

Draft Report

Phase 2 CSO Control Plan Wellington Avenue CSO Facility

Prepared for:

City of Newport
Department of Utilities
70 Halsey Street
Newport, RI 02840

Prepared by:

AECOM
300 Baker Avenue
Concord, Massachusetts 01742-2167

March 2009

J.N. 82372

TABLE OF CONTENTS

ES	EXECUTIVE SUMMARY	ES-1
1.0	INTRODUCTION	1-1
1.1	BACKGROUND	1-1
1.1.1	HISTORY OF PAST REPORTS AND SEPARATION PROJECTS	1-1
1.1.2	SUMMARY OF ADMINISTRATIVE CONSENT ORDER	1-1
1.2	SUMMARY OF PHASE 1 PART 1, PHASE 1 PART 2, AND PHASE 1 PART 3 COMBINED SEWER OVERFLOW (CSO) CONTROL PLANS.....	1-2
1.3	PHASE 2 CSO CONTROL PLAN APPROACH AND OBJECTIVES.....	1-5
1.4	REPORT ORGANIZATION.....	1-6
2.0	EXISTING SYSTEM CHARACTERIZATION	2-1
2.1	COLLECTION SYSTEM BACKGROUND.....	2-1
2.1.1	SANITARY/COMBINED SEWER SYSTEM.....	2-1
2.2.2	PUMP STATIONS	2-3
2.1.3	STORM DRAINAGE SYSTEM	2-6
2.2	COMBINED SEWER OVERFLOW FACILITIES	2-6
2.3	WATER POLLUTION CONTROL PLANT (WPCP).....	2-9
3.0	RECENT SYSTEM IMPROVEMENTS AND CSO MANAGEMENT.....	3-1
3.1	ENHANCED SEWER SEPARATION	3-1
3.1.1	ROOF LEADER DISCONNECTION PROGRAM	3-1
3.1.2	SUMP PUMP DISCONNECTION PROGRAM.....	3-2
3.1.3	CATCH BASIN SEPARATION PROJECTS	3-2
3.1.4	HIGH FLOW MANAGEMENT AT THE WPCP	3-6
3.2	CURRENT BEST MANAGEMENT PRACTICES	3-6
4.0	HYDROLOGIC AND HYDRAULIC MODELING.....	4-1
4.1	OVERVIEW AND MODELING APPROACH	4-1
4.1.1	MODEL BACKGROUND AND APPROACH	4-1
4.1.2	MODEL DEVELOPMENT	4-5
4.1.3	MODEL CALIBRATION APPROACH.....	4-15
4.2	WELLINGTON AVENUE CSO FACILITY TRIBUTARY AREA	4-18
4.2.1	WAVE AVENUE PUMP STATION FLOW.....	4-21
4.3	WASHINGTON STREET CSO FACILITY TRIBUTARY AREA	4-21
4.4	CALIBRATION OF FLOWS TO THE WPCP	4-22

TABLE OF CONTENTS CONTINUED

4.5	CSO CALIBRATION AT THE WELLINGTON AVENUE CSO FACILITY	4-23
4.6	RAINFALL ANALYSIS METHODOLOGY	4-24
4.6.1	METHODOLOGY	4-24
4.6.2	SELECTION OF DATA SOURCES.....	4-27
4.7	LONG TERM RAINFALL ANALYSIS	4-27
4.7.1	UPDATED RAINFALL ANALYSIS	4-27
4.7.2	SELECTION OF TYPICAL YEAR FOR LONG TERM ANALYSIS	4-29
4.7.3	MODEL RESULTS OF TYPICAL YEAR UNDER EXISTING CONDITIONS	4-34
4.8	DESIGN STORM ANALYSIS	4-35
5.0	CSO CONTROL.....	5-1
5.1	OVERVIEW OF ABATEMENT TECHNOLOGIES	5-1
5.2	NINE MINIMUM CONTROLS.....	5-1
5.2.1	NINE MINIMUM CONTROLS OVERVIEW.....	5-1
5.2.2	NINE MINIMUM CONTROLS IN NEWPORT	5-2
5.3	SEWER SEPARATION	5-5
5.4	IN-LINE STORAGE	5-5
5.5	OFF-LINE STORAGE	5-7
5.5.1	SEDIMENTATION TANKS.....	5-7
5.5.2	TUNNELS	5-7
5.6	SATELLITE TREATMENT	5-9
5.7	OUTFALL RELOCATION/ELIMINATION	5-10
5.8	CONVEYANCE AND TREATMENT AT WPCP	5-10
5.8.1	CONVEYANCE AND TREATMENT AT WPCP OVERVIEW	5-10
5.8.2	CONVEYANCE AND TREATMENT AT NEWPORT WPCP	5-12
5.9	SUMMARY.....	5-12
6.0	CSO ABATEMENT ALTERNATIVES SCREENING	6-1
6.1	SCREENING METHODOLOGY AND CRITERIA	6-1
6.1.1	ELIMINATION OF CSO	6-2
6.1.2	CONSEQUENTIAL IMPACTS	6-2
6.1.3	COST CONSIDERATIONS.....	6-2
6.1.4	ENVIRONMENTAL ISSUES.....	6-2

TABLE OF CONTENTS CONTINUED

6.1.5	TECHNICAL ISSUES	6-4
6.1.6	IMPLEMENTATION ISSUES	6-5
6.2	SCREENING OF ALTERNATIVES	6-6
6.2.1	NO ACTION.....	6-6
6.2.2	IMPLEMENTATION OF NINE MINIMUM CONTROLS	6-6
6.2.3	SEWER SEPARATION.....	6-6
6.2.4	IN LINE STORAGE.....	6-7
6.2.5	OFF LINE STORAGE.....	6-7
6.2.6	SATELLITE TREATMENT	6-8
6.2.7	OUTFALL ELIMINATION/RELOCATION	6-8
6.2.8	CONVEYANCE AND TREATMENT AT THE EXISTING WPCP	6-8
6.3	COST CRITERIA	6-9
6.4	RESULTS OF SCREENING.....	6-9
7.0	EVALUATION OF CSO CONTROL ALTERNATIVES	7-1
7.1	INTRODUCTION	7-1
7.1.1	EXISTING CONDITIONS 2008 BASELINE MODEL	7-1
7.2	OFFLINE STORAGE.....	7-4
7.2.1	CENTRALIZED STORAGE.....	7-4
7.2.2	MODELING ANALYSIS OF CENTRALIZED STORAGE.....	7-5
7.2.3	DECENTRALIZED STORAGE	7-9
7.2.4	MODELING ANALYSIS OF DECENTRALIZED STORAGE	7-12
7.3	CONVEYANCE AND TREATMENT TO LONG WHARF PUMP STATION.....	7-15
7.3.1	MODELING ANALYSIS OF CONVEYANCE TO LONG WHARF P.S...7-16	
7.4	CONVEYANCE AND TREATMENT AT WPCP	7-18
7.4.1	MODELING ANALYSIS OF CONVEYANCE TO WPCP	7-19
7.5	SEWER SEPARATION	7-22
7.5.1	MODELING ANALYSIS OF SEWER SEPARATION	7-23
7.5.2	SEWER SEPARATION ALTERNATIVES	7-28
7.6	THAMES STREET FLOW REGULATOR ANALYSIS	7-29
7.7	WAVE AVENUE PUMP STATION ANALYSIS.....	7-29
7.8	EVALUATION OF ALTERNATIVES.....	7-30
7.8.1	SITTING ISSUES.....	7-30

TABLE OF CONTENTS CONTINUED

7.8.2	ENVIRONMENTAL ISSUES.....	7-32
7.8.3	INSTITUTIONAL ISSUES.....	7-35
7.8.4	REGULATORY PERMITTING ISSUES	7-36
7.9	PRELIMINARY SELECTION OF RECOMMENDED ALTERNATIVE	7-36
8.0	COST ANALYSIS.....	8-1
8.1	CAPITAL COSTS	8-1
8.2	OPERATION AND MAINTENANCE COSTS.....	8-2
8.3	PRESENT WORTH ANALYSIS.....	8-3
8.4	COST SUMMARY.....	8-3
8.5	KNEE OF THE CURVE ANALYSIS.....	8-5
9.0	FINANCIAL CAPABILITY ANALYSIS.....	9-1
9.1	INTRODUCTION	9-1
9.2	KEY ASSUMPTIONS.....	9-1
9.3	PROJECTED REVENUE REQUIREMENTS, FINANCING AND RATE IMPACTS	9-3
9.4	US EPA FINANCIAL CAPABILITY ANALYSIS	9-4
9.4.1	PHASE 1 – THE RESIDENTIAL FACTOR	9-4
9.4.2	PHASE 2 – CITY OF NEWPORT FINANCIAL INDICATORS.....	9-6
9.4.3	OVERALL FINANCIAL CAPABILITY	9-15
9.5	SUMMARY.....	9-17
10.0	RECOMMENDED PLAN	10-1
10.1	OVERVIEW AND CONCLUSIONS.....	10-1
10.1.1	MODEL DEVELOPMENT.....	10-1
10.1.2	CSO CONTROL ALTERNATIVES	10-1
10.1.3	CONCLUSIONS	10-2
10.2	RECOMMENDED CSO CONTROL PLAN	10-5
10.3	IMPLEMENTATION SCHEDULE.....	10-11
10.4	MONITORING PLAN	10-12

LIST OF TABLES

LIST OF FIGURES

APPENDICES

LIST OF TABLES

TABLE ES.1	CSO CONTROLS ALTERNATIVES ANALYSIS SUMMARY.....	ES-4
TABLE ES.2	CSO CONTROL ALTERNATIVES COST ESTIMATES	ES-5
TABLE ES.3	IMPACTS TO CSO FACILITIES FROM WAVE AVENUE PUMP STATION FLOWS TYPICAL YEAR 1996 SIMULATION SEPTEMBER THROUGH OCTOBER 1996	ES-7
TABLE ES.4	RECOMMENDED CSO PLAN COSTS FOR THE WELLINGTON AVENUE CSO AREA	ES-10
TABLE ES.5	PRELIMINARY COST ESTIMATES FOR RECOMMENDATIONS FOR WASHINGTON STREET CSO AREA	ES-11
TABLE ES.6	COST SUMMARY OF RECOMMENDED PLAN	ES-11
TABLE 2.1	WPCP DISCHARGE LIMITATIONS	2-9
TABLE 2.2	NEWPORT WPCP UNIT PROCESS VOLUMES	2-10
TABLE 3.1	PHASE 1 PART 2 - PUBLIC SMOKE TESTING STATUS.....	3-3
TABLE 3.2	PREVIOUSLY IDENTIFIED DIRECT PUBLIC CONNECTIONS TO THE SANITARY SEWER.....	3-5
TABLE 3.3	PUBLIC SMOKE TESTING STATUS CATCHMENT AREA 6 DIRECT PUBLIC CONNECTIONS TO THE SANITARY SEWER	3-5
TABLE 3.4	PUBLIC SMOKE TESTING STATUS CATCHMENT AREA INDIRECT PUBLIC STRUCTURES POTENTIALLY CONNECTED TO THE SANITARY SEWER.....	3-6
TABLE 4.1	HYDRAULIC MODULE NETWORK DATA	4-7
TABLE 4.2	PIPE ROUGHNESS	4-10
TABLE 4.3	PUMP OPERATION MODEL PARAMETERS	4-11
TABLE 4.4	HYDROLOGIC MODULE SIMULATION CONTROL PARAMETERS	4-15
TABLE 4.5	HYDRAULIC MODULE SIMULATION CONTROL PARAMETERS	4-15
TABLE 4.6	CALIBRATION HYDROLOGIC PARAMETERS FOR FRC.....	4-17
TABLE 4.7	CALIBRATION PARAMETERS FOR SRC.....	4.18
TABLE 4.8	COMPARISONS OF FLOWS ORIGINATING FROM THE NAVY AND MIDDLETOWN DIRECT TO NEWPORT WPCP APRIL - MAY 2006	4-23
TABLE 4.9	COMPARISON OF OBSERVED AND SIMULATED CSO VOLUMES AT WELLINGTON AVENUE CSO FACILITY	4-24
TABLE 4.10	SUMMARY OF RAINFALL DATA SETS.....	4-25

LIST OF TABLES CONTINUED

TABLE 4.11	CORRELATION FACTORS OF RAINFALL DATA SETS	4-25
TABLE 4.12	COMPARISON OF 1951 AND 1978 FROM NBC REPORT	4-27
TABLE 4.13	SUMMARY OF STORMS IN 1951 BASED ON NBC DESIGN STORMS	4-28
TABLE 4.14	LONG-TERM STATISTICS FOR T.F. GREEN AIRPORT RAIN GAGE	4-30
TABLE 4.15	ILLUSTRATION OF SCORING SYSTEM	4-30
TABLE 4.16	SUMMARY OF TOP TEN TYPICAL YEARS IN PERIOD OF RECORD.....	4-31
TABLE 4.17	SUMMARY OF STORM EVENTS IN THE TYPICAL YEAR SELECTED FOR LONG TERM RAINFALL ANALYSIS	4-32
TABLE 4.18	SUMMARY OF PREDICTED OVERFLOWS DURING SIMULATED TYPICAL YEAR 1996 WELLINGTON AVENUE CSO FACILITY EXISTING SYSTEM CONFIGURATION.....	4-35
TABLE 4.19	SUMMARY OF SYNTHETIC STORM DATA (DURATION OF EACH STORM = 24 HOURS).....	4-35
TABLE 5.1	CITY OF NEWPORT'S COMPLIANCE WITH EPA'S NINE MINIMUM CONTROLS	5-3
TABLE 6.1	RESULTS OF SCREENING ANALYSIS	6-10
TABLE 7.1	WELLINGTON AVENUE CSO FACILITY ANNUAL CSO VOLUMES AND EVENTS TYPICAL YEAR 1996 SIMULATIONS	7-2
TABLE 7.2	TYPICAL YEAR (1996) FLOWS AT WPCP 6.4 MG CENTRALIZED STORAGE ALTERNATIVE	7-8
TABLE 7.3	DECENTRALIZED STORAGE CONDUIT/TANK LOCATIONS SUITABILITY FOR USE TO REDUCE OVERFLOWS AT THE WELLINGTON AVENUE CSO FACILITY	7-11
TABLE 7.4	TYPICAL YEAR (1996) FLOWS AT WPCP DECENTRALIZED STORAGE ALTERNATIVE	7-13
TABLE 7.5	TYPICAL YEAR (1996) FLOWS AT WPCP CONVEYANCE TO LONG WHARF PUMP STATION ALTERNATIVE	7-16
TABLE 7.6	TYPICAL YEAR (1996) FLOWS AT WPCP CONVEYANCE TO WPCP ALTERNATIVE.....	7-20
TABLE 7.7	SEWER SEPARATION ALTERNATIVE WELLINGTON AVENUE CSO FACILITY	7-25

LIST OF TABLES CONTINUED

TABLE 7.8	SEWER SEPARATION IMPACTS TO WASHINGTON STREET CSO FACILITY CSO VOLUME AND FREQUENCY	7-25
TABLE 7.9	TYPICAL YEAR (1996) FLOWS AT WPCP SEWER SEPARATION30% INFILTRATION AND INFLOW REDUCTION.....	7-26
TABLE 7.10	TYPICAL YEAR (1996) FLOWS AT WPCP SEWER SEPARATION50% INFILTRATION AND INFLOW REDUCTION.....	7-26
TABLE 7.11	TYPICAL YEAR (1996) FLOWS AT WPCP SEWER SEPARATION80% INFILTRATION AND INFLOW REDUCTION.....	7-27
TABLE 7.12	WELLINGTON AVENUE CSO FACILITY ANNUAL CSO VOLUMES AND EVENTS TYPICAL YEAR 1996 SIMULATIONS	7-27
TABLE 7.13	SYSTEM OPTIMIZATION IMPACT ON THE VOLUME OF CSO AT THE WELLINGTON AVENUE AND WASHINGTON STREET CSO FACILITY AND THE WPCP FLOW	7-28
TABLE 7.14	IMPACTS TO CSO FACILITIES FROM WAVE AVENUE PUMP STATION FLOWS TYPICAL YEAR 1996 SIMULATION SEPTEMBER THROUGH OCTOBER	7-29
TABLE 7.15	ENVIRONMENTAL ISSUES.....	7-32
TABLE 7.16	INSTITUTIONAL ISSUES.....	7-35
TABLE 7.17	MAJOR PERMITTING REQUIREMENTS	7-36
TABLE 7.18	CSO CONTROLS ALTERNATIVE ANALYSIS SUMMARY	7-37
TABLE 8.1	CONSTRUCTION COST ADJUSTMENT FACTORS TO DEVELOP BASE CONSTRUCTION COST	8-2
TABLE 8.2	UNIT COSTS	8-3
TABLE 8.3	COST ESTIMATES FOR CSO CONTROL ALTERNATIVES	8-4
TABLE 8.4	DESIGN STORMS	8-5
TABLE 8.5	DESIGN STORM SIMULATION RESULTS	8-5
TABLE 9.1	CAPITAL IMPROVEMENT PROGRAM 2009-2013	9-3
TABLE 9.2	ANNUAL COST PER HOUSEHOLD (CPH)	9-5
TABLE 9.3	MEDIAN HOUSEHOLD INCOME (MHI)	9-6
TABLE 9.4	FINANCIAL IMPACT MATRIX	9-6
TABLE 9.5	FINANCIAL IMPACT OF EACH ALTERNATIVE	9-7
TABLE 9.6	BOND RATINGS AND CREDITWORTHINESS	9-8

LIST OF TABLES CONTINUED

TABLE 9.7	USEPA BENCHMARKS FOR BOND RATINGS	9-8
TABLE 9.8	USEPA BOND RATING WORKSHEET	9-9
TABLE 9.9	USEPA BENCHMARKS FOR NET DEBT AS A PERCENT OF FULL MARKET PROPERTY VALUE.....	9-10
TABLE 9.10	US EPA WORKSHEET FOR NET DEBT AS A PERCENT OF FULL MARKET PROPERTY VALUE.....	9-10
TABLE 9.11	US EPA BENCHMARKS FOR UNEMPLOYMENT	9-11
TABLE 9.12	US EPA WORKSHEET FOR UNEMPLOYMENT RATE.....	9-11
TABLE 9.13	US EPA BENCHMARKS FOR MEDIAN HOUSEHOLD INCOME	9-12
TABLE 9.14	US EPA WORKSHEET FOR MEDIAN HOUSEHOLD INCOME.....	9-12
TABLE 9.15	US EPA BENCHMARKS FOR PROPERTY TAX REVENUES AS A PERCENT OF FULL MARKET PROPERTY VALUE	9-13
TABLE 9.16	US EPA WORKSHEET FOR PROPERTY TAX REVENUES AS A PERCENT OF FULL MARKET PROPERTY VALUE	9-13
TABLE 9.17	USEPA BENCHMARKS FOR PROPERTY TAX REVENUE COLLECTION RATE	9-13
TABLE 9.18	US EPA WORKSHEET FOR PROPERTY TAX REVENUE COLLECTION RATE	9-14
TABLE 9.19	US EPA BENCHMARK	9-14
TABLE 9.20	FINANCIAL CAPABILITY SCORES	9-15
TABLE 9.21	SUMMARY OF FINANCIAL CAPABILITY INDICATORS PER USEPA GUIDANCE.....	9-16
TABLE 9.22	FINANCIAL CAPABILITY SCORE FOR EACH ALTERNATIVE	9-16
TABLE 10.1	CSO CONTROL ALTERNATIVES COST ESTIMATES	10-5
TABLE 10.2	RECOMMENDED PLAN COSTS	10-9
TABLE 10.3	PRELIMINARY COST ESTIMATES FOR RECOMMENDATIONS FOR WASHINGTON STREET CSO AREA	10-11
TABLE 10.4	COST SUMMARY OF RECOMMENDED PLAN	10-11

LIST OF FIGURES

FIGURE ES-1 IMPLEMENTATION SCHEDULE.....	ES-12
FIGURE ES.2 WELLINGTON AVENUE CSO FACILITY CSO VOLUME AND TOTAL RAINFALL 2001-2008	ES-13
FIGURE ES.3 WELLINGTON AVENUE CSO FACILITY CSO VOLUME PER INCH OF RAINFALL 2001-2008	ES-14
FIGURE 2.1 SANITARY SEWER SYSTEM	2-2
FIGURE 2.2 SYSTEM SCHEMATIC.....	2-4
FIGURE 2.3 STORM DRAIN SYSTEM	2-7
FIGURE 2.4 WELLINGTON AVENUE CSO FACILITY CSO VOLUME AND TOTAL RAINFALL 2001-2008	2-8
FIGURE 4.1 VIEW OF RDII HYDROLOGIC MODEL	4-3
FIGURE 4.2 TIME – AREA (TA) CURVES USED IN MIKE URBAN	4-4
FIGURE 4.3 TRIBUTARY CATCHMENT AREAS.....	4-6
FIGURE 4.4 WELLINGTON AVENUE AND WASHINGTON STRRET MODELED PIPE NETWORK	4-8
FIGURE 4.5 METER LOCATIONS	4-13
FIGURE 4.6 INFLOW LOCATIONS	4-14
FIGURE 4.7A SAMPLE COMPARISON OF 2005 SIMULATED AND OBSERVED FLOWS 2005 CATCHMENT AREA 4 – WELLINGTON AVENUE.....	4-19
FIGURE 4.7B SAMPLE COMPARISON OF 2005 SIMULATED AND OBSERVED FLOWS 2005 CATCHMENT AREA 6 – TERMINUS OF THE THAMES STREET INTERCEPTOR.....	4-20
FIGURE 4.8A SAMPLE COMPARISON OF 2007 SIMULATED AND OBSERVED FLOWS 2007 CATCHMENT AREA 4 – WELLINGTON AVENUE.....	4-20
FIGURE 4.8B SAMPLE COMPARISON OF 2007 SIMULATED AND OBSERVED FLOWS 2007 CATCHMENT AREA 6 – TERMINUS OF THE THAMES STREET INTERCEPTOR.....	4-21
FIGURE 4.9 SAMPLE COMPARISON OF 2007 SIMULATED AND OBSERVED FLOWS 2008 CATCHMENT AREA 10 – PRESCOTT HALL/HILLSIDE AVENUE/RAILROAD EASEMENT 18-INCH SEWER.....	4-22
FIGURE 4.10 RAINFALL DATA SET COMPARISONS: NEWPORT TO PROVIDENCE AND NEWPORT TO KINGSTON	4-26

LIST OF FIGURES CONTINUED

FIGURE 4.11	DESIGN STORMS FROM NBC CSO FACILITIES PLAN REPORT	4-28
FIGURE 5.1	IN-LINE STORAGE SCHEMATIC DIAGRAM	5-6
FIGURE 5.2	SEDIMENTATION TANK SCHEMATIC DIAGRAM	5-8
FIGURE 5.3	TUNNEL STORAGE SCHEMATIC DIAGRAM	5-9
FIGURE 5.4	SATELLITE TREATMENT SCHEMATIC DIAGRAM	5-10
FIGURE 5.5	CSO TREATMENT AT WATER POLLUTION CONTROL PLANT SCHEMATIC DIAGRAM	5-12
FIGURE 7.1	FLOW HYDROGRAPH – THAMES STREET NEAR WASHINGTON SQUARE	7-3
FIGURE 7.2	TIDE INFLUENCE ON WELLINGTON AVENUE CSO WITH TIDE FLUCTUATION	7-4
FIGURE 7.3	CENTRALIZED STORAGE ALTERNATIVE	7-7
FIGURE 7.4	CONCEPTUAL DECENTRALIZED STORAGE LOCATIONS	7-10
FIGURE 7.5	DECENTRALIZED STORAGE ALTERNATIVE	7-14
FIGURE 7.6	CONVEYANCE TO LONG WHARF PUMP STATION	7-17
FIGURE 7.7	MODIFICATIONS TO WPCP	7-18
FIGURE 7.8	CONVEYANCE TO WPCP	7-21
FIGURE 7.9	INFILTRATION/INFLOW FIELD INVESTIGATION REQUIREMENTS	7-24
FIGURE 7.10	WATER RESOURCES	7-33
FIGURE 7.11	RESOURCE AREAS	7-34
FIGURE 8.1	KNEE-OF-THE CURVE ANALYSIS	8-6
FIGURE 9.1	PROJECTED EXPENSES AND DEFICIT THROUGH 2013	9-4
FIGURE 10.1	PROPOSED FLOW METER LOCATIONS	10-7
FIGURE 10.2	IMPLEMENTATION SCHEDULE	10-13

LIST OF APPENDICES

APPENDIX VOLUME 1

- | | |
|------------|--|
| APPENDIX A | WELLINGTON AVENUE CSO MODEL SETUP AND DATA COLLECTION, JUNE 2008 |
| APPENDIX B | WELLINGTON AVENUE CSO FLOW MONITORING FOR CALIBRATION AND VERIFICATION, JANUARY 2008 |
| APPENDIX C | WELLINGTON AVENUE CSO MODEL CALIBRATION, JUNE 2008 |
| APPENDIX D | WASHINGTON STREET CSO FACILITY MODEL CALIBRATION |
| APPENDIX E | WELLINGTON AVENUE CSO MODEL CALIBRATION AND ALTERNATIVE ANALYSIS, SEPTEMBER 2008 |
| APPENDIX F | WELLINGTON AVENUE CSO MODEL OUTPUT RESULTS, MARCH 2009 |

APPENDIX VOLUME 2

- | | |
|------------|---|
| APPENDIX G | WELLINGTON AVENUE CSO COST BACKUP TABLES, MARCH 2009 |
| APPENDIX H | US EPA CSO GUIDANCE FOR FINANCIAL CAPABILITY ASSESSMENT AND SCHEDULE DEVELOPMENT, FEBRUARY 1997 |
| APPENDIX I | WELLINGTON AVENUE CSO RAINFALL ANALYSIS, OCTOBER 2008 |