

NOTE

Only the cover page of this document is being provided / posted on the EPA Region 1's Merrimack Station NPDES Draft Permit Web page.

For further viewing, the full document is available at EPA Region 1.

The full document may contain a Table of Contents, Executive Summary, List of Figures, List of Tables, etc.

Admin # 184

RECEIVED

JAN 22 1997

MA STATE PROGRAM UNIT

MERRIMACK STATION

THERMAL DISCHARGE MODELING STUDY

NORMANDEAU ASSOCIATES
ENVIRONMENTAL CONSULTANTS

TABLE OF CONTENTS

	PAGE
1.0 INTRODUCTION	1
2.0 STUDY AREA	3
3.0 FIELD STUDY	6
3.1 OBJECTIVES	6
3.2 METHODOLOGY	6
3.3 RESULTS	8
4.0 MODELING STUDY	11
4.1 OBJECTIVES	11
4.2 REGRESSION ANALYSIS	11
4.3 RESULTS	14
5.0 THERMAL IMPACTS ON ANADROMOUS FISH MIGRATION	15
5.1 TARGET SPECIES OF CONCERN	15
5.2 PREDICTED IMPACTS ON HISTORIC ANADROMOUS FISH MIGRATION ..	15
5.2.1 American Shad and Alewife Impacts	16
5.2.2 Atlantic Salmon Impacts	18
5.3 PREDICTED IMPACTS ON FUTURE ANADROMOUS FISH MIGRATION ..	20
6.0 CONCLUSIONS	27
 APPENDICES	
APPENDIX A - MERRIMACK RIVER TEMPERATURE SAMPLING DATA FOR 1995	
APPENDIX B - TEMPERATURE CONTOUR PLOTS FOR 1995	
APPENDIX C - HISTORICAL DATABASE (1985-1994) AND PREDICTED TEMPERATURES AT STATION A0	
APPENDIX D - FLOW DURATION CURVES FOR GARVINS FALLS AND TEMPERATURE DURATION CURVES FOR STATION N10	
APPENDIX E - PREDICTED PROBABILITY OF EXCEEDENCE OF UPPER OPTIMAL MIGRATION TEMPERATURES	

LIST OF FIGURES

	PAGE
2-1. Location of sampling stations, Merrimack River Monitoring Program, Hooksett Pond, New Hampshire 1994-1995.	4
2-2. Location of sampling stations, Merrimack River Monitoring Program, Amoskeag Pond, New Hampshire 1994-1995	5
5-1. Observed average daily background (Station N10) temperatures (°C) and predicted daily average downstream (Station A0) temperatures (°C) on the Merrimack River during 1994 anadromous fish migration periods. Upper optimal migration temperatures shown for the species of concern	17