Long-term Aquatic Research Survey

Fox River- 2008-2009

Atherinidae		N	%
Brook silverside	*Labidesthes sicculus*	80	1.00
Cyprinidae		N	%
Bluntnose minnow	*Pimephales notatus*	2301	28.72
Brassy minnow	*Hybognathus hankinsoni*	1	0.01
Bullhead minnow	*Pimephales vigilax*	248	3.09
Common carp	*Cyprinus carpio*	334	4.17
Common shiner	*Luxilus cornutus*	3	0.04
Creek chub	*Semotilus atromaculatus*	4	0.05
Emerald shiner	*Notropis atherinoides*	184	2.30
Golden shiner	*Notemigonus crysoleucas*	33	0.41
Grass carp	*Ctenopharyngodon idella*	1	0.01
Pugnose minnow	*Opsopoedus emiliae*	3	0.04
Red shiner	*Cyprinella lutrensis*	35	0.44
Sand shiner	*Notropis ludibundus*	118	1.47
Spotfin shiner	*Cyprinella spiloptera*	694	8.66
Spottail shiner	*Notropis hudsonius*	7	0.09
Centrarchidae		N	%
Black crappie	*Pomoxis nigromaculatus*	102	1.27
Bluegill	*Lepomis macrochirus*	1689	21.08
Green sunfish	*Lepomis cyanellus*	44	0.55
Green sunfish/bluegill	*Lepomis cyanellus X macrochirus*	1	0.01
Largemouth bass	*Micropterus salmoides*	12	0.15
Orangespotted sunfish	*Lepomis humilis*	101	1.26
Pumpkinseed	*Lepomis gibbosus*	20	0.25
Smallmouth bass	*Micropterus dolomieu*	327	4.08
White crappie	*Pomoxis annularis*	24	0.30
Catostomidae		N	%
Black redhorse	*Moxostoma duquesnei*	48	0.60
Golden redhorse	*Moxostoma erythrurum*	27	0.34
Highfin carpsucker	*Carpiodes velifer*	177	2.21
Quillback	*Carpiodes cyprinus*	179	2.23
River carpsucker	*Carpiodes carpio*	70	0.87
Shorthead redhorse	*Moxostoma macrolepidotum*	347	4.33
Silver redhorse	*Moxostoma anisurum*	37	0.46
White Sucker	*Catostomus commersonii*	9	0.11
Clupeidae		N	%
Gizzard shad	*Dorosoma cepedianum*	19	0.24
Esocidae		N	%
Muskellunge	*Esox masquinongy*	1	0.01
Fundulidae		N	%
Blackstripe topminnow	*Fundulus notatus*	275	3.43
Ictaluridae		N	%
Channel catfish	*Ictalurus punctatus*	266	3.32
Flathead catfish	*Pylodictis olivaris*	23	0.29
Stonecat	*Noturus flavus*	1	0.01
Tadpole madtom	*Noturus gyrinus*	5	0.06
Yellow bullhead	*Ameiurus natalis*	4	0.05
Moronidae		N	%
White bass	*Morone chrysops*	30	0.37
Yellow bass	*Morone mississippiensis*	10	0.12
Percidae		N	%
Johnny darter	*Etheostoma nigrum*	32	0.40
Walleye	*Stizostedion vitreum*	17	0.21
Poeciliidae		N	%
Mosquitofish	*Gambusia affinis*	3	0.04
Sciaenidae		N	%
Freshwater drum	*Aplodinotus grunniens*	67	0.84
12 Families	46 species	8013	

Long-term Aquatic Research Survey

Fox River- Segment 1			
Atherinidae		N	%
Brook silverside	*Labidesthes sicculus*	5	0.32
Cyprinidae		N	%
Bluntnose minnow	*Pimephales notatus*	476	30.18
Brassy minnow	*Hybognathus hankinsoni*	1	0.06
Bullhead minnow	*Pimephales vigilax*	150	9.51
Common carp	*Cyprinus carpio*	60	3.80
Emerald shiner	*Notropis atherinoides*	21	1.33
Red shiner	*Cyprinella lutrensis*	22	1.40
Sand shiner	*Notropis ludibundus*	20	1.27
Spotfin shiner	*Cyprinella spiloptera*	175	11.10
Spottail shiner	*Notropis hudsonius*	1	0.06
Centrarchidae		N	%
Black crappie	*Pomoxis nigromaculatus*	1	0.06
Bluegill	*Lepomis macrochirus*	56	3.55
Green sunfish	*Lepomis cyanellus*	12	0.76
Orangespotted sunfish	*Lepomis humilis*	1	0.06
Pumpkinseed	*Lepomis gibbosus*	1	0.06
Smallmouth bass	*Micropterus dolomieu*	77	4.88
Catostomidae		N	%
Black redhorse	*Moxostoma duquesnei*	27	1.71
Golden redhorse	*Moxostoma erythrurum*	22	1.40
Highfin carpsucker	*Carpiodes velifer*	66	4.19
Quillback	*Carpiodes cyprinus*	44	2.79
River carpsucker	*Carpiodes carpio*	29	1.84
Shorthead redhorse	*Moxostoma macrolepidotum*	113	7.17
Silver redhorse	*Moxostoma anisurum*	23	1.46
White sucker	*Catostomus commersoni*	7	0.44
Clupeidae		N	%
Gizzard shad	*Dorosoma cepedianum*	1	0.06
Esocidae		N	%
Muskellunge	*Esox masquinongy*	1	0.06
Fundulidae		N	%
Blackstripe topminnow	*Fundulus notatus*	78	4.95
Ictaluridae		N	%
Channel catfish	*Ictalurus punctatus*	45	2.85
Flathead catfish	*Pylodictis olivaris*	4	0.25
Stonecat	*Noturus flavus*	1	0.06
Yellow bullhead	*Ameiurus natalis*	1	0.06
Moronidae		N	%
White bass	*Morone chrysops*	1	0.06
Percidae		N	%
Johnny darter	*Etheostoma nigrum*	25	1.59
Walleye	*Stizostedion vitreum*	4	0.25
Sciaenidae		N	%
Freshwater drum	*Aplodinotus grunniens*	6	0.38
11 Families	34 species	1577	

Long-term Aquatic Research Survey

Fox River- Segment 2

Atherinidae		N	%
Brook silverside	*Labidesthes sicculus*	5	0.16
Cyprinidae		N	%
Bluntnose minnow	*Pimephales notatus*	1208	39.39
Bullhead minnow	*Pimephales vigilax*	46	1.50
Common carp	*Cyprinus carpio*	81	2.64
Creek chub	*Semotilus atromaculatus*	1	0.03
Emerald shiner	*Notropis atherinoides*	44	1.43
Golden shiner	*Notemigonus crysoleucas*	2	0.07
Grass carp	*Ctenopharyngodon idella*	1	0.03
Red shiner	*Cyprinella lutrensis*	5	0.16
Sand shiner	*Notropis ludibundus*	72	2.35
Spotfin shiner	*Cyprinella spiloptera*	256	8.35
Spottail shiner	*Notropis hudsonius*	5	0.16
Centrarchidae		N	%
Black crappie	*Pomoxis nigromaculatus*	74	2.41
Bluegill	*Lepomis macrochirus*	562	18.32
Green sunfish	*Lepomis cyanellus*	22	0.72
Green sunfish/bluegill	*Lepomis cyanellus X macrochirus*	1	0.03
Orangespotted sunfish	*Lepomis humilis*	29	0.95
Pumpkinseed	*Lepomis gibbosus*	5	0.16
Smallmouth bass	*Micropterus dolomieu*	99	3.23
White crappie	*Pomoxis annularis*	15	0.49
Catostomidae		N	%
Black redhorse	*Moxostoma duquesnei*	11	0.36
Golden redhorse	*Moxostoma erythrurum*	2	0.07
Highfin carpsucker	*Carpiodes velifer*	41	1.34
Quillback	*Carpiodes cyprinus*	81	2.64
River carpsucker	*Carpiodes carpio*	26	0.85
Shorthead redhorse	*Moxostoma macrolepidotum*	4	0.13
Silver redhorse	*Moxostoma anisurum*	11	0.36
White Sucker	*Catostomus commersonii*	1	0.03
Clupeidae		N	%
Gizzard shad	*Dorosoma cepedianum*	16	0.52
Fundulidae		N	%
Blackstripe topminnow	*Fundulus notatus*	147	4.79
Ictaluridae		N	%
Channel catfish	*Ictalurus punctatus*	115	3.75
Flathead catfish	*Pylodictis olivaris*	11	0.36
Tadpole madtom	*Noturus gyrinus*	5	0.16
Yellow bullhead	*Ameiurus natalis*	3	0.10
Moronidae		N	%
White bass	*Morone chrysops*	20	0.65
Yellow bass	*Morone mississippiensis*	9	0.29
Percidae		N	%
Johnny darter	*Etheostoma nigrum*	4	0.13
Walleye	*Stizostedion vitreum*	7	0.23
Poeciliidae		N	%
Mosquitofish	*Gambusia affinis*	3	0.10
Sciaenidae		N	%
Freshwater drum	*Aplodinotus grunniens*	17	0.55
11 Families	40 species	3067	

Long-term Aquatic Research Survey

Fox River 2008-2009 - Segment 3			
Atherinidae		N	%
Brook silverside	*Labidesthes sicculus*	70	2.93
Cyprinidae		N	%
Bluntnose minnow	*Pimephales notatus*	543	22.71
Bullhead minnow	*Pimephales vigilax*	51	2.13
Common carp	*Cyprinus carpio*	45	1.88
Emerald shiner	*Notropis atherinoides*	82	3.43
Golden shiner	*Notemigonus crysoleucas*	30	1.25
Pugnose minnow	*Opsopoedus emiliae*	3	0.13
Red shiner	*Cyprinella lutrensis*	4	0.17
Sand shiner	*Notropis ludibundus*	9	0.38
Spotfin shiner	*Cyprinella spiloptera*	77	3.22
Catostomidae		N	%
Black redhorse	*Moxostoma duquesnei*	5	0.21
Highfin carpsucker	*Carpiodes velifer*	32	1.34
Quillback	*Carpiodes cyprinus*	43	1.80
River carpsucker	*Carpiodes carpio*	11	0.46
Shorthead redhorse	*Moxostoma macrolepidotum*	4	0.17
Silver redhorse	*Moxostoma anisurum*	2	0.08
Centrarchidae		N	%
Black crappie	*Pomoxis nigromaculatus*	26	1.09
Bluegill	*Lepomis macrochirus*	1036	43.33
Green sunfish	*Lepomis cyanellus*	10	0.42
Largemouth bass	*Micropterus salmoides*	12	0.50
Orangespotted sunfish	*Lepomis humilis*	68	2.84
Pumpkinseed	*Lepomis gibbosus*	12	0.50
Smallmouth bass	*Micropterus dolomieu*	96	4.02
White crappie	*Pomoxis annularis*	9	0.38
Fundulidae		N	%
Blackstripe topminnow	*Fundulus notatus*	25	1.05
Ictaluridae		N	%
Channel catfish	*Ictalurus punctatus*	43	1.80
Flathead catfish	*Pylodictis olivaris*	4	0.17
Moronidae		N	%
White bass	*Morone chrysops*	8	0.33
Yellow bass	*Morone mississippiensis*	1	0.04
Percidae		N	%
Johnny darter	*Etheostoma nigrum*	2	0.08
Walleye	*Stizostedion vitreum*	2	0.08
Sciaenidae		N	%
Freshwater drum	*Aplodinotus grunniens*	26	1.09
9 Families	32 species	2391	

Long-term Aquatic Research Survey

Fox River- Segment 4

Cyprinidae		N	%
Bluntnose minnow	*Pimephales notatus*	74	8.59
Bullhead minnow	*Pimephales vigilax*	1	0.12
Common carp	*Cyprinus carpio*	31	3.60
Common shiner	*Luxilus cornutus*	3	0.35
Creek chub	*Semotilus atromaculatus*	3	0.35
Emerald shiner	*Notropis atherinoides*	37	4.30
Golden shiner	*Notemigonus crysoleucas*	1	0.12
Red shiner	*Cyprinella lutrensis*	4	0.46
Sand shiner	*Notropis ludibundus*	17	1.97
Spotfin shiner	*Cyprinella spiloptera*	186	21.60
Spottail shiner	*Notropis hudsonius*	1	0.12
Centrarchidae		N	%
Black crappie	*Pomoxis nigromaculatus*	1	0.12
Bluegill	*Lepomis macrochirus*	35	4.07
Orangespotted sunfish	*Lepomis humilis*	3	0.35
Pumpkinseed	*Lepomis gibbosus*	2	0.23
Smallmouth bass	*Micropterus dolomieu*	55	6.39
Catostomidae		N	%
Black redhorse	*Moxostoma duquesnei*	5	0.58
Golden redhorse	*Moxostoma erythrurum*	3	0.35
Highfin carpsucker	*Carpiodes velifer*	38	4.41
Quillback	*Carpiodes cyprinus*	11	1.28
River carpsucker	*Carpiodes carpio*	4	0.46
Shorthead redhorse	*Moxostoma macrolepidotum*	226	26.25
Silver redhorse	*Moxostoma anisurum*	1	0.12
White sucker	*Catostomus commersoni*	1	0.12
Clupeidae		N	%
Gizzard shad	*Dorosoma cepedianum*	2	0.23
Fundulidae		N	%
Blackstripe topminnow	*Fundulus notatus*	25	2.90
Ictaluridae		N	%
Channel catfish	*Ictalurus punctatus*	63	7.32
Flathead catfish	*Pylodictis olivaris*	4	0.46
Moronidae		N	%
White bass	*Morone chrysops*	1	0.12
Percidae		N	%
Johnny darter	*Etheostoma nigrum*	1	0.12
Walleye	*Stizostedion vitreum*	4	0.46
Sciaenidae		N	%
Freshwater drum	*Aplodinotus grunniens*	18	2.09
9 Families	32 species	861	

Long-term Aquatic Research Survey—Mussel Collections

Fox River			
Ambleminae		N(alive)	%
Mapleleaf	*Quadrula quadrula*	63	39.87
Pimpleback	*Quadrula pustulosa*	1	0.63
Anodontinae			
Giant floater	*Pyganodon grandis*	9	5.70
White heelsplitter	*Lasmigona complanata*	35	22.15
Corbiculidae			
Asian clam†	*Corbicula fluminea*	37	23.42
Dreissenidae			
Zebra mussel†	*Dreissena polymorpha*	2	1.27
Lampsilinae			
Plain pocketbook	*Lampsilis cardium*	8	5.06
Sphaeriidae			
Fingernail clam	*Sphaerium sp.*	3	1.09
6 Subfamilies	8 species	158	

†Exotic species—Zebra mussels native to eastern Europe and western Asia; Asian clams native to southwest Asia—both considered invasive in North America

QUALITY ASSURANCE PROJECT PLAN

For the Combined Sewer Overflow Long Term Control Project

NPDES Permit No. IL0020818, Special Condition 14

Prepared by

Walter E. Deuchler Associates, Inc. AND Deuchler Environmental, Inc.

for the Fox Metro Water Reclamation District

March 21, 2008

The following personnel have approved this document:

04-04-08

Philippe Moreau, P.E.
Project Manager

Date

Carrie Carter

04.04.08

Carrie Carter
Project Quality Assurance Officer

Date

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APPENDICES

1.0 PROJECT MANAGEMENT

1.1 Distribution

Data collection and management for this project will be the responsibility of Walter E. Deuchler Associates, Inc. (WEDA) and Deuchler Environmental, Inc. (DEI). Laboratory analysis will be provided by the Fox Metro Water Reclamation District (FMWRD) and First Environmental Laboratories (Naperville, Illinois). Model selection, calibration and validation will be the responsibility of the Illinois State Water Survey (ISWS).

All of the following individuals will receive a copy of the QAPP.

TABLE 1
Distribution List

Individual	Organization
Philippe Moreau, Project Manager	WEDA
Tom Muth, District Manager	FMWRD
Randy Hummer, Lab Supervisor	FMWRD
James Slowikowski, Field Coordinator	Illinois State Water Survey (ISWS)
Alena Bartosova, Assistant Professional Scientist	ISWS
Carrie Carter, Project Engineer and Project Quality Assurance Officer	DEI
Karen Clementi, Project Scientist	DEI
Ryan Cramer, Project Engineer	WEDA
Steve Leppert, Project Technician	WEDA
Tim Rutsay, Project Technician	WEDA

1.2 Project/Task Organization

An organizational chart describing lines of communication and responsibilities for the FMWRD CSO study can be seen in **Appendix A.** **Table 2** lists individuals that will participating in this study and the role that each participant will have in this project.

TABLE 2
Roles and Responsibilities

Individual	Organization	Role	Responsibility
Philippe Moreau	WEDA	Project Manager	General oversight of project Review and revise QAPP
Carrie Carter	DEI	QA Officer	Ensure the quality of all aspects of the project
Karen Clementi	DEI	Bridge Team Leader/ Macroinvertebrates	General oversight of bridge sampling Macroinvertebrate sampling
Carrie Carter	DEI	Co-project manager/CSO Lead	Supervision of sample collection Review and revise QAPP Technical Support Manage ISCO Samplers Format data for modeling by ISWS
John Frerich	WEDA	Hydraulics Manager	General Oversight of Hydraulics Calculations
Dan Stein	WEDA	Discharge Measurements Leader	Supervison of stream gaging/velocity measurements
Randy Hummer	FMWRD	Laboratory Manager	Analyze all CSO and bridge samples (except chlorophyll a) QA/QC all laboratory data Provide data to DEI in excel format
Ryan Cramer	WEDA	Bridge Team Leader - Team 1	General oversight of bridge sampling.
Steve Leppert	WEDA	Bridge Team Leader – Team 2	General oversight of bridge sampling.
Alena Bartosova	ISWS	Project Manager Modeling Team	Provide guidance in data collection/develop models

1.3 Project Background

The Illinois Environmental Protection Agency (IEPA) *Illinois Water Quality Report 2000* (IEPA, 2000) listed parts of the Fox River in McHenry and Kane Counties as impaired. The IEPA 2002 report listed the entire length of the Fox River in Illinois as impaired. The IEPA included the Fox River on its list of impaired waters, commonly called the 303(d) list (IEPA, 2006). The most prevailing causes for the listing were flow alterations, habitat, sedimentation/siltation, dissolved oxygen, suspended solids, excess algal growth, fecal coliform and polychlorinated biphenyls. The most prevailing potentials for the listings were hydromodification and flow regulation, urban runoff and combined sewer overflows.

The City of Aurora (COA) began installing separate storm sewers in the mid-1960's, for the purpose of reducing sewage backups into residential basements and reducing combined sewer overflows into the Fox River during rain storm events. Currently, there are 14 permitted CSO outfalls (Rathbone, E. Illinois, Hazel, Third, E. Benton, First, W. Benton, Clark, Stolp, W. Galena, W. Park, Superior, W. Illinois and Pierce) discharging to the Fox River and one CSO discharging to Indian Creek (Dearborn-Trask) within the City of Aurora. There is one permitted CSO outfall at the FMWRD facility. In 1997, the COA and FMWRD built a CSO primary treatment facility for storing combined sewer overflows and treating excess flows from four of the previously mentioned CSOs prior to discharge to the river. The CSO facility is located at 400 North Broadway on the east side of Aurora.

FMWRD NPDES Permit (#IL0020818) was renewed in February 2007. As part of its permit, the FMWRD is required to develop a Long Term CSO Control Plan (LTCP). One of the components of the LTCP is to characterize, monitor and model the combined sewer system.

1.4 Project Description

This project seeks to collect data in support of characterizing potential impacts to the Fox River from the COA and FMWRD combined sewer overflows. Data collected will be used to model potential impacts to the Fox River from CSO discharges as well as simulate potential treatment alternatives. Data for characterization of the main stem will be collected at five (5) bridge locations crossing the Fox River in North Aurora, Aurora, Montgomery, and Oswego and one (1) location on Indian Creek in order to determine background conditions and to evaluate the potential water quality impact of the CSOs on the mainstem. In addition, macroinvertebrate studies will be conducted in spring, summer and fall as river levels permit, dissolved oxygen will be continuously monitored from approximately April to October, and velocity and stage measurements will be collected at select locations in order to develop a discharge rating curve. **Appendix B** includes a map of the Aurora area that shows the sampling locations for this project.

River water samples will be collected from the bridges using a depth integrating sampler for the locations on the Fox River mainstem and a Van-Dorn sampler will be used for Indian Creek sampling. Bridge sampling will be coordinated with the collection of water samples from seven (7) CSOs outfalls in order determine the concentration and loading of pollutants originating from the CSOs during overflow events. CSO samples will be collected using programmable, automated Isco samplers.

Since 2006, Hester-Dendy samplers have been used to collect data on quantity and quality of the macroinvertebrate population within the Fox River. Seven to nine locations are utilized per sampling event. Sampling locations vary slightly from year to year depending on river conditions, past vandalism and access to the locations. In 2007, there were seven sampling locations utilized. These same stations will be utilized in 2008 and are described in **Table 3.**

Since 2005, continuous dissolved oxygen data has been collected from April to October at several locations along the Fox River using a YSI sondes. In 2008, there will be three locations: Sullivan Bridge, Ashland Bridge, and the Route 34 Bridge.

Currently, there is one gauging station within the study area located at the Montgomery dam. This station is located below all the combined sewers for Aurora. Three additional gauging stations will be deployed in 2008 in order to monitor flows upstream of Aurora's CSOs and to quantify flow from the Indian Creek to the Fox River. One gauging station will be located just below the North Aurora dam, a second gauging station will be located in the mill race whose inlet is just above this dam, and third gauging station will be located on Indian Creek.

The reaches of the Fox River and Indian Creek that are part of this study will be modeled using a water quality model capable of simulating dynamic water quality processes. At this time, the most appropriate model may be WASP7. However, part of this study will be selecting the correct model based on reach specifics and the data encountered during the initial stages of the project.

The model will be calibrated and validated using the discharge and water quality data collected during overflow events. In order to meet the requirements of an IEPA NPDES permit application, the model will be calibrated and modeled to simulate the following constituents during overflow events: suspended solids, fecal coliform, and dissolved oxygen.

The model selected will establish the current conditions in the receiving waters under CSO events and will be capable of simulating scenarios, which may affect the receiving waters during overflow events.

All data will be managed using Microsoft Excel and Microsoft Access in order that it may be later downloaded into the Fox River Database.

Table 3
Sample Locations

Category	Site Name/Location	Continuous Sampling	Discrete Sampling	Macroinvertebrate	Discharge and Stage Measurement
Mainstem	Fox River - North Aurora Dam				Continuous (Gaging Station)
Mainstem	Fox River - Sullivan Road Bridge	Every 30 minutes	Prior, During, After Rain Events	Spring, Summer and Autumn (1 sampler)	
Mainstem	Fox River - North Avenue		Prior, During, After Rain Events	Spring, Summer and Autumn (2 samplers)	
Mainstem	Fox River – Park Avenue		None	Spring, Summer and Autumn (2 samplers)	
Mainstem	Fox River - Ashland Bridge	Every 30 minutes	Prior, During, After Rain Events		Continuous (USGS Station)
Mainstem	Fox River - Mill Street Bridge		Prior, During, After Rain Events	Spring, Summer and Autumn (2 samplers)	
Mainstem	Fox River - Route 34 Bridge	Every 30 minutes (2004-2007)	Prior, During, After Rain Events		
Tributary	Indian Creek - Pedestrian		Prior, During, After Rain Events	Spring, Summer and Autumn (1 sampler)	Continuous (Gaging Station)
CSO – Mainstem	Rathbone – OVF 1		When discharging		
CSO – Mainstem	Hazel – OVF 4		When discharging		
CSO – Mainstem	East Benton – OVF 8		When discharging		
CSO – Mainstem	Prairie & River –OVF 10		When discharging		
CSO – Mainstem	W. Benton – OVF 15		When discharging		
CSO – Mainstem	W. Galena – OVF 18		When discharging		
CSO – Mainstem	FMWRD – OVF 002		When discharging	Spring, Summer and Autumn (1 sampler)	

1.5 Quality Objectives and Criteria for Measurement Data

The purpose of this project is to provide data in order to characterize potential impacts to the Fox River from combined sewer overflows.

1.5.1 Field Measurements and Observations

Preventative maintenance and calibration of equipment is part of the quality control procedures for this project. **Table 4** shows the parameter and meter specifications for the field measurement equipment. **Table 5** shows the calibration procedures and frequency to be used for the project.

TABLE 4
Parameter and Meter Specifications

Discrete Monitoring				
Parameter	**Meter**	**Meter Range**	**Accuracy**	**Resolution**
Water Temperature	Hach Sension 6	0 to 50° C.	± 1°C	0.01°C
DO	Hach Sension 6	0 to 20 mg/L 0-200% saturation	± 1% of full scale	0.01 mg/L 0.01 %
pH	Omega PHH-60BMS	0 to 14 units	± 2 % of span	10 ppm
Conductivity	Omega PHH-60BMS	0 to 19990 ppm	± 2 % of span	10 ppm
Continuous Monitoring				
DO (2004-2006)	YSI 6600 EDS (Membrane Sensor)	0 to 50 mg/L	0 to 20 mg/L ± 2% or 0.2 mg/L 20 to 50 mg/L ± 6%	0.01mg/L
DO (2007 - 2010)	YSI 6600 EDS (Optical Sensor)	0 to 50 mg/L	0 to 20 mg/L ± 1% or 0.1 mg/L 20 to 50 mg/L ± 15%	0.01mg/L
Water Temperature	YSI 6600 EDS	-5 to 45 °C	+0.15 °C	0.1 °C

TABLE 5
Calibration Requirements

Discrete Monitoring					
Parameter	**Unit**	**Laboratory Calibration**	**Frequency**	**Field Calibration/ Preparation**	**Frequency**
Water Temperature	^{0}C	Factory Calibration	NA	NA/Rinse with DI Water	Daily/Between Sites
DO	mg/L	Air Calibration Chamber	Daily	Air Calibration Chamber	Daily/Between Sites
pH	Standard Units	2 points; 7 and 10 standards	Daily	NA/Rinse with Distilled Water	Daily/Between Sites
Conductivity	μS	1 point; 1000 μS	Daily	NA/Rinse with Distilled Water	Daily/Between Sites
Continuous Monitoring					
Water Temperature	^{0}C	Factory Calibration	NA	NA/Rinse with Distilled Water	Each Site Visit
DO (Optical Sensor)	mg/L	Air Calibration Chamber	Daily	Air Saturated Water	Weekly
DO (Optical Sensor)	mg/L	Air Calibration Chamber	Daily	Air Saturated Water	Twice Monthly

1.5.2 Physical and Chemical Analytical Samples

To ensure good quality analytical data, sampling, preservation, and transport methods will be followed exactly.

For bridge sampling, two opaque, plastic, one-liter Nalgene bottles will be used to collect samples from each bridge. These bottles will be used to collect a sample for analysis of all parameters with the exception of fecal coliform and chlorophyll. The Nalgene bottles will be washed by FMWRD's laboratory for reuse. Fecal coliform samples will be a grab sample and will be collected using sterile 100-ml locking plastic bottles. Chlorophyll samples will be composited and collected in one-liter amber glass bottles, placed on ice, and taken to an IEPA accredited laboratory, First Environmental, Inc. (Naperville, IL) for analysis.

Samples to be composited will be collected in a pre-rinsed stainless steel bucket with a lid to mix the samples. **Table 6** shows the sampling, handling, and storage requirements for the physical and chemical analytical samples.

TABLE 6
Sampling, Transport, and Storage Requirements

Parameter	Sample Container	Transport/Storage in Field	Holding Time
CBOD5	1 L plastic opaque wide mouth bottle	Ice (Temp. <6°C)	48 hours
Total Suspended Solids	1 L plastic opaque wide mouth bottle	Ice (Temp. <6° C)	7 days
Nitrate	1 L plastic opaque wide mouth bottle	Ice (Temp. <6° C)	48 hours
Nitrite	1 L plastic opaque wide mouth bottle	Ice (Temp. <6° C)	48 hours
Ammonia Nitrogen	1 L plastic opaque wide mouth bottle	Ice (Temp. <6° C)	28 days
Total Kjedahl Nitrogen	1 L plastic opaque wide mouth bottle	Ice (Temp. <6° C)	28 days
Dissolved Reactive Phosphorus	1 L plastic opaque wide mouth bottle	Ice (Temp. <6° C)	48 hours
Total Phosphorus	1 L plastic opaque wide mouth bottle	Ice (Temp. <6° C)	28 days
Fecal Coliform	100 ml sterile bottle	Ice (Temp. <6° C)	6 hours
Chloride	1 L plastic opaque wide mouth bottle	Ice (Temp. <6° C)	28 days
Fluoride	1 L plastic opaque wide mouth bottle	Ice (Temp. <6° C)	28 days
Chlorophyll (Bridges Only)	1 L wide mouth amber bottle	Ice (Temp. <6° C)	7 days (filter within 48 hours)

Samples collected from the CSO overflows will be collected in plastic bottles which are designed to fit in the ISCO samplers. When a standard size sampler is used, 1 one-liter plastic bottle will be collected per sample time. When a compact sampler is used two 500 milliliter plastic bottles will be collected per sample. Each bottle will be fitted with a Teflon coated cap prior to transportation to the lab.

In order to characterize the macroinvertebrate population upstream and within the areas of CSO discharges, round multiple plate Hester-Dendy samplers will be used to collect benthic macroinvertebrates. These samplers will be left in the river for four to six weeks. Once removed from the river, each sampler will be placed in a zip-loc bag with river water and will be labeled with time, date, location of sampler, company and field personnel. Subsequently, this bag will be placed in a larger zip-loc bag which will also be labeled and then placed on ice for overnight shipment to an outside laboratory for analysis.

Since both the data sondes and the velocity meter are in-situ measuring devices, there is no additional handling.

1.5.3 Data Quality Indicators

The overall objective for this project is to develop and implement procedures for field sampling, laboratory analysis, chain of custody, and reporting that will provide quality data for modeling purposes. A series of standard quality tests (precision, accuracy, representativeness, and completeness) will be run on the data following completion of the sampling season. If the data is found to be of insufficient quality, it will be flagged and used on a discretionary basis.

Precision

Precision is defined as a measure of the degree to which two or more measurements are in agreement. The precision of selected chemical analysis will be examined by using standard methods and comparison of duplicate analysis. Duplicate water quality samples will be collected at 10% of the bridge sample locations. If field measurements of the duplicate samples do not agree with the primary sample, the duplicate and primary sample will be re-analyzed (if sufficient quantity is available) to confirm or refute the discrepancy in the results.

Relative percent difference (RPD) will be calculated for field duplicate analysis to assess the precision of field collection procedure. Laboratory precision will be determined by calculating the RPD of the primary sample results and the laboratory duplicate results using the following formula:

$$RPD = \{(V1-V2)/[(V1+V2)/2]\} \times 100$$

Where:

RPD = Relative Percent Difference
V1 = Larger of the two observed values
V2 = Smaller of the two observed values

Accuracy

Accuracy is defined as the degree of agreement between the observed value and an accepted reference or true value. Accuracy depends on precision and on how well systematic errors including faulty equipment calibration and observer bias can be controlled. The accuracy of data will be calculated for both field and laboratory techniques. Field accuracy will be assessed by the use of field blanks. These samples will be collected, preserved, transported and stored in the same manner as all other samples. These samples should have no detectable concentrations of any of the constituents being analyzed. Laboratory accuracy is assessed through the analysis of MS/MSDs, laboratory control samples (ALCS=s@) and surrogate compounds and the subsequent determination of percent recoveries (A%R=s@). The formula for calculating percent recovery is as follows:

$$\%R = 100 \times (Rm/Ra)$$

Where:

%R = Percent Recovery
Rm = Measured concentration of standard reference solution
Ra = Actual concentration of standard reference solution

Completeness

Completeness is defined as a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions. Normal conditions are defined as the conditions expected if the sampling plan is implemented as planned.

Field completeness is a measure of the amount of valid measurements obtained from all the measurements taken in the project. The field completeness objective is 90%. Laboratory completeness is a measure of the amount of valid measurements obtained from all the measurements taken in the project. The laboratory completeness objective is greater than 95%. The formula for completeness is as follows:

$$\%C = 100 \times (V/n)$$

Where:

%C = Percent completeness
V = number of data points determined to be valid
n = number of expected data points.

Representativeness

Representativeness expresses the degree to which data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, a process condition or an environmental condition within a defined spatial and/or temporal boundary.

Representativeness is dependent upon the proper design of the sampling program and will be satisfied by ensuring that the field sampling techniques as described in the QAPP are followed and that proper sampling techniques are used. In designing the sampling program, media of concern will be specified.

Using the proper analytical procedures to ensure representativeness in the laboratory including appropriate methods, meeting sample holding times and analyzing and assessing field duplicate samples.

Comparability

Comparability expresses the confidence with which one data set can be compared to another. Field comparability is dependent upon the proper design of the sampling program and will be satisfied by ensuring that the QAPP and SOPs are followed and that proper sampling techniques are used.

Analytical data will be comparable by using similar sampling and analytical methods, meeting hold times and assessment and comparison of field duplicate samples.

1.6 Special Training

A special training session was conducted on August 20, 2007 to ensure all WEDA and DEI personnel who may be involved with this project are familiar with the techniques and procedures outlined in the project QAPP. Only staff members who have completed training will participate in this project. A sample agenda for this training session is included as **Appendix C.** Additional training sessions will be held in February and March 2008 to refresh all staff members on proper sampling technique and procedures and to review changes to the sampling protocol for 2008.

1.7 Documents and Records

Ms. Carrie Carter and Ms. Karen Clementi of DEI will be responsible for managing the QAPP, including version control, updates, distribution, and disposition. In the case of a revision, all appropriate project personnel will receive a revised version by hard copy.

Ms. Carrie Carter and Ms. Karen Clementi of DEI will be responsible for managing and archiving all data, including the sampling and analytical procedures, field data sheets, calibration logs, and laboratory analytical results pertaining to this project. Hard copies of these files will be stored at the DEI offices. With the exception of chlorophyll results, FMWRD will provide all analytical results including field data in an excel spreadsheet form using their Laboratory Information Management System (LIMS). FMWRD will be responsible for storing all analytical data and QA/QC in their system.

First Environmental Laboratories, Inc. (Naperville, IL) will provide a hard copy of chlorophyll results and these will be added to the spreadsheets provided by FMWRD. The Excel spreadsheets will be formatted by DEI and imported to an access database suitable for use in the FoxDB when permitted. See **Appendix D** for examples of the spreadsheet received from FMWRD.

2.0 SAMPLE DESIGN

2.1 Sample Locations

The sampling locations are shown on the map in **Appendix B**. There are several sampling activities involved in this project including bridge sampling, combined sewer overflow sampling, macroinvertebrate sampling, dissolved oxygen monitoring, and stream gauging.

2.1.1 Discrete Water Quality Sampling Locations

Bridges
The first sampling activity includes sampling the Fox River at five (5) bridge locations and one location at Indian Creek. The bridge locations include the Sullivan Road Bridge, Indian Creek pedestrian bridge, and North Avenue Bridge in Aurora; the Ashland Avenue Bridge and Mill Street Bridge in Montgomery; and the Route 34 Bridge in Oswego. Based on the results of past sampling events, it is known that the Fox River will have different results across the river transects.

The sampling stations on each bridge are shown in **Table 7**. The sampling stations on each bridge were chosen as follows.

The Sullivan Road Bridge was selected for this project due to the fact that it is upstream of the northern most CSO in Aurora (East and West Illinois Avenue) and therefore not impacted by combined sewer overflows. Other bridges were considered for the upstream sampling location for this project including: the Illinois Avenue Bridge and the Indian Trail Bridge. The Illinois Avenue Bridge was rejected due to ongoing construction activities and the potential impact of the East and West Illinois CSOs, which are located underneath the bridge abutments. The Indian Trail Bridge was rejected because it is considered unsafe because there is no sidewalk to access the bridge. Sullivan Road Bridge was chosen as the most upstream bridge sampling station. In 2007, three (3) stations were chosen on this bridge to ascertain the background conditions across the river. The three (3) stations are approximately equidistant from one another and divide the river into thirds. The next downstream bridge is the Fox River Trail pedestrian bridge at the confluence of Indian Creek with the Fox River. CSO discharge #25 near Dearborn and Trask Avenues is located approximately one (1) mile upstream on Indian Creek. One (1) sampling station is located at the pedestrian bridge over Indian Creek at the midpoint of the stream.

Bridge construction on the I-88 Tollway began in September 2007, this construction includes temporarily filling in the Fox River on both the east and west banks thereby channeling the flow. It should be noted that although samples will continue to be collected at the Sullivan Road Bridge in 2008, samples maybe impacted from construction activities upstream this location.

The next downstream bridge is the North Avenue Bridge. The North Avenue Bridge is located downstream of the downtown Aurora CSOs. The Fox River is narrower in this station than at the Sullivan Road Bridge and field observation indicates that the CSO discharge stays close to each bank as they overflow. Therefore, two (2) sampling stations were chosen at the North Avenue bridge and are located approximately ¼ width of the stream from the east and west bank.

The Ashland Avenue Bridge is the next bridge downstream and located approximately one quarter mile downstream of two major CSO discharges (Rathbone and Hazel Avenues). There are no other CSO discharges located between the North Avenue Bridge and the Ashland Avenue Bridge. There is an island at the Ashland Avenue Bridge and the majority of river flow is confined to the west channel because the east channel is dammed at the south end. One (1) sampling station was chosen at the center of the west bank channel.

The next sampling location downstream is the Mill Street Bridge in Montgomery. There are no CSO discharges between Ashland Avenue and Mill Street. The purpose of this sampling location is to gauge the persistence of the CSO impact, if any, to the water quality of the Fox River. Two (2) sampling stations are located on the Mill Street Bridge, each located approximately 1/3 the width of the stream.

The final sampling location is the Route 34 Bridge in Oswego. This bridge is the closest bridge downstream of the FMWRD STP Headworks CSO outfall, located at the wastewater treatment plant facility. There are two (2) sampling stations on this bridge. It should be noted that this sampling location is slightly downstream of the Waubonsie Creek tributary. While this tributary is not part of the sampling plan it may have some minor impacts to this sample location.

TABLE 7
Bridge Sampling Stations

Bridge Name	**Latitude**	**Longitude**
North Aurora Main Street Bridge	41°48'23.40"N	88°19'27.03"W
Sullivan Road	41^{0}47'19.10"N	88^{0}19'03.41"W
Indian Creek Foot Bridge	41^{0}46'07.33"N	88^{0}18'33.13"W
North Avenue	41^{0}45'09.09"N	88^{0}19'21.24"W
Ashland Avenue	41^{0}44'15.96"N	88^{0}19'51.29"W
Mill Street	41^{0}44'00.59"N	88^{0}20'02.06"W
Route 34 Oswego	41^{0}41'04.91"N	88^{0}21'21.57"W

CSO Outfalls

The second sampling activity includes collecting samples from seven (7) CSO outfalls to determine the concentration and loading of pollutants originating from the CSOs. These seven (7) CSOs are: West Galena, East Benton, West Benton, First (Prairie), Hazel, Rathbone, and FMWRD. These CSOs were chosen because they are the combined sewer overflows that discharge the most frequently and for the longest duration. Table 8 summarizes the CSO sampling location information from the most upstream to the most downstream.

The West Galena overflow (OVF #18) is located beneath the Galena Boulevard Bridge in the west abutment wall. It discharges into the west channel of the Fox River in downtown Aurora. The discharge pipe size is 24 inches. The tributary area to this overflow is approximately 40 acres. The ISCO sampler and the flow meter are installed in a manhole serving as a diversion structure located at the intersection of River Street and Galena Blvd.

The East Benton overflow (OVF #8) is located on the east bank of the Fox River at Benton Street. The 54 inch interceptor transports flows from the combined sewer through a diversion structure. The diverted flows are controlled by a 16 foot, 8 inch long dam in the overflow structure. The discharge outfall pipe size is 72 inches. The ISCO sampler and flow meter are located in the diversion chamber.

The West Benton overflow (OVF #15) is located in the abutment wall underneath the Benton Street Bridge. The discharge outfall pipe size is 42 inches. The ISCO sampler and the flow meter are installed in a manhole serving as a diversion structure on West Benton Street.

The First Street overflow (OVF #10) is located at Prairie Avenue (formerly named First Street). The tributary area to this overflow is approximately 118 acres. A 15 inch sewer carries the flow to the West Bank Interceptor. The discharge outfall pipe is 27 inches. The ISCO sampler and flow meter installed in a manhole serving as a diversion structure at the intersection of Prairie Avenue and River Street.

The Hazel overflow (OVF #4) is located on the east bank of the Fox River, just south of the old railroad trestle across Hazel Avenue in a park owned by the Fox Valley Park District. All flows are screened in a bar screen prior to the overflow. The ISCO sampler and the flow meter are installed inside the bar screen chamber.

The Rathbone overflow (OVF #1) is located at the intersection of Rathbone Avenue and River Street in Aurora. At the overflow diversion structure, the dry weather flows from the 96-inch combined sewer discharges into the 69-inch east and west bank interceptors via two 15-inch concrete pipes. Excess flow discharges into the river via a 96 inch outfall pipe extending approximately 150 linear feet into the center of the Fox River. The Rathbone overflow serves the largest tributary area of all of the overflows. The ISCO sampler and the flow meter are installed in the diversion structure.

The FMWRD overflow pipe, also known as the STP Headworks (#002) overflow, is located on the west bank of the Fox River at the wastewater treatment plant. It is located upstream approximately one quarter mile of the WWTP treated effluent (STP Outfall #001). All combined flows as well as flows from all separated sewage areas are combined at the headworks. The ISCO sampler is located in the 84-inch outfall pipe to the river.

TABLE 8
CSO Outfall Sampling Locations

CSO Name	CSO Number	Latitude	Longitude
West Galena	#18	41°45’32.54”N	88°19’01.10”W
East Benton	#8	41°45’20.42”N	88°18’58.38”W
West Benton	#15	41°45’24.26”N	88°19’07.24”W
First (Prairie)	#10	41°45’04.81”N	88°19’32.74”W
Hazel	#4	41°44’38.38”N	88°19’38.37”W
Rathbone	#1	41°44’36.12”N	88°19’44.85”W
STP Headworks	#002	41°42’55.92”N	88°20’59.38”W

2.1.2 Benthic Macroinvertebrate Locations

In order to conduct upstream versus downstream comparisons of the conditions in the Fox River through the CSO area, macroinvertebrate sampling was conducted using Hester-Dendy samplers. In 2006, Hester-Dendy samplers were placed at nine locations along the Fox River mainstem as shown in **Table 9**. In 2006, the Hester-Dendy sampler on the west bank at Indian Trail Avenue was relocated during the sampling event due to repeated tampering. In 2007, the Indian Trail sampling location was not utilized due to continued tampering. Additionally, two new Hester-Dendy locations were added in 2007. One sampler was placed at Sullivan Road and one sampler was placed on Indian Creek, approximately 0.5 mile upstream from the confluence of the Fox River, to total nine Hester Dendy samplers for the 2007 sampling event.

TABLE 9
Hester-Dendy Locations

Location	Year of Sampling	Reason	Latitude	Longitude
Sullivan Road Bridge	2007	Upstream of CSOs	41°47′19.10″N	88°19′03.41″W
East Bank Indian Trail	2006	Upstream of CSOs	41° 46.872′	88° 18.727′
West Bank Indian Trail (original location)	2006	Upstream of CSOs	41° 46.864′	88° 18.807′
West Bank Indian Trail (new location)	2006	Upstream of CSOs	41° 46.922′	88° 18.854′
East Bank Park Avenue	2006 and 2007	Characterize Impacts from Indian Creek	41° 45.997′	88° 18.589′
West Bank Park Avenue	2006 and 2007	Characterize Impacts from Indian Creek	41° 45.992′	88° 18.656′
Indian Creek Mainstem	2007	Characterize Impacts from Indian Creek	41°46'0.88"	88°18'16.72"
East Bank North Avenue	2006 and 2007	Characterize Impacts from CSO discharges	41° 45.180′	88° 19.313′
West Bank North Avenue	2006 and 2007	Characterize Impacts from CSO discharges	41° 45.190′	88° 19.361′
East Bank Mill Street	2006 and 2007	Downstream of Aurora CSOs	41° 43.774′	88° 20.331′
West Bank Mill Street	2006 and 2007	Downstream of Aurora CSOs	41° 43.784′	88° 20.331′
West Bank FMWRD	2006 and 2007	Downstream of FMWRD CSO	41° 42.857′	88° 21.046′

2.1.3 Continuous Water Quality Sampling

Dissolved oxygen sampling locations have been selected to monitor DO levels upstream and downstream of all City of Aurora CSOs, and below discharges from FMWRD's outfalls. Originally the upstream location of the DO sondes was under the Indian Trail Bridge. The data sondes remained at this location for several seasons (2004 through 2006). However, prior to installation in 2007, it was found that the cables used to hold the sondes in place had been tampered with during the winter. The park beneath the Indian Trail Bridge is heavily used by fishermen. Since the area around the Sullivan Bridge is not as heavily used, it was determined that this was a more secure location to deploy the DO sondes and in 2007, the monitoring station was moved. The monitor lies horizontally in the river at both these locations.

The Ashland Avenue Bridge is the division line between Montgomery and Aurora and serves as the monitoring location downstream of the COA CSO discharges. There was one incident of tampering at this location; however, this location is the only location that can be used for monitoring discharges downstream of the COA. To move it further downstream would require the use of buoy and would be too close to the influences of the Montgomery Dam. This sondes hangs from the bridge vertically.

The last location is at the Route 34 Bridge in Oswego. This location was selected to be downstream of FMWRD's outfall. This monitor hangs from the bridge vertically. To avoid influences from Waubonsie Creek which is slightly upstream of this location, the data sondes will likely be moved to the pedestrian bridge at Violet Patch Park. A decision has not been reached regarding this location at the time of writing this QAPP.

2.1.4 Velocity and Stage Measurements

Although a gauging station at Sullivan Road would be closer to the actual study area of the CSOs in Aurora, the upstream gauging station for this study will be located below the North Aurora Dam. It was determined that even though the mill race in this same location would require the use of two gauges, it was felt that it would be easier to calibrate and measure velocities and levels at this location. In order to quantify flow impacts from Indian Creek, a third gauging station was located approximately 1/4 mile east of where Indian Creek and the Fox River meet, away from the influence of the river's backwaters.

2.2 Sample Frequency and Duration

2.2.1 Discrete Water Sampling

According to 35 IAC 375.402 the intensity and duration of first flush are a function of variables including physical and hydraulic features of the sewer system and tributary watershed; amount of sediment accumulated in the sewer system and on impervious surfaces of the watershed; and the intensity and duration of the storm event causing the flushing. Conditions for this determination are defined as storm event of 1.2 inch per hour intensity with a duration of 60 minutes, which approximates a one-year-one-hour storm for the City of Aurora which occurs after a ten day period of dry weather.

Bridges

As part of determining the impacts to the Fox River from the CSOs, Mr. Philippe Moreau and Ms. Carrie Carter will observe the weather forecast using http://www.intellicast.com to see if a significant rainfall event is projected. A significant rainfall event for this project is defined as at least 0.25 inches of rain within 1 hour. This rainfall event must be preceded by a dry weather period of approximately ten to fourteen days. If the weather forecast predicts a significant rainfall event, a sample from each bridge will be collected once on the day preceding the forecasted storm event. The day of and the day after the storm event, all bridge locations will be sampled as many times as possible during daylight hours using two sample teams.

To facilitate the efforts of the Illinois State Water Survey (ISWS) and the Fox River Study Group (FRSG), bridge samples will also be collected during non-significant rainfall events when requested and provided there is adequate laboratory capacity at FMWRD. Grab samples from bridge locations will be collected as many times as possible during daylight hours as prescribed previously.

CSO Outfalls

ISCO samplers are equipped with a liquid actuator and are automatically triggered to sample if an overflow occurs during or after storm event. Samples collected by the ISCO samplers will be retrieved during daylight conditions for safety. If a significant rain event has occurred as described in **Table 10**, samples will be collected as previously described, placed on ice and taken to FMWRD for analysis. If the ISCO samplers collect samples during a non-significant rainfall event, these samples will be discarded and the samplers will be cleaned accordingly.

TABLE 10
Sample Frequency and Location

Rainfall Event	**CSO Outfalls**	**Bridge Locations**
Significant = Minimum of 0.25 inches of rain Minimum of 1 hour duration Approximately 10 days of dry weather	Collect samples	Collect at least one sample before the event, collect as frequently as possible during, and after a storm event
Not Significant = Less than 0.25 inches of rain Less than 1 hour duration Less than 10 days of dry weather	Discard samples	Collect at least one sample before the event, collect as frequently as possible during, and after a storm event

2.2.2 Benthic Macroinvertebrates

Benthic macroinvertebrate sampling will occur at four week intervals during the spring, summer and fall for 2008. At least one set of Hester-Dendy samplers at each of the nine sampling locations utilized in 2007 will be deployed during each season.

2.2.3 Continuous Water Sampling

Dissolved oxygen levels will be collected every thirty minutes from April to October using data sondes.

2.2.4 Velocity and Stage Measurements

Velocity and stage measurements will be collected as needed to create stage curves. Measurements will be made bi-weekly or more often when river stages rise or lower significantly. These measurements will be repeated throughout the entire 2008 season and will continue into the following years for a minimum of at least six times during each year.

2.3 Sample Methods

A standard operating procedure (SOP) will be developed detailing the step-by-step sampling process to be utilized in the field (**Appendix E**). The sections below discuss the general field sampling methods.

2.3.1 Discrete Water Quality Sampling

Bridges

During 2007 sampling events, at least one sample teams consisting of two to three trained field crews will be used to conduct sample collection. A sampling device constructed by Randy Hummer at FMWRD was utilized for the 2007 sampling events. This sampler consists of 4-250 ml plastic bottles equally distributed at 12 inch intervals on a rod with a weight on the bottom. This sampler is tied to a rope and lowered from the bridge sampling stations as described in Section 2.1. The sample is composited and split into 3 sample bottles: one sterilized 100-ml bottle for fecal coliform and two one-liter bottles for the remaining constituents shown on **Table 3**. Each station on each bridge will be kept separate from one another in an attempt to discern the potential water quality differences that exist between the Fox River and Indian Creek. The sampling bottles are rinsed with distilled water between each sampling station on each bridge. Each sampling team consisted of a minimum of 2 persons. One or two sampling teams were utilized, depending on staff availability. This method was approved by the IEPA on March 25, 2002 as part of the QAPP for use by Fox River Study Group's Fox River Water Quality Study.

During the 2008 sampling events, two teams of a minimum of two and a maximum of three trained field crew members will be used for sampling bridges. A DH-2 depth integrating sampler will be utilized for sampling at the bridge stations. The procedures as outlined in the Federal Interagency Sedimentation Project (FISP) Operations Manual will be utilized. If the flow or velocity requirements of the DH-2 are not met, a Van-Dorn type sampler called the Horizontal Beta Bottle by Wildco will be used. At the same time, a composite sample is collected at each bridge location, a fecal coliform sample will be collected using the sampling device described in the previous paragraph at the center of each bridge location. In addition, a grab sample using the DH-2 sampler will be collected at the same location and analyzed for the same parameters as the composite sample. This sample will be used for comparison with the grab samples that will be collected throughout the day. Subsequently, on a rotating basis grab samples will be collected from each bridge at the same location so that each bridge can be sampled several times during the day. If adequate personnel are available, each bridge location will be sampled every one to two hours.

In order to establish a baseline of water quality data for the bridge sampling locations, one transect sample per bridge will be collected every two weeks during the 2008 season if no additional sampling has been done. A minimum of ten samples across the span of each bridge will be collected and composited for analysis with the exception of the Indian Creek foot bridge. Samples collected will be weighted to include variations in velocities across the river. In addition to collecting a transect sample, for comparison purposes, a grab sample from the center of each bridge location will be collected for analysis. Fecal coliform samples will also be grab samples.

TABLE 11
Bridge Length and Number of Sample Stations per Bridge

Bridge Name	Length	2007 sampling stations (grab)	2008 sampling stations (composite)
North Aurora Main Street Bridge	280 + 43	0	0
Sullivan Road	520	3	15
Indian Creek Foot		1	3
North Avenue	445	2	15
Ashland Avenue	185	1	10
Mill Street	250	2	10
Route 34 Oswego	263	2	10
Total Sample Locations		11	58

CSO Outfall Sampling

One sample team of two to three people will be used for collecting samples from the ISCO sampler. Overflow discharges will be collected using a Teledyne ISCO 3700 series portable samplers. These samplers are programmable and suitable for use in sanitary sewers. The Model 3700 Standard is designed to hold 24 wide-mouth, polypropylene one-liter bottles. There are numbers molded into the sampler's base to identify the sample location of each bottle during collection. The 3700 Compact is a smaller version of the 3700 Standard and will be used in manholes where the larger standard model will not fit. The 3700 Compact has an inner sleeve which is numerically coded to indicate which bottle is which. The sleeve which holds the bottles is keyed with the sampler so the sleeve can be placed in the sampler only one way. The 3700 Compact holds 24 polypropylene bottles of 500 milliliter capacity.

Both models use a peristaltic pump for sample collection. Each sampling cycle includes an air pre-sample purge and post-sample purge to clear the suction line before and after sampling. The samplers are powered by 12 VDC rechargeable nickel-cadmium batteries. These batteries will be changed on a biweekly basis during the sample season to ensure adequate power during a sampling event. Programming, maintenance and care for both samplers are the same and will be followed as detailed in the Installation and Operation Guide included with the samplers.

The 3700 Compact samplers will be used in the following overflow locations: West Galena, East Benton, West Benton, and First (Prairie). The 3700 Standard sampler will be installed at Hazel, Rathbone, and the STP Headworks. With the exception of the locations at the STP Headworks and Hazel, all samplers will be suspended by an armed device which hangs on the rim of the manhole beneath the cover. Cables will suspend the sampler in the manhole and keep the sampler vertical. At the Hazel location, the sampler will be suspended by cables from a bolt connected to the side of the siphon chamber. At the STP headworks, the sampler will sit outside next to the manhole to be sampled.

In order to sample only during an overflow event, an ISCO liquid level actuator model #1640 will be used to trigger the pre-programmed sample routine when the liquid level reaches a predetermined height. The actuator will inhibit sampling if the flow level falls below the actuator's probe until the level rises again. In order to sample only the overflow event, the actuator probes and strainers at Rathbone, Hazel, East Benton and West Benton will be mounted on top of the overflow dam located in the overflow pipe. At the First overflow structure, the actuator probe will be located at the bottom of the manhole. At the West Galena overflow, the actuator probe will be mounted at the invert elevation of the outfall pipe which discharges to the river.

The 3700 Standard sampler will be programmed to collect one 1-liter bottle at the following intervals: initiation (0 minutes), 5 minutes, 10 minutes, 15 minutes, 30 minutes, 45 minutes, 1 hour, 2 hours, 3 hours, 4 hours, 5 hours, and 6 hours. Since overflows may occur during late night or early morning hours, sample retrieval will occur as soon as possible in the morning. Samples will be labeled, capped and placed on ice for compositing in the laboratory.

In order to ensure sufficient sample for laboratory analysis, the 3700 Compact sampler will be programmed to collect two 500 ml bottles at the following times: initiation (0 minutes), 5 minutes, 10 minutes, 15 minutes, 30 minutes, 45 minutes, 1 hour, 2 hours, 3 hours, 4 hours, 5 hours, and 6 hours. Part of the first of two bottles will be placed in a sterile container for fecal coliform analysis, part of the first bottle will be used for the in-situ measurements, and the remaining part of the first bottle of each sample will be capped and placed on ice along with the second bottle for laboratory analysis.

On both the Compact and Standard sampler, information regarding the time and date of the sample collection will be retrieved and recorded at the same time as the samples are collected.

All CSO outfall locations are equipped with Marsh McBirney Flowmeters which are maintained by WEDA. These meters continuously log velocity and levels using an electromagnetic sensor for velocities and pressure transducers for flow levels. These meters will be used to verify that an overflow has occurred when the ISCO sampler collects samples.

Since the strainers have been placed at the depth of the start of presumed overflow (see previous description of strainer location) recorded overflow data from the ISCO sampler can be compared with data downloaded and viewed from the flow meters. The time and date information from the ISCO sampler will be compared with the flow meter data to see if times are comparable for the overflow event. The data collected from the Marsh McBirney meters can be used to verify that samples were collected during the overflow event and will be of assistance to trouble shoot potential problems with the samplers.

A typical readout for an overflow from a Marsh McBirney flow meter can be seen in **Appendix F.**

2.3.2 Benthic Macroinvertebrate Community

The mainstem of the river and Indian Creek will be sampled to characterize the effect of discharges on the macroinvertebrate community. Hester-Dendy samplers will be deployed upstream of the CSO discharges as well as in areas where CSO discharges occur. Each Hester-Dendy consists of a round, multiple plate sampler with fourteen 7.5 cm diameter hardboard plates spaced by eight single spacers, one double spacer, two triple spacers, and two quadruple spacers with a surface area of approximately 0.13 square meters anchored to a round landscaping stones using long bolts. The landscaping stones serve as ballast and are attached to steel cables which are fastened to rocks, roots, etc. on the river bank in order to facilitate locating the samplers once deployed. The locations of the samplers are based on the locations of the CSOs within Aurora and at the FMWRD facility's outfall. These samplers will be deployed for approximately four weeks to six weeks in the spring, in the summer and in the fall in 2008.

2.3.3 Continuous Water Quality Monitoring

At each site the sondes will be deployed at a pre-determined location as shown in Table 3. The exact location on each bridge will be selected using DO and velocity profiles collected prior to the monitoring effort, with the sondes being placed at the location where the DO location is the most representative of the DO concentration of the entire stream cross-section. A Hach Sension 6 will be utilized to obtain DO measurements as part of the profiling activities. To summarize, vertical DO profiles will be taken at 10 equal distant locations across the stream channel. As part of the vertical profiling, DO measurements will be taken at 1.5 to 2 foot increments. Data obtained will be statistically analyzed to determine the location for the sondes placem ent. Profiling may be done several times during the summer depending on river levels.

The sondes will be calibrated as recommended by the manufacturer. Methods for sondes set-up, data download, deployment and retrieval will be based on professional experience. Methods are detailed in the SOP manual. DO and temperature will be collected at 30 minute intervals and logged in a data recorder. The sondes calibration will be checked against a calibrated Hach Sension 6 on a bi-weekly basis. The use of luminescent DO probes during 2007 have shown this technology to be extremely stable and not subject to sensor drift and fouling compared to the membrane probes used in previous years. All calibration data and deployment data will be recorded in a field book dedicated to DO monitoring.

2.3.4 Velocity and Stage Measurements

In support of installation of gauging stations at Indian Creek and the Fox River mainstem at North Aurora dam, from January 2008 forward, velocity and stage measurements will be collected as often as necessary to accommodate changes in the river stage. To facilitate this effort, the river beds of both Indian Creek and the Fox River at the Main Street Bridge in North Aurora were surveyed and plotted prior to any velocity readings being collected. Velocity measurements for calculating discharge of the stream will be completed as described in Rantz (1982).

2.4 Sample Handling

2.4.1 Discrete Water Quality Monitoring

Bridge Sampling

As samples are collected, the sample number, date, and time are recorded on the appropriate sampling form. Copies of the sampling forms for the bridge sampling are provided in **Appendix G.** All samples will be transferred to an ice-filled cooler immediately following completion of sampling at a bridge. Samples will be transported to the FMWRD laboratory as soon as possible to meet holding times.

All field measurements will be performed in-situ and in accordance with EPA recognized methods as shown on **Table 12.** The FMWRD laboratory will use approved methods listed in the most current editions of "Standard Methods" of 40 CFR 136.

TABLE 12
Field Measurement Methods

Meter	**Parameter**	**Method**
Hach Sension 6	DO	Standard Method 4500-O G
Hach Sension 6	Temperature	Standard Method 2550
Omega PHH-60MBS	pH	Standard Method 4500
Omega PHH-60MBS	Conductivity	Standard Method 2510

CSO Monitoring

As samples are collected, the sample number, date, and time are recorded on the appropriate sampling form. Copies of the sampling forms for the ISCO samplers are provided in **Appendix H.** All samples will be transferred to an ice-filled cooler immediately following completion of sampling at the CSO outfall location. Samples will be transported to the FMWRD laboratory as soon as possible to meet holding times. For CSO samples only, pH and conductivity will be measured in the field.

2.4.2 Benthic Macroinvertebrate Community Monitoring

When the deployment period is complete, the Hester-Dendy samplers will be retrieved using a 500-micron, D-frame net to prevent loss of organisms. Each Hester-Dendy will be removed from its ballast and the Hester-Dendy will be double packaged in zip-loc bags containing river water, placed on ice, and mailed to a lab with appropriate chain of custody procedures. Observations regarding the sample location will be recorded.

2.4.3 Dissolved Oxygen Monitoring

All sample measurements are performed at the sample location (i.e. in-situ) therefore there is no sample collection, preservation, shipment or storage.

2.4.4 Velocity and Stage Measurements

All sample measurements are performed at the sample location (i.e. in-situ) therefore there is no sample collection, preservation, shipment or storage.

2.5 Analytical Methods

2.5.1 Discrete Water Quality Monitoring

All discrete water quality monitoring analysis and measurement will be EPA recognized methods. Methods for field measurements can be found in **Table 12**. Laboratory analysis methods conducted my FMWRD and First Environmental Laboratories can be found in **Table 13.**

TABLE 13
Laboratory and Method Analysis

Parameter	Laboratory	Method
CBOD5	FMWRD	Std Method 5210B
Total Suspended Solids	FMWRD	Std Method 2540D
Nitrate	FMWRD	EPA 300.0
Nitrite	FMWRD	EPA 300.0
Ammonia Nitrogen	FMWRD	Std Method 4500-NH3-E
Total Kjedahl Nitrogen	FMWRD	Std Method 4500-Norg B
Dissolved Reactive Phosphorus	FMWRD	Std Method 4500 - P B&E
Total Phosphorus	FMWRD	Std Method 4500 - P B&E
Fecal Coliform	FMWRD	Std Method 9222D
Chloride	FMWRD	EPA 300.0
Fluoride	FMWRD	EPA 300.0
Chlorophyll a (Bridges Only)	First Environmental Laboratories	Std Method 10200H

It is anticipated that when bridge locations are sampled, there will be a sufficient quantity of sample from each location to measure all parameters. Since the quantity of sample collected from the ISCO samplers is limited, there may be times when there is not enough water sample to analyze for all the parameters. If this is the case, FMWRD and WEDA have prioritized the order of analyses which are most critical if sufficient quantity from a sample is not available. If there is insufficient sample then the lowest priority parameter(s) will not be analyzed. The priority of sample analysis, from highest to lowest priority, is as follows:

Fecal Coliform
$CBOD_5$
Total Suspend Solids
Ammonia Nitrogen
Nitrate
Nitrite
Total Phosphorus
Dissolved Phosphorus
Total Kjedahl Nitrogen

Chloride
Fluoride
Chlorophyll a (bridges only)

2.5.2 Continuous Water Quality Monitoring

All field measurement methodologies used are EPA recognized methods. Methods for field measurements can be found in **Table 12**. All monitoring is performed at the point of the sample collection and therefore there is no laboratory analysis.

2.6 Instruments and Equipment

2.6.1 Testing, Inspection, and Maintenance

To ensure that all data collected under this project is of sufficient quality, all instruments and equipment used that are owned by WEDA and DEI will be maintained on a regular basis by Ms. Carrie Carter of DEI. Records of all maintenance activities will be documented and stored at the DEI office. A kit, which includes replacement parts for each of the pieces of equipment to be used as well as tools to conduct this maintenance, will be present at the DEI office.

The pH and conductivity probes on the Omega PHH-60 MBS will be replaced yearly. The DO membrane for the Hach Sension 6 will be changed at least yearly but more frequently if it appears that calibration is drifting. Tubing connecting the strainer to the pump will be inspected yearly and replaced as needed. Tubing for the peristaltic pump will be changed on a yearly basis.

2.6.2 Calibration and Frequency

All calibrations will be conducted as recommended by the manufacturer. Calibration procedures and frequency for this project can be found in **Table 5** of **Section 1.5**. If during the time of collection any values seem to fall outside of the expected range, these values will be noted and a calibration check will be conducted upon completion of the sampling to verify the validity of the measurements taken. Calibrations will be checked again at the end of each day during field activities.

2.7 Quality Control

2.7.1 Field Measurement and Sample Collection

Field QA/QC will be obtained by using trained staff for field measurements and sample collection. Only those individuals who have read this QAPP and associated SOPs prior to sample collection will conduct measurements and sample collection.

All equipment used for field measurements will be properly maintained and decontaminated as described in the SOPs. Logbooks of calibration and maintenance of equipment will be kept, documenting all procedures conducted on equipment throughout the sampling season.

Prior to the start of the discrete water quality sampling all equipment utilized will be decontaminated by placing the equipment in a detergent bath. The equipment will be removed and triple rinsed with distilled water. Subsequently the equipment will be rinsed with distilled water. Following the field sampling activities at each location, the equipment will be rinsed with distilled water and stream/river water obtained from the next sampling site to be sampled.

2.7.2 QA/QC Samples

QA/QC samples will include equipment rinsate blank, trip blank, method blank, field duplicate, laboratory duplicate, and matrix spike samples. Each bridge sample team will be required to collect at least one laboratory duplicate per day. Due to the nature of the samples collected, no duplicates will be collected for the CSO locations. At least one equipment blank per bridge sampling team and CSO sampling team per day will be required to be collected and analyzed. Equipment blanks for the CSO samplers will be collected only from samplers that have an overflow occur. For bridge sampling, equipment blanks will be collected using the same method as normal sample collection. The sampling apparatus will be filled with distilled water and decanted into pre-cleaned bottles. All samples will be analyzed to assess the quality of the data resulting from the field sampling and analytical programs. In general:

> Equipment rinsate consisting of distilled water will be submitted to the analytical laboratory to provide the means to assess the quality of the data resulting from the field sampling program. Equipment rinsate blank samples are analyzed to check for procedural contamination at the site that may cause sample contamination. Trip blanks are used to assess the potential for contamination of samples due to contamination migration during shipment and storage;
>
> Method blank samples are generated within the laboratory and are used to assess contamination resulting from laboratory procedures;
>
> Duplicate samples are analyzed to check for sampling and analytical reproducibility;

2.8 Data Management

WEDA and DEI staff will manage all data generated by this project. The following procedures will be used for the management of the data obtained during this project.

2.8.1 Data Recording

Data that is transposed from field datasheets to an excel spreadsheet will be verified after transcription. Field data (located on the Chain of Custody) will be transposed into an Excel spreadsheet by FMWRD. DEI staff will check the transcription for accuracy. Once accuracy is verified data will be formatted and copied into the database.

2.8.2 Data Transformation

It is expected that data transformations made during this investigation will be relatively simplistic and all calculations made during data transformation will be checked 100% prior to dissemination of the transformed information. Calculations conducted during data transcription will be conducted by members of the field sampling teams.

2.8.3 Data Reduction

Raw data from field measurements will be recorded directly on the field data sheets. Examples of the field data sheets are included in **Appendix G** and **Appendix H**. If errors are made, results will be legibly crossed out, initialed and dated by the person recording the data, and corrected in a space adjacent to the original (erroneous) entry. Data sheets will be reviewed by DEI staff to insure that records are complete, accurate, and legible.

2.8.4 Data Analysis

Following data analysis, field measurements and water quality monitoring data will be entered into a Microsoft Excel by FMWRD and then formatted by DEI prior to importing into the Microsoft Access database. This data will then be forwarded to ISWS for use in modeling and other analyses.

3.0 ASSESSMENT AND OVERSIGHT

3.1 Assessment and Response Reactions

Performance evaluations of the sampling/sample transport teams shall be performed periodically. The teams will be evaluated to ensure that established protocols have been followed. The FMWRD laboratory will maintain all internal QA documents. Any noncompliance issues shall be reported to the project managers. No data will be released that has failed to meet all QA/QC requirements as established in this QAPP or in the internal QA plans of the laboratories. Samples that have not met the QA/QC requirements will be retested if possible or rejected.

3.2 Reports to Management

Mr. Philippe Moreau will receive notification of any non-compliance issues and reports related to quality control issues.

4.0 DATA VALIDATION AND USABILITY

4.1 Data Review

All data shall be reviewed by Ms. Carrie Carter, Project Quality Assurance Officer, and Mr. Philippe Moreau, Project Manager to determine its usability.

Sampling Design

Sample collection plans will be developed and used during the sample collection periods. These plans will include a detailed map of the sample locations and the types of samples to be collected. The team leader will develop the sample collection plan and brief the sample collection teams on the objective of the sampling.

Sonde Drift During Deployment

Throughout the summer the data sondes will be field checked as previously described to assure that each sondes remains in calibration. DO and temperature will be measured with both the sondes and hand-held Hach Sension6 to verify that the sondes has held its calibration and that dissolved oxygen readings are within 0.7 mg/L of each instrument. Data not meeting this criteria will be flagged accordingly.

Data Reduction and Processing

Analytical data quality will be assessed to determine if the objectives have been met. In addition data will be reviewed by QA/QC Officer for indications of interference to results caused by sample matrices, cross contamination during sampling or in the laboratory and storage anomalies. For instance holding times may be exceeded for samples collected by the ISCO samplers since outfalls may be discharging in the late evening or early morning hours.

4.2 Verification and Validation Methods

Sample collection and field measurements should be verified by the sampling teams with records kept by the team leaders. The laboratory data shall be verified by Mr. Randy Hummer of FMWRD. Field and laboratory data shall be archived by DEI or WEDA staff.

In the case of the data verification process resulting in a change to the data or if data accuracy, reliability or usability has been reduced as the result of errors in stored data or corrupted files, the Project Manager and/or the Project Quality Assurance Officer shall inform all data users and make corrections.

4.3 User Requirements

The execution of the project shall follow the procedures outlined in this QAPP. The QAPP shall be reviewed after six months by the persons on the cover page. The review shall determine if the objectives are being met. If modification of the project is required, any changes shall require the approval of the persons listed on the approval page. All changes shall be documented in a memorandum that will be distributed to all participants in the project. The QAPP shall be updated to reflect any changes.

5.0 REFERENCES

Edwards, T.K. and G.D. Glysson. 1999. Field Methods for Measurement of Fluvial Sediment, Book 3, Chapter C2. Techniques of Water-Resources Investigations of the United States Geological Survey, U.S. Government Printing Office, Washington, D.C.

FISP. Operator's Manual for the US DH-2 Depth-Integrating Collapsible Beg Suspended-Sediment Water Quality Sampler.

Hach. Instruction Manual for the Sension6 Portable Dissolved Oxygen Meter.

Omega. Operator's Manual for the pH/Conductivity Pocket Pal Meter.

Rantz, S.E. et al. 1982. Measurement and computation of stream flow - v. 1, Measurement of stage, and v. 2, Computation of discharge. U.S. Geological Survey Water - Supply Paper 2175. United Sates Department of Interior, U.S. Geological Survey. Washington D.C. 631 p.

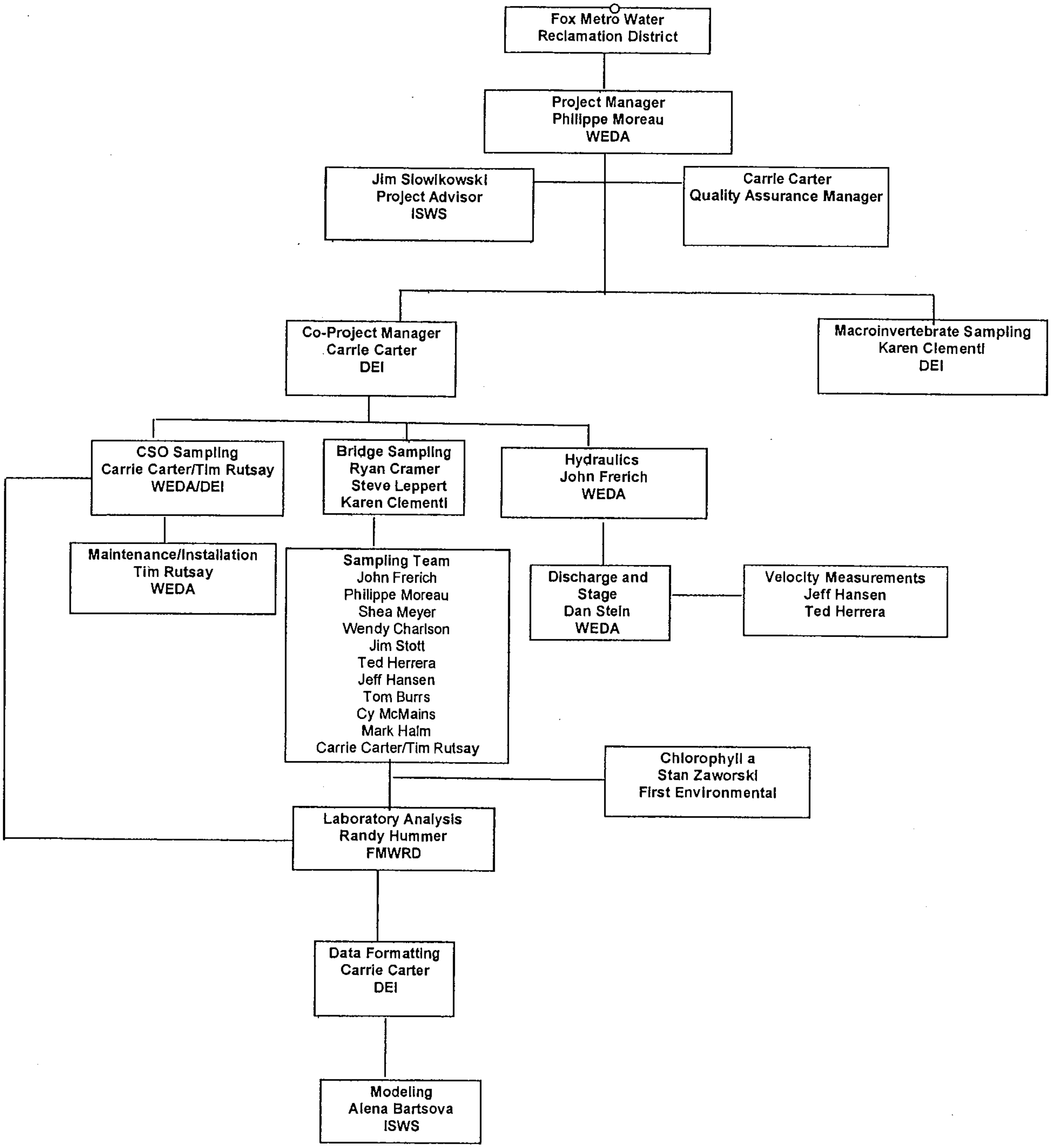
Teledyne ISCO. 1994, revised 2006. 3700 Portable Samplers: Installation and Operation Guide.

YSI Incorporated, "Environmental Monitoring Systems Operations Manual (6-Series).

APPENDIX A

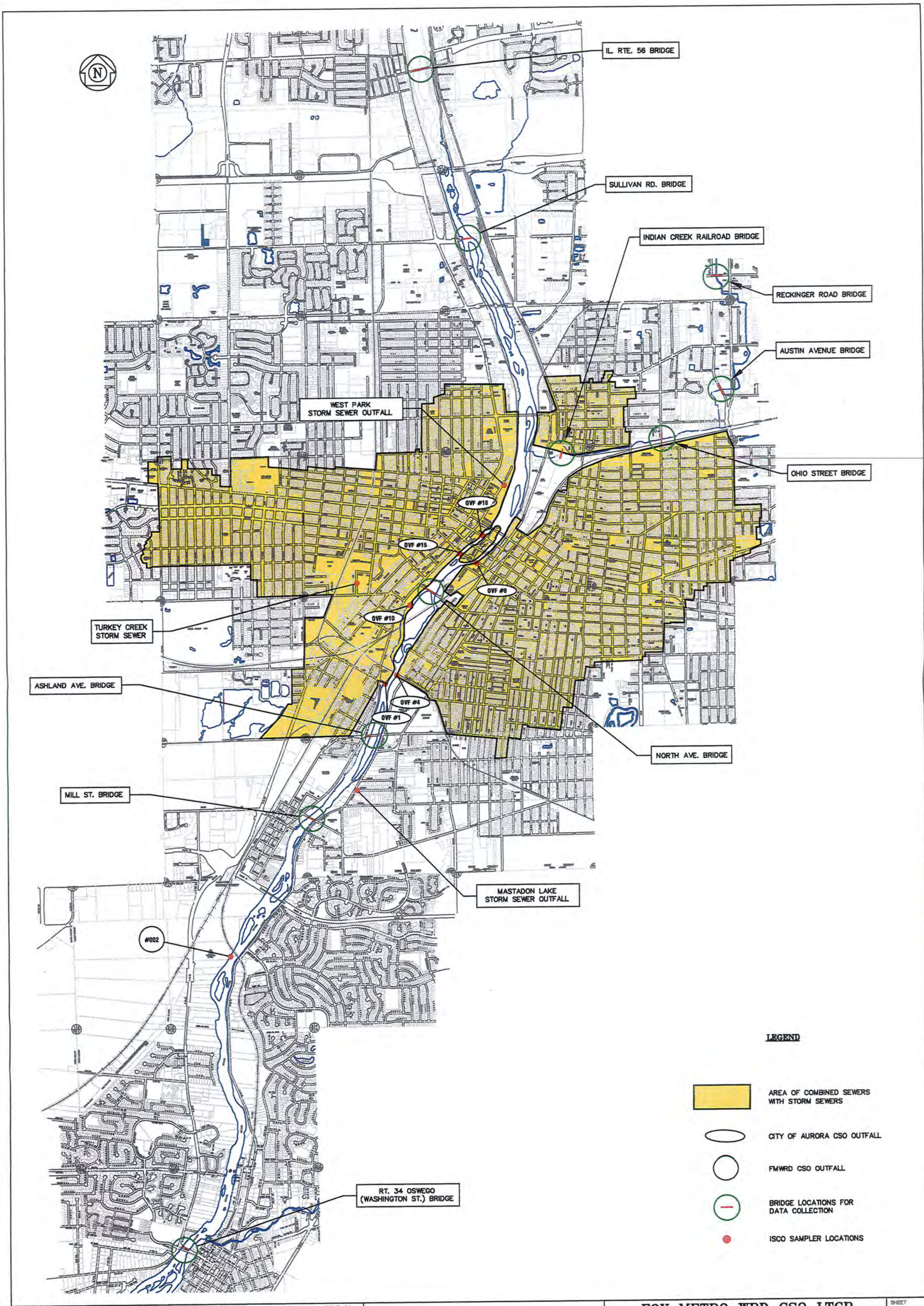
ORGANIZATION CHART

CSO Long Term Control Plan
Sampling/Modeling
Organization Chart



APPENDIX B

MAP OF STUDY AREA



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REVISIONS				
DATE 8/28/08	DESIGNED CJC	DRAWN JES	APPROVED PFM	BOOK 000 000
SCALE NONE	CAD DWG. ASD\06060-00\STREAM-SAMPLING		JOB NO. 111/06060-00	

FOX METRO WRD CSO LTCP
STREAM CHARACTERIZATION
WATER QUALITY SAMPLING

SHEET 1
OF 1

APPENDIX C

AGENDA FOR TRAINING SESSION

2008 CSO LTCP Sampling Training

- Project overview – Carrie
  - Purpose
  - Teams

- Notification – Phil
  - Timing of Sample Event
  - Duration of Sample Event
  - Phone List

- ISCO sampling – Carrie and Tim

- Bridge sampling – Karen
  - Changes to 2008 Sampling Protocol
  - Composite vs Grabs
  - Use of DH-2 Sampler
  - Use of Van-Dorn Sampler
  - Field Trip to North Avenue Bridge (weather permitting)

- Velocity Measurements – Ryan

- Equipment use – Carrie
  - pH meters
  - DO meters

- Sampling Protocols – Karen and Carrie
  - Filling Bottles
  - Labeling Bottles
  - Coolers and Ice
  - Distilled Water
  - Gloves
  - Record Keeping
  - Sample Delivery to FMWRD
  - Sample Delivery to First Environmental

- Safety Issues – Carrie
  - Safety Vests
  - Traffic Issues
  - Rain Gear

APPENDIX D

FMWRD LABORATORY SPREADSHEET

CSO Project: Walter E Deuchler Associates
Fox Metro Laboratory Data Summary

Sample Date: September 26, 2007

Test Parameters	Stream Sampling Locations											CSO Discharge Samples						
	1 Sullivan A	2 Sullivan B	3 Sullivan C	4 Indian Cr. B	5 North Ave. A	6 North Ave. C	7 Ashland A	8 Mill St. A	9 Mill St. C	10 Route 34 A	11 Route 34 C	Rathbone			West Benton			
												1	2	3	1	2	3	4
pH (units)	6.27	6.40	6.43	6.15	6.25	6.48	6.34	6.25	6.40	6.43	6.48	6.09	6.05	6.31	5.70	5.84	6.24	5.95
Conductivity	730	870	870	870	890	870	880	900	880	920	870	560	570	580	730	20	20	330
Temperature ©	21.2	21.2	21.2	18.1	20.8	22.1	21.7	21.6	21.8	23.4	23.4	23.1	22.1	22.4	20.9	21.0	21.3	20.9
DO (mg/L)	5.7	5.8	6.1	6.5	6.8	6.6	6.6	6.8	7.0	8.2	8.1	0.6	0.8	0.8	0.5	1.1	0.8	1.1
BOD (mg/L)	< 2	< 2	< 2	4	2	< 2	3	2	2	3	3	120	100	82	167	108	191	130
TSS (mg/L)	23	25	36	15	24	26	27	24	26	21	25	120	120	120	740	640	920	500
Fecal Coliforms (#/100mL)	300	350	200	67000	340	540	640	748	757	600	793	TNTC	TNTC	TNTC	TNTC	TNTC	TNTC	TNTC
TKN (mg/L)	4.62	6.53	8.85	9.69	2.68	3.79	2.06	2.03	8.83	5.89	5.94	19.4	18.8	18.7	19.1	20.0	20.5	15.0
Ammonia N (mg/L)	0.07	0.06	0.06	0.10	0.04	0.04	0.03	0.02	0.02	1.15	0.02	5.84	6.80	5.88	0.90	0.72	0.21	1.42
Nitrate N (mg/L)	1.17	1.12	1.09	< 0.18	1.03	1.06	1.05	1.03	1.01	1.52	0.83	< 0.36	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	0.20
Nitrite N (mg/L)	< 0.05	< 0.05	< 0.05	< 0.10	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.20	< 0.05	< 0.05	0.09	0.18	0.26	0.14
Organic N (mg/L)	4.55	6.47	8.79	9.59	2.64	3.75	2.03	2.01	8.81	ND	5.92	13.6	12.0	12.8	18.2	19.3	20.3	13.6
Total P (mg/L)	0.35	0.34	0.34	0.16	0.33	0.33	0.33	0.32	0.31	0.32	0.29	3.02	3.16	2.98	3.83	3.90	5.49	3.97
Dissolved P (mg/L)	0.23	0.22	0.21	0.04	0.19	0.19	0.20	0.20	0.18	0.21	0.17	1.11	1.27	1.06	0.41	0.40	0.40	0.49
Chloride (mg/L)	127	126	126	116	126	126	127	128	128	146	126	61	74	73	51	40	37	27
Fluoride (mg/L)	0.23	0.23	0.21	0.26	0.20	0.21	0.24	0.22	0.21	0.38	0.20	0.30	0.41	0.25	0.41	0.17	0.55	0.13
Turbidity (NTU)	16	17	10	5.9	12	16	15	15	15	12	14	100	100	100	270	220	240	170

Cell Color Key: ▨ = Tributary Sampling Point
☐ = Fox River Sampling Point

Abbreviations: NS = No Sample
ND = Not Determined
AF = Analysis Failure
CG = Confluent Growth
TNTC = Too Numerous to Count

Note: This Page is Formatted to print on 11 x 17 Paper

APPENDIX E

STANDARD OPERATING PROCEDURES

Fox Metro Water Reclamation District
Combined Sewer Overflow Long Term Control Project

Procedures for Equipment Cleaning

1.0 Introduction

1.1 Purpose

To ensure effective cleaning of sampling equipment prior to use in the field in order to prevent cross-contamination between sites.

1.2 Definitions

Cross-contamination - Contamination of a sample by the sampler due to poor decontamination practices.

Native Rinse - Refers to collecting water from the same source as the intended sample prior to sampling, for use as a rinse of the sampling equipment. The purpose is to further remove trace residue of any constituents in the containers.

2.0 Health and Safety Considerations

Care should be taken to avoid injury during all field activities and the project personal protective equipment should be worn during all activities. This includes closed toed shoes, gloves and safety vests for all field personnel. Field personnel working around manholes or with heavy objects should include steel-toed boots.

3.0 Personnel Qualifications

3.1 Personnel will be trained in all sampling equipment procedures by an experienced sampler before initiating the sampling procedure.

3.2 All personnel shall be responsible for complying with the Quality Assurance Project Plan for the Fox Metro Water Reclamation District (FMWRD) Combined Sewer Overflow Long Term Control Project.

4.0 Materials

4.1 Sample collection equipment (DH-2 samplers, horizontal beta bottles)
4.2 Stainless steel buckets with lids
4.3 Latex gloves
4.4 10% HCl Solution
4.5 4% Liquinox Solution

5.0 Pre-cleaning procedures

- 5.1 Obtain all necessary equipment

6.0 Cleaning Procedures

- 6.1 Office cleaning of sampling equipment prior to sampling activities.
  - 6.1.1 Put on disposable gloves and soak all equipment including samplers and stainless steel buckets with lids using 4% Liquinox solution.
  - 6.1.2 Rinse equipment with distilled water. Be sure to swirl the DI water in the equipment to rinse out residues.
  - 6.1.3 Rinse the equipment with 10% hydrochloric solution.
  - 6.1.4 Rinse equipment with distilled water. Be sure to swirl the water in the equipment to rinse out residues.
  - 6.1.5 Allow containers to dry.

- 6.2 Field cleaning of sample equipment between sites.
  - 6.2.1 Upon arrival at the sampling site, rinse the samplers and stainless steel bucket with distilled water.
  - 6.2.2 Do a native rinse of the equipment prior to collecting the next sample using native rinse water.

7.0 Sample Handling, Preservation, Storage

Not Applicable

8.0 Chain of Custody

Not Applicable

9.0 Quality Control/Quality Assurance and Decontamination

- 9.1 All QC requirements in the QAPP must be followed.

Fox Metro Water Reclamation District
Combined Sewer Overflow Long Term Control Project

Procedures for Chain of Custody

1.0 Introduction

1.1 Purpose

The purpose of this Standard Operating Procedure is to provide a framework for the Chain of Custody (COC) procedures as part of this project. These are specific instructions for completing and handling the COCs associated with the FRSG LTCP monitoring project.

1.2 Definitions

1.2.1 Chain of Custody: The protocol that provides a record of the persons having control and access to a sample. The chain of custody begins when the sample is collected and ends when the sample is disposed. If the analytical results for a project are questioned, the chain of custody documentation is the record that proves the sample was collected and handled according to specifications and that the sample can be directly linked to the analytical results.

2.0 Health and Safety Considerations

Not applicable

3.0 Interferences

3.1 If Chain of Custody protocols are not properly followed, results may be challenged or invalidated.

4.0 Personnel Qualifications

4.1 Personnel will be pre-trained in COC procedures by an experienced sampler before initiating the COC procedure.

4.2 All personnel shall be responsible for complying with the Quality Assurance Project Plan for the Fox Metro Water Reclamation District (FMWRD) Combined Sewer Overflow Long Term Control Project.

5.0 Materials
  5.1 COC Form
  5.2 Field book
  5.3 Pen

6.0 Pre-sampling
  6.1 Obtain necessary equipment
  6.2 Prepare a schedule and coordinate with staff

7.0 Procedures
  7.1 Procedure for field personnel.
    7.1.1 The field personnel is required to complete the following information on the COC form (Appendix G).
      7.1.1.1 Project Number
      7.1.1.2 Sample location
      7.1.1.3 Date and time of sample collection
      7.1.1.4 Sampler's signature and remarks
      7.1.1.5 Signature of person relinquishing sample custody
      7.1.1.6 Date and time relinquished
      7.1.1.7 Laboratory parameters
    7.1.2 The COC must be filled out completely and legibly in ink. Corrections will be made if necessary, by drawing a single line through and initialing and dating the error. The corrected information is then recorded in ink. All COC form in the "Relinquished by" and "Received by" sections
    7.1.3 If samples are to be transported by courier, the person hand carrying the samples is the sample custodian. If the carrier is a different person than the one who filled out the COC and packaged the samples, then that person must transfer custody to the carrier by signing and dating each form in the "relinquished by" section and the laboratory sample custodian must sign and date each form in the "received by" section.

  7.2 Laboratory Sample Receipt and Inspection
      7.1.2.1 Upon sample receipt, the coolers are inspected for general condition. The coolers are then opened and each sample inspected for damage.
      7.1.2.2 Sample containers are removed from the cooler and the sample labels are verified against the COC form.
      7.1.2.3 The COC form is completed by signing and recording the date and time of receipt.

7.1.2.4 The Project Manager will be notified immediately of any breakage, temperature exceedences, or discrepancies between the COC paperwork and the samples.

8.0 Sample Handling and Preservation

After fill of the coolers, the cooler will be closed.

9.0 Chain of Custody

Not applicable

10.0 Data Management

10.1 All data and information shall be recorded on the COC

10.2 The chain of custody form is signed over to the laboratory. A copy is kept with the sampling records.

10.3 The sampling data is stored at WEDA's office for at least 5 years.

11.0 Quality Control/Quality Assurance and Decontamination

11.1 The records generated in the procedure are subject to review during data validation, in accordance with QAPP.

12.0 Routine Maintenance

None applicable.

Fox Metro Water Reclamation District
Combined Sewer Overflow Long Term Control Project

Procedures for Continuous Dissolved Oxygen Monitoring

1.0 Introduction

1.1 Purpose

The purpose of this Standard Operating Procedure is to provide a framework for monitoring dissolved oxygen and temperature using YSI 6600 EDS sondes as part of FMWRD Long Term Control Project. These procedures include detailed instruction on sonde calibration, selection of sonde deployment locations.

1.2 Definitions

1.2.1 Dissolved Oxygen: A relative measure of the amount of oxygen dissolved in water.

1.2.2 In-situ: In place. Measurements are taken in the field without collection of a sample for laboratory analysis.

1.2.3 Sonde: Water quality monitoring device that can be equipped with multiple probes to continuously record stream data.

2.0 Health and Safety Considerations

All personnel are required to wear closed toed shoes, orange reflective vests and latex gloves. When wading in a stream a personal flotation device should be worn. There shall be no less than two people deploying or retrieving a sonde.

3.0 Interferences

Interferences can occur during an unattended deployment. Physical damage may occur to the probes due to debris such as leaves, plastic bags and sediment. Physical tampering may occur from recreational users of the stream. The sonde may become entangled in a fishing line, people may remove it from the water or physically remove the sonde.

4.0 Personnel Qualifications

4.1 Personnel will be trained in all sampling equipment procedures by an experienced sampler before initiating the sampling procedure.

4.2 All personnel shall be responsible for complying with the Quality Assurance Project Plan for the Fox Metro Water Reclamation District (FMWRD) Combined Sewer Overflow Long Term Control Project.

5.0 Materials
- 5.1 6600 EDS Sonde
- 5.2 Distilled water
- 5.3 Disposable Gloves
- 5.4 Protective cup for sonde
- 5.5 Protective case for sonde
- 5.6 Hach Sension6 DO/Temperature Meter
- 5.7 Laptop
- 5.8 Sonde communication cable
- 5.9 Padlocks
- 5.10 Keys for padlocks
- 5.11 Duplicate set of keys
- 5.12 Bolt cutter
- 5.13 Stream flow meter
- 5.14 Wadders
- 5.15 Personal flotation jacket
- 5.16 Disinfectant wipes/hand sanitizer
- 5.17 Clipboard
- 5.18 Field book
- 5.19 Calibration log
- 5.20 Pen

6.0 Pre-sampling
- 6.1 Obtain necessary equipment
- 6.2 Prepare a schedule and coordinate with staff
- 6.3 Inspect and calibrate sonde using procedures outlined below.
- 6.4 All instrument probes must be calibrated before they are deployed. Before performing any calibration procedure the sonde must be stabilized for at least ten minutes.

7.0 Procedures
- 7.1 Office sonde calibration procedures.
  - 7.1.1 Temperature

    For instrument probes that rely on temperature such as dissolved oxygen, the sonde temperature sensor needs to be checked for accuracy against a thermometer that is traceable to the NIST. The reference thermometer's accuracy check will be performed once a year and the date and results of the check will be kept with the instrument. Temperature measurements made by the sonde will be verified with each calibration using the following procedure:

7.1.1.1 Allow a container filled with water and the sonde to come to room temperature.

7.1.1.2 Place reference thermometer into the water and wait for both temperature readings to stabilize. Compare the two measurements. The instrument's temperature sensor must agree with the reference thermometer within the accuracy of the sensor (+/- 0.15° C). If the measurements do not agree, the instrument may not be working correctly and the manufacturer should be contacted.

7.1.2 DO

7.1.2.1 Clean all the probes on the sonde with tap water then shake off excess water.

7.1.2.2 Place approximately 1/8 inch of water in the bottom of the calibration cup. Place the probe end of the sonde into the cup and loosely screw on the calibration cup to ensure that the DO probe is vented to the atmosphere. Make sure the DO probe is not immersed in water . Wait for approximately 10 minutes for the probe to equilibrate with the atmosphere.

7.1.2.3 From the calibration menu select the "Dissolved Oxygen" option, then the "DO%" option.

7.1.2.4 Read and record the atmospheric pressure obtained from the office.

7.1.2.5 Press enter to accept the calibration. Press enter again to return to the calibration menu.

7.1.3 Date and Time

7.1.3.1 To verify that the time is correct from the systems menu select "date/time". Press enter to accept. Date and time are set on Central standard time.

7.2 Procedure for selecting sonde deployment locations.

7.2.1 Mount the velocity meter and DO meter on the bridge board.

7.2.2 At each sampling site, measure the stream width.

7.2.3 After the total stream width is determined, divide the stream into 10 equal sections.

7.2.4 At each equal distant location, measure the total stream depth using a wadiong rod

7.2.5 Depending on the stream depth, measure DO, temperature and velocity at the appropriate depths below the water surface.

  7.2.5.1.1.1 If the depth is less than 2 feet, measure DO, temperature and velocity at mid-depth.

  7.2.5.1.1.2 If the depth is greater than 2 feet but equal to or less than 3 feet, measure DO, temperature and velocity at 1-foot below surface and 2 feet below surface

  7.2.5.1.1.3 If the depth is greater than 3 feet but equal to or less than 4 feet, measure DO, temperature and velocity at 1-foot below surface, 2 feet below surface and 3 foot below surface.

  7.2.5.1.1.4 If the depth is greater than 4 feet but equal to or less than 5 feet, measure DO, temperature and velocity at 1-foot below surface, 2 feet below surface and 4 foot below surface.

  7.2.5.1.1.5 If the depth is greater than 5 feet but equal to or less than 6 feet, measure DO, temperature and velocity at 1-foot below surface, 3 feet below surface and 5 foot below surface.

  7.2.5.1.1.6 If the depth is greater than 6 feet but equal to or less than 7 feet, measure DO, temperature and velocity at 1-foot below surface, 3 feet below surface and 6 foot below surface.

7.2.6 Record DO, temperature, and velocity on the field logs.

7.2.7 Data will be analyzed using Excel in order to determine the deployment location at site that is most representative of the entire stream width.

7.3 Sonde deployment procedure.

7.3.1 Replace the calibration cup with the protective cup.

7.3.2 For the Route 34 Bridge and Ashland Avenue Bridge, place the cable around the bridge pole nearest the selected deployment location. Lock cable attach sonde to other end of cable with lock. Gently lower into the river.

7.3.3 At the Sullivan Road Bridge, find the cable attached to the abutment. Lock the sonde on the cable and place in the appropriate location.

7.3.4 Complete information in the log book.

8.0 Sample Handling and Preservation

All sample measurements are performed *in-situ*, therefore there is no need for sample handling, preservation or storage.

9.0 Chain of Custody

All sample measurements are performed *in-situ*, therefore there is no need for chain of custody procedures.

10.0 Data Management

10.1 All data and information shall be recorded in the field book for the dissolved oxygen meters.

11.0 Quality Control/Quality Assurance and Decontamination

11.1 The records generated in the procedure are subject to review during data validation, in accordance with QAPP.

12.0 Routine Maintenance

12.1 Cleaning Guidelines

At the end of each sample season the units should be thoroughly cleaned. Batteries should be removed from each sonde to prevent corrosion. Sondes should be stored with the probes in place. A moist sponge should be placed in the base of the calibration cup and the calibration cup should be placed at the end of the probe to prevent damage.

13.0 References

YSI Incorporated, "YSI Environmental Operations Manual" (6-Series).

Fox Metro Water Reclamation District
Combined Sewer Overflow Long Term Control Project

Procedures for Discrete Water Quality Sampling

1.0 Introduction

1.1 Purpose

The Standard Operating Procedure (SOP) provides the framework for collecting representative discrete water quality samples as part of the Fox Metro Water Reclamation District Long Term Control Plan.

1.2 Summary of Methods

This SOP described the procedures for the collection of representative water samples via bridges using depth integrated and point samplers.

1.3 Definitions

1.3.1 Depth-Integrating Sampler: The depth integrating sampler collects and accumulates a velocity or discharge weighted sample as it is lowered into and raised back to the surface of the stream.

1.3.2 Discharge: The volume of water that passes a given river cross-section in a given period of time.

1.3.3 Equal-Width-Increment Sampling: A method used to collect a series of water quality samples to represent a single stream cross-section. The stream width is divided into a number of equal-width intervals which are sampled. In this case, the EWI method is used during sampling conditions where a discharge measurement is not made before sampling.

1.3.4 Transit Rate: The transit rate is the speed of lowering and raising the sampler in the sampling vertical.

2.0 Health and Safety Considerations

2.1 Proper personal protective clothing must be worn including gloves and closed toes shoes.

2.2 Field personnel must wear a reflective safety vest.

2.3 Care should be taken when using chemicals in the field to prevent spillage on the skin or splatter in the eyes.

3.0 Interferences

3.1 Interference may result from using contaminated equipment, solvents, reagents or sample containers.

3.2 Cross contamination problems can be eliminated or minimized through the use of dedicated sampling equipment. Clean and decontaminate all sampling equipment prior to use and between each sampling site. See the SOP for

Laboratory Cleaning of Sampling Equipment and Field Cleaning of Equipment for details on the cleaning and decontamination procedures.

3.3 Interference can come when using a depth integrated sampler if the orifice becomes clogged with debris, the sampler disturbs bottom sediment or improper transit rates are used.

4.0 Personnel Qualifications

4.1 Personnel will be trained in all sampling equipment and calibration procedures by an experienced sampler before initiating the sampling procedure.

4.2 All personnel shall be responsible for complying with the Quality Assurance Project Plan for the Fox Metro Water Reclamation District (FMWRD) Combined Sewer Overflow Long Term Control Project.

5.0 Materials

5.1 Distilled water
5.2 Sample collection equipment (DH-2 samplers and Van Dorn samplers).
5.3 Safety Vests
5.4 Calibration standard of 1000 mS
5.5 Clean Nalgene sampling bottles
5.6 Laboratory supplied amber bottles
5.7 Sterile 100 ml bacteria bottles.
5.8 Coolers
5.9 Field Logs
5.10 Pen
5.11 Chain of Custody Forms
5.12 Gloves

6.0 Pre-sample Collection

6.1 Determine the number of samples and quality control (QC) samples specified in the QAPP.

6.2 Obtain necessary sampling equipment.

6.3 Decontaminate or pre-clean equipment and ensure that it is in working condition. See the SOP for Laboratory Cleaning and Field Cleaning of Sampling Equipment for details on the cleaning and decontamination procedures.

6.4 Ensure all sampling locations are pre-marked with tape.

7.0 Procedures for Identifying Sampling Locations

7.1 Procedures for determining equal-width-increment sampling locations.

7.1.1 A minimum of 10 verticals will be used for streams over five feet wide. For streams less than 5 feet wide, as many verticals as possible should be used as long as they are spaced a minimum of 3 inches apart to allow for discrete sampling of each vertical and to avoid overlaps. The width of the increments to be sampled or the distance between the verticals is determined by dividing the stream width by the number of verticals necessary to collect a discharge-weighted suspended-sediment sample representative of the sediment concentration of the flow in the cross section. For example if the stream width at the sample cross-section is determined to be 130 feet and the number of verticals necessary is 10, than the width (W) of each sample increment would be 13 feet. To reduce sampling time by the discrete sampling crews, the equal-width-increments will be pre-determined before the sampling period.

7.2 Procedures for identifying the equal-width-increment sampling locations along the bridges.

7.2.1 At all bridge sites on the main stem of the Fox River the equal-width-increments have been pre-measured and marked on the bridge using pink and green duct tape. Each bridge has been marked into ten equal increments based on the total cross-section of the channel.

7.3 Procedures for identifying discrete sampling locations at tributary sites.

7.3.1 At each tributary site the width of the stream will be pre-measured using a graduated tape measure. Each stream cross section will be pre-marked into appropriate increments on a using red tape.

8.0 Procedures for Discrete Water Sampling

8.1 Water quality samples on the main stem of the Fox River will be collected using the pre-marked locations for the Equal-Width-Increment Method as described in Edwards and Glysson (USGS, 1999). This sampling method requires that all verticals be traversed using the transit rate (Table 1) established at the highest velocity of the cross section. The descending and ascending transit rates must be equal during the sampling traverse of each vertical and they must all be the same verticals. By using this equal transit rate technique with a depth integrating sampler at each vertical, a volume of water proportional to the flow in the vertical will be collected. The method used to collect suspend sediment samples will be dependent on the flow conditions and particle size of the suspended sample of the suspended sediment being transported. For sampling in the main stem, based on previous field observations it is assumed that velocities will be between 2 and 12.0 ft/s and depths will be less than 15 feet which are considered Category 2 conditions.

8.1.1 Take the nozzle and nozzle holder. Check to see that there are no obstructions in the nozzle or air-exhaust tube. Select a bag and place the bag opening over the rear of the nozzle holder. Gather the bag around the rear of the nozzle holder. Secure the bag by cinching it down with the Velcro strap. Slide the nozzle holder into the back of the nose-piece. Align the lug on the nozzle holder with the slot in the nose. Insert the nozzle through the hole in the front of the nose-piece and screw it into the nozzle holder. Hand tighten only. Lay the nose piece with nozzle, nozzle-holder, and bag on a flat surface. Starting at the rear of the bag use one hand to hold the bag and the other hand to flatten and push the air out of the bag through the nozzle. Fold the bag in half along the longitudinal center line and push air out of the bag. Insert the bag into the sampler cavity. Place the bottom of the nose-piece into the bottom of the sampler cavity and snap into place.

8.1.2 Lower sampler to water surface so that the nozzle is above the water and the lower tail vane or back of the sampler is in the water for proper upstream-downstream orientation. After orientation of the sampler, depth integration is accomplished by traversing the full depth and returning to the surface with the sampler at a constant transit rate. When the bottom of the sampler touches the streambed, immediately reverse the sampler direction and raise the sampler to clear the surface of the flow at a constant transit rate.

8.1.3 The minimum transit rate is one at which the sample volume does not exceed 1 liter. The minimum transit rate can be calculated using the sampling time from the table and the total distance to be transited. For example, if the total sampling time is 30 seconds, the minimum transit rate should such that it takes 15 seconds to descend from the surface to the bottom and 15 seconds to return to the surface. The stream is 5 feet deep, then the transit rate would be 3 seconds per feet.

8.1.4 Once the sample is collected, remove the nose piece by grabbing it at the sample body indentations and popping it out. Make sure to support the bag with sample as it is removed from the sampler. Do not pour the sample back through the nozzle. The sample may then be transferred to the container for compositing. Plastic bags should be discarded after use.

8.1.5 The tightness of fit of the nose-piece in the sampler body can be adjusted by removing the O-ring and adding or removing Teflon plumber's tape in the groove and replacing the O-ring.

8.1.6 Always transport the sampler in the shipping box to prevent damage to the sampler.

8.2 Sampling on Indian Creek

Indian Creek is a shallow stream and in general is less than two feet in depth. Since access down to the stream is difficult, a Van Dorn (Wildco Horizontal Beta Bottle) will be used.

8.3 General Sampling Procedures

8.3.1 Upon collecting the required vertical samples, begin processing the samples.

8.3.2 Put on the lid for the stainless steel bucket and gently invert three times to ensure proper mixing. Label all sample bottles to be filled. One amber bottle and two Nalgene bottles should be collected. Place samples back in the cooler.

8.3.3 From the remaining sample in the bucket measure pH, conductivity, temperature and dissolved oxygen.

9.0 Sample Handling, Preservation and Storage

9.1 Don necessary safety equipment.

9.2 Fill the bottles with the composite water sample from the bucket and cap the bottles.

9.3 Load all samplers in the cooler.

10.0 Chain of Custody

10.1 Follow the chain of custody SOP.

10.2 Chain of custody forms should stay with the samples at all times. When samples are not in custody of the sampler, the samples should be locked inside the building.

11.0 Data Management

11.1 Complete the field logs.

11.2 The chain of custody form is signed over to the laboratory. A copy is kept with the sampling records.

11.3 The sampling data is stored at WEDA's office for at least 5 years.

12.0 Quality Control/Quality Assurance and Decontamination

12.1 Representative samples are required. The sampler will evaluate the site specific conditions to assure the sample will be representative.

12.2 All sampling equipment must be decontaminated between sampling sites. See the SOPs for cleaning equipment.

11.2 All field QC sample requirements in the QAPP must be followed.

13.0 Routine Maintenance

12.1 pH and conductivity electrodes should be changed once a year.

12.2. DO membrane should be changed at least once a year or more frequently if needed.

14. References

14.1 Federal Interagency Sedimentation Project. Date Unknown. *Operator's Manual for the US DH-2 Depth-Integrating Collapsible-Bag Suspended-Sediment/Water Quality Sampler.*

14.2 Edwards T.K., and G.D. Glysson, 1999. *Field Methods for Measurement of Fluvial Sediment, Book 3, Chapter C2.* Techniques of Water Resources Investigations of the United States Geological Survey, U.S. Government Printing Office, Washington, D.C.

Fox Metro Water Reclamation District
Combined Sewer Overflow Long Term Control Project

Procedures for Calibrating Handheld Meters

1.0 Introduction

1.1 Purpose

The Standard Operating Procedure (SOP) provides the framework for calibrating the Hach Sension6 and the Omega Pocket Pal meters used to measure dissolved oxygen, temperature, pH and conductivity as part of the discrete water quality sampling portion of the Fox Metro Water Reclamation District Long Term Control Plan.

1.2 Summary of Methods

This SOP described the procedures for the calibration and field measurement programming for the Hach Sension6 and the Omega Pocket Pal.

1.3 Definitions

1.3.1 Buffer: A solution that can maintain a nearly constant pH is it is diluted, or if strong acids or bases are added.

1.3.2 Conductivity: The ability of an aqueous solution to carry an electrical current.

1.3.3 Dissolved Oxygen (DO): A relative measure of the amount of oxygen dissolved in water.

1.3.4 In-situ: In place. An *in-situ* environmental measurement is one that is taken in the field, without removal of a sample to the laboratory.

1.3.5 Material Safety Data Sheets (MSDS): A compilation of information required under the Occupation Safety and Health Agency Communication Standard on the identity of hazardous chemicals, health and physical hazards, exposure limits and precautions.

1.3.6 pH: A measure of acidity or alkalinity of a solution

2.0 Health and Safety Considerations

2.1 Proper personal protective clothing must be worn including gloves and closed toes shoes.

2.2 The standard solutions for calibrating conductivity contain iodine and potassium chloride. When using the standards, avoid inhalation, skin contact, eye contact or ingestion. If skin contact occurs remove contaminated clothing immediately. Wash the affected areas thoroughly with large amounts of water. If inhalation, eye contact or ingestion occurs, consult the MSD for prompt action and seek medical attention as necessary.

2.3 All standard solutions for calibrating pH contain the following compounds:

pH 7 Solutions: sodium phosphate (dibasic), potassium phosphate (monobasic), water
pH 10 Solutions: potassium borate (tetra) potassium carbonate, potassium hydroxide, sodium (di) ethylenediamine, tetra-acetate, water

2.4 Avoid inhalation, skin contact, eye contact or ingestion. If skin contact occurs remove contaminated clothing immediately. Wash the affected areas thoroughly with large amounts of water. If inhalation, eye contact or ingestion occurs, consult the MSD for prompt action and seek medical attention as necessary.

3.0 Interferences

3.1 Interference may result from using contaminated equipment, solvents, reagents or sample containers.

3.2 Cross contamination problems can be eliminated or minimized through the use of dedicated sampling equipment. Clean and decontaminate all sampling equipment prior to use and between each sampling site. See the SOP for Laboratory Cleaning of Sampling Equipment and Field Cleaning of Equipment for details on the cleaning and decontamination procedures.

4.0 Personnel Qualifications

4.1 Personnel will be trained in all sampling equipment and calibration procedures by an experienced sampler before initiating the sampling procedure.

4.2 All personnel shall be responsible for complying with the Quality Assurance Project Plan for the Fox Metro Water Reclamation District (FMWRD) Combined Sewer Overflow Long Term Control Project.

5.0 Materials

5.1 Distilled water
5.2 Hach Sension6
5.3 Omega pH/Conductivity Pocket Pal Meter
5.4 Calibration standard of 1000 mS
5.5 pH 7.0 Buffer

5.6 pH 10.0 Buffer
5.7 Plastic cups
5.8 Calibration Logs
5.9 Pen

6.0 Calibration
6.1 Obtain necessary equipment
6.2 Decontaminate or pre-clean equipment and ensure that it is in working condition. See the SOP for Laboratory Cleaning and Field Cleaning of Sampling Equipment for details on the cleaning and decontamination procedures.
6.3 Prepare a schedule and coordinate with staff

7.0 Calibration Procedures
7.1 These methods are based on the manufacturer prescribed calibration procedures for the Hach Sension6. Calibration should be completed on a daily basis prior to use.
7.1.1 Turn the instrument on by pushing the "exit" key.
7.1.2 Ensure that the sponge inside the instrument's calibration chamber is wet. Insert the probe into the calibration chamber which is attached to the probe cable.
7.1.3 Allow ten minutes for the atmosphere in the chamber to reach steady-state.
7.1.4 To enter the calibration mode, press the "cal" key located in the lower left corner of the keypad.
7.1.5 The main display will show the current value of the barometric pressure. If the meter has been moved to a different elevation or if the barometric pressure has changed, enter the new value.
7.1.6 Press the "READ/enter" key.
7.1.7 The display will show the current value of the altitude. This should read "0".
7.1.8 Press the "READ/enter" key.
7.1.9 The main display will show % salinity. This should read "0".
7.1.10 Press the "READ/enter" key.
7.1.11 The main display should show 100%.
7.1.12 Press the "READ/enter" key.
7.1.13 The stabilizing icon will flash during calibration.
7.1.14 When calibration is complete, the meter will beep and will return to read mode.

7.2 Calibrating the Omega Pocket Pal Meter should occur on a daily basis prior to use.

7.2.1 pH mode

7.2.1.1 Organize calibration buffer standards in the two designatedglass jars.

7.2.1.2 Press the "On/Off" button to turn the instrument on.

7.2.1.3 Dip the end of the probes in the 7.0 buffer solution.

7.2.1.4 Slide back the battery compartment door to the first stop to expose the potentiometers.

7.2.1.5 After the readout stabilizes, adjust the meter to read 7.00 ± 0.02 using the "CAL" potentiometer. Rinse with tap water and insert in the 10.0 buffer solution

7.2.1.6 Adjust the "SLOPE" potentiometer until the display reads 10.00 ± 0.02.

7.2.1.7 Repeat this sequence until the readings are stable.

7.2.2 Conductivity mode

7.2.2.1 Rinse electrodes in distilled water.

7.2.2.2 Wipe off conductivity electrode and allow to dry.

7.2.2.3 When dry conductivity should read "0" in air.

7.2.2.4 Adjust "ZERO" potentiometer if electrode does not read zero.

7.2.2.5 Immerse electrode in a 1000 mS calibration solution., Adjust "SPAN" potentiometer to read 1000.

7.2.2.6 Rinse electrodes and return pH to its storage chamber.

8 Sample Handling and Preservation

All sample measurements are performed *in-situ*, therefore there is no need for sample handling, preservation, or storage.

9 Chain of Custody

Not applicable

10 Data Management

10.1 All data and information shall be recorded on the calibration log section of the field sheet.

10.2 The sampling data is stored at WEDA's office for at least 5 years.

11 Quality Control/Quality Assurance and Decontamination

- 11.1 All sampling equipment must be decontaminated between sampling sites. See the SOPs for cleaning equipment.
- 11.2 The records generated in the procedure are subject to review during data validation, in accordance with QAPP.

12 Routine Maintenance

- 12.1 pH and conductivity electrodes should be changed once a year.
- 12.2. DO membrane should be changed at least once a year or more frequently if needed.

13. References

- 13.1 Omega pH/Conductivity Pocket Pal Meter Operator's Manual.
- 13.2 Hach Sension6 Portable Dissolved Oxygen Meter Instruction Manual.

Fox Metro Water Reclamation District
Combined Sewer Overflow Long Term Control Project

Procedures for Collecting Benthic Macroinvertebrates using a Hester-Dendy Sampler

1.0 Introduction

1.1 Purpose

The purpose of this SOP is to provide a framework for the collection of benthic macroinvertebrates using the Hester-Dendy (H-D) artificial substrate sampler. These procedures include detailed instruction on selection of deployment locations, deployment, retrieval and sample handling.

1.2 Definitions

Macroinvertebrates - Small organisms lacking a backbone. In the case of sampling using H-D samplers, all macroinvertebrates will be aquatic; that is found living in water

Artificial Substrate – A constructed version of the natural habitat of various aquatic life.

2.0 Health and Safety Considerations

All personnel are required to wear closed toed shoes and latex gloves. Field crew members wading in streams must wear a safety vest.

3.0 Personnel Qualifications

3.1 Personnel will be trained in all sampling equipment procedures by an experienced sampler before initiating the sampling procedure.

3.2 All personnel shall be responsible for complying with the Quality Assurance Project Plan for the Fox Metro Water Reclamation District (FMWRD) Combined Sewer Overflow Long Term Control Project.

4.0 Materials

4.1 14-plate round H-D samplers
4.2 16-inch diameter round concrete stepping stones
4.3 1/8" Galvanized Wire Rope
4.4 Carriage Bolts
4.5 Nuts

4.6 Rod Coupling Nuts
4.7 Cable Clamp
4.8 Wire Rope Thimble
4.9 Washers
4.10 Iron Stakes
4.11 Drill with concrete bit
4.12 Wire cutters
4.13 Wire pliers
4.14 Heavy leather gloves
4.15 Spray paint
4.12 Hammer
4.16 Waders
4.17 1-Gallon Freezer Bags with zipper
4.18 500-Micron D-Frame Dip Net

5.0 Procedures

5.1 Location Selection

5.1.1 Choose collection sites as stated in the QAPP.
5.1.2 Within the sites decide on a location to place the H-D sampler.
5.1.3 The H-D sampler should be placed in an area in which low water will not expose the sampler.

5.2 Deployment

3.2.1 Drill a hole in the center of round stepping stone.
3.2.2 Place the carriage bolt through a washer and then the concrete stepping stone.
3.2.3 Cut a length of wire rope of sufficient length to anchor the stepping stone to the bank of the river or stream. Place a washer over the top of the carriage bolt. Then place the wire rope around the carriage bolt using a wire rope simple. Secure the short end of the wire rope with cable clamps.
3.2.4 Place a washer followed by a nut over the top of the carriage bolt and secure with the pliers.
3.2.5 Attach a rod coupling nut to the top of the carriage bolt.
3.2.6 Attach the H-D sampler to the rod coupling nut securely.
3.2.6 Pound an iron stake into the ground and secure the other end of the wire rope to the stake.

3.2.7 Place the concrete stone with the attached H-D sampler into the water such that it:

  3.2.7.1 remains submerged the entire duration of the deployment (4-6 weeks),

  3.2.7.2 will be exposed to flow velocity of at least 0.2 feet per second for the duration of the deployment,

  3.7.3 will be in a location that will be accessible should the depth in the stream rise,

  3.7.4 is not easily visible from the bank, and

  3.7.5 will not be tampered with by recreational users of the river.

3.2.8 Spray paint the location of the iron stake. It may be advisable to using flagging tape in the area.

5.3 Retrieval Procedures

  5.3.1 Enter the stream being sure not to disturb the areas around the H-D samplers.

  5.3.2 Place the 500-micron D-Frame net downstream of the H-D sampler to catch any organisms that may detach during removal of the H-D.

  5.3.3 Carefully detach the H-D sampler from the carriage bolt.

  5.3.4 Place the H-D sampler and any material from the net into a labeled plastic bag with zipper. Carefully add river water to the bag and seal. Place this sealed sample bag into another bag, seal and place on ice.

  5.3.5 Repeat same procedure with other locations.

6.0 Sample Handling, Preservation, Storage

  6.1 Don appropriate safety equipment and latex gloves.

  6.2 Place the H-D sampler and any material from the net into a labeled plastic bag with zipper.

  6.3 Use river water for transporting the H-D sampler. Be sure to label and seal the bag.

  6.4 Place this sealed sample bag into another labeled bag and seal.

  6.5 Store all samples on ice.

  6.6 Record all information on the field log.

7.0 Chain of Custody

  7.1 Follow the chain of custody SOP.

7.2 Chain of custody forms should stay with samples at all times. When samples are not in the custody of the sampler or designated person, the samples should be stored in a secure location.

8.0 Quality Control/Quality Assurance and Decontamination

9.1 All QC requirements in the QAPP must be followed.

9.0 References

California Department of Pesticide Regulation Environment Branch. 2005. Hester-Dendy Standard Operating Procedure.

H-D Sampler Source: Forestry Suppliers Inc.
205 West Rankin Street
P.O. Box 8397
Jackson, MS 39284-8397
800-647-5368
www.forestry -suppliers.com

Fox Metro Water Reclamation District
Combined Sewer Overflow Long Term Control Project

Instructions for Operating ISCO® Samplers when Collecting Combined Sewer Overflows

1.0 Introduction

1.1 Purpose

The purpose of this SOP is to provide standardized instruction for the operation of the ISCO ® model 3700 Standard and 3700 Compact Portable Samplers when sampling combined sewer overflow events. This document will provide specific instructions for instrument set-up, calibration and collection of CSO events with an automatic sampler. This document is designed for the collection of up to 24 separate (discrete) sequential samples using an actuator to trigger the sampling. The samples are collected using a purge and fill sequence that can be programmed for each site.

These are general instructions for setting up the ISCO samplers. Refer to the operation and installation manual for a more detailed programming guide and maintenance routine.

2.0 Health and Safety Considerations

All personnel are required to wear steel toed shoes, orange reflective vests and latex gloves. Since both the manhole covers and sampling equipment are heavy (40 pounds or more) proper lifting techniques should be used to avoid back injury. Be extremely careful to stay away from the manhole to avoid accidentally stepping into it. Since most of the manholes are located in heavy traffic and there is the risk of stepping in the manhole, there will be no retrievals after dark.

Only personnel authorized for confined space entry may enter the manholes.

3.0 Personnel Qualifications

3.1 Personnel will be trained in all sampling equipment procedures by an experienced sampler before initiating the sampling procedure.

3.2 All personnel shall be responsible for complying with the Quality Assurance Project Plan for the Fox Metro Water Reclamation District (FMWRD) Combined Sewer Overflow Long Term Control Project.

4.0 Materials

- 4.1 Model 3700 Standard and Model 3700 Compact ISCO samplers
- 4.2 3/8" Teflon tubing
- 4.3 Sample Strainer
- 4.4 24 500 ml polypropylene bottles (Compact Sampler)
- 4.5 24 1000 ml polypropylene bottles (Standard Sampler)
- 4.6 Polyethylene foam lined caps
- 4.7 12 V DC battery
- 4.8 Base and Retaining Ring
- 4.9 Distilled Water
- 4.10 Disposable Gloves
- 4.11 ISCO ProHanger with Suspension Harness
- 4.12 Model 1640 ISCO Liquid Level Sample Actuator
- 4.13 Lifting Hook
- 4.14 Heavy leather gloves
- 4.15 Spray paint

5.0 Procedures

- 5.1 Prior to the samplers being samplers being used at each location the following must be done:
  - 5.1.1 Place strainer at depth of the overflow threshold which is different for each overflow location and secure with clamps. Attach the vinyl tubing along the side of the pipe and up the side of the manhole to approximately two feet below ground level.
  - 5.1.2 Cut the vinyl tubing to a sufficient length to allow the sampler to be lifted out of the manhole and to be place approximately three to five feet away from the manhole.
  - 5.1.3 Set up the 1640 actuator sensor such that it will detect liquid at the overflow threshold. Note that in most cases this is not the bottom of the manhole.
  - 5.1.4 Secure the cable for the actuator along the pipe, up through the manhole to the surface. Make sure there is sufficient slack to attach the actuator to the sampler.
  - 5.1.5 Once the strainer, tubing and actuator have been installed secure the tubing and cable with cable ties until the sampler is attached. If there will be a significant time period between the two events. Cover the connector plug for the actuator and the open end of the coupler with electrical tape.
- 5.2 System set-up for Model 3700 Standard and Model 3700 Compact

5.2.1 Place sampler near the manhole and attach the ProHanger to the sampler using the suspension cables.

5.2.2 Attach the suction line by slipping the free end of the vinyl tubing into the pump tubing using the tube coupling and securing with the attached nylon clamp. The suction tubing extends from the sampler pump to the liquid source of the sample. The vertical distance between the liquid level and the pump should be as short as possible but no more than 26 feet of lift.

5.2.3 Attach the Liquid Level Actuator by plugging the connector end of the sensor into the flow meter connector on the back of the control box. Screw finger tight. Set the actuator switch to "toggle" which will stop the sampler from sampling if the water level drops below the sensor. Whenever the control box is re-set flip the sensor switch once or twice so that the computer recognizes that the sensor is in use. Once the program is started , the display should read "No Water Detected - Sampling Halted".

5.2.4 Attach the external power source (12V battery) by plugging in the connector end of the battery cable into the "12 VDC" connector on the back of the control box. Screw finger tight.

5.2.5 Install sample bottles

Model 3700 Standard

Remove the top portion of the sampler so that the bottom tub is open. Remove the retaining ring. Wearing disposable gloves, place 24 of the 1000 ml wide-mouth, wedge-shaped polypropylene bottles. Make sure that all bottles are fitted in properly then replace the retaining ring and secure it with the attached elastic draw cords. Note that the bottle numbers are molded into the bottom of the base. Place the top portion of the sampler back on and secure. Note there is only one way the top portion can be secured to the bottom portion.

Model 3700 Compact

Remove the top portion of the sampler so that the base is exposed. The compact model has a sleeve which is numerically coded. This sleeve is keyed into the base of the sampler and will only fit one way. Detach the retaining ring from the base by disconnecting the elastic draw cords from the hooks on the retaining ring. Wearing disposable gloves, place 24 of the 500 ml wide-mouth, wedge-shaped polyethylene bottles in the sleeve. Make sure that all bottles are fitted in properly, then set the sleeve back in the base such that it is seated properly and securely. Place the retaining ring back on the slanted part of the bottles and pull the elastic draw cord over the hooks.

5.3 Configuring of Model 3700 Standard and Model 3700 Compact

Both samplers should be Configured as follows:

5.3.1 LIQUID.DETECTOR: *Enable*
5.3.2 RINSE CYCLES: *0*
5.3.3 ENTER HEAD MANUALLY: *No*
5.3.4 RETRY: *1*
5.3.5 PROGRAMMING MODE: *Extended*
5.3.6 LOAD STORED: *None*
5.3.7 SAVE PROGRAM: *None*
5.3.8 FLOW MODE SAMPLING: SAMPLE START TIME: *No*
SAMPLE TIME SWITCH: *No*
5.3.9 NONUNIFORM TIME: *Minutes*
5.3.10 CALIBRATE SAMPLER: *Disable*
5.3.11 SAMPLING STOP/RESUME: *Disable*
5.3.12 START TIME DELAY: *0 Minutes*
5.3.13 ENABLE PIN: MASTER/SLAVE: *No*
5.3.14 SAMPLE UPON DISABLE: *No*
5.3.15 SAMPLE UPON ENABLE: *Yes*
5.3.16 RESET SAMPLE INTERVALS: *No*
5.3.17 INHIBIT COUNTDOWN: *No*
5.3.18 END MARK: *Continuous*
5.3.19 RESET PUMP COUNTER: *No*

5.4 Manual programming of Model 3700 Standard and Model 3700 Compact

Be sure to change the battery every two weeks to ensure the sampler will operate correctly when required. Once a program has been configured, it will remain in the memory unless the internal battery dies. Therefore, if programming for a similar sampling event, many steps have already been completed and you may surpass the steps by pressing the START SAMPLING key.

5.4 .1 Press the ON key.
5.4.2 Press the ENTER/PROGRAM key.
5.4.3 Select *Time* and press ENTER key.
5.4.4 Select *Nonuniform* and press ENTER key.
5..4.5 Select *No* for Modify Sequence and press ENTER key

Note if *Yes* is selected the following sequence should be displayed:

Take *12* Samples
Quantity at Interval:
1. *1* at *5*

2. *1* at *10*
3. *1* at 15
4. *1* at *20*
5. *1* at *30*
6. *1* at *45*
7. *1* at *60*
8. *1* at *120*
9. *1* at *180*
10. *1* at *240*
11. *1* at *300*

Press ENTER key

Not e the first sample is collected at 0 minutes when the actuator detects water and signals the sampler to start the program

5.4.5 Change Bottles Based On - Select *Samples* press ENTER key

5.4.6 Select *1*Bottle Per Sample Event (for Standard Sampler) press ENTER key
Select 2Bottles Per Sample Event (for Compact Sampler) press ENTER key

5.4.7 Sample Continuously Select *No* ENTER key

5.4.8 Sample Volume *1000* (for Standard Sampler) press ENTER key
Sample Volume *500* (for Compact Sampler)

5.4.9 Enter Start Time? *No* press ENTER key

5.4.10 This will bring up *Programming Sequence Complete*

6. Sample Handling and Preservation
   - 6.1 Don appropriate safety equipment and latex gloves.
   - 6.2 Press DISPLAY STATUS key
   - 6.3 Select *Review* press enter key
   - 6.4 Select *Results* press enter key
   - 6.5 Display will indicate when the Sampler was started and at what time each sample was collected. Record this information in the log book and on a chain of custody.
   - 6.6 Label each bottle with the location, bottle number, time and date collected, and initial.
   - 6.7 Place a cap on each bottle.
   - 6.8 Store all bottles on ice.

7 Chain of Custody

7.1 Follow the chain of custody SOP.

7.2 Chain of custody forms should stay with samples at all times. When samples are not in the custody of the sampler or designated person, the samples should be stored in a secure location.

8 Quality Control/Quality Assurance and Decontamination

9.1 All QC requirements in the QAPP must be followed.

9 Routine Maintenance

9.1 Cleaning Guidelines

At the end of each sample season the units should be thoroughly cleaned. All internal tubing should be replaced and suction lines should be replaced in the manholes.

9.1.1 Wash the samplers inside and out using warm, soapy water. The machines may also be sprayed with a hose as long as the water is kept from the control box and power source connectors.

9.1.2 Clean the strainer with a brush and soapy water. Rinse thoroughly.

9.1.3 Replace the bags of dessicant in the control box as indicated by the humidity indicator at the top of the box.

10 References

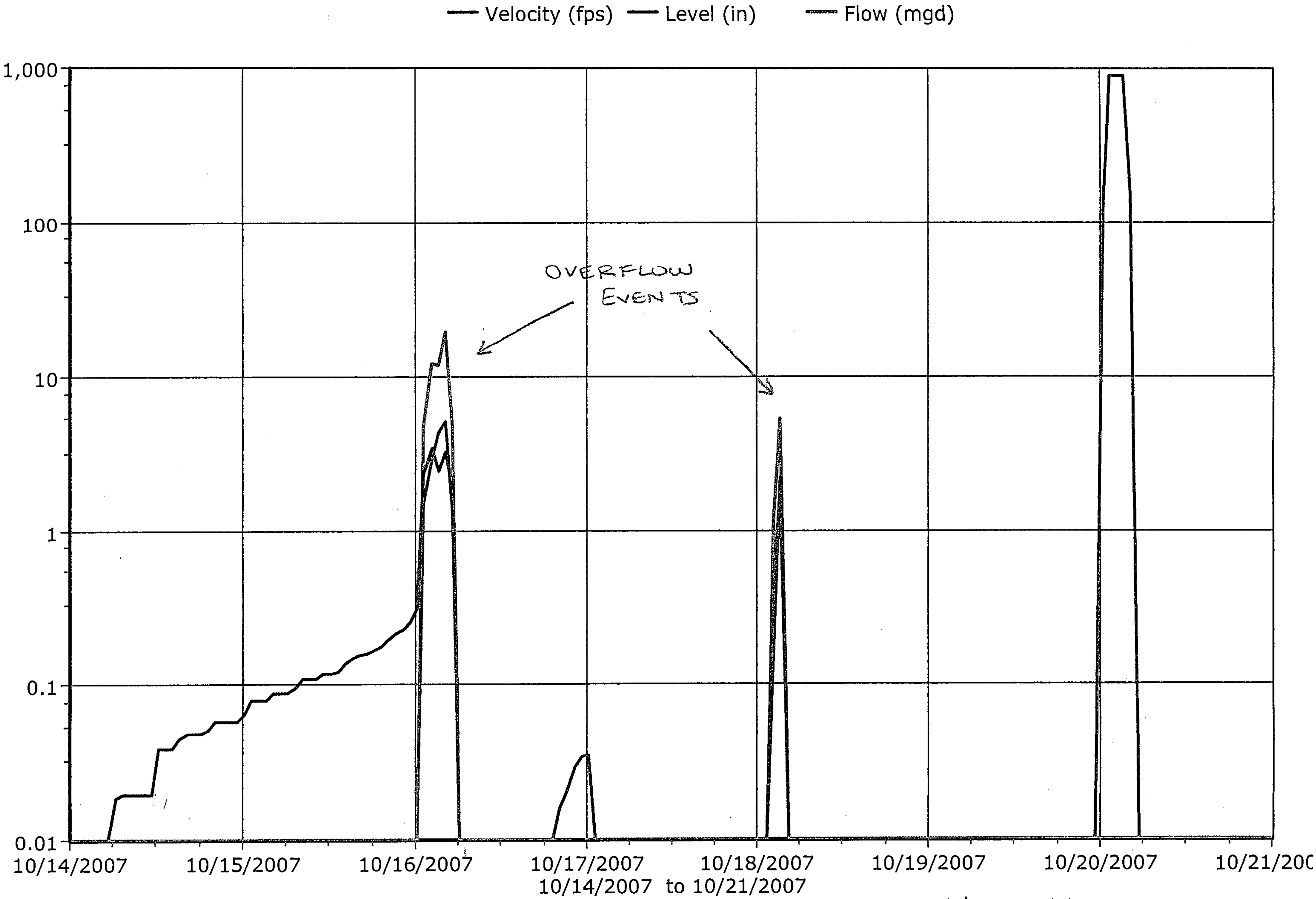
California Department of Pesticide Regulation Environment Branch. Instructions for Operating ISCO Samplers when Collecting Surface Water.

Teledyne ISCO. 3700 Portable Samplers Installation and Operation Guide

APPENDIX F

MARSH MCBIRNEY GRAPH OF OVERFLOW EVENT

OVF#1 69IN.



MARSH MCBIRNEY PRINTOUT

APPENDIX G

BRIDGE SAMPLING FIELD DATA SHEET

FMWRD CSO STUDY
BRIDGE SAMPLING

FIELD SAMPLE COLLECTION DATA:

Sample Collectors ______________________

Sampling Location ______________________

Date and Time ______________ Arrival: ______ Departure: ______

Weather Observations ______________________

Water Temperature °C __________ pH (S.U.) __________

Conductivity (μS/cm) __________ D.O. (mg/L) __________

Transect or Grab Sample __________

Number of transect samples composited __________

Samplers comments __________

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CHAIN OF CUSTODY:

Relinquished By	Date / Time	Received By	Date / Time
Relinquished By	Date / Time	Received By	Date / Time
Relinquished By	Date / Time	Received By	Date / Time
Relinquished By	Date / Time	Received By	Date / Time

TRANSPORT TEAM COMMENTS:

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APPENDIX H

CSO OUTFALL SAMPLING FIELD DATA SHEET

2008 CSO Sampling

Location: East Benton (OVF No. 8) (Compact Sampler)

Date/Time:____

Personnel: ____

Parameter Bottle No.	**Initial 1-2**	**5 min. 3-4**	**10 min. 5-6**	**15 min. 7-8**	**30 min. 9-10**	**45 min. 11-12**	**1 hr. 13-14**	**2 hr. 15-16**	**3 hr. 17-18**	**4 hr. 19-20**	**5 hr. 21-22**	**6 hr. 23-24**
Date/Time of Collection												
pH (units)												
Conductivity (µS)												

Worklist:

Review “Display Status” should tell you when the sample was collected.
Replace bottles
To Restart Program, first toggle switch on the actuator.
Press “Start Sampling”
Press “Enter” when Sample 1 displayed. Should respond with “Sampling Inhibited.”

Field Observations:

____

Chain of Custody

Relinquished By	Date/Time	Received By	Date/Time

Relinquished By	Date/Time	Received By	Date/Time

2008 CSO Sampling

Location: First (OVF No. 10) – Prairie at First (Compact Sampler)

Date/Time:______________________________________

Personnel: ____________________________________

Parameter Bottle No.	**Initial 1-2**	**5 min. 3-4**	**10 min. 5-6**	**15 min. 7-8**	**30 min. 9-10**	**45 min. 11-12**	**1 hr. 13-14**	**2 hr. 15-16**	**3 hr. 17-18**	**4 hr. 19-20**	**5 hr. 21-22**	**6 hr. 23-24**
Date/Time of Collection												
pH (units)												
Conductivity (µS)												

Worklist:

Review “Display Status” should tell you when the sample was collected.
Replace bottles
To Restart Program, first toggle switch on the actuator.
Press “Start Sampling”
Press “Enter” when Sample 1 displayed. Should respond with “Sampling Inhibited.”

Field Observations:

Chain of Custody

Relinquished By	Date/Time	Received By	Date/Time

Relinquished By	Date/Time	Received By	Date/Time

2008 CSO Sampling

Location: Fox Metro (Standard Sampler)

Date/Time:

Personnel:

Parameter Bottle No.	**Initial 1**	**5 min. 2**	**10 min. 3**	**15 min. 4**	**30 min. 5**	**45 min. 6**	**1 hr. 7**	**2 hr. 8**	**3 hr. 9**	**4 hr. 10**	**5 hr. 11**	**6 hr. 12**
Date/Time of Collection												
pH (units)												
Conductivity (µS)												

Worklist:

Review "Display Status" should tell you when the sample was collected.
Replace bottles
To Restart Program, first toggle switch on the actuator.
Press "Start Sampling"
Press "Enter" when Sample 1 displayed. Should respond with "Sampling Inhibited."

Field Observations:

Chain of Custody

Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received By	Date/Time

2008 CSO Sampling

Location: Rathbone (Standard Sampler)

Date/Time:

Personnel:

Parameter Bottle No.	**Initial 1**	**5 min. 2**	**10 min. 3**	**15 min. 4**	**30 min. 5**	**45 min. 6**	**1 hr. 7**	**2 hr. 8**	**3 hr. 9**	**4 hr. 10**	**5 hr. 11**	**6 hr. 12**
Date/Time of Collection												
pH (units)												
Conductivity (μS)												

Worklist:

Review "Display Status" should tell you when the sample was collected.
Replace bottles
To Restart Program, first toggle switch on the actuator.
Press "Start Sampling"
Press "Enter" when Sample 1 displayed. Should respond with "Sampling Inhibited."

Field Observations:

Chain of Custody

Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received By	Date/Time

2008 CSO Sampling

Location: Hazel (OVF No. 4) (Standard Sampler)

Date/Time:

Personnel:

Parameter Bottle No.	**Initial 1**	**5 min. 2**	**10 min. 3**	**15 min. 4**	**30 min. 5**	**45 min. 6**	**1 hr. 7**	**2 hr. 8**	**3 hr. 9**	**4 hr. 10**	**5 hr. 11**	**6 hr. 12**
Date/Time of Collection												
pH (units)												
Conductivity (µS)												

Worklist:

Review "Display Status" should tell you when the sample was collected.
Replace bottles
To Restart Program, first toggle switch on the actuator.
Press "Start Sampling"
Press "Enter" when Sample 1 displayed. Should respond with "Sampling Inhibited."

Field Observations:

Chain of Custody

Relinquished By	Date/Time	Received By	Date/Time

Relinquished By	Date/Time	Received By	Date/Time

2008 CSO Sampling

Location: West Benton (OVF No. 15) – (Compact Sampler)

Date/Time:____

Personnel: ______________________________________

Parameter **Bottle No.**	**Initial** **1-2**	**5 min.** **3-4**	**10 min.** **5-6**	**15 min.** **7-8**	**30 min.** **9-10**	**45 min.** **11-12**	**1 hr.** **13-14**	**2 hr.** **15-16**	**3 hr.** **17-18**	**4 hr.** **19-20**	**5 hr.** **21-22**	**6 hr.** **23-24**
Date/Time of Collection												
pH (units)												
Conductivity (µS)												

Worklist:

Review "Display Status" should tell you when the sample was collected.
Replace bottles
To Restart Program, first toggle switch on the actuator.
Press "Start Sampling"
Press "Enter" when Sample 1 displayed. Should respond with "Sampling Inhibited."

Field Observations:

____

Chain of Custody

Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received By	Date/Time

2008 CSO Sampling

Location: West Galena (OVF No. 18) – (Compact Sampler)

Date/Time:____

Personnel: ____

Parameter Bottle No.	**Initial 1-2**	**5 min. 3-4**	**10 min. 5-6**	**15 min. 7-8**	**30 min. 9-10**	**45 min. 11-12**	**1 hr. 13-14**	**2 hr. 15-16**	**3 hr. 17-18**	**4 hr. 19-20**	**5 hr. 21-22**	**6 hr. 23-24**
Date/Time of Collection												
pH (units)												
Conductivity (µS)												

Worklist:

Review “Display Status” should tell you when the sample was collected.
Replace bottles
To Restart Program, first toggle switch on the actuator.
Press “Start Sampling”
Press “Enter” when Sample 1 displayed. Should respond with “Sampling Inhibited.”

Field Observations:

____

Chain of Custody

Relinquished By Date/Time Received By Date/Time

____

Relinquished By Date/Time Received By Date/Time

____

FMWRD CSO STUDY
BRIDGE SAMPLING

FIELD SAMPLE COLLECTION DATA:

Sample Collectors ____________________

Sampling Location ____________________

Date and Time __________ Arrival: __________ Departure: __________

Weather Observations ____________________

Water Temperature °C __________ pH (S.U.) __________

Conductivity (µS/cm) __________ D.O. (mg/L) __________

Transect or Grab Sample __________

Number of transect samples composited __________

Samplers comments __________

____

____

____

CHAIN OF CUSTODY:

Relinquished By	Date / Time	Received By	Date / Time
Relinquished By	Date / Time	Received By	Date / Time
Relinquished By	Date / Time	Received By	Date / Time
Relinquished By	Date / Time	Received By	Date / Time

TRANSPORT TEAM COMMENTS:

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FOX RIVER WATER QUALITY STUDY

FIELD SAMPLE COLLECTION DATA:

Sample Collectors ____________________

Sampling Location ____________________

Date and Time __________ Arrival: __________ Departure: __________

Weather Observations ____________________

Water Temperature °C __________ pH (S.U.) __________

Conductivity (μS/cm) __________ D.O. (mg/L) __________

Number of transect samples composited __________

Samplers comments ____________________

____

____

CHAIN OF CUSTODY:

Relinquished By	Date / Time	Received By	Date / Time
Relinquished By	Date / Time	Received By	Date / Time
Relinquished By	Date / Time	Received By	Date / Time
Relinquished By	Date / Time	Received By	Date / Time

TRANSPORT TEAM COMMENTS:

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2008 CSO Sampling

Location: East Benton (OVF No. 8) (Compact Sampler)

Date/Time:____

Personnel: ______________________________________

Parameter Bottle No.	**Initial 1-2**	**5 min. 3-4**	**10 min. 5-6**	**15 min. 7-8**	**30 min. 9-10**	**45 min. 11-12**	**1 hr. 13-14**	**2 hr. 15-16**	**3 hr. 17-18**	**4 hr. 19-20**	**5 hr. 21-22**	**6 hr. 23-24**
Date/Time of Collection												
pH (units)												
Conductivity (µS)												

Worklist:

Review “Display Status” should tell you when the sample was collected.
Replace bottles
To Restart Program, first toggle switch on the actuator.
Press “Start Sampling”
Press “Enter” when Sample 1 displayed. Should respond with “Sampling Inhibited.”

Field Observations:

____

Chain of Custody

Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received By	Date/Time

2008 CSO Sampling

Location: First (OVF No. 10) – Prairie at First (Compact Sampler)

Date/Time:____________________________________

Personnel: ____________________________________

Parameter Bottle No.	**Initial 1-2**	**5 min. 3-4**	**10 min. 5-6**	**15 min. 7-8**	**30 min. 9-10**	**45 min. 11-12**	**1 hr. 13-14**	**2 hr. 15-16**	**3 hr. 17-18**	**4 hr. 19-20**	**5 hr. 21-22**	**6 hr. 23-24**
Date/Time of Collection												
pH (units)												
Conductivity (μS)												

Worklist:

Review "Display Status" should tell you when the sample was collected.
Replace bottles
To Restart Program, first toggle switch on the actuator.
Press "Start Sampling"
Press "Enter" when Sample 1 displayed. Should respond with "Sampling Inhibited."

Field Observations:

____

Chain of Custody

Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received By	Date/Time

2008 CSO Sampling

Location: Fox Metro (Standard Sampler)

Date/Time:____

Personnel: ____

Parameter Bottle No.	**Initial 1**	**5 min. 2**	**10 min. 3**	**15 min. 4**	**30 min. 5**	**45 min. 6**	**1 hr. 7**	**2 hr. 8**	**3 hr. 9**	**4 hr. 10**	**5 hr. 11**	**6 hr. 12**
Date/Time of Collection												
pH (units)												
Conductivity (µS)												

Worklist:

Review "Display Status" should tell you when the sample was collected.
Replace bottles
To Restart Program, first toggle switch on the actuator.
Press "Start Sampling"
Press "Enter" when Sample 1 displayed. Should respond with "Sampling Inhibited."

Field Observations:

____

Chain of Custody

Relinquished By	Date/Time	Received By	Date/Time

Relinquished By	Date/Time	Received By	Date/Time

2008 CSO Sampling

Location: Rathbone (Standard Sampler)

Date/Time: ______________________________

Personnel: ______________________________

Parameter Bottle No.	**Initial 1**	**5 min. 2**	**10 min. 3**	**15 min. 4**	**30 min. 5**	**45 min. 6**	**1 hr. 7**	**2 hr. 8**	**3 hr. 9**	**4 hr. 10**	**5 hr. 11**	**6 hr. 12**
Date/Time of Collection												
pH (units)												
Conductivity (µS)												

Worklist:

Review "Display Status" should tell you when the sample was collected.
Replace bottles
To Restart Program, first toggle switch on the actuator.
Press "Start Sampling"
Press "Enter" when Sample 1 displayed. Should respond with "Sampling Inhibited."

Field Observations:

____

Chain of Custody

Relinquished By	Date/Time	Received By	Date/Time

Relinquished By	Date/Time	Received By	Date/Time

2008 CSO Sampling

Location: Hazel (OVF No. 4) (Standard Sampler)

Date/Time:

Personnel:

Parameter Bottle No.	**Initial 1**	**5 min. 2**	**10 min. 3**	**15 min. 4**	**30 min. 5**	**45 min. 6**	**1 hr. 7**	**2 hr. 8**	**3 hr. 9**	**4 hr. 10**	**5 hr. 11**	**6 hr. 12**
Date/Time of Collection												
pH (units)												
Conductivity (µS)												

Worklist:

Review "Display Status" should tell you when the sample was collected.
Replace bottles
To Restart Program, first toggle switch on the actuator.
Press "Start Sampling"
Press "Enter" when Sample 1 displayed. Should respond with "Sampling Inhibited."

Field Observations:

Chain of Custody

Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received By	Date/Time

2008 CSO S pling

Location: West Benton (OVF No. 15) – (Compact Sampler)

Date/Time:____

Personnel: ____

Parameter Bottle No.	**Initial 1-2**	**5 min. 3-4**	**10 min. 5-6**	**15 min. 7-8**	**30 min. 9-10**	**45 min. 11-12**	**1 hr. 13-14**	**2 hr. 15-16**	**3 hr. 17-18**	**4 hr. 19-20**	**5 hr. 21-22**	**6 hr. 23-24**
Date/Time of Collection												
pH (units)												
Conductivity (µS)												

<u>Worklist:</u>

Review “Display Status” should tell you when the sample was collected.
Replace bottles
To Restart Program, first toggle switch on the actuator.
Press “Start Sampling”
Press “Enter” when Sample 1 displayed. Should respond with “Sampling Inhibited.”

<u>Field Observations:</u>

____

<u>Chain of Custody</u>

Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received By	Date/Time

2008 CSO Sampling

Location: West Galena (OVF No. 18) – (Compact Sampler)

Date/Time:____

Personnel: ______________________________________

Parameter Bottle No.	**Initial 1-2**	**5 min. 3-4**	**10 min. 5-6**	**15 min. 7-8**	**30 min. 9-10**	**45 min. 11-12**	**1 hr. 13-14**	**2 hr. 15-16**	**3 hr. 17-18**	**4 hr. 19-20**	**5 hr. 21-22**	**6 hr. 23-24**
Date/Time of Collection												
pH (units)												
Conductivity (µS)												

Worklist:

Review "Display Status" should tell you when the sample was collected.
Replace bottles
To Restart Program, first toggle switch on the actuator.
Press "Start Sampling"
Press "Enter" when Sample 1 displayed. Should respond with "Sampling Inhibited."

Field Observations:

____

Chain of Custody

Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received By	Date/Time

MEETING AGENDA

CAC Meeting No. 6
October 28, 2009
11:00 a.m. to 1:00 p.m.

Introductions 11:00 a.m.

Review Meeting Minutes – CAC Meeting No. 5
Handouts for CAC Meeting No. 6

Presentation 11:15 a.m.

Topic: Fox River Water Quality Modeling
by Alena Bartosova and William Gillespie
of the Illinois State Water Survey

Lunch and Open Discussions 12:30 p.m.

Adjournment 1:00 p.m.

MEETING MINUTES

CAC Meeting No. 5
August 26, 2009 at 11:00 a.m.

Purpose: Meeting No. 5 served to provide the members with an understanding of the water quality assessment performed to date by the Fox Metro Water Reclamation District on the Fox River as part of the receiving stream characterization requirement of the CSO LTCP. The water quality assessment discussed at this meeting included: water chemistry, macroinvertebrate sampling, fish sampling and mussel sampling.

Attendees:

CAC Members	
Daryl Devick	City of Aurora
Judith Sotir	Fox Metro WRD
Tim Pollowy	Fox River Ecosystem Partnership
Fran Caffee	Sierra Club, Valley of the Fox Group
Joe Wywrot	United City of Yorkville
Paul Young*	Village of North Aurora
Bill Donnell	Fox Valley Park District
Jerry Weaver	Village of Oswego
Michael Pubentz	Village of Montgomery
Brad Merkel	Village of Sugar Grove
CAC Support Staff	
Tom Muth	Fox Metro WRD
Philippe Moreau	Walter E. Deuchler Associates, Inc.
John Frerich	Walter E. Deuchler Associates, Inc.
Other Guests	
Karen Clementi	Deuchler Environmental, Inc.
Jared Woodcock	Deuchler Environmental, Inc.

* **alternate for Mike Glock, Village of North Aurora**

Distribution: The above attendees and the following:

CAC Support Staff	
Jeff Humm	Fox Metro WRD
Roy Harsch	Drinker Biddle & Reath
Other Guests	
Jay Patel	Illinois EPA

Discussion Items:

1. John Frerich welcomed everyone. The following information was handed out to each member to include in their binders: meeting agenda for Meeting No. 5; meeting minutes for Meeting No. 4; revised Tentative Meeting Schedule, list of Abbreviations and Definitions, a PowerPoint presentation handout of today's topic "Fox River Water Quality Assessment"; a copy of the results to-date of the Long-term Aquatic Research Survey for fish and mussel collections, a copy of the "Quality Assurance Project Plan" for the CSO Long Term Control Project dated March 21, 2008.

2. A PowerPoint presentation was given regarding "Fox River Water Quality Assessment". The general points of discussion were:

   a. General Background (by John Frerich)
      i. USEPA CSO Control Policy (April 19, 1994)
         - Characterization, Monitoring and Modeling of the CSS
         - Main Elements of CSS Characterization
         - Section II.C.2 calls for the development of a comprehensive representative monitoring program including: CSO effluent monitoring, ambient in-stream monitoring and biological assessment.

      ii. Quality Assurance Project Plan (QAPP) – Document developed to establish policies and procedures for completing the various CSO and stream monitoring tasks (copy of project QAPP provided to members)

   b. Water Chemistry Sampling (by John Frerich)
      i. Sampling locations conducted on 5 bridges along Fox River from Sullivan Road to U.S. Route 34, 4 bridges along Indian Creek from Reckinger Road to Indian Creek outfall, 7 CSO outfalls and 3 storm sewer outfalls
      ii. A review of the sampling parameters given that included both field measurements and laboratory analysis
      iii. A review of the various sampling equipment and the parameters the sampling equipment measured was given.
      iv. Sampling durations and protocols were discussed.

v. Results to be used in development of long-term water quality model simulation, which will be the topic at the next CAC meeting.

c. Benthic Macroinvertebrate Sampling (by Karen Clementi)
    i. Reasons for sampling – cost effective, stationary sampling, demonstrates sensitivity to pollution
    ii. Various sampling locations along Fox River between Sullivan Road and U.S. Route 34
    iii. Sampling dates, equipment and methods were discussed.
    iv. Sampling challenges included high river flows, flooding and tampering (fishermen).
    v. MBI scoring and preliminary results of sampling conducted from 2006-08 were presented.
    vi. Conclusions to date
    - Water quality of Fox River upstream of the Aurora and FMWRD CSO outfalls is poor as identified by the MBI score.
    - River segment upstream of New York Street is the worst area even though CSO discharges in this area have been significantly reduced since 2001.
    - Water quality appears to improve downstream of Mill Street likely due to oxygenation provided by Montgomery Dam

d. Fish and Mussel Sampling (by Jared Woodcock)
    i. Reasons for fish sampling – determine fish community composition, develop overall trends of fish assemblage
    ii. Various fish sampling locations along Fox River between Sullivan Road and U.S. Route 34
    iii. Fish sampling duration, equipment and methods were discussed.
    iv. Preliminary results of fish sampling conducted from 2008-09 were presented.
    - 8013 total fish representing 46 species from 12 families were sampled.
    - Comparatively, IDNR sampled 1589 total fish representing 38 species from 8 families from 1994-2002
    - Of 31 DO sensitive species in Illinois, only 5 species were sampled in this segment of the Fox River during this study. No threatened or endangered species have been found to date.

    v. Mussel sampling dates and methods were discussed.
    vi. Preliminary results of mussel sampling were presented.
    - 2008 sampling occurred below the FMWRD CSO outfall. A total of 15 mussels representing 6 species were found. No living specimens were found.
    - 2009 sampling occurred at 4 different sites both upstream and downstream of the FMWRD CSO outfall. A total of 158 living mussel specimens representing 8 species were found. Of this total, 3 living mussel specimens were found along the west bank and 41 living mussel

specimens were found along the east bank of the Fox River downstream of the FMWRD CSO outfall. 38 of the 44 living specimens were of an invasive species

3. An open discussion ensued upon conclusion of the presentation. The key topics of discussion included the following:

    a. Judith Sotir inquired if there were methods that could be implemented to prevent/reduce tampering of the macroinvertebrate samplers. Notifications via local fishing organizations or the fishing license renewal program was discussed. Tags on the samplers were also discussed but were deemed to be impractical due to the accumulation of debris on the samplers. The samplers are tethered to the bank using steel cabling. Bill Donnell offered to contact the local small mouth bass organization regarding tampering.

    b. Michael Pubentz asked if there will be an attempt to correlate the data with the CSO overflow discharges. Philippe Moreau responded yes. The correlation of the water chemistry sampling data will be discussed in greater detail at the next CAC meeting when the water quality modeling will be presented.

    c. Tom Pollowy wondered if the Macroinvertebrate sampling demonstrated if the results were due to habitat or water quality and whether there were any trends to the data. He mentioned a similar study and recent report along the Blackberry Creek. Karen Clementi advised that the results are still preliminary and have not yet been analyzed for trending. She would be interested in obtaining the Blackberry Creek study and reviewing its conclusions.

    d. Paul Young asked about specific types of fish, if they were found during the study and the range of depth of the electrofishing equipment. Jared Woodcock answered: 1 muskee, 0 northern pikes, lots of walleye. The largest fish sampled to date was a 36-inch flathead weighing 19 lbs. in the vicinity of Violet Patch Park. Jared has been unable to sample at the Montgomery Dam due to river conditions. The electrofishing is good for water depths of approximately ±6 feet.

    e. Tim Pollowy mentioned an upcoming presentation by IDNR at a meeting of the Fox River Ecosystem Partnership on September 16th. The presentation will be given by Steve Pescatelli of IDNR and the title of the program is "State of the Fox River: Summary of Fish Sampling Efforts by IDNR 1995-2009". Jared Woodcock and Karen Clementi both plan on attending this presentation. John Frerich advised that we have presented our sampling methods and procedures to the IDNR for them to critique and have modified them accordingly. We will continue to work with and share information with the local IDNR field office.

Next CAC Meeting: The next meeting is scheduled for Wednesday, September 30, 2009 at 11:00 a.m. at the Fox Metro Water Reclamation District W.J. "Ben" Baines Memorial Administration Building located at 682 State Route 31, Oswego, IL

The above constitutes our understanding of the information discussed and the decisions reached. Any corrections or clarifications should be directed in writing to the attention of the author.

Prepared by: John W. Frerich, P.E.

CSO LTCP

CAC Meeting #6

Modeling the Effect of CSOs on the Fox River Water Quality

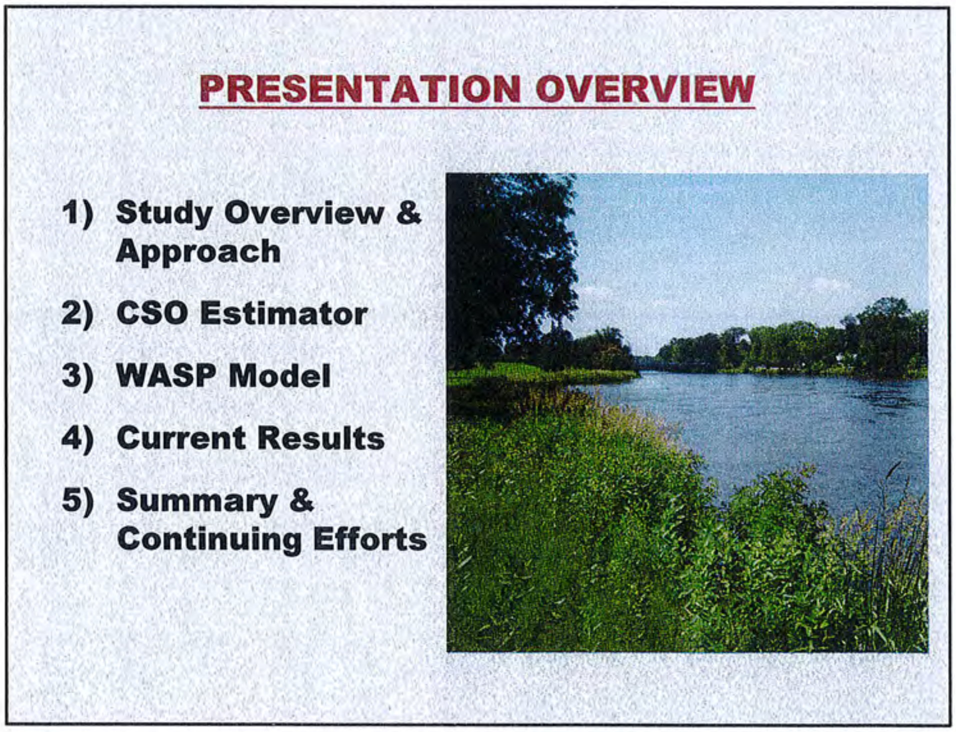
October 28, 2009

Alena Bartosova, William Gillespie
John Frerich, Carrie Carter
Michal Ondrejcek, Jory Hecht, Tze-Ling Ng

ILLINOIS
UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

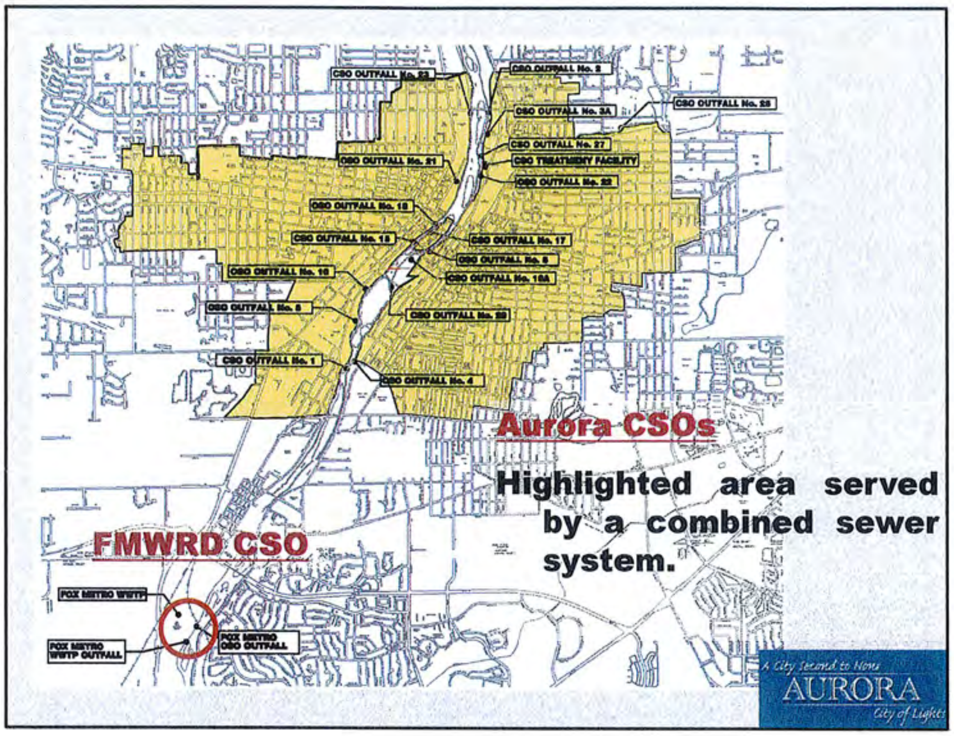
WALTER E. DEUCHLER ASSOCIATES, INC.
Consulting Engineers

Fox Metro
Water Reclamation District



PRESENTATION OVERVIEW

1) **Study Overview & Approach**
2) **CSO Estimator**
3) **WASP Model**
4) **Current Results**
5) **Summary & Continuing Efforts**



Aurora CSOs

Highlighted area served by a combined sewer system.

FMWRD CSO

FACTORS AFFECTING WATER QUALITY

- **Sources in the Study Area:**
  - **Treated Effluent**
    - **Fox Metro WRD**
    - **IL American Water - Valley Marina**
  - **Tributaries**
    - **Indian Creek**
    - **Waubonsee Creek**
  - **Storm Sewers (44)**
  - **CSOs (14+1)**
- **Impact varies with:**
  - **Fox River (upstream conditions)**
  - **Precipitation**
  - **Preceding conditions**

WATER QUALITY STANDARDS

- **Fecal Coliform Bacteria:**
  - *During the months May through October, based on a minimum of five samples taken over not more than a 30 day period, fecal coliform shall not exceed a geometric mean of 200 per 100 ml, nor shall more than 10% of the samples during any 30 day period exceed 400 per 100 ml in protected waters.*
- **Ammonia*:***
  - ***General (Ammonia >15mg/L)***
  - ***Acute, Chronic, Subchronic***
    (calculated from pH and temperature)
- **Dissolved Oxygen:**
  - ***General vs. Enhanced DO Protection***
  - *During the period of March through July, A) 5.0 (5.0) mg/L at any time; and B) 6.0 (6.25) mg/L as a daily mean averaged over 7 days. During the period of August through February, A) 3.5 (4.0) mg/L at any time; B) 4.0 (4.5) mg/L as a daily minimum averaged over 7 days; and C) 5.5 (6.0) mg/L as a daily mean averaged over 30 days.*

Title 35, Subtitle C,
Chapter I: Pollution Control Board,
Part 302, Water Quality Standards

Simulated:

- **Fecal Coliform**
- **Nitrogen**
  - **Ammonia**
  - **Nitrate/Nitrite**
  - **Organic Nitrogen**
- **Phosphorus**
  - **Orthophosphate**
  - **Organic Phosphorus**
- **Biological Oxygen Demand**
- **Total Suspended Solids**

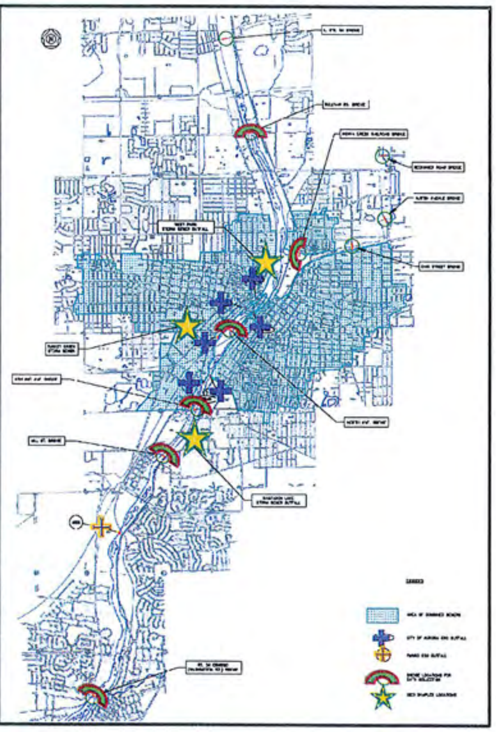
SAMPLING LOCATIONS

Discharge

- **a. North Aurora Dam**
- **b. Indian Creek**
- **c. Montgomery Dam (USGS)**
- **d. all CSOs**
- **e. 3 storm sewers (2009)**

Water Quality

- **a. 5 on Fox River**
- **b. 4 on Indian Creek**
- **c. 7 CSOs**
- **d. 3 storm sewers**

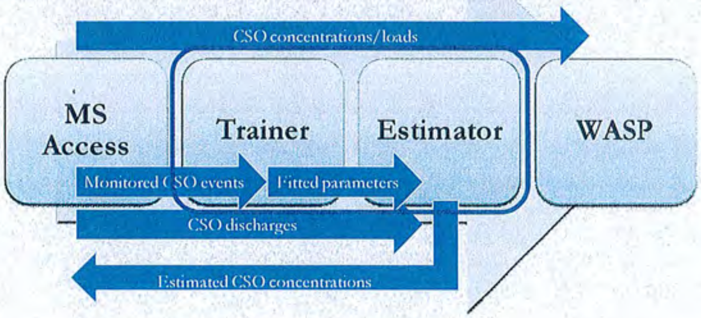


CSO LOAD ESTIMATOR

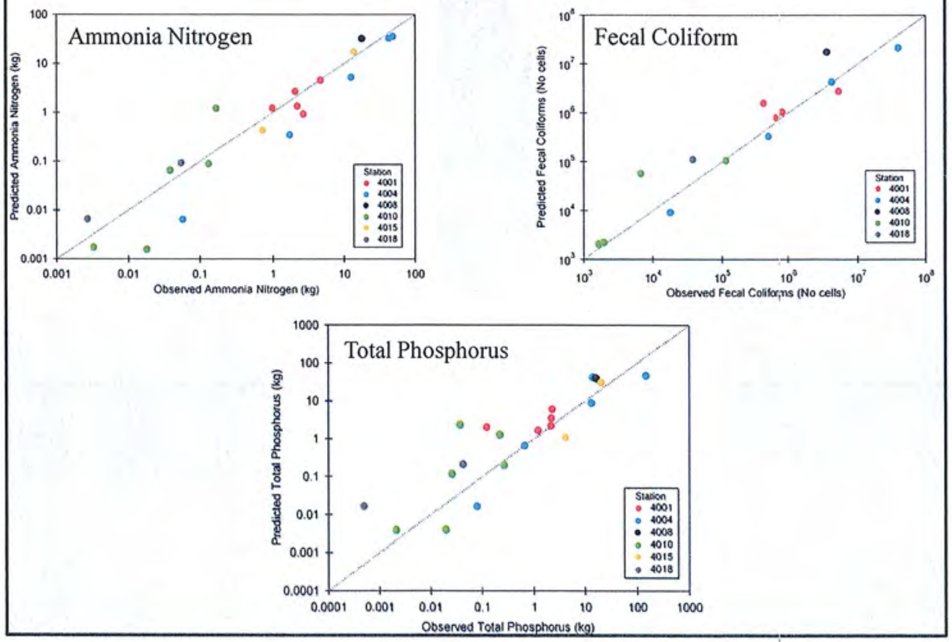
Only 7 CSOs sampled for water quality.

Total load (Pt) estimated from the event duration, peak discharge, and time from preceding event using build-up and wash-off relationships.

Data from sampled events are used to determine the model coefficients. Total load is then estimated for all remaining events.

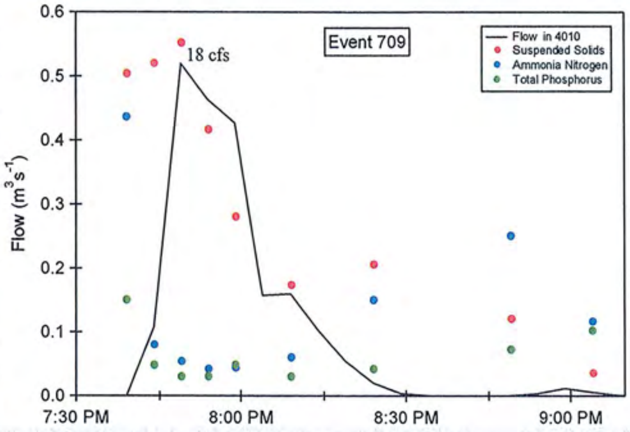


TOTAL LOAD ESTIMATION



CSO CHARACTERISTICS

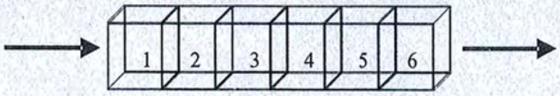
- **CSOs Discharge**
  - **Driven by precipitation**
  - **When sewer interceptor capacity exceeds certain level**
  - **Water level above a weir**
- **Dynamic situation**
  - **Fast changes**
  - **Short duration**



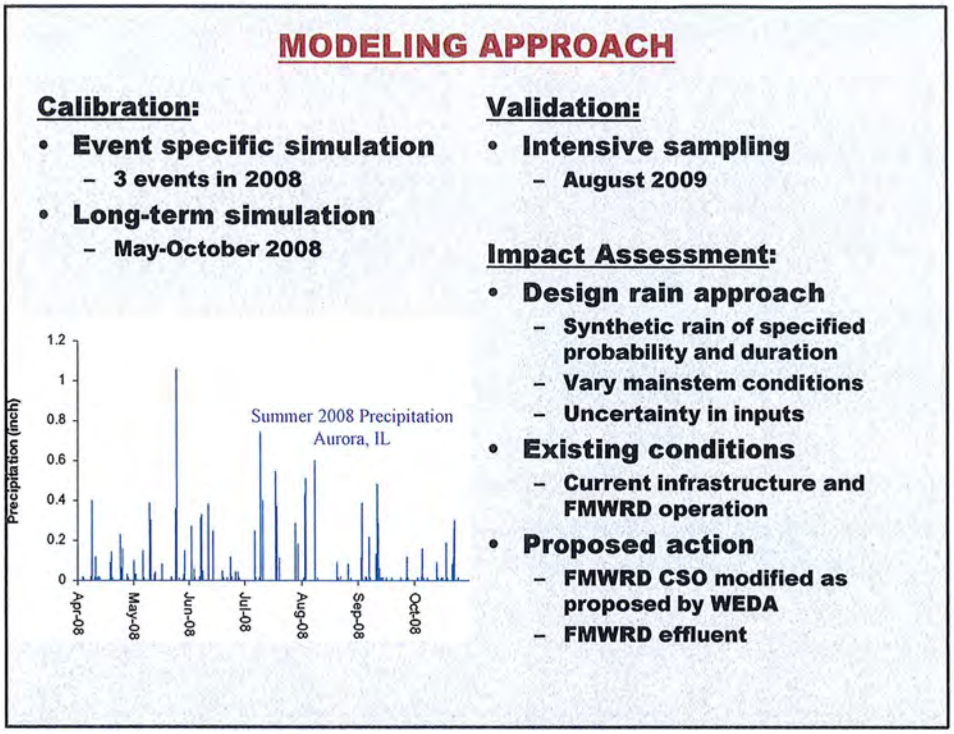
WASP MODEL BACKGROUND

Water Quality
Analysis
Simulation
Program

- **Dynamic simulation**
  - **Flows are changing**
  - **Concentrations are changing**
  - **Time step**
    - **Selected by program, bounded by user**
    - **2.5 minutes**
- **Segmentation**
  - **Branching (islands)**
  - **Effect of dams**
- **Public-Domain model**
  - **Supported by USEPA**
  - **Frequently updated**
- **Common applications**
  - **Rivers and streams**
  - **Estuaries**
  - **Lakes**
- **Potential for 2-D and 3-D simulations**



**WASP can be downloaded from: http://www.epa.gov/athens/wwqtsc/html/wasp.html*

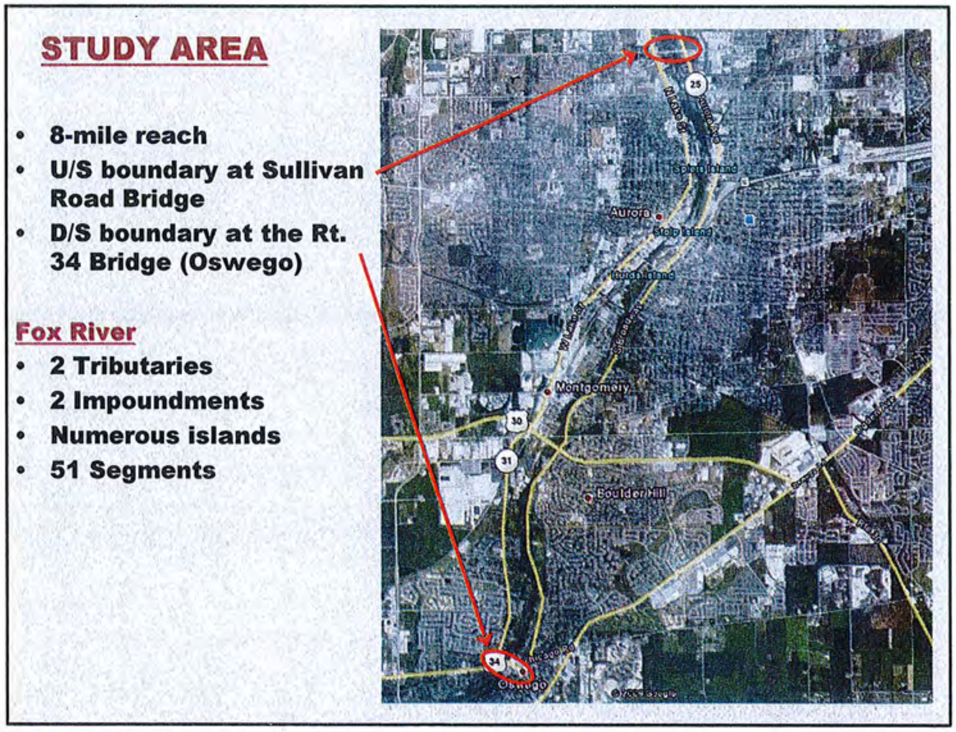


MODELING APPROACH

Calibration:
- **Event specific simulation**
  - 3 events in 2008
- **Long-term simulation**
  - May-October 2008

Validation:
- **Intensive sampling**
  - August 2009

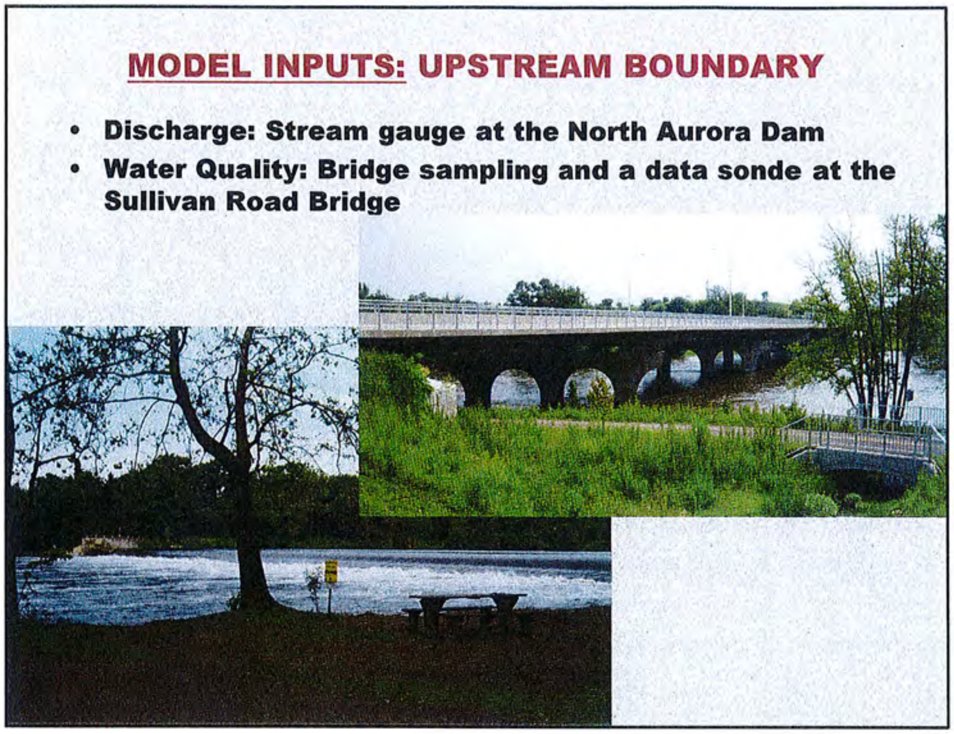
Impact Assessment:
- **Design rain approach**
  - Synthetic rain of specified probability and duration
  - Vary mainstem conditions
  - Uncertainty in inputs
- **Existing conditions**
  - Current infrastructure and FMWRD operation
- **Proposed action**
  - FMWRD CSO modified as proposed by WEDA
  - FMWRD effluent



STUDY AREA

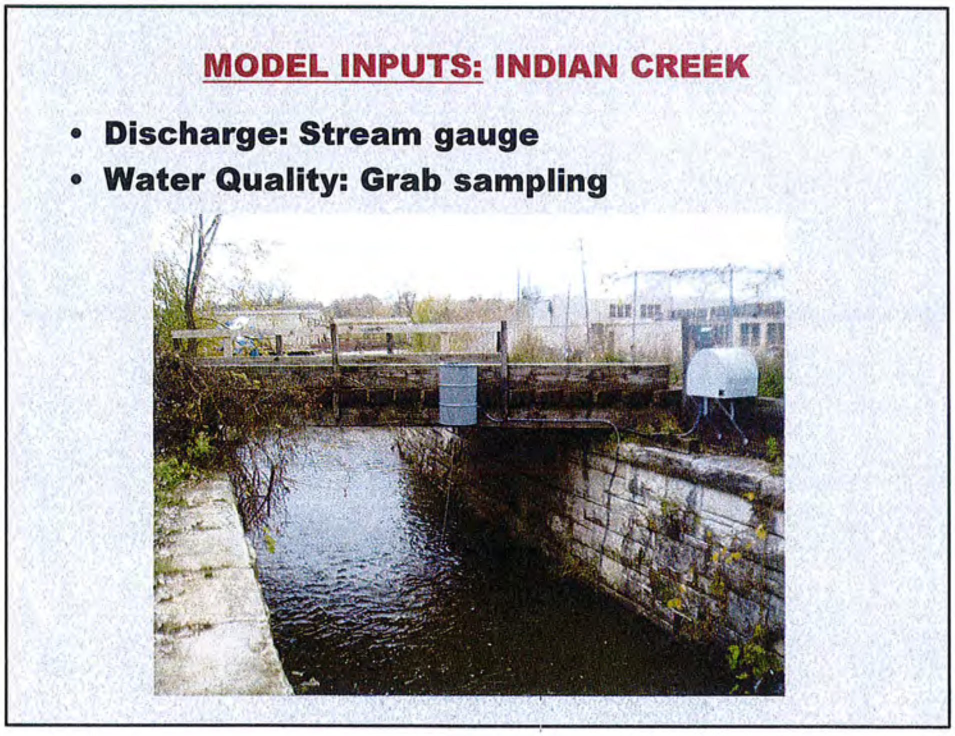
- 8-mile reach
- U/S boundary at Sullivan Road Bridge
- D/S boundary at the Rt. 34 Bridge (Oswego)

Fox River
- 2 Tributaries
- 2 Impoundments
- Numerous islands
- 51 Segments



MODEL INPUTS: UPSTREAM BOUNDARY

- **Discharge: Stream gauge at the North Aurora Dam**
- **Water Quality: Bridge sampling and a data sonde at the Sullivan Road Bridge**

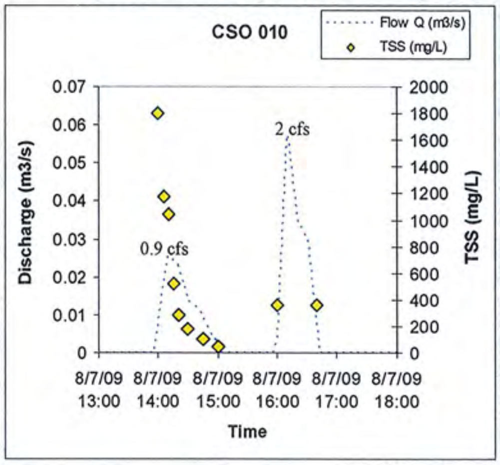


MODEL INPUTS: INDIAN CREEK

- **Discharge: Stream gauge**
- **Water Quality: Grab sampling**

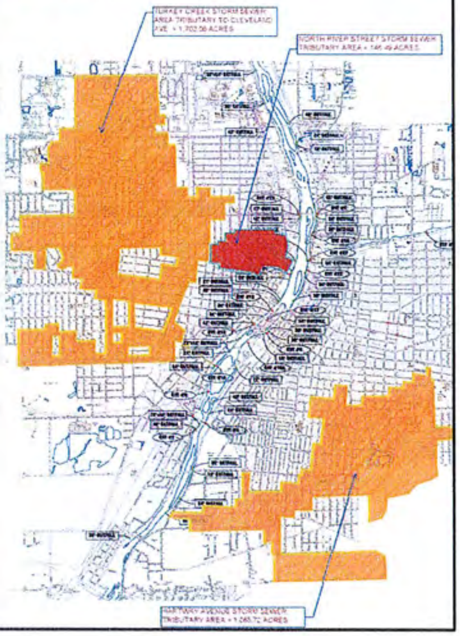
MODEL INPUTS: CSOs

- **14 CSOs are equipped with flow meters**
- **The 7 most active CSOs are also equipped with ISCO automated samplers**



MODEL INPUTS: STORMWATER

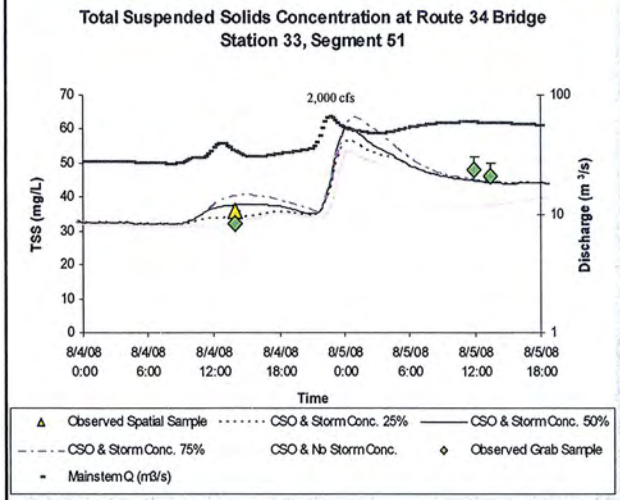
- **44 Outfalls, 3 sampled:**
  - **Turkey Creek Storm Sewer (1,702 acres)**
  - **Hartway Avenue Storm Sewer (1,066 acres)**
  - **North River Street Storm Sewer (146 acres)**
- **Discharge:**
  - **Total stormwater discharge estimated**
- **Water Quality:**
  - **Low, medium, and high concentrations determined**
  - **First flush separated**



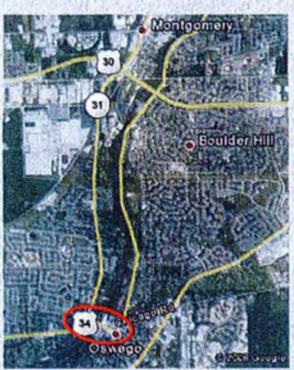
MODEL INPUTS: FOX METRO WRD

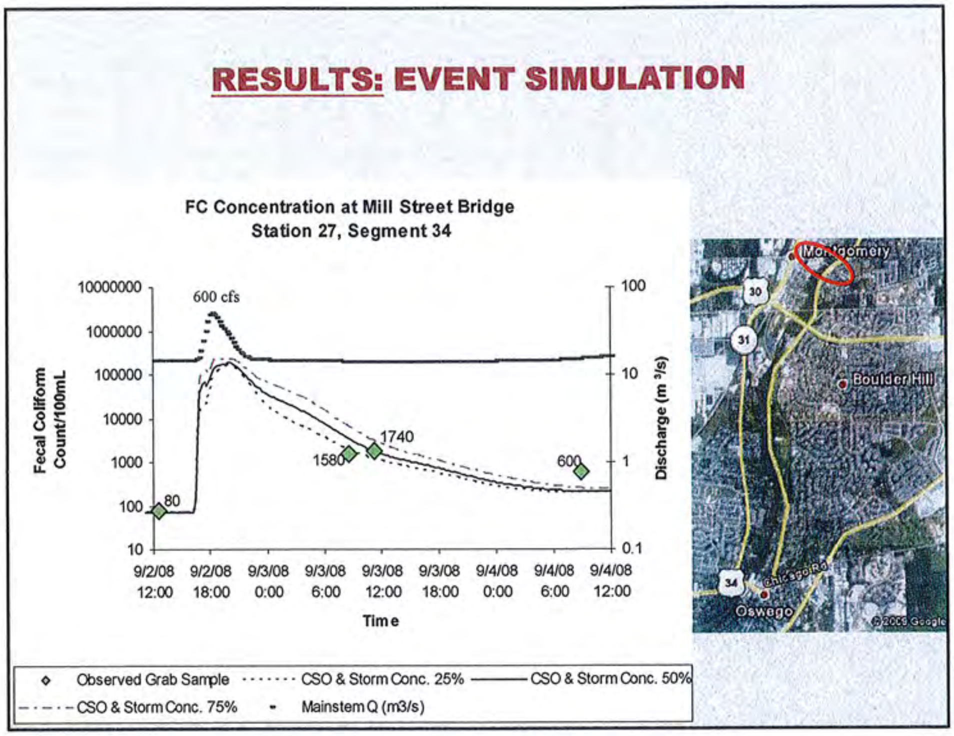
- **Discharge Monitoring Report (DMR):**
  - **Discharge & Water Quality**
  - **Effluent & FMWRD CSO**
- **Additional Water Quality for FMWRD CSO**
  - **Automated sampler**

MODEL RESULTS


Total Suspended Solids Concentration at Route 34 Bridge
Station 33, Segment 51

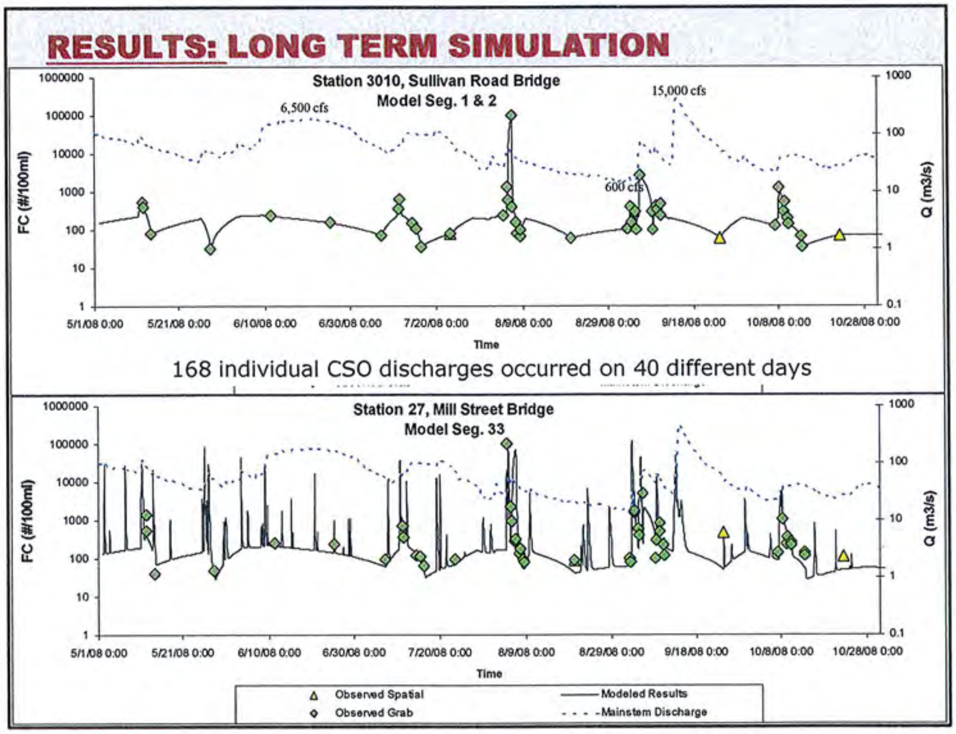
Stormwater Input Levels:
- **No Stormwater**
- **Low Concentration**
- **Medium Concentration**
- **High Concentration**





RESULTS: EVENT SIMULATION

FC Concentration at Mill Street Bridge
Station 27, Segment 34



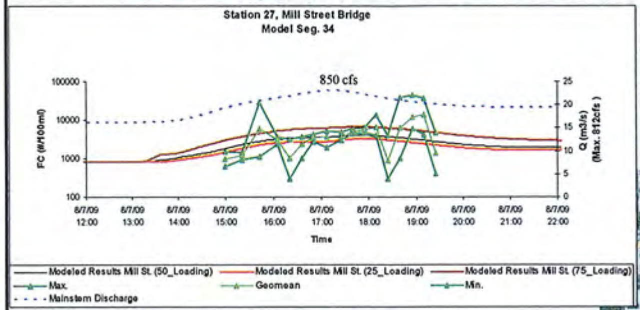
RESULTS: LONG TERM SIMULATION

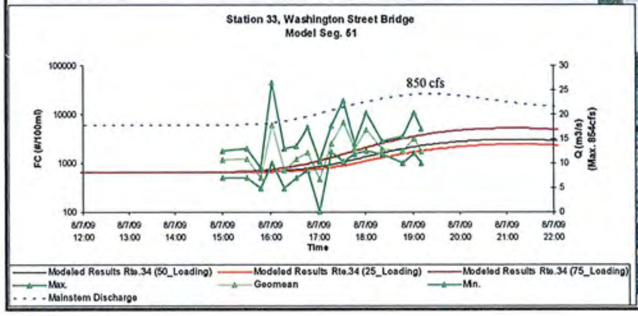
Station 3010, Sullivan Road Bridge
Model Seg. 1 & 2

168 individual CSO discharges occurred on 40 different days

Station 27, Mill Street Bridge
Model Seg. 33

RESULTS: INTENSIVE SAMPLING EVENT


Station 27, Mill Street Bridge
Model Seg. 34


Station 33, Washington Street Bridge
Model Seg. 61

Observed Concentrations Across the Channel:

- **Maximum**
- **Average**
- **Minimum**

SUMMARY

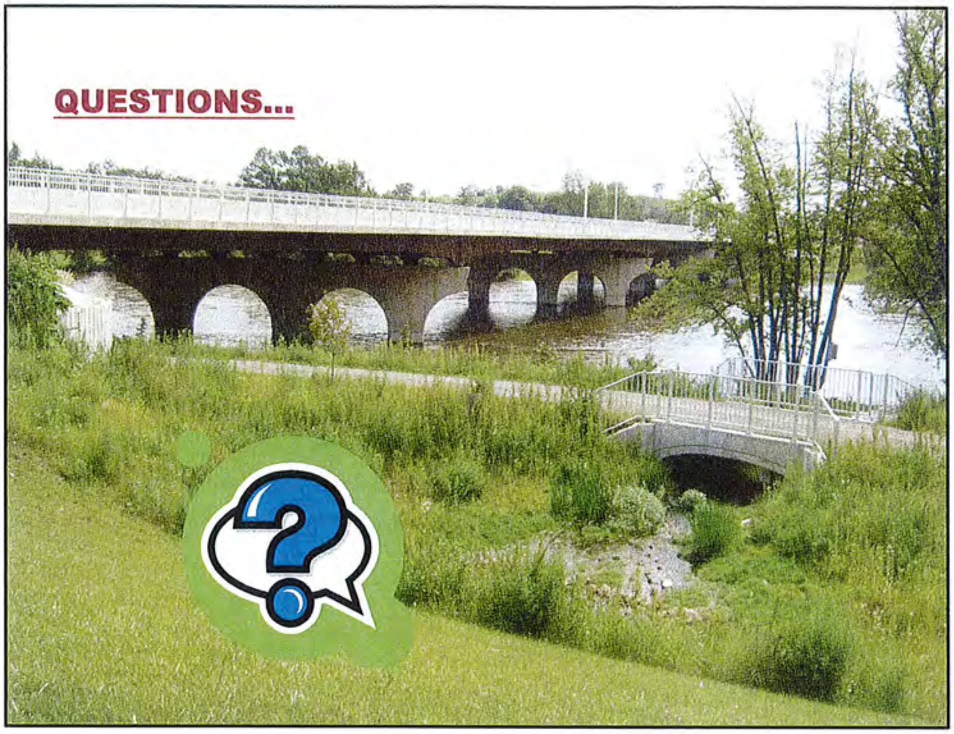
Model simulates water quality changes driven by precipitation adequately.

WHAT'S IN THE FUTURE

Model will be used to evaluate the impact on the Fox River under design rain conditions

a. Existing condition

b. Proposed action on FMWRD CSO.



QUESTIONS...

Fox Metro
Water Reclamation District

FOX METRO WRD CSO LTCP
CITIZENS ADVISORY COMMITTEE

MEETING AGENDA

CAC Meeting No. 7
March 23, 2010
10:00 a.m. to 2:00 p.m.

Introductions 10:00 a.m.

Review Meeting Minutes – CAC Meeting No. 6
Handouts for CAC Meeting No. 7

Presentation 10:20 a.m.

Topics: CSO Control Technologies – John Frerich
Recommended LTCP – Mark Halm
Financial Capability Assessment – John Frerich
Implementation Plan – John Frerich
Regulatory Issues – Roy Harsch

Lunch Break 12:00 p.m.

Adjournment 2:00 p.m.

MEETING MINUTES

CAC Meeting No. 6
October 28, 2009 at 11:00 a.m.

Purpose: Meeting No. 6 served to provide the members with an understanding of the water quality modeling performed to date by the Fox Metro Water Reclamation District on the Fox River as part of the receiving stream characterization requirement of the CSO LTCP.

Attendees:

CAC Members	
Daryl Devick	City of Aurora
Judith Sotir	Fox Metro WRD
Tim Pollowy	Fox River Ecosystem Partnership
Fran Caffee	Sierra Club, Valley of the Fox Group
Joe Wywrot	United City of Yorkville
Bill Donnell	Fox Valley Park District
Mike Runyon*	Village of Oswego
Brad Merkel	Village of Sugar Grove
CAC Support Staff	
Tom Muth	Fox Metro WRD
Jeff Humm	Fox Metro WRD
Roy Harsch	Drinker Biddle & Reath
Philippe Moreau	Walter E. Deuchler Associates, Inc.
John Frerich	Walter E. Deuchler Associates, Inc.
Other Guests	
Alena Bartosova	Illinois State Water Survey
William Gillespie	Illinois State Water Survey

* **alternate for Jerry Weaver, Village of Oswego**

Distribution: The above attendees and the following:

CAC Members	
Mike Glock	Village of North Aurora
Michael Pubentz	Village of Montgomery
Other Guests	
Jay Patel	Illinois EPA

Discussion Items:

1. John Frerich welcomed everyone. The following information was handed out to each member to include in their binders: meeting agenda for Meeting No. 6; meeting minutes for Meeting No. 5; a PowerPoint presentation handout of today's topic "Modeling the Effect of CSOs on the Fox River Water Quality".

2. A PowerPoint presentation was given by Alena Bartosova and William Gillespie of the Illinois State Water Survey regarding "Modeling the Effect of CSOs on the Fox River Water Quality". John Frerich introduced Alena and William and provided a brief summary of the Illinois State Water Survey's role in the project. The general points of discussion were:

    a. Study Overview & Approach (by Alena Bartosova)
        i. Project limits – Fox River between IL Route 56 bridge in North Aurora and US Route 34 bridge in Oswego
        ii. Factors affecting water quality – Treated effluent, tributaries, storm sewers, CSOs, boundary conditions and precipitation
        iii. Water quality standards – as defined in Title 35 of the Illinois Administrative Code regarding environmental regulations for the State of Illinois
        iv. Sampling locations – both for discharge and water quality measurements

    b. CSO Estimator (by Alena Bartosova)
        i. The seven (7) largest and most frequent CSOs were sampled for water quality during rain events
        ii. Methodology for estimating the pollutant loadings from the remaining CSOs was developed using event duration, peak discharge, time from preceding event, build-up and wash-off relationships, etc.
        iii. Best fit curves established for the various water quality parameters to be used to estimate remaining CSO locations.

c. WASP Model (by Alena Bartosova and William Gillespie)
  i. WASP stands for **W**ater quality **A**nalysis **S**imulation **P**rogram and is a modeling software program.
  ii. Reasons for selecting WASP model include: dynamic simulation capability, segmentation capability, public-domain model supported by USEPA, common application for rivers, potential for 2D and 3D simulations
  iii. Modeling approach
    - Calibration – event specific simulations calibrated to three (3) specific rain events in 2008 with field measured data and long term simulation calibrated to field measured data from May to October 2008
    - Validation – simulation validated against intensive sampling during rain event in August 2009
    - Impact Assessments – for specific design rain events under existing conditions and proposed CSO corrective actions
  iv. Model inputs include: stream discharges of Fox River and Indian Creek, water quality sampling on Fox River and Indian Creek, CSO discharges, storm sewer discharges, water quality of CSOs and storm sewer outfalls, Fox Metro CSO and WWTP discharges and water quality data

d. Current Results and Summary (by William Gillespie)
  i. Reviewed results with varying stormwater input levels (no stormwater, low concentration, medium concentration and high concentration). Storm sewer discharges demonstrate a significant impact on water quality model
  ii. Results of event specific simulations, long term simulations and intensive sampling event were discussed
  iii. Model calibration and validation is complete
  iv. Impact Assessments will begin in the next few months

3. An open discussion ensued upon conclusion of the presentation. The key topics of discussion included the following:

a. Bill Donnell inquired about the location of the 2nd WWTP identified in the study area during the presentation. Tom Muth answered that it is a small private treatment facility owned and operated by Illinois American Water located along IL Route 31 just south of Fox Metro's WWTP. It serves approximately 250 homes.

b. John Frerich explained that the reason the impact assessments have not yet been started has been due to ongoing coordination efforts with the City of Aurora and its engineering consultant. The District has yet to receive the final calibrated sewer system model from the City along with the City's proposed CSO corrective actions. The District has decided that, due to looming completion deadlines, the ISWS will begin the impact assessments using only the Fox Metro CSO corrective actions.

c. Tim Pollowy asked how the model was developed – as an event based or continuous model. Alena Bartosova explained that the model was developed and calibrated using actual events, however, the model can run a continuous long term simulation.

d. Philippe Moreau explained the work and coordination involved in conducting an intensive sampling event.

e. Bill Donnell asked what affect dams have on the CSOs. Alena Bartosova answered that under low flow conditions more sediment is trapped behind the dams. However, the low head dams on the Fox River do not have much of an impact under high flow conditions.

f. Tim Pollowy asked about the intensity of the rain event during the intensive sampling. John Frerich and William Gillespie answered that it was a high intensity, low duration event.

Next CAC Meeting: Due to a conflict, the date of the next CAC Meeting will need to be rescheduled. Potential alternate dates will be sent to committee members for concurrence with their personal schedules.

The above constitutes our understanding of the information discussed and the decisions reached. Any corrections or clarifications should be directed in writing to the attention of the author.

Prepared by: John W. Frerich, P.E.

CSO LTCP
CAC MEETING #7

CSO Control Technologies

(Screening and Development of Alternatives)

March 23, 2010

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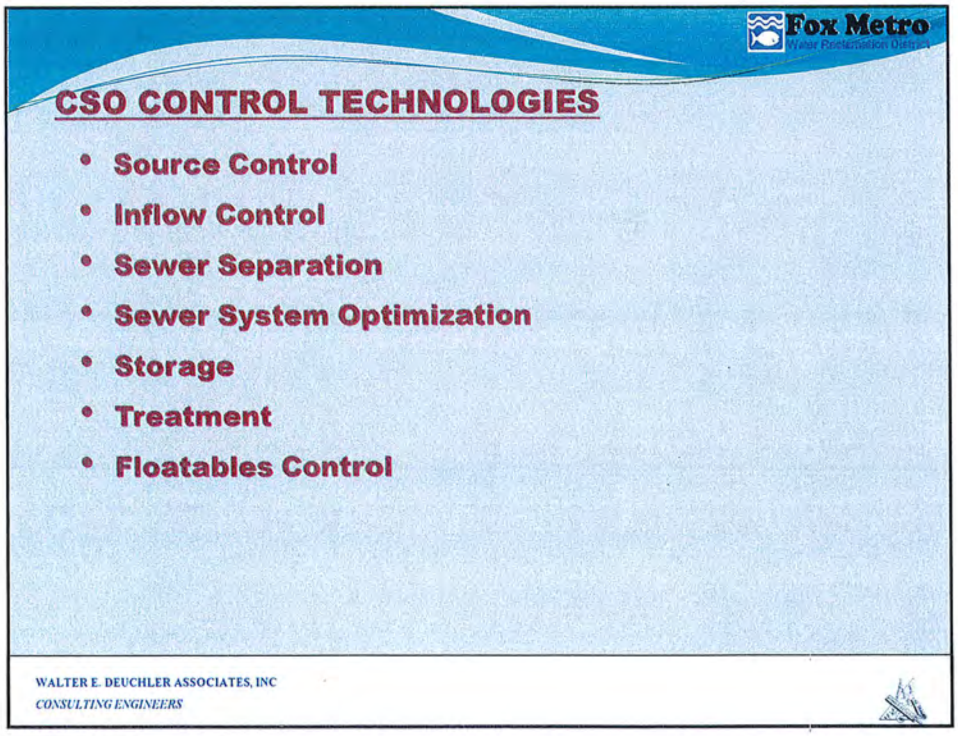
CONSULTING ENGINEERS

Fox Metro
Water Reclamation District



Fox Metro
Water Reclamation District

CSO CONTROL TECHNOLOGIES

- Source Control
- Inflow Control
- Sewer Separation
- Sewer System Optimization
- Storage
- Treatment
- Floatables Control

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CONSULTING ENGINEERS

SCREENING OF ALTERNATIVES

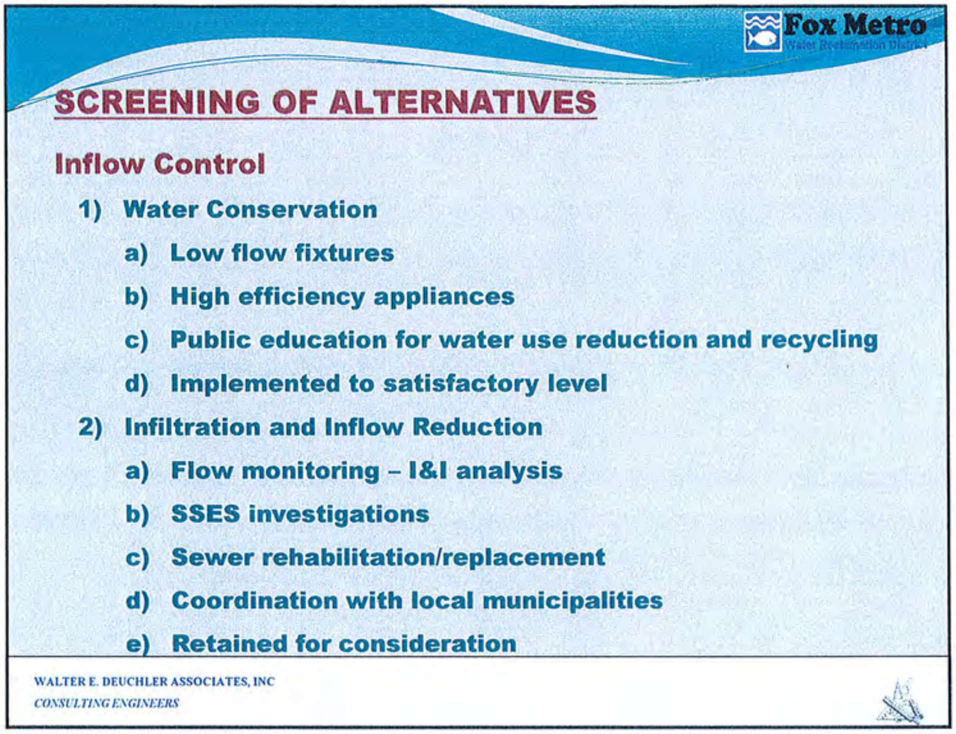
Source Control

1) **Public Education**
   - a) **Littering in CSS area**
   - b) **Illegal dumping of contaminants in sewer system**
   - c) **Implemented to satisfactory level**
     - ✓ **Website**
     - ✓ **Sewer bill inserts**
     - ✓ **Classroom programs and site tours of WWTP**
     - ✓ **Display at SciTech Hands-on-Museum**
     - ✓ **Participation in community events**

SCREENING OF ALTERNATIVES

Source Control

2) **Combined Sewer Flushing**
   - a) **Flushing deposited sewage solids**
   - b) **Transmit solids to WWTP during dry-weather**
   - c) **Eliminated from further consideration**
     - ✓ **Sewer size too large (69")**
     - ✓ **Sewer too flat (0.03%)**
     - ✓ **Requires 23,000 gpm to reach scour velocity**



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SCREENING OF ALTERNATIVES

Inflow Control

1) Water Conservation
    a) Low flow fixtures
    b) High efficiency appliances
    c) Public education for water use reduction and recycling
    d) Implemented to satisfactory level
2) Infiltration and Inflow Reduction
    a) Flow monitoring – I&I analysis
    b) SSES investigations
    c) Sewer rehabilitation/replacement
    d) Coordination with local municipalities
    e) Retained for consideration

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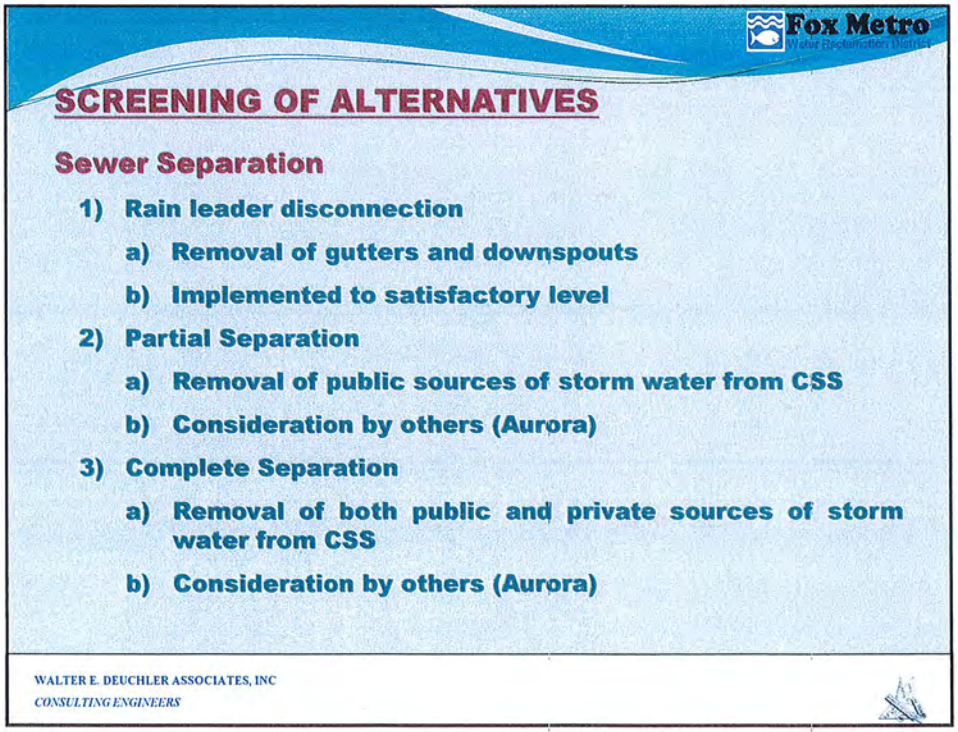

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SCREENING OF ALTERNATIVES

Sewer Separation

1) Rain leader disconnection
    a) Removal of gutters and downspouts
    b) Implemented to satisfactory level
2) Partial Separation
    a) Removal of public sources of storm water from CSS
    b) Consideration by others (Aurora)
3) Complete Separation
    a) Removal of both public and private sources of storm water from CSS
    b) Consideration by others (Aurora)

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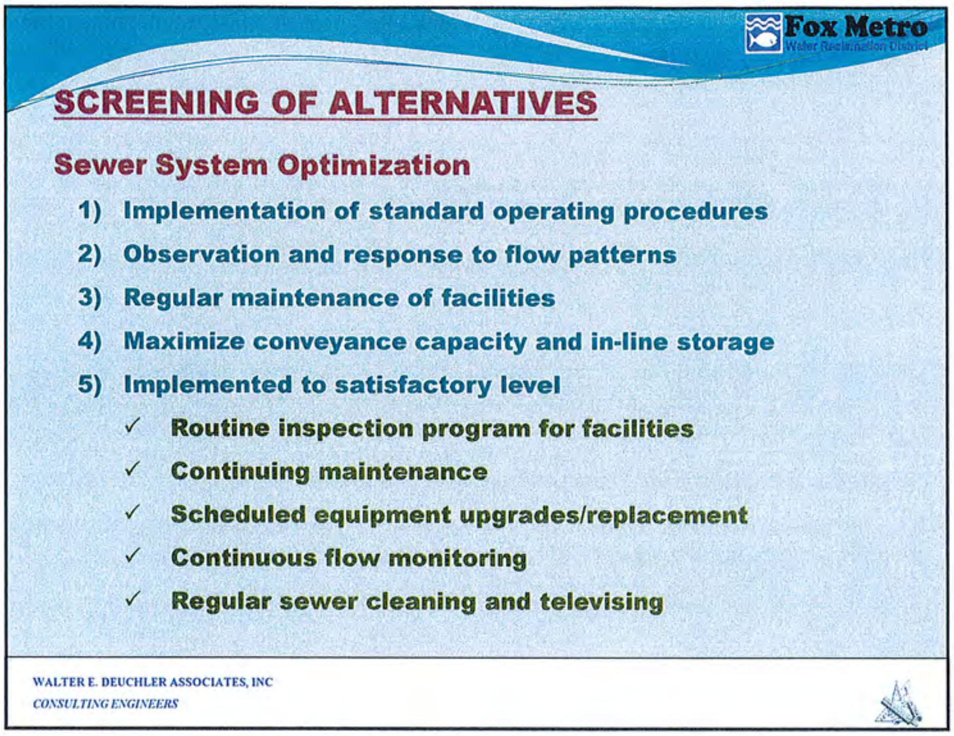

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SCREENING OF ALTERNATIVES

Sewer System Optimization

1) Implementation of standard operating procedures
2) Observation and response to flow patterns
3) Regular maintenance of facilities
4) Maximize conveyance capacity and in-line storage
5) Implemented to satisfactory level
   - ✓ Routine inspection program for facilities
   - ✓ Continuing maintenance
   - ✓ Scheduled equipment upgrades/replacement
   - ✓ Continuous flow monitoring
   - ✓ Regular sewer cleaning and televising

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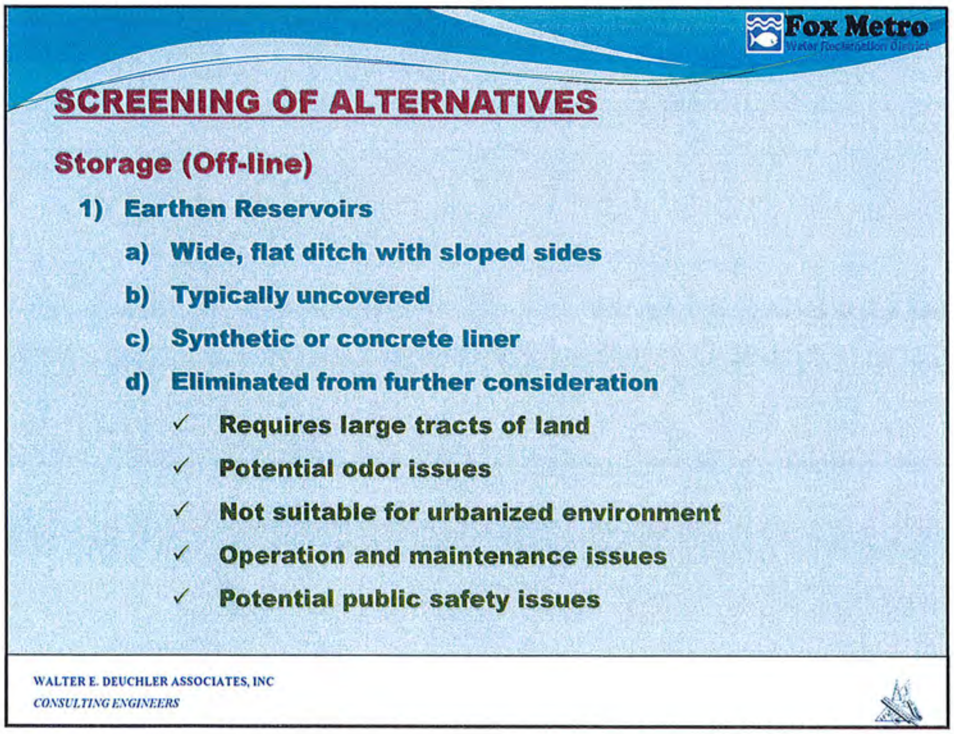

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SCREENING OF ALTERNATIVES

Storage (Off-line)

1) Earthen Reservoirs
   a) Wide, flat ditch with sloped sides
   b) Typically uncovered
   c) Synthetic or concrete liner
   d) Eliminated from further consideration
      - ✓ Requires large tracts of land
      - ✓ Potential odor issues
      - ✓ Not suitable for urbanized environment
      - ✓ Operation and maintenance issues
      - ✓ Potential public safety issues

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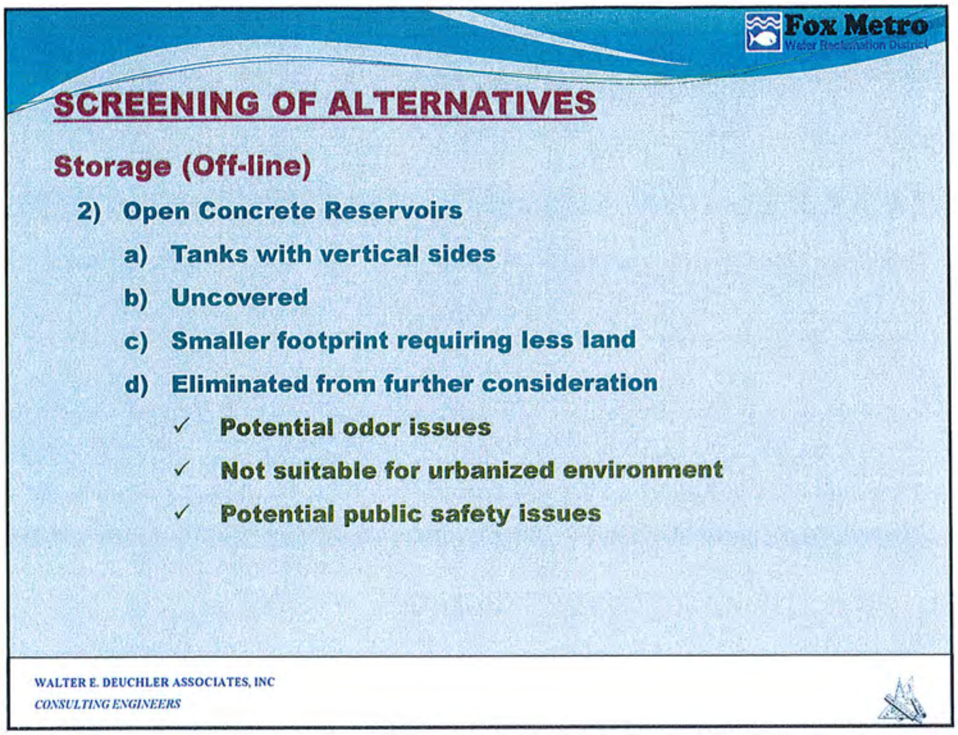

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SCREENING OF ALTERNATIVES

Storage (Off-line)

2) Open Concrete Reservoirs
   a) Tanks with vertical sides
   b) Uncovered
   c) Smaller footprint requiring less land
   d) Eliminated from further consideration
      - ✓ Potential odor issues
      - ✓ Not suitable for urbanized environment
      - ✓ Potential public safety issues

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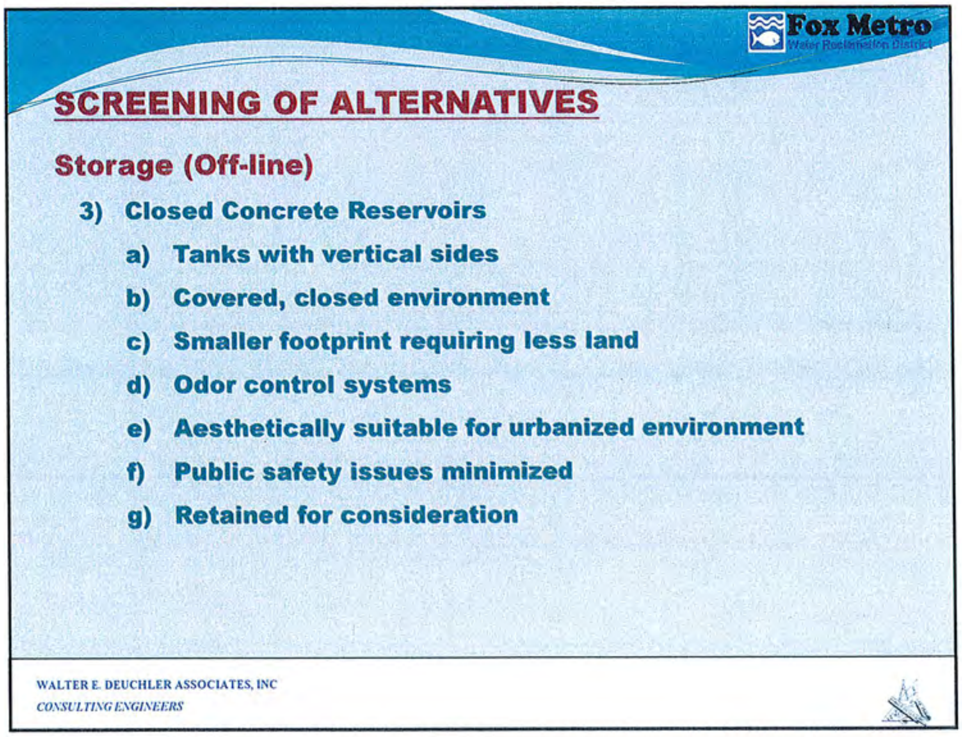

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SCREENING OF ALTERNATIVES

Storage (Off-line)

3) Closed Concrete Reservoirs
   a) Tanks with vertical sides
   b) Covered, closed environment
   c) Smaller footprint requiring less land
   d) Odor control systems
   e) Aesthetically suitable for urbanized environment
   f) Public safety issues minimized
   g) Retained for consideration

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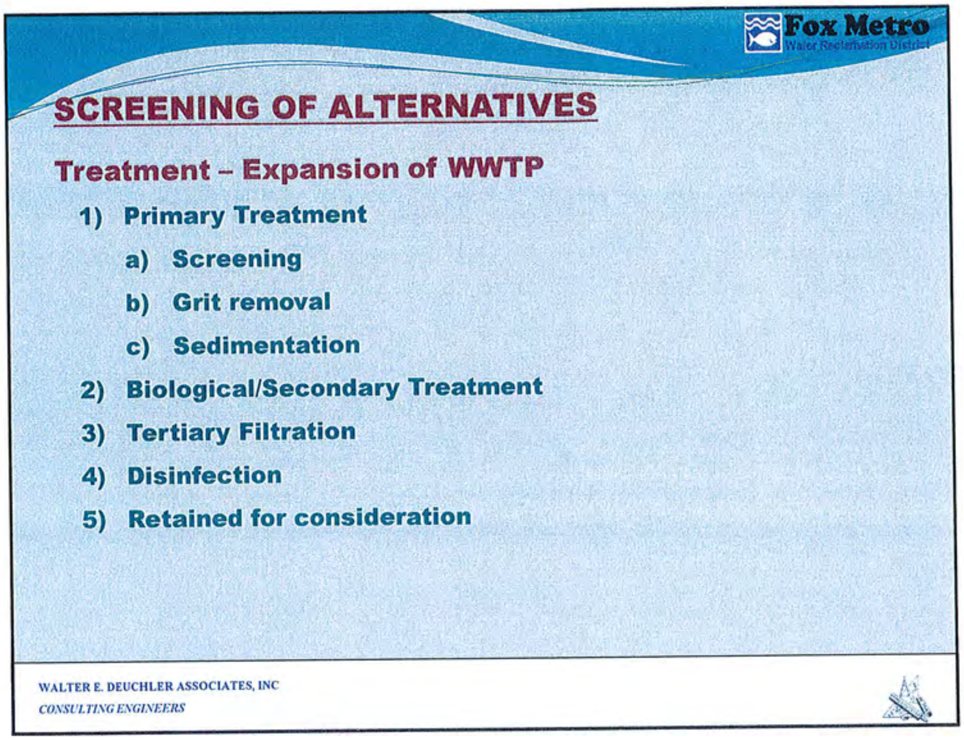

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SCREENING OF ALTERNATIVES

Treatment – Expansion of WWTP

1) Primary Treatment
    a) Screening
    b) Grit removal
    c) Sedimentation
2) Biological/Secondary Treatment
3) Tertiary Filtration
4) Disinfection
5) Retained for consideration

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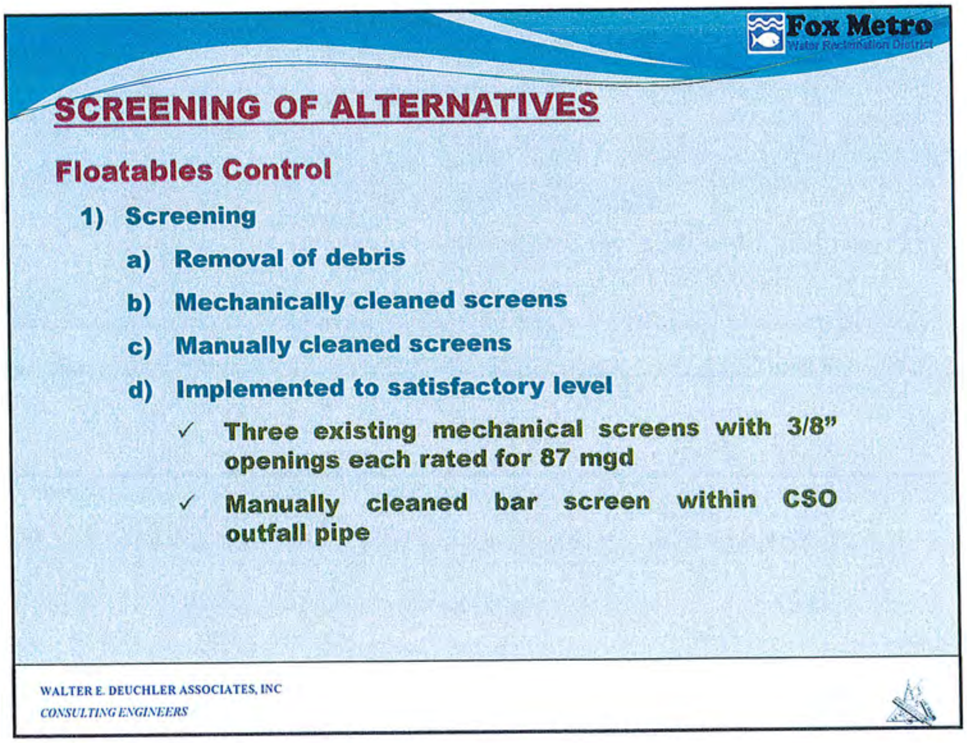

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SCREENING OF ALTERNATIVES

Floatables Control

1) Screening
    a) Removal of debris
    b) Mechanically cleaned screens
    c) Manually cleaned screens
    d) Implemented to satisfactory level
        - ✓ Three existing mechanical screens with 3/8" openings each rated for 87 mgd
        - ✓ Manually cleaned bar screen within CSO outfall pipe

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SCREENING OF ALTERNATIVES

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Summary of Screening of CSO Control Technologies

CSO Control Technology	Retained for Consideration	Implemented to Satisfactory Level	Eliminated from Further Consideration	Consideration by Others
Source Control				
Public Education		X		
Combined Sewer Flushing			X	
Inflow Control				
Water Conservation		X		
I&I Reduction	X			
Sewer Separation				
Rain Leader Disconnection		X		
Partial Separation				X
Complete Separation				X
Sewer System Optimization				
Optimize Existing System		X		
Storage				
Earthen Reservoirs			X	
Open Concrete Reservoirs			X	
Closed Concrete Reservoirs	X			
Treatment – Expansion of WWTP				
Primary Treatment	X			
Biological/Secondary Treatment	X			
Tertiary Filtration	X			
Disinfection	X			
Floatables Control				
Screening		X		

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DEVELOPMENT OF ALTERNATIVES

Inflow Control vs. Storage vs. Treatment - 2005 Wet Weather Facilities Study

1) **Inflow Control**
    a) **I&I reduction at WWTP via sewer rehabilitation**
2) **Storage**
    a) **I&I reduction at WWTP via peak attenuation**
3) **Treatment**
    a) **Transport and Treat I&I at WWTP**

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DEVELOPMENT OF ALTERNATIVES

Inflow Control vs. Storage vs. Treatment

COST-EFFECTIVE SUMMARY
2005 – WET WEATHER FACILITIES STUDY

	Option 1	Option 2	**Option 3**
	Sewer Rehab	Transport and Treat	**Flow EQ Storage Basins**
Capital Cost	$93,669,695	$527,940,452	$47,091,460
Present Worth of O&M Costs	$0	$3,165,979	$1,628,477
Present Worth of Salvage Costs	($5,024,166)	($46,928,134)	($3,532,999)
Total Present Worth	$88,645,529	$481,012,318	$45,186,938
Average Annual Equivalent Cost	$9,028,743	$48,992,167	**$4,602,389**

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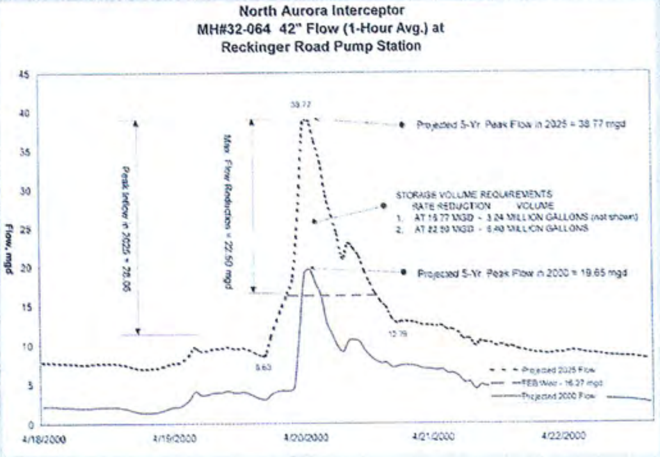
DEVELOPMENT OF ALTERNATIVES

Storage – Peak Attenuation



North Aurora Interceptor
MH#32-064 42" Flow (1-Hour Avg.) at
Reckinger Road Pump Station

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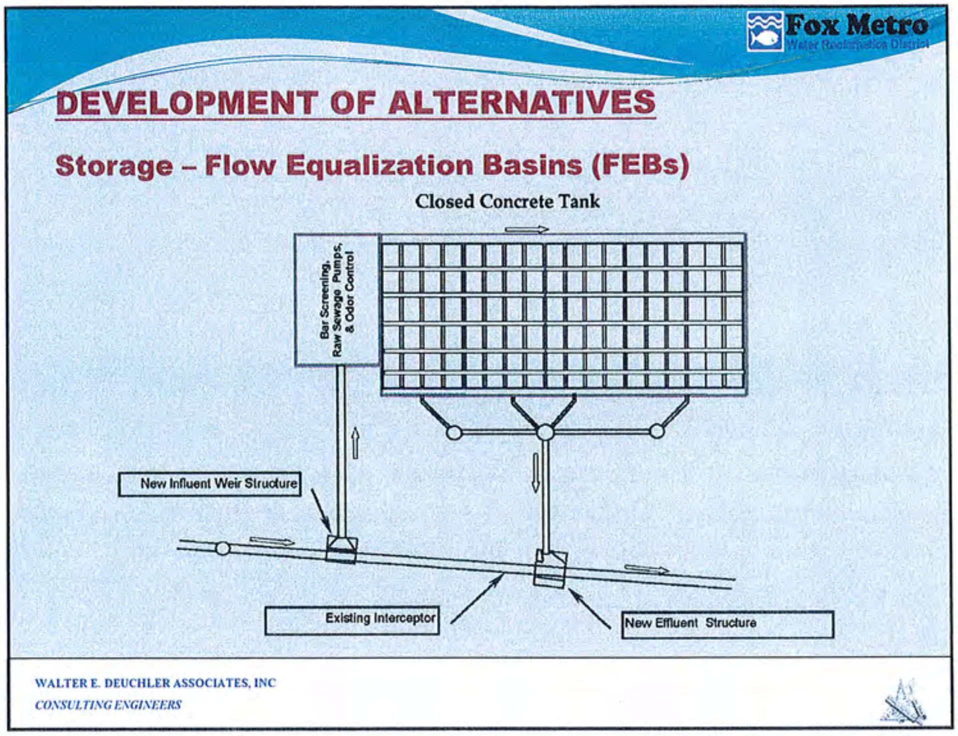

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DEVELOPMENT OF ALTERNATIVES

Storage – Flow Equalization Basins (FEBs)

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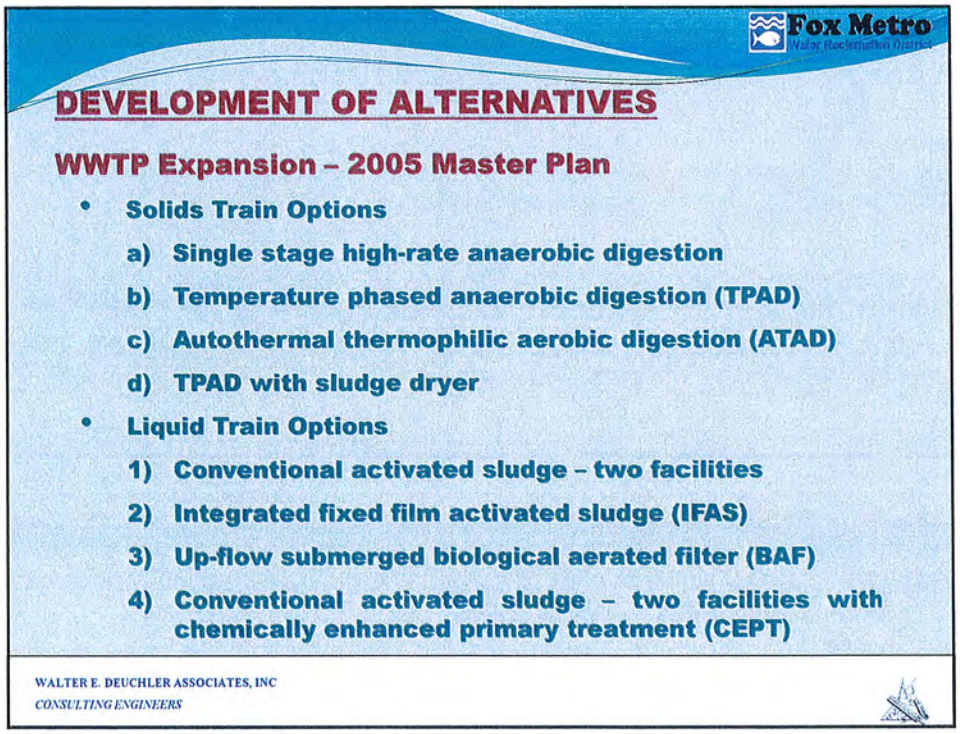

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DEVELOPMENT OF ALTERNATIVES

WWTP Expansion – 2005 Master Plan

- **Solids Train Options**
  - a) Single stage high-rate anaerobic digestion
  - b) Temperature phased anaerobic digestion (TPAD)
  - c) Autothermal thermophilic aerobic digestion (ATAD)
  - d) TPAD with sludge dryer
- **Liquid Train Options**
  - 1) Conventional activated sludge – two facilities
  - 2) Integrated fixed film activated sludge (IFAS)
  - 3) Up-flow submerged biological aerated filter (BAF)
  - 4) Conventional activated sludge – two facilities with chemically enhanced primary treatment (CEPT)

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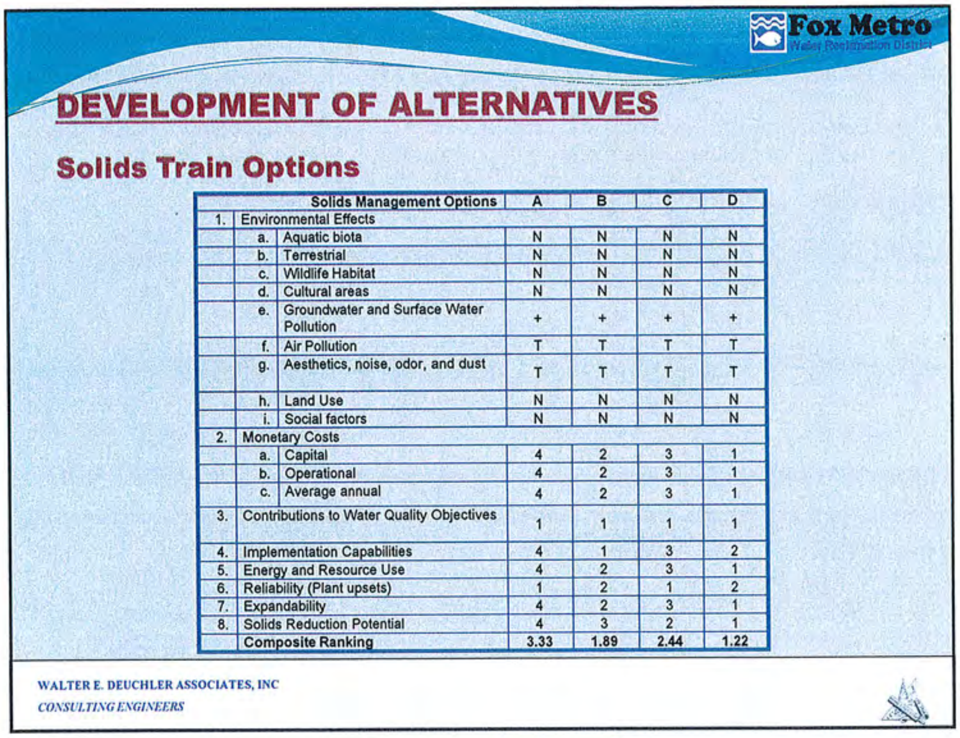

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DEVELOPMENT OF ALTERNATIVES

Solids Train Options

		Solids Management Options	A	B	C	D
1.	Environmental Effects					
	a.	Aquatic biota	N	N	N	N
	b.	Terrestrial	N	N	N	N
	c.	Wildlife Habitat	N	N	N	N
	d.	Cultural areas	N	N	N	N
	e.	Groundwater and Surface Water Pollution	+	+	+	+
	f.	Air Pollution	T	T	T	T
	g.	Aesthetics, noise, odor, and dust	T	T	T	T
	h.	Land Use	N	N	N	N
	i.	Social factors	N	N	N	N
2.	Monetary Costs					
	a.	Capital	4	2	3	1
	b.	Operational	4	2	3	1
	c.	Average annual	4	2	3	1
3.	Contributions to Water Quality Objectives		1	1	1	1
4.	Implementation Capabilities		4	1	3	2
5.	Energy and Resource Use		4	2	3	1
6.	Reliability (Plant upsets)		1	2	1	2
7.	Expandability		4	2	3	1
8.	Solids Reduction Potential		4	3	2	1
	Composite Ranking		**3.33**	**1.89**	**2.44**	**1.22**

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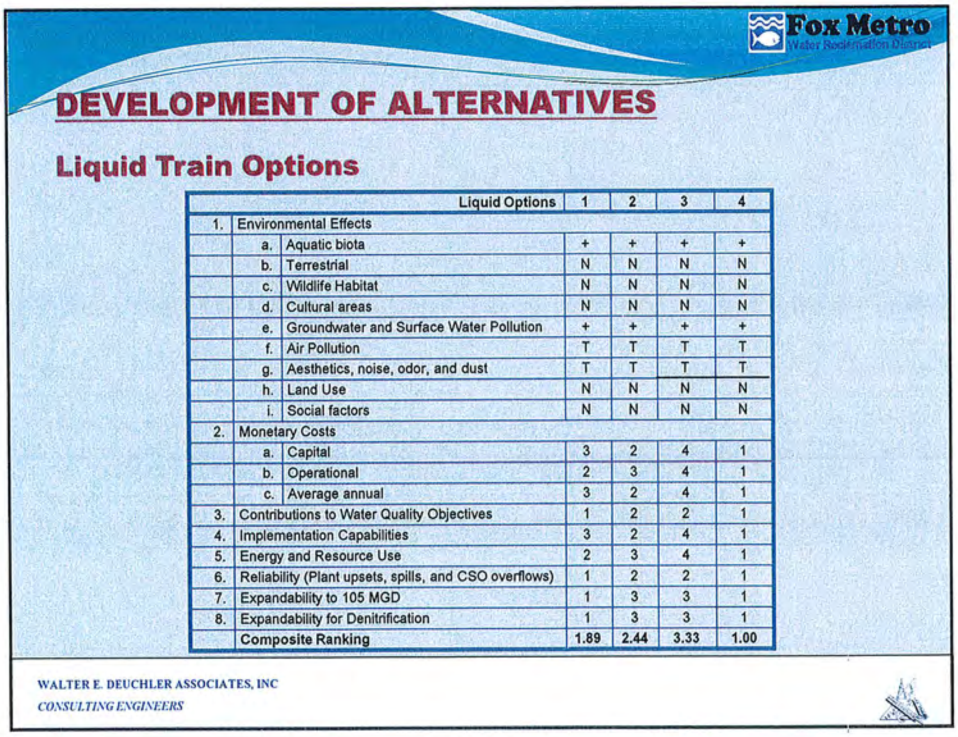

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DEVELOPMENT OF ALTERNATIVES

Liquid Train Options

		Liquid Options	1	2	3	4
1.	Environmental Effects					
	a.	Aquatic biota	+	+	+	+
	b.	Terrestrial	N	N	N	N
	c.	Wildlife Habitat	N	N	N	N
	d.	Cultural areas	N	N	N	N
	e.	Groundwater and Surface Water Pollution	+	+	+	+
	f.	Air Pollution	T	T	T	T
	g.	Aesthetics, noise, odor, and dust	T	T	T	T
	h.	Land Use	N	N	N	N
	i.	Social factors	N	N	N	N
2.	Monetary Costs					
	a.	Capital	3	2	4	1
	b.	Operational	2	3	4	1
	c.	Average annual	3	2	4	1
3.	Contributions to Water Quality Objectives		1	2	2	1
4.	Implementation Capabilities		3	2	4	1
5.	Energy and Resource Use		2	3	4	1
6.	Reliability (Plant upsets, spills, and CSO overflows)		1	2	2	1
7.	Expandability to 105 MGD		1	3	3	1
8.	Expandability for Denitrification		1	3	3	1
	Composite Ranking		**1.89**	**2.44**	**3.33**	**1.00**

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DEVELOPMENT OF ALTERNATIVES

2005 Master Plan Conclusions

1) Option D – Solids Processing selected for implementation
    - a) Most cost-effective alternative
    - b) Destroys up to 55% of Volatile Solids
    - c) Produces Class A sludge
    - d) Reduces volume of biosolids
2) Option 4 – Liquid Processing selected for implementation
    - a) Most cost-effective alternative
    - b) Most flexible process layout
    - c) Least disruptive to existing facilities
    - d) Least energy intensive
    - e) Reliable proven technology

QUESTIONS...

CSO LTCP
CAC MEETING #7

Recommended LTCP

March 23, 2010

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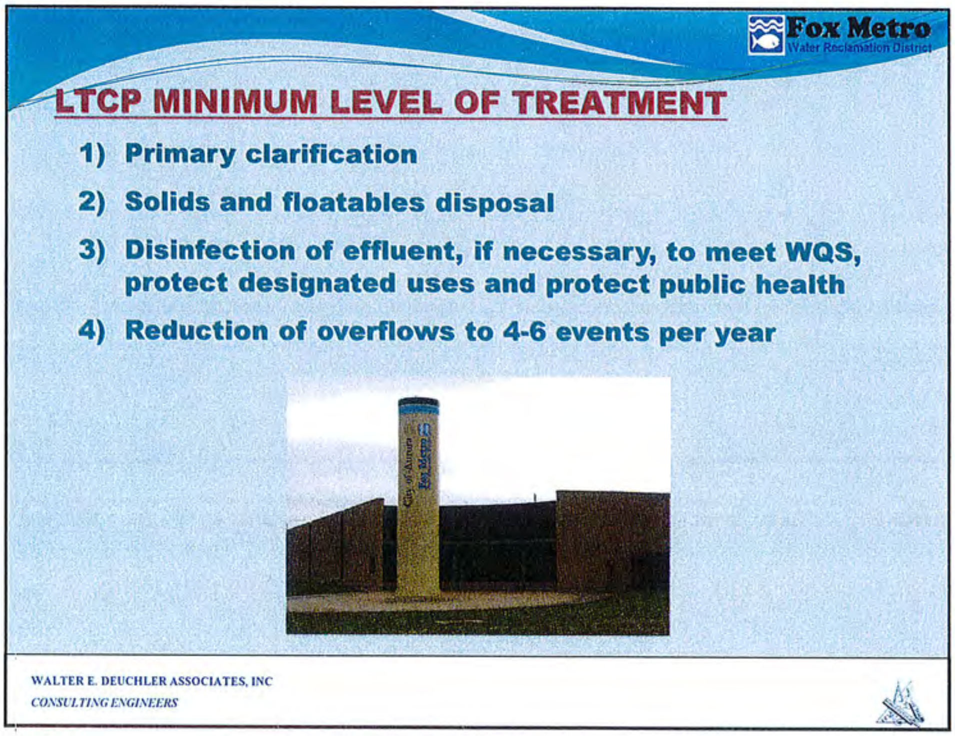

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LTCP MINIMUM LEVEL OF TREATMENT

1) Primary clarification
2) Solids and floatables disposal
3) Disinfection of effluent, if necessary, to meet WQS, protect designated uses and protect public health
4) Reduction of overflows to 4-6 events per year

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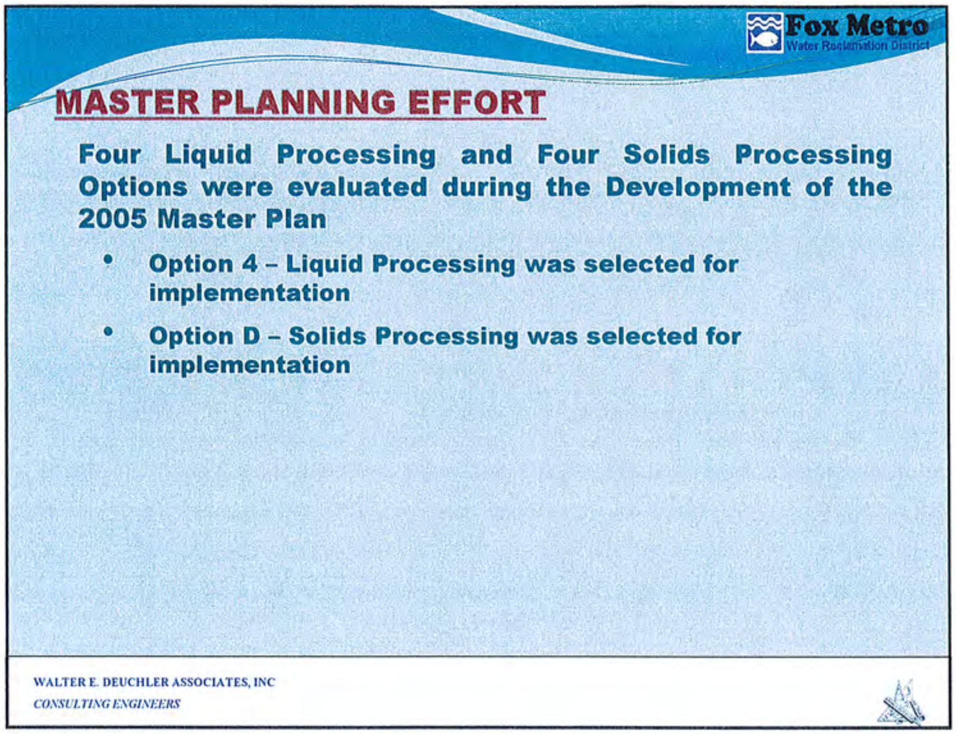
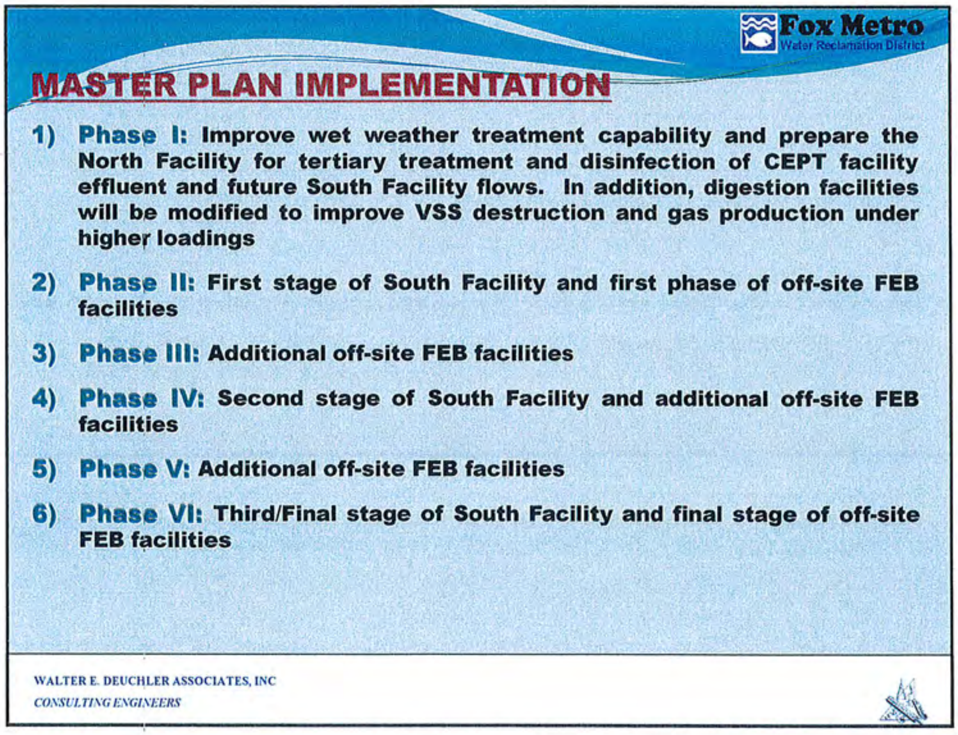


MASTER PLANNING EFFORT

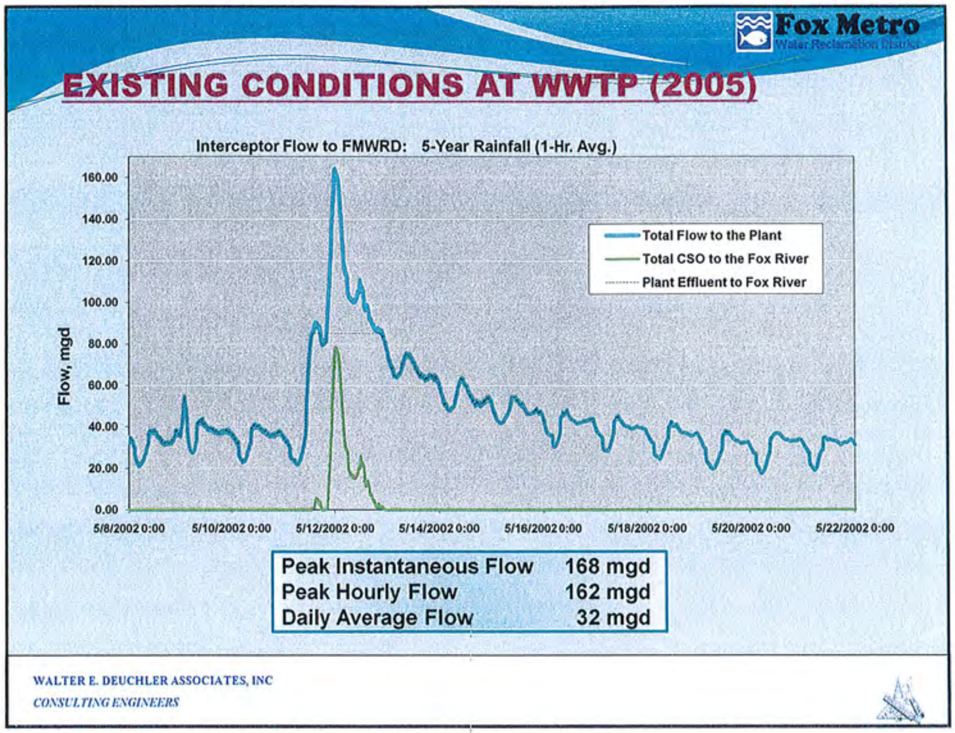
Four Liquid Processing and Four Solids Processing Options were evaluated during the Development of the 2005 Master Plan

- **Option 4 – Liquid Processing was selected for implementation**
- **Option D – Solids Processing was selected for implementation**



MASTER PLAN IMPLEMENTATION

1) **Phase I:** **Improve wet weather treatment capability and prepare the North Facility for tertiary treatment and disinfection of CEPT facility effluent and future South Facility flows. In addition, digestion facilities will be modified to improve VSS destruction and gas production under higher loadings**
2) **Phase II:** **First stage of South Facility and first phase of off-site FEB facilities**
3) **Phase III:** **Additional off-site FEB facilities**
4) **Phase IV:** **Second stage of South Facility and additional off-site FEB facilities**
5) **Phase V:** **Additional off-site FEB facilities**
6) **Phase VI:** **Third/Final stage of South Facility and final stage of off-site FEB facilities**



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EXISTING CONDITIONS AT WWTP (2005)

Interceptor Flow to FMWRD: 5-Year Rainfall (1-Hr. Avg.)

Peak Instantaneous Flow	168 mgd
Peak Hourly Flow	162 mgd
Daily Average Flow	32 mgd

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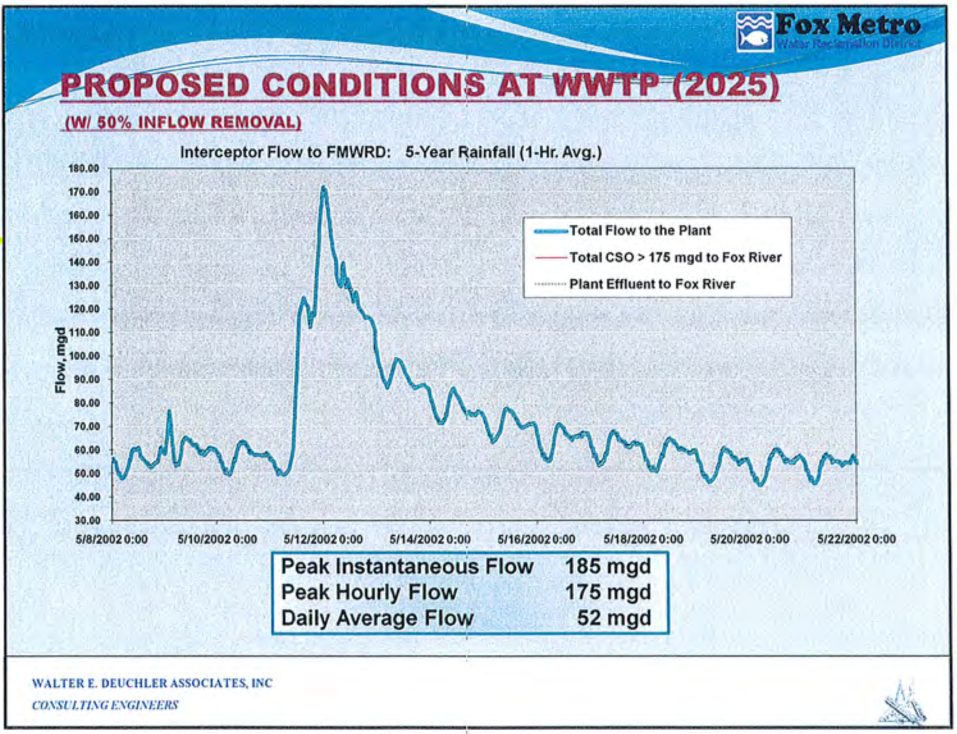

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PROPOSED CONDITIONS AT WWTP (2025)

(W/ 50% INFLOW REMOVAL)

Interceptor Flow to FMWRD: 5-Year Rainfall (1-Hr. Avg.)

Peak Instantaneous Flow	185 mgd
Peak Hourly Flow	175 mgd
Daily Average Flow	52 mgd

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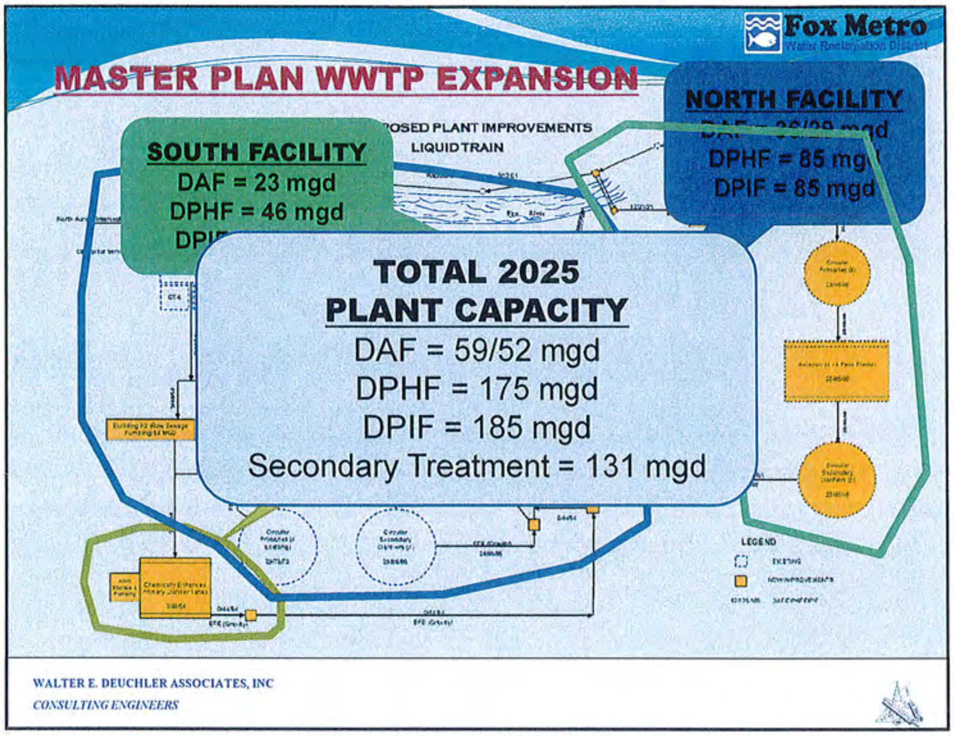

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MASTER PLAN WWTP EXPANSION

SOUTH FACILITY
DAF = 23 mgd
DPHF = 46 mgd
DPI

NORTH FACILITY
DAF = 36/29 mgd
DPHF = 85 mg
DPIF = 85 mgd

TOTAL 2025
PLANT CAPACITY
DAF = 59/52 mgd
DPHF = 175 mgd
DPIF = 185 mgd
Secondary Treatment = 131 mgd

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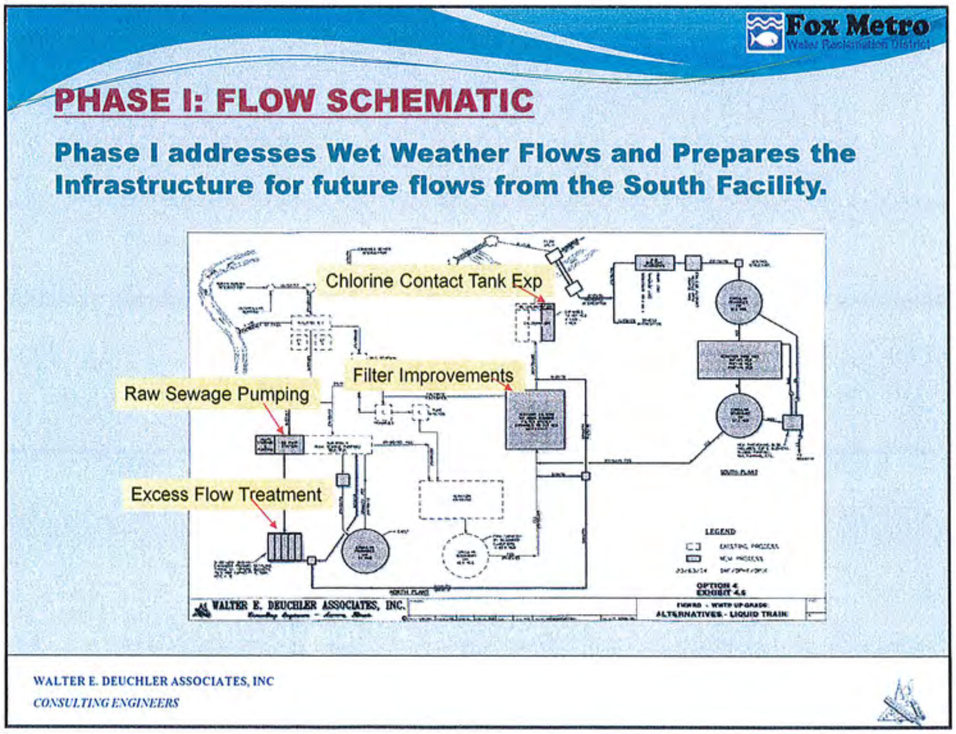

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PHASE I: FLOW SCHEMATIC

Phase I addresses Wet Weather Flows and Prepares the Infrastructure for future flows from the South Facility.

Chlorine Contact Tank Exp

Filter Improvements

Raw Sewage Pumping

Excess Flow Treatment

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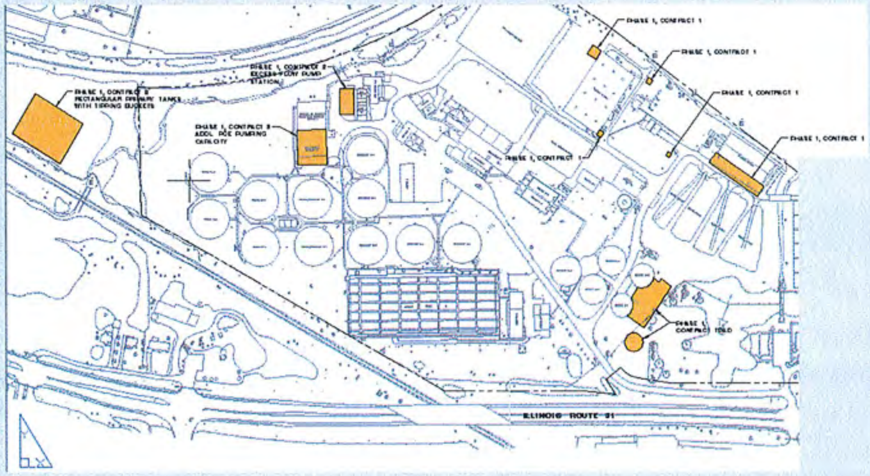
PHASE I: MULTIPLE CONTRACTS



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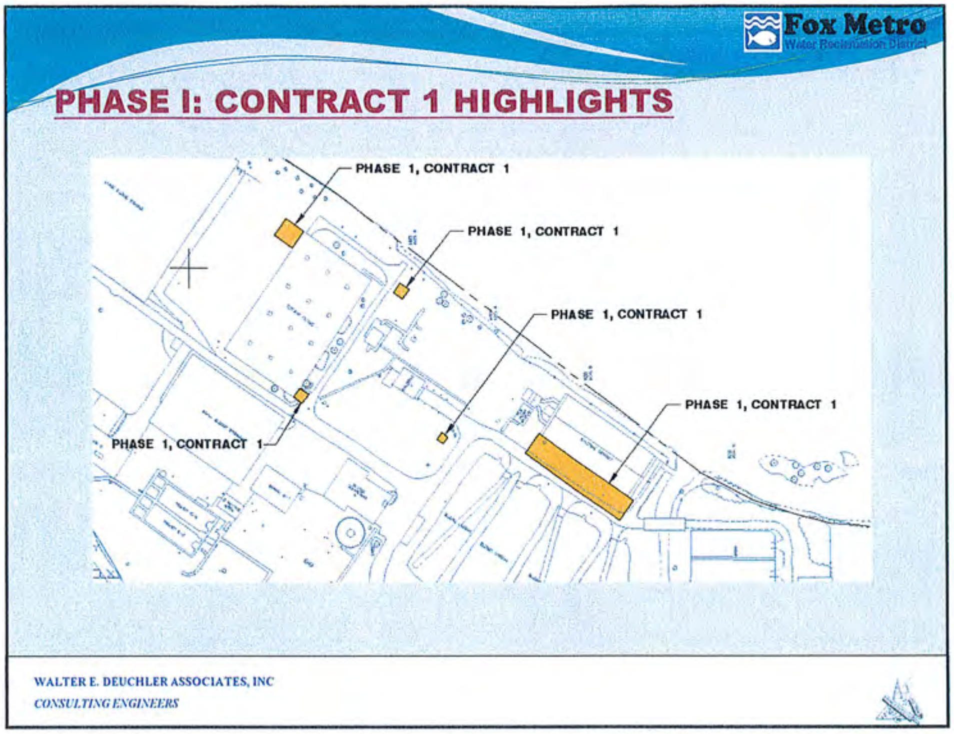
CONTRACT 1 OF PHASE I OF THE MASTER PLAN

A. Disinfection Improvements – Treatment of up to 185 mgd
   a. 85 mgd from Existing North Facilities
   b. 46 mgd from Future South Facilities (Phase II)
   c. 54 mgd from Future Excess Flow Facilities (Contract 3, Phase 1)

B. K(2) Pump Station – Pumps to Future Excess Flow Facilities
   a. Four 225 HP Pumps
   b. Also provides additional flexibility to off-load K Pump Station in event of a problem

C. Tertiary Filter Hydraulic Improvements to increase capacity from 85 mgd to direct flows to and around building up to 185 mgd



PHASE I: CONTRACT 1 HIGHLIGHTS

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PHASE I: CONTRACT 1 HIGHLIGHTS

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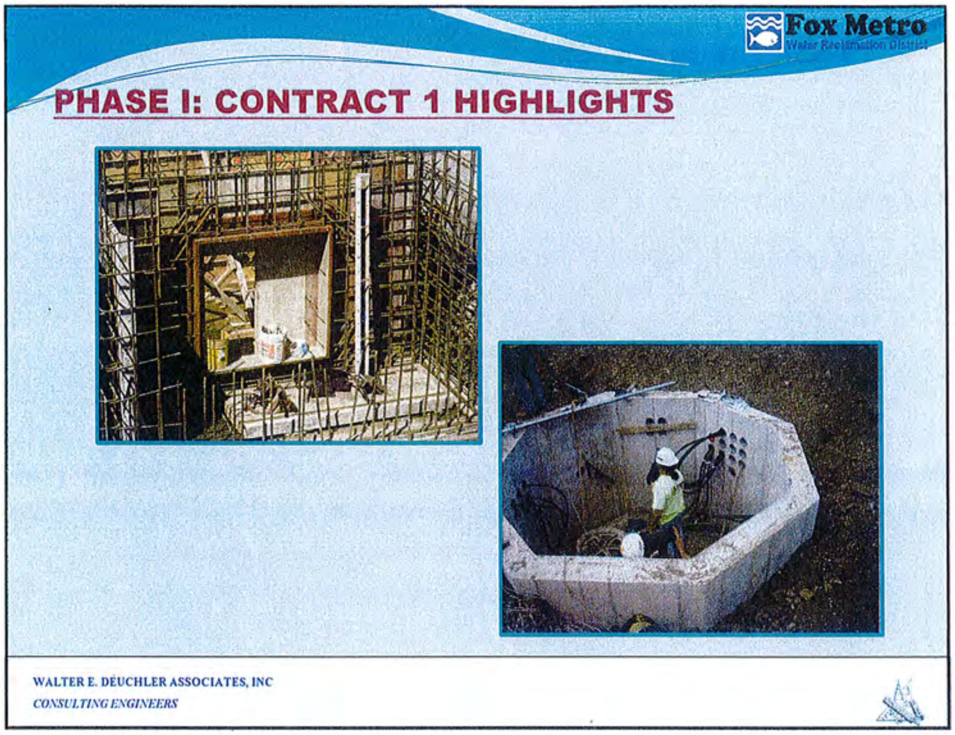

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PHASE I: CONTRACT 1 HIGHLIGHTS

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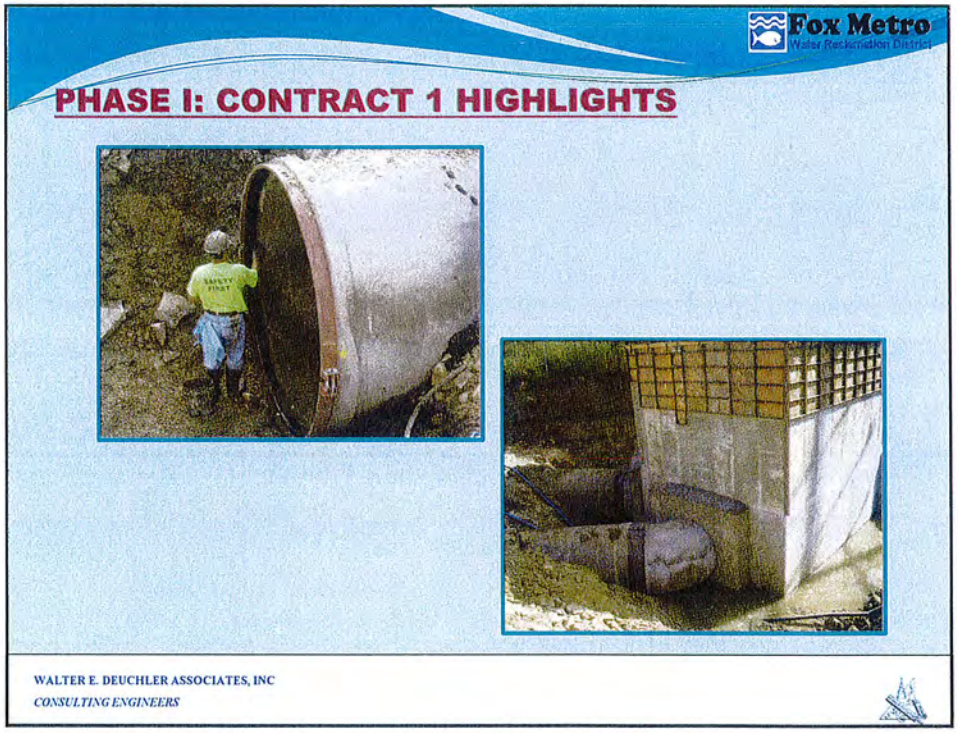

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PHASE I: CONTRACT 1 HIGHLIGHTS

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PHASE I: CONTRACT 1 HIGHLIGHTS

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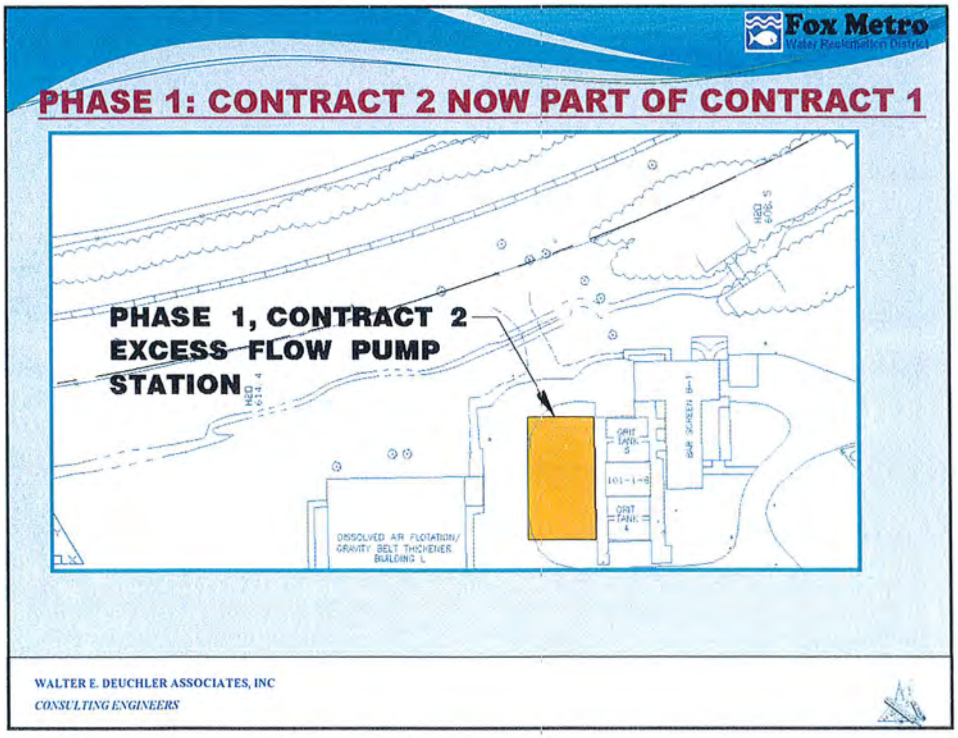

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PHASE 1: CONTRACT 2 NOW PART OF CONTRACT 1

PHASE 1, CONTRACT 2
EXCESS FLOW PUMP
STATION

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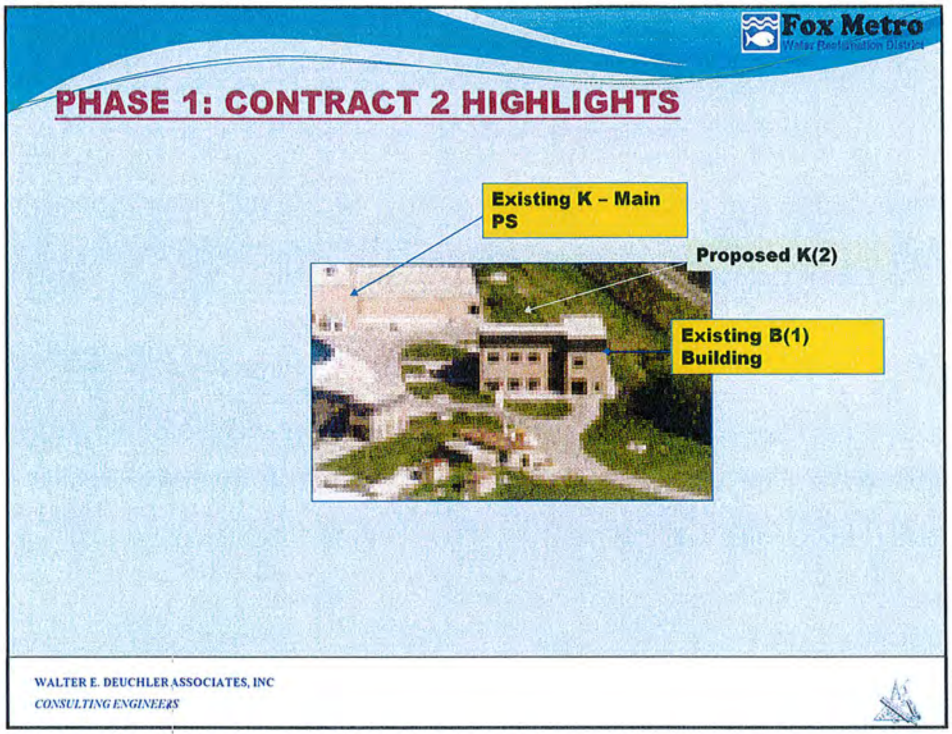

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PHASE 1: CONTRACT 2 HIGHLIGHTS

Existing K – Main PS

Proposed K(2)

Existing B(1) Building

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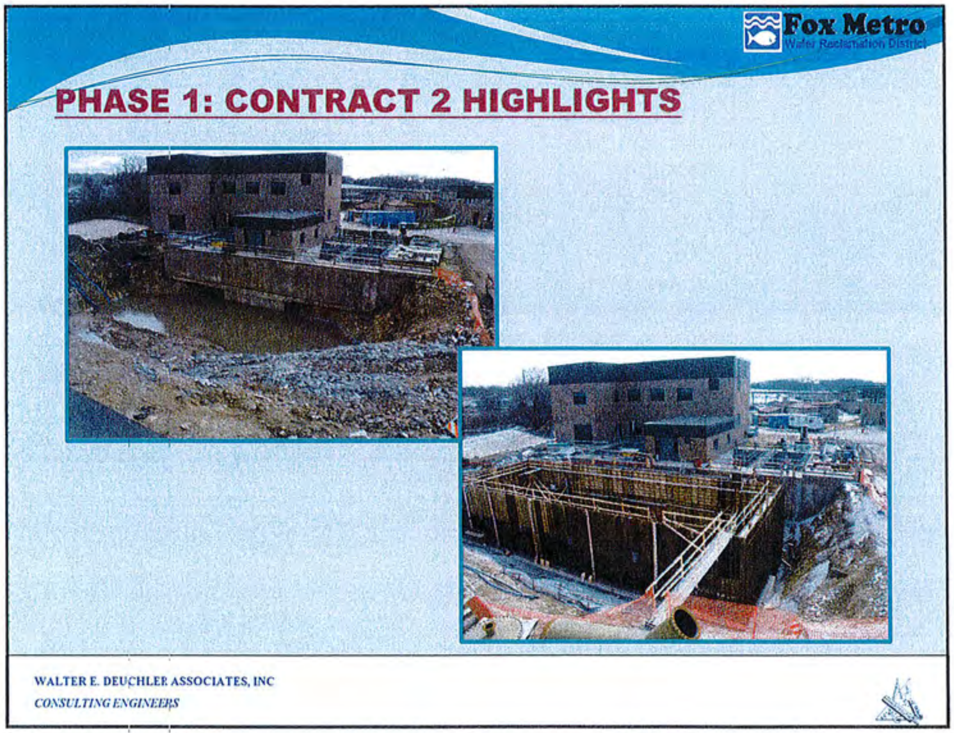

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PHASE 1: CONTRACT 2 HIGHLIGHTS

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PHASE 1: CONTRACT 3 HIGHLIGHTS

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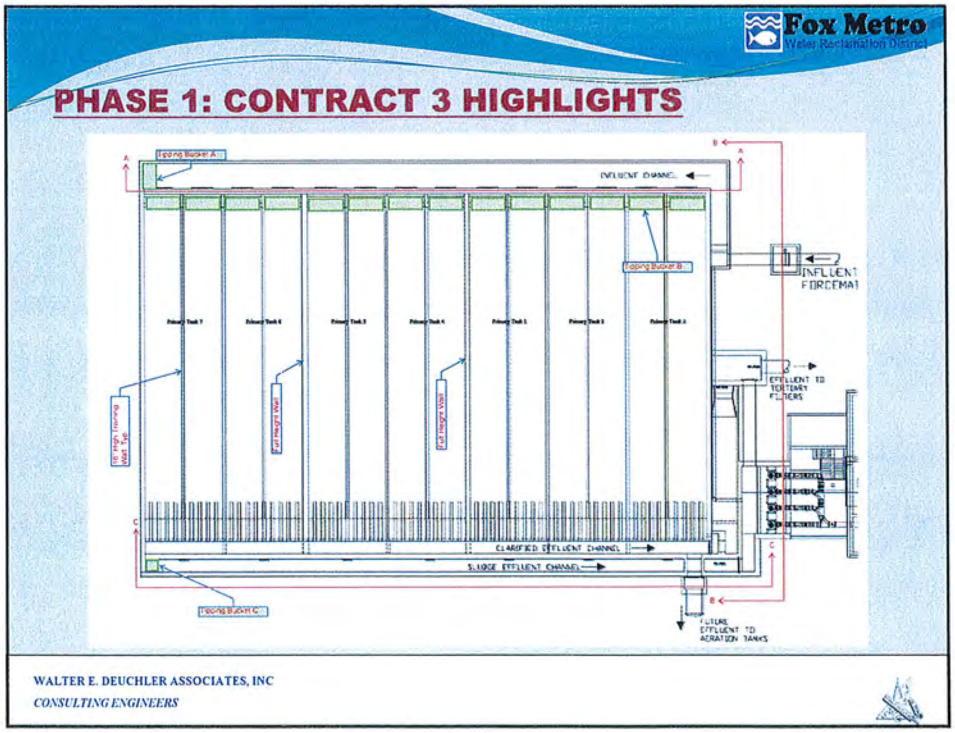

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PHASE 1: CONTRACT 3 HIGHLIGHTS

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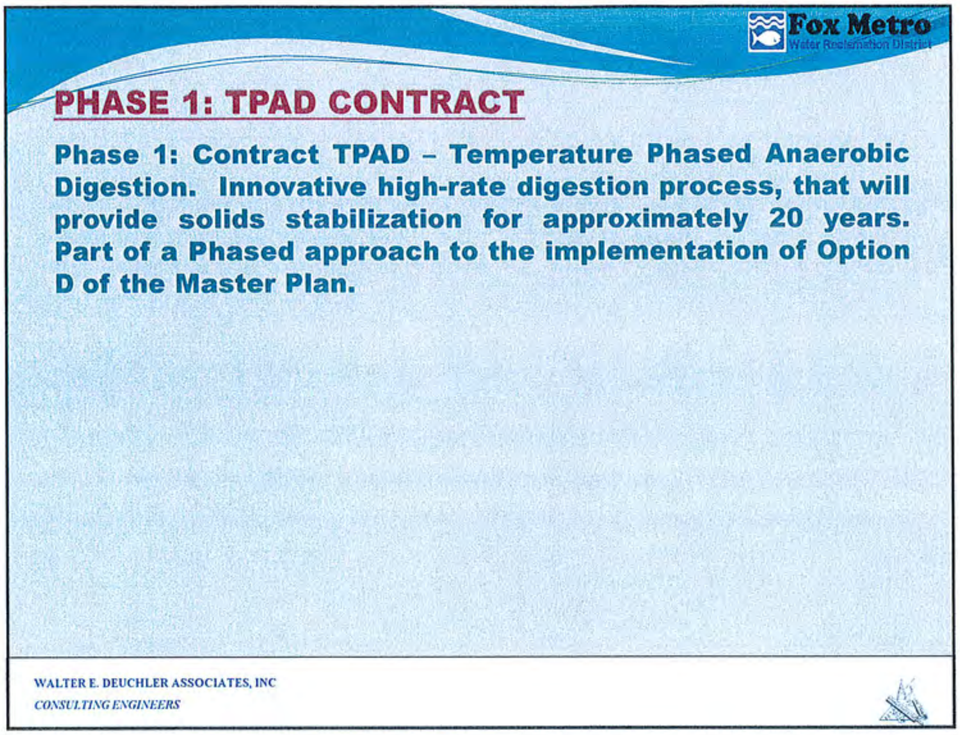

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PHASE 1: TPAD CONTRACT

Phase 1: Contract TPAD – Temperature Phased Anaerobic Digestion. Innovative high-rate digestion process, that will provide solids stabilization for approximately 20 years. Part of a Phased approach to the implementation of Option D of the Master Plan.

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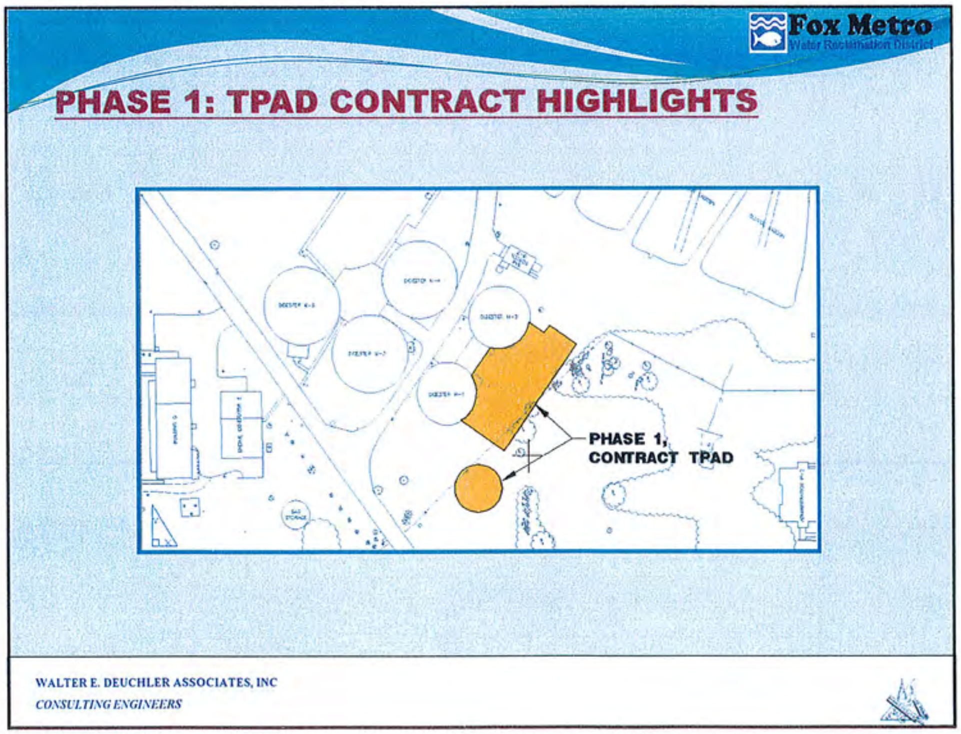

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PHASE 1: TPAD CONTRACT HIGHLIGHTS

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PHASE 1: TPAD CONTRACT HIGHLIGHTS

TPAD CONTROL BUILDING AND IMS TANK

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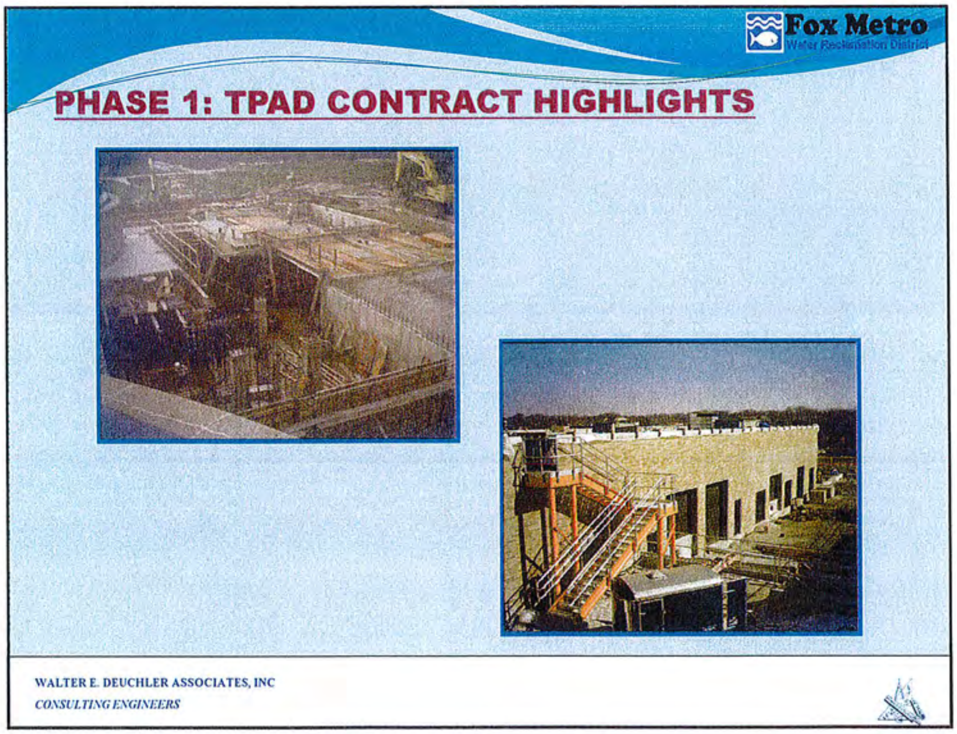

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PHASE 1: TPAD CONTRACT HIGHLIGHTS

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PHASE 1: TPAD CONTRACT HIGHLIGHTS

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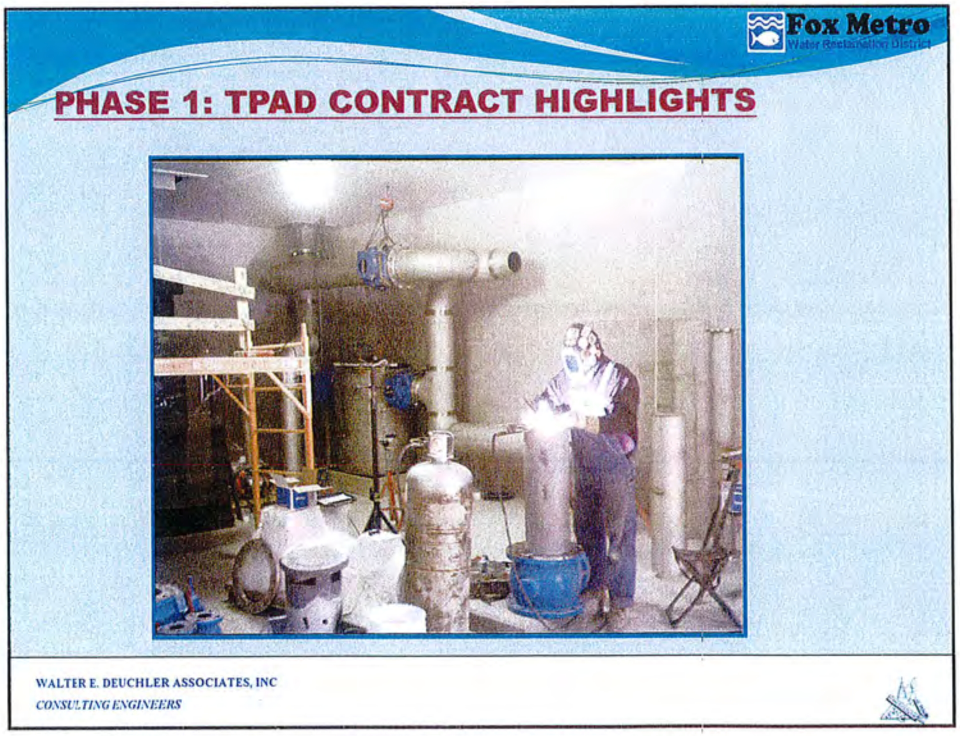

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PHASE 1: TPAD CONTRACT HIGHLIGHTS

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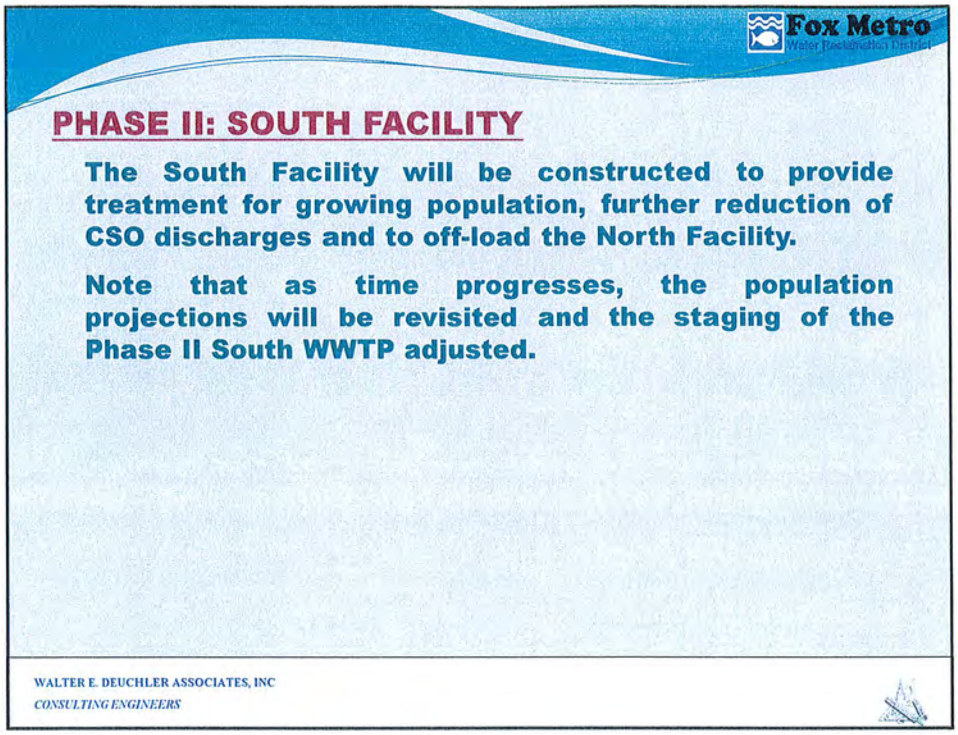

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PHASE II: SOUTH FACILITY

The South Facility will be constructed to provide treatment for growing population, further reduction of CSO discharges and to off-load the North Facility.

Note that as time progresses, the population projections will be revisited and the staging of the Phase II South WWTP adjusted.

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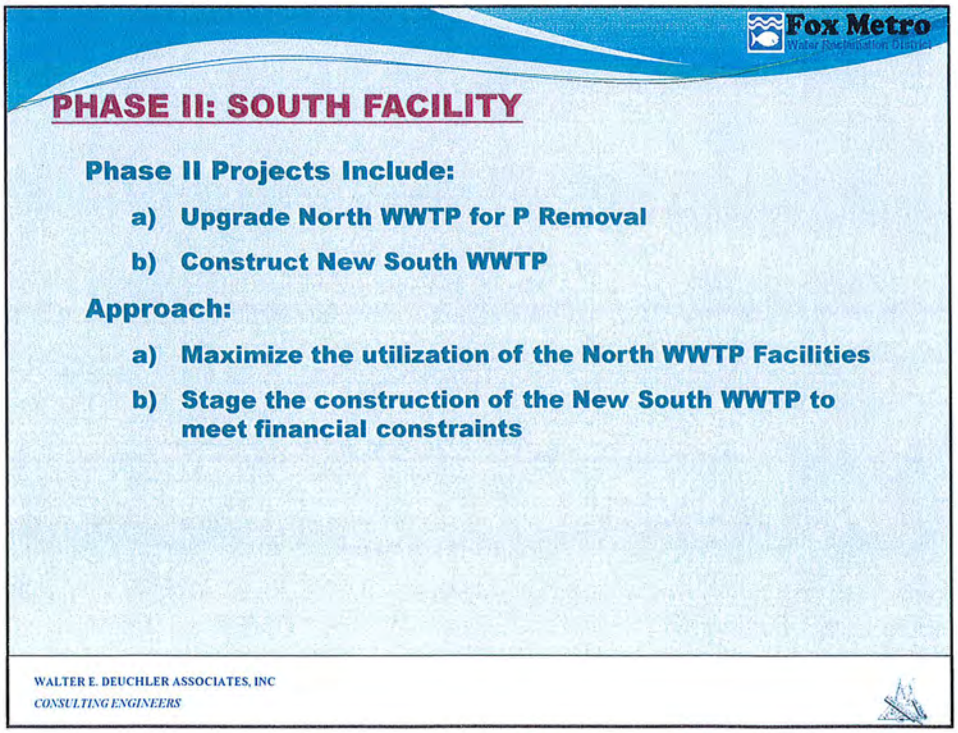

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PHASE II: SOUTH FACILITY

Phase II Projects Include:

a) Upgrade North WWTP for P Removal

b) Construct New South WWTP

Approach:

a) Maximize the utilization of the North WWTP Facilities

b) Stage the construction of the New South WWTP to meet financial constraints

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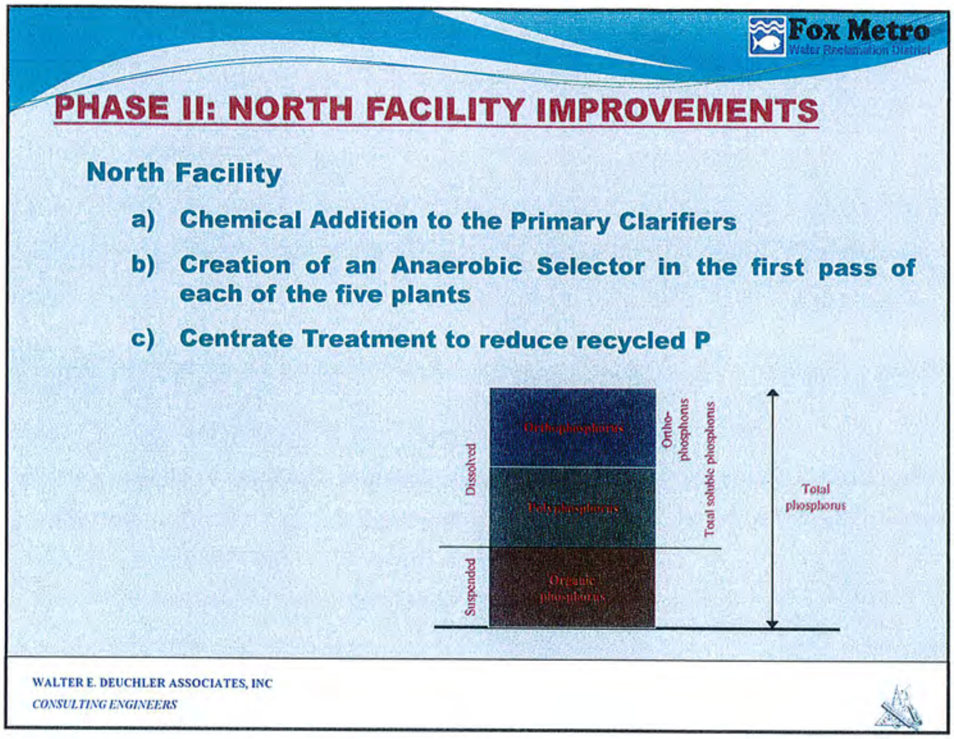

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PHASE II: NORTH FACILITY IMPROVEMENTS

North Facility

a) Chemical Addition to the Primary Clarifiers

b) Creation of an Anaerobic Selector in the first pass of each of the five plants

c) Centrate Treatment to reduce recycled P

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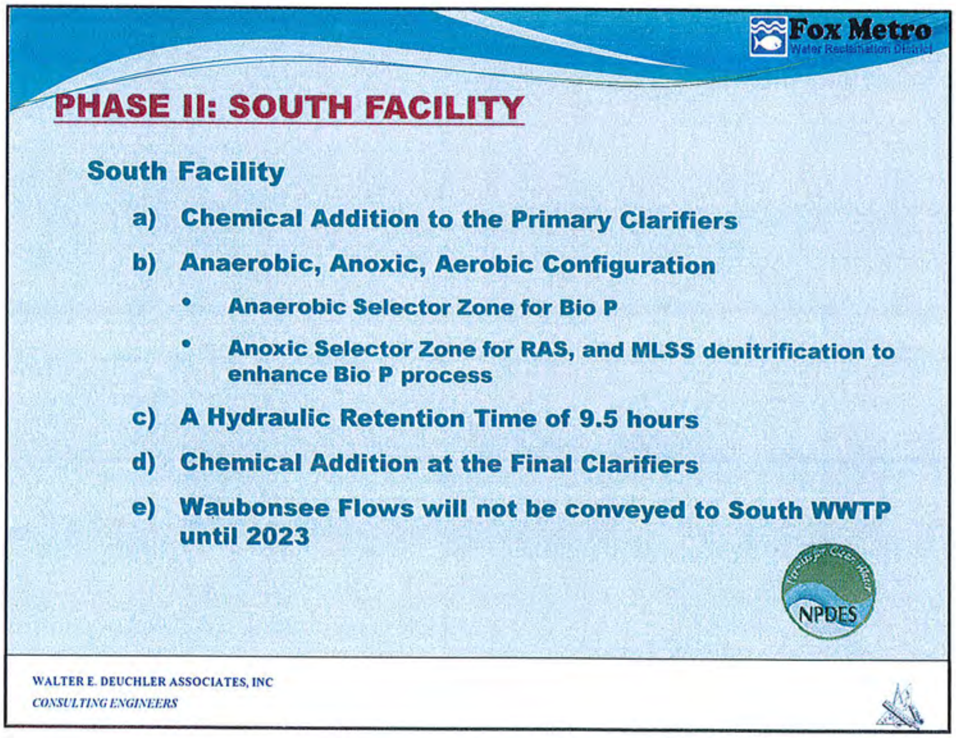

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PHASE II: SOUTH FACILITY

South Facility

a) Chemical Addition to the Primary Clarifiers

b) Anaerobic, Anoxic, Aerobic Configuration

- Anaerobic Selector Zone for Bio P
- Anoxic Selector Zone for RAS, and MLSS denitrification to enhance Bio P process

c) A Hydraulic Retention Time of 9.5 hours

d) Chemical Addition at the Final Clarifiers

e) Waubonsee Flows will not be conveyed to South WWTP until 2023

NPDES

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PHASE II: NORTH FACILITY

Aeration Tank Mods for P Removal

Sidestream Removal of P

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PHASE II: NEW SOUTH FACILITY

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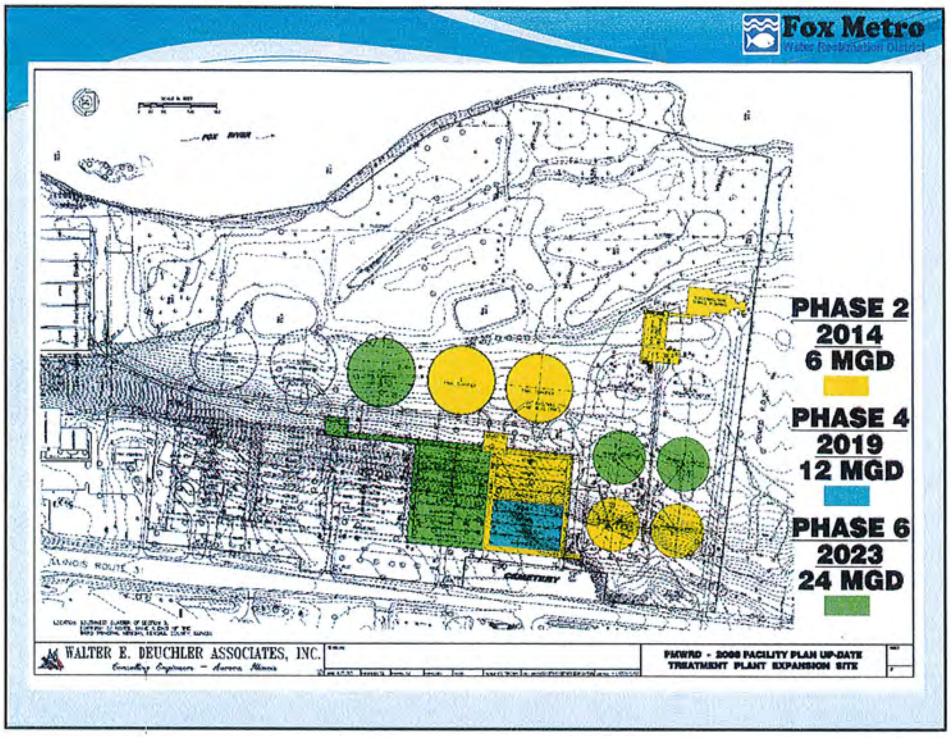
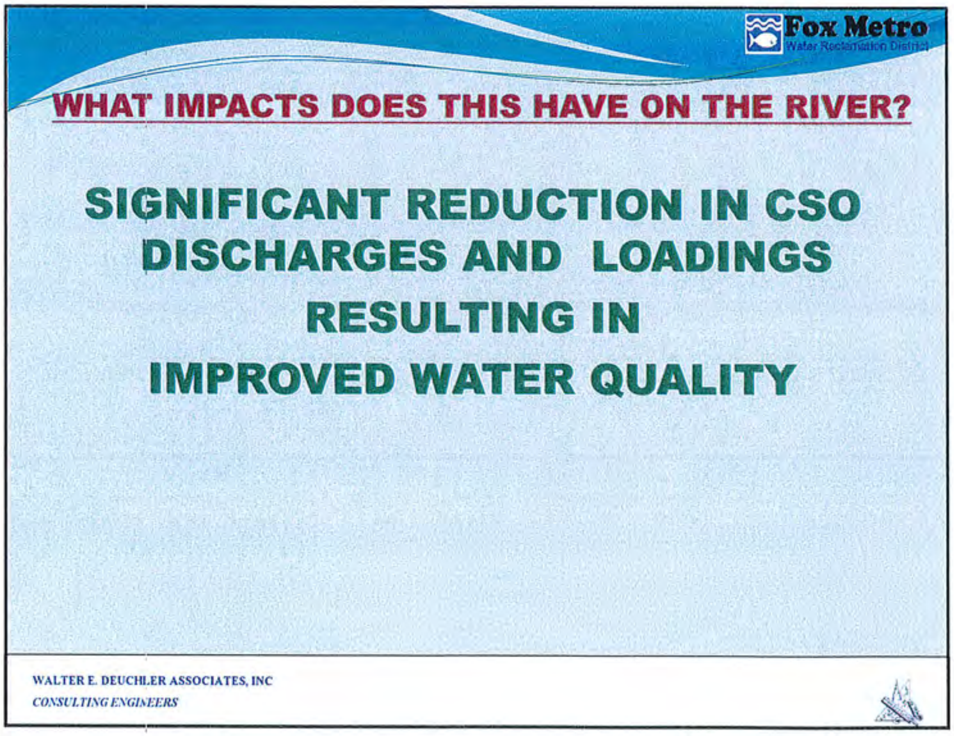


PHASE 2
2014
6 MGD
🟨

PHASE 4
2019
12 MGD
🟦

PHASE 6
2023
24 MGD
🟩



WHAT IMPACTS DOES THIS HAVE ON THE RIVER?

SIGNIFICANT REDUCTION IN CSO DISCHARGES AND LOADINGS RESULTING IN IMPROVED WATER QUALITY

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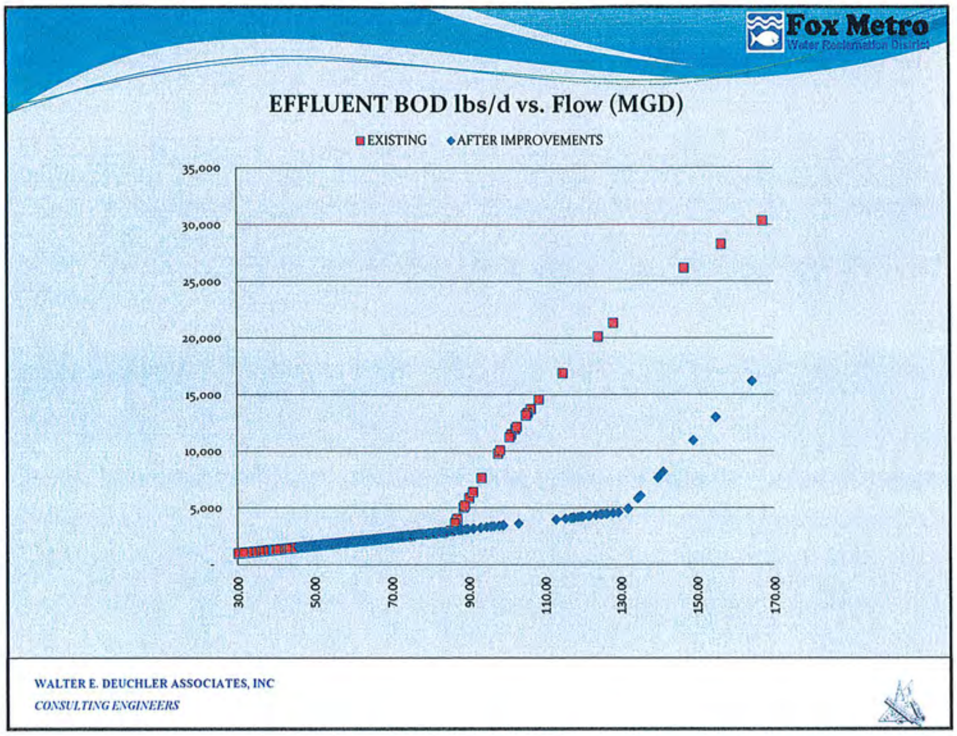

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EFFLUENT BOD lbs/d vs. Flow (MGD)

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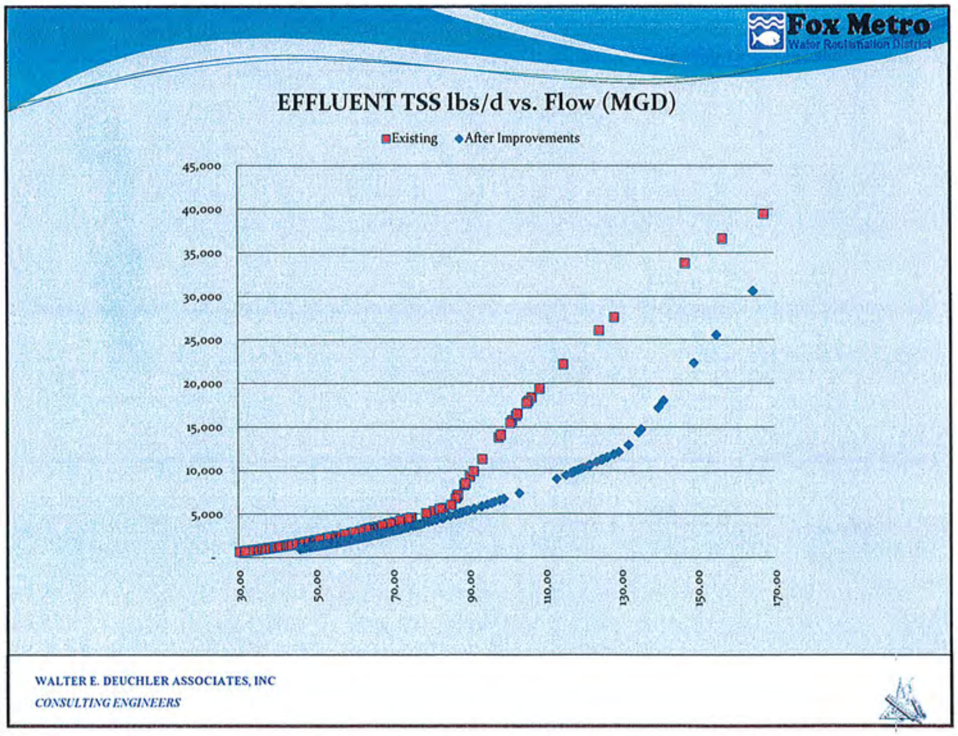

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EFFLUENT TSS lbs/d vs. Flow (MGD)

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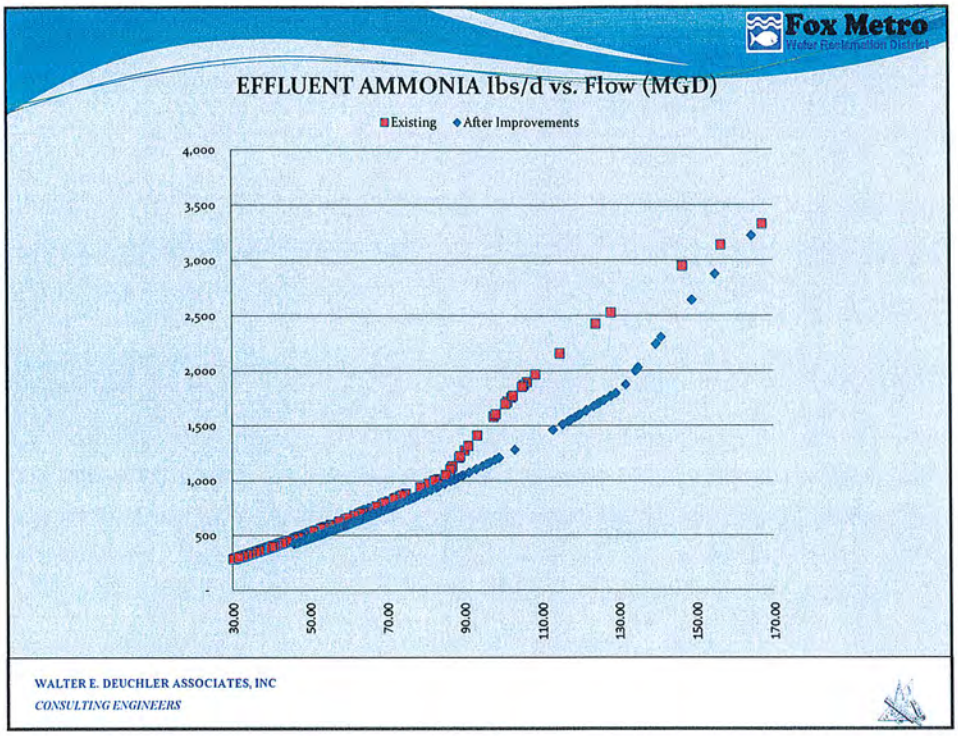

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EFFLUENT AMMONIA lbs/d vs. Flow (MGD)

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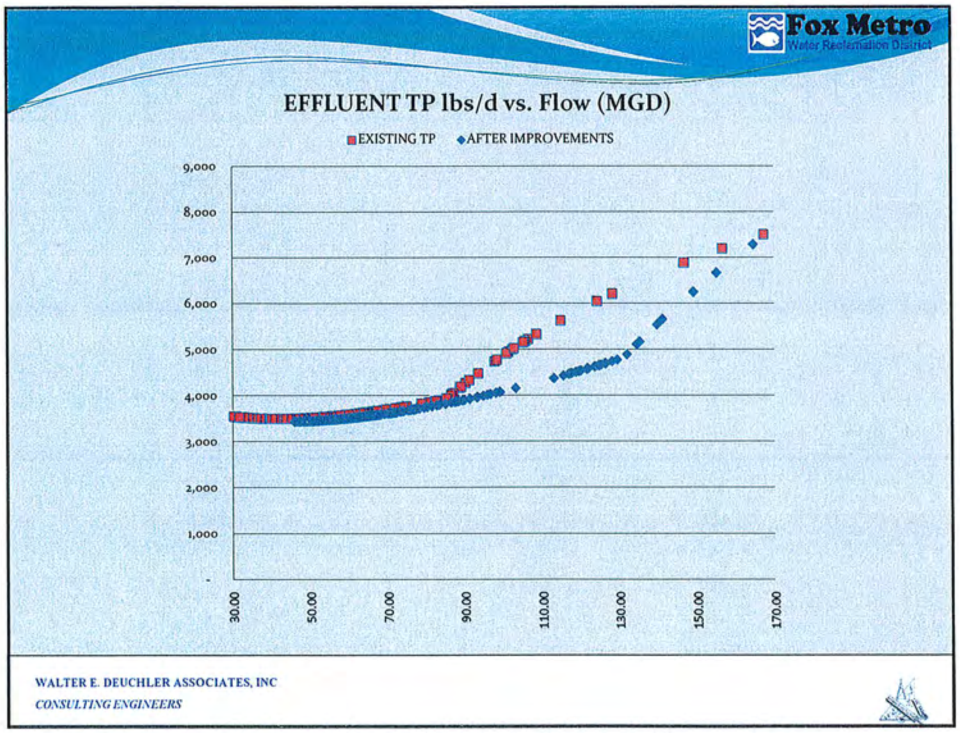

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EFFLUENT TP lbs/d vs. Flow (MGD)

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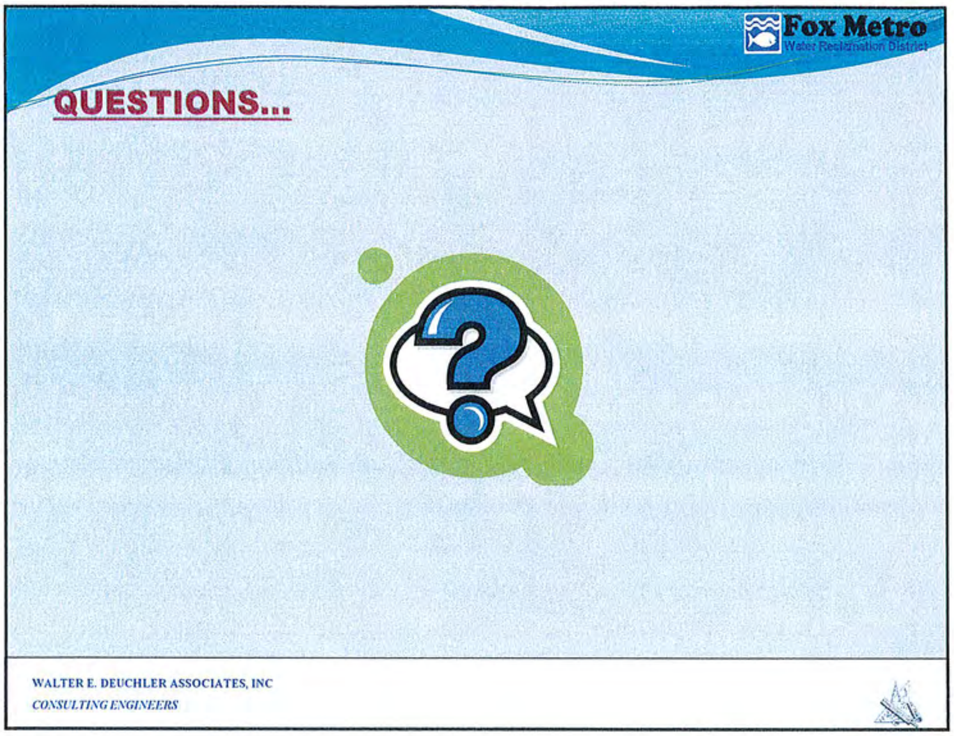

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QUESTIONS...

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CONSULTING ENGINEERS

CSO LTCP
CAC MEETING #7

Financial Capability Assessment

March 23, 2010

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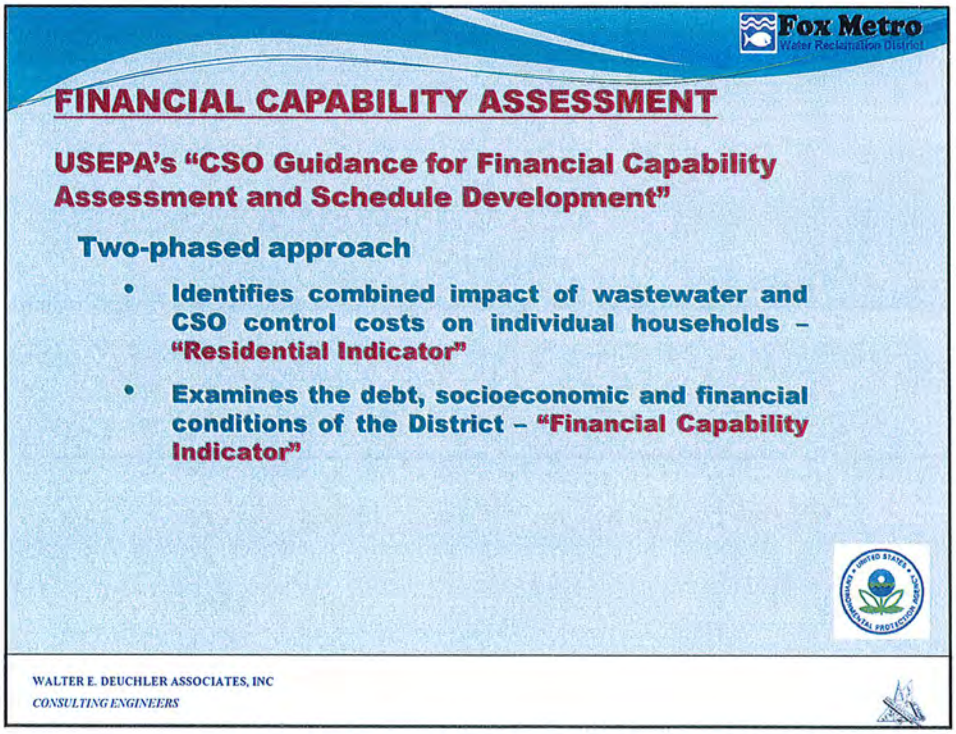

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FINANCIAL CAPABILITY ASSESSMENT

USEPA's "CSO Guidance for Financial Capability Assessment and Schedule Development"

Two-phased approach

- **Identifies combined impact of wastewater and CSO control costs on individual households – "Residential Indicator"**
- **Examines the debt, socioeconomic and financial conditions of the District – "Financial Capability Indicator"**

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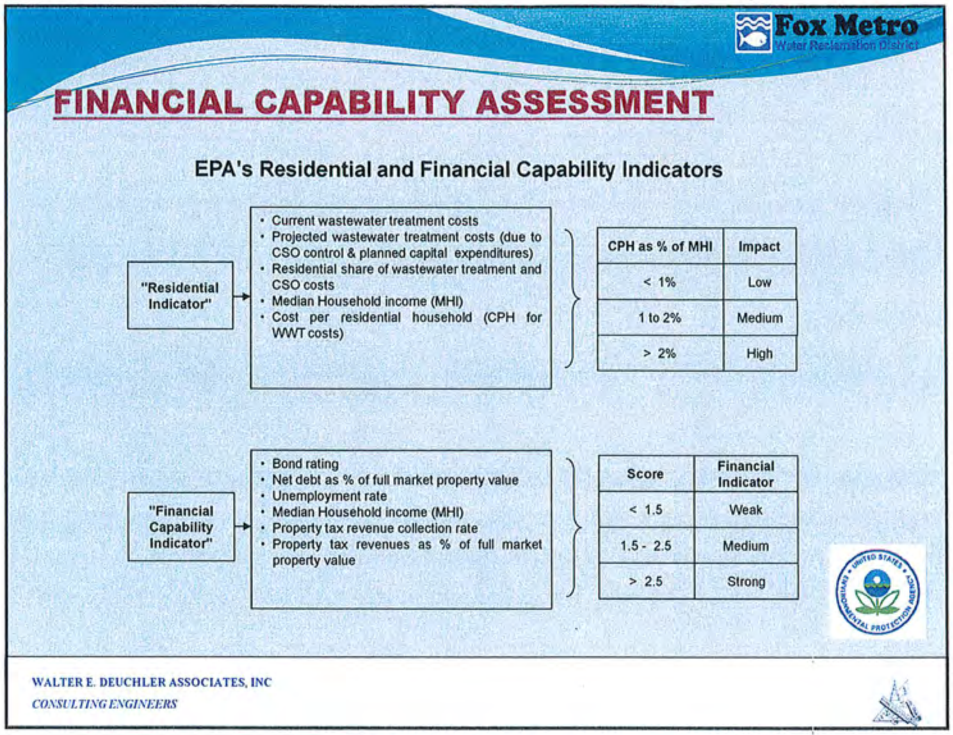

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FINANCIAL CAPABILITY ASSESSMENT

EPA's Residential and Financial Capability Indicators

"Residential Indicator" →

- Current wastewater treatment costs
- Projected wastewater treatment costs (due to CSO control & planned capital expenditures)
- Residential share of wastewater treatment and CSO costs
- Median Household income (MHI)
- Cost per residential household (CPH for WWT costs)

CPH as % of MHI	Impact
< 1%	Low
1 to 2%	Medium
> 2%	High

"Financial Capability Indicator" →

- Bond rating
- Net debt as % of full market property value
- Unemployment rate
- Median Household income (MHI)
- Property tax revenue collection rate
- Property tax revenues as % of full market property value

Score	Financial Indicator
< 1.5	Weak
1.5 - 2.5	Medium
> 2.5	Strong

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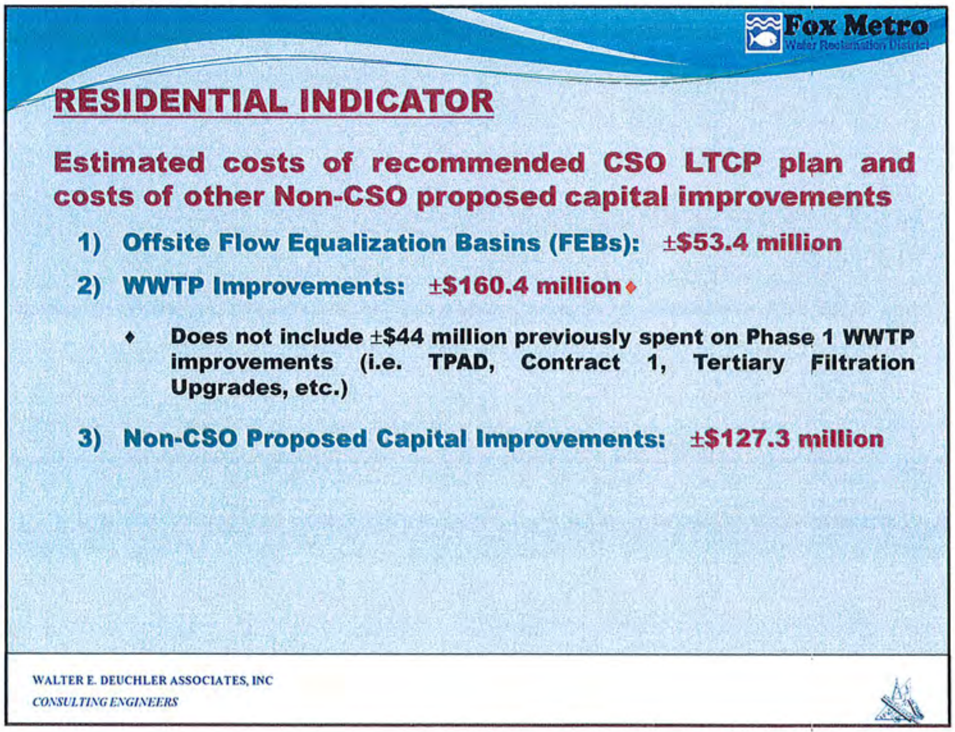

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RESIDENTIAL INDICATOR

Estimated costs of recommended CSO LTCP plan and costs of other Non-CSO proposed capital improvements

1) **Offsite Flow Equalization Basins (FEBs): ±$53.4 million**
2) **WWTP Improvements: ±$160.4 million♦**
   - ♦ **Does not include ±$44 million previously spent on Phase 1 WWTP improvements (i.e. TPAD, Contract 1, Tertiary Filtration Upgrades, etc.)**
3) **Non-CSO Proposed Capital Improvements: ±$127.3 million**

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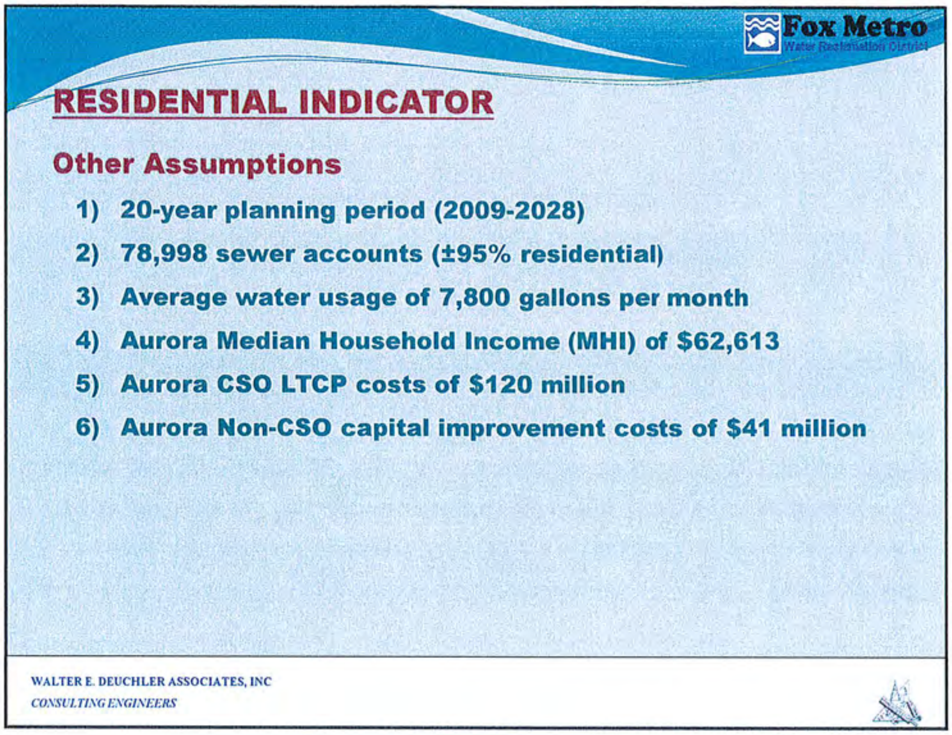

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RESIDENTIAL INDICATOR

Other Assumptions

1) 20-year planning period (2009-2028)
2) 78,998 sewer accounts (±95% residential)
3) Average water usage of 7,800 gallons per month
4) Aurora Median Household Income (MHI) of $62,613
5) Aurora CSO LTCP costs of $120 million
6) Aurora Non-CSO capital improvement costs of $41 million

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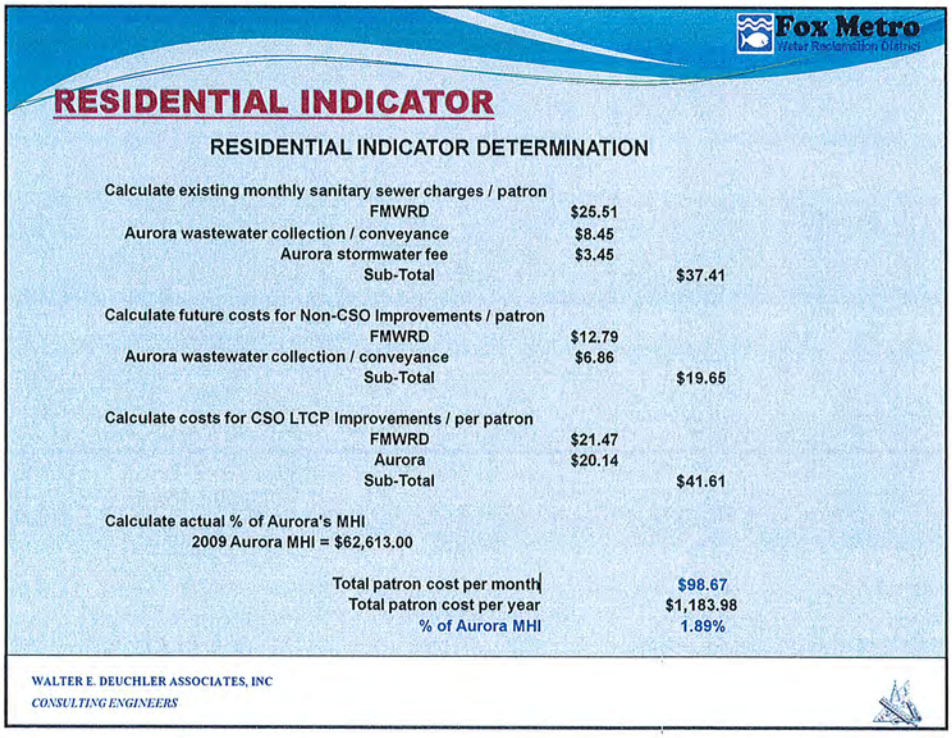

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RESIDENTIAL INDICATOR

RESIDENTIAL INDICATOR DETERMINATION

Calculate existing monthly sanitary sewer charges / patron		
FMWRD	$25.51	
Aurora wastewater collection / conveyance	$8.45	
Aurora stormwater fee	$3.45	
Sub-Total		$37.41
Calculate future costs for Non-CSO Improvements / patron		
FMWRD	$12.79	
Aurora wastewater collection / conveyance	$6.86	
Sub-Total		$19.65
Calculate costs for CSO LTCP Improvements / per patron		
FMWRD	$21.47	
Aurora	$20.14	
Sub-Total		$41.61
Calculate actual % of Aurora's MHI		
2009 Aurora MHI = $62,613.00		
Total patron cost per month		$98.67
Total patron cost per year		$1,183.98
% of Aurora MHI		1.89%

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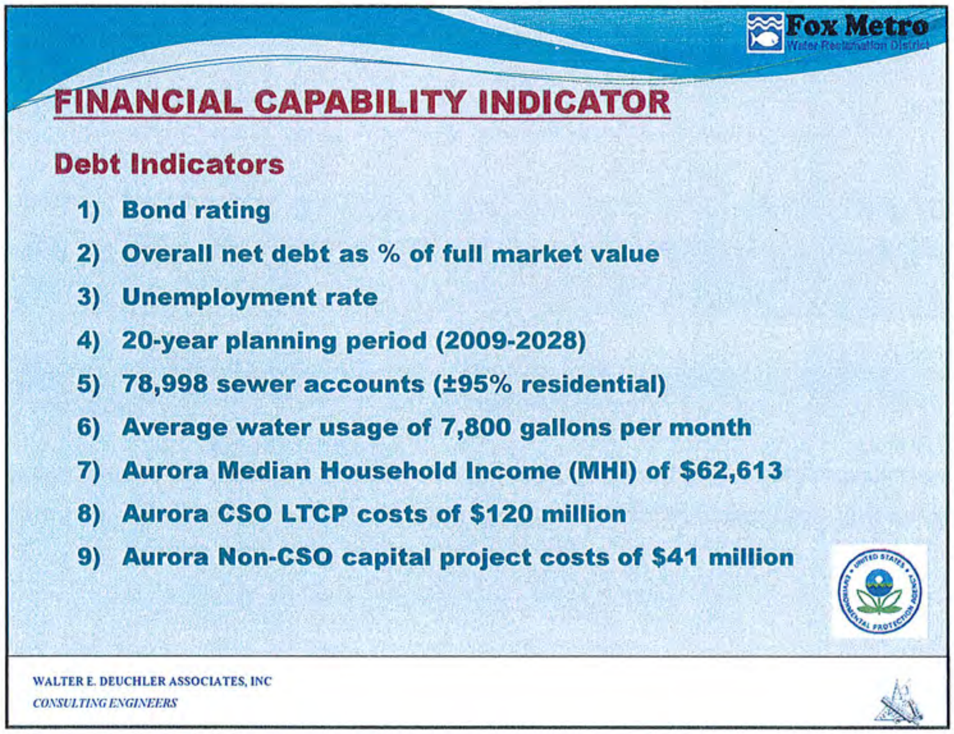

FINANCIAL CAPABILITY INDICATOR

Debt Indicators

1) **Bond rating**
2) **Overall net debt as % of full market value**
3) **Unemployment rate**
4) **20-year planning period (2009-2028)**
5) **78,998 sewer accounts (±95% residential)**
6) **Average water usage of 7,800 gallons per month**
7) **Aurora Median Household Income (MHI) of $62,613**
8) **Aurora CSO LTCP costs of $120 million**
9) **Aurora Non-CSO capital project costs of $41 million**

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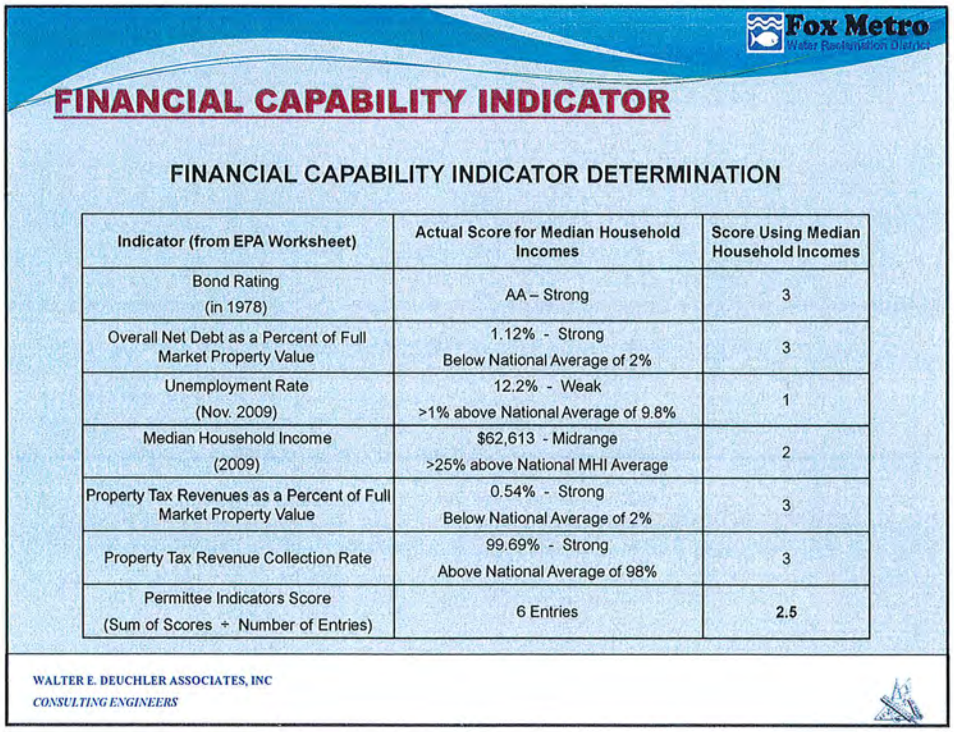

FINANCIAL CAPABILITY INDICATOR

FINANCIAL CAPABILITY INDICATOR DETERMINATION

Indicator (from EPA Worksheet)	Actual Score for Median Household Incomes	Score Using Median Household Incomes
Bond Rating (in 1978)	AA – Strong	3
Overall Net Debt as a Percent of Full Market Property Value	1.12% - Strong Below National Average of 2%	3
Unemployment Rate (Nov. 2009)	12.2% - Weak >1% above National Average of 9.8%	1
Median Household Income (2009)	$62,613 - Midrange >25% above National MHI Average	2
Property Tax Revenues as a Percent of Full Market Property Value	0.54% - Strong Below National Average of 2%	3
Property Tax Revenue Collection Rate	99.69% - Strong Above National Average of 98%	3
Permittee Indicators Score (Sum of Scores ÷ Number of Entries)	6 Entries	**2.5**

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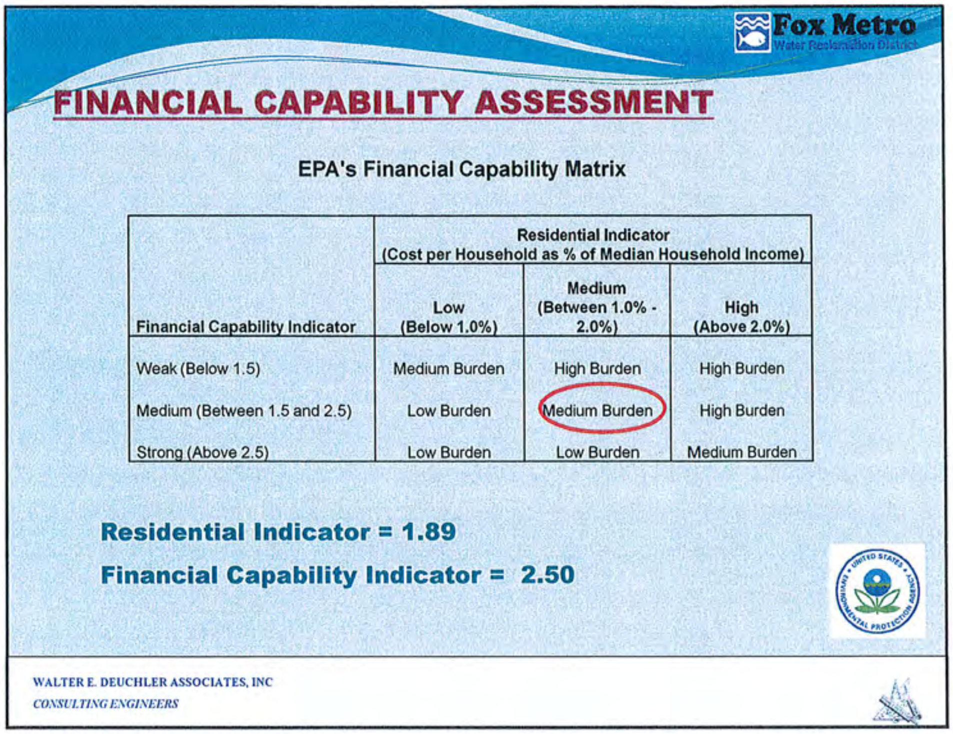

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FINANCIAL CAPABILITY ASSESSMENT

EPA's Financial Capability Matrix

	Residential Indicator (Cost per Household as % of Median Household Income)		
Financial Capability Indicator	**Low (Below 1.0%)**	**Medium (Between 1.0% - 2.0%)**	**High (Above 2.0%)**
Weak (Below 1.5)	Medium Burden	High Burden	High Burden
Medium (Between 1.5 and 2.5)	Low Burden	Medium Burden	High Burden
Strong (Above 2.5)	Low Burden	Low Burden	Medium Burden

Residential Indicator = 1.89

Financial Capability Indicator = 2.50

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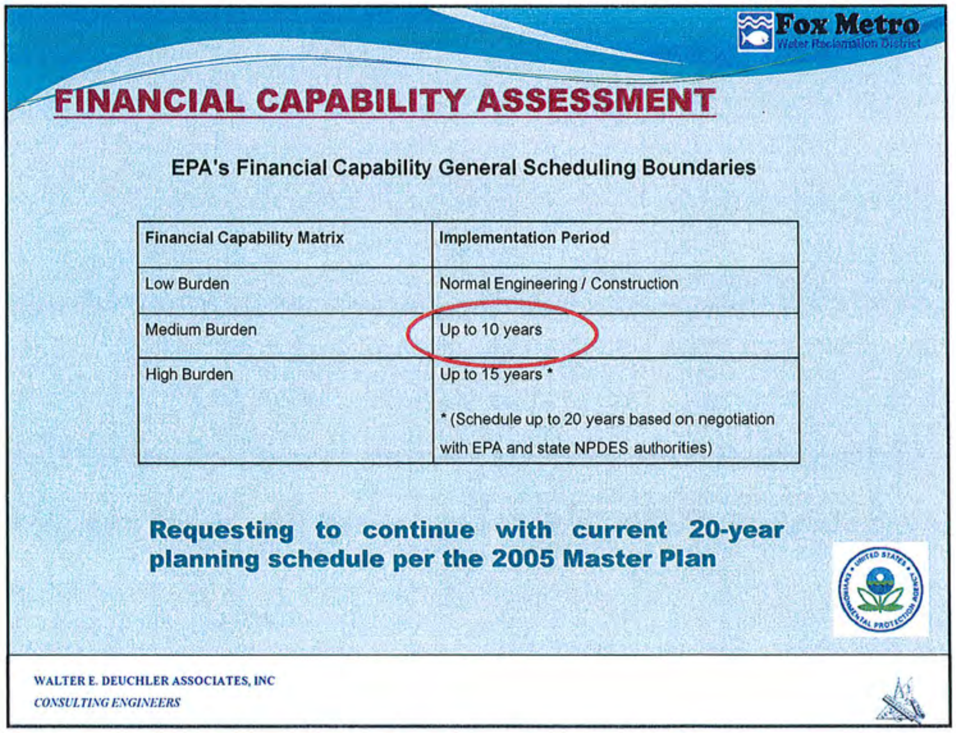

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FINANCIAL CAPABILITY ASSESSMENT

EPA's Financial Capability General Scheduling Boundaries

Financial Capability Matrix	Implementation Period
Low Burden	Normal Engineering / Construction
Medium Burden	Up to 10 years
High Burden	Up to 15 years * * (Schedule up to 20 years based on negotiation with EPA and state NPDES authorities)

Requesting to continue with current 20-year planning schedule per the 2005 Master Plan

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FINANCIAL CAPABILITY ASSESSMENT

Secondary Financial Considerations

1) Grant and Loan Availability
2) Sewer User Fees
3) Alternate Source of Funding

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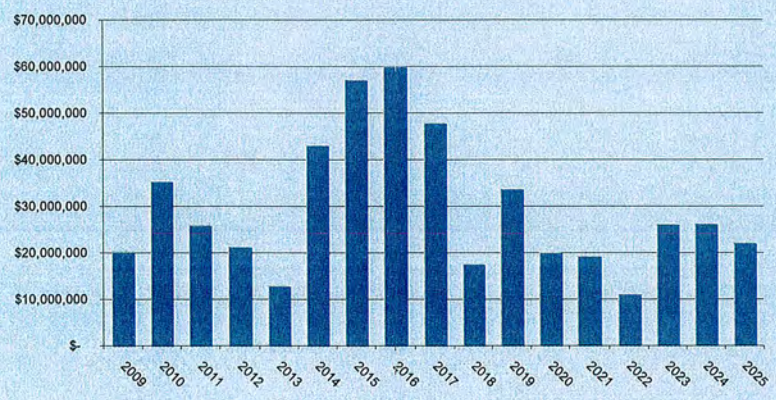
FINANCIAL CAPABILITY ASSESSMENT

Total Annual Capital Improvements Costs

Does Not Include Positive Inflow From Loan Disbursements



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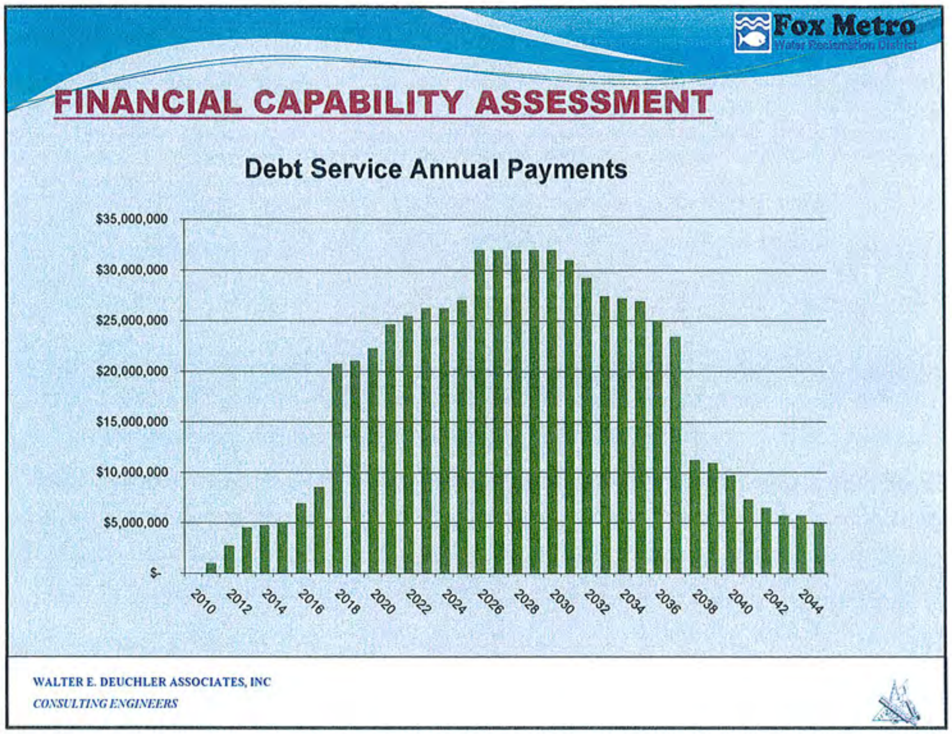

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FINANCIAL CAPABILITY ASSESSMENT

Debt Service Annual Payments

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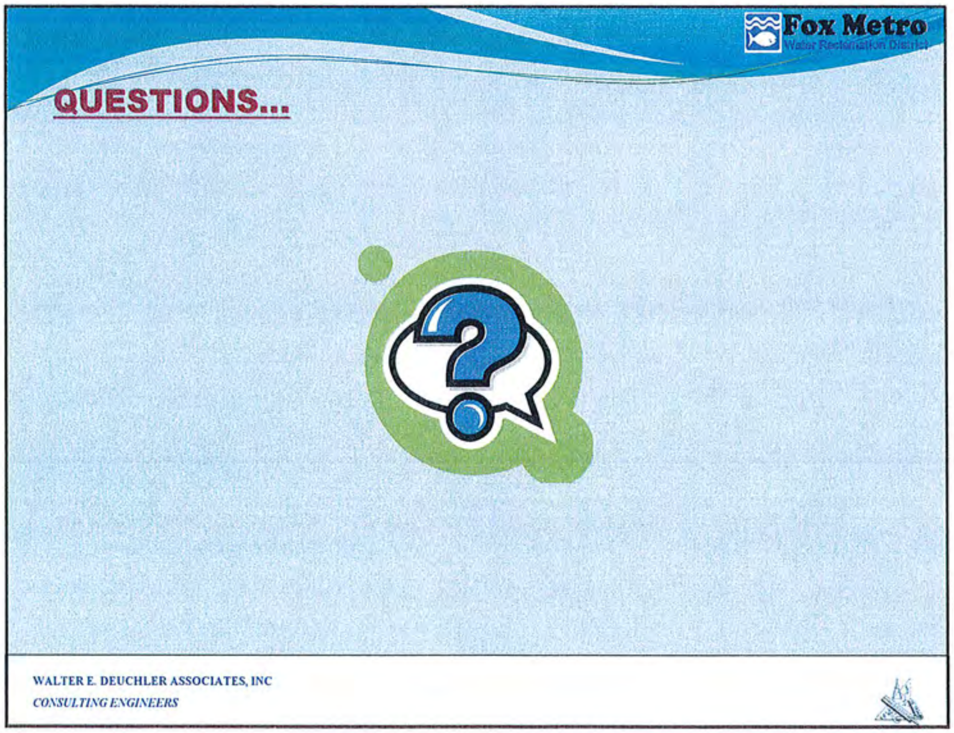

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QUESTIONS…

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CSO LTCP
CAC MEETING #7

Implementation Plan

March 23, 2010

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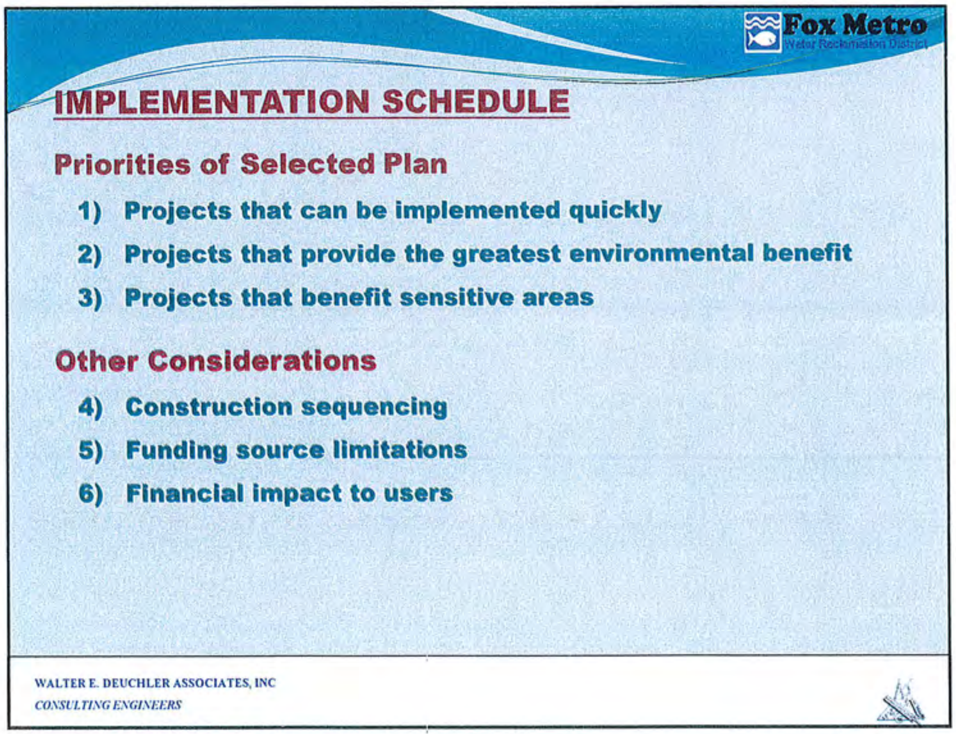

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IMPLEMENTATION SCHEDULE

Priorities of Selected Plan

1) **Projects that can be implemented quickly**
2) **Projects that provide the greatest environmental benefit**
3) **Projects that benefit sensitive areas**

Other Considerations

4) **Construction sequencing**
5) **Funding source limitations**
6) **Financial impact to users**

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IMPLEMENTATION SCHEDULE

Steps of a Typical Plan

1) **Facility Planning**
2) **Preliminary Design and Land Acquisition**
3) **Design**
4) **Permitting and Approvals**
5) **Bidding**
6) **Construction**
7) **Startup and Operation**

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IMPLEMENTATION SCHEDULE

Basis for Implementation Schedule

1) **2005 Master Plan**
2) **20-Year Planning Period (2005-2025)**
3) **Multi-Phased Approach to Meet Financial Constraints**
4) **Sequencing Limitations - Construction of treatment processes from downstream to upstream (from outfall to headworks)**
5) **Priorities**
   a) **Maximize existing facilities first**
   b) **Construction of CEPT system for CSO reduction**
   c) **Construction of FEBs for I&I reduction**
   d) **Construction of new south treatment facilities**

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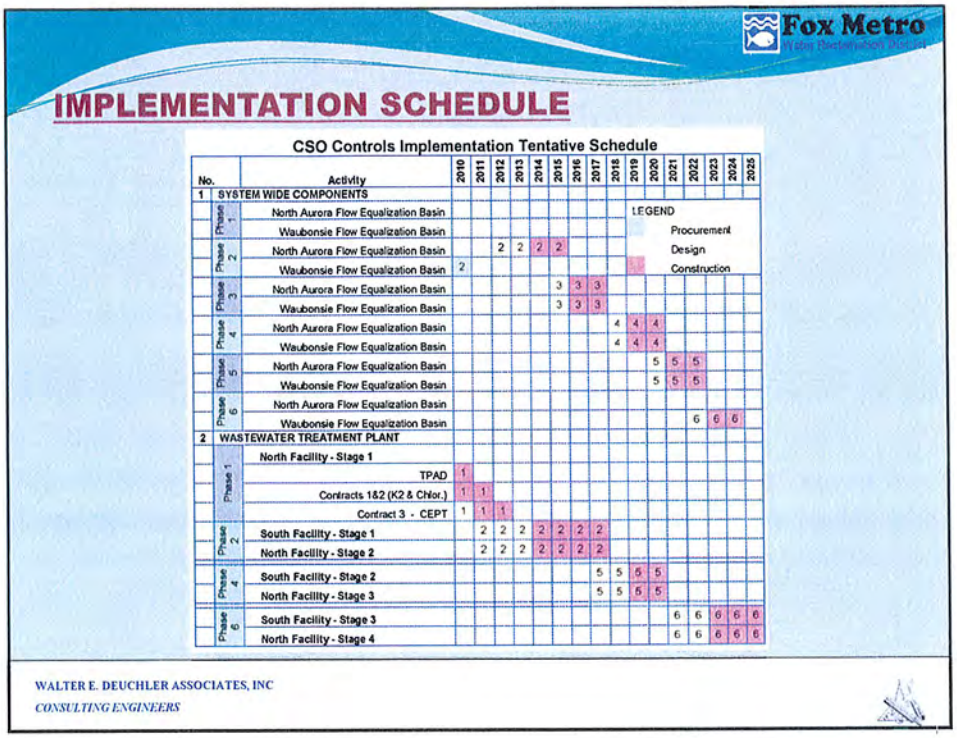

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IMPLEMENTATION SCHEDULE

CSO Controls Implementation Tentative Schedule

No.		Activity	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
1	SYSTEM WIDE COMPONENTS																	
	Phase 1	North Aurora Flow Equalization Basin																
		Waubonsie Flow Equalization Basin																
	Phase 2	North Aurora Flow Equalization Basin			2	2	2	2										
		Waubonsie Flow Equalization Basin	2															
	Phase 3	North Aurora Flow Equalization Basin						3	3	3								
		Waubonsie Flow Equalization Basin						3	3	3								
	Phase 4	North Aurora Flow Equalization Basin									4	4	4					
		Waubonsie Flow Equalization Basin									4	4	4					
	Phase 5	North Aurora Flow Equalization Basin											5	5	5			
		Waubonsie Flow Equalization Basin											5	5	5			
	Phase 6	North Aurora Flow Equalization Basin																
		Waubonsie Flow Equalization Basin													6	6	6	
2	WASTEWATER TREATMENT PLANT																	
	Phase 1	North Facility - Stage 1																
		TPAD	1															
		Contracts 1&2 (K2 & Chlor.)	1	1														
		Contract 3 - CEPT	1	1	1													
	Phase 2	South Facility - Stage 1		2	2	2	2	2	2	2								
		North Facility - Stage 2		2	2	2	2	2	2	2								
	Phase 4	South Facility - Stage 2								5	5	5	5					
		North Facility - Stage 3								5	5	5	5					
	Phase 6	South Facility - Stage 3												6	6	6	6	6
		North Facility - Stage 4												6	6	6	6	6

LEGEND
Procurement
Design
Construction

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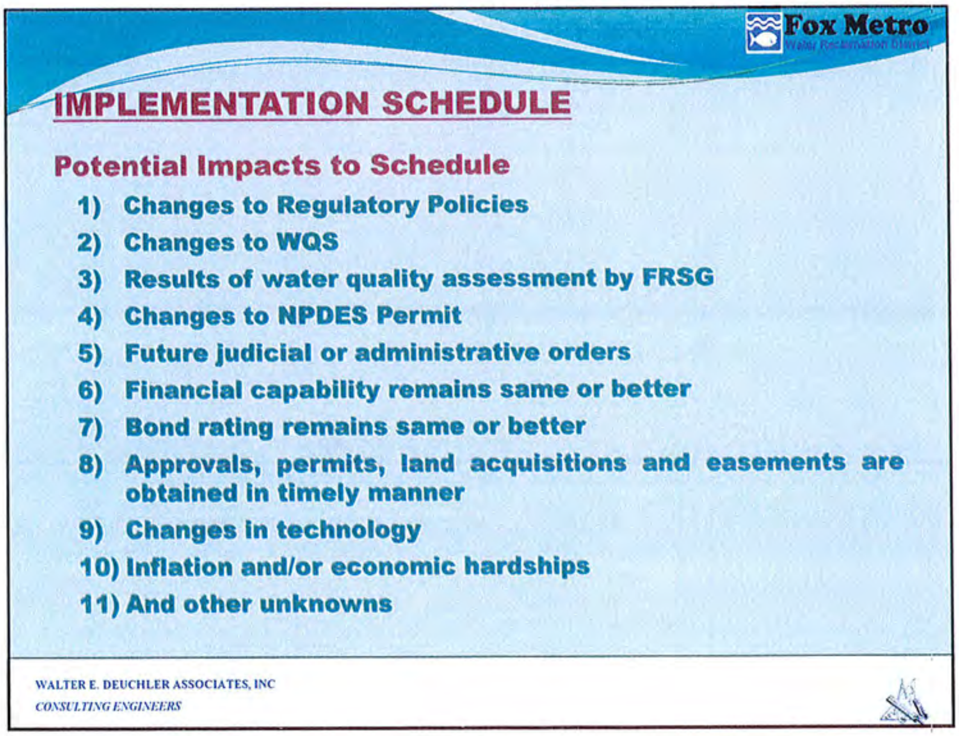

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IMPLEMENTATION SCHEDULE

Potential Impacts to Schedule

1) Changes to Regulatory Policies
2) Changes to WQS
3) Results of water quality assessment by FRSG
4) Changes to NPDES Permit
5) Future judicial or administrative orders
6) Financial capability remains same or better
7) Bond rating remains same or better
8) Approvals, permits, land acquisitions and easements are obtained in timely manner
9) Changes in technology
10) Inflation and/or economic hardships
11) And other unknowns

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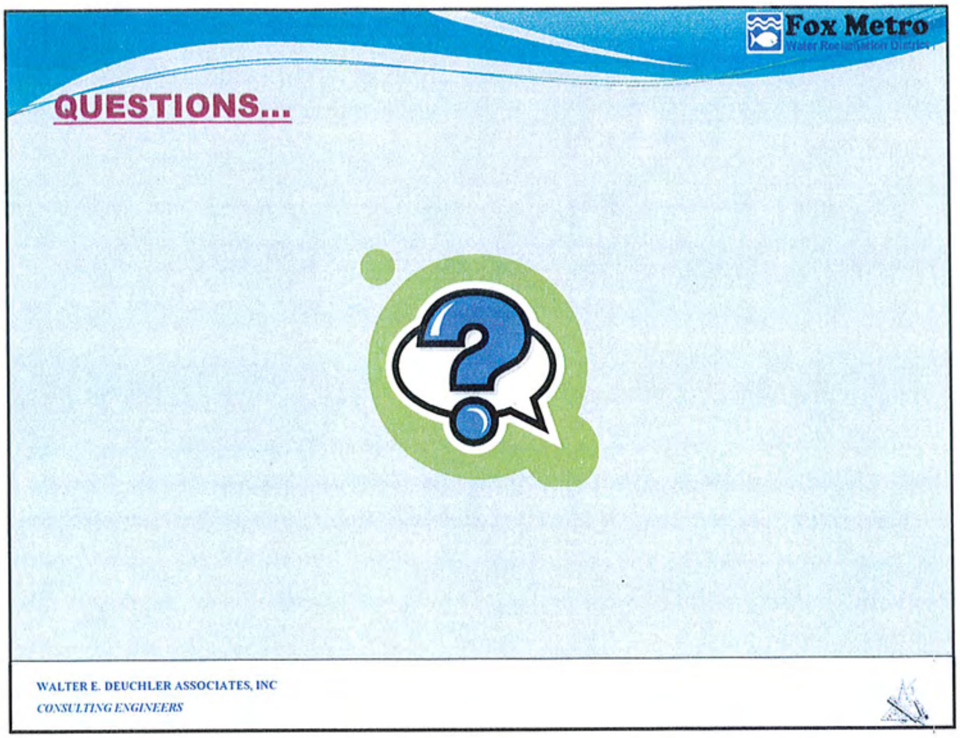

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QUESTIONS...

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MEETING MINUTES

CAC Meeting No. 7
March 23, 2010 at 10:00 a.m.

Purpose: Meeting No. 7 served to discuss the CSO control technologies considered in developing the LTCP, present the recommended LTCP, discuss the financial capability assessment analysis performed and the proposed implementation plan of the recommended LTCP.

Attendees:

CAC Members	
Daryl Devick	City of Aurora
Judith Sotir	Fox Metro WRD
Tim Pollowy	Fox River Ecosystem Partnership
Fran Caffee	Sierra Club, Valley of the Fox Group
Jackie Dearborn*	United City of Yorkville
Bill Donnell	Fox Valley Park District
Jerry Weaver	Village of Oswego
Mike Glock	Village of North Aurora
CAC Support Staff	
Tom Muth	Fox Metro WRD
Jeff Humm	Fox Metro WRD
Roy Harsch	Drinker Biddle & Reath
John Frerich	Walter E. Deuchler Associates, Inc.
Other Guests	
Mark Halm	Walter E. Deuchler Associates, Inc.

* **alternate for Joe Wywrot, Village of Yorkville**

Distribution: The above attendees and the following:

CAC Members	
Brad Merkel	Village of Sugar Grove
Michael Pubentz	Village of Montgomery
CAC Support Staff	
Philippe Moreau	Walter E. Deuchler Associates, Inc.
Other Guests	
Jay Patel	Illinois EPA

Discussion Items:

1. John Frerich welcomed everyone. The following information was handed out to each member to include in their binders: meeting agenda for Meeting No. 7; meeting minutes for Meeting No. 6; a PowerPoint presentation handout titled "CSO Control Technologies: Screening and Development of Alternatives"; a PowerPoint presentation handout titled "Recommended LTCP"; a PowerPoint presentation handout titled "Financial Capability Assessment"; and a PowerPoint presentation handout titled "Implementation Plan".

2. A PowerPoint presentation was given by John Frerich regarding "CSO Control Technologies: Screening and Development of Alternatives". The general points of discussion were:

    a. Screening of CSO Control Technology Alternatives
        i. Source Control
            - Public Education – implemented to satisfactory level
            - Combined Sewer Flushing – eliminated from further consideration
        ii. Inflow Control
            - Water Conservation – implemented to satisfactory level
            - Infiltration and Inflow Reduction – retained for further consideration
        iii. Sewer Separation
            - Rain Leader Disconnection – implemented to satisfactory level
            - Partial Separation – to be considered in City of Aurora LTCP
            - Complete Separation – to be considered in City of Aurora LTCP
        iv. Sewer System Optimization – implemented to satisfactory level
        v. Storage
            - Earthen Reservoirs – eliminated from further consideration
            - Open Concrete Reservoirs – eliminated from further consideration
            - Closed Concrete Reservoirs – retained for further consideration
        vi. Treatment – Expansion of WWTP
            - Primary Treatment – retained for further consideration
            - Biological/Secondary Treatment – retained for further consideration

        - Tertiary Filtration – retained for further consideration
        - Disinfection – retained for further consideration

    vii. Floatables Control – implemented to satisfactory level

b. Development of CSO Control Technology Alternatives

    i. Inflow Control vs. Storage vs. Treatment

    - A Wet Weather Facilities Study conducted in 2005 by Walter E. Deuchler Associates performed a cost effective analysis regarding the reduction of a minimum of 50% of the inflow monitored at the existing WWTP.
    - The study looked at three methods for handling the excess I&I
        1) I&I reduction via sewer rehabilitation (Inflow Control)
        2) I&I reduction via peak attenuation (Storage)
        3) Transport and treat the I&I (Treatment)
    - The study concluded that I&I reduction via peak attenuation was the most cost-effective method and that transport and treatment was not an economically feasible option for this portion of inflow
    - John Frerich and Tom Muth stressed the importance of continued sewer maintenance, evaluation and I&I reduction within the municipalities' wastewater collection systems

    ii. Treatment – WWTP Expansion

    - Four solids train handling options and four liquid train handling options were evaluated as part of the 2005 Master Plan
    - Each option was ranked based on its environmental effects, monetary costs, water quality objectives, implementation capabilities, energy and resource use, reliability and expandability
    - Option D – TPAD and sludge dryer was selected as the best solids train handling option
    - Option 4 – Conventional activated sludge: two facilities with chemically enhanced primary treatment was selected as the best liquid train handling option

3. A PowerPoint presentation was given by Mark Halm regarding "Recommended LTCP". The general points of discussion were:

a. Minimum level of treatment required in the LTCP
b. 2005 Master Planning effort and implementation
c. Existing (2005) and future (2025) flow conditions
d. Phases of proposed WWTP expansion

    i. Phase 1 – Upgrades to existing North WWTP facility

    - TPAD – under construction
    - Contract 1 (disinfection, pumping capacity and tertiary filtration improvements) – under construction
    - Contract 3 (chemically enhanced primary treatment facility) – design complete and construction anticipated to begin in Fall of 2010

    ii. Phase 2 – Upgrades to existing North WWTP facility and construction of new south WWTP facility – design underway
    iii. Phases 3 thru 6 to be completed over next 15 years
  e. Impacts to the Fox River consist of significant reduction in CSO discharges and loadings resulting improved water quality

4. A PowerPoint presentation was given by John Frerich regarding "Financial Capability Assessment". The general points of discussion were:

  a. Residential Indicator
    i. Assumptions used in calculations
    ii. Inclusion of Aurora's CSO LTCP costs results in a %MHI of 1.89%
  b. Financial Capability Indicator
    i. Assumptions used in calculations
    ii. Resultant score of 2.5
  c. Financial Capability Assessment
    i. USEPA's financial capability matrix indicates a Medium Burden
    ii. Medium Burden provides general guidance for a 10 year implementation period.
    iii. Requesting to continue with current 20-year planning schedule per the 2005 Master Plan
  d. Secondary Financial Considerations
    i. Grant and loan availability
    ii. Sewer user fee impacts
    iii. Alternate sources of funding
  e. Annual Capital Improvements Costs and Debt Service Payments

5. A PowerPoint presentation was given by John Frerich regarding "Implementation Plan". The general points of discussion were:

  a. Priorities of selected plan
    i. Projects that can be implemented quickly
    ii. Projects that provide the greatest environmental benefit
    iii. Projects that benefit sensitive areas
  b. Other considerations
    i. Construction sequencing
    ii. Funding source limitations
    iii. Financial impact to users
  c. Steps of a typical plan
  d. Basis for Implementation Schedule
  e. Proposed Implementation Schedule
  f. Potential impacts to the schedule

6. Atty. Roy Harsch gave a synopsis of several regulatory issues the District is currently addressing. These stem from the USEPA/IEPA inspection of the District's facilities in September of 2009. The fundamental differences in the interpretation of the District's outfall (CSO vs. Bypass) and excess flow treatment facility regulations by the agencies (IEPA vs. USEPA) were discussed and the potential impact to the development of the LTCP. This led to a compromise requiring with IEPA that some of the Bypass regulations be addressed in the LTCP. This was beyond the original scope required by the 1994 CSO Control Policy, Illinois CSO regulations and the District's NPDES permit requirements. Other recent action taken by IEPA involved the issuance of a Violation Notice (VN) in January of 2010 regarding CSO outfall discharges prior to attaining treatment of design maximum flow. District staff met with IEPA on March 15, 2010 to discuss the VN and a written response is being prepared for submittal by April 5, 2010. The LTCP will be submitted to IEPA by April 1, 2010 and will be considered the District's compliance commitment agreement for the VN.

7. Questions were asked during and after the above presentations, followed by open discussions upon conclusion of the presentations. The key questions and topics of discussion included the following:

    a. Tim Pollowy inquired whether localized flooding would be a concern as a result of removing sources of I&I (e.g. downspouts, area drains, etc.) and/or sewer separation. John Frerich explained that this would be dependent upon the sources removed and the method of separation. Downspouts, footing drains and sump pump disconnections could lead to consistently saturated yard conditions and local flooding if there is no alternative provided for drainage. The City of Aurora has typically performed partial sewer separation (removal of public storm structures from the combined sewer system) in the past by installing new storm sewers to convey overland runoff. The reasons the City conducted partial sewer separation was to alleviate chronic basement backups and eliminate/reduce localized street and yard flooding.

    b. Fran Caffee asked if discharges from storm sewers were better, worse or similar to CSO discharges into the river. John Frerich advised that the recent water quality monitoring and modeling demonstrated that storm sewer discharges could be similar to CSO discharges depending on the time of year and length of dry weather preceding rain events allowing for solids buildup in the system. Road salts, oil, litter, illegal dumping, etc. can all impact storm discharges. The water quality modeling demonstrated that storm sewer discharges had a significant impact on water quality in the Fox River. Each of the municipalities in the District's service area have MS4 NPDES Permits and are addressing storm sewer discharges as part of the Storm Water Phase II regulations.

    c. Bill Donnell inquired about the benefits of the Class A sludge that will be produced by the selected solids handling improvements (TPAD). Tom Muth and Mark Halm explained that the District currently land applies their Class B sludge on local farms in Kane and Kendall County. In producing a Class A sludge, the volume and weight is greatly reduced requiring less storage, less land needed for application and reduced handling costs. There is also the potential to distribute the sludge commercially. In addition, upon completion of the TPAD project, the District plans to investigate sludge dryers that will further dry and pelletize the sludge for potential distribution for residential purposes. Bill Donnell stated that the Fox Valley Park District currently uses large quantities of fertilizer on their facilities and expressed the Fox Valley Park District's potential interest in this byproduct.

d. Tim Pollowy asked if the methane gas produced from the TPAD project was reused at the District. Mark Halm explained that methane gas is capture and used to heat the boilers for the process. Also excess gas is captured and stored in the District's methane tank for use at other locations in the WWTP. An analysis of the quantity and quality of methane gas produced will be conducted upon the successful startup of the TPAD project for future considerations.

e. Tim Pollowy asked how the intensity of the rain event (5-year, 1-hour storm) used in the LTCP was determined. John Frerich explained that this rain event has been used since the Illinois CSO compliance studies performed by the District in the 1980's. A cost-effective (knee of the curve) analysis at that time concluded that the 5-year storm provided the greatest environmental benefits for the lowest cost. The District has since adopted the 5-year storm as policy in evaluating all of its wastewater collection and treatment facilities.

f. Bill Donnell asked about funding for these projects. John Frerich explained that the funding outlined in the LTCP utilized municipal bonds with an assumed interest at 6.5% to be paid back through user rate increases. It is the intent of the District to continue funding these projects with the IEPA state revolving loan fund program, which has a lower interest rate. Other sources of funding, such as grants, will be thoroughly researched and sought to help reduce the financial impact to users.

Action Items: A motion was made by Bill Donnell and seconded by Daryl Devick that *"the CAC concur with the staff recommended CSO LTCP as presented and further recommend that it be forwarded to the Fox Metro Water Reclamation District Board of Trustees for further action"*. A vote was taken of the CAC members present. Motion was passed by unanimously.

Next CAC Meeting: To be scheduled upon receipt of IEPA's review comments, if any, on the submitted LTCP.

The above constitutes our understanding of the information discussed and the decisions reached. Any corrections or clarifications should be directed in writing to the attention of the author.

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