SUWANNEE
RIVER
WATER
MANAGEMENT
DISTRICT

REPORT

TECHNICAL REPORT

BUFFER ZONE STUDY

FOR

SUWANNEE RIVER WATER MANAGEMENT DISTRICT

SEPTEMBER 8, 1988

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SUWANNEE RIVER WATER MANAGEMENT DISTRICT

I. INTRODUCTION

As part of its responsibilities under the Surface Water Improvement and Management Act (SWIM), the Suwannee River Water Management District (SRWMD) reviewed the natural resources impacts on several developments constructed or proposed for construction in riverine floodplains. The district's staff was concerned that existing regulations were not adequate to protect the diverse natural resources of riverine floodplains from the impacts of medium and high density developments. Development adjacent to the district's rivers and creeks was resulting in a loss of wildlife habitat and an increase in soil erosion and water pollution. In an effort to expand its ability to provide additional protection to resources and water quality, the SRWMD contracted with Dames & Moore, an environmental consulting firm, to develop a buffer zone for the Suwannee River that would protect the river's natural resources.

The consultant would accomplish the following tasks:

1. Conduct a brief literature survey to determine the approaches taken by other Florida water resources organizations and other state governments to develop natural resources buffer zones.

2. Develop a buffer zone methodology based on the use of the U.S. Soil Conservation Service (SCS) TR-55 rainfall/runoff model, an established model widely accepted and used throughout government and industry, and test this methodology at three representative sites along the Suwannee River.

3. Conduct an assessment of the efficacy of the state's septic tank rule in the counties along the Suwannee River and determine if any proposed rule changes would affect the district.

A buffer zone can be equated to the commonly used land planning term "setback", wherein a particular structure must be situated a predetermined distance away from a land use feature such as a road or a neighboring property. In essence, a buffer zone is a setback designed to protect a natural resource or feature from the direct impacts of development. Currently, SRWMD policy allows for a setback (or buffer zone) of 75 feet from open water for single family residences. (See Figure 1.) This setback is a minimum threshold designed primarily to protect water quality from direct runoff from impervious surfaces. The current 75 foot setback line does not, however, provide adequate water quality protection against the runoff from medium to high density development located adjacent to waterbodies. Also, the current setback does not provide adequate protection from the clearing of

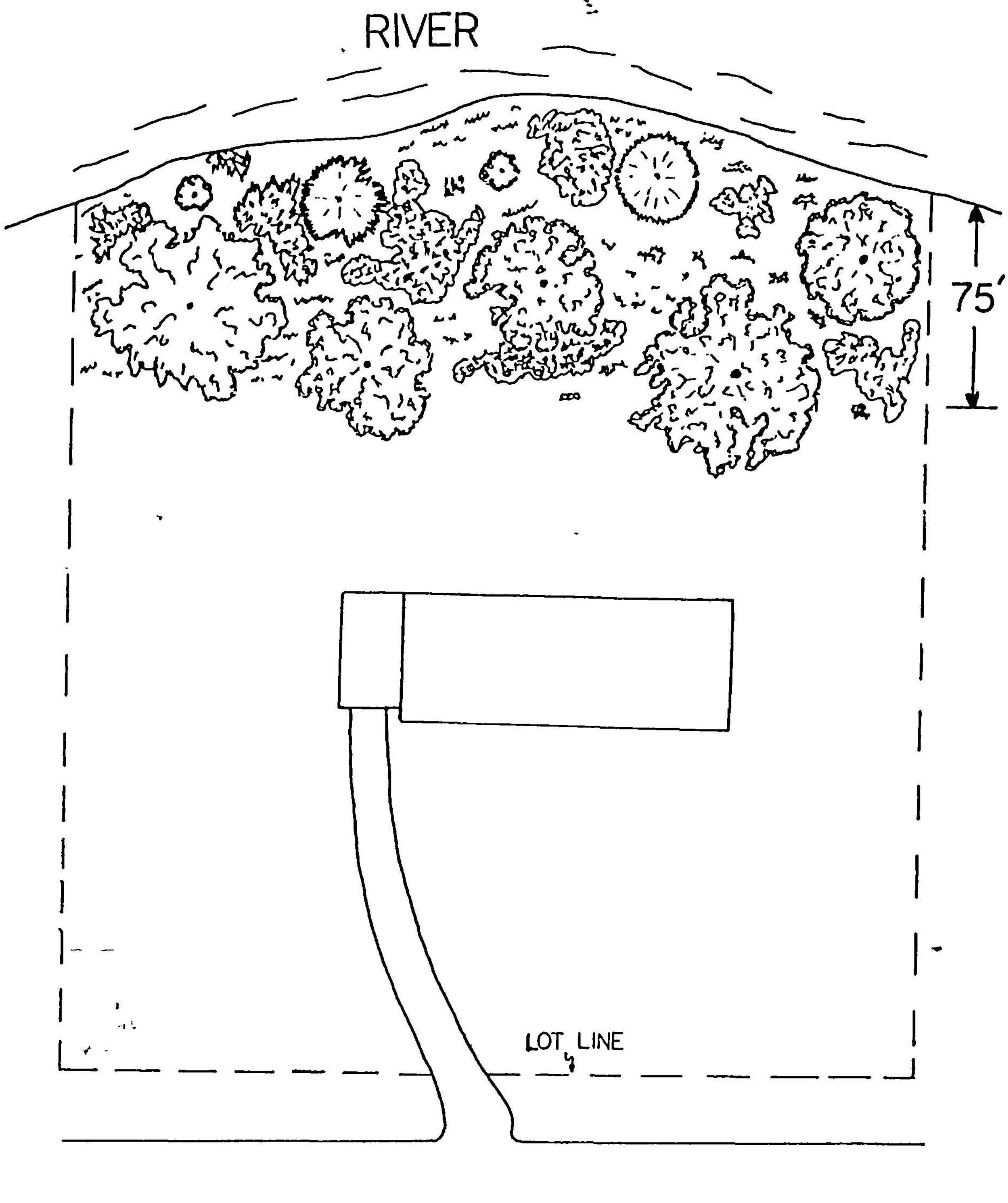


Figure 1. SRWMD Buffer Strip

vegetation that binds floodplain soils and keeps them from eroding into the waterbody.

At the present time, a 75 foot buffer strip is required along any jurisdictional water within the SRWMD. The buffer strip is to contain natural vegetation and extend back from the normally recognized bank of the water. This requirement was adopted as a rule in Chapter 40B-4, Surface Water Management Works of the District in 1985. The basis for selecting a 75 foot buffer in the District dates back to the mid-1960's when the Suwannee River was being considered for designation at the federal level as a Wild and Scenic River. As part of the conditions for this designation, a setback, or buffer strip, of 75 feet from the river bank was proposed primarily for aesthetic purposes.

Although the Suwannee River ultimately was never designated as a Wild and Scenic River, the provision for a 75 foot buffer strip continued to be discussed by various organizations. In the 1970's, the Suwannee River Resources Planning and Management Committee, under the authority of Chapter 380, Florida Statutes, recommended the adoption by local government of a 75 foot buffer strip along the Suwannee River. By 1982, all the counties along the river had implemented ordinances requiring the 75 foot buffer strip within which only very limited destruction of vegetation was allowed. In 1984, the SRWMD began the process of incorporating all the county and local ordinances for the Suwannee River into the broader context of the entire District, culminating in the 75 foot requirement being incorporated into Chapter 40B-4.

To date, the 75 foot buffer strip appears to be effective for its intended purpose, which is the protection of waterbodies from typical activities along the river, especially the construction of single family homes. The question is now arising as to the effectiveness of the 75 feet if more intense development occurs. This report attempts to answer that question by demonstrating a method by which larger buffer strips could be implemented as the intensity of development goes beyond that of the typical single family home unit.

Ideally, buffer zones should both protect floodplain vegetation and soil and minimize runoff so as to maintain post-development water quality and quantity in the receiving waterbody to that of the natural or pre-development condition. It must be realized however, that this ideal condition can never be met under practical conditions. The realistic purpose of a buffer zone, therefore, is to minimize the adverse environmental impacts of floodplain development activity and not to eliminate them entirely.

SRWMD wanted to have a method of deriving buffer zone distances which was fairly simple to implement and would provide flexibility in its application. The district also desired that the method be capable of providing buffer zones which would vary in width according to actual conditions; that is, a site specific buffer zone, an activity specific buffer zone, or a combination.

II. OTHER PLANNING AND REGULATORY APPROACHES TO THE USE OF NATURAL RESOURCES BUFFER ZONES

In order to properly evaluate both the district's existing 75 foot setback requirement and the proposed buffer zone model described in the next section, the consultant reviewed the planning literature to learn how other governmental jurisdictions have regulated natural resource buffer zones. We reviewed the regulatory approaches of seven states who have successfully established buffer zones of setbacks to protect riverine floodplains from development encroachment. The Florida DER, some local governments and the other water management districts were also consulted on their approaches. Finally, as a part of this task, the consultant was asked to review the buffer zone report prepared by the Center for Wetlands.

Coincidentally, during the preparation of this report, the 1988 Florida Legislature adopted the Wekiva River Protection Act, which directed the establishment of buffer zones to protect the river's water quality and floodplain natural resources. The legislature expressed concern for the environmental impacts caused by increasing development encroachment into the floodplain of the Wekiva River. The St. Johns River Water Management District has developed various buffer zones that provide extensive areas of protection. The policy principal applied for the Wekiva River is valid for the SRWMD's desire to protect its riverine natural resources.

1. Review of the Center for Wetlands Buffer Report

"An Evaluation of the Applicability of Upland Buffers for the Wetlands of the Wekiva Basin" (Brown and Schaefer, 1987) introduces the buffer zone concept and discusses the significant benefits buffer zones provide for the maintenance and protection of water quality, water quantity and wildlife habitats for wetland, upland and transitional zone species. The authors did a commendable job amassing and presenting the available, relevant literature, especially in the areas relating to edge (ecotonal) and corridor effects. Several conclusions are readily apparent from their review:

(1) Limited information is available that directly relates to the establishment of buffer zones;

(2) The limited direct and considerable indirect evidence suggest that buffer zones are clearly beneficial and necessary for the protection of natural resources;

(3) Little quantitative information is available which can be used to establish widths of buffer zones; and

(4) The limited quantitative data that exist suggest highly variable buffer widths, influenced by a variety of factors such as: what organisms are examined, vegetation and soil type present, and topography.

In the latter portion of the report, the Center proposed a method for establishing a flexible-width buffer zone which could be estimated at varying distances along a riverine/wetland shoreline. The buffer methodology was designed for use within the St. Johns River Water Management District (SJRWMD), specifically in the Wekiva River Basin. The width of the buffer zone was based on four factors:

(1) The St. Johns River Water Management District's wetland line (40C-4, F.A.C.),

(2) A water quality maintenance factor based on soil erodibility in the immediate vicinity of the wetland line,

(3) A water quantity maintenance factor based on ground water table depth in the vicinity immediately upland of the wetland line, and

(4) Habitat requirements of aquatic and wetland-dependent wildlife species.

The 40C-4 Wetland Line. The Center for Wetlands proposes using the SJRWMD wetland line to establish the landward extent of the wetlands (or conversely, the waterward boundary of the buffer zone). This wetland line is not identical, but similar to the Department of Environmental Regulation's wetland jurisdictional line (Chapter 17-4, F.A.C.) and is based on an assessment of dominant vegetation, soils and other indicators of wetland conditions. Dames & Moore agrees with the Center that the use of a wetland jurisdictional line of this nature (e.g., WMD's, DER's, COE's) is an essential first step in buffer delineation.

Once the wetland line is established, the Center proposes evaluating the remaining three factors (discussed below). The final buffer width is determined by what the Center states is the "controlling factor," i.e., the factor calculation that results in the largest buffer zone. While Dames & Moore strongly agrees with the Center's method for determining the boundary of the buffer, we have serious reservations concerning the proposed methodologies used by the Center to calculate buffer widths.

Water Quality Maintenance. The maintenance of water quality in a wetland is suggested by the Center to be "related to the filtering capacity and roughness of natural undisturbed vegetation to minimize inputs of sediments and destructive velocities of water." Erosion potential and subsequent sediment deposition in the wetland is a function of water velocity, slope and soil erodibility. The Center relates these factors through the following "simple relationship of slope and erodibility" (p. 119; Brown & Schaefer, 1987):

$$B_w = \frac{S}{E}^{1/2}$$, where: B_w = buffer width
S = average land slope
E = Soil erodibility factor; indexed to Soil Conservation Service erosion factors

The Center proposes that this equation be evaluated to determine buffer width at any point along the wetland/riverine shoreline.

Dames & Moore offers several observations about the Center's equation. First, while reference is made by the Center to the "filtering capacity... of natural undisturbed vegetation," the authors make no provision to factor into the equation either the type or amount of vegetation present, both of which can profoundly affect runoff quality (and quantity).

Second, the Center makes no provisions in the equation to factor in the influence or presence of anthropogenic materials, (e.g., nutrients, pesticides, heavy metals); in fact, there are no suggestions in the report that environmental chemistry should even be assessed. Water quality is apparently evaluated only as a function of potential erosion, sediment transport, deposition and subsequent turbidity increases in the receiving waterbody. Similarly, there are no provisions to factor in the type of activity from which the buffer protects the wetlands.

Third, the Center presents no clear rationale for using the particular formulation given. While the Center's equation is scaled such that its solution results in intuitively reasonable buffer widths, no empirical data are presented to verify that the calculated buffer width (B_w) in fact provides the proposed level of water quality protection.

The authors state in the report that the above equation should be taken as a "framework" out of which "equations better suited for the conditions encountered" can be developed and that the equation is provided only "as an example for determining buffer requirements..." On this point, Dames & Moore agrees with the Center. We suggest that either field data be collected to substantiate the equation's validity or new methods be examined.

Water Quantity Maintenance. The maintenance of water quantity in a wetland is suggested by the Center to be related only to the influence of drainage structures on the ground water table adjacent to the wetland. These drainage structures (e.g., ditches) interrupt normal ground water flows from the upland to the wetland, cause ground water table drawdown and can result in the lowering of wetland water levels. To minimize this drawdown on the wetland, the Center proposes that an acceptable setback from the wetland for drainage structures can be calculated from the following highly simplified equation (p. 123; Brown and Schaefer, 1987):

$B_w = (1.69\ D/s)\ (10^{-(1.3/sL)})$ where: B_w = buffer width
D = ditch depth
L = ditch length
s = water table surface slope in the vicinity of the ditch

Similar to our comments on the previous equation, Dames & Moore questions the appropriateness of the above calculations for buffer width estimation. First, the equation is a greatly simplified version of a more complex formula, neither of which was accompanied by adequate rationale for use by the Center. Additionally, no discussion was provided by the Center concerning the determination of constant terms in the equation.

Second, the Center assumed a drawdown of 0.25 feet at the wetland edge which is acceptable. The rationale for this acceptable drawdown is unclear. While a drawdown of this magnitude may have negligible impacts on the main stem of a river or the deeper, central portion of a lake, the shallow-water, peripheral areas of a wetland (e.g., shallow marshes, sloughs) may be affected to a greater extent, depending on their elevations and slopes.

Third, the Center provides no empirical data to verify that the calculated buffer width provides the proposed level of protection of water quantity.

Wildlife Habitat Requirements. To provide habitat protection for aquatic and wetland-dependent wildlife species, the Center's authors suggest evaluating four factors: habitat suitability, spatial requirements, access of wetland species to upland and/or transitional habitats and noise impacts. Dames & Moore believes that the lack of technical data on which to assess buffer widths is most evident in this section of the Center's report.

The Center's report lists seven criteria as minimum standards for an area to be considered suitable habitat for a full spectrum of wildlife species. These standards were derived from an extremely limited data set on "several of the more sensitive forest-dwelling wetland-dependent species" (i.e., data were presented for several turtle species, several birds and a snake; Table V.2 in Center's report, p. 125). Dames & Moore feels this is not a representative or adequate sample of a "full spectrum" of species. Additionally, it is unclear from the Center's report how these criteria should be translated into an estimate of buffer width without detailed, field observations.

The Center states that by providing suitable habitat for certain sensitive species that the needs of less sensitive species will automatically be insured. Dames & Moore feels this statement is misleading and not adequate justification for proceeding with only limited data. Sensitive species are usually "sensitive" because of a particular limiting resource requirement. This limiting resource may have little to do with other species. By providing this resource, the sensitive species may be assisted with little benefit to any other species. Dames & Moore suggests that more species specific information be acquired before this type of approach is taken.

A similar lack of quantitative data were available to the Center on the spatial requirements of wildlife species (Table V.2 in report and above discussion indicate the paucity of data). Further aggravating the problem is the fact that none of the cited studies used by the Center were carried out in Florida, or more specifically in the Wekiva Basin. Certainly the fault does not lie with the Center on this issue; few technical data exist which can provide estimates of the spatial needs of wildlife species.

Even less data are available to assess the buffer requirements based on accessibility of wetland species to upland habitats; data were presented by the Center only for turtles and the gopher tortoise. Dames & Moore believes these data are clearly inadequate to assess this wildlife factor.

In conclusion, Dames & Moore feels that the methodologies proposed in the Center for Wetland's report for the establishment of wetland buffer widths are based on either (1) highly simplified, artificially constructed equations with no empirical data to verify their effectiveness in wetland protection, or (2) such limited data as to cast considerable doubt on their general predictability and usefulness. Highly quantitative models are only as good as the data on which they are based. Clearly, considerably more species-specific information, at least collected on a regional basis, is necessary before buffer widths can be quantitatively evaluated based on approaches proposed by the Center. If adequate data are not available from the literature, which we believe to be the case, and cannot be acquired from new research within a relatively short period of time, other approaches should be sought by which reasonable estimates of buffer widths can be objectively determined. Dames & Moore recommends consideration of a qualitative model (see discussion on the New Jersey Pinelands Buffer Model in the following section).

2. Other States Approaches to Wetland Buffers

Dames & Moore briefly reviewed the planning literature to obtain an insight into other states' approaches to the setting of buffer zones or setback lines around wetland areas. To do so we acquired information from the Strozier Library (Florida State University), the Florida Department of Environmental Regulation Library, the Department of Urban and Regional Planning (Florida State University), the Department of Natural Resources in the states of Delaware, Maryland and Virginia, the Virginia Institute of Marine Science and the Citizens Program for the Chesapeake Bay.

Wisconsin. To deal with development pressures on its aquatic resources, Wisconsin passed the Water Resources Act, Chapter 614, Laws of 1965. In Section 59.971, Wisconsin Statutes, a variety of shoreline zoning provisions were set forth to preserve the natural, historical, cultural and scenic resources that are present near lakes and streams (Burnett and Hansen, 1982). Administered by the Department of Natural Resources, the shoreland zoning program was aimed at controlling water pollution, protecting wildlife habitats and regulating structures and land uses within the shoreline areas.

Under the Act, all Wisconsin counties are required to zone their unincorporated areas lying within 1,000 feet of lakes or ponds, and within 300 feet of rivers or streams, or to the landward side of the floodplain, whichever distance is greater. Within this shoreline zone, counties must regulate a variety of activities including sanitary facilities, subdivisions, tree cutting, building setbacks, drainage alterations and wetlands. Chapter NR 115, Wisconsin Administrative Code, established minimum standards as guidelines which the counties may exceed if desired. A minimum building setback of 75 feet from the ordinary high water mark was set along with regulations governing the removal of vegetation within a 35-foot wide strip parallel to the water.

Wisconsin's approach has merit to the SRWMD's attempts to establish site-specific setback lines. We suggest the district pursue this further by obtaining data from the Wisconsin Department of Natural Resources.

New Jersey. Although summarized in the Center for Wetlands report, the New Jersey Pinelands buffer is a unique approach to wetland protection and is worth briefly reviewing here. In 1980, the State of New Jersey adopted the New Jersey Pinelands Comprehensive Management Plan which was designed to provide protective regulations for the 445,000 hectare Pinelands National Reserve. The plan prohibits most development in wetlands and establishes a flexible buffer zone, ranging in width from 50 to 300 feet around any wetland.

A buffer delineation model (Roman and Good, 1985, 1986) was developed that incorporates information on three general factors: an evaluation of relative wetland quality, an assessment of potential impacts associated with proposed development, and existing and projected land use. Each factor is evaluated over a series of criteria; for example, relative wetland quality is assessed by examining the existing vegetation, existing water quality, the ability to maintain water quality, wildlife habitats and sociocultural values such as recreational potential. A particular wetland area is ranked qualitatively for each criterion with a score from 1 to 3. Scores for all criteria for each of the three general factors are averaged and a buffer width is calculated between the minimum and maximum values. A more detailed description of the buffer model can be found in Roman and Good (1985, 1986).

Dames & Moore feels that the above approach, like Wisconsin's, has considerable merit and suggest that the model be examined in more detail for its applicability in the SRWMD.

Maryland. In 1984, the Maryland General Assembly passed the Chesapeake Bay Critical Area Law establishing a Commission authorized to develop criteria for guiding local land-use decisions within a 1000-foot wide buffer strip around the bay's shoreline and along its tributary streams, up to the head of tide (Sullivan, 1986). This buffer zone is known as the "Critical Area." The law mandated local governments to develop management plans for the lands under their jurisdiction that lie within the Critical Area. Additionally, local governments must establish a minimum 100-foot buffer along their shoreline and streams, within which most new structures, roads, septic systems, and impervious surfaces are prohibited. Regulations also require that this 100-foot buffer be maintained in, or returned to, natural vegetation. Local plans were due in December, 1987, and are currently being reviewed by the Commission.

Maryland's approach to wetland setbacks is promising. Although it is too early to tell how successful Maryland's approach will be, Dames & Moore suggests acquiring additional information on their approach as well as carefully monitoring the success of their program over the next few years.

Maine. The Saco River Corridor Act, 38 Maine Rev. Stat. Ann., Chapter 6, established regulations governing development within a corridor defined by the limits of the 100-year floodplain of the Saco River (a minimum of 500 feet and a maximum of 1000 feet on either side). A Resource Protection District was set up to include wetlands, areas where the entire width of the corridor was within the 100-year floodplain, and areas important for either wildlife habitat or scenic value. Within the Resource Protection District very limited uses are allowed; dredging or filling of wetlands and dwelling structures are prohibited. A limited Residential District was established, however, which allows for single family residences as long as there is no encroachment on the 100-year floodplain. Single family residences may have a combined river frontage and building setback of not less than 100 feet (Comer, et al., 1982).

Michigan. Michigan's Natural River Act, Public Act 231 of 1970, was designed to establish a system of designated natural rivers for the purpose of preserving, protecting, and enhancing these river environments in a natural state for future generations. Rivers and their tributaries are nominated for inclusion in the system, studied and a river management plan prepared by the Department of Natural Resources with local assistance. Once a river management plan is adopted by the Natural Resources Commission, lands along a designated reach are managed according to the plan. The principal management tool is zoning regulations adopted by local government units, or in their absence, by state administrative rules patterned after zoning regulations. The Act specifically includes authority to establish structural setbacks from the water's edge and to prohibit or limit the removal of vegetation up to a distance of 100 feet from the water's edge (MDNR, 1978).

Pennsylvania. The Commonwealth of Pennsylvania Department of Environmental Resources uses a 50-foot building setback measured landward from the top of a river channel to regulate encroachment along the floodplains which do not have an identified floodway (Accurti and Keptner, 1982).

Local Regulations. In addition to the state-regulated buffer zones cited above, numerous local governmental agencies in other states have passed ordinances establishing wetland buffer zones or setbacks for the protection of aquatic and wetland habitats (Thurow et. al., 1975; Comer et. al., 1982; Brown and Schaefer, 1987). Boundaries may extend from as little as 25 feet, as was recommended in the Oakland County, Michigan, to as high as 200 feet in Orange County, New York. Numerous local ordinances fall within this range; examples include: 40-foot buffers in New Castle, New York; 50-foot widths in Napa, California, and Dartmouth, Massachusetts, and a 150-foot buffer in Marlborough and Brooklyn, Connecticut (Thurow et. al., 1975).

Recently in Florida, two good examples of locally established buffers can be seen around Apalachicola Bay in the Panhandle and Mosquito Lagoon on the East Central coast. Interestingly, both of these wetland/shoreline buffers were originated to protect shellfish harvesting in the areas. In both areas, shellfishing activities were jeopardized by poor water quality in some locations, primarily resulting from inadequate septic systems.

In early 1987, Franklin County, under pressure from the state (Apalachicola Bay Protection Act of 1985) instituted its Critical Shoreline District Ordinance (Franklin County Ordinance No. 87-1) around Apalachicola Bay, producer of over 90% of the harvested oysters in the state. This ordinance set up a 150-foot buffer zone of critical concern around the bay, extending landward from the DER wetland jurisdictional line. The first 50 feet from the wetland boundary within the Critical Shoreline District was designated as the Critical Habitat Zone (CHZ) within which only limited, water-dependent development is allowed. The maintenance of natural vegetation is required within the CHZ. Traditional septic tanks are prohibited within the entire 150-foot buffer, yet, aerobic units may be installed within the landward 75 feet of the district.

In late 1986, Volusia County instituted in the county zoning ordinances a set of performance standards by which shoreline and water quality protection could be reasonably insured. Guidelines for two types of buffers were developed, a wetland protection buffer and a shoreline protection buffer. The wetland protection buffer extends 25 feet from the upland limit of any wetland habitat, must preserve the natural vegetation and must meet or exceed the requirements of the shoreline buffer. The shoreline buffer extends 50 feet landward from the mean high water line. Within this zone, no development is permitted except limited water-dependent structures (e.g., boat ramps, docks). No more than 20% or 25 feet, whichever is greater, of any shoreline may be altered.

3. Buffer Zone Regulations in Water Management Districts and Regional Planning Councils

Dames & Moore interviewed staff in all of the water management districts and regional planning councils concerning any wetland buffer zone or setback regulations in effect. The following is a synopsis of our findings.

Water Management Districts. Currently, no buffer zone regulations or rules governing setbacks from wetlands exist for either the Northwest Florida Water Management District (NWFWMD) or the St. Johns River Water Management District (SJRWMD). While the NWFWMD has no plans for establishing buffers, the SJRWMD is proceeding with rulemaking on buffers in the Wekiva River Basin to incorporate the details of the 1988 legislation covering the Wekiva River. The 500 foot buffer cited in the Wekiva bill is to be coupled with Best Management Practices. Development may occur within this buffer zone only if stormwater controls are in place and stabilized prior to construction. The proposed rule is based in part on the Center for Wetland's study (reviewed in Section .1 of this chapter) and its progress should be followed closely.

South Florida Water Management District (SFWMD) adopted its Isolated Wetland Rule in early 1987. The rule was challenged, but upheld, in administrative hearing not on the issue of determination of buffer width, but on the District's authority to create a development setback. The basis for the rule resides in the statutory language stating that natural wetlands and appropriate buffers be preserved. A buffer zone of 25 feet is preserved landward of the wetland control elevation which is determined by SFWMD staff (and should not be confused with a vegetation-based jurisdictional line, e.g., DER's vegetation rule). In many cases the buffer zone begins at the upper end of the transition zone, which is considered part of the wetlands. The setback is somewhat flexible in that it may be contracted in some areas so that expansion to capture a significant resource can be accomplished in other areas, thus yielding an average setback of 25 feet.

Southwest Florida Water Management District (SWFWMD) currently provides a 15-foot buffer extending landward from the wetland demarcation line. The district, however, has the ability to make changes, if necessary, in the buffer widths on a case-by-case basis. If any threatened or endangered species are present, SWFWMD requires that an additional, unspecified distance be added to the buffer; this distance theoretically has no upper limit.

Regional Planning Councils. In July, 1987, Comprehensive Regional Policy Plans were adopted for the eleven Regional Planning Councils (RPC's) throughout the state. In all cases, language was included, however vague, encouraging local governments to institute requirements for natural, vegetative buffers around wetland habitats. Most of the RPC's stopped short of specifying exact buffer dimensions; instead, local governments are allowed to set their own guidelines.

Only two RPC's interviewed (Treasure Coast and North Central Florida) have specific buffer widths incorporated in their policy language. Treasure Coast RPC set a minimum buffer width of 10 square feet per linear foot of wetland perimeter. This area is used as a minimum value and is coupled with the requirement that no less than 50% of the perimeter should be buffered by this 10-foot wide strip. The North Central Florida RPC requires a 75-foot buffer (measured landward from the commonly recognized river/stream bank) around rivers and streams of regional significance and a 35-foot buffer around all other perennial rivers and streams. Residential, commercial and industrial development is discouraged within these buffer zones; agriculture, silviculture and recreation are allowed subject to Best Management Practices.

4. Review of DER's 10 Year Floodplain "backstop" Rule and Determination of problems with implementation

The Department of Environmental Regulation rules, Chapter 17-4.022(6), states that the landward extent of waters of the state will extend only as far as the elevation of the one in 10-year recurring flood event, or the area of land covered with standing or flowing water for more than thirty (30) consecutive days per year, calculated on an average basis, unless the indigenous vegetation indicates a smaller area or lower elevation should be considered. This is what has commonly become known as the ten year floodplain backstop rule.

Generally, landward extension of surface waters of the state is determined for any waterbody by dominant plant species. If the so-called wetland species predominate, then they are within waters of the state. In some instances, however, these plants may extend for considerable distances from the waterbody in question. If it can be determined that the ten year floodplain does not extend as far as the wetland species, then the ten year floodplain "stops" the jurisdiction for waters of the state.

Dames & Moore interviewed Mr. Rick Cantrell and Mr. Abbas Gerami, who work in the DER's Division of Environmental Permitting, Jurisdictional Evaluation Section, in Tallahassee. The purpose of this meeting was to see how the ten year floodplain backstop rule was applied and what, if any, problems could be determined.

We were able to go over three separate permit applications where the backstop rule was applied. The applications of the rule was straightforward for the streams, except in one instance where a seepage zone was encountered. This presented a situation in which a rather constant seepage of water kept a sizable area wet, although not necessarily inundated, for most of the year. In this case, the area was viewed as a spring discharging into the river, and even though the 10 year floodplain of the receiving river did not encompass the entire seep area, the entire zone was ultimately classified as waters of the state.

In one other example, a lake, the 10-year flood elevation was calculated based on elevations of the river draining the lake and working the calculations back upstream to determine the elevation at the lake. This elevation resulted in a much smaller zone around the lake being considered as waters of the state than what would have been determined based solely on vegetation. The DER accepted this determination and removed from their jurisdiction a portion of the property measuring approximately 150 foot by 300 foot.

5. Conclusions and Recommendations

After reviewing the above planning literature, regulatory approaches and interviewing numerous staff persons in other states and Florida agencies, Dames & Moore observed that most buffer zones being used in other states: (1) have a fixed width about the wetland, (2) appear to be based on little to no quantitative information, and (3) were presented with no rationale for choice of buffer width. For this reason, many jurisdictions have adopted setbacks or buffer zones based on a qualitative methodology. Some of the Florida approaches are more quantitative in that they rely on subsurface hydrologic conditions and ground water movement rates.

Clearly the main advantage of a fixed-width buffer, e.g., 75 feet, is the ease with which it is administered. It is relatively simple to determine whether a proposed development will fall within the buffer or not. The key weakness of this method is found in its rigidity. For example, the SRWMD's 75 foot setback line is suitable for single family houses, but is probably inadequate to protect against the impacts caused by development of greater density. A flexible buffer, however, varies in width according to the location of specific resources (e.g., specific vegetation types, endangered species habitat). The flexible-buffer approach assures a certain degree of regulatory sensitivity to critical areas along a wetland, while its weakness lies in the need for field investigation and more extensive program administration.

Of all the buffer zones we examined, only two incorporated a flexible-width buffer determination, the New Jersey Pinelands model and the Wekiva Basin model proposed by the Center for Wetlands. (Please note that the St. Johns River Water Management District, at the direction of the legislature, is developing different buffer zones for the Wekiva River.) We feel that the flexible-buffer approach offers considerably more protection for both wetland habitats and wildlife, as well as proposed development, and we recommend that this approach be pursued in more detail.

At the request of the SRWMD staff, Dames & Moore developed a methodology that combines the flexibility of the qualitative approach together with a computer model that utilizes numerical values derived from lot size, development density, soil types and vegetative cover. See Section III for a detailed discussion of this model.

III. TECHNIQUE FOR ESTABLISHING BUFFER ZONES BASED ON THE SOIL CONSERVATION SERVICE TR-55 RUNOFF MODEL

In view of the limited scope of the consultant's contract, Dames & Moore decided it was not possible to develop an entirely new model for a buffer zone. Instead, we turned to the TR-55 model developed by the U.S. Soil Conservation Service (SCS) and widely used throughout the country. Dames & Moore adapted the TR-55 to serve the development of a buffer zone methodology. TR-55 is a simple and widely accepted modeling technique that has been used for many years to calculate the amount of runoff expected for various surface conditions. Because water quality generally depends on the volumes of runoff water that enters surface waters, it was felt that a technique which looked at this parameter would serve as a useful method by which buffer zones could be determined. If the amount of runoff from land being disturbed in some manner can be minimized, then the attendant pollutants reaching the rivers and lakes also would be minimized.

The SCS TR-55 model calculates amounts of water running over the land surface based on several factors such as, type of soil, vegetative cover, slope and percentage of impervious surface. The SCS has determined how much water can be expected to run off an area and has assigned numbers, known as curve numbers (CN), to many differing types of soils and cover. It also divided all named soils in the U.S. into four hydrologic groups from A through D; where A has the lowest potential for natural runoff and D has the highest, all other parameters being equal. An area with a high CN will have more water runoff than an area with a lower CN. The TR-55 manual, provided by the SCS, lists the CN values for the four hydrologic soil groups, broken down by various types of cover, development and hydrologic condition.

Water classified as runoff travels in three ways across the land: 1) as sheet flow over the entire surface area, 2) as channel flow, such as rivulets and streams, and 3) as shallow subsurface flow in the upper few inches of the soil. Sheet flow was selected as the key factor in the development of the buffer zone methodology because an undisturbed buffer zone will act to slow sheet flow, thereby reducing erosion and allowing pollutants to drop out before reaching the river. The SCS has demonstrated that the maximum distance that sheet flow can occur before becoming either channelized or shallow subsurface flow is 300 feet; therefore, this was the distance chosen to represent the maximum available buffer zone for the hypothetical lot along a waterbody.

Five scenarios were used to develop the buffer zone model, based on land use landward of an undisturbed buffer zone along the river's edge. These are presented as cases one through five. Table 1 briefly describes each case and gives the corresponding CN for the area landward of the buffer zones for typical conditions.

These five cases were chosen to represent typical conditions one might expect to encounter as an undeveloped area gradually becomes more developed. The CN values given for each case are merely representative values and may be higher or lower for individual situations, because of variations in the natural vegetative cover. It is assumed that an undisturbed/undeveloped site (case 5) consists of a lot with substantial tree cover and a brush/grass/weed understory and ground cover. These physical conditions present a great deal of resistance to runoff, allowing water adequate time to soak into the ground before it reaches an open body of water.

The next level of development (case 4) is the "cabin in the woods," in which some minor site alteration occurs, but most of the trees are left intact and there is very little clearing of the surrounding lot, which is still mostly brush/weed combination.

The middle case (case 3) represents a typical single family home in which most of the underbrush and ground cover is replaced by lawn grass, and up to 20% of the total lot area is converted to impervious surface (such as roof, deck, driveway, sidewalk, bare packed ground). This is the predominant type of development currently taking place along the rivers in the district, and which the district considers as the baseline for assessing all other types or densities of development.

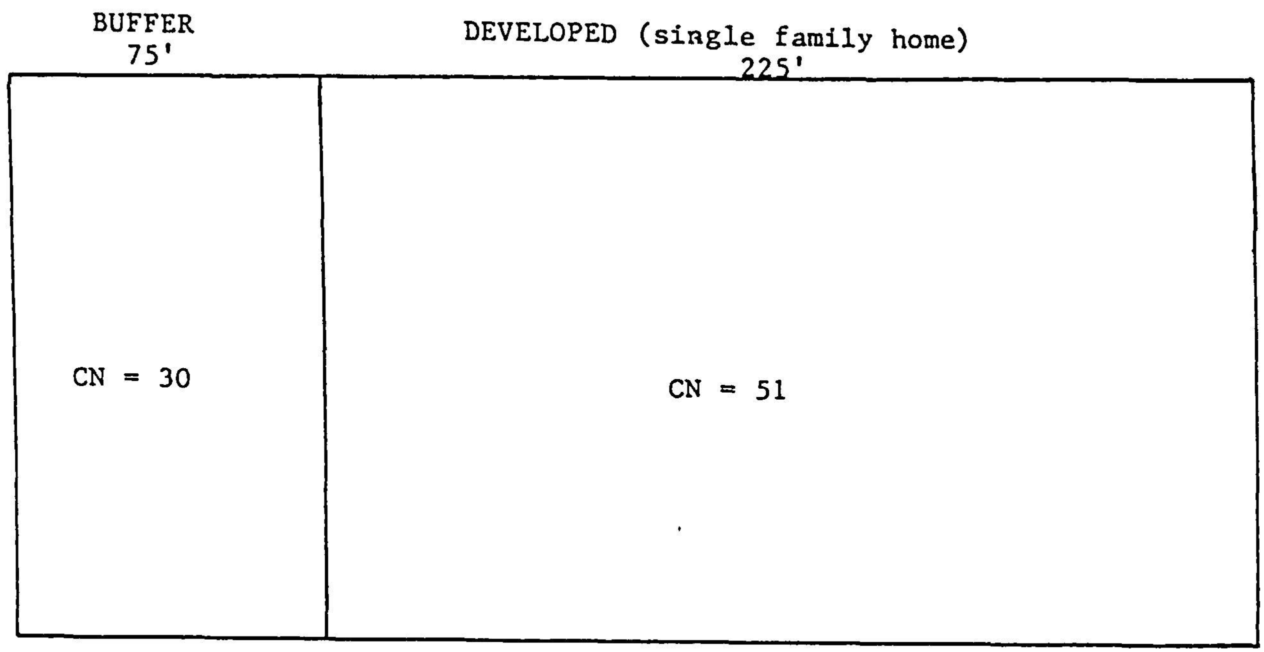
Case 2 represents a higher density of development along the waterbody, such as multi-family housing or some similar high density use having a total impervious surface area of between 40% and 65%, and very little natural vegetation left other than a few trees.

Finally, case 1 can be thought of as the "worst case" of site alteration in which 90% or more of the total lot is impervious, or nearly so, such as bare hard packed ground or a parking lot surface. Each of these cases (as well as all other cases) will have a varying CN, depending on the type and amount of vegetation on the lot, for a particular soil group.

Table 1 - CN for area landward of buffer zone

Case Description	CN A	CN B	CN C	CN D	(soil type)
1 impervious area (bare, packed soil)	98	98	98	98	
2 dense development; severe disturbance	77	85	90	92	
3 single family house with grass yard	51	68	79	84	
4 small cabin; minor disturbance	36	60	73	79	
5 undisturbed; undeveloped	30	55	70	77	

The CN for case 5 (the undeveloped or naturally existing site condition) in each soil type is used as the CN value for the buffer zone. A composite CN for a lot with a specific buffer zone and type of development is calculated by proportioning the buffer zone width to that of the remaining width (300 feet minus the buffer zone width). As an example, assume a buffer zone of 75 feet having a CN of 30. (See Figure 2.) A development is to be placed in the 225 feet behind this buffer zone which will have a CN (for the developed portion only) of 51. The composite CN for the entire 300 feet length is then calculated to be 46, as follows:



$$\text{COMPOSITE CN} = \frac{75 * 30}{300} + \frac{225 * 51}{300} = 46$$

Figure 2 - Example of Composite CN Calculation

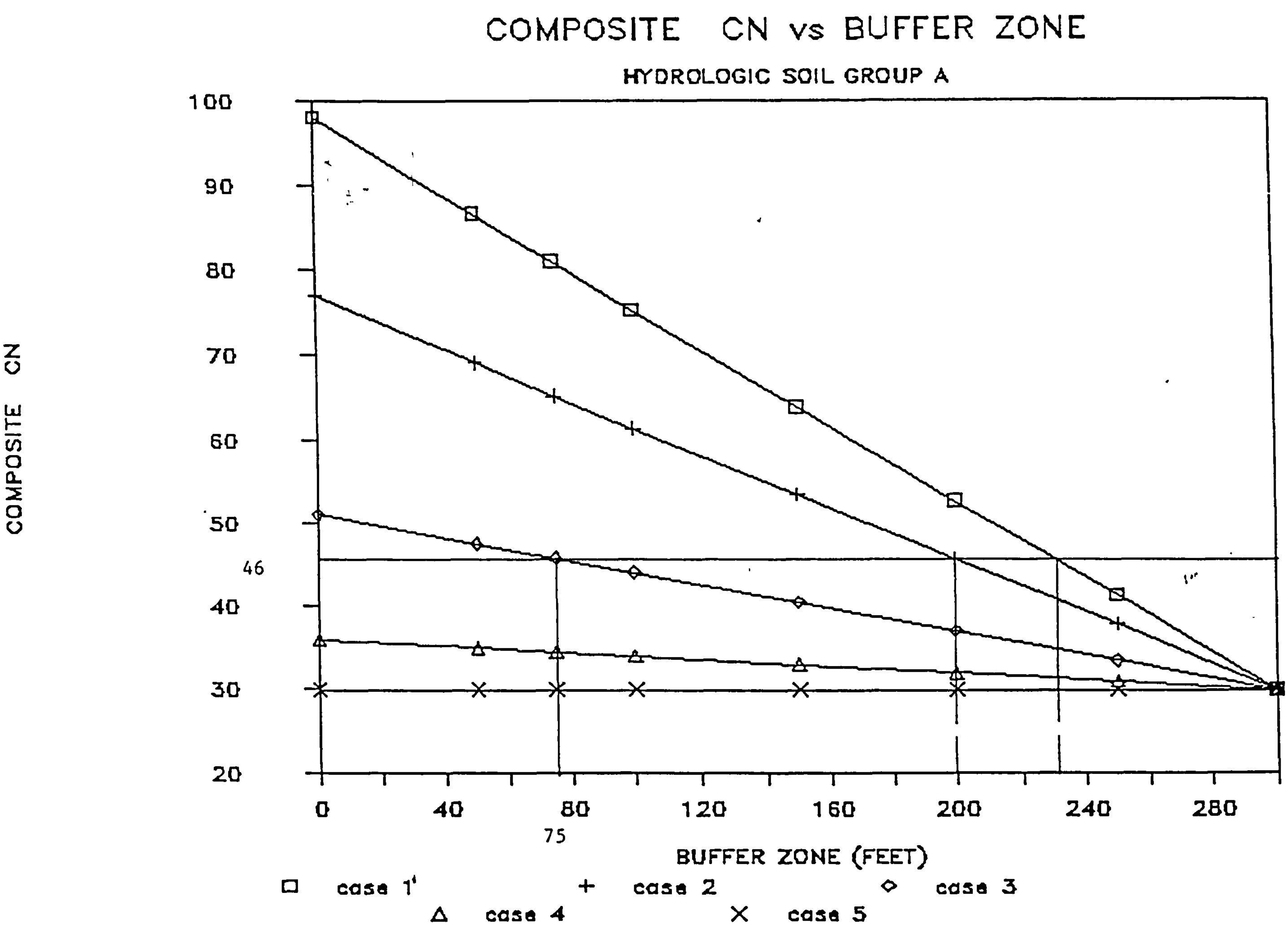

COMPOSITE CN vs BUFFER ZONE
HYDROLOGIC SOIL GROUP A
COMPOSITE CN
100
90
80
70
60
50
46
40
30
20
0
40
80
120
160
200
240
280
75
BUFFER ZONE (FEET)
case 1
case 2
case 3
case 4
case 5

Figure 3.

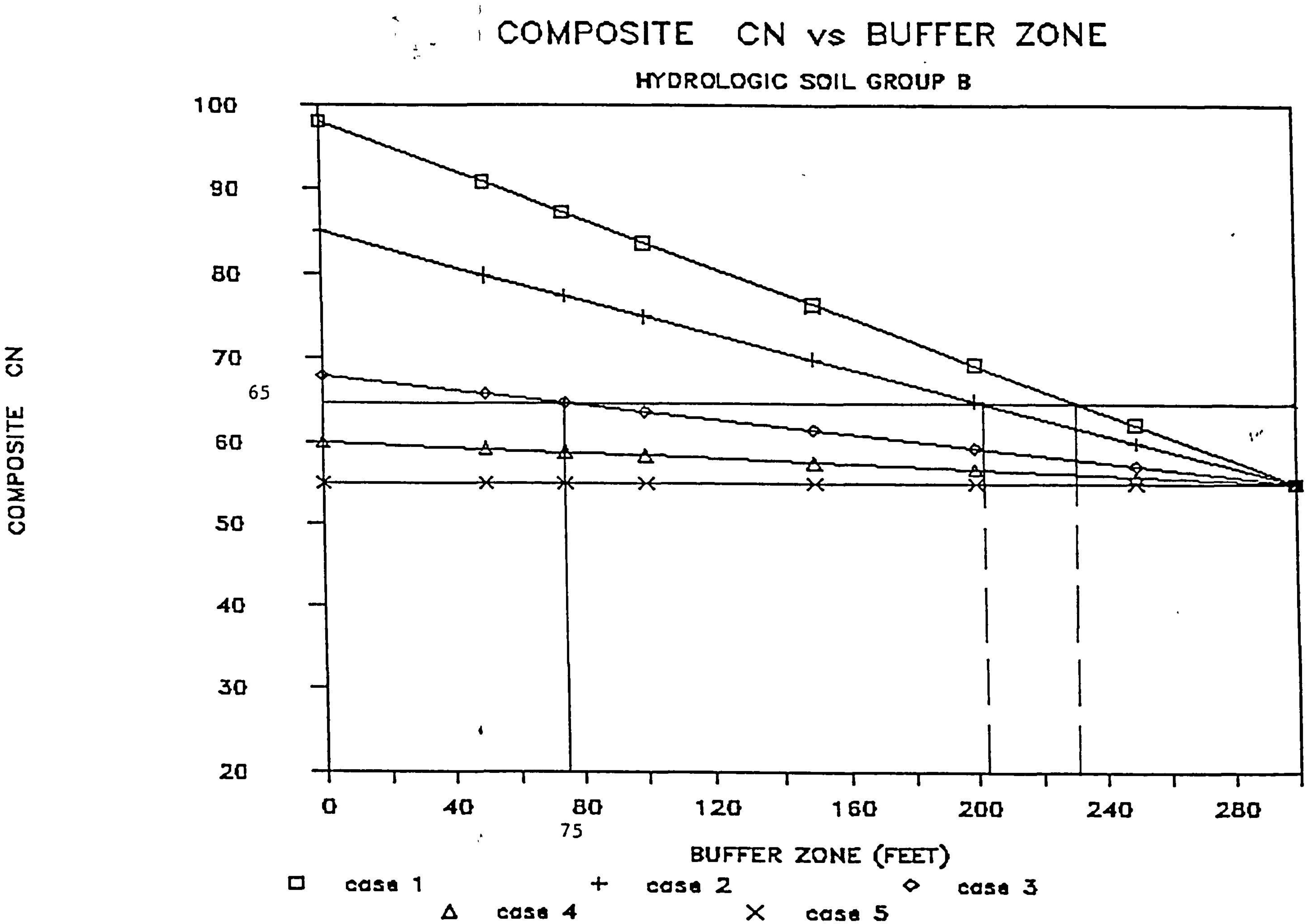
$$\frac{(75)}{(300)} 30 + \frac{(225)}{(300)} 51 = 46$$

Composite CN values were calculated for each case within each soil group using varying widths of buffer zones for each 300 foot lot. As the buffer zone gets wider for each particular case the composite CN for the entire lot becomes smaller, until the entire 300 feet becomes a buffer zone and the composite CN for all cases is the same as the undeveloped lot. Obviously in this extreme situation the ability to develop the property as proposed is not feasible. At the point, the district staff and the applicant must negotiate an acceptable level of development that will most likely involve structural water management features (such as retention ponds) as well as a buffer zone.

Sets of graphs were developed using this methodology for hydrologic soil type A to D (Figures 3 through 6). Each graph compares the effect of development type to varying buffer widths. Each graph consists of a set of sloping straight lines, each one representing a particular level of development for the area landward of a buffer zone. The buffer zones were assumed to have a CN value corresponding to the naturally occurring state prior to any disturbance. For this reason, the bottom line on each set of graphs is horizontal, indicating that when no disturbance occurs behind a buffer zone, no change occurs in the runoff characteristics for the entire length.

These graphs illustrate the effect of increased disturbance or development on the CN value and the effect of increasing the buffer zone for a particular type of activity on the CN. The greater the disturbance, the greater the potential runoff; the wider the buffer zone, the lower the potential runoff.

In order to make practical use of this method, each individual site must have its buffer zone CN determined based on the soil type and cover existing on the site prior to any development. It is also necessary to establish a maximum value for an acceptable composite CN for each particular lot. To do this, the current SRWMD policy of allowing a single family dwelling to have a setback of 75 feet is utilized. By entering the graph along the X-axis at a value of 75 feet and picking the point along the line corresponding to the single family dwelling (case 3), a maximum composite CN for the graph is established. Activities which maintain a composite CN of this value or less will be able to have the minimum 75 foot buffer zone. Development that causes a greater disturbance will need to have larger buffer zones. This larger buffer zone can be determined from the intersection of the sloping line representing the proper level of disturbance with the maximum CN allowed and reading down to the value for buffer zone width.


COMPOSITE CN vs BUFFER ZONE
HYDROLOGIC SOIL GROUP B
COMPOSITE CN
100
90
80
70
65
60
50
40
30
20
0
40
80
75
120
160
200
240
280
BUFFER ZONE (FEET)
case 1
case 2
case 3
case 4
case 5

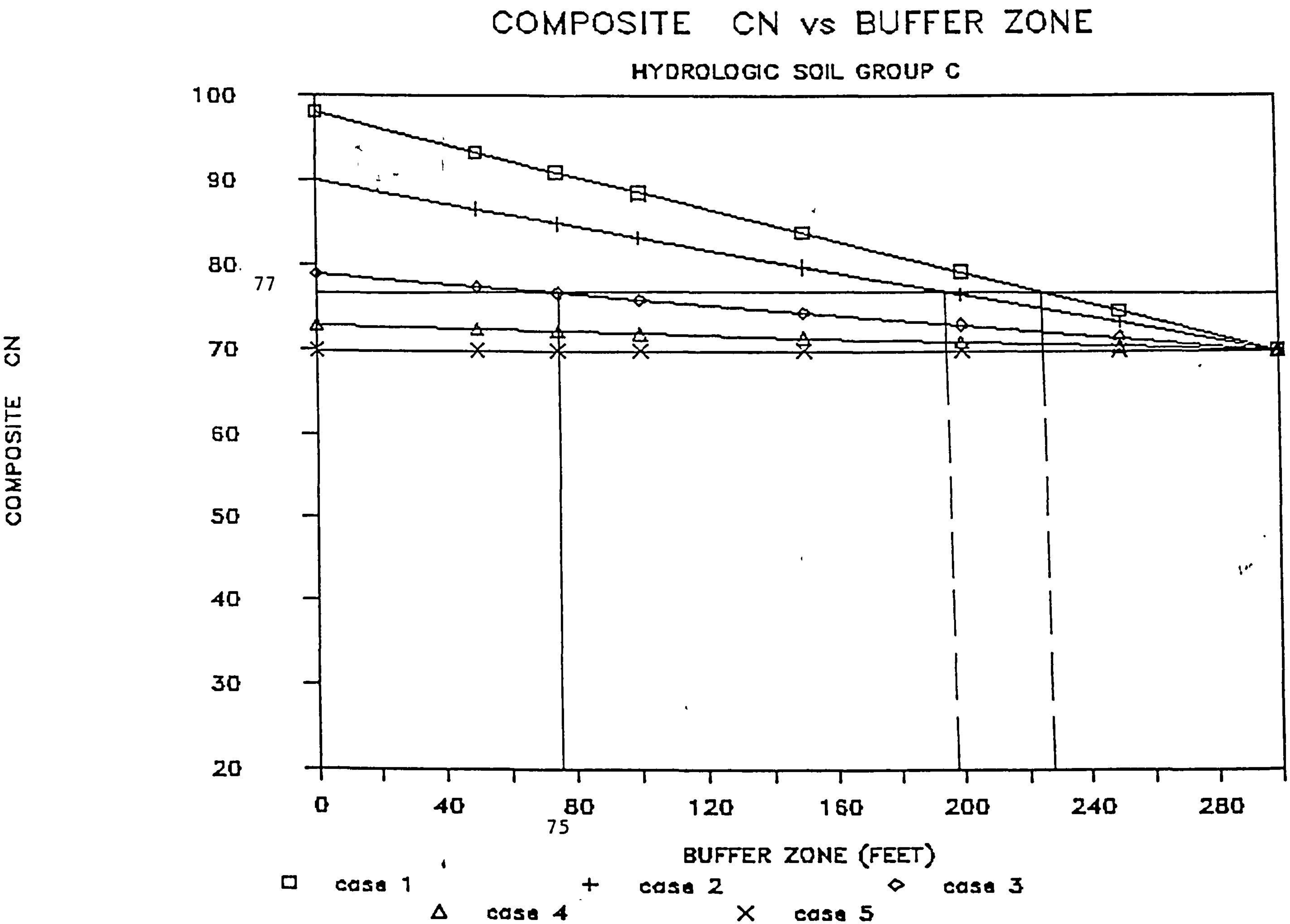
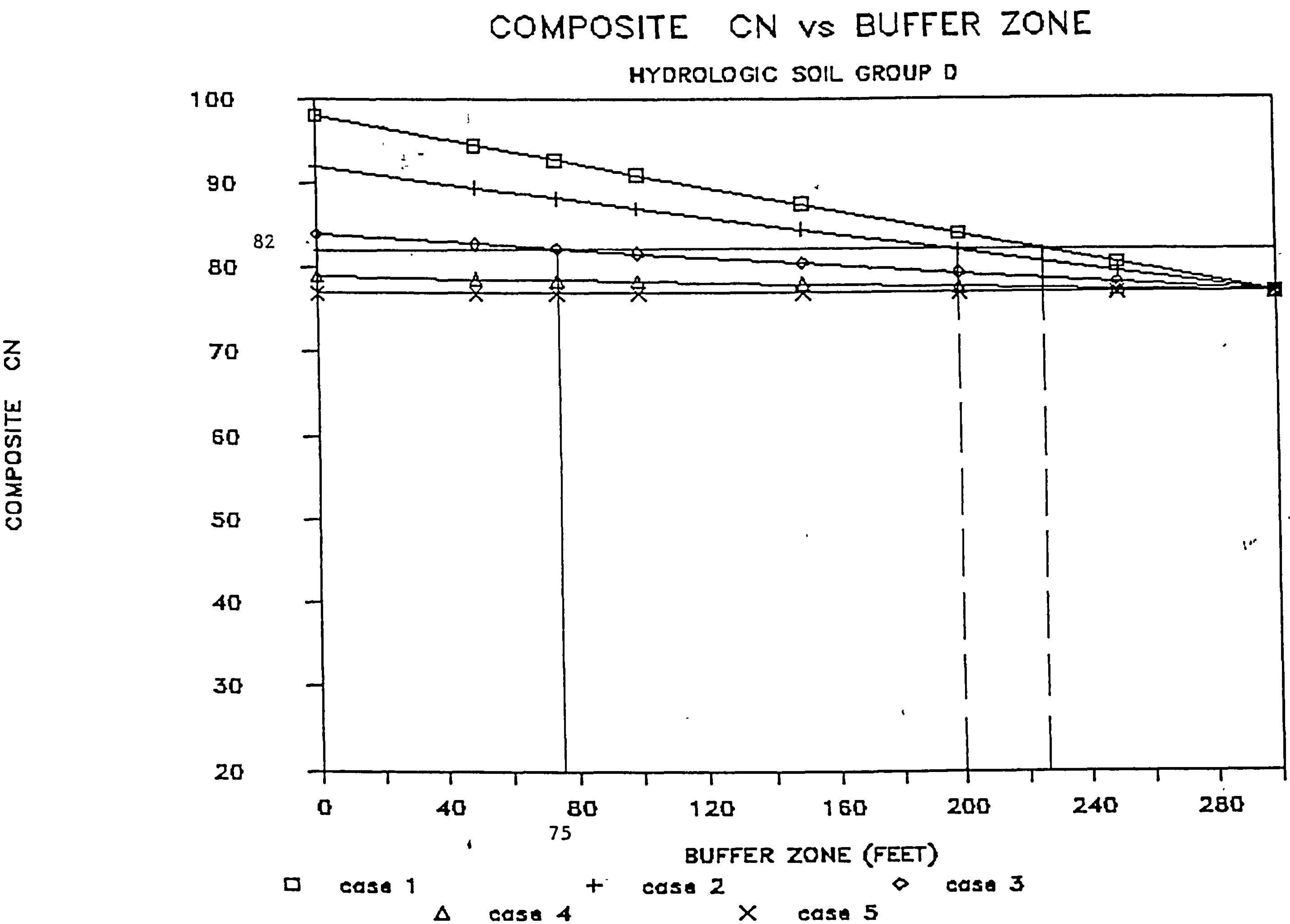

COMPOSITE CN vs BUFFER ZONE
HYDROLOGIC SOIL GROUP C
COMPOSITE CN
100
90
80
77
70
60
50
40
30
20
0
40
80
75
120
160
200
240
280
BUFFER ZONE (FEET)
case 1
case 2
case 3
case 4
case 5

Figure 5.



COMPOSITE CN vs BUFFER ZONE
HYDROLOGIC SOIL GROUP D
COMPOSITE CN
100
90
82
80
70
60
50
40
30
20
0
40
80
75
120
160
200
240
280
BUFFER ZONE (FEET)
case 1
case 2
case 3
case 4
case 5

Figure 6.

Figure 3, is an example graph for a typical hydrologic soil type A, having an undisturbed CN value of 30. The composite CN for a single family residence (case 3) having a setback of 75 feet is found to be 46. Any line in this figure which lies above the case 3 line (meaning a higher level of development or disturbance) will cross the CN = 46 line where the buffer zone value is greater, meaning that a greater amount of site alteration requires a larger buffer zone. In this figure, the case 2 line crosses the CN = 46 line where the buffer zone is 200 feet therefore, any activity which is represented by the case 2 line needs a 200 foot buffer zone.

After developing the buffer zone methodology, we applied it to five sites at three locations along the Suwannee River. These three particular locations were chosen because they represent fairly typical cross sections of the conditions most likely to be encountered along the Suwannee River. Three out of four hydrologic soil groups are represented, as well as varying amounts and type of vegetative cover. A map of the Suwannee River showing the approximate location of each of these sites is presented in Figure 7. Detailed maps of each site are shown in Figures 8 through 10. The three locations were designated as (1) Upper Suwannee, (2) Middle Suwannee, and (3) Lower Suwannee. Field reconnaissance by SRWMD personnel provided the necessary input information at each site. The Upper and Lower locations each had two sites, one located along each bank and designated as north, south, east, or west. Table 2 summarizes the field conditions found at each site, and gives the required buffer zone distance for high density development (case 2) as determined from the set of graphs prepared for each site.

Site	Hydrologic Soil Type	Vegetative Cond. Canopy	Vegetative Cond. Ground	Existing Site CN	Case 3* CN	Buffer Zone, ft
1N	D	woods	30%	79	84	215
1S	A	woods	25%	45	51	260
2	B	woods	30%	66	68	275
3E	D	woods	50%	82	84	250
3W	B	woods	25%	60	68	235

*the case 3 CN is the single family house benchmark condition.

Graphs for typical conditions in hydrologic soil groups A through D are included in this report (Figures 6 through 6), along with graphs the for five specific sites along the Upper, Middle and Lower Suwannee River (Figures 11 through 15).

The methodology developed by the consultant and described in this report, is an effective method for determining buffer zone distances around waterbodies in the SRWMD using the concept of water runoff relationships as they are affected by changes to the land surface. This technique for determining effective buffer

SUWANNEE RIVER WATER MANAGEMENT DISTRICT

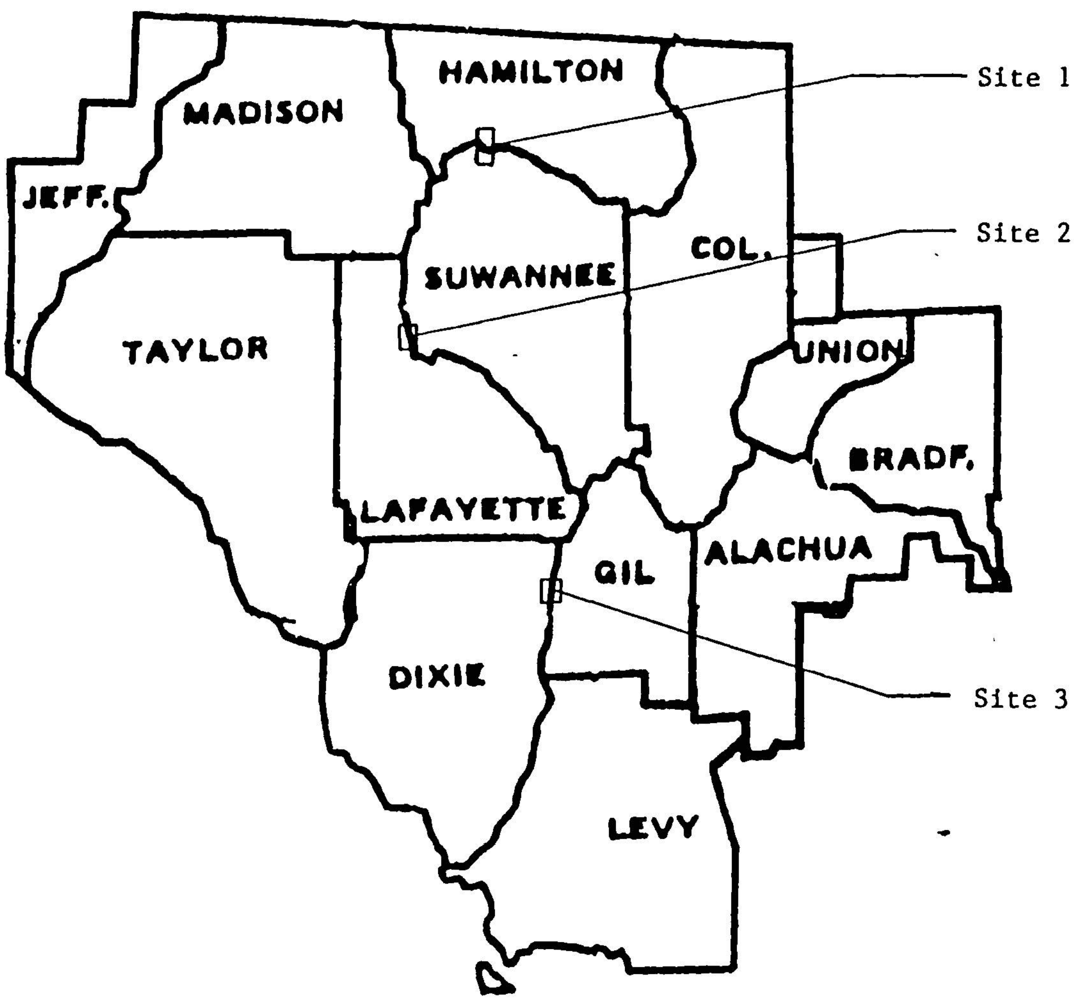


Figure 7. General location map of example sites

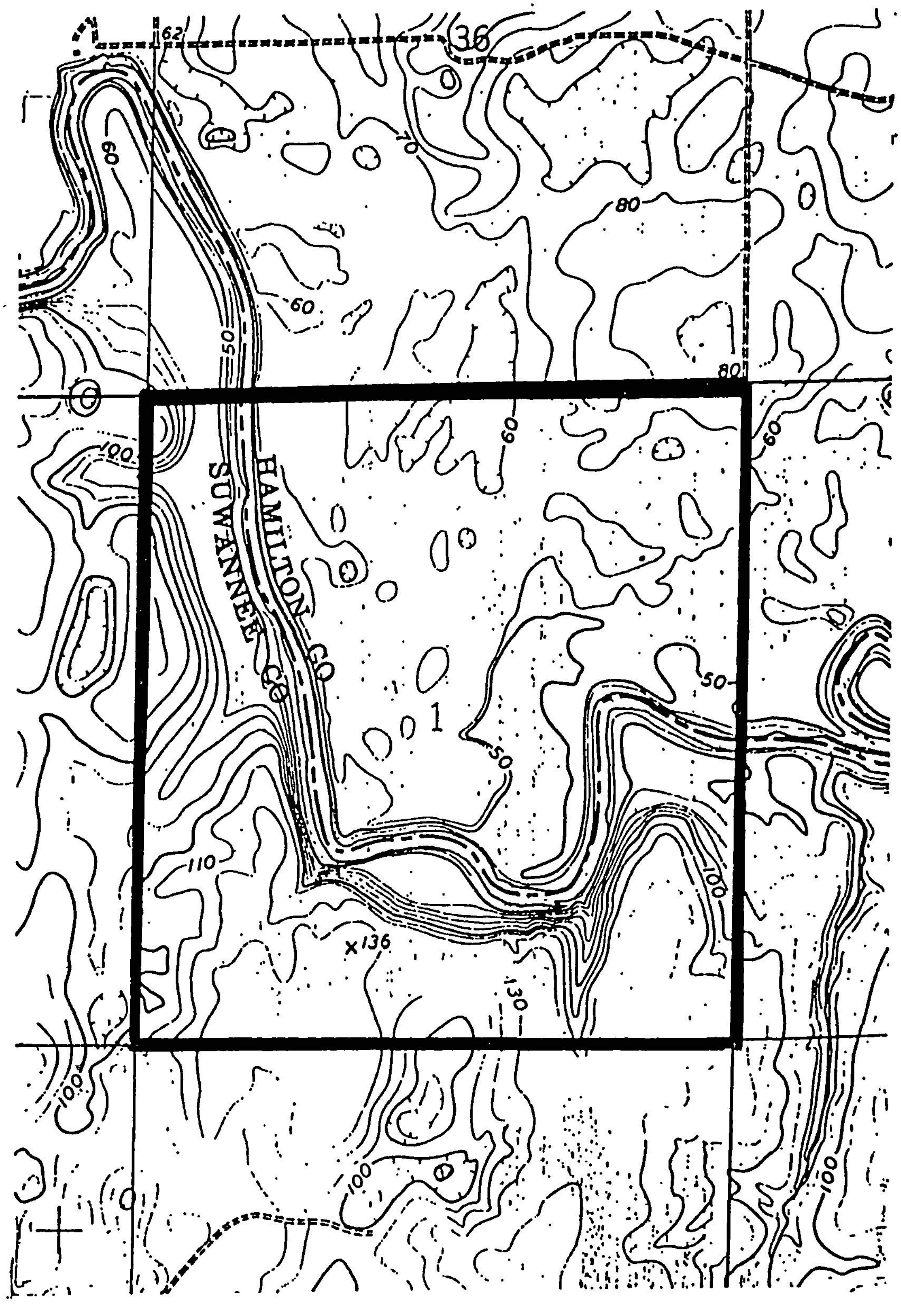


Figure 8. Upper Suwannee River Site
(Site 1)

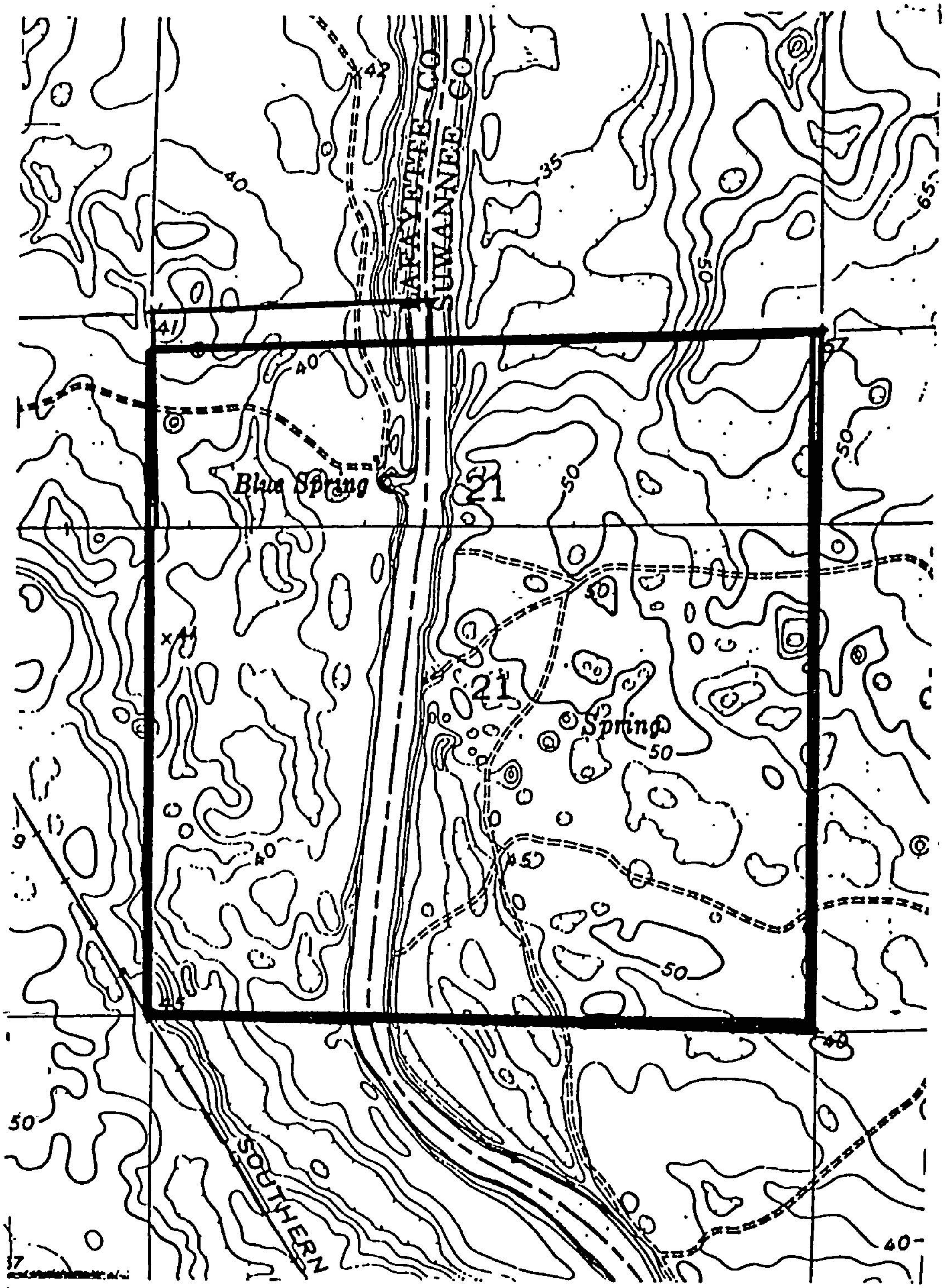


Figure 9. Middle Suwannee River Site
(Site 2)

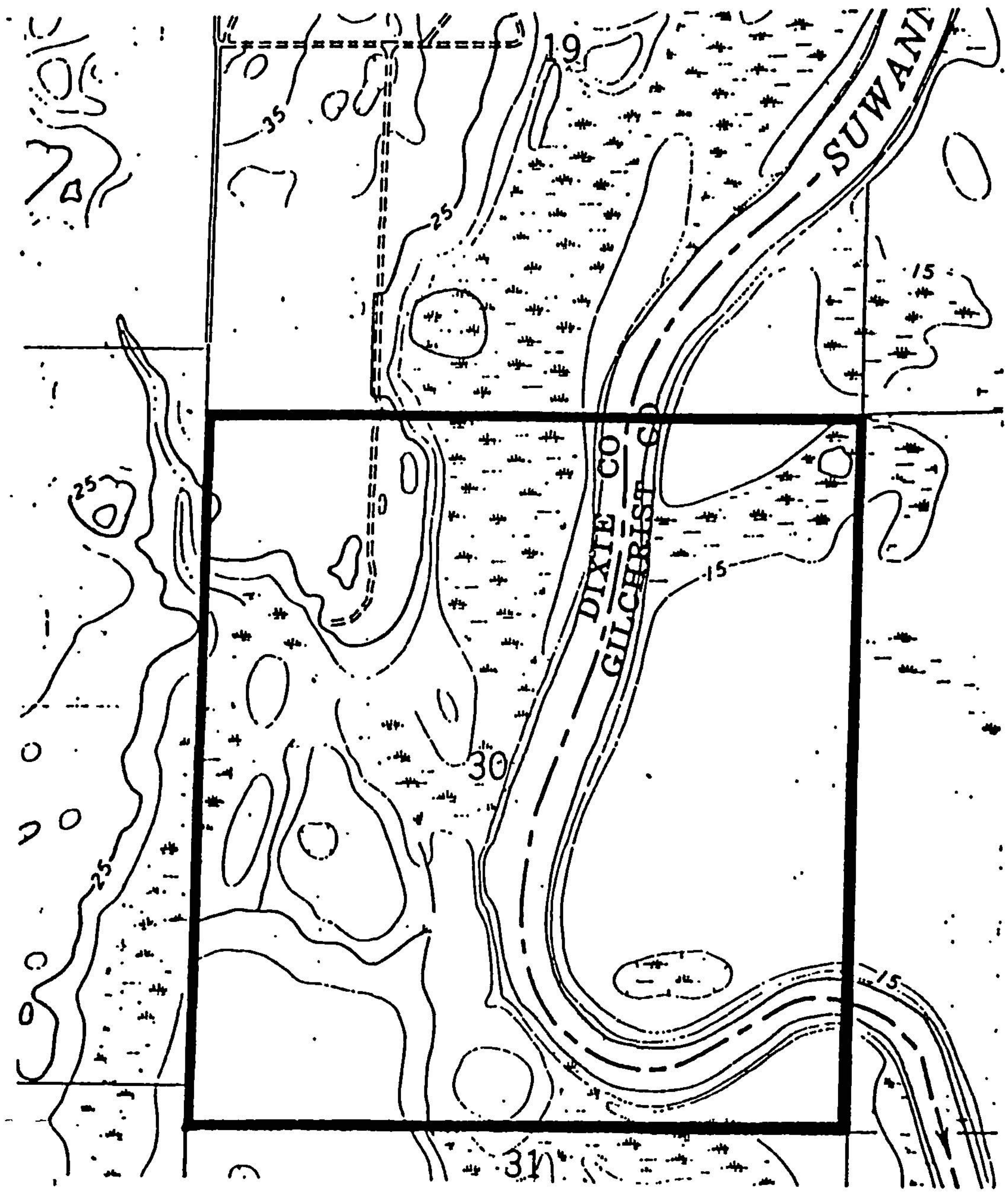


Figure 10. Lower Suwannee River Site
(Site 3)

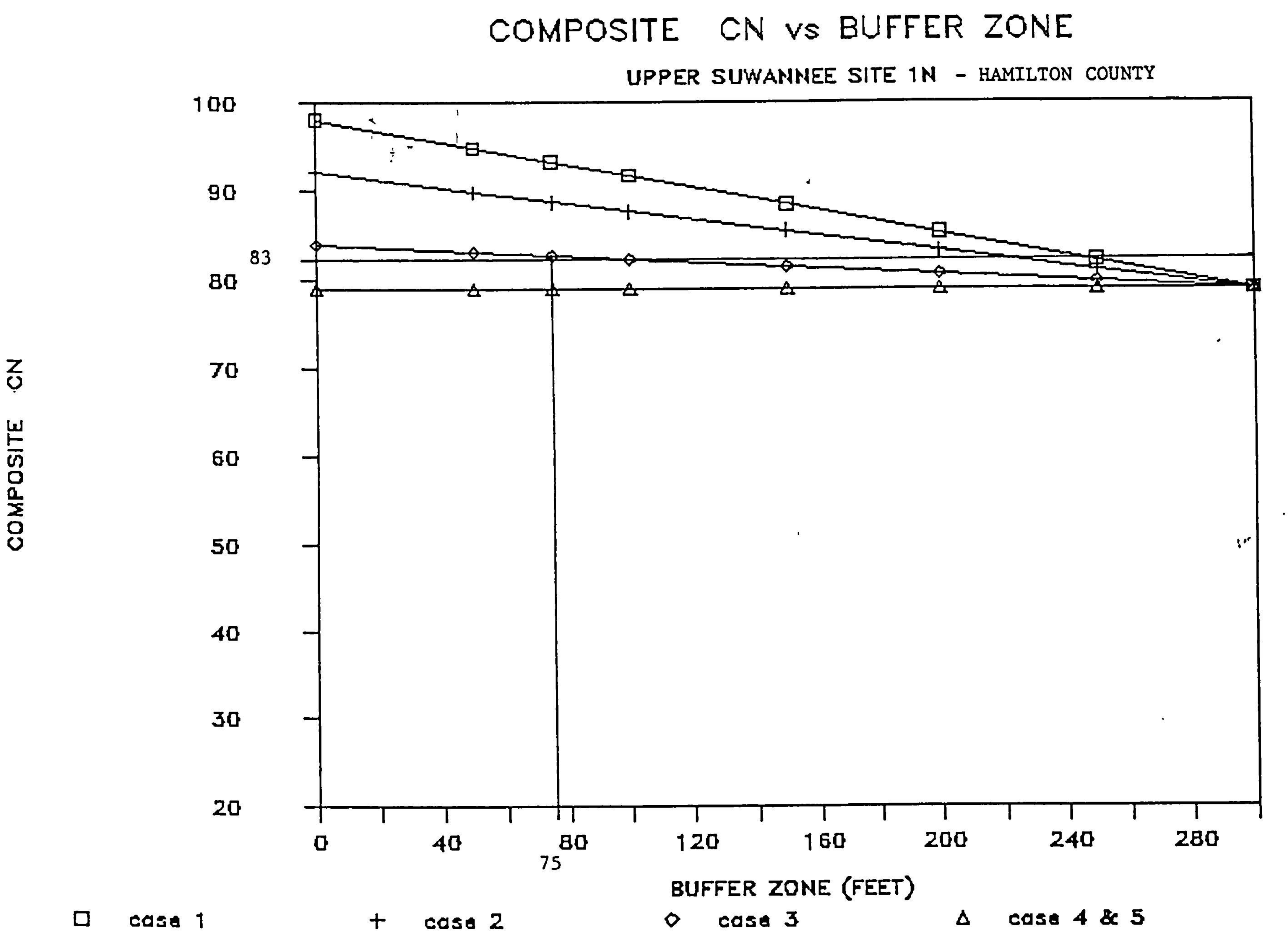

COMPOSITE CN vs BUFFER ZONE
UPPER SUWANNEE SITE 1N - HAMILTON COUNTY
COMPOSITE CN
BUFFER ZONE (FEET)
100
90
83
80
70
60
50
40
30
20
0
40
80
75
120
160
200
240
280
case 1
case 2
case 3
case 4 & 5

Figure 11.

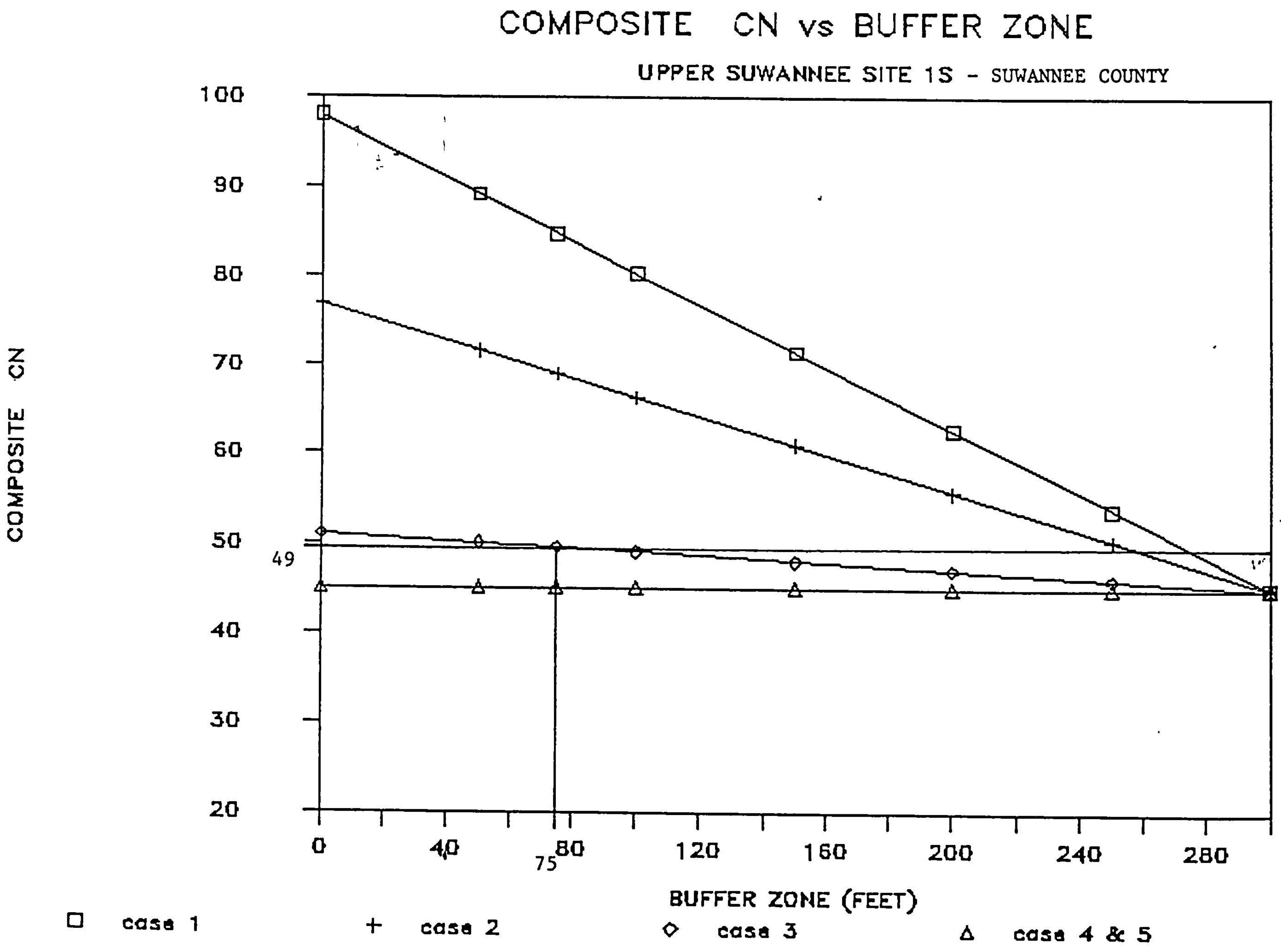

COMPOSITE CN vs BUFFER ZONE
UPPER SUWANNEE SITE 1S - SUWANNEE COUNTY
COMPOSITE CN
100
90
80
70
60
50
49
40
30
20
0
40
75
80
120
160
200
240
280
BUFFER ZONE (FEET)
case 1
case 2
case 3
case 4 & 5

Figure 12.

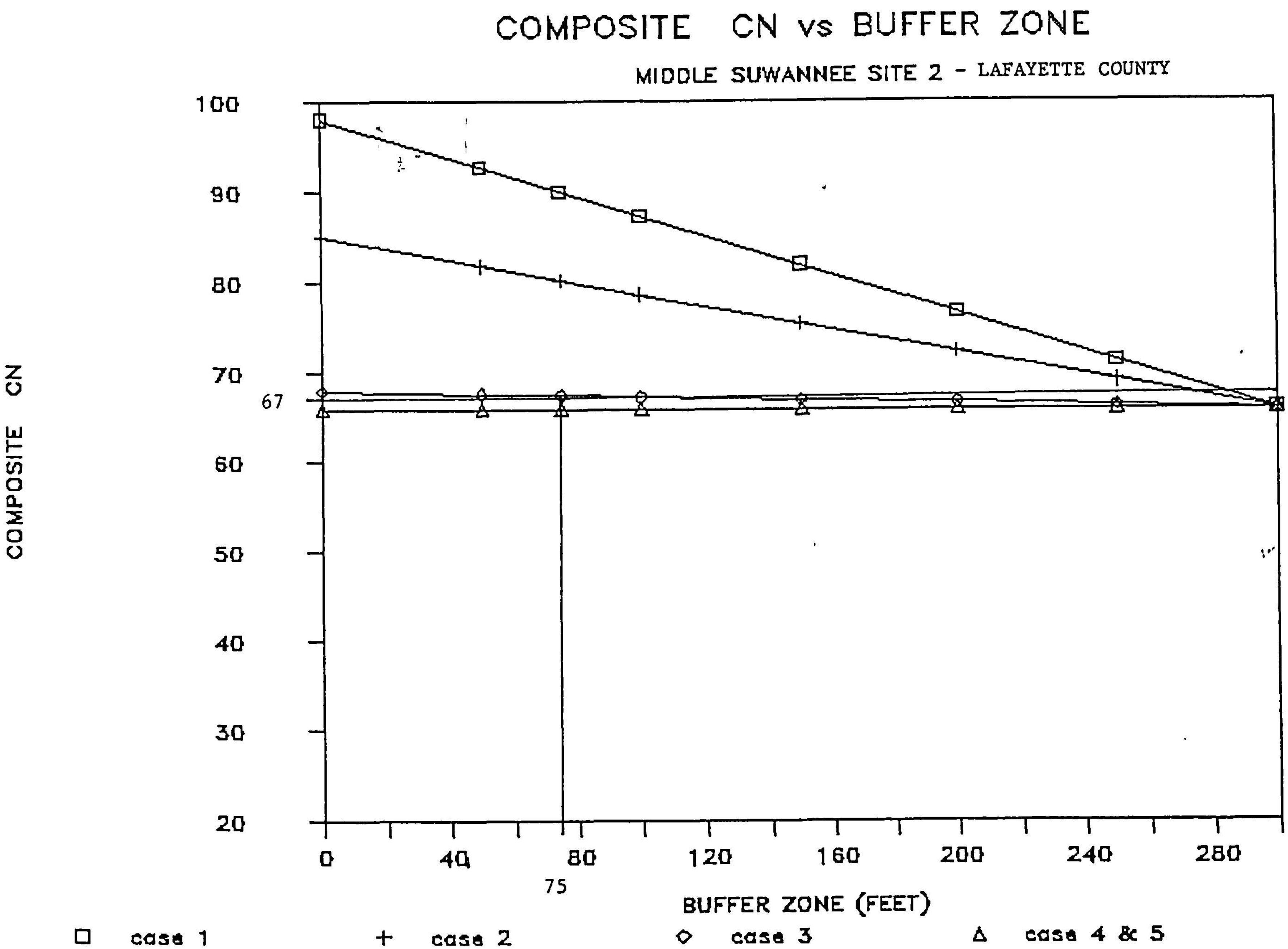

COMPOSITE CN vs BUFFER ZONE
MIDDLE SUWANNEE SITE 2 - LAFAYETTE COUNTY
100
90
80
70
67
60
50
40
30
20
COMPOSITE CN
0
40
80
120
160
200
240
280
75
BUFFER ZONE (FEET)
case 1
case 2
case 3
case 4 & 5

Figure 13.

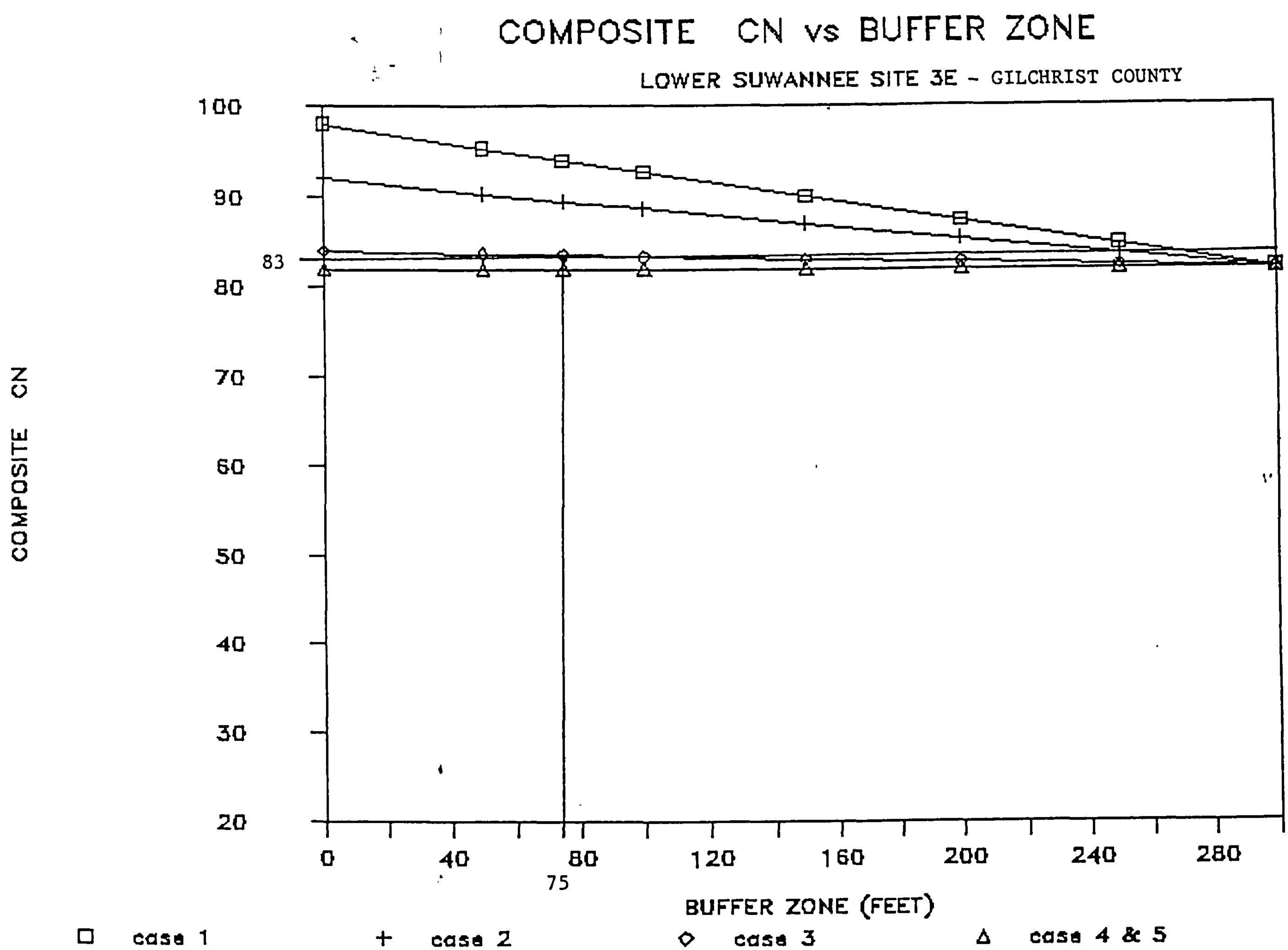

COMPOSITE CN vs BUFFER ZONE
LOWER SUWANNEE SITE 3E - GILCHRIST COUNTY
COMPOSITE CN
100
90
83
80
70
60
50
40
30
20
0
40
80
120
160
200
240
280
75
BUFFER ZONE (FEET)
case 1
case 2
case 3
case 4 & 5

Figure 14.

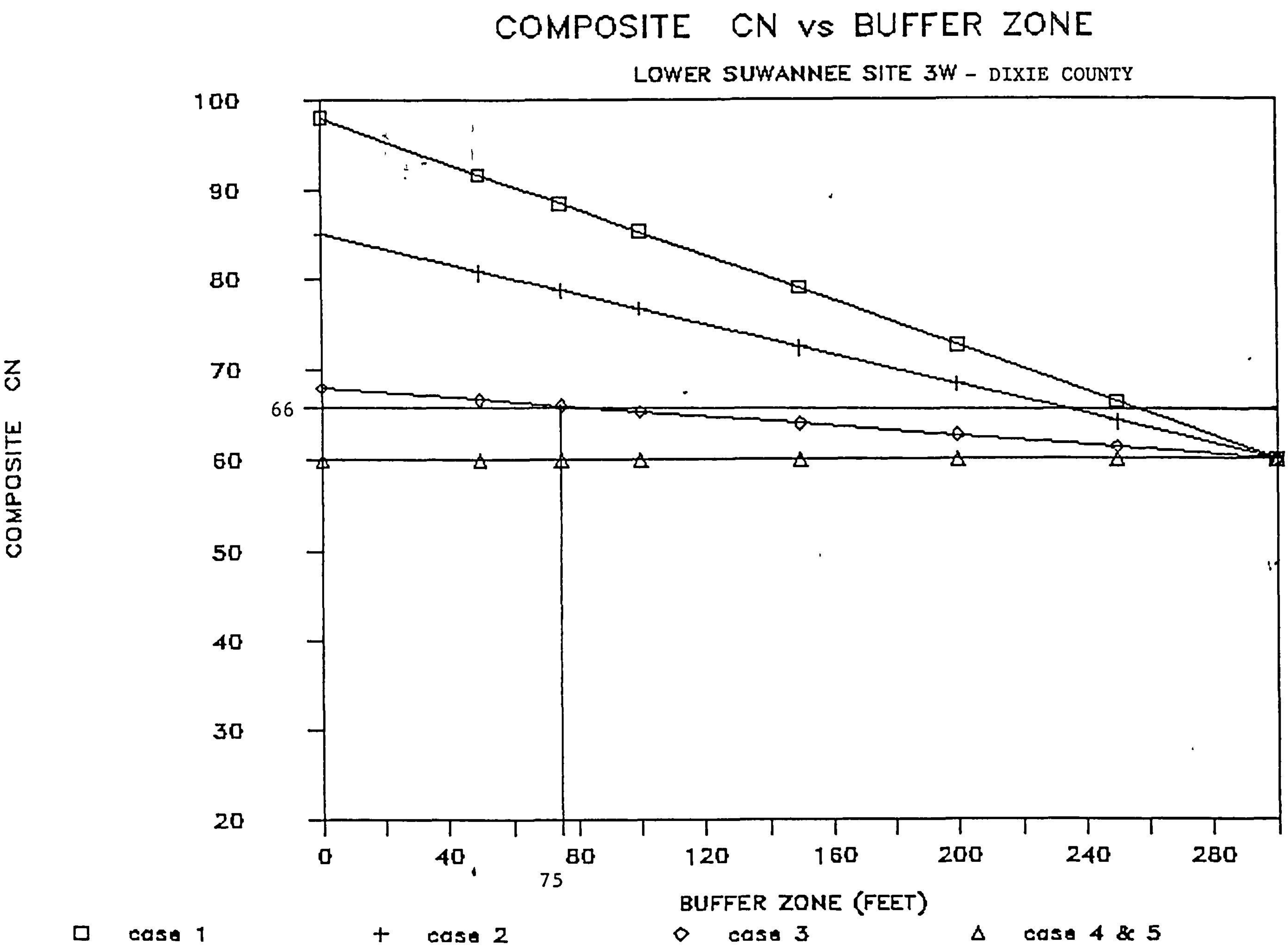

COMPOSITE CN vs BUFFER ZONE
LOWER SUWANNEE SITE 3W - DIXIE COUNTY
COMPOSITE CN
100
90
80
70
66
60
50
40
30
20
0
40
80
120
160
200
240
280
75
BUFFER ZONE (FEET)
case 1
case 2
case 3
case 4 & 5

Figure 15.

zones can be applied to any activity which results in a change to the land surface, whether it is a permanent or a transitory change and the result of development of a residential or commercial nature, agricultural activity or industrial activity. The concept is simple and the necessary input parameters are readily available to the public, making the use of this technique relatively easy to administer by the district staff. It can be as easily applied to lakes and to streams, also.

It is recommended that this technique be combined with the SRWMD's existing surface water management regulatory techniques to provide district staff with a flexible approach to determining appropriate buffer zones. Although varying buffer zones have been calculated at specific sites using this technique, additional trials should be run by the SRWMD staff to determine the efficacy of the method for their particular regulation needs. Additional research may be desired in order to more fully explore the potential for using the TR-55 (or perhaps another similar model) in determining buffer zone dimensions.

Dames & Moore wants to emphasize that this buffer zone model is designed to be used in conjunction with the district's existing regulations and water management policies. As explained above, there will be instances where the buffer zone model by itself would be inadequate. The examples described earlier illustrate this issue: if the property is unsuitable to accept the proposed level of development, the model would indicate a huge, unworkable buffer zone. Similarly, the district's rule currently states that wetlands cannot be eliminated. Therefore, applying only the buffer model to a site that has a wide band of wetlands would result in another large, perhaps untenable buffer zone. However, in such instances the district staff has the flexibility to augment the buffer zone or supplant it with other non-structural or structural solutions. For example, to increase development on a lot that has unsuitable soils, the district could recommend the use of swales, retention basins, clustering, etc. The buffer zone methodology described in this section sets a baseline for natural resource protection. In combination with other regulatory tools available in the district, this methodology should offer greater flexibility to the permitting district staff.

IV. EVALUATION OF SEPTIC TANK REGULATIONS THAT AFFECT THE SUWANNEE RIVER

1. Introduction

As part of the contract to evaluate buffer zones for surface waters, Dames & Moore was requested to conduct a brief review of the effectiveness of the state septic tanks regulations within the SRWMD, particularly in those counties bordering the Suwannee River. We reviewed Chapter 10D-6, F.A.C., the current Department of Health and Rehabilitative Services (DHRS) regulations governing Onsite Sewage Disposal Systems (OSDS's), and interviewed representatives of DHRS or DER. Public health officials in the counties that border the Suwannee River were interviewed to learn how the septic tank rules were actually applied and what, if any, problems they were experiencing. Finally, this section of the report discusses changes DHRS is proposing for 10D-6.

2. Existing Rule Criteria and Proposed Changes

The state's setback requirement for septic tanks from surface waterbodies is currently a minimum of 75 feet away from the mean high water line of tidal waterbodies or 75 feet from the ordinary high water line of lakes, streams, canals, or other non-tidal surface waters. The setbacks apply to all lots platted during or after 1972. All lots platted prior to 1972 have a minimum setback requirement of only 50 feet. All of existing setbacks remain unchanged in the proposed revision of 10D-6.

The district also uses similar setback requirements under F.A.C. 40B-4 as DHRS does in FAC 10D-6. Both rules employ a 75 foot minimum setback from surface waters. The district's setback pertains to lands subdivided after January 1, 1985.

10D-6 sets forth site evaluation criteria in 10D-6.047. These criteria include effective soil depth, water table evaluation, vehicular traffic restrictions, saturation of soil from other than natural sources and lot elevations. Of these items, water table elevation and lot elevation are the most pertinent to Dames & Moore's investigation into surface waterbody setbacks.

10D-6 requires that the depth to the water table during the wettest season of the year be a minimum of 24 inches below the bottom surface of the drainfield trench or absorption bed. HRS is proposing to revise this provision of the rule by further requiring that systems shall not be approved for sites which have a seasonal high water table above the ground or where hydric soils exist, as defined by the U.S.D.A. Soil Conservation Service. The proposed rule would provide an exception to this requirement when the area's water table is artificially lowered through drainage structures and this impact is certified by a registered engineer with soils training.

10D-6.46(7)(b) limits septic tank densities based on lots per acre and the effluent applied per acre. The current limits are four lots per acre and a projected daily domestic sewage flow that does not exceed an average of 2500 gallons per acre per day. This does not directly limit the number of dwelling units, however. There are no proposed changes to this section of the rule.

The last section of relevance is 10D-6.049, Alternative Systems; paragraph 3 of this section deals with mound systems. Currently, this type of system may be used to overcome such limiting factors as seasonally high water tables and unsuitable soils. Under the current rule, the maximum allowable height of the mound system is 36 inches. This is somewhat irrelevant, however, because the existing 10D-6 allows for all or part of the lot to be filled prior to construction of the system. Essentially, the existing rule allows an unrestricted height of the mound system, within certain engineering constraints. The proposed rule changes will restrict this existing practice. The maximum height of the mound would be increased to 45 inches, but the section of the paragraph allowing partial or total fill of the lot prior to construction would be stricken. In effect, this restriction on total fill will hold the height of the mound to 45 inches.

F.A.C. 40B-4.3030 is the current district regulation pertaining to OSDS installation within Works of the District. Section 40B-4.3030(2)(e) exempts minor amounts of fill associated with mounded OSDS's which have been approved by the DHRS. The district's exemption only covers the current 10D-6 situation, which allows for a maximum 36 inch ("less than 3 feet" under 40B-4.3030). If the proposed revisions to 10D-6 are adopted, the district's rule will have to be modified to exempt a 45 inch high fill area. This assumes, of course, that the district would want to remain consistent with DHRS and allow the increased mound height.

3. Other Studies

There is a wealth of documentation and data available throughout the country dealing with effects of OSDS's on ground water. Less data is available for the effects on surface waters. Dames & Moore conducted a brief literature search to learn what, if any, approaches to septic tank controls would be relevant to the SRWMD buffer zone study.

A. <u>Soils</u>

The DHRS is administering a three year grant to explore the impacts of OSDS's on Florida's water resources. The firm of Ayres Associates is conducting the study with the assistance of Kirkner and Associates, Inc. In this study, preliminary results have shown that areas with higher hydraulic conductivity have more rapid and widespread contamination potentials, but generally have lower levels of contamination due to dilution factors. Conversely, areas with low hydraulic conductivity have generally smaller areas of contamination but higher levels of contaminants.

The first report in this study by Kirkner and Associates, has made several observations about soil characteristics and their relation to contamination. Soils with a high hydraulic conductivity and high average seepage velocity have a higher contamination risk than do other soils. Soil particle size is a factor in seepage rates. In general, there is a decrease in soil particle size moving from north to south in the state. Coarse grained sands and gravels predominate in the western panhandle, medium to fine-grained sands dominate in the peninsular areas becoming increasingly finer and less predominant progressing south, with limestone predominating in the extreme south. Variations to this pattern do, of course, occur. One example of this are the sand ridges of the Central Florida Ridge. Generally, these coarse sands have higher average seepage velocities than do finer materials. This would lead to a higher risk of potential contamination. When these sands occupy the higher areas of the state, such as the sand ridges, they have a greater depth to the water table. The greater depth allows for a larger treatment zone, which tends to balance for the increased seepage velocity thereby lowering the risk for these areas. Conversely, finer grained materials have slower velocities but are subject to shallower depth to the water table.

In a study conducted recently by the Lake County Department of Pollution Control (Wicks and Erickson, 1982), two lakes were studied for the effects of OSDS's on surface waters. This study confirmed that sandy soils overlying clay strata tend to promote down gradient movement of water. A three percent slope in a sand layer over clay can result in a 50 foot per day subsurface water velocity. At the interface of the sand/clay layers, however, velocities decrease to less than 0.05 inches per day.

The second report of the current DHRS study conducted by Ayres Associates explores in more detail soils of the state and the demographics of Florida which dictate OSDS placement. The researchers found that eight soil series predominate in the high growth areas studied. These are the Paola, Candler, Astatula, Tavares, Basinger, Myakka, Immokalee and Apopka series. Of these, the Basinger, Immokalee and Myakka are listed by the SCS as hydric soils. Nearly all of the eight soil series are very sandy with very wet conditions or high seasonal water tables.

Florida has only 21 percent of its land comprised of soils suited to OSDS. These are the "slightly limited" soils. By contrast 74 percent of the state has soils which are classed as "severely limiting" soils. A survey of all the county environmental health units revealed that soils with severe limitations for proper operation of OSDS's are currently being developed without central sewage systems. The survey also indicated that most areas of high growth have already developed all or most of the soils suitable for septic tanks.

Only three counties in the Suwannee River Water Management District (SRWMD); Suwannee, Gilchrist and Madison, have as little as 50 to 60 percent of their soils significantly limited for OSDS development. The rest of the counties have 60 to 100 percent of their soils significantly limited for the installation of OSDS.

This shows that most of the district is not suited for OSDS's.

The Ayres report also explored demographics and projected growth data. The report estimates that each of the counties within the SRWMD will have less than 5000 new OSDS's between the years of 1986 and 2005, with the exception of Alachua. Alachua is predicted to have between 5000 and 15,000 new OSDS's installed within the same time period. Because most of the new OSDS's are expected to be constructed in the unsewered fringes of Florida's metropolitan areas, it would be safe to assume the portions of Alachua County within the SRWMD will have new OSDS's near the lower end of the predicted range.

According to the DHRS survey results, approximately 44 percent of all OSDS's constructed in Florida since 1984 are of the mound or fill type design. By contrast, the most commonly used OSDS design in the SRWMD is the conventional trench type. However, this design with bed systems represents less than 55 percent of all OSDS's installed statewide (Ayres Associates, 1987).

B. <u>Water Quality</u>

Nitrogen, phosphorous and bacteriological/viral pathogens have been documented to leach from OSDS's into surface waterbodies. The National Eutrophication Survey staff surveyed 41 lakes in Florida over a one year period (Bicki, et. al., 1984). The estimated nitrogen input to these lakes from OSDS's was shown to be significantly related to the numbers of OSDS's within 100 feet of the lakes. It also was shown through algal assays that nitrogen was the rate-limiting nutrient in 40 of the 41 lakes during at least two-thirds of the sampling periods.

Phosphorous has been documented as a surface water contaminant from OSDS leachate. Documented cases have shown this to occur when OSDS's are in close proximity (less than 100 to 150 feet) to the surface waterbody (Bicki, et. al., 1984). In the Lake County study, Wicks, et. al., suggested that a deep clay confining layer (>6 feet deep) appeared to be beneficial in retarding leachate movement and promoting phosphorous absorption.

This same study looked at bacteriological contamination of two lakes with adjacent mixed land use, including pastures and residential. The data suggested that the runoff from livestock and the associated pasture lands have a localized effect on the water quality; residential uses, on the other hand, have the most adverse impact on water quality. Other reports also have shown pathogen contamination associated with OSDS. It should also be pointed out that the pathogens reported are only "indicator species." Many other pathogens are present, depending upon users of the OSDS's and their health over time.

Leachate components from OSDS's obtain varying degrees of treatment from soils. Some water soluble components, such as nitrate, travel virtually uninhibited through the soil, while others, such as phosphorous and pathogenic bacterial/viral agents, have relatively good absorption rates in unsaturated soils. The literature reviewed indicates 36 inches of unsaturated soil is an adequate layer for the treatment of OSDS leachate. Currently, 10D-6 only requires 24 inches. This is a minimum standard, but some counties, such as Sarasota, are currently requiring a 36 inch unsaturated zone below the system (pers. comm. Gary Schneider, 1988).

In the Wicks study (1982), the data showed that residential OSDS's impact the ground water quality, and to a lesser extent, the water quality in adjacent surface waterbodies occurring down slope. One conclusion of their study in respect to septic tank densities is to limit residential dwelling units to less than four per acre and encourage densities of 2 units per acre in new developments. As stated earlier, 10D-6 currently allows 4 lots per acre with no direct limit on the number of dwelling units.

4. Interviews Regarding the Effectiveness of the Septic Tank Rule along the Suwannee River

Dames & Moore interviewed representatives of the Health and Rehabilitative Service (HRS), Department of Environmental Regulation (DER), and the local County Public Health Units (CPHU) along the Suwannee River to get their comments and opinions on the current septic tank regulations. All agencies had high praise for the cooperation they receive from the SRWMD staff. However, opinions did differ on how the district reviews requests for variances for septic tanks installed in the floodway. The following are summaries of the interviews:

Gary Schneider - HRS, Tallahassee

The county health departments are responsible for ensuring compliance with the septic tank rules. About one year ago, HRS started investigating the level of compliance. According to Mr. Schneider, compliance appears to vary depending upon the county; some counties are more stringent than others. The septic tank permitting system has improved in the last couple of years. The result is that more permits are being denied for lots on the river.

Mr. Schneider feels the SRWMD has changed their attitude in the last year. He said they used to "hard line it", but because of public involvement and increased workload on the water management district staff, they now are more reasonable. They are encouraging subsurface treatment systems and limiting the amount of fill in the floodway.

Mr. Schneider has high praise for the SRWMD. The water management district has "a good handle" on the septic tank regulations and works well with HRS. Mr. Schneider is in favor of granting variances for the installation of septic tanks provided the circumstances would not compromise ground water or surface water quality, or endanger public health. He said it is easier to obtain variances in the SRWMD because they have much better data, (i.e., floodway maps) than the other water management districts.

Emily Wilson - HRS, Field office in Gainesville

HRS keeps records of every septic tank installed. The CPHU representative inspects installation of the septic tanks. CPHU representatives receive training from HRS, the county and the Florida Septic Tank Association. HRS keeps records of the training each individual receives.

According to Ms. Wilson, the SRWMD has changed rules twice in the last four years. This has confused people. The SRWMD "claims to get tougher" but they never back this claim up with any enforcement. Ms. Wilson states that issuing variances for septic tanks in the floodway is not good policy, and the SRWMD should make critical comments when asked in order to provide input to the Variance Board. HRS seriously weighs the water management district comments. Ms. Wilson reports that the SRWMD staff are very helpful when called upon to answer questions about the rules.

Ms. Wilson feels that central sewage systems are needed for subdivisions; this should be a requirement along the river.

Patti Sanzone - DER, Tallahassee

According to Ms. Sanzone, there is inconsistency in the way septic tank variances are granted. The HRS rule 10D-6 says the bottom of the drainfield must be 2 ft. above the 10 year flood elevation. The rule also has a maximum limit of three feet of mounding. The Variance Board has been approving variances if the septic tank is in a regulatory floodway and if it meets all other conditions. Occasionally, this conflicts with the rule.

Ms. Sanzone said the Board looks to SRWMD for critical reviews; however, Ms. Sanzone claims that the SRWMD hardly ever makes any objections. The district tends to use the two year flood elevation as the minimum. Ms. Sanzone also stated that septic tanks are typically placed between the house and the river. The water management district should, according to Ms. Sanzone, require the septic tanks be moved to a higher spot on the property. The lots are usually long enough to move the septic as far from the floodway as possible.

DER is also concerned about the use of fill for septic tank mounding and the applicants using fill to meet the rule requirements. Ms. Sanzone would like to see a written policy between the agencies (HRS, DER, WMD) to resolve these discrepancies in rule interpretation and implementation.

The Septic Tank Variance Board receives requests for 2-3 variances per month. It is much easier for people to get variances on the Suwannee River than any other place in the state, according to Ms. Sanzone. So far there is no evidence of negative effects on the river from the installation and operation of septic tanks. But as more and more such systems are permitted, cumulative effects could occur. DER believes that to prevent future problems, higher levels of treatment than can be provided by septic tanks is needed for the floodway areas and a lesser number of variances or stricter requirements for variances (like moving the septic tank to a higher area on the property) should be the norm. According to Ms. Sanzone, the SRWMD could make a difference in overall rule implementation by strengthening their input to the Variance Board.

O. J. Baker - Suwannee and Lafayette CPHU

Mr. Baker is satisfied with the septic tank rules and the way they are implemented. Mr. Baker claims they haven't had any septic tank problems or complaints in his area, and they also don't receive many variance requests. The soil in Baker's area is acceptable for septic tanks. Mr. Baker states the rules are adequate and do not need to be changed. Mr. Baker feels changing the rules is the cause of the problems.

Finally, Mr. Baker said, the real problem with septic tanks is along the Santa Fe because of the "bad" soils in that area.

Marvin Rogers - Hamilton CPHU

Mr. Rogers feels the septic tank regulations are adequate and effectively implemented. The HRS could be more lenient about the 10 year flood criteria, according to Mr. Rogers. If everything else is acceptable, Mr. Rogers is in favor of using the two year flood instead of the 10 year flood, since, according to Rogers, the Variance Board always approves this lesser standard.

Hamilton County has had no complaints about septic tank malfunctions. The county has a good working relationship with the SRWMD on this issue.

Jerome Blake - Dixie CPHU

Mr. Blake feels the rules on septic tanks are strict enough. His office gets complaints about once every six months, but they can never get any specifics, because people refuse to give their names. Mr. Blake states the mounded septic tanks are more likely to fail in a high velocity flood, but slopping and sodding help alleviate this problem.

Mr. Blake points out some of the older lots are not deep enough to move the septic tanks back out of the floodway. The Variance Board is sympathetic to these circumstances and responds accordingly. Finally, Dixie County has a good relationship with the SRWMD.

Dan Fulton - Gilchrist CPHU

According to Mr. Fulton, no one is paying attention to the 10 year flood rule. All variances are approved. Gilchrist County is now requiring individual aerobic wastewater treatment units. This requirement is new in the county. The first system went to the Board in July, 1988. The SRWMD has approved this system on an experimental basis. Gilchrist County will now approve only this method of treatment in areas 2 1/2 feet above the two year flood.

Mr. Fulton believes, mounding is inappropriate and will just wash away. Mr. Fulton feels something needs to be done to force the other counties into requiring aerobic treatment systems. According to Mr. Fulton, several homeowners are installing the aerobic systems (approximately 6-8 units) in Gilchrist County, on his recommendation.

5. Conclusions

At the present time, both the SRWMD rule 40B-4 and HRS', 10D-6 require a minimum setback of 75 feet from surface waterbodies. Both setbacks were arrived at independently, and both are supported by a reasonable base of data. HRS is proposing a few changes to 10D-6 which would affect Works of the District. Specifically, one change will increase the height of septic tank mound systems to 45 inches. This proposed rule change would conflict with the district's rule. We suggest the district participate in the rule workshops in an attempt to reconcile this difference.

Additionally, HRS is currently administering a three year research program being conducted by Ayres Associates and Kirkner and Associates to gather data which will be used to evaluate 10D-6 and its minimum requirements relative to conditions within the state. When this project is over, it is likely additional changes will be proposed within several sections of 10D-6.

After reviewing all of the available material on septic tank usage along the Suwannee River and interviewing the state and local officials responsible for the regulation of septic tanks, Dames & Moore concludes that the implementation of septic tank regulatory systems in the SRWMD is basically sound. Some criticism was directed at the district's approach to approving

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variances for the placement of septic tanks too close to the river's floodway. It is our understanding that the district is currently reviewing its practices for approving variances from 10D-6. It might be advisable for the district to review its policy for the installation of septic tanks and to promulgate any new policy direction. Finally, the district setback policy for the installation of septic tanks should be consistent with any buffer zone that might be adopted for use within the district.

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