City of Clearwater
Floodplain Management Plan

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Resolution No. 09-37

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SECTION 1.0 INTRODUCTION

The City of Clearwater is the second largest city in Pinellas County with 26.1 square miles and approximately 110,830 residents. Nearly half of the City's land is devoted to residential use. The City has undergone considerable growth since its incorporation in 1897. Between 1970 and 1990, the City's population increased by 80 percent and the number of housing units within the City doubled. Since 1990, the City's population has grown by approximately 11 percent and the number of housing units has grown by approximately 25.9 percent.

Due to the amount of development constructed within the floodplain, as well as an increase of stormwater runoff as a result of the overall increase of development since Clearwater's incorporation, floodplain management has become an important component in protecting the well-being of the City's people and property. To help decrease the vulnerability of flood damage for thousands of properties located within the coastal and floodplain areas, the City actively participates in the Federal Emergency Management Agency's (FEMA), National Flood Insurance Program's (NFIP), Community Rating System (CRS).

Communities that participate in the NFIP adopt and enforce floodplain management programs in order to reduce future flood damage. In exchange, the NFIP provides federally backed flood insurance for property owners and renters in the participating communities. In addition to providing flood insurance and reducing flood damage through floodplain management regulations, the NFIP identifies and maps the Nation's floodplains.

The NFIP has been successful in requiring new buildings to be protected from damage by a 100-year flood. However, flood damage still results from more frequent, less intense, flooding episodes and from flooding in unmapped areas. Under the Community Rating System (CRS), there is an incentive for communities to do more than just regulate construction of new buildings to minimum national standards. The CRS adjusts flood insurance premiums to reflect community activities that reduce flood damage to existing buildings, manage development in areas not mapped by the NFIP, protect new buildings beyond the minimum NFIP protection level, help insurance agents obtain flood data and help residents obtain flood insurance. The objective of the CRS is to reward communities that are doing more than meeting the minimum NFIP requirements to help their citizens prevent or reduce flood losses. The CRS also provides an incentive for communities to initiate new flood protection activities. The goal of the CRS is to encourage, by the use of flood insurance premium adjustments, community and State activities beyond those required by the National Flood Insurance Program to:

1. Reduce flood losses, e.g.:
    - Protect public health and safety,

- Reduce damage to buildings and contents,
- Prevent increases in flood damage from new construction,
- Reduce the risk of erosion damage, and
- Protect natural and beneficial floodplain functions.

2. Facilitate accurate insurance rating, and
3. Promote the awareness of flood insurance.

Initially, the City submitted a Repetitive Loss Plan to FEMA in 1991 to satisfy the CRS requirements. On September 21, 2000, the City adopted a *Floodplain Management Plan* in accordance with the then existing CRS requirements. The *Plan* creates a comprehensive strategy for implementing sound floodplain management activities and was designed in accordance with the 10-step activities promulgated by FEMA's Disaster Mitigation Act 2000 and adopted in Section 510 Floodplain Management Planning of the CRS Coordinator's Manual. The 2000 *Plan* was updated in 2004 and adopted by the City Council by resolution on October 21, 2004.

In 2009, the City created a Floodplain Management Planning Committee (FMPC) to review and update the floodplain management activities identified in the *Plan*. In accordance with requirements of the CRS program, this 2009 update provides a reporting of the implementation of the 2004 *Plans* activities, a description of the planning process involved with the 2009 update and descriptions of current and future projects. The City Council adopted this Update to the *Plan* by resolution on September 17, 2009 at its regularly scheduled meeting. See Appendix A for a copy of the resolution.

SECTION 2.0 PLANNING PROCESS

The FMPC was formed to complete this 2009 update and will continue to be responsible for the review and implementation of the *Plan*. The FMPC consists of the CRS coordinator and representatives from Engineering, Planning, and Public Service Departments. The FMPC held a kick off meeting March 3, 2009 to discuss the planning process and to identify, and assign tasks. A progress meeting held on March 30, 2009 allowed the FMPC to review technical data, update progress, and plan a public information meeting. Members of the FMPC met again on June 10, 2009 to prepare for the public information meeting. Minutes from the meetings are available in Appendix B.

The public information meeting was held on June 17, 2009 at the Ross Norton Recreation and Aquatic Complex & Extreme Sports Park located at 1426 S. Martin Luther King Jr. Ave in Clearwater, Florida. The public information meeting provided a forum for residents to discuss the natural hazards, problems and possible solutions specific to their neighborhoods and to offer input on the draft update to the plan. Representatives from Engineering and Public Service

departments presented information to residents. A flood protection questionnaire was distributed at the meeting and will be mailed to residents in September 2009. Information obtained from the public will be incorporated into the 2010 CRS recertification and *Plan* evaluation. See Appendix C for the flood protection questionnaire

In order to enhance the plan to address the flooding needs of the City, coordination with surrounding communities and county, regional, state and federal agencies is required. To assist in the understanding of the technical aspects of the Federal requirements of the 2007 CRS Coordinator's Manual, the City's assigned CRS Specialist and the Department of Community Affairs (DCA) Bureau of Recovery and Mitigation staff were contacted. In addition, the Southwest Florida Water Management District (SWFWMD), the Jacksonville District of the US Army Corps of Engineers, the Tampa Bay Regional Planning Council (TBRPC), the Pinellas County Office of Emergency Management and the City of Largo staffs were all contacted and notified that the *Plan* was being updated. Copies of the adopted *Plan* will be provided to these agencies. The City's CRS coordinator met regularly with CRS coordinators from neighboring communities to discuss local hazard mitigation activities and floodplain management.

Some of the tasks involved in the update of the *Plan* include verification of existing data, review of the latest GIS information, review of watershed studies, census data and Pinellas County Property Appraiser information. Drainage basin areas and existing floodplain land use have been refined. Repetitive loss information has been updated. New floodplain regulations have been developed to reduce damage to buildings and contents and prevent increases in flood damage from new construction. Information from the current City of Clearwater's Comprehensive Plan is included under planning goals. The list of stormwater management projects has been updated to show completed improvements and describe current and proposed projects.

SECTION 3.0 RISK ASSESSMENT

The City of Clearwater was incorporated in 1897 at which time the area was important as a trading post. The City remained a small town with a 1930 population of 7,607 until after World War II, when the population doubled to 15,581. Similar to the rest of Florida, Clearwater experienced significant growth after this time.

Garden Memorial Causeway, now referred to as Memorial Causeway, was constructed in 1928 and connected mainland Clearwater with Clearwater Beach. The Causeway replaced an old wooden bridge and allowed for better access to Clearwater's barrier islands. In the late 1950's, traffic counts by the Florida State

Highway Department indicated 6.3 million cars annually traveled the roadway.

During the 1950's and 1960's, dredge and fill projects were numerous in Pinellas County. Clearwater's Island Estates neighborhood was the City's most prominent fill project located between Clearwater Beach and the mainland. This neighborhood was described as "Venice-type development for exclusive homes". Although this neighborhood is located on the waterfront, only one repetitive loss property has been identified.

From 1970 to present, Clearwater's population has more then doubled, with most of this growth occurring between 1970 and 1990. Clearwater has become virtually built out and experiences growth primarily through relatively small annexations and redevelopment projects. The beach is a mix of residential and commercial uses and is generally redeveloped on a parcel-by-parcel basis.

Figure 1.0 shows the City of Clearwater Service area and the FEMA designated Flood zones. This figure shows the difference between the floodplain area as designated by FEMA on the Flood Insurance Rate Maps, May 2005 and the area of the floodplain located on the land mass within the City of Clearwater service area. This hazard mitigation plan is concerned with floodplain area located within the City's land mass.

The majority of resources devoted by the City to address stormwater management deficiencies are aimed at the following four areas: the Coastal Basins, which includes Clearwater Beach (Sand Key, North and South Clearwater Beach and Island Estates) and the areas located adjacent to the Tampa Bay and Clearwater Harbor; the Stevenson Creek drainage basin; the Allen's Creek drainage basin and the Alligator Creek drainage basin.

These four locations receive an increased level of concern, as they contain much of the City's land area and residential population. Other smaller areas of the City located within the Bishop Creek, Curlew Creek, Jerry Branch, Lake Tarpon Canal and Mullet Creek drainage basins also receive stormwater attenuation projects to help alleviate flooding in those specific areas. Since the drainage basins span municipal and county boundaries, Figure 2.0 shows the overall delineation of the Southwest Florida Water Management District (SWFWMD) drainage basins inside and outside the service area. Figure 3.0 illustrates the drainage basins within the boundary of the City of Clearwater service area.

To minimize the loss of life, human suffering, damage to public and private property, and economic loss, a complete knowledge of how flooding affects the City of Clearwater, and the resources affected, must be determined. This hazard identification and vulnerability assessment is a vital component to a citywide floodplain mitigation plan. Through the information gathered, the City will be better able to determine and prioritize mitigation initiatives used to prepare for

flooding episodes.

By developing a comprehensive assessment of the City's natural and man-made resources and providing an analysis of how past flooding episodes affected these resources, this flood mitigation plan will help to assure that the most beneficial and cost effective flood mitigation activities are implemented by the City. Future development potential within the City is illustrated in Figure 4.0, the City Zoning Map, which is derived from the Pinellas County Future Land Use Map.

These land use categories provide a measurement of the maximum development potential of current and future land use patterns. See Figure 5.0 for the Pinellas County Future Land Use Boundaries Map.

General Description

The City of Clearwater is located in central Pinellas County along the west central coast of Florida, bordered on the west by the Gulf of Mexico and the Tampa Bay on the east. The city is bordered by the Cities of Dunedin to the north and Safety Harbor to the east, the Town of Belleair and the Cities of Belleair Beach and Largo to the south. The City of Clearwater has a total of 28-miles of coastline.

Natural Features

The topography of the City of Clearwater can be characterized as nearly level to a gently sloping terrain with the highest areas centrally located in the study area. High coastal bluffs and white sandy beaches characterize the shoreline. Low inland areas exist along the Allen's Creek, Alligator Creek and Stevenson Creek floodplain. Elevations typically range from Mean Sea Level (m.s.l.) up to 104-feet at its highest point (See Figure 6.0). The vegetation is typical of urban land in a subtropical climate zone.

Drainage Basins

The City is divided into twelve drainage basins, of which four drain directly to the Tampa Bay or the Gulf of Mexico. The 100-year floodplain is represented in two of these drainage basins. See Figure 7.0 for an illustration of the Flood Insurance Zones, May 2005. All of the basins are multi-jurisdictional and include unincorporated enclaves. As these basins span municipal and county boundaries, an increased level of coordination is required among the government entities involved in mitigation projects.

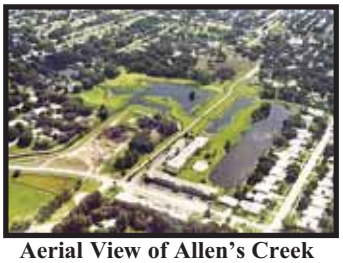
The Coastal Basin, Stevenson Creek, Alligator Creek and Allen's Creek drainage basins are the four largest watersheds in the city. The three creeks drain an area several miles inland, and under specific conditions, tidewaters generated at their

mouths can inundate the creeks upstream and intensify flooding episodes. See Figure 8.0 for the locations of creeks, lakes, and ponds. In addition, the Bishop Creek, Curlew Creek, Jerry Branch, Lake Tarpon Canal, and Mullet Creek drainage basins, all located in the northern portion of the City, also function as stormwater runoff collectors. Refer to Figure 2.0 and 3.0 for drainage basin locations. The Coastal Basin, the Stevenson Creek drainage basin and the Alligator Creek drainage basin will be analyzed thoroughly in the Repetitive Loss Property section, as these three areas contain repetitive loss structures.

The Stevenson Creek Watershed, the largest and most urbanized watershed within the City of Clearwater, drains 6,291-acres of land area in west central Pinellas County; of this area, 4,605-acres (73%) are within the Clearwater city limits. Bodies of water located within the Stevenson Creek Watershed are Lake Bellevue, Lake Lucille, Crest Lake, and Hibiscus Lake.

At a total of 5,594-acres, of which 5,118-acres (91%) are located within Clearwater, the Alligator Creek Watershed is the second largest in the region and most urbanized watershed in the City and includes a complex basin consisting of four major lakes and seven tributaries. Alligator Lake and Lake Chautauqua, at 78-acres and 52-acres, respectively, are the largest interior water body features located in the City. The two other main lakes located in this watershed are Beckett Lake and Harbor Lake.

Lake Chautauqua



Aerial View of Allen's Creek

The Allen's Creek Watershed is approximately 4,871-acres in area. A total of 2,345-acres (48%) are located within the south-central section of the City. The majority of land uses located within this basin are low-density single family residential. The main lakes located within this watershed are Venus Lake, Lake Starcrest, Lake Helen, and Sonny Lake.

At 908-acres, the Bishop Creek Watershed is the smallest basin with a portion of its area located within Clearwater. The basin's land area within the City totals just 214-acres (24%) and is located in the northeast section of the City. Nearly one-third of the basin's land area functions as a school and the remaining uses are medium-density residential and public/semi-public.

The Curlew Creek Watershed, located in the northern most section of the City, drains 4,109-acres. With 1,390-acres (34%) of this watershed located within the City, it contributes to a significant drainage area for the overall stormwater management system of the City.

While the majority of land uses located within this drainage basin function as a mixture of residential density classifications, which vary from low- to high-density, property fronting US Highway 19 North is classified as commercial and office.

Located in the north-central portion of the City, the Jerry Branch Watershed is located between the Stevenson Creek, Alligator Creek, and Curlew Creek Watersheds. At a total of 2,410-acres, 1,039 (43%) of which are located within the City, the Jerry Branch drainage basin consists primarily of low- to medium-density residential, with commercial uses sparsely found along the US Highway 19 and State Road 580 corridors.

The Lake Tarpon Canal Watershed provides a total drainage area of 1,782-acres for the northeastern most section of the City and portions of Safety Harbor and Oldsmar. Within the City of Clearwater, the basin totals 1,004-acres (56%). Much of the area is devoted to low density residential, recreation/open space and transportation utility uses.

At 1,928-acres, the Mullet Creek Watershed provides the neighboring City of Safety Harbor with a significant area for stormwater retention. However, with just 581-acres (30%) of the drainage basin located within the City of Clearwater, the basin manages a limited portion of the City's overall stormwater management system. Mostly low-density residential land uses exist throughout the entire drainage basin, while limited public/semipublic uses are located throughout and a sparse amount of commercial uses are located along the McMullen Booth corridor.

In addition to the above basins, some basins provide direct runoff to the Gulf of Mexico, Tampa Bay, or Safety Harbor. These areas, labeled Direct Runoff to the Gulf and Direct Runoff to the Bay, are shown on Figure 2.0. The Direct Runoff to the Gulf Basin is the largest, 19,242-acres and includes all of the area known as Clearwater Beach, as well as the western most portion of the City's mainland. This western portion includes much of the area included in the City's Downtown District and Harbor Oaks neighborhood. Figure 3.0 shows the separation of the larger basin into Coastal Basin 1, Coastal Basin 3, and Coastal Basin Beach, a total of 2179-acres (11%) located within the City of Clearwater land mass. The land uses located in the mainland portion of this basin range from low-density to high-density residential, recreation/open space, commercial and public/semi-public uses.

The main portion of Clearwater Beach is made-up of two natural barrier islands, separated by an inlet that provides access to Clearwater Harbor (the Intra-Coastal Waterway) and the Gulf of Mexico. These two barrier islands extend approximately six-miles along the Gulf of Mexico and consist of the areas known as Clearwater Beach and Sand Key.

In addition to the two barrier islands, the area known as Island Estates is also included in the basin. This man-made fill island, created during the 1960's, contains approximately 210-acres and 10-miles of intra-coastal waterfront property consisting of a series of islands and peninsulas. All of these areas are densely populated and almost completely built-out. The land uses consist of residential properties that vary from single-family and multi-family condominium and town homes, hotels and motels, commercial businesses, offices, parks and outdoor recreation areas, churches and government buildings.


Island Estates

SWFWMD's Direct Runoff to the Bay basin is located along the eastern section of the City and is 2,484 acres. The basin is separated into Coastal Basin 4 and Coastal Basin 2 (See Figure 3.0) a total of 2,166 acres (10.5%) within the City land mass. Coastal Basin 2 provides stormwater retention for various types of land use in an area approximately east of Highway US 19 and south of State Road 60. The land use in the basin ranges from low- to high-density residential, recreation/open space, commercial, office, and public/semi-public. While much of the basin's elevation does not exceed 30-feet, a small section in the western most portion rises up to 80-feet.

Coastal Basin 4 located in the northeast area of the City consists primarily of low-density residential uses.

Climate

The climate in Clearwater is subtropical marine, characterized by long, humid summers and mild winters. Rainfall is abundant, especially during the summer months. The annual average rainfall is 51.9 inches, mostly occurring between June and September. The driest months of the year are April and November. Snowfall in Clearwater is extremely rare. The maximum-recorded accumulation was two inches in January 1977.

The average annual temperature is 74.1 degrees Fahrenheit. The average high temperature is 81.7 degrees Fahrenheit, with an average low of 61.6 degrees Fahrenheit.

In the winter months, the normal daily fluctuation in temperatures is from the low 50 degrees Fahrenheit to the low 70 degrees Fahrenheit.

In the summer months, the temperatures range from the low 70 degrees Fahrenheit to the high 90 degrees Fahrenheit. The number of freezes recorded at Tampa International Airport is an average of 3.3 days at 32 degrees

Fahrenheit or below per year. Due to Clearwater's exposure to the shoreline, the average number of freezes tends to be less than those recorded in Tampa.

Clearwater has a very active thunderstorm season during the summer months. There is an average of 85 thunderstorms per year. Most occur during the months of June through September. The hurricane season extends from June 1st through November 30th.

Population

Clearwater is the second largest city in Pinellas County and has a population of approximately 110,830 residents. The current population density is 4,336 people per square mile. The average household size is 2.19 persons per home and the average age of Clearwater residents is 41.3, with 25.6 percent of the population over 60 years of age. Having a population base with 25.6 percent of the residents over 60 years of age makes it very important to have an evacuation program in place that considers the mobility limitations of the elderly. See Figure 9.0 for Hurricane Evacuation Level areas and Evacuation Routes.

Housing and Development

The City's total land mass is 20,640 acres. There are 25,611 residential parcels containing 29,224 structures within the City. Of these, there are 4,547 parcels in the floodplain, containing 6,048 structures with a total estimated improved value of $3,467,270,300.

There are 1,321 commercial parcels containing 1,483 structures within the City. Of these, there are 158 parcels in the floodplain containing 174 structures, with a total estimated improved value of $155,971,800.

There are 644 office parcels containing 590 structures within the City. Of these, there are 76 parcels in the floodplain containing 75 structures, with a total estimated improved value of $52,393,200.

There are 1,431 tourist/downtown parcels containing 1,074 structures within the City. Of these, there are 519 parcels in the floodplain containing 444 structures, with a total estimated improved value o $953,094,900.

There are 233 industrial parcels containing 313 structures within the City. Of these, there are 46 parcels in the floodplain containing 80 structures, with a total estimated improved value of $28,865,500.

There are 354 institutional parcels containing 737 structures within the City. Of

these, there are 96 parcels in the floodplain containing 207 structures, with an estimated improved value of $126,201,800.

There are 153 open space / recreation parcels containing 128 structures within the City. Of these, there are 97 parcels in the floodplain containing 91structures, with an estimated improved value of $25,110,800.

There are 45 parcels designated as preservation within the City. Of these, 32 parcels are located in the floodplain containing 9 structures, with an estimated improved value of $5,914,700.

The existing residential character of the City is maintained with approximately 6,372-acres or 31 percent of the net land devoted to residential uses at a density not exceeding 7.5 units per acre. Of this, 816-acres (4%) are located within the floodplain. Generally, this density is not proposed to change.

Multi-family residential uses (7.6+ units per acre) occupy 2,686-acres or 13 percent of the City, of which 514-acres (2.5%) are located within the floodplain.

Mobile home parks occupy 357-acres (1.7%) of the City, of which 49-acres, or 0.2%, are located within the floodplain.

The majority of new multi-family residential development and redevelopment projects are occurring on Clearwater Beach and Downtown Clearwater. Motels located on Clearwater Beach are undergoing redevelopment to multi-family residential uses on a parcel-by-parcel basis, while the redevelopment of Downtown Clearwater is also occurring through infill projects on a parcel-by-parcel basis. The mainly single-family residential area of north Clearwater Beach is projected to remain low-density. New development and redevelopment is being built within the permitted density and reviewed in detail for consistency with the City's flood mitigation requirements.

All new residential development and redevelopment projects proposed within the floodplain are required to be constructed to current FEMA requirements, limiting potential flooding.

Development Constraints

1. Clearwater is surrounded by bodies of water to the east and west and no large developable land areas to the north or south.

2. Clearwater has experienced a 10.9 percent increase in population growth since 1990, increasing from 98,784 to an estimated 110,830 in 2005.

3. There is limited vacant land within the entire City that is developable. Within the floodplain, 197-acres (5.6%) of vacant land is available for

development.

4. Environmentally sensitive lands are designated Preservation and Recreation/Open Space on the Clearwater Zoning Boundaries and Drainage Basins Map (Figure 4).

Preservation and Recreation/Open Space future land use designations amount to 31.3 percent of the floodplain and 11.0 percent of the entire City land area. These designations do not permit residential or commercial development. Despite these constraints, future development is still possible. Redevelopment of existing properties and the annexation of additional properties currently located outside of the municipal boundaries present future development opportunities for the City.

Transportation

A network of state and local roadways service the City of Clearwater with U.S. Highway 19, Alternate U.S. Highway 19, County Route 1 and County Route 611 providing the major north/south transportation corridors, while State Route 60, State Road 580 and State Road 590 provide the major east/west transportation corridors. The City is also serviced by a number of bus routes operated by PSTA, the Pinellas Suncoast Transit Authority.

Identifying Hazards

Several hazards have been identified that pose a threat to the City's residents. It was determined that the City of Clearwater is most vulnerable to the following episodes:

- Tidal Flooding
- Hurricanes and Tropical Storms; and
- Seasonal Flooding.

While all three of these hazards pose a significant threat to the City's residents, hurricanes and tropical storms are statistically the least likely to impact the City, but would result in the most severe amount of damage.

Profiling Hazard Events

Flooding in the City of Clearwater results primarily from rain storms, tropical storms and hurricanes that cause intense rainfall, excessive runoff and tidal surge (and associated wave action) in coastal areas. Figure 10.0 provides the

Hurricane Storm Surge Areas located within the City. Although somewhat protected from the Gulf of Mexico by the offshore islands, the coastline at the City is subject to abnormally high storm tides. Not all storms that pass close to the study area produce extremely high tides. Similarly, storms that produce extreme conditions in one area may not necessarily produce critical conditions in other parts of the study area.

Stevenson, Allen's and Alligator Creeks are coastal creeks that drain an area several miles inland. Under certain conditions, tidewaters generated at the mouths of these creeks can intrude far upstream. Strong consistent winds associated with intense rain storms and tidal surges, which typically accompany hurricanes, can aggravate the tidal flood situation, particularly in areas where the secondary drainage system is poorly developed. Due largely to heavy seasonal rainfalls and its location directly on the Gulf of Mexico, the City of Clearwater is subject to periodic flooding and hurricanes. Storms passing in the vicinity of the City have produced a number of major floods causing significant damage. A historical review of the City's records from 1921 to 1972 revealed how major storm events impacted the City.

The following list details these events.

- **August 31-September 8, 1935** ***"Labor Day Hurricane"***

This storm, called the "Labor Day Hurricane," was one of the most severe tropical disturbances ever recorded. The storm was first located east of Turks Island, traveled toward the Florida Straits, re-curved across the Florida Keys, and then passed up the west coast of Florida on a broad re-curve that brought it inland near Cedar Key. Along the beach areas from the City of Sarasota northward to Clearwater Beach, homes were undermined and badly damaged. Mass evacuation of those areas was accomplished before the storm.

- **September 1-7, 1950** ***"No-name Hurricane"***

This hurricane originated over the western Caribbean Sea; passed northward over Cuba and the Gulf of Mexico, then moved north-northwestward parallel to the Florida coastline. It made two loops near Cedar Key, moved inland southeastward, passed approximately 30 miles north of the City of Tampa, recurved, and traveled northward. Pinellas County beach areas sustained heavy damage, principally from the long duration of high tides and waves that caused considerable erosion and recession of the shoreline. In turn, that erosion was responsible for major structural damage along the beaches. This small, but severe hurricane was also accompanied by intense rainfall. A total of 12.7 inches of rain in two days was reported in the City of Clearwater.

- **June 4-14, 1966** ***"Hurricane Alma"***

Hurricane Alma originated in the Gulf of Honduras, passed between Dry

Tortugas and Key West, and landed in the Apalachee Bay area, causing variable tides ranging up to 10-feet above normal on the west coast of Florida. Besides structural damage in west Florida, the mango crop in the southwestern portion of the state and the grapefruit crop around Pinellas County were severely damaged.

- **June 19, 1972** ***"Hurricane Agnes"***

Hurricane Agnes originated on the northeastern tip of the Yucatan Peninsula and traveled westward. The storm was of large diameter, and, although the center of this storm passed approximately 150 miles west of the Florida peninsula, it produced a high, damaging tidal surge. In Pinellas County, tides averaged 3 to 6-feet above normal in the coastal areas. Beaches and causeways were flooded. Flooding conditions of extreme magnitude occurred in Tampa Bay and caused an influx of saltwater through the outlet canal into Lake Tarpon. Damage in Pinellas County from this storm was estimated at $12.5 million.

A review of the flood insurance claims submitted within the City from 1978 to the present indicates that the majority of claims resulted from the following four storms and/or tidal events:

- **August 31, 1985 – September 4, 1985** ***"Hurricane Elena"***

Rainfall and high tides over a two-day period resulting in the flooding of 43 homes with insurance.

- **September 6, 1988 – September 9, 1988** ***Stationary Front***

Greater than 15 inches of rainfall in a four day period and high tides resulting in the flooding of 15 homes with insurance.

- **March 13, 1993** ***Winter No Name Storm***

Rainfall and a tidal surge resulting in the flooding of 61 homes with insurance, the worst event in terms of the number of claims.

- **October 6, 1996 – October 8, 1996** ***Tropical Storm Josephine***

Rainfall combined with high tides caused flooding in 32 homes with insurance.

The following list exhibits the dates identified by the NFIP that residents submitted flood insurance claims following heavy rainfall and/or tidal events:

Date of Event Number of Claims

- May 4, 1978 2
- May 8, 1979 3
- August 29, 1979 1
- September 23-29, 1979 3
- February 8, 1981 1
- August 20 – 21, 1981 1

- February 8, 1981 1
- August 9-10, 1982 1
- June 18, 1982 9
- August 18-19, 1982 1
- February 28, 1983 1
- September 11, 1983 1
- September 29, 1984 1
- July 25-26, 1985 1
- August 31, 1985 43
- October 31, 1985 2
- December 31, 1986 1
- July 2, 1987 1
- July 20-21, 1987 5
- September 6, 1988 15
- November 22-23, 1988 7
- January 2, 1990 6
- February 28, 1993 1
- March 12, 1993 61
- September 11, 1993 1
- October 4-5, 1995 5
- June 2-4, 1995 1
- July 11, 1995 1
- July 27, 1995 1
- October 7, 1996 32
- June 22-25, 1997 1
- July 5, 1997 1
- October 31, 1997 1
- November 22, 1998 1
- January 2-3, 1999 5
- July 15, 2000 5
- December 9, 2002 1
- February 22, 2004 1

Assessing Vulnerability

An assessment of the existing resources of the City is crucial to identifying the vulnerabilities of an area. While it is highly important to understand the location and demographics of the residential population living within the City, an assessment of the built environment must also be available. A comprehensive assessment will allow the City to fully understand where floodplain mitigation strategies will most benefit the City's residents, as well as the built resources that are critical to the welfare and safety of the residents. In addition, the assessment

needs to provide a description of the areas that are continuously flooded. Identifying these areas and the structures that are affected by the repeated flooding will allow the City to efficiently utilize the resources available to help mitigate the impact of repetitive damages that occur to structures during flooding episodes.

Residential Population

Identifying the existing number of residents living within the floodplain, as well as the established hurricane evacuation levels, is crucial to the effectiveness of understanding how to assess the floodplain management needs of the City. It is essential that a coastal community establish the number and any age limitations of residents living within the floodplain area to implement a successful mitigation strategy.

The tables below identify the number of residents living within the specified Flood Insurance Zones, established by FEMA, May 2005.

Population Living in Flood Insurance Zones			
VE Zone	AE Zone	A Zone	**Total**
3035	18,645	1,734	**23,414**

Special Facilities Populations

Home to a significant special needs population, 25.6 percent of the population over 60 years of age, the City must take special considerations when developing plans relating to pre-and post-disaster mitigation strategies. In addition, individual facilities are required to develop hazard mitigation plans specific to the facility. The table below illustrates the maximum capacity of hospitals, nursing homes, assisted living facilities (ALF's), and ambulatory service centers (ASC's) located within the City's Flood Insurance Zones and the maximum capacity at each facility. See Figure 11.0 for Special Needs Facilities.

Special Facilities Population in Flood Insurance Zones				
	In the City		Located in Floodplain	
	Total	Max Capacity	Total	Max Capacity

Hospital	1	687	0	-
Nursing Home	6	390	1	120
ALF	39	1134	4	53
ASC	3	6	0	-
Total	**49**	**2217**	**5**	**173**

Areas of Repetitive Loss Properties

Repetitive loss properties are properties that the National Flood Insurance Program (NFIP) has paid two or more claims of $1,000 or more in any given 10-year period since 1978. Since the inception of the CRS reporting system, 235 repetitive loss flood insurance claims have been made on 89 properties within the City, amounting to $4,196,871 in flood insurance compensation (NFIP, Repetitive Loss Details by Community, June 30, 2007). See Figure 12.0 for current repetitive loss property locations as of June 30, 2007. The following section provides an assessment of the reoccurring flood problems and includes the number of repetitive loss properties, the primary existing land uses, and a description of the area. Clearwater Beach and Stevenson Creek contain the majority of repetitive loss claims. Alligator Creek has only five repetitive loss properties located within its basin.

Coastal Basin

At approximately 2179-acres, the Coastal Basin contains more than half (62%) of the City's land area located within the 100-year floodplain. The 65 repetitive loss properties located on Clearwater Beach, eight of which are located on Sand Key and one on Island Estates, represents 80 percent of the total for the City. Since the inception of the National Flood Insurance Program, these 74 properties have produced 192 flood insurance claims, 76 percent of the total claims for the City, that have amounted to $3,151,860.00 in insurance payments. Land uses within the Clearwater Beach area are residential and commercial. Many of the commercial facilities are hotels, motels, restaurants and retail shops catering to the tourist population. The Island Estates neighborhood and the fingers off Hamden Drive on Clearwater Beach and Gulf Boulevard along Sand Key were created through fill activities.

Storm outfalls below mean high tide, lower than desirable building finish floor elevations and the topography of these areas are all contributing factors to the repetitive losses, generally caused by tidal flooding. The highest benchmark, 7.4-feet above m.s.l. NGVD29, on Clearwater Beach is located along the Memorial Causeway at Island Way in Island Estates. The beach watershed was first studied and addressed in the *1997 Clearwater Watershed Action Plan*. A high percentage of impervious acreage, increased channelization and a decreased headwater depressional storage area have contributed to flooding problems,

which are typical of highly developed urban areas.

Stevenson Creek Basin

There are 10 repetitive loss properties located in the Stevenson Creek Basin. Since the inception of the National Flood Insurance Program, these 10 properties have produced 29 flood insurance claims, which amounted to $207,188 in insurance payments. The Stevenson Creek watershed is highly urbanized with less than 10 percent of the land area undeveloped. The predominant land use in this watershed within Clearwater City limits is low-density residential particularly east of Stevenson Creek and north of Drew Street. Land use west of Stevenson Creek and south of Drew Street is comprised of mixed urban land uses including low-density residential, high-density residential, commercial, overnight accommodations, office and industrial. The Stevenson Creek basin is shared with the cities of Dunedin, Largo and Pinellas County. The main lakes located within the watershed, and limits of the City of Clearwater, include Lake Bellevue (24-acres), Crest Lake (10-acres) and Lake Hobart (12-acres). Lake Bellevue and Crest Lake are adjacent to low-density residential and recreational uses, while a large area of low-density residential land use surrounds Lake Hobart.

The gently rolling topography of the Stevenson Creek watershed varies in elevation from zero to 65 feet above mean sea level. Dense development has resulted in extensive impervious surfaces and very limited amounts of natural stream and floodplains. Most constructed channels are inadequate for heavy storm runoff and are further restricted by small bridges and culverts, which frequently cross the creek.

Historically, the Stevenson Creek watershed provided examples of many different habitats found in Florida. The mouth of the creek is estuarine. A weir, constructed at Palmetto Street along the creek, separates the saltwater portion from the freshwater portion. South of the weir, the banks are relatively steep and create only a small zone for wetland vegetation. This extends to Court Street, where the creek runs through the Glen Oaks Municipal Golf Course. Vertical walls confine the southern end before opening up into a wider expanse of exotic and nuisance species of vegetation.

Stevenson Creek at the Pinellas Trail

The stream is controlled by a weir at Druid Road and functions as a long linear retention area south of Druid Road to Jeffords Street. South of Jeffords Street, a significant amount of aquatic vegetation occurs in the stream way with wetland

vegetation confined to a narrow bank zone in this channelized section. From Lakeview Road and beyond, the stream channel is confined to a narrow easement and is overgrown with exotic and nuisance species until the stream is piped underground at Bellevue Boulevard.

Several studies have been conducted on the Stevenson Creek watershed over the last 15 years including two watershed management plans. New projects are implemented as a result of the latest watershed management plan and as the projects are completed the City of Clearwater Engineering Department proactively updates the plan to reflect the mitigation activities.

Alligator Creek Basin

There are five repetitive loss properties in the Alligator Creek watershed, which have produced 14 flood insurance claims that have amounted to $837,823 in insurance payments.

Alligator Creek

The Alligator Creek watershed lies within three jurisdictions, including the City of Clearwater, Pinellas County and the City of Safety Harbor. This is the most urbanized watershed in the City, with a large industrial area covering the western portion, low density residential areas in the central portions and a wide corridor of commercial land use along U.S. Highway 19 and Gulf-to Bay Boulevard. The Alligator Creek watershed is the second largest watershed within the City of Clearwater and drains approximately 5,594-acres.

Nearly 90 percent of the drainage area is within the Clearwater City limits. The main stem of Alligator Creek originates near the intersection of Keene Road and Sunset Point Road on the northern edge of a large industrial area adjacent to the Clearwater Airpark. There are five defined tributaries which discharge to the main Alligator Creek channel. The main channel flows easterly, eventually discharging to Alligator Lake, which in turn discharges into Old Tampa Bay. Alligator Lake is fitted with a salinity control structure, which prevents saltwater intrusion into the lake. Significant lakes within the watershed include Alligator Lake (80-acres); Lake Chautauqua (50-acres); and Moccasin Lake (30-acres). Lake Chautauqua discharges into a south flowing tributary of the main channel. Moccasin Lake is located almost centrally along the length of the stream at Moccasin Lake Park. Runoff is received from the surrounding areas and the lake, as well as two retention ponds which outfall into a channel and

Moccasin Lake

subsequently into the main channel. Alligator Lake is the most downstream lake in the Alligator Creek watershed and receives runoff from the entire upstream portion of the watershed as well as from local residential runoff.

The topography of Alligator Creek is the most dramatic of Clearwater's basins in that it contains two relatively large areas within its northern region with elevations over 90 feet, as well as areas within the eastern region that are just above sea-level. The creek has two main areas of headwaters within the City; one is located in a topographically high area north of Lake Chautauqua (90-feet above m.s.l.) and the other is located west of Keene Road (65-feet above m.s.l.).

Several studies have been performed for the Alligator Creek basin over the past 15 years. The first of these studies was conducted in 1981 by HDR for Pinellas County as part of a countywide comprehensive stormwater drainage master plan. The U.S. Army Corp of Engineers conducted a detailed study in a portion of the basin for the City of Clearwater in 1989. In 1997, Parsons Engineering Science, Inc. performed the most comprehensive study for this basin, and updated the study in 2005.

There are no repetitive loss properties in the other drainage basins (Allen's Creek, Bishop Creek, Curlew Creek, Jerry Branch, Lake Tarpon Canal and Mullet Creek) located within the City.

Identifying Assets

Existing Floodplain Land Uses

The City's floodplain is primarily a mix of single-family and multi-family residential uses, open space/recreation and preservation, with limited commercial and industrial uses. Residential land uses (40%) and land designated as preservation or recreation/open space (31%) account for 2472-acres (71%) of the floodplain. Much of the City's 100-year floodplain is located along the coastal areas, and at 1130-acres, Clearwater Beach encompasses less than half of the City's entire floodplain area. See Figure 7.0 for special flood hazard areas. Due to the natural beauty and recreational opportunities offered by the beach, much of the Clearwater Beach area is utilized for residential and/or tourist purposes.

The existing land use data analysis shows both positive and negative trends. The limited amount of land utilized for non-residential purposes (29.1%) and the abundant amount of preservation and recreation/open space land uses (31.4%) within the floodplain shows an encouraging trend. With approximately one-third of a city's land area located within the floodplain utilized for residential purposes, the importance of the City's continued participation in the pre- and post-flood hazard programs offered by the Federal government and flood mitigation planning at the local, regional and state level is reinforced.

An analysis of existing floodplain land uses results in the following findings:

1. 17.0 percent (3,487-acres) of the City land mass is located within the 100-year floodplain.

2. Residentially developed land within the floodplain totals 1,379-acres (40.0%), approximately 4,547 residential parcels, containing 6,048 structures.

3. Within the floodplain, 1,093-acres (31.4%) are designated as preservation or utilized as recreation/open space land uses.

4. Only 651-acres (18.7%) of land area is utilized as commercial, office, downtown, tourist, mixed-use, industrial and institutional purposes.

5. 197-acres (5.6%) of land located within the floodplain is currently vacant.

Existing floodplain land uses are inventoried and summarized in the table below.

Land Use Acres Percent

Land Use Type	Total Acres in Floodplain	% of Floodplain
Residential	1,379	39.5
Commercial/Retail	143	4.1
Office	43	1.2
Tourist / Downtown	239	6.9
Industrial	59	1.7
Institutional	167	4.8
Recreation/Open Space	682	19.6
Preservation	411	11.8
Vacant	197	5.6
Unincorporated	167	4.8
TOTAL	**3487**	**100**

Annexation Areas

There is approximately 4,108-acres of unincorporated county land located within the Clearwater's Planning Area, most of which are developed. Only 167-acres of unincorporated land exists in the floodplain and is not a concentrated area, but rather a scattered throughout the central portions of the City. Unincorporated land located within the floodplain exists primarily as low- and medium density single-residential uses.

Clearwater has a voluntary annexation program that encourages properties located within the Clearwater Planning Area to annex into the City. The annexation program is governed under the Pinellas County Ordinance 00-63 and Florida Statutes, Chapter 171.

Critical Facilities
A critical facility is defined as a facility in either the public or private sector that provides essential products and services to the general public, is otherwise necessary to preserve the welfare and quality of life in the City, or fulfills important public safety, emergency response, and/or disaster recovery functions. The critical facilities identified in the City include storm shelters, hospitals and other health care facilities; municipal, county, state and federal government buildings; airports; gas, electric and communication utilities; water and wastewater treatment plants; hazardous waste sites; and schools. The following list exhibits the figures that reference each of the critical facilities:

- Figure 13.0, *Critical Facilities* (Fire Stations; Police Stations; Hospitals; Shelters; Special Needs Shelters; Airports; Hazardous Material Storage Sites)
- Figure 14.0, *Sanitary Sewer Facilities*
- Figure 15.0, *Natural Gas Infrastructure*
- Figure 16.0, *Public and Private School Facilities*

The following table exhibits the number, of the critical facilities located throughout the entire city, as well as the facilities located within the floodplain.

Critical Facilities in the Floodplain

TYPE OF FACILITY	# in the City	# in the Floodplain
Fire Stations	8	2
Police Stations	9	3
Hospitals	1	0
Storm/Emergency Shelters	4	0
Airports	1	0
Hazardous Material Storage Site	18	5
Total	**52**	**10**

SECTION 4.0 HAZARD MITIGATION STRATEGY

Three departments within the City's administration guide stormwater management. The Engineering Department is responsible for identifying

problems and implementing solutions. The Pubic Services Department is responsible for maintenance of public drainage systems. The Planning and Development Department, in conjunction with the Engineering Department, are responsible for the review and approval of private drainage conveyance and retention. An engineer with the Engineering Department currently serves as the CRS coordinator. Since its incorporation in the NFIP, the City has been involved with stormwater management and reduction of flood damages, and the planning, design and construction of drainage improvements. Historically, the 1981 Alligator Creek Drainage Basin Study and the 1981 Stevenson Creek Drainage Basin Study, and the subsequent updates, have guided flood management and built a foundation for implementing mitigation projects.

The *Clearwater Comprehensive Plan* (2001), the *Watershed Action Plan* (1997), the *Allen's Creek Watershed Management Plan* (1996), the *Alligator Creek Watershed Management Plan* (1997) and *Update* (2005) and the *Stevenson Creek Watershed Management Plan* (2001) have guided recent stormwater management activity. As the projects identified from these studies are implemented, the plans are updated to include the mitigation activity. Numerous other supplemental studies have also been completed to address the City's flood prone areas. As a result of the planning efforts and mitigation projects identified by the watershed management plans, the City created the Capital Improvement Stormwater Management Committee (CISMC) to efficiently address effective stormwater management strategies. The CISMC, comprised of City representatives from the Engineering and Public Service Departments, regularly convenes to discuss various issue related to stormwater policy and to address any deficiencies in the City's Stormwater Management system.

Evaluation of Previous Plan's Activities

Several activities identified through the 2004 version of the *Floodplain Management Plan* have been, or are in the process of being implemented. Many of these activities are continuously updated and are also included in this *Plan*. The following is a list of activities and projects identified through the 2004 *Plan* that have been completed:

- Kapok Land Acquisition and Restoration Analysis
- Prospect Lake Park (Town Pond) Construction
- Moccasin Lake Habitat Improvement Feasibility
- Stevenson Creek Stormwater Retrofit Project
- North Greenwood Neighborhood Stormwater Project
- Myrtle Avenue Drainage Improvements
- Palmetto Street Drainage Improvements
- Glen Oaks Phase I and II Stormwater and Recreation Improvements
- Alligator Creek Channel B

Prospect Lake Park

- Alligator Creek Channel G
- North Beach Drainage Improvements
- NE Coachman Road Bridge Assessment

On-going activities and projects identified through the 2004 version of the *Plan* are also referenced in the "Identification and Analysis of Mitigation Measures" section included in this *Plan.* The City will continue to monitor the progress of these ongoing projects to help alleviate the impacts of flooding on residents. Current and future projects and activities are also identified in this *Plan*.

Floodplain Regulations

The extent of the flood hazard exposure in developed floodplain areas is largely due to construction below the 100-year base flood elevation. These properties are referred to as pre-FIRM because of their construction before the adoption of Flood Insurance Rate Maps (FIRM) requiring construction above flood elevation. Formal regulation of floodplain development did not occur until 1980 when the Flood Damage Prevention Ordinance was passed. The Flood Damage Prevention Ordinance (Appendix D), contained in the Clearwater Community Code, regulates coastal construction in all areas of special flood hazard, consistent with 161 Florida Statutes and the National Flood Insurance Program. The Ordinance refers to the Federal Emergency Management Agency's (FEMA) maps in defining the coastal high hazard area. Special construction standards are required for new development, substantial improvements and the facilities that service areas vulnerable to flooding. The standards are intended to minimize impacts on natural features and allow structures to withstand the effects of a 100-year storm. The majority (58) of the 89 repetitive loss properties are located on Clearwater Beach, constructed prior to FEMA's current base flood elevation requirements. Base flood elevation requirements for the North Clearwater Beach area are generally 11 feet NAVD88. Article 4, Division 13 of the *Clearwater Community Development Code* provides strict requirements for the process of land clearing and grubbing (Appendix E). This section requires that specific procedures are met prior to the issuance of a permit to clear land within the City.

The Erosion and Siltation Control Policy was implemented in 1984, and amended in April 2003 (Appendix F). These measures require erosion and siltation control methods to be employed during construction. This policy includes measures such as land clearing and grubbing, stabilization of denuded areas, protection and stabilization of soil stockpiles, protection of existing storm sewer systems and sediment trapping procedures.

The Design Criteria for Stormwater Drainage was implemented in 1991 and

revised July 2000 (Appendix G). In general, these standards are requirements set by the Southwest Florida Water Management District and the City of Clearwater Engineering Department. This document prevents damage from flooding by reducing peak flows of surface water runoff and ensures water quality by managing the concentration of pollutants entering surface waters.

The City also utilizes a Stormwater Management System Policy 2002 guidance manual (Appendix H). This manual is intended to provide water policy guidance for the development and implementation of programs, projects, rules and plans relating to City water resources. This manual also establishes the policies and goals by the City's Engineering Department to address floodplain management. The Tampa Bay Estuary Program (TBEP) was established in 1991 to assist the community in developing a comprehensive plan to restore and protect Tampa Bay. The program is part of a national network of 28 estuary programs established under the Clean Water Act and administered nationally by the U.S. Environmental Protection Agency (EPA). Local administrative support is provided through the Tampa Bay Regional Planning Council. *Charting the Course – The Comprehensive Conservation and Management Plan (*CCMP) for Tampa Bay, provides strategies to repair and protect the Tampa Bay ecosystem in the most cost-effective manner and according to the principles of ecosystem management. Clearwater is a TBEP participant and has created an action plan to meet the goals of the CCMP.

Identification and Analysis of Mitigation Measures

The City of Clearwater has completed and will continue to implement floodplain management activities that are ongoing, as well as propose new projects. These fall into the CRS Floodplain Management Activities: planning goals, preventive activities, property protection, natural resource protection, emergency services, public information and stormwater management projects. The following activities were previously identified through meetings with city staff, the flood protection surveys, coordination with other local, regional and state agencies and the review of previous City reports and documents. These goals and activities listed below represent those that would provide the greatest level of hazard reduction to the City. The City will continue to implement these goals as well as add new goals through update of this *Plan.*

Planning Goals

Planning goals appropriate to the Floodplain Management Plan have been adopted as part of the City of Clearwater's Comprehensive Plan.

These community policies have been implemented, will be implemented, or are ongoing, and are found in the Future Land Use, Coastal Management, Conservation, Recreation and Open Space, Intergovernmental Coordination, and Capital Improvement Elements, and the Stormwater Subelement. The evaluation

of these goals is an on-going process. A comprehensive review was conducted in 2006 through the City's Evaluation and Appraisal Report (EAR) process. Selected goals directly associated with the mitigation of flooding activities and the protection of property from flood episodes are provided below.

A. Future Land Use Element

Policy 1.1.5 Stormwater shall be controlled through consistent application of local, state, and federal regulations, mitigation and management plans, and permitting procedures for both site-specific and basin-level development plans.

Policy 1.1.6 All development and/or redevelopment activities in floodways and floodplains shall be controlled through consistent application of local, state, and federal regulations, mitigation and management plans, and the permitting process.

Policy 1.1.7 New development or redevelopment in the Coastal High Hazard Area shall be permitted consistent with F.E.M.A. and City Guidelines.

Policy 1.1.8 Mitigation plans for alteration of non-jurisdictional wetlands, beach dunes, swamps, marshes, streams, creeks, one hundred (100) year flood plains, or lakes shall require not less than a 1:1 ratio of mitigation land (on- or off-site) as approved by the Engineering Department and/or City Council, and in coordination with the Southwest Florida Water Management District (SWFWMD).

Policy 1.1.9 The effects of erosion shall be carefully controlled through local permitting and construction standards, procedures and regulations, and through the development of local and regional erosion control management programs.

Policy 1.1.10 The Community Development Code shall provide for on-site drainage detention and/or retention or payment in lieu thereof for compatibility with community master drainage plans.

1.2 Objective – Population densities in the coastal storm areas are restricted to the maximum density allowed by the Countywide Future Land Use Designation of the property, except for specific areas identified in Beach by Design: A preliminary Design for Clearwater Beach and Design Guidelines, in which case densities identified in Beach by Design shall govern. All densities in the coastal storm area and shall be consistent with the Pinellas County Comprehensive Emergency Management Plan and the Regional Hurricane Evacuation Study.

Policy 1.2.1 The City shall require new or redeveloped overnight accommodations uses located within the City's coastal storm area to have a hurricane evacuation plan, approved by the City, for all guests. This plan shall require the commencement of evacuation of hotel guests as soon as a hurricane watch is posted for the City.

Policy 1.2.2 Continue to cooperate with the Tampa Bay Regional Planning Council and Pinellas County to meet the regional objectives for evacuation of permanent populations as well as other emergency concerns.

Policy 2.2.2 Residential land uses shall be appropriately located on local and minor collector streets; if appropriately buffered; they may be located on major collector and arterial streets. Residential land uses shall be sited on well-drained soils, in proximity to parks, schools, mass transit and other neighborhood-serving land uses.

Policy 4.1.1 No new development or redevelopment will be permitted which causes the level of City services (roads, recreation and open space, water, sewage treatment, garbage collection, public school facilities, and drainage) to fall below minimum acceptable levels. However, development orders may be phased or otherwise modified consistent with provisions of the concurrency management system to allow services to be upgraded concurrently with the impacts of development.

B. Stormwater Management Subelement D.3 (See Appendix I for entire Subelement D.3)

Policy D.3.2.3 All stormwater management improvements should seek to meet applicable goals, guidelines, and regulations established to provide flood protection and pollution abatement.

D.3.3 Objective Lower highwater profiles during storm events, as necessary, to reduce house-flooding occurrences and to lessen the resulting adverse effects on public health, the natural environment, and public and private property.

Policy D.3.3.1 Continue to provide a program of regular maintenance to the stormwater management system to ensure maximum efficiency and performance. Ensure that stormwater management plans include measures to remove trash, sedimentation and other debris which impede flow and incorporate structural and non-structural measures to reduce or eliminate the discharge of oil, grease, heavy metals, and other suspended particles into the stormwater management systems.

Policy D.3.3.2 Natural and man-made wetlands shall be considered as a

means to provide stormwater management wherever possible and shall be maintained for hydrologic purposes. The efficiency of natural and man-made systems to convey stormwater runoff shall be protected through the provision of routine water quality maintenance schedules overseen by city inspections.

Policy D.3.3.3 Continue to provide multiple use facilities, such as recreational open space uses, with open channel stormwater management systems, when appropriate.

Policy D.3.3.4 Development and redevelopment activities shall comply with all stormwater management design standards and criteria.

Policy D.3.3.5 Structural Development shall be prohibited where it is determined that such development will have an adverse impact on stormwater storage areas, increase flood prone areas, significantly increase rates of runoff, or cause other unfavorable drainage conditions. Both man-made and natural systems shall be treated on an equal basis as a sensitive preservation area; no distinction shall be made between a natural system and a man-made or man altered hydrologic system.

Policy D.3.3.6 Limit development that will result in building(s) constructed within/or over stormwater retention/detention ponds, streams or channels. All wetlands, streams, channels, or other hydrologic features, whether wetlands, ponds or bodies of water having intrinsic hydrologic, biologic and zoological functions with no distinction made in regard to its status to whether it is man-made or natural shall be considered for a Preservation Land Use Plan classification to ensure protection from development.

Policy D.3.3.7 Continue active participation and cooperation with the National Flood Insurance Program and the Florida Emergency Management Agency for the purpose of recognizing flood prone areas, and establishing abatement programs that endeavor toward a reduction in damages and losses due to flooding.

Policy D.3.3.8 Continue the established requirement of a twenty-five foot setback from the tops of a bank from all wetlands whether natural or man-made, and require minimum finished floor elevations in areas adjacent to lakes, bays, creeks, the Gulf of Mexico, Tampa Bay and Old Tampa Bay, and other flood prone areas.

D.3.4 Objective Continue the implementation of the most cost effective and efficient plan to reduce the occurrence of street flooding where safety issues and traffic problems exist as prioritized and set forth in the Capital Improvement Element, and listed in the stormwater management plans.

Policy D.3.4.1 Identify areas where inadequate stormwater management easements exist, and obtain proper access to stormwater management channels, structures and appurtenances for maintenance purposes.

Policy D.3.4.2 Improve all street stormwater management systems where deficiencies exist as articulated in the City's annual budget document.

Policy D.3.5 Objective - Protect and enhance the quality of receiving waters by the use of "Best Management Practices" in accordance with the adopted watershed management plans.

Policy D.3.5.1 The use of "best management practices" shall be required before, during, and after construction activities to prevent water pollution resulting from erosion and siltation.

Policy D.3.5.4 Maximize water recharge potential in designing stormwater management improvements by utilizing natural wetland areas for stormwater storage.

Policy D.3.5.5 Coordinate stormwater management improvements with other local governments to assist in solving stormwater management problems of an extraterritorial nature.

D.4 GOAL - STORMWATER DISCHARGE SHALL BE MANAGED TO PROVIDE FLOOD PROTECTION FOR THE CITIZENS OF THE CITY OF CLEARWATER AND TO PRESERVE, PROTECT, AND ENHANCE THE WATER QUALITY OF RECEIVING WATERBODIES.

D.4.1 Objective - The protection, restoration, and enhancement of water quality associated with stormwater runoff will be considered a function of the City's overall stormwater management plans.

Policy D.4.1.1 The City shall incorporate water quality protection and enhancement criteria into the City stormwater management plans.

Policy D.4.1.2 The use of natural alternatives, the conservation of natural stormwater management systems, and the protection and improvement of the quality of receiving waters shall be a goal of the City's stormwater management plans.

Policy D.4.1.3 Management plans shall continue to be developed on an ongoing basis for waterbodies with known or suspected water quality problems in the City to include Tampa Bay, Clearwater Harbor, Stevenson

Creek, Allen's Creek, and Alligator Creek.

Policy D.4.1.4 The City shall systematically and timely prepare watershed or waterbody specific management plans, and update them as necessary for waterbodies within the City. Such plans shall include both water quality and flood control considerations and recommended funding sources.

Policy D.4.1.5 The City shall implement all City-approved watershed management plans.

Policy D.4.1.6 All City stormwater management plan projects within watersheds of the City shall comply with applicable SWFWMD, State, and Federal requirements, including SWIM Plans for that waterbody or watershed.

Policy D.4.1.7 The City shall continue to coordinate with and supplement the County's surface water monitoring program.

C. Coastal Management Element

E.1.1 Objective - Clearwater shall continue to protect beaches and dunes by use of the State Coastal Construction Control Line as the building and land alteration setback line for purposes of administering the Community Development Code. The Florida Building Code, Federal Emergency Management Agency (FEMA) regulations, and City coastal construction regulations will continue to govern the structural integrity of new buildings.

1.2 Objective The coastal storm area shall be the area delineated in Map E-1 of the Coastal Management Element, which encompasses all of the following:
(1) the Coastal High Hazard Area (CHHA), which shall be defined by the sea, Lake and Overland Surges from Hurricanes (SLOSH) model to be inundated from a category one hurricane, as reflected in the most recent Regional Evacuation Study, Storm Tide Atlas,
(2) all land connected to the mainland of Clearwater by bridges or causeways
(3) those isolated areas that are defined by the SLOSH model to be inundated by a category two hurricane or above and that are surrounded by the CHHA or by the CHHA and a body of water, and
(4) all land located within the Velocity Zone as designated by the Federal Emergency Management Agency.

The City shall direct permanent population concentrations away from the coastal storm area consistent with the goals, objectives and policies of the Clearwater Comprehensive Plan.

Policy E.1.2.2 Clearwater shall continue hazard mitigation by participation in

the National Flood Insurance Program's (NFIP) Community Rating System, Pinellas County's Local Mitigation Strategy, administration of building and rebuilding regulations consistent with City and FEMA regulations, prohibition of beach sand dune alteration, and restriction of development in flood plains.

Policy E.1.2.3 The City will encourage natural hazard mitigation actions recommended by any interagency hazard report that the City deems appropriate.

Policy E.1.2.4 General hazard mitigation will be encouraged to include the regulation of building practices, floodplains, beach and dune alteration, stormwater management, sanitary sewer and septic tanks, and land use to reduce the exposure of human life and public and private property to natural hazards; and appropriate recommendation from the Pinellas County Local Mitigation Strategy will be incorporated into the Clearwater Comprehensive Plan.

Policy E.1.2.5 The City shall prohibit the location of new hospitals, nursing homes and assisted living facilities in the Coastal Storm Area and the area inundated by a category 2 hurricane as depicted by the SLOSH model, as reflected in the most recent Regional Evacuation Study, Storm Tide Atlas.

Policy E.1.6.1 Redevelopment proposals and plans shall be reviewed for compliance with the goals, objectives and policies of the Comprehensive Plan and other appropriate plans including Beach by Design: A Preliminary Design for Clearwater Beach and Design Guidelines and the City's NFIP Community Rating System Floodplain Management Plan.

Policy E.2.1 Objective - The City shall continue to protect coastal wetlands, estuaries and wildlife habitats to maintain or increase the acreage for threatened and endangered species populations.

Policy E.2.1.1 Restoration and enhancement of disturbed or degraded estuaries identified by the Surface Water Improvement and Management (SWIM) program shall be accomplished by strict regulation of proposed impacts to wetlands and by controls on the operation and installation of marinas and other water-dependent uses.

Policy E.2.1.2 Development applications shall be reviewed to ensure that proposed new development or redevelopment will not encroach on or remove wetlands or beaches. New development and redevelopment shall be guided away from environmentally sensitive areas and into those most able to withstand impacts.

Policy E.2.1.3 Marina siting criteria shall restrict marinas and related activities from areas of environmental significance, which include but are not limited to the north end of Clearwater Beach, grass beds in Clearwater Harbor, Cooper's Point, and Clearwater Harbor Spoil Islands 25, Sand Key Park, and the southern edge of Alligator Lake. Marinas shall only be allowed in these areas with appropriate and approved mitigation.

Policy E.2.1.4 The City shall work toward reducing the existing quantity and improving the quality of stormwater runoff to estuarine and surface water bodies by ensuring that development and redevelopment adheres to the treatment standards set forth in State Water Policy, and complies with the retention and treatment requirements of Chapter 62-25 F.A.C., the Environmental Resource Permitting Rules 40D-4, 40D-40, 40D-400, F.A.C. of the Southwest Florida Water Management District (SWFWMD) and with any more stringent local regulations.

Policy E.2.1.5 The City shall proactively pursue and facilitate coordination and participation in the implementation of the Tampa Bay Estuary Comprehensive Conservation and Management Plan (CCMP), and related plans, as a means of achieving mutual local and regional resource management and restoration goals for Tampa Bay.

Policy E.2.1.6 The City shall permit passive recreation uses in appropriate coastal areas as identified in the Future Land Use Element of the Comprehensive Plan.

Policy E.2.1.7 The City shall coordinate with Pinellas County and other local governments for water quality monitoring and related program planning.

Policy E.2.1.8 Future land uses which are incompatible with the protection and conservation of wetlands and wetland functions shall be directed away from wetlands.

Policy E.2.1.9 The type, intensity or density, extent, distribution and location of allowable land uses and the types, values, functions, sizes, conditions and locations of wetlands are land use factors, which shall be considered when directing incompatible land use away from wetlands.

Policy E.2.1.10 Land uses shall be distributed in a manner that minimizes the effect and impact on wetlands. The protection and conservation of wetlands by the direction of incompatible land uses away from wetlands shall occur in combination with other goals, objectives and policies in the comprehensive plan. Where incompatible land uses are allowed to occur, mitigation shall be considered as one means to compensate for loss of wetlands functions.

Policy E.2.2 Objective - Clearwater's barrier islands include natural resources which shall be preserved from encroachment and development.

Policy E.2.2.1 Restoration and enhancement of disturbed or degraded dune and beach areas shall be implemented with the appropriate methods and quality of material necessary to enable successful reestablishment.

Policy E.2.2.2 The specific and cumulative impacts of development and redevelopment upon wetlands, water quality, water quantity, wildlife habitat, and beach and dune systems shall be limited by: strict maintenance of existing setback requirements, adherence to storm water detention requirements, retaining all publicly owned natural habitats in their undeveloped state and transfer of development rights.

Policy E.2.3 Objective - Clearwater Harbor and Tampa Bay are designated Outstanding Florida Waters and are under a non-degradation rule. Clearwater will continue to manage stormwater runoff and control erosion during construction to reduce waterborne sediments. As additional initiatives are approved under the SWIM program, they will be considered for inclusion in the Community Development Code.

Policy E.2.3.1 Restoration and enhancement of disturbed or degraded drainage systems shall be implemented by upstream detention of stormwater, maintenance of existing drainage channels, widening of bridges, culverts and other stormwater conveyance structures.

Policy E.2.4 Objective - Clearwater shall seek funding and approval to renourish eroded beaches on Sand Key and Clearwater Beach when necessary. Restored beach areas shall be considered public resources seaward of construction setback lines and shall not be counted as plan density or buildable lot area.

Policy E.2.4.1 The City shall seek State funding and approval to enable beach renourishment when necessary.

Policy E.3.1 Objective - Clearwater shall administer land development regulations to protect public and private property and human life from the effects of hurricane winds and flooding.

Policy E.3.1.1 The City shall grant building permits in compliance with the rules of FEMA.

Policy E.3.1.2 Post-disaster redevelopment plans of coastal areas shall be designed to reduce the vulnerability of public and private property and include

proper elevations.

Policy E.3.2.2 The City shall develop operating policies that address post-disaster redevelopment needs to facilitate permissible reconstruction in a timely manner, which includes participating in the Pinellas County Local Mitigation Strategy

Policy E.3.3.9 The City shall not amend the Future Land Use Plan map or Zoning Atlas to permit any mobile home parks to be located within the coastal storm area.

Policy E.4.1.2 To the maximum extent feasible, sanitary sewer facilities and lift stations shall be built to resist the infiltration by floodwaters. The hazard mitigation annex, which covers the wastewater treatment system, shall be followed in the event of a storm; and hazard mitigation plans shall be updated as necessary.

Policy E.4.1.3 Immediate repair and clean-up actions after a storm shall be limited to removal of debris, and repair of existing primary structures to allow re-occupancy (repairs to allow re-occupancy shall be considered when damage is limited to less than fifty percent (50%) of the value of the structure prior to damage). Long-term repair and redevelopment shall consist of upgrading structures and accessory facilities to expand habitable space or repair of greater than fifty percent (50%) of the value of the structure prior to damage. Post-disaster redevelopment and long-term repair can only be permitted consistent with the requirements of FEMA and the Florida Statutes.

Policy E.4.1.4 Damaged infrastructure shall be repaired or rebuilt to minimize the potential for future damage. Unless the facility is necessary to serve the population of the coastal storm area, consideration shall be given to relocating public facilities outside the coastal storm area.

Policy E.4.1.6 Repair and rebuilding of critical facilities such as water facilities, sewage treatment plants and lift stations, and other utilities damaged in future storms shall be reconstructed to minimize hurricane vulnerability.

D. Conservation Element

F.1.2 Objective - The City shall continue to protect floodplains, drainage ways, and all other natural areas having functional hydrological characteristics.

Policy F.1.2.1 Any construction in the one hundred (100) year floodplain shall comply with all requirements and standards of the Federal Emergency Management Agency of the Federal Flood Insurance Administration, and the City's building codes.

Policy F.1.2.2 Construction and development activities in natural drainage channels shall be prohibited, except for public flood protection projects designed to correct specifically identified pre-existing flood conditions and for which no reasonable alternative flood control measures are available; such activities shall not increase the flood potential for areas outside the project target area, nor shall the overall water quality of the affected drainage channels be reduced as a result of the activities.

Policy F.1.2.3 The City shall support the establishment of Total Maximum Daily Loads (TMDL) for impaired water and its implementation as appropriate within the City.

Policy F.1.2.4 Utilize design methods that will trap stormwater sediments before entering surface waters.

Policy F.1.2.5 Cooperate and coordinate activities with the Southwest Florida Water Management District (SWFWMD) and the Florida Department of Environmental Protection (FDEP) in the implementation of the Surface Water Improvement and Management (SWIM) Program including maintaining and upgrading the quality of water of Tampa Bay and Clearwater Harbor.

Policy F.1.2.6 Natural filtration techniques and methods such as grassy swales and natural wetland water storage should be implemented when appropriate to provide purification of stormwater runoff before entering any surface waters.

Policy F.1.2.7 Transfer of development rights should be implemented to provide alternatives to development and degradation of wetlands and other natural resources.

Policy F.1.2.8 Protect all natural drainage channels from destruction or any restriction of their functional use and regulate protection through the Clearwater Community Development Code: this policy may be waived for any public flood conditions when it can be demonstrated that: (a) No reasonable alternative flood control measures are available; (b) The project will not increase the flood potential for areas outside the project target area; and (c) Overall water quality of the affected drainage channel will not be reduced as a result of the project

Policy F.1.2.9 Design and approve future redevelopment of Clearwater's

downtown waterfront with consideration of the natural bluff features through the Future Land Use Plan, the Community Development Code, Clearwater Downtown Redevelopment Plan, and in accordance with the City Charter.

Policy F.1.2.10 Monitor and enforce City requirements for treatment ponds and environmental mitigation sites.

Policy F.1.8.9 Pesticide dealers, auto paint and repair shops, salvage yards, and other small quantity generators of hazardous waste identified as per Florida State Law shall provide storage of hazardous products and by products outside of the elevation of the 25-year flood plain, shall not cause the direct discharge of runoff from said storage areas into water of the State, and shall have containment/separation traps of adequate size to prevent any discharge in case of a spill or accident.

F.2 GOAL - DISCHARGES OF STORMWATER SHALL BE MANAGED TO PROVIDE FLOOD PROTECTION FOR THE CITIZENS OF THE CITY OF CLEARWATER AND TO PRESERVE, PROTECT, AND ENHANCE THE WATER QUALITY OF RECEIVING WATERBODIES.

F.2.1 Objective - The City shall continue to protect, improve and enhance surface waters from stormwater runoff discharging into both interior and coastal surface waters.

Policy F.2.1.1 The City shall incorporate water quality protection and enhancement criteria into all City stormwater management plans.

Policy F.2.1.2 The use of natural alternatives, the conservation of natural drainage systems, and the protection and improvement of the quality of receiving waters shall be a goal of the City stormwater management plans.

Policy F.2.1.3 A stormwater utility fee or other adequate funding mechanism shall be continued to provide the necessary funding mechanism to achieve this goal.

Policy F.2.1.4 The City shall continue to implement a stormwater ordinance requiring redeveloped sites other than single-family residential areas, to incorporate water quantity and quality controls consistent with new development regulations, recognizing that case-by-case limitations may call for partial controls, offsite improvements or payments in lieu of improvements to achieve this goal.

Policy F.2.1.5 Management plans shall be developed for waterbodies with known or suspected water quality problems in the City to include Tampa Bay, Clearwater Harbor, Stevenson Creek, Allen's Creek, and Alligator Creek.

Policy F.2.1.6 The City shall systematically and timely prepare and update watershed or waterbody specific management plans in accordance with the Surface Water Improvement and Management (SWIM) program. These plans shall include both water quality and flood control considerations and recommended funding sources.

Policy F.2.1.7 The City shall prioritize and implement all City approved stormwater management plans.

Policy F.2.1.8 All City stormwater management plan projects within watersheds of the City shall comply with applicable SWIM Plans for that waterbody or watershed.

Policy F.2.1.9 The City shall coordinate with and supplement the County's surface water monitoring program.

Policy F.2.1.10 The City will encourage the use of "Low Impact Development" techniques for stormwater management, such as minimal land disturbance, the preservation of native vegetation, and the minimization of impervious cover, through site plan and internal review processes.

E. Recreation and Open Space Element

Policy G 1.4.4 Preserve coastal and interior wetlands, floodways, floodplains and other environmentally significant areas to protect their aesthetic and environmental qualities which benefit the City.

Policy G 1.4.8 Coordinate recreation planning with other plans concerning water quality, stormwater management, fish and wildlife management, and environmental education.

F. Intergovernmental Coordination Element

2.6 Objective Clearwater shall participate on a technical and a policy level in the preparation, planning, funding, coordination, and implementation of a master stormwater management plan with other governmental entities, SWFWMD, State Department of Environmental Protection (DEP) and other affected parties.

Policy H 2.6.1 The Public Works Department shall continue to coordinate and oversee preparation of stormwater management plans.

Policy H 2.6.2 Clearwater shall participate in inter local agreements to implement and fund stormwater management plan improvements.

Policy H 2.6.3 The Engineering Department shall prepare, monitor, and update watershed plans and coordinate with other jurisdictions.

2.7 Objective Clearwater shall coordinate with Pinellas County's Department of Environmental Management and with the Department of Environmental Protection to upgrade and maintain air quality.

Policy H 2.7.2 Clearwater shall continue and seek to expand, as necessary, joint use agreements for recreational facilities with the Pinellas County School Board and other recreation facility providers.

G. Capital Improvements Element

I 1.2 Objective Management of Clearwater's coastal zone shall limit public expenditures to those necessary to serve existing and planned development.

Policy I.2.1 City infrastructure located in coastal high hazard areas shall be given first priority in receiving renourishment projects, necessary maintenance, and repair and replacement projects; the coastal high hazard area is determined to be evacuation level "A" zone for a Category 1 hurricane as delineated by Pinellas County and the Tampa Bay Regional Planning Council.

Policy I.2.2 Damaged infrastructure shall be replaced or rebuilt to minimize the potential for future damage. Unless the facility is necessary to serve the population of the coastal zone, consideration shall be given to relocating public facilities outside the coastal zone.

Policy I.2.3 Infrastructure damage in coastal high hazard areas during previous storms was limited to beach and water-dependent uses. Repairs and rebuilding of sewage treatment plants and lift stations damaged in future storms shall be conducted with such methods to minimize hurricane vulnerability.

Policy I.2.4 The following infrastructure improvements shall be specifically considered as part of the local coastal zone management element for purposes of consistency with applicable State law: expansion/rebuilding of Memorial Causeway Bridge and addition of turn lanes; expansion of public park and beach access facilities; beach renourishment, and addition of sanitary sewer and street drainage capacities, as needed, to implement water quality objectives. These improvements are consistent with the local coastal zone management element and are eligible for State funds, which are now or

may become available.

Policy I.2.5 Level of service standards will not be the exclusive determinant of the need for a capital improvement in the coastal high hazard area when a repair, remodeling, renovation or replacement of an obsolete or worn out facility, as determined by the City Manager and City Commission, is necessary or when capital improvements are provided in excess of the standards adopted in this Plan based upon the following criteria:

1. The capital improvement does not make financially infeasible any capital improvement of the same type that is needed to achieve or maintain the standards for levels of service adopted in this Plan; and

2. The capital improvement does not contradict, limit or substantially change the goals, objectives and policies of any element of this Plan; and

3. The excess capacity is an integral part of a capital improvement that is needed to achieve or maintain standards for levels of service; or

4. The excess capacity provides economies of scale making it less expensive than a comparable amount of capacity if acquired at a later date; or

5. The asset acquired is land that is environmentally sensitive or designated by the City as necessary for conservation, recreation or protection of coastal high hazard areas; or

6. The excess capacity is part of a capital project financed by general obligation bonds approved by referendum.

Preventive Activities

Preventive activities keep flood problems from getting worse by regulating land use and development through planning, land acquisition and/or regulation.

Project A.1 The City will continue to participate in the Pinellas County Local Mitigation Strategy.

Project A.2 The City will assist the Tampa Bay Regional Planning Council and Pinellas County with Project Impact implementation such as providing property information data, and other general support activities. Project Impact is the FEMA mitigation initiative to reduce local vulnerability to natural disasters.

Project A.3 As part of the 2007 EAR-based amendments, the Planning Department will research amending the *Comprehensive Plan* to prohibit new construction of hospitals, nursing homes and convalescent homes in the Coastal High Hazard Area. - Completed

Project A.4 As part of the 2007 EAR-based amendments, the Planning Department will research amending the *Comprehensive Plan* to prohibit the siting of new mobile home parks within the Coastal High Hazard Area. - Completed

Project A.5 The City will pursue the acquisition of land that has a history of flooding and is an important component to alleviate localized flooding and flooding in other areas of the City.

Project A.6 The City will continue to support implementation of the Tampa Bay Estuary Program's *Comprehensive Conservation and Management Plan* for Tampa Bay through its projects and activities.

Project A.7 As part of the CRS program requirements, the Floodplain Management Planning Committee will conduct a yearly evaluation of the goals and activities of the *Floodplain Management Plan*.

Property Protection

Property Protection activities are usually undertaken by property owners on a building by- building or parcel basis and are intended to alleviate the damage inflicted by episodes of flooding.

Project B.I The City will continue to participate in the FEMA Project Impact program to help reduce the impacts of natural disasters.

Project B.2 The City will continue to provide "Substantial Improvement" information to property owners in the floodplain (Appendix J). This information will be updated to reflect changes in regulations as necessary.

Project B.3 The Development Services Department will continue to offer the public information regarding residential flood protection construction methods.

Project B.4 The Engineering Department will assist homeowners in obtaining flood mitigation grants through the Florida Department of Community Affairs. These grants are available on an annual basis and are given priority to repetitive loss properties. – As requested by residents

Project B.5 The City will continue to utilize the flood complaint handling process to better address flood issues (Appendix H).

Project B.6 The City shall assist residents in preparing FEMA Flood Mitigation Assistance (FMA) Grants that offer funding for the elevation and demolition/rebuild of properties that have been damaged by flooding in the past. – As requested by residents

Natural Resource Protection

Natural resource protection activities preserve or restore natural areas or the natural functions of floodplain and watershed areas.

Project C.1 The Parks and Recreation Department will continue to maintain, protect and manage natural areas that are under the city jurisdiction as open space and preservation parks.

Project C.2 The City will designate a representative to field concerns regarding dune reconfiguration or construction. This representative will coordinate directly with the region's State DEP agent to facilitate the reporting of any prohibited actions. – Pinellas County is now responsible for this.

Project C.3 The City will continue to pursue the creation and enhancement of wetlands that provide compensation for future unavoidable City-incurred wetland impacts from roadway improvements, drainage improvements and public utility expansions.

Project C.4 The City will continue to provide support to the U.S. Army Corps of Engineers (USACOE) for the design and implementation of Stevenson Creek Estuary Restoration Project.

Project C.5 The *Stevenson Creek Watershed Management Plan* will continue to be updated as recommended projects are implemented. – Remove add to CIP project list.

Emergency Services

Emergency Services are post-disaster mitigation measures taken during and after flooding that helps minimize the negative impact on resident's well-being and property.

Project D.1 The Emergency Management office will work in conjunction with other City departments and Pinellas County Emergency Management to update the City's *Emergency Operation Plan* as needed.

Public Information

Public Information activities advise property owners and residents about the hazards of the floodplain through several means of advertisement and information dissemination.

Project E.1 The City will utilize C-VIEW TV, the City of Clearwater television station, to provide flood mitigation information and hurricane preparedness information to the public.

Project E.2 The City will continue to provide flood mitigation information to residents through various City publications and advertisements. These information mailings will be targeted to repetitive loss properties.

Project E.3 The City will continue to work with neighborhoods experiencing flooding to provide flood mitigation and procedures information.

Project E.4 The Clearwater Library system, Engineering Department and Development Services Department will continue to make floodplain information available to the public.

Project E.5 The City will provide information as necessary to the various hurricane guides regarding flood safety information.

Project E.6 The City will provide information as necessary to Verizon that provides natural hazard information including flood procedures in the telephone book.

Project E.7 The City will provide additional flood information on the City's Website at myclearwater.com.

Project E.8 The City will submit an application for certification as a National Weather Service *StormReady City*. – Pinellas County is *StormReady*

Stormwater Management Projects

Stormwater Management Projects are capital improvement projects constructed to reduce flooding potential, enhance drainage and improve stormwater quality. The CISMC, comprised of City staff develops and maintains a master list of improvements.

This list is available in the Implementation of Mitigation Measures section of this document. The following is a list of CISMC projects that will be overseen, or continue to be overseen by the Engineering Department.

Project G.1 Lake Bellevue Stormwater Management Project

The Lake Bellevue Stormwater Management Project consists of the expansion of Lake Bellevue to provide additional flood storage capacity and littoral zone for water quality improvements, within the Stevenson's Creek Watershed. The expansion requires the excavation of an area of approximately 8 acres of unutilized areas of Ed Wright Park and Ross Norton Park. This project includes modification of the lake outfall structure to control the 100-year flood discharge, elevating the eastern 400 feet of Dempsey Street, and construction of a low berm through a portion of the park. Completion of this project is expected to remove 17 dwelling units from the 100-year flood zone.

This design cost for this project was $266,717 and construction costs are estimated at 1.6 M. The Southwest Florida Water Management is funding $348,871 of the construction costs and FDEP is funding $366,624 of the construction costs.

The construction contract was awarded to Caladesi Construction Company on April 15, 2009, in the amount of $ 1,662,525. Construction began in May 2009 with completion in 2010.

Project G.2 Spring Branch Stormwater Improvements

The improvements will consist of widening approximately 700 feet of the Spring Branch Channel of Stevenson's Creek downstream of King's Highway and constructing of a stormwater retention treatment pond. The total area of the pond will be approximately 2.5 acres and will require acquisition of a 4-acre parcel from the Sunset Point Baptist Church. This project will reduce the 100 year flood plain, stabilize the conveyance features, provide treatment and attenuate the runoff in this area of the watershed.

The design and construction estimate of this project is $2,500,00. Design of this project is ongoing with construction anticipated to commence in October 2009 with completion in 2010. The Southwest Florida Water Management District and FDEP are cooperatively funding the land acquisition, design and construction of this project.

Project G.3 Stevenson Creek Estuary Restoration Project

This project will involve the dredging of approximately 196,000 cubic yards of

sediments from the Stevenson's Creek estuary, removal of exotic vegetation and replanting of native vegetation. The project components will restore habitat, reduce odors associated with the organic muck, improve area aesthetics, restore dissolved oxygen levels, increase the channel cross sections, reduce potential flooding and help reestablish the estuary tidal flow and food chain base.

The total project cost is estimated at $7,360,987. The USACOE is the lead agency on this project. The Corp will manage this project and fund 65 percent of the project costs. The City will be responsible for the remaining 35 percent of the project cost.

The contract was awarded in 2009. Construction is scheduled to begin in 2009 and is expected to be complete in 2010.

Project G.4 Tropic Hills Phase I, II, III

Tropic Hills is located within in the Coastal Basin 2 watershed. Tropic Hills Drainage Improvements Project consists of 3 phases:

Phase I consists of the rehabilitation of an existing outfall channel serving 250-acre drainage basin. The proposed rehabilitation activities including construction of a gabion wall system for stabilization of the north bank, installation of the gabion mattress on the bottom of the channel to minimize scour, and replacement of the existing failing seawall along the south side of the channel. The design and construction estimate of phase I is $2,500,000. The project is cooperatively funded by the SWFWMD, SWIM Section and the City of Clearwater. The City anticipates the construction to start in 2009 with completion in 2010.

Phase II consists of replacing the 2 undersized 36" pipes under U.S. 19 with a 4'x10' box culvert during the reconstruction from SR 60 to Harn Blvd. The estimate costs for this phase is $1,114,000 and construction starts in August 2009 and complete by 2012.

Phase III consists of replacing 900' undersized pipe that is upstream of phase II. The design and construction estimate of this phase is $2,500,000. The City anticipates the construction to start by 2012 and complete by 2013.

When all three phases of the project are complete, the Tropic Hills neighborhood will have an outfall that reduces the risk of houses and streets flooding.

Project G.5 Alligator Creek Channel F Improvements

The project includes construction to improve drainage of Alligator Creek Channel F from Old Coachman Road to approximately 1500 feet upstream. The work involves realigning approximately 850 feet of channel to the historical flow path within the City's public utility easement, reinforcing and stabilizing the channel through the installation of approximately 1800 feet of gabion structures, replacing existing culverts under Old Coachman Road and Wetherington Road and reconstructing and paving the disturbed areas of Old Coachman Road and Wetherington Road.
The Contract was awarded to Keystone Excavators, Inc. in the amount of $1,432,233. Construction will begin in September 2009 and will be complete in 2010.

Project G.6 Kipling Plaza Lift Station

This project consists of the rehabilitation of the stormwater pump station at Kipling Plaza on north Clearwater Beach in the Coastal Basin Beach watershed. This project will be completed in 2010 at an estimated cost of $100,000.

Project G.7 Myrtle Ave/ Seminole Street Northeast Outfall System

This project consists of replacing 900 linear feet of aging corrugated storm pipe, within the Stevenson's Creek watershed. The present pipe runs diagonally through the area from Seminole and Vine to Palmetto and MLK. The proposed project will relocate the pipe out of backyards where there is no easement and into the adjacent city right of ways.

The estimate for this project is approximately $1,500,000. Construction is anticipated to begin in 2011.

Project G.8 Beachwalk Water Quality Spencer Pond

The City purchased two adjacent properties on Spencer Avenue that are approximately 1/3 of an acre total. Two additional property adjacent to Spencer Avenue was purchased that consists of approximately ½ of an acre. A proposed pond will be constructed on the combined properties that will supply most of the water quality treatment benefits required for the Beachwalk project.

The neighborhood will directly benefit from a stormwater retention pond at the lowest point of the basin. It will also remove two properties from FEMA's repetitive loss list and reduce the risk of flooding to adjacent flood prone properties. The removal of properties from the repetitive loss list will help the City to reduce flood insurance costs through FEMA's Community Rating System (CRS).

The estimated cost of the project is $160,000. Construction of the pond is expected to start in 2010 and be complete in 2011.

Project G.9 **Allen Creek**

The project consists of channel improvements to Allen's Creek between Magnolia Avenue and Sandra Drive. It includes two concrete check dams, approximately 2,000 feet of bank stabilization by installing gabions on each side of the creek and grading the creek banks above the gabions at a gradual slope to blend with surrounding topography.

Pinellas County approached the City to partner with them and Southwest Florida Water Management District (SWFWMD) for the design and construction of this project. The County was the lead on the project and will handle design and construction management. The engineers estimate for this project was $1,651,500.00.

The County received bids on March 5, 2009. The County awarded the construction contract to Kamminga & Roodvoets, Inc. in the amount of $895,690.00 in June 2009. Construction will start in September 2009 and be complete within 270 days.

Project G.10 Alligator Creek Watershed Plan Update

This is a project to perform the 1) Topographic Information, 2) Watershed Evaluation, and 3) Watershed Management Plan elements of the District's Watershed Management Program (WMP) for the Alligator Creek Watershed (ACWMP). The watershed covers an area of approximately 9 square miles and is located in Clearwater, and Pinellas County. The District and the City cooperatively funded the 1997 ACWMP and many of the recommended projects.

The revisions to the ACWMP will include developing projects to reduce flooding, increase water quality and improving natural systems. The revised model will be in a District approved format that can be imported into newer versions as software progresses. In addition the information from implemented projects will be included, existing data will be verified, the

modeling data will be formatted to District Standards and the FEMA maps will be revised to reflect the existing conditions flooding risk. The City of Clearwater is requesting that the Pinellas-Anclote River Basin Board provide $300,000 from its fiscal year FY2009 budget for the revision to the ACWMP.

Project G.11 Stevenson Creek Watershed Plan Update

This is a project to perform the 1) Topographic Information, 2) Watershed Evaluation, and 3) Watershed Management Plan elements of the District's Watershed Management Program (WMP) for the Stevenson Creek Watershed. The watershed covers an area of approximately 6,286 acres and is located in Pinellas County. Of the 6,286 acres, 4,057 acres (65 percent) are within the limits of the City of Clearwater. The remaining 35 percent of the watershed are within the City of Dunedin (1,287 acres or 20%), unincorporated Pinellas County (859 acres or 14%) and the City of Largo (83 acres or about 1%).

The District and the City cooperatively funded the Stevenson Creek Watershed Management Plan (SCWMP) Federal Emergency Management Agency (FEMA) Map Revision Data Report in October 2001and many of the recommended projects.

The revisions to the SCWMP will include developing projects to reduce flooding, increase water quality and improving natural systems. The revised model will be in a District approved format that can be imported into newer versions as software progresses. In addition, the information from implemented projects will be included, existing data will be verified, the modeling data will be formatted to District Standards, and the FEMA maps will be revised to reflect the existing conditions flooding risk. The City of Clearwater is requesting that the Pinellas-Anclote River Basin Board provide $375,000 from its fiscal year FY2009 budget for the revision to the SCWMP

Implementation of Mitigation Activities

The City of Clearwater Engineering and Public Service Departments are the main entities in charge of implementing and managing the projects and activities that mitigate the effects of flooding. The work force is comprised of 40 staff members that are separated into two divisions. The Engineering Stormwater Management Division consists of eight employees and is responsible for project planning, project prioritization, project design, regulatory compliance and private development plan review. The Public Services Department consists of 32 employees and is responsible for street sweeping, pond and ditch maintenance, storm collection maintenance and

repair and infrastructure inspection. The Engineering Stormwater Management Division has an annual operating budget of approximately $1.3 million and manages approximately $8 million per year in capital improvement projects.

The City created the Capital Improvement Stormwater Management Committee (CISMC). The CISMC, comprised of City representatives from the Engineering and Public Service Departments, regularly convenes to discuss various issues related to stormwater policy and to address any deficiencies in the City's Stormwater Management system.

Appendix K contains the list of projects identified by the CISMC. The list provides the priority of the project established by the committee, with 1.0 being the highest priority; the Engineering Department staff member selected as project manager; the project classification type; project location; location's problem; total cost of project; and the project status. In addition to existing projects, this list also provides the projects that have been completed since the last floodplain document was approved. As all of the stormwater management projects listed are approved capital improvement projects, funding has already been identified by City Council.

The following table provides an implementation schedule for the activities identified through this Plan. The table includes the project name and reference number provided in the "Identification and Analysis of Mitigation Measures" section; the department responsible for implementing the activity; a timetable for completion; and the current priority of the activity. All of these projects will be funded through the operating budget of the identified department. Capital improvements to the City's Stormwater management systems identified are included in the above table and will not be repeated.

Activity	Department	Timetable	Priority
Preventive			
1. Participate in the Pinellas County Local Mitigation Strategy	Planning and Engineering	Annually	High
2. Assist with FEMA's Project Impact Program	Planning and Engineering	Ongoing	High
3. Pursue the acquisition of flood prone land	Engineering	Ongoing	Low
4. Support implementation of TBEP's CCMP	Engineering	Ongoing	High
5. Re-evaluate the goals and activities of the Floodplain Management Plan	City wide	Annually	High
Property Protection			
1. Assist with Project Impact homeowner's mitigation grant program	Engineering	Ongoing	High
2. Provide substantial improvement information	Development Services	Ongoing	Medium

3. Provide flood proofing information	Development Services	Ongoing	Medium
4. Maintain flood complaint handling process	Engineering	Ongoing	Low
Natural Resource Protection			
1. Maintain, protect and manage the City's natural areas	Park and Recreation	Ongoing	Medium
2. Continue support of the USACOE's Stevenson Creek Estuary Restoration Project	Engineering	Ongoing	Low
Emergency Services			
1. Update the Emergency Operations Plan	City wide	Ongoing	High
Public Information			
1. Utilize C-View to provide information	Public Relations	Ongoing	Medium
2. Flood information in City publication and advertisements	Public Relations	Annually	Medium
3. Continued coordination with flood prone neighborhoods	City wide	Annually	High
4. Distribute updated information to Library	Engineering and Building	As Needed	High
5. Provide information to disaster guides	Public Relations and Engineering	As Needed	Medium
6. Coordinate information with Verizon	Public Relations	As Needed	Low
7. Provide additional flood information on website	IT, Engineering and Public Relations	Ongoing	High

High priority activities identified though the implementation schedule that are not currently in affect, will be implemented using the operating budget of the identified City department. Any goals and activities not immediately implemented will be re-evaluated during the annual evaluation of the *Plan.*

SECTION 5.0 PLAN MAINTENANCE

Monitoring, Evaluating and Updating the Plan

In 2009, the City created a Floodplain Management Planning Committee (FMPC) to review and update the floodplain management activities identified in the *Plan*. The FMPC was formed to complete this 2009 update and will continue to be responsible for the review and implementation of the *Plan*. The FMPC consists of the CRS coordinator, representatives from Engineering, Planning, and Public Service Departments.

The FMPC will be responsible for organizing the annual meeting. The meeting

will be held in June of each year and committee members will be responsible for monitoring and evaluating the progress of the mitigation strategies in the *Plan*.

The City will review each goal and objective to determine their relevance to changing situations in the City, as well as changes in County, State or Federal policy to ensure that the *Plan* addresses current and expected conditions. The committee will also review the risk assessment portion of the *Plan* to determine if this information should be updated or modified. The parties responsible for the various implementation actions will report on the status of their projects and will include reports on which processes worked well, any difficulties encountered, how coordination efforts were proceeding and which strategies should be revised.

The FMPC will then have three months to update and modify the *Plan* before submitting it to the CRS Coordinator. If no changes are necessary, the CRS Coordinator will be given a justification for this determination. Updates will be provided with the annual CRS re-certification.

Implementation through Existing Programs

The City of Clearwater currently utilizes comprehensive land use planning, capital improvements planning and building codes to guide and regulate development in the City. After the adoption of the *Floodplain Management Plan*, the City will use this document to continue to address flood hazards in its *Comprehensive Plan* and land use regulations. The City's Planning and Development Department will conduct periodic reviews of the *Comprehensive Plan* and land use policies, analyze any plan amendments and implement these requirements. The capital improvement planning that occurs in the future will also contribute to the goals of the *Floodplain Management Plan*.

The City's Planning and Development Department is responsible for administering the building code throughout the City. After the adoption of the *Floodplain Management Plan Update*, the Planning and Development Department will work with the State Building Code Office to ensure that the City enforces the new building code. This is to ensure that all new construction in the City meets the identified requirements to limit the effects of flooding.

The Engineering Department is responsible for project planning, project prioritization, project design, regulatory compliance and private development plan review. The FMPC and the CISMC are comprised of City representatives from the Engineering and Public Service Departments. These committees will continue to discuss issues related to stormwater policy and address any deficiencies in the City's Stormwater Management system.

Copies of the City's *Floodplain Management Plan* will be catalogued and kept on hand at all branches of the City's public library. The existence and location of these copies will be publicized. In addition, copies of the *Plan* and any proposed changes will be posted on the City's Government website. This site will also contain contact information and direction on where to submit comments or concerns. The annual review meeting of the FMPC will be publicized in the newspaper and will be open to the public. The meeting will provide the public a forum for which they can express concerns, opinions or ideas about the *Plan*. The Engineering Department will publicize, host and mediate this meeting.

References

"Alligator Creek Watershed Management Plan", City of Clearwater, July 1999, & Update 2005

"Clearwater Comprehensive Plan", City of Clearwater, July 2001.

"CRS Coordinator's Manual", Federal Emergency Management Agency, National Flood Insurance Program, Community Rating System, February 2002.

"Erosion and Siltation Control Policy", City of Clearwater, April 2003.

"Example Plans", Federal Emergency Management Agency, National Flood Insurance Program, Community Rating System, March 2003.

"Flood Insurance Rate Maps, City of Clearwater, Community Number 125096", Federal Emergency Management Agency, National Flood Insurance Program, October 2003.

"Flood Insurance Study, City of Clearwater", Federal Emergency Management Agency, August 1991.

"Floodplain Management Plan", City of Clearwater, September 2001.

"Pinellas County Local Mitigation Strategy", Tampa Bay Regional Planning Council, December 2003.

"The Local Mitigation Strategy: A Guidebook for Cities and Counties", Florida Department of Community Affairs, January 1999.

"NO ADVERSE IMPACT: A Toolkit For Common Sense Floodplain Management", Association of State Floodplain Managers, September 2003.

"Repetitive Loss Detail by Community Report", Federal Emergency Management Agency, National Flood Insurance Program, Community Rating System, July 31, 2003.

"STATE AND LOCAL MITIGATION PLANNING how-to-guide: ***Getting Started****",* Federal Emergency Management Agency, September 2002.

"STATE AND LOCAL MITIGATION PLANNING how-to-guide: ***Developing the Mitigation Plan****",* Federal Emergency Management Agency, April 2003.

"STATE AND LOCAL MITIGATION PLANNING how-to-guide: ***Understanding Your Risks****",* Federal Emergency Management Agency, August 2001.

"*State and Local Plan Criteria Under the Disaster Mitigation Act of 2000"*, Federal Emergency Management Agency, July, 2002.

"Stevenson Creek Watershed Management Plan", City of Clearwater, October 2001.

"Stormwater Management Design Criteria", City of Clearwater, July 2001.

On-line Resources

Association of State Floodplain Managers,
http://www.floods.org/home/default.asp

Pinellas County Property Appraiser's Office,
http://www.pcpao.org/

Climatic Diagnostics Center, http://www.cdc.noaa.gov/index.html

Department of Community Affairs, Bureau of Recovery and Mitigation,
http://www.floridadisaster.org/brm/

Emergency Management Institute, Community Rating System Resource Center,
http://training.fema.gov/EMIWeb/CRS/index.htm

Federal Emergency Management Agency, http://www.fema.gov/

Federal Emergency Management Agency, Map Service Center,
http://www.msc.fema.gov/

Florida Division of Emergency Management, http://www.floridadisaster.org/

National Climatic Data Center, http://www.ncdc.noaa.gov/oa/ncdc.html

National Oceanic and Atmospheric Administration,
http://www.noaa.gov/floods.html

Pinellas County Emergency Management,
http://www.pinellascounty.org/emergency/default.htm

Tampa Bay Regional Planning Council Emergency Management Program,
http://www.tampabaydisaster.org/

US Census Bureau, http://www.census.gov/

US Army Corps of Engineers, http://www.usace.army.mil/

Appendix A
Resolution 09-37
Adopting the Floodplain Management Plan

RESOLUTION NO. 09-37

A RESOLUTION ADOPTING THE FLOODPLAIN MANAGEMENT PLAN: TRANSMITTING THE PLAN TO THE FEDERAL EMERGENCY MANAGEMENT AGENCY AS REQUIRED BY THE NATIONAL FLOOD INSURANCE PROGRAM'S COMMUNITY RATING SYSTEM; AUTHORIZING THE CITY MANAGER TO INITIATE ACTIVITIES AS RECOMMENDED IN THE FLOODPLAIN MANAGEMENT PLAN; AND PROVIDING AN EFFECTIVE DATE.

WHEREAS, the National Flood Insurance Program (NFIP) provides federally supported flood insurance in communities that regulate development in their floodplains, and the Community Rating System (CRS) reduces flood insurance premiums in those communities that do more than implement the minimum regulatory requirements; and,

WHEREAS, the City of Clearwater is required to update the Floodplain Management Plan in order to continue to receive CRS credits for this document; and

WHEREAS, the City Council adopted Floodplain Management Plans in 2000 and 2004, which updated the Repetitive Loss Plan adopted on December 11, 1991; and

WHEREAS, the Floodplain Management Plan updates the 2004 Floodplain Management Plan in compliance with the 2007 CRS Coordinators Manual; and

WHEREAS, the Floodplain Management Plan as amended is consistent with the Clearwater's adopted Comprehensive Plan; and

WHEREAS, adopting the Floodplain Management Plan will provide the citizens of Clearwater access to the Flood Hazard Mitigation Assistance program funds; and

WHEREAS, various City projects, programs, operations and initiatives in the Plan may lower flood insurance rates for the City residents; now, therefore

BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF CLEARWATER, FLORIDA:

Section 1. The Floodplain Management Plan as amended and attached hereto is adopted.

Section 2. The Floodplain Management Plan shall be transmitted to the Federal

Emergency Management Agency for appropriate action as required under the National Flood Insurance Program's Community Rating System.

Section 3. The City Manger is authorized to initiate activities as recommended in the Floodplain Management Plan.

Section 4. This resolution shall take effect immediately upon adoption.

PASSED AND ADOPTED this 17th day of September, 2009.

_____
Frank V. Hibbard
Mayor

Approved as to form:

_____
Leslie K. Dougall-Sides
City Attorney

Attest:

_____
Cynthia E. Goudeau
City Clerk

Appendix B
FMPC Meeting Minutes

2009 Floodplain Management Plan

Kick Off Meeting Minutes

March 3, 2009 - MSB 221
Attendees:

Allison McKinney	CRS Coordinator – Engineering / Stormwater
Elliot Shoberg	Engineering Stormwater Manager
Ozell George	Public Services Supervisor II
Catherine Lee	Planner II
Scott Rice	Engineering Assistant Director
Heather Shell	Public Communication
James Hersh	Engineering / GIS
Jack Fahey	Plans Examiner - Dev & Neighbor Services
Muhammad Abdur-Rahim	Stormwater Maintenance Manager

The meeting began with introductions. The purpose of the meeting was to discuss updating the existing Floodplain Management Plan (FMP).

Allison began the meeting be describing the NFIP CRS program and explained that residents can obtain flood insurance & obtain a discount because the City participates. The City had a cycle visit in 2008 and one of the requirements to complete the verification visit is to provide the update to the FMP. The schedule to complete the Plan presented. The Plan must be adopted by City Council by October 1, 2009.

The specific sections of the Plan that would be updated were reviewed and discussed. Each department that would need to provide the updated information was determined as follows:

- Planning is responsible for the Community Development Code – Chapter 51 Flood Damage Prevention and Catherine will provide the most recent version of the document.
- Planning is responsible for Community Development Code, Art. 4, Div. 13, Land Clearing and Grubbing and Catherine will provide the most recent version of the document.
- Planning is also responsible for the Clearwater Comprehensive Plan. The Stormwater Sub-element should be included in the FMP policy section.
- Catherine will provide the current version of the comp plan and indicate the policy numbers that deal with stormwater and should be included.

The planning department verified that review of the EAR was completed in 2006. Catherine will provide the current version of the document and will use this

The Planning department will provide the current application for Non-Substantial Damage/Improvement Review.

Each of the following sections were discussed in detail.

- Population & Land Use (pg 1, 5, 9) – Planning will provide updated information
- Housing and Development (pg 9) – GIS will provide updated data
- Development Constraints (pg 10) – No changes will be made
- Population in Flood Insurance Zones & Hurricane Evacuation Levels (pg 14) – GIS will provide updated data
- Special Facilities Populations (pg 15) – GIS will provide updated data
- Annexation Areas (pg 19) – Planning will provide updated data
- Critical Facilities in City & Replacement Cost (pg 20) – GIS will provide updated data
- Critical Facilities in Floodplain & Replacement Cost (pg 20) –GIS will provide updated data –Replacement cost was not going to be included in this update

At the next progress meeting additional sections would be discussed in detail. Information from capital improvement project lists would be used to evaluate the implementation of the 2004 plan activities.

GIS will provide all of the following figures:

Figure 1	City Service Area and FEMA Flood Zones
Figure 2	SWFWMD Drainage Basins
Figure 3	Drainage Basins inside the City Service Area
Figure 4	City Zoning Map
Figure 5	Future Land Use Map
Figure 6	Elevation Contours
Figure 7	Flood Insurance Zones, FEMA 2005
Figure 8	Water bodies – Creeks, Lakes & Ponds
Figure 9	Hurricane Evacuation Levels
Figure 10	Hurricane Storm Surge Areas
Figure 11	Special Needs Facilities
Figure 12	Repetitive Loss Property Locations
Figure 13	Critical Facilities
Figure 14	Sanitary Sewer Facilities
Figure 15	Natural Gas Infrastructure
Figure 16	Public and Private School Facilities

Please review and provide updated information by 4/10/2009.
Please provide all information and maps to Allison by 4/10/2009.

2009 Floodplain Management Plan
Progress Meeting Minutes

March 30, 2009 - MSB 227
Attendees:

Allison McKinney	CRS Coordinator – Engineering / Stormwater
Catherine Lee	Planner II
James Hersh	Engineering / GIS

The purpose of this meeting was to discuss and review the technical data in the plan. Each major section of the report was reviewed and progress to date was discussed.

Catherine mentioned that she was not sure what source to use to update the Housing and Development information under Risk Assessment. The US Census gives much higher figures for housing unites than does past City documents (EAR ad Sub-Area Trend Analysis reports). It was decided to use the Pinellas County Property Appraiser information to report and categorize the number of parcels and the structures in the City and in the floodplain. It was also decided to provide the estimated improved value for the parcels.

All data regarding the floodplain would come from GIS analysis.

Catherine reported that there are approximately 1,210 acres of unincorporated county land located within the City's planning area, most of which are developed.

Special facilities population refers to the percent of residents over 60 years of age.

The Community Development Code – Chapter 51 Flood Damage Prevention has not changed.

The Community Development Code – Article 4, Division 13, Land Clearing and Grubbing has not changed.

Catherine stated that the Clearwater Comprehensive Plan has been updated and approved. She indicated the policies from the comp plan and the stormwater element that should be updated in the plan.

Catherine provided updated population, land use, population growth and current population density. She also provided updates for the development

constraints section.

The CRS coordinator has reviewed the hazard mitigation strategy section and provided applicable updates.

The new floodplain management planning committee that was created will perform plan maintenance. This process will be described in the plan.

The CRS coordinator has updated the CIP list and the stormwater management project descriptions. This information has been added to the plan.

Jim will continue to work with Allison directly to update the figures and GIS data.

Appendix C
Flood Protection Questionnaire

City of Clearwater Floodplain Management Plan – 2009 Update
Flood Protection Questionnaire

Property address:_____ Years living at this address:____

1. Has your home or property ever been flooded or had a water problem ( ) yes( ) no
   If "yes", please complete the entire questionnaire. If "no", please complete questions 6-11.

2. In what years did the flood occur, and was it due to a named hurricane or tropical storm? If so, please provide the name of the storm(s).
   _____

3. Where did you get water and how deep did it get? (In feet)
   ( ) In crawl space: _____deep ( ) In yard only: _____deep
   ( ) Over first floor: _____deep
   ( ) Water kept out of house by sandbagging or other protective measure

4. What do you feel was the cause of your flooding? Check all that apply to your situation
   ( ) Storm sewer backup ( ) Sanitary sewer backup
   ( ) Sump pump failure/power failure ( ) Standing water next to house
   ( ) Extreme high tide
   ( ) Overbank flooding from _____Creek/Lake/Intercoastal/Gulf
   ( )Other_____

5. Have you installed any flood protection measures on your property?
   ( ) Sump pump ( ) Gutters
   ( ) Waterproof walls ( ) Regraded yard to keep water away from building
   ( ) Other
   _____

6. Are there any areas in your neighborhood (streets, yards, vacant lots, etc.) that consistently get flooded during periods of heavy rain?
   If yes, please describe the location of the areas by using intersections or street addresses.
   _____

7. What type of foundation does your building have?
   ( ) Slab ( ) Crawlspace

8. Do you have flood insurance with your homeowner's insurance?
   ( ) Yes ( ) No

9. Have you ever received information on how to protect your family and home from flooding?
   ( ) Yes ( ) No

10. If yes, how recently?
    ( ) Within the last year ( ) Between 1 and 2 years ( ) Between 2 and 5 years ( ) 5 years or more

11. From whom did you **last** receive information from about safeguarding your family and home from flooding?
    ( ) News Media ( ) Insurance agent ( ) Other non-profit agency
    ( ) City of Clearwater ( ) Utility company ( ) Not sure
    ( ) Other government agency ( ) American Red Cross ( ) Other

Please include any additional comments you may have about flooding in your area.

_____
_____
_____

City of Clearwater – Engineering Department 100 South Myrtle Avenue, #220 Clearwater, Florida 33756-5520

Appendix D

Community Development Code, CH 51 – Flood Damage Prevention

Community Development Code, CH 51 – Flood Damage Prevention

***Cross references:** Buildings and building regulations, ch. 47; minimum floor elevation for buildings constructed after February 3, 1975, § 47.011; restoration of electrical service to flooded structures, § 47.012.

Article I. In General
Sec. 51.01. Findings of fact.
Sec. 51.02. Purpose of chapter.
Sec. 51.03. Definitions.
Sec. 51.04. Interpretation of chapter.
Sec. 51.05. Warning and disclaimer of liability.
Sec. 51.06. Penalties for violation of chapter.
Sec. 51.07. Lands to which this chapter applies.
Sec. 51.08. Adoption of maps and study.
Sec. 51.09. Development permit required.
Sec. 51.10. Administration, permit procedures, duties of building official.
Sec. 51.11. Variances from chapter.
Article II. Flood Hazard Reduction
Sec. 51.31. General standards.
Sec. 51.32. Specific standards.
Sec. 51.33. Streams without established base flood elevations or floodways.
Sec. 51.34. Subdivision proposals.
Sec. 51.35. Areas of shallow flooding (AO zones).

ARTICLE I. IN GENERAL

Sec. 51.01. Findings of fact.

The city commission finds and declares that:

(1) The flood hazard areas of the city are subject to periodic inundation which results in loss of life and property, health and safety hazards, disruption of commerce and governmental services, extraordinary public expenditures for flood protection and relief, and impairment of the tax base, all of which adversely affect the public health, safety and general welfare; and

(2) These flood losses are caused by the cumulative effect of obstructions in floodplains causing increases in flood heights and velocities, and by the occupancy in flood hazard areas by uses vulnerable to floods or hazardous to other lands which are inadequately elevated, floodproofed, or otherwise unprotected from flood damages.

(Code 1980, § 146.002)

Sec. 51.02. Purpose of chapter.

It is the purpose of this chapter to promote the public health, safety and general welfare and to minimize public and private losses due to flood conditions in specific areas by provisions designed to:

(1) Restrict or prohibit uses which are dangerous to health, safety and property due to water or erosion hazards, or which result in damaging increases in erosion or in flood heights or velocities;

(2) Require that uses vulnerable to floods, including facilities which serve such uses, be

protected against flood damage at the time of initial construction;
(3) Control the alteration of natural floodplains, stream channels and natural protective barriers which are involved in the accommodation of floodwaters;
(4) Control filling, grading, dredging and other development which may increase erosion or flood damage; and
(5) Prevent or regulate the construction of flood barriers which may unnaturally divert floodwaters or which may increase flood hazards to other lands.
(Code 1980, § 146.003)

Sec. 51.03. Definitions.
The following words, terms and phrases, when used in this chapter, shall have the meanings ascribed to them in this section, except where the context clearly indicates a different meaning:
Addition (to an existing building) means any walled and roofed expansion to the perimeter of a building in which the addition is connected by a common loadbearing wall other than a firewall. Any walled and roofed addition which is connected by a firewall or is separated by independent perimeter loadbearing walls is new construction.
Appeal means a request for a review of the building official's interpretation of any provision of this chapter or a request for a variance.
Area of shallow flooding means a designated AO or VO zone on the flood insurance rate map (FIRM) with base flood depths from one to three feet where a clearly defined channel does not exist, where the path of flooding is unpredictable and indeterminate, and where velocity flow may be evident.
Area of special flood hazard means the land in the floodplain within the city subject to a one percent or greater chance of flooding in any given year. The area may be designated on the FHBM as zone A. After detailed ratemaking has been completed in preparation for publication of the FIRM, zone A is usually refined into zones A, AO, A1-99, VO and V1-30.
Base flood means the flood having a one percent chance of being equaled or exceeded in any given year.
Base flood elevation and *BFE* mean the elevation above mean sea level as shown in the Flood Insurance Study.
Basement means that portion of a building having its floor subgrade, i.e., below ground level, on all sides.
Breakaway wall means a wall that is not part of the structural support of the building and is intended through its design and construction to collapse under specific lateral loading forces without causing damage to the elevated portion of the building or the supporting foundation system.
Building means any structure built for support, shelter or enclosure for any occupancy or storage.
Building official means the building official of the city within the meaning of the building code adopted for enforcement within the city.
City engineer means the city engineer of the city.
Coastal high hazard area means the area subject to high velocity waters, including but not limited to hurricane wave wash. The area may be designated on a FIRM as zone V1-

30, VE or V.

Development means any manmade change to improved or unimproved real property, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavating, drilling or storage of materials.

Elevated building means a nonbasement building built to have the lowest floor elevated above the ground level by means of fill, solid foundation, perimeter walls, pilings, columns, posts, piers, shear walls or breakaway walls.

Elevation means elevation in relation to mean sea level.

Existing manufactured home park or subdivision means a manufactured home park or subdivision for which the construction of facilities for servicing the lots on which the manufactured homes are to be affixed, including at a minimum the installation of utilities, the construction of streets, and either final site grading or the pouring of concrete pads, was completed before December 31, 1974.

Expansion to an existing manufactured home park or subdivision means the preparation of additional sites by the construction of facilities for servicing the lots on which the manufactured homes are to be affixed, including the installation of utilities, the construction of streets, and either final site grading or the pouring of concrete pads.

Flood and *flooding* mean a general and temporary condition of partial or complete inundation of normally dry land areas from the overflow of inland or tidal waters or from the unusual and rapid accumulation or runoff of surface waters from any source.

Flood hazard boundary map and *FHBM* mean an official map of the city, issued by the Federal Emergency Management Agency, where the boundaries of the areas of special flood hazard have been defined as zone A.

Flood insurance rate map and *FIRM* mean an official map of the city on which the Federal Emergency Management Agency has delineated both the areas of special flood hazard and the applicable risk premium zones.

Flood insurance study means the official report provided by the Federal Emergency Management Agency which contains profiles, the flood boundary floodway map and the water surface elevation of the base flood.

Floodway means the channel of a river or other water course and the adjacent land areas that must be reserved in order to discharge the base flood without increasing the water surface elevation by a designated height of one foot.

Floor means the top surface of an enclosed area in a building (including basement), e.g., top of slab in concrete slab construction or top of wood flooring in wood frame construction. The term does not include the floor of a garage used solely for parking vehicles.

Functionally dependent facility means a facility which cannot be used for its intended purpose unless it is located or carried out in close proximity to water, such as but not limited to a boat docking or port facility, shipbuilding, or ship repair . The term does not include long term storage, manufacture, sales or service facilities.

Habitable floor means any floor usable for living purposes, including working, eating, sleeping, cooking or recreation, or a combination thereof, such as but not limited to bedrooms, living rooms, laundry rooms, bathrooms, workshops, dens and studies. The term does not include a floor used only for storage or vehicle parking purposes.

Highest adjacent grade means the highest natural elevation of the ground surface, prior

to construction, next to the proposed walls of a structure.
Lowest floor means the lowest floor of the lowest enclosed area (including a basement). An unfinished or flood resistant enclosure, usable solely for parking of vehicles, building access or storage in an area other than a basement area is not considered a building's lowest floor, provided that such enclosure is not built so as to render the structure in violation of the applicable nonelevation design requirements.
Mangrove stand means an assemblage of mangrove trees which is mostly low trees noted for a copious development of interlacing adventitious roots above the ground and which contain one or more of the following species: black mangrove (Avicennia nitida); red mangrove (Rhizophora mangle); white mangrove (Languncularia racemosa); and buttonwood (Conocarpus erecta).
Manufactured home means a structure, transportable in one or more sections, which is built on a permanent chassis and designed to be used with or without a permanent foundation when connected to the required utilities. The term "manufactured home" does not include a recreational vehicle.
Manufactured home park or subdivision means a parcel or contiguous parcels of land divided into two or more lots for rent or sale as manufactured home sites.
Market value of the structure means the appraised value of the structure, not including land, driveways, sidewalks, landscaping, swimming pools and other similar improvements not related to the basic structure, prior to the start of repair or improvement or, in the case of damage, prior to the damage occurring.
Mean sea level means the average height of the sea for all stages of the tide. It is used as reference for establishing various elevations within the floodplains. For purposes of this chapter, the term is synonymous with National Geodetic Vertical Datum (NGVD).
New construction means structures for which the start of construction commenced on or after December 31, 1974.
New manufactured home park or subdivision means a manufactured home park or subdivision for which the construction of facilities for servicing the lots on which the manufactured homes are to be affixed, including at a minimum the installation of utilities, the site grading or the pouring of concrete pads, is completed on or after December 31, 1974.
Nonconforming structure means a structure in any area of special flood hazard within the city which is not elevated or floodproofed to National Flood Insurance Program standards, as set forth in 44 CFR 59 and 60.
North American Vertical Datum and *NAVD,* as corrected in 2003, mean a vertical control used as a reference for establishing varying elevations within the floodplain.
Ready for highway use, as applied to a recreational vehicle, means that the recreational vehicle is on its wheels or jacking system, is attached to the site only by quick disconnect type of utilities and security devices, and has no permanently attached additions.
Recreational vehicle means a vehicle which is built on a single chassis, 400 square feet or less when measured at the largest horizontal projection, designed to be self-propelled or permanently towable by a light duty truck, and designed primarily not for use as a permanent dwelling but as temporary living quarters for recreational, camping, travel or seasonal use.
Sand dunes means naturally occurring accumulations of sand in ridges or mounds

landward of the high-water line on the beach.
Start of construction, for other than new construction or substantial improvements under the Coastal Barrier Resources Act (P. L. 97-348), means substantial improvement, and means the date the building permit was issued, provided the actual start of construction, repair, reconstruction or improvement was within 180 days of the permit date. The actual start of construction means the first placement of permanent construction of a structure on a site, such as the pouring of slabs or footings, installation of piles, construction of columns, or any work beyond the stage of excavation or the placement of a manufactured home on a foundation. Permanent construction does not include land preparation, such as clearing, grading and filling; installation of streets or walkways; excavation for a basement, footings, piers or foundations or the erection of temporary forms; or the installation on the property of accessory buildings, such as garages or sheds not occupied as dwelling units or not part of the main structure.
Structure means a walled and roofed building that is principally above ground, a manufactured home, or a gas or liquid storage tank.
Substantial damage means damage of any origin sustained by a structure whereby the cost of restoring the structure to its before damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred.
Substantial improvement means with respect to any property located in an area of special flood hazard reconstruction, rehabilitation, addition or other improvement of a structure during a one-year period, the cost of which equals or exceeds 50 percent of the market value of the structure before the start of construction of the improvement.
For the purposes of this definition, construction is considered to have started when the first alteration of any wall, ceiling, floor or other structural part of the building commences, whether or not that alteration affects the external dimensions of the structure. The term includes structures which have incurred substantial damage, regardless of the actual repair work performed. The term does not, however, include any project for improvement of a structure to correct existing violations of health, sanitary or safety code specifications which have been identified by the building official and which are the minimum necessary to ensure safe living conditions. The term does not include any alteration of a structure listed on the National Register of Historic Places or the state inventory of historic places, provided that the alteration will not preclude the structure's continued designation as a historic structure on such National Register or state inventory.
Variance means a grant of relief from the requirements of this chapter which permits construction in a manner otherwise prohibited by this chapter where specific enforcement would result in unnecessary and exceptional hardship.
(Code 1980, § 146.004; Ord. No. 5124, § 1, 9-5-91; Ord. No. 5265, § 1, 9-17-92; Ord. No. 6987-02, § 1, 6-6-02; Ord. No. 7213-03, § 1, 11-20-03)

Sec. 51.04. Interpretation of chapter.
In the interpretation and application of this chapter all provisions shall be considered as minimum requirements and deemed neither to limit nor repeal any other powers granted under state laws.
(Code 1980, § 146.11)

Sec. 51.05. Warning and disclaimer of liability.
The degree of flood protection required by this chapter is considered reasonable for regulatory purposes and is based upon scientific and engineering considerations. Larger floods can and will occur on rare occasions. Flood heights may be increased by manmade or natural causes. This chapter does not imply that land outside the areas of special flood hazard or uses permitted within such areas will be free from flooding or flood damages. This chapter shall not be deemed to create liability on the part of the city or any officer or employee thereof for any flood damages that may result notwithstanding reliance on this chapter or any administrative decision made thereunder.
(Code 1980, § 146.12)

Sec. 51.06. Penalties for violation of chapter.
A failure to comply with the provisions of this chapter or any of its requirements, including conditions and safeguards established in connection with grants of variances, shall constitute a violation. Any person who violates this chapter or fails to comply with any of its requirements shall, upon a finding of such violation, be fined not more than $500.00. Each day a violation continues shall be considered a separate offense. Nothing contained in this section shall prevent the city from taking such other lawful action as is necessary to prevent or remedy any violation.
(Code 1980, § 146.13)

Sec. 51.07. Lands to which this chapter applies.
This chapter shall apply to all areas of special flood hazard within the city.
(Code 1980, § 146.005)

Sec. 51.08. Adoption of maps and study.
Federal Emergency Management Agency maps entitled "Flood Insurance Rate Map and Floodway", and the accompanying study entitled "Flood Insurance Study -Clearwater", all effective September 3, 2003, and any subsequent revisions, shall be used to provide the database for this chapter.
(Code 1980, § 146.001; Ord. No. 7182-03, § 1, 8-21-03; Ord. No. 7213-03, § 1, 11-20-03)

Sec. 51.09. Development permit required.
(1) A development permit shall be required in conformance with the provisions of this chapter prior to the commencement of any development activities.
(2) No structure or land shall be located, extended, converted or structurally altered without full compliance with the terms of this chapter and other applicable regulations.
(Code 1980, § 146.006)

Sec. 51.10. Administration, permit procedures, duties of building official.
(1) *Designation of building official.* The building official is hereby appointed to administer and implement the provisions of this chapter.
(2) *Permit procedures.* An application for a development permit shall be made to the building official on forms furnished by him prior to any development activities, and shall

include but not be limited to plans drawn to scale showing the nature, location, dimensions and elevations of the property; existing or proposed structures; fill; storage of materials; drainage facilities; and the location of the foregoing. Specifically, the following information is required:

(a) *Application stage.*

1. Elevation of the proposed lowest floor, including basement, of all structures.
2. Elevation to which any nonresidential structure will be floodproofed.
3. Certificate from a state registered professional engineer or architect that the nonresidential floodproofed structure will meet the floodproofing criteria in section 51.32(2).
4. Description of the extent to which any watercourse will be altered or relocated as a result of proposed development.
5. For all additions to or alterations of any structure, an appraisal of the market value of the structure from an MAI (Member, Appraisal Institute) or SRPA (Senior Real Estate Appraiser) designated appraiser may be provided, along with information showing all costs involved in the proposed work, including but not limited to materials and labor. If an appraisal is not provided, then the appraisal of the value of the structure as determined by the county property appraiser will be used.
6. For all additions to or alterations of any nonconforming structure, information showing all of the costs of the proposed work shall be provided to the building official.
7. Elevation certificate of the property showing lowest floor and grade elevations duly certified by a state registered land surveyor.

(b) *Construction stage.* Provide a floor elevation or floodproofing certification after the lowest floor is completed, or, in instances where the structure is subject to the regulations applicable to coastal high hazard areas, after placement of the horizontal structural members of the lowest floor. Upon placement of the lowest floor or floodproofing by whatever construction means, or upon placement of the horizontal structural members of the lowest floor, whichever is applicable, it shall be the duty of the permit holder to submit to the building official a certificate of the elevation of the lowest floor, floodproofed elevation, or the elevation of the lowest portion of the horizontal structural members of the lowest floor, whichever is applicable, as built, in relation to mean sea level. The certification shall be prepared by or under the supervision of a state registered land surveyor or, when floodproofing is utilized for a particular building, the certification shall be prepared by or under the supervision of a state registered professional engineer or architect, and shall be certified and sealed. Any work undertaken prior to submission of the certification shall be at the permit holder's risk. The building official shall review the floor elevation survey data submitted. Deficiencies detected by such review shall be corrected by the permit holder immediately and prior to further progressive work being permitted to proceed. Failure to submit the certification or failure to make the corrections required hereby shall be cause to issue a stop work order for the project.

(3) *Duties of the building official.* The duties of the building official shall include but not be limited to:

(a) Reviewing all development permit applications to ensure that the permit requirements of this chapter have been satisfied;

(b) Advising applicants that additional federal or state permits may be required and, if

specific federal or state permit requirements are known, requiring that copies of such permits are provided and maintained on file with the development permit;
(c) Notifying adjacent communities and the state assistance office for the National Flood Insurance Program prior to any alteration or relocation of a watercourse, and submitting evidence of such notification to the Federal Emergency Management Agency;
(d) Ensuring that maintenance is provided within the altered or relocated portion of a watercourse so that the flood-carrying capacity is not diminished;
(e) Obtaining a certification of the actual elevation of the lowest floor, including the basement, of all new or substantially improved structures, when certification is required;
(f) Obtaining a certification of the actual elevation to which the new or substantially improved structures have been floodproofed, when certification is required;
(g) For coastal high hazard areas, obtaining a certification from a state registered professional engineer or architect that the structure is designed to be securely anchored to adequately anchored pilings or columns in order to withstand velocity waters and hurricane wave wash;
(h) For coastal high hazard areas, reviewing plans for adequacy of breakaway walls in accordance with section 51.32(5);
(i) When floodproofing is utilized for a particular structure, obtaining a certification from a state registered professional engineer or architect, when certification is required;
(j) Making any interpretations which may be needed as to the exact location of boundaries of the areas of special flood hazard, for example, where there appears to be a conflict between a mapped boundary and actual field conditions;
(k) Obtaining, reviewing and reasonably utilizing any base flood elevation and floodway data available from a federal, state or other source whenever base flood elevation data or floodway data have not been provided as required;
(l) Maintaining all records pertaining to the administration of the provisions of this chapter;
(m) Promulgating administrative policies and procedures for determining eligible and ineligible costs for construction or renovation of a structure in the floodplain, consistent with this chapter and applicable state and federal law. Such administrative policies and procedures shall be issued before February 1, 1990, and may be amended from time to time thereafter as circumstances require. Copies thereof shall be provided without cost to all applicants for building permits in any area of special flood hazard within the city. A current copy shall be conspicuously posted in a public area of the building official's office and a current copy shall also be filed in the office of the city clerk.
(Code 1980, § 146.007)

Sec. 51.11. Variances from chapter.
(1) The building/flood board of adjustment and appeals shall hear and decide appeals from decisions of the building official pursuant to this chapter and requests for variances from the requirements of this chapter. A decision of the board shall be final, subject to judicial review by common law certiorari in circuit court.
(2) Variances may be granted for the reconstruction, rehabilitation or restoration of structures listed on the National Register of Historic Places or the state inventory of

historic places, if the proposed reconstruction, rehabilitation or restoration will not result in the structure losing its historical designation.
(3) In passing upon such applications, the board shall consider all technical evaluations, all relevant factors, all standards specified in other sections of this chapter; and:
(a) The danger that materials may be swept onto other lands to the injury of others;
(b) The danger to life and property due to flooding or erosion damage;
(c) The susceptibility of the proposed facility and its contents to flood damage and the effect of such damage on the owner;
(d) The importance of the services provided by the proposed facility to the community;
(e) The necessity of the facility to a waterfront location, in the case of a functionally dependent facility;
(f) The availability of alternative locations not subject to flooding or erosion damage for the proposed use;
(g) The compatibility of the proposed use with existing and anticipated development;
(h) The relationship of the proposed use to the comprehensive plan and floodplain management program for that area;
(i) The safety of access to the property in times of flood for emergency and nonemergency vehicles;
(j) The expected heights, velocity, duration, rate of rise and sediment transport of the floodwaters and the effects of wave action, if applicable, expected at the site; and
(k) The costs of providing governmental services during and after flood conditions, including maintenance and repair of public utilities and facilities such as sewer, gas, electrical and water systems, and streets and bridges.
(4) Conditions for variances:
(a) Variances shall only be issued upon a determination that the variance is the minimum necessary, considering the flood hazard, to afford relief; and, in the instance of a historical building, upon a determination that the variance is the minimum necessary so as not to destroy the historic character and design of the building.
(b) Variances shall only be issued upon a showing of good and sufficient cause, a determination that failure to grant the variance would result in unnecessary and exceptional hardship, and a determination that the granting of a variance will not result in increased flood heights, additional threats to public safety, extraordinary public expense, the creation of a nuisance or a conflict with existing local laws or ordinances.
(c) Variances shall not be issued within any designated floodway if any increase in flood levels during the base flood discharge would result.
(5) Upon consideration of the factors listed above, and the purposes of this chapter, the board may attach such conditions to the granting of variances as it deems necessary to further the purposes of this chapter.
(6) Any applicant to whom a variance is granted shall be given written notice specifying the difference between the base flood elevation and the elevation to which the structure is to be built and stating that the cost of flood insurance will be commensurate with the increased risk resulting from the reduced lowest floor elevation.
(7) The building official shall maintain the records of all appeal actions and shall report any variances to the Federal Emergency Management Agency upon request.
(Code 1980, § 146.10)

ARTICLE II. FLOOD HAZARD REDUCTION*

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***Cross references:** Buildings and building regulations generally, ch. 47; floodproofing certification for the coastal construction zones, § 47.010.

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Sec. 51.31. General standards.

In all areas of special flood hazard, the following standards are required, and compliance with those standards relating to structural stability shall be certified by an engineer or architect registered in this state:

(1) New construction and substantial improvements shall be anchored to prevent flotation, collapse or lateral movement of the structure.

(2) Manufactured homes shall be anchored to prevent flotation, collapse or lateral movement. Methods of anchoring may include but are not limited to use of over-the-top or frame ties to ground anchors. This standard shall be in addition to and consistent with applicable state requirements for resisting wind forces.

(3) New construction and substantial improvements shall be constructed with materials and utility equipment resistant to flood damage.

(4) New construction and substantial improvements shall be constructed by methods and practices that minimize flood damage.

(5) Electrical, heating, ventilation, plumbing, air conditioning equipment, and other service facilities shall be located at or above the base flood elevation or shall be designed or located so as to prevent water from entering or accumulating within the components during conditions of flooding.

(6) New and replacement water supply systems shall be designed to minimize or eliminate the infiltration of floodwaters into the system.

(7) New and replacement sanitary sewage systems shall be designed to minimize or eliminate the infiltration of floodwaters into the systems and discharges from the systems into floodwaters.

(8) Onsite waste disposal systems shall be located and constructed to avoid impairment to them or contamination from them during flooding.

(9) Any alteration, repair, reconstruction or improvements to a structure which is in compliance with the provisions of this chapter shall meet the requirements of new construction as contained in this chapter.

(Code 1980, § 146.008(a))

Sec. 51.32. Specific standards.

In all areas of special flood hazard, the following standards are required:

(1) *Residential construction (A zone).* New construction or substantial improvement of any residential structure shall have the lowest floor, including the basement, elevated at or above the base flood elevation. Should solid foundation perimeter walls be used to elevate a structure, openings sufficient to facilitate the automatic equalization of flood hydrostatic forces on exterior walls shall be

provided in accordance with the standards set forth in subsection (3) of this section.

(2) *Nonresidential construction (A zone).* New construction or substantial improvement of any commercial, industrial or non-residential structure shall have the lowest floor, including the basement, elevated at or above the base flood elevation. Structure located in all A zones may be floodproofed in lieu of being elevated, provided that all areas of the structure, together with attendant utilities, below the required elevation are watertight with walls substantially impermeable to the passage of water and use structural components having the capability of resisting hydrostatic and hydrodynamic loads and the effects of buoyancy. A state registered professional engineer or architect shall certify that the standards of this subsection are satisfied.

(3) *Elevated buildings (A zone).* New construction or substantial improvements of elevated buildings that include fully enclosed areas formed by the foundation and other exterior walls below the base flood elevation shall be designed to preclude finished living space and designed to allow for the entry and exit of floodwaters to automatically equalize hydrostatic flood forces on exterior walls.

(a) Designs for complying with this requirement shall either be certified by a state registered professional engineer or architect or meet the following minimum criteria:

1. Provide a minimum of two openings having a total net area of not less than one square inch for every square foot of enclosed area subject to flooding;
2. The bottom of all openings shall be no higher than one foot above grade; and
3. Openings may be equipped with screens, louvers, valves or other coverings or devices provided they permit the automatic flow of floodwaters in both directions.

(b) Electrical, plumbing and other utility connections are prohibited below the base flood elevation except as may be required by other codes, or where there is a more practical location consistent with the intent of another code, and approved by the building official.

(c) Access to the enclosed area shall be the minimum necessary to allow for parking of vehicles (garage door), limited storage of maintenance equipment used in connection with the premises (standard exterior door), and entry to the living area (stairway or elevator).

(d) The interior portion of such enclosed area shall not be partitioned or finished into separate rooms.

(4) *Manufactured homes and RV requirements.*

(a) New and existing manufactured home parks and subdivisions, new and existing manufactured homes not located within a new or existing manufactured home park and subdivision, and recreational vehicles that are located or placed or substantially improved in either areas of special flood hazard or in coastal high hazard areas as defined in this chapter shall conform to all requirements of 44 CFR 59 and 60, effective November 1, 1989, and for the purpose of this chapter such definitions and requirements as are contained therein are adopted in this section by reference unless specifically set forth in this section.

(b) No floodplain management regulations will apply to a recreational vehicle if the recreational vehicle was onsite for fewer than 180 consecutive days or was fully licensed as a motor vehicle and ready for highway use.
(5) *Floodways.* Located within areas of special flood hazard are areas designated as floodways. Because the floodway is an extremely hazardous area due to the velocity of floodwaters and erosion potential, the following standards shall apply in any floodway:
(a) Encroachments, including fill, new construction, substantial improvements and other developments, are prohibited unless certification, with supporting technical data, by a state registered professional engineer is provided demonstrating that the encroachments shall not result in any increase in flood levels during the occurrence of the base flood discharge.
(b) All new construction and substantial improvements shall comply with all applicable flood hazard reduction provisions of this section.
(c) The placement of manufactured homes is prohibited except in an existing manufactured home park or subdivision; however, a replacement manufactured home may be placed on a lot in an existing manufactured home park or subdivision provided the anchoring standards and the elevation standards set forth in this section are met.
(6) *Coastal high hazard areas (V zones).* Located within the areas of special flood hazard are areas designated as coastal high hazard areas. Because these areas have special flood hazards associated with wave wash, the following standards are required:
(a) All buildings or structures shall be located landward of the coastal construction control line.
(b) All buildings or structures shall be elevated so that the bottom of the lowest supporting horizontal structural member, excluding pilings or columns, is located at or above the base flood elevation level, with all space below the lowest supporting member open so as not to impede the flow of water. Breakaway walls may be permitted if designed to wash away in the event of abnormally high tides or wave action and in accordance with subsection (6)(h) of this section.
(c) All buildings or structures shall be securely anchored on pilings or columns.
(d) All pilings and columns and the attached structures shall be anchored to resist flotation, collapse and lateral movement due to the effect of wind and water loads acting simultaneously on all building components. The anchoring and support system shall be designed with wind and water loading values which equal or exceed the 100-year mean recurrence interval or one percent annual chance flood.
(e) A state registered professional engineer or architect shall certify that the design, specifications and plans for construction are in compliance with the provisions of subsections (6)(b), (c) and (d) of this section.
(f) There shall be no fill used as structural support. Limited noncompacted fill may be used around the perimeter of a building for landscaping or aesthetic purposes provided the fill will wash out from storm surge, thereby rendering the building free of obstruction, prior to generating excessive loading forces, ramping

effects or wave deflection. The building official shall approve design plans for landscaping/aesthetic fill only after the applicant has provided an analysis by an engineer, architect or soil scientist which demonstrates that the following factors have been fully considered:

1. Particle composition of fill material does not have a tendency for excessive natural compaction.
2. Volume and distribution of fill will not cause wave deflection to adjacent properties.
3. Slope of fill will not cause wave runup or ramping.

(g) There shall be no alteration of sand dunes or mangrove stands which would increase potential flood damage.

(h) Nonsupporting breakaway walls, open wood latticework or mesh screening shall be allowed below the base flood elevation provided they are not part of the structural support of the building and are designed so as to break away, under abnormally high tides or wave action, without damage to the structural integrity of the building on which they are to be used and provided the following design specifications are met:

1. Design safe loading resistance of each wall shall be not less than ten nor more than 20 pounds per square foot; or
2. If more than 20 pounds per square foot, a state registered professional engineer or architect shall certify that the design wall collapse would result from a water load less than that which would occur during the base flood event, and the elevated portion of the building and supporting foundation system shall not be subject to collapse, displacement or other structural damage due to the effects of wind and water loads acting simultaneously on all building components during the base flood event. Maximum wind and water loading values to be used in this determination shall each have a one percent chance of being equalled or exceeded in any given year or 100-year mean recurrence interval.

(i) If breakaway walls are utilized, such enclosed space shall not be designed to be usable for human habitation but shall be designed to be usable only for parking of vehicles, building access or limited storage of maintenance equipment used in connection with the premises.

(j) Prior to construction, plans for any structures that will have breakaway walls shall be submitted to the building official for approval.

(k) Any alteration, repair, reconstruction or improvement to a structure shall not enclose the space below the lowest floor except with breakaway walls.

(l) The placement of manufactured homes is prohibited except in an existing manufactured home park or subdivision; however, a replacement manufactured home may be placed on a lot in an existing manufactured home park or subdivision provided the anchoring standards and the elevation standards set forth in this section are met.

(Code 1980, § 146.008(b); Ord. No. 5558-94, § 1, 5-5-94; Ord. No. 7213-03, § 1, 11-20-03)

Sec. 51.33. Streams without established base flood elevations or floodways.

(1) Within the areas of special flood hazard where small streams exist where base flood data have been provided but where no floodways have been provided, the following standards apply:

No encroachments, including fill material or structures, shall be located less than 20 feet from the top of the stream bank unless certification by a state registered professional engineer is provided demonstrating that such encroachments shall not result in any increase in flood levels during the occurrence of the base flood discharge.

(2) Within the areas of special flood hazard where small streams exist but where no base flood data have been provided and where no floodways have been provided, the following standards apply:

New construction or substantial improvements of structures shall be elevated or floodproofed to elevations established by the building official utilizing data available from a federal, state or other source.

(Code 1980, § 146.008(c); Ord. No. 7213-03, § 1, 11-20-03)

Sec. 51.34. Subdivision proposals.

All proposed subdivisions, including but not limited to manufactured home parks and subdivisions and other proposed developments consisting of at least 50 lots or five acres, or both, shall be reviewed by the city engineer to determine that the following requirements have been or will be satisfied:

(1) All subdivision proposals shall be consistent with the need to minimize flood damage.

(2) All subdivision proposals shall have public utilities and facilities, such as sewer, gas, electrical and water systems, located and constructed so as to minimize flood damage.

(3) All subdivision proposals shall have adequate drainage provided so as to reduce exposure to flood hazards.

(4) Base flood elevation data shall be provided.

(Code 1980, § 146.008(d))

Sec. 51.35. Areas of shallow flooding (AO zones).

Located within the areas of special flood hazard are areas designated as shallow flooding areas. Because these areas have special flood hazards associated with base flood depths of one to three feet, where a clearly defined channel does not exist and where the path of flooding is unpredictable and indeterminate, the following standards are required:

(1) All new construction and substantial improvements of residential structures shall have the lowest floor, including the basement, elevated to the depth number specified on the flood insurance rate map, in feet, above the highest adjacent grade. If no depth number is specified, the lowest floor, including the basement, shall be elevated at least two feet above the highest adjacent grade.

(2) All new construction and substantial improvements of nonresidential structures shall:
(a) Have the lowest floor, including the basement, elevated to the depth number specified on the flood insurance rate map, in feet, above the highest adjacent grade. If no depth number is specified, the lowest floor, including the basement, shall be elevated at least two feet above the highest adjacent grade; or
(b) Together with attendant utility and sanitary facilities, be completely floodproofed to or above that level so that any space below that level is watertight with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy.
(Code 1980, § 146.008(e))

Appendix E

Community Development Code
Article 4 Division 13 – Clearing and Grubbing

DIVISION 13. LAND CLEARING AND GRUBBING

Section 4-1301. Permit required.
A land clearing and grubbing permit is required in order to clear or grub any land in the city. No land clearing and grubbing permit shall be granted prior to issuance of a Level One or Level Two approval in accordance with the provisions of Article 4, Divisions 3 and 4. If no Level One or Level Two approval is required a land clearing and grubbing permit shall be granted if the permit request is in conformance with the provisions of this division or the terms of a prior approval.
(Ord. No. 6526-00, § 1, 6-15-00; Ord. No. 6928-02, § 109, 5-2-02)

Section 4-1302. Application/appeal.
A. An application for a clearing and grubbing permit shall be submitted to the community development coordinator applications forms to be provided, accompanied by the fee required by Section 4-202(E), and including the following information:
1. A legible scaled drawing or scaled aerial photograph and a tree survey showing property boundaries, physical or natural features, and limits of the proposed work.
2. Purpose of clearing and/or grubbing.
3. Types of equipment to be used.
4. General description of existing vegetation, topography, and any surface waters present.
5. Method of debris disposal.
6. Anticipated date of commencement and completion of work.
7. Methods of soil erosion and sedimentation control to be undertaken during earthwork activities and the means and timing of soil stabilization subsequent to the completion of the clearing and grubbing activities.
8. No tree statement, no tree removal permit required or tree removal permit required.
B. A denial of a clearing and grubbing permit may be appealed in the manner provided in Article 4 Division 5.
(Ord. No. 6526-00, § 1, 6-15-00)

Section 4-1303. Criteria for issuance.
In determining whether or not to issue a permit to clear or grub land, the community development coordinator shall consider:
A. The need for vegetation removal on the property for purposes of land surveying or land preparation for development or other economic uses.
B. Whether visual access is necessary to comply with the tree survey requirements in Section 4-1302.
C. Whether the applicant has filed a "no tree verification" form or "no tree removal permit required verification" form stating that there are no protected trees on the site or that protected trees exist but do not need to be removed for construction purposes.
D. The applicant has provided protective barriers around all protected trees on the site.
E. Whether the applicant has provided soil erosion and sedimentation control as required in Article 3, Division 7.
(Ord. No. 6526-00, § 1, 6-15-00)

Appendix F

Engineering Department's Erosion and Siltation Control Policy

City of Clearwater
Florida
Erosion and Siltation

Control Policy

Requirements for ALL construction

sites regardless of type or size of construction activity

EROSION AND SILTATION CONTROL POLICY

The following Erosion and Siltation Control Standards and procedures shall apply to all physical improvement projects, which are subject to the rules and regulations of the City of Clearwater.

1. SITE PLAN REVIEW: All erosion and siltation control methods to be employed during construction shall be shown on the final construction plans submitted for approval to the City.

2. LAND CLEARING AND GRUBBING: All projects that will denude soil (i.e., one that requires grass and brush removal or asphalt, concrete and building removal prior to actual construction) or that will involve ground alteration such as excavation shall be required to have a grubbing and clearing permit prior to any such work (per Part 1, Article 4, Division 1301, Community Development Code).

3. STABILIZATION OF DENUDED AREAS: No disturbed area may be denuded for more than thirty (30) calendar days unless otherwise authorized by the City. During inactive construction periods, denuded areas shall be covered by mulches such as straw, hay, filter fabric, seed and mulch, sod, or some other permanent vegetation. Within sixty (60) calendar days after final grade is established on any portion of a project site, that portion of the site shall be provided with established permanent soil stabilization measures per the original site plan, whether by impervious surface or landscaping.

4. PROTECTION AND STABILIZATION OF SOIL STOCKPILES: Fill material stockpiles shall be protected at all times by on-site drainage controls which prevent erosion of the stockpiled material. Control of dust from such stockpiles may be required, depending upon their location and the expected length of time the stockpiles will be present. In no case shall an unstabilized stockpile remain after thirty (30) calendar days.

5. PROTECTION OF EXISTING STORM SEWER SYSTEMS: During construction, all storm sewer inlets in the vicinity of the project shall be protected by sediment traps such as secured hay bales, sod, stone, etc., which shall be maintained and modified as required by

construction progress, and which must be approved by the City before installation.

6. SEDIMENT TRAPPING MEASURES: Sediment basins and traps, perimeter berms, filter fences, berms, sediment barriers, vegetative buffers and other measures intended to trap sediment and/or prevent the transport of sediment onto adjacent properties, or into existing water bodies, must be installed, constructed or, in the case of vegetative buffers, protected from disturbance, as a first step in the land alteration process. Such systems shall be fully operative and inspected by the City before any other disturbance of the site begins. Earthen structures including but not limited to berms, earth filters, dams or dikes shall be stabilized and protected from drainage damage or erosion within one week of installation.

7. SEDIMENTATION BASINS: Areas of 3 acres or more shall be required to have temporary sedimentation basins as a positive remedy against downstream siltation and will be shown and detailed on construction plans. During development, permanent detention areas may be used in place of silt basins, provided they are maintained to the satisfaction of the City. The contractor will be required to prohibit discharge of silt through the outfall structure during construction of any detention area and will be required to clean out the detention area before installing any permanent subdrain pipe. In addition, permanent detention areas must be totally cleaned out and operating properly at final inspection and at the end of the one year warranty period. When temporary sedimentation basins are used, they shall be capable at all times of containing at least one (1) cubic foot of sediment for each one hundred (100) square feet of area tributary to the basin. Such capacity shall be maintained throughout the project by regular removal of sediment from the basin.

8. WORKING IN OR CROSSING WATERWAYS OR WATERBODIES: Land alteration and construction shall be minimized in both permanent and intermittent waterways and the immediately adjacent buffer of 25 feet from top of bank of the waterway. Construction equipment and vehicles shall be kept out of waterways and the buffer area whenever possible, and barriers shall be used to prevent access. Where in-channel work cannot be avoided, precautions must be taken to stabilize the work area during land alteration, development and/or construction to minimize erosion. If the channel and buffer area are disturbed during land alteration, they must be stabilized within three (3) calendar days after the in-channel work is completed.

Silt curtains or other filter/siltation reduction devices must be installed on the downstream side of the in-channel alteration activity to eliminate impacts due to increased turbidity. (See Index #609 & 610). Wherever stream crossings are required, properly sized temporary culverts shall be provided by the contractor and removed when construction is completed. The area of the crossing shall be restored to a condition as nearly as possible equal to that, which existed prior to any construction activity.

9. SWALES, DITCHES AND CHANNELS: All swales, ditches and channels leading from the site shall be sodded within three (3) days of excavation. All other interior swales, etc., including detention areas will be sodded prior to issuance of a Certificate of Occupancy.

10. UNDERGROUND UTILITY CONSTRUCTION: The construction of underground utility lines and other structures shall be done in accordance with the following standards:

a. No more than 400 lineal feet of trench shall be open at any one time;

b. Wherever consistent with safety and space consideration, excavated material shall be cast to the uphill side of trenches. Trench material shall not be cast into or onto the slopes of any stream, channel, road ditch or waterway.

c. Storm sewer inlets in the vicinity shall be protected.

11. MAINTENANCE: All erosion and siltation control devices shall be checked regularly, especially after each rainfall and will be cleaned out and/or repaired as required.

12. COMPLIANCE: Failure to comply with the aforementioned requirements may result in a fine and/or more stringent enforcement procedures such as (but not limited to) issuance of a "Stop Work Order". (Part 1, Article 7, Section 101, Community Development Code)

City of Clearwater Standard Detail Drawings No. 601-607 are examples of accepted methods that may be used or required to control erosion and siltation.

13. TEMPORARY GRAVEL CONSTRUCTION ENTRANCE & EXIT

Definition - A stone stabilized pad located at points of vehicular ingress and egress on a construction site.

Purpose - To stabilize entrances to the construction site and reduce the amount of sediment transported onto public roads by motor vehicles or runoff.

Conditions Where Practice Applies - Wherever traffic will be leaving a construction site and moving directly onto a public road or other paved area.

Planning Considerations - Construction entrances provide an area where mud can be removed from construction vehicle tires before they enter a public road. If the action of the vehicle traveling over the gravel pad is not sufficient to remove most of the mud, then the tires must be washed before the vehicle enters a public road. If washing is used, provisions must be made to intercept the wash water and trap the sediment before it is carried off-site. Construction entrances should be used in conjunction with the stabilization of construction roads to reduce the amount of mud picked up by construction vehicles.

Design Criteria -

Aggregate Size - FDOT No. 1 Coarse Aggregate (1.5 - 3.5 inch stone)(4 -9 cm) should be

used. Wood chips may be used for single family residential construction, provided that they can be prevented from floating away in a storm.

Entrance Dimensions - The aggregate layer must be at least 6 inches (15 cm) thick. It must extend the full width of the vehicular ingress and egress area. The length of the entrance must be at least 50 feet (20 m). The entrance must widen at its connection to the roadway in order to accommodate the turning radius of large trucks. (See Index # 601).

14. DEWATERING

Definition - Lowering the water table by means of pumping.

Purpose - To allow the construction of structural and stormwater improvements by removing water from excavation areas and allowing construction by conventional "dry" methods.

Planning Considerations - The major planning consideration in dewatering is disposal of removed water. Volume, quality, and topography are the factors governing the method and destination of removed water. Discharge from well-point dewatering is relatively clear except for the initial discharge after installation or inactivity. Water pumped from a sump hole is thoroughly sediment laden and must always be treated. Turbid water must either be filtered before leaving the site or must be impounded onsite and allowed to settle. In flat terrain it is sometimes more economical to impound relatively clean water rather than pipe it long distances to a receiving water body.

Specifications - The two most common methods of dewatering used in Florida are well-point systems and sump pumps. A well-point system consists of one or more rows of small 2" (5 cm) collector pipes, which are jetted vertically into the ground near the proposed excavation. The small pipes are connected by a larger 6" (15 cm) manifold pipe, which is connected to the pump and discharge line. The sump method is simply a hole in the ground with a pump drawing all of the water flowing into the hold. Excess water is conveyed to the sump by open ditches or perforated pipes embedded in sand or gravel.

Sumps and Ditches - The water table is lowered by ditching and conveying water to a lowered sump hole. Water pumped from a sump hole is usually heavily laden with sediments. Water flowing over disturbed and saturated ground detaches and transports all sizes of soil particles into the sump pit to be sucked up by the pump. Saturated liquid soil (mud) is also drawn into the pump. The discharged water must be treated before release into a receiving water body or stormwater system. Placing haybales around the pump intake or outlet is not sufficient filtration by itself. Turbid water must either be impounded long enough for effective settling of fines, or filtered through a temporary filter or sediment tank. Initially the water may percolate freely into the ground, however, this will diminish as the fine particles settle and clog the surface layer of soil. In situations which preclude the use of filtration or settlement facilities, and turbid water is discharged directly into a water body, a suitably designed floating turbidity barrier must be used. Note that this method does not

remove any sediments, it merely allows for dilution to lower the turbidity level.

Horizontal Wells - This system also consists of a series of ditches leading to a sump hole or pump. The ditches are filled with sand or gravel surrounding a perforated pipe. A geotextile may also be used to prevent excessive migration of fines into the system. The discharged water must be treated before release as described below.

Well-point Systems - The well-point system is the preferred system for dewatering and should be used whenever possible. The initial discharge yields the sediments displaced by the installation of the small collector pipes. This can be directed into the excavation, a small settling or filtration facility, or larger temporary impoundment. Thereafter the water is generally clear ground water and may be discharged into a receiving water body provided that there is suitable conveyance.

Maintenance -

1. Any water impoundment must be inspected daily to prevent failure of dikes, berms, or control structures. Minor problems should be repaired at once. Major problems will require a redesign and plan modification.

2. Any filtration device must be inspected and cleaned frequently. The discharge should be monitored daily and whenever the pumps are started. Inspection and maintenance of the system are best performed when the facility is dry. The first signs of diminished performance should be an alarm that maintenance is required. If the facility will no longer drain itself, the untreated water must be pumped back to its source, rather than by-passing the facility and discharging to the water body or stormwater system.

3. Floating turbidity barriers shall be maintained as per FLOATING TURBIDITY BARRIER

15. FLOATING TURBIDITY BARRIER

Definition - A floating geotextile material which minimizes sediment transport from a disturbed area adjacent to or within a body of water.

Purpose - To provide sedimentation protection for a watercourse from up-slope land disturbance where conventional erosion and sediment controls cannot be used, or from dredging or filling within the watercourse.

Conditions where Practice Applies - Applicable to non-tidal and tidal watercourses where intrusion into the watercourse by construction activities has been permitted and subsequent sediment movement is unavoidable.

Planning Considerations - Soil loss into a watercourse results in long-term suspension of

sediment. In time, the suspended sediment may travel large distances and affect widespread areas. A turbidity curtain is designed to deflect and contain sediment within a limited area and provide enough residence time so that soil particles will fall out of suspension and not travel to other areas.

Turbidity curtain types must be selected based on the flow conditions within the water body, whether it be a flowing channel, lake, pond, or a tidal watercourse. The specifications contained within this practice pertain to minimal and moderate flow conditions where the velocity of flow may reach 5 feet (1.5 m) per second (or a current of approximately 3 knots). For situations where there are greater flow velocities or currents, a qualified engineer and product manufacturer should be consulted.

Consideration must also be given to the direction of water movement in channel flow situations. Turbidity curtains are not designed to act as water impoundment dams and cannot be expected to stop the flow of a significant volume of water. They are designed and installed to trap sediment, not to halt the movement of water itself. In most situations, turbidity curtains should not be installed across channel flows.

In tidal or moving water conditions, provisions must be made to allow the volume of water contained within the curtain to change. Since the bottom of the curtain is weighted and external anchors are frequently added, the volume of water contained within the curtain will be much greater at high tide verses low tide and measures must be taken to prevent the curtain from submerging. In addition to allowing slack in the curtain to rise and fall, water must be allowed to flow through the curtain if the curtain is to remain in roughly the same place and maintain the same shape. Normally, this is achieved by constructing part of the curtain from a heavy woven filter fabric. The fabric allows the water to pass through the curtain, but retains the sediment particles. Consideration should be given to the volume of water that must pass through the fabric and sediment particle size when specifying fabric permeability.

Sediment which has been deflected and settled out by the curtain may be removed if so directed by the on-site inspector or the permitting agency. However, consideration must be given to the probable outcome of the procedure - will it create more of a sediment problem by resuspension of particles and by accidental dumping of the material by the equipment involved? It is, therefore, recommended that the soil particles trapped by a turbidity curtain only be removed if there has been a significant change in the original contours of the effected area in the watercourse. Regardless of the decision made, soil particles should always be allowed to settle for a minimum of 6 - 12 hours before their removal by equipment or before removal of a turbidity curtain.

It is imperative that the intended function of the other controls in this chapter, to keep sediment out of the watercourse, be the strategy used in every erosion control plan. However, when proximity to the watercourse makes successfully mitigating sediment loss impossible, the use of the turbidity curtain during land disturbance is essential. ***Under no circumstances shall permitted land disturbing activities create violations of water quality***

standards.

Design Criteria

1. Type I configuration (See Index # 609) should be used in protected areas where there is no current and the area is sheltered from wind and waves.

2. Type II configuration (See Index # 609) should be used in areas where there may be small to moderate current running (up to 2 knots or 3.5 feet (1 m) per second) and/or wind and wave action can affect the curtain.

3. Type III configuration (See Index # 609) should be used in areas where considerable current (up to 3 knots or 5 feet (1.5 m) per second) may be present, where tidal action may be present, and/or whether the curtain is potentially subject to wind and wave action.

4. Turbidity curtains should extend the entire depth of the watercourse whenever the watercourse in question is not subject to tidal action and/or significant wind and wave forces. This prevents silt-laden water from escaping under the barrier, scouring and resuspending additional sediments.

5. In tidal and/or wind and wave action situations, the curtain should never be so long as to touch the bottom. A minimum 1-foot (30-cm) "gap" should exist between the weighted lower end of the skirt and the bottom at "mean" low water. Movement of the lower skirt over the bottom due to tidal reverses or wind and wave action on the flotation system may fan and stir sediments already settled out.

6. In tidal and/or wind and wave action situations, it is seldom practical to extend a turbidity curtain depth lower than 10 to 12 feet (3 to 4 m) below the surface, even in deep water. Curtains which are installed deeper than this will be subject to very large loads with consequent strain on curtain materials and the mooring system. In addition, a curtain installed in such a manner can "billow up" toward the surface under the pressure of the moving water, which will result in an effective depth, which is significantly less than the skirt depth.

7. Turbidity curtains should be located parallel to the direction of flow of a moving body of water. Turbidity curtains should not be placed across the main flow of a significant body of moving water.

8. When sizing the length of the floating curtain, allow an additional 10 - 20% variance in the straight line measurements. This will allow for measuring errors, make installing easier and reduce stress from potential wave action during high winds.

9. An attempt should be made to avoid an excessive number of joints in the curtain; a minimum continuous span of 50 feet (15 m) between joints is a good "rule of

thumb."

10. For stability reasons, a maximum span of 100 feet (30 m) between anchor or stake locations is also a good rule to follow.

11. The ends of the curtain, both floating upper and weighted lower, should extend well up into the shoreline, especially if high water conditions are expected. The ends should be secured firmly to the shoreline to fully enclose the area where sediment may enter the water.

12. When there is a specific need to extend the curtain to the bottom of the watercourse in tidal or moving water conditions, a heavy woven pervious filter fabric may be substituted for the normally recommended impervious geotextile. This creates a "flow-through" medium, which significantly reduces the pressure on the curtain and will help to keep it in the same relative location and shape during the rise and fall of tidal waters.

13. Typical alignments of turbidity curtains can be seen in (Index # 610). The number and spacing of external anchors may vary depending on current velocities and potential wind and wave action; manufacturer's recommendations should be followed.

14. Be certain that the type, location, and installation of the barrier is as shown on the approved plan and permit. Additional permits may be required in navigable waterways, especially when the barrier creates an obstruction.

16. CONSTRUCTION SPECIFICATIONS

Materials

1. Barriers should be a bright color (yellow or "international" orange are recommended) that will attract the attention of nearby boaters.

2. The curtain fabric must meet the minimum requirements.

3. Seams in the fabric shall be either vulcanized welded or sewn, and shall develop the full strength of the fabric.

4. Floatation devices shall be flexible, buoyant units contained in an individual floatation sleeve or collar attached to the curtain. Buoyancy provided by the floatation units shall be sufficient to support the weight of the curtain and maintain a freeboard of at least 3 inches (8 cm) above the water surface level. (See Index # 609).

5. Load lines must be fabricated into the bottom of all floating turbidity curtains. Type

II and Type III must have load lines also fabricated into the top of the fabric. The top load line shall consist of woven webbing or vinyl-sheathed steel cable and shall have a break strength in excess of 10,000 pounds (4.5 t). The supplemental (bottom) load-line shall consist of a chain incorporated into the bottom hem of the curtain of sufficient weight to serve as ballast to hold the curtain in a vertical position. Additional anchorage shall be provided as necessary. The load lines shall have suitable connecting devices, which develop the full breaking strength for connecting to load lines in adjacent sections (See Index # 609, which portray this orientation).

6. External anchors may consist of 2 x 4 (5 x 10 cm) or 2 - 1/2 inch (6 cm) minimum diameter wooden stakes, or 1.33 pounds/linear foot (2 kg/m) steel posts when Type I installation is used; when Type II or Type III installations are used, bottom anchors should be used.

7. Bottom anchors must be sufficient to hold the curtain in the same position relative to the bottom of the watercourse without interfering with the action of the curtain. The anchor may dig into the bottom (grappling hook, plow or fluke-type) or may be weighted (mushroom type) and should be attached to a floating anchor buoy via an anchor line. The anchor line would then run from the buoy to the top load line of the curtain. When used with Type III installations, these lines must contain enough slack to allow the buoy and curtain to float freely with tidal changes without pulling the buoy or curtain down and must be checked regularly to make sure they do not become entangled with debris. As previously noted, anchor spacing will vary with current velocity and expected wind and wave action; manufacturer's recommendations should be followed. See orientation of external anchors and anchor buoys for tidal installation in Index # 610.

Installation

1. In the calm water of lakes or ponds (Type I installation) it is usually sufficient to merely set the curtain end stakes or anchor points (using anchor buoys if bottom anchors are employed), then tow the curtain in the furled condition out and attach it to these stakes or anchor points. Following this, any additional stakes or buoyed anchors required to maintain the desired location of the curtain may be set and these anchor points made fast to the curtain. Only then, the furling lines should be cut to let the curtain skirt drop.

2. In rivers or in other moving water (Type II and Type III installations) it is important to set all the curtain anchor points. Care must be taken to ensure that anchor points are of sufficient holding power to retain the curtain under the expected current conditions, before putting the furled curtain into the water. Anchor buoys should be employed on all anchors to prevent the current from submerging the floatation at the anchor points. If the moving water into which the curtain is being installed is tidal and will subject the curtain to currents in both directions as the tide changes, it is important to provide anchors on both sides of the curtain for two reasons:

a.) Curtain movement will be minimized during tidal current reversals.

When the anchors are secure, the furled curtain should be secured to the upstream anchor point and then sequentially attached to each next downstream anchor point until the entire curtain is in position. At this point, and before unfurling, the "lay" of the curtain should be assessed and any necessary adjustments made to the anchors. Finally when the location is ascertained to be as desired, the furling lines should be cut to allow the skirt to drop.

3. Always attach anchor lines to the flotation device, not to the bottom of the curtain. The anchoring line attached to the floatation device on the downstream side will provide support for the curtain. Attaching the anchors to the bottom of the curtain could cause premature failure of the curtain due to the stresses imparted on the middle section of the curtain.

4. There is an exception to the rule that turbidity curtains should not be installed across channel flows; it occurs when there is a danger of creating a silt buildup in the middle of a watercourse, thereby blocking access or creating a sand bar. Curtains have been used effectively in large areas of moving water by forming a very long-sided, sharp "V" to deflect clean water around a work site, confine a large part of the silt-laden water to the work area inside the "V" and direct much of the silt toward the shoreline. Care must be taken, however, not to install the curtain perpendicular to the water current.

5. See Index # 610 for typical installation layouts.

6. The effectiveness of the barrier can be increased by installing two parallel curtains, separated at regular intervals by 10' (3 m) long wooden boards or lengths of pipe.

Removal

1. Care should be taken to protect the skirt from damage as the turbidity curtain is dragged from the water.

2. The site selected to bring the curtain ashore should be free of sharp rocks, broken cement, debris, etc., so as to minimize damage when hauling the curtain over the area.

3. If the curtain has a deep skirt, it can be further protected by running a small boat along its length with a crew installing furling lines before attempting to remove the curtain from the water.

Maintenance

1. The developer/owner shall be responsible for maintenance of the filter curtain for the duration of the project to ensure the continuous protection of the watercourse.

2. Should repairs to the geotextile fabric become necessary, there are normally repair kits available from the manufacturers; manufacturer's instructions must be followed to ensure the adequacy of the repair.

3. When the curtain is no longer required as determined by the inspector, the curtain and related components shall be removed in such a manner as to minimize turbidity. Sediment shall be removed and the original depth (or plan elevation) restored before removing the curtain. Remaining sediment shall be sufficiently settled before removing the curtain. Any spoils must be taken to an upland area and stabilized.

Sheet Flow Application: Silt Fence

This sediment barrier uses standard strength or extra strength synthetic filter fabrics. It is designed for situations in which only sheet or overland flows are expected. (See Index # 607).

1. The height of a silt fence shall not exceed 36 inches (90 cm). Higher fences may impound volumes of water sufficient to cause failure of the structure.

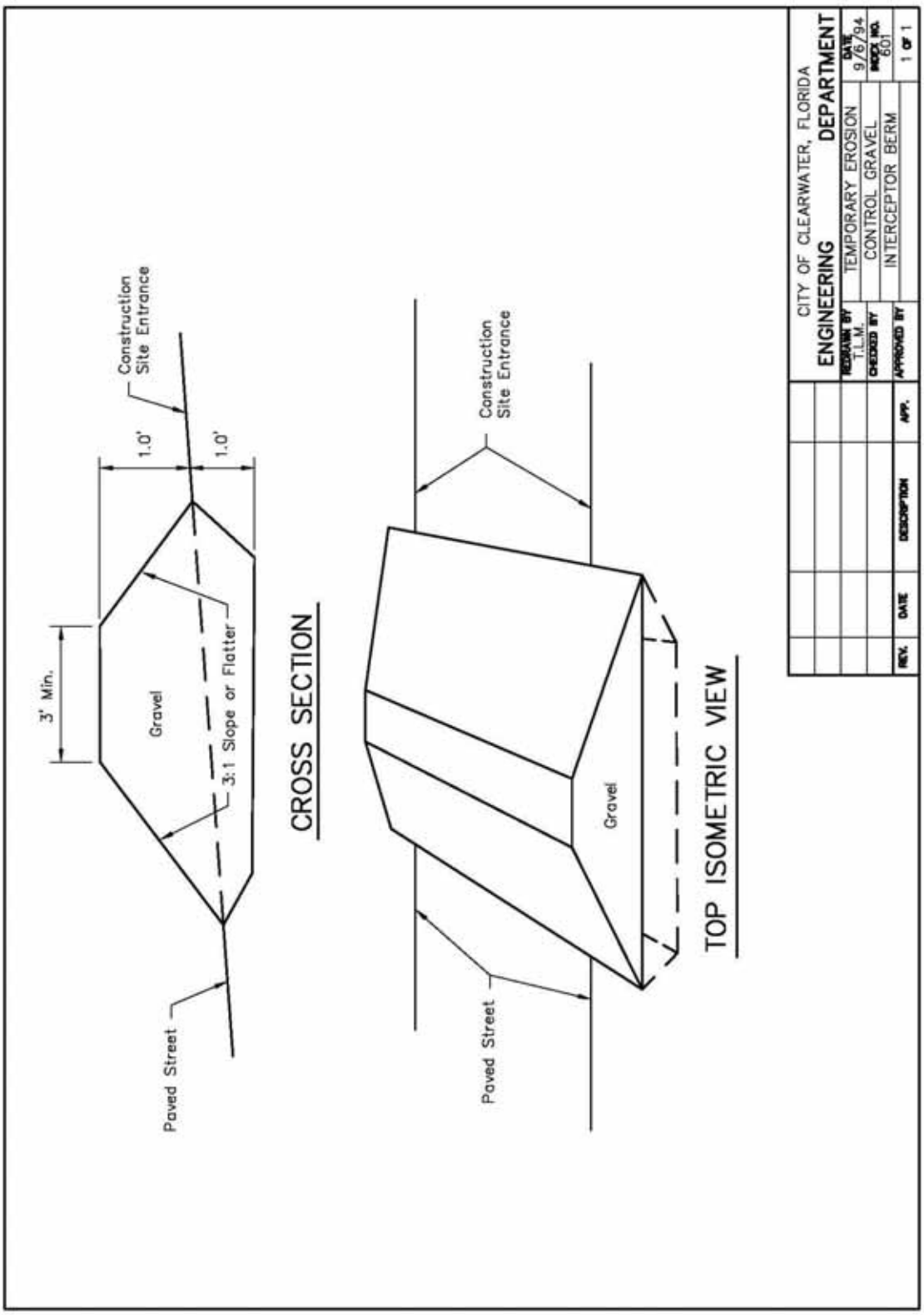
2. The filter fabric shall be purchased in a continuous roll cut to the length of the barrier to avoid the use of joints. When joints are necessary, filter cloth shall be spliced as described in Figure 6.

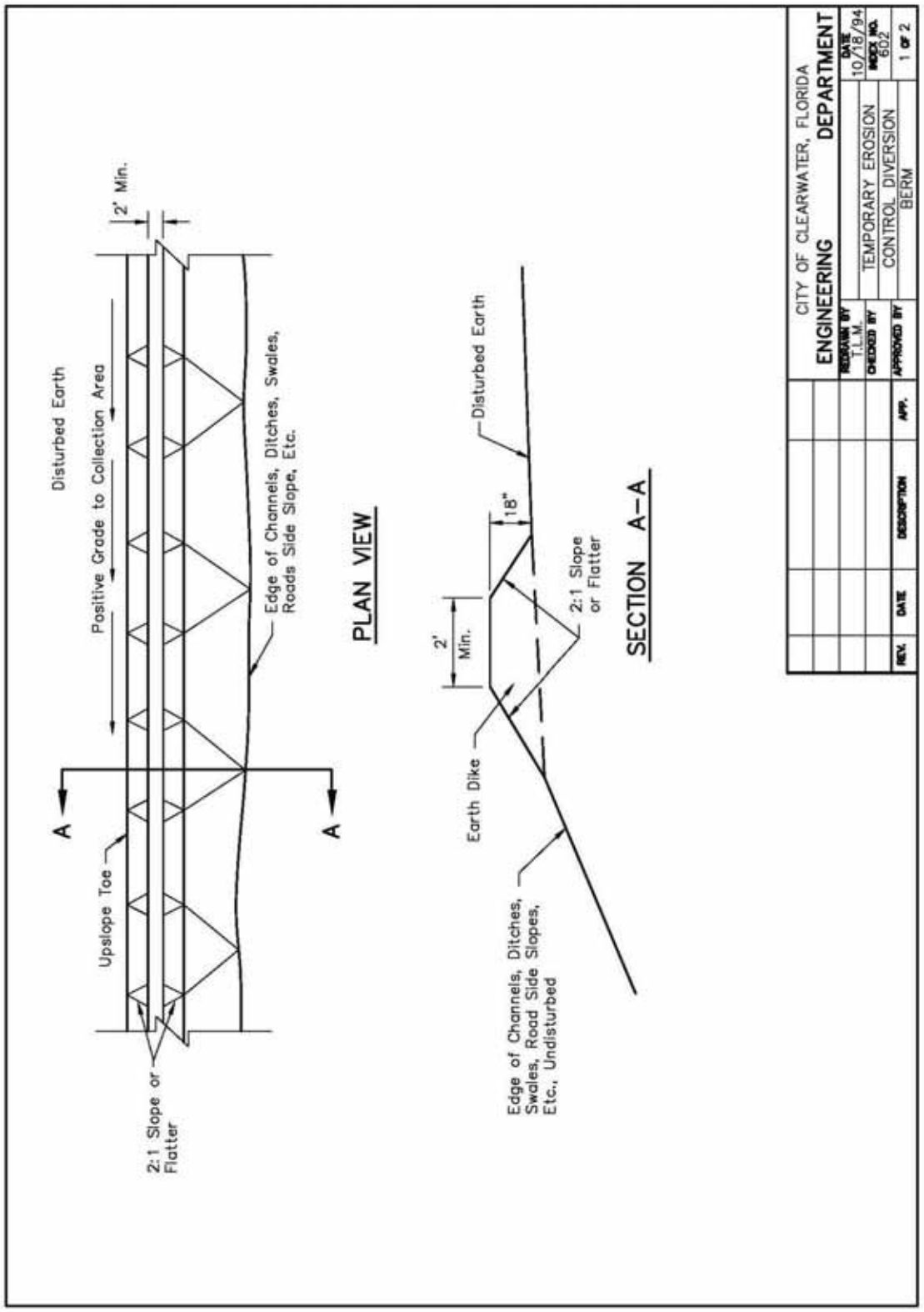
3. Posts shall be spaced a maximum of 10 feet (3 m) apart at the barrier location and driven securely into the ground a minimum of 12 inches (30 cm). When extra strength fabric is used without the wire support fence, post spacing shall not exceed 6 feet (1.8 m).

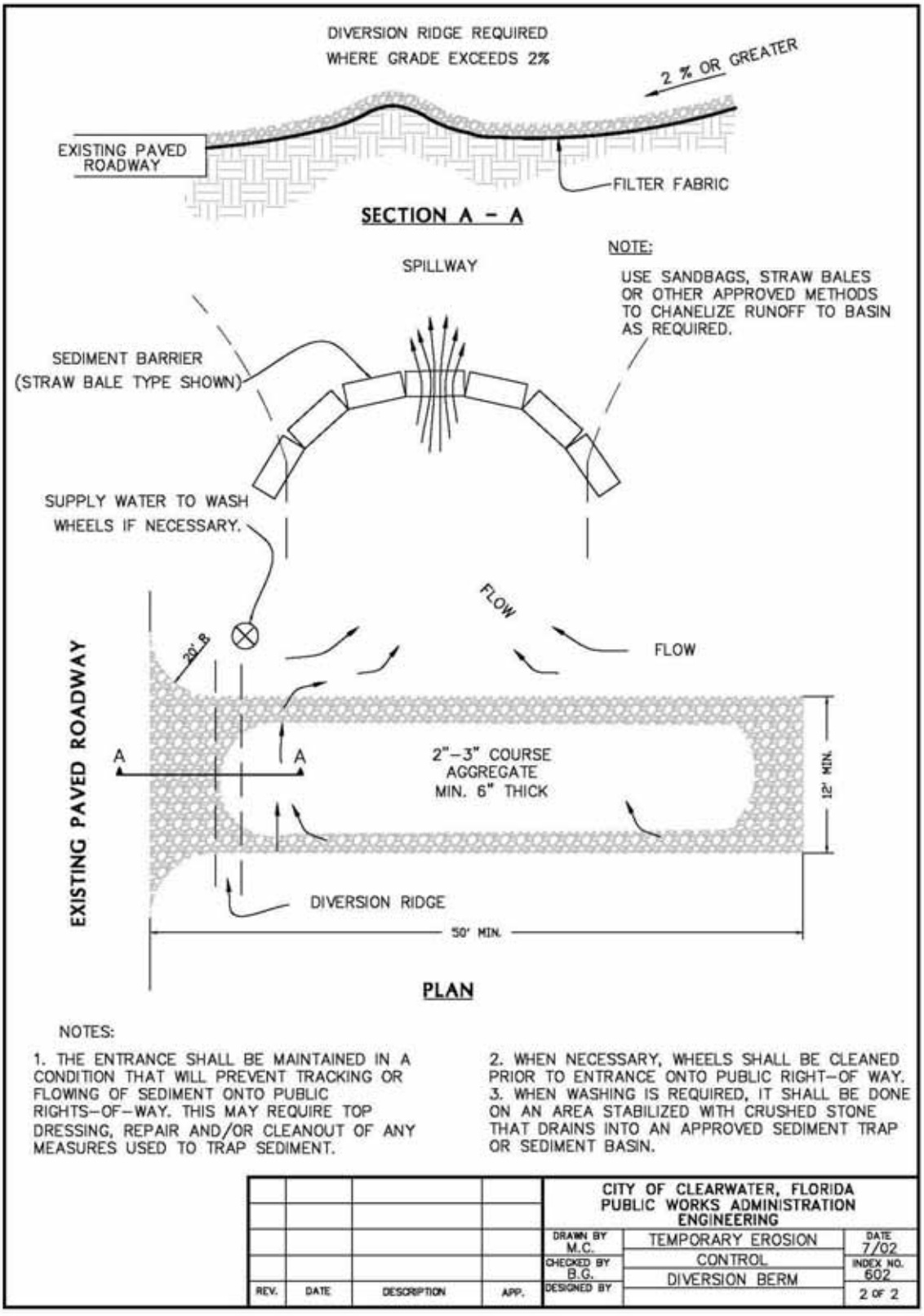
4. A trench shall be excavated approximately 4 inches (10 cm) wide and 4 inches (10 cm) deep along the line of posts and upslope from the barrier.

5. When standard strength filter fabric is used, a wire mesh support fence shall be fastened securely to the upslope side of the posts using heavy duty wire staples at least 1 inch (25 mm) long, tie wires, or hog rings. The wire shall extend into the trench a minimum of 2 inches (5 cm) and shall not extend more than 36 inches (90 cm) above the original ground surface.

6. The standard strength filter fabric shall be stapled or wired to the fence, and 8 inches (20 cm) of the fabric shall be extended into the trench. The fabric shall not extend more than 36 inches (90 cm) above the original ground surface.


Construction Site Entrance
1.0'
1.0'
3' Min.
Gravel
3:1 Slope or Flatter
Paved Street
CROSS SECTION
Construction Site Entrance
Gravel
Paved Street
TOP ISOMETRIC VIEW
CITY OF CLEARWATER, FLORIDA
ENGINEERING DEPARTMENT
TEMPORARY EROSION CONTROL GRAVEL INTERCEPTOR BERM
DRAWN BY T.L.M.
DATE 9/6/94
INDEX NO. 601
1 OF 1


Disturbed Earth
Positive Grade to Collection Area
2' Min.
Edge of Channels, Ditches, Swales, Roads Side Slope, Etc.
A
A
Upslope Toe
2:1 Slope or Flatter
PLAN VIEW
Disturbed Earth
18"
2' Min.
2:1 Slope or Flatter
Earth Dike
Edge of Channels, Ditches, Swales, Road Side Slopes, Etc., Undisturbed
SECTION A-A
CITY OF CLEARWATER, FLORIDA
ENGINEERING DEPARTMENT
REVISION BY
T.L.M.
CHECKED BY
APPROVED BY
DATE
10/18/94
INDEX NO.
602
TEMPORARY EROSION
CONTROL DIVERSION
BERM
1 OF 2
REV.
DATE
DESCRIPTION
APP.



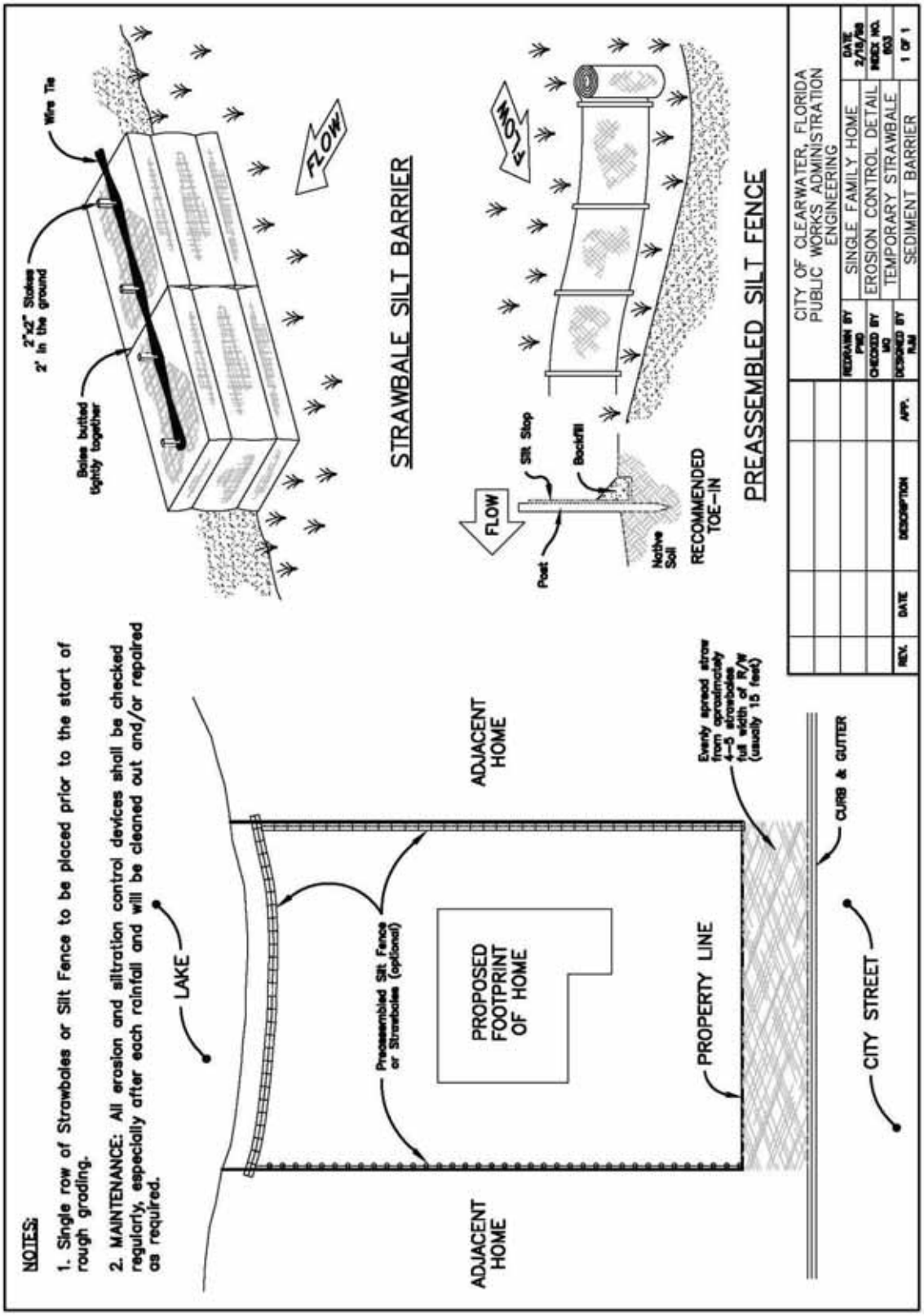
NOTES:

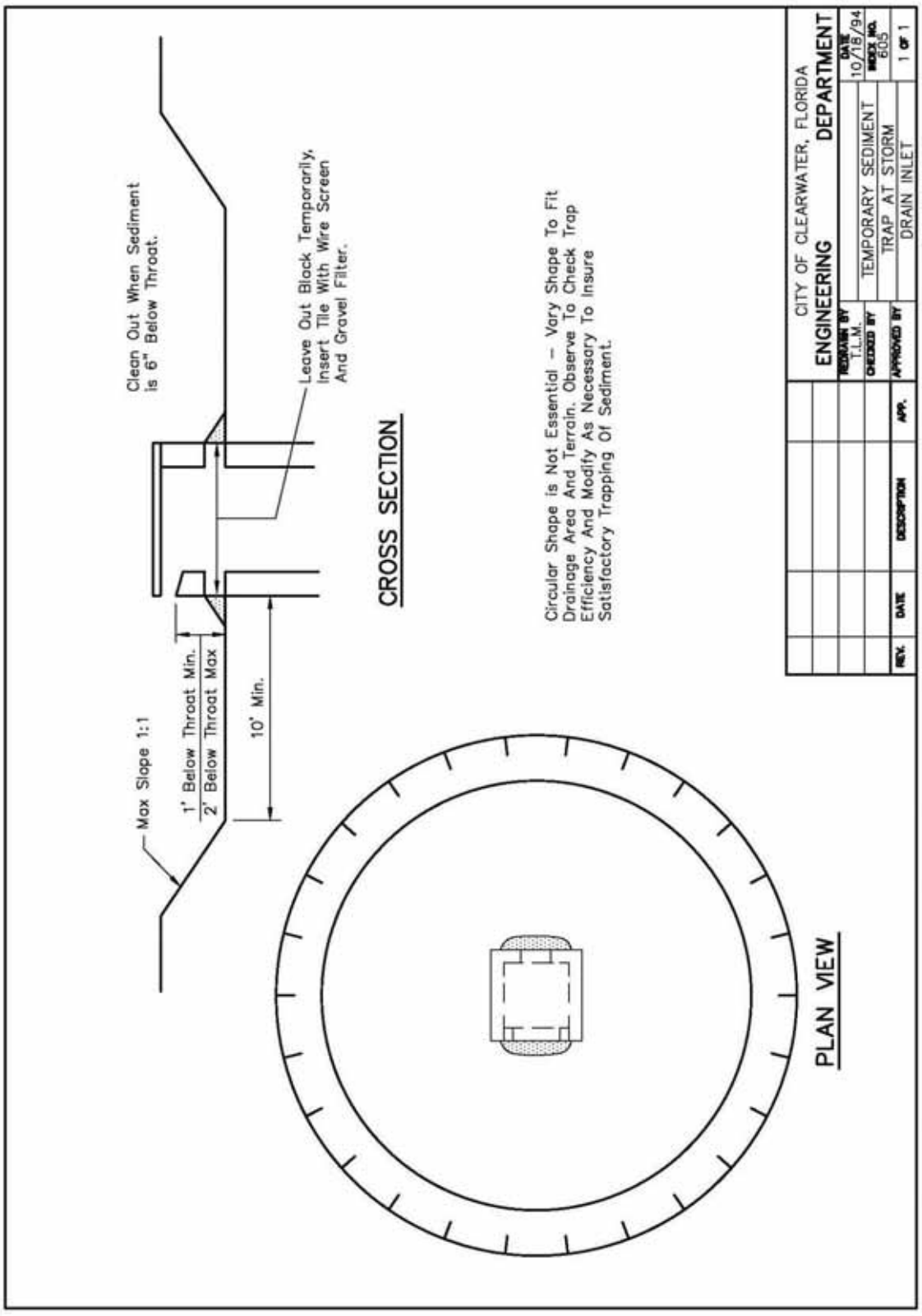
1. THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION THAT WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY. THIS MAY REQUIRE TOP DRESSING, REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT.
2. WHEN NECESSARY, WHEELS SHALL BE CLEANED PRIOR TO ENTRANCE ONTO PUBLIC RIGHT-OF WAY.
3. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH CRUSHED STONE THAT DRAINS INTO AN APPROVED SEDIMENT TRAP OR SEDIMENT BASIN.

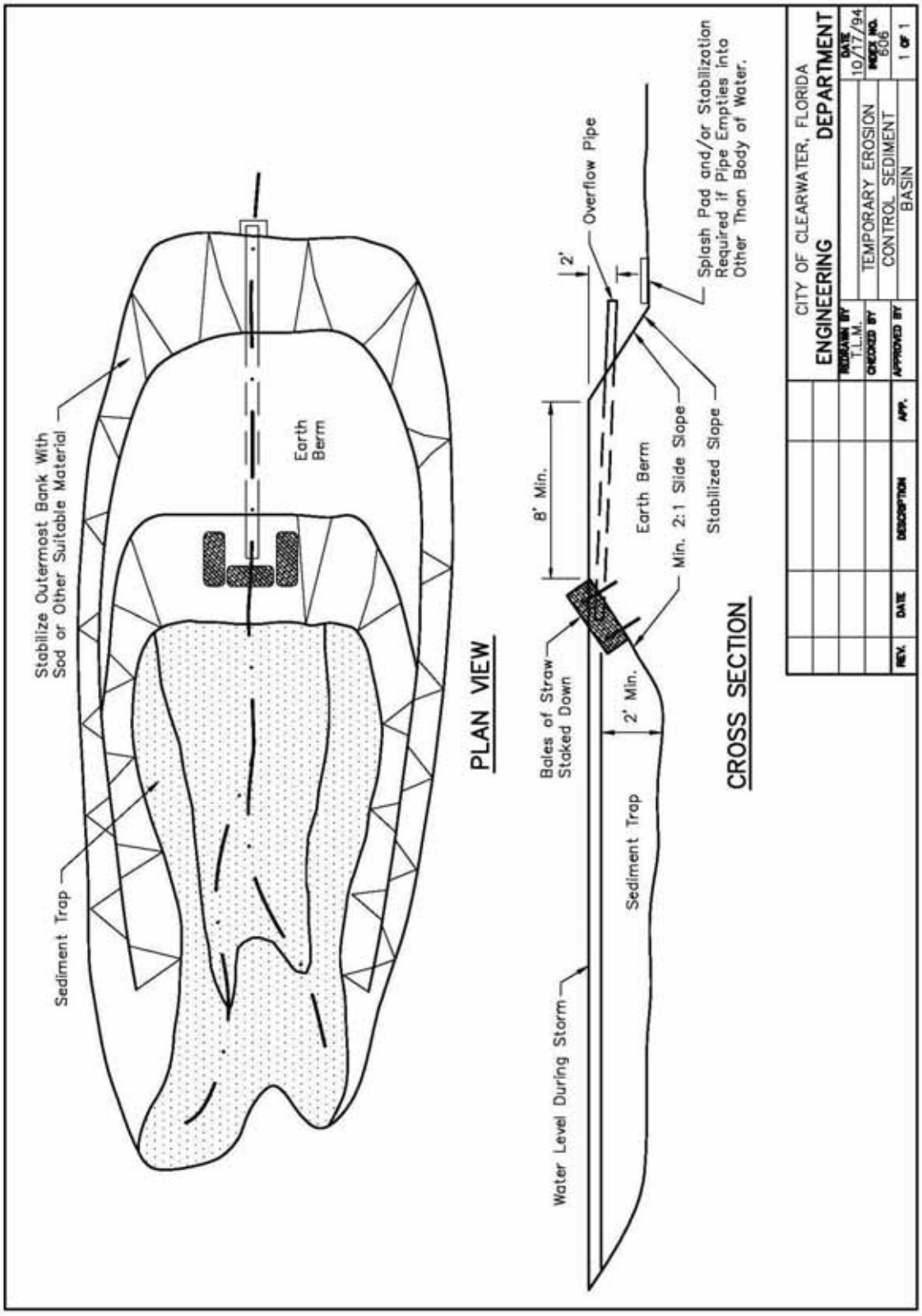
REV.	DATE	DESCRIPTION	APP.

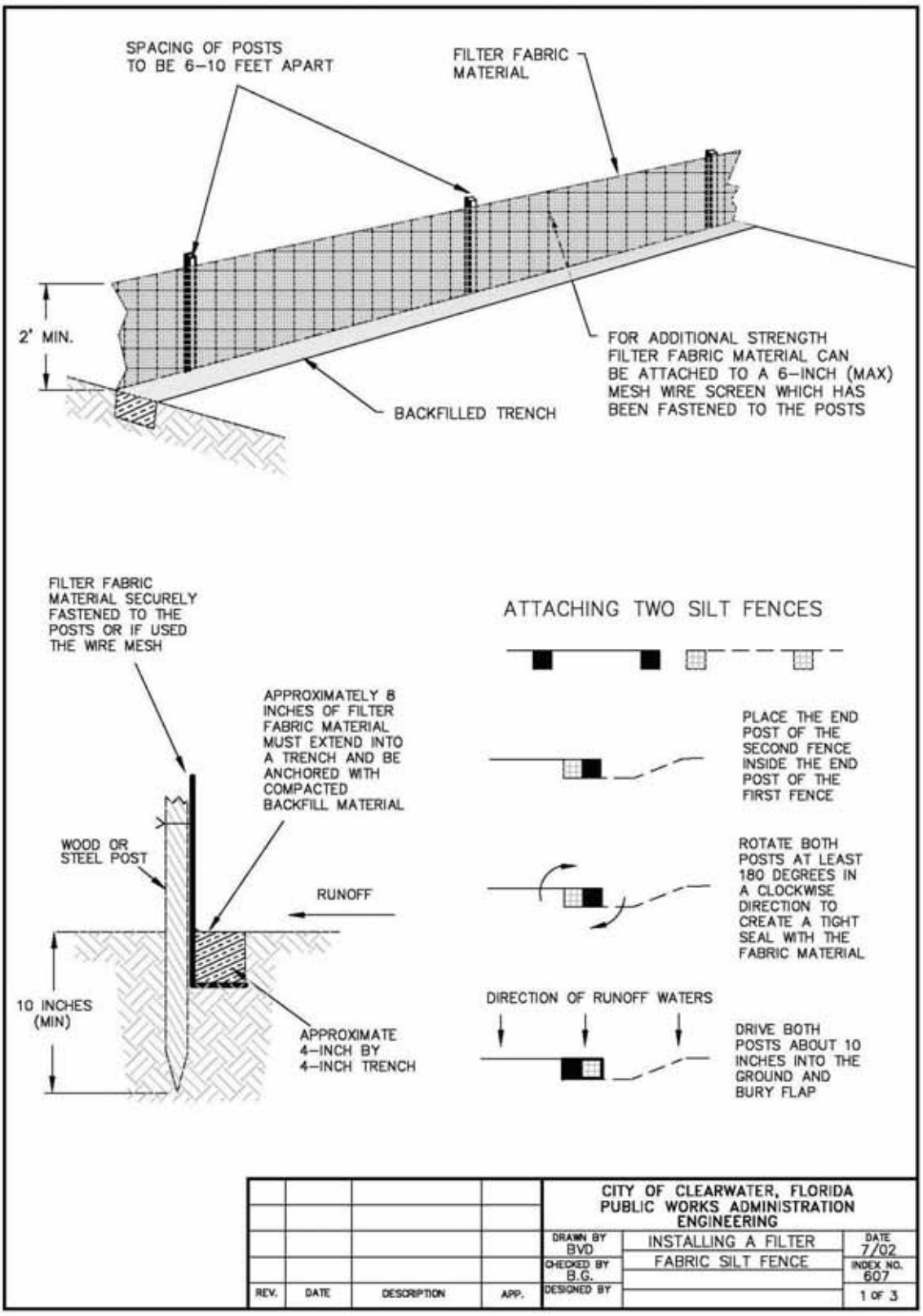
CITY OF CLEARWATER, FLORIDA
PUBLIC WORKS ADMINISTRATION
ENGINEERING

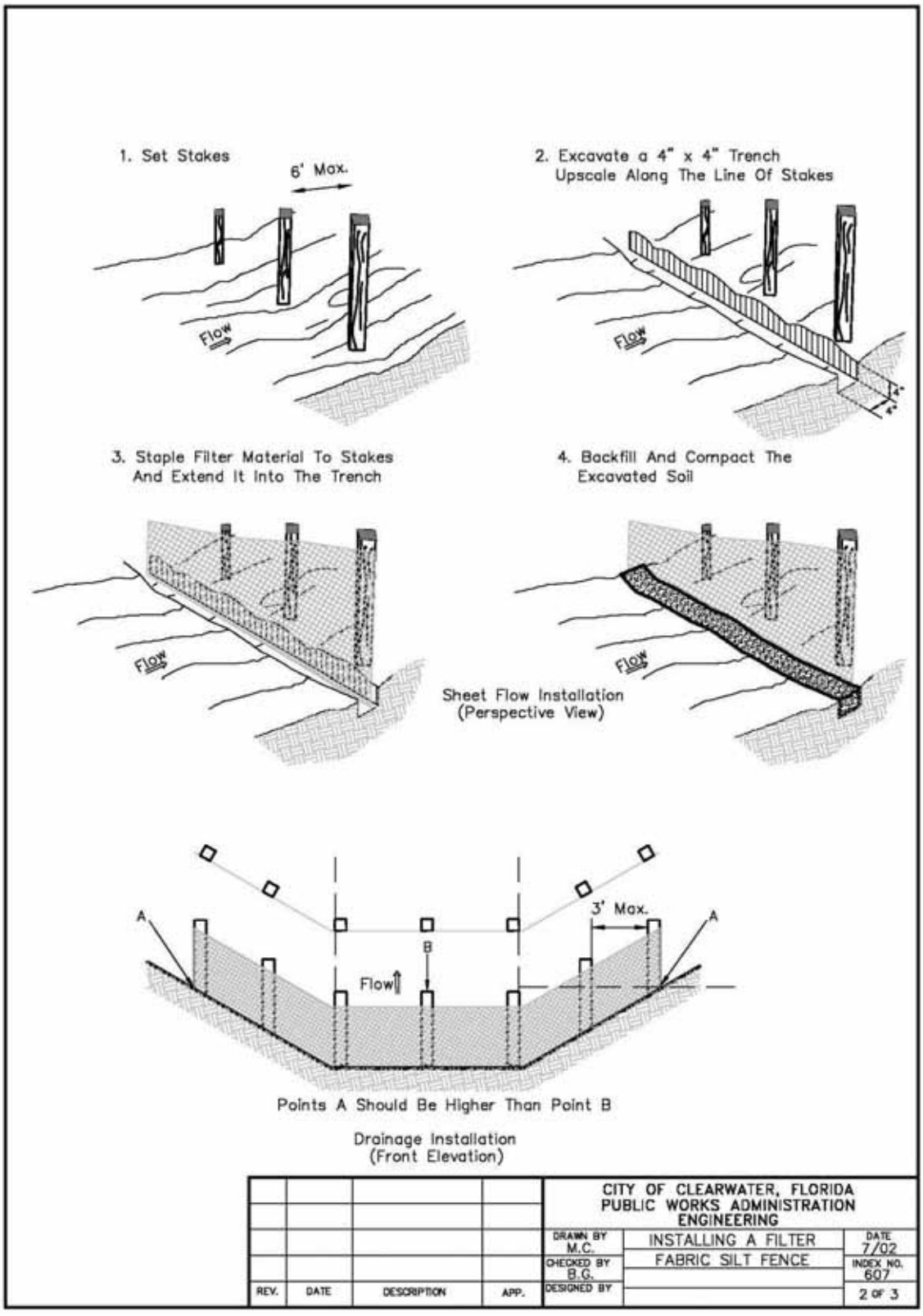
DRAWN BY M.C.	TEMPORARY EROSION CONTROL DIVERSION BERM	DATE 7/02
CHECKED BY B.G.		INDEX NO. 602
DESIGNED BY		2 OF 2

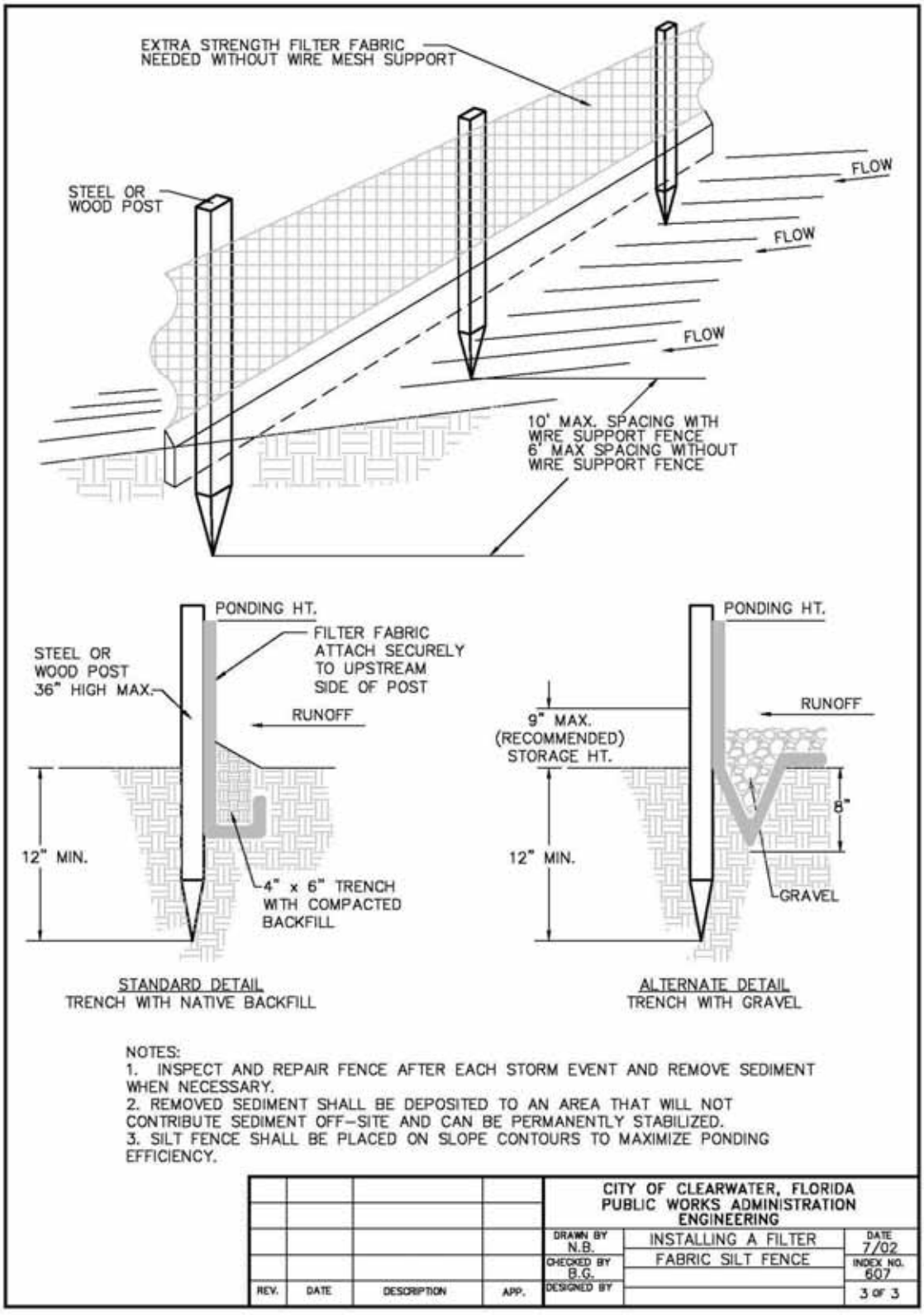

NOTES:
1. Single row of Strawbales or Silt Fence to be placed prior to the start of rough grading.
2. MAINTENANCE: All erosion and siltration control devices shall be checked regularly, especially after each rainfall and will be cleaned out and/or repaired as required.
LAKE
Preassembled Silt Fence or Strawbales (optional)
PROPOSED FOOTPRINT OF HOME
PROPERTY LINE
ADJACENT HOME
ADJACENT HOME
Evenly spread straw from approximately 4-5 strawbales full width of R/W (usually 15 feet)
CURB & GUTTER
CITY STREET
STRAWBALE SILT BARRIER
Wire Tie
2"x2" Stakes 2' in the ground
Bales butted tightly together
FLOW
PREASSEMBLED SILT FENCE
FLOW
Silt Stop
Backfill
Post
Native Soil
RECOMMENDED TOE-IN
CITY OF CLEARWATER, FLORIDA
PUBLIC WORKS ADMINISTRATION
ENGINEERING
SINGLE FAMILY HOME
EROSION CONTROL DETAIL
TEMPORARY STRAWBALE
SEDIMENT BARRIER
DATE 2/19/98
INDEX NO. 603
1 OF 1
REVISION BY PSD
CHECKED BY MO
DESIGNED BY RJM
REV. DATE DESCRIPTION APP.

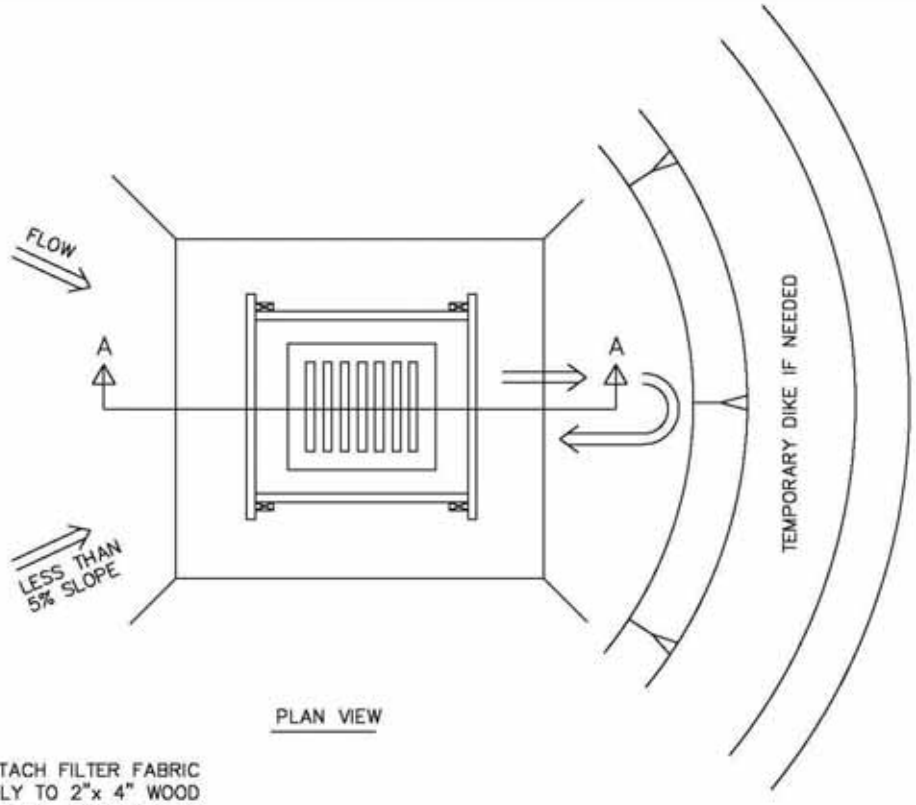

CITY OF CLEARWATER, FLORIDA
ENGINEERING DEPARTMENT
DESIGNED BY T.L.M.
DRAWN BY
CHECKED BY
APPROVED BY
DATE 10/18/94
INDEX NO. 605
TEMPORARY SEDIMENT TRAP AT STORM DRAIN INLET
1 OF 1
REV. DATE DESCRIPTION APP.
CROSS SECTION
Clean Out When Sediment is 6" Below Throat.
Leave Out Block Temporarily, Insert Tile With Wire Screen And Gravel Filter.
Max Slope 1:1
1' Below Throat Min.
2' Below Throat Max
10' Min.
Circular Shape is Not Essential – Vary Shape To Fit Drainage Area And Terrain. Observe To Check Trap Efficiency And Modify As Necessary To Insure Satisfactory Trapping Of Sediment.
PLAN VIEW


Stabilize Outermost Bank With Sod or Other Suitable Material
Earth Berm
Sediment Trap
PLAN VIEW
2'
Overflow Pipe
Splash Pad and/or Stabilization Required if Pipe Empties into Other Than Body of Water.
8' Min.
Earth Berm
Min. 2:1 Slide Slope
Stabilized Slope
Bales of Straw Staked Down
2' Min.
Sediment Trap
Water Level During Storm
CROSS SECTION
CITY OF CLEARWATER, FLORIDA
ENGINEERING DEPARTMENT
DRAWN BY T.L.M.
CHECKED BY
APPROVED BY
DATE 10/17/94
TEMPORARY EROSION CONTROL SEDIMENT BASIN
INDEX NO. 606
1 OF 1
REV. DATE DESCRIPTION APP.

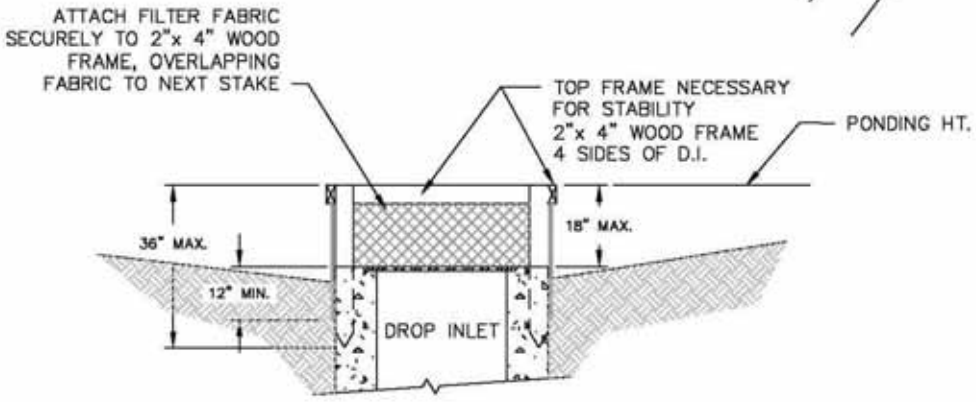

SPACING OF POSTS TO BE 6–10 FEET APART
FILTER FABRIC MATERIAL
2' MIN.
FOR ADDITIONAL STRENGTH FILTER FABRIC MATERIAL CAN BE ATTACHED TO A 6–INCH (MAX) MESH WIRE SCREEN WHICH HAS BEEN FASTENED TO THE POSTS
BACKFILLED TRENCH
FILTER FABRIC MATERIAL SECURELY FASTENED TO THE POSTS OR IF USED THE WIRE MESH
APPROXIMATELY 8 INCHES OF FILTER FABRIC MATERIAL MUST EXTEND INTO A TRENCH AND BE ANCHORED WITH COMPACTED BACKFILL MATERIAL
WOOD OR STEEL POST
RUNOFF
10 INCHES (MIN)
APPROXIMATE 4–INCH BY 4–INCH TRENCH
ATTACHING TWO SILT FENCES
PLACE THE END POST OF THE SECOND FENCE INSIDE THE END POST OF THE FIRST FENCE
ROTATE BOTH POSTS AT LEAST 180 DEGREES IN A CLOCKWISE DIRECTION TO CREATE A TIGHT SEAL WITH THE FABRIC MATERIAL
DIRECTION OF RUNOFF WATERS
DRIVE BOTH POSTS ABOUT 10 INCHES INTO THE GROUND AND BURY FLAP
REV.
DATE
DESCRIPTION
APP.
CITY OF CLEARWATER, FLORIDA
PUBLIC WORKS ADMINISTRATION
ENGINEERING
DRAWN BY BVD
CHECKED BY B.G.
DESIGNED BY
INSTALLING A FILTER FABRIC SILT FENCE
DATE 7/02
INDEX NO. 607
1 OF 3


1. Set Stakes
6' Max.
Flow
2. Excavate a 4" x 4" Trench
Upscale Along The Line Of Stakes
Flow
4"
4"
3. Staple Filter Material To Stakes
And Extend It Into The Trench
Flow
4. Backfill And Compact The
Excavated Soil
Flow
Sheet Flow Installation
(Perspective View)
A
B
Flow
3' Max.
A
Points A Should Be Higher Than Point B
Drainage Installation
(Front Elevation)
CITY OF CLEARWATER, FLORIDA
PUBLIC WORKS ADMINISTRATION
ENGINEERING
DRAWN BY M.C.
CHECKED BY B.G.
DESIGNED BY
INSTALLING A FILTER
FABRIC SILT FENCE
DATE 7/02
INDEX NO. 607
2 OF 3
REV.
DATE
DESCRIPTION
APP.


EXTRA STRENGTH FILTER FABRIC
NEEDED WITHOUT WIRE MESH SUPPORT
STEEL OR
WOOD POST
FLOW
FLOW
FLOW
10' MAX. SPACING WITH
WIRE SUPPORT FENCE
6' MAX SPACING WITHOUT
WIRE SUPPORT FENCE
PONDING HT.
FILTER FABRIC
ATTACH SECURELY
TO UPSTREAM
SIDE OF POST
STEEL OR
WOOD POST
36" HIGH MAX.
RUNOFF
12" MIN.
4" x 6" TRENCH
WITH COMPACTED
BACKFILL
STANDARD DETAIL
TRENCH WITH NATIVE BACKFILL
PONDING HT.
RUNOFF
9" MAX.
(RECOMMENDED)
STORAGE HT.
8"
12" MIN.
GRAVEL
ALTERNATE DETAIL
TRENCH WITH GRAVEL
NOTES:
1. INSPECT AND REPAIR FENCE AFTER EACH STORM EVENT AND REMOVE SEDIMENT WHEN NECESSARY.
2. REMOVED SEDIMENT SHALL BE DEPOSITED TO AN AREA THAT WILL NOT CONTRIBUTE SEDIMENT OFF-SITE AND CAN BE PERMANENTLY STABILIZED.
3. SILT FENCE SHALL BE PLACED ON SLOPE CONTOURS TO MAXIMIZE PONDING EFFICIENCY.
REV.
DATE
DESCRIPTION
APP.
CITY OF CLEARWATER, FLORIDA
PUBLIC WORKS ADMINISTRATION
ENGINEERING
DRAWN BY N.B.
CHECKED BY B.G.
DESIGNED BY
INSTALLING A FILTER
FABRIC SILT FENCE
DATE 7/02
INDEX NO. 607
3 OF 3



PLAN VIEW



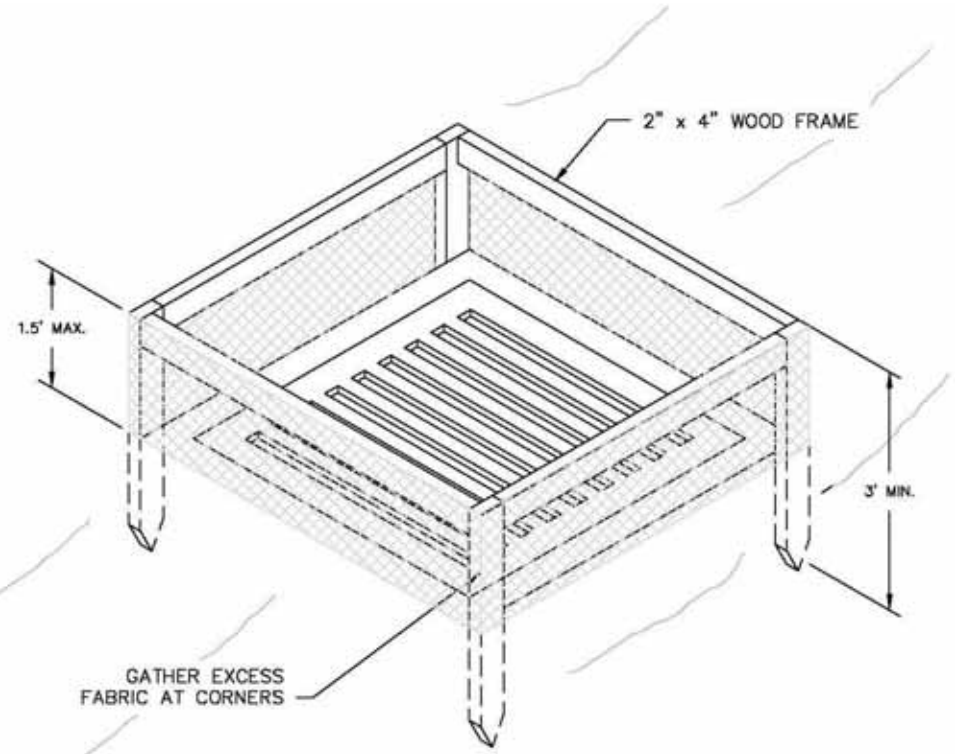
SECTION A–A

NOTES:
1. DROP INLET SEDIMENT BARRIERS ARE TO BE USED FOR SMALL, NEARLY LEVEL DRAINAGE AREAS. (LESS THAN 5%)
2. USE 2"x 4" WOOD OR EQUIVALENT METAL STAKES. (3 FT. MIN. LENGTH)
3. INSTALL 2"x 4" WOOD TOP FRAME TO INSURE STABILITY.
4. THE TOP OF THE FRAME (PONDING HEIGHT) MUST BE WELL BELOW THE GROUND ELEVATION DOWNSLOPE TO PREVENT RUNOFF FROM BYPASSING THE INLET. A TEMPORARY DIKE MAY BE NECESSARY ON THE DOWNSLOPE SIDE OF THE STRUCTURE.

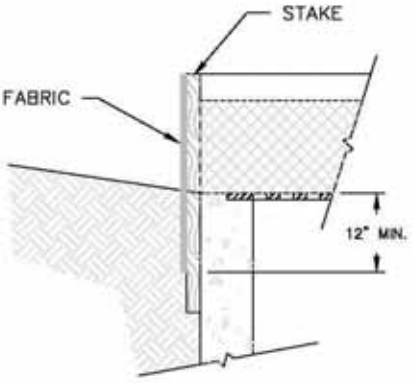
REV.	DATE	DESCRIPTION	APP.

CITY OF CLEARWATER, FLORIDA
PUBLIC WORKS ADMINISTRATION
ENGINEERING

DRAWN BY Novo	TEMPORARY SEDIMENT	DATE 7/02
CHECKED BY B.G.	BARRIER AT DROP INLET	INDEX NO. 608
DESIGNED BY		1 OF 2



Isometric View



Elevation of Stake and
Fabric Orientation

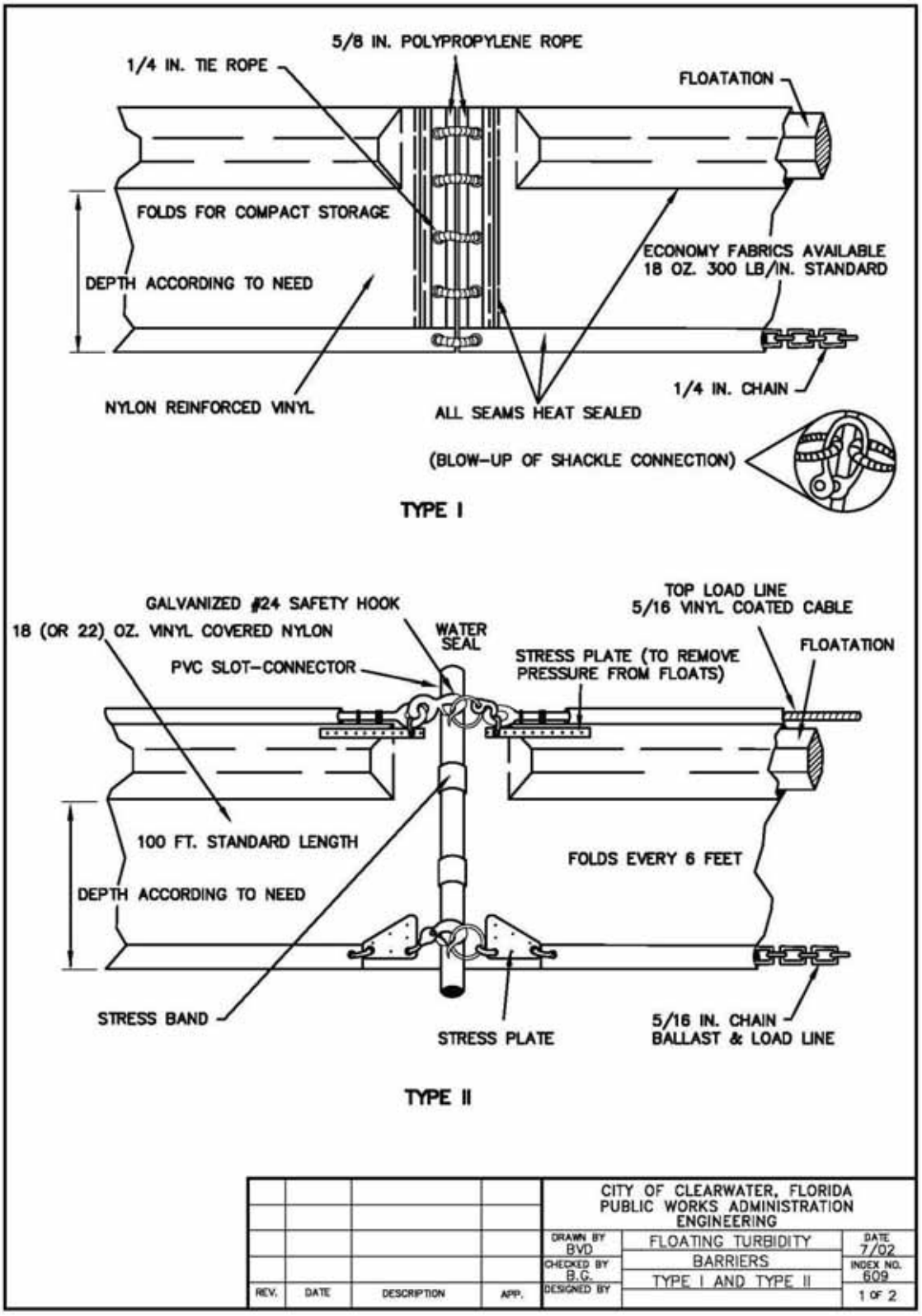
Specific Application

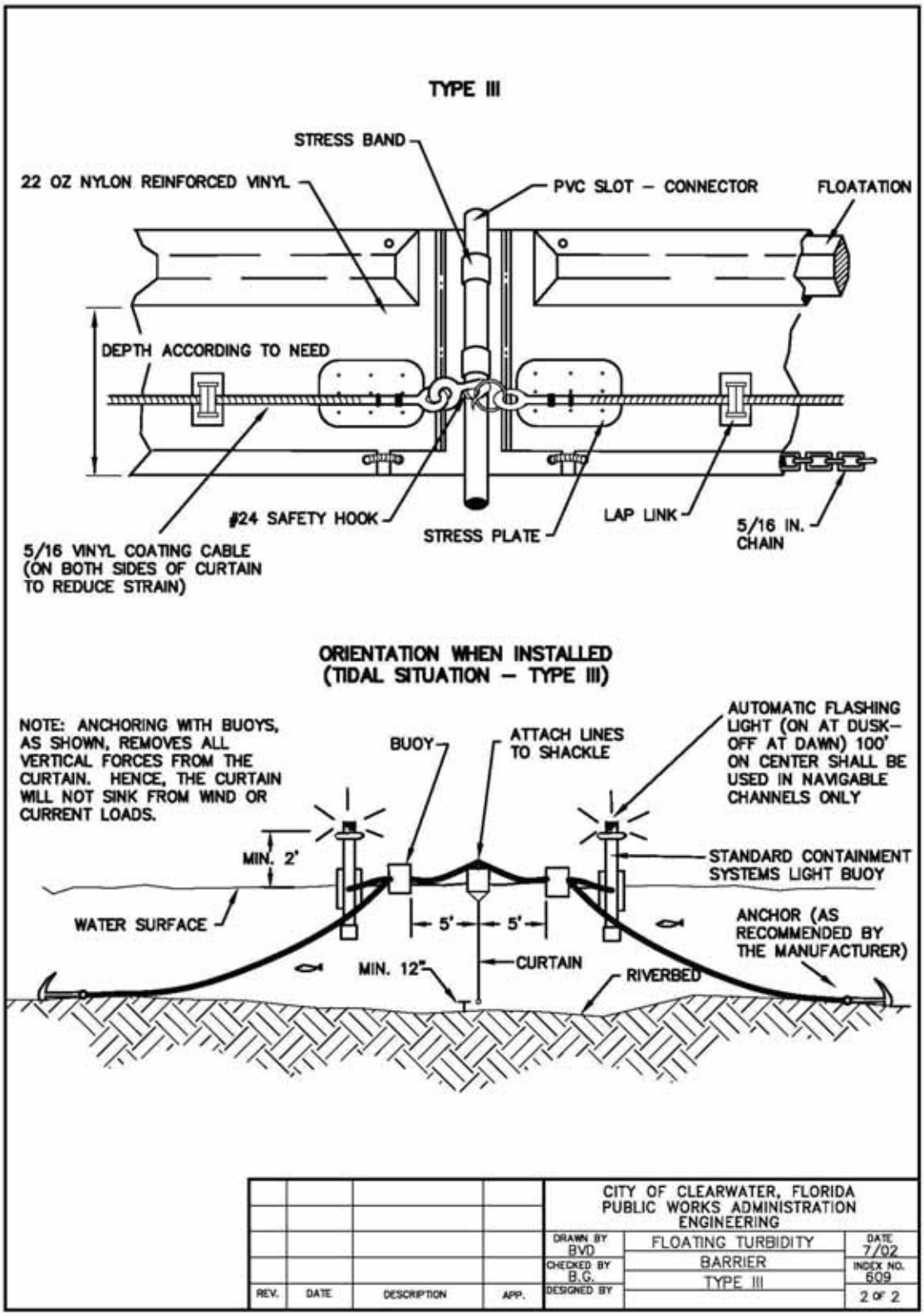
This method of inlet protection is applicable where the inlet drains in a relatively flat area (slope no greater than 5%) where the inlet sheet of overlandflows (not exceeding 1 c.f.s.) are typical. The method shall not apply to inlets receiving concentrated flows, such as in street or highway medians.

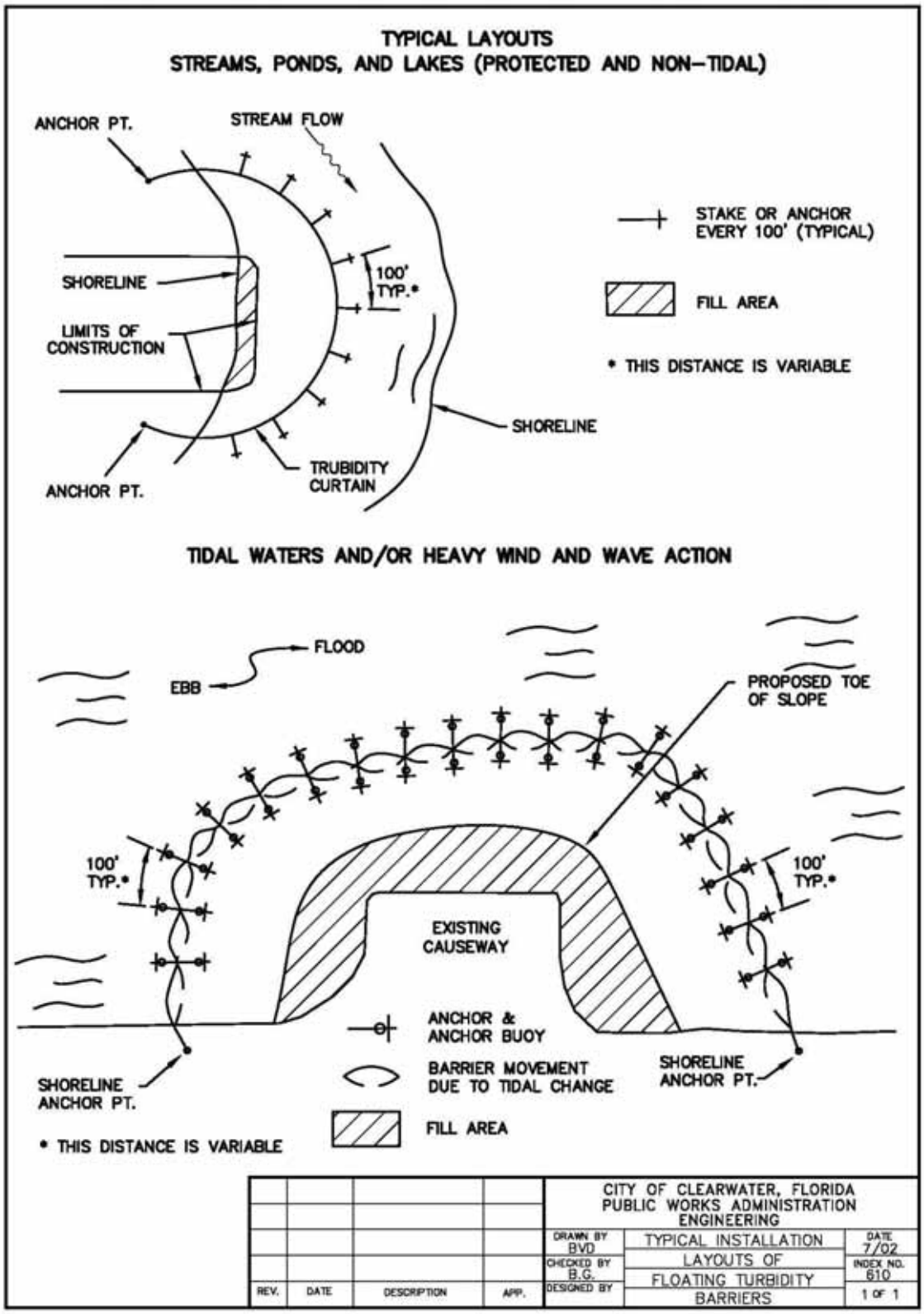
REV.	DATE	DESCRIPTION	APP.

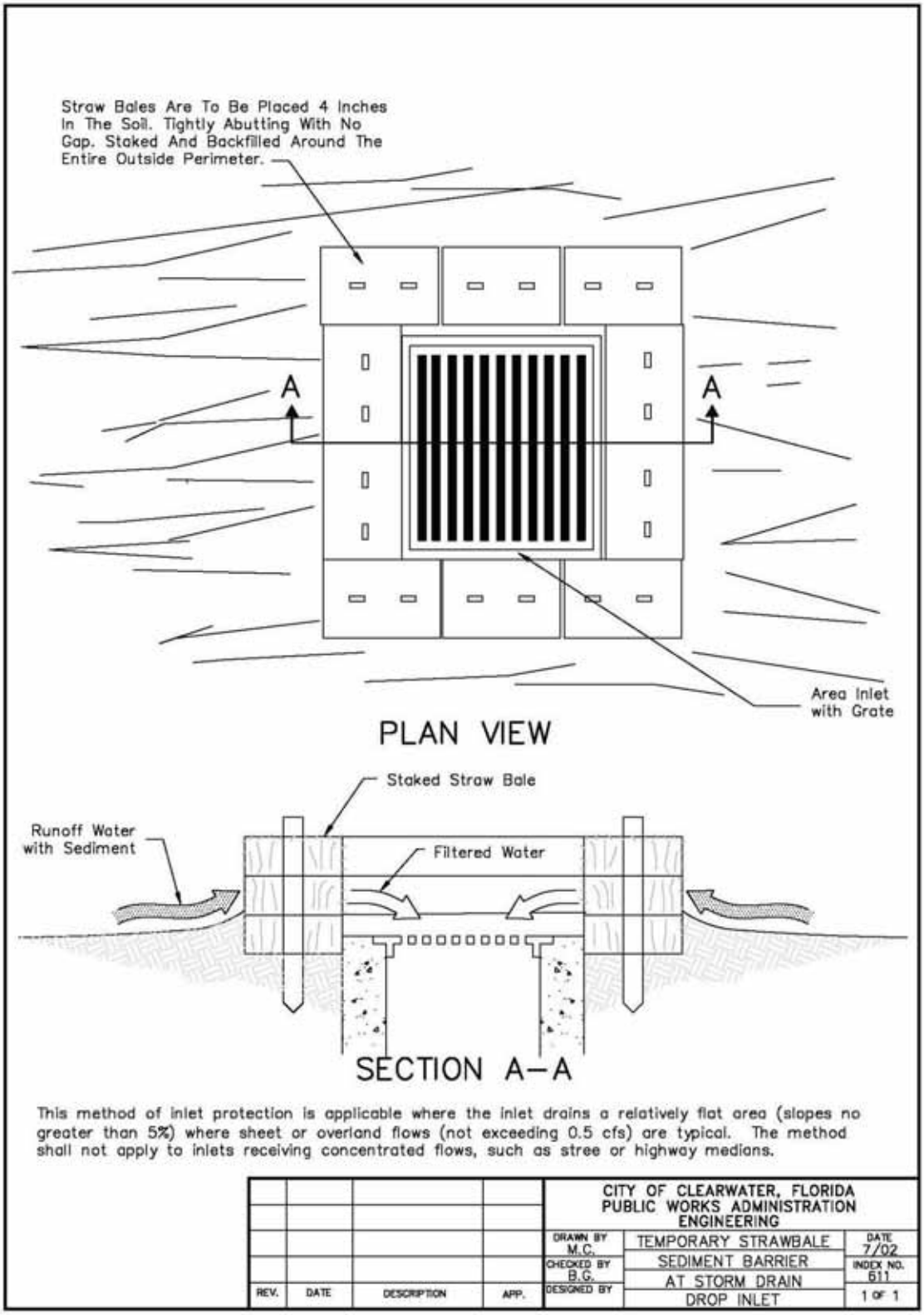
CITY OF CLEARWATER, FLORIDA
PUBLIC WORKS ADMINISTRATION
ENGINEERING

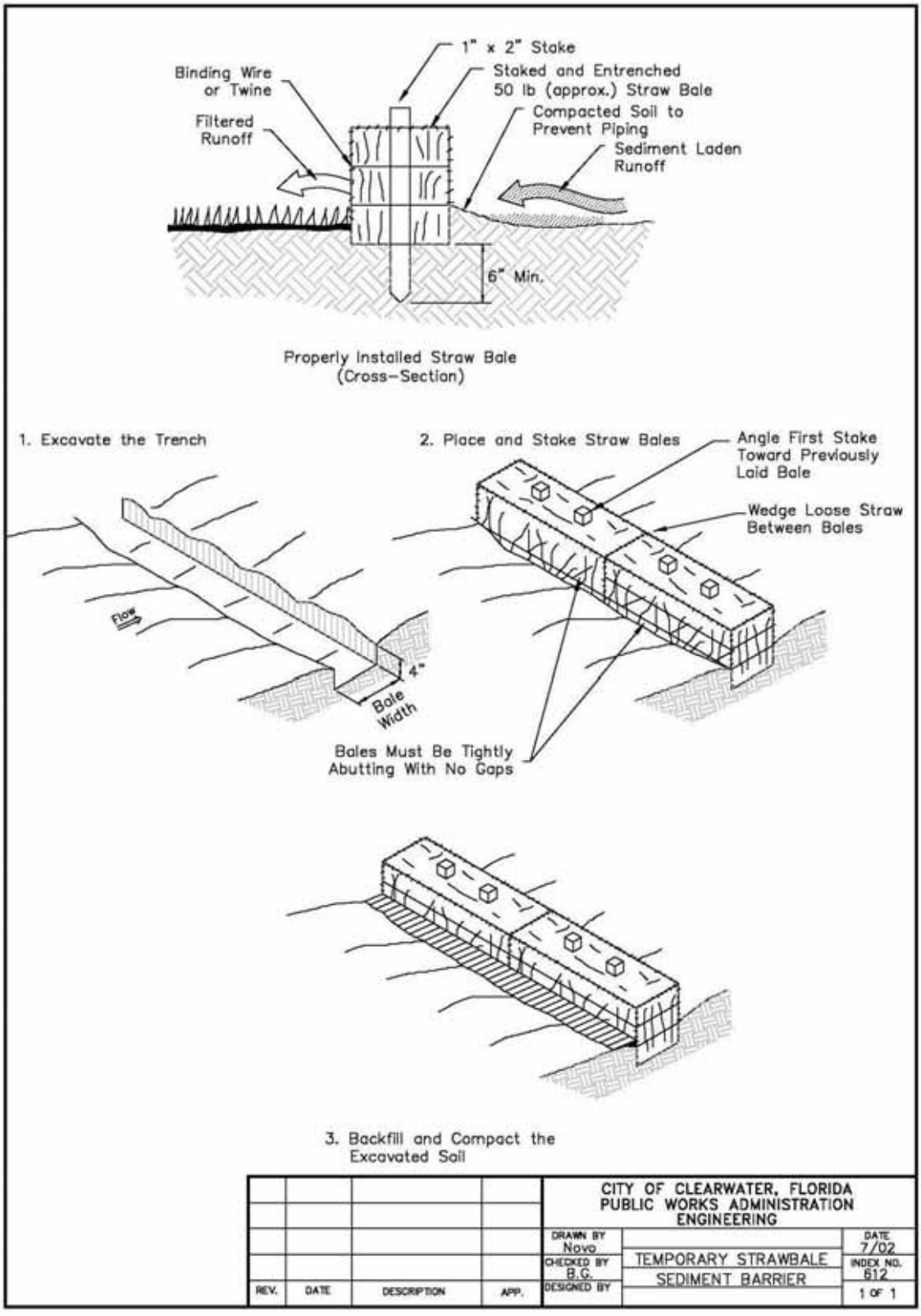
DRAWN BY Novo	TEMPORARY SEDIMENT BARRIER AT DROP INLET	DATE 7/02
CHECKED BY B.G.		INDEX NO. 608
DESIGNED BY		2 OF 2

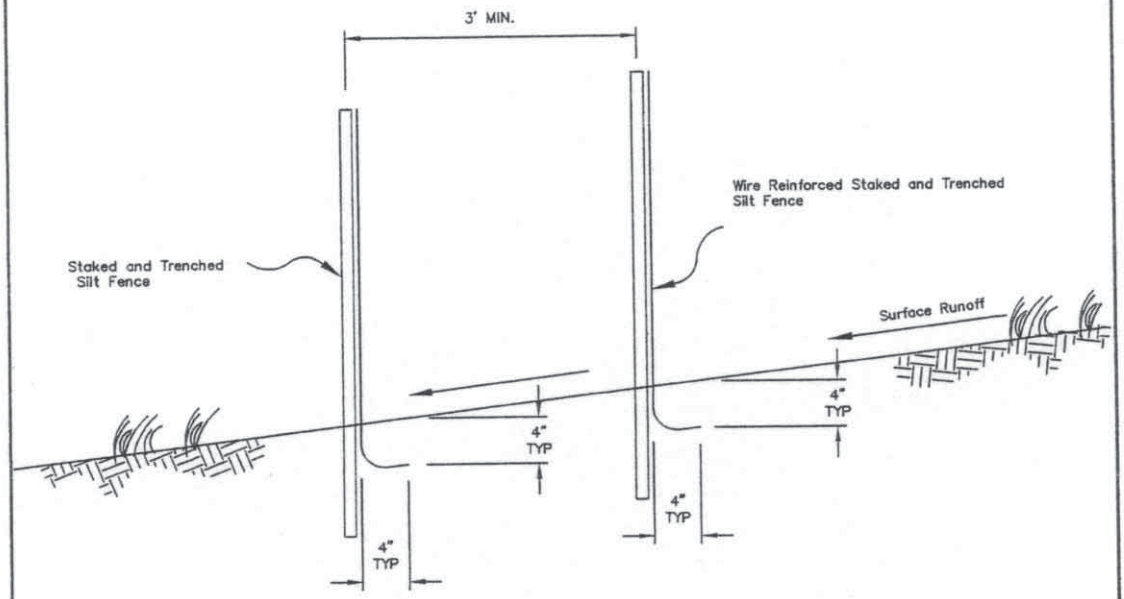

5/8 IN. POLYPROPYLENE ROPE
1/4 IN. TIE ROPE
FLOATATION
FOLDS FOR COMPACT STORAGE
DEPTH ACCORDING TO NEED
ECONOMY FABRICS AVAILABLE
18 OZ. 300 LB/IN. STANDARD
1/4 IN. CHAIN
NYLON REINFORCED VINYL
ALL SEAMS HEAT SEALED
(BLOW-UP OF SHACKLE CONNECTION)
TYPE I
GALVANIZED #24 SAFETY HOOK
18 (OR 22) OZ. VINYL COVERED NYLON
WATER SEAL
PVC SLOT-CONNECTOR
TOP LOAD LINE
5/16 VINYL COATED CABLE
FLOATATION
STRESS PLATE (TO REMOVE PRESSURE FROM FLOATS)
100 FT. STANDARD LENGTH
FOLDS EVERY 6 FEET
DEPTH ACCORDING TO NEED
STRESS BAND
STRESS PLATE
5/16 IN. CHAIN BALLAST & LOAD LINE
TYPE II
CITY OF CLEARWATER, FLORIDA
PUBLIC WORKS ADMINISTRATION
ENGINEERING
DRAWN BY BVD
CHECKED BY B.C.
DESIGNED BY
FLOATING TURBIDITY BARRIERS TYPE I AND TYPE II
DATE 7/02
INDEX NO. 609
1 OF 2
REV. DATE DESCRIPTION APP.


TYPE III
STRESS BAND
22 OZ NYLON REINFORCED VINYL
PVC SLOT – CONNECTOR
FLOATATION
DEPTH ACCORDING TO NEED
#24 SAFETY HOOK
STRESS PLATE
LAP LINK
5/16 IN. CHAIN
5/16 VINYL COATING CABLE (ON BOTH SIDES OF CURTAIN TO REDUCE STRAIN)
ORIENTATION WHEN INSTALLED (TIDAL SITUATION – TYPE III)
NOTE: ANCHORING WITH BUOYS, AS SHOWN, REMOVES ALL VERTICAL FORCES FROM THE CURTAIN. HENCE, THE CURTAIN WILL NOT SINK FROM WIND OR CURRENT LOADS.
BUOY
ATTACH LINES TO SHACKLE
AUTOMATIC FLASHING LIGHT (ON AT DUSK–OFF AT DAWN) 100' ON CENTER SHALL BE USED IN NAVIGABLE CHANNELS ONLY
MIN. 2'
STANDARD CONTAINMENT SYSTEMS LIGHT BUOY
WATER SURFACE
5'
5'
ANCHOR (AS RECOMMENDED BY THE MANUFACTURER)
MIN. 12"
CURTAIN
RIVERBED
REV.
DATE
DESCRIPTION
APP.
CITY OF CLEARWATER, FLORIDA
PUBLIC WORKS ADMINISTRATION
ENGINEERING
DRAWN BY BVD
CHECKED BY B.G.
DESIGNED BY
FLOATING TURBIDITY BARRIER TYPE III
DATE 7/02
INDEX NO. 609
2 OF 2


TYPICAL LAYOUTS
STREAMS, PONDS, AND LAKES (PROTECTED AND NON-TIDAL)
ANCHOR PT.
STREAM FLOW
SHORELINE
LIMITS OF CONSTRUCTION
100' TYP.*
ANCHOR PT.
TRUBIDITY CURTAIN
SHORELINE
STAKE OR ANCHOR EVERY 100' (TYPICAL)
FILL AREA
* THIS DISTANCE IS VARIABLE
TIDAL WATERS AND/OR HEAVY WIND AND WAVE ACTION
FLOOD
EBB
PROPOSED TOE OF SLOPE
100' TYP.*
100' TYP.*
EXISTING CAUSEWAY
ANCHOR & ANCHOR BUOY
BARRIER MOVEMENT DUE TO TIDAL CHANGE
FILL AREA
SHORELINE ANCHOR PT.
SHORELINE ANCHOR PT.
* THIS DISTANCE IS VARIABLE
REV.
DATE
DESCRIPTION
APP.
CITY OF CLEARWATER, FLORIDA
PUBLIC WORKS ADMINISTRATION
ENGINEERING
DRAWN BY BVD
CHECKED BY B.G.
DESIGNED BY
TYPICAL INSTALLATION
LAYOUTS OF
FLOATING TURBIDITY
BARRIERS
DATE 7/02
INDEX NO. 610
1 OF 1


Straw Bales Are To Be Placed 4 Inches In The Soil. Tightly Abutting With No Gap. Staked And Backfilled Around The Entire Outside Perimeter.
A
A
Area Inlet with Grate
PLAN VIEW
Staked Straw Bale
Runoff Water with Sediment
Filtered Water
SECTION A–A
This method of inlet protection is applicable where the inlet drains a relatively flat area (slopes no greater than 5%) where sheet or overland flows (not exceeding 0.5 cfs) are typical. The method shall not apply to inlets receiving concentrated flows, such as stree or highway medians.
CITY OF CLEARWATER, FLORIDA
PUBLIC WORKS ADMINISTRATION
ENGINEERING
REV. DATE DESCRIPTION APP.
DRAWN BY M.C.
CHECKED BY B.G.
DESIGNED BY
TEMPORARY STRAWBALE SEDIMENT BARRIER AT STORM DRAIN DROP INLET
DATE 7/02
INDEX NO. 611
1 OF 1


1" x 2" Stake
Staked and Entrenched
50 lb (approx.) Straw Bale
Binding Wire
or Twine
Filtered
Runoff
Compacted Soil to
Prevent Piping
Sediment Laden
Runoff
6" Min.
Properly Installed Straw Bale
(Cross-Section)
1. Excavate the Trench
Flow
4"
Bale
Width
2. Place and Stake Straw Bales
Angle First Stake
Toward Previously
Laid Bale
Wedge Loose Straw
Between Bales
Bales Must Be Tightly
Abutting With No Gaps
3. Backfill and Compact the
Excavated Soil
CITY OF CLEARWATER, FLORIDA
PUBLIC WORKS ADMINISTRATION
ENGINEERING
DRAWN BY
Novo
DATE
7/02
CHECKED BY
B.G.
TEMPORARY STRAWBALE
SEDIMENT BARRIER
INDEX NO.
612
DESIGNED BY
1 OF 1
REV.
DATE
DESCRIPTION
APP.



DOUBLE ROW STAKED SILT FENCE

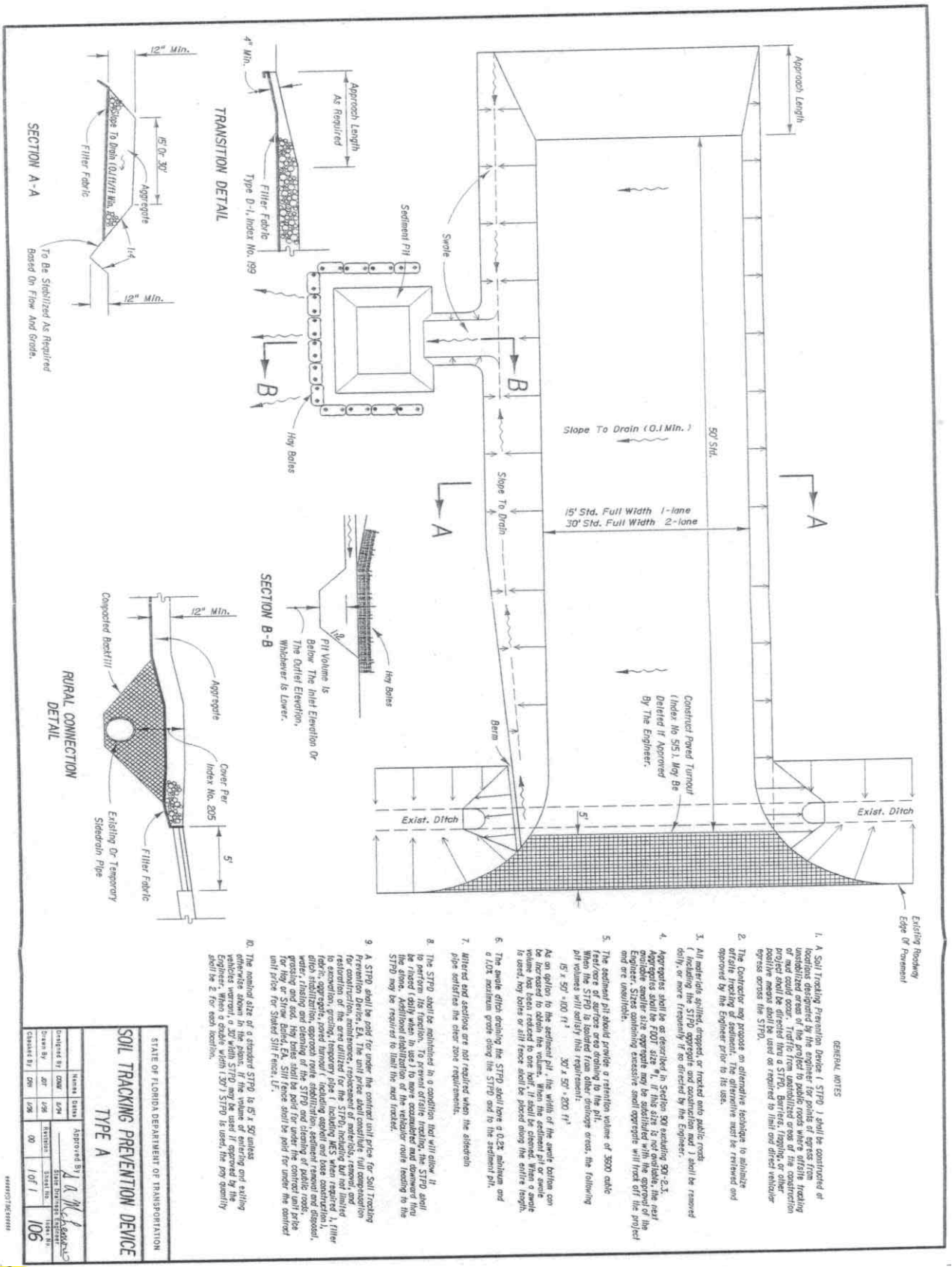
REV.	DATE	DESCRIPTION	APP.

CITY OF CLEARWATER, FLORIDA
PUBLIC WORKS ADMINISTRATION
ENGINEERING

DRAWN BY: Novo
CHECKED BY: B.G.
DESIGNED BY:

TEMPORARY STRAWBALE SEDIMENT BARRIER

DATE: 7/02
INDEX NO.: 612
1 OF 1



GENERAL NOTES

1. A Soil Tracking Prevention Device (STPD) shall be constructed at locations designated by the engineer for points of egress from unstabilized areas of the project to public roads where offsite tracking of mud could occur. Traffic from unstabilized areas of the construction project shall be directed thru a STPD. Barriers, flagging, or other positive means shall be used as required to limit and direct vehicular egress across the STPD.
2. The Contractor may propose an alternative technique to minimize offsite tracking of sediment. The alternative must be reviewed and approved by the Engineer prior to its use.
3. All materials spilled, dropped, or tracked onto public roads (including the STPD aggregate and construction mat) shall be removed daily, or more frequently if so directed by the Engineer.
4. Aggregates shall be as described in Section 901 excluding 901-2.3. Aggregates shall be FDOT size #1, if this size is not available, the next available smaller size aggregate may be substituted with the approval of the Engineer. Sizes containing excessive small aggregate will track off the project and are unsuitable.
5. The sediment pit should provide a retention volume of 3600 cubic feet/acre of surface area draining to the pit. When the STPD is located near a drainage divide, the following pit volumes will satisfy this requirement:

   15' x 50' = 100 ft³ 30' x 50' = 200 ft³

   As an option to the sediment pit , the width of the swale bottom can be increased to obtain the volume. When the sediment pit or swale volume has been reduced to one half, it shall be cleaned. When a swale is used, hay bales or silt fence shall be placed along the entire length.
6. The swale ditch draining the STPD shall have a 0.2% minimum and a 10% maximum grade along the STPD and to the sediment pit.
7. Mitered end sections are not required when the sidedrain pipe extends the clear zone requirements.
8. The STPD shall be maintained in a condition that will allow it to perform its function. To prevent offsite tracking, the STPD shall be raised daily when in use (to more accumulated mud downward thru the stone. Additional stabilization of the vehicular route leading to the STPD may be required to limit the mud tracked.
9. A STPD shall be paid for under the contract unit price for Soil Tracking Prevention Device, EA. The unit price shall constitute full compensation for construction, maintenance, replacement of materials, removal, and restoration of the area utilized for the STPD, including but not limited to excavation, grading, temporary pipe (including MES when required), filter fabric, aggregate, paved turnout (including asphalt and base construction), ditch stabilization, approach route stabilization, sediment removal and disposal, water, lighting and cleaning of the STPD and cleaning of public roads. Silt fencing and sod, hay bales, shall be paid for under the contract unit price for Hay or Straw Bales, EA. Silt fence shall be paid for under the contract unit price for Staked Silt Fence, LF.
10. The nominal size of a standard STPD is 15' x 50' unless otherwise shown in the plans. If the volume of entering and exiting vehicles warrant, a double STPD may be used by the Engineer. A double STPD is 30' wide. If a 30' STPD is used, the pay quantity shall be 2 for each location.

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION

SOIL TRACKING PREVENTION DEVICE
TYPE A

	Name	Date
Designed By	CDW	6/04
Drawn By	JDT	1/06
Checked By	CDW	1/06

Approved By: A. M. Lassen
State Drainage Engineer

Revision	Sheet No.	Index No.
00	1 of 1	106

Appendix G
Engineering Department's Stormwater Design Criteria

CITY OF CLEARWATER
DEPARTMENT OF PUBLIC WORKS
STORM DRAINAGE DESIGN CRITERIA

INTRODUCTION

This manual is a guide to assist Engineers in the design of stormwater systems in the City of Clearwater. In general these standards are a combination of requirements set by the Southwest Florida Water Management District, and requirements set by the City of Clearwater, Public Works Department. This manual does not propose to itemize the requirements of the Southwest Florida Water Management District, but to highlight and detail the requirements of the City of Clearwater. Where design standards of applicable regulatory agency's vary, the more restrictive or higher standard will apply. The Designer is required to be familiar with the current design requirements of the Southwest Florida Water Management District. The appropriate Southwest Florida Water Management District storm water permit and other applicable regulatory agency permits will be required prior to any final construction permit approval by the City of Clearwater.

The Designers attention is called to the City of Clearwater requirement that all development and redevelopment will require provisions for storm water management. In particular, redevelopment will be required to provide storm water management facilities in accordance with the regulations herein.

For the purpose of administering these stormwater management regulations, redevelopment is defined as the alteration of buildings, parking, or other landform features of a property which necessitates the Community Development Code review process. Redevelopment of property for which no stormwater management facilities exists will be required to provide such facilities in accordance with the methodology contained herein, notwithstanding that the circumstances of the redevelopment may not result in an increase of stormwater runoff.

STORMWATER MANAGEMENT DESIGN CRITERIA

1. **GENERAL:**

All construction shall comply with the City of Clearwater Contract Specifications and Standards. All stormwater facility designs must be designed and certified by a Florida Registered Engineer.

Record drawings shall be submitted and certified by a Florida Registered Engineer before final acceptance of project.

Design Frequency

(a) - 10 Year - storm systems, culverts
(b) - 25 Year - channels and detention areas with outfalls
(c) - 50 Year - detention areas without outfalls
(d) - 100 Year - detention areas without outfalls which when capacity is exceeded overflow onto private property

Runoff Coefficients:

Ponds, lakes and detention area (wet or dry)	1.00
Buildings, paved areas, and other impervious areas	0.95
Turfblock	0.45
Green or pervious areas	0.20

Design coefficients shall be obtained by using the above coefficients on a weighted run off method for both pre-development and post-development.

2. **STORM DRAINAGE**:

Detention areas must be built before storm sewers are installed. Slopes shall not be steeper than four to one (4 : 1) and shall be protected from erosion by sod.

Time of Concentration

Time of concentration to first inlet on a system shall be determined by using velocity of runoff chart. (Chart attached). A minimum time of 15 minutes to first inlet shall be used.

3. **STORM SEWERS, INLETS, AND STREET DESIGN PERTAINING TO WATER FLOW**

Unless specifically approved by the City Engineer, reinforced concrete pipe shall be used in all easements and street rights-of- way. Minimum size shall be 15" diameter. Design frequency - 10 year storm. Mannings Roughness coefficient for storm pipe:

	N
(a) RCP	
15" - 30" inclusive	0 .013
36" - 48" "	0.012
54" - up	0.011
(b) CMP or Aluminum	0.023
Asphalt coated	0.018
(c) PVC Storm Drain Pipe	0.009

The slopes for culverts used as storm sewers shall produce a velocity within the following limits:

	Maximum	**Minimum**
CMP	10 f.p.s.	2 f.p.s.
RCP	12 f.p.s.	2 f.p.s.

Standard hydraulic gradient elevation shall be minimum of 1.0 foot below throat of inlet or manhole.

Minimum Culvert Size:

(a) - Pipe - 15"
(b) - Box Culvert - 3' x 3'

Maximum length of pipe without access structure:

(a) - (15" - 18") Pipe - 350 ft.
(b) - (24" - 36") Pipe - 400 ft.
(c) - (42" & cover & all box culverts) - 500 ft.

4. **INLETS AND MANHOLES**:

Vertical throat opening for inlets shall be 5".

Inlets and manholes will be designed so as not to have standing water when not functioning.

All inlets to have manhole lids in accordance with City standards.

Inlets are not to be placed in curb return.

Pipes are to be cut flush with inside wall of inlet.

Subdrain shall enter structure a minimum of one foot above invert and 2' 6" below top of structure.

When pipe diameter exceeds 30", inlets shall not be used as junction boxes, limit 3 pipes per inlet.

For design purposes inlet capacity should be assumed as follows:

	Grate Inlet *	- 4 CFS
	(No Wing Type *	- 4 CFS
5" Throat	(Single Wing Type	- 6 CFS
	(Double Wing Type	- 8 CFS

* - Subject to City Engineer's approval only.

Standard inlet wings shall be a minimum of four feet in length as per City Standards.

5. **STREET DESIGN:**

Generally gutter water should not be carried for distances exceeding 600 feet.

Except as where impractical, channeling water across intersections will not be allowed.

	Inlet Spacing
Normal Grades - .5% up to 2%	- 600 ft.
Steep Grades - greater than 2%	- 400 ft.

Where grades exceed 2%, a 6' wing will be required on the inlet. Grades less than 0.5% are subject to City Engineer's approval only. A minimum of 0.5% grade shall be required for asphalt drives and parking lots. Right-of-way shoulders shall be sodded three feet behind curb and remainder, graded, seeded, and mulched. Mulch to be dry or green per F.D.O.T. current standard.

6. **HEADWALLS**:

All inlet and outlet pipes shall be provided with a headwall, mitred end section, or flared end section. Headwalls shall be reinforced concrete. Pinned Sand/Cement bag structures built

in accordance with City of Clearwater specifications may be permitted only for temporary use. All outlets shall have an appropriate apron to prevent erosion.

7. **CHANNELS AND SWALES:**

Roughness Coefficient - for a channel with maintained vegetation is .030 to .035.

Normal channel depth shall not be within 10% of critical depth. When velocities exceed maximum allowable values energy dissipators shall be provided. Plans shall include undeveloped areas, pre- development drainage, and pre-development discharge at key design points such as channels, existing ponds, sloughs, etc. Also post- development calculations for storm runoff and proper detention shall be determined.

Type of Soil in Flow Line	Maximum Allowable Velocity (f.p.s.)
Fine Sand	1.5
Sandy Loam	1.8
Silt Loam	2.0
Firm Loam	2.5
Fine Gravel	2.5
Stiff Clay	3.8
Coarse Gravel	4.0
Hardpan	6.0

Major channels (Q greater than 30 CFS) shall have a five foot bottom width. Drainage swales normally will not be permitted along rear lot lines.

Swales shall be vegetated and designed for a 50 year storm.

8. **STORM WATER DETENTION**:

This policy is to insure that runoff will not be increased beyond its present state by development. It is also intended to protect the quality of receiving waters in the City from additional pollution resulting from new development. The design frequency shall be a 25 year storm based on rainfall intensity graph for the Clearwater area. The duration may be obtained from the Rational method for areas up to 10 acres. Design variations may be considered for areas less than one acre. The runoff coefficient differential DELTA C is obtained by subtracting pre-development coefficient from post-development coefficient.

For projects greater than 10 acres, systems design must incorporate the U.S. Department of Agriculture Soil Conservation Service Modified Unit Hydrograph, or equivalent as

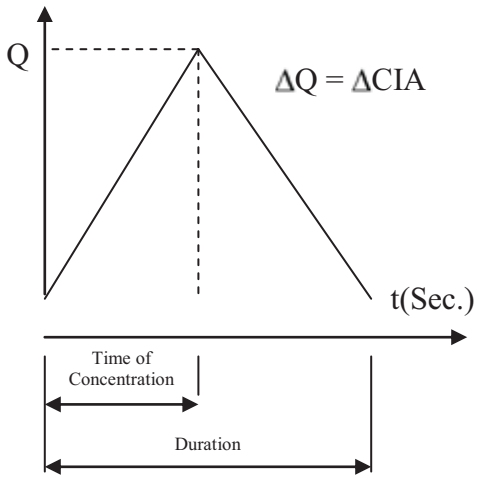
determined by the City Engineer, in conjunction with a SCS Type II Florida Modified rainfall distribution curve.

In the case of redevelopment of land upon which no stormwater attenuation or water quality feature exists, or upon which the existence of such features do not meet the standards applicable at the time of redevelopment, the redeveloper will be required to provide facilities in a manner similar to an original developer and in proportion to the extent to which the site plan of the property is affected or disturbed by the redevelopment. In the methodology for calculating stormflow from property undergoing redevelopment, the pre-development volume of runoff will be calculated by the use of a Weighted Runoff Coefficient taken from the following table:

PROPERTY DESCRIPTION*	WEIGHTED COEFFICIENT OF RUNOFF**
Undergoing redevelopment and not contributing to an existing flooding problem ***	1/2 Actual
Undergoing redevelopment and contributing to an existing flooding problem	.20
Undergoing redevelopment and contributing to an existing flooding problem for which an attenuating stormwater manage-ment project is under construction	1/2 Actual

* City Engineer shall be the determining authority of the Property Description
** In no case shall the coefficient be less than .20
** To be applied only to area of property undergoing alteration
*** Situation wherein property damage occurs in a 25 year - 24 hour storm

The City of Clearwater standards relative to the provision of water-quality features are, by this reference, the same as the Southwest Florida Water Management District's, excepting that where SWFWMD may rule that no water quality features are required, the City's standard shall require the provision of treatment of 1/2 inch of rainfall as applied over the entire area of a development project and 1/2 inch as applied over the portion of the site plan undergoing alteration in the case of redevelopment.



The design hydrograph is an isosceles triangle with a time of concentration equal to one half of the duration. Detention design shall incorporate **a minimum time of concentration of one hour** & a 25 year storm intensity. The outfall shall be restricted to accommodate the pre-development flow with appropriate overflow facilities for larger volumes. Detention ponds will require 0.5' of freeboard.

Volume of detention may be established by multiplying time of concentration times DELTA Q providing the outlet control structure (weir, pipe, etc.) is designed to restrict other than pre-development Q. An outfall design allowing less than the pre-developed Q to pass is acceptable if storage is provided.

Discharge to Lake or Wetland

In situations where the pre-developed Q abuts a lake or wetland, the developer may store additional runoff above that required for water quality treatment in the wetland subject provided that the following conditions are met:

Wetland with positive outfall has the capacity to store a 25 year design storm.
Wetland with no outfall has the capacity to store a 50 year design storm.
Wetland has sufficient capacity to absorb additional runoff.

All areas on or off site contributing to a wetland shall be included in the design. Runoff discharging directly to the wetland shall be transmitted via grassed swales. Runoff from lots abutting a wetland shall be collected in an interceptor swale designed to drain dry in less than 24 hours.

The maximum design high water elevation of the wetland shall be one foot below the lowest floor elevation around the wetland or one foot below the flow line of the nearest adjacent road, whichever is lower. The design wetland elevation shall be determined by the inflow and outflow hydrograph method.

The impact to the wetland system will be taken into consideration when reviewing these applications. Those areas directly outfalling tidal salt water basins will be reviewed for water quality impacts only.

Dry Detention Systems

Dry detention systems are those that under non storm conditions are dry, ie., has a grassed bottom and side slopes that can be mowed. These systems shall be designed with no steeper than 4:1 side slopes, preferably no deeper than three feet deep and drain dry within 24 hours or less. The side slopes and bottom shall be sodded. Drawdown may be accomplished by the use of underdrain according to City specifications or by percolation if the soil conditions permit. At least one soil boring showing soil profile and the seasonal high water table shall be provided with the site plan. The soil boring shall be located at the center of the proposed detention area.

Wet Detention Systems

Wet detention/retention systems are those that under non storm conditions are designed to have a standing pool of water. The design shall be in accordance with City Details. All wet systems shall incorporate a vegetated littoral shelf over 35% of the areal cover of the pond under normal conditions. Drawdown may include an underdrain system, natural percolation or slow bleed down system. Underground vaults are not allowed as water quality facilities and are permitable for water quantity storage only as specifically allowed by the City Engineer.

Detention Pond Walls

The use of vertical walls on the sides of detention ponds or side slopes steeper than 4:1 are discouraged and will not be permitted except as may be specifically approved due to reason of undue hardship to the developer. In no circumstance will vertical walls on detention ponds be permitted adjacent to rights-of-ways, along the boundaries of adjacent parcels of land, on more than two sides of a detention pond, or any side of a pond serving only as a water quality facility.

9. SUBMITTALS

In addition to submitting complete plans and specifications, the Engineer shall also submit the following:

A. - Drainage calculations or computations including hydro-graphs for any detention areas, retention ponds, complete with cross sections.

B. - A scale map or plat showing each subdivision drainage basin, as an aid for review of the proposed work. A minimum of 50 feet of topographical survey shall be required adjacent to the perimeter of the proposed site.

C. - Profile of hydraulic gradient for storm pipe system.

D. - All pertinent information of adjoining properties affected by stormwater from site such as finish floor elevations of buildings, streets, channel or receiving waters to the final outfall. All adjacent property draining onto the proposed site is to be shown on the site plan.

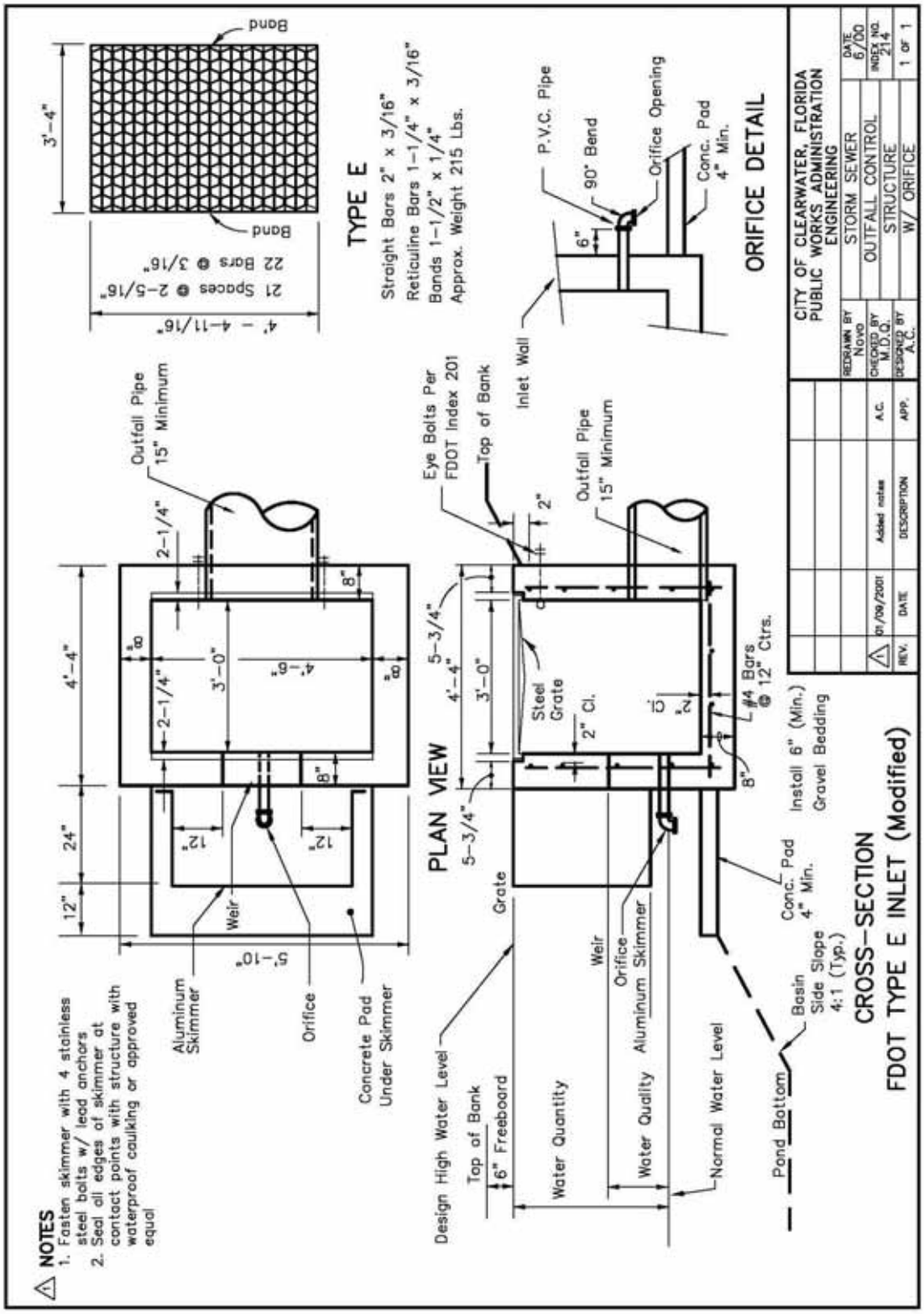
Before project is accepted by the Public Works Department, a Registered Engineer must submit written verification that the project was constructed in accordance with approved construction plans.

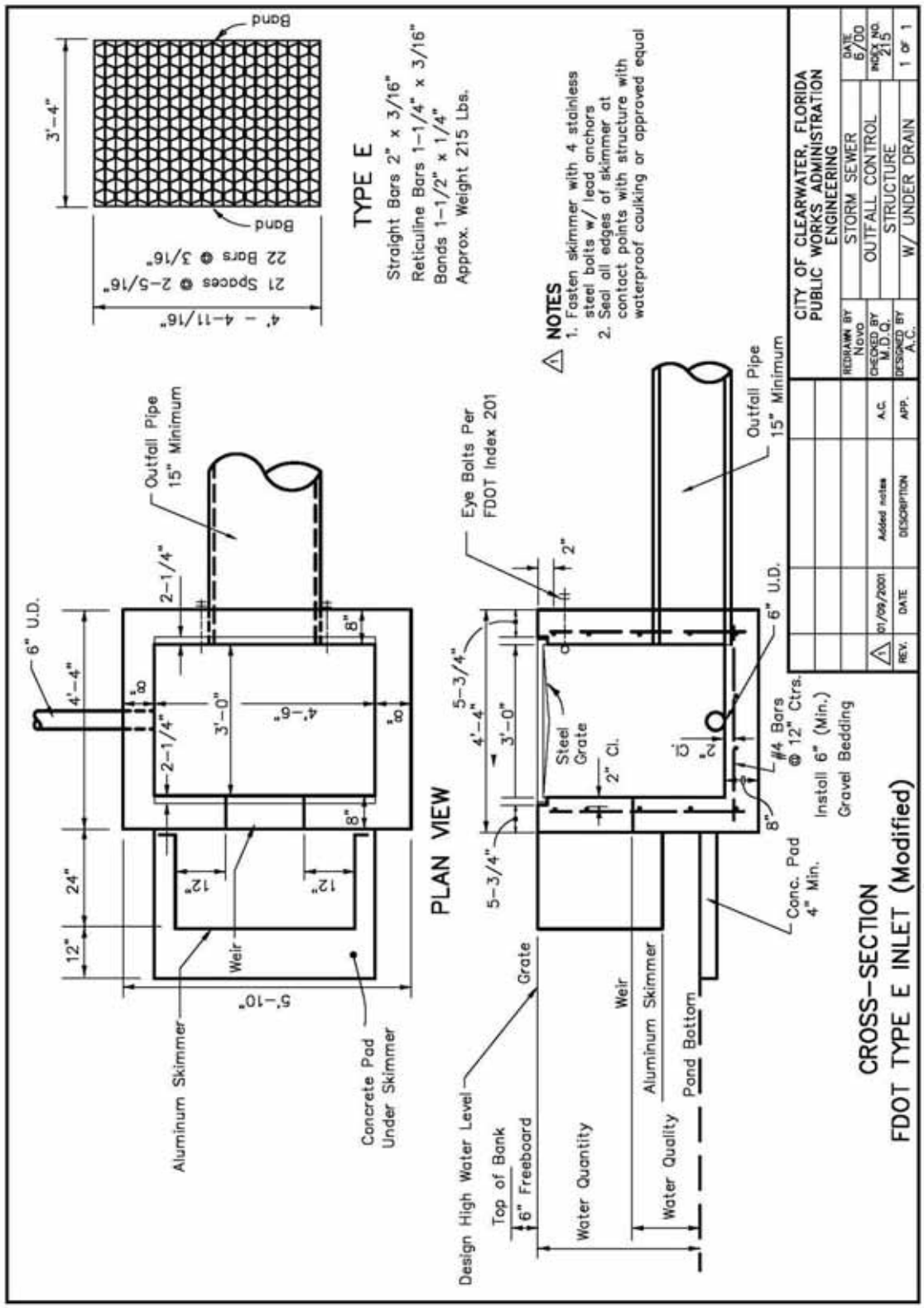
10. **ATTACHMENTS:**

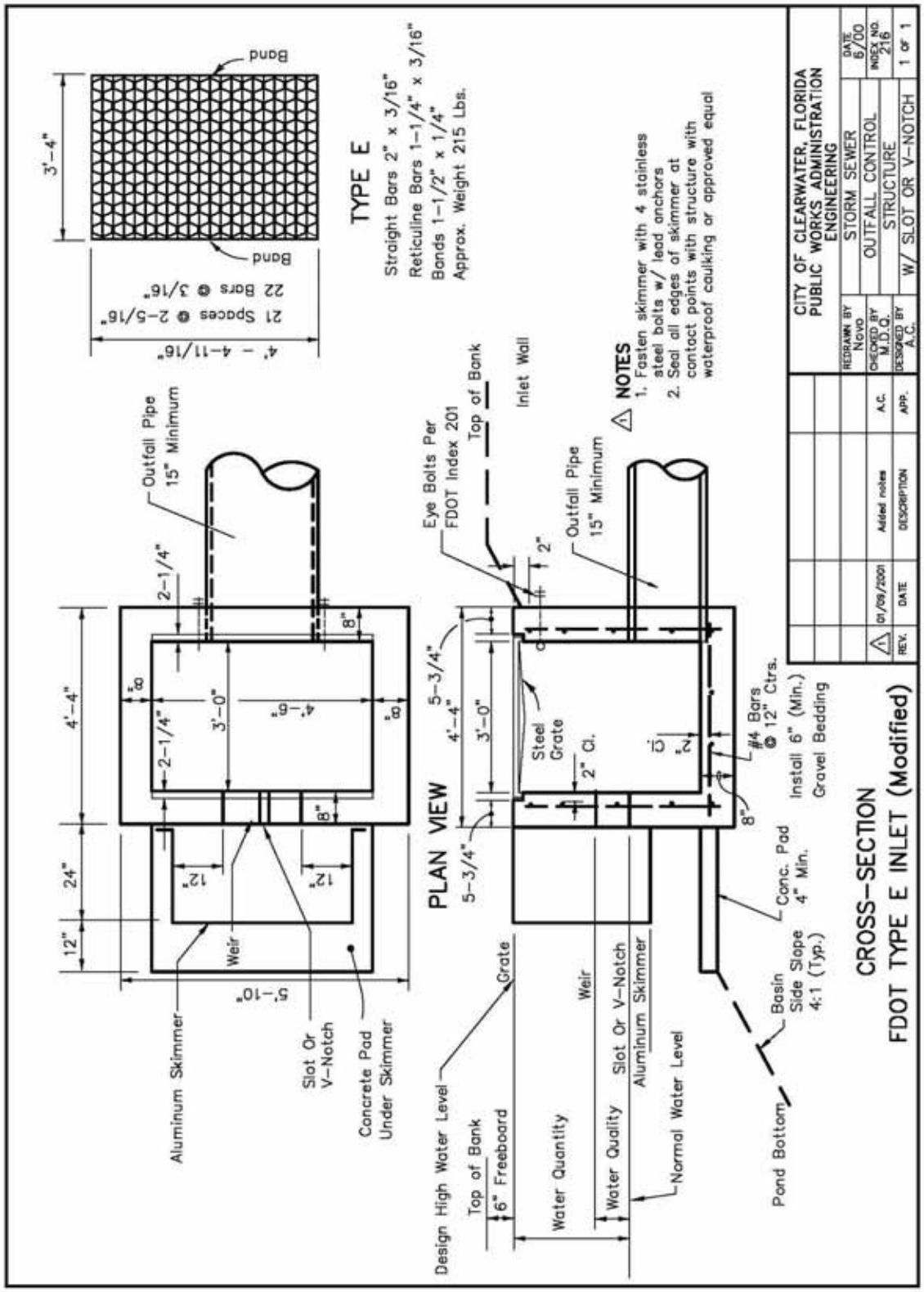
Rainfall - Intensity/Duration - Clearwater. This Rainfall Intensity Graph shall be used for 10, 25, and 50 year storms.

Velocity of Runoff - for use in determining intensity for above grade runoff.

Drainage Design Computations - suggested for working out drainage computations showing required information for submittal to City of Clearwater for approval.


NOTES
1. Fasten skimmer with 4 stainless steel bolts w/ lead anchors
2. Seal all edges of skimmer at contact points with structure with waterproof caulking or approved equal
Aluminum Skimmer
Weir
Orifice
Concrete Pad Under Skimmer
Outfall Pipe 15" Minimum
Design High Water Level
Top of Bank
6" Freeboard
Water Quantity
Water Quality
Normal Water Level
Pond Bottom
Basin Side Slope 4:1 (Typ.)
Grate
Concrete Pad 4" Min.
Install 6" (Min.) Gravel Bedding
CROSS-SECTION
FDOT TYPE E INLET (Modified)
PLAN VIEW
Eye Bolts Per FDOT Index 201
Top of Bank
Outfall Pipe 15" Minimum
Steel Grate
2" Cl.
#4 Bars @ 12" Ctrs.
Inlet Wall
P.V.C. Pipe
90° Bend
Orifice Opening
Conc. Pad 4" Min.
ORIFICE DETAIL
TYPE E
Straight Bars 2" x 3/16"
Reticuline Bars 1-1/4" x 3/16"
Bands 1-1/2" x 1/4"
Approx. Weight 215 Lbs.
Band
21 Spaces @ 2-5/16"
22 Bars @ 3/16"
CITY OF CLEARWATER, FLORIDA
PUBLIC WORKS ADMINISTRATION
ENGINEERING
STORM SEWER
OUTFALL CONTROL
STRUCTURE
W/ ORIFICE
DATE 6/00
INDEX NO. 214
1 OF 1


CITY OF CLEARWATER, FLORIDA
PUBLIC WORKS ADMINISTRATION
ENGINEERING
STORM SEWER
OUTFALL CONTROL
STRUCTURE
W/ UNDER DRAIN
DATE 6/00
INDEX NO. 215
1 OF 1
REDRAWN BY Novo
CHECKED BY M.D.Q.
DESIGNED BY A.C.
REV. DATE DESCRIPTION APP.
1 01/09/2001 Added notes A.C.
NOTES
1. Fasten skimmer with 4 stainless steel bolts w/ lead anchors
2. Seal all edges of skimmer at contact points with structure with waterproof caulking or approved equal
TYPE E
Straight Bars 2" x 3/16"
Reticuline Bars 1-1/4" x 3/16"
Bands 1-1/2" x 1/4"
Approx. Weight 215 Lbs.
4' - 4-11/16"
21 Spaces @ 2-5/16"
22 Bars @ 3/16"
Band
3'-4"
PLAN VIEW
Outfall Pipe 15" Minimum
Eye Bolts Per FDOT Index 201
6" U.D.
4'-4"
2-1/4"
3'-0"
8"
#4 Bars @ 12" Ctrs.
Steel Grate
2" Cl.
Install 6" (Min.) Gravel Bedding
Conc. Pad 4" Min.
Aluminum Skimmer
Concrete Pad Under Skimmer
Weir
Grate
5'-10"
24"
12"
CROSS-SECTION
FDOT TYPE E INLET (Modified)
Design High Water Level
Top of Bank
6" Freeboard
Water Quantity
Water Quality
Pond Bottom


TYPE E
Straight Bars 2" x 3/16"
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Bands 1-1/2" x 1/4"
Approx. Weight 215 Lbs.
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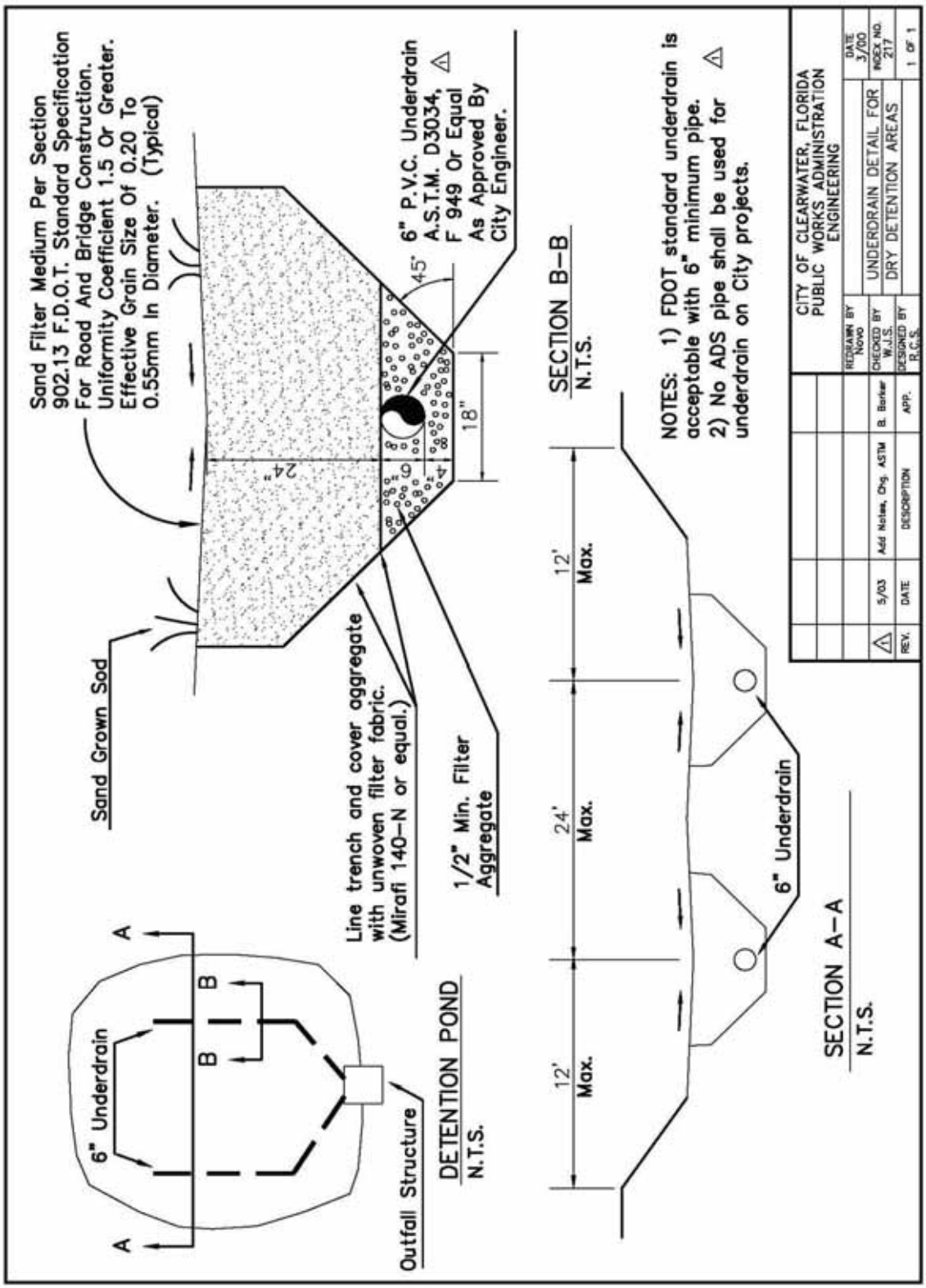
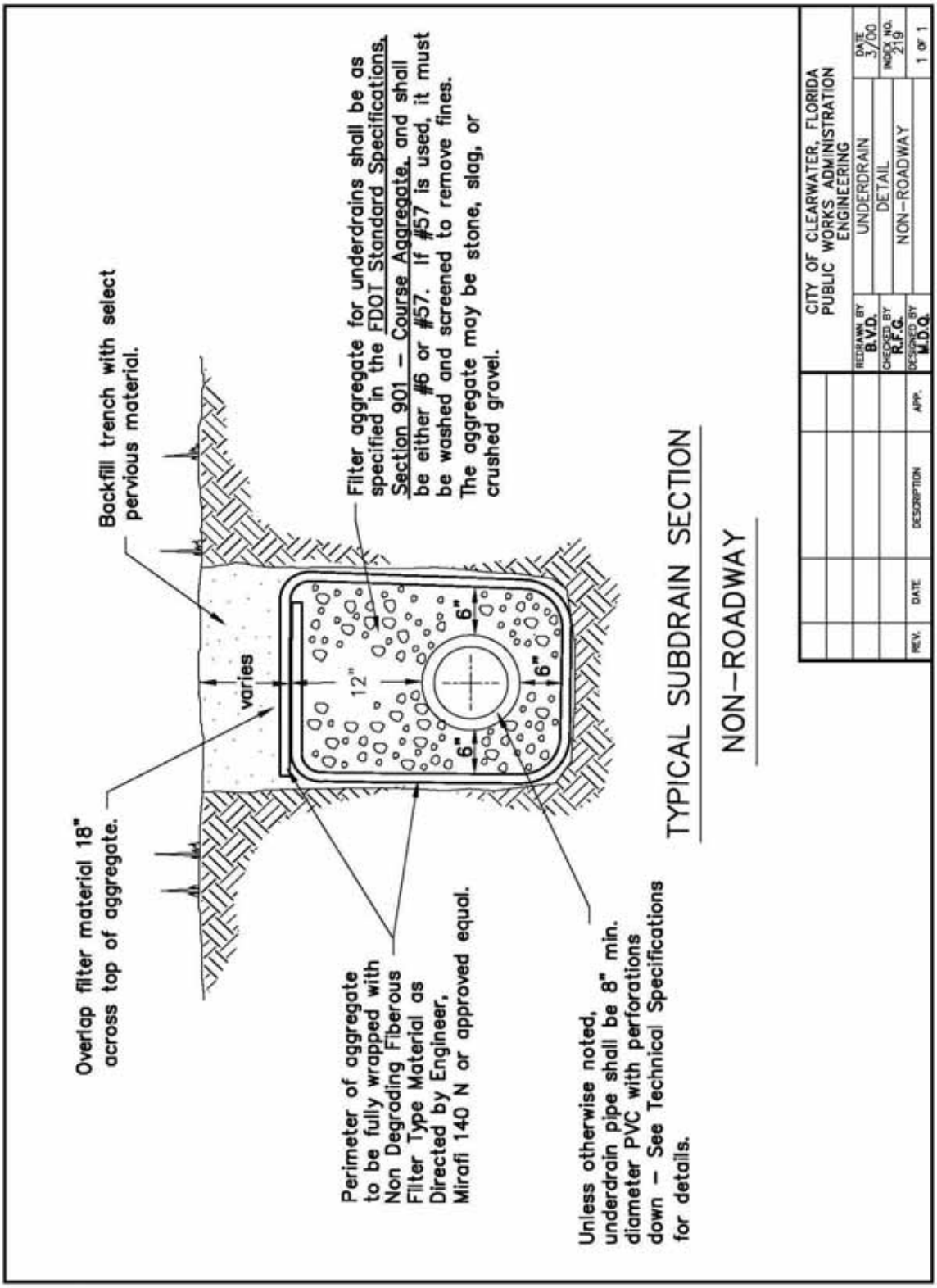
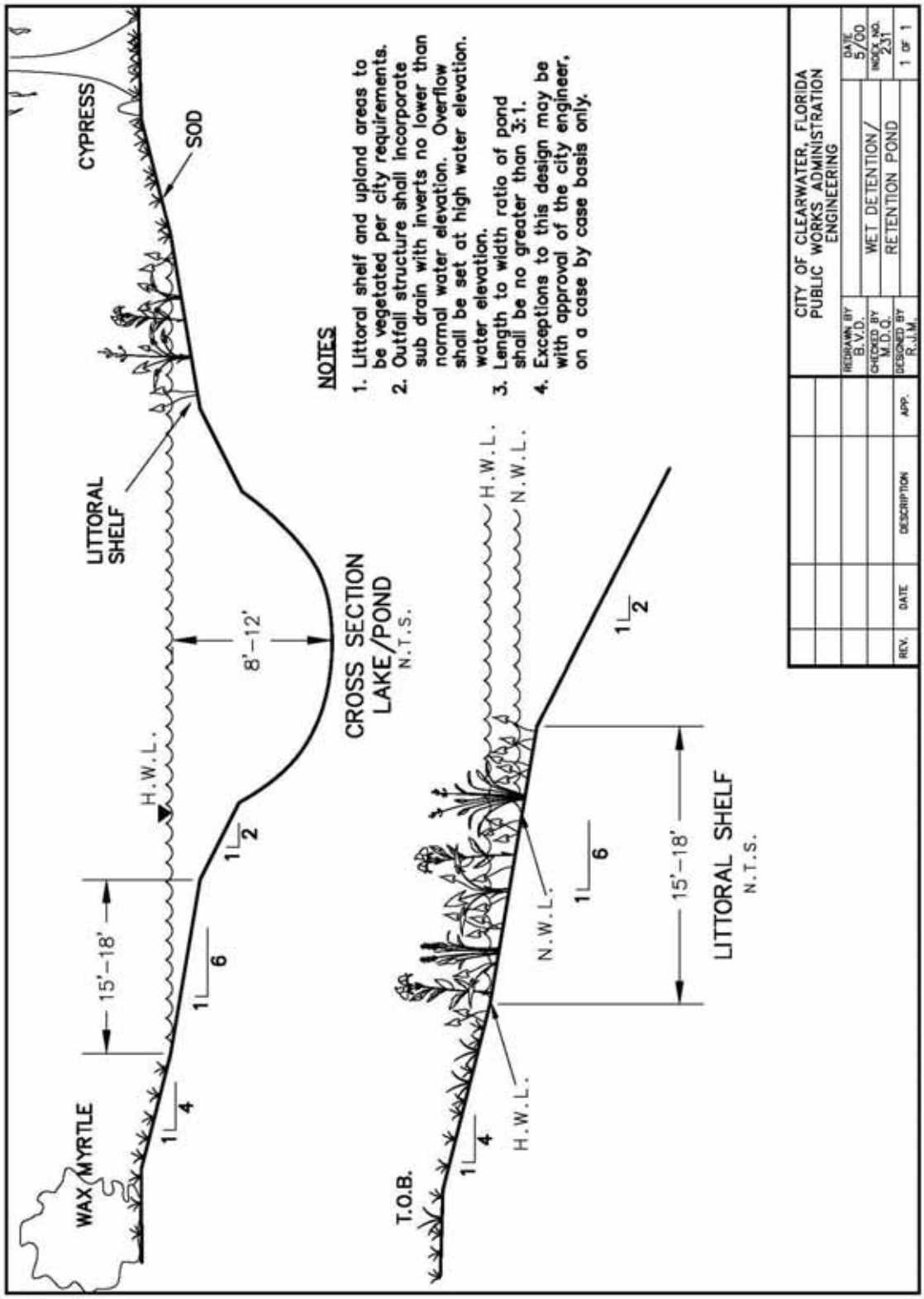
3'-4"
4' - 4-11/16"
21 Spaces @ 2-5/16"
22 Bars @ 3/16"
NOTES
1. Fasten skimmer with 4 stainless steel bolts w/ lead anchors
2. Seal all edges of skimmer at contact points with structure with waterproof caulking or approved equal
Outfall Pipe 15" Minimum
Eye Bolts Per FDOT Index 201
Top of Bank
Inlet Wall
2"
2-1/4"
8"
4'-4"
3'-0"
4'-0"
5'-10"
12"
24"
Weir
Aluminum Skimmer
Slot Or V-Notch
Concrete Pad Under Skimmer
PLAN VIEW
5-3/4"
Steel Grate
2" Cl.
#4 Bars @ 12" Ctrs.
Install 6" (Min.) Gravel Bedding
Conc. Pad 4" Min.
Basin Side Slope 4:1 (Typ.)
Pond Bottom
Design High Water Level
Top of Bank
6" Freeboard
Grate
Water Quantity
Water Quality
Slot Or V-Notch
Aluminum Skimmer
Normal Water Level
CROSS-SECTION
FDOT TYPE E INLET (Modified)
CITY OF CLEARWATER, FLORIDA
PUBLIC WORKS ADMINISTRATION
ENGINEERING
STORM SEWER
OUTFALL CONTROL
STRUCTURE
W/ SLOT OR V-NOTCH
DATE 6/00
INDEX NO. 216
1 OF 1
REDRAWN BY Novo
CHECKED BY M.D.Q.
DESIGNED BY A.C.
REV. DATE DESCRIPTION APP.
1 01/09/2001 Added notes A.C.


Sand Filter Medium Per Section 902.13 F.D.O.T. Standard Specification For Road And Bridge Construction. Uniformity Coefficient 1.5 Or Greater. Effective Grain Size Of 0.20 To 0.55mm In Diameter. (Typical)
6" P.V.C. Underdrain A.S.T.M. D3034, F 949 Or Equal As Approved By City Engineer.
45°
18"
24"
6"
Sand Grown Sod
Line trench and cover oggregate with unwoven filter fabric. (Mirafi 140-N or equal.)
1/2" Min. Filter Aggregate
6" Underdrain
Outfall Structure
A
B
DETENTION POND
N.T.S.
SECTION B-B
N.T.S.
12' Max.
24' Max.
12' Max.
6" Underdrain
SECTION A-A
N.T.S.
NOTES: 1) FDOT standard underdrain is acceptable with 6" minimum pipe.
2) No ADS pipe shall be used for underdrain on City projects.
CITY OF CLEARWATER, FLORIDA
PUBLIC WORKS ADMINISTRATION
ENGINEERING
REDRAWN BY Novo
CHECKED BY W.J.S.
DESIGNED BY R.C.S.
UNDERDRAIN DETAIL FOR DRY DETENTION AREAS
DATE 3/00
INDEX NO. 217
1 OF 1
REV. DATE DESCRIPTION APP.
5/03 Add Notes, Chg. ASTM B. Barker


Backfill trench with select pervious material.
Filter aggregate for underdrains shall be as specified in the FDOT Standard Specifications, Section 901 – Course Aggregate, and shall be either #6 or #57. If #57 is used, it must be washed and screened to remove fines. The aggregate may be stone, slag, or crushed gravel.
varies
12"
6"
6"
6"
Overlap filter material 18" across top of aggregate.
Perimeter of aggregate to be fully wrapped with Non Degrading Fiberous Filter Type Material as Directed by Engineer, Mirafi 140 N or approved equal.
Unless otherwise noted, underdrain pipe shall be 8" min. diameter PVC with perforations down – See Technical Specifications for details.
TYPICAL SUBDRAIN SECTION
NON–ROADWAY
CITY OF CLEARWATER, FLORIDA
PUBLIC WORKS ADMINISTRATION
ENGINEERING
REVISED BY
DRAWN BY B.V.D.
CHECKED BY R.F.G.
DESIGNED BY M.D.Q.
APP.
DESCRIPTION
DATE
REV.
UNDERDRAIN
DETAIL
NON–ROADWAY
DATE 3/00
INDEX NO. 219
1 OF 1


CYPRESS
SOD
LITTORAL SHELF
H.W.L.
8'-12'
15'-18'
1/4
1/6
1/2
WAX MYRTLE
CROSS SECTION
LAKE/POND
N.T.S.
NOTES
1. Littoral shelf and upland areas to be vegetated per city requirements.
2. Outfall structure shall incorporate sub drain with inverts no lower than normal water elevation. Overflow shall be set at high water elevation. water elevation.
3. Length to width ratio of pond shall be no greater than 3:1.
4. Exceptions to this design may be with approval of the city engineer, on a case by case basis only.
H.W.L.
N.W.L.
T.O.B.
H.W.L.
N.W.L.
1/4
1/6
1/2
15'-18'
LITTORAL SHELF
N.T.S.
CITY OF CLEARWATER, FLORIDA
PUBLIC WORKS ADMINISTRATION
ENGINEERING
REV.
DATE
DESCRIPTION
APP.
REDRAWN BY B.V.D.
CHECKED BY M.D.Q.
DESIGNED BY R.J.M.
DATE 5/00
WET DETENTION/
RETENTION POND
INDEX NO. 231
1 OF 1

Appendix H

Engineering Department's
Stormwater Management System Policy

Updated August 17, 2007

CITY OF CLEARWATER

ENGINEERING & PUBLIC SERVICES

STORMWATER MANAGEMENT SYSTEM POLICY

Guidance Manual

DECLARATION AND INTENT:

- The surface water of the City of Clearwater is a natural resource and must be conserved and protected to maintain it's scenic beauty, and to achieve the full beneficial use of the resource for the citizens and visitors of the City. This manual is intended to provide a surface water policy for the development and implementation of plans, programs, projects, and rules relating to the City's surface water resource. This document shall not constitute "standards" or "criteria"; rather this document is intended only to be a reference guide. Specific stormwater drainage design shall continue to be developed in accordance with the City Design Criteria, codified by City ordinance. Specific goals, objectives, and policies that guide project implementation are clearly defined by the City's National Pollutant Discharge Elimination System (NPDES) permit, the City Comprehensive Plan Drainage Policies (Goals No. 16 and 17), and State Water Policy and Law.

POLICY GUIDELINES

It shall be the policy of the Engineering and Public Services Departments that:

I. GENERAL SURFACE WATER PROTECTION AND MANAGEMENT

The Engineering and Public Services Departments shall provide an effective stormwater management program to minimize adverse impacts on the City's natural systems, property, public health, safety and welfare for the citizens of Clearwater. Inadequate management of stormwater increases stormwater flows and velocities, contributes to erosion and sedimentation, overtaxes the carrying capacity of streams and other conveyances, disrupts the functions of natural systems, undermines floodplain management and flood control efforts in downstream communities, reduces ground water recharge, threatens public health and safety, and is the primary source of the pollutant load to Clearwater's natural coastal water resources. As a result, water quality is degraded and beneficial use of the resource is lost.

- Effective stormwater management shall require Maintenance and Operation by the City of Clearwater of drainage infrastructure, consisting of City-owned land and land on which the City has an easement or right-of-way, for purposes of maintaining water flow to prevent flooding.

- Engineering and Public Services Departments surface water management programs shall protect, preserve and restore the quality, quantity and environmental values for existing and new water resource drainage systems to the maximum extent practicable.

- Engineering and Public Services Departments, stormwater management projects shall maintain, to the maximum extent practicable, during and after construction, the pre-development stormwater characteristics of the site; to reduce stream channel erosion, pollution, siltation, sedimentation, and flooding; to reduce pollutant loading that diminish beneficial uses; to reduce the loss of freshwater by encouraging stormwater reuse, and to address stormwater management on a watershed basis, thereby providing cost effective water quality and quantity solutions to specific watershed problems.

- All operation and maintenance activities undertaken by Engineering and Public Services Departments in City Stormwater systems, all capital improvement projects developed by Engineering and Public Services Departments, and private development projects which are reviewed in Engineering and Public Services Departments within City Stormwater systems shall conform to the requirements of State Water Policy as required by the City NPDES MS4 Permit.

- All stormwater related maintenance and capital improvements shall conform to the specific goals, objectives, and policies contained within the City Comprehensive Plan, with particular attention being given to compliance with prescribed Levels of Service which have been established to determine the availability of facility capacity and demand created by new or redeveloped projects.

- Effective stormwater management shall require maintenance and operation of drainage infrastructure dedicated to the City of Clearwater for purposes of maintaining flow to prevent flooding.

- When determining the impact on surface water resources of the City, in the development of all stormwater related projects by Engineering and Public Services Departments, staff shall consider the impact of the facilities on water quality, fish and wildlife, environmentally sensitive lands, reasonable-beneficial uses of water, recreation, navigation, saltwater or pollution intrusion, and factors related to erosion and sedimentation, public health, safety, and welfare to minimize adverse impacts.

- Stormwater facility project development shall encourage interagency cooperation and alternate funding sources for implementation whenever feasible.

II. STORMWATER MANAGEMENT IMPLEMENTATION

The Engineering and Public Services Departments shall fully develop stormwater programs and capital improvement projects with implementation success in mind. Inappropriate implementation of stormwater management programs and projects, and the management of project construction, monitoring, reporting and related permit or agreement conditions can lead to ineffective and costly project delays or imposed penalties.

- The construction and operation of City stormwater facilities which manage or store surface waters, or other facilities which drain, divert, impound, discharge into, or otherwise impact waters in the State, and the improvements served by such facilities, shall be consistent with all State and regional permitting requirements.

- All stormwater facilities project development shall meet applicable design or performance standards, with particular attention being given to whether adequate provisions exist for the continued satisfactory operation and maintenance of the planned facilities after construction has been completed.

- All stormwater facilities and related improvements must provide adequate provision to avoid increased damage to off-site properties, water resources, natural systems or the public caused by:

  (1) floodplain development, encroachment or other alteration;
  (2) retarding, accelerating or diversting of flowing water;
  (3) reduced natural attenuation;
  (4) lack of adequate maintenance access;
  (5) facility failure; or
  (6) other actions that could adversely affect off-site water flows or levels.

- All stormwater facility repairs shall be performed in a manner that does not exacerbate existing stormwater problems.

- Erosion and sediment control plans detailing appropriate methods to retain sediment on-site shall be required for all land disturbing activities. Sediment control plans shall be fully implemented and maintained during construction.

- Where conflicts may reasonably be expected to exist between public and private stormwater facilities during commercial site plan review, resolution of those conflicts shall be resolved by the Capital Improvements Stormwater Management Committee (CISMC).

- There shall be a Capital Improvements Stormwater Management Committee that shall meet at least quarterly and is to be made up of at least two representatives from Environmental Stormwater Management, (ESM) and Public Services. The purpose of this Committee is to consider significant operational issues, address policy changes needed to facilitate stormwater management for the City and to establish capital project recommendations annually, by January, each year.

- Stormwater system management in Clearwater shall be categorized as either Stormwater Maintenance or Stormwater Capital Improvements. Stormwater Maintenance shall be funded as a line item while Stormwater Capital Improvements shall be funded as discrete projects based on annual prioritization through the annual watershed management planning and evaluation process, subject to recommendation by the Capital Improvements Stormwater Management Committee annually.Administration of the Stormwater System shall be facilitated by a geographic information system database that shall be created and maintained by Engineering with direct input by Public Services.

- A rainfall, water quality, and flow monitoring network shall be installed and maintained by Engineering for the purposes of model calibration, monitoring system response, and permit program compliance (NPDES & Tampa Bay Estuary Program).

- Engineering shall maintain a current and calibrated hydrologic/hydraulic model for the monitoring of existing conditions and the evaluation of proposed alternative solutions to stormwater problems.

III. STORMWATER MAINTENANCE

The establishment of these maintenance policies for Public Services is critical to the overall effectiveness of unit operation and accountability, and will serve as a guide to meeting the compliance requirements of NPDES to further enhance the present MS4 system operation and maintenance programs.

- NPDES Permit Compliance: Procedures for maintenance of roadways and stormwater runoff shall operate in compliance with NPDES, MS4 Permitting.

- Stormwater Ponds: Lake/Pond maintenance shall be restricted to City owned systems or those portions of systems owned by the City only, and shall be limited to only those controls needed to satisfy an immediate problem, system operation, or to comply with provisions of agreement to remove silt and/or nuisance or exotic plant species where all appropriate licenses, permits, or exemptions have first been obtained. The City shall not be responsible for maintenance of private lakes or ponds. All repair work shall be recorded on appropriate forms.

- Conveyance Systems: Shall not be enlarged or enhanced from the existing condition without prior approval from Engineering. Repairs and installation of equivalent pipe(s) shall be limited to a maximum of 200 feet in length and up to 24 inches in maximum diameter, no deeper than 5 feet (Sub-drain and storm pipes). Ditches, swales, and channel creeks shall be maintained within their original design parameters through silt removal and ditch bank grading on a frequency of no less than once every five years. Ditch cleaning and cutting shall occur twice a year. Stormwater pipe cleaning by machine such as Vactor/Vaccon and hand rods shall be on a regular basis.

- Inlets, Curbs and Gutters: Street sweeping operations shall occur on all residential streets twice a year. Some areas of the City may be addressed more frequently than others at the discretion of the Public Services Director. Street sweeping all City main arterials shall occur on a regular basis. Curbs and gutters affected by stormwater construction shall be restored to "As-Built" conditions for lengths less than 200 feet. Any pedestrian ramps affected by stormwater construction are to meet the ADA requirements for proper grade, slope, and landing. Design of inlets, catch basin boxes, and silt boxes shall be within these established maintenance guidelines. Whenever possible, inlets and catch basins shall not be installed within sidewalks.

- Paved and Unpaved Streets: Maintenance and operational reporting shall be reported, as defined under Stormwater Management Implementation guidelines. Litter control shall be provided by Public Services on only those streets that maintain an active "Adopt-A-Street" or an "Adopt-A- Pond" Program.

- Drainage Easements: Maintenance and operation of City lakes and streams rights-of-way and easements and associated City stormwater facilities shall be the responsibility of Public Services.

- Citizen Support: Public Services shall be the point of first contact by citizen response requests to investigate stormwater problems in Clearwater. Public Services shall record and respond to all citizen requests for inspection of a problem within 48 hours of receipt (Attachment A). Response shall either include a maintenance resolution or follow-up request in writing to ESM for further investigation as a potential candidate to capital improvement.

- Stormwater Certification: All Engineering and Public Services Department employees working with stormwater and drainage shall be certified in sedimentation and erosion control. Furthermore, it shall be a requirement that all Public Services stormwater personnel are "C" licensed and/or sedimentation erosion control certified stormwater technicians within two years of hire.

IV. STORMWATER CAPITAL IMPROVEMENTS

The City Comprehensive Plan requires that stormwater management be implemented in the most cost effective and efficient manner possible. The City has developed a Watershed Management Action Plan intended; to prevent existing water resource problems from becoming worse, to reduce existing flooding problems, to improve existing water quality, and to preserve or restore the values of City natural ecosystems. Therefore, all stormwater related problems that are not defined as Stormwater Maintenance shall be considered as a Stormwater Capital Improvement and shall be prioritized (Attachment B) and funded in accordance with the City Watershed Management Action Plan annually. This shall be accomplished upon recommendation by the Capital Improvements Stormwater Management Committee and approved by the City Engineer, Public Services Director, City Manager and City Commission.

- All projects received by ESM shall be evaluated and ranked according to the problem classification established by the City Watershed Management Action Plan and included in the project database for quarterly review by the Capital Improvements Stormwater Management Committee. Category Code and Watershed Basin shall be used to sort all projects provided to the Committee for their review and approval.

- Implement project development and construction in accordance with Committee recommendations and appropriate City approvals.

V. EMERGENCY PROVISIONS

There shall come from time to time, those situations which result from unforeseen circumstances that shall require staff the flexibility to accommodate resolution of an immediate problem. Implementation of any project relative to this section shall be recommended by the Capital Improvements Stormwater Management Committee and approved by the City Engineer and Public Services Director whenever:

- The Florida Department of Environmental Protection has declared a shoreline emergency, consistent with Chapters 62B-33.014 or 62B-49.009.
- A project requires immediate action to protect life and property, provided that EITHER condition exists:
  - ⇒ The condition of any stormwater management system, dam, impoundment, reservoir, appurtenant work, or works is so dangerous to the safety of life or property as not to permit time for the issuance and enforcement of an order relative to maintenance or operation; OR
  - ⇒ The condition of passing or imminent floods that threaten the safety of any stormwater management system, dam, impoundment, reservoir, appurtenant work, or works; AND

THE FOLLOWING GUIDELINES ARE ALSO TRUE:

- There are no operational changes appropriate or available to alleviate the emergency.
- The project will not result in the creation of any new lands or permanent structures that did not exist before the emergency.
- Project construction is minimized to only that which is absolutely necessary to prevent the imminent collapse of a structure or improve circumstances that threaten human safety or life.
- An after-the-fact permit shall be required for all work completed that clearly, is not temporary in nature.

City Engineer — Date: 7-23-07

Public Services Director — Date: 07/23/07

Updated August 17, 2007

Attachment "A"

CITIZEN COMPLAINT / CONCERNS

PROJECT REVIEW PROCESS

1.	Citizen calls in complaint/concern	Go to 2.
2.	Call goes to Stormwater Maintenance, 562-4950, and data is logged	Go to 3.
3.	Stormwater Maintenance determines concern is a maintenance issue	Go to 4
4.	Stormwater Maintenance resolves issue with in-house staff	Stop
5.	Stormwater Maintenance determines concern is not a maintenance issue.	Go to 6
6.	Concern/issue and inspection report is submitted to ESM	Go to 7
7.	ESM inspects site	Go to 8 or 11
8.	Problem/concern/issue determined to require R&R solution	Go to 9
9.	Develops contract	Go to 10
10	Out to bid, give to Construction	Stop
11	Problem/concern/issue determined to require CIP solution	Go to 12
12	Hire consultant or being in-house design	Go to 13
13	Review project, 30/60/90/100 %	Go to 10

Updated August 17, 2007

Attachment "B"

Project Priority List from Engineering

Appendix I

City of Clearwater Comprehensive Plan - 2008
Stormwater Management Element

Stormwater Management Element

- The City of Clearwater will continue to monitor the stormwater management utility fee rate structure and amend it as required to remain competitive and maintain an adequate funding source to provide revenue for flood control, maintenance, retrofitting, and treatment of stormwater. In addition to the hydraulic improvements, this would improve the quality of stormwater discharging into surface waters, and will complement the measures proposed in the Surface Water Improvement and Management (SWIM) program and the Tampa Bay Estuary Program to improve surface water quality standards.

- The City of Clearwater needs to take advantage of any alternative funding opportunities that may become available from any State agency with regard to watershed management and/or general stormwater improvements.

- The City of Clearwater needs to continue to reduce flooding problems and strive for abatement of flood damage to houses and streets.

- The City of Clearwater needs to continue to coordinate stormwater management improvement efforts with Pinellas County and other incorporated areas adjacent to Clearwater City limits for both water quality and attenuation.

- The City of Clearwater needs to continue to maintain, correct deficiencies and improve, where necessary, current levels of service. Maintenance and improvement of the City stormwater management system must be recognized as a service provided by the City on a regular and continuous basis.

- The City of Clearwater needs to continue to prepare stormwater management plans which will identify and prioritize the implementation of programs to improve and enhance stormwater quality and quantity.

- Natural and man-made wetlands need to be utilized for stormwater storage and protected as natural resources. Wetlands provide a natural wildlife habitat and groundwater recharge functions which are pivotal characteristics of the natural and urbanized environment. Such features are firmly established within Clearwater's quality of life values.

- The City of Clearwater must continue to obtain appropriate permits from all environmental regulatory agencies prior to implementation of water resource projects.

- The City of Clearwater needs to research and develop new methods that are technically, environmentally, and economically viable of treating stormwater runoff before final discharge to improve and enhance local surface waters.

- Prospect Lake will continue to serve as a basin for stormwater attenuation and water quality management, as well as enhancing the aesthetic beauty of the downtown area.

- The City of Clearwater needs to continue to participate in the National Flood Insurance Program's Community Rating System (NFIP/CRS). Clearwater has been an active participant since 1990.

STORM WATER

D.3 GOAL - PROVIDE THE MOST COST EFFECTIVE AND EFFICIENT PROVISION OF STORMWATER MANAGEMENT INCLUDING THE IMPROVEMENT AND ENHANCEMENT OF STORMWATER QUALITY DISCHARGING INTO LOCAL RECEIVING WATERS, AND PROVIDE MAXIMUM PRACTICAL PROTECTION TO PERSONS, PROPERTY, AND THE NATURAL ENVIRONMENT.

D.3.1 Objective - To maintain adequate levels of service for existing and future populations through the year 2020.

Policies

D.3.1.1 The following level of service standards have been established for the City of Clearwater and shall be used in determining the availability of facility capacity and the demand created by new development and shall be applied to all new development, redevelopment, and for all City facilities through 2020.

Service	Level of Service Standards
Stormwater Management Facilities	Design storm 10 - year storm frequency for all new street development using the rational design method. 25 - year storm frequency with positive outfall for major storm systems with basin time of intensities controlling the duration.* 50 - year storm frequency when no outfall and discharge is to street right-of-way.* 100 - year storm frequency when no outfall and discharge is across private property.*

* Design standards for stormwater quality treatment/storage quantity shall conform to the current SWFWMD requirement [Presently being the SCS Unit Hydrograph design method, using the design storm frequency and a twenty-four (24) hour duration for sites ten (10) acres or more, and the rational design method for sites under ten (10) acres].

D.3.2 Objective -The City of Clearwater shall continue to develop watershed management plans which should seek to identify, evaluate and implement the most cost effective and cost efficient programs for stormwater management, including stormwater quantity and quality. These plans should also address any projects included in the Pinellas County Surface Water Management Plan for the implementation of all stormwater management, as well as recommended funding sources.

Policies

D.3.2.1 Coordinate and cooperate with appropriate local, State, regional, and Federal agencies implementing the Pinellas County and City of Clearwater stormwater management plans.

D.3.2.2 Continue to Provide a stormwater management system throughout the City that will afford the most economically feasible protection to residents and property.

D.3.2.3 All stormwater management improvements should seek to meet applicable goals, guidelines, and regulations established to provide flood protection and pollution abatement.

D.3.2.4 Participate in interlocal agreements to study and evaluate stormwater quality and stormwater runoff management issues consistent with the National Pollutant Discharge Elimination System (NPDES).

D.3.2.5 Coordinate and cooperate with Southwest Florida Water Management District policies and regulations.

D.3.2.6 Continue to require new development to detain water on site and control quantity, quality, and rate of flow being released into the receiving drainage systems.

D.3.3 Objective - Lower high water profiles during storm events, as necessary, to reduce house flooding occurrences and to lessen the resulting adverse effects on public health, the natural environment, public and private property.

Policies

D.3.3.1 Continue to provide a program of regular maintenance to the stormwater management system to ensure maximum efficiency and performance. Ensure that stormwater management plans include measures to remove trash, sedimentation and other debris which impede flow and incorporate structural and non-structural measures to reduce or eliminate the discharge of oil, grease, heavy metals, and other suspended particles into the stormwater management systems.

D.3.3.2 Natural and man-made wetlands shall be considered as a means to provide stormwater management wherever possible and shall be maintained for hydrologic purposes. The efficiency of natural and man-made systems to convey stormwater runoff shall be protected through the provision of routine water quality maintenance schedules overseen by city inspections.

D.3.3.3 Continue to provide multiple use facilities, such as recreational open space uses, with open channel stormwater management systems, when appropriate.

D.3.3.4 Development and redevelopment activities shall comply with all stormwater management design standards and criteria.

D.3.3.5 Structural Development shall be prohibited where it is determined that such development will have an adverse impact on stormwater storage areas, increase flood prone areas, significantly increase rates of runoff, or cause other unfavorable drainage conditions. Both man-made and natural systems shall be treated on an equal basis as a sensitive preservation area; no distinction shall be made between a natural system and a man-made or man altered hydrologic system.

D.3.3.6 Limit development that will result in building(s) constructed within/or over stormwater retention/detention ponds, streams or channels. All wetlands, streams, channels, or other hydrologic features, whether wetlands, ponds or bodies of water having intrinsic hydrologic, biologic and zoological functions with no distinction made in regard to its status to whether it is man-made or natural shall be considered for a Preservation Land Use Plan classification to ensure protection from development.

D.3.3.7 Continue active participation and cooperation with the National Flood Insurance Program and the Florida Emergency Management Agency for the purpose of recognizing flood prone areas, and establishing abatement programs that endeavor toward a reduction in damages and losses due to flooding.

D.3.3.8 Continue the established requirement of a twenty-five foot setback from the tops of a bank from all wetlands whether natural or man-made, and require minimum finished floor elevations in areas adjacent to lakes, bays, creeks, the Gulf of Mexico, Tampa Bay and Old Tampa Bay, and other flood prone areas.

D.3.4 Objective Continue the implementation of the most cost effective and efficient plan to reduce the occurrence of street flooding where safety issues and traffic problems exist as prioritized and set forth in the Capital Improvement Element, and listed in the stormwater management plans.

Policies

D.3.4.1 Identify areas where inadequate stormwater management easements exist, and obtain proper access to stormwater management channels, structures and appurtenances for maintenance purposes.

D.3.4.2 Improve all street stormwater management systems where deficiencies exist as articulated in the City's annual budget document.

D.3.5 Objective - Protect and enhance the quality of receiving waters by the use of "Best Management Practices" in accordance with the adopted watershed management plans.

Policies

D.3.5.1 The use of "best management practices" shall be required before, during, and after construction activities to prevent water pollution resulting from erosion and siltation.

D.3.5.2 Vegetated swales, sodding, and appropriate landscaping will be required as components of the drainage system for natural filtration before final discharge into receiving waters.

D.3.5.3 Monitor major stormwater management outfalls and receiving water bodies to identify the quality of stormwater runoff and the impact on receiving bodies.

D.3.5.4 Maximize water recharge potential in designing stormwater management improvements by utilizing natural wetland areas for stormwater storage.

D.3.5.5 Coordinate stormwater management improvements with other local governments to assist in solving stormwater management problems of an extraterritorial nature.

D.3.5.6 Continue to identify impaired bodies of water and prioritize them for improvement and enhancement.

D.3.5.7 Water resource projects shall be consistent with the policies of the Conservation Element and with adopted watershed management plans.

D.3.5.8 All stormwater management plan projects of the City of Clearwater shall comply with the Florida Surface Water Improvement and Management (SWIM) program and the National Estuary Program.

D.3.5.9 The City of Clearwater shall continue to upgrade and retrofit City-owned drainage system facilities and include stormwater treatment for water quality in accordance with the proposed stormwater management plan.

D.3.6 Objective - Continue to provide sound fiscal management of the stormwater management systems to include maintenance, operation, and construction in accordance with the watershed management plans and concurrent with its implementation.

Policies

D.3.6.1 Operation and maintenance of the stormwater management systems may be financed through revenues from the City's stormwater utility fee.

D.3.7 Objective - Provide economic development incentives that promote water resource protection and enhancement.

Policies

D.3.7.1 Methods of financing stormwater management system improvements and new stormwater infrastructure construction should be evaluated to determine the most feasible and equitable arrangement, both city-wide and in local problem areas.

D.3.7.2 The City of Clearwater shall continue to seek and be on notice of financial support for system improvements through grant programs administered by appropriate State and Federal agencies.

D.3.7.3 The City of Clearwater shall pursue a system of regional stormwater management which is both economically and environmentally sound.

D.4 GOAL - STORMWATER DISCHARGE SHALL BE MANAGED TO PROVIDE FLOOD PROTECTION FOR THE CITIZENS OF THE CITY OF CLEARWATER AND TO PRESERVE, PROTECT, AND ENHANCE THE WATER QUALITY OF RECEIVING WATERBODIES.

D.4.1 Objective - The protection, restoration, and enhancement of water quality associated with stormwater runoff will be considered a function of the City's overall stormwater management plans.

Policies

D.4.1.1 The City shall incorporate water quality protection and enhancement criteria into the City stormwater management plans.

D.4.1.2 The use of natural alternatives, the conservation of natural stormwater management systems, and the protection and improvement of the quality of receiving waters shall be a goal of the City's stormwater management plans.

D.4.1.3 Management plans shall continue to be developed on an ongoing basis for waterbodies with known or suspected water quality problems in the City to include Tampa Bay, Clearwater Harbor, Stevenson Creek, Allen's Creek, and Alligator Creek.

D.4.1.4 The City shall systematically and timely prepare watershed or waterbody specific management plans, and update them as necessary for waterbodies within the City. Such plans shall include both water quality and flood control considerations and recommended funding sources.

D.4.1.5 The City shall implement all City-approved watershed management plans.

D.4.1.6 All City stormwater management plan projects within watersheds of ~~T~~the City shall comply with applicable SWFWMD, State, and Federal requirements, including SWIM Plans for that waterbody or watershed.

D.4.1.7 The City shall continue to coordinate with and supplement the County's surface water monitoring program.

Appendix J

Application for Non-Substantial Damage/Improvement Review

Development and Neighborhood Services Department
100 S. Myrtle Avenue, Suite 210

Clearwater, FL 33756
Telephone: (727) 562-4567 Fax: (727) 562-4576
www.myclearwater.com

APPLICATION FOR
NON-SUBSTANTIAL DAMAGE / IMPROVEMENT REVIEW

Parcel Number: _____

Property Address: _____

Owner's Name: _____

Co-Owner's Name: _____

Owner's Mailing Address: _____

Owner Phone Number: _____

FIRM Panel: _____ Flood Zone: _____ BFE: _____

Lowest Floor Elevation (excluding garage): _____

I am attaching an appraisal report of my property, or _____ Initials _____
I am not submitting an appraisal report of my property _____ Initials _____
I accept the County's Estimated Market Value. _____ Initials _____

I accept the attached estimated cost of construction as a fair cost of repair or improvement for my home.
Initials _____

SIGNATURES:

Owner: _____

Date: _____

Co-Owner: _____

Date: _____

Contractor: _____

Date: _____

City of Clearwater
Floodplain Management Plan

Development & Neighborhood Services Department

100 S. Myrtle Avenue, Suite 210

Clearwater, FL 33756

Telephone: (727) 562-4567 Fax: (727) 562-4576

www.myclearwater.com

SUBSTANTIAL IMPROVEMENT/DAMAGE
NOTICE TO PROPERTY OWNERS

"Are you rebuilding your home after a storm?"
"Are you making an addition, renovating or remodeling your home?

Here is information **YOU** need to know about the 50% Rule.

If your home or business is below the 100-year flood elevation, Clearwater has flood damage prevention regulations that may affect how you remodel, renovate, or add on to your building. If your home or business sustained structural and or interior damage, these regulations may affect how you rebuild. These laws are required by the National Flood Insurance Program to protect your lives and investment from future flood damages. Your community must adopt and enforce these laws in order for federally-backed flood insurance to be made available to community residents and property owners.

Inform yourself and save time, aggravation, and money. Please read the following information.

Substantial Damage means damage of the origin sustained by a structure whereby the cost of restoring the structure to its before damaged condition would equal or exceed 50 percent of the market value or replacement cost of the structure before the damage occurred. (Note: the cost of the repairs must include all costs necessary to fully repair the structure to its before-damage condition.)

Substantial Improvement means any reconstruction, rehabilitation, addition, or other improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure before the "start of construction" of the improvement.

If a building is "substantially damaged" or "substantially improved", it must be brought into compliance with Clearwater's flood damage prevention regulations, including elevating the building to or above the 100-year flood elevation.

Clearwater, following National Flood Insurance Program requirements, has the responsibility to determine "substantial damage" and "substantial improvement" and has implemented the following procedure to do so:

1. Development & Neighborhood Services will estimate Market Value by using the tax assessment value of your structure (excluding the land).

   If you disagree with this estimate of Market Value, you may hire a state licensed appraiser and submit a comparable property appraisal for the depreciated value of the structure.

2. You must submit to Development & Neighborhood Services a detailed and complete cost estimate for the addition, remodeling, reconstruction, or repair of all damages sustained by your home, prepared and signed by a licensed general contractor. The contractor and you must sign separate reconstruction or improvement affidavits indicating that the costs estimate submitted includes **all damages or all improvements** to your home, not just structural.

   Development & Neighborhood Services will evaluate the cost of improvements or repairs and determine if they are fair and reasonable. For damage repairs, pre-storm prices and rates will be utilized. The cost of improvements or repairs does not include items not considered a permanent part of the structure. (i.e., Plans, surveys, permits, sidewalks, pools, screens, gazebos, fences, etc.) (See attached copy.)

3. If your home is in the designated flood zone, then an Elevation Certificate must be submitted to determine the lowest flood elevation. Garages and carports are not considered the "lowest floor".

4. Substantially damaged or substantially improved structures with the lowest floor below the 100-year flood elevations are required to be elevated to or above that level. Likewise, all electrical and mechanical equipment (heating and cooling, etc.), bathrooms, and laundry rooms must be elevated to or above the 100-year flood level. Only parking, building access, and limited, incidental storage is allowed below the flood level. Non-residential buildings may be "flood-proofed" instead of being elevated.

   If the lowest floor, electrical and mechanical, equipment, laundry and bathroom are already above the 100-year flood elevation, the building can be repaired and reconstructed without further modifications.

5. Building plans must be prepared to show how the building is to be elevated. These plans must be prepared and certified by a registered professional engineer or architect.

6. Following a Presidential disaster declaration, the Small Business Administration may make loans available for both homes and businesses for purposes of elevating the structure to or above the 100-year flood elevation. Proof of "substantial damage" from Clearwater Development & Neighborhood Services is required.

ITEMS TO BE INCLUDED

All structural elements including:

- ✓ Spread or continuous foundation footings and pilings
- ✓ Monolithic or other types of concrete slabs
- ✓ Bearing walls, tie beams and trusses
- ✓ Wood or reinforced concrete decking or roofing
- ✓ Floors and ceilings
- ✓ Attached decks and porches
- ✓ Interior partition walls
- ✓ Exterior wall finishes (e.g., brick, stucco, or siding) including painting and decorative moldings.
- ✓ Windows and doors
- ✓ Re-shingling or re-tiling a roof
- ✓ Hardware

All interior finish elements, including:

- ✓ Tiling, linoleum, stone, or carpet over sub-flooring
- ✓ Bathroom tiling and fixtures
- ✓ Wall finishes, e.g., drywall, painting, stucco, plaster, paneling, marble, or other decorative finishes.
- ✓ Kitchen, utility, and bathroom cabinets
- ✓ Built-in bookcases, cabinets, and furniture
- ✓ Hardware

All utility and service equipment, including:

- ✓ HVAC equipment
- ✓ Repair or reconstruction of plumbing and electrical services
- ✓ Light fixtures and ceiling fans
- ✓ Security systems
- ✓ Built-in kitchen appliances
- ✓ Central vacuum system
- ✓ Water filtration, conditioning or re-circulation systems

ALSO:

- ✓ Labor and other costs associated with demolishing, removing or altering building components
- ✓ Overhead and profit

ITEMS TO BE EXCLUDED

- Plans and specifications
- Survey costs
- Permit fees

- Debris removal (e.g., removal of debris from building or lot, dumpster rental, transport fees to landfill and landfill tipping fees), and "clean-up" (i.e., dirt and mud removal, building dry out, etc.).

- Items not considered real property such as: throw rugs (carpeting over finished floors), furniture, refrigerators, stove not built-in, etc.

Outside improvements, including:

- Landscaping
- Sidewalks
- Fences
- Yard lights
- Swimming pools
- Screened pool enclosures
- Sheds
- Gazebos
- Detached structures (including garages)
- Landscaping irrigation systems

ITEMS REQUIRED TO DETERMINE SUBSTANTIAL DAMAGE:

The following must be included in the application submittal (please keep a copy for your files)

1. Completed application
2. Detailed cost of improvement/reconstruction estimate and affidavit, signed by a general contractor
   and a copy of his license certificate.
3. Elevation certificate
4. Current photos, or photos before and after the storm (if available)
5. Existing floor plan drawing (if available)
6. Owner's reconstruction improvement affidavit signed and dated.
7. Contractor's reconstruction improvement affidavit signed and dated.

Development & Neighborhood Services Department

100 S. Myrtle Avenue, Suite 210

Clearwater, FL 33756

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GUIDELINES TO COMPLETE
THE RECONSTRUCTION IMPROVEMENT COST ESTIMATE FORM (attached)

Reconstruction/Repair = Percentage of item that must be repaired or reconstructed.
(Example: A house has 20 windows, only 10 were damaged and being replaced; ratio should equal 50%)

ITEMS	COST	RECON/REPAIR RATIO OF WORK	OFFICIAL USE
	LABOR + MATERIALS		
Concrete, Form, ETC	$4,500.00	40%	
Carpentry Material (r)	$9,004.00	100%	
Doors/Windows, Shutters	$2,046.00	50%	

Development & Neighborhood Services Department

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ARCHITECT/ENGINEER
RECONSTRUCTION/IMPROVEMENT AFFIDAVIT

Parcel #: ____ / ____ / ____ / ____ / ____ / ____

Property Address: _____

Architect Name: _____ License #: _____

Address: _____ Phone: _____

I have reviewed the contractor's list of work to be done with the plans prepared by my office. The list accurately reflects the scope of work indicated on my plans and specifications. The proposed estimated cost is in line with current average industry standards for the work reflected in my plans and specifications.

See Attached Itemized List

Total Labor and Materials $_____
Overhead & Profit $_____

Total $_____

AFFIDAVIT

STATE OF FLORIDA
COUNTY OF PINELLAS

PERSONALLY APPEARED before me, the undersigned authority,

---

who, being duly sworn, deposes and says that he/she has read, understands, and agrees to comply with all of the aforementioned conditions.

_____

_____

Architect/Engineer's Signature Date

SWORN TO AND SUBSCRIBED before me this _____ day of _____, _____ A.D.

_____

Notary Public-State of Florida

_____

Commission Expiration Date

City of Clearwater
Floodplain Management Plan

Development & Neighborhood Services Department

100 S. Myrtle Avenue, Suite 210

Clearwater, FL 33756

Telephone: (727) 562-4567 Fax: (727) 562-4576
www.myclearwater.com

ESTIMATED COST OF RECONSTRUCTION/IMPROVEMENT

Parcel # ____ / ____ / ____ / ____ / ____

Property Address: _____

This Cost Estimate of Reconstruction/Improvement must be prepared and signed by a licensed General Contractor

ITEMS	COST LABOR + MATERIALS	COMMENTS
Concrete, Form, ETC		
Carpentry Material (rough)		
Carpentry labor (rough)		
Roofing		
Insulation & Weather Strip		
Exterior Finish (stucco)		
Doors, Windows & Shutters		
Lumber Finish		
Carpenter labor (finish)		
Hardware (finish)		
Hardware (rough)		
Cabinets (built-in)		
Floor covering (tile/rug)		
Plumbing		
Shower/Tub/Toilet		
Electrical		
Light Fixtures		
Built-in Appliances		
HVAC		
Paint		

City of Clearwater
Floodplain Management Plan

Demolition and Removal		
Overhead and Profit TOTAL		

(PLEASE ATTACH ANY ADDITIONAL INFORMATION)

Contractor Name: _____ Contractor Lic. #: _____

Address: _____ Phone #: _____

Signature: _____ Date: _____

Development & Neighborhood Services Department

100 S. Myrtle Avenue, Suite 210

Clearwater, FL 33756

Telephone: (727) 562-4567 Fax: (727) 562-4576
www.myclearwater.com

CONTRACTOR
RECONSTRUCTION/IMPROVEMENT AFFIDAVIT

Parcel #: _____ / _____ / _____ / _____ / _____ / _____

Property Address: _____

Contractor Name: _____ License #: _____

Address: _____ Phone: _____

I attest that I, or a member of my staff, personally inspected the above-described property and produced the attached itemized list of repairs, reconstruction and/or remodeling. This list is submitted for a **Substantial Damage or Improvement Review**. These damages/improvements are ALL OF THE DAMAGES / IMPROVEMENTS sustained by this structure, and that all additions, improvements or repairs proposed on the subject building are included in this estimate.

I understand that I am subject to enforcement and penalties if an inspection of the property reveals that I have made repairs or improvements NOT INCLUDED ON THE ATTACHED LIST. This includes any non-conforming or illegal structures/additions, or repairs made to the existing structure without having presented plans for such work. I understand that any permit issued by the City of Clearwater pursuant to this affidavit does not authorize the reconstruction, repair or maintenance of any illegal additions, fences, sheds, or non-conforming uses or structures on the subject property.

(See Attached Itemized List)

Total Labor and Materials $_____
Overhead & Profit $_____

Total $_____

AFFIDAVIT

STATE OF FLORIDA
COUNTY OF PINELLAS

Before me this day personally appeared _____

who, being duly sworn, deposes and says that he/she has read, understands, and agrees to comply with all of the aforementioned conditions.

_____ Date: _____

Contractor's Signature

SWORN TO AND SUBSCRIBED before me this _____ day of _____, _____

_____

Notary Public-State of Florida

_____

Commission Expiration Date

Development & Neighborhood Services Department

100 S. Myrtle Avenue, Suite 210

Clearwater, FL 33756

Telephone: (727) 562-4567 Fax: (727) 562-4576
www.myclearwater.com

OWNER
RECONSTRUCTION/IMPROVEMENT AFFIDAVIT

Parcel #: _____/_____/_____/_____/_____/_____

Property Address: _____

Contractor Name: _____ License #: _____

Address: _____ Phone: _____

I attest that I, or a member of my staff, personally inspected the above-mentioned property and produced the attached itemized list of repairs, reconstruction and/or remodeling. This list is submitted for a **Substantial Damage or Improvement Review**. These damages/improvements are ALL OF THE DAMAGES / IMPROVEMENTS sustained by this structure, and that all additions, improvements or repairs proposed on the subject building are included in this estimate.

I understand that I am subject to enforcement and penalties if an inspection of the property reveals that I have made repairs or improvements NOT INCLUDED ON THE ATTACHED LIST. This includes any non-conforming or illegal structures/additions, or repairs made to the existing structure without having presented plans for such work. I understand that any permit issued by the City of Clearwater pursuant to this affidavit does not authorize the reconstruction, repair or maintenance of any illegal additions, fences, sheds, or non-conforming uses or structures on the subject property.

(See Attached Itemized List)

Total Labor and Materials $_____
Overhead & Profit $_____

Total $_____

AFFIDAVIT

STATE OF FLORIDA
COUNTY OF PINELLAS

Before me this day personally appeared _____
who, being duly sworn, deposes and says that he/she has read, understands, and agrees to comply with all of the aforementioned conditions.

_____ Date: _____

Owner's Signature

_____

Co-Owner's Signature

SWORN TO AND SUBSCRIBED before me this _____ day of _____ , _____

_____

Notary Public-State of Florida

_____

Commission Expiration

Date

Appendix K
Capital Improvement Stormwater Utility Project List

Item #	KIO	PM	Class	10 yr Structure	25 yr Structure	100 yr Structure	Status	WS	Location	PROBLEM	TOTAL COST (est.)	STATUS
1		PV	F-1				PI in D	CZ 2	Tropic Hills Drainage Improvement Project (Burma)	Property & Street Flooding.	$5,600,000	Begin design of phase I 4/07, FDOT implementing phase II, Phase 3 in out years
2		ES	F-1				P	ALC	Morningside Meadows Drainage Improvements (Flushing/ Chinaberry/ Moreland/ Summerlin)	Property & Street Flooding.	$100,000	On hold (regrading)
3		MM	F-1	3	11	18	D	STC	Expansion of Lake Bellevue/Upper Lake Bellevue Culverts (includes Lakeview Drainage)	Remove 8 structures/ 17 dwelling units from 100yr flood	$3,800,000	100% Design (Construction 10-07)
4		ES	F-1	2	3	20	P	STC	Spring Branch Flood Detention Basin/Spring Branch Conveyance Enhancements Upper & Lower	Remove 21 structures/ 21 dwelling units from 100yr flood	$1,760,000	(School board property not available, scope will be reduced and design will begin in 07, Const 08)

5		MM	F-1	1	2	6	D	STC	Turner St. Box Culvert	Remove 5 structures from 100yr flood	$3,800,000	Design in 07, construction begin in 08 and complete in 09
6		ES	F-1	1	1	4	P	STC	Bermuda St/Woodlawn Terrace Storm Sewer Replacement	Remove 4 structures from the 100yr flood	$850,000	Project 1D, add inlets on Bermuda
7		ES	F-1	0	0	2	P	STC	Smallwood Cir Drainage Improvements	Remove 2 structres from the 100yr flood	$850,000	Project 5D
8		ES	F-1	0	2	2	D	AGC	Phase II Improvements, 1) Waste Transfer Station Pond, 2) Channel A Improvements from US 19 to Old Coachman, 3) Clearwater Collection Center Detention Pond Outfall Replacement, 4) Waste Transfer Station Culverts, 5) Old Coachman Road Bridge Replacement and Roadway Vertical Relocation, 6) Channel Improvements from Old Coachman Road to NE Coachman Road	Remove 5 structures from 100yr flood. Improve LOS at Old Coachman Road.	$7,000,000	Phase II Improvements, design complete in 07, construction begin in 08 and complete by 09
9		EC	F-1	0	1	1	P	AGC	NE Coachman Road Bridge Replacement	Remove 1 structure from the 100 yr flood. Improve LOS at NE Coachman Road.	$1,680,000	Must be replaced before channel F improvements

10		EC	F-2	0	0	0	D	AGC	Channel F Improvements (Stag Run/Wetherington/Lee)	Improve LOS at Old Coachman Rd.	$1,999,000	
11		ES	F-1	0	2	41	P	STC	Hillcrest Ave Overflow Bypass Culvert	Remove 42 structures from 100yr flood	$2,530,000	Project 4A
12		RJM	F-1				P	STC	Myrtle Avenue/Seminole Streets NE Outfall System	Major storm pipe failure imminent and present system is undersized and under homes.	$1,200,00	Tak
13		RJM	F-2				P	ALC	415 North Duncan	Undersized pipe with major street flooding.	$126,000	Collection System
14		RJM	F-2				P	AGC	Marilyn St., off N.E. Coachman	Insufficient storm sewer system		
15		RJM	F-2				P		1729 Jade Ave	Water backed up for years		
16		RJM	F-2				P		Rainbow/Mars Street Flooding	Undersized pipe with major street flooding.		
17		ES	E-1				P	STC	Byram Pond Dredging & Expansion - Spring Branch Stabilization Union St to Byram Pond	Water Quality / Maintenance	$831,636	
18		ES	E-1				P	STC	Upper Stevensons Creek Stabilization	Erosion	$1,415,843	
20		ES	WQ-1				P	STC	Betty Lane Forested Habitat Preservation Site	Water Quality	$1,100,000	Verify needs to be Removed
21		ES	O-1				P	BCH	Mandalay Outfall Improvements	Beach pump station removed & new box culvert outfall	$500,000	100% Design (Advanced Engineering) construction on hold

22			O-1				P	BCH	Storm Lift Station Rehab-Kippling Plaza	Beach pump station needs retrofit	$880,000	
23		PV	O-1					STC	Transfer Yard Upgrade	FDEP Compliance issue	$326,000	
26		EC	WQ-1					AGC	Alligator Lake	Complince with FDEP consent order	$874,000	
28		EC	WQ-1					AGC	Alligator Lake	Compliance with FDEP consent order	$874,000	
29		ES	F-1					STC	Stevenson Creek Watershed Management Plan Update	Update with improvements and ID new or revised projects	$250,000	
30		EC	F-2					AGC	Alligator Creek Watershed Management Plan Update	Update with improvements and ID new or revised projects	$250,000	
31		ES						STC	St Thomas to Bellevue	950' of failing CMP		Ditch was closed in and piped

R&R Projects											
I-5		RJM	R&R					Turner St. east of Missouri Box Culvert	joints need to be grouted		box repair
I-5		RJM	R&R					1551 Jeffords	3015		box repair
I-4		RJM	R&R					1015 Tuscawilla St	1075-1065		box repair
I-5		RJM	R&R					Causeway & East Shore	(seditment need to be remove from Bay)		barnacles

I-4		RJM	R&R					Papaya & East Shore	3070 (seditment need to be remove from Bay)		barnacles
I-4		RJM	R&R					2986 Fernham Dr	Asset #7105		repair through liner
I-5		RJM	R&R					Downing St. (3155&3161) Storm pipe in easmt between homes	Replace pipe between houses		pipe relocate to front of property.
I-5		RJM	R&R					Betty Lane/St. Thomas	pipe replacement		pipe replacement
I-5		RJM	R&R					1535 Clark St.	Asset #4055 to 4056		pipe replacement
I-5		RJM	R&R					1520 Betty Lane	Asset #8090		pipe replacement
I-5		RJM	R&R					1000 Lakeview	Asset #1090 to #1065		pipe replacement
I-3		RJM	R&R					Drew St/Coachman to Nash (United Methodist Church)	200' CMP Replacement		pipe replacement
I-5		RJM	R&R					WPC Marshall St			seawall/headwall
I-5		RJM	R&R					Bay Cove			seawall/headwall
I-5		RJM	R&R					Progress Energy ROW	7005		liner
I-5		RJM	R&R					2076 Ridge Ln	24" CMP		
I-4		RJM	R&R				AGC	Landmark Dr. North of Green Meadow Ct.	Pipe failure		
I-4		RJM	R&R					3353 Lake Shore Lane	24" into 30" RCP		

I-4		RJM	R&R						2632 Brandy Wine Dr	18" RCP		
I-4		RJM	R&R						2951 Meadow Hill Dr	Sinkhole at box, 18" RCP		

City of Clearwater
Floodplain Management Plan

Priority			
F-1 /Stucture Flooding		Project Start	Discuss these for removal from the CIP List
F-2/Street Flooding			2007
C-1/Regulatory Compliance			2008
F-3/Bridge Flooding			2009
E-1/Major Erosion			2010
WQ-1/ Water Quality			2011
O-1/Other			R&R 07(ongoing)
R&R/Repair and/or replace			Completed Projects
Infrastructure - 1 - New			
Infrasturcture - 2 - Fair			
Infrasturcture - 3 -Average			
Infrasturcture - 4 - Bad			
Infrasturcture- 5 - Failure			

END OF REPORT