206/)

NH Department of Transportation
Bureau of Highway Design
Project, #29613
Env-Wt 904.09 Alternative Design
TECHNICAL REPORT

NH 106 Sta 5484+60 Existing Twin 72" RCP crossing

Env-Wt 904.09(a) - If the applicant believes that installing the structure specified in the applicable rule is not practicable, the applicant may propose an alternative design in accordance with this section.

Please explain why the structure specified in the applicable rule is not practicable (Env-Wt ~~101.69~~ 101.74 defines practicable as *available and capable of being done after taking into consideration costs, existing technology, and logistics in light of overall project purposes.)*

Assessment by McFarland Johnson indicates a bankfull with at this crossing of 52', due to the influence of beavers. Using the 2005 NH Regional Curves, the calculated bankfull width is 24.7'. Based on the calculated width, the Stream Crossing Guidelines recommend structure width of about 32'. Construction of a compliant structure was determined not practicable due to costs and impacts. The recommended structure would be a bridge, approximately 32' x 66', with a preliminary cost of $1.75 million. Extending the pipes by 12' on each end and constructing new headwalls was also determined not practicable due the significant stream impacts that would result from realigning the severely skewed stream channel on both ends. The existing crossing has no history of flooding and the preliminary cost for the proposed design is about $300,000.

Also see the attached Stream Crossing Summary information

The proposed alternative meets the specific design criteria for Tier 2 and Tier 3 crossings to the *maximum extent practicable*, as specified below.

Env-Wt 904.05 Design Criteria for Tier 2 and Tier 3 Stream Crossings – New Tier 2 stream crossings, replacement Tier 2 crossings that do not meet the requirements of Env-Wt 904.07, and new and replacement Tier 3 crossings shall be designed and constructed:

(a) In accordance with the NH Stream Crossing Guidelines.
It is not practicable to design and construct alternatives other than the proposed modification. Since the existing capacity is adequate and the project is not significantly affecting runoff from high flow events, the additional costs and impacts associated with other options cannot be justified.

(b) With bed forms and streambed characteristics necessary to cause water depths and velocities within the crossing structure at a variety of flows to be comparable to those found in the natural channel upstream and downstream of the stream crossing.
It is not practicable to alter water depths or velocities within the existing culvert without adversely affecting hydraulic capacity.

(c) To provide a vegetated bank on both sides of the watercourse to allow for wildlife passage.
It is not practicable to provide vegetated banks within the existing culvert without adversely affecting hydraulic capacity.

(d) To preserve the natural alignment and gradient of the stream channel, so as to accommodate natural flow regimes and the functioning of the natural floodplain.
It is not practicable to alter the existing culvert alignment or grade as part of the proposed modification treatment.

(e) To accommodate the 100-year frequency flood, to ensure that (1) there is no increase in flood stages on abutting properties; and (2) flow and sediment transport characteristics will not be affected in a manner which could adversely affect channel stability.
The proposed modification will have no significant effect on flood stages or sediment transport characteristics.

(f) To simulate a natural stream channel.
It is not practicable to simulate a natural stream channel within the existing culvert without adversely affecting hydraulic capacity.

(g) So as not to alter sediment transport competence.
The proposed modification will have no significant effect on sediment transport competence.

Env-Wt 904.09(c)(3) – The alternative design must meet the general design criteria specified in Env-Wt 904.01:

Env-Wt 904.01
(a) Not be a barrier to sediment transport;
The proposed modification will have no significant effect on sediment transport.

(b) Prevent the restriction of high flows and maintain existing low flows;
The proposed modification will have no significant effect on high or low flows.

(c) Not obstruct or otherwise substantially disrupt the movement of aquatic life indigenous to the waterbody beyond the actual duration of construction;
The proposed modification will not affect the movement of aquatic life.

(d) Not cause an increase in the frequency of flooding or overtopping of banks;
The proposed modification will not significantly change the existing capacity and will not cause an increase in the frequency of flooding or overtopping.

(e) Preserve watercourse connectivity where it currently exists;
The proposed modification will have no effect on watercourse connectivity where it currently exists.

(f) Restore watercourse connectivity where: (1) Connectivity previously was disrupted as a result of human activity(ies); and (2) Restoration of connectivity will benefit aquatic life upstream or downstream of the crossing, or both;

The existing crossing provides adequate watercourse connectivity.

(g) Not cause erosion, aggradation, or scouring upstream or downstream of the crossing; and
The proposed rehabilitation will not significantly change the outlet velocity. Stone lining will be added around the headwalls and wing walls to prevent scour. The proposed rehabilitation will not cause erosion or aggradation.

(h) Not cause water quality degradation.
The proposed modification will have no effect on water quality.

*****Note: An alternative design for <u>Tier 1</u> stream crossings must meet the general design criteria (Env-Wt 904.01) only to the *maximum extent practicable.***

New Hampshire DOT
Department of Transportation

PROJECT	Loudon		
PROJECT NO.	29613	ROUTE	NH 106
CALCULATED BY	CAC	DATE	12/13/2017
CHECKED BY	JJN	DATE	2/13/2018
SUBJECT	Stream Crossings	SHEET	1 OF 2

Sta 5484+60 Tier 3 Crossing **Gues Meadow Brook** Wetland ID# 13 & 16, Class R2UB1H

Existing Conditions:

Drainage Area	4.03 sq miles (approx 2,580 ac)	Watershed ID = C1 and C East	
Existing Pipe	Twin 72" concrete	Upstream Inv	425.00
Length (ft)	94	Downstream Inv	424.50
Slope	0.53%		

These pipes were constructed by Project P2440 in the late 1950's.
Stone headwalls have had minor repairs. No other changes / repairs known.

Inlet Conditions - Top of headwall elevation 433.0 (8' above invert)
Approach channel about 12' wide, at less than 1% slope.
Water level was about 12" higher than pipe inverts.
Headwater is contained by the banks and NH 106 embankment. All flow goes through the pipes.

Field review found minor cracking and evidence of recent repair of some mortar joints.
No evidence of erosion or sedimentation. The pipes were in good condition.

Outlet conditions - Top of headwall elevation 432.0 (7.5' above invert).
Downstream channel is about 20' wide at the pipe outlet and narrows to about 10' wide.
Channel is about 3' deep with floodplain on the left and a steep bank on the right.
Channel slope near 0%.

Field review found the outlet area mostly submerged, about 2' above pipe inverts.
Areas is heavily vegetated. No evidence of erosion or sedimentation.
Headwall showed signs of recent repair of mortar joints. Pipes were in good condition.

District Comments - No reports of flooding or damage to roadway or private property related to this crossing. It was noted that the headwalls are in need of replacement.

Design Flow:
Streamstats Q50 = 513 cfs +-36.4% (range 326 cfs to 700 cfs) Q100 = 621 cfs Q10 = 315 cfs
An alternate regression menthod (FHWA Report RD-77-159) predicts the Q50 between 672 cfs and 950 cfs
HY-8 capacity with headwater at top of headwall (El 433.0) = 633 cfs (HW/D = 1.33)
Design flows will be based on the Streamstats peak flow values.

Analysis from HY-8:
Q10 HW Elev = 430.05 (HW/D = 0.84)
Q50 HW Elev = 431.7 (HW/D = 1.12)
Q100 HW Elev = 432.86 (HW/D = 1.31)

Q10 outlet velocity 10.5 ft/s
Q50 outlet velocity 11.8 ft/s
Q100 outlet velocity 12.8 ft/s

New Hampshire DOT
Department of Transportation

PROJECT	Loudon		
PROJECT NO.	29613	ROUTE	NH 106
CALCULATED BY	CAC	DATE	12/13/2017
CHECKED BY	JJN	DATE	2/13/2018
SUBJECT	Stream Crossings	SHEET	2 OF 2

Sta 5484+60 Tier 3 Crossing (continued)

Proposed Design: Drainage Area Same as exisitng Watershed ID same as existing

Based on the 2005 NH Regional Hydraulic Curves, the calculated bankfull width is 24.66'.
Based on Consultant's research and field review, bankfull width is 52' (beaver influenced).
NH Stream Crossing Guidelines recommend a structure width of 1.2 x 24.66' + 2' = 31.6'

Design Flow:
From Streamstats, the average impervious area for the 2,580 ac watershed is 4.13%,
The project will not change the drainage boundary for the watershed.
The project proposes to convert approximately 0.075 ac of existing grass roadside to pavement (increasing the impervious area from 106.5 ac to 106.6 ac). Based on the scale of the proposed impact, no measurable change in runoff to the crossing is anticipated.
No change to Design flow as a result of the project. Q50 = 513 cfs (Streamstats)

Based on the condition of the existing pipes, past performance, and capacity analysis, the proposed design is to construct new larger headwalls to contain the proposed roadway fill. Existing headwalls will remain in place and new headwalls will be cast in front.
No change to the pipes is proposed.

The proposed work will not significantly affect capacity, headwater depth or outlet velocity.

Construction of a compliant structure was considered and determined not practicable due to cost and impacts. The structure would be a bridge, approximately 32' x 66', with a preliminary cost of $1.75 million (2112 sf x $750 / sf +10%).
Extending the pipes by 12' on each end and constructing new headwalls would involve significant impacts to the stream on both ends due to the severe skew angle of the stream.
The preliminary cost for the proposed design is about $300,000

29613 Loudon Twin 72" Pipes Sta 5484+60

StreamStats Report

Region ID: NH
Workspace ID: NH20161128123428346000
Clicked Point (Latit... 43.34843,-71.46671
Time: 2016-11-28 14:37:26 -0500

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	4.03	square miles
APRAVPRE	Mean April Precipitation	3.716	inches
WETLAND	Percentage of Wetlands	3.8488	percent
CSL10_85	Change in elevation divided by length between points 10 and 85 percent of distance along main channel to basin divide - main channel method not known	87.4	feet per mi
OUTLETX	Basin outlet horizontal (x) location in state plane coordinates	1037445	State plane coordinates
OUTLETY	Basin outlet vertical (y) location in state plane coordinates	309285	State plane coordinates
CENTROIDX	Basin centroid horizontal (x) location in state plane coordinates	1034873.6	State plane coordinates
CENTROIDY	Basin centroid vertical (y) location in state plane units	319150.5	State plane coordinates
BSLDEM30M	Mean basin slope computed from 30 m DEM	7.41	percent
ELEVMAX	Maximum basin elevation	1113.96	feet
TEMP	Mean Annual Temperature	44.4	degrees F
TEMP_06_10	Basinwide average temperature for June to October summer period	60.813	degrees F
CONIF	Percentage of land surface covered by coniferous forest	6.9475	percent
MIXFOR	Percentage of land area covered by mixed deciduous and coniferous forest	29.2204	percent
PREBC0103	Mean annual precipitation of basin centroid for January 1 to March 15 winter period	6.73	inches
PREG_06_10	Mean precipitation at gaging station location for June to October summer period	16.9	inches
PREG_03_05	Mean precipitation at gaging station location for March 16 to May 31 spring period	8	inches
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	4.13	percent
LC11DEV	Percentage of developed (urban) land from NLCD 2011 classes 21-24	7.7	percent
MINTEMP_W	Mean winter minimum air temperature over basin surface area	13.041	degrees F
PREBC_1112	Mean annual precipitation of basin centroid for November 1 to December 31 period	7.2	inches
PRECIPCENT	Mean Annual Precip at Basin Centroid	39.1	inches

Parameter Code	Parameter Description	Value	Unit
PRECIPOUT	Mean annual precip at the stream outlet (based on annual PRISM precip data in inches from 1971-2000)	38.8	inches
SNOFALL	Mean Annual Snowfall	76.118	inches

Peak-Flow Statistics Parameters [100.00 Percent Peak Flow Statewide SIR2008 5206]

Parameter	Value	Min Limit	Max Limit
Drainage Area	4.03	0.7	1290
Mean April Precipitation	3.716	2.79	6.23
Stream Slope 10 and 85 Method	87.4	5.43	543
Percent Wetlands	3.8488	0	21.8

Peak-Flow Statistics Flow Report [100.00 Percent Peak Flow Statewide SIR2008 5206]

Statistic	Value	Unit	Prediction Error
2 Year Peak Flood	142	ft^3/s	30.1
5 Year Peak Flood	236	ft^3/s	31.1
10 Year Peak Flood	315	ft^3/s	32.3
25 Year Peak Flood	423	ft^3/s	34.3
50 Year Peak Flood	513	ft^3/s	36.4
100 Year Peak Flood	621	ft^3/s	38.6
500 Year Peak Flood	886	ft^3/s	44.1

Peak-Flow Statistics Citations

Olson, S.A., 2009, Estimation of flood discharges at selected recurrence intervals for streams in New Hampshire: U.S.Geological Survey Scientific Investigations Report 2008-5206, 57 p. (http://pubs.usgs.gov/sir/2008/5206/)

Memo

NH NATURAL HERITAGE BUREAU
NHB DATACHECK RESULTS LETTER

To: Christine Perron, McFarland Johnson
53 Regional Drive
Concord, NH 03301

From: Amy Lamb, NH Natural Heritage Bureau
Date: 6/7/2017 (valid for one year from this date)
Re: Review by NH Natural Heritage Bureau
NHB File ID: NHB17-1748 Town: Loudon, Canterbury Location: The project begins just south of Shaker Road at the State Maintenance Shed in Loudon and continues north for approximately 3.5 miles

Description: The project proposes to widen NH 106 to improve highway safety and mobility. The widened highway will provide two 12' wide travel lanes, two 12' wide shoulders, and a 12' wide center two way left turn lane.

cc: Kim Tuttle

As requested, I have searched our database for records of rare species and exemplary natural communities, with the following results.

Comments: Please continue to coordinate with NHB and NH Fish & Game.

Plant species	State[1]	Federal	Notes
Sensitive species	T	--	Please contact NH Natural Heritage (271-2215 x 323) if project impacts could occur in the area shown on the map.
Sensitive species	T	T	Please contact NH Natural Heritage (271-2215 x 323) if project impacts could occur in the area shown on the map.

Vertebrate species	State[1]	Federal	Notes
American Eel (*Anguilla rostrata*)	SC	--	Contact the NH Fish & Game Dept (see below).
Bridle Shiner (*Notropis bifrenatus*)	T	--	Contact the NH Fish & Game Dept (see below).
Wood Turtle (*Glyptemys insculpta*)	SC	--	Contact the NH Fish & Game Dept (see below).

[1]Codes: "E" = Endangered, "T" = Threatened, "SC" = Special Concern, "--" = an exemplary natural community, or a rare species tracked by NH Natural Heritage that has not yet been added to the official state list. An asterisk (*) indicates that the most recent report for that occurrence was more than 20 years ago.

Contact for all animal reviews: Kim Tuttle, NH F&G, (603) 271-6544.

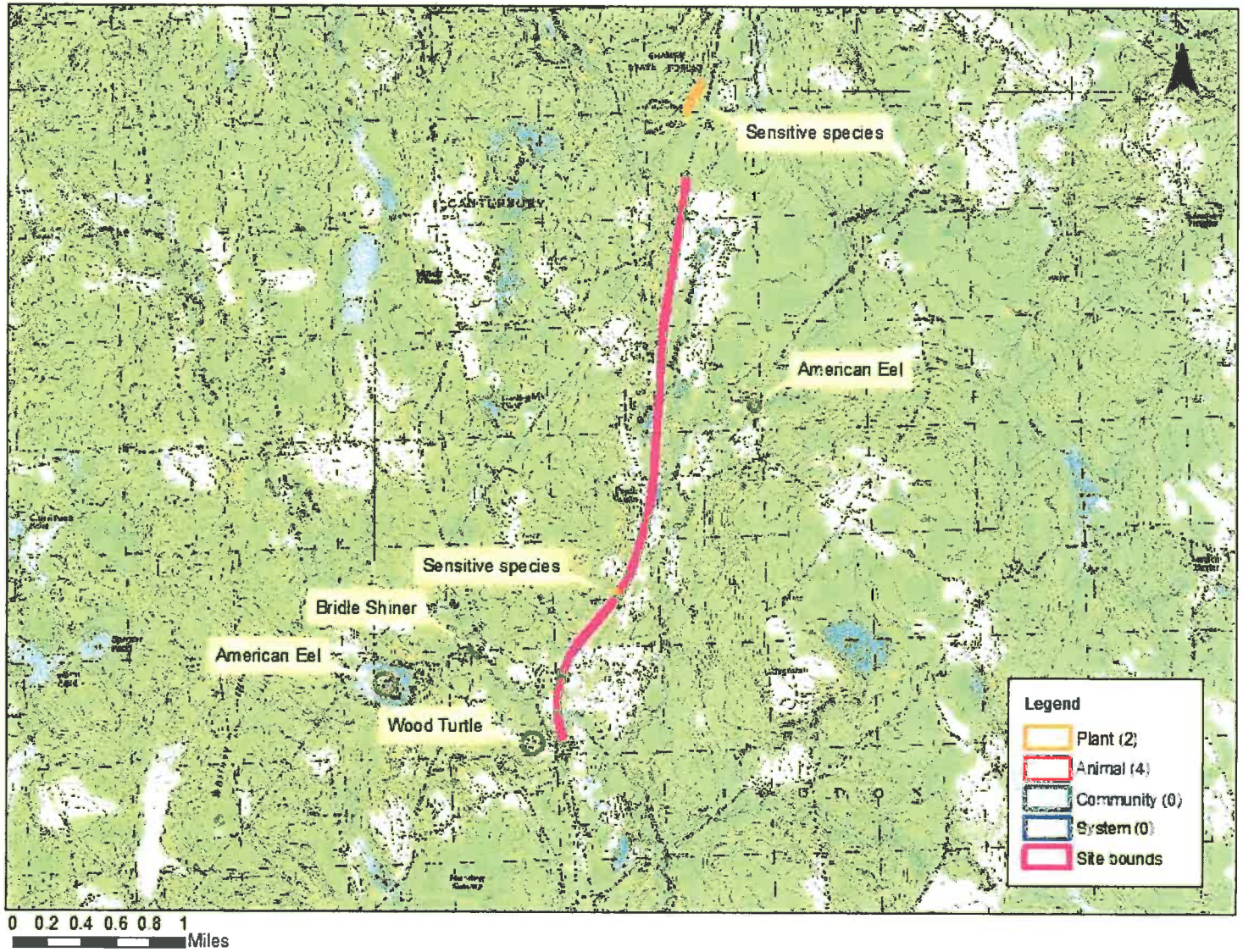
A negative result (no record in our database) does not mean that a sensitive species is not present. Our data can only tell you of known occurrences, based on

information gathered by qualified biologists and reported to our office. However, many areas have never been surveyed, or have only been surveyed for certain species. An on-site survey would provide better information on what species and communities are indeed present.

Department of Resources and Economic Development
Division of Forests and Lands
(603) 271-2214 fax: 271-6488

DRED/NHB
172 Pembroke Rd.
Concord, NH 03301

NHB17-1748


Sensitive species
American Eel
Sensitive species
Bridle Shiner
American Eel
Wood Turtle
Legend
Plant (2)
Animal (4)
Community (0)
System (0)
Site bounds
0 0.2 0.4 0.6 0.8 1
Miles

New Hampshire Natural Heritage Bureau - Animal Record

American Eel (*Anguilla rostrata*)

Legal Status

Federal: Not listed
State: Special Concern

Conservation Status

Global: Apparently secure but with cause for concern
State: Rare or uncommon

Description at this Location

Conservation Rank: Not ranked
Comments on Rank:

Detailed Description: 2008: Area 13330 Not enumerated.
General Area:
General Comments:
Management
Comments:

Location

Survey Site Name: Soucook River
Managed By:

County: Merrimack
Town(s): Loudon
Size: 7.7 acres
Elevation:

Precision: Within (but not necessarily restricted to) the area indicated on the map.

Directions: 2008: Clough Pond

Dates documented

First reported: 2008-10-01
Last reported: 2008-10-01

The New Hampshire Fish & Game Department has jurisdiction over rare wildlife in New Hampshire. Please contact them at 11 Hazen Drive, Concord, NH 03301 or at (603) 271-2461.

New Hampshire Natural Heritage Bureau - Animal Record

American Eel (*Anguilla rostrata*)

Legal Status

Federal: Not listed
State: Special Concern

Conservation Status

Global: Apparently secure but with cause for concern
State: Rare or uncommon

Description at this Location

Conservation Rank: Not ranked
Comments on Rank:

Detailed Description: 1999: Area 13397: Not enumerated.
General Area:
General Comments:
Management
Comments:

Location

Survey Site Name: Gues Meadow Brook
Managed By: Soucook River WMA

County: Merrimack
Town(s): Loudon
Size: 1.9 acres
Elevation:

Precision: Within (but not necessarily restricted to) the area indicated on the map.

Directions: 1999: Bumfagon Brook

Dates documented

First reported: 1999
Last reported: 1999

The New Hampshire Fish & Game Department has jurisdiction over rare wildlife in New Hampshire. Please contact them at 11 Hazen Drive, Concord, NH 03301 or at (603) 271-2461.

New Hampshire Natural Heritage Bureau - Animal Record

Bridle Shiner (*Notropis bifrenatus*)

Legal Status

Federal: Not listed
State: Listed Threatened

Conservation Status

Global: Rare or uncommon
State: Imperiled due to rarity or vulnerability

Description at this Location

Conservation Rank: Not ranked
Comments on Rank:

Detailed Description: 2009: Area 12427: Occupied habitat. No details.2005: Area 12427: 80 observed, age and sex unknown. 2000: Area 849: 1 observed, age and sex unknown.

General Area: 2009: Area 12427: Occupied habitat throughout impounded reach.2005: Area 12427: Freshwater stream or river. 2000: Area 849: Freshwater stream or river.

General Comments: 2009: Area 12427: Most of Soucook mainstem surveyed. Far less suitable habitat than previously thought. Only two confirmed occupied reaches.2000: Area 568: One bridled shiner sampled by electrofishing by DES at index site 150 meters long.

Management Comments:

Location

Survey Site Name: Shaker Brook
Managed By:

County: Merrimack
Town(s): Loudon
Size: 18.2 acres
Elevation:

Precision: Within (but not necessarily restricted to) the area indicated on the map.

Directions: 2005: Area 12427: Soucook River bridge crossing near the intersection of Rte 129 and 106. 2000: Area 849: Shaker Brook at DES Station 00M-7.

Dates documented

First reported: 2000-07-11
Last reported: 2009

The New Hampshire Fish & Game Department has jurisdiction over rare wildlife in New Hampshire. Please contact them at 11 Hazen Drive, Concord, NH 03301 or at (603) 271-2461.

New Hampshire Natural Heritage Bureau - Animal Record

Wood Turtle (*Glyptemys insculpta*)

Legal Status

Federal: Not listed
State: Special Concern

Conservation Status

Global: Rare or uncommon
State: Rare or uncommon

Description at this Location

Conservation Rank: Not ranked
Comments on Rank:

Detailed Description: 2011: Area 13135: 1 adult observed.
General Area: 2011: Area 13135: Residential driveway.
General Comments:
Management Comments:

Location

Survey Site Name: Shaker Brook
Managed By:

County: Merrimack
Town(s): Loudon
Size: 7.7 acres
Elevation:

Precision: Within (but not necessarily restricted to) the area indicated on the map.

Directions: 2011: Area 13135: 73 Clough Pond Road, Loudon.

Dates documented

First reported: 2011-08-13
Last reported: 2011-08-13

The New Hampshire Fish & Game Department has jurisdiction over rare wildlife in New Hampshire. Please contact them at 11 Hazen Drive, Concord, NH 03301 or at (603) 271-2461.

Christine J. Perron

From: Henderson, Carol <Carol.Henderson@wildlife.nh.gov>
Sent: Friday, January 27, 2017 11:25 AM
To: Christine J. Perron
Subject: RE: NHDOT Project - Loudon-Canterbury 29613

Hi Christine:

As always, excellent meeting minutes. Considering that the perches are proposed to be addressed at some point, then I do not have any additional comments and I agree with the comments that were provide by others at the January meeting. I suspect that the project may impact more area after the stormwater issue is further discussed and look forward to hearing the project again in the near future. Overall, I believe you understand what the Department is looking for in terms of minimization of impacts within the streams especially since the T&E species were aquatic. Thanks for your consideration. Carol

---

From: Christine J. Perron [mailto:CPerron@mjinc.com]
Sent: Wednesday, January 25, 2017 9:19 AM
To: Henderson, Carol
Subject: NHDOT Project - Loudon-Canterbury 29613

Hi Carol,

We gave an update on the subject project at the January 18 Natural Resource Agency Meeting. I'm attaching our draft meeting minutes. Also attached is the NHB memo, which lists three vertebrate species of concern.
The proposed stream crossing work is described in detail in the minutes. To summarize, this project will be addressing 5 stream crossings:

- Two crossings are 15" pipes that carry intermittent streams – these will be replaced with a larger and longer pipe.
- Two crossings are Gues Meadow Brook and are both twin 72" pipes. These will be extended.
- One crossing is a 4x4 box extended with 48" pipes at each end. This carries an intermittent stream. This structure will be extended.

Three of these crossings are currently perched, and the perch will be addressed to the extent possible.

Since you were not at the January meeting, I wanted to touch base and find out if you have any concerns with the project at this time. The project will be discussed again, likely sometime this spring, to discuss final design prior to submitting permit applications.

Also, I wanted to let you know that one property on which NHFG holds an easement will be impacted by the project (by the widened roadway slope). I am working on scheduling a meeting between Rich Cook and the NHDOT design team.

Let me know if you would like any additional information.

Thanks Carol.

Christine

Christine Perron, CWS • Senior Environmental Analyst
McFarland Johnson
53 Regional Drive • Concord, NH 03301
OFFICE: 603-225-2978 ext. 128

United States Department of the Interior

FISH AND WILDLIFE SERVICE
New England Ecological Services Field Office
70 COMMERCIAL STREET, SUITE 300
CONCORD, NH 03301
PHONE: (603)223-2541 FAX: (603)223-0104
URL: www.fws.gov/newengland

Consultation Code: 05E1NE00-2017-SLI-0584
Event Code: 05E1NE00-2017-E-00922
Project Name: Loudon-Canterbury 29613

December 29, 2016

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment

United States Department of Interior
Fish and Wildlife Service

Project name: Loudon-Canterbury 29613

Official Species List

Provided by:

New England Ecological Services Field Office
70 COMMERCIAL STREET, SUITE 300
CONCORD, NH 03301
(603) 223-2541
http://www.fws.gov/newengland

Consultation Code: 05E1NE00-2017-SLI-0584
Event Code: 05E1NE00-2017-E-00922

Project Type: TRANSPORTATION

Project Name: Loudon-Canterbury 29613
Project Description: Roadway Improvement Project

Please Note: The FWS office may have modified the Project Name and/or Project Description, so it may be different from what was submitted in your previous request. If the Consultation Code matches, the FWS considers this to be the same project. Contact the office in the 'Provided by' section of your previous Official Species list if you have any questions or concerns.

United States Department of Interior
Fish and Wildlife Service

Project name: Loudon-Canterbury 29613

Project Location Map:

Project Coordinates: MULTIPOLYGON (((-71.47934075910598 43.32226293720956, -71.47281762678176 43.333501522268406, -71.4697277219966 43.34448835037294, -71.46663781721145 43.36021602944541, -71.4642345579341 43.374691876526846, -71.46011468488723 43.38641977031682, -71.45736810285598 43.38492271870401, -71.45977136213332 43.37593963263403, -71.46320458967239 43.36271211161501, -71.4690410764888 43.339244884952386, -71.47144433576614 43.33100423862333, -71.47384759504348 43.32426105986199, -71.47556420881301 43.32126385123893, -71.47934075910598 43.32226293720956)))

Project Counties: Merrimack, NH

United States Department of Interior
Fish and Wildlife Service

Project name: Loudon-Canterbury 29613

Endangered Species Act Species List

There are a total of 2 threatened or endangered species on your species list. Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Critical habitats listed under the **Has Critical Habitat** column may or may not lie within your project area. See the **Critical habitats within your project area** section further below for critical habitat that lies within your project. Please contact the designated FWS office if you have questions.

Flowering Plants	**Status**	**Has Critical Habitat**	**Condition(s)**
Small Whorled pogonia *(Isotria medeoloides)* Population: Wherever found	Threatened		
Mammals			
Northern long-eared Bat *(Myotis septentrionalis)* Population: Wherever found	Threatened		

United States Department of Interior
Fish and Wildlife Service

Project name: Loudon-Canterbury 29613

Critical habitats that lie within your project area

There are no critical habitats within your project area.

Christine J. Perron

From: vonOettingen, Susi <susi_vonoettingen@fws.gov>
Sent: Friday, February 24, 2017 1:36 PM
To: Christine J. Perron
Subject: Fwd: Loudon-Canterbury 29613 NLEB

I thought this was put to rest? NHDOT also asked. No, I don't think further surveys are warranted.

****
Susi von Oettingen
Endangered Species Biologist
New England Field Office
70 Commercial Street, Suite 300
Concord, NH 03301
(W) 603-223-2541 ext. 6418

www.fws.gov/newengland

---------- Forwarded message ----------
From: **vonOettingen, Susi** <susi_vonoettingen@fws.gov>
Date: Tue, Feb 7, 2017 at 10:03 AM
Subject: Re: Loudon-Canterbury 29613 NLEB
To: "Crickard, Ronald" <Ronald.Crickard@dot.nh.gov>
Cc: "Martin, Rebecca" <Rebecca.Martin@dot.nh.gov>, "Christine Perron (CPerron@mjinc.com)" <CPerron@mjinc.com>

Thanks Ron.

Is this the project that Rebecca will check in June for small whorled pogonia? I spoke with a few NH experts and we all feel that one plant in the transmission line was a stray. Most likely no more will be found.

Susi

****
Susi von Oettingen
Endangered Species Biologist
New England Field Office
70 Commercial Street, Suite 300
Concord, NH 03301
(W) 603-223-2541 ext. 6418

www.fws.gov/newengland

On Tue, Feb 7, 2017 at 9:43 AM, Crickard, Ronald <Ronald.Crickard@dot.nh.gov> wrote:

Good morning Susi, attached is the Project submittal form, location map, and the IPaC official species list for the referenced FHWA project. An Acoustic Survey was completed for the project area in accordance with the 2016 Indiana Bat Summer Survey Guidelines. Neither EchoClass nor SonoBat reported an MLE of <0.05 for MYSE for any site and survey night. Based on the results of this survey, probable absence of MYSE during the summer is assumed and no further surveys are required for this project. Based on these results, the Department/FHWA will be making a Not Likely to Adversely Affect determination for the NLEB.

Also, You will also notice on the IPaC official species list that small whorled Pogonia came up. The coordination is ongoing to determine if the Pogonia is in the project area.

Please let me know if you need anything else, or have any questions.

Thank you,
Ron

Ronald Crickard
Chief, Project Management
NH Department of Transportation
Bureau of Environment
7 Hazen Drive, Concord, NH 03302
Ph: (603) 271-7966
Fax: (603) 271-7199
rcrickard@dot.state.nh.us

Federal Highway Administration (FHWA), Federal Railroad Administration (FRA), and Federal Transit Administration (FTA)

Range-wide Programmatic Consultation for Indiana Bat and Northern Long-eared Bat

Project Submittal Form

Updated December 2016

If not using the Assisted Determination Key in the U.S. Fish and Wildlife Service (Service) Information for Planning and Conservation (IPaC) System, transportation agencies must provide this submittal form (or a comparable Service approved form) with provide project-level information for use of the range-wide programmatic consultation covering actions that may affect the Indiana bat and/or northern long-eared bat (NLEB). The completed form should be submitted to the appropriate Service Field Office prior to project commencement. For more information, see the Standard Operating Procedure for Site Specific Project(s) Submission in the User's Guide.

By submitting this form, the transportation agency ensures that the proposed project(s) adhere to the criteria and conditions of the range-wide programmatic consultation, as outlined in the biological assessment (BA) and biological opinion (BO). Upon submittal of this form, the appropriate Service Field Office may review the project-specific information provided and request additional information. For projects that may affect, but are not likely to adversely affect (NLAA) the Indiana bat and/or NLEB, if the applying transportation agency is **not** contacted by the Service with any questions or concerns within 14 calendar days of form submittal, it may proceed under the range-wide programmatic consultation and assume concurrence of the NLAA determination made by the Service in the BO. For projects that may affect, and are likely to adversely affect (LAA) the Indiana bat and/or the NLEB, the appropriate Service Field Office will respond (see recommended response letter template) within 30 calendar days of receiving a complete project-level submission, which includes, but may not be limited to this completed form.

Further instructions on completing the submittal form can be found by hovering your cursor over each text box.

---

1. Date: February 2, 2017FHWA

2. Lead agency: FHWA
   This refers to the Federal governmental lead action agency initiating consultation; select FHWA, FRA or FTA as appropriate.

3. Requesting agency: NHDOT
   This refers to the transportation agency completing the form (it may or may not be the same as the Lead Agency.

   Name: Ronald Crickard

   Title: Chief, Project Management

Phone: 603-271-3226

Email: Ronald.Crickard@dot.nh.gov

4. Consultation code[1]: 05E1NE00-2017-SLI-0584

5. Project name(s): Loudon-Canterbury 29613

6. Project description:
Please attach additional documentation or explanatory text if necessary

This project begins just south of Soucook Lane in Loudon NH and continues north for approximately 3.5 miles on NH Route 106 to just north of the Canterbury NH town line. The project proposes to widen the roadway to accommodate an additional 12' lane to serve as a two-way left-turn lane. The project will require some tree clearing.

An Acoustic Survey was completed for the project area in accordance with the 2016 Indiana Bat Summer Survey Guidelines. Neither EchoClass nor SonoBat reported an MLE of <0.05 for MYSE for any site and survey night. Based on the results of this survey, probable absence of MYSE during the summer is assumed and no further surveys are required for this project.

7. Project location (county, state): Merrimack County, NH
If not delineated in IPaC, attach shape files

8. For species other than Indiana bat and NLEB (from IPaC official species list):

☐ No effect – project(s) are inside the range, but no suitable habitat (see additional information attached).

☐ May affect – see additional information provided for those species (see attached or forthcoming).

Coordination is on going with the USFWS for Small whorled pogonia, which was reported in the IPaC Official Species list.

Please confirm and identify how the proposed project(s) adhere to the criteria of the BO by completing the following (see User Guide Section 2.0):

[1] Available through IPaC System Official Species List: https://ecos.fws.gov/ipac/

NO EFFECT

9. For Indiana bat/NLEB, if applicable, select your no effect determination:

☐ No effect – project(s) are outside the species' range. *submittal form complete*

☐ No effect – project(s) are inside the species range with no suitable summer habitat; project(s) must also be greater than 0.5 miles from any hibernaculum unless meeting exceptions listed below. *submittal form complete*

☐ No effect – project(s) do not involve any construction activities (e.g., bridge/ abandoned structure assessments, property inspections, planning and technical studies, property sales, property easements, and equipment purchases). *submittal form complete*

☐ No effect – project(s) are completely within existing road/rail surface and do not involve percussive or other activities that increase noise above existing traffic/ background levels (e.g., road line painting). *submittal form complete*

☐ No effect - project(s) are outside suitable summer bat habitat and limited to the maintenance of existing facilities (e.g., rest areas, stormwater detention basins) with no new ground disturbance.

☐ No effect – project(s) includes maintenance, alteration, or removal of bridge(s)/ structure(s) and indicate(s) no signs of bats from results of a bridge/abandoned structure assessment. *submittal form complete*
Otherwise, please continue below.

MAY AFFECT, NOT LIKELY TO ADVERSELY EFFECT – W/O AMMS

10. For Indiana bat/NLEB, if applicable, select your may affect, NLAA determination (without implementation of AMMs):

☑ NLAA – project(s) are inside the species range and within suitable bat habitat, but **negative** bat presence/absence (P/A) surveys; must also be greater than 0.5 miles from any hibernaculum. *submittal form complete*

☐ NLAA – project(s) are within 300 feet of the existing road/rail surface and in area that contain suitable habitat (but no documented habitat) that do not involve tree removal, but include percussives or other activities that increase noise above existing traffic/background levels (must also be greater than 0.5 miles of a hibernaculum). *submittal form complete*

☐ NLAA – project(s) are limited to slash pile burning (must also be greater than 0.5 miles from any hibernaculum). *submittal form complete*

☐ NLAA – project(s) are limited to wetland or stream protection activities associated

with compensatory wetland mitigation that do not clear suitable habitat (must also be greater than 0.5 miles from any hibernaculum). *submittal form complete*

☐ NLAA – project(s) *anywhere,* including within 0.5 mile of hibernacula, with suitable summer bat habitat present that are limited to the maintenance of existing facilities (e.g., rest areas, stormwater detention basins) with no new ground disturbance or tree removal/trimming. ***submittal form complete***

Otherwise, please continue below.

MAY EFFECT, NOT LIKELY TO ADVERSELY AFFECT – WITH AMMs

11. For Indiana bat/NLEB, if applicable, document your may affect, NLAA determination by completing the following section (**with implementation of AMMs**; use #13 to document AMMs).

Affected Resource/Habitat Type:

a. Trees

☐ Verify that all tree removal occurs greater than 0.5 mile from any hibernaculum

☐ Verify that the project is within 100 feet of existing road/rail surfaces

☐ Verify that no documented Indiana bat and/or NLEB roosts and/or surrounding summer habitat within 0.25 mile of documented roosts will be impacted

Verify that all tree removal will occur outside the active season (i.e., will occur in winter)[2]:

Acres of trees proposed for removal:

b. Bridge/Structure Work Projects

Proposed work:

Timing of work:

Evidence of bat activity on/in bridge/structure? Yes: ◯ No: ◉

☐ Verify that work will be conducted outside the active season, or if during the active season, verify that no roosting bats will be harmed or disturbed in any way

☐ Verify that work will not alter roosting potential in any way

[2] Coordinate with the local Service Field Office for appropriate dates

☐ Verify that all applicable lighting minimization measures will be implemented

MAY AFFECT, LIKELY TO ADVERSELY AFFECT

12. For Indiana bat/NLEB, if applicable, document your may affect, LAA determination by completing the following section (use #13 to document AMMs).

Affected Resource/Habitat Type:

a. Trees

☐ Verify that all tree removal occurs greater than 0.5 mile from any hibernaculum

Project Location:
☐ 0-100 feet from edge of existing road/rail surface
☐ 100-300 feet from edge of existing road/rail surface

☐ Verify that no documented Indiana bat roosts or surrounding summer habitat within 0.25 mile of documented roosts will be impacted between May 1 and July 31

☐ Verify that no documented NLEB roosts or surrounding summer habitat within 150 feet of documented roosts will be impacted between June 1 and July 31

Timing of tree removal:

Acres of trees proposed for removal:

b. Bridge/Structure Work Projects

Proposed work:

Timing of work:

☐ Verify no signs of a colony

☐ Verify that work will not alter roosting potential in any way

13. For Indiana bat/NLEB, **if applicable to the action type**, the following AMMs will be implemented[3] unless P/A surveys and/or bridge/abandoned structure assessments[4] have occurred to document that the species are not likely to be present:

✓ General AMM 1 (required for all projects):

The NH DOT NLEB Flyer will be posted on the Project bulletin board.

[3] See AMMs Fact Sheet (Appendix C) for more information on AMMs

[4] Structure assessment for occupied buildings means a cursory inspection for bat use. For abandoned buildings a more thorough evaluation is required (See User Guide Appendix D for bridge/abandoned structure assessment guidance).

- ☐ Tree Removal AMM 1
- ☐ Tree Removal AMM 2 (required for NLAA)
- ☐ Tree Removal AMM 3 (required for all projects)
- ☐ Tree Removal AMM 4 (required for NLAA)
- ☐ Tree Removal AMM 5 (required for LAA)
- ☐ Tree Removal AMM 6 (required for LAA)
- ☐ Tree Removal AMM 7 (required for LAA)

- ☐ Bridge AMM 1
- ☐ Bridge AMM 2 (required for all projects during active season)
- ☐ Bridge AMM 3 (required for NLAA during active season)
- ☐ Bridge AMM 4 (required for NLAA during active season)
- ☐ Bridge AMM 5 (required for all projects)

Structure AMMs are required for all Indiana bat projects, required for NLAA NLEB projects.

- ☐ Structure AMM 1
- ☐ Structure AMM 2
- ☐ Structure AMM 3
- ☐ Structure AMM 4

- ☐ Lighting AMM 1 (required for all projects during the active season)
- ☐ Lighting AMM 2 (required for all projects)

- ☐ Hibernacula AMM 1 (required for all projects)

14. For Indiana bat, if applicable, compensatory mitigation measures will also be required to offset adverse effects on the species (see Section 2.10 of the BA). Please verify the mechanism in which compensatory mitigation will be implemented and that sufficient information is provided to the Service.

Range-wide In-Lieu Fee Program, The Conservation Fund ☐

State, Regional, Recovery Unit-Specific In-Lieu Fee Program
Name:

Conservation Bank
Name:
Location:

Local Conservation Site(s)
Name:
Location:
Description:

Christine J. Perron

From: Crickard, Ronald <Ronald.Crickard@dot.nh.gov>
Sent: Tuesday, February 07, 2017 9:44 AM
To: 'susi_vonoettingen@fws.gov'
Cc: Martin, Rebecca; Christine J. Perron
Subject: Loudon-Canterbury 29613 NLEB
Attachments: 29613AppB_ProjectSubmittalFormRev07Dec2016.pdf; Figure 1 - Location Map.pdf; RTE_IPAC 29613.pdf

Good morning Susi, attached is the Project submittal form, location map, and the IPaC official species list for the referenced FHWA project. An Acoustic Survey was completed for the project area in accordance with the 2016 Indiana Bat Summer Survey Guidelines. Neither EchoClass nor SonoBat reported an MLE of <0.05 for MYSE for any site and survey night. Based on the results of this survey, probable absence of MYSE during the summer is assumed and no further surveys are required for this project. Based on these results, the Department/FHWA will be making a Not Likely to Adversely Affect determination for the NLEB.

Also, You will also notice on the IPaC official species list that small whorled Pogonia came up. The coordination is ongoing to determine if the Pogonia is in the project area.

Please let me know if you need anything else, or have any questions.

Thank you,
Ron

Ronald Crickard
Chief, Project Management
NH Department of Transportation
Bureau of Environment
7 Hazen Drive, Concord, NH 03302
Ph: (603) 271-7966
Fax: (603) 271-7199
rcrickard@dot.state.nh.us

New Hampshire DOT
Department of Transportation

Victoria F. Sheehan
Commissioner

THE STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION

William Cass, P.E.
Assistant Commissioner

LOUDON-CANTERBURY 29613
X-A004(201)
29613
RPR 7985

No Historic Properties Affected Memo

Pursuant to the Request for Project Review signed August 12, 2016, and for the purpose of compliance with regulations of the National Historic Preservation Act and the Advisory Council on Historic Preservation's *Procedures for the Protection of Historic Properties* (36 CFR 800), the NH Division of Historical Resources (NHDHR) and the NH Division of the Federal Highway Administration (FHWA) have coordinated the identification and evaluation of historical and archaeological resources with plans to widen and rehabilitate NH Route 106 from just south of Soucook Lane in Loudon to just north of the Canterbury town line.

Project Description

This project begins just south of Soucook Lane in Loudon and continues north for approximately 3.5 miles to just north of the Canterbury town line. The purpose of this project is to respond to increasing development in the Loudon-Canterbury region as it relates to traffic demands imposed on NH Route 106. The existing roadway consists of two 12' shoulders and two 12' travel lanes for a pavement width of 48'. The project proposes to widen the roadway to accommodate an additional 12' lane to serve as a two-way left-turn lane. The travel lanes and shoulders would remain 12'. Overall widening would be approximately 12', resulting in a pavement width of 60', with 6' of widening on each side of the road in most locations. The roadway typical will be wider along one section of NH Route 106 between Clough Hill Road and the south entrance of the speedway, a distance of approximately 1,600 linear feet. This area experiences heavy pedestrian use during events at the NH Motor Speedway. In order to address safety concerns associated with large numbers of pedestrians and vehicles on the road at the same time, there will be an additional 6' offset to guardrail, resulting in a grass panel between the paved shoulder and guardrail.

Analysis

Based on a review pursuant to 36 CFR 800.4 of the architectural and/or archaeological significance of resources in the APE, we agree on the following:

- A Phase I archaeological survey was completed in the project area in 1995. There are three known archaeological sites located near but outside the APE the French site, the Parker site, and the Lovering Mill site. None of these resources will be impacted.
- There are three un-inventoried properties in the APE: Parcel 49-63 (house constructed 1964); Parcel 50-13 (commercial building constructed 1963); and Parcel 60-30 (commercial building constructed 1950). Minimal clearing, slope widening, and/or drainage work is proposed along the frontage of these parcels with NH Route 106.
- There are twelve previously inventoried properties in the APE. Ten of these were surveyed in 1993 and two were surveyed in 2011. All twelve properties were determined ineligible. Seven of these properties no longer contain extant structures (Parcels 50-18; 50-5; 50-6; 50-10; 50-14; 50-20; 60-45). On the remaining five parcels, there will be either no work or only minimal clearing, slope widening, and/or drainage work along the frontage of these parcels.

Public Consultation

A public information meeting was held on November 30, 2016. Letters seeking input on the project were sent to town officials and the Historical Society in Loudon and Canterbury. There are no consulting parties.

Determination of Effect

Based on a review pursuant to 36 CFR 800.4, we agree that work as proposed will not change the setting or viewshed near the parcels listed above and that no further survey work is needed. Should project plans change and any of the above mentioned sites be impacted, NHDOT will notify FHWA and NHDHR and complete all necessary surveys.

Section 4(f) *(to be completed by FHWA)*	*There Will Be:*	☒ **No 4(f);**	☐ **Programmatic 4(f);**	☐ **Full 4 (f);** or
	☐ **A finding of *de minimis* 4(f) impact as stated:** In addition, with NHDHR concurrence of no adverse effect for the above undertaking, and in accordance with 23 CFR 774.3, FHWA intends to, and by signature below, does make a finding of *de minimis* impact. NHDHR's signature represents concurrence with both the no adverse effect determination and the *de minimis* findings. Parties to the Section 106 process have been consulted and their concerns have been taken into account. Therefore, the requirements of Section 4(f) have been satisfied.			

In accordance with the Advisory Council's regulations, we will continue to consult, as appropriate, as this project proceeds.

5/11/17

for Patrick Bauer, Administrator — Date
Federal Highway Administration

Jill Edelmann — 5/10/17
Jill Edelmann — Date
Cultural Resources Manager

Concurred with by the NH State Historic Preservation Officer:

5-11-17

for Elizabeth H. Muzzey — Date
State Historic Preservation Officer
NH Division of Historical Resources

c.c. Chris St. Louis, NHDHR
Jamie Sikora, FHWA
Ron Crickard, NHDOT
Christine Perron, MJ
Keith Cota, NHDOT

S:\Environment\PROJECTS\LOUDON\29613\Cultural\NoHistoricPropAffectedFHWA.docx

US Army Corps of Engineers
New England District

U.S. Army Corps of Engineers
New Hampshire Programmatic General Permit (PGP)
Appendix B - Corps Secondary Impacts Checklist
(for inland wetland/waterway fill projects in New Hampshire)

1. Attach any explanations to this checklist. Lack of information could delay a Corps permit determination.
2. All references to "work" include all work associated with the project construction and operation. Work includes filling, clearing, flooding, draining, excavation, dozing, stumping, etc.
3. See PGP, GC 5 regarding single and complete projects.
4. Contact the Corps at (978) 318-8832 with any questions.

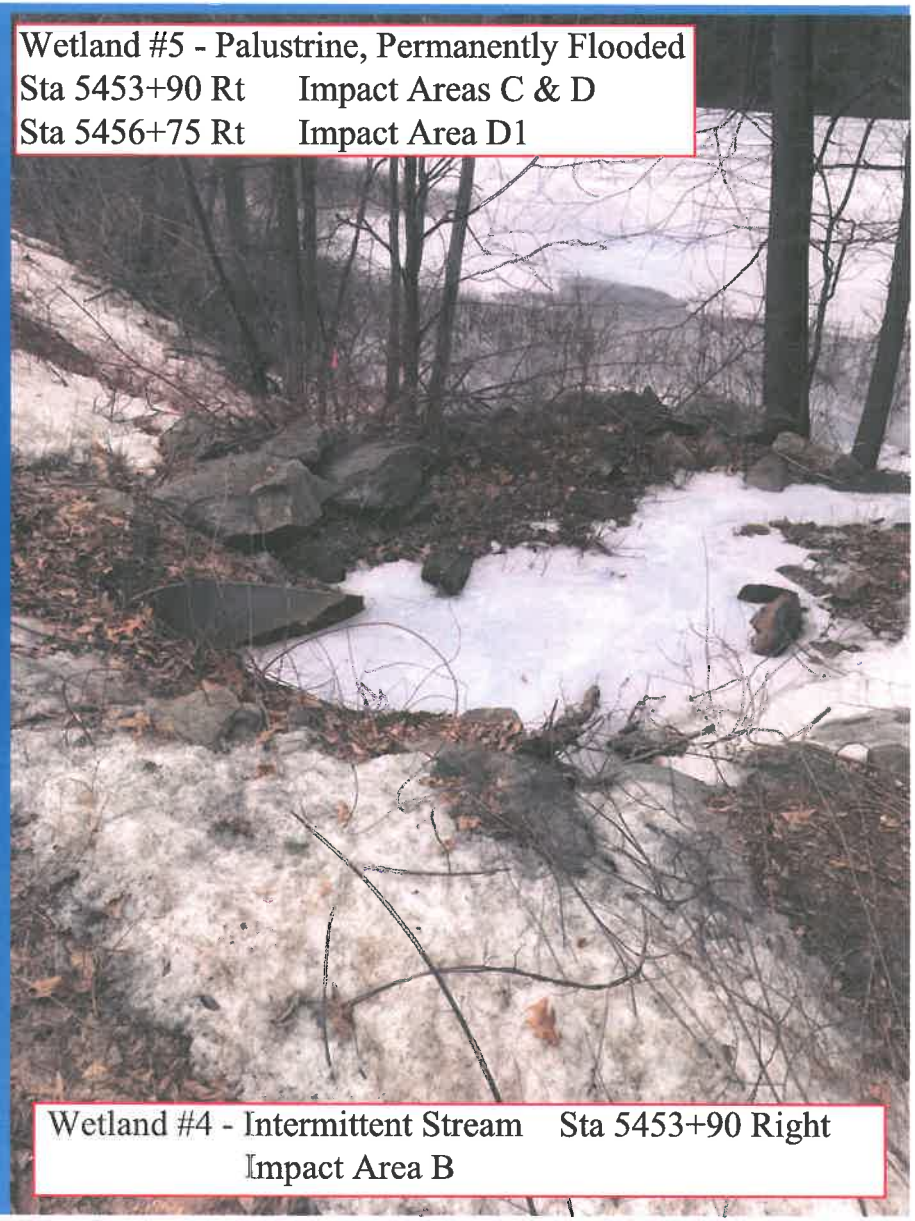
1. Impaired Waters	Yes	No
1.1 Will any work occur within 1 mile upstream in the watershed of an impaired water? See http://des.nh.gov/organization/divisions/water/wmb/section401/impaired_waters.htm to determine if there is an impaired water in the vicinity of your work area.*	X	
2. Wetlands	Yes	No
2.1 Are there are streams, brooks, rivers, ponds, or lakes within 200 feet of any proposed work?	X	
2.2 Are there proposed impacts to SAS, shellfish beds, special wetlands and vernal pools (see PGP, GC 26 and Appendix A)? Applicants may obtain information from the NH Department of Resources and Economic Development Natural Heritage Bureau (NHB) website, www.nhnaturalheritage.org, specifically the book Natural Community Systems of New Hampshire.		X
2.3 If wetland crossings are proposed, are they adequately designed to maintain hydrology, sediment transport & wildlife passage?	X	
2.4 Would the project remove part or all of a riparian buffer? (Riparian buffers are lands adjacent to streams where vegetation is strongly influenced by the presence of water. They are often thin lines of vegetation containing native grasses, flowers, shrubs and/or trees that line the stream banks. They are also called vegetated buffer zones.)	X	
2.5 The overall project site is more than 40 acres. Total Project area (Phase 1) 13.75 acres		X
2.6 What is the size of the existing impervious surface area? Existing pav't within slope lines	5.98 acres	
2.7 What is the size of the proposed impervious surface area? Proposed pav't within slope lines	7.07 acres	
2.8 What is the % of the impervious area (new and existing) to the overall project site?	43.5	51.4
3. Wildlife	Yes	No
3.1 Has the NHB determined that there are known occurrences of rare species, exemplary natural communities, Federal and State threatened and endangered species and habitat, in the vicinity of the proposed project? (All projects require a NHB determination.)	X	
3.2 Would work occur in any area identified as either "Highest Ranked Habitat in N.H." or "Highest Ranked Habitat in Ecological Region"? (These areas are colored magenta and green, respectively, on NH Fish and Game's map, "2010 Highest Ranked Wildlife Habitat by Ecological Condition.") Map information can be found at: • PDF: www.wildlife.state.nh.us/Wildlife/Wildlife_Plan/highest_ranking_habitat.htm. • Data Mapper: www.granit.unh.edu. • GIS: www.granit.unh.edu/data/downloadfreedata/category/databycategory.html.		X
3.3 Would the project impact more than 20 acres of an undeveloped land block (upland, wetland/waterway) on the entire project site and/or on an adjoining property(s)?		X
3.4 Does the project propose more than a 10-lot residential subdivision, or a commercial or industrial development?		X
3.5 Are stream crossings designed in accordance with the PGP, GC 21?	X	

4. Flooding/Floodplain Values	Yes	No
4.1 Is the proposed project within the 100-year floodplain of an adjacent river or stream?	X	
4.2 If 4.1 is yes, will compensatory flood storage be provided if the project results in a loss of flood storage? No fill within the floodplain is proposed.	X	
5. Historic/Archaeological Resources		
If a minor or major impact project, has a copy of the Request for Project Review (RPR) Form (www.nh.gov/nhdhr/review) been sent to the NH Division of Historical Resources as required on Page 5 of the PGP?**	X	

*Although this checklist utilizes state information, its submittal to the Corps is a Federal requirement.
** If project is not within Federal jurisdiction, coordination with NH DHR is not required under Federal law.

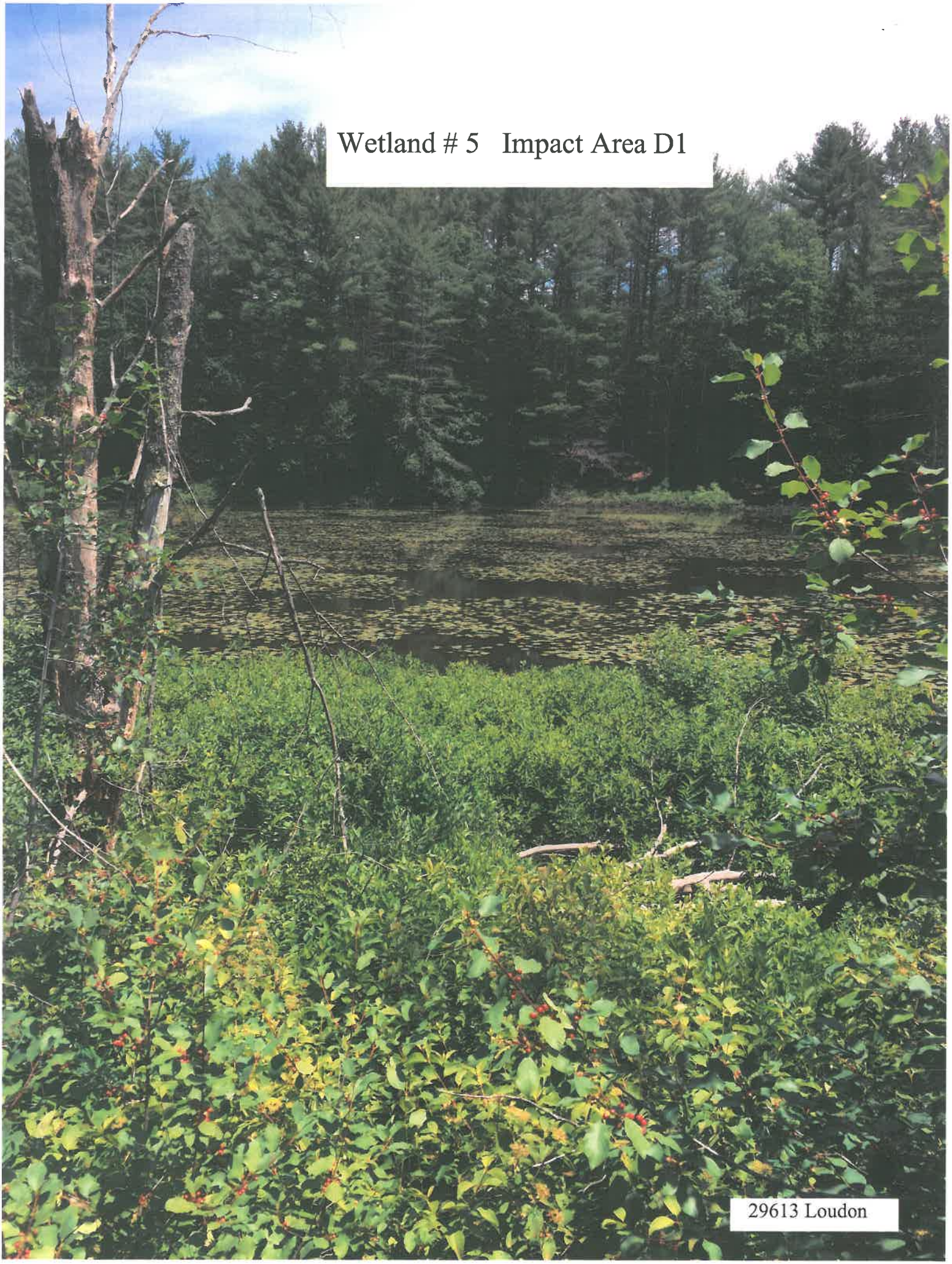
Wetland #1 Sta 5441+00 Lt Wet Ditch
Impact Area A
29613 Loudon

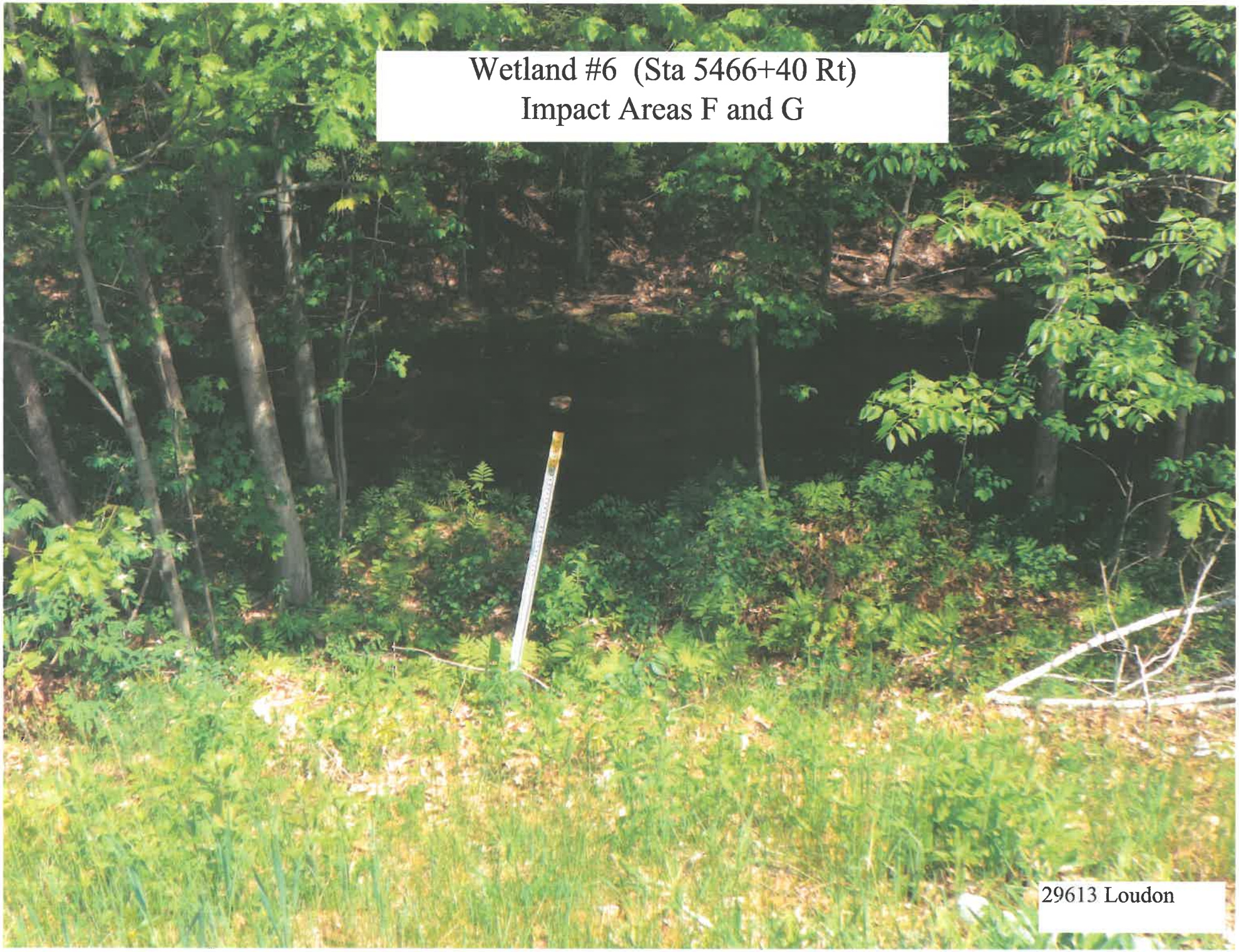
Wetland #3- Intermittent Stream Sta 5453+90 Left
Impact Area E



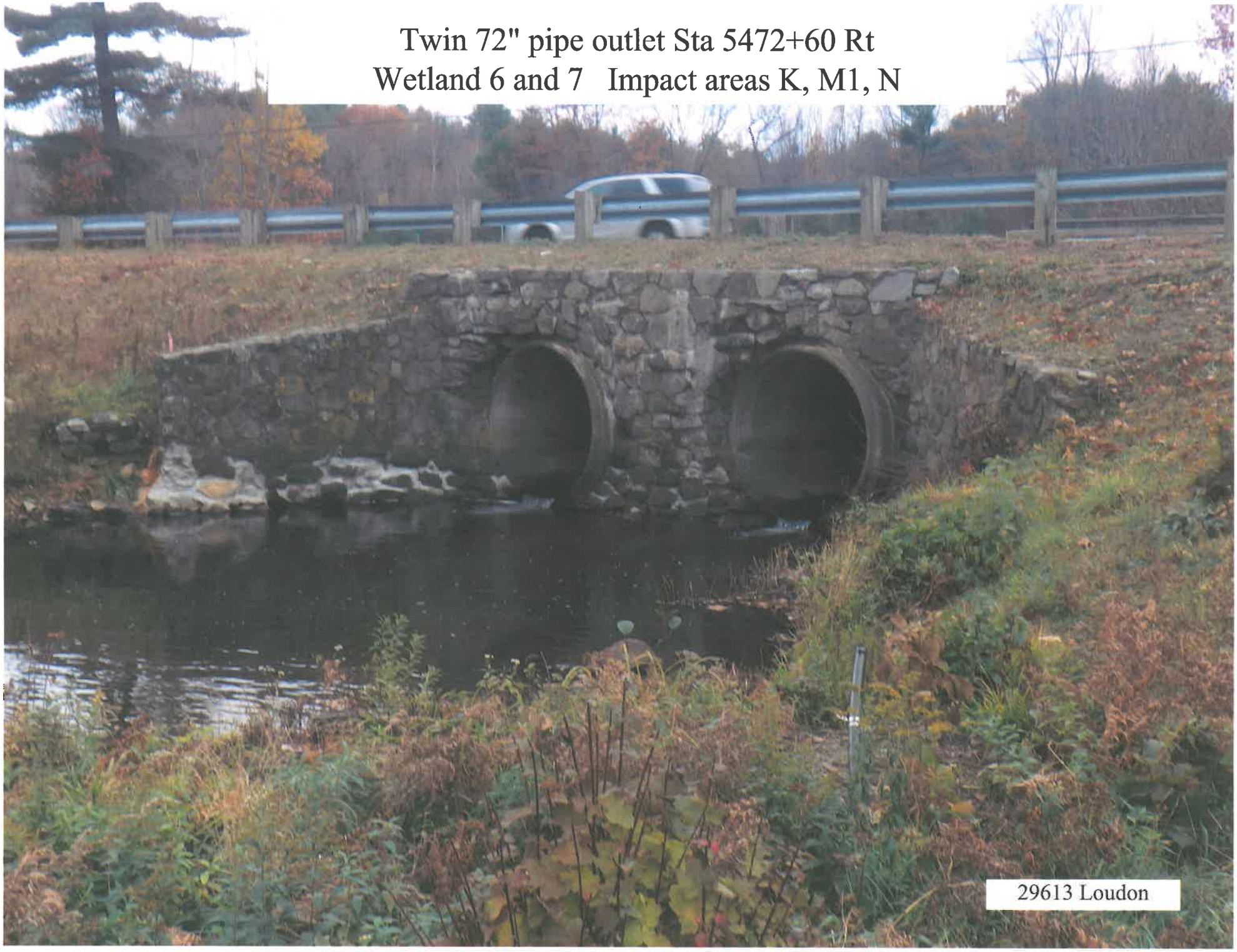
Wetland #5 - Palustrine, Permanently Flooded
Sta 5453+90 Rt Impact Areas C & D
Sta 5456+75 Rt Impact Area D1

Wetland #4 - Intermittent Stream Sta 5453+90 Right
Impact Area B


Wetland # 5 Impact Area D1
29613 Loudon


Wetland #6 (Sta 5466+40 Rt)
Impact Areas F and G
29613 Loudon

Twin 72" pipe outlet Sta 5472+60 Rt
Wetland 6 and 7 Impact areas K, M1, N

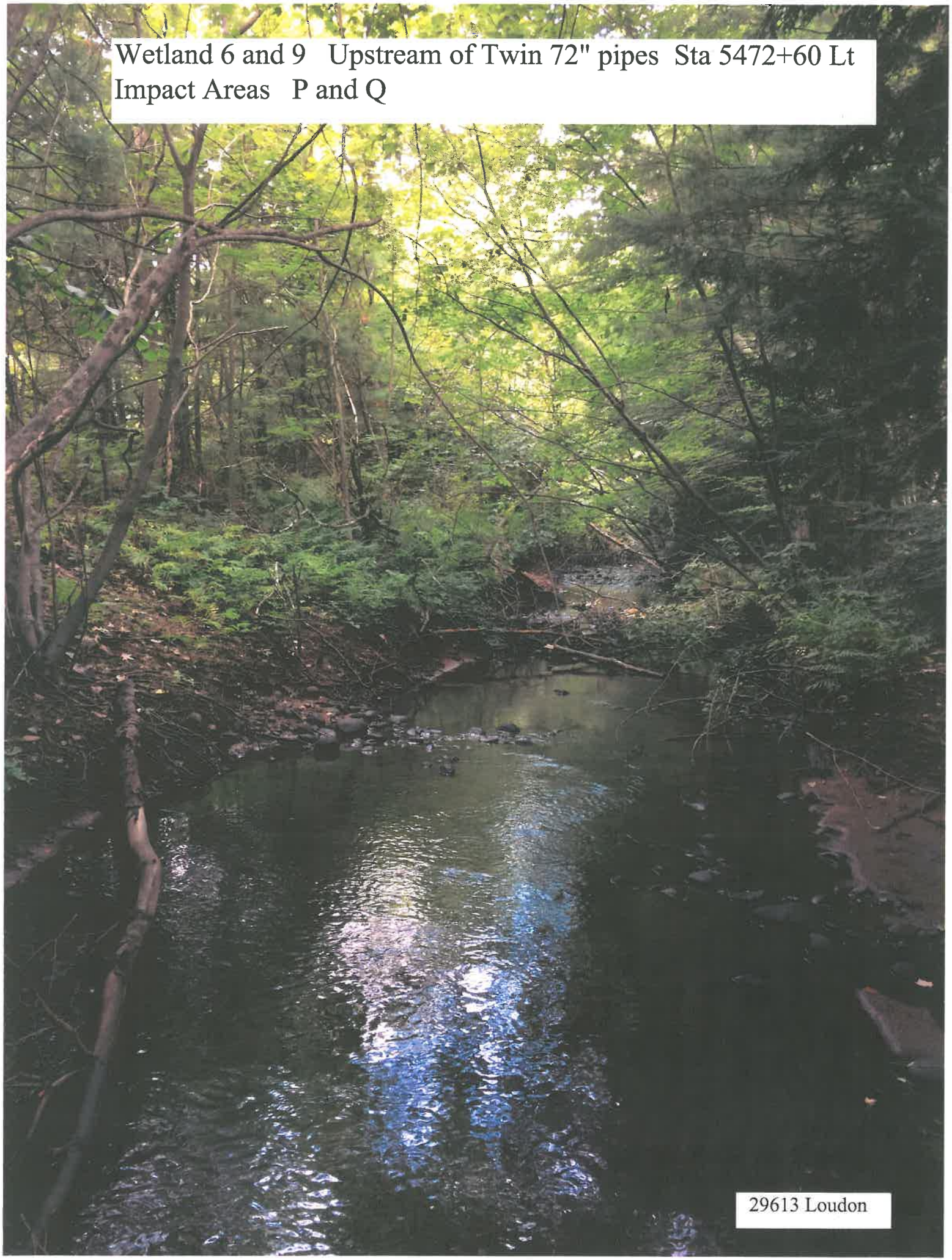


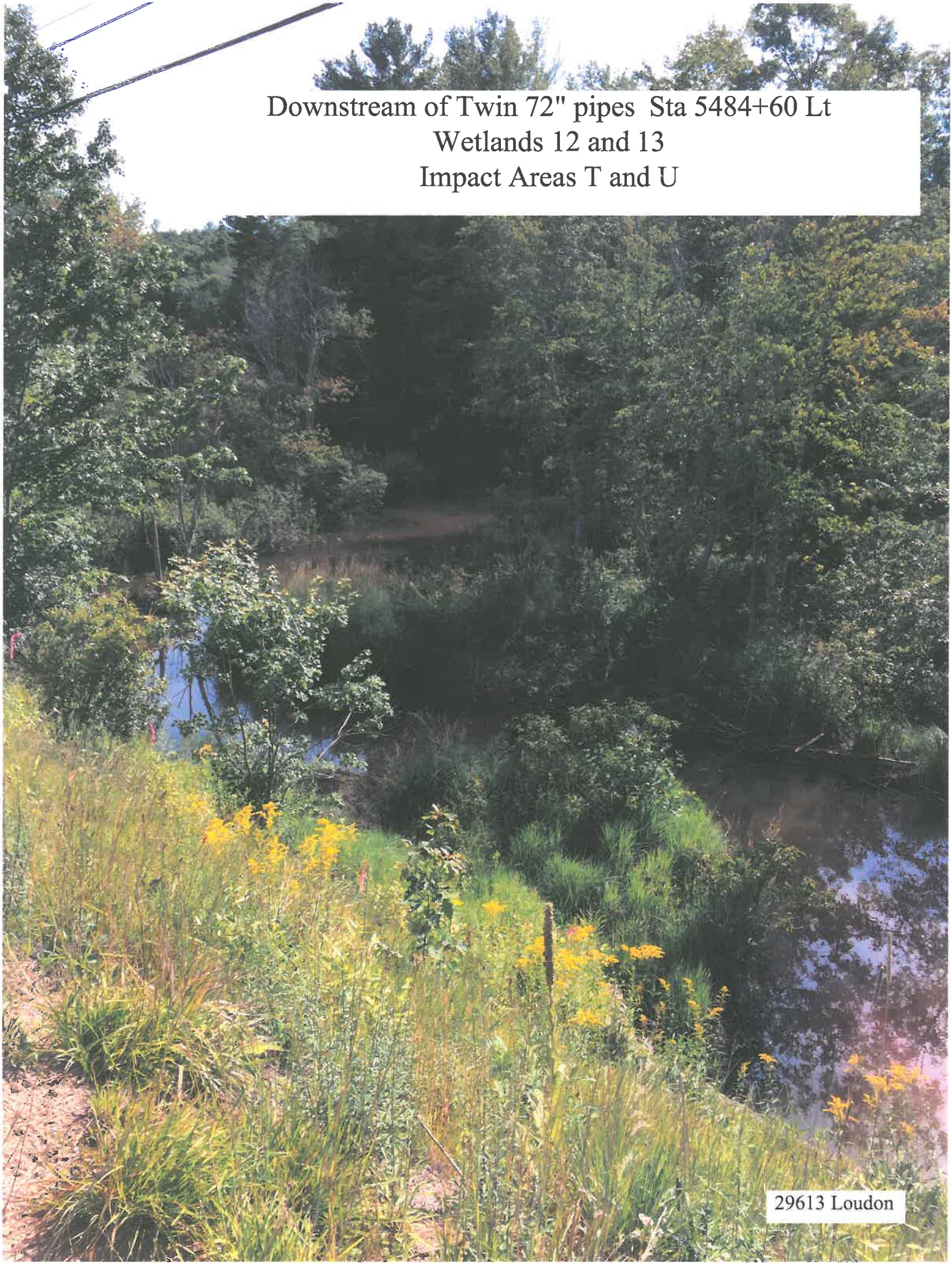
Sta 5472+50 Rt Downstream of Twin 72" pipes
Wetland 6 and 7 Impact areas K, L, M1, N

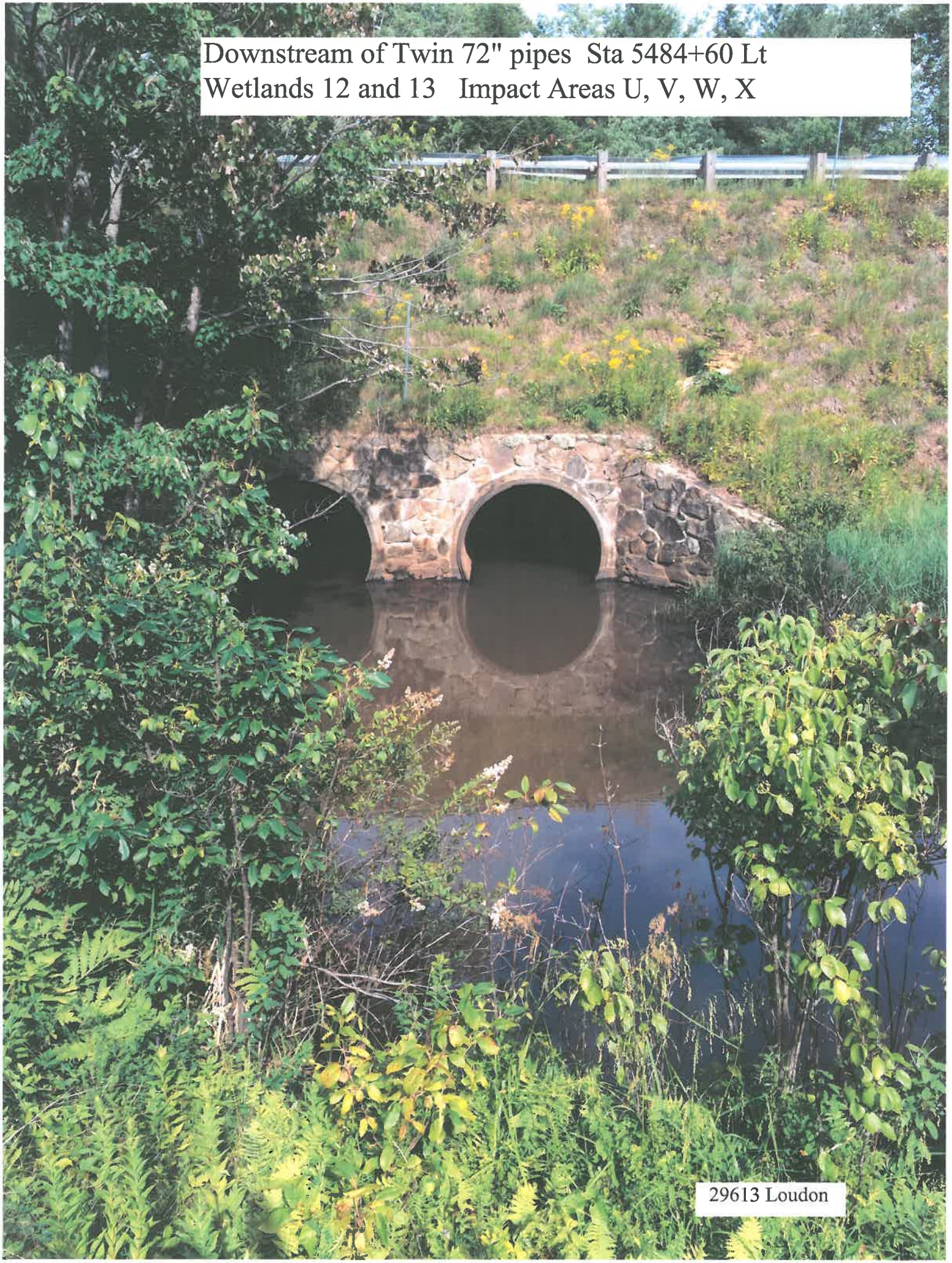
29613 Loudon

Wetland #7 Sta 5466+00 Rt
Impact Areas H and I
29613 Loudon

Wetland #6 Twin 72" pipe inlet Sta 5472+60 Lt
Impact Areas M2 and Q


Wetland 6 and 9 Upstream of Twin 72" pipes Sta 5472+60 Lt
Impact Areas P and Q
29613 Loudon


Downstream of Twin 72" pipes Sta 5484+60 Lt
Wetlands 12 and 13
Impact Areas T and U
29613 Loudon


Downstream of Twin 72" pipes Sta 5484+60 Lt
Wetlands 12 and 13 Impact Areas U, V, W, X
29613 Loudon

Twin 72" pipe inlet Sta 5484+60 Rt
Wetland 16 Impact Area AA
29613 Loudon

Upstream of Twin 72" pipes Sta 5484+60 Rt
Wetland 16 Impact Area AB
29613 Loudon

Upstream of Twin 72" pipes Sta 5484+60 Rt
Wetland 16 and 17 Impact Areas AC and AD
29613 Loudon

PART Env-Wt 404 CRITERIA FOR SHORELINE STABILIZATION

The Project proposes to widen a 0.9 mile segment of NH 106, including placing stone fill in jurisdictional shoreline areas at the following locations:

- Sta 5453+85, at the inlet and outlet of a culvert carrying an intermittent stream under NH 106.
- Sta 5464+50 Rt to Sta 5468+25 Rt, on a fill slope adjacent to Gues Meadow Brook.
- Sta 5472+60 Lt and Rt, at the inlet and outlet of the twin 72" pipe crossing
- Sta 5482+33 Lt to Sta 5485+00 Lt, on a fill slope adjacent to Gues Meadow Brook

Env-Wt 404.01 Least Intrusive Method. Shoreline stabilization shall be by the least intrusive but practical method.

Stone lining is required at the inlet and outlet of the replacement culvert at Sta 5453+90 Lt to prevent erosion and dissipate energy due to the proposed channel slopes and resulting velocities.

Fill slopes extending into jurisdictional shoreline areas have been steepened from the typical 2:1 to 1.5:1 to minimize impacts. Slopes steeper than 2:1 require special construction and/or surface stabilization, and stone lining is the most practical method of stabilization for this project..

Stone lining is required at the inlet and outlet of the extended twin 72" pipes at Sta 5472+60 Lt & Rt and at Sta 5484+60 Lt & Rt to prevent scour under the new headwalls and wingwalls.

Env-Wt 404.02 Diversion of Water. Diversion of stormwater run-off often provides effective and low maintenance erosion protection, and shall be used to the maximum extent practical.

Diversion of water at the proposed stone fill locations is not practical. Most of the flow comes from off-site areas and passes under or adjacent to NH 106.

Env-Wt 404.03 Vegetative Stabilization.

(a) Natural vegetation shall be left intact to the maximum extent possible. If space and soil conditions allow, unstable banks shall be cut back to a flatter slope, seeded, and replanted with native, non-invasive trees and shrubs

Natural vegetation will be left intact to the maximum extent practical.

(b) If space relative to the highest observable tide line, water turbulence, and soil conditions allow, the project shall include vegetation of existing sand beach or dunes or construction of vegetated sand dunes.

N/A

Env-Wt 404.04 Rip-rap.

(a) Rip-rap applications shall be considered only where the applicant demonstrates that anticipated turbulence, flows, restricted space, or similar factors render vegetative and diversion methods physically impractical.

(b) Applications for rip-rap shall include:

(1) Designation of a minimum and maximum stone size;
(2) Gradation;
(3) Minimum rip-rap thickness;
(4) Type of bedding for stone;
(5) Cross-section and plan views of the proposed installation;
(6) Sufficient plans to clearly indicate the relationship of the project to fixed points of reference, abutting properties, and features of the natural shoreline; and
(7) A description of anticipated turbulence, flows, restricted space, or similar factors that would render vegetative and diversion methods physically impractical.

The attached specifications provide the proposed stone size and gradation.

The plans and details in the Wetland Plans provide the information required by items 3 – 6 above.

#7: Fill slopes adjacent to Gues Meadow Brook have been steepened from the typical 2:1 to 1.5:1 to minimize impacts. Stone surfacing is the most practical method of achieving long term stability of these slopes. Stone lined fill slopes adjacent to Gues Meadow Brook will be intermixed with humus to fill voids in the stone, covered with a 3.5" layer of humus, seeded, and landscaped.

Replacement of the culvert at Sta 5453+85 requires regrading the inlet channel and constructing a stable outlet channel. Stone lining is required to protect the newly constructed channels from erosion (inlet channel slope 10%, outlet channel slope 15%).

Stone lining is required at the inlet and outlet of the extended twin 72" pipes at Sta 5472+60 Lt & Rt and at Sta 5484+60 Lt & Rt to prevent scour under the new headwalls and wingwalls.

(c) Applications to use rip-rap adjacent to great ponds or water bodies where the state holds fee simple ownership shall include a stamped surveyed plan showing the location of the normal high water shoreline and the footprint of the proposed project.

N/A

(d) Rip-rap shall be located shoreward of the normal high water shoreline, where practical, and shall not extend more than 2 feet lakeward of that line at any point.

Fill slopes adjacent to Gues Meadow Brook have been steepened from the typical 2:1 to 1.5:1 to minimize impacts. Stone surfacing is the most practical method of achieving long term stability of these slopes. This treatment will result in the least practical impact to jurisdictional shoreline areas.

(e) Stamped engineering plans shall be provided as part of any application for rip-rap in excess of 100 linear feet along the bank of a stream or river.

Wetland Plans are stamped by a Professional Engineer.

SECTION 585 -- STONE FILL

Description

1.1 This work shall consist of furnishing and placing a dense stone fill at the locations shown on the plans or ordered.

Materials

2.1 Stone for stone fill shall be approved quarry stone, or broken rock of a hard, sound, and durable quality. The stones and spalls shall be so graded as to produce a dense fill with a minimum of voids.

2.1.1 Class A stone shall be irregular in shape with approximately 50 percent of the mass having a minimum volume of 12 ft^3 (0.3 m^3), approximately 30 percent of the mass ranging between 3 and 12 ft^3 (0.08 and 0.3 m^3), approximately 10 percent of the mass ranging between 1 and 3 ft^3 (0.03 and 0.08 m^3), and the remainder of the mass composed of spalls.

2.1.2 Class B stone shall be irregular in shape with approximately 50 percent of the mass having a minimum volume of 3 ft^3 (0.08 m^3), approximately 40 percent of the mass ranging between 1 and 3 ft^3 (0.03 and 0.08 m^3), and the remainder of the mass composed of spalls.

2.1.3 Class C stone shall consist of clean, durable fragments of ledge rock of uniform quality, reasonably free from thin or elongated pieces. The stone shall be made from rock which is free from topsoil and other organic material. The stone shall be graded as follows:

Sieve Size	Percentage by Weight Passing
12 in (300 mm)	100
4 in (100 mm)	50 - 90
1-1/2 in (37.5 mm)	0 - 30
3/4 in (19.0 mm)	0 - 10

2.1.4 Class D stone shall conform to 520.2 - Table 3 - Coarse Aggregate, Standard Stone Size No. 467.

2.1.5 Spalls for filling voids shall be stones or broken rock ranging downward from a maximum size of 1 ft^3 (0.03 m^3).

2.2 Gravel blanket material shall conform to 209.2.1.2.

2.3 Geotextile shall conform to 593.

Construction Requirements

3.1 Stones and spalls for stone fill shall be deposited and graded to eliminate voids and obtain a dense mass throughout the course. The spalls shall be tamped into place using an equipment bucket or other approved method.

3.1.1 When stone fill is placed on a slope, the stones shall be deposited in such a manner as not to dislodge the underlying material unnecessarily.

3.1.2 When stone fill is placed on a geotextile, it shall be deposited in a manner to maintain the integrity of the geotextile.

3.2 When gravel blanket is shown or ordered, the gravel shall be placed in layers not exceeding 12 in. (300 mm) in depth unless otherwise ordered.

3.3 The completed surface shall approximate the lines and grades shown or ordered. When ordered, stone placed over 1 ft. (300 mm) outside or above such lines and grades shall be removed.

3.4 Stone fill (Bridge) shall be placed within the limits shown on the plans.

Method of Measurement

4.1 Stone fill will be measured by the cubic yard (cubic meter) and in accordance with 109.01.

Basis of Payment

5.1 The accepted quantity of stone fill of the class specified will be paid for at the Contract unit price per cubic yard (cubic meter) complete in place.

5.2 Gravel blanket material specified or ordered will be paid for under 209.

5.3 Geotextile specified or ordered will be paid for under 593.

5.4 The accepted quantity of excavation required for placing stone fill and for placing any underlying gravel blanket will be paid for under the item of excavation being performed. Excavation herein refers only to excavation of original ground or to material ordered removed not shown on the plans.

5.5 Free borrow will not be required to replace the accepted quantity of stone obtained from the excavation. However, when the plans do not call for borrow, but the quantity of material removed from excavation for use under this item requires the Contractor to furnish borrow to complete the work, such borrow will be subsidiary.

Pay items and units:

585.1	Stone Fill, Class A	Cubic Yard (Cubic Meter)
585.2	Stone Fill, Class B	Cubic Yard (Cubic Meter)
585.21	Stone Fill, Class B (Bridge)	Cubic Yard (Cubic Meter
585.3	Stone Fill, Class C	Cubic Yard (Cubic Meter)
585.4	Stone Fill, Class D	Cubic Yard (Cubic Meter)

08/12/16
SSD: 6/14/00, 8/28/00

LOUDON
29613

SPECIAL PROVISION

AMENDMENT TO SECTION 585 -- STONE FILL

Item 585._2 - Stone Fill, Class _, Intermixed with Humus

Add to Materials:

2.4 Humus shall conform to Section 647.2.

Add to 3.1:

3.1.3 The stone fill surface shall have all voids filled with humus to provide for a vegetative growth. Humus shall be spread over the surface and worked into the voids.

Add to 4.1:

4.1.1 The volume of humus used to work into the voids will not be measured.

Add to 5.1:

5.1.1 Humus used to work into the voids will be subsidiary.

5.1.2 Humus used to provide a vegetative bed will paid under the appropriate item.

Add to Pay Items and Units:

585.22	Stone Fill, Class B, Intermixed with Humus	Cubic Yard

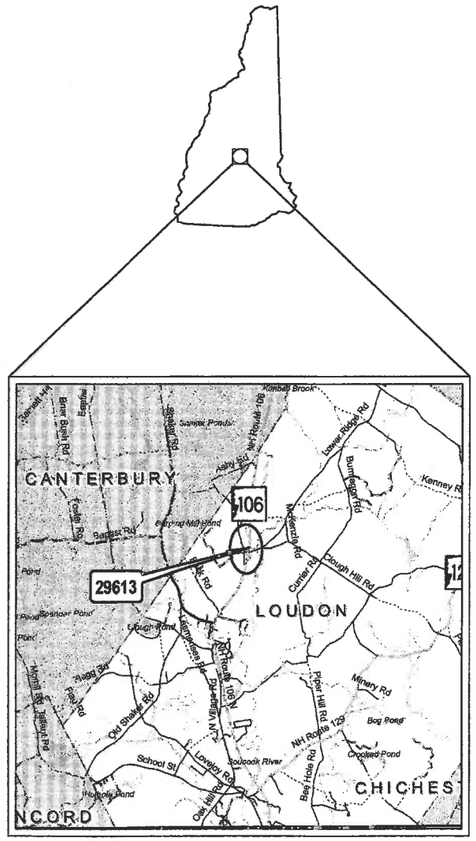
STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION

WETLANDS PLANS
FEDERAL AID PROJECT

X-A004(201)
N.H. PROJECT NO. 29613
NH ROUTE 106

DESIGN DATA

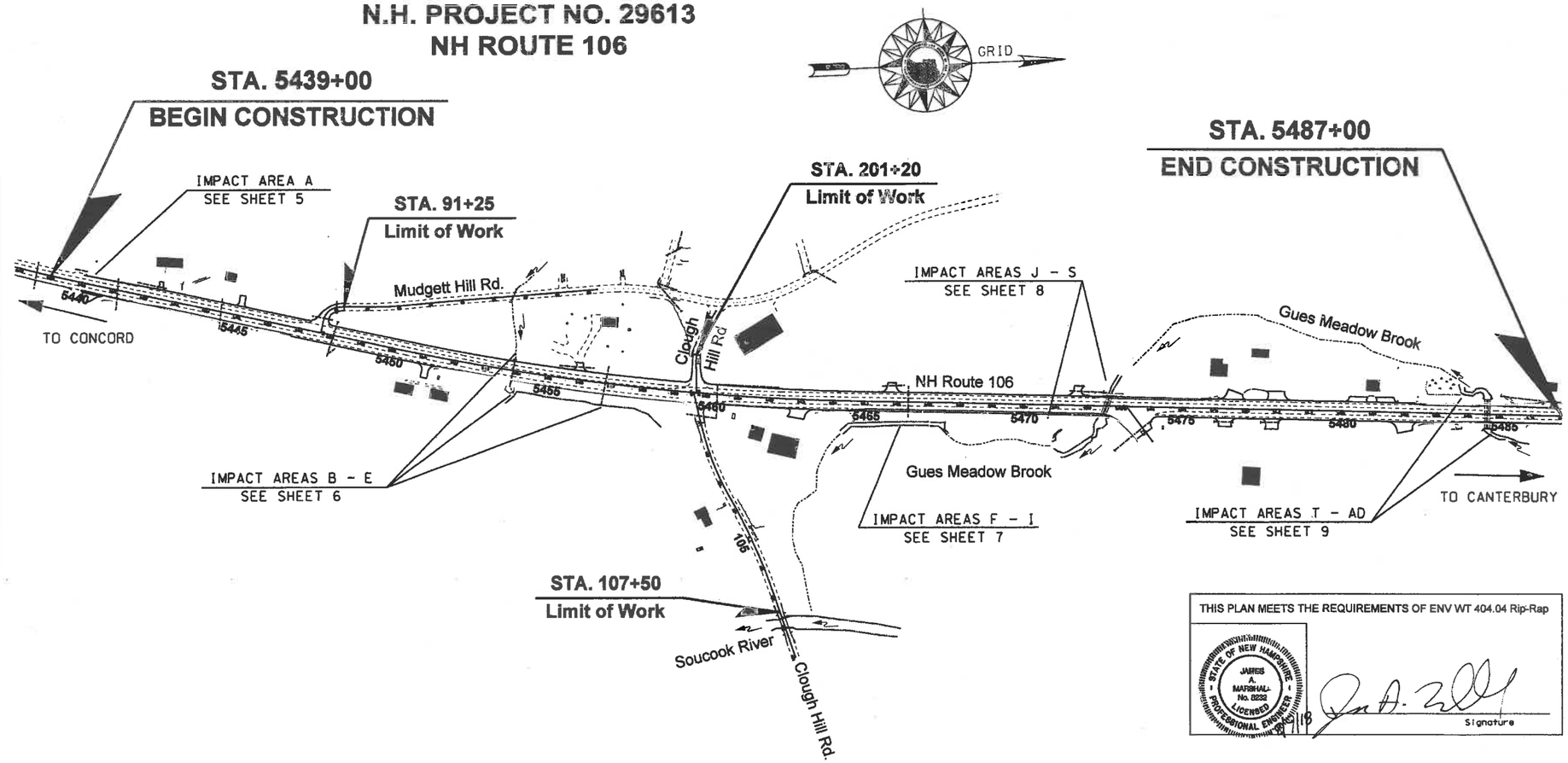
AVERAGE DAILY TRAFFIC 20 15	17,200
AVERAGE DAILY TRAFFIC 20 35	21,000
PERCENT OF TRUCKS	8.5%
DESIGN SPEED	55 mph
LENGTH OF PROJECT	0.9 miles



LOCATION MAP

1 ½ 0 1 2 mi.

GRAPHIC SCALE



THIS PLAN MEETS THE REQUIREMENTS OF ENV WT 404.04 Rip-Rap

STATE OF NEW HAMPSHIRE JAMES A. MARSHAL No. 8232 LICENSED PROFESSIONAL ENGINEER

Signature

2/9/2018

INDEX OF SHEETS

1	FRONT SHEET
2-3	STANDARD SYMBOLS SHEETS
4	WETLAND IMPACT SUMMARY
5-10	WETLAND IMPACT PLANS
11-16	WETLAND IMPACT DETAILS
17-20	CONSTRUCTION DETAILS
21-27	EROSION CONTROL PLANS

TOWN OF LOUDON
COUNTY OF MERRIMACK

SCALE: 1" = 200'

Wetland Delineation by:
McFarland Johnson
DATE: June-July 2016
Christine Perron, CWS
Jed Merrow, CWS
Steve Hoffman

NHDOT THE STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

NH ROUTE 106
WETLAND IMPACT PLANS

FEDERAL PROJECT NO.	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
X-A004(201)	29613	1	27

DRAWN BY AMC DATE 12/2017
CHECKED BY CAC DATE 1/2018

GENERAL

EDGE OF PAVEMENT — PROPOSED ROADWAY
TRAVELED WAY — existing roadway — (pavement removed outside slope lines)

DRIVEWAYS — (label surface type)

BUILDINGS — (building to be removed) — (label house or type of building)

FOUNDATION — (label type)

LEACH FIELD — leach field

BRIDGE CROSSINGS — STREAM — OVERPASS

STEPS AND WALK — (label type)

INTERMITTENT WATER COURSE

SHORE LINE — river/stream — pond — (label name of water body)

POTENTIAL WET AREA SYMBOL

BRUSH OR WOODS LINE

TREES (PLANS) — (deciduous) (coniferous) (stump)
(show station, circumference in feet & type)

TREE OR STUMP (CROSS-SECTIONS)

HEDGE — (label type)

MONITORING WELL — mon W

WELL — W

FLAG POLE — fp

ORIGINAL GROUND (TYPICALS)

ROCK OUTCROP

ROCK LINE (TYPICALS & SECTIONS ONLY)

GUARDRAIL (label type) — existing: bgr, cgr — PROPOSED

JERSEY BARRIER

CURB (LABEL TYPE)

STONE WALL

RETAINING WALL (LABEL TYPE) — (points toward retained ground)

FENCE (LABEL TYPE)

SIGNS — (single post) — (double post)

GAS PUMP — gp

FUEL TANK (ABOVE GROUND) — ft (label size & type)

STORAGE TANK FILLER CAP — fc

SEPTIC TANK — S

GRAVE — gr

MAILBOX — mb

VENT PIPE — vp

SATELLITE DISH ANTENNA — da

PHONE — ph

GROUND LIGHT/LAMP POST — gl — lp

BORING LOCATION — B

TEST PIT — TP

INTERSTATE NUMBERED HIGHWAY — 293

UNITED STATES NUMBERED HIGHWAY — 3

STATE NUMBERED HIGHWAY — 102

SHORELAND - WETLAND

WETLAND DESIGNATION AND TYPE — 2 PUB2E

DELINEATED WETLAND — DW
ORDINARY HIGH WATER — OHW
TOP OF BANK — TOB
TOP OF BANK & ORDINARY HIGH WATER — TOBOHW
NORMAL HIGH WATER — NHW
WIDTH AT BANK FULL — WBF
PRIME WETLAND — PWET
PRIME WETLAND 100' BUFFER — PWET100
NON-JURISDICTIONAL DRAINAGE AREA — NJDA
COWARDIN DISTINCTION LINE — CDL
TIDAL BUFFER ZONE — TBZ
DEVELOPED TIDAL BUFFER ZONE — DTBZ
HIGHEST OBSERVABLE TIDE LINE — HOTL
MEAN HIGH WATER — MHW
MEAN LOW WATER — MLW
VERNAL POOL — VP
SPECIAL AQUATIC SITE — SAS
REFERENCE LINE — REF
WATER FRONT BUFFER — WB50
NATURAL WOODLAND BUFFER — NWB150
PROTECTED SHORELAND — PS250
INVASIVE SPECIES LABEL — I.S. I — I.S. II
INVASIVE SPECIES — INV

FLOODPLAIN / FLOODWAY

500 YEAR FLOODPLAIN BOUNDARY — FP500
100 YEAR FLOODPLAIN BOUNDARY — FP100
FLOODWAY — FW

ENGINEERING

CONSTRUCTION BASELINE — 30 31 32

PC, PT, POT (ON CONST BASELINE)

PI (IN CONSTRUCTION BASELINES)

INTERSECTION OR EQUATION OF TWO LINES

ORIGINAL GROUND LINE (PROFILES AND CROSS-SECTIONS)

PROFILE GRADE LINE (PROFILES AND CROSS-SECTIONS)

CLEARING LINE — SLOPE LINE

SLOPE LINE

SLOPE LINE (FILL)

SLOPE LINE (CUT)

PROFILES AND CROSS SECTIONS:
ORIGINAL GROUND ELEVATION (LEFT) — 72.5
FINISHED GRADE ELEVATION (RIGHT) — 79.14

SHEET 1 OF 2

STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN

STANDARD SYMBOLS

REVISION DATE	DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
11-21-2014	stdsymb1_2	29613	2	27

DRAINAGE

MANHOLE
CATCH BASIN — cb — (existing) — (PROPOSED)
DROP INLET — di
DRAINAGE PIPE (existing) — (label size & type)
DRAINAGE PIPE (PROPOSED)
UNDERDRAIN (existing) W/ FLUSHING BASIN — fb — (label size & type)
UNDERDRAIN (PROPOSED) W/ FLUSHING BASIN
show direction of flow
HEADER (existing & PROPOSED) — (with stone outlet protection)
END SECTION (existing & PROPOSED) — METAL or PLASTIC — RCP
OPEN DITCH (PROPOSED)
EROSION CONTROL/ STONE SLOPE PROTECTION

BOUNDARIES / RIGHT-OF-WAY

RIGHT-OF-WAY LINE — (label type)
RR RIGHT-OF-WAY LINE
PROPERTY LINE — PL
PROPERTY LINE (COMMON OWNER) — Z
TOWN LINE — BOW / CONCORD
COUNTY LINE — COOS / GRAFTON
STATE LINE — MAINE / NEW HAMPSHIRE
NATIONAL FOREST
CONSERVATION LAND — LC
BENCH MARK / SURVEY DISK
BOUND — bnd — (PROPOSED)
STATE LINE/ TOWN LINE MONUMENT — S/L — T/L
NHDOT PROJECT MARKER
IRON PIPE OR PIN — ip
DRILL HOLE IN ROCK — dh
TAX MAP AND LOT NUMBER — 156 / 14 — 1642/341 — 6.80 Ac.±
PROPERTY PARCEL NUMBER — 12
HISTORIC PROPERTY — H

UTILITIES

existing — PROPOSED

TELEPHONE POLE
POWER POLE
JOINT OCCUPANCY
MISCELLANEOUS/UNKNOWN POLE
GUY POLE OR PUSH BRACE
(plot point at face not center of symbol)
LIGHT POLE
LIGHT ON POWER POLE
LIGHT ON JOINT POLE

POLE STATUS:
REMOVE, LEAVE, PROPOSED, OR TEMPORARY AS APPLICABLE e.g.:
R — L — P+04 25.0' — T+04 25.0'

RAILROAD — (label ownership)
RAILROAD SIGN
RAILROAD SIGNAL
UTILITY JUNCTION BOX — jb — JB
OVERHEAD WIRE — OW — (label type)

UNDERGROUND UTILITIES
WATER (on existing lines label size, type and note if abandoned) — W — PW
SEWER — S — PS
TELEPHONE — T — PT
ELECTRIC — E — PE
GAS — G — PG
LIGHTING — L — PL
INTELLIGENT TRANSPORTATION SYSTEM — ITS — PITS
FIBER OPTIC — FO — PFO
WATER SHUT OFF
GAS SHUT OFF
HYDRANT

MANHOLES
SEWER — MHS
TELEPHONE — MHT
ELECTRICAL — MHE
GAS — MHG
UNKNOWN

TRAFFIC SIGNALS / ITS

existing — PROPOSED

MAST ARM (existing) — 30' MA (NOTE ANGLE FROM ℄)
OPTICOM RECEIVER
OPTICOM STROBE
TRAFFIC SIGNAL
PEDESTAL WITH PEDESTRIAN SIGNAL HEADS AND PUSH BUTTON UNIT
SIGNAL CONDUIT — C — PC
CONTROLLER CABINET — cc — CC
METER PEDESTAL — mp — MP
PULL BOX — pb — PB
LOOP DETECTOR (QUADRUPOLE) — (label size)
LOOP DETECTOR (RECTANGULAR) — (label size)
CAMERA POLE (CCTV)
FIBER OPTIC DELINEATOR — fod — FOD
FIBER OPTIC SPLICE VAULT — SVF
ITS EQUIPMENT CABINET — its — ITS
VARIABLE SPEED LIMIT SIGN
DYNAMIC MESSAGE SIGN
ROAD AND WEATHER INFO SYSTEM

CONSTRUCTION NOTES

CURB MARK NUMBER - BITUMINOUS — B-1
CURB MARK NUMBER - GRANITE — G-1
CLEARING AND GRUBBING AREA — A
DRAINAGE NOTE — 1
EROSION CONTROL NOTE — A
FENCING NOTE — A
GUARDRAIL NOTE — 1
ITS NOTE — 1
LIGHTING NOTE — A
TRAFFIC SIGNAL NOTE — 1

SHEET 2 OF 2

STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN

STANDARD SYMBOLS

REVISION DATE	DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
9-1-2016	stdsymb1_2	29613	3	27

WETLAND IMPACT SUMMARY

WETLAND NUMBER	WETLAND CLASSIFICATION	LOCATION	AREA IMPACTS				LINEAR STREAM IMPACTS				
			PERMANENT		TEMPORARY		PERMANENT			TEMPORARY	
			N.H.W.B (NON-WETLAND) (BANK)	N.H.W.B AND A.C.O.E. (WETLAND)	N.H.W.B (NON-WETLAND) (BANK)	N.H.W.B AND A.C.O.E. (WETLAND)	BANK LEFT	BANK RIGHT	CHANNEL	BANK	CHANNEL
			SF	SF	SF	SF	LF	LF	LF	LF	LF
1	PEM1Ex	A		812							
4	R4SB3J	B		104					20		
5	PUBH	C		416							
5	PUBH	D				902					
5	PUBH	D1				553					
3	R4SB3J	E		97					36		
6	R2UB1H	F		1192					201		
6	R2UB1H	G				4433					320
7	PFO1E	H		345							
7	PFO1E	I				938					
7	PFO1E	J		211							
7	PFO1E	K				2271					
6	R2UB1H	L		47					3		
6	R2UB1H	M1		594					22		
6	R2UB1H	M2		297					22		
6	R2UB1H	N				785					26
9	BANK	O	244					22			
9	BANK	P			448					31	
6	R2UB1H	Q				557					31
11	PFO1E	R				689					
11	PFO1E	S		963							
12	PSS1Jb	T				1025					
13	R2UB1Hb	U				982					83
13	R2UB1Hb	V		183					31		
12	PSS1Jb	W		455							
13	R2UB1Hb	X		437					16		
14	BANK	Y			281					39	
14	BANK	Z	73					11			
16	R2UB1H	AA		466					49		
16	R2UB1H	AB				397					30
17	PSS1E	AC		1030							
17	PSS1E	AD				799					
SUB-TOTALS			317	7649	729	14,331	0	33	400	70	490
TOTALS			7,966		15,060		433			560	
TOTAL (PERM + TEMP)			23,026								

WETLAND CLASSIFICATION CODES

PEM1Ex	PALUSTRINE, EMERGENT, PERSISTENT, SEASONALLY FLOODED/SATURATED, EXCAVATED
PFO1E	PALUSTRINE, FORESTED, BROAD-LEAVED DECIDUOUS, SEASONALLY FLOODED/SATURATED
PSS1E	PALUSTRINE, SCRUB-SHRUB, BROAD-LEAVED DECIDUOUS, SEASONALLY FLOODED/SATURATED
PSS1Jb	PALUSTRINE, SCRUB-SHRUB, BROAD-LEAVED DECIDUOUS, INTERMITTENTLY FLOODED, BEAVER
PUBH	PALUSTRINE, UNCONSOLIDATED BOTTOM, PERMANENTLY FLOODED
R2UB1H	RIVERINE, LOWER PERENNIAL, UNCONSOLIDATED BOTTOM, COBBLE-GRAVEL, PERMANENTLY FLOODED
R2UB1Hb	RIVERINE, LOWER PERENNIAL, UNCONSOLIDATED BOTTOM, COBBLE-GRAVEL, PERMANENTLY FLOODED, BEAVER
R4SB3J	RIVERINE, INTERMITTENT, STREAMBED, COBBLE-GRAVEL, INTERMITTENTLY FLOODED
BANK	BANK

REVISIONS AFTER PROPOSAL

NUMBER	DATE	STATION	STATION	DESCRIPTION

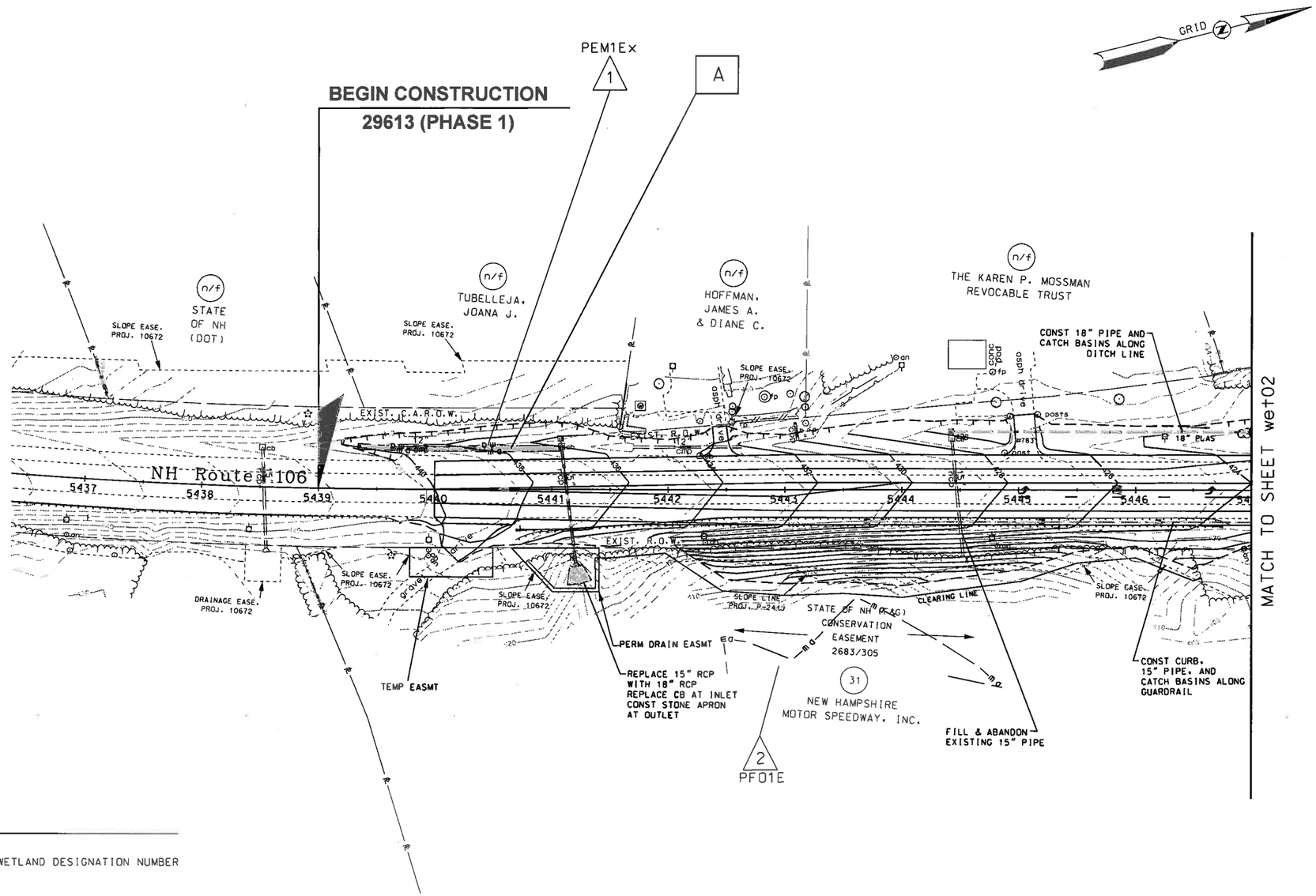
SDR PROCESSED – DATE –
NEW DESIGN AMC DATE 12/2017
SHEET CHECKED CAC DATE 1/2018

AS BUILT DETAILS DATE

STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN

WETLAND IMPACT SUMMARY

DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
29613 wet sum	29613	4	27



LEGEND

TYPE OF WETLAND IMPACT	SHADING/ HATCHING
NEW HAMPSHIRE WETLANDS BUREAU (PERMANENT NON-WETLAND)	
NEW HAMPSHIRE WETLANDS BUREAU & ARMY CORP OF ENGINEERS (PERMANENT WETLAND)	
TEMPORARY IMPACTS	

- # — WETLAND DESIGNATION NUMBER
- # — WETLAND IMPACT LOCATION
- # — WETLAND MITIGATION AREA
- MITIGATION

50 0 50 100
SCALE IN FEET

STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN

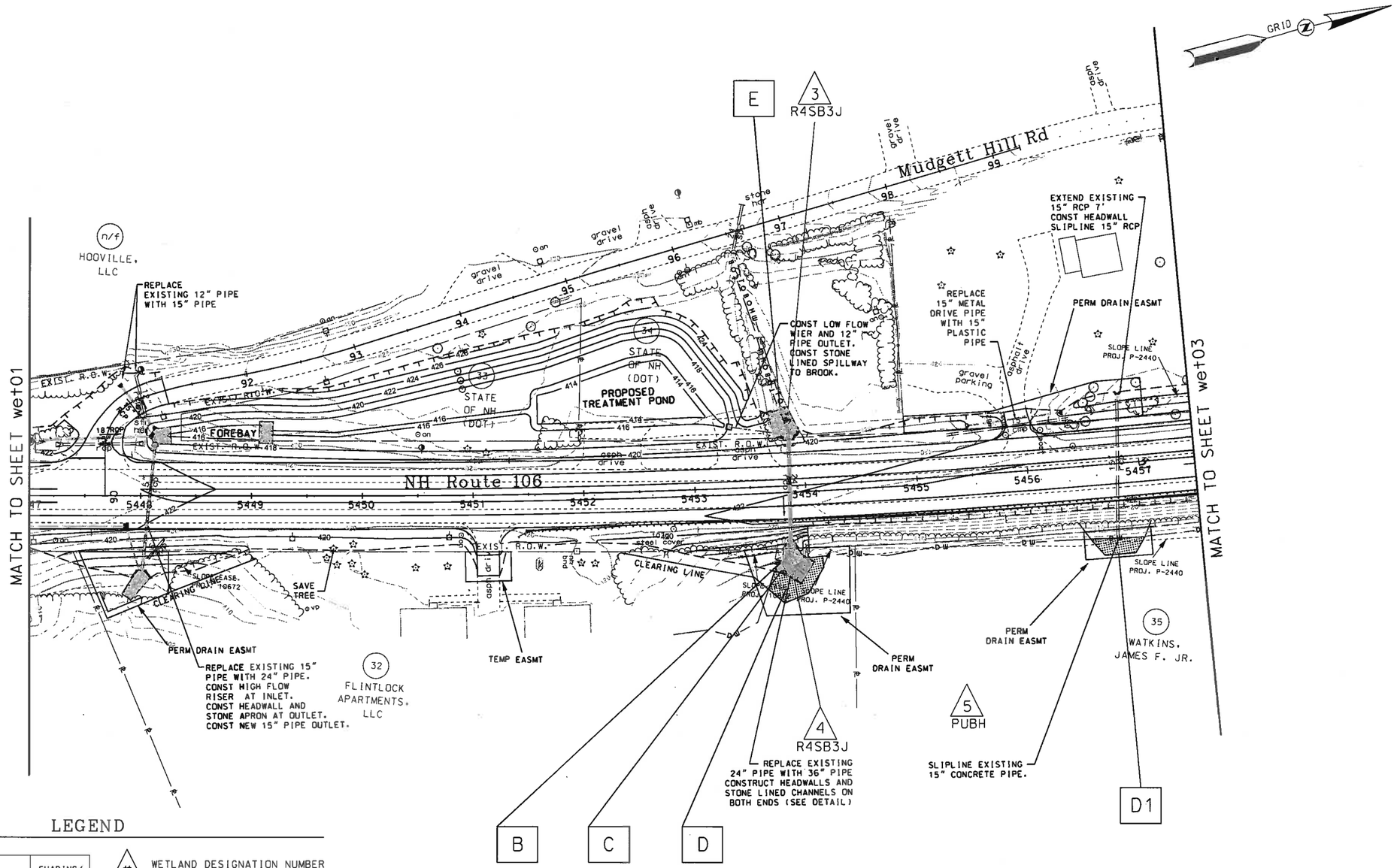
WETLAND IMPACT PLANS

MODEL	DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
wet01	29613wet	29613	5	27

REVISIONS AFTER PROPOSAL

NUMBER	DATE	STATION	STATION	DESCRIPTION

		DATE
SDR PROCESSED	AMC	DATE 12/2017
NEW DESIGN	CAC	DATE 1/2018
SHEET CHECKED		
AS BUILT DETAILS		DATE



LEGEND

TYPE OF WETLAND IMPACT	SHADING/ HATCHING
NEW HAMPSHIRE WETLANDS BUREAU (PERMANENT NON-WETLAND)	
NEW HAMPSHIRE WETLANDS BUREAU & ARMY CORP OF ENGINEERS (PERMANENT WETLAND)	
TEMPORARY IMPACTS	

- # WETLAND DESIGNATION NUMBER
- # WETLAND IMPACT LOCATION
- # WETLAND MITIGATION AREA
- MITIGATION

SEE DETAILS ON SHEETS 11 AND 12
FOR IMPACT AREAS B, C, D, E

ALSO SEE PIPE DETAIL ON SHEET 20

50 0 50 100
SCALE IN FEET

STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN

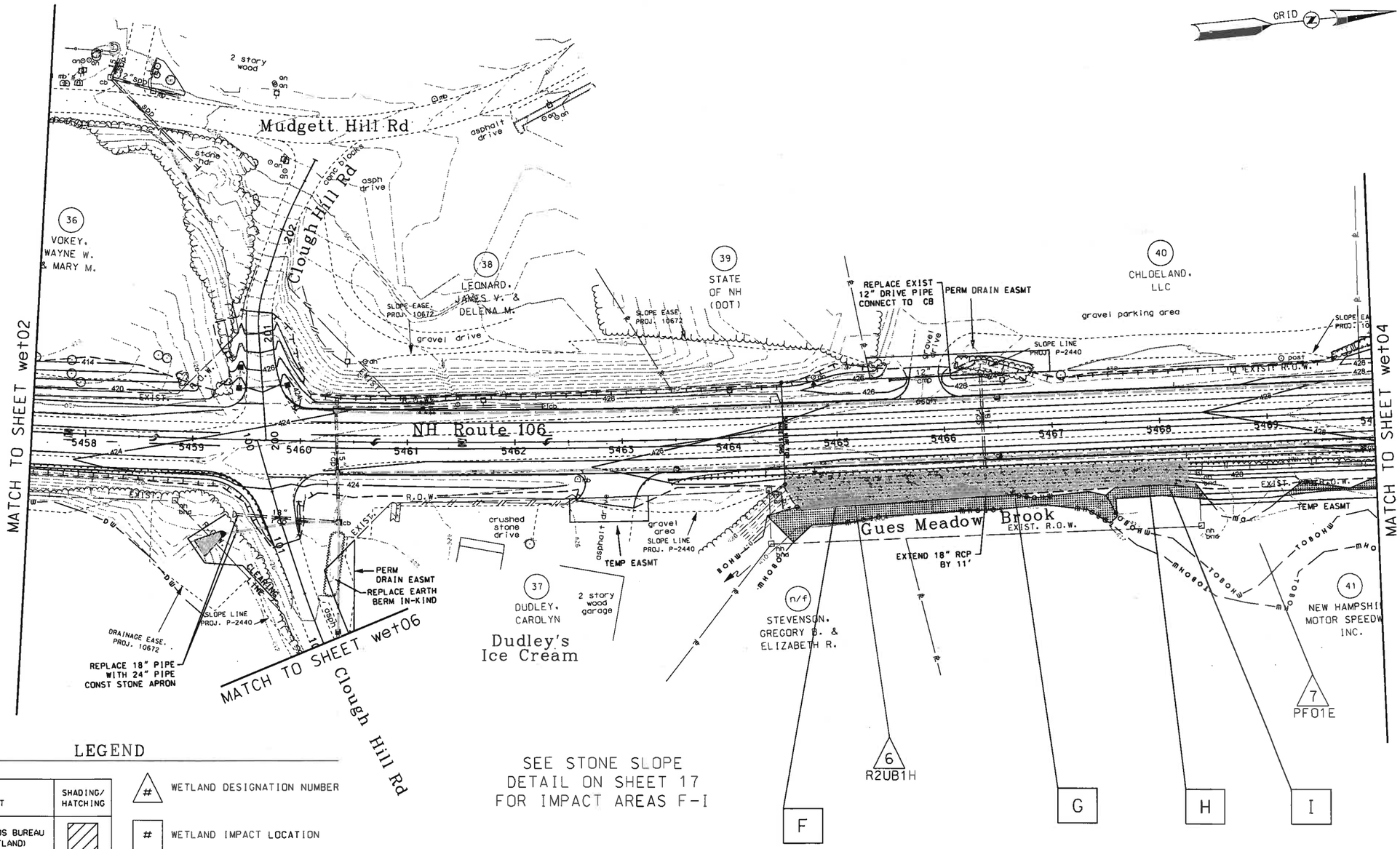
WETLAND IMPACT PLANS

MODEL	DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
wet02	29613wet	29613	6	27

REVISIONS AFTER PROPOSAL

NUMBER	DATE	STATION	DESCRIPTION

		DATE
SDR PROCESSED	AMC	
NEW DESIGN	AMC	DATE 12/2017
SHEET CHECKED	CAC	DATE 1/2018
AS BUILT DETAILS		DATE



SEE STONE SLOPE DETAIL ON SHEET 17 FOR IMPACT AREAS F-I

LEGEND

TYPE OF WETLAND IMPACT	SHADING/ HATCHING
NEW HAMPSHIRE WETLANDS BUREAU (PERMANENT NON-WETLAND)	
NEW HAMPSHIRE WETLANDS BUREAU & ARMY CORP OF ENGINEERS (PERMANENT WETLAND)	
TEMPORARY IMPACTS	

- # WETLAND DESIGNATION NUMBER
- # WETLAND IMPACT LOCATION
- # WETLAND MITIGATION AREA
- MITIGATION

50 0 50 100
SCALE IN FEET

STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN

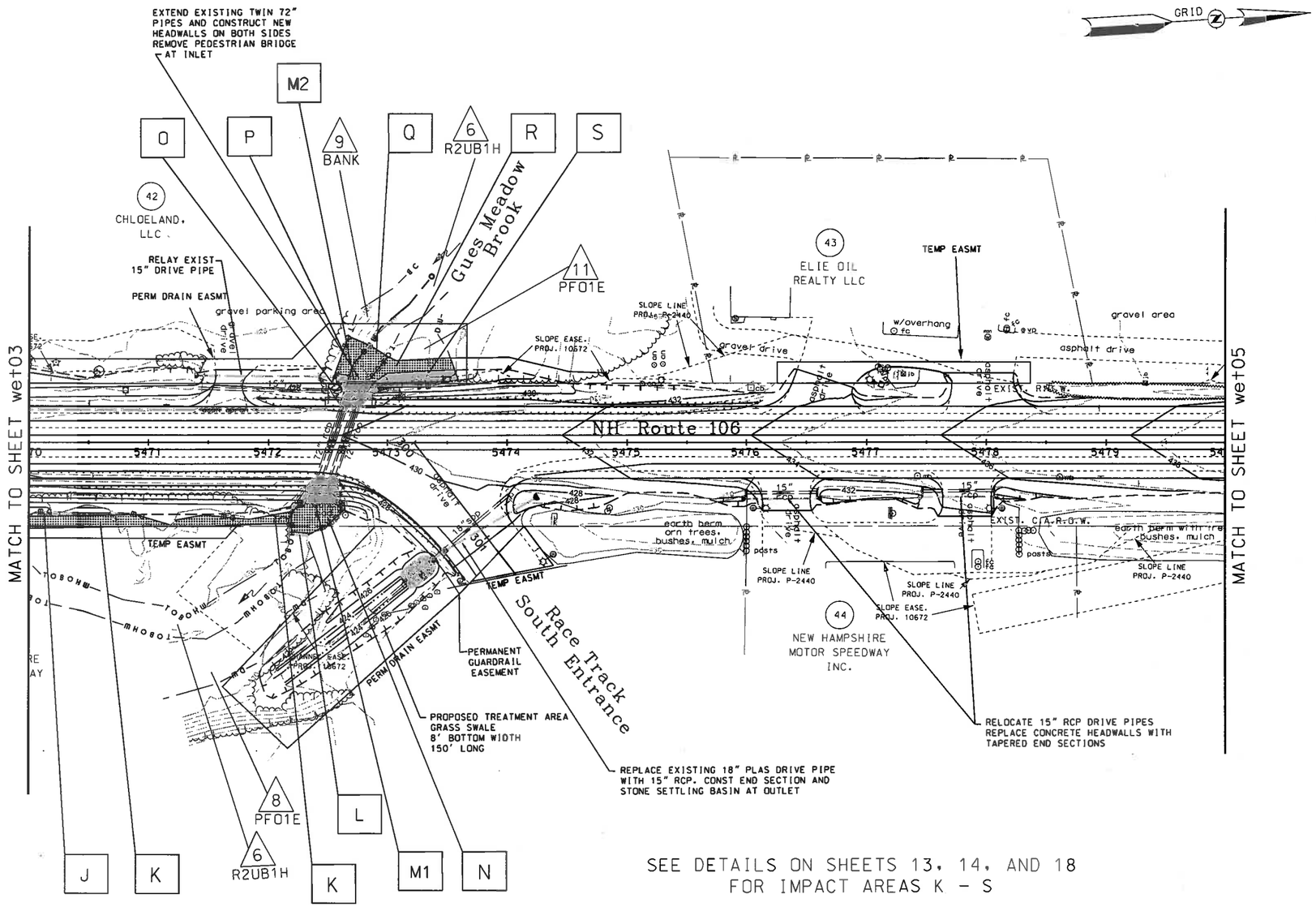
WETLAND IMPACT PLANS

MODEL	DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
wet03	29613wet	29613	7	27

REVISIONS AFTER PROPOSAL

NUMBER	DATE	STATION	STATION	DESCRIPTION

SDR PROCESSED DATE
NEW DESIGN AMC DATE 12/2017
SHEET CHECKED CAC DATE 1/2018
AS BUILT DETAILS DATE



SEE DETAILS ON SHEETS 13, 14, AND 18 FOR IMPACT AREAS K - S

LEGEND

TYPE OF WETLAND IMPACT	SHADING/ HATCHING
NEW HAMPSHIRE WETLANDS BUREAU (PERMANENT NON-WETLAND)	
NEW HAMPSHIRE WETLANDS BUREAU & ARMY CORP OF ENGINEERS (PERMANENT WETLAND)	
TEMPORARY IMPACTS	

- # WETLAND DESIGNATION NUMBER
- # WETLAND IMPACT LOCATION
- # WETLAND MITIGATION AREA
- MITIGATION

50 0 50 100
SCALE IN FEET

STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN

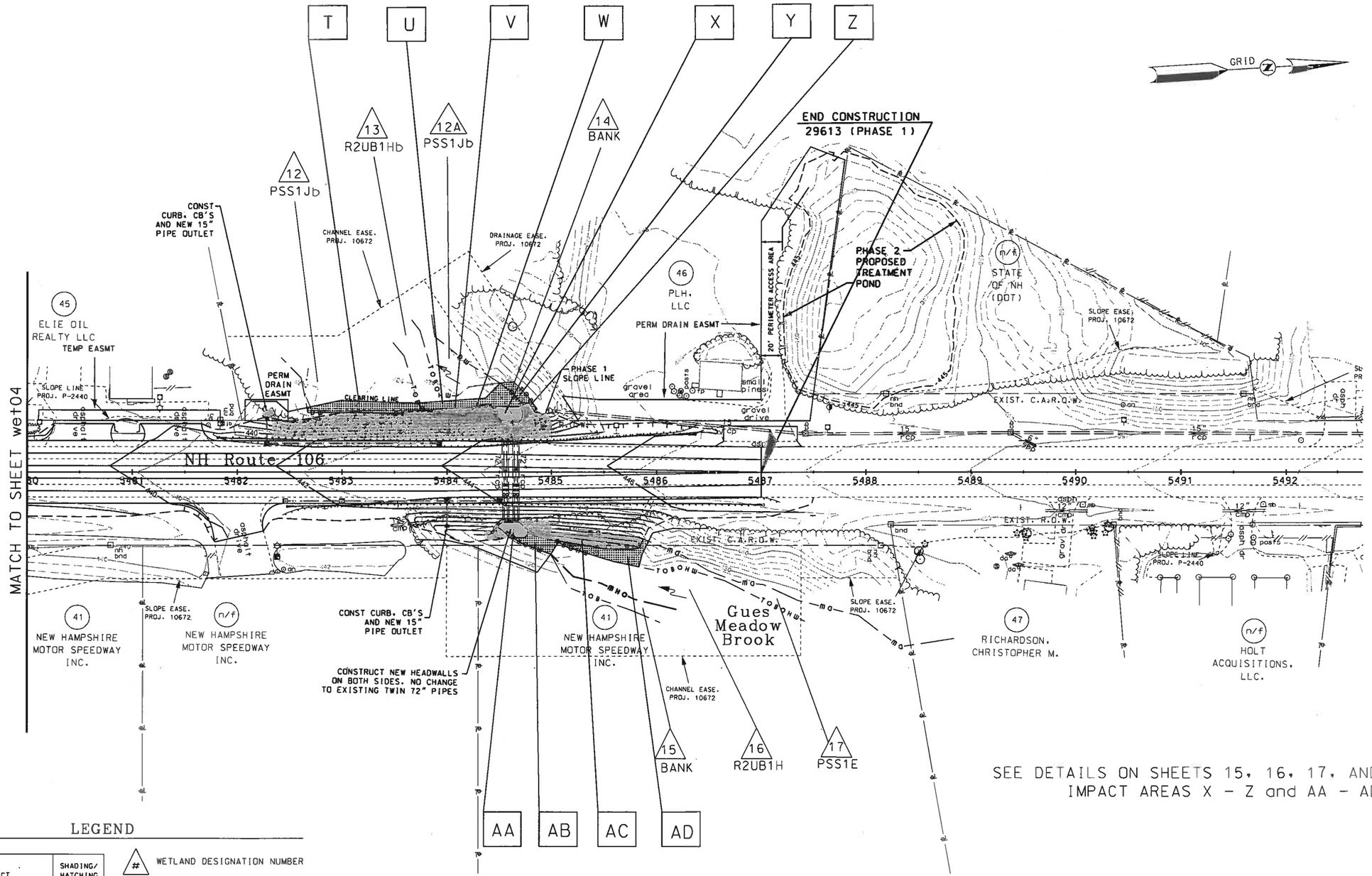
WETLAND IMPACT PLANS

MODEL	DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
wet04	29613wet	29613	8	27

REVISIONS AFTER PROPOSAL

NUMBER	DATE	STATION	STATION	DESCRIPTION

SDR PROCESSED DATE
NEW DESIGN AMC DATE 12/2017
SHEET CHECKED CAC DATE 1/2018
AS BUILT DETAILS DATE



SEE DETAILS ON SHEETS 15, 16, 17, AND 18 FOR IMPACT AREAS X – Z and AA – AD

LEGEND

TYPE OF WETLAND IMPACT	SHADING/ HATCHING
NEW HAMPSHIRE WETLANDS BUREAU (PERMANENT NON-WETLAND)	
NEW HAMPSHIRE WETLANDS BUREAU & ARMY CORP OF ENGINEERS (PERMANENT WETLAND)	
TEMPORARY IMPACTS	

- WETLAND DESIGNATION NUMBER
- WETLAND IMPACT LOCATION
- WETLAND MITIGATION AREA
- MITIGATION

50 0 50 100
SCALE IN FEET

STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN

WETLAND IMPACT PLANS

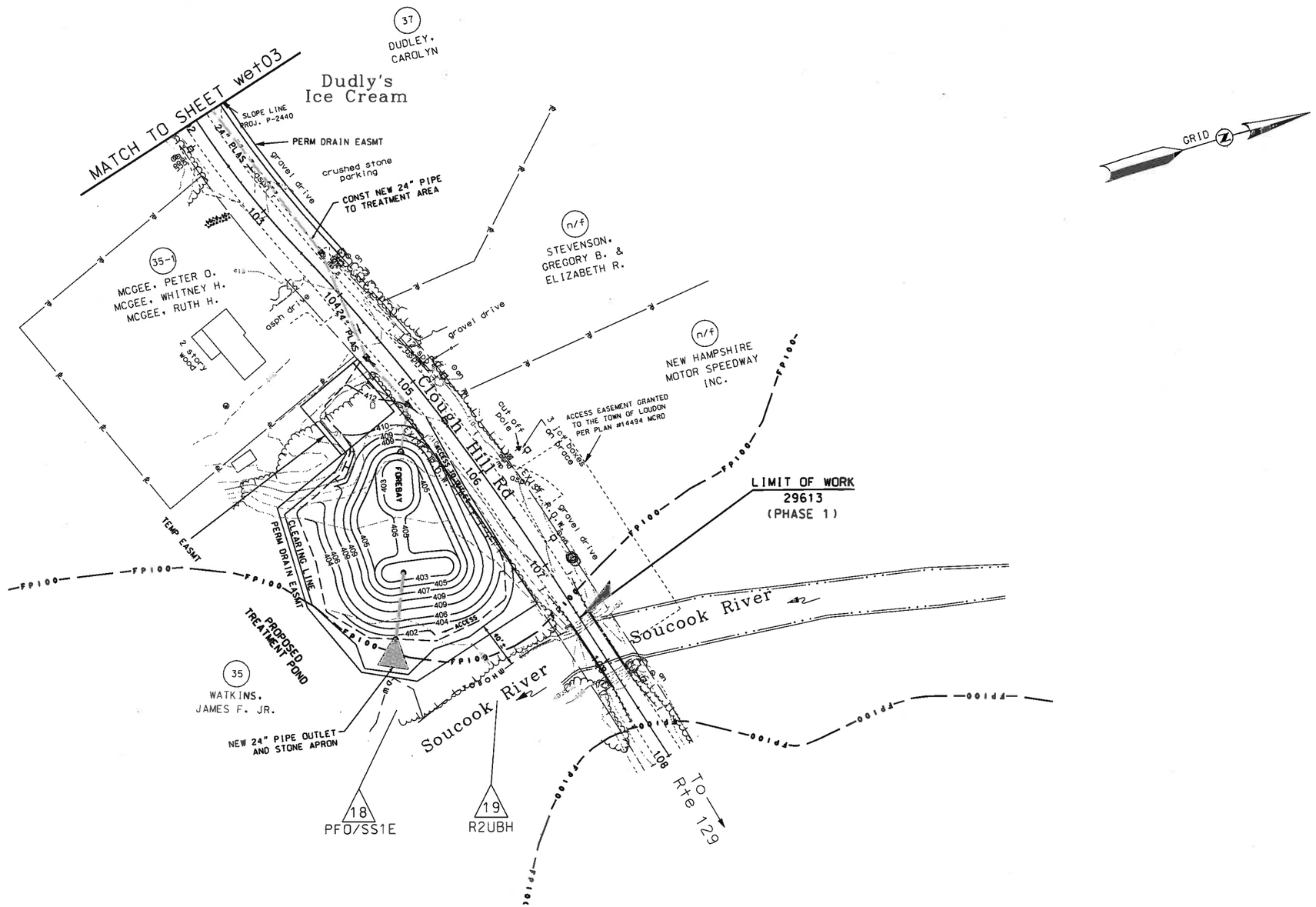
MODEL	DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
wet05	29613wet	29613	9	27

REVISIONS AFTER PROPOSAL

NUMBER	DATE	STATION	STATION	DESCRIPTION

		DATE
SDR PROCESSED	AMC	
NEW DESIGN	AMC	DATE 12/2017
SHEET CHECKED	CAC	DATE 1/2018

AS BUILT DETAILS DATE



NO IMPACTS ON THIS SHEET

50 0 50 100
SCALE IN FEET

STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN

WETLAND IMPACT PLANS

MODEL	OGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
wet06	29613wet	29613	10	27

REVISIONS AFTER PROPOSAL

NUMBER	DATE	STATION	STATION	DESCRIPTION

		DATE
SOR PROCESSED		
NEW DESIGN	AMC	DATE 12/2017
SHEET CHECKED	CAC	DATE 1/2018
AS BUILT DETAILS		DATE

NH Route 106 NB

exist. 24" rcp

PROP. 36" RCP
AND HEADWALL

PROP. SLOPE LINE

Ex. ROW

D W

PROP. SLOPE LINE

D W

PROP STONE LINED CHANNEL
3' (MIN) BOTTOM WIDTH,
2:1 (MAX) SIDE SLOPES

4
R4SB3J

B

C

D

STA 5453+85 RT

GRID N

5 0 5 10
SCALE IN FEET

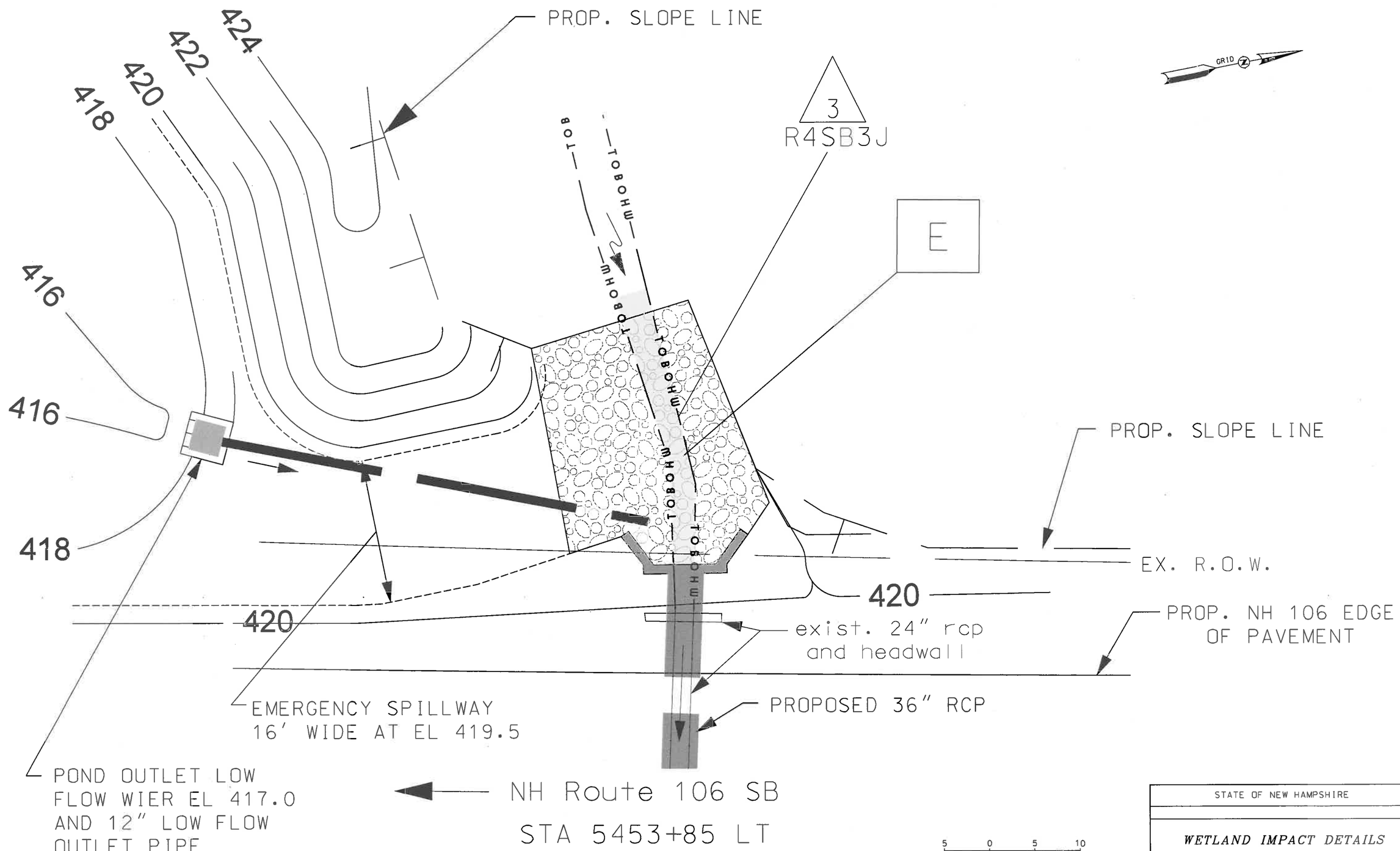
REVISIONS AFTER PROPOSAL			
NUMBER	DATE	STATION	DESCRIPTION

SDR PROCESSED		DATE
NEW DESIGN	AMC	DATE 12/2017
SHEET CHECKED	CAC	DATE 1/2018
AS BUILT DETAILS		DATE

STATE OF NEW HAMPSHIRE

WETLAND IMPACT DETAILS

DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
29613pwtdetail01	29613	11	27



REVISIONS AFTER PROPOSAL			
NUMBER	DATE	STATION	DESCRIPTION

		DATE
SOR PROCESSED	AMC	
NEW DESIGN		DATE 12/2017
SHEET CHECKED	CAC	DATE 1/2018
AS BUILT DETAILS		DATE

STATE OF NEW HAMPSHIRE

WETLAND IMPACT DETAILS

DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
29613pwtdetail02	29613	12	27

NH Route 106 NB

PROP EDGE OF PAVEMENT AND CURB

exist. headwall

exist. twin 72" rcp's

GRID

6' GRASS PANEL

TOBOHW

TOBOHW

Prop. Slope Line

PROP GUARDRAIL

Exist. conc. pad and elec. outlet

TOBOHW

TOBOHW

TOBOHW

Ex. CAROW

Prop. Slope Line

K

BOHW

TOBOH

L

M1

N

IMPACT FOR BOULDER WIER
TO CORRECT PERCH
SEE DETAIL ON SHEET 19

6
R2UB1H

STA 5472+50 RT

5 0 5 10
SCALE IN FEET

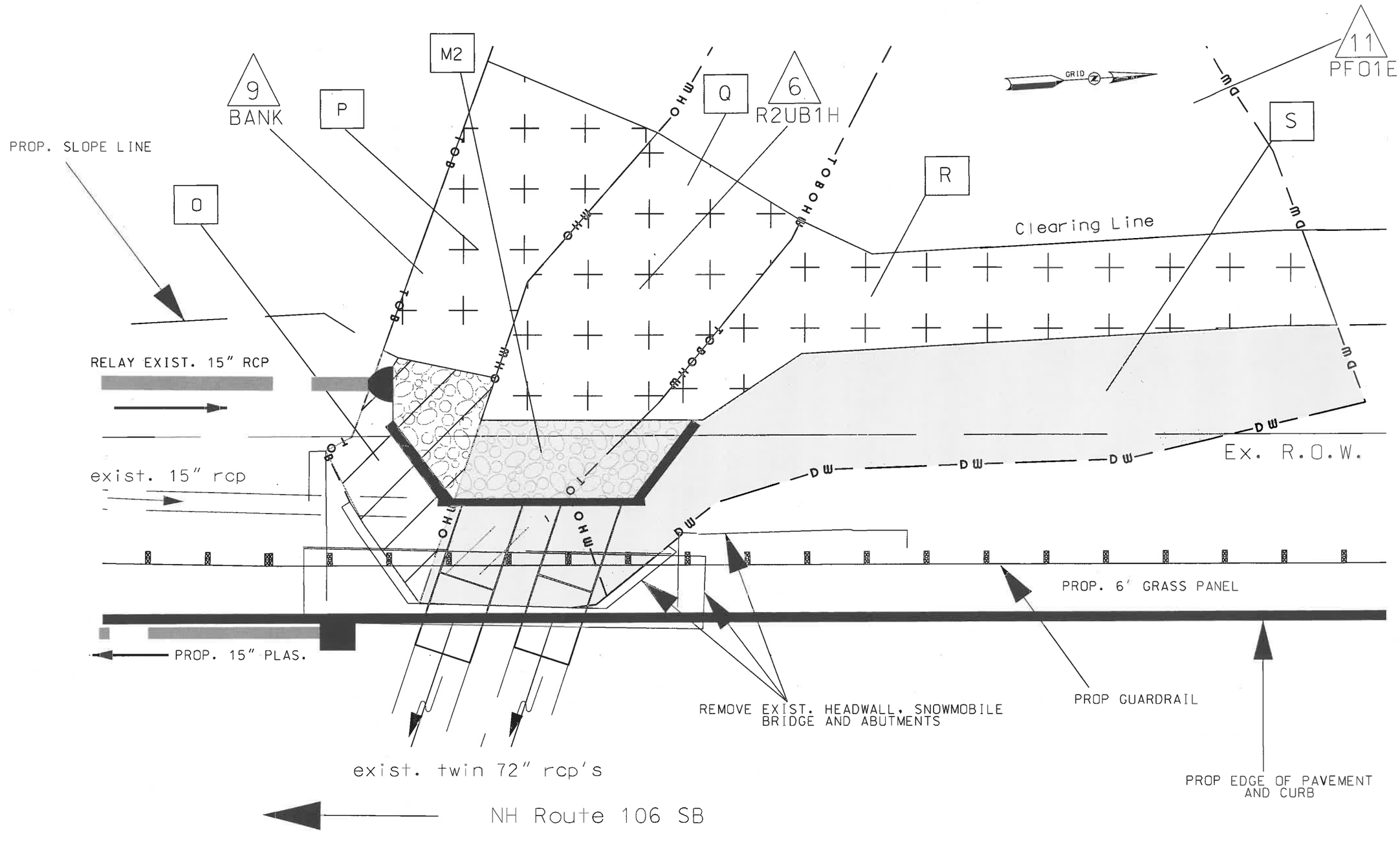
REVISIONS AFTER PROPOSAL			
NUMBER	DATE	STATION	STATION	DESCRIPTION

SDR PROCESSED		DATE
NEW DESIGN	AMC	DATE 12/2017
SHEET CHECKED	CAC	DATE 1/2018
AS BUILT DETAILS		DATE

STATE OF NEW HAMPSHIRE

WETLAND IMPACT DETAILS

DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
29613pwtdetail03	29613	13	27



STA 5472+50 LT

5 0 5 10
SCALE IN FEET

STATE OF NEW HAMPSHIRE

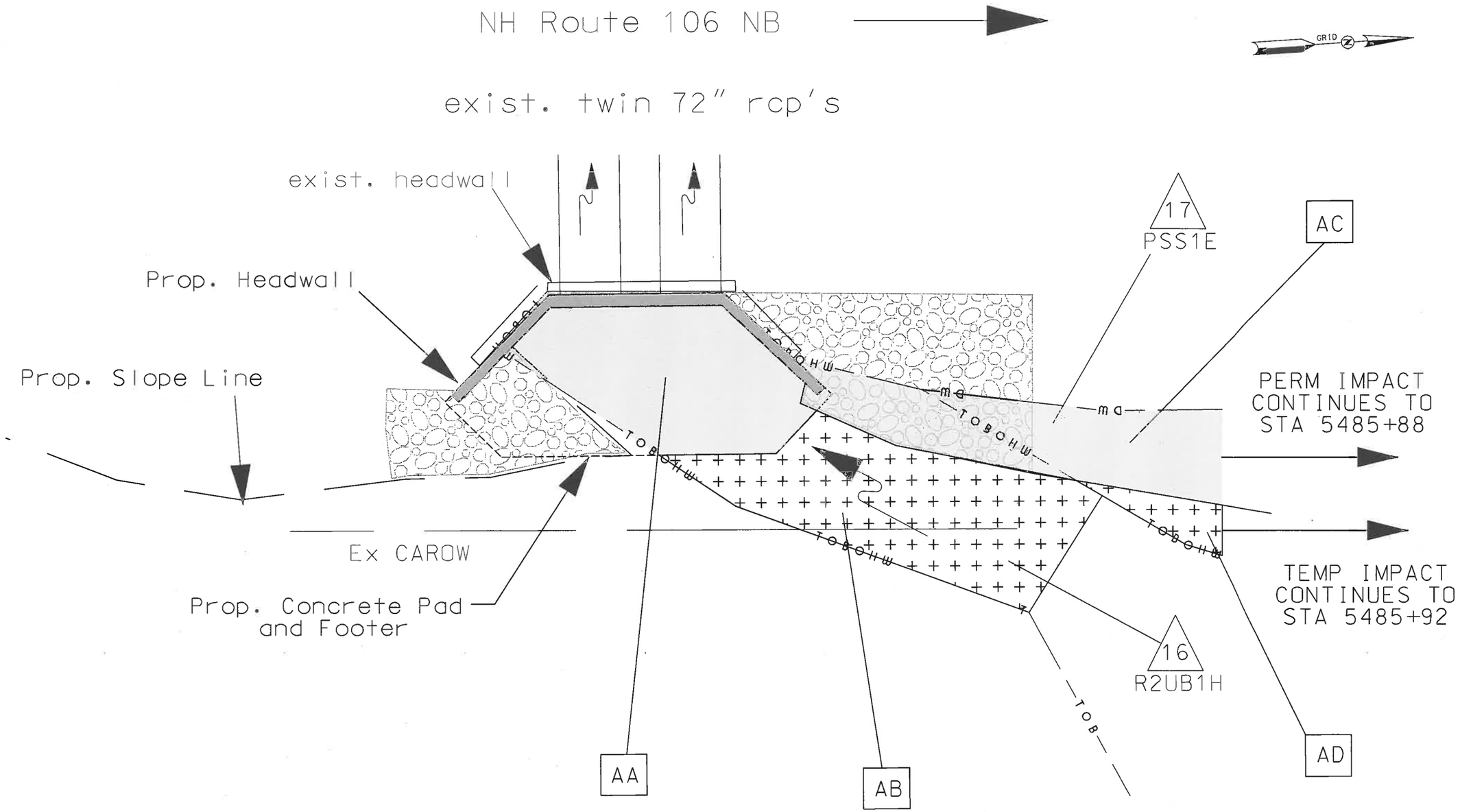
WETLAND IMPACT DETAILS

DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
29613pwtdetail04	29613	14	27

REVISIONS AFTER PROPOSAL

NUMBER	DATE	STATION	STATION	DESCRIPTION

		DATE
SOR PROCESSED		
NEW DESIGN	AMC	DATE 12/2017
SHEET CHECKED	CAC	DATE 1/2018
AS BUILT DETAILS		DATE



5 0 5 10
SCALE IN FEET

STATE OF NEW HAMPSHIRE

WETLAND IMPACT DETAILS

DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
29613pwtdetail05	29613	15	27

REVISIONS AFTER PROPOSAL

NUMBER	DATE	STATION	STATION	DESCRIPTION

SOR PROCESSED DATE
NEW DESIGN AMC DATE 12/2017
SHEET CHECKED CAC DATE 1/2018

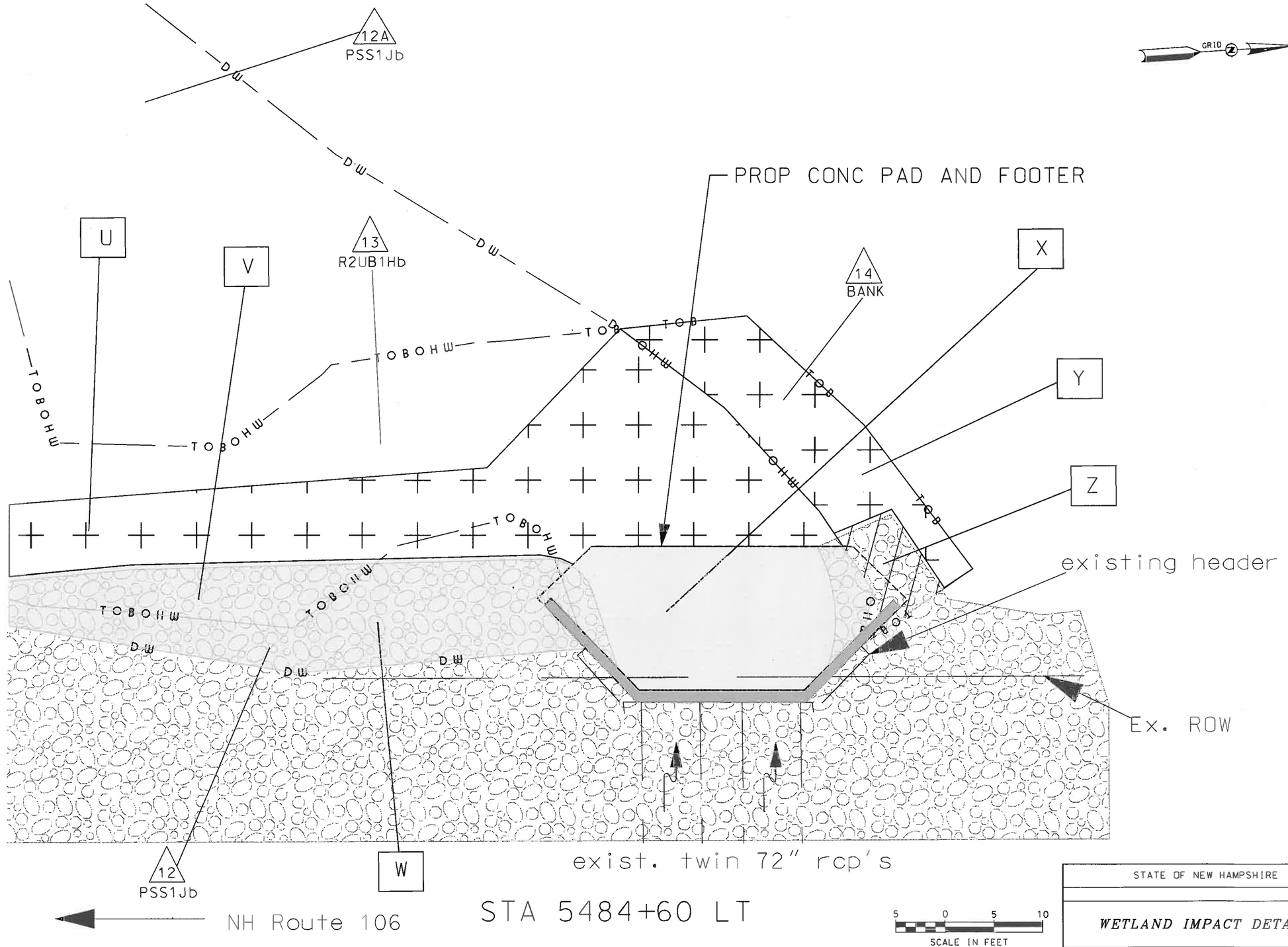
AS BUILT DETAILS DATE

REVISIONS AFTER PROPOSAL

NUMBER	DATE	STATION	STATION	DESCRIPTION

SDR PROCESSED		DATE
NEW DESIGN	AMC	DATE 12/2017
SHEET CHECKED	CAC	DATE 1/2018

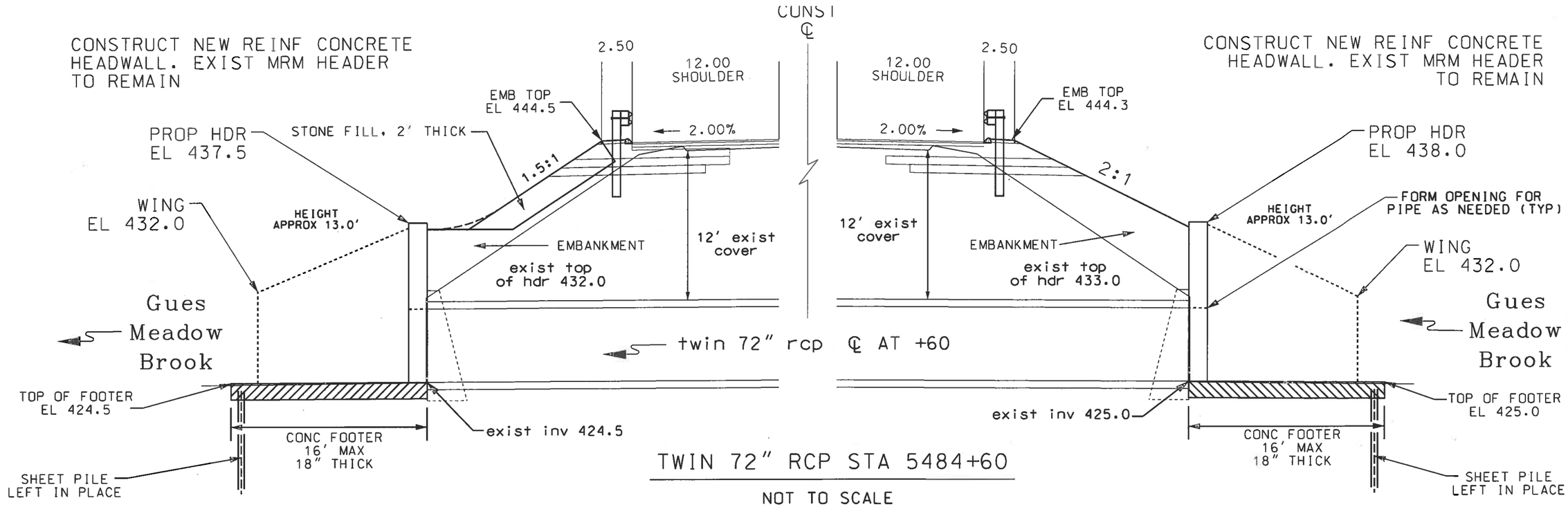
AS BUILT DETAILS DATE



STATE OF NEW HAMPSHIRE

WETLAND IMPACT DETAILS

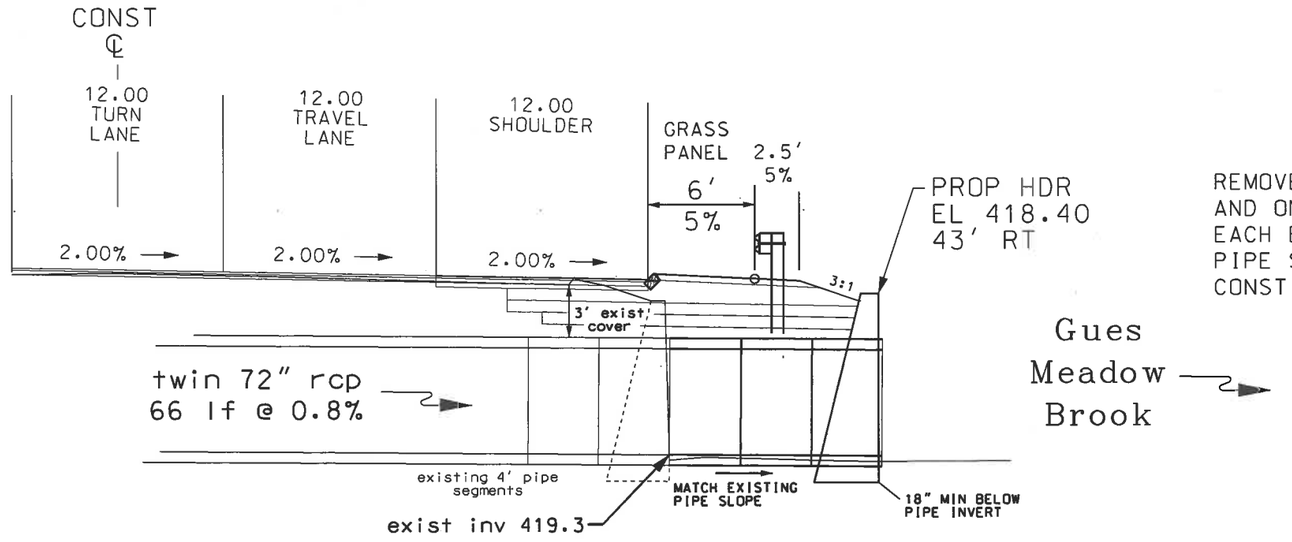
DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
29613pwtdetail06	29613	16	27



TWIN 72" RCP STA 5484+60

NOT TO SCALE

LEFT SIDE SIMILAR
REMOVE EXISTING
SNOWMOBILE BRIDGE
AND CONCRETE ABUTMENTS



REMOVE EXIST MRM HEADER
AND ONE 4' PIPE SEGMENT FROM
EACH BARREL. PLACE 2 NEW 8'
PIPE SEGMENTS ON EACH BARREL.
CONST NEW PC-9 CONCRETE HEADWALL.

TWIN 72" RCP STA 5472+50

NOT TO SCALE

REVISIONS AFTER PROPOSAL			
STATION	STATION	NUMBER	DATE

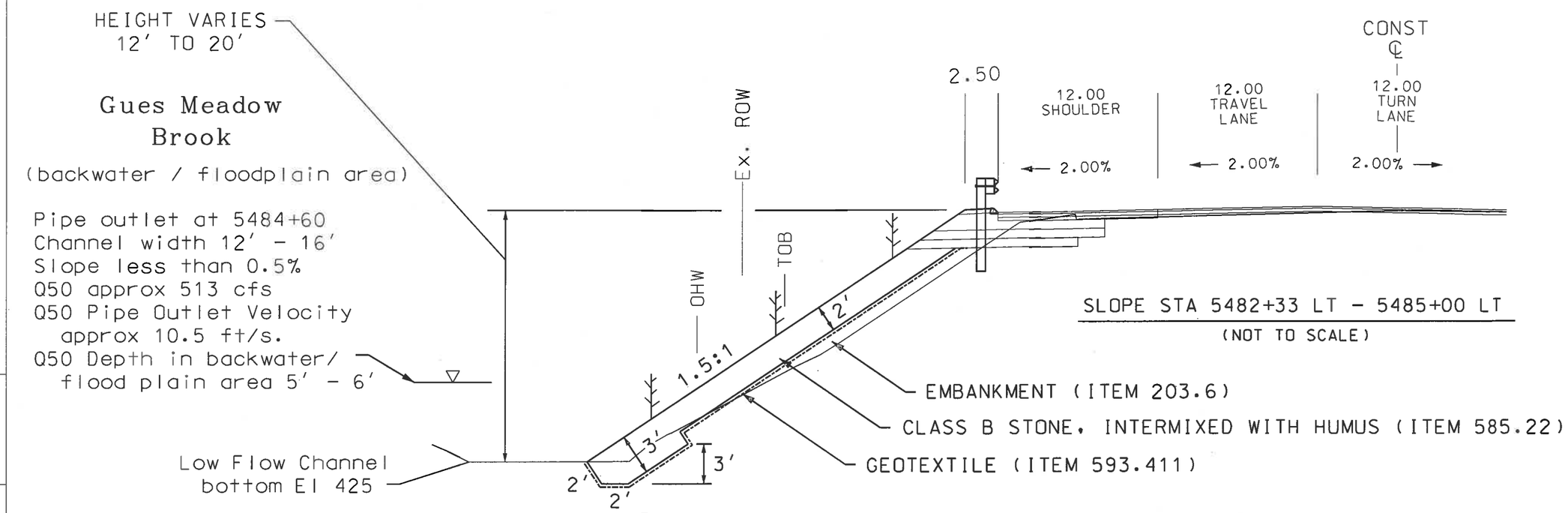
		DATE
SDR PROCESSED	CAC	
NEW DESIGN	CAC	DATE 12/2017
SHEET CHECKED	AMC	DATE 1/2018
AS BUILT DETAILS		DATE

STATE OF NEW HAMPSHIRE

DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN

CONSTRUCTION DETAILS

DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
29613condetails	29613	17	27

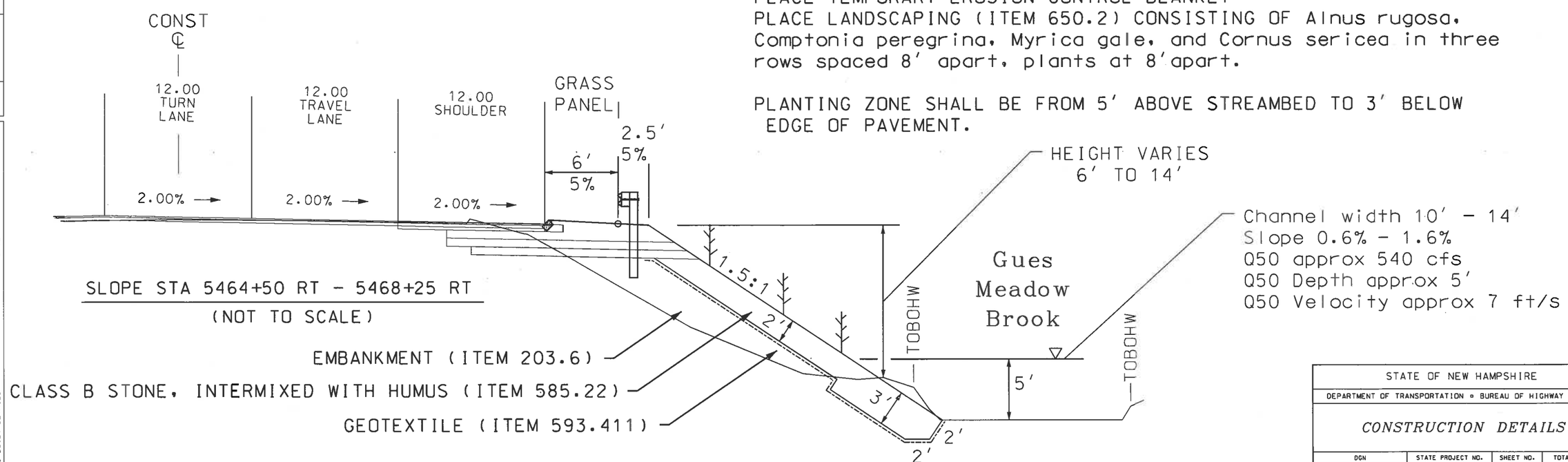


SLOPE STA 5482+33 LT - 5485+00 LT

(NOT TO SCALE)

VEGETATIVE STABILIZATION OF STONE SLOPES - BOTH LOCATIONS:
PLACE 3.5" HUMUS, SEED AND MULCH ON TOP OF STONE
PLACE TEMPORARY EROSION CONTROL BLANKET
PLACE LANDSCAPING (ITEM 650.2) CONSISTING OF Alnus rugosa, Comptonia peregrina, Myrica gale, and Cornus sericea in three rows spaced 8′ apart, plants at 8′ apart.

PLANTING ZONE SHALL BE FROM 5′ ABOVE STREAMBED TO 3′ BELOW EDGE OF PAVEMENT.



SLOPE STA 5464+50 RT - 5468+25 RT

(NOT TO SCALE)

NUMBER	DATE	STATION	STATION	DESCRIPTION
				REVISIONS AFTER PROPOSAL

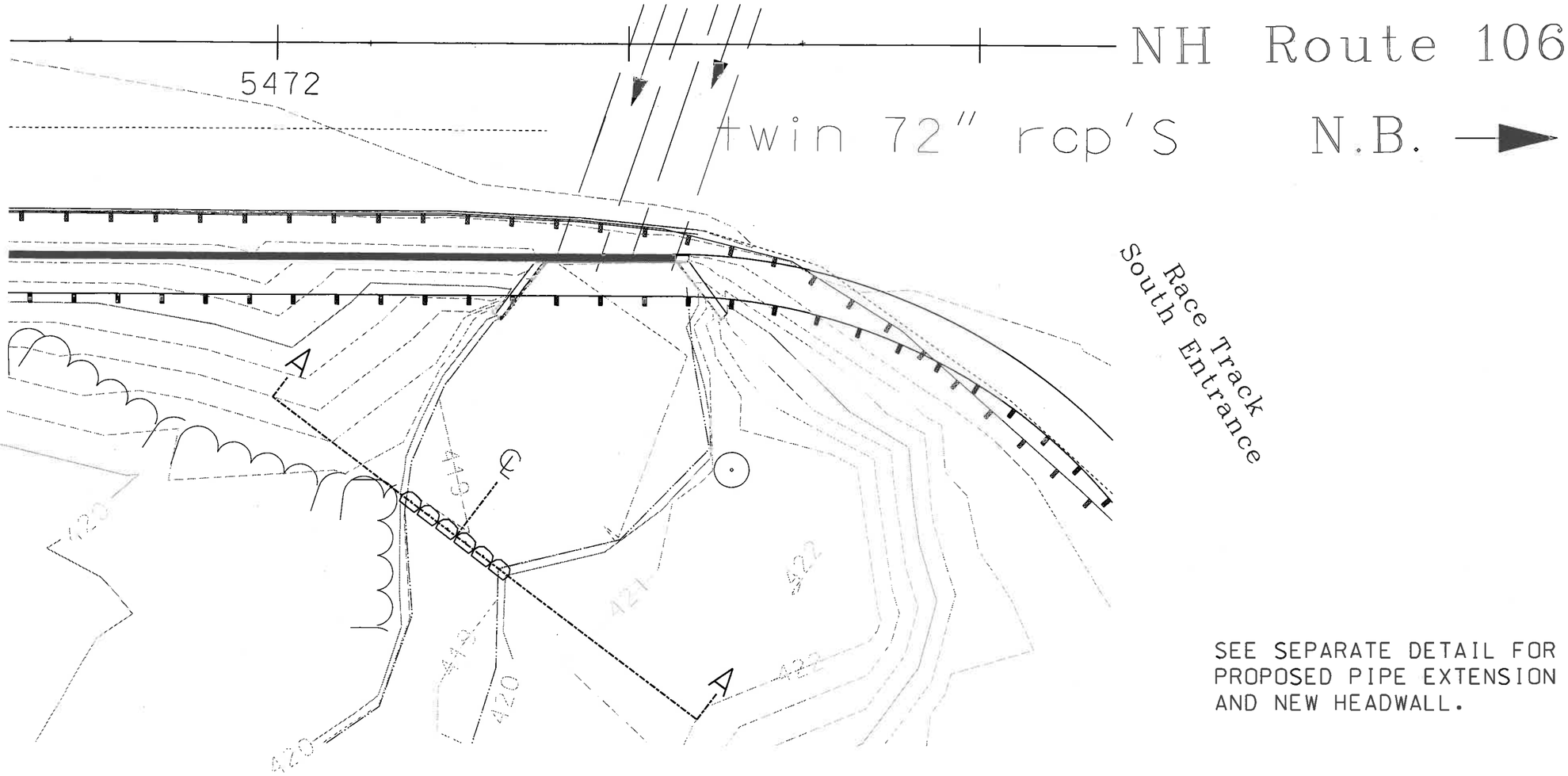
		DATE
SDR PROCESSED		
NEW DESIGN	CAC	DATE 12/2017
SHEET CHECKED	AMC	DATE 1/2018
AS BUILT DETAILS		DATE

STATE OF NEW HAMPSHIRE

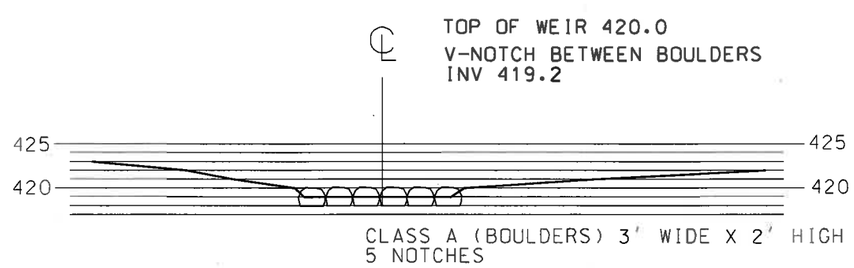
DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN

CONSTRUCTION DETAILS

DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
29613condetails	29613	18	27



SEE SEPARATE DETAIL FOR PROPOSED PIPE EXTENSION AND NEW HEADWALL.



SECTION A-A

PROPOSED OUTLET INVERTS 419.2

SECTION A-A BOTTOM WIDTH 16.6'

BASEFLOW 3" DEEP IN BOTH PIPES
= APPROX 2 CFS

TWIN 72" RCP STA 5472+50

DOWNSTREAM WEIR TO CORRECT PERCHED OUTLET

NOT TO SCALE

REVISIONS AFTER PROPOSAL			
NUMBER	DATE	STATION	DESCRIPTION

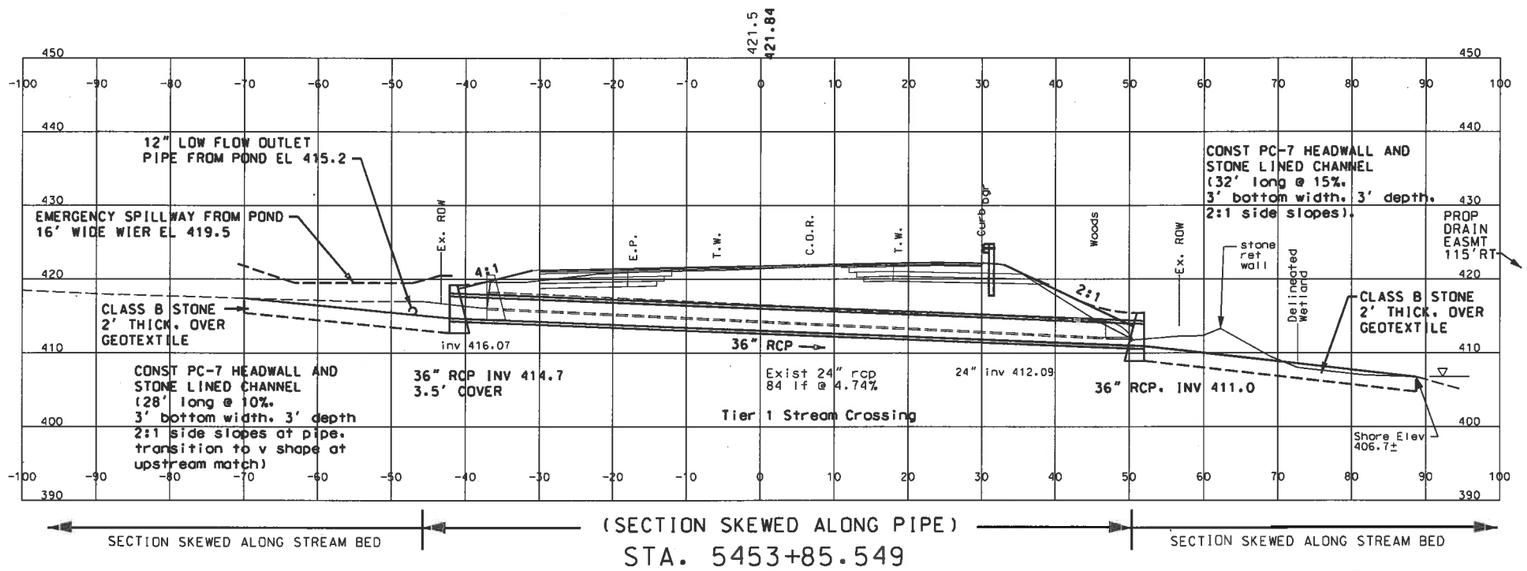
SDR PROCESSED	CAC	DATE	12/2017
NEW DESIGN		DATE	1/2018
SHEET CHECKED	AMC		
AS BUILT DETAILS		DATE	

STATE OF NEW HAMPSHIRE

DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN

CONSTRUCTION DETAILS

DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
29613condetails	29613	19	27



REVISIONS AFTER PROPOSAL

NUMBER	DATE	STATION	STATION	DESCRIPTION

SDR PROCESSED		DATE
NEW DESIGN	CAC	DATE 1/2018
SHEET CHECKED	AMC	DATE 1/2018
AS BUILT DETAILS		DATE

STATE OF NEW HAMPSHIRE

DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN

CONSTRUCTION DETAILS

DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
29613condetails	29613	20	27

EROSION CONTROL STRATEGIES

1. ENVIRONMENTAL COMMITMENTS:
   1.1. THESE GUIDELINES DO NOT RELIEVE THE CONTRACTOR FROM COMPLIANCE WITH ANY CONTRACT PROVISIONS, OR APPLICABLE FEDERAL, STATE, AND LOCAL REGULATIONS.
   1.2. THIS PROJECT WILL BE SUBJECT TO THE US EPA'S NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) STORM WATER CONSTRUCTION GENERAL PERMIT AS ADMINISTERED BY THE ENVIRONMENTAL PROTECTION AGENCY (EPA). THIS PROJECT IS SUBJECT TO REQUIREMENTS IN THE MOST RECENT CONSTRUCTION GENERAL PERMIT (CGP).
   1.3. THE CONTRACTOR'S ATTENTION IS DIRECTED TO THE NHDES WETLAND PERMIT, THE US ARMY CORPS OF ENGINEERS PERMIT, WATER QUALITY CERTIFICATION AND THE SPECIAL ATTENTION ITEMS INCLUDED IN THE CONTRACT DOCUMENTS.
   1.4. ALL STORM WATER, EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSTALLED AND MAINTAINED IN ACCORDANCE WITH THE NEW HAMPSHIRE STORMWATER MANUAL, VOLUME 3, EROSION AND SEDIMENT CONTROLS DURING CONSTRUCTION (DECEMBER 2008) (BMP MANUAL) AVAILABLE FROM THE NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL SERVICES (NHDES).
   1.5. THE CONTRACTOR SHALL COMPLY WITH RSA 485-A:17, AND ALL, PUBLISHED NHDES ALTERATION OF TERRAIN ENV-WQ 1500 REQUIREMENTS (HTTP://DES.NH.GOV/ORGANIZATION/COMMISSIONER/LEGAL/RULES/INDEX.HTM)
   1.6. THE CONTRACTOR IS DIRECTED TO REVIEW AND COMPLY WITH SECTION 107.1 OF THE CONTRACT AS IT REFERS TO SPILLAGE, AND ALSO WITH REGARDS TO EROSION, POLLUTION, AND TURBIDITY PRECAUTIONS.

2. STANDARD EROSION CONTROL SEQUENCING APPLICABLE TO ALL CONSTRUCTION PROJECTS:
   2.1. PERIMETER CONTROLS SHALL BE INSTALLED PRIOR TO EARTH DISTURBING ACTIVITIES. PERIMETER CONTROLS AND STABILIZED CONSTRUCTION EXITS SHALL BE INSTALLED AS SHOWN IN THE BMP MANUAL AND AS DIRECTED BY THE STORMWATER POLLUTION PREVENTION PLAN (SWPPP) PREPARER.
   2.2. EROSION, SEDIMENTATION CONTROL MEASURES AND INFILTRATION BASINS SHALL BE CLEANED, REPLACED AND AUGMENTED AS NECESSARY TO PREVENT SEDIMENTATION BEYOND PROJECT LIMITS THROUGHOUT THE PROJECT DURATION.
   2.3. EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSPECTED IN ACCORDANCE WITH THE CONSTRUCTION GENERAL PERMIT AND SECTION 645 OF THE NHDOT SPECIFICATIONS FOR ROAD AND BRIDGES CONSTRUCTION.
   2.4. AN AREA SHALL BE CONSIDERED STABLE IF ONE OF THE FOLLOWING HAS OCCURRED:
      (A) BASE COURSE GRAVELS HAVE BEEN INSTALLED IN AREAS TO BE PAVED;
      (B) A MINIMUM OF 85% VEGETATED GROWTH HAS BEEN ESTABLISHED;
      (C) A MINIMUM OF 3" OF NON-EROSIVE MATERIAL SUCH AS STONE OR RIP-RAP HAS BEEN INSTALLED;
      (D) TEMPORARY SLOPE STABILIZATION CONFORMING TO TABLE 1 HAS BEEN PROPERLY INSTALLED
   2.5. ALL STOCKPILES SHALL BE CONTAINED WITH A PERIMETER CONTROL. IF THE STOCKPILE IS TO REMAIN UNDISTURBED FOR MORE THAN 14 DAYS, MULCHING WILL BE REQUIRED.
   2.6. A WATER TRUCK SHALL BE AVAILABLE TO CONTROL EXCESSIVE DUST AT THE DIRECTION OF THE CONTRACT ADMINISTRATOR.
   2.7. TEMPORARY EROSION AND SEDIMENTATION CONTROL MEASURES SHALL REMAIN UNTIL THE AREA HAS BEEN PERMANENTLY STABILIZED.
   2.8. CONSTRUCTION PERFORMED ANY TIME BETWEEN NOVEMBER 30" AND MAY 1" OF ANY YEAR SHALL BE CONSIDERED WINTER CONSTRUCTION AND SHALL CONFORM TO THE FOLLOWING REQUIREMENTS.
      (A) ALL PROPOSED VEGETATED AREAS WHICH DO NOT EXHIBIT A MINIMUM OF 85% VEGETATIVE GROWTH BY OCTOBER 15", OR WHICH ARE DISTURBED AFTER OCTOBER 15", SHALL BE STABILIZED IN ACCORDANCE WITH TABLE 1.
      (B) ALL DITCHES OR SWALES WHICH DO NOT EXHIBIT A MINIMUM OF 85% VEGETATIVE GROWTH BY OCTOBER 15", OR WHICH ARE DISTURBED AFTER OCTOBER 15", SHALL BE STABILIZED TEMPORARILY WITH STONE OR IN ACCORDANCE WITH TABLE 1.
      (C) AFTER NOVEMBER 30" INCOMPLETE ROAD SURFACES, WHERE WORK HAS STOPPED FOR THE SEASON, SHALL BE PROTECTED IN ACCORDANCE WITH TABLE 1.
      (D) WINTER EXCAVATION AND EARTHWORK SHALL BE DONE SUCH THAT NO MORE THAN 1 ACRE OF THE PROJECT IS WITHOUT STABILIZATION AT ONE TIME, UNLESS A WINTER CONSTRUCTION PLAN HAS BEEN APPROVED BY NHDOT THAT MEETS THE REQUIREMENTS OF ENV-WQ 1505.02 AND ENV-WQ 1505.05.
      (E) A SWPPP AMENDMENT SHALL BE SUBMITTED TO THE DEPARTMENT, FOR APPROVAL, ADDRESSING COLD WEATHER STABILIZATION (ENV-WQ 1505.05) AND INCLUDING THE REQUIREMENTS OF NO LESS THAN 30 DAYS PRIOR TO THE COMMENCEMENT OF WORK SCHEDULED AFTER NOVEMBER 30".

GENERAL CONSTRUCTION PLANNING AND SELECTION OF STRATEGIES TO CONTROL EROSION AND SEDIMENT ON HIGHWAY CONSTRUCTION PROJECTS

3. PLAN ACTIVITIES TO ACCOUNT FOR SENSITIVE SITE CONDITIONS:
   3.1. CLEARLY FLAG AREAS TO BE PROTECTED IN THE FIELD AND PROVIDE CONSTRUCTION BARRIERS TO PREVENT TRAFFICKING OUTSIDE OF WORK AREAS.
   3.2. CONSTRUCTION SHALL BE SEQUENCED TO LIMIT THE DURATION AND AREA OF EXPOSED SOILS.
   3.3. PROTECT AND MAXIMIZE EXISTING NATIVE VEGETATION AND NATURAL FOREST BUFFERS BETWEEN CONSTRUCTION ACTIVITY AND SENSITIVE AREAS.
   3.4. WHEN WORK IS PERFORMED IN AND NEAR WATER COURSES, STREAM FLOW DIVERSION METHODS SHALL BE IMPLEMENTED PRIOR TO ANY EXCAVATION OR FILLING.
   3.5. WHEN WORK IS PERFORMED WITHIN 50 FEET OF SURFACE WATERS (WETLAND, OPEN WATER OR FLOWING WATER), PERIMETER CONTROL SHALL BE ENHANCED CONSISTENT WITH SECTION 2.1.2.1. OF THE 2012 NPDES CONSTRUCTION GENERAL PERMIT.

4. MINIMIZE THE AMOUNT OF EXPOSED SOIL:
   4.1. CONSTRUCTION SHALL BE SEQUENCED TO LIMIT THE DURATION AND AREA OF EXPOSED SOILS. MINIMIZE THE AREA OF EXPOSED SOIL AT ANY ONE TIME. PHASING SHALL BE USED TO REDUCE THE AMOUNT AND DURATION OF SOIL EXPOSED TO THE ELEMENTS AND VEHICLE TRACKING.
   4.2. UTILIZE TEMPORARY MULCHING OR PROVIDE ALTERNATE TEMPORARY STABILIZATION ON EXPOSED SOILS IN ACCORDANCE WITH TABLE 1.
   4.3. THE MAXIMUM AMOUNT OF DISTURBED EARTH SHALL NOT EXCEED A TOTAL OF 5 ACRES FROM MAY 1" THROUGH NOVEMBER 30", OR EXCEED ONE ACRE DURING WINTER MONTHS, UNLESS THE CONTRACTOR DEMONSTRATES TO THE DEPARTMENT THAT THE ADDITIONAL AREA OF DISTURBANCE IS NECESSARY TO MEET THE CONTRACTORS CRITICAL PATH METHOD SCHEDULE (CPM), AND THE CONTRACTOR HAS ADEQUATE RESOURCES AVAILABLE TO ENSURE THAT ENVIRONMENTAL COMMITMENTS WILL BE MET.

5. CONTROL STORMWATER FLOWING ONTO AND THROUGH THE PROJECT:
   5.1. DIVERT OFF SITE RUNOFF OR CLEAN WATER AWAY FROM THE CONSTRUCTION ACTIVITY TO REDUCE THE VOLUME THAT NEEDS TO BE TREATED ON SITE.
   5.2. DIVERT STORM RUNOFF FROM UPSLOPE DRAINAGE AREAS AWAY FROM DISTURBED AREAS, SLOPES, AND AROUND ACTIVE WORK AREAS AND TO A STABILIZED OUTLET LOCATION.
   5.3. CONSTRUCT IMPERMEABLE BARRIERS AS NECESSARY TO COLLECT OR DIVERT CONCENTRATED FLOWS FROM WORK OR DISTURBED AREAS.
   5.4. STABILIZE, TO APPROPRIATE ANTICIPATED VELOCITIES, CONVEYANCE CHANNELS OR PUMPING SYSTEMS NEEDED TO CONVEY CONSTRUCTION STORMWATER TO BASINS AND DISCHARGE LOCATIONS PRIOR TO USE.
   5.5. DIVERT OFF-SITE WATER THROUGH THE PROJECT IN AN APPROPRIATE MANNER SO NOT TO DISTURB THE UPSTREAM OR DOWNSTREAM SOILS, VEGETATION OR HYDROLOGY BEYOND THE PERMITTED AREA.

6. PROTECT SLOPES:
   6.1. INTERCEPT AND DIVERT STORM RUNOFF FROM UPSLOPE DRAINAGE AREAS AWAY FROM UNPROTECTED AND NEWLY ESTABLISHED AREAS AND SLOPES TO A STABILIZED OUTLET OR CONVEYANCE.
   6.2. CONSIDER HOW GROUNDWATER SEEPAGE ON CUT SLOPES MAY IMPACT SLOPE STABILITY AND INCORPORATE APPROPRIATE MEASURES TO MINIMIZE EROSION.
   6.3. CONVEY STORMWATER DOWN THE SLOPE IN A STABILIZED CHANNEL OR SLOPE DRAIN.
   6.4. THE OUTER FACE OF THE FILL SLOPE SHOULD BE IN A LOOSE RUFFLED CONDITION PRIOR TO TURF ESTABLISHMENT. TOPSOIL OR HUMUS LAYERS SHALL BE TRACKED UP AND DOWN THE SLOPE, DISKED, HARROWED, DRAGGED WITH A CHAIN OR MAT, MACHINE-RAKED, OR HAND-WORKED TO PRODUCE A RUFFLED SURFACE.

7. ESTABLISH STABILIZED CONSTRUCTION EXITS:
   7.1. INSTALL AND MAINTAIN CONSTRUCTION EXITS, ANYWHERE TRAFFIC LEAVES A CONSTRUCTION SITE ONTO A PUBLIC RIGHT-OF-WAY.
   7.2. SWEEP ALL CONSTRUCTION RELATED DEBRIS AND SOIL FROM THE ADJACENT PAVED ROADWAYS AS NECESSARY.

8. PROTECT STORM DRAIN INLETS:
   8.1. DIVERT SEDIMENT LADEN WATER AWAY FROM INLET STRUCTURES TO THE EXTENT POSSIBLE.
   8.2. INSTALL SEDIMENT BARRIERS AND SEDIMENT TRAPS AT INLETS TO PREVENT SEDIMENT FROM ENTERING THE DRAINAGE SYSTEM.
   8.3. CLEAN CATCH BASINS, DRAINAGE PIPES, AND CULVERTS IF SIGNIFICANT SEDIMENT IS DEPOSITED.
   8.4. DROP INLET SEDIMENT BARRIERS SHOULD NEVER BE USED AS THE PRIMARY MEANS OF SEDIMENT CONTROL AND SHOULD ONLY BE USED TO PROVIDE AN ADDITIONAL LEVEL OF PROTECTION TO STRUCTURES AND DOWN-GRADIENT SENSITIVE RECEPTORS.

9. SOIL STABILIZATION:
   9.1. WITHIN THREE DAYS OF THE LAST ACTIVITY IN AN AREA, ALL EXPOSED SOIL AREAS, WHERE CONSTRUCTION ACTIVITIES ARE COMPLETE, SHALL BE STABILIZED.
   9.2. IN ALL AREAS, TEMPORARY SOIL STABILIZATION MEASURES SHALL BE APPLIED IN ACCORDANCE WITH THE STABILIZATION REQUIREMENTS (SECTION 2.2) OF THE 2012 CGP. (SEE TABLE 1 FOR GUIDANCE ON THE SELECTION OF TEMPORARY SOIL STABILIZATION MEASURES.)
   9.3. EROSION CONTROL SEED MIX SHALL BE SOWN IN ALL INACTIVE CONSTRUCTION AREAS THAT WILL NOT BE PERMANENTLY SEEDED WITHIN TWO WEEKS OF DISTURBANCE AND PRIOR TO SEPTEMBER 15, OF ANY GIVEN YEAR. IN ORDER TO ACHIEVE VEGETATIVE STABILIZATION PRIOR TO THE END OF THE GROWING SEASON.
   9.4. SOIL TACKIFIERS MAY BE APPLIED IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATIONS AND REAPPLIED AS NECESSARY TO MINIMIZE SOIL AND MULCH LOSS UNTIL PERMANENT VEGETATION IS ESTABLISHED.

10. RETAIN SEDIMENT ON-SITE AND CONTROL DEWATERING PRACTICES:
   10.1. TEMPORARY SEDIMENT BASINS (CGP-SECTION 2.1.3.2) OR SEDIMENT TRAPS (ENV-WQ 1506.10) SHALL BE SIZED TO RETAIN, ON SITE, THE VOLUME OF A 2-YEAR 24-HOUR STORM EVENT FOR ANY AREA OF DISTURBANCE OR 3,600 CUBIC FEET OF STORMWATER RUNOFF PER ACRE OF DISTURBANCE, WHICHEVER IS GREATER. TEMPORARY SEDIMENT BASINS USED TO TREAT STORMWATER RUNOFF FROM AREAS GREATER THAN 5-ACRES OF DISTURBANCE SHALL BE SIZED TO ALSO CONTROL STORMWATER RUNOFF FROM A 10-YEAR 24 HOUR STORM EVENT. ON-SITE RETENTION OF THE 10-YEAR 24-HOUR EVENT IS NOT REQUIRED.
   10.2. CONSTRUCT AND STABILIZE DEWATERING INFILTRATION BASINS PRIOR TO ANY EXCAVATION THAT MAY REQUIRE DEWATERING.
   10.3. TEMPORARY SEDIMENT BASINS OR TRAPS SHALL BE PLACED AND STABILIZED AT LOCATIONS WHERE CONCENTRATED FLOW (CHANNELS AND PIPES) DISCHARGE TO THE SURROUNDING ENVIRONMENT FROM AREAS OF UNSTABILIZED EARTH DISTURBING ACTIVITIES.

11. ADDITIONAL EROSION AND SEDIMENT CONTROL GENERAL PRACTICES:
   11.1. USE TEMPORARY MULCHING, PERMANENT MULCHING, TEMPORARY VEGETATIVE COVER, AND PERMANENT VEGETATIVE COVER TO REDUCE THE NEED FOR DUST CONTROL. USE MECHANICAL SWEEPERS ON PAVED SURFACES WHERE NECESSARY TO PREVENT DUST BUILDUP. APPLY WATER, OR OTHER DUST INHIBITING AGENTS OR TACKIFIERS, AS APPROVED BY THE NHDES.
   11.2. ALL STOCKPILES SHALL BE CONTAINED WITH TEMPORARY PERIMETER CONTROLS. INACTIVE SOIL STOCKPILES SHOULD BE PROTECTED WITH SOIL STABILIZATION MEASURES (TEMPORARY EROSION CONTROL SEED MIX AND MULCH, SOIL BINDER) OR COVERED WITH ANCHORED TARPS.
   11.3. EROSION AND SEDIMENT CONTROL MEASURES WILL BE INSPECTED IN ACCORDANCE WITH SECTION 645 OF NHDOT SPECIFICATIONS, WEEKLY AND WITHIN 24 HOURS AFTER ANY STORM EVENT GREATER THAN 0.25 IN. OF RAIN PER 24-HOUR PERIOD. EROSION AND SEDIMENT CONTROL MEASURES WILL ALSO BE INSPECTED IN ACCORDANCE WITH THE GUIDANCE MEMO FROM THE NHDES CONTAINED WITHIN THE CONTRACT PROPOSAL AND THE EPA CONSTRUCTION GENERAL PERMIT.
   11.4. THE CONTRACTOR SHOULD UTILIZE STORM DRAIN INLET PROTECTION TO PREVENT SEDIMENT FROM ENTERING A STORM DRAINAGE SYSTEM PRIOR TO THE PERMANENT STABILIZATION OF THE CONTRIBUTING DISTURBED AREA.
   11.5. PERMANENT STABILIZATION MEASURES WILL BE CONSTRUCTED AND MAINTAINED IN LOCATIONS AS SHOWN ON THE CONSTRUCTION PLANS TO STABILIZE AREAS. VEGETATIVE STABILIZATION SHALL NOT BE CONSIDERED PERMANENTLY STABILIZED UNTIL VEGETATIVE GROWTH COVERS AT LEAST 85% OF THE DISTURBED AREA. THE CONTRACTOR SHALL BE RESPONSIBLE FOR EROSION AND SEDIMENT CONTROL FOR ONE YEAR AFTER PROJECT COMPLETION.
   11.6. CATCH BASINS: CARE SHALL BE TAKEN TO ENSURE THAT SEDIMENTS DO NOT ENTER ANY EXISTING CATCH BASINS DURING CONSTRUCTION. THE CONTRACTOR SHALL PLACE TEMPORARY STONE INLET PROTECTION OVER INLETS IN AREAS OF SOIL DISTURBANCE THAT ARE SUBJECT TO SEDIMENT CONTAMINATION.
   11.7. TEMPORARY AND PERMANENT DITCHES SHALL BE CONSTRUCTED, STABILIZED AND MAINTAINED IN A MANNER THAT WILL MINIMIZE SCOUR. TEMPORARY AND PERMANENT DITCHES SHALL BE DIRECTED TO DRAIN TO SEDIMENT BASINS OR STORM WATER COLLECTION AREAS.
   11.8. WINTER EXCAVATION AND EARTHWORK ACTIVITIES NEED TO BE LIMITED IN EXTENT AND DURATION, TO MINIMIZE POTENTIAL EROSION AND SEDIMENTATION IMPACTS. THE AREA OF EXPOSED SOIL SHALL BE LIMITED TO ONE ACRE, OR THAT WHICH CAN BE STABILIZED AT THE END OF EACH DAY UNLESS A WINTER CONSTRUCTION PLAN, DEVELOPED BY A QUALIFIED ENGINEER OR A CPESC SPECIALIST, IS REVIEWED AND APPROVED BY THE DEPARTMENT.
   11.9. CHANNEL PROTECTION MEASURES SHALL BE SUPPLEMENTED WITH PERIMETER CONTROL MEASURES WHEN THE DITCH LINES OCCUR AT THE BOTTOM OF LONG FILL SLOPES. THE PERIMETER CONTROLS SHALL BE INSTALLED ON THE FILL SLOPE TO MINIMIZE THE POTENTIAL FOR FILL SLOPE SEDIMENT DEPOSITS IN THE DITCH LINE.

BEST MANAGEMENT PRACTICES (BMP) BASED ON AMOUNT OF OPEN CONSTRUCTION AREA

12. STRATEGIES SPECIFIC TO OPEN AREAS LESS THAN 5 ACRES:
   12.1. THE CONTRACTOR SHALL COMPLY WITH RSA 485:A:17 AND ENV-WQ 1500: ALTERATION OF TERRAIN FOR CONSTRUCTION AND USE ALL CONVENTIONAL BMP STRATEGIES.
   12.2. SLOPES STEEPER THAN 3:1 WILL RECEIVE TURF ESTABLISHMENT WITH MATTING.
   12.3. SLOPES 3:1 OR FLATTER WILL RECEIVE TURF ESTABLISHMENT ALONE.
   12.4. AREAS WHERE HAUL ROADS ARE CONSTRUCTED AND STORMWATER CANNOT BE TREATED THE DEPARTMENT WILL CONSIDER INFILTRATION.
   12.5. FOR HAUL ROADS ADJACENT TO SENSITIVE ENVIRONMENTAL AREAS OR STEEPER THAN 5%, THE DEPARTMENT WILL CONSIDER USING EROSION STONE, CRUSHED GRAVEL, OR CRUSHED STONE BASE TO HELP MINIMIZE EROSION ISSUES.
   12.6. ALL AREAS THAT CAN BE STABILIZED SHALL BE STABILIZED PRIOR TO OPENING UP NEW TERRITORY.
   12.7. DETENTION BASINS SHALL BE DESIGNED AND CONSTRUCTED TO ACCOMMODATE A 2 YEAR STORM EVENT.

13. STRATEGIES SPECIFIC TO OPEN AREAS BETWEEN 5 AND 10 ACRES:
   13.1. THE CONTRACTOR SHALL COMPLY WITH RSA 485:A:17 AND ENV-WQ 1500 ALTERATION OF TERRAIN AND SHALL USE CONVENTIONAL BMP STRATEGIES AND ALL TREATMENT OPTIONS USED FOR UNDER 5 ACRES WILL BE UTILIZED.
   13.2. DETENTION BASINS WILL BE CONSTRUCTED TO ACCOMMODATE THE 2-YEAR 24-HOUR STORM EVENT AND CONTROL A 10-YEAR 24-HOUR STORM EVENT.
   13.3. SLOPES STEEPER THAN A 3:1 WILL RECEIVE TURF ESTABLISHMENT WITH MATTING OR OTHER TEMPORARY SOIL STABILIZATION MEASURES DETAILED IN TABLE 1. THE CONTRACTOR MAY ALSO CONSIDER A SOIL BINDER IN ACCORDANCE WITH THE NHDES APPROVALS OR REGULATIONS. OTHER ALTERNATIVE MEASURES, SUCH AS BONDED FIBER MATRIXES (BFMS) OR FLEXIBLE GROWTH MEDIUMS (FGMS) MAY BE UTILIZED, IF MEETING THE NHDES APPROVALS AND REGULATIONS.
   13.4. SLOPES 3:1 OR FLATTER WILL RECEIVE TURF ESTABLISHMENT OR OTHER TEMPORARY SOIL STABILIZATION MEASURES DETAILED IN TABLE 1. THE CONTRACTOR MAY ALSO CONSIDER A SOIL BINDER IN ACCORDANCE WITH THE NHDES APPROVALS OR REGULATIONS.

14. STRATEGIES SPECIFIC TO OPEN AREAS OVER 10 ACRES:
   14.1. THE CONTRACTOR SHALL COMPLY WITH RSA 485:A:17 AND ENV-WQ 1500 ALTERATION OF TERRAIN AND SHALL USE CONVENTIONAL BMP STRATEGIES AND ALL TREATMENT OPTIONS USED FOR UNDER 5 ACRES AND BETWEEN 5 AND 10 ACRES WILL BE UTILIZED.
   14.2. THE DEPARTMENT ANTICIPATES THAT SOIL BINDERS WILL BE NEEDED ON ALL SLOPES STEEPER THAN 3:1, IN ORDER TO MINIMIZE EROSION AND REDUCE THE AMOUNT OF SEDIMENT IN THE STORMWATER TREATMENT BASINS.
   14.3. THE CONTRACTOR WILL BE REQUIRED TO HAVE AN APPROVED DESIGN IN ACCORDANCE WITH ENV-WQ 1506.12 FOR AN ACTIVE FLOCCULANT TREATMENT SYSTEM TO TREAT AND RELEASE WATER CAPTURED IN STORM WATER BASINS. THE CONTRACTOR SHALL ALSO RETAIN THE SERVICES OF AN ENVIRONMENTAL CONSULTANT WHO HAS DEMONSTRATED EXPERIENCE IN THE DESIGN OF FLOCCULANT TREATMENT SYSTEMS. THE CONSULTANT WILL ALSO BE RESPONSIBLE FOR THE IMPLEMENTATION AND MONITORING OF THE SYSTEM.

TABLE 1
GUIDANCE ON SELECTING TEMPORARY SOIL STABILIZATION MEASURES

APPLICATION AREAS	DRY MULCH METHODS				HYDRAULICALLY APPLIED MULCHES[2]				ROLLED EROSION CONTROL BLANKETS[3]			
	HMT	WC	SG	CB	HM	SMM	BFM	FRM	SNSB	DNSB	DNSCB	DNCB
SLOPES[1]												
STEEPER THAN 2:1	NO	NO	YES	NO	NO	NO	NO	YES	NO	NO	NO	YES
2:1 SLOPE	YES[1]	YES[1]	YES	YES	NO	NO	YES	YES	NO	YES	YES	YES
3:1 SLOPE	YES	YES	YES	YES	NO	YES	YES	YES	YES	YES	YES	NO
4:1 SLOPE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	NO
WINTER STABILIZATION	4T/AC	YES	YES	YES	NO	NO	YES	YES	YES	YES	YES	YES
CHANNELS												
LOW FLOW CHANNELS	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	YES
HIGH FLOW CHANNELS	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES

ABBREV.	STABILIZATION MEASURE	ABBREV.	STABILIZATION MEASURE	ABBREV.	STABILIZATION MEASURE
HMT	HAY MULCH & TACK	HM	HYDRAULIC MULCH	SNSB	SINGLE NET STRAW BLANKET
WC	WOOD CHIPS	SMM	STABILIZED MULCH MATRIX	DNSB	DOUBLE NET STRAW BLANKET
SG	STUMP GRINDINGS	BFM	BONDED FIBER MATRIX	DNSCB	2 NET STRAW-COCONUT BLANKET
CB	COMPOST BLANKET	FRM	FIBER REINFORCED MEDIUM	DNCB	2 NET COCONUT BLANKET

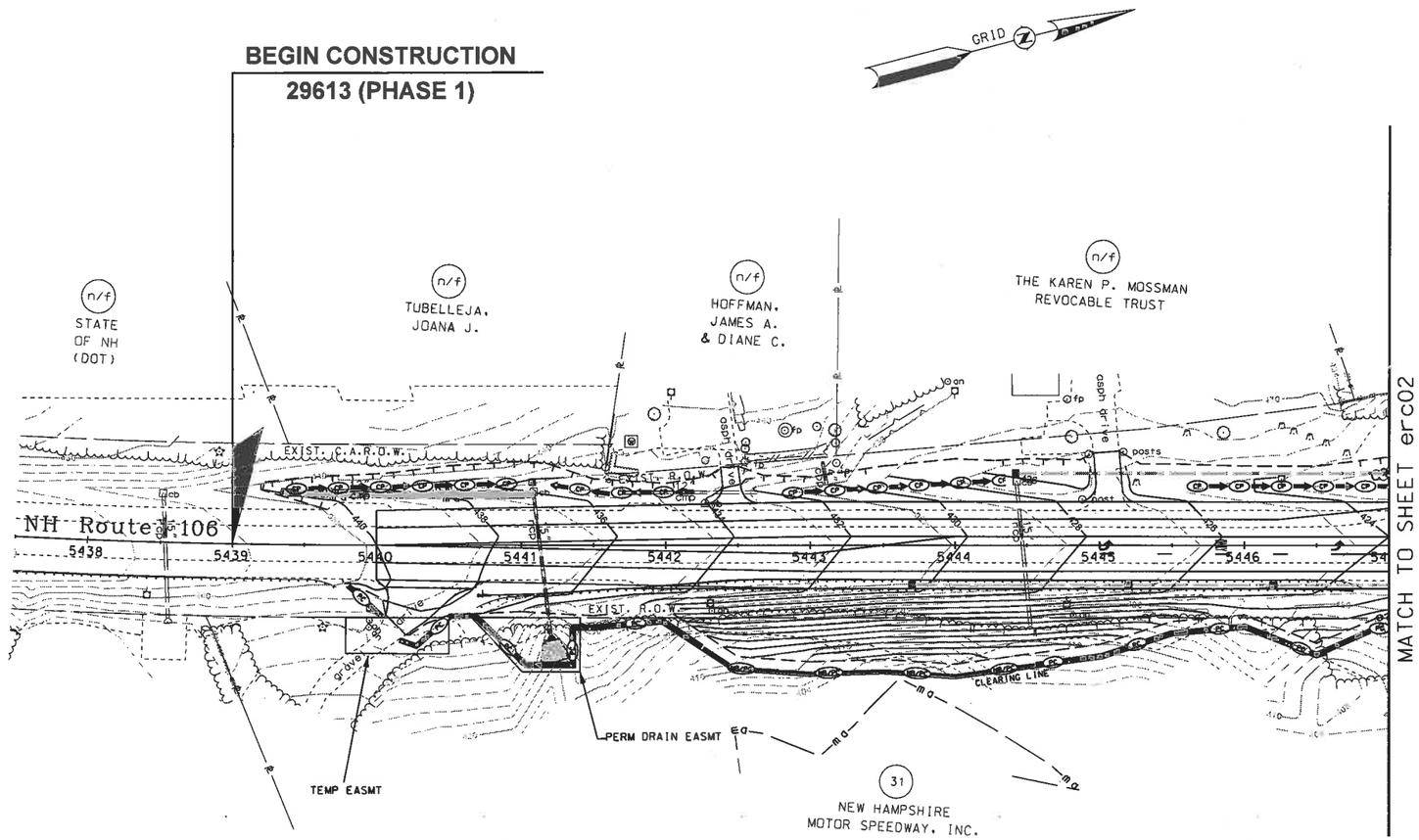
NOTES:
1. ALL SLOPE STABILIZATION OPTIONS ASSUME A SLOPE LENGTH ≤10 TIMES THE HORIZONTAL DISTANCE COMPONENT OF THE SLOPE, IN FEET.
2. PRODUCTS CONTAINING POLYACRYLAMIDE (PAM) SHALL NOT BE APPLIED DIRECTLY TO OR WITHIN 100 FEET OF ANY SURFACE WATER WITHOUT PRIOR WRITTEN APPROVAL FROM THE NH DEPARTMENT OF ENVIRONMENTAL SERVICES.
3. ALL EROSION CONTROL BLANKETS SHALL BE MADE WITH WILDLIFE FRIENDLY BIODEGRADABLE NETTING.

STATE OF NEW HAMPSHIRE

DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN

EROSION CONTROL STRATEGIES

REVISION DATE	OGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
12-21-2015	erosstrat	29613	21	27



GENERAL NOTES:

General:

1. A Contractor prepared SWPPP (Item 645.7) will be required for this project.

2. Phasing and erosion controls shall comply with the Erosion Control Strategies sheet, Construction Plans, and all other Contract requirements.

3. The Phase 1 project area (including existing pavement) is about 600,000 SF (13.75 AC). The approximate disturbed area along NH 106 is 154,000 SF on each side (excluding existing pavement). The Clough Hill Rd pond site adds about 31,000 SF of disturbed area, making the total about 339,000 SF (7.8 AC).

Anticipated project sequence:

1. Advance clearing for utility pole relocations. (Utility poles are not in direct conflict with the work). Utility pole relocations will be concurrent throughout the project.

2. Rough grade treatment areas for use as temporary sediment control locations.

3. Construct culvert replacements, extensions, rehabilitations one location at a time, unless otherwise approved. Traffic can be accomodated within the existing pavement width. No need for temporary widenings is anticipated.

4. Construct widened roadway base, slopes, drainage, curb, and guardrail one side at a time.

5. Typical sequence for east or west side:

A. Shift traffic away from work area. Maintain one lane of traffic in each direction.
B. Remove part of shoulder pavement as needed. Construct base courses and slopes, drive pipes, and drive matches.
C. Construct closed drainage systems and outlets.
D. Fine grade road base course, install curb where required.
E. Pave widened areas up to binder course (typically 1.5" below finished grade).
F. Install sign foundations, guardrail.
G. Place permanent slope treatments (humus, seed, mulch, landscaping.
H. Pave final wearing course, place permanent striping and shoulder levelling.

CONSTRUCTION SEQUENCE NOTES:

1. At the beginning of Phase 1, proposed roadway base, slopes, and guardrail will be constructed to accomodate the ultimate pavement width to be constructed under Phase 2.

2. At Sta 5441+05, replace existing 15" rcp with 18" rcp. Construct new catch basin at inlet. Construct end section and stone apron at outlet. No baseflow is anticipated at this location.

3. Regrade west side ditch line and construct closed drainage system from Sta 5444+50 Lt to 5448+10 Lt. Fill and abandon existing 15" rcp at 5444+50. No baseflow is anticipated at this location.

EROSION CONTROL PLAN LEGEND

PC — PERIMETER CONTROL
- SILT FENCE
- EROSION CONTROL MIX BERM
- EROSION CONTROL MIX SOX
- TURBIDITY CURTAIN
- SHEET PILE
- COFFER DAM

NB/PC — NATURAL BUFFER/PERIMETER CONTROL
- SILT FENCE
- EROSION CONTROL MIX BERM
- EROSION CONTROL MIX SOX
- TURBIDITY CURTAIN
- SHEET PILE
- COFFER DAM

CP — CHANNEL PROTECTION
- STONE CHECK DAMS
- STRAW WATTLES
- CHANNEL MATTING
- CLASS D EROSION STONE
- CLASS C STONE

CWB — CLEAN WATER BYPASS
- PUMP THROUGH PIPE
- DRAIN THROUGH PIPE OR CHANNEL

50 0 50 100
SCALE IN FEET

STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN

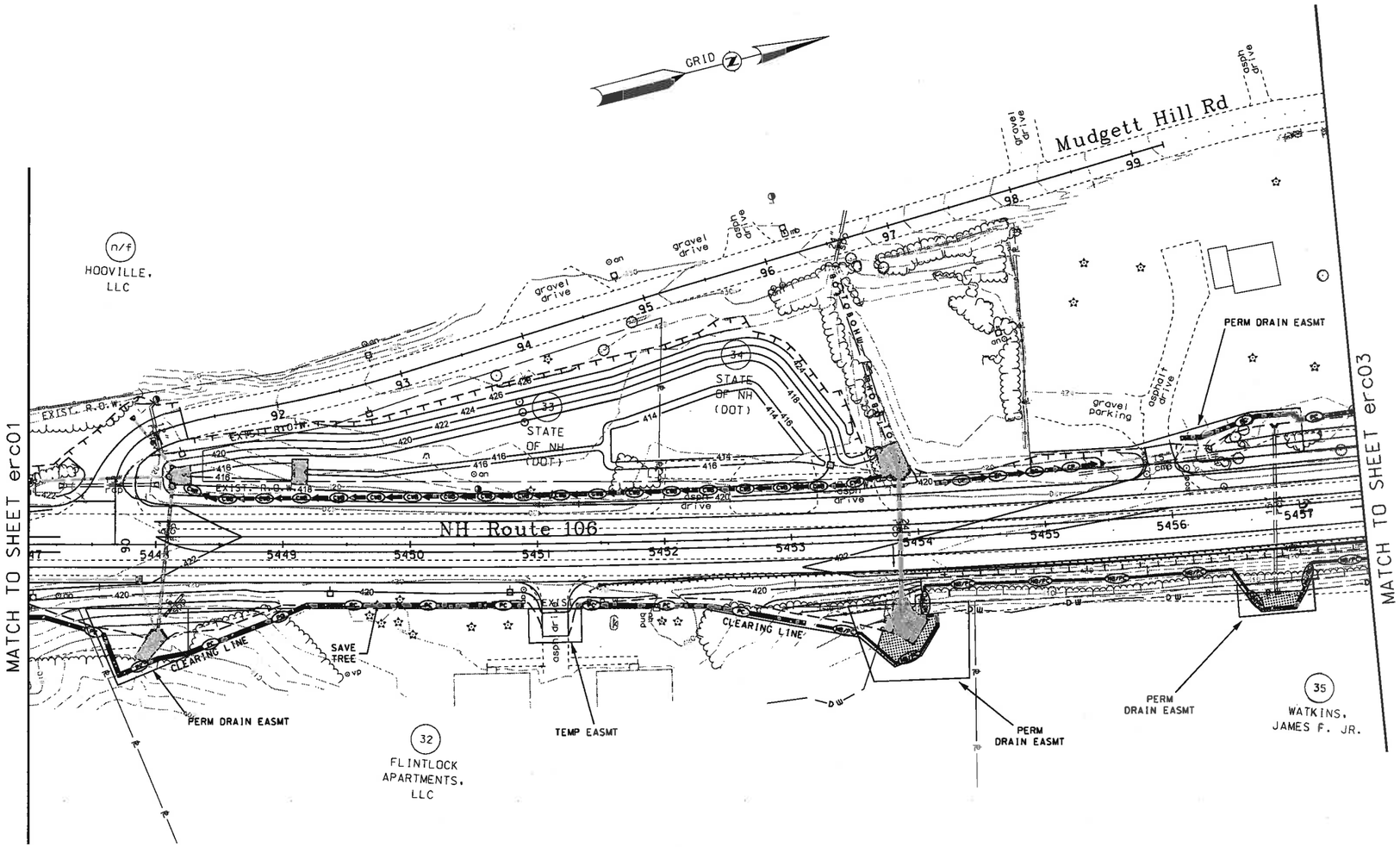
Erosion Control Plans

MODEL	DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
erc01	29613erc	29613	22	27

REVISIONS AFTER PROPOSAL

NUMBER	DATE	STATION	STATION	DESCRIPTION

		DATE
SDR PROCESSED		
NEW DESIGN	CAC	DATE 12/2017
SHEET CHECKED	AMC	DATE 12/2017
AS BUILT DETAILS		DATE



CONSTRUCTION SEQUENCE NOTES:

1. Rough grade treatment area for use as sediment control basin prior to constructing drainage pipe outletting at Sta 5448+05 Lt.

2. At Sta 5448+05, replace existing 15" rcp with 24" rcp. Const high flow riser at 24" pipe inlet. and temporary stone protection at outlet.
   No baseflow is anticipated at this location. Construct stone apron at outlet. Do not construct outlet headwall until adjacent closed drainage outlet is built. Construct diversion structure at inlet. Low flows will drain to the treatment area. High flows and clean water discharge can be directed to the culvert under NH 106 at 5448+05.

3. At 5453+85, install water diversion upstream of existing 24" rcp. Baseflow is anticipated to be less than 1 cfs. Direct clean water to the cross culvert at Sta 5448+05. Replace existing 24" rcp with 36" rcp. Construct stone inlet and outlet channels. Use a silt boom or other approved control
   to prevent sediment from entering the ponded area at the outlet (wetland #5).

4. At Sta 5456+80, extend upstream side of existing 15" rcp and construct headwall. No baseflow is anticipated at this location. Sliplining of the exsiting 15" rcp is not a critical path item. This work should be scheduled for a time when water level at the outlet is below the pipe invert. Machine access to the outlet should not be required. The temporary impact area is intended for sand bags and/or silt boom if necessary.

EROSION CONTROL PLAN LEGEND

PERIMETER CONTROL (PC)
- SILT FENCE
- EROSION CONTROL MIX BERM
- EROSION CONTROL MIX SOX
- TURBIDITY CURTAIN
- SHEET PILE
- COFFER DAM

NATURAL BUFFER/PERIMETER CONTROL (NB/PC)
- SILT FENCE
- EROSION CONTROL MIX BERM
- EROSION CONTROL MIX SOX
- TURBIDITY CURTAIN
- SHEET PILE
- COFFER DAM

CHANNEL PROTECTION (CP)
- STONE CHECK DAMS
- STRAW WATTLES
- CHANNEL MATTING
- CLASS D EROSION STONE
- CLASS C STONE

CLEAN WATER BYPASS (CWB)
- PUMP THROUGH PIPE
- DRAIN THROUGH PIPE OR CHANNEL

50 0 50 100
SCALE IN FEET

MODEL	DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
erc02	29613erc	29613	23	27

STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN

Erosion Control Plans

NUMBER	DATE	STATION	STATION	DESCRIPTION

REVISIONS AFTER PROPOSAL

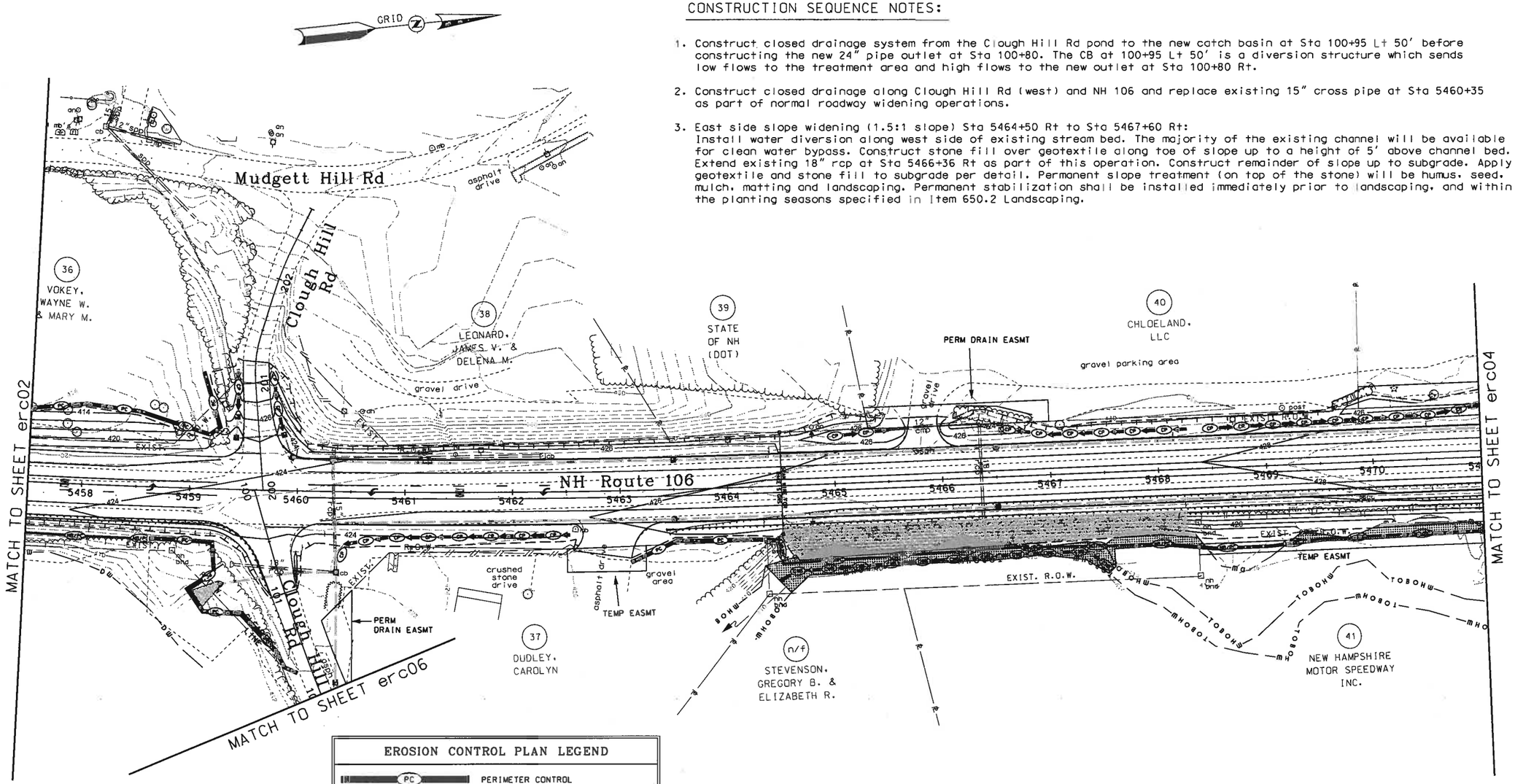
		DATE
SDR PROCESSED		
NEW DESIGN	CAC	DATE 12/2017
SHEET CHECKED	AMC	DATE 12/2017
AS BUILT DETAILS		DATE

CONSTRUCTION SEQUENCE NOTES:

1. Construct closed drainage system from the Clough Hill Rd pond to the new catch basin at Sta 100+95 Lt 50' before constructing the new 24" pipe outlet at Sta 100+80. The CB at 100+95 Lt 50' is a diversion structure which sends low flows to the treatment area and high flows to the new outlet at Sta 100+80 Rt.

2. Construct closed drainage along Clough Hill Rd (west) and NH 106 and replace existing 15" cross pipe at Sta 5460+35 as part of normal roadway widening operations.

3. East side slope widening (1.5:1 slope) Sta 5464+50 Rt to Sta 5467+60 Rt:
   Install water diversion along west side of existing stream bed. The majority of the existing channel will be available for clean water bypass. Construct stone fill over geotextile along toe of slope up to a height of 5' above channel bed. Extend existing 18" rcp at Sta 5466+36 Rt as part of this operation. Construct remainder of slope up to subgrade. Apply geotextile and stone fill to subgrade per detail. Permanent slope treatment (on top of the stone) will be humus, seed, mulch, matting and landscaping. Permanent stabilization shall be installed immediately prior to landscaping, and within the planting seasons specified in Item 650.2 Landscaping.



EROSION CONTROL PLAN LEGEND

PC	PERIMETER CONTROL SILT FENCE EROSION CONTROL MIX BERM EROSION CONTROL MIX SOX TURBIDITY CURTAIN SHEET PILE COFFER DAM
NB/PC	NATURAL BUFFER/PERIMETER CONTROL SILT FENCE EROSION CONTROL MIX BERM EROSION CONTROL MIX SOX TURBIDITY CURTAIN SHEET PILE COFFER DAM
CP	CHANNEL PROTECTION STONE CHECK DAMS STRAW WATTLES CHANNEL MATTING CLASS D EROSION STONE CLASS C STONE
CWB	CLEAN WATER BYPASS PUMP THROUGH PIPE DRAIN THROUGH PIPE OR CHANNEL

50 0 50 100
SCALE IN FEET

STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN

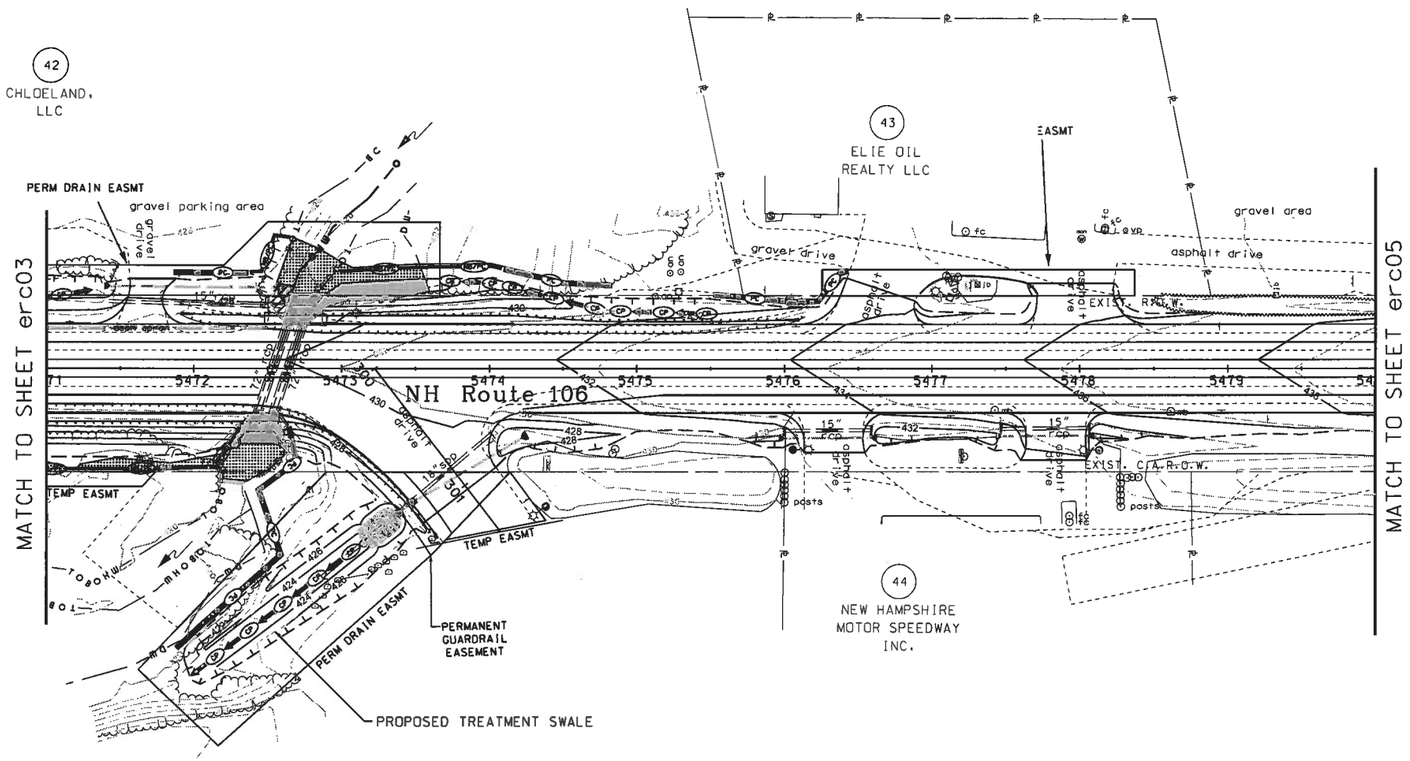
Erosion Control Plans

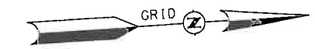
MODEL	DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
erc03	29613erc	29613	24	27

REVISIONS AFTER PROPOSAL

NUMBER	DATE	STATION	DESCRIPTION

		DATE
SDR PROCESSED		
NEW DESIGN	CAC	DATE 12/2017
SHEET CHECKED	AMC	DATE 12/2017
AS BUILT DETAILS		DATE





CONSTRUCTION SEQUENCE NOTES:

1. Rough grade proposed treatment swale for use as a sediment control basin.

2. Twin 72" Pipe Extension and Headwall Construction:
A. Install perimeter controls, including controls along the adjacent slope widening.
B. Install Item 503.10x Water Diversion at the inlet.
C. Clean water shall be routed through the existing pipes via a temporary pipe or pump(s).
D. Baseflow at this location is estimated at 2 cfs.
E. Construct one side at a time unless otherwise approved.

3. Outlet side:
A. Install Item 503.20x Cofferdam around the pipe extension and headwall footing excavation area.
B. Remove existing stone headwall and one 4' section of pipe from each barrel.
C. Add two 8' sections of pipe to each barrel.
D. Construct new headwall.
E. Backfill behind headwall. Apply temporary slope stabilization.
F. Install rock weir in channel downstream of the pipe outlets.

4. Inlet side:
A. A. Install Item 503.20x Cofferdam around the pipe extension and headwall footing excavation area.
B. Remove snowmobile bridge and abutments.
C. Remove existing stone headwall and one 4' section of pipe from each barrel.
D. Add two 8' sections of pipe to each barrel.
E. Construct new headwall.
F. Backfill behind headwall. Apply temporary slope stabilization.

EROSION CONTROL PLAN LEGEND

PC — PERIMETER CONTROL
SILT FENCE
EROSION CONTROL MIX BERM
EROSION CONTROL MIX SOX
TURBIDITY CURTAIN
SHEET PILE
COFFER DAM

NB/PC — NATURAL BUFFER/PERIMETER CONTROL
SILT FENCE
EROSION CONTROL MIX BERM
EROSION CONTROL MIX SOX
TURBIDITY CURTAIN
SHEET PILE
COFFER DAM

CP — CHANNEL PROTECTION
STONE CHECK DAMS
STRAW WATTLES
CHANNEL MATTING
CLASS D EROSION STONE
CLASS C STONE

CWB — CLEAN WATER BYPASS
PUMP THROUGH PIPE
DRAIN THROUGH PIPE OR CHANNEL

50 0 50 100
SCALE IN FEET

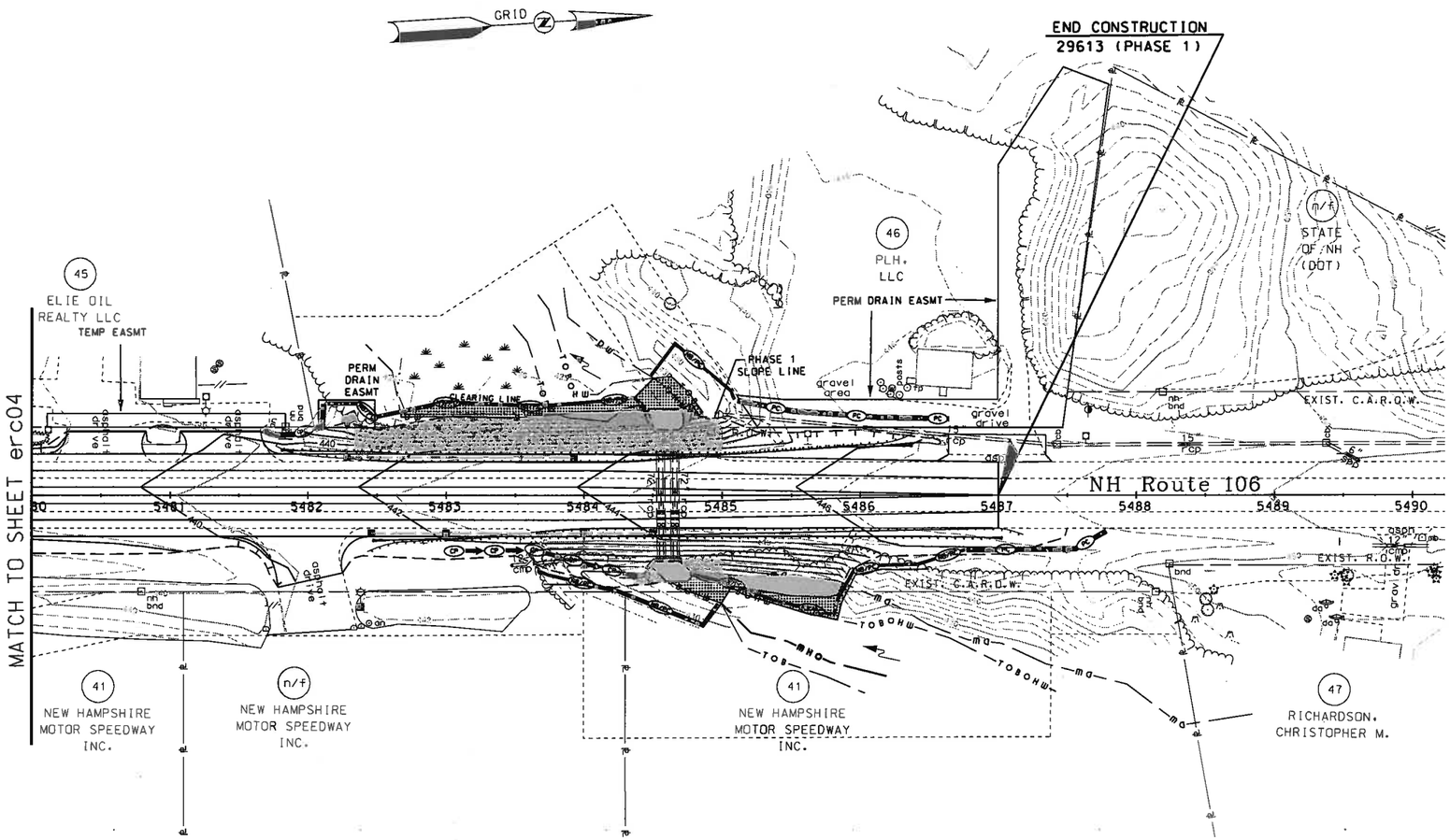
REVISIONS AFTER PROPOSAL			
NUMBER	DATE	STATION	STATION	DESCRIPTION

SDR PROCESSED	CAC	DATE 12/2017
NEW DESIGN		
SHEET CHECKED	AMC	DATE 12/2017
AS BUILT DETAILS		DATE

STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN

Erosion Control Plans

MODEL	DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
erc04	29613erc	29613	25	27



CONSTRUCTION SEQUENCE NOTES:

1. Proposed treatment pond at Sta 5488 Lt will be constructed under Phase 2 (Project 29613A). No change to the existing drainage system outletting at Sta 5485 Lt is required for Phase 1 construction.

2. At the end of Phase1, proposed roadway base, slopes, and guardrail will be constructed to accommodate the ultimate pavement width to be constructed under Phase 2.

3. Twin 72" Headwall Construction:
A. Install perimeter controls, including controls along the adjacent slope widening.
B. Install Item 503.10x Water Diversion at the inlet. Baseflow at this location is estimated at 2 cfs.
C. Clean water shall be routed through the existing pipes via a temporary pipe or pump(s).
D. Construct one headwall at a time unless otherwise approved, using the following sequence:
E. Install Item 503.20x Cofferdam around the footing excavation area.
F. Construct footing, headwall and wingwalls.
G. Backfill around headwall and construct adjacent slope widening up to subgrade.
H. Apply temporary slope stabilization if required.

4. Construct East side slope widening (2:1 earth slope).
A. Apply temporary slope stabilization if required.
B. Permanent slope treatment will be humus, seed, mulch, and temporary erosion control matting.

5. Construct West side slope widening (1.5:1 slope).
A. Apply geotextile and stone to subgrade per detail.
B. Apply temporary slope stabilization if required.
C. Permanent slope treatment (on top of the stone) will be humus, seed, mulch, matting, and landscaping.
D. Permanent stabilization shall be installed immediately prior to landscaping, and within the planting seasons specified in Item 650.2 Landscaping.

EROSION CONTROL PLAN LEGEND

PC — PERIMETER CONTROL
SILT FENCE
EROSION CONTROL MIX BERM
EROSION CONTROL MIX SOX
TURBIDITY CURTAIN
SHEET PILE
COFFER DAM

NB/PC — NATURAL BUFFER/PERIMETER CONTROL
SILT FENCE
EROSION CONTROL MIX BERM
EROSION CONTROL MIX SOX
TURBIDITY CURTAIN
SHEET PILE
COFFER DAM

CP — CHANNEL PROTECTION
STONE CHECK DAMS
STRAW WATTLES
CHANNEL MATTING
CLASS D EROSION STONE
CLASS C STONE

CWB — CLEAN WATER BYPASS
PUMP THROUGH PIPE
DRAIN THROUGH PIPE OR CHANNEL

REVISIONS AFTER PROPOSAL

NUMBER	DATE	STATION	STATION	DESCRIPTION

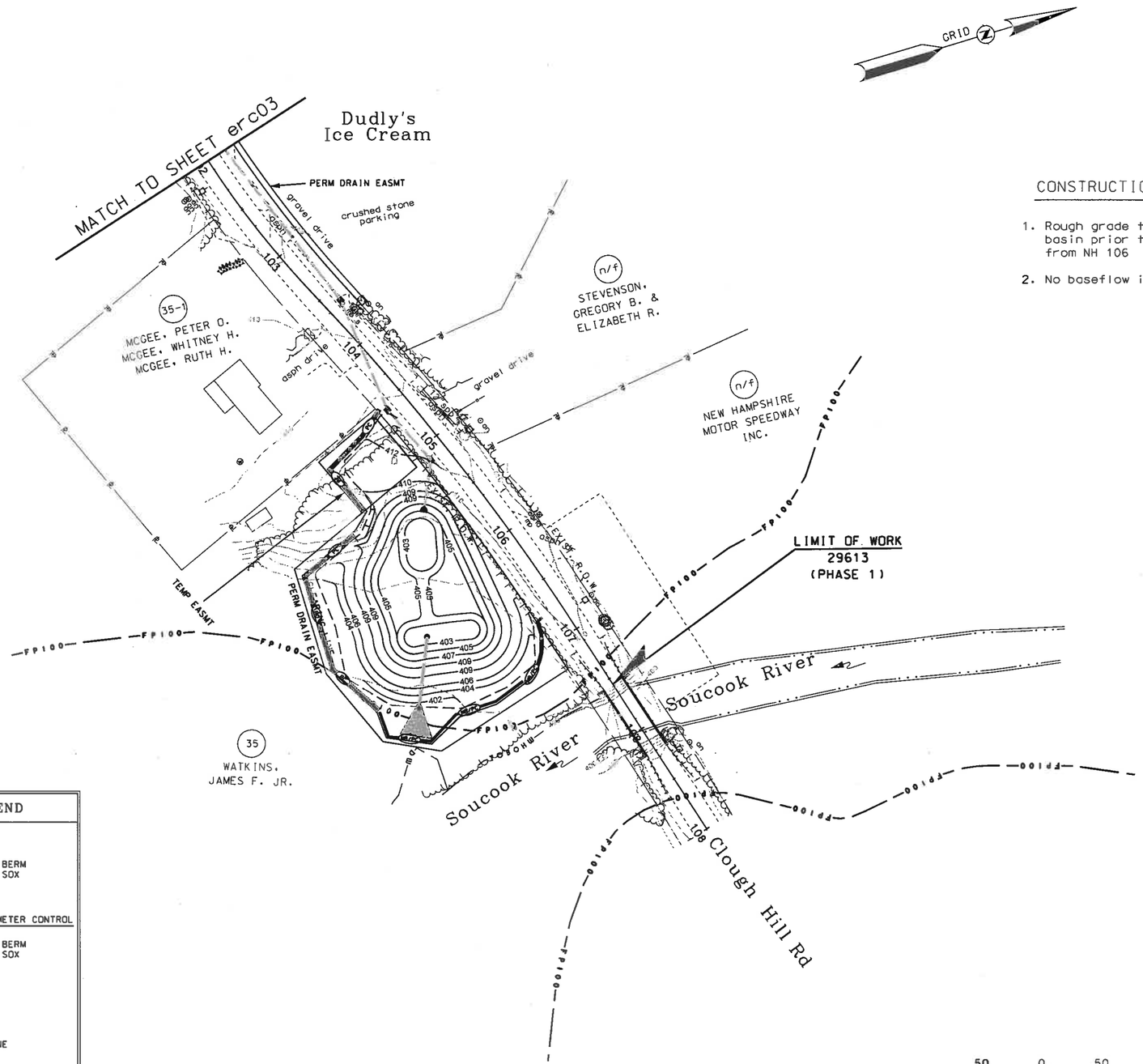
		DATE
SDR PROCESSED		
NEW DESIGN	CAC	DATE 12/2017
SHEET CHECKED	AMC	DATE 12/2017
AS BUILT DETAILS		DATE

50 0 50 100
SCALE IN FEET

STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN

Erosion Control Plans

MODEL	DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
erc05	29613erc	29613	26	27



CONSTRUCTION SEQUENCE NOTES:

1. Rough grade treatment area for use as sediment control basin prior to constructing new closed drainage system from NH 106
2. No baseflow is anticipated at this location.

EROSION CONTROL PLAN LEGEND

PC	PERIMETER CONTROL SILT FENCE EROSION CONTROL MIX BERM EROSION CONTROL MIX SOX TURBIDITY CURTAIN SHEET PILE COFFER DAM
NB/PC	NATURAL BUFFER/PERIMETER CONTROL SILT FENCE EROSION CONTROL MIX BERM EROSION CONTROL MIX SOX TURBIDITY CURTAIN SHEET PILE COFFER DAM
CP	CHANNEL PROTECTION STONE CHECK DAMS STRAW WATTLES CHANNEL MATTING CLASS D EROSION STONE CLASS C STONE
CWB	CLEAN WATER BYPASS PUMP THROUGH PIPE DRAIN THROUGH PIPE OR CHANNEL

50 0 50 100
SCALE IN FEET

STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN

Erosion Control Plans

MODEL	DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
erc06	29613erc	29613	27	27

REVISIONS AFTER PROPOSAL

NUMBER	DATE	STATION	DESCRIPTION

		DATE
SDR PROCESSED		
NEW DESIGN	CAC	DATE 12/2017
SHEET CHECKED	AMC	DATE 12/2017
AS BUILT DETAILS		DATE