Exhibit VIII

Countywide Comprehensive Plan For Pinellas County

Master Drainage Plan

Adopted on December 20, 1988 by the Pinellas County Board of County Commissioners as the Countywide Planning Authority and Recommended by the Pinellas Planning Council.

This document was a plan element of the PPC under previous legislation. Although the introduction and title page have been modified, references may remain concerning that previous legislation. It should be noted in such cases that Chapter 88–464 of the State Statues now applies to this document by the adoption of the Countywide Planning Authority.

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Section 1 - Introduction

Purpose

The purpose of the *Pinellas County Master Drainage Plan* is to:

1. Identify potential flood hazard areas and needed improvements to major drainage outfalls.
2. Improve the management of available water resources.
3. Conserve existing natural drainage areas.

In the past, the term drainage included only the hydrologic and hydraulic aspects for disposing of storm runoff. Perhaps the most pressing challenge that we will face in the future is the management of our water resources to maintain a continuous supply of potable water for present and future generations.

The *Pinellas County Master Drainage Plan* encompasses many aspects of drainage, including flooding, pollution abatement and water resource management. The *Master Drainage Plan* proposes improvements necessary to the major drainage systems within the county to accommodate a 25-year storm runoff. This study also utilizes nonstructural techniques, such as land runoff restrictions, in reducing the flooding potential from a 100-year storm. In addition, development restrictions will protect the remaining natural and ecologically sensitive areas from degeneration and will also implement water resource management objectives.

The *Master Drainage Plan* is countywide in scope. All of the major drainage outfalls, throughout the county, have been investigated in light of these goals to develop a plan encompassing improvements to the major outfalls and restrictions for development in the 100-year floodplain.

Specific Objectives

The specific objectives addressed in this *Master Drainage Plan* are:

1. Delineation of the 100-year floodplain areas on the drainage maps.
2. Evaluation of the ability of the major drainage outfalls to pass a 25-year storm runoff.
3. Recommendations for improving outfalls to prevent flooding by a 25-year storm (channel, structure and storage improvements).

4. Delineation of right-of-way requirements for major outfall systems.
5. Development of cost estimates for recommended improvements to the major drainage outfalls.
6. Recommendation of methods for financing improvements to the major drainage outfalls.
7. Evaluation of restrictions and criteria for future development to minimize the storm runoff pollution reaching the ultimate receiving waters.
8. Evaluation of techniques for preventing storm runoff pollution.
9. Development of criteria for designating ecologically significant areas as conservation areas.
10. Evaluation of land management techniques suitable for enhancing the viability of various types of ecosystems.
11. Evaluation of procedures and facilities to abate saltwater intrusion related to drainage.

These specific objectives have been considered for each of the major drainage outfalls within the county. In addition, these objectives have been incorporated into the land development portion of the *Uniform Development Code* where they were applicable.

Utilization

The *Master Drainage Plan* is a planning tool and should be used as a guideline by the county and cities that will be responsible for the approval of drainage improvements to the major drainage basins. The improvements proposed herein have been developed and sized from varied existing data and generalized evaluations of conditions. A more detailed study of each basin is necessary to develop flood profiles and elevations before optimum facility construction plans can be prepared for individual basins.

Flood profiles are also necessary for reviewing specific site plans. The flood prone areas and flood elevations shown on the *Master Drainage Plan* may be used as a guide in reviewing proposed development site plans. The developer should be permitted to use specific flood elevations developed from flood profiles of the applicable outfall in delineating the actual flood prone area on the site plan.

Technical Advisory Committees

Technical advisory committees (TAC) were established by the Pinellas Planning Council to provide policy guidance and local governmental input into the *Uniform Development Code* and *Master Drainage Plan*. Three TACs were formed to deal specifically with the building codes, zoning and subdivision regulations and the *Master Drainage Plan*. These TACs were composed of representatives of each municipality in the county. The representatives on the Drainage Plan TAC were city engineers, public works directors and other designated representatives.

The Drainage Plan TAC met twice monthly to review and evaluate the work of the consultant. Work elements were presented and modified when necessary to meet the approval of the TAC. This constant review by the TAC insured local participation in the [*Master*] *Drainage Plan* resulting in a plan that is tailored specifically to the needs and conditions in Pinellas County.

Section 2 - Conclusions and Recommendations

Conclusions

Most major drainage basins in Pinellas County overlap municipal boundaries. This makes uniform design criteria and maintenance programs a necessity.

The construction and maintenance of the major drainage system on a basin-wide basis can most efficiently be done by individual drainage districts.

Additional studies are required to develop flood profiles and to finalize necessary improvements for each major drainage outfall as a guide for the design of secondary drainage systems.

Recommendations

1. The Pinellas Planning Council should adopt this *Master Drainage Plan* as a means for storm water management in Pinellas County.
2. A similar study should be made for critical tributary drainage channels and sub-basins in flood prone areas.
3. A study should be made of the major drainage outfalls to determine the potential benefits of installing barrier structures to abate saltwater intrusion.
4. A more detailed study to develop flood profiles should be made for the drainage basins which have existing or potentially sever flooding problems. This is required for optimum design of drainage facilities and for accurate definition of floodplain areas.
5. The existing Drainage Technical Advisory Committee should be permanently established and assigned the responsibility of reviewing any future recommended drainage improvement to the major basins to assure that those improvements conform to the concepts established in this drainage plan.
6. Funds for the construction, maintenance and right-of-way costs for the major outfalls should be provided through an agreement between the county and/or municipalities that contribute runoff to the drainage basin. Each jurisdiction should contribute a percentage of the total project cost equal to the percentage of runoff being contributed to the major outfall by that jurisdiction.

Section 3 - Guidelines and Techniques for Nonpoint Source Pollution Control

General

The scope of this project includes a requirement to develop guidelines for use in evaluating drainage improvements and land development plans with respect to drainage systems and water quality management. Under the broad term water quality management, there are a number of specific areas of concern which include:

- Determination of the coastal vegetation line.
- Saltwater intrusion abatement.
- Management of natural drainage areas.
- Reduction of insect breeding areas.
- Waterway use classifications.
- Easement requirements and permitting procedures.
- Storm runoff water quality.

Guidelines have been developed for each of these items of assist in implementing the *Uniform Development Code* and *Master Drainage Plan*. These guidelines are general in nature. Application of them to specific situations will require judgment in reaching the best compromise of criteria.

Determination of the Coastal Vegetation Line

The determination of a coastal vegetation line is a means by which local governments can regulate development within coastal areas for the protection of significant stands of coastal vegetation.

The State of Florida has also played a role in the regulation of coastal development, passing laws for the purpose of protecting the coastal zone from hazardous development practices. In Chapter 253 of the 1973 Florida Statutes, the Trustees of the Internal Improvement Trust Fund (TIIF) were given the power to administer all state owned lands, including those tidal wetlands located seaward of the mean high-water line. Dredging, filling or other development activities within these lands require a permit form the TIIF.

Additionally, pursuant to Florida Statutes [Section] 161.052, 1970 Supplement, construction or excavation along the sand beaches which face the open waters of the Atlantic Ocean or Gulf of Mexico must be at least fifty feet upland of the line of mean high-water. It was soon realized that a fifty-foot setback line was inadequate in many areas of the state. For this reason, Section 161.053 of the Florida Statutes was passed to give the Department of Natural Resources, acting through the Division of Marine Resources, the authority to establish coastal construction setback lines along these sand beaches on a countywide basis.

Coastal areas support a variety of plant communities. These include the sea grasses of shallow marine waters, the mangrove swamps and salt marches of saline wetlands and the strand vegetation of beaches and dunes. The coastal vegetation line should delineate the landward extent of continuous, native coastal vegetation. Lands seaward of the coastal vegetation line may be classified as a coastal management zone. The intent of the coastal management zone is to protect those coastal plant communities capable of performing functions vital to the marine ecosystem. These functions include:

- Protection and stabilization of natural shorelines.
- Contribution to the marine food chain.
- Providing nursery grounds for fishes, invertebrates and wildlife.
- Providing habitats for marine, estuarine and terrestrial organisms.

The coastal vegetation line is defined as the landward extent of continuous native coastal vegetation communities and their associated soil formations which are characteristic of beaches and saline wetlands. Sandy beaches and dunes support plant communities which are subject to wind and salt spray, but not regular tidal inundation. Saline wetlands occur in low coastal areas that characteristically support salt tolerant communities, the mangrove swamps and salt marches, and which are influenced by surface waters ranging in salinity from brackish to saltwater to hypersaline. The characteristic soils of saline wetlands are classified in Pinellas County as tidal marsh and tidal swamp. The communities may be characterized in terms of the dominant plant species including, but not limited to the following:

Scientific Name	Common Name
Avicennia germinans Linnaeus	Black mangrove
Batis maritima Linnaeus	salt wort
Borrichia fructescens Linnaeus	sea-oxeye daisy
Conocarpus erecta Linnaeus	buttonwood
Distichilis spicata Greene	salt grass
Juncus roemerianus Scheele	black rush
Laguncularia racemosa Gaertner	white mangrove
Monanthochloe littoralis Engelmann	key grass
Rhizophora mangle Linnaeus	red mangrove
Salicornia virginica Linnaeus	glasswort
Sesuvium portulacastrum Linnaeus	sea purslane
Spartina alterniflora Loiseleur-Deslongchamp	cordgrass
Spartina patens Muhlinberg	cordgrass

Coastal vegetation is naturally distributed according to environmental gradients such as salinity, surface water level, soils and similar items. Determination of areas to be retained in the natural state should not follow an arbitrary formula. The determination should be flexible to follow the natural undulation of coastal topography and its associated vegetation. Natural areas should not merely be isolated as a means of protection; consideration should be given to the suitability, as well as requirements of an area for maintenance in the natural state. Thus, a systems approach should be used in coastal management. This approach to evaluation emphasizes not only a particular area, but that area's role in regional ecology.

The selection of areas for maintenance in the natural state should be determined by the environmental characteristics which are necessary for the overall maintenance of quality and function of the ecosystem including, but not limited to, the following criteria.

- The area should support desirable habitats for wildlife. Evaluation should particularly concern rookeries, as well as the habitats required by existing threatened or endangered species. The status of a species is determined by the Department of Interior according to the *Endangered Species Conservation Act of 1969* (16 USC 688 aa).
- The area should include natural drainage systems, particularly those which channel surface freshwaters into the estuarine environment. Existing drainage patterns in estuarine areas are responsible for maintenance of a salinity gradient ranging from freshwater to brackish water to seawater.
- The distribution of many species is influenced by this gradient. The juveniles and adult forms of many marine organisms significant to fisheries are restricted to estuarine environments because of their requirement for brackish water.
- The area should be significant to marine productivity. Mangrove swamps, salt marshes and sea grasses, are important contributors to detritus-based marine food chains. Contributions from saline wetlands are most significant in areas located below mean high water. However, localized conditions may promote the productivity of areas landward of the mean high-water line. The productivity of an area relative to the marine food chain may be roughly estimated from published productivity measurements of comparable stands. The productivity should also be evaluated in terms of vigor, degree of development, soils and frequency of flushing by surface water. The area should be contiguous to the mean high-water line and thereby provide for an uninterrupted band of vegetation.
- The area should be selected to maintain, as much as possible, the continuity of transition from marine to freshwater or terrestrial environments.

- The area should be analyzed for its individual ecological value, as well as its role in regional ecology.
- Consideration should be given to the requirements of a community or ecosystem to maintain itself.
- The area should support a well-developed biological community. Even the most marginal lands will support a natural community of some form. It should be recognized that not all coastal communities are necessarily productive with respect to the functioning of an ecosystem. The development of biological communities may be severely stressed or limited by edaphic factors (i.e., nutrient deficient soils, hypersalinity, etc.). Examples of such ecologically marginal areas would include certain sparse scrub vegetation along ditch banks, coastal landfills or other severely stressed shore areas. Such marginal areas may not be desirable or suitable for maintenance in the natural state. Selected portions of these areas should be retained where appropriate to provide a safety factor in coastal zone management and to maintain diversity, as well as continuity of the ecosystem.

Development In Coastal Management Zone

Management for the protection of coastal ecosystems does not exclude development which is compatible with the system. Development within the coastal management zone should only take place in a very limited, carefully controlled manner. Consideration should be given, but not limited to the following:

- Development should be restricted to areas of marginal ecological value except in cases of overriding public interest.
- Carefully controlled modifications to facilitate active and passive recreational uses should be permitted in ecologically valuable areas, provided proper authorization is obtained.
- The necessity of locating coastal developments or other alterations within the area delineated by the coastal vegetation line should be evaluated. Examples of conditional uses would include erosion control structures and utility facilities as well as water dependent development such as marinas or parks.
- Coastal developments or other alterations should be carefully designed to minimize adverse environmental impact.

Saltwater Intrusion Abatement

Drainage procedures on upland areas can have an important effect on saltwater intrusion in areas such as Pinellas County. Any lowering of the groundwater table by pumping, ditching, grading, or prevention of groundwater recharge will cause the interface between saltwater and freshwater in the ground to rise or intrude further into the interior. The procedures included in this drainage plan are designed to reduce this saltwater intrusion as much as possible through drainage practices. There are generally four causes of saltwater intrusion:

- Excessive pumping of wells.
- Lowering of the water table through excavation of drainage ditches.
- Reduction of the groundwater recharge capability through construction practices or drainage facilities.
- Construction of sea level canals that permit tidal flow of saltwater inland.

Excessive pumping of wells is not a consideration of the drainage plan since this is controlled by other agencies.

The three other main causes of saltwater intrusion can be affected by the drainage plan. Groundwater recharge can be increased through a restriction on the quantity of runoff that may be permitted under the development code. This restriction and the use of swale drainage wherever possible will minimize the lowering of the water table caused by development.

Sea level canals should be restricted in depth so that minimal tidal action will be possible. In addition, the major drainage outfalls should be studied to determine if the installation of barrier structures is feasible.

Natural Drainage Areas

Drainage systems should be designed to protect, enhance and utilize natural areas. These areas can fulfill many useful functions. They can stabilize drainage channels, provide controlled sedimentation areas, promote increased filtration and provide short-term detention thereby reducing peak flow rates.

Natural drainage areas might include freshwater swamps and marshes, bodies of water and their associated floodplain vegetation, and other selected undeveloped areas with suitable soil and topographical conditions. Some areas may be retained with little or no

modifications being allowed, while the ecological condition of other natural areas may permit considerable alteration.

As part of the development site plan review procedure, the proposed development should be evaluated with regard to protection of natural vegetation for multipurpose use in a systems or watershed basis. Such determination regarding natural areas should not follow an arbitrary formula.

Selection of Natural Areas

Designation of natural areas for retention within drainage systems should include, but not be limited to consideration of the following criteria:

The biological and physical characteristics of a natural area should be evaluated on the basis of the ecological value of the individual area, as well as its role in regional or watershed ecology.

- The suitability, as well as management requirements for maintenance of an area in its natural state within drainage systems should be evaluated.
- Areas retained in natural or altered states should be contiguous and/or linked by open space systems as much as possible.
- The determination of areas to be retained in natural states should maintain, as much as possible, the continuity of transition between major biological communities.
- Areas should be considered which support desirable habitats required by threatened or endangered species. The status of a species is determined by the Department of the Interior according to the Endangered Species Conservation Act of 1969 (16 USC 668 aa).
- Areas retained in natural or altered states should be carefully selected to promote ecological diversity. Selected maintenance of only one type of biological community should be avoided
- Selected areas should be retained in their natural state with little or no modification. These natural areas should include, but not be limited to, freshwater wetlands and natural bodies of water and associated floodplain vegetation. A freshwater wetland is defined by a combination of biological and physical characteristics including, but not limited to, the following three characteristics:

  - Hydric or mesic vegetation communities which require, respectively, abundant or moderate amounts of moisture for survival.
  - Seasonal or relatively constant inundation by surface water.
  - Soil associations.

The structure, function and viability of natural wetland communities require either seasonal or relatively constant surface water. A true wetland community requires these hydrological conditions, or it will undergo succession to an upland community. The presence of either plant species or typical soil variations, characteristics of wetlands communities, does not in itself constitute a wetland. If alteration of historical drainage patterns has occurred to the extent that the wetland community is no longer viable or functional, and restoration is not feasible, it should not be regarded as a wetland. If hydrological conditions have been only slightly modified by drainage practices, so that flooding occurs frequently enough to prevent invasion by dry land species, and restoration through drainage design is feasible, the community may be regarded as wetland.

Development in Natural Areas

Modifications permitted in certain natural areas should include, but not be limited to, the following:

- Appropriate buffers to minimize adverse impact from adjacent development.
- Suitable structures to regulate local surface water levels, enhance water storage capacities, provide flood protection or similar items. Such structures should be compatible with the natural system.
- Access for maintenance of sedimentation or other treatment facilities.
- Access for active or passive recreational uses.
- No development should be permitted in areas which are determined to be suitable for maintenance in natural states except in cases of overriding public interest.
- Maintenance of certain plant communities in a natural state may not be feasible or desirable, however, selected portions of the entire community might be retained in an altered state within drainage systems. Selected trees and shrubs may be protected for use in landscaping.
- Certain areas might be selectively cleared to provide recreational facilities, but still be incorporated into a drainage system.
- Excavation of lakes or other drainage facilities might occur in selectively cleared portions of plant communities.

Reduction of Insect Breeding Areas

The mosquito population may be reduced through a control of the breeding habitat when designing drainage facilities. This is a secondary priority of the drainage plan when compared to the prevention of bodily injury and property damage from flooding.

In order for the mosquito life cycle to continue, areas suitable for breeding and egg hatching must remain in existence for periods of four days or longer. To prevent this, the design criteria included in this drainage plan is such that facilities will be designed to drain dry whenever possible. Where this is not possible and long-term retention of water is necessary, facilities should be designed to maintain sufficient water year-round to propagate minnows and fish life.

Waterway Use Classifications

The classification of waterways provides a tool for improving the quality of the waterway system. Classification can be used as a standard for reviewing proposed projects to insure that the proposed improvements will not violate the standards for any classification of waterway.

The Florida Department of Pollution Control has established a system of water classification that identifies uses and sets minimum standards of quality for each classification. Since this classification system has already been established and is used by the Department of Pollution Control, there does not seem to be any justification for setting up a new system of waterway classification for reviewing projects having a potential impact on the waterways.

The classification of water uses by the Florida Department of Pollution Control is given in Chapter 17-3 of the rules of the Department of Pollution Control (see Appendix). The waters of Florida are classified according to their use as follows:

- Public water supplies
- Shellfish harvesting
- Recreation and propagation in management of fish and wildlife
- Agricultural and industrial water supply
- Navigation, utility and industrial use

A detailed breakdown of each of these classifications is given in Chapter 17-3 with a listing of all the minimum water quality standards within each classification.

Easement Requirements and Permitting Procedures

In order to provide for the continual maintenance of major drainage facilities within Pinellas County, all facilities should have sufficient rights-of-way or easements to facilitate continual maintenance and operation. Culverts, storm drains and other closed conduit drainage systems can be adequately maintained through the use of easements wherein the property owner can make reasonable use of that controlled area without jeopardizing the drainage function of the facility.

Open drainage facilities such as swales, ditches, canals, etc., require more stringent controls over the land occupied by and adjacent to the drainage facility. This more stringent control is required to maintain access for maintenance purposes, bank protection and water quality protection. Control of this type is available through the use of rights-of-way for open drainage facilities.

The minimum width for both easements and rights-of-way will be as defined in the section titled "Drainage Design Procedure." The widths given in the "Drainage Design Procedure" shall be desired widths and, upon more detailed study of a specific area, may be increased as required to save significant ecological and land use features or reduced where existing development limits the available space. This flexible approach will prevent a "bare bank" policy along each major drainage outfall.

Where the major outfall system includes retention basins, lakes or other open water bodies utilized in the drainage plan for storage capacity, the implementing agency should control these areas to prevent a reduction of storage capacity.

Where it is necessary for other utilities to cross the major drainage outfall systems or to construct facilities within those major drainage outfalls, work should not be commenced until the appropriate authority has issued a permit for that construction. This procedure will insure coordination between the various utilities so that the drainage system capacity is not reduced.

Buried utility lines constructed within the major drainage outfall system should have a minimum clearance of 2 feet below the ultimate design grade of the drainage system. Overhead conduits should be subject to the same clearance requirements as for bridges. Overhead power and telephone lines should have a minimum clearance of 18 feet above the top of bank although regulations may establish greater heights. An "as-built" detail of construction within the major drainage outfall system should be a requirement of the permit procedure.

In cases where the major outfall system crosses state or county highways or otherwise occupies publicly controlled rights-of-way, the appropriate authority should coordinate such usage with the rights-of-way agency to insure coordination with future utility companies constructing within the drainage outfall system.

Storm Runoff Water Quality

Protection of the quality of receiving waters can be achieved in two ways:

- Remove pollutants from the runoff before discharging to the waterway.
- Reduce the quantity of runoff being discharged.

The implementation of both of these methods will involve a combination of both nonstructural and structural procedures.

The nonstructural procedures will include a mass educational effort to promote an awareness of the pollution problem, its cost and the solutions to the problem, and institution of better municipal maintenance such as street cleaning, garbage and trash pick up and drainage facility maintenance. These nonstructural procedures will be most effective in reducing the pollution from existing land uses.

Methods should be incorporated in the *Uniform Development Code* for requiring all new construction to provide suitable drainage practices to minimize the pollution discharge to the waterways. This can be accomplished by both restricting the quantity of runoff and by removing pollutants from the runoff. Some of the methods would be:

- Design drainage facilities for new construction to retain the first flush of runoff or to remove the pollutants prior to discharge.
- Utilize surface drainage over vegetated surfaces where feasible.
- Maximize groundwater recharge.
- Include a review of the proposed drainage system in the site plan review procedure.
- Require all contractors to minimize pollution from their construction sites by including a review of the temporary pollution control measures as part of the building permit process for both issuance and inspection. Techniques used by the contractors should be in accordance with EPA publication 430/9-73-007 entitled, "Process, Procedures and Methods to Control Pollution Resulting from All Construction Activity."
- Upgrade existing waterways by removing sediment and debris and by stabilizing the bottom and side slopes of channels and ponding areas.

- Modify existing and develop new standard drainage facility details that will reduce the amount of pollutants discharged to the waterway.
- Relocate storage facilities for potential pollutants to areas outside the limits of the floodway or floodplain to keep them from being damaged or spilled during flood periods.

Section 4 - Guidelines for Future Drainage and Improvements

General

The Drainage Technical Advisory Committee, identified in the "Introduction," provided review and input to the drafting of this section, which is to be used in the form of a model "Requirements for the Design and Construction of Future Drainage Improvements." This section will be incorporated into the *Uniform Development Code* now being prepared by the Pinellas County Planning Council.

Editor's Note:

1. All references to "Standard Construction Details" should be interpreted as being the standards set by the county, city or town in which the subdivision is located.
2. All references to the "Director" should be interpreted, as the agency, person, or persons designated by the governing body of the county, city or town to perform such duties.

Comprehensive Drainage System Required

A comprehensive drainage system shall be provided in all subdivisions in accordance with the requirements of this section. The developer shall be required to submit all pertinent information in plan and specification form and environmental data as necessary to construct the drainage facilities.

Provision for Drainage Facilities

The design of all drainage facilities shall accommodate and provide for the following:

1. Disposal of storm water

2. Prevention of salinity intrusion
3. Water quality protection and control
4. Water table control
5. All public and private areas within the subdivision and all surface and subsurface runoff from adjacent tributary areas

Plans and specifications for the design of all required drainage facilities shall be signed and sealed by a professional engineer licensed by the State of Florida to certify the adequacy of said facilities.

Requirements of Design

A comprehensive drainage system and appurtenant facilities shall include improvements constructed in accordance with the criteria established herein.

Earthwork Requirements

The subdivision shall be graded and where necessary, filled to comply with the comprehensive drainage system. The developer shall be required to clear all rights-of-way and to make all grades for public and private streets, alleys, lots and other areas compatible with proper drainage design. Any dredging, filling or excavation shall have evidence of proposed approved permits from all federal, state, and local agencies exercising jurisdiction over said operations. Prior to commencing any landfill, the developer shall secure approval of all necessary plans and specifications of the clearing filling and grading operation under the "Conceptual Plans and Public Improvements Plans" section of Article XI, Chapters 2 and 3 of this code. In the interest of preserving existing natural features of aesthetic or environmental significance, the Director, based upon a tree survey as required in Article IX, Chapter 8, may vary the requirements of this subsection to enhance existing natural conditions not preventing proper drainage of the subdivision. Surface drainage from public and private lots and other building sites shall be diverted for disposal via swale, ditch or a storm drainage system. All fill, dredge and excavation proposals shall incorporate provisions for dust and water quality control and erosion protection during and after construction operations.

Hydraulic Requirements

The analysis and design of all existing and proposed drainage facilities shall incorporate sound engineering principles and methods based on available data and current analysis and design procedures. Analysis and design features shall provide the

necessary capacity for all existing and proposed drainage runoff from tributary areas beyond the development boundaries. In addition, the developer shall incorporate the necessary provisions for restricting the subdivision's runoff rate and volume as required in order to provide an equitable allocation of available capacity of existing and proposed public drainage facilities within the tributary basin. The developer shall not alter, reroute, deepen, widen or change in any way, any existing ditch, canal, stream, swale, drain or drainage system without first making application, complete with environmental data, for a written permit from the Director. All drainage facilities shall be designed to operate without recourse to mechanical, electrical or any other such energy device which operates against gravitational forces. Provisions for drainage shall include but not be limited to the following design criteria:

1. Minimum design criteria for design storm shall be the current State of Florida Department of Transportation rainfall intensity curves or U.S. Weather Bureau rainfall intensity curves developed specifically for Pinellas County, whichever is the higher standard.

    a. Drainage structures whose total tributary area from origin to outfall equals or exceeds one (1) square mile shall be designed for a 25-year storm recurrence interval. Top of bank of all major waterways shall be above design high water level. Where design high water level exceeds any existing and/or proposed waterway, top of bank compliance with all requirements for floodplain restrictions shall be insured for any development in the floodplain adjacent to the channel.

    b. Culverts, storm sewers and appurtenances within state highway rights-of-way shall be designed in accordance with current DOT standards or county (City, Town of _____), drainage requirements, whichever is the higher standard.

    c. Storm water collection systems including minor waterways and appurtenant structures, whose total tributary area from origin to outfall equals or is less than one (1) square mile shall be designed for a 10-year storm recurrence interval. Top of bank and floodplain requirements shall be the same as for major waterways under paragraph a. above.

    d. Retention basins shall be designed for a 25-year storm recurrence interval with a 2-foot freeboard between the maximum (25-year) flood storage level and the low bank elevation surrounding detention area. Additionally, storage of the 100-year storm runoff shall be evaluated for its effects on storage capacity and flooding of the area surrounding the basin. If the design indicates that it is apparent the basin would become inundated, the limits of flooding in the area surrounding the basin shall be designed as the 100-year floodplain and subject to all restrictions thereof.

Design of retention basins with no outflow or outlet shall be based on the 100-year storm recurrence interval and a rainfall of 48-hour duration. Design high-water elevation shall be established in consideration of adjacent properties land facilities. The design high-water level of any retention basin shall be one (1) foot below the gutter of adjacent streets or one foot below the ground surface adjacent to the retention basin, whichever is lower. Design low water elevation shall be established in consideration of ground percolation factors, water table and other contingencies.

e. All other drainage facilities not included above shall be designed for a 5-year storm recurrence interval.

f. Flow limits in gutters or swales of roads and streets shall be as shown herein.

Additionally, all other drainage appurtenances shall be designed according to the storm frequency as indicated:

Type Area	Recommended Flow Limits	Design Storm
Private streets and paved areas	To 2 inches below crown of street	5-year
Residential and commercial areas and local roads	To 2 inches below crown of street	5-year
Arterials and collectors	To 5 inches below crown of street	5-year

In no case shall the crown of any public street be at or below the water surface level of a 5-year storm. Streets with inverted crown sections shall not be permitted except in special circumstances such as alleys where the right-of-way is confined and where it is impractical to provide drainage along the edge of pavement subject to approval of the Director.

g. The maximum rate of runoff or estimates of peak discharge for design of drainage facilities shall be based on the rational formula as follows:

$$Q = CIA$$

Q = peak runoff in cubic feet per second
C = coefficient of runoff
I = rainfall intensity in inches per hour
A = drainage area in acres

2. Coefficients of runoff used in the design of drainage facilities shall be based on values shown in the *Florida Department of Transportation Drainage Manual*.

Additionally, where accurate determination of pervious and impervious surface areas cannot be made, the following list of coefficient ranges of various land uses may be used subject to approval of the Director.

	Coefficient of Runoff "*C*"	
Land Use	Well-Drained Soils	Poorly-Drained Soils
Agricultural	0.25	0.45
Residential Rural	0.35	0.50
Residential Rural Estate	0.35	0.50
Residential Single-family	0.50	0.55
Residential Single-family Townhouse	0.45	0.60
Residential Multiple Family	0.45	0.60
Mobile Home Park or Subdivision	0.45	0.60
Commercial Neighborhood	0.80	0.85
Commercial General	0.80	0.85
Commercial Parkway/Hotels/Motels/Inns	0.85	0.90
Commercial Parkway/Shopping Centers	0.90	0.90
Commercial Tourist	0.80	0.85
Professional Office	0.90	0.90
Industrial	0.70	0.75
Preservation/Conservation	0.20	0.40
Aquatic Land	1.00	1.00
Public Ownership	0.25	0.45

3. Hydraulic design of drainage facilities shall be based on current engineering principles and practices.

   a. Storm sewers shall be designed as flowing full and pipe capacities determined by use of Manning's Equation. Total available head loss for any storm sewer main network outfalling to a waterway shall be taken as the difference between an elevation three (3) inches below the grate elevation and the water level of the waterway at design discharge for the same frequency storm as used for the storm sewers. Design elevation shall be a minimum of 2.0 feet MSL. Water level of any waterway receiving discharges shall be at the high operation level of any downstream control structure.

   b. Minimum time of concentration for storm sewers in streets shall be taken as 15 minutes. Time of concentration for other drainage facilities shall be based on Department of Transportation velocity of runoff curves.

   c. Pipe Sizes: Minimum pipe sizes shall be as follows:

Type	Minimum Size
Underdrains	6 inches
Sidedrains with inlets and endwall	15 inches
Storm sewer	15 inches
Cross drains with endwalls	18 inches
Pipe culvert	15 inches

Pipe sizes above 18 inches shall be sizes readily available locally and approved by the Director. Reinforced concrete box culverts may be used in lieu of pipe at the discretion of the design engineer and subject to approval of the Director.

d. The maximum length of pipe to be used without an access structure shall be as follows:

Pipe Size	Maximum Length
15 inches to 36 inches, inclusive	350 feet
42 inches and larger and box culverts	500 feet

e. The minimum velocity shall be 3.0 feet per second. Erosion protection at the outlet will be provided on all culverts. For pipes between access structures, the maximum allowable design velocity shall be ten (10) feet per second for concrete pipes and eight (8) feet per second for metal pipes.

f. Roughness coefficients for use in Manning's Formula for concrete pipes and box culverts and smooth and corrugated metal pipes shall be as follows:

Concrete Pipes and Box Culverts

15 inches – 30 inches, inclusive	n = 0.013
36 inches – 48 inches, inclusive	n = 0.012
54 inches – including smooth concrete boxes of 15 square feet and up	n = 0.011
Smooth metal pipes	n = 0.011
Corrugated metal pipes, unpaved	n = 0.024
Corrugated metal pipes, partially paved	n = 0.021
Corrugated metal pipes, helical and fully paved	n = 0.018

Application of these values to oval or elliptical pipe shall be based on equivalent round diameter.

g. Unless otherwise approved, the minimum clearance for all storm sewer pipes and culverts shall be 1.25 feet from outside crown of pipe to bottom of

roadway base course. The minimum clearances between outside surfaces of utilities shall be six (6) inches. The minimum cover of pipe in swale areas shall be two (2) feet.

h. Drainage structures at stream crossings of less than 20-foot span shall be considered as culverts. Culvert capacity shall be based on the culvert flowing full. The design head shall not exceed 1.0 foot at design flow unless approved by the Director and based upon sound engineering practice. Detailed analysis and design shall be based on either inlet or outlet control, whichever is applicable, using applicable entrance loss coefficients and/or culvert nomograms from current *U.S. Bureau of Public Roads Hydraulic Engineering Circulars for Hydraulic Design of Culverts*.

   Backwater curve data, flood profiles and other hydraulic information, where available, along a waterway reach shall be used to establish design water elevation and set the elevation on the crown of culvert. Culverts longer than 300 feet shall be designed as storm sewers according to paragraph 3. a. above.

i. Storm sewers shall be designed to avoid abrupt changes in hydraulic slope and velocity. All deflections in alignment of storm sewers shall have access structures.

j. The minimum and maximum allowable hydraulic slopes shall be those that produce the aforementioned minimum and maximum velocities. Manholes may be used as drop structures where necessary to lessen slopes in storm sewers.

k. The capacity of inlets, grates or openings shall equal or exceed the tributary runoff from an individual drainage area. Capacity of curb and gutter inlets shall be as noted on the Standard Construction Details of this code. Where no test data are available, the following formulas shall be used to determine the capacity of inlets in cubic feet. The capacity of grate inlets shall be:

$$Q \text{ (grate)} = CA\sqrt{2gh}$$

   Where the coefficient of discharge is 0.6 and h is the head in feet or the depth of throat in feet.

   The capacity of curb inlets without a gutter grate shall be considered as a rectangular weir whose capacity is based on the following formula:

$$Q \text{ (curb)} = 3.0Lh^{3/2}$$

Where *L* is the length of curb opening in feet. The capacity of a combination inlet consisting of a gutter grate and curb opening shall be considered as the sum of the capacities of the orifice and a weir.

l. With prior approval by the Director, weirs, gates, and other control structures may be used as part of a comprehensive drainage system. Where provided, control structure design shall be based on current engineering principles and practices for the particular type structure.

m. The saltwater intrusion along the coast shall be controlled to hold the existing line represented by the approximate position of the saltwater–freshwater interface in which chloride concentrations of 250 mgl occur at a depth of 100 feet below mean sea level.

The location of a control weir shall be as close to the coast as possible to hold the present line of saltwater encroachment. The minimum crest elevation of weirs shall be 2.5 feet above mean sea level unless further evidence or studies indicate a higher elevation is required.

n. Under these regulations it shall be a requirement to limit runoff of future development to existing or predevelopment conditions. In cases where it has been determined that the existing outfall which receives the runoff has more capacity than needed to handle runoff from existing development, a higher rate of runoff may be permitted each landowner for future development in proportion to the amount of land owned as determined by the Director. In cases where a suitable retention site exists just downstream of a development, upon approval by the implementing agency, that site may be used to store the additional runoff from the development. However, it must be stated that the retention areas delineated on the drainage plan aerials were not sized to accommodate runoff from future developments, and should it become necessary to use one of these storage sites, the required storage volume should be increased accordingly. This requirement for onsite retention shall apply to areas inland from the coastal 100-year floodplain. In accordance with the requirement to limit runoff to existing conditions, subdivision drainage shall be designed to achieve maximum percolation and/or filtration of runoff from impervious surfaces. Special structures shall be used with engineering features to remove oils, suspended solids, and other objectionable material in storm water runoff, so as not to degrade the quality of water in the receiving stream such as:

(1) Bottomless inlets or inlets with sumps

(2) Special grading to retain or detain runoff

(3) Roadside and subdivision swales

(4) Natural or artificial percolation basins with grass, trees and shrubs to aid in nutrient removal

(5) Perimeter swales along waterways to prevent direct runoff

(6) Where soil or water table problems are encountered, underdrains may be used to aid percolation rates

(7) Recharge wells and seepage drains subject to approval of Director

(8) Ditch or swale checks and baffles

(9) Special structures at pipe outfalls with screens, baffles and sumps to filter runoff prior to discharge into waterways

(10) Routing storm runoff from pipe outfalls through retention, detention, perimeter swales or other such facilities to filter runoff to discharge into waterways

Where public or private lands are reserved for detention, retention, percolation, filtration, of similar use, the land shall be so designated on the final plat with applicable reservations and restrictions as to use, dedication and reversions.

o. Underdrains when used shall be designed to maintain the groundwater table at least 24 inches below the surface. Groundwater data logs taken during September at the end of the normal rainy season shall be submitted to substantiate the omission of underdrains. Accordingly, all public streets with curb and gutter or with swale ditches less than 24 inches below the crown of the road shall be provided with underdrains.

Underdrains shall be placed 18 inches from back of curb or on the centerline of swale and a minimum of 24 inches below the edge of pavement elevation. Underdrains shall be sized according to the drainage area based on a minimum removal rate of one inch of water in 24 hours and shall have positive outfall to inlets, manholes or waterways.

p. Design of canals, streams, ditches and any other waterways shall be based on current open channel design procedures using Chezy, Talbot, and/or Manning's Formula. Design velocities without erosion protection shall not exceed maximums set by the Department of Transportation for subdivision soil types as shown below. Where design levels exceed top of banks for the required design storm (i.e., 25-year for major waterways) and berms are not provided, the extent of flooding in the floodplain shall be shown. Runoff and roughness coefficients, save velocities, nomographs, erosion control and practical limitations on use of design formulas shall be based on current

practice in the field of hydraulics notwithstanding any requirements of this chapter.

Mulching of exposed ground surfaces shall be provided as temporary protection against erosion. Conditions such as alignment and presence of severe irregularities in smoothness will alter the allowable velocities. Maximum flow velocities for various soil types are as follows:

Type of Soil	Allowable Velocity
Fine Sand	1.50 feet per second
Sandy Loam	1.75 feet per second
Silt Loam	2.00 feet per second
Firm Loam	2.50 feet per second
Fine Gravel	2.50 feet per second
Stiff Clay	3.50 feet per second
Course Gravel	4.00 feet per second
Hardpans	6.00 feet per second

q. Where public or private lakes, ponds, borrow pits, or similar type water retention areas are incorporated in a subdivision's comprehensive drainage plan, design criteria shall be based on storage of the required design storm. Retention time, storage volumes, design water levels, and discharge shall be based on average groundwater level for September at the end of the rainy season, as minimum pond level. Designs of drainage facilities outfalling to a lake or pond shall be based on the design high-water level of the lake or pond even though a lesser frequency storm may be used to design the drainage facilities (i.e., 5-year for storm sewers). Flood routing analysis and design shall be based on current hydraulic procedures, and storage computations shall include a tabulation or graph of inflow discharge, storage capacity, minimum and maximum design water depth and retention time. Where design water surface exceeds top of bank during the retention period of the applicable design storm, the flood limits and floodplain requirements to handle the storage capacity shall be shown.

4. Where a subdivision adjoins or encompasses any portion of a flood plain the developer shall:

   a. Include in the subdivision's conceptual plans, preliminary plat, final plat, construction plans and specifications, and other plans required by this code, such provisions or restrictions necessary to comply with the following:

      i. All applicable zoning requirements of this code.

ii. All applicable building requirements of this code and the Southern Building, Plumbing and Mechanical Codes 1973 edition as amended.

iii. All requirements of the Federal Flood Insurance Administration regulations.

iv. All requirements of other federal, state or local agencies exercising jurisdiction over the area.

b. Not alter the channel in such a manner that would prohibit any section of the channel from conveying, in its final state, the amount of flow at the same or lower maximum water elevation that it conveyed in its existing state.

c. Furnish for the Director's review and approval the following information:

i. Plan view of the channel showing the location of existing constructions, obstructions and other non-typical areas.

ii. Typical cross-section of the existing and proposed channel and special cross-section areas as indicated by paragraph i. above.

iii. Hydrographs and/or flood routing calculation and backwater curve profiles of the proposed waterway due to a 100-year storm recurrence interval, unless the Director approves the use of a lesser recurrence interval.

iv. Engineering evaluation of all potential increase in flood hazards to the immediate upstream or downstream private or public lands and facilities thereon and show provisions for eliminating any and all adverse effects due to this increase on said lands and facilities at no public cost.

v. Minimum finished floor elevation which shall be set at or above the maximum water surface elevation determined from:

(i) Map of Flood Prone Areas prepared by the U.S. Geological Survey for the Department of HUD, EIA.

(ii) *Pinellas County Master Drainage Plan* prepared for Pinellas Planning Council.

(iii) Backwater curve profiles required by paragraph iii. above.

d. Shall designate on the final plat all areas reserved for flood routing, retention or storage together with the required wording as pertains to restrictions, dedications and maintenance responsibilities of such areas.

Requirements of Construction

The drainage facilities and improvements required under the provisions of this chapter shall be installed in compliance with the provisions of this Article. In those instances where the requirements of another chapter, article, section or subsection of this code conflict, the higher or more restrictive requirement shall prevail.

Rights-of-Way and Easements

All open canals and waterways shall be within a dedicated right-of-way and closed storm drainage conduits shall be within an easement or dedicated right-of-way. Minimum rights-of-way and maintenance easements by instrument or plat dedication shall be provided for all waterways used to convey runoff to a publicly owned and/or maintained facility. The minimum widths of rights-of-way and easements shall be as follows:

	Top of Bank Width	Maintenance Width	Minimum Controlled Width
Canals and Waterways	40 feet or greater	25 feet each side	Varies 50 feet plus top of bank width (right-of-way)
Canals and Waterways	20 feet to 40-feet	25 feet one side	Varies 25 feet plus top of bank width (right-of-way)
Canals and Waterways	Less than 20 feet	20 feet one side	Varies 20 feet plus top of bank width (right-of-way)
Swales	---	---	20 feet (easement)
Pipes and Culverts	---	---	20 feet (easement)

1. Swales shall be grassed and mulched and shall comply with minimum and maximum design velocities and erosion protection requirements of this code. Swales shall be sloped to drain dry. Maximum side slopes of swales shall be 6:1 and the minimum longitudinal slope shall be 0.30%. Roadside swales may be used, but shall conform to all underdrain requirements and be at least 2 feet in depth below the roadway crown unless underdrains are also used. Roadside swales shall have a maximum depth of 3.5 feet.
2. Ditches shall be grassed and mulched and shall comply with minimum and maximum design velocities and erosion protection requirements of this code. Ditches shall have a minimum 2-foot bottom width, a minimum 2½-foot depth and a 3:1 side slope. Soil conditions shall be considered in setting side slopes. Ditches shall be designed to drain dry. Paved ditches or stabilized banks shall be provided to protect channels against scour where allowable velocities are

exceeded. Concrete retaining walls may be used as an alternate to provide adequate channel capacity through constricted areas subject to approval of the Director.

3. Canals and waterways designed to remain wet throughout the year shall be a minimum of 6-foot depth from average water level.

    a. Minimum bottom width of canals shall be 10 feet and side slope shall be 3:1, but not steeper than 2:1. Soil conditions shall be considered in setting side slopes. Concrete retaining walls may be used as an alternate where right-of-way is restricted and where access for maintenance would be difficult subject to approval of the Director.

    b. Lakes and ponds shall have gently sloping littoral area with slopes not exceeding 6:1 to 5-foot depth from normal water level. Side slopes for depths below 5 feet may be 2:1 (horizontal to vertical) or flatter as soil conditions permit.

4. A minimum right-of-way of 20 feet shall be provided for access to any runoff storage basin from a dedicated road or street. In addition, a continuous 25-foot easement, to serve as a maintenance berm, shall be provided around the perimeter of the retention basin.

5. Erosion control shall be provided by grassing and mulching, sod or bagged concrete riprap for erosion protection of ditches and waterways. Concrete shall be used for the larger structures. Additional techniques that may be used are listed below:

    a. Paved gutters, ditches, channels, or channel side slopes using concrete, riprap, or bituminous lining.

    b. Sod cover in gutters and ditches

    c. Wide channels with shallow bottom slopes using check dams.

    d. Culverts with a break in grade to hold outlet velocity within the allowable limits. (When this method is employed, the position of the hydraulic jump must be determined to insure uniform flow occurring within the culvert).

    e. Drop structures, stilling basins and baffles to dissipate energy at the entrance, or outlet of culverts.

    f. Sheet piling cutoffs to protect the entrance and outlets of culverts from undercutting.

    g. Slope protecting of bridge abutments, and embankments at ends of culverts with concrete paving, or riprap.

Inlets and Manholes

The walls of all inlets, manholes and other similar structures shall be eight (8) inches thick if brick or block is used and six (6) inches thick if precast reinforced concrete is used. Frames and covers shall be cast iron. The minimum inside width of inlets, manholes and other similar structures shall be as shown in standard construction details. Grate capacity shall equal or exceed tributary runoff.

Pipes and Culverts

Pipes and culverts shall be reinforced concrete pipe, asphalt coated metal pipe or aluminum pipe. Pipes used shall meet ASTA, AASHTO and current State of Florida DOT specifications. Concrete pipe shall have gasket joints according to AASHTO specifications. Metal pipes within the right-of-way lines of public streets shall be designed to provide a joint free installation or be jointed with a 12-inch wide band having mastic or neoprene gasket providing a watertight joint. The minimum cover for pipes and culverts under pavement shall be 1.25 feet from the bottom of roadway base to pipe crown.

Headwalls and Endwalls

All pipes shall be provided with endwalls at outlets. Culverts shall have headwalls and endwalls at entrances and outlets. Endwalls and headwalls may be reinforced concrete or sand/cement riprap and the design shall conform to current State of Florida DOT specifications.

Curbs and Curb Gutter

Curbs, and curb and gutter shall be concrete of a minimum 3,000 psi strength. Valley gutter, and valley curb and gutter shall be a minimum of two (2) feet wide. Vertical curbs shall be six (6) inches wide by twelve (12) inches deep with six (6) inches of curb extending above the edge of pavement. Minimum curb grades shall conform to the minimum street grades of this code except in special cases such as plateau intersections and the like and subject to approval of the Director.

Control Structures

Control structures shall not be placed on any public drainage facility without furnishing the Director complete hydraulic analysis of the drainage basin served by such public facilities and the effects of the control structure on both the drainage basin and existing public and private facilities and structures.

Section 5 - Drainage Design Procedure

General

A major portion of the drainage design was developed through the use of a computer program developed specifically for this project. Runoff rates were based on the "Rational Formula" (explained below). Final channel cross sections were determined through "Manning's Equation," and culvert capacities were determined from design equations developed by the Bureau of Public Roads in 1963 and modified in 1966.

Design Criteria

The maximum rate of runoff or estimate of peak discharge was based on the "Rational Formula" $Q = CIA$, where:

Q = Peak runoff in cubic feet per second (cfs)
C = Coefficient of runoff
I = Rainfall intensity in inches per hour
A = Drainage area in acres

The coefficient for each land use was utilized in determining a weighted coefficient for each drainage sub-basin. This coefficient of runoff was determined from an evaluation of the various land uses identified in the *Comprehensive Land Use Plan for Pinellas County, Florida*.

Rainfall intensity for the 25-year design storm was based on the current State of Florida Department of Transportation (DOT) rainfall intensity curve, Zone IV, Tampa.

Roughness coefficients (n) for drainage structures are as follows:

Concrete Pipe	=	0.013
Corrugated Metal Pipe	=	0.024
Concrete Box Culvert	=	0.013

Where pipe of different materials were used together, a weighted roughness coefficient was determined for that combination. In cases where two or more different pipe sizes were encountered, equivalent circular pipes were substituted to determine culvert capacity.

Roughness coefficients for channels were taken from the U.S. Department of Transportation manual, "Design Charts for Open Channel Flow," Appendix A, Table I.

The velocity in structures and channels was limited as follows:

1. Maximum velocity in open channels, 3.0 fps–3.5 fps
2. Maximum velocity in culverts, 6 fps for most of the structures and up to 8 fps in some cases

The maximum designed headwater elevation used for structures was one foot below the pavement crown.
To determine the capacity of waterways of multiple span bridges, the openings were assumed to be box culverts whose height equaled the channel depth immediately upstream.

Time of concentration or overland flow time was determined through the use of the chart shown in the Appendix of this report.

Storage Requirements

Storage requirements were computed based on a simplified procedure of estimating inflow in a reach or sub-basin, subtraction outflow and producing a remainder which represented the amount to be stored. The runoff into a storage area was considered to be the runoff from the sub-basin immediately upstream of a structure, plus the upstream inflow draining from the nearest structure upstream. The inflow was based on a 25-year recurrence interval derived from the DOT intensity duration curve. The quarter hour intensities were converted to accumulated inches of rainfall for successive time periods. The inches were then converted to acre feet of runoff by applying the rational method using the weighted runoff coefficient *"C"* for existing land use in the sub-basin and the drainage area *"A"* in acres. This drainage area equaled the area of the sub-basin, plus an equivalent drainage area representing the inflow from the upstream structure. This procedure of estimating inflow is based on the theoretical assumption that the most intense rainfall occurs first in any storm period and reduces in intensity as time progresses. Local and upstream inflow was assumed to occur simultaneously with no consideration of the times of concentration. The outflow from the storage area was assumed to be equal to the capacity of the existing downstream structure.

Rights-of-Way Easements

All open canals and waterways are proposed to be within dedicated rights-of-way. Closed storm drainage conduits are proposed to be within either an easement or dedicated right-of-way. Except in cases where existing development restricts the available width, the desirable minimum widths of rights-of-way and easements are as follows:

A wide maintenance width is recommended to allow for a meandering path for maintenance equipment so that trees and vegetation along the banks can be preserved.

Where the desired right-of-way is not available, channel improvements may be necessary to provide for hydraulic capacity and maintenance accessibility.

	Top of Bank Width	Maintenance Width	Minimum Controlled Width
Canals and Waterways	40 feet or greater	25 feet each side	Varies 50 feet plus top of bank width (right-of-way)
Canals and Waterways	20 feet to 40-feet	25 feet one side	Varies 25 feet plus top of bank width (right-of-way)
Canals and Waterways	Less than 20 feet	20 feet one side	Varies 20 feet plus top of bank width (right-of-way)
Pipes and Culverts	---	---	20 feet (easement)

Paved ditches or concrete retaining walls may be used as an alternate method of providing adequate channel capacity through constructed areas.

Section 6 - Drainage Review Procedure

The *Master Drainage Plan for Pinellas County* was developed using the drainage criteria embodied in the *Uniform Development Code*, with the dual purpose of providing a positive drainage system for a 25-year storm and abating nonpoint source pollution to the greatest extent feasible.

A review of data was conducted in the initial stage of the study by various agencies concerned with drainage. Maximum use was made of these existing data, which included existing and proposed drainage plans, drainage studies for various

municipalities, contour mapping by various governmental agencies and land use planning maps by the Pinellas County Planning Department.

The procedure used in developing the *Master Drainage Plan* was to designate the major drainage outfall systems in the county within each drainage basin without regard to municipal boundaries. The boundaries of the major drainage basins were delineated on the United States Geological Survey (USGS) topographic maps. These maps provide a five-foot contour interval of existing topography covering the entire county. When available, maps with smaller contour intervals were used to resolve the locations of the basin boundary. If a more detailed study was necessary, a field investigation was made to determine the boundary of the basin. This procedure resulted in the definition of fifty-two basins within the county, not including the beach communities. Each of these major drainage basins was then investigated to form a segment of the *Master Drainage Plan*.

A major drainage basin is defined as one with definable boundaries or ridge lines, an outfall system, and a drainage area of approximately one square mile or more. A major outfall system is the primary drainage outlet with a definite channel or conduit for conveying runoff from a drainage basin or watershed. The main channel and tributaries (of a major outfall) must have a minimum length of one-half mile and drain approximately one square mile of land. On this basis, outfall systems of thirty-six of the fifty-two county drainage basins met this criteria. These systems are shown on the *Master Drainage Plan* (separate attachment to this report).

Upper limits for each basin study were determined next. For open systems, the upper limit was the point on the channel whose upstream drainage area equaled approximately two hundred acres. For closed systems, the upper limit was the point where a fifty-four inch round pipe (or its equivalent) was first encountered. In some cases, the limits were extended further upstream to a lake, major highway, or railroad crossing. These study limits were then presented for approval at the Drainage Technical Advisory Committee (TAC) meeting. Any recommended extensions or additions were accepted and the study limits changed accordingly.

Following the delineation of basin, outfalls and upper limits, field surveys were conducted in twenty-eight of the major basins. In the remaining ten basins, field surveys were not preformed since existing plans indicated that the outfall had been previously improved and enclosed in pipe for most of its length. The surveys consisted of visual observations at each survey point on the major outfall to determine the existing structure and channel sizes and channel flow conditions upstream and downstream of the culvert. The depth from roadway crown to structure invert was also measured.

Each major drainage basin was subdivided into drainage sub-basins [and] were defined as areas tributary to a specific point (referred to as a survey point on the drainage plans) on the major outfall system. Survey points include street and road crossings, railroad crossings and channel junctions on the major outfall. Delineation of sub-basins allowed computation of the drainage area, land use and time of concentration for computation of runoff for the 25-year design storm at each drainage structure or survey point on the major outfall.

Map overlays were made of existing land use and ultimate land use within each sub-basin area. Calculation of the percentage of drainage area for each classification of land use enabled the computation of a weighted coefficient of runoff to be made for each sub-basin area both for existing and ultimate land use.

In evaluating structure and channel capacities, the maximum allowable headwater difference under submerged flow conditions was assumed to be the depth of one foot below the roadway crown to the inside crown of the structure. However, if by using this head, the estimated flow exceeded the velocity of 6.0 fps, then the capacity was limited to a flow of 6.0 fps and used as the controlling factor in lieu of the head difference.

The flow capacity for channels was estimated by the slope-area method assuming a uniform channel section for the reach between survey points. If this resulted in a velocity exceeding 3.0 fps, the channel slope was decreased and the channel widened as necessary to accommodate the design flow. Channel slopes would be reduced through the use of check dams.

Runoff for the 25-year design storm under the existing land use conditions is considered the design runoff and was utilized in evaluating the capacity of outfall channels and drainage structures. In cases where the existing capacity of the outfall channels or drainage structures is less than the design runoff, improvements were recommended to either store part of the runoff (thus reducing the peak flow rate) or improve the structure to meet the design capacity. The decision to provide storage or increase structure capacity was based on the availability of a suitable storage site. Where a suitable storage site was available as evidenced on the aerial maps, storage was the preferred method. If a storage site did not appear available due to the intensity of development as evidenced on the aerial maps, the culvert capacity was increased to accept the design runoff. An effort was made to identify structures whose capacities were not in proportion to their contributory areas. The objective was to improve only those that had capacities below this desired level. In this way, only a minimum of structure improvement was recommended.

Section 7 - Master Drainage Plan

The *Master Drainage Plan for Pinellas County* was developed on aerial photograph maps at a scale of 1 inch equals 400 feet. Drainage information has been added on these base maps to show the major drainage basin boundaries, channel centerlines, and right-of-way widths for major drainage outfalls, as well as municipal and county boundaries. Also delineated are the elevations and boundaries of flood prone areas.

Survey points have been used to reference the tables and the discussions in the *Master Drainage Plan* regarding improvements to the major outfall system and the cost estimates for those improvements.

The desired rights-of-way required to provide an improved channel section and perms to provide access for maintenance of the drainage system have been shown on the drainage plans. It may become necessary during the final design of channel improvements to revise the right-of-way requirements due to specific site conditions.

The 100-year floodplain limits, development by the USGS for the Federal Insurance Administration (FIA), are shown on the *Master Drainage Plan*. These show the areas that may be flooded by a 100-year storm. Where the elevations of the 100-year floodplain have been estimated by the USGS, those elevations have been shown. Some areas of potential flooding not mapped by USGA have also been delineated on the *Master Drainage Plan*.

Where a specific location of the 100-year floodplain limit must be determined, the determination should be based on locating the flood elevation on the ground rather than locating the boundary by information shown on the *Master Drainage Plan*.

A “Plan of Drainage Basins and Major Outfalls, Pinellas County, Florida” showing the drainage basins, major outfalls and city limits is included in the rear cover of this report.

Section 8 - Proposed Improvements

General

Proposed improvements were divided into four categories: Channel, Structure, Storage and Right-of-Way. Estimated costs to construct the proposed improvements were also developed. These were based on the latest construction bid prices available in the Pinellas County area, and assume "basin-wide" construction contract prices. If work is broken into several smaller contracts, estimated costs would be increased. Also, since this is an engineering/planning study based on limited fieldwork, a "Contingencies" item was added to all basin costs. This item reflects costs that cannot be foreseen (e.g., relocating or avoiding major utilities, etc.), and also takes into account the large and more costly structures that may be recommended upon completion of the detailed engineering construction plans that must be done before construction can begin. See Table 1 for a summary of construction and right-of-way costs.

Annual Maintenance

Proposed costs for annual maintenance of the major drainage outfalls are made up of three separate costs: channel, structure and right-of-way costs. The cost of channel maintenance was estimated at $5,000 per year per mile of channel and includes clearing, mowing and erosion repair of channel banks and bottom. The cost for maintaining the structures was estimated at $100 per year per structure and includes cleaning of silt and debris from the structure opening and erosion repair of headwalls and slopes. The third cost item included maintenance of the drainage right-of-way at $50 per acre for mowing once per year of the berms along the channels to permit access for maintenance. A summary of estimated costs for each of the major outfalls is presented in Table 2.

Explanation of Improvements

Channel

Excavation to increase capacity, ditch checks to reduce velocity and clearing, seeding and mulching were considered as channel improvements. These costs are included under "Channel Improvement Costs." Adequate berms for equipment operation were assumed to be available.

Structure

Structure costs include end walls at both ends of pipe culverts, cubic yards of concrete and tons of steel in concrete box culverts (based on DOT standards), traffic maintenance, erosion control, pavement replacement, stabilization, etc. These costs are totaled under "Structure Improvement Cost."

Storage

Storage volume required (not existing) is shown between survey points with the total costs for construction shown in "Storage Improvement Cost." No consideration was given to existing rights-of-way, easements, or storage areas.

Right-of-Way

The "Desirable Right-of-Way Area" is that acreage needed for both channel and storage sites. A detailed explanation of how each is computed can be found in Section 4, "Drainage Design Procedures." It should be noted that in congested portions of Pinellas County, berm requirements were varied to allow for the use of retaining walls, sea walls, pipes or concrete box culverts. Right-of-way costs were inflated to reflect these substitutes. Since congestion in these and other areas is likely to increase before construction plans are made for any specific area, a social and economic study would be necessary to determine the best type of channel for that location.

Explanation of Land Use Abbreviations

Reference is made to existing land use categories throughout this section. The types of land uses and their abbreviations are as follows:

RPD	-	Residential Planned Development
LDR	-	Low Density Residential
MDR	-	Medium Density Residential
HDR	-	High Density Residential
C	-	Commercial/Transient Accommodation
P	-	Public/Semipublic
R	-	Recreation/Open Space
M	-	Manufacturing

Table 1
Construction and Right-of-Way Costs

No.	Basin	Estimated Construction Improvement Costs				Estimated Right-of-Way Costs	Estimated Total Costs
		Channel	Structure	Storage	Contingencies		
1	Anclote River	$ 64,300	$ 22,200	$ 135,800	$ 66,700	$ 200,000	$ 489,000
2	Klosterman Bayou	3,900	28,600	330,200	108,800	100,000	571,500
5	Oldsmar	69,700	48,200	225,400	103,000	300,000	746,300
6	South Creek	56,800	19,900	28,000	31,500	200,000	336,200
7	Sutherland Bayou	21,500	10,100	23,200	16,500	100,000	171,300
8	Smith Bayou	62,100	61,900	114,600	71,600	400,000	710,200
9	Cedar Creek	164,800	34,800	0	59,900	400,000	659,500
10	Curlew Creek	730,600	321,000	954,600	601,900	8,500,000	11,106,100
11	Possum Branch	39,400	14,600	6,500	18,200	100,000	178,700
12	Bishop Creek	88,600	39,200	41,100	50,700	400,000	619,600
13	Mullet Creek	72,200	7,700	101,600	54,500	800,000	1,036,000
14	Alligator Creek	408,400	486,200	413,500	392,500	3,100,000	4,800,600
15	Spring Branch Stevenson's Creek	85,300	105,000	194,300	115,400	1,400,000	1,900,000
17	Coastal Zone 1	44,900	135,900	176,000	107,100	1,100,000	1,563,900
18	Stevenson's Creek	40,900	200,100	0	72,300	500,000	813,300
19	Allen's Creek	183,200	107,100	71,300	108,500	2,700,000	3,170,100
22	Long Branch	235,000	102,300	10,900	104,500	1,500,000	1,952,700
23	Roosevelt	317,600	70,900	863,800	375,700	1,600,000	3,228,000
24	Cross Bayou	2,637,800	226,200	333,700	959,400	4,300,000	8,457,100

No.	Basin	Estimated Construction Improvement Costs				Estimated Right-of-Way Costs	Estimated Total Costs
		Channel	Structure	Storage	Contingencies		
25	Starkey Road	467,900	755,400	789,500	604,000	3,400,000	6,016,800
26	Lake Seminole	15,000	1,200	25,900	13,000	600,000	656,000
27	McKay Creek	3,107,700	393,200	0	1,050,300	1,700,000	6,251,200
29	Pinellas Park Ditch	887,400	138,000	131,700	347,200	2,700,000	4,204,300
30	Sawgrass Lake	165,300	22,100	163,500	105,300	1,600,000	2,056,200
31	Tinney Creek	0	2,000	22,100	7,300	400,000	431,400
34	54th Ave. East Canal	147,600	0	0	44,300	500,000	691,900
35	Joe's Creek	1,877,300	1,602,700	124,000	1,081,200	1,700,000	6,385,200
37	Pasadena Lake	(♦)					
39	Bear Creek	124,800	19,400		43,300	1,100,000	1,287,500
40	Brooker Creek	106,800	209,900		95,000	140,000	551,700
42	45th Ave. East Canal	(♦)					
43	Coffee Pot Bayou	(♦)					
45	34th Street	33,200	23,100		16,900	300,000	373,200
46	Clam Bayou	22,600	206,200	45,000	82,200	600,000	956,000
49	Lake Maggiore/Salt Creek	(♦)					
51	Little Bayou Creek	20,700	46,800	0	20,300	60,000	147,800
	Totals	$12,304,200	$5,461,900	$5,326,200	$6,929,000	$42,500,000	$72,519,300

♦ No improvement necessary. Only maintenance cost in this basin.

Table 2
Estimated Annual Maintenance Costs

No.	Basin	Estimated Annual Maintenance Costs	No.	Basin	Estimated Annual Maintenance Costs
1	Anclote River	$ 7,000	24	Cross Bayou	$ 68,000
2	Klosterman Bayou	3,000	25	Starkey Road	72,000
5	Oldsmar	13,000	26	Lake Seminole	7,000
6	South Creek	13,000	27	McKay Creek	38,000
7	Sutherland Bayou	5,000	29	Pinellas Park Ditch 1	26,000
8	Smith Bayou	16,000	30	Sawgrass Lake	46,000
9	Cedar Creek	11,000	31	Tinney Creek	8,000
10	Curlew Creek	63,000	34	54th Ave. East Canal	10,000
11	Possum Branch	7,000	35	Joe's Creek	67,000
12	Bishop Creek	19,000	37	Pasadena Lake	7,000
13	Mullet Creek	17,000	39	Bear Creek	26,000
14	Alligator Creek	47,000	40	Brooker Creek	27,000
15	Spring Branch Stevenson's Creek	23,000	42	45th Ave. East Canal	13,000
17	Coastal Zone 1	10,000	43	Coffee Pot Bayou	8,000
18	Stevenson's Creek	21,000	45	34th Street	19,000
19	Allen's Creek	41,000	46	Clam Bayou	10,000
22	Long Branch	20,000	49	Lake Maggiore/Salt Creek	24,000
23	Roosevelt	6,000	51	Little Bayou Creek	8,000
				Total for All Maintenance	$ 826,000

Summary of Improvement Priorities

After determining that improvements were necessary in a drainage basin, a high, medium or low priority rating was assigned to those improvements. This rating indicates which improvements could be considered more important than others. A high priority is generally given to densely populated areas of the county where improvements will show the greatest return. Advanced engineering studies should begin immediately in these areas and completion of these studies, efforts to acquire right-of-way needed for improvements, and storage sites should begin. Medium and low priority areas are either less populated or contain only minor flooding problems. Improvements here can be postponed until those with a high priority are completed. Basins in which no improvements are proposed were not given a priority. An explanation of how a specific basin priority was determined can be found in the basin summary paragraphs throughout the remainder of this section. Basins requiring improvements and their priorities are as follows:

High Priority

Allen's Creek
Alligator Creek
Bear Creek
Cedar Creek
Clam Bayou
Coastal Zone 1
Cross Bayou
Curlew Creek
Joe's Creek
Klosterman Bayou
Long Branch
McKay Creek
Pinellas Park Ditch 1
Sawgrass Lake
Smith Bayou
Springbranch of Stevenson's Creek
Starkey Road
Stevenson's Creek
Tinney Creek

Medium Priority Basins

Booker Creek
Mullet Creek
Sutherland Bayou
34th Street
54th Avenue East Canal

Low Priority Basins

Anclote River
Bishop Creek
Lake Seminole
Oldsmar
Possum Branch
Roosevelt
South Creek

[The above links contain maps of Pinellas County, each indicating the location of a major basin and descriptive text concerning the needed work in each basin. The map and information for Allen's Creek is unavailable. Links to additional maps are found in the Drainage Element.]

Section 9 - Implementation and Financing

General

The [*Master*] *Drainage Plan* recommends improvements to major outfalls and is a guide for future development within Pinellas County to insure the preservation of the natural creeks, channels and outfalls within the county. The county and city governments should use the plan for setting aside rights-of-way for the major channels, locating retention/detention areas, and establishing minimum improvements for the major channels. These improvements to the major outfalls are required to satisfy existing conditions. Improvements to satisfy future developments will not be necessary if the *Drainage Plan* is adopted because of the requirement that runoff from developed properties cannot be increased. Broadly, this means that property owners desiring to develop projects will have to design the drainage system of the project so that the runoff rate to the major outfall will not be increased. Major outfalls must be improved to handle the runoff from developments that have occurred in the past. Some outfalls are in more need of improvement than others when the drainage system of Pinellas County is looked at in total. As each municipality views its drainage problems it establishes priorities. The most feasible method, when all aspects (political, financial priorities, etc.) of implementing this plan are considered, is for each jurisdiction to continue to have the responsibility for maintaining and improving major outfalls. Funds should be provided through the capital improvement concept. Since many major outfalls cross municipal boundaries, this plan will assure that improvement on each side of a boundary line will be compatible.

Implementation

A permanent Drainage Technical Advisory Committee, consisting of one representative each from the county and each city, should be established to assist and advise the Pinellas Planning Council with respect to drainage improvements to be made to the main channels within Pinellas County. The responsibilities of the Technical Advisory Committee would be as follows:

- To insure that the concepts outlined in the plan are fulfilled.
- To insure that the necessary channel rights-of-way are set aside.
- To insure that future improvements to the channels and structures contained within the major outfalls of Pinellas County comply with those outlined in the plan.

- To insure that the development of major outfalls is compatible across jurisdictional boundaries.

Only plans affecting the major outfalls shown in the *Drainage Plan* should be reviewed and approved by the Pinellas Planning Council. Because the *Drainage Plan* is conceptual, it is anticipated that changes to right-of-way widths, relocation of retention/detention areas and adjustments in other recommended improvements will be required upon completion of more detailed individual drainage basin studies. Changes to this *Drainage Plan* should be reviewed and approved by the Pinellas Planning Council in accordance with the Planning Council change procedure as outlined in Chapter 73-594, Section 10 of the Laws of Florida.

Drainage plans and projects that require the approval of the Planning Council should first be reviewed by the [Drainage] Technical Advisory Committee so that the municipalities may comment on the effect that the plan or project will have on their local conditions.

The channel widening, structural improvements and maintenance of the major outfalls in Pinellas County as outlined in this plan, and in the more detailed studies to follow, must be funded by the governmental agency involved. The funding and construction of major outfalls connecting more than one jurisdiction should be cooperatively planned among the jurisdictions. The practice of Pinellas County participating in drainage projects within municipal boundaries should be continued. Generally, the practice has been for the county to pay proportionally according to the amount of runoff contributed to the outfall from lands within the county.

The acquisition of necessary right-of-way, however, can be accomplished in one of two ways. In undeveloped areas, as property owners apply for permits to develop lands along a major outfall the following drainage conditions would have to be met:

- The design standards and criteria contained in the drainage plan would have to be followed in the proposed project.
- If a major outfall as shown on the Pinellas County Master Drainage Plan crosses the property, then the right-of-way width for the outfall shown on the plan would be dedicated to the public by the property owner.
- If a retention/detention area for a major outfall as shown on the *Pinellas County Master Drainage Plan* is contained partially or wholly within the property, then the land for the retention/detention area would be dedicated to the public by the property owner.

In already developed areas, the jurisdiction involved would be responsible for determining the means by which the right-of-way is acquired.

Financing

Good fiscal policy is necessary for the implementation of the drainage program. Funding requirements, in terms of construction costs and maintenance, should be identified for each phase of the plan. Projects must be analyzed to determine the timing and priority of construction. There are several areas of concern dealing with the funding of the drainage plan. Each will be discussed separately.

The first step in a good fiscal policy is to set goals and priorities. The time phase for all projects should be identified. Phases should be broken into short, medium and long-term time spans. By establishing the priorities in phases, it is possible to prepare a capital improvements program and to estimate the annual funding requirements.

Funding requirements are established by the capital improvements program. The next step would be to determine where the funds will come from and to proceed with their collection. There are several means to attaining the funds and the best procedure would be to use a combination of these methods. Each of these methods is discussed in this section along with its application to the drainage projects.

Bonds

Due to the fact that large amounts of money are required for construction projects, funds for this purpose should come from a bond issue. By selling bonds, the money will be available at the beginning of the project when it is needed. If bonds are used to finance the construction of drainage improvements, the bonds should apply to individual drainage basins so that the total major outfall system within the basin can be improved.

Taxes

It will be necessary to levy a tax within a drainage basin to meet bond debt service requirements, as well as the operating and administrative costs of the municipality or county. Bond debt service includes the principal, interest and reserves required to pay off the bonds sold to raise the operating and construction funds. Operating costs would include maintenance of the system and the cost of staff and materials. This tax should be labeled according to its use for the drainage plan and then utilized for those purposes.

Jurisdictions may wish to tax on a basin wide system to pay for improvements with[in] a specific drainage basin. This would require tax assessment rolls for each drainage basin which has made improvements. This tax has another advantage in that since a

referendum in each district would be required, voters would decide the need of drainage improvements on a local basis.

Southwest Florida Water Management District

The Southwest Florida Water Management District (SWFWMD) was created in 1961 by the Florida Legislature with the authority to cooperate with the federal government as a local sponsor for flood control and other related purposes, including water management and water conservation. One of the agencies under the auspices of SWFWMD is the Anclote River Basin Board. This agency has jurisdiction over Pinellas County and has sponsored in the past such projects as aerial and topographic mapping of Northeast Pinellas County, and the design and construction of drainage control structures in Sawgrass Lake. The agency has a basin wide ad valorem taxing limit of 0.25 mill, and the SWFWMD has a taxing limit of 0.75 mill. The taxes collected during fiscal 1976 were based on the maximum millage rates. This money can only be used to fund projects that directly benefit the Anclote River Basin, and SWFWMD, under the direction of the Anclote River Basin Board, should be encouraged to continue its practice of funding the design and construction of drainage improvements throughout the county.

Grants

There are several grant programs which may aid in the implementation of the *Master Drainage Plan* or in any studies concerning water management. All jurisdictions should take full advantage of any grant which may be applicable to their needs. Use of these grants will lower the bond requirements and keep down the tax rate. Some of the grants that may apply are:

PL 556

The *Watershed Protection and Flood Prevention Act of 1954* is intended to protect soil and water resources. The Department of Agriculture administrates the grants under this section through the Soil Conservation Service and the state governments. The plans can cover:

- Land treatment
- Flood protection
- Agricultural water
- Public recreation development (water related)
- Public fish and wildlife development

- Municipal or industrial water supply
- Other water resource activities

The federal government participation includes technical assistance for land treatment measures, the total cost of measures on federal land for all flood prevention construction and one-half of the construction, land rights and technical costs for water management and recreation projects. The local government must pay for acquiring rights-of-way, contract administration on nonfederal land and the cost not covered by the grant.

The Soil Conservation Service (SCS), may advance funds to preserve sites for future construction. There are also Federal Housing Administration (FHA) low interest loans available for the local governments to pay their share of the costs.

PL 433

Safe Drinking Water Act was signed into law in late 1974. This law allows grants for the development and demonstration of any project which will demonstrate new or improved methods of providing safe drinking water. The grants cover two-thirds of the total cost of construction of any one facility and three-fourth of any other costs.

Army Corps of Engineers Urban Studies

The Corps of Engineers will provide technical assistance for a study involving water resource management. These projects are instituted by legislative action and the scope and detail of the study vary. The congressman from the district would be contacted to provide help concerning this program.

Impact Fees

Jurisdictions have the authority to impose an impact fee for new construction. Under this provision, the developer must pay a fee to compensate for the added burdens on the public services of the area. Developments affecting the drainage plan would contribute to the cost of providing the necessary improvements. A disadvantage of the concept is that the collection of the fee would be delayed and might not be available at the beginning of a construction project. Developers are naturally opposed to the fee and will increase the price of homes to cover the cost.

Section 10 - Governmental Requirements

General

At each level of government, there are several agencies exercising some control over the development of land and the drainage system characteristics. The emphasis of state and federal agencies is toward preventing environmental pollution. The local and regional agencies tend to be concerned more with the hydraulics of a drainage system. The more significant controls exercised by governmental bodies are discussed in this chapter.

Federal Agencies Exercising Control

Environmental Protection Agency

The Environmental Protection Agency is charged with the responsibility under PL 92-500 of protecting the wetlands above the mean high tide line. This area of responsibility has been interpreted to include wetlands of lacustrine and riverine characteristics as well as coastal wetlands. The EPA exercises permit authority over development in wetlands, including the uncontrolled discharge of drainage into wetlands.

Corps of Engineers

The Corps of Engineers exercise protective control over development in wetlands below the mean high tide line under authority of PL 92-500. This area of responsibility has been interpreted by the courts to include all wetland areas adjacent to navigable water. The Corps of Engineers is writing new regulations to implement this ruling.

State Agencies Exercising Control

Trustees of the Internal Improvement Trust Fund[1]

The trusties hold title for the state to the majority of land below the mean high tide line. In exercising their control over this property for the public interest, the trustees prohibit development below the mean the mean high tide line or uncontrolled discharge of storm water into the waters of the state.

Florida Department of Pollution Control[1]

The Department of Pollution Control (DPC) has been given authority under Chapter 17-3 of the rules of the Department of Pollution Control to protect the waters of the State of Florida. In order to fulfill their responsibilities under this rule, the DPC has classified all of the waters of the State of Florida according to the best usage. These classifications are based on criteria listing the amounts of pollutants under several parameters that may be allowed in the water. The classification and the criteria for each are listed in Chapter 17-3 of the rules of the Department of Pollution Control which are included in the Appendix of this report.

Department of Transportation

The Department of Transportation is primarily concerned with the hydraulics of drainage that may affect state highways. Stream crossings of state highways must be designed to pass the 25-year storm and to protect the roadway, stream and other property from significant damage during a 100-year storm.

Regional Agencies Exercising Control

Southwest Florida Water Management District

The Southwest Florida Water Management District (SWFWMD) was established by the State Legislature in 1961 for the purpose of providing proper management of the water and land resources in alleviation flood destruction and enhancing the potable water supply available in the district. Pinellas County lies within the Pinellas/Anclote River Basin and is totally within the SWFWMD control area. The regulations adopted

[1] The trustees of the Internal Improvement Trust Fund and the Florida Department of Pollution Control have been reorganized and some of the duties and responsibilities of these two agencies are being assumed by the Department of Environmental Regulation.

by SWFWMD require that a permit be attained prior to any construction within the district that will:

- Cause the flow of a stream or other water course to be lowered below the minimum flow established by SWFWMD.
- Cause the level of the potentiometric surface to be lowered below the regulatory level established by SWFWMD.
- Cause the level of the surface of water in any lake or other impoundment to be lowered below the minimum level established by SWFWMD.
- Significantly induce saltwater encroachment.
- Cause the water table to be lowered so that the lake stages or vegetation will be adversely and significantly affected on lands other than those owned, leased or otherwise controlled by the applicant.

The specific limits affecting the *Pinellas County Master Drainage Plan* are:

- The flow of a stream or watercourse must not be reduced by more than five percent at the time and point of withdrawal except in the case of a dam where the water is stored for subsequent release downstream.
- The level of the potentiometric surface under lands not owned, leased or otherwise controlled by the applicant must not be lowered more than five feet.
- The potentiometric surface must not be lowered below sea level.
- The level of the water table under lands not owned, leased or otherwise controlled by the applicant must not be lowered more than three feet.
- The level of the surface of water in any lake or other impoundment must not be lowered more than one foot unless the lake or impoundment is wholly owned, leased or otherwise controlled by the applicant.

West Coast Regional Water Supply Authority

The West Coast Regional Water Supply Authority (WCRWSA) was established by the State Legislature in 1975 to coordinate the water supply activities of Pinellas, Pasco and Hillsborough counties and the cities of Tampa and St. Petersburg. The WCRWSA is not fully active at this time and has not promulgated rules or regulations that would affect drainage in the Pinellas County area.

Tampa Bay Regional Planning Council

The Tampa Bay Regional Planning Council (TBRPC) has been designated as a regional planning agency under Section 208 of PL 92-500 to develop a *Regional Water Quality Management Plan* (208 Plan). The water management plan developed in the 208 planning process will result in a coordinated waste treatment management system for the area of which Pinellas County is a part. The 208 Plan will include consideration of municipal and industrial waste, water discharges, non-point source pollution and protection of the groundwater resources. Development of the 208 Plan started in July 1975 and is scheduled to be completed in July 1977.

The 208 Plan will provide techniques and procedures to limit the potential contamination of both surface and groundwaters from drainage source pollution. This *Master Drainage Plan* will provide input to the 208 Plan.

There are no restrictions on drainage by the Tampa Bay Regional Planning Council at this time. However, through the 208 Plan, the Council may impose restrictions in the future.

Local Agencies Exercising Control

Pinellas County

Pinellas County has exercised control over the drainage aspects of development projects within the county for many years. General drainage studies have been conducted in most of the basins and many improvements have been made to the drainage system.

All developments within the unincorporated area of Pinellas County must submit drainage plans for review prior to construction.

Municipalities Exercising Control

Each of the municipalities within Pinellas County exercises control over the drainage system within its corporate limits through their review process of development plans and subdivision regulations. Each municipality has its own set of drainage criteria and requirements. The successful completion of drainage improvements to the major outfall systems has generally depended upon the cooperation among adjacent municipalities in improving common drainage outfall.

Appendices

[Nomograph For Time of Concentration]

[Rainfall Intensity Duration Zone 4 Tampa]

Rules Of The
Department of Pollution Control
Chapter 17-3
Pollution of Waters

17-3.01 Declaration and intent
17-3.02 Minimum conditions of all waters; times and places
17-3.03 Water quality testing
17-3.04 General water quality and waste treatment
17-3.05 Water quality standards; specifications
17-3.06 Classification of waters, usage
17-3.07 Criteria: Class I waters – public water supply
17-3.08 Criteria: Class II waters – shellfish propagation and harvesting
17-3.09 Criteria: Class III waters – recreation – propagation and management of fish and wildlife
17-3.10 Criteria: Class IV waters – agricultural and industrial water supply
17-3.11 Criteria: Class V waters – navigation utility and industrial use
17-3.12 Definitions
17-3.13 Drainage well, permits
17-3.14 Drainage wells, applications
17-3.15 Effective date of permits
17-3.16 Drainage wells drilling requirements
17-3.17 Drainage well permit revocation or modification
17-3.18 Test wells and boring
17-3.19 Abandoned wells
17-3.20 Pollution surveys
17-3.21 Classification waters

17-3.01 Declaration and intent. The Florida Pollution Control Board in order to more properly protect the waters of the State of Florida, declares that the presence of pollutants in excess of concentrations hereinafter provided is harmful to the waters of this State and the presence of such excessive concentrations is deemed to be prima facie evidence to pollution of the waters of the State of Florida and the same is expressly prohibited.

The policy inherent in the standards shall be to protect water quality existing at the time these water quality standards were adopted or to upgrade or enhance water quality within the State of Florida. In any event where a new or increased source of pollution poses a possibility of degrading existing high water quality, such project development shall not be issued a Department permit until the Board is satisfied that such development will not be detrimental to the best interests of the State and necessary to its social and economic development. In administering the policy, high quality receiving waters will be protected by requiring as a part of the initial project design the highest and best practicable treatment available under existing technology.

The Board recognizes and will protect the interest of the Federal Government in interstate and coastal waters in accordance with the Federal Water Pollution Control Act, as amended. The Board further shall consult with the U.S. Department of the Interior on all matters affecting the Federal Interest in a cooperative effort.

It is the intent of the State of Florida to review Class V stream classifications periodically as often as necessary, and as water quality of such areas improves, hearings will be held and reclassification shall be established. It is expected that in all instances presently classified as Class V Waters, there shall be decided and definitive enhancement not later than January 1, 1973.

General Authority 403.061 FS Law Implemented 403.021, 403.061, 403.101 (1), 403.182, 403.261, FS, History – Formerly 28-5.01

17-3.02 Minimum conditions of all waters; times and places.

The following minimum conditions are applicable to all waters, at all places and at all times. Within the territorial limits of this state all such waters shall be free from:

(1) Settleable Substances – substances attributable to municipal, institutional, agricultural, of other discharges that will settle to form putrescent or otherwise objectionable sludge deposits.

(2) Floating Substances – floating debris, oil, scum, and other floating materials attributable to municipal, industrial, agricultural, or other discharge in amounts sufficient to be unsightly or deleterious.

(3) Deleterious Substances – materials attributable to municipal, industrial, agricultural, or other discharges producing color, odor, or other conditions in such degrees as to create a nuisance.

(4) Toxic Substances – substances attributable to municipal, industrial, agricultural, or other discharges in concentrations or combinations which are toxic or harmful to humans, animal, plant or aquatic life.

General Authority 403.061 FS Law Implemented 403.021, 403.031, 403.061, 403.101 (1), FS, History – Formerly 28-5.02 Amended 10-28-70.

17-3.03 Water quality testing. Tests or analytical procedures to determine compliance of noncompliance with water quality criteria provided by this chapter shall be in accordance with methods given in the latest edition of Standard Methods for the Examination of Water and Wastewater, published by the American Public Health Association, American Water Works Association and Water Pollution Control Federation; and a copy of same shall be available for public inspection at the offices of the Pollution Control Board. Where other tests or analytical procedures are found to be more satisfactory, such tests or procedures will be used only upon the acceptance and approval by the regulatory agency.

General Authority 403.061 FS Law Implemented 403.021, 403.031, 403.061, 403.101, FS, History – Formerly 28-5.03.

17-3.04 General water quality and waste treatment.

(1) Sewage Industrial Wastes or Other Wastes – Any industrial wastes of other wastes shall be effectively treated by the latest modern technological advances as approved by the regulatory agency.

All discharges from municipal and privately owned domestic waste plants will comply with the Water Quality Standards of the State of Florida with 90% treatment or better as expeditiously as possible, but not later than January 1, 1973, except that those plants discharging sanitary sewage through ocean outfalls or disposal wells must provide for at least 90% treatment or better as deemed necessary by the Department not later than January 3, 1974.

The degree of treatment for industrial waste ha been further defined as follows: That which provides an effluent equivalent to that produced by the highest quality municipal waste treatment, but in no case shall the efficiency be less than 90% organic removal. In some cases, due to waste characteristics, it will be necessary that the efficiency exceed 90%. In the case of inorganic wastes; waste treatment shall have similar efficiencies. The 90% organic and inorganic removal factor shall be applied against the total untreated waste produced by a given plant. All discharges from industrial waste treatment plants shall attain such treatment efficiency as expeditiously as possible, but not later than January 1, 1973.

(2) Advanced Waste Treatment –

(a) Intent – Chapter 403.086(1), Florida Statutes, as amended by Chapter 72-58 (Laws of Florida 1972), and Chapter 17-3.04, Florida Administrative Code, set forth certain minimum requirements for the treatment of sanitary wastes. These provide that a minimum treatment efficiency of 90 percent, or advanced waste treatment as deemed necessary and ordered by the Department, shall be attained by facilities for the disposal of sanitary wastes.

The purpose of this subsection is to establish criteria for advanced waste treatment for sanitary waste and for alternative forms of sanitary waste disposal, however, nothing in this subsection shall relieve a person from compliance with all other applicable provisions of 17-3, Florida Administrative Code.

(b) Definitions

(1) Advanced waste treatment is that treatment which will provide an effluent containing not more than the following concentrations:

a. Biochemical Oxygen Demand (BOD_5)	5 mg/l
b. Suspended Solids	5 mg/l
c. Total Phosphorous expressed as P	1 mg/l
d. Total Nitrogen expressed as N	3 mg/l

(2) Disinfection shall be provided so that contact time shall be not less than fifteen minutes at maximum flow and the effluent shall have a free chlorine residual of not less than 1.0 mg/l, or equivalent.

(3) Alternate effluent disposal is a minimum of secondary treatment (90 percent) followed by an effluent disposal system approved by the Department which will prevent any effluent from being discharged to the surface waters of the State. Such disposal may include land disposal, deep injection wells, or combination thereof, or other methods approved by the Department.

(c) Requirements

(1) The following requirements apply to those treatment facilities for the disposal of sanitary wastes into Old Tampa Bay, Tampa Bay, Hillsborough Bay, Boca Ciega Bay, St. Joseph Sound, Clearwater Bay, Sarasota Bay, Little Sarasota Bay, Roberts Bay, Lemon Bay, Punta Gorda Bay, and any bay, bayou or sound tributary thereto.

a. Existing Facilities. All those facilities for the treatment of sanitary waste which existed without a Department permit or variance or had either a Department construction permit, temporary operating permit, operating permit, or variance prior to March 15, 1972, including the expansion of existing facilities, shall provide for advanced waste treatment or alternate effluent disposal. The owners of existing facilities shall provide the Department as soon as possible, but not later than three months after the effective date of this rule, with a preliminary plan for compliance with this Section and a time schedule for the implementation of said plan which schedule shall be submitted within six months after approval by the Department of the preliminary plan, except that any facility for which certification has been received from the Department for state or federal grants and/or loans for the modification or expansion of said facility which will provide not less than ninety (90) per cent treatment, including nitrogen and phosphorous, shall be deemed to comply with these requirements.

b. New Facilities. All those facilities for the treatment of sanitary waste not defined as existing facilities in 17-3.04 (2) (c) 1.a. shall provide for advanced waste treatment, or shall provide for alternate effluent disposal.

(2) Other Facilities. All other facilities for the disposal of sanitary wastes into waters of the State other than those in 17-3.04 (2) (c) 1.a. shall provide advanced waste treatment of alternate effluent disposal as deemed necessary and ordered by the Department.

(3) Chemical Constituents and Compounds – Presence of certain other elements, organic and inorganic compounds are recognized to affect water quality and aquatic life. These substances often occur naturally in streams or lakes and may be difficult to measure accurately and their effects are usually indirect or accentuated when found in combination with substances or conditions listed in the established criteria.

(4) When any of the constituents listed below occur in any amounts in any individual body of water, they shall be suspected of degrading the quality of the particular lake or stream. As improvement in analytical technique dictates, exact numerical thresholds may be established, but the same shall not be limited to the following:

Sulfates	Free Mineral Acids
Sulfides	Nitrates
Nickel	Phosphates
Aluminum	Potassium

General Authority 403.061(7) FS Law Implemented 403.021, 403.031, 403.061, 403.085 403.086 403.101, FS., Chapter 72.58 (Laws of Florida, 1972) History – Formerly 28-5.04, Amended 10-28-70, 10-17-72.

17-3.05 Water quality standards: specifics.

(1) The criteria for water quality hereinafter provided will be applied only after reasonable opportunity for mixture of wastes with receiving waters has been afforded; the reasonableness of the opportunity for mixture of wastes and receiving waters shall be determined on the basis of the physical characteristics of the receiving waters and the methods in which the discharge is physically made shall be approved by the regulatory agency.

(2) The following water quality standards shall be the criteria for pollution when concentrations exceed following limitations;

(a) Fluorides – shall not exceed 1.4 to 1.6 mg/l as fluoride ion, depending on annual average daily air temperature for at least a five-year period for sources of Class I public water supplies measured immediately above or adjacent to raw water intake.

(b) Fluorides – for waters not used for public water supplies, shall not exceed 10.0 mg/l as fluoride ion or will not interfere with other beneficial uses.

(c) Chlorides – chlorides shall not exceed two hundred fifty (250) mg/l in streams considered to be fresh water streams; in other waters of brackish or saline nature the chloride content shall not be increased more than ten percent (10%) above normal background chloride content.

(d) Turbidity – shall not exceed fifty (50) Jackson units as related to standard candle turbidimeter above background.

(e) Dissolved Oxygen – shall not be artificially depressed below the values of four (4.0) ppm unless background information available to the regulatory agency indicates prior existence under unpolluted conditions of lower values. In such cases, lower limits may be utilized after approval by the regulatory authority.

(f) BOD – shall not be altered to exceed values which would cause dissolved oxygen to be depressed below the limit listed above and, in no case, shall it be great enough to produce nuisance conditions.

(g) Dissolved Solids – not to exceed five hundred (500) mg. per liter as a monthly average or exceed one thousand (1,000) mg. per liter at any time.

(h) Specific Conductance – shall not be increased more than one hundred percent (100%) above background levels or to a maximum level of 500 micromhos per centimeter (cm) for streams considered to be fresh water streams.

(i) Radioactive Substances, Gross Beta Activity – (in known absence of strontium – 90 and alpha emitters), not to exceed one thousand (1,000) micromicrocuries at any time. See also Chapter 10D-4.

(j) Cyanide or cyanates – none detectable.

(k) Copper – shall not exceed 0.5 mg/l.

(l) Zinc – shall not exceed 1.0 mg/l.

(m) Chromium – shall not exceed 0.50 mg/l hexavalent or 1.0 mg/l total chromium in effluent discharge and shall not exceed 0.05 mg/l after reasonable mixing in the receiving stream.

(n) Phenolic type compounds calculated or reported as phenol – shall not exceed 0.001mg/l.

(o) Lead – shall not exceed 0.05 mg/l.

(p) Iron – shall not exceed 0.30 mg/l.

(q) Arsenic – shall not exceed 0.05 mg/l.

(r) Oils and Greases – shall not exceed fifteen (15) mg/l, or that no visible oil, defined as iridescence, be present to cause taste and odors, or interfere with other beneficial uses.

(s) pH – of receiving waters shall not be caused to vary more than one (1.0) unit above or below normal pH of the waters and lower value shall be not less than six (6.0), and the upper value not more than eight and one-half (8.5). In cases where pH may be, due to natural background or causes, outside limits stated above, approval of the regulatory agency shall be secured prior to introducing such material in waters of the state.

(t) Detergents – shall not exceed one-half (0.5) mg/l.

(u) Mercury – none detectable in effluent discharge.

(3) All discharges or proposed discharges of heated water into receiving bodies of water (RBW) which are controlled by the state shall be subject to a through study to assess the consequences of the discharge upon the environment. The state shall be divided into two general climatological zones: Peninsular Florida, which varies from tropical in nature to temperate but is modified by the peninsular configuration and is the area south of latitude 30° N (excluding Gulf and Franklin Counties); and Northern Florida which is temperate and continental and is the area above latitude 30° N plus the portions of Gulf and Franklin Counties which lie below 30° N.

(a) Heated water discharges existing on July 1, 1972:

(i) Shall not increase the temperature of the RBW so as to cause damage or harm to the aquatic life or vegetation therein or interfere with beneficial uses assigned to the RBW.

(ii) Shall be monitored by the discharger to ensure compliance with this rule, and

(iii) Shall be converted to offstream cooling or approved alternate methods in the event such monitoring produces evidence of substantial damage.

(b) Heated water sources proposed for future discharge into RBW controlled by the state shall not increase the water temperature by more than the monthly temperature limits prescribed for the particular type and location of the RBW. New sources shall include all expansions, modifications, alterations, replacements, or repairs which will result in an increased output of ten percent (10%) or more of the level of energy production which existed on the date this rule became effective. Water temperatures shall be measured by procedures approved by the Florida Department of Pollution Control (DPC). In all cases where a temperature rise above ambient is allowed and a maximum RBW temperature is also prescribed, the lower of the two limitations shall be the control temperature.

(c)Definitions

(i) Ambient (natural) temperature of a RBW is the existing temperature of the receiving water at a location which is unaffected by manmade thermal discharges and a

location which is also of a depth and exposure to winds and currents which typify the most environmentally stable portions of the RBW.

(ii) Coastal waters shall be all waters in the state which are not classified as fresh waters or as open waters.

(iii)A cooling pond is a body of water enclosed by natural or constructed restraints which has been approved by the Florida DPC for the purposes of controlling heat dissipation from thermal discharges.

(iv) An existing heat source is any thermal discharge (a) which is presently taking place, or (b) which is under construction of for which a construction or operating permit has been issued prior to the effective date of this rule.

(v) Fresh water shall be all waters of the state which are contained in lakes and ponds, or are in flowing streams above the zone in which tidal actions influence the salinity of the water and where the concentration of chloride ions is normally less than 1,500 mg/l.

(vi) Open waters shall be all waters in the state extending seaward from the most seaward 18-foot depth contour line (three-fathom bottom depth contour) which is offshore from any island; exposed or submerged bar or reef, or mouth of any embayment or estuary which is narrowed by headlands. Contours lines shall be determined from Coast and Geodetic Survey Charts.

(vii) The point of discharge (POD) for a heated water discharge shall be primarily that point at which the effluent physically leaves its carrying conduit (open or closed), and discharges into the waters of the state, or in the event it is not practicable to measure temperature at the end of the discharge conduit, a specific point designated by the Florida Department of Pollution Control for that particular thermal discharge.

(viii) Heated water discharges are the effluents from commercial or industrial activities or processes in which water is used for the purpose of transporting waste heat, and which constitute heat sources of one million British Thermal Units per hour (1,000,000 BTU.HR.) or greater.

(d) Monthly and Maximum Temperature Limits.

(i) Fresh waters – Heated water with a temperature at the POD more than 5° F higher than the ambient (natural) temperature of any stream shall not be discharged into such stream. At all times under all conditions of stream flow the discharge temperature shall be controlled so that at least two-thirds (⅔) of the width of the stream's surface remains at ambient (natural) temperature. Further, no more than one-fourth (¼) of the cross-section of the stream at a traverse perpendicular to the flow shall be heated by the discharge. Heated water with a temperature at the POD more than 3° F higher than the ambient (natural) temperature of any lake or reservoir shall not be discharged into such lake of reservoir. Further no heated water with a temperature above 90° F shall be discharged into any fresh waters of Northern Florida regardless of the ambient temperature of the RBW. In peninsular Florida, heated waters above 92° F shall not be discharged into freshwaters.

(ii) Coastal Waters – Heated water with a temperature at the POD more than 2° F higher than the ambient (natural) temperature of the RBW shall not be discharged into coastal waters in any zone during the months of June, July, August and September. During the remainder of the year, heated water with a temperature at the POD more than 4° F higher than the ambient (natural) temperature of the RBW shall not be discharged into coastal waters in any zone. In addition, during June, July, August, and September, no heated water with a temperature above 92° shall be discharged into coastal waters. Further, no heated water with a temperature above 90° F shall be discharged into coastal waters during the period October through May.

(iii) Open Waters – Heated water with a temperature at the POD up to 17° above ambient (natural) temperature of the RBW may be discharged from an open or closed conduit into open waters under the following restraints: The surface temperature of the RBW shall not be raised to more than 97° F and the POD must be sufficient distance offshore to ensure that the adjacent coastal waters are not heated beyond the temperatures permitted in such waters.

(iv) Cooling Ponds – The temperatures for heated water discharged from a cooling pond shall be measured at the POD from the pond, and the temperature limitations shall be that specified for the RBW.

(e) General.

(i) Daily seasonal temperature variations that were normal to the RBW before the addition of heat from other than natural causes shall be maintained.

(ii) Recapitulation of temperature limitations prescribed above:

Zone	Streams	Lakes	Coastal		Open Waters
			Summer	Remainder	
North Florida	90° Max. Ambient + 5°	90° Max. Ambient + 3°	92° Max. Ambient + 2°	90° Max. Ambient + 4°	97° Max. Ambient + 17°
Peninsular	92° Max. Ambient + 5°	92° Max. Ambient + 3°	92° Max. Ambient + 2°	90° Max. Ambient + 4°	97° Max. Ambient + 17°

(4) Exceptions – in cognizance of the fact that certain waters of the state, due to natural causes may not fall within desired or prescribed limitations outlined above, the Board is empowered to authorize exceptions to limitations upon presentation of good and sufficient evidence. In no case shall it be lawful to authorize disposition or introduction of materials in waters of the

state which will cause material harm or damage to said waters.

General Authority 403.061 FS Law Implemented 403.021, 403.031, 403.061, 403.101, FS., History – Formerly 28-5.05, Amended 2-17-71, 8-30-72.

17-3.06 Classification of waters, usage.

The waters of Florida are classified according to their usage as follows:

Class I – Public Water Supplies

Class II – Shellfish Harvesting

Class III – Recreation – Propagation and management of fish and Wildlife.

Class IV – agricultural and industrial water supply

Class V – Navigation, utility and industrial use

General Authority 403.061 FS Law Implemented 403.021, 403.031, 403.061, 403.101 (1), FS., History – Formerly 28-5.06.

17-3.07 Criteria: Class I waters – public water supply.

The following criteria are for classification of any waters from which water is withdrawn for treatment and distribution as a potable supply.

(1) Sewage, Industrial Wastes or Other Wastes – any industrial wastes or other wastes shall be effectively treated by the latest modern technological advances as approved by the regulatory agency.

(2) Odor – threshold odor number not to exceed 24 at 60° C as a daily average.

(3) pH – of receiving waters shall not be caused to vary more than one (1.0) unit above or below normal pH of the waters; and lower value shall not be less than six (6.0), and the upper value not more than eight and one-half (8.5). In cases where pH may be, due to natural background or causes, outside limits stated above, approval of the regulatory agency shall be secured prior to introducing such material in waters of the state.

(4) Dissolved Oxygen – shall not be artificially depressed below the values of four (4.0) ppm unless background information available to the regulatory agency indicates prior existence under unpolluted conditions of lower values. In such cases, lower limits may be utilized after approval by the regulatory authority.

(5) Toxic Substances – free from substances attributable to municipal, industrial, agricultural or other discharges in concentrations or combinations which are toxic or harmful to humans, animal or aquatic life.

(6) Bacteriological Quality – coliform group not to exceed 1,000 per 100 ml as a monthly average, (either MPN or MF counts); nor to exceed this number in more than 20% of the samples examined during any month; nor exceed 2,400 per 100 ml (MPN or MF count) on any day.

General Authority 403.061 FS Law Implemented 403.021, 403.031, 403.061, 403.101, FS., History – Formerly 28-5.07.

17-3.08 Criteria: Class II waters – shellfish harvesting.

The following criteria are for classification for waters in areas which either actually or potentially have the capability of supporting recreational or commercial shellfish propagation and harvesting. Harvesting may only occur in areas approved by the Division of Health, Florida Department of Health and Rehabilitative Services.

(1) Bacteriological Quality, Coliform Group – areas classified for shellfish harvesting, the median coliform MPN (Most Probable Number) of water cannot exceed seventy (70) per hundred (100) ml, and not more than ten (10) percent of the samples ordinarily exceed an MPN of two hundred and thirty (230) per one hundred (100) ml in those portions of areas most probably exposed to fecal contamination during most unfavorable hydrographic and pollution conditions.

(2) Sewage, Industrial Wastes or Other Wastes – any industrial wastes or other wastes shall be effectively treated by the latest modern technological advances as approved by the regulatory agency.

(3) pH – of receiving waters shall not be caused to vary more than one (1.0) unit above or below normal pH of the waters; and lower value shall not be less than six (6.0), and the upper value not more than eight and one-half (8.5). In cases where pH may be, due to natural background or causes, outside limits stated above, approval of the regulatory agency shall be secured prior to introducing such material in waters of the state.

(4) Dissolved Oxygen – shall not be artificially depressed below the values of four (4.0) ppm unless background information available to the regulatory agency indicates prior existence under unpolluted conditions of lower values. In such cases, lower limits may be utilized after approval by the regulatory authority.

(5) Toxic Substances – free from substances attributable to municipal, industrial, agricultural or other discharges in concentrations or combinations which are toxic or harmful to humans, animal or aquatic life.

(6) Odor – threshold odor number not to exceed 24 at 60° C as a daily average.

General Authority 403.061 FS Law Implemented 403.021, 403.031, 403.061, 403.101, FS., History – Formerly 28-5.08, Amended 6-10-72, 8-30-72.

17-3.09 Criteria: Class III waters – recreation – propagation and management of fish and wildlife.

The following criteria are for classification of waters to be used for recreational purposes, including such body contact activities as swimming and water skiing; and for the maintenance of a well balanced fish and wildlife population. All surface waters within and coastal waters contiguous to these basins, including offshore waters, not otherwise classified shall be classified as Class III; however, waters of the open ocean shall be maintained at a dissolved oxygen of not less five (5.0) ml/l. Streams specifically listed in Section 17.3.21 by a separate listing designated as "Special Stream Classification" shall similarly be maintained at a minimum dissolved oxygen level of five (5) ml/l.

(1) Sewage, Industrial Wastes or Other Wastes – any industrial wastes or other wastes shall be effectively

treated by the latest modern technological advances as approved by the regulatory agency.

(2) pH – of receiving waters shall not be caused to vary more than one (1.0) unit above or below normal pH of the waters; and lower value shall not be less than six (6.0), and the upper value not more than eight and one-half (8.5). In cases where pH may be, due to natural background or causes, outside limits stated above, approval of the regulatory agency shall be secured prior to introducing such material in waters of the state.

(3) Dissolved Oxygen – shall not be artificially depressed below the values of four (4.0) ppm unless background information available to the regulatory agency indicates prior existence under unpolluted conditions of lower values. In such cases, lower limits may be utilized after approval by the regulatory authority.

(6) Bacteriological Quality – coliform group not to exceed 1,000 per 100 ml as a monthly average, (either MPN or MF counts); nor to exceed this number in more than 20% of the samples examined during any month; nor exceed 2,400 per 100 ml (MPN or MF count) on any day. These criteria shall apply only to waters used for body contact activities.

(5) Toxic Substances – free from substances attributable to municipal, industrial, agricultural or other discharges in concentrations or combinations which are toxic or harmful to humans, animal or aquatic life.

(6) Deleterious – free from materials attributable to municipal, industrial, agricultural or other discharges producing color, odor of other conditions in such degrees as to create a nuisance.

(7) Turbidity – shall not exceed fifty (50) Jackson units as related to standard candle turbidimeter above background.

General Authority 403.061 FS Law Implemented 403.021, 403.031, 403.061, 403.101, FS., History – Formerly 28-5.09, Amended 6-10-72, 8-30-72.

17-3.10 Criteria: Class IV waters – agricultural and industrial water supply.

The following criteria are for classification of waters to be used for agricultural or stock watering or industrial water supply. Additionally, all secondary and tertiary canals wholly within agricultural areas are Class IV waters.

(1) Sewage, industrial wastes or other wastes – none which are not effectively treated or controlled to the satisfaction of the regulatory agency.

(2) pH –not more than one (1.0) unit from the normal or not less than six (6.0), nor greater than 8.5.

(3) Dissolved Oxygen – shall not be artificially depressed below the values of four (4.0) ppm unless background information available to the regulatory agency indicates prior existence lower values. In such cases, lower limits may be utilized after approval by the regulatory authority.

(4) Color, odor, and taste producing substances and other deleterious substances, including other chemical compounds, attributable to domestic wastes, industrial wastes, and other wastes – only such amounts as will not render the water unsuitable for agricultural irrigation, livestock watering, industrial cooling, industrial process water supply purposes and fish survival.

(5) Turbidity – shall not exceed fifty (50) Jackson units as related to standard candle turbidimeter above background

General Authority 403.061 FS Law Implemented 403.021, 403.031, 403.061, 403.101, FS., History – Formerly 28-5.10, Amended 6-10-72, 8-30-72.

17-3.11 Criteria: Class V waters – navigation, utility and industrial use.

The following criteria are for classification of waters which will be suitable for navigation and any other uses except for waters previously classified in this Chapter.

(1) Sewage, industrial wastes or other wastes – none which are not effectively treated or controlled to the satisfaction of the regulatory agency.

(2) pH – not lower than 5.0 nor greater than 9.5 except certain swamp waters which may be as low as 4.5.

(3) Dissolved oxygen – sufficient to be aerobic. The term "aerobic" is defined as "being not less than one (1.0) ppm with and average value of not less than two (2.0) ppm"

(4) Odor producing substances – only in such amounts that will not unreasonably interfere with the use of the water for the designated purpose of this classification.

General Authority 403.061 FS Law Implemented 403.021, 403.031, 403.061, 403.101, FS History – Formerly 28-5.11

17-3.12 Definitions.

(1) Definitions of technical terms used shall be in accordance with the glossary – water and sewage control engineering, standard methods for the examination of water and wastewater and the condensed chemical directory.

(2) Drainage well shall be considered to have the same meaning as absorbing well.

General Authority 403.061 FS Law Implemented 403.021, 403.031, 403.061, 403.101, FS., History – Formerly 28-5.11

17-3.13 Drainage wells, permits. Before any municipal or private corporation or person shall use an existing well or sink, drive or drill a new well for discharge of sewage or surface water, the owner of existing well or well drilling contractor and owner of property in the case of a new well shall apply to the Department for a permit authorizing drilling and use of said well.

General Authority 403.061 FS Law Implemented 403.021, 403.031, 403.061, 403.101, FS., History – Formerly 28-5.11

17-3.14 Drainage well, applications:

Application for drainage well permit shall be on form supplied by the Board and accompanied by the following data:

(1) Complete report of inspection by county or regional sanitary engineer.

(2) Location and depth of [the] well and depth of [the] casing of all water supply wells within one (1) mile radius of [the] proposed well

(3) Nature of waters to be discharged into proposed drainage well including analysis thereof, source, estimated quantity and pertinent bacteriological analyses if deemed necessary by the Board.

(4) If transmittal ditches or depressions are used to allow flow of surface or other waters to the well, a complete drawing of drained area shall be supplied and considered a part of drainage structure.

(5) If drainage well or drainage structure will present possible pollution hazards to underground water or water supply wells within one (1) mile thereof, additional data may be required.

(6) All applications shall be signed by the will drilling contractor and the owner of property where proposed well or drainage structure is located or his duly authorized agent.

(7) In all cases except for wells to receive condenser cooling waters or where receiving aquifer or aquifers contain fifteen hundred (1,500) parts per million or more of chlorides, bacteriological examination must be made of water from all water supply wells within one (1) mile radius that are drilled to approximate depth of proposed drainage well. The bacteriological survey shall be conducted in [the] following manner:

(a) Samples shall be collected from each well for the first three (3) days of each week for [a] period of four (4) weeks.

(b) Duplicate samples shall be collected in each case after well has been pumped at least twenty (20) minutes. Whenever a drainage well installation is approved following preliminary bacteriological survey of the neighboring water supply wells, and identical survey of the same well shall be conducted following opening of [the] drainage well.

General Authority 403.061 FS Law Implemented 403.021, 403.061, 403.101, 403.182, FS History – Formerly 28-5.14

17-3.15 Effective date of permits. No permit, for operation or drilling of a drainage well, shall become effective or operative until filed with the clerk of the circuit court as required in Section 387.03 FS.

General Authority 403.061 FS Law Implemented 403.021, 403.061, 403.182, FS History – Formerly 28-5.15

17-3.16 Drainage wells, drilling requirements.

(1) A log showing various strata pierced by the well shall be forwarded to the Department within two (2) days after completion of drilling operations.

(2) Samples of strata formations pierced in drilling shall be forwarded to the state geologist, P.O. Drawer 631, Tallahassee, when drilling is completed.

(3) If casing is used within the well it shall be first quality lap-welded pipe only. Use of but welded pipe is prohibited.

(4) Practice of dynamiting clogged wells shall not be resorted to except upon written permission of the Board.

General Authority 403.061 FS Law Implemented 403.021, 403.061, 403.101, 403.182, FS History – Formerly 28-5.16

17-3.17 Drainage well permit revocation or modification. Drainage well permits are revocable or subject to modification by the Board in accordance with provisions of Section 387.03 and Sections 120.20 through 120.28 FS. Pumping into drainage wells unless specifically authorized in permit will constitute violation of permit and be cause for permit revocation.

General Authority 403.061 FS Law Implemented 403.021, 403.061, 403.182, FS History – Formerly 28-5.17

17-3.18 Test wells and borings. Test wells or borings shall be filled with concrete within five (5) days after completion of testing purposes for which it was drilled. Such test wells or borings shall not be used as drainage wells unless [a] permit has been obtained in accordance with this chapter. Failure to obtain [a] permit prior to drilling of said well or boring shall bar future use except for testing purposes not connected with drainage in any manner whatsoever.

General Authority 403.061 FS Law Implemented 403.021, 403.061, 403.101, 403.182, FS History – Formerly 28-5.18

17-3.19 Abandoned wells. Within ten (10) days after abandonment of drainage wells they shall be backfilled from bottom to top with neat cement grout.

General Authority 403.061 FS Law Implemented 403.021, 403.061, FS History – Formerly 28-5.19

17-3.20 Pollution surveys. Surveys of surface waters including treatment plant effluents shall be made in accordance with good sanitary engineering practice and shall be of sufficient scope to provide information as requested by the board in cases where the Board deems such survey necessary to provide information relative to request for additional loading on sewage treatment plant or evaluate effect of such existing facilities on receiving waters. Such surveys shall take into account factors such as physical, chemical, biological and bacteriological which are pertinent.

General Authority 403.061 FS Law Implemented 403.021, 403.061, 403.101, 403.182, FS History – Formerly 28-5.20

17-3.21 Classified waters. Pursuant to the criteria of water classification, Section 17-3.06 through 17-3.11, inclusive, the waters of the State of Florida are classified by river basins or sub-basins as Class III – Recreation – Propagation and management of Fish and Wildlife with only the individual exceptions to Class III listed within each basin. (Classifications are not printed in the Code pursuant to Section 120.051 (1) (e), Florida Statutes, but as filed are of full force and effect).

General Authority 403.061 FS Law Implemented 403.021, 403.061, FS History – Formerly 28-5.21, Amended 6-10-72.

Drainage Basins Listed by Aerial Photo Sheet Numbers

No.	Basin	Aerial Photo Sheet Numbers						
1	Anclote River	C-1-N D-2-S G-1-N	C-1-S E-1-N G-1-S	C-2-N E-1-S	C-2-S E-2-N	D-1-N F-1-N	D-1-S F-1-S	D-2-N F-2-N
2	Klosterman Bayou	D-2-N E-4-N	D-2-S	D-3-N	D-3-S	D-4-N	E-3-N	E-3-S
3	Lake Tarpon	D-2-N E-3-S F-4-N	D-2-S E-4-N	D-3-N F-1-S	E-1-S F-2-N	E-2-N F-2-S	E-2-S F-3-N	E-3-N F-3-S
4	Brooker Creek	F-1-S G-1-S	F-2-N G-2-N	F-2-S G-2-S	F-3-N G-3-N	F-3-S G-3-S	F-4-N G-4-N	F-4-S G-4-S
5	Oldsmar	F-4-S G-6-N	F-5-N G-6-S	F-5-S	G-4-N	G-4-S	G-5-N	G-5-S
6	South Creek	E-4-N	E-4-S	E-5-N	F-4-N	F-4-S	F-5-N	
7	Sutherland Bayou	C-3-S	C-4-N	D-3-N	D-3-S	D-4-N	E-3-S	E-4-N
8	Smith Bayou	C-4-S	C-5-N	D-4-N	D-4-S	D-5-N	E-4-N	E-4-S
9	Cedar Creek	C-5-S	C-6-N	D-5-N	D-5-S	D-6-N		
10	Curlew Creek	C-5-N E-4-S	D-4-S E-5-N	D-5-N E-5-S	D-5-S E-6-N	D-6-N E-6-S	D-6-S	D-7-N
11	Possum Branch	E-5-N	E-5-S	F-5-N	F-5-S	F-6-N		
12	Bishop Creek	E-6-N	F-6-N	F-6-S	G-6-S			
13	Mullet Creek	E-6-N	E-6-S	E-7-N	F-6-N	F-6-S	F-7-N	G-6-S
14	Alligator Creek	D-6-S E-7-S	D-7-N E-8-N	D-7-S F-7-N	D-8-N F-7-S	E-6-N F-8-N	E-6-S	E-7-N
15	Spring Branch – Stevenson's Creek	C-6-N	C-6-S	C-7-N	D-6-N	D-6-S	D-7-N	
16	Coastal Zone 4	C-5-N	C-5-S	C-6-N	C-6-S	C-7-N		
17	Coastal Zone 1	B-9-N C-9-N	B-9-S	B-10-N	C-7-N	C-7-S	C-8-N	C-8-S
18	Stevenson's Creek	C-7-N D-8-N	C-7-S D-8-S	C-8-N D-9-N	C-8-S	C-9-N	D-7-N	D-7-S
19	Allen's Creek	D-7-S E-9-N	D-8-N E-9-S	D-8-S	D-9-N	D-9-S	E-8-N	E-8-S
20	Coastal Zone 2	E-8-N	E-8-S					
21	Coastal Zone 3	E-7-S	E-8-N	F-7-S	F-8-N			
22	Long Branch	D-9-S	D-10-N	E-9-N	E-9-S	E-10-N	F-9-N	F-9-S
23	Roosevelt	F-9-S G-11-N	F-10-N G-11-S	F-10-S H-10-N	F-11-N H-10-S	G-9-S H-11-N	G-10-N	G-10-S
24	Cross Bayou	D-10-S E-10-S E-11-N	D-11-N E-11-N	D-11-S E-11-S	D-12-N F-9-N	D-12-S F-9-S	E-9-S F-10-N	E-10-N F-10-S

No.	Basin	Aerial Photo Sheet Numbers						
25	Starkey Road	C-9-N D-10-S F-11-N	C-9-S D-11-N	C-10-N D-11-S	C-10-S D-12-N	D-9-N D-12-S	D-9-S E-10-N	D-10-N E-10-S
26	Lake Seminole	C-10-S D-11-N	C-11-N D-11-S	C-11-S D-12-S	C-12-N	C-12-S	C-13-N	D-10-S
27	McKay Creek	B-9-S C-10-N	B-10-N C-10-S	B-10-S C-11-N	B-11-N C-11-S	B-11-S C-12-N	B-12-N	C-9-S
28	Coastal Zone 5	B-10-S C-13-N	B-11-N	B-11-S	B-12-N	B-12-S`	C-12-N	C-12-S
29	Pinellas Park Ditch # 1	D-12-N	E-11-S	E-12-N	F-11-S	F-12-N		
30	Sawgrass Lake	F-11-S G-13-N	F-12-N H-11-S	F-12-S H-12-N	F-13-N	G-11-S	G-12-N	G-12-S
31	Tinney Creek	G-11-S	G-12-N	H-10-S	H-11-N	H-11-S	H-12-N	
32	N.E. St. Petersburg	H-12-N	H-12-S	H-13-N	H-13-S	I-12-N	I-12-S	
33	70th Ave. N. Canal	H-12-N	H-12-S					
34	54th Ave. E. Canal	G-12-S	G-13-N	H-12-S	H-13-N			
35	Joe's Creek	D-12-N F-12-N G-13-S	D-12-S F-12-S	E-12-N F-13-N	E-12-S F-13-S	E-13-N F-14-N	E-13-S G-12-S	E-14-N G-13-N
36	Long Bayou	D-12-S	D-13-N	D-13-S	D-14-N	E-13-N	E-13-S	E-14-N
37	Pasadena Lake	D-14-S	E-14-N	E-14-S				
38	S.W. St. Petersburg	E-14-S	E-15-N					
39	Bear Creek	E-14-N	E-14-S	E-15-N	F-13-S	F-14-N	F-14-S	F-15-N
40	Booker Creek	F-13-N H-15-N	F-13-S	G-13-S	G-14-N	G-14-S	G-15-N	H-14-S
41	North Coffee Pot	G-13-S	H-13-S					
42	45th Av. N. East Canal	G-13-N	G-13-S	H-13-N	H-13-S			
43	Coffee Pot Bayou	G-13-S	G-14-N	G-14-S	H-13-S	H-14-N		
44	Albert Whitted	G-14-S	H-14-N	H-14-S	H-15-N			
45	34th Street	F-13-S G-15-N	F-14-N G-15-S	F-14-S	F-15-N	F-15-S	G-14-N	G-14-S
46	Clam Bayou	F-14-S	F-15-N	F-15-S				
47	Gulfport	E-15-N	E-15-S	F-15-N	F-15-S			
48	Frenchman Creek	F-15-S	F-16-N	F-16-S	G-15-N	G-15-S	G-16-N	G-16-S
49	Lake Maggiore/Salt Creek	G-15-N	G-15-S	G-16-N	G-16-S	H-15-N	H-15-S	H-16-N
50	Big Bayou	H-15-N	H-15-S	H-16-N				
51	Little Bayou Creek	G-16-N	G-16-S	H-16-N	H-16-S			
52	Pinellas Point	G-16-S	G-17-N	H-16-S	H17-N			