A Compilation of Selected Analyses
Supporting the
Tampa Bay National Estuary Program’s
Nitrogen Allocation Workshops

1993-1996

Prepared by
Apogee Research, Inc.

May 1996
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Preface

This document presents selected analyses and presentations prepared by Apogee Research, Inc. for the Tampa Bay National Estuary Program (TBNEP) between June 1993 and May 1996. This work was conducted under TBNEP Contracts T-93-05 and T-94-07. This compilation does not include cost estimates Apogee developed for selected TBNEP CCMP actions (1995). It also does not include work plans, scopes of work, or selected planning and strategy papers Apogee prepared under the above referenced contract at TBNEP’s request.

Materials in Sections 1, 2, and 3 were developed specifically for a Management Conference workshop held in June 1993. The purpose of these materials, consisting of two sets of overheads and a background paper, was to present basic pollutant load reduction allocation concepts.

Materials in Sections 4 through 8 were developed specifically for a Management Conference workshop held in October 1995. Apogee performed several related tasks in conjunction with this workshop:

- Developed a spreadsheet model for Tampa Bay that includes data on current loadings and estimated future loadings by source by segment, where assumptions about future growth in loadings and effectiveness of loading reductions are variables, as are reduction responsibilities and unit load reduction costs;
- Projected nitrogen load reductions for bay segments under base case assumptions;
- Developed unit load reduction cost estimates for nitrogen;
- Developed a trading scenario for each bay segment;
- Calculated potential cost savings under trading assumptions;
- Prepared four cost-effectiveness case studies for CCMP actions; and
- Identified issues associated with implementing nitrogen load reduction allocations with and without a trading option.

The purpose of this compilation is to locate the bulk of Apogee’s work for TBNEP in a single document. It is not intended to provide additional analysis beyond that presented in each section. If you have questions about any of the materials presented herein, please call the Tampa Bay National Estuary Program office at 813-893-2765 or Apogee Research, Inc. at 301-652-8444.
WORKSHOP STRUCTURE

OBJECTIVE: Minimize total cost of reducing pollutant loads

CONSTRAINTS: Effectiveness

Equity

Technological Feasibility

Affordability

Support For Other Water Goals
EFFECTIVENESS

Assurance that the final set of pollutant load reductions will, indeed, attain ambient water quality goals. Interesting issues include:

- Whether and how the seven areas affect each other
- How to measure and incorporate background loadings
- How much reserve is needed to account for growth
EQUITY

Assurance that members of the regulated community are being treated fairly in the reductions they must bear. 
Key issues include:

- Discussion and agreement on what equity means
- How to measure equity for purposes of this process
- Intergenerational and spatial equity
TECHNOLOGICAL FEASIBILITY

Assurance that readily available technologies and BMPs are capable of performing at the levels of removal contemplated. Key issues include:

- Practical versus capital limits
- Robustness and reliability of technologies and BMPs
- Role of O & M
AFFORDABILITY

Assurance that all members of the regulated community are able to pay for the level of reduction contemplated. Defining affordability is harder than it sounds:

- Total cost
- Cost per capita
- Fixed or expandable budgets
WORKSHOP 1: INTRODUCTION

- Introduce Pollutant Load Reduction Allocation Process
- Introduce Current Regulatory Approach
- Introduce Alternative Approaches
- Planning The Workshop Series
- Introduce Organizing Principles
- Seek Leadership on Issues
WORKSHOP 2: EFFICIENCY & EFFECTIVENESS

- Present Refined PLRGs by Bay Segment
- Agreement on Product
- The Objective Function -- Minimize Total Cost
- The Effectiveness Constraint -- How to Define & Quantify It
- Accounting for Reserve Loading & Baseline Loading
WORKSHOP 3: EQUITY & AFFORDABILITY

• The Equity Constraint -- How Do We Define & Measure Equity?

• The Affordability Constraint -- What Does Affordability Mean & How Do We Measure It?
WORKSHOP 4: TECHNOLOGICAL FEASIBILITY

- Technological Feasibility -- What Does It Mean & How Do We Measure It?

- Perhaps Treat this Subject in Sub-Groups by Type of Source?

- Discuss Possible Evaluation of the Dual Problem -- i.e., Switch Constraints with Objective Function

- Potential to Attain Other Water Management Goals -- Water Use Efficiency, Flood Control, etc.
WORKSHOP 5: UNDERSTANDING AND PRESENTING RESULTS

- Present Results of Optimizations -- Alternative Allocations

- Discuss Nature and Form of Presentation of Allocations to Regulatory Agencies
2. GOALS OF WASTELoad ALLOCATIONS

and other reference documents are cited in Section 5 of this paper. This document
of wasteload allocations for multiple discharge scenarios conducted in 1983 and 1990. This document
The presentation of the information herein is also based on Mr. Williamson’s survey
with local maximum delay load processes and policies, including wasteload and load allocations.
The information provided in this background paper is drawn from Apgar’s experience.

A short list of references for additional information.

For each method, a list of advantages, disadvantages, and information from field

A summary list of the primary methods that states have used to make wasteload

Recommended for Tampa Bay to consider.

A series of lessons learned from other states experiences that provide

A summary of the goals of wasteload allocations.

material is presented in this paper.

This paper provides background information on the alternative methods for making

1. INTRODUCTION

Background Paper: Alternative Wasteload Allocation Bases

Tampa Bay Watershed Management Workshops
An early identification of the responsible parties (often the discharged) for decontamination or future actions. Organizational solutions for future decision making, financing mechanisms, and technical solutions for point and non-point sources of pollution. Solutions for both point and non-point sources of pollution, strategic and non-strategic. These lessons are presented below.

LESSONS FROM WLA EXPERIENCES

The following forces in the criteria above illustrate the difficulty in achieving an appropriate solution to the practical problem they must address.

Has a broad based consensus of approval from the regulated discharges.

Is understandable to wide segments of interested parties; and

Enhances the environmental impact of each source.

Allows the process to be dynamic and inclusive of all parties.

Incorporates an appropriate factor of severity.

Discourages: Accounts for and handles equitably the occurrence of new or expanded utilites the full assimilative capacity of the receiving water body.

Does not impose an undue financial burden on any individual discharger.

Requires the minimum cost individually and collectively.
- Use of different methodologies for oxygen demand and substances versus toxics.
- Possible use of different methodologies for multiphase and industries.
- Regulatory agency will make the decision.
- Allow for solutions that include sequencing of actions.
- Allow for solutions that include sequencing of actions.
- When modeling, ensure that (1) regulators approve the model, and (2) the model making process.
- Possibly incorporate the availability of grants or loans as part of the decision.
- Require a plan of study early in the process that is approved by all parties.
- WLV negotiations should include local justifications.
- Overarch to preliminary conclusions.
- Recognize that WLV determinations are an iterative process.
- Recognize that WLV determinations are an iterative process.
- In an initial step in the process.

An allowance for seasonal allocations.

Organize the WLV negotiations by establishing a local "advisory group", that is, a group where all key interests are represented.

An allowance for seasonal allocations.

Perform remedial, require the discharge to pull together the financial information, and
Seasonal WLA

- River Flow Augmentation From Upstream Reservoir Releases
- Relating Efficient Limitations To Flow In The Receiving Stream
- Controlled Release Strategies: All Low Flows, Start Discharge
- Inclusion of Maximum and Minimum WLA in Model
- Hybrid - Variable Criteria Per Source
- Negotiated Load Allocations and Trading Bubbles
- Tradable Discharge Permits
- Production Based Methods
- Proportional Approach Methods
- Cost Based Methods
- Equal Total Mass Discharge Per Day
- Maximum Assimilative Capacity
- Equal Percent Removal
- Equal Effluent Concentration

The most commonly used methods are described in the tables listed below. Some of these have several variations. These approaches and some variations are listed below. Approximately eight to ten major approaches to WLA in exist in practice and theory.
Adaptable to both municipalities and industries.

FIELD INDICATIONS

Pollutant loading is smaller.
Additional incremental capabilities although their relative contribution to total concentration limits can be unmanageable for small dischargers who must install concentration-based limits are generally not directly related to control costs.

Increase in concentration does not prevent increased pollutant loading as flows

DISADVANTAGES

Can be easily incorporated into discharge permits.

Concentration-based limits allows for variations and increases in flow.

Identical limits for all dischargers appears equitable.

Concentration limits are easily understood by dischargers.

ADVANTAGES

According to a survey of the states, 18 states, including Florida, have used this method. It is the most widely used.

USE

Each discharger is assigned the same initial limitation by concentration (€.€.

DESCRIPTION

EQUAL EFFLUENT CONCENTRATION
smaller dischargers incur relatively higher treatment costs.

More favorable to larger dischargers, less favorable to smaller dischargers, where

**FIELD INDICATIONS**

- Permit requirements.
- Equal percent removal requirements may not be readily adaptable to discharge
- Contribution (potentially inefficient).
- Treatment costs resulting from this method may be proportional to pollution capability.
- Method does not directly relate effluent limits to receiving water assimilative
- Pollutant loading may increase as flows increase.

**DISADVANTAGES**

- Changing water quality variables do not alter allocations.
- Equal percent removal requirement appears equitable.
- Method is readily understandable by discharges and regulators.

**ADVANTAGES**

- 6 states have used this method.

**USE**

A "equal effluent from all discharges."

- A method where total assimilative capacity is divided among dischargers to regulate
- Parameters (e.g., 85%). Loading differs according to flow. Variations include
- Each discharger is assigned the same effluent limitation by percent removal of

**EQUAL PERCENT REMOVAL**
upstream discharges receive a greater benefit from receiving waters' assimilative capacity. Discharger location and background water quality conditions are major factors.

FIELD INDICATIONS

- Receiving water if permitted cannot be reoportun.cally.
- This method may not be flexible enough to address changing conditions in the dischargers' receiving appearsances of unclean leachate.
- Upstream discharges may receive larger relative allocations than downstream.

DISADVANTAGES

- May be unclean.
- Dischargers generally feel they are getting a fair deal, even though allocations differ.
- Gives dischargers most flexible limitations, local water quality conditions allow.
- Advantage of the waterbody's assimilative capacity.
- Method established clear link between standard and water quality science, taking

ADVANTAGES

- 10 states have used this method.

USE

- Factor and/or reserve capacity.
- Percent of receiving water assimilative capacity to discharges to build in a safety precaution at discharger location and according to flow. Allocation: apportionment of concentrations and effluent design flow, loading differences according to assimilative capacity of the receiving water at the point of discharge, background, background.
- Effluent concentration for each discharger is a function of water quality standards.

DESCRIPTION

MAXIMUM ASSIMILATIVE CAPACITY
contribution – increasing equity of allocation.
Pollution reduction requirements are proportional to discharge’s relative pollution
Adaptable to both municipal and industrial,
As a result, larger discharge must meet to higher limits.
Larger discharge because larger flows require lower concentrations to meet
Method is generally more favorable to smaller dischargers, and less favorable to

FIELD INDICATIONS

meet mass-based limits.
As growth leads to flow increases, flows, treatment levels must also increase to
require higher expenditures.
Mass-based allocation may impose unequal treatment costs and larger flows may

DISADVANTAGES

(inefficiency good)
Limits by varying flow, concentration, or treatment method (potential for
Limits based on mass flow flexibility to dischargers to determine whether to meet
Load allocations are easily incorporated into discharge permits.
Allocation appears equitable as each discharger allowed equal pollutant loads.
Method is clear and easily understood.

ADVANTAGES

Two states have used this method.

USE

Kg/day. Loading does not differ according to flow.
Each discharger is assigned the same load allowance per unit of time (e.g., 15

DESCRIPTION

EQUAL TOTAL MASS DISCHARGE PER DAY
When this method leads to allocations that minimize financial impacts, discharges.

Cost information has been most accepted when it comes from a neutral source.

According to some financial measures.

Cost-based allocations focus directly on equity and fairness by equalizing impacts.

FIELD INDICATIONS

Industry cost information is generally considered proprietary and may be difficult.

Necessary cost information may not be available over the continuum of pollutants.

Controversial, amount discharged and amount the environmental community.

Allocate the resources to the basis of cost, or some proxy thereof, can be.

DISADVANTAGES

Because, unlike many of the other methods, it directly addresses financial issues.

Where cost and financial WLA criteria are important, this method is useful.

Least cost criteria.

Method can be used to maximize efficiency by basing control requirements on

Capacity per pound of discharge, and across discharges.

Methods attempt to minimize adverse financial impacts by equalizing financial.

ADVANTAGES

6 states have used these methods.

USE

cost per discharge per unit of flow; and equal marginal cost.

polllutant removed; actual incremental cost of pollutant removed; equal

to community income baseline (activity to pay); equal total cost for pound of

criteria. Valuations include: minimum total cost; financial removal proportional

efficient allocation according to some cost-based.

DESCRIPTION

COST BASED METHODS
Proprietary information re-structed -- those using more polluting inputs should face a higher polluting inputs used -- those using more polluting inputs should face a higher burden to clean up. Therefore, there is a need for a more refined approach to the relative environmental impact of the amount of pollution emitted. The proposed proportional approach is based on the logic that pollutant removal levels and discharge requirements must be perceived as fair: the proportional allocation approach may generally be perceived as fair. Therefore, proportional allocation is an equitable and adaptable approach. Efficiency limits resulting from this approach may vary across dischargers and facilities. It is not clear if this approach distributes the treatment cost burden in an equitable manner. It is not clear how this approach relates to the TMDL calculation. Recalling WLA's 10 percent input removals may not be easily adaptable to these new concerns. 

Disadvantages

Approaches are easily understandable by regulated and regulators.

Principal that larger contributors should be required to make larger reductions.

Based on input requirements on use of polluting inputs is consistent with the discharges.

Approach is widely applicable and equitably applies to different types of inputs.

Advantages

3 states have used these methods.

Use of input or raw load of pollutants (and) an effluent concentration that is inversely proportional to raw loading.

Each discharger is assessed (1) a percent removal requirement that is proportional

Description

Proportional Approach Methods
As usage of raw materials increases, so does the production increase. Therefore, production-based methods are applicable only to industries.

**Field Indications**

- Experience with the approach exists.
- This method has not been widely applied, and as a result, little practical calculations to arrive at efficient limits are independent of assimilative capacity.
- Production limits based on production units of products creates a disincentive to increasing industries.
- It may be difficult to determine equivalent units of production for varying industries.

**Disadvantages**

- All industries are treated the same.
- Lower cost burden.
- Requires pollution control to productivity so that small and new industries have a

**Advantages**

- I have used these methods.

**Use**

Production discharged per unit of raw materials and equivalent mass discharged per unit of production; vertical weighting includes: equal treatment cost per unit of production; equal mass discharged per unit of production. Each discharger is assigned pollution limits based on some unit of production of production-based methods.
Similar permit trading systems have a successful track record in air quality control programs.

Permits, supporting the goal of meeting water quality standards at least cost. In theory, dischargers with higher abatement costs will purchase the majority of permits, while dischargers with lower abatement costs will sell their permits.

FIELD INDICATIONS

Transaction and administrative costs to regulate and participate. Tradable permit systems can require detailed and complex accounting, increasing participation in trading.

Depressed communities may be at a significant financial disadvantage to permit holders who can afford them -- as a result, economically disadvantaged communities may be uncomfortable for some regulators and the majority of the environmental community.

The system creates an appearance of "selling" a "right" to pollute that is very uncomfortable for some regulators and the majority of the environmental community.

A true system of tradable efficient permits is implemented in field.

DISADVANTAGES

Expected to be less than for traditional command-and-control systems.

Once the trading system is established, regulatory agencies administrate costs are expected to be less than for traditional command-and-control systems.

A system in which permits may be traded involves dischargers in control efforts.

 Tradable permits, in theory, maximize efficiency and promote cost effectiveness.

ADVANTAGES

A system in which permits may be traded involves dischargers in control efforts.

 Tradable permits, in theory, maximize efficiency and promote cost effectiveness.

USE

 Tradable permits, sometimes on an open market, and sometimes at set times.

 Tradable permits may be traded for a fixed price. Under this system, dischargers may buy higher bids, or sell for a fixed price. Under this system, tradable permit systems are established and the regulatory agencies issue a fixed number of permits. These permits may be auctioned to the highest bidder, or sold for a fixed price. Under this system, tradable permit systems are established and the regulatory agencies issue a fixed number of permits.

DESCRIPTION

TRADEABLE DISCHARGE PERMITS
be controlled to receive credit for one pound of point source control.

- Establishment of trading protocols to facilitate trading of nonpoint source pollution that must be controlled to receive credit for one pound of point source control is difficult.

- Uncertainty about nonpoint source control effectiveness makes it difficult to establish regulatory authority over real trading programs.

- Point/nonpoint source trading may result in local water quality problems.

Practical experience with this approach has been limited and many results from existing projects are still unclear.

**DISADVANTAGES**

- Level without trading:
  - When trading occurs, the arrangement increases nonpoint source controls over cost information.

- Allocation by negotiation offers a path to least cost solutions without divesting the measures and gives discharge rights flexibility in allocating loads.

- This method provides flexibility with a process to come up with allocations and discharge rights. Cooperation between regulators and dischargers and among dischargers.

- This method is an interactive process that provides meaningful opportunities for cooperation.

**ADVANTAGES**

Bassin in Colorado and the Chelmsford River Basin in Washington State.

- This approach is currently in use at the Dillon Reservoir in Colorado and Tar

**USE**

- Under a bubble system, the regulatory agency establishes the TMDL for the

**DESCRIPTION**

**NEGOTIATED LOAD ALLOCATIONS AND TRADING BUBBLES**
EPA verbally supports pilot projects, funding support has been limited. Accessing funding to do nonpoint source control studies has been difficult. Successful programs at Dillon Reservoir and Tar Pits into River are generally considered.

FIELD INDICATIONS
REFERENCES
Required Type or Scope of BMPs

Required Type or Level of Treatment

mg/l

e.g., percent removal rates, lbs/day

Loading Reduction Requirements

Allowances -- e.g., lbs/day, mg/l

Reduction allocations may be expressed as:

A pollutant load reduction goal that a source must meet, that portion of the total pollutant load (PLR) allocation is

What Are Pollutant Load Reduction Allocations?
Allocations

Enable Sources to Approve Process and

Clarity Process and Allocations

Sources

Equalize Environmental Impacts Across

Include All Stakeholders in Process

Make Allocation Process Dynamic

Include Appropriate Safety Factor(s)

Sources

Equitably Account for New/Expanded

Consume Assimilative Capacity

Avoid Unmanageable Financial Burdens

Minimize Costs

Meet Water Quality Standards

PIR ALLOCATION GOALS
Hybrids - Varying Criteria by Source

- Cost Based Methods
- Seasonal Plans
- Negotiated Allocations/Trading Bubbles
- Proportional Approach Methods
- Equal Total Mass Loaded per Day
- Maximum Assimilative Capacity
- Equal Percent Removal
- Equal Effluent Concentration

ALTERNATIVE ALLOCATION BASES
Can be unfavorable to small discharges

Not directly related to control costs

Increased flows lead to increased loadings

Easily incorporated into permits

Allows for variations and increases in flow

Idemical limits for all effluents applicable

Limits are easy to understand

Including Florida, most widely used method (18 states)

By flow concentration (e.g., mg/l) -- loading differs by source assigned same effluent limit by
NH₃-N, DO, and fecal coliforms subjected to same effluent limits for BOD, SS, regional plants and industrial dischargers.

- Regional requirements, regardless of cost
- Compromise solution: all meet same discharge quality problems
- Numerous particulates in regional studies of water
- Municipalities, industries, and rural consort-

- Municipalities, industrial dischargers
- Point sources include 2 regional WWTPs and
- Advanced treatment requirements
- BOD and ammonia problems resulted in
- River flows from Utah Lake to Great Salt Lake

Jordan River, Utah
Effluent Concentration:
May not be readily adaptable in permits

Pollution contribution (potentially inefficient)

Treatment costs may not be proportional to

Receiving water assimilative capacity

Does not directly relate effluent limits to

Loading may increase as flows increase

Allocations

Changing water quality variables don't alter

Appears equitable

Effort from all
divided among sources to require "equal"
Variation: total assimilative capacity

Percent removal of parameters (e.g., 85%)

Sources assigned same effluent limit by

Equal Percent Removal
No new point source discharges
Industries treated as one discharger
Sources already at 85% receive credits
Source with greatest load must treat first
$$\text{capital outlays avoided until necessary}
\text{some of their costs from others}
\text{Dischargers taking immediate action recover}
\text{85% removal requirement (phased in)}

Group proposed and regulators accepted:
Dischargers allowed to allocate TMDL
Three industries
Point sources: Six municipalities, and
Phosphorus TMDL: 259 kg (571 lbs)/day
Water quality problem: Phosphorus

SPOKANE RIVER & LONG LAKE
EQUAL PERCENT REMOVAL:
Sources upriver may receive larger relative

Sources often see limits as fair, even if different

Output conditions allow

Results in most flexible limitations Local water

Takes advantage of assimilative capacity

Clear link between allocations and water quality

Variation: 90% capacity assigned, 10%

Background concentration, and design flow

Assimilative capacity at point of loading,

Limits a function of water quality standards,

MAXIMUM ASSIMILATIVE CAPACITY
DEQ solicited input from discharge points at public forums held throughout process.

Control regulation includes compliance schedule.

DEQ assigned loads according to segment or river mile.

DEQ established TMDLs that relate allowable loads (pounds/day) for each plant to flow throughout river basin.

Objective of TMDL: maximize assimilative capacity throughout river basin.

Secondary treatment standards sources include 6 regional WWTPs -- they exceed TMDLs phosphorous and ammonia.

Bloom caused by ammonia and phosphorous-induced algal River slow moving, problems included low DO.

**MAXIMUM ASSIMILATIVE CAPACITY**

**TUALATIN RIVER, OREGON**
Support has been limited
EPA verbally supports pilot projects, funding limited in past
Funding for nonpoint source control studies
Regulatory authority over trades may be unclear
Local water quality problems may develop
Specific practical experience limited, results may be case-specific

Trading provides funding for nonpoint source controls over level without trading
Trading provides funding for nonpoint source trading provides sensitive cost information
difficult to least cost solutions without opportunities for cooperation
Process interactive, flexible, and provides

Sources may "trade" for reductions by funding Sources may "trade" for reductions by funding
Sources decide how to apportion the total load

NEGOTIATED ALLOCATIONS & TRADING
CHEHALIS RIVER, WASHINGTON (planned)

TMDL for DO
Sources: 6 WWTPs, stormwater and industrial discharges, dairy, other agricultural sources
BMPs for credit and/or some NPS allocations may fund BMPs for other NPS allocations made to tributaries

TAR PAMLICO RIVER, NORTH CAROLINA

Phosphorus sources: 16 WWTPs and agriculture
200,000 kg/yr reduction goal over 5 yrs
PS contribute $ to a fund for NPS BMPs
Reduction goal related to water quality standards

DILLON RESERVOIR, COLORADO

Phosphorus sources: 4 WWTPs and urban development
Each WWTP assigned allocation based on 1984 loads
WWTPs contract directly for BMPs
Program now focuses on new NPS funding BMPs for existing NPS
must increase to meet mass-based limits

With growth, treatment levels/scope of controls

larger flows, higher expenditures

May impose unequal treatment/control costs

pollutant contribution -- allocations equitable

Reduction requirements proportional to relative

potential for efficiency

concentration, or treatment method/BMP (good

whether to meet limits by varying flow,

gives discharges flexibility to determine

load allocations easily incorporated into permits

discharger allowed equal pollutant loads

Resulting allocations appear equitable as each

dischargers

May be more favorable to smaller

Loading does not differ according to flow

per unit of time (e.g., 15 kg/day)

Sources assigned the same load allowance

EQQUAL TOTAL MASS PER DAY
Inequitable limits may vary across sources and appear unequal.

Equity of distribution of treatment/BMP costs may not be easily adaptable in permits.

Relation to TMDL calculation unclear.

Relating allocations to percent impit removals should be required to make larger reductions consistent with principle that larger contributors similarly applicable to a variety of sources.

Loading:

A pollutant concentration limit that is inversely proportional to raw load of pollutant(s).

Or is proportional to some input or percent removal requirement that:

Sources assigned:

PROPORTIONAL APPROACHES
Convert To Loading Limits (except for BMPs)
Models Approved by Regulators, Results Directly

Sequence Actions in Solutions

Allow Seasonal Allocations When Appropriate

Geographically Target BMPs

Allocations Part of Broader Management Plan

Hierarchical Process, Early Results May Change

Group Develops and Approves Plan of Study

Identify Parties With Cost and Loading Data

Point & Nonpoint Program Plans Submitted

DER Will Make Allocations if Group Can't
Establish an Advisory Group

Use a Facilitator

Lessons From Past Experiences
Comparative Scenarios for Hillsborough Bay (Segment 2)

Proportional
$1,067,000 yr

With Trading
$299,000 yr

72% Cost Savings

Percentage of Total Annual Reduction
Comparative Scenarios for Middle Tampa Bay (Segment 3)

Proportional $502,000 yr

With Trading $295,000 yr

41% Cost Savings

Percentage of Total Annual Reduction

Apogee Research, Inc.

10/19/95
Comparative Scenarios for Lower Tampa Bay (Segment 4)

Proportional $343,000 yr

With Trading $168,000 yr

51% Cost Savings

Percentage of Total Annual Reduction

Apogee Research Inc.

10/19/95
Comparative Scenarios for Boca Ciega Bay (Segment 5)

Proportional $116,000 yr

With Trading $105,000 yr

10% Cost Savings

Percentage of Total Annual Reduction
Comparative Scenarios for Terra Ceia Bay (Segment 6)

Proportional $24,000 yr

With Trading $20,000 yr

17% Cost Savings

Percentage of Total Annual Reduction

0% 20% 40% 60% 80% 100%

0.133 0.003 0.026

ML Domestic Springs Industrial Urban Agriculture GW AD
Comparative Scenarios for Manatee River (Segment 7)

Proportional
$207,000 yr

With Trading
$121,000 yr

41% Cost Savings

Percentage of Total Annual Reduction
Comparative Scenarios, Totaled across All Segments

Proportional
$3,320,000 yr

With Trading
$1,738,000 yr

48% Cost Savings

Percentage of Total Annual Reduction

0%  20%  40%  60%  80%  100%
Cost Estimate Assumptions

Atmospheric Deposition: $126,000/N tpy *(Average of industry range for Selective Non-Catalytic and Catalytic Reduction and 0.01 air-open water transfer)*

Agriculture: $50,000/N tpy *(Chesapeake Bay Program, May 1995, average of selected agricultural BMPs)*

Urban: $284,000/N tpy *(Chesapeake Bay Program, May 1995)*

Industrial: $50,000/N tpy *(Ballpark placeholder, Apogee)*

Springs: $120,000/N tpy *(Case study to sewer portion of Allens Creek Area, Apogee, October 1995)*

Domestic: $50,000/N tpy *(Average based on 12 reuse projects, TBNEP)*

Material Loss: $6,000/N tpy *(Based on Port Sutton Terminal experience reducing spillage and stormwater nutrient loads, Apogee, October 1995)*
Trading Assumptions

Scenarios developed for each segment based on comparative economics and reduction capacity using several rules of thumb:

- Urban sources buy nitrogen reductions from material losses, agriculture, domestic sources, and sometimes atmospheric deposition (in that order where possible)

- Trading does not reduce loading by more than half for any "selling" source category (cumulative, 1995 to 2010)

- Special trading ratios for atmospheric deposition

- Industrial, springs, and groundwater sources not involved
Trading Scenarios Summary

1. Old Tampa Bay:  \( Urban \leftrightarrow Ag, Air, Domestic \)
2. Hillsborough Bay:  \( Urban \leftrightarrow Material Loss \)
                   \( Air \leftrightarrow Material Loss \)
3. Middle Tampa Bay:  \( Urban \leftrightarrow Ag, Domestic \)
                     \( Air \leftrightarrow Ag \)
4. Lower Tampa Bay:  \( Urban \leftrightarrow Ag, Domestic \)
                   \( Air \leftrightarrow Material Loss \)
5. Boca Ciega Bay:   \( Urban \leftrightarrow Air \)
6. Terra Ceia Bay:   \( Urban \leftrightarrow Air \)
7. Manatee River:   \( Urban \leftrightarrow Ag \)
### SUMMARY TABLES

#### Loading Summary

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### COMPARISON OF RESULTS

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Apogee Research, Inc.  
10/18/05  
Page 5-2
**SEGMENT: MIDDLE TAMPA BAY (3)**

At Current Light %

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Apogee Research, Inc.

10/19/95
Page 5-3
**SEGMENT: LOWER TAMPA BAY (4)**

**At Current Light %**

**SUMMARY TABLES**

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**COMPARISON OF RESULTS**

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Apogee Research, Inc  
10/19/95  
Page 5-4
### Summary Tables

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</tr>
<tr>
<td>Projected Loading (tpy) in 2010</td>
<td>117.0</td>
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<td>0.0</td>
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<td>Cost per Ton Reduced</td>
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### Trading Case

#### AD GW Agriculture Urban Industrial Springs Domestic ML Total

<table>
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<th>AD</th>
<th>GW</th>
<th>Agriculture</th>
<th>Urban</th>
<th>Industrial</th>
<th>Springs</th>
<th>Domestic</th>
<th>ML</th>
<th>Total</th>
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<tr>
<td>by reduced</td>
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<td>0%</td>
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<tr>
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### Comparison of Results

#### Proportional Case

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<th>AD</th>
<th>GW</th>
<th>Agriculture</th>
<th>Urban</th>
<th>Industrial</th>
<th>Springs</th>
<th>Domestic</th>
<th>ML</th>
<th>Total</th>
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<tbody>
<tr>
<td>Annual Reduction (tpy)</td>
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<td>0.0</td>
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<tr>
<td>Cost per Ton Reduced</td>
<td>$128,600</td>
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<td>$264,000</td>
<td>$50,000</td>
<td>$120,000</td>
<td>$50,000</td>
<td>$6,000</td>
</tr>
<tr>
<td>Ann. Cost to Target</td>
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<td>Total Cost to Target</td>
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#### Trading Case

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<th>Urban</th>
<th>Industrial</th>
<th>Springs</th>
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<tr>
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<td>$126,000</td>
<td>$50,000</td>
<td>$120,000</td>
<td>$50,000</td>
<td>$6,000</td>
</tr>
<tr>
<td>Ann. Cost to Target</td>
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### Summary Tables

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<th>POINT SOURCES</th>
<th>ML</th>
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<td></td>
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<td>GW</td>
<td>Agriculture Urban</td>
<td>Industrial</td>
<td>Springs</td>
<td>Domestic</td>
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### Trading Case

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<th>Industrial</th>
<th>Springs</th>
<th>Domestic</th>
<th>ML</th>
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<tr>
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<td>0%</td>
<td>0%</td>
<td>0%</td>
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<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
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<td>0%</td>
<td>0%</td>
<td>0%</td>
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<td>trp reduced</td>
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<td>0.0</td>
<td>0.0</td>
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### Comparison of Results

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<th>AD</th>
<th>GW</th>
<th>Agriculture Urban</th>
<th>Industrial</th>
<th>Springs</th>
<th>Domestic</th>
<th>ML</th>
<th>Total</th>
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<td>Cost per Ton Reduced</td>
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<td>$50,000</td>
<td>$284,000</td>
<td>$50,000</td>
<td>$120,000</td>
<td>$50,000</td>
<td>$5,000</td>
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<td>$120,000</td>
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### SUMMARY TABLES

#### Loading Summary

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<th>GW</th>
<th>Nonpoint Sources</th>
<th>Point Sources</th>
<th>ML</th>
<th>Total</th>
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<tr>
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#### Growth in Discharges

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<th>Percent of Loading by Category</th>
<th>Total Required Reduction in 2010 (lbs)</th>
<th>Average Reduction (lbs)</th>
<th>Cost per Ton Reduced</th>
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<tbody>
<tr>
<td>Overall</td>
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### BASE CASE

#### Source Category

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<th>Urban</th>
<th>Industrial</th>
<th>Springs</th>
<th>Domestic</th>
<th>ML</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Projected Loading (tpy)</td>
<td>58.0</td>
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<tr>
<td>Percent of Total Loading</td>
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<tr>
<td>Percent of Loading by Category</td>
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<td>23%</td>
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<td>$50,000</td>
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### TRADING CASE

#### Source Category

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<th>Source</th>
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<th>GW</th>
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<td>0.0</td>
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</tr>
<tr>
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<td>$50,000</td>
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<td>$30,000</td>
<td>$170,000</td>
<td>$50,000</td>
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### COMPARISON OF RESULTS

#### Proportional Case

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<th>Agriculture</th>
<th>Urban</th>
<th>Industrial</th>
<th>Springs</th>
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<th>ML</th>
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Total With Trading
$1,738,000 yr
6.6  | 0.0 | 6.1 | 1.2 | 12.0 | 0.0 | 4.8 | 8.3 | 61.7 |

Total Proportional
$3,320,000 yr
7.9  | 0.0 | 5.1 | 6.4 | 12.0 | 0.0 | 3.5 | 2.7 | 61.7 |

Annual Cost, totalled for all segments -- Proportional
$3,320,069

Annual Cost, totalled for all segments -- With Trading
$1,737,566
What are the Potential Harms of Reusing Water at Hookers Point?

- Approximate 67.3% decrease in TSS loading to Hillsborough and Tampa Bays.
- Approximate 93.7% decrease in nitrogen loading and nutrient increase with hurricanes.
- Approximate 93.7% losses per year (py) that decrease in nitrogen loading to Hillsborough and Tampa Bays.
- Allow continued growth in population, business and industry, and other economic factors. This extra water supply could also allow continued growth in population, business and industry, and other economic factors.
- The City of Tampa expires the year 2020. This extra water supply could also allow continued growth in population, business and industry, and other economic factors.

For the Hookers Point project, these benefits translate into the following:

- Decrease drawdown of ground water aquifers (and resulting protection of aquifers)
- Increase water treatment capacity
- Decrease loadings of nutrients and total suspended solids (TSS) to the receiving waters of Hillsborough and Tampa Bays

What are the Benefits of Reusing Water?

- Water reuse increases the supply of water available for municipal, industrial and agricultural use.
- The general potential benefits of reusing effluent from a wastewater treatment plant are:
  - The water reuse increases the supply of water available for municipal, industrial and agricultural use.

What is the Action?

TVW -- Expand the Use of Reclaimed Water Where Reuse Beneﬁts are the Largest

Cost-Efficiency Case Study
### Project Costs

#### What are the Estimated Costs of Implementing the Hookers Point Reuse Project?

- **WCRWSA**
- **The City of Tampa**

#### Who Would Pay the Costs?

- Regional economy: The reliability of water supplies and the additional water capacity necessary to support urban growth and business growth allow for substantial economic gains.
- Effects of lost recreational value could play a counterproductive role, although these effects are expected to be relatively mitigable.
- Hillsborough and Tampa Bay: The bay system would receive lower nitrogen and TSS loads, and receive the ecological benefits from such decreases. However, the salinity levels would see beneficial fluctuations.

### Hookers Point Water Reuse Potential

The potential benefits of the Hookers Point Water Reuse Project include:

- **Residential users**: Reductions, and commercial and industrial operations would benefit from a reliable water supply for an extended period of time.

---

Season water deficits as follows:

- 3.06 mgd
- 1.14 mgd
- 0.77 mgd
- 2.5 mgd
- Year

Based on a projected water use of 150 gallons per day, the City of Tampa would experience dry


---
supply shortages, lead to make the project cost-effective.

Implementing the project aligns with the pollution reduction benefits and the avoidance of water pollution costs. This ensures the cost of the water supply project is not a primary concern. The cost of the water supply project is a secondary concern of the water pollution project. While the cost of the reuse project is somewhat lower than conventional water supply projects, the economic benefits of more conventional options are higher.

What Are the Cost-Effectiveness Implications of the Hookers Point Project?

One unconventional water supply project being considered is an aquifer storage and recovery methodology. This option is in the initial stages of research and may not provide enough additional, there are few if any remaining ground water sources that have not been tapped. Although groundwater is an aquifer and relatively low-cost option, the practice is encountering by many regulations concerning water quality and total dissolved solids. Expanding surface collection is initially not possible due to the lack of reservoir sites available in the city. Expanding surface water and groundwater of ground water from well fields.

Economic growth.

Unconventional methods. Accepting desalination could cost the region immense amounts from loss of other current projects. If per capita water use were regulated and decreased over time, these deficits would be lower.
Decreased nitrogen loads to Tampa Bay with the resultant positive health effects on seagrasses and the rest of the ecosystem.

Discharge are:

The benefits of imposing limits on the amount of nitrogen that industrial point sources can discharge are:

**What are the benefits of limiting Industrial Nitrogen Discharges?**

- Renew the permit, and also will be subject to the new requirement.
- One year from now, the current permit will still need to be renewed.
- Discharge of nitrogen per year.
- The Lennaque plant would require an NPDES permit that is consistent with nitrogen discharge.
- Superseding current limiting nitrogen per year.
- The Lennaque plant is the largest industrial discharger of nitrogen to Tampa Bay. It is subsidiaries are discharge of nitrogen in excess of 20 pounds per year (the current limiting nitrogen per year is 120 pounds per year). The Lennaque plant is the largest industrial discharger of nitrogen to Tampa Bay.
- The ecological effects will result in a healthy ecosystem of seagrasses.

The specific case to illustrate the cost-effectiveness of this action is a hypothetical expansion of a cost-effective reduction of nonpoint sources.

- Contributing money to a governmental fund that supports control of nonpoint sources.
- Attaining a limit of discharge from a nonpoint source(s); and
- Attaining a limit of discharge from another point source(s).
- Decreasing on-site discharge.

Ways:

Industrial point sources could meet their permit requirements by one or more of the following:

- **NPDES Permit:** Both newly issued and those that are being renewed.
- **Standards:** Industrial sources are allowed to discharge from industrial point sources. Limits are incorporated into the permit.
- **Mandatory Loading:** Allows for the discharge of nitrogen.
- **Mandate:** Industrial sources to allow for a healthy bay ecosystem. Includes a limit of seagrasses habitat.

Generally, this action involves setting stricter limits on overall nitrogen discharges from industrial sources is somewhat precautionary. From the perspective of nitrogen reduced per regulatory dollar spent, this action may seem like a bargain. However, the effects on existing or industrial sources is somewhat precautionary. From the perspective of nitrogen reduced per dollar spent, this action may seem like a bargain. However, the effects on existing or industrial sources is somewhat precautionary.
<table>
<thead>
<tr>
<th>Options</th>
<th>Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option 1: Upgrade treatment capabilities at the orange juice plant.</td>
<td>For each additional Ion, $xx$ per Ion for the first 10 tons removed and $xx+Ion$</td>
</tr>
<tr>
<td>Option 2: Cut back production at either plant.</td>
<td>Lost profits from selling back output. This cost is highly variable, but estimated to be $xx in Year 1 and $xx in Year 2.</td>
</tr>
<tr>
<td>Option 3: Initial urban plants to control nonpoint source discharges to the bay.</td>
<td>Average of $xx/Ion.</td>
</tr>
</tbody>
</table>

**What are the potential harms of limiting industrial nitrogen discharge?**

- Freedom of industrial sources to choose the lowest cost method of complying with the total nitrogen limit.
What are the Cost-Effectiveness Implications of the Nitrogen Limits for Superphos?

Future could be more difficult (politically and administratively) and costly.

Policy could be more difficult (politically and administratively) and costly.

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Policy could be more difficulty (politically and administratively) and costly.
Someone must pay the sizable costs of extending sewer lines and connecting households to the lines; and

**What are the Potential Hazards of Extending Central Sewer Service?**

- Increase in tax revenues to the city
- Potential annexation of the Allen’s Creek residential area of the city of Largo, with a resultant increase in area revenues to the city
- Continuing to high levels of nutrient pollution and lack of phosphorus removal in the area
- Removal of approximately 0.28 tons of nitrogen per year, 0.30 tons of phosphorus per year, and some of the pathogens loads to the creek
- Potential for economic growth and higher property values in the area receiving sewer service

**The General Potential Benefits of Providing Sewer Service to More Areas**

- Nutrient pollution in the area is a significant concern, and pollution problems at the septic tanks are found in the area.
- The sewage flows into the bay, and the bay is germane to the area.
- The capacity of the sewers to handle pollution is inadequate, and the capacity of the sewer system is insufficient to handle pollution.
- The general area is a special concern, and the sewage system is inadequate to handle pollution.

**What is the Action?**

- Exceed Central Sewer Service to Priority Areas Now Served by Septic Tanks
- WW3 -- Exceed Central Sewer Service to Priority Areas Now Served by Septic Tanks
- General, this involves upgrading community infrastructure to include sewer lines to unsewered areas. Given the potential scenario of sewer system problems at the local level, it is important to determine the cost-effectiveness of several Hook-up projects.
If the sewer extension project is delayed or halted, the pollution from the septic tanks will continue, and possibly increase as tanks age. While no study has documented the level of

What are the Potential Consequences of Postponing or Forgoing the Project?

removed and 0.70 py of phosphorus removed, nitrogen removed from the bay by 2025 of phosphorus. Based on 0.7 py of nitrogen wastewater treatment remains at current levels, this cost yields approximately $60 per pound of nitrogen removed from the bay by 2025 of phosphorus. Taking into account the capital for the sewer expansion, this represents a cost of $27.874 per ton. The city would receive a total of $1.1 million. This represents a cost of $27.874 per ton.

What are the Estimated Costs of Implementing the Sewer Expansion Project?

Effectively subsidizing the capital costs of extending the sewer system, and

Other Florida residents.
Resident in the Largo’s Creek area.
Resident of the city of Largo.

However, this loan must be repaid by one or more of the following groups:

Several different groups, or a combination of them, could conceivably pay for the extension of

Who Would Pay the Costs?

base and a larger supply of clean wastewater for infiltration projects.

Sewer utility.
The sewer utility may increase revenues due to an increase in the customer

Regional economy.
Residents in the geographic area receiving sewer lines may benefit.

Water in Allen’s Creek and Tampa Bay.
Commercial and industrial operations, and marine life would benefit from having cleaner

Who Stands to Benefit from Extension of Central Sewer Service?

Specified tank service providers may be displaced.
What Are the Cost-Effectiveness Implications of the Sewer Extension Project?

Small to accommodate such a tank. Obtaining spil tank is ideal equipment with all standards is $5,700. But many losses in the area are too small to accommodate such a tank. Obtaining spil tank for all conditions is $5,700. But many losses in the area are too small to accommodate such a tank. Obtaining spil tank is ideal equipment with all standards is $5,700. But many losses in the area are too small to accommodate such a tank.
and induces rehabilitation of a noncompliant facility is 75 percent (compared to 67 percent of any facility). The estimated local nitrogen reduction from an inspection is much less than from the other facilities.

Decreased pollution: Assuming that a noncompliant stormwater facility is equivalent to a noncompliant industrial facility, the number of noncompliant facilities will result in 45 noncompliant facilities per year (the number of noncompliant facilities is estimated). Given an enforcement effort can conduct approximately 450 inspections per year, increased rate of compliance with stormwater rules is estimated that one additional inspection could translate into the following:

- Improved efficiency, both voluntarily comply with permits.
- Enhanced effectiveness of the standards found in stormwater permits.
- Greater public awareness of stormwater requirements.
- Wider compliance with stormwater standards, with an accompanying decrease in loading.

The general potential benefits of improving compliance and enforcement are:

**Benefits:**

- Increased efficiency to meet targets and undertake new compliance and enforcement efforts.
- Development of larger for increased facilities, enforcing compliance, and providing the ability to improve compliance monitoring and enforcement of stormwater permits.
- Permit renewals did the District check their compliance with standards.

What are the Benefits of Improved Compliance and Enforcement for Stormwater?

SW7 - Improve Compliance with and Enforcement of Stormwater Permits

What is the Action?
without strong enforcement. Tampa Bay system permits are in place to prevent this pollution, but they are largely ineffective. 

Functional Stormwater Recllisiens will continue, and possibly increase as more facilities implement enforcement of stormwater permit requirements. Stormwater Recllisiens will continue, and possibly increase as more facilities implement enforcement of stormwater permit requirements.

What are the Potential Consequences of Positioning or Performing the Improvement?

- Recllisiens could be very high, and even higher if multiple inspections are held.
- The estimated cost of this system is $2,700.
- The estimated annual cost to develop larger for inspections is $7,000.
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- The estimated annual cost to develop larger for inspections is $7,000.
- The estimated cost of this system is $2,700.
- The estimated annual cost to develop larger for inspections is $7,000.

Who Would Pay the Costs?

- Taxpayers: Taxpayers who live in SWFWMD’s jurisdiction would pay most of the cost.
- Operators of noncompliant Stormwater Systems:
  - Although expensive, the stafe is responsible for noncompliant Stormwater Systems.

Who Stands to Benefit?

- Taxpayers: Taxpayers who live in SWFWMD’s jurisdiction would pay most of the cost.
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- Taxpayers: Taxpayers who live in SWFWMD’s jurisdiction would pay most of the cost.
- Operators of noncompliant Stormwater Systems:
  - Although expensive, the stafe is responsible for noncompliant Stormwater Systems.
What are the cost-effectiveness implications of the SWMWD project?
If you have any questions, please do not hesitate to call me or Eileen at (501) 652-8444. Thank you.

Cost-effectiveness figure: subsequent work with TNRDP, Apgace would be happy to try to obtain these data and calculate how to use data when they become available to calculate a final cost-effectiveness figure. In qualitative terms, discussion in previous case studies does, however, provide a description of what happened in each case. In response to gaps in the data, the case study's final cost-effectiveness discussion is more

1. The actual SWPMID compliance rate:
2. The difference in performance between an average noncompliant stormwater facility and an average compliant one (the case study uses the difference between a compliant facility and no facility);
3. The total for an average stormwater facility; and
4. The cost to operate and maintain the average noncompliant facility.

Additional data in the case study included

This is the final cost-effectiveness case study on improving compliance with stormwater permits.

Memo/landmark

Re: Cost Effectiveness Case Study -- SW7

From: Rob Drake

To: Holly Grier

Date: February 14, 1996

Memorandum
If you have any questions, please do not hesitate to call either of us at (301) 652-8444. We look forward to hearing from you. Thanks.

You want to do...

.''can distribute drafts of the case study, or we can make other arrangements, depending on what the results. We wanted to check with you before taking any actions to handle those requests. We

during our data collection efforts for all of the case studies, we received several requests to see

although I clarity some responses in her letter. Should you want to incorporate the data. These would probably be some follow-up with Karen. Explains how to place the data. This task requires minimal effort since the case study already

A photo would be happy to update the case study with the new data as part of one of our other

Greetings from the SWP/MAD. We are including a copy of her letter with this memo. After submission of the final case study, we received some additional data from Karen.

---

Memorandum

Updattes: Case Study 4, SWP and distribution of case

RE: Updates to Case Study 4

FROM: Rob, Diane, and Elise Bacon

TO: Holly Greenberg, TRNEP

DATE: March 4, 1996
A: Improperly.

Q: What is the approximate rate of compliance among stormwater facilities (how many are operating correctly and how many are operating improperly)?

A: There is no information available to directly answer this question. However, the District's surveys indicate that about 90% of stormwater facilities are operating correctly.

Q: What is the rate of compliance among stormwater facilities?

A: In 2018, the District has issued a total of 23,796 permits to facilities that authorize the construction of stormwater facilities. In determining a stormwater facility, the District must consider factors such as the size and location of the facility, the type of activity it will support, and the potential impact on the surrounding environment.

Q: SWMPD?

A: What is the total number of stormwater facilities that received permits from the SWMPD?

A: At least 1,000 permits have been issued by the SWMPD to date.

SUBJECT: Requested Information

FROM: Karen Griswold, Environmental Scientist, Technical Services

TO: Rob Dier, Aquaculture Research, Inc.

MEMORANDUM

February 16, 1996

Water Management District

Southwest Florida
I hope this information isn't to late to be included into your analysis. Please call if you have any concerns.

Q: About 17 staff have responsible for surface water enforcement and stormwater regulation. What is the total number of compliance and enforcement staff who work full time on Compliance, Job responsibilities cover both stormwater and water quantity (flooding)?

A: There are about 17 staff that have responsibilities for surface water enforcement and stormwater regulation.

Q: In 1995, 186 compliance cases involving on-site developments were closed. This is a court of impact and mitigation. Incorrect stormwater facility construction from other aspects of the project such as wellheads located outside of the permitted plans. Hence, I can not separate noncompliance from other compliance.

A: In the most recent full year for which data is available, how may noncompliant stormwater facilities were brought into compliance?

Q: February 16, 1996  
Parker, Robert Director, APOGEO INC.
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<th>SNCR</th>
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NOx Reduction Cost Estimates

**Source:** TECCO (TECO)
WHO will pay to measure performance?
WHO will pay to maintain the monitoring systems?
WHO will pay the broker?

Financial Support System

Will quality results be predicted?
Inventions made as promised?
Physical actions taken?
Answers question "How is it working?"

Performance Measurement System

Buyer, seller, price, amount, date, effective, etc.
Perhaps a database of transactions

Institutional Monitoring System

individual or institution
Public, private, or non-profit
Minimizes "transaction costs"
Contracts, other relevant information known to all parties
To reallocate trades by identifying reduction options by location and makes costs

A Trading "Broker"

Consultation with other utilities and regulators
What kind of "planning agreement" is needed to effect a trade?
Who bears ultimate regulatory responsibility - buyer or seller or both?
Is balancing allowed?
Can non-sources affect a trade with cash?
Trading only N or other pollution load reductions?
Transportation considerations - tons reduced by the right unit?
Trading within or across segments?
Trading rights?

A Trading Policy -- the "rules of the game" -- such as:

Major Components of a Trading Program
Teaching concept:

- Determine how the TMDL process should be integrated with the bubble "puzzle." Determine if the allocations should be pay-wide, pay-repayment, tier-based, or otherwise.
- Examine the question of special scale at which allocations should be applied, i.e., the size of the "bubble." Determine which sources are buyers and which are sellers of nitrogen reduction. If will be especially important to determine where electric utilities fall out.
- Get better information on cost versus benefits, i.e., shift of N reduction versus which will determine the result.

- Determine what happens if some players drop out (either as sellers or as buyers).

- Decide how to monitor performance of the players (are they doing what they agreed to?) and relationship to a loan on N reduction from whom stormwater sources?

- Decide on trading strategies, e.g., how much would atmospheric deposition have to be reduced in order and/or

- Establishing actions would be necessary to establish trading bubbles and the process for trading?

- Decide upon and establish the structure for negotiated trading. What legislative and/or

- Information to NEP?

- Determine how allocated reductions will be implemented -- first, determine how far planned improvements should be accounted for in allocating loads targets.

- Decide how the benefits accruing to downstream users of the bay from upstream

- Increases in loads between now and 2000.

- Allocated nitrogen reductions among controllable sources in proportion to an agreed upon baseline.

- Decile which types of loads will be considered "controllable" and which "uncontrollable".

- Management Committee establishes specific reduction and nitrogen load targets for

- TAC and selected experts outside of the NEP review and revised water quality

(not necessarily in this order)

NEXT STEPS IN NITROGEN LOAD ALLOCATION
Determining which nonpoint sources can participate in trades with point sources, deciding whether or not additional reductions to point sources, States and localities have some flexibility in nonpoint sources may be expected to fulfill applicable regulatory responsibilities before are any potential nonpoint source trading partners covered by regulations? Where they exist, quality standards.

Nonpoint sources' water quality in the point source mixing zone could fail short of water quality objectives met everywhere in the trading area.

Where point sources will arrange trades with nearby nonpoint sources to ensure water quality objectives are met everywhere in the trading area.

A key concern in point/nonpoint source trading is the attainment of water quality standards at multiplied.

uses all provide benefits for trading. TMDL's PUC's, American water quality standards, mixing zone standards, and designated.

where trading occurs.

CWA provisions establish performance objectives for trading -- trading results should meet where trading occurs.

VLA's are developed for specific point sources and incorporated into NPDES permits.

Permit conditions can be modified to reflect different conditions when point sources trade.

Additional pollution reductions needed to meet water quality criteria.

Regulatory Issues

Within segments only, across certain segments, across any segment (wetlands?)

Geography

EXECUTING TRADING IN TAMPA BAY: DISCUSSION POINTS
Chemical Considerations: Chemical differences can exist between the same pollutants.

How periods after a trade is critical to producing water quality year-round are reduced. For this reason, estimating loads coming from a point source during low assimilative capacity; although loadings remain constant, on average, wet depot flows are higher relative to a wet depot’s sanitary sewers with high inflow.

Point source loadings are relatively consistent across seasons; exceptions include CSOs of nonpoint sources are mitigated to some extent since rain also dilutes nonpoint source runoff with higher wet depot flows, the effects of seasons (one exception is nonpoint source productivity by inference of the flow)

Nonpoint source loadings generally increase during rainy seasons and decrease during dry

and soil conditions. Nonpoint source loads are more random, and will vary with seasons, weather, topography,

Temporal Considerations: Point source loadings are relatively predictable and vary little

Boundary.

Spatial Considerations: Point source discharge is relatively constant, load continuously environmental objectives.

Spatial, temporal, and chemical differences between point and nonpoint source pollution.

Techno-Scientific Issues

achieve LVS. Problems which vary in their reliance on regulatory requirements and voluntary measures to geographic area. LVS are implemented through state and local nonpoint source control are more commonly developed for sectors or all nonpoint sources within a TMDL’s, they are subject to regulatory requirements. LVS can be developed for individual sources, but TMDL’s raise regulatory issues for nonpoint sources involved in trading only to the extent
Administrative Issues

Sources: Generally, they include the following activities:
- Administrative issues relate to the rules and policies of loading between point and nonpoint

Technological assistance:
- Training and documentation
- Procurement and relocation
- Providing information
- Regulatory oversight

Key support needs of any loading project include:
- Sources is critical to successful loading
- Support from institutions and organizations that have relationships with point and nonpoint

Institutional Issues

Excepted water quality improvements are usually occur.

``Exempt`` reduction represents a margin of safety to help ensure that
point source will pay for more than one unit of loading reduction for every unit of credit
less certain that point source reductions (or result in less water quality improvement)
are one unit of point source loading reduction. Where nonpoint source loading reductions are
unknown, differences in credit also offer option. Exchange areas or loading ratios define
loading for each over time periods where loading is acceptable.

For example, point and nonpoint source loadings could be compared using average
loading between point and nonpoint source loadings. Address uncertainty about how to exchange
standardized differences -- Several approaches are available to account for differences

Accommodation Differences
trade to reach or maintain a joint loading target in any of the above scenarios.

Two or more point sources are treated as a single source as if under a bubble and

Buyers (point sources) and sellers (nonpoint sources),

A governmental or private entity establishes a bank and services as a clearinghouse for both

level of pollutant reduction or water quality improvement

contributing funds to increase the size and/or scope of projects to generate a specified

point sources "pickle-back" trades on nonpoint source BMP or restoration projects.

loading reduction targets.

Water quality improvement or pollutant loading reduction point sources apply to their

conduct restoration activities; for the specific purpose of providing quantifiable level of

environmental groups, and profit firms, to implement nonpoint source BMPs or

point sources contract with third parties, including public agencies, non-profit

Stream restoration, wetlands restoration,

supports quantifiable loading reductions (e.g., technical assistance, BMP maintenance,

(existing or learning-scopic) that pays for nonpoint source controls, BMPs, or otherwise

point sources buy pollutant loading reduction credits with contributions to a fund

change land use practices to achieve a specific level of pollutant loading reduction.

point sources contract directly with nonpoint sources to implement BMPs or otherwise

Examples of trading arrangements:

- Shareholders.

Point and nonpoint sources would benefit from administrative assistance from other

will influence how much and what kind of administrative support is needed and whether

arrangements between point and nonpoint sources, as well as the number of trades and trades

Matching administrative arrangements to trading arrangements: The type of trading

minimize administrative requirements for trading parties and their governmental partners.

Experience in other media has shown that the most successful trading projects are those that

Trading and documentation; and

Information management and dissemination;

Guidelines for trading (e.g., eligibility, trading ratios).
SOURCES.

Technical assistance -- Because many potential nonpoint source trading partners may have had

Licensing of point and nonpoint source(s),

Location of trade (e.g., type of maintenance, price, trading facility, monitoring/maintenance

Terms of trade (e.g., type of maintenance, price, trading facility, monitoring/maintenance

Number locating reduction credits purchased

Parties to a trade:

...and other stakeholders might be interested in includes:

...and other stakeholders might be interested in includes:

Some governmental agencies meet these criteria.

Some governmental agencies meet these criteria.

and issues; and independence. Water quality associations, non-profit groups, private firms, and

and issues; and independence. Water quality associations, non-profit groups, private firms, and

Traders will likely look for two things in a potential or partner: a familiarity with partners

Traders will likely look for two things in a potential or partner: a familiarity with partners

Facilitation and brokering -- In some cases, point and nonpoint source trading partners can

Facilitation and brokering -- In some cases, point and nonpoint source trading partners can

Opportunities.

Opportunities.

Provide information about point and nonpoint sources to interested parties.

Provide information about point and nonpoint sources to interested parties.

Regulatory agencies, resource management departments, watershed groups, trade

Regulatory agencies, resource management departments, watershed groups, trade

Through a combined service.

This can be accomplished by the sources independently, or

nonpoint source partners need to be able to identify each other.
Understanding can be used to assign specific responsibilities to nonpoint sources beyond src@e or local governments have identified non-voluntary water quality projects or exceptions exist where TMDL load allocations.

BMP/PSI implementation project implementation that addresses efficiency of responsibilities for nonpoint sources. Is the preferred method of agreement or

Accountability for Overall Water Quality -- The Clean Water Act currently focuses pollution prevention responsibilities on point sources making them accountable for source water quality objectives under a trading program. Exceptions exist where TMDL load allocations,

All stakeholders, especially point sources, will be interested in clearly specifying

be responsible for BMPs and other projects producing water quality improvements.

Nonpoint source managers, owners, and organizations that traditionally provide

Generally, it will be most effective for nonpoint sources or point sources to accept

Accountability for BMPs and Restoration Efforts --

2. Who is responsible for the attainment of water quality objectives?

1. Who is responsible for ensuring that nonpoint source pollution loadings reductions

The resulting situation presents two types of accountability issues for point/nonpoint sources:

- Detailed responsibilities for water quality protection.

- Point/nonpoint source loading poses interesting questions with respect to accountability and enforcement because a majority of potential sources for nonpoint sources, generally operate

Point/nonpoint source loading poses interesting questions with respect to accountability and enforcement.
Other tools such as performance bonds can supplement trading documents and further reduce risk and uncertainty.

- Clearly specifying point source and nonpoint source roles and responsibilities in permits
- Option and introducing new obligations
- Point source sources also may be reluctant to discuss trading if they believe it will draw control responsibilities.

Point source sources may be uncertain about or unwilling to accept additional pollution resulting in an unwillingness to make capital investment choices that rely on trading.

Even a trade produced lower trading reductions than expected.

Reasons for risk include:

- Reducing Uncertainty and Risk

- Source contributions.

- As well as watershed management, growth management, and local comprehensive plans.

- Point source source pollution prevention management, nonpoint source pollution management, environmental regulations, and local governments and their agencies.

- Stakeholders help reduce transaction costs by supplying both point and nonpoint sources with

- and monitoring reductions.

- Examples include: searching for and identifying trading partners, evaluating and selecting criteria.

- Transaction costs are expenses that point and nonpoint sources incur to complete a trade.

- Minimizing Transaction Costs