MIAMI-DADE COUNTY

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COASTAL WETLANDS REUSE REHYDRATION DEMONSTRATION PROJECT

February 20, 2007

CDM

Subconsultants:

CH2MHILL

MSA Milian, Swain & Associates, Inc.

MIAMI-DADE WATER AND SEWER DEPARTMENT
Coastal Wetlands Reuse Rehydration Demonstration Project

Background

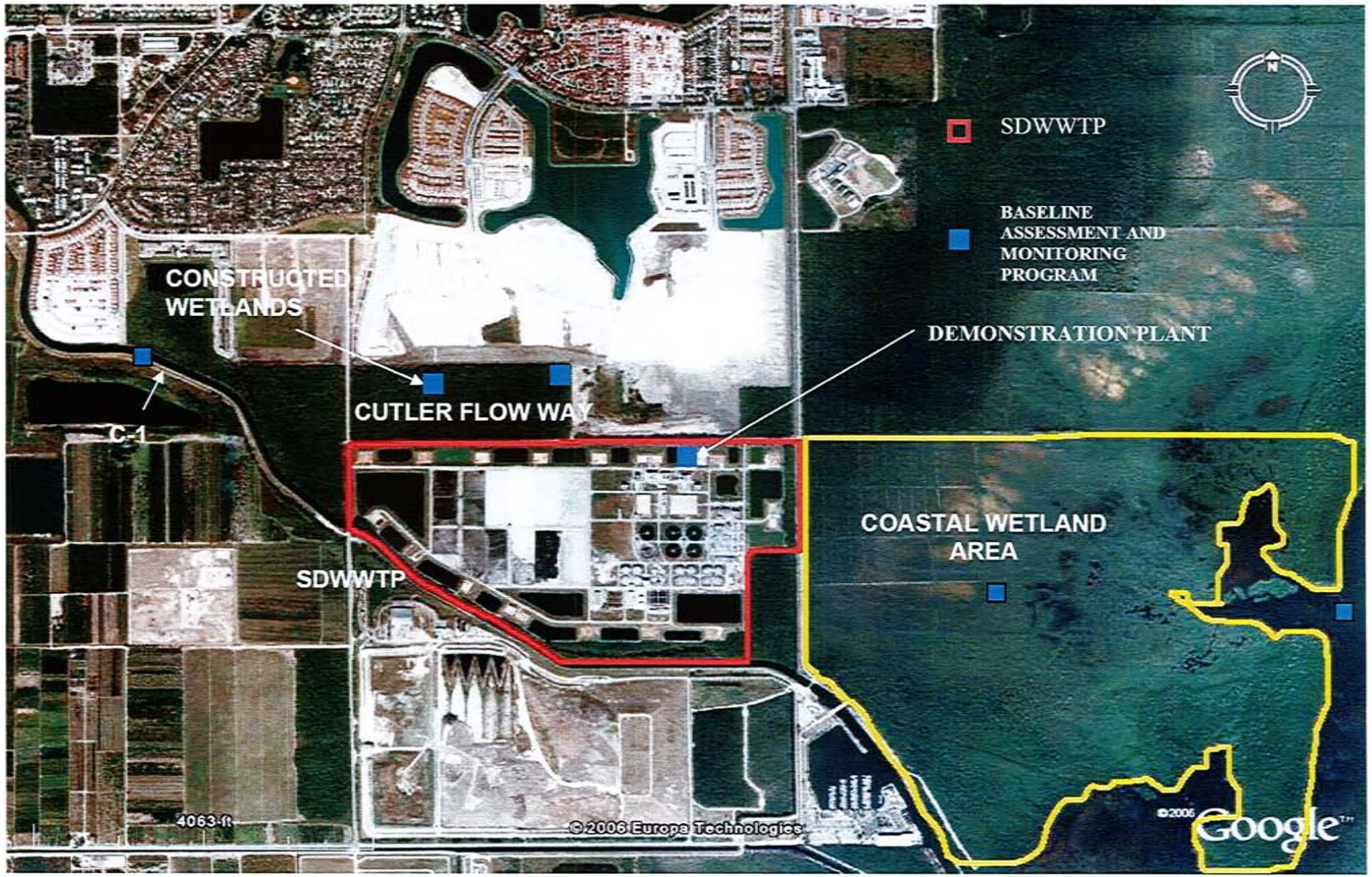
Miami-Dade County has proposed to undertake two pilot reuse projects as part of the Alternative Water Supply Plan, Table 1, Item IX (e) of the May 2006 Miami-Dade Interim Consumptive Use Authorization and Agreement with the South Florida Water Management District (SFWMD). One of the two pilot projects is the Coastal Wetlands Reuse Rehydration Demonstration Project (CWRRDP). The CWRRDP consists of a Water Reuse Demonstration Plant (WRDP) at the South District Wastewater Treatment Plant (SDWWTP), a constructed wetland at the Cutler (formerly Lennar) Flow Way, and a baseline assessment and monitoring program to include the C-1 Canal, the Cutler Flow Way, the WRDP, the constructed wetlands, the coastal wetlands, and Biscayne Bay. An aerial photograph of the site including the Cutler Flow Way, the SDWWTP and the rehydration area is provided on **Figure 1**. According to the Agreement, 90 percent complete designs and permit applications for the construction of the CWRRDP must be submitted by *May 5, 2007*. In August 2006, CDM was authorized to conduct the initial design of the CWRRDP. This is a summary of the CWRRDP preliminary design (technical memorandum TM) work conducted by CDM and sub-consultants that set the stage for the final design, currently underway.

Purpose and Scope

The objectives of the CWRRDP project are first to test the performance of advanced treatment technologies in reference to reduction of nutrients and other water quality parameters of interest in the SDWWTP effluent, and second, to evaluate the ecological impact to receiving wetlands from highly treated reclaimed water from the SDWWTP. The aim of the WRDP process is to meet the water quality goals of Outstanding Florida Waters (OFW) through advanced treatment as presented by the 2004 Comprehensive Everglades Restoration Plan (CERP) Wastewater Reuse Pilot Project. The results of the CWRRP will assist in determining the technological feasibility and cost effectiveness of a large scale reuse project to rehydrate the coastal wetlands.

The scope of of the CWRRDP is broken down into three main parts: (1) the water reuse demonstration plant, (2) the constructed wetlands test site, and (3) the baseline assessment and monitoring program. Each part is described below:

Part 1 consists of establishing preliminary process design criteria, determination of facility sizing and selection of equipment, preparation of conceptual construction and operating costs, implementation schedule, and a list of the required permits for construction.



CDM

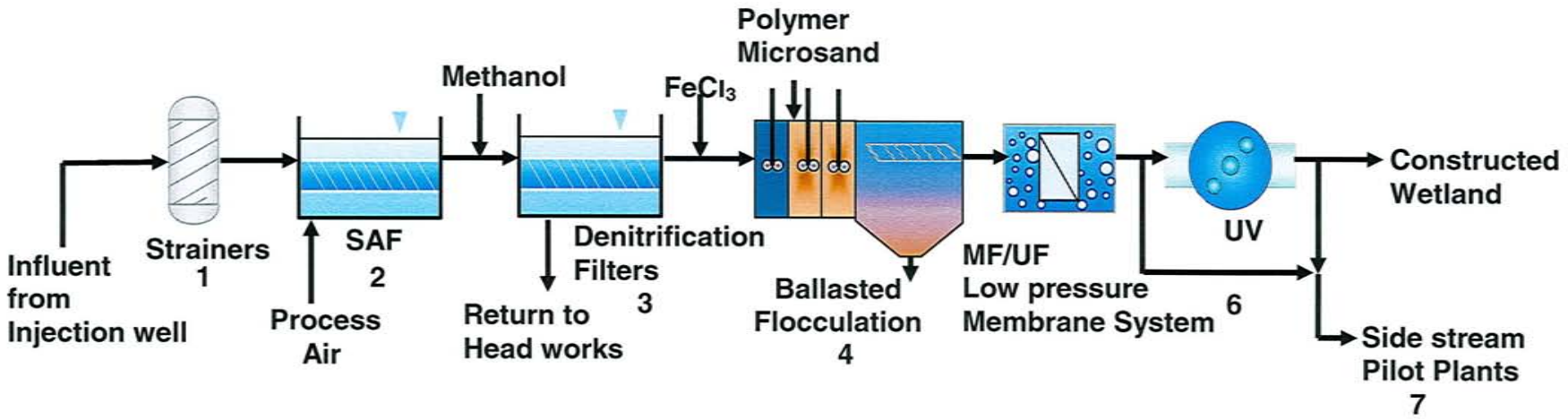
Figure 1
Coastal Wetlands Reuse Rehydration Demonstration Project
Project Overview

Part 2 consists of the conceptual design of a constructed wetlands system. This part addresses application and distribution of the WRDP effluent to the constructed wetland system, conceptual design of multiple test/demonstration wetland cells to allow assessment of flow and biological response to the WRDP effluent, and return of the constructed wetland outflow/overflow to the SDWWTP site. The discharge of the highly treated reclaimed water to the Biscayne Bay Coastal Wetland system is not considered necessary during the demonstration project operation.

Part 3 consists of developing a baseline assessment and monitoring program, which will assist in evaluating the treatment efficacy, water quality, vegetative and biological responses of the Cutler Flow Way constructed wetland system receiving effluent from the WRDP. The preliminary design for this part consists on collection and tabulation of existing and readily accessible data to characterize the existing conditions within the Cutler Flow Way and surrounding water bodies (i.e. nearby C-1 canal, coastal wetlands and Biscayne Bay). A data inventory of existing soil, groundwater, surface water, sediment and biological quality will be generated to identify data gaps and information needs. This inventory will provide insight into monitoring activities to be executed during the final design and/or construction phases to satisfy those data gaps needed to generate a baseline and an effective monitoring program to assess groundwater, surface water and ecological impacts. Stakeholder input will then be solicited during final design and utilized in conjunction with the information contained in the inventory of existing datasets to design a monitoring program.

Water Reuse Demonstration Project (WRDP)

The WRDP will provide additional treatment of a representative flow of the SDWWTP secondary effluent to further improve effluent water quality by reducing nitrogen and phosphorus levels, providing disinfection, and removing selected microconstituents. The facility is designed to produce a constant nominal flow of about 1 MGD of highly treated reclaimed water. The effluent of the WRDP will be conveyed to a constructed wetland in the Cutler Flow Way. The effluent from the constructed wetland will be sent to a holding pond at the SDWWTP. The main process components of WRDP include submerged aerated filters (SAF), denitrification filters, ballasted flocculation treatment (BFT) units, ultrafiltration (UF) submerged membranes, and ultraviolet (UV) light disinfections. These processes were selected based on the recommendations provided in the 2004 CERP Wastewater Reuse Pilot Project. A simplified diagram of the process flow scheme and treatment objectives are shown on **Figure 2.** Although reverse osmosis (RO) was evaluated in the 2004 CERP Wastewater Reuse Pilot Project, it was not recommended due to concerns over concentrate disposal and high incremental costs versus the anticipated water quality improvements with the other treatment processes. Nonetheless, in the WRDP provisions will be made for a sidestream of the demonstration plant effluent to flow through additional treatment steps referred to as the Sidestream Pilot Plant (SPP).



Item	Treatment Objectives
1	Solids removal of fine particles (> 3mm)
2	Biological nitrification process to convert ammonia to nitrate
3	Biological denitrification process to convert nitrates to nitrogen gas
4	Chemical and physical processes to remove phosphorus
5	Solids separation process to remove suspend solids including particulate TP and TN
6	UV radiation for inactivation of microbial contaminants
7	SSPPs include a combination of GAC, RO, IX, and AOP to test for removal of very low nutrient concentrations (TP < 0.1 mg/Land TN < 3.0 mg/L) and microconstituents

Figure 2
WRDP Process Flow Schematic and Treatment Objectives

The SPP consists of RO, advance oxidation processes (AOP), granular activated carbon (GAC), and ion exchange (IX). Since there is not a comprehensive treatment technology that will remove all the compounds indicated in the OFW water quality goals, the SPP will provide provisions to test for various process flow schemes as indicated on **Figure 3**. The objective of the SPP is to evaluate the performance of the technologies and process flow schemes in removing microconstituents, total nitrogen, total phosphorus, and N-nitrosodimethylamine (NDMA).

The WRDP site will include the SAF reactors, denitrification filters, clearwell tanks, ballasted flocculation treatment units, membrane system, chemical handling area, back pressure control valve, RO pilot trailer, lift station, and a building to house the SPP equipment, electrical room, restroom, control room, and a laboratory area. A site plan depicting the location of the facilities and the proposed piping plan for the WRDP is shown on **Figure 4.** A preliminary flow diagram and hydraulic profile are shown on **Figure 5**.

The CWRRDP Technical Memorandum includes additional information regarding the WRDP, such as design criteria, facility sizing, process and instrumentation diagrams (P&ID), and conceptual civil and mechanical drawings. Planning-level project cost estimate for the 1-MGD WRDP and SPP is estimated at approximately $11,385,000 (based on December 2006 dollars). The project cost estimate includes construction costs and associated engineering, legal, and administrative services. Final design of the CWRRDP includes the detail of the WRDP, and preparation and submittal of the numerous permit applications.

Constructed Wetlands System

There is a need to rehydrate the Biscayne Bay Coastal Wetlands with freshwater to return the system to a historically lower salinity environment. The introduction of highly treated effluent reuse water from the SDWWTP could provide a source of additional freshwater to rehydrate the coastal wetlands. To demonstrate the feasibility of this approach, the Coastal Wetlands Reuse Rehydration Demonstration Project will investigate the biological response of coastal wetland vegetation hydrated with reuse water from the proposed WRDP. The results of this demonstration project are needed prior to committing to full-scale reuse of highly treated effluent from the SDWWTP.

The demonstration project includes the construction of a wetland located in a parcel of land contiguous to and north of the SDWWTP as indicated on **Figure 6**. The constructed wetland is proposed to be designed as a series of two 2½-acre (1-hectare) wetland cells with flexibility in flow distribution to determine realistic responses to varying hydraulic loading rate, hydraulic residence time, depth of inundation, vegetation type, and seasonality. An initial conceptual wetland site layout is shown on **Figure 7. Figure 8** illustrates the design cross-sections for the constructed wetlands cells, and **Figure 9** presents the site plan with the spreader and collection canals, inflow and outflow systems. Site specific topographic and geotechnical data will be gathered to support the constructed wetland design. An initial review of the

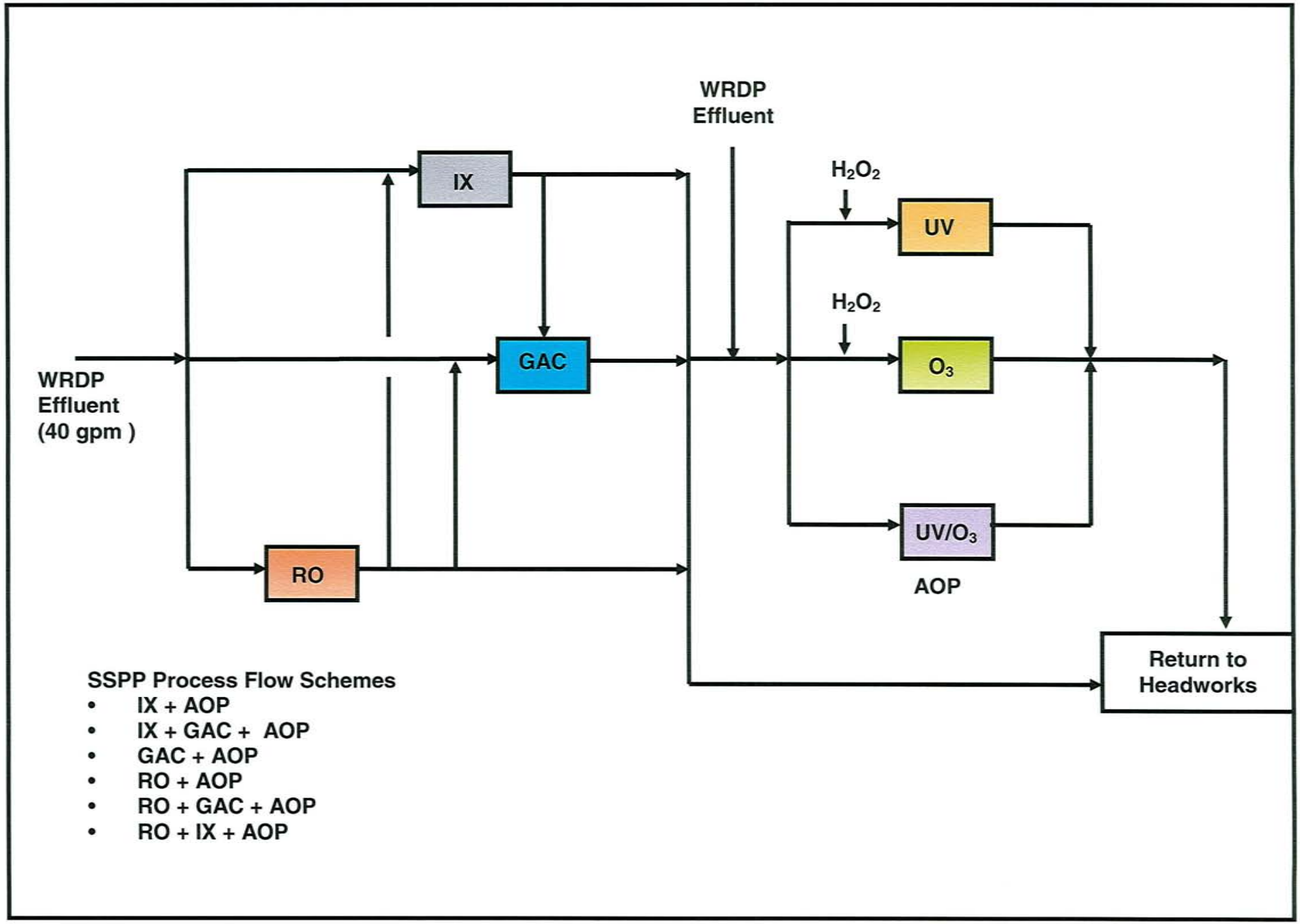


Figure 3
Sidestream Pilot Plant (SPP) Process Flow Schemes

CDM

S.W. 23RD STREET

8' Ch. Link Fence

TO CONSTRUCTED WETLANDS

N

5 0 10

Grass

Tree (6"ø)

BACK PRESSURE CONTROL VALVE

FLUSH SUMP
FLUSH SUMP PUMPS

DENITE INFLUENT DISTRIBUTION BOX

TO FACILITY LIFT STATION

UV DISINFECTION

BACKPULSE TANK

BLOWERS

MEMBRANE TANKS

SAF REACTOR NO.1

SAF REACTOR NO.2

DENITRIFICATION FILTERS

10" BY-PASS

BALLASTED FLOCCULATION

PERMEATE SKID

PERMEATE SKID

PROCESS AIR BLOWERS

BACKWASH AIR BLOWERS

CLEARWELL

CIP TANK

CIP SKID

TO PLANT HEADWORKS

LIFT STATION

BACKWASH WATER PUMPS

STATIC MIXER

1" CHEMICAL FEED

MEMBRANE LAYDOWN AREA (TYP 2)

METHANOL SYSTEM

FERRIC CHLORIDE SYSTEM

QUICK COUPLING CONNECTION

6" BY--PASS

PILOT PLANT FACILITIES

RO PILOT TRAILER

C. Wood Pole

Water's Edge

ASPHALT ROAD

4" DRAIN TO FACILITY LIFT STA.

STRAINER

4" SIDEWALK (TYP)

PARKING AREA

Conc. Slab

1 Story C.B.S. Bldg.

INJECTION WELL PAD 7

1" PVC

1" PVC

6" Vert. Pole

ASPHALT ROAD

Water's Edge

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WATER AND SEWER DEPARTMENT
ENGINEERING DIVISION

3071 SW 38TH AVENUE
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305-665 7471
miamidade.gov

COASTAL WETLANDS REUSE REHYDRATION PROJECT
23300 S.W. 88 AVE. MIAMI, FLORIDA 33190-0000
WATER REUSE DEMONSTRATION PLANT
CONTRACT/ ER No. X-000

WATER REUSE DEMONSTRATION PLANT
YARD PIPING PLAN

DRAWING HISTORY

RELEASED FOR		DATE	BY
REVIEW 30%	X	00/00/05	XX
REVIEW 70%			
REVIEW 100%			
PERMIT			

REVISIONS

No.	DESCRIPTION	DATE	BY

APPROVALS

CHIEF ENGINEER:	
SECTION HEAD:	
PROJECT MGR.:	
DESIGNED: X.X.X.	CHECKED: X.X.X.
DRAWN: X.X.X.	FINAL CHECK: X.X.X.

XXXXXXX XXXXX
XXXXXXXXX Engineer
State of Florida – License No. 00000
Date:_____

ER No. : 00000

FILE NAME: 4698COX.DWG

DATE: OCT. 13, 2006 SCALE: 1" = 10'

SHEET FIG 4

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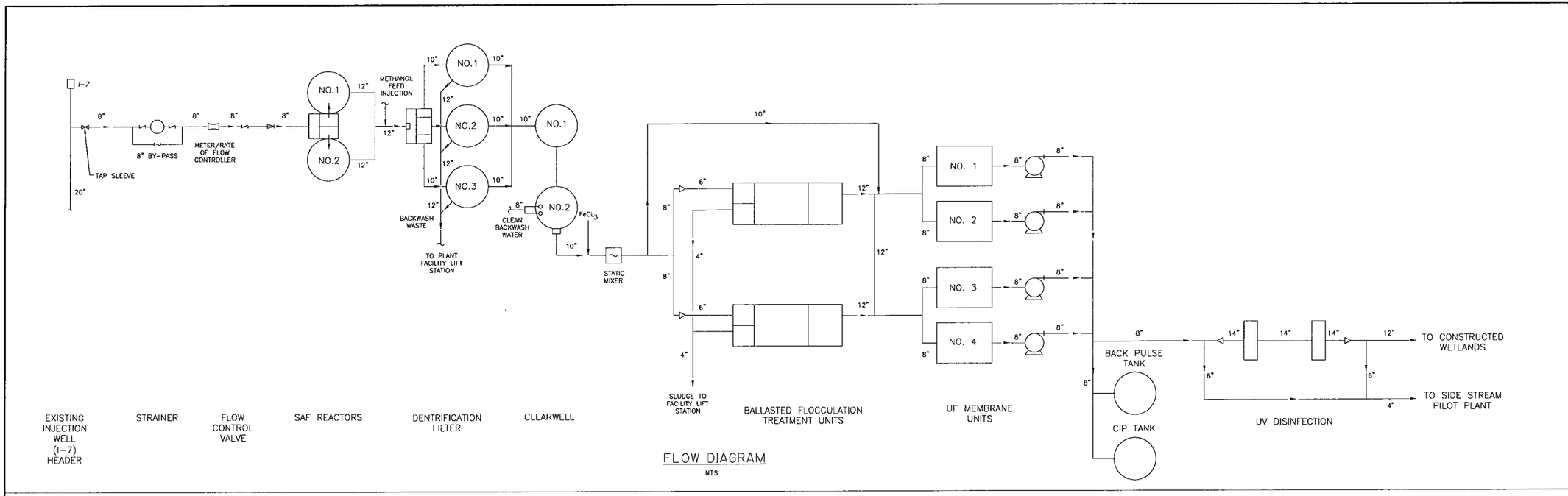
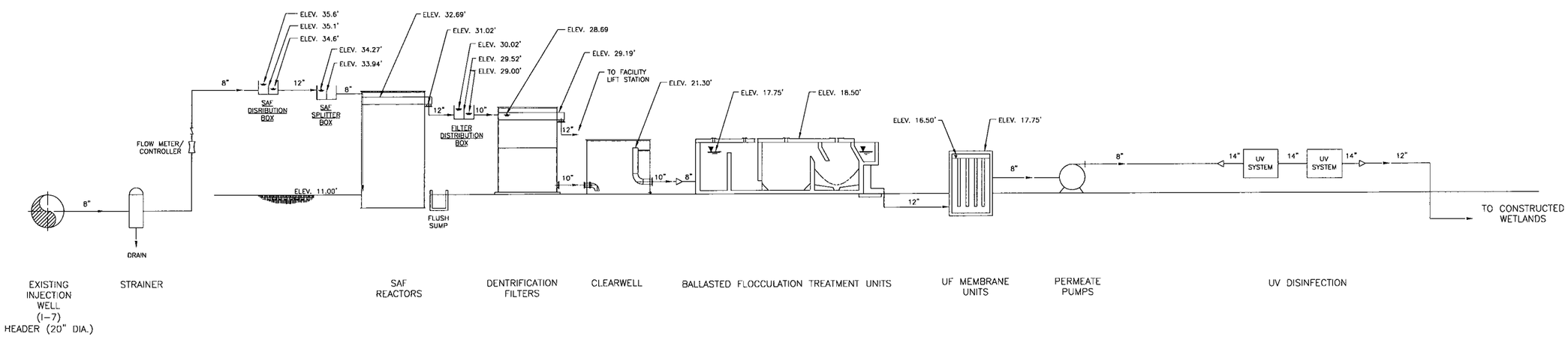


FLOW DIAGRAM

NTS



HYDRAULIC PROFILE

NTS

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CONTRACT/ ER No. X-000

FLOW DIAGRAM AND HYDRAULIC PROFILE

DRAWING HISTORY

RELEASED FOR		DATE	BY
REVIEW 30%	X	00/00/05	XX
REVIEW 70%			
REVIEW 100%			
PERMIT			

REVISIONS

No.	DESCRIPTION	DATE	BY
1	XXXXXX	00/00/05	XX

APPROVALS

CHIEF ENGINEER:

SECTION HEAD:

PROJECT MGR.:

DESIGNED: X.X.X. CHECKED: X.X.X.

DRAWN: X.X.X. FINAL CHECK: X.X.X.

XXXXXXX XXXXX
XXXXXXXXXX Engineer
State of Florida - License No. 00000
Date:

ER No. : 00000

FILE NAME: 4698G04.DWG

DATE: OCT. 13, 2006 SCALE: AS NOTED

SHEET FIG 5

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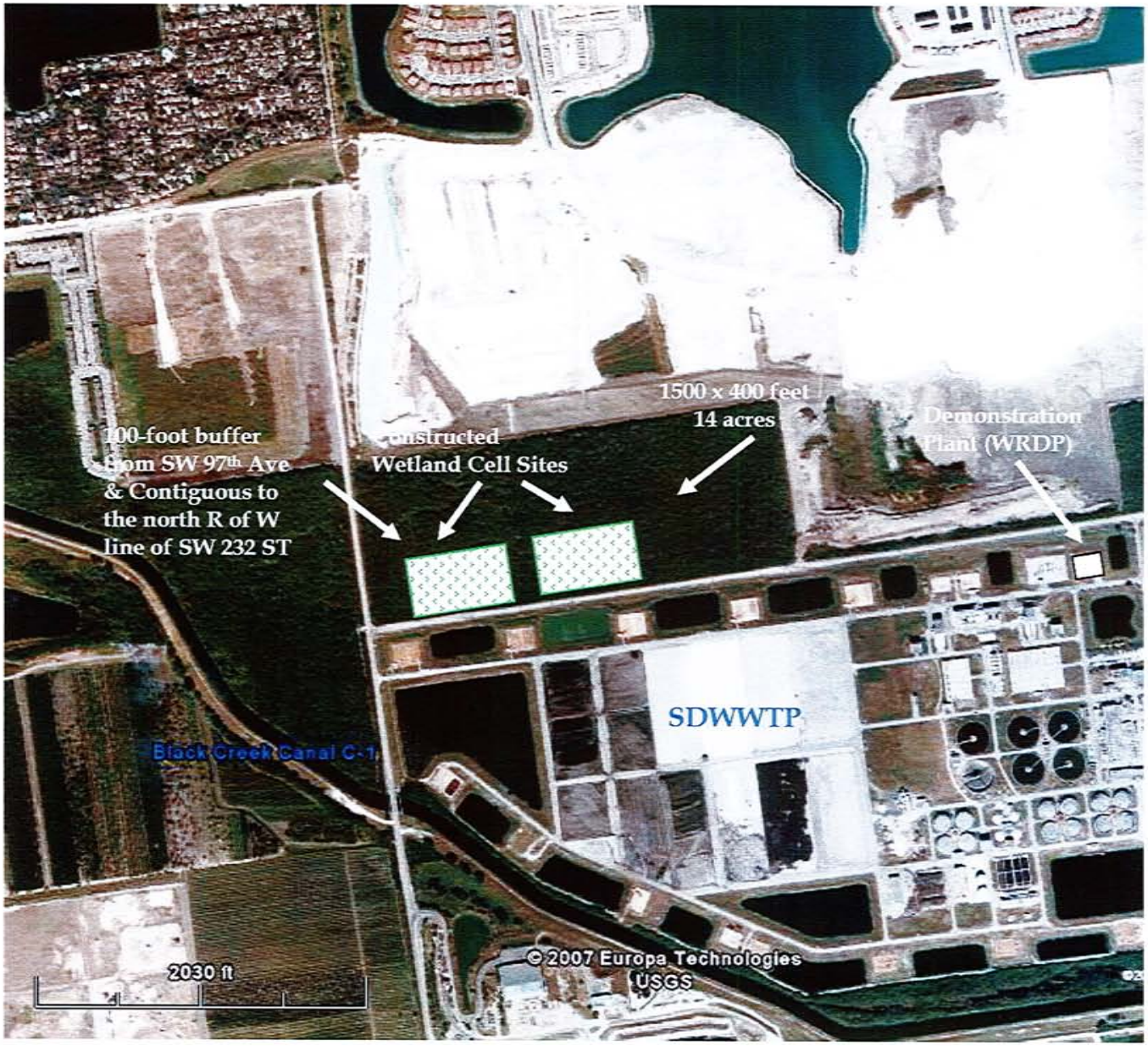

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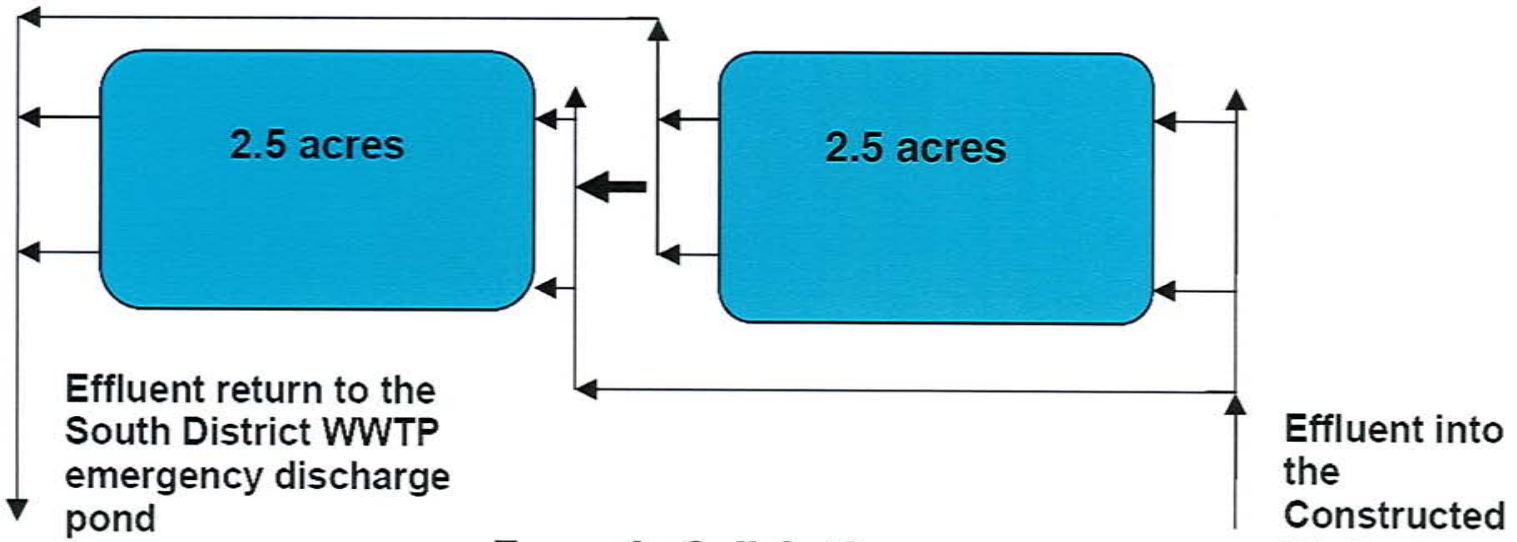
Figure 6
Proposed Constructed Wetland Demonstration Site Configuration



Example Cell Options

2.5 ac Cell	emergent (e.g., sawgrass)
2.5 ac Cell	submerged aquatic vegetation (SAV)

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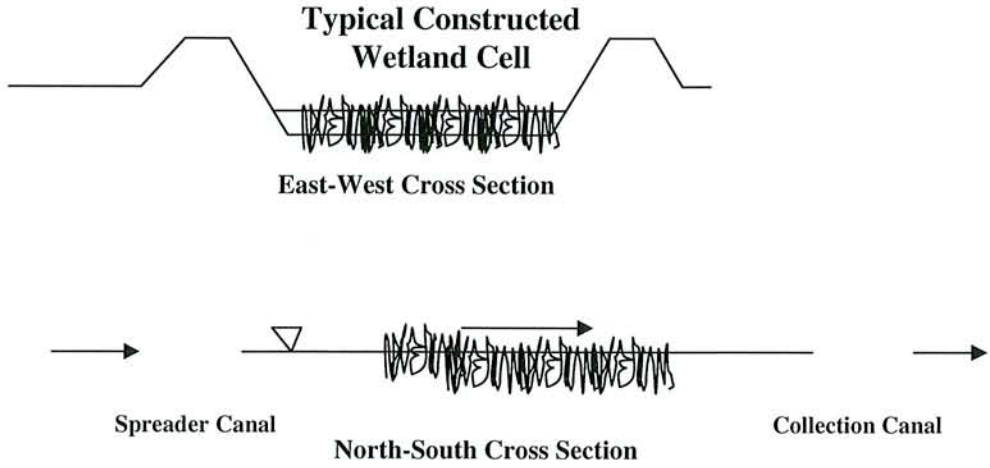
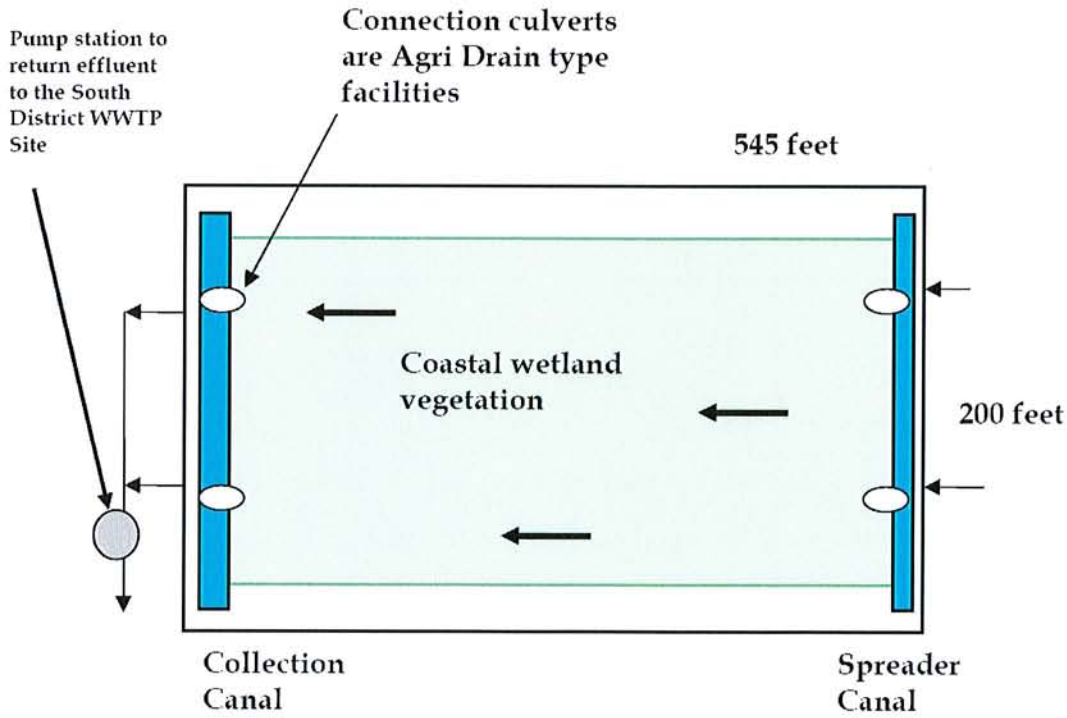
Figure 7
Initial Conceptual Wetland Site Layout



Typical Constructed Wetland Cell Cross Sections



Constructed Wetland Cell Site Plan – Typical Layout

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Figure 8 - Top
Figure 9- Bottom

Phase I/II ESA and subsequent Additional Assessment Report for the selected site indicates that the parcel is acceptable for use in the demonstration project.

The biological response investigation will focus on vegetation typical of the Biscayne Bay Coastal Wetlands. The characterization of native Biscayne Bay Coastal Wetland vegetation types and density will be used in designing the planting plan for the constructed wetland cells. The coastal vegetation plants type and diversity to be used in the demonstration project will be determined through the use of a control wetland transect. The control wetland transect will be monitored during the project life to identify natural vegetation changes not related to the reuse water testing. The design phase of the project will include a coastal wetland site inspection to select the location of the control wetland transect and assist in the definition of the "biological response" parameters to be monitored, and the probable range of values.

The detailed design of the constructed wetland will be enhanced through use of first order spreadsheet models for sizing the wetland cells and the site groundwater seepage analysis, and use of conventional proprietary and public domain hydrology models. The schedule for the constructed wetland will include a two season (summer growing season) grow-in and start-up period, and the initiation of "biological response" monitoring in the third season.

A technical memorandum was prepared by CH2MHILL, a subconsultant to CDM, detailing the conceptual design of the constructed wetlands and the information obtained to assist in the conceptual design. Planning-level cost estimate for the Constructed Wetland, based on the best available unit cost information (in December 2006 dollars), is estimated at approximately $1,587,500. Final design of the CWRRDP includes a detail design of the constructed wetland, and preparation and submittal of the permitting applications.

Baseline Assessment and Monitoring Program

Milian, Swain & Assoc., Inc. (MSA) performed a review of readily available water quality, vegetation, soil, wetlands hydrologic, topographic, land use, and utility data to characterize the existing conditions of the subject areas, including the Cutler Flow Way and nearby water bodies. To identify this baseline information, specific tasks performed included conducting a site visit of the subject areas to determine existing site conditions; obtaining and reviewing existing reports, investigations, and data regarding the subject area; and developing an inventory of existing conditions data including identification of data gaps.

This data collection and review served two primary purposes:

- Characterize an environmental baseline, where physical, chemical and biological responses to the constructed wetlands demonstration project can be assessed.
- Provide information needed to design, construct, and develop a monitoring plan for the CWRRDP.

There were no significant findings that would indicate that the proposed test area would be unsuitable for project implementation. However, it should be noted that there was no environmental data available to provide baseline information for the proposed constructed wetland site specifically.

Although multiple datasets for the surrounding canals, the coastal wetland fringe, and Biscayne Bay are provided, no data was readily available for the coastal wetlands specifically. Available datasets are provided to characterize the surrounding water quality and to provide existing conditions of the surrounding water bodies. Parameters consistent with those anticipated for testing during the demonstration project testing were included. No data was readily available for microconstituents in the vicinity of the project area.

Vegetation data has also been provided to characterize the existing conditions within the proposed constructed wetland site. It is not anticipated that any of the current vegetation will be used in the constructed wetland. Vegetation consistent with that found in the Biscayne Bay Coastal Wetlands and the proposed control site will need to be planted in the constructed wetland areas. This vegetation will need an establishment period of more than a year in order to stabilize so that the response evaluations can begin in a "mature" system.

Specific recommendations for water quality and biological data collection will be outlined in the CWRRDP Monitoring Plan and will be based on monitoring plans implemented during other reuse pilots, the operations schedule of the plant, and physical site conditions dictated through design and construction.

A data inventory of existing soil, groundwater, surface water, sediment and biological quality has been generated to identify data gaps and information needs. This inventory provides insight into monitoring activities to be executed during the final design and/or construction phases to satisfy those data gaps needed to generate a baseline and an effective monitoring program.

Evaluation of Emerging Contaminants of Concern at the South District Wastewater Treatment Plant Based on Seasonal Sampling Events, Miami-Dade County, Florida, 2004

By A.C. Lietz and Michael T. Meyer

Prepared as part of the Comprehensive Everglades Restoration Plan

Scientific Investigations Report 2006–5260

U.S. Department of the Interior
U.S. Geological Survey

The full report may be found at: http://pubs.usgs.gov/sir/2006/5240/

Evaluation of Emerging Contaminants of Concern at the South District Wastewater Treatment Plant Based on Seasonal Sampling Events, Miami-Dade County, Florida, 2004

By A.C. Lietz and Michael T. Meyer

Abstract

The Comprehensive Everglades Restoration Plan has identified highly treated wastewater as a possible water source for the restoration of natural water flows and hydroperiods in selected coastal areas, including the Biscayne Bay coastal wetlands. One potential source of reclaimed wastewater for the Biscayne Bay coastal wetlands is the effluent from the South District Wastewater Treatment Plant in southern Miami-Dade County. The U.S. Geological Survey, in cooperation with the Comprehensive Everglades Restoration Plan Wastewater Reuse Technology Pilot Project Delivery Team, initiated a study to assess the presence of emerging contaminants of concern in the South District Wastewater Treatment Plant influent and effluent using current wastewater-treatment methods.

As part of the study, 24-hour composite and discrete samples were collected at six locations (influent at plants 1 and 2, effluent pump, reuse train, chlorine dioxide unit, and ultraviolet pilot unit) at the plant during: (1) a dry-season, low-flow event on March 2-3, 2004, with an average inflow rate of 83.7 million gallons per day; (2) a wet-season, average-flow event on July 20-21, 2004, with an average inflow rate of 89.7 million gallons per day; and (3) high-rate disinfection tests on October 5 and 20, 2004, with average flow rates of 84.1 and 119.6 million gallons per day, respectively. During these four sampling events, 26, 27, 29, and 35 constituents were detected, respectively. The following transformations in concentration were determined in the waste stream: -100 to 180 percent at the effluent pump and -100 to 85 percent at the reuse train on March 2-3, 2004, and -100 to 1,609 percent at the effluent pump and -100 to 832 percent at the reuse train on July 20-21, 2004; -100 to -37 percent at the effluent pump, -100 to -62 percent at the reuse train, -100 to -56 percent at the chlorine dioxide unit, and -100 to -40 percent at the ultraviolet pilot unit on October 5, 2004; and -100 to -4 percent at the effluent pump, -100 to 17 percent at the reuse train, -100 to -40 percent at the chlorine dioxide unit, and -100 to -14 percent at the ultraviolet pilot unit on October 20, 2004.

Samples were tested for detection of household and industrial (organic) wastewater compounds, pharmaceutical compounds, antibiotic compounds, and hormones in influent. Two "known" endocrine disrupting compounds—17 beta-estradiol (E2) and diethoxynonylphenol— and four "suspected" endocrine-disrupting compounds—1,4-dichlorobenzene, benzophenone, tris(2-chloroethyl) phosphate, and tris(dichloroisopropyl) phosphate—were detected during these sampling events. Phenanthrene and indole showed the greatest concentration ranges and highest concentrations for the organic wastewater compounds. Acetaminophen showed the greatest concentration range and highest concentration, and warfarin showed the smallest concentration range for the pharmaceutical compounds. Sulfamethoxazole (a sulfonamide) showed the greatest concentration range and highest concentration, and sulfathiozole (also a sulfonamide) showed the smallest concentration range for the antibiotic compounds. Two hormones, 17 beta-estradiol (E2) and estrone (E1), were detected in influent.

Samples were also tested for detection of organic wastewater compounds, pharmaceutical compounds, antibiotic compounds, and hormones in effluent. Indole showed the greatest concentration range and highest concentration, and triphenyl phosphate showed the smallest concentration range for the organic wastewater compounds. Dehydronifedipine showed the greatest concentration range and highest concentration, and warfarin had the smallest concentration range for the pharmaceutical compounds. Anhydro-erythromycin (a macrolide degradation product) showed the greatest concentration range, and sulfadiazine (a sulfonamide) and tetracycline showed the lowest concentration ranges for the antibiotic compounds. One hormone, 17 beta-estradiol (E2), was detected in effluent.

A statistical approach using the Wilcoxon signed-ranks test was undertaken to determine if there were statistically significant differences at the 95-percent confidence level between concentrations from composite and discrete samples. Of the 83 constituents detected, only 3.5 percent showed any statistically significant differences at the 95-percent confidence level.

Quality-assurance samples were collected for all organic wastewater compounds and included field blanks, equipment blanks, a duplicate sample, and matrix spikes. Analytical results of field and (or) equipment blanks were less than the minimum reporting levels (MRLs) for aceptophenone, N,N-diethyl-*meta*-toluamide (DEET), and naphthalene. Phenol had a concentration greater than the MRL. One duplicate sample was collected for 63 organic wastewater compounds. The relative percent differences were not determined or estimated for 62 and 11 percent of the compounds, respectively, because of censored data and matrix interference; however, relative percent differences were estimated for 25 percent of the compounds because of data below the MRLs. Of the relative percent differences that were determined, values ranged from 0.0 to 97.

Quality-assurance samples were also collected for pharmaceutical compounds, antibiotic compounds, and hormones. Analytical results of field and (or) equipment blanks for pharmaceutical compounds had concentrations greater than the MRL for 1,7-dimethylxanthene, diphenhydramine, and fluoxetine. Four pharmaceutical compounds had concentrations less than the MRL including acetaminophen, diltiazem, thiabendazole, and trimethoprim. Lincomycin, ofloxacin, and tetracycline were the only antibiotic compounds with concentrations greater than the MRLs for equipment blanks. The hormone 17 beta-estradiol (E2) had concentrations greater than the MRL for field and equipment blanks.

Average matrix spike recoveries were determined for 55 organic wastewater compounds. Average spike recoveries for 22 compounds (40 percent) were outside of the expected spike recovery range, and 16 compounds (29 percent) were considered "estimated" because one or more values were below the MRLs because of matrix interference or multiple detection levels. Recoveries could not be determined for 22 compounds because of a predominance of censored data values and lack of recovery for two samples.

The enzyme-linked immunosorbent assay (ELISA) analyses for hormones were confirmed by liquid chromatography/mass spectrometry (LC/MS) results. For 17-beta estradiol (E2), the average concentration of spiked samples and the spiked minus unspiked samples was about twice as high for the ELISA tests as for the LC/MS results. For the estrone (E1) and ethenyl estradiol (EE2) analyses, the average concentrations for the spiked samples and spiked minus unspiked samples were similar.

Surrogate performance was analyzed for selected compounds. Results indicated that decafluorobiphenyl, caffeine C-13, bisphenol A-d3, and fluoranthene d-10 were all within expected surrogate recovery ranges, indicating acceptable laboratory extraction and processing procedures.

Introduction

One objective of the Comprehensive Everglades Restoration Plan (CERP) is to restore natural water flows and historical hydroperiods to the southern Florida ecosystem. To accomplish this task, the Central and Southern Florida Restudy (U.S. Army Corps of Engineers, 1999) evaluated the use of reclaimed water to augment existing water supplies and identified highly treated wastewater as a potential source. The Wastewater Reuse Technology Pilot Project was established to: (1) identify advanced wastewater-treatment technologies capable of supplying reclaimed water (that will not adversely affect natural systems) in viable quantities to meet regional water demands as identified in CERP, and (2) investigate the effects of applying reclaimed water to ecosystems within Miami-Dade County.

In accordance with these objectives, CERP proposes to develop one of two advanced wastewater-treatment pilot facilities at the current South District Wastewater Treatment Plant (SDWWTP) in southeastern Miami-Dade County. Superior highly treated reuse wastewater from this facility will be used to replace and augment freshwater flows to the sensitive Biscayne Bay ecosystem, and restore more natural hydroperiods to the Biscayne Bay coastal wetlands area, which covers about 13,600 acres east of L-31E Canal in southeastern Miami-Dade County (fig. 1).

A critical concern that must be addressed in the application of reused water to ecosystems is the degree to which certain constituents in reclaimed water may adversely affect the aquatic biota of an ecosystem. The ecological and human health impacts of emerging contaminants of concern have received increased attention within the past decade, specifically, the endocrine disrupting chemicals and their effects on the aquatic biota. To address these issues, the U.S. Geological Survey (USGS), in cooperation with the CERP Wastewater Reuse Technology Pilot Project Delivery Team, initiated a study to evaluate: (1) the presence of emerging contaminants in influent and effluent at the SDWWTP, and (2) the degree of constituent transformation at selected locations in the waste stream using current (2004) treatment processes.

http://www.epa.gov/waterscience/criteria/aqlife.html
Last updated on Thursday, December 28th, 2006.

Water Quality Criteria

Aquatic Life

National water quality criteria for the protection of aquatic organisms and their uses:

- Guidelines for deriving numerical criteria
- Finalized criteria
- Criteria under development
- Other resources

You will need Adobe Reader to view some of the files on this page. See EPA's PDF page to learn more.

Guidelines for deriving numerical criteria

- Draft Strategy: Proposed Revisions (PDF) (5 pages, 74 K) (February 6, 2003)
  We will establish a guidelines revision workgroup to identify, evaluate, and revise the existing guidelines.
- 1985 Guidelines (PDF) (105 pages, 4.5 Mb) | Please email us for a Section 508 accessible copy.

Finalized criteria

- Current Criteria Table containing aquatic life criteria for pollutants.
- Ammonia (Update, December 1999)
- Cadmium
- Diazinon
- Dissolved Oxygen
- Methyl Tertiary-Butyl Ether (MTBE)
- Nonylphenol
- Tributyltin
- Chemical specific criteria documents from the 1980's

Criteria under development

EPA is revising the current aquatic life criteria for copper, silver, lead, and selenium, re-evaluating the current aquatic life criteria for ammonia, and developing new aquatic life criteria for atrazine.

- Atrazine
- Ammonia
- Copper
- Lead
- Selenium (December 9, 2004)
- Silver

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