

Table of Contents

	page
1. Introduction	1
1.1 Background	1
1.2 Project Objectives.....	1
1.3 Scope	2
2. Design Criteria	4
2.1 Level 2 Design Flows and Loads.....	4
2.1.1 Introduction.....	4
2.1.2 Population Projections	4
2.1.3 Design Flows and Loads	5
2.2 Effluent Criteria.....	8
2.3 Other Environment Act Licence Requirements	9
3. Plant Overview	10
3.1 Introduction.....	10
3.2 Liquid Stream Treatment Processes	10
3.2.1 Area H – Headworks Facility	10
3.2.2 Area X – Hauled Wastewater Receiving Facility	14
3.2.3 Area P – Primary Clarification Facility	14
3.2.4 Area R – Biological Nutrient Removal Facility	14
3.2.5 Area S – Secondary Clarification Facility.....	14
3.2.6 Area U – UV Disinfection Facility.....	15
3.2.7 Area C – Centrate Treatment Facility	15
3.2.8 Area F – Ferric Chloride Receiving and Storage Facility.....	15
3.3 Sludge Stream Treatment Processes.....	15
3.3.1 Area N – Hauled Raw Sludge Receiving Facility	15
3.3.2 Area Q – Wet Weather Sludge Storage Facility	16
3.3.3 Area J – Fermentation and Phosphorus Release Facility.....	16
3.3.4 Area T – Pre-digestion Sludge Treatment Facility	16
3.3.5 Area D – Anaerobic Digestion Facility	17
3.3.6 Area V – Biosolids Processing and Loading Facility.....	17
3.3.7 Area K – Digester Gas Handling Facility	17
3.4 Other Facilities.....	17
3.4.1 Area G – Standby Power Generation Facility	17
3.4.2 Area M – Main Building.....	18
3.4.3 Area Z – Maintenance Facility	18
3.4.4 Area Y – Yard	18
3.5 Mass Balances	18
3.6 Operational Philosophy	25
3.6.1 Introduction	25
3.6.2 Operating Philosophy to Meet the Anticipated Environment Act Licence	25
3.6.3 Operating Philosophy to Meet the Water Protection Act	27

3.7	Hydraulic Profile	28
3.7.1	Hydraulic Capacities	28
3.7.2	Gravity Flow	29
3.7.3	Pumped Flow	29
3.7.4	Flood Protection	30
4.	Civil Sitework	31
4.1	Introduction	31
4.2	Layout	31
4.3	Construction Laydown and Staging Area	31
4.4	Roads and Sidewalks	32
4.4.1	Roads	32
4.4.2	Parking Lots	33
4.4.3	Sidewalks	33
4.5	Utilities and Yard Piping	33
4.5.1	Pipeline Design	33
4.5.2	Large Chamber Design	33
4.5.3	Trenchless Pipe Design	33
4.5.4	Pipe Joint Design	34
4.5.5	Buried Utilities	34
4.5.6	Major Yard Piping	34
4.5.7	Process Conveyance Piping	35
4.5.8	Water Distribution System	35
4.5.9	Wastewater Collection System	38
4.6	Interceptor Junction Chamber	38
4.6.1	Hydraulic Design Criteria	38
4.6.2	Flow Bypass Requirements	41
4.6.3	Interceptor Gate Chambers and Real-Time Flow Control Chambers	41
4.6.4	Interceptor Connections and Staging	41
4.7	Grading and Drainage	43
4.7.1	Existing Condition	43
4.7.2	Drainage Design	43
4.8	Landscaping	45
4.9	CPR Crossing	45
4.10	Tunnels	46
5.	Liquid Stream Facilities	47
5.1	Area H – Headworks Facility	47
5.1.1	Process	47
5.1.2	Structural	74
5.1.3	Architectural	77
5.1.4	Mechanical	78
5.1.5	Electrical	84
5.1.6	Instrumentation and Controls	88
5.2	Area X – Hauled Wastewater Receiving Facility	89
5.2.1	Process	89
5.2.2	Structural	92

5.2.3	Architectural.....	93
5.2.4	Mechanical.....	93
5.2.5	Electrical	93
5.2.6	Instrumentation and Controls.....	93
5.3	Area P – Primary Clarification Facility	94
5.3.1	Process.....	94
5.3.2	Structural	104
5.3.3	Architectural.....	105
5.3.4	Mechanical.....	105
5.3.5	Electrical	107
5.3.6	Instrumentation and Controls.....	109
5.4	Area Z – Maintenance Facility	110
5.4.1	Process.....	110
5.4.2	Structural	110
5.4.3	Architectural.....	111
5.4.4	Mechanical.....	111
5.4.5	Electrical	112
5.5	Area R – Biological Nutrient Removal Facility	112
5.5.1	Process.....	112
5.5.2	Intermediate Pumping.....	113
5.5.3	Biological Nutrient Removal Reactors	116
5.5.4	Structural	124
5.5.5	Architectural.....	126
5.5.6	Mechanical.....	126
5.5.7	Electrical	129
5.5.8	Instrumentation and Controls.....	132
5.6	Area S – Secondary Clarification Facility	133
5.6.1	Process.....	133
5.6.2	Operation and Maintenance	146
5.6.3	Structural	147
5.6.4	Architectural.....	147
5.6.5	Mechanical.....	148
5.6.6	Electrical	150
5.6.7	Instrumentation and Controls.....	153
5.7	Area U – UV Disinfection Facility.....	154
5.7.1	Process.....	154
5.7.2	Structural	160
5.7.3	Architectural.....	161
5.7.4	Mechanical.....	162
5.7.5	Electrical	162
5.7.6	Instrumentation and Controls.....	164
5.8	Area F – Ferric Chloride Receiving and Storage Facility.....	165
5.8.2	Mechanical.....	169
5.8.3	Electrical	170
5.8.4	Instrumentation and Controls.....	171
5.9	Area C – Centrate Treatment Facility	172
5.9.1	Process.....	172

5.9.2	Structural	178
5.9.3	Architectural.....	178
5.9.4	Mechanical.....	178
5.9.5	Electrical	179
5.9.6	Instrumentation and Controls.....	179
6.	Sludge Stream Facilities.....	180
6.1	Area N – Hauled Raw Sludge Receiving Facility.....	180
6.1.1	Process.....	180
6.1.2	Structural	186
6.1.3	Architectural.....	187
6.1.4	Mechanical.....	188
6.1.5	Electrical	192
6.1.6	Instrumentation and Controls.....	194
6.2	Area Q – Wet Weather Sludge Storage Facility	196
6.2.1	Process.....	196
6.2.2	Structural	200
6.2.3	Architectural.....	200
6.2.4	Mechanical.....	200
6.2.5	Electrical	203
6.2.6	Instrumentation and Controls.....	205
6.3	Area J – Fermentation and Phosphorus Release Facility	205
6.3.1	Process.....	205
6.3.2	Structural	213
6.3.3	Architectural.....	215
6.3.4	Mechanical.....	215
6.3.5	Electrical	218
6.3.6	Instrumentation and Controls.....	221
6.4	Area T – Pre-digestion Sludge Treatment Facility.....	222
6.4.1	Process.....	222
6.4.2	Structural	236
6.4.3	Architectural.....	237
6.4.4	Mechanical.....	238
6.4.5	Electrical	244
6.4.6	Instrumentation and Controls.....	247
6.5	Area D – Anaerobic Digestion Facility	248
6.5.1	Process.....	248
6.5.2	Design Basis.....	249
6.5.3	Structural	260
6.5.4	Architectural.....	261
6.5.5	Mechanical.....	262
6.5.6	Electrical	265
6.5.7	Instrumentation and Controls.....	267
6.6	Area V – Biosolids Processing and Loading Facility	268
6.6.1	Process.....	268
6.6.2	Design Basis.....	270
6.6.3	Structural	281

6.6.4	Architectural.....	282
6.6.5	Mechanical.....	284
6.6.6	Electrical	290
6.6.7	Instrumentation and Controls.....	292
6.7	Area K – Digester Gas Handling Facility	293
6.7.1	Process.....	293
6.7.2	Structural	298
6.7.3	Architectural.....	299
6.7.4	Mechanical.....	299
6.7.5	Electrical	302
6.7.6	Instrumentation and Controls.....	304
7.	Standby Power	306
7.1	Introduction.....	306
7.2	Standby Power Distribution System	306
7.2.1	Power Generation System.....	306
7.2.2	Power Distribution and Transferring / Paralleling Switchgear.....	306
7.2.3	Electrical Power System Modes of Operations.....	307
7.2.4	Power Distribution Calculations and Studies	307
7.3	Electrical Requirements.....	307
7.3.1	Power Service.....	308
7.3.2	Lighting	308
7.3.3	Lightning Protection	308
7.3.4	Grounding	308
7.3.5	Fire Alarm System	308
7.3.6	Voice and Data Communications	309
7.3.7	Building Security System	309
7.4	Operation and Maintenance	309
7.5	Structural	309
7.6	Architectural.....	310
7.7	Mechanical	310
7.7.1	Generator Room	311
7.7.2	Electrical Room.....	311
7.7.3	Battery Room.....	312
7.7.4	Pump Room.....	312
7.7.5	Fuel System.....	312
7.7.6	HVAC Controls	312
8.	Process Control System.....	314
8.1	Overall System Description	314
8.1.1	Background Information.....	314
8.2	Identification	314
8.3	Guiding Automation Principles	315
8.3.1	PCS, HMI and Historian System.....	315
8.3.2	Programming/Maintenance Workstations	315
8.3.3	Process Controllers	316
8.4	Control System Architecture.....	316

8.5	Communication Networks.....	317
8.5.1	Process Control System Network	317
8.6	Control System Hierarchy.....	317
8.6.1	Information and Control Points on HMI System.....	317
8.6.2	Local User Interface.....	319
8.6.3	Control Strategies and Modes	319
8.6.4	Motor Control Centres	320
8.7	Migration Strategy from the Existing DCS and HMI System	320
8.7.1	Existing DCS.....	320
8.7.2	Existing HMI.....	321
8.8	Instrumentation.....	321
8.9	Fieldbus Networks	321
8.10	Automation Power Supply	322
8.11	Environmental and Hazardous Classification	322
8.12	Main Control Rooms.....	322
8.12.1	Main Control Room Layout.....	323
8.12.2	Server Rooms.....	323
9.	Decommissioning	324
9.1	Introduction.....	324
9.2	Surge Well, Pump Wells and Discharge Chamber.....	324
9.3	Junction Chamber	325
9.4	Primary Clarification	325
9.5	UV Disinfection	325
9.6	Sludge Dewatering	326
9.7	Anaerobic Digesters 11 to 14	326
10.	Demolition	327
10.1	Introduction.....	327
10.2	Partial Demolition	327
10.2.1	Grit Building	327
10.2.2	HPO Reactors.....	327
10.2.3	Secondary Clarifiers	328
10.2.4	Former Drying Bed Drainage	328
10.3	Full Demolition.....	328
10.3.1	Former Anaerobic Digesters 1-10.....	328
10.3.2	Digester Gas Sphere and Flare	329
10.3.3	Boiler Building	329
10.3.4	Abandoned Building (Bunker).....	329
10.3.5	Tunnels	329
11.	Implementation Plan and Critical Path Schedule	331
11.1	Introduction.....	331
11.2	Required Permits, Licences and Agreements	331
11.3	Construction Sequencing	332
11.4	Construction Issues	333
11.4.1	Tie-Ins.....	333

11.4.2 Temporary Facilities	333
11.4.3 Early Works	334
11.4.4 Early Compliance Benefits.....	335
11.4.5 Concurrent Works by Others	335
11.4.6 Commissioning	336
11.4.7 Traffic Control and Site Access	336
11.5 Project Schedule	337
12. Cost Estimate	339
12.1 Construction Cost Estimate	340
12.1.1 Derivation of Cost Estimate	340
12.1.2 Basis of Estimate	340
12.1.3 Construction Cost	341
12.2 Operation and Maintenance Cost Estimate.....	342
13. Reference.....	343

