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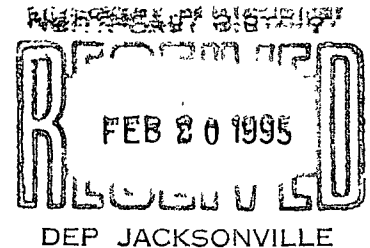
TRAIL RIDGE LANDFILL

MONITORING REPORT OF WETLANDS
ADJACENT TO CLASS I STORMWATER POND
(3 of 5)

2 February 1995

Prepared By

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TRAIL RIDGE LANDFILL

MONITORING REPORT OF WETLANDS ADJACENT TO CLASS I STORMWATER POND

I. INTRODUCTION

The Florida Department of Environmental Protection (DEP) has required that the wetlands adjacent to the Class I stormwater pond be monitored in order to determine if there are any detrimental changes to the wetland vegetation or hydrology due to construction and operation of the pond. The monitoring work is required pursuant to condition #48 in permit SC 16-184444 (I.D. #1GMS3116P03090). A copy of this permit condition is included as attachment A.

On 3 January 1992 a baseline study was completed to establish the site conditions prior to pond construction. The following report summarizes the findings of the third of five annual studies subsequent to the base line report. Field data was collected on December 20, 1994. This report includes a description of the stormwater pond and wetland irrigation system, the adjacent wetlands, and the monitoring transects with vegetative sampling plots and piezometers.

II. STORMWATER POND AND WETLAND IRRIGATION SYSTEM

The Class I stormwater pond was constructed east of the Class I landfill cell within the Trail Ridge Landfill (Figure 1). Construction of the pond commenced in January 1992 and was completed in September/October 1992.

Figure 4 is a typical cross-sectional view through the edge of the pond. The pond bottom was excavated to elevation +80.0 feet. There is a 62 foot-wide berm surrounding the pond. The top of the berm was constructed at elevation +112.0 feet. The normal water level is designed to be at elevation +104.0 feet. Following certain storm events the main pond discharges to the south into a smaller dispersion pond. For a detailed description of the design and operation of the Class I stormwater pond, please refer to the engineering plans for the landfill.

There is an 8-inch diameter PVC force main pipe extending along the outer edge of the basin of the main pond (Figure 4). Sections of 2 inch diameter PVC pipe extend at right angles from the force main at intervals, as indicated on the plan. A valve was installed near the connection of the 8 inch and 2 inch PVC pipes to control the flow of water. At the opposite end, the 2 inch PVC pipes connect with 20 foot lengths of perforated 2 inch diameter PVC pipe (spreader pipes). Water discharges from the spreader pipes through 3/8 inch diameter holes. There are two holes per ring with each ring spaced three inches on center. The spreader pipes were installed approximately five (5) feet landward of the wetland jurisdiction line. No portion of the wetland irrigation system extends directly into the wetlands. The flow of water from the spreader pipes has been adjusted to prevent

erosion downstream. Based on the results of the second monitoring report, the rate of discharge was modified further in order to provide irrigation where it is most needed.

The wetlands adjacent to the stormwater pond will be monitored annually until January 1996 in order to detect any potential draw down to the water table. If there is a significant drawdown, water will be pumped into the force main and discharged through the spreader pipes at a controlled rate. The rate of discharge will be regularly adjusted (at the valves) so that the adjacent wetlands will have a more natural hydroperiod.

III. ADJACENT WETLANDS

A. Drainage Pattern

Wetlands border the stormwater pond to the south (wetland A), east (wetland B) and north (wetland C). These wetlands drain off-site to the east. Some of the water eventually flows to the north into Deep Creek, which is a tributary of St. Mary's River. Some of the water eventually flows to the south into Long Branch, which is a tributary of the North Fork of Black Creek.

The primary source of water for the wetlands on-site is ground water seepage. A portion of the rain that falls on the uplands along Trail Ridge enters the surficial water table and begins to flow down slope. The wetlands occur where the ground surface intercepts the seasonal high water table. Over time some of the wetlands have eroded uphill into Trail Ridge and formed relatively broad, linear drainageways, oriented east/west and perpendicular to the center line of the ridge. Part way downslope the wetland drainages broaden and connect with each other, forming a large wetland complex (Hell's Bay).

The wetlands located to the south and east of the Class I stormwater pond (wetlands A and B) are an example of this type of drainage pattern. The upstream drainage basin for this wetland is relatively large (700± acres). Considering the size of the Class I stormwater pond, any potential draw down effect should be relatively minor to those wetlands.

Other wetlands occur as essentially isolated pockets on the side of the slope. These wetlands may have formed where less permeable layers are located close to the surface. Such layers may consist of silt, loam, clay or a cemented spodic horizon (hardpan). These layers can create a perched water table during the rainy season, but otherwise the water table may occur far below the surface during drier seasons. Other isolated wetlands may occur in shallow depressional areas that naturally formed on the side of the slope.

The wetland located north of the stormwater pond (wetland C) may have formed as a result of a combination of slightly lower topography and an underlying, impermeable layer.

B. Elevations and Hydrology

The topography in the project area slopes down from west to east from elevation +120 feet to +100 feet (Figure 5). The deepest portions of the wetlands are approximately 2 to 3 feet lower than the adjacent uplands. The wetlands are roughly concave in cross section except where wetland A connects with wetland B. At this point the wetland floor slopes gradually down from south to north from elevation +112 feet to +108 feet. Wetland B slopes down from south to north from elevation +108 feet to +100 feet.

Through the deeper, central portions of wetlands A and B, there are a number of small drainage channels. These flow ways are generally 5 to 10 feet across and 1 to 2 feet deep and contains some water at almost all times. The surrounding hardwood swamp appears to be saturated at or near the surface for prolonged periods of time and is periodically inundated when the flow ways overflow during the rainy season. Upslope from the hardwood swamp are broad, fringing areas of seepage slope wetlands. These areas appear to be periodically saturated at or near the surface during the rainy season. During much of the year the water table is within 1 to 2 feet of the surface. However, during prolonged droughts the water table recedes to a greater depth. The seepage slopes do not appear to be inundated from the flow ways during most storm events.

The western two thirds of wetland C has a seasonal high water table but is rarely, if ever, inundated. There are small pockets (<0.1 acre) scattered throughout this portion of the wetland that periodically contain shallow puddled water. During much of the year, the water table is more than 12 to 18 inches below the surface. Following prolonged droughts, the water table is 3 or more feet below the surface.

The eastern one third of wetland C (3.0± acres) consists of a deeper pocket of swamp and shrubby/grassy wetlands. Based on stain lines on the trees and past visual observations, this swamp periodically contains 12 to 18 inches of standing water. The water drains east through a narrow, incised channel into wetland B. During much of the year, this portion of wetland C is saturated at or near the surface. However, during drought conditions, the water table may recede at least 2 feet below the surface.

C. Soils

The Soil Survey of City of Jacksonville, Duval County, Florida (U.S. Department of Agriculture, Soil Conservation Service 1978) indicates three soil types in the study area (Figure 6).

(1) Wesconnett fine sand

The main wetland drainage system to the south and east of the pond is mapped as containing Wesconnett fine sand. This soil is nearly level, very poorly drained and was formed in thick deposits of marine sands. It occurs in shallow depressions and large drainageways. Slopes are smooth to concave and range from 0 to 2 percent. Under natural conditions, the water table is at a depth of 0 to 10 inches, or the soil is covered by water for 6 to 12 months during most years.

There is a weakly cemented spodic or hardpan layer typically between 2 and 32 inches below the surface and a second layer usually from 44 inches to at least 80 inches below the surface. Permeability is moderate to moderately rapid (0.6 to 6.0 inches/hour) in the spodic horizons and rapid (6.0 to 20.0 inches/hour) in all other layers. Included with this soil in mapping may be small areas of other soil types such as Maurepas muck and Pamlico muck.

(2) Ridgeland fine sand

Most of the wetland north of the stormwater pond is mapped as containing Ridgeland fine sand. This is a nearly level, poorly drained, acid soil that formed in marine sands. It occurs in broad flatwood areas. Slopes are smooth to convex and range from 0 to 2 percent. Under natural conditions, the water table is at a depth of less than 10 inches for brief periods of 2 to 4 weeks, at a depth of 10 to 20 inches for 2 to 4 months, and at a depth of 20 to 40 inches for most of the remainder of the year. A few small areas of this soil are covered with water for periods of 1 to 2 weeks.

There are two weakly cemented spodic horizons, one between 6 and 16 inches of the surface and the second from 31 to at least 80 inches from the surface. The permeability is moderate to moderately rapid (0.6 to 6.0 inches/hour) in the spodic horizons and rapid (6.0 to 20 inches/hour) in all other layers.

(3) Lynn haven fine sand

A small portion of wetland C and the upland area where the pond is to be constructed are mapped as containing Lynn Haven fine sand. This is a nearly level, poorly drained soil that was formed in thick beds of marine sand. It occurs in broad flatwood areas. Slopes are smooth to convex and range from 0 to 2 percent. Under natural conditions, the water table is at a depth of less than 10 inches for 2 to 4 months and at a depth of 10 to 30 inches for 2 to 8 months during most years.

There is a weakly cemented spodic horizon from 21 to at least 80 inches below the surface. Permeability is moderate to moderately rapid (0.6 to 6.0 inches/hour) in the spodic horizon and permeability is rapid (6.0 to 20.0 inches/hour) in the surface horizon.

D. Vegetation

There are five distinct types of wetlands in the study area (Figure 7). Most of the wetlands have been significantly impacted in the past due to the silvicultural practices of the former land owner (Gilman Paper Company).

(1) Mature hardwood swamp

The central portion of wetland A consists of relatively mature hardwood swamp. The canopy is dominated primarily by tupelo (Nyssa sylvatica var. biflora) with lesser amounts of sweet bay (Magnolia virginiana), swamp bay (Persea palustris), red maple (Acer rubrum), pond pine (Pinus serotina), and slash pine (Pinus elliottii). The shrub layer consists of dense patches of sweet gallberry (Ilex coriacea) mixed with lesser amounts of fetterbush (Lyonia lucida), bitter gallberry (Ilex glabra), dog hobble (Leucothoe axillaris), opossum haw (Viburnum nudum), Virginia willow (Itea virginica) and wax myrtle (Myrica cerifera and M. heterophylla). Ground cover species included dog hobble, fetterbush, cinnamon fern (Osmunda cinnamomea) sphagnum moss (Sphagnum sp.) and netted chain fern (Woodwardia areolata).

(2) Cut-over hardwood swamp

Most of wetland B and portions of wetlands A and C consist of hardwood swamp that was cut in the recent past by Gilman Paper Company. The trees appear to be approximately 20 years old. The canopy is dominated by a mixture of tupelo and sweet bay with lesser amounts of swamp bay and loblolly bay (Gordonia lasianthus). The shrub layer consists of tupelo and bays mixed with wax myrtle, dahoon holly (Ilex cassine), fetterbush,

and sweet gallberry. Ground cover species include those listed above as well as large mats of sphagnum moss and patches of sedges (Carex sp. and Cyperus sp.) and grasses (Andropogon sp., Erianthus sp., Panicum sp. and Aristida sp.).

The swamp within wetland C has a canopy consisting of tupelo and pond cypress (Taxodium distichum var nutans).

In general the cut-over swamps have no pines but have more sweet bay and less tupelo in the canopy and shrub layer, more wax myrtle and dahoon holly in the shrub layer, and more sphagnum moss and grasses and sedges in the ground cover as compared with the mature swamp. Over time as the trees mature, the tupelo may gradually increase in dominance. As the canopy closes, the shrub layer and ground cover will thin out and look more like that in the mature swamp.

(3) Pond pine seepage slope

Bordering wetland A on the north and south are broad fringing areas of pond pine seepage slope. The canopy is dominated by pond pine with lesser amounts of slash pine, loblolly pine (Pinus taeda), long leaf pine (Pinus palustris), swamp bay, sweet bay, and tupelo. The subcanopy consists primarily of swamp bay, sweet bay and tupelo. The shrub layer is relatively dense and consists of a mixture of sweet gallberry and bitter gallberry mixed with scattered wax myrtle, high bush blueberry (Vaccinium corymbosum), and Virginia willow. The ground cover consists of the same species listed above as well as scattered cinnamon fern.

(4) Pine/gallberry wetlands

This wetland type occurs as a narrow band around almost all of the wetlands. The band widens into a relatively broad fringe south of wetlands A and B and also comprises most of wetland C. The vegetation in wetland C consists of rows of planted slash pine with a dense shrub layer of bitter gallberry. Sweet bay, swamp bay, loblolly bay and tupelo saplings are widely scattered among the pines. Other shrubs include scattered high bush blueberry, sweet gallberry and choke berry (Aronia arbutifolia). Bamboo briar (Smilax lauifolia) and cat briar (Smilax glauca) are common vines. Widely scattered under the gallberry are bog button (Eriocaulon sp.), club moss (Lycopodium sp.), hooded pitcher plant (Sarracenia minor), meadow beauty (Rhexia sp.), sphagnum moss, red root (Lachnanth caroliniana), blue maidencane (Amphicarpum muhlenbergianum), wire grass (Aristida sp.), yellow-eyed grass (Xyris sp.), cinnamon fern, netted chain fern, and St. Johns wort (Hypericum fasciculatum). This area has a

seasonal high water table at or near the surface during parts of the rainy season as evidenced by the presence of crayfish borrows.

The area south of wetlands A and B consists of pine plantation with widely scattered clusters of bitter gallberry and an open ground cover of wire grass mixed with bog buttons and other herbaceous species listed above. This area has been bedded and planted with rows of slash pine.

Within the pine/gallberry portion of wetland C, there are a number of small (<0.1 acre) open patches vegetated with a mixture of listed and nonlisted species such as red root, St. Johns wort, and blue maidencane. Some of these pockets have enough listed species to be considered jurisdictional wetlands pursuant to Section 40C-4 F.A.C., Management and Storage of Surface Waters (MSSW) permit. All of wetland C is mapped as being jurisdictional in the landfill's MSSW permit. However, most of the pine/gallberry portion of the wetland is dominated by nonlisted vegetation and, therefore, does not truly function as a "water in the State."

Historically the areas of pine/gallberry wetlands may have consisted of open savannahs of wire grass pine flatwoods. The vegetation was kept open by regular summer wildfires. After the property was converted into pine plantation, the fire regime was altered and summer wildfires were controlled or completely suppressed. As a result of the fire suppression, bitter gallberry may have gradually become the dominant shrub and ground cover plant in most areas. The ground cover vegetation has also been degraded somewhat due to intensive silvicultural practices such as bedding.

During the life span of the landfill, there should continue to be some changes in the vegetation in the pine/gallberry wetlands. The pines will continue to grow to maturity. Hardwoods, such as bays and tupelo, may gradually increase in numbers. Bitter gallberry and vines will continue to dominate and become taller and denser in the shrub and ground cover layers.

(5) Pine/St. Johns wort wetlands

Portions of wetlands A, B and C consist of pine/St. Johns wort wetlands. This wetland type appears to be a transitional zone between the pine/gallberry wetland and the hardwood swamp. The canopy and subcanopy consist of planted rows of slash pine with scattered swamp bay, sweet bay and tupelo. Due to the wetter condition of this area, the pines are more widely scattered and are smaller and stunted as compared with the pines in the pine/gallberry wetlands. The shrub layer consists primarily

of St. John's wort (Hypericum fasciculatum) mixed with lesser amounts of bitter gallberry, sweet gallberry, wax myrtle, and titi (Cyrilla racemiflora). For some reason, approximately one half of the St. Johns wort plants are dead. This may have occurred as a direct or indirect result of a recent severe freeze or prolonged drought. Ground cover vegetation consists of such species as sphagnum moss, grasses (Dicanthelium spp., Aristida sp., and Erianthus sp.), bog buttons, sedges (Carex sp. and Cyperus sp.), red root, and Asiatic coinwort (Centella asiatica).

Over time some succession may occur in this wetland type. Trees and shrubs may become more dominant and eventually shade out much of the ground cover species. The area may succeed into a transitional edge of bays, fetterbush and sweet gallberry.

IV. ESTABLISHMENT OF MONITORING TRANSECTS

Monitoring transects were established in the wetlands adjacent to the proposed stormwater pond (Figure 8). The number and specific locations of the transects were determined in the field by Environmental Services, Inc. and the Florida Department of Environmental Regulation on 11 December 1991. The transects extend through all five of the vegetative community types and cover representative areas of each of the main wetlands. Sunshine State Surveyors, Inc. surveyed the location of each transect and cut a line approximate 5 to 10 feet wide for access. Surface elevations were surveyed at intervals approximately 100 feet apart and marked with iron pins and PVC pipe.

Sampling stations were established about every 100 feet at the survey points, starting on the wetland jurisdiction line, and extending for a minimum length of 200 feet. A piezometer and square meter plot were established at each sampling station. The piezometers consist of perforated PVC pipe installed from 4 to 6 feet below the surface, depending on the location in the wetland. The initial water table readings from the baseline study were taken several days after the piezometers were installed. Each piezometer was capped after installation to prevent rainwater and debris from entering.

Square meter sampling plots were permanently marked with short sections of PVC pipe. Each station was established away from the centerline of the transects, in a representative area where the vegetation had not been disturbed. All ground cover vegetation within each plot was recorded according to species and percent coverage.

General notes were made regarding the composition of the canopy, subcanopy and shrub layer in the immediate area and the presence or absence of surface water such as flow channels. Color photographs were taken of each sampling plot, and along each transect (attachment B).

The sampling stations were established at least 200 feet into each wetland because that is the maximum extent of potential draw down as calculated by the project engineers. In order to compare the vegetation and water table in unaffected portions of the wetlands, reference transects were established. The reference transects consist of the northern halves of transects 1 and 2, the eastern half of transect 3, and all of transects 6 and 7. The transects sufficiently cover each wetland area, from the lowest point to the wetland edge. Additional piezometers and square meter plots will be established as needed, based on future monitoring work.

The data sheets recorded for each transect are included as attachment C. The notes on vegetation are summarized in the previous discussion of wetland vegetative community types. The information on elevations and water tables are summarized below and indicated on figures 9 through 13.

V. RESULTS OF THIRD MONITORING ITERATION

A. Transect 1

Transect 1 is approximately 435 feet long (Figure 9). It extends through a section of pine/gallberry wetland and a St. Johns wort/grass pocket in the western half of Wetland C. At the time of sampling in December 1994, the water table was 2.3 to 4.0 feet below the surface at the southern end of the transect and at or above the surface in the northern half. The monitoring report for 1992 noted a drop in water level in this transect as compared with the baseline study. The rate of irrigation was increased in this area and raised the water level considerably as compared with the 1992 report. Current water levels are now above the baseline levels recorded in 1992. The rate of irrigation in this area will be adjusted to more closely mimic the conditions prior to construction of the stormwater pond.

There was no red root (Lachnanthes caroliniana) recorded in the St. Johns wort/grass pocket as compared with the baseline study. However, the groundwater level in this area was higher, and the decrease in red root probably reflects a natural fluctuation in annual species composition. Other than the red root, there were no significant changes in species composition or coverage by dominant species along the transect.

B. Transect 2

Transect 2 is approximately 850 feet long (Figure 10). It extends through sections of pine/St. Johns wort, tupelo/cypress, and bay wetlands in the eastern half of Wetland C. The depth to the water table averaged 2.5 feet from the surface along the landward edges of the wetland. Within the tupelo/cypress portion of the wetland, there was approximately 4 to 6 inches of standing water near elevation +102.8 feet. As compared with the readings taken in December 1993, the water

table remained unchanged throughout the wetland. In profile view the water table appeared to be slightly mounded within the wetland.

There were no significant changes in species composition in the sampling plots along Transect 2.

C. Transect 3

Transect 3 is 536 feet long (Figure 11). It extends through sections of pine/St. Johns wort wetland and cut-over hardwood swamp. The depth to the water table averaged 0.6 feet below the surface along the wetland edges. The deeper portion of the wetland contained approximately 2.5 inches of standing water. As compared with the readings taken in December 1993, the water table remained unchanged.

There were no significant changes in species composition in the sampling plots along Transect 3.

D. Transects 4 and 7

Transects 4 and 7 are each 400 feet long (Figure 12). Piezometers and sampling plots were established in the first 200 feet of each transect. The water table was 1.7 feet below the surface at the southern end of Transect 7 at the farthest point from the stormwater pond while the water table was only 0.2 feet from the surface 90 feet from the pond at the northern end of Transect 4. On average the water table along Transect 7 was 1.0 feet below the surface which was a slight increase from the readings December 1993. On average the water table was at the surface or within a few inches of the surface along Transect 4 which was consistent with the readings from December 1993.

There were no significant changes in species composition in the sampling plots along Transects 4 and 7.

E. Transects 5 and 6

Transects 5 and 6 are each 400 feet long (Figure 13). Piezometers and sampling plots were established in the first 200 feet of each transect. At the time of sampling, the water table was 1.1 feet below the surface at the southern end of Transect 6 and 0.3 feet below the surface at the northern end of the transect. As compared with the readings from December 1993, the water table rose slightly along Transect 6.

There were flow ways scattered through the center of the hardwood swamp that contained water. The water table in the swamp was generally within 6 inches of

the surface. The ordinary high water level in the swamp appears to be at elevation +114.5 feet.

The water table along the length of Transect 5 was between 0.03 and 2.5 feet below the surface. The water table depth at piezometer #1 was slightly deeper than the baseline results, however, the depths at piezometer #2 and #3 were higher than the 1993 data. The wetland in this area is characterized as a stand of pond pine with a shrub layer of bitter gallberry and sweet gallberry and scattered saplings of bays and tupelo. Irrigation in this area has raised the ground water level above the levels of the baseline study. The amount of irrigation will be adjusted to more closely resemble baseline ground water levels.

There were no significant changes in species composition in the sampling plots along Transects 5 and 6.

V. CONCLUSION

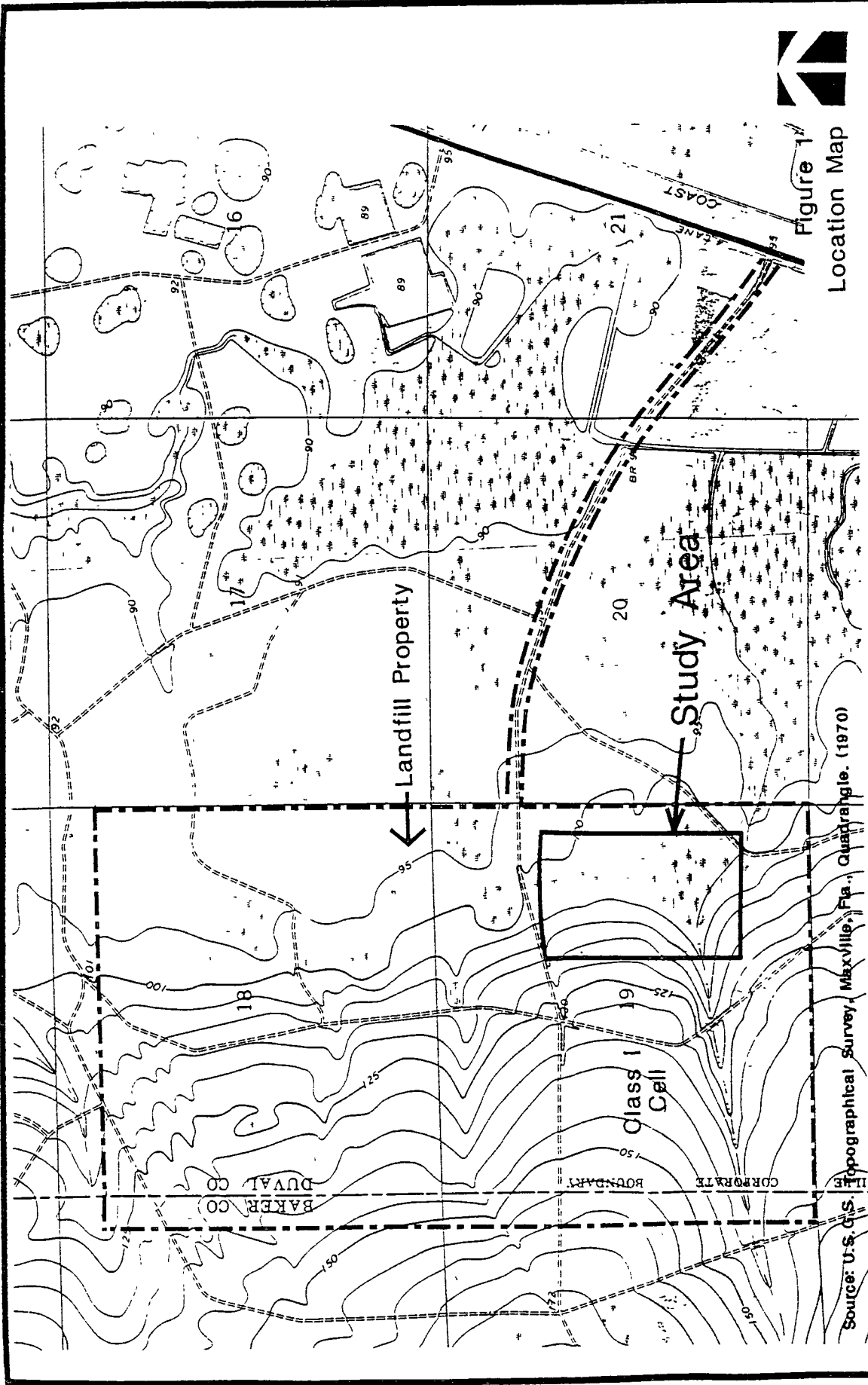
Based on the data collected in December 1994, there were no significant changes in species composition in the vegetation sampling plots in any of the transects. As compared with the readings from the baseline study, the water table was either higher or at approximately the same level.


Future monitoring work will determine if the Class I stormwater pond will have any effects on the adjacent wetlands. The vegetation in the areas of potential draw-down is dominated by woody plants that are either transitional or upland and should readily adapt to a slight drop in the water table. Because the wetlands are not truly inundated by "waters of the State," any draw-down should not significantly affect overall wetland functions and values.

The on-going irrigation program is adequately compensating for any potential drawdown of the water table. The sampling stations along the transects will be monitored and compared with stations along the reference transects and with rainfall/weather data.

Operation of the Class I stormwater pond during the past 12 months has not had any detrimental effects on the vegetation of the adjacent wetlands. Any effects on wetland hydrology appear to have been negligible.

(tc\91-297-4 MR3\Jan95)



 <p>England-Thimbs & Miller, Inc. ENVIRONMENTAL SERVICES, INC.</p>	<p>Trail Ridge Landfill Wetlands Monitoring Plan</p>		<p>Project No. 91-297.4</p>
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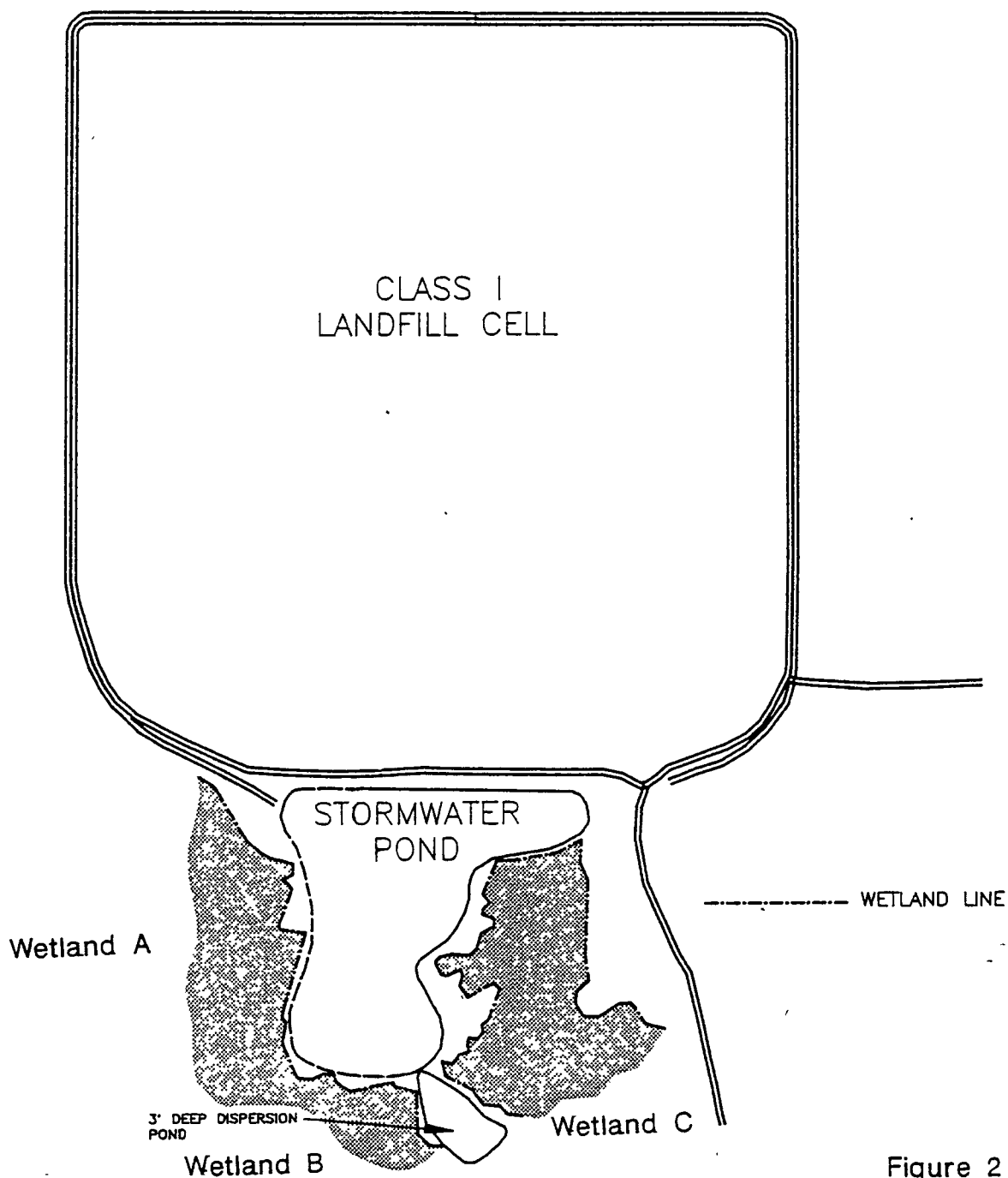


Figure 2
Plan View



**England-Thims
& Miller, Inc.**
Consulting & Design Engineers
3131 St. Johns Blvd. SE, Jacksonville, FL 32216

**ENVIRONMENTAL
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Trail Ridge Landfill

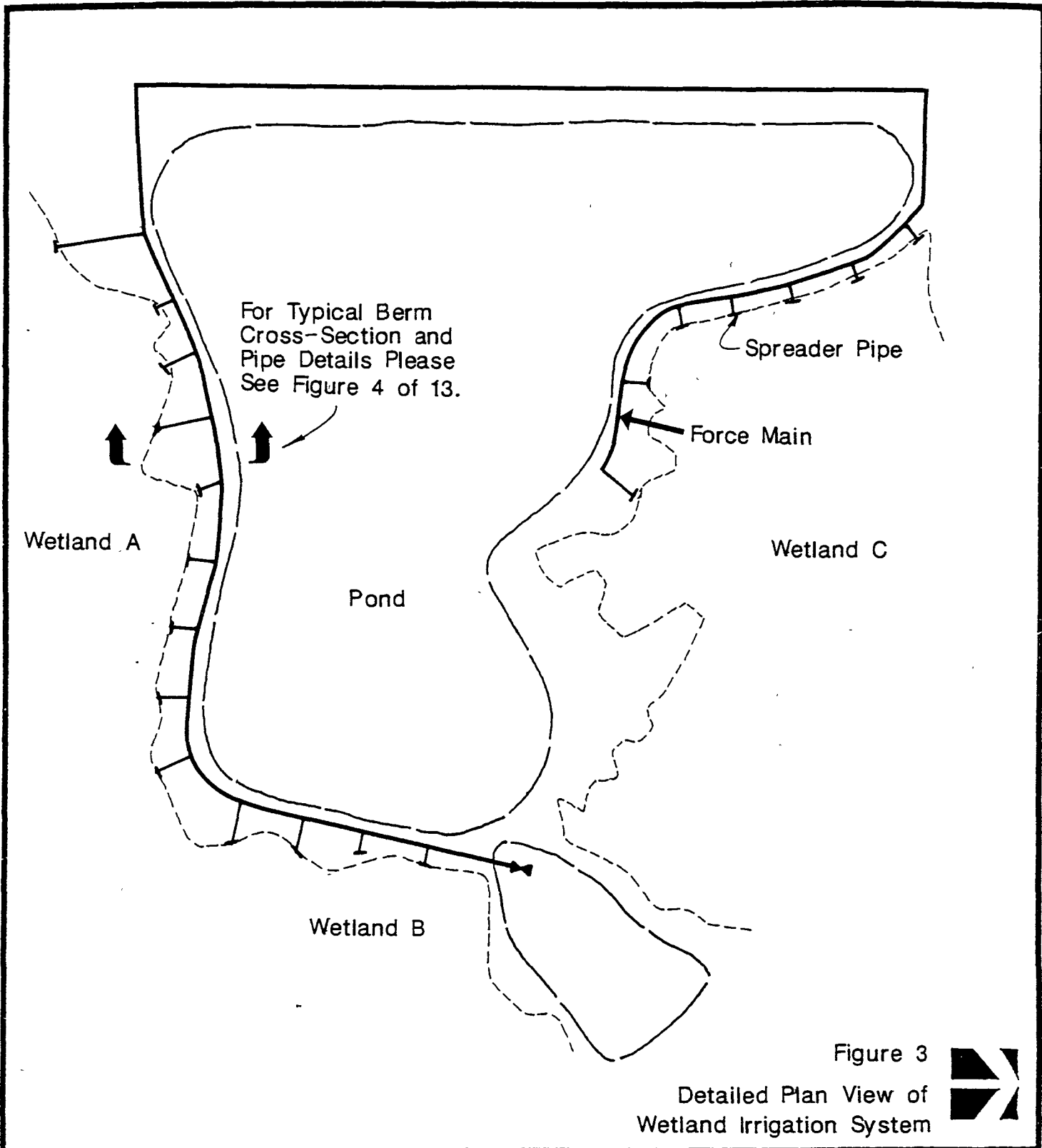
Wetlands Monitoring Plan

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Scale 1"=600'

Drawing No. 2 of 13



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Wetlands Monitoring Plan

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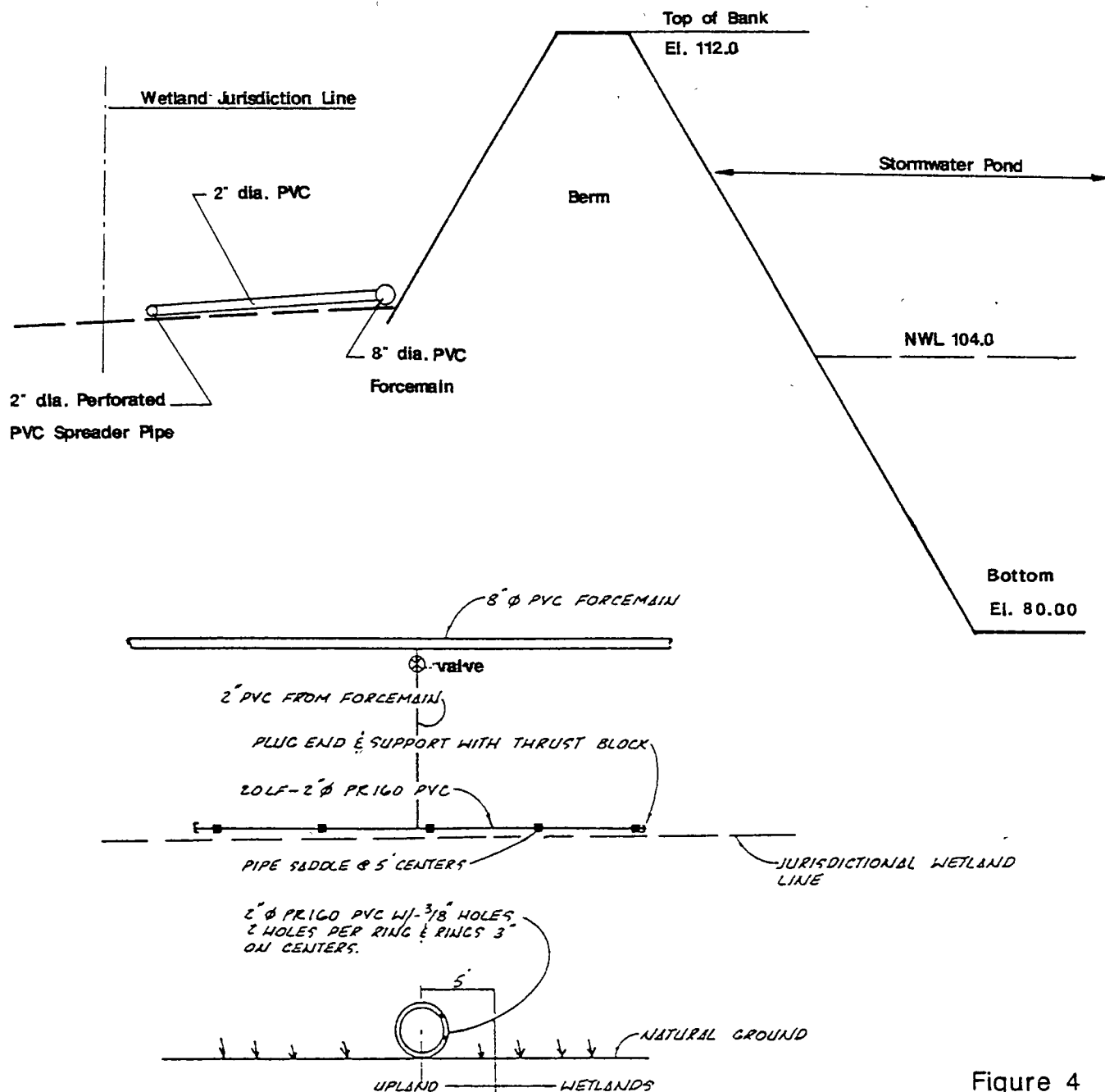


Figure 4
Plans for Wetland
Irrigation System



England-Thimms
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Drawing No.	4 of 13

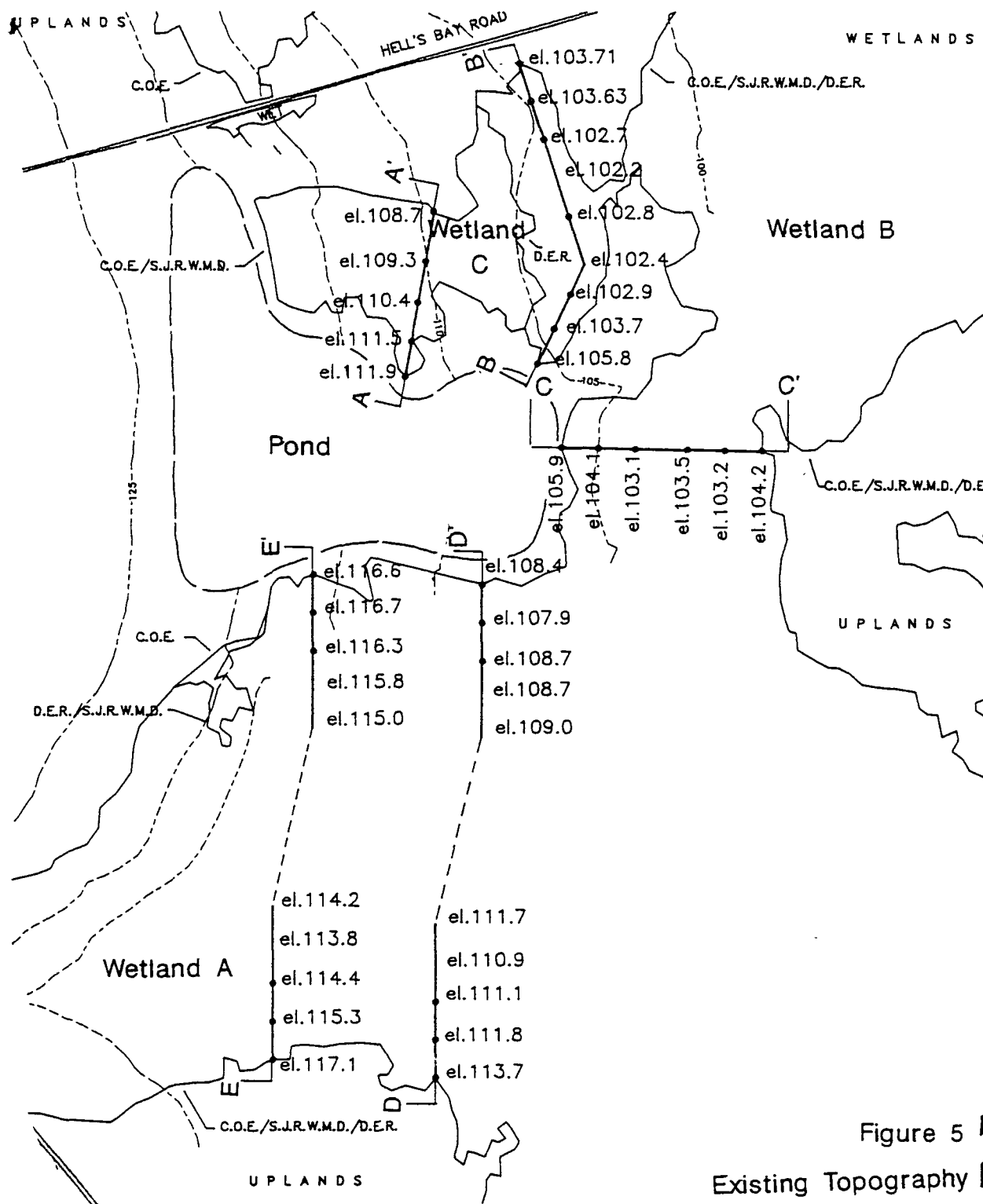


Figure 5
Existing Topography

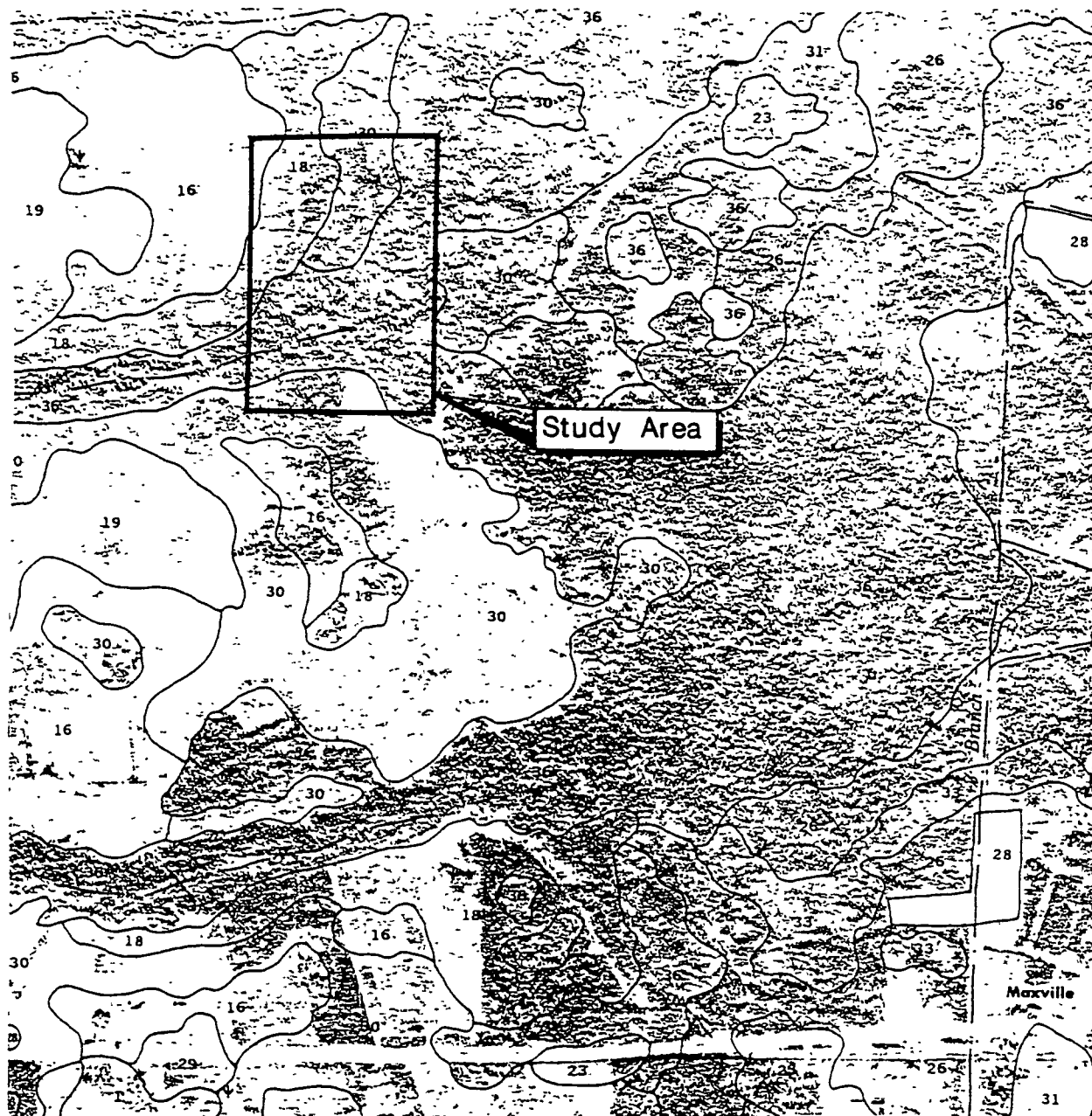


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Trail Ridge Landfill Wetlands Monitoring Plan

Proj No.	91-297.4
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Scale	1"=400'
Drawing No.	5 of 13



Soil Legend:

- 18 - Lynn Haven fine sand
- 30 - Ridgeland fine sand
- 36 - Wesconnett fine sand

Source: U.S.D.A. Soils Survey for Duval County, Fla. (1978)

Figure 6
Soils Map



**England-Thims
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3131 St. Johns Ave. Ste. 500 Jacksonville, FL 32206

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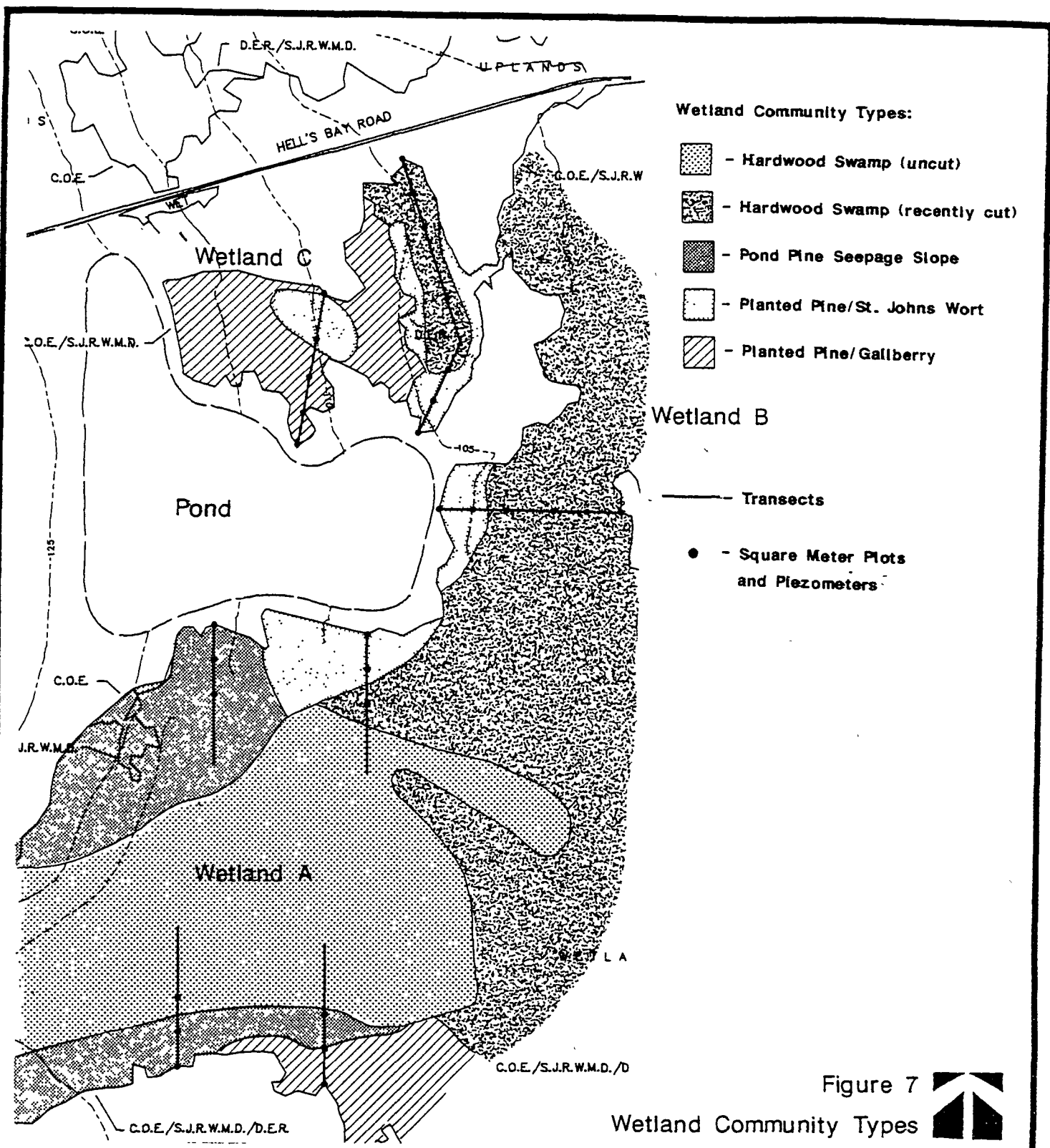


Figure 7
Wetland Community Types



England-Thims
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3151 St. Johns Ave. Suite 200, Jacksonville, FL 32206

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Drawing No. 7 of 13

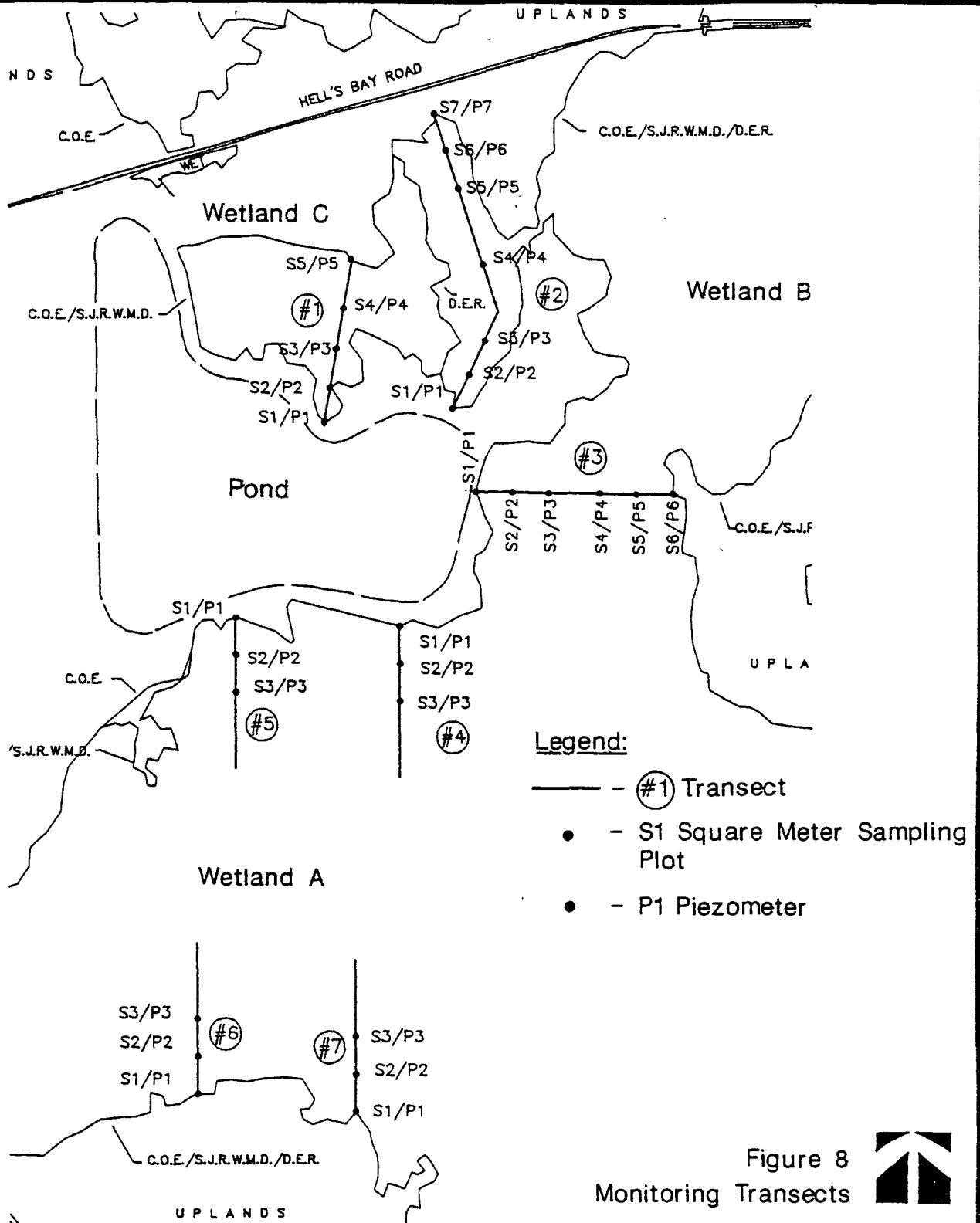


Figure 8
Monitoring Transects



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3031 St. Johns Street, Rt. 30, Jacksonville, FL 32216

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Trail Ridge Landfill

Wetlands Monitoring Plan

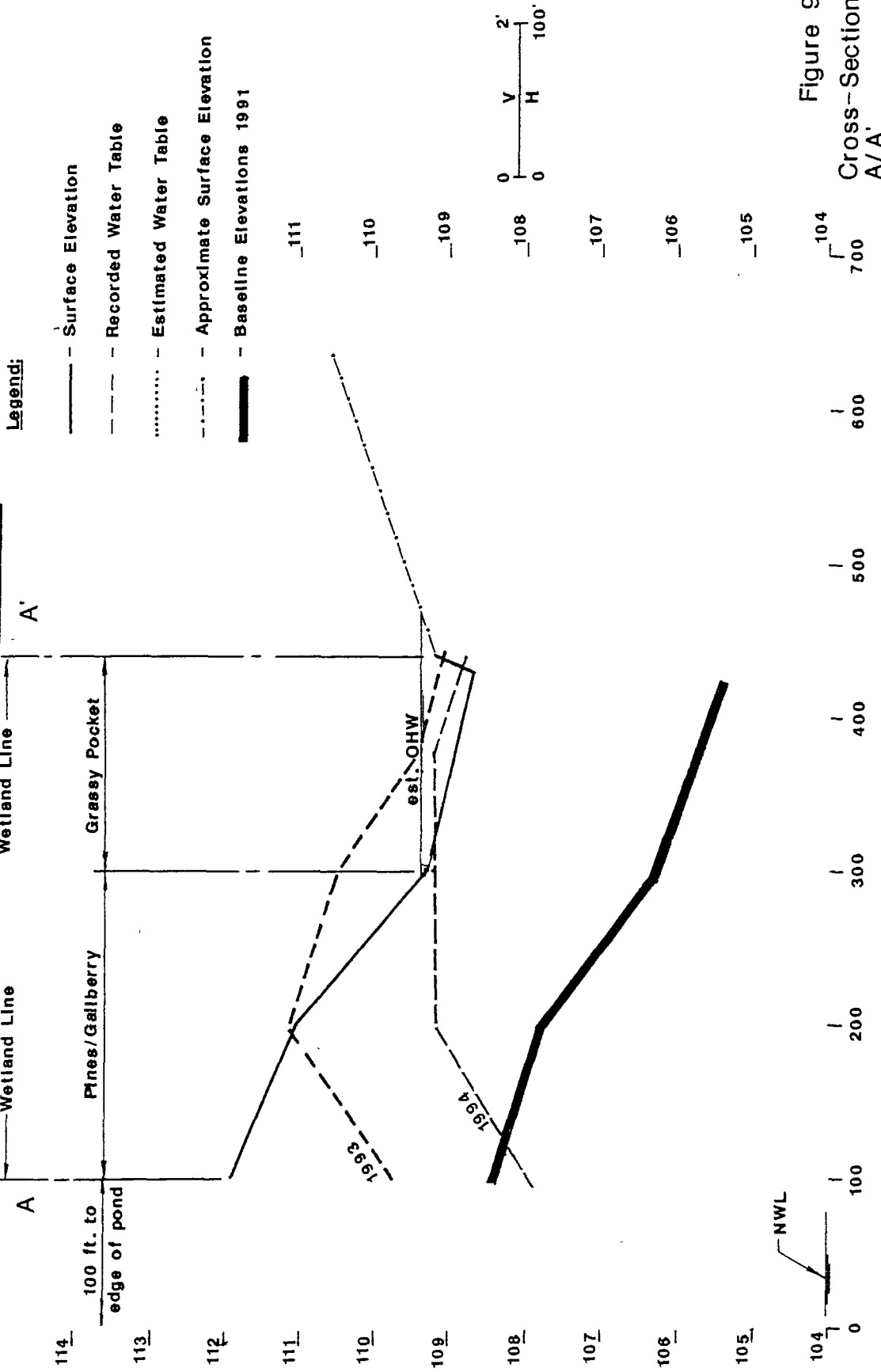
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Drawing No. 8 of 13

Transect 1

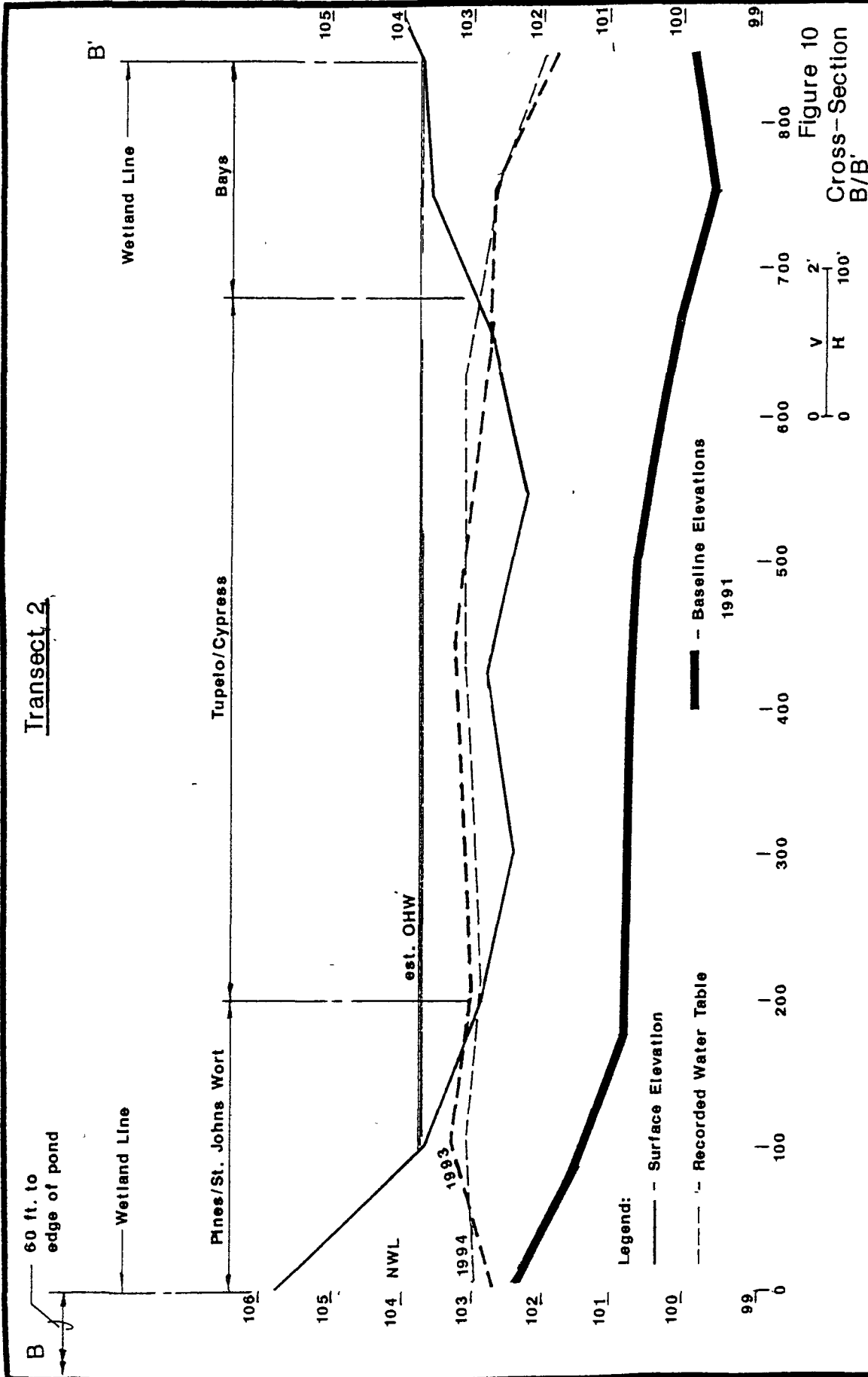


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10000 Old Highway 11, Suite 110
Baltimore, MD 21244



Trail Ridge Landfill Wetlands Monitoring Plan

Project No.	91-297.4
Date	revised 1/7/94
Scale	as shown
Drawing No.	9 of 13



England-Thims
& Miller, Inc.
Consulting & Design Engineers
13151 28th Street SE, Jackson, FL 32216



ENVIRONMENTAL
SERVICES, INC.

Trail Ridge Landfill

Wetlands Monitoring Plan

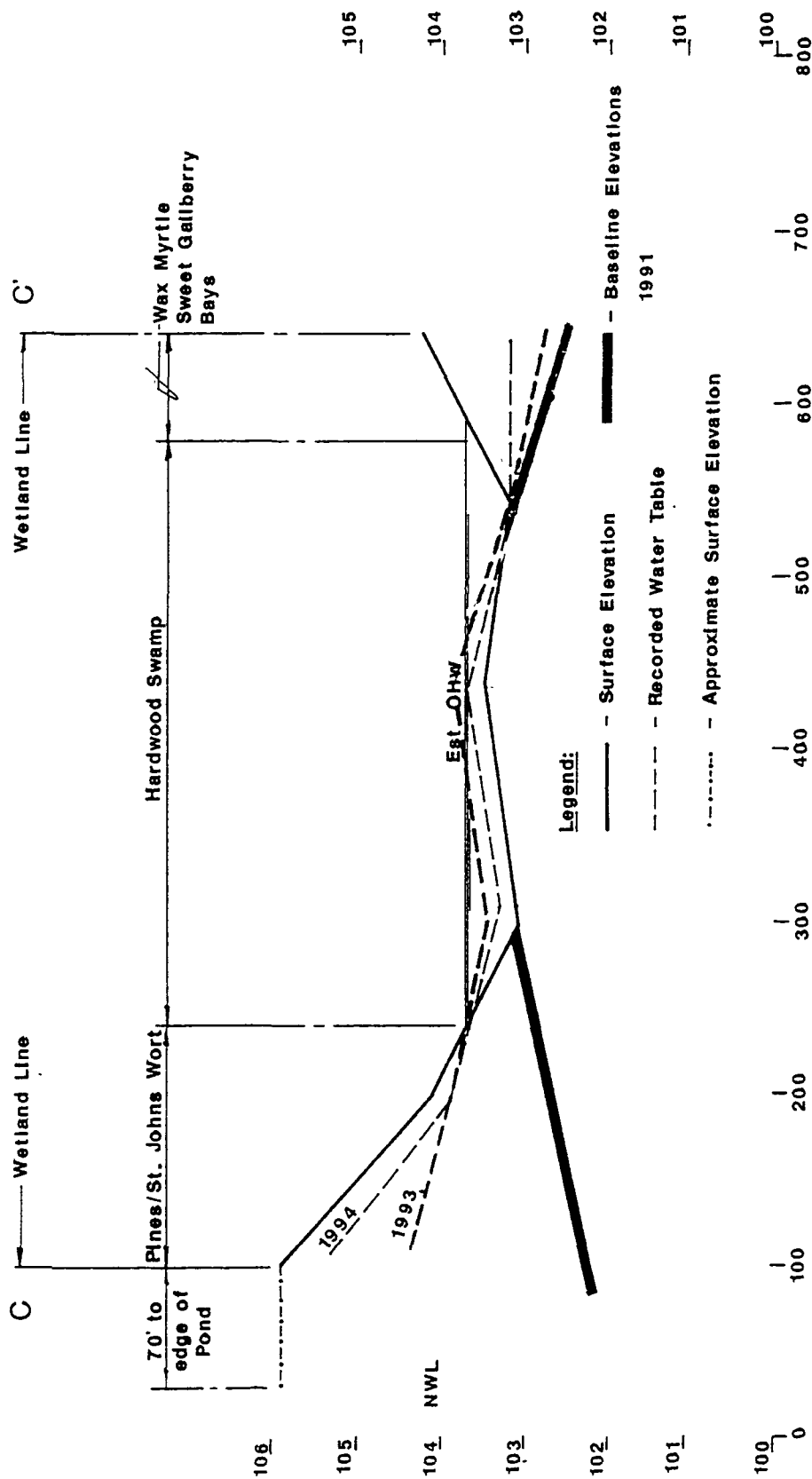
Project No. 91-297.4

Date revised 1/7/94

Scale as shown

Drawing No. 10 of 13

Transect 3



England-Thims
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531 E. 35th Street
Des Moines, IA 50319

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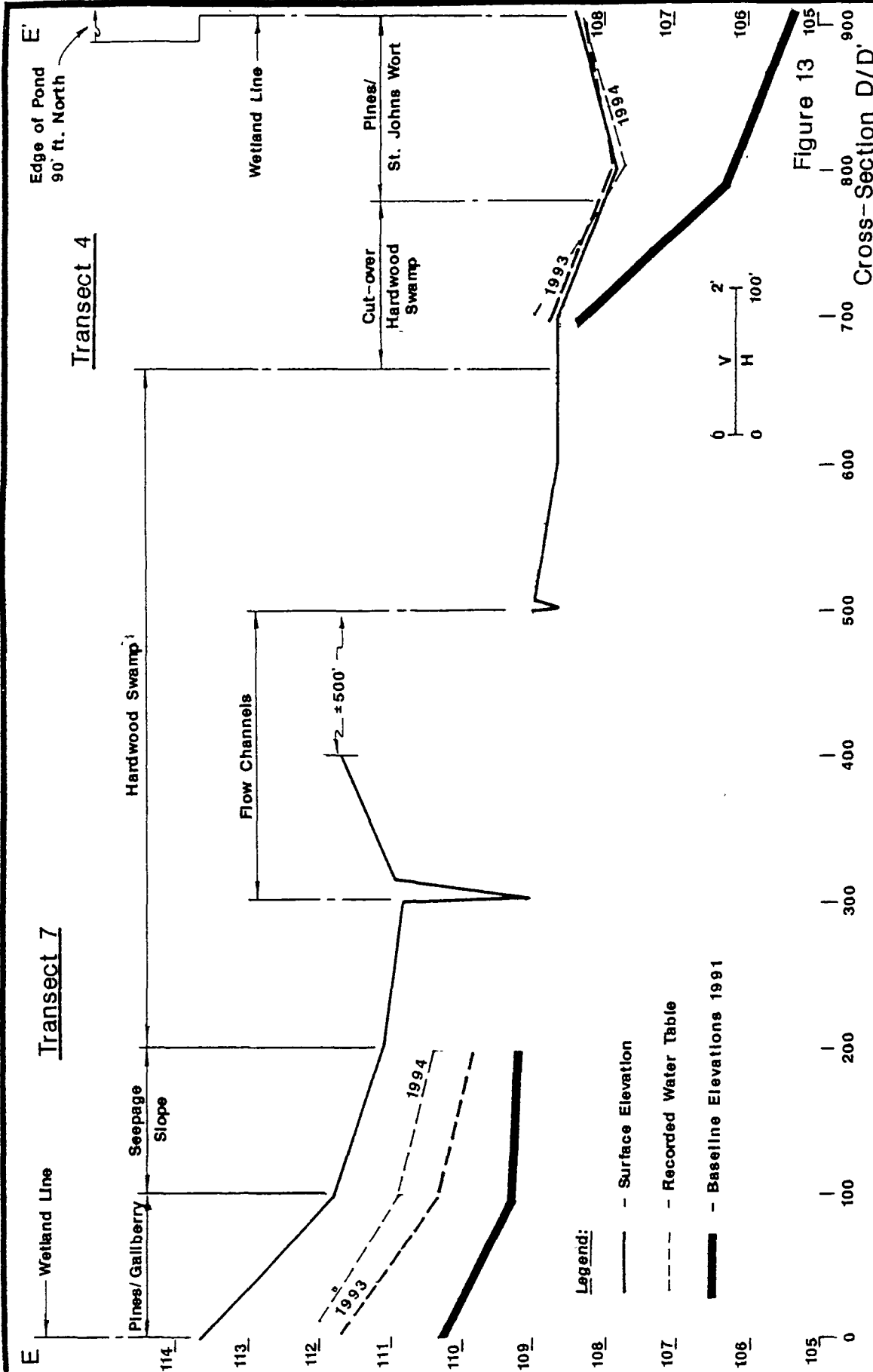
Project No. 91-297.4

Date revised 1/7/94

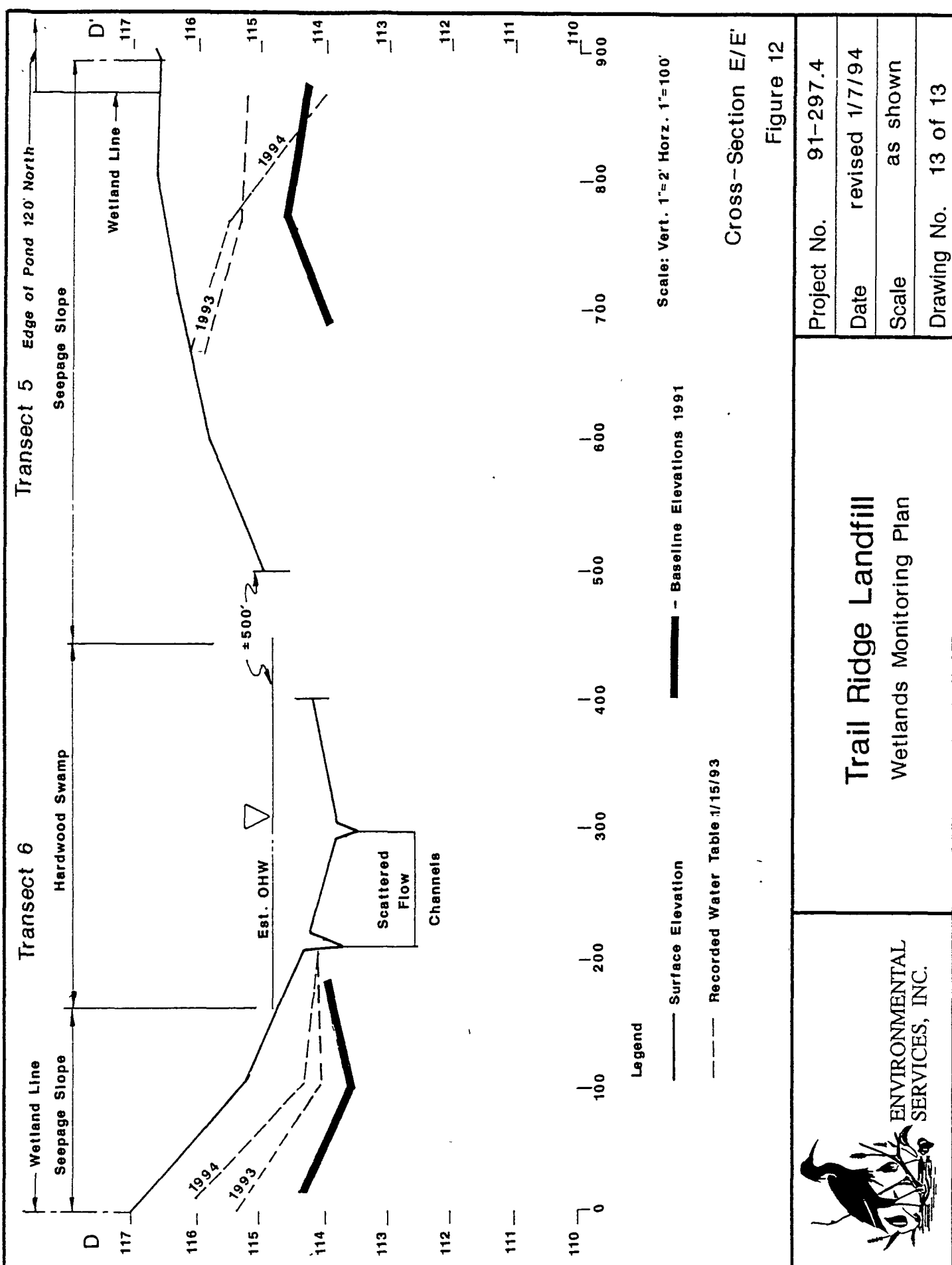
Scale as shown

Drawing No. 11 of 13

Trail Ridge Landfill
Wetlands Monitoring Plan



Project No. 91-297.4	<div data-bbox="1291 1883 1485 2032" data-label="Image"> </div> <div data-bbox="1291 1521 1388 1862" data-label="Text"> <p>England-Thims & Miller, Inc. <small>CONSULTING ENGINEERS 1015 S. 28th Street, Suite 101, Lincoln, NE 68502</small></p> </div>
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Trail Ridge Landfill

Wetlands Monitoring Plan



ENVIRONMENTAL
SERVICES, INC.

Project No.	91-297.4
Date	revised 1/7/94
Scale	as shown
Drawing No.	13 of 13

Permit Condition
for
Wetlands Monitoring
at
Trail Ridge Landfill

48. In order to evaluate the effects of the discharging of water from the stormwater management systems by pumping into the adjacent wetlands, the permittee shall establish a monitoring plan which shall include the following:

I. For the Class I Stormwater Management System:

- (a) A Base Line Data Study shall be conducted which shall include the following:

(1) A detailed scaled plan site drawing shall be submitted to the Department's Northeast District Office which contains the location of all wetland stormwater discharge structures to include details of the structures. The jurisdictional delineation line shall be depicted on the drawings.

(2) A series of line transects shall be established, divided into appropriate intervals, and vegetation shall be determined by the appropriate methodology which shall be approved, in writing, by the Department. The transect vegetational data shall be compiled in a report format and submitted to the Northeast District of the Department.

(3) The transects shall be established at appropriate intervals along the areas of discharge and extend into the wetland areas to the lowest elevation along each transect line. All transect lines shall be approved by the Department prior to data collection for the Base Line Study. All transects shall be clearly indicated on the site plan drawing required in (1) above.

(4) The transect lines shall be permanently marked and utilized for all wetland stormwater discharge monitoring requirements established in this permit.

(5) Photographs along each established transect line shall be submitted as part of the Base Line Data Study. These photographs shall be labeled so as to graphically depict each interval along each transect line.

(6) At the wetland/upland boundary and at the mid-elevation of each transect as required in (2) above, a piezometer shall be installed to determine ground water elevations in the wetland discharge areas. A reference piezometer shall be established at the same elevation as the mid-elevation piezometer for each transect at a point extended along

PERMITTEE:

Trail Ridge Landfill, Inc.

I.D. Number: GMS116F03090

Permit/Case Number: SC16-184444

Date of Issue: 12-24-91

Expiration Date: 12-24-96

SPECIFIC CONDITIONS (CONT'D):

each transect so as to be at the greatest distance from the stormwater pond. These ground water elevations shall be recorded as part of each transect evaluation the location of each piezometer shall be clearly indicated for each transect as required in (1) above on the scaled site plan for each monitoring report.

(7) The complete Base Line Study shall be submitted to the Northeast District Office prior to the commencement of the construction of the stormwater pond.

(b) The wetland areas of discharge shall be monitored at 1 year intervals commencing one year from the start date of the construction of the stormwater pond until the expiration date of this permit. These monitoring reports shall utilize the transect established in the Base Line Study and shall include all the information required in the Base Line Study. These monitoring reports shall be submitted no later than two (2) weeks after each monitoring event. The monitoring requirements shall be reviewed and/or revised by the Department at the time of renewal of this permit.

(c) The permittee shall notify the Northeast District Office of the Department, in writing, of the start date of the stormwater pond and the date of the first wetland stormwater discharge within seven (7) days of the event.

(d) In the event of any quantified vegetational species compositional changes along any interval of any transect during any monitoring event, the permittee shall include any such changes in that periods monitoring report and include any proposed changes in the discharge schedule to mitigate these changes. The Department shall review the proposed changes and the permittee shall take what remedial actions deemed necessary by the Department.

(e) The permittee shall take all appropriate measures to insure that the wetland stormwater discharge system does not cause erosion into any wetland area during construction and operation.

(f) The wetland stormwater discharge system shall be completed and operational prior to accepting any waste in the Phase I, Class I Landfill.

II. For the Class III Stormwater Management System:

(a) All provisions of paragraphs (2), (b), (c), (d), and (e), shall apply to the Class III Storm Water Management System Wetland Discharge System.

(b) The wetland discharge system shall be completed and operational no later than 180 days from the commencement of the excavation of the Class III Stormwater Management Pond.

(c) The permittee shall notify the Northeast District Office of the Department, in writing, of the "start date" of the excavation of the Class III Stormwater Management Pond within 7 days of the commencement of the activity.

TRAIL RIDGE LANDFILL
WETLAND MONITORING PLAN

Attachment B

Color Photographs
of
Wetlands Adjacent to Stormwater Pond
for
Class I Landfill Cell

T1 - Transect 1

S1 - Sampling Plot 1

Photographs taken 12/28/94

Trail Ridge Landfill

December 1994



Photo 1: T1
Pine/Gallberry Wetland along Transect 1, looking North

Trail Ridge Landfill

December 1994



Photo 2: T1-S2



Photo 3: T1-S3

Trail Ridge Landfill

December 1994



Photo 4: T1-S4



Photo 5: T1-S5

Note: Standing Water approximately 6" deep.

Trail Ridge Landfill

December 1994



Photo 6: T2
Planted Pine/St. Johns Wort Wetland along Transect 2.
Looking North between Piezometer #2 and #3.

Trail Ridge Landfill

December 1994



Photo 7: T2-S1
Note: Vegetation in plot recently cut.



Photo 8: T2-S2

Trail Ridge Landfill

December 1994



Photo 9: T2-S3



Photo 10: T2-S4

Note: Standing water approximately 6" - 8" deep.

December 1994



Photo 11: T2-S5



Photo 12: T2-S6

Trail Ridge Landfill

December 1994



Photo 13: T2-S7

Trail Ridge Landfill

December 1994



Photo 14: T3
Cut-over Hardwood Swamp along Transect 3.
Looking East between Piezometer #3 and #4.

Trail Ridge Landfill

December 1994



Photo 15: T3-S1



Photo 16: T3-S2

Trail Ridge Landfill

December 1994



Photo 17: T3-S3



Photo 18: T3-S4

Trail Ridge Landfill

December 1994



Photo 19: T3-S5



Photo 20: T3-S6

Trail Ridge Landfill

December 1994



Photo 21: T4
Planted Pine/St. Johns Wort Wetland along Transect 4.
Looking North between Piezometer #3 and #2.

Trail Ridge Landfill

December 1994



Photo 22: T4-S1



Photo 23: T4-S2

Trail Ridge Landfill

December 1994



Photo 24: T4-S3

Trail Ridge Landfill

December 1994



Photo 25: T5
Pond Pine Seepage Slope along Transect 5.
Looking South between Piezometer #1 and #2.

Trail Ridge Landfill

December 1994



Photo 26: T5-S1



Photo 27: T5-S2

Trail Ridge Landfill

December 1994



Photo 28: T5-S3

Trail Ridge Landfill

December 1994



Photo 29: T6
Uncut Pine/Hardwood Swamp along Transect 6.
Looking North between Piezometer #2 and #3.

Trail Ridge Landfill

December 1994



Photo 30: T6-S1



Photo 31: T6-S2

Trail Ridge Landfill

December 1994



Photo 32: T6-S3

Trail Ridge Landfill

December 1994



Photo 33: T7
Planted Pine/Gallberry Wetland along Transect 7.
Looking North between Piezometer #2 and #3.

Trail Ridge Landfill

December 1994



Photo 34: T7-S1



Photo 35: T7-S2

Trail Ridge Landfill

December 1994



Photo 36: T7-S3

TRAIL RIDGE LANDFILL
WETLAND MONITORING PLAN

Attachment C

Transect Data
from
December 1994

TRAILRIDGE LANDFILL - WETLANDS MONITORING PLAN
CLASS I - STORMWATER POND

SECOND STUDY		DATE: 28 December 1994	
TRANSECT NUMBER: 5		FIELD INVESTIGATOR: Todd Wilkinson	
<u>Hydrology</u> Piezometer No. P-1	<u>Water Elevation</u> 114.0'	<u>Vegetation</u> Quadrat No. S-1	
GROUND COVER & SHRUBS			
<u>Species</u>	<u>Status</u>	<u>% Cover</u>	
Ilex glabra	U	75	
Osmunda cinnamomea	T	5	
Open		60	
VEGETATION IN GENERAL VICINITY			
<u>Species</u>	<u>Status</u>	<u>Relative Abundance</u>	
Pinus serotina	T	Dominant canopy	
Magnolia virginiana	S	Mixed canopy & subcanopy	
Nyssa sylvatica var. biflora	S	Mixed canopy & subcanopy	
Persea palustris	S	Mixed canopy & subcanopy	
Acer rubrum	T	Mixed canopy & subcanopy	
Ilex glabra	U	Dominant groundcover	
Osmunda cinnamomea	T	Scattered groundcover	
WETLAND COMMUNITY TYPE: Pond Pine Seepage Slope			
NOTES:			

(tc\91-297.4\MRDEC.94)

TRAILRIDGE LANDFILL - WETLANDS MONITORING PLAN
CLASS I - STORMWATER POND

SECOND STUDY		DATE: 28 December 1994	
TRANSECT NUMBER: 5		FIELD INVESTIGATOR: Todd Wilkinson	
<u>Hydrology</u> Piezometer No. P-2	<u>Water Elevation</u> 115.5'	<u>Vegetation</u> Quadrat No. S-2	
GROUND COVER & SHRUBS			
<u>Species</u>	<u>Status</u>	<u>% Cover</u>	
Ilex coriacea	T	75	
Ilex glabra	U	20	
Leucothoe axillaris	T	5	
Open		40	
VEGETATION IN GENERAL VICINITY			
<u>Species</u>	<u>Status</u>	<u>Relative Abundance</u>	
Pinus serotina	T	Dominant canopy	
Ilex glabra	U	Dominant groundcover	
Ilex coriacea	T	Dominant groundcover	
Nyssa sylvatica var. biflora	S	Dominant subcanopy	
Magnolia virginiana	S	Dominant subcanopy	
Osmunda cinnamomea	T	Dominant groundcover	
WETLAND COMMUNITY TYPE: Pond Pine Seepage Slope			
NOTES:			

(tc91-297.4\MRDEC 94)

TRAILRIDGE LANDFILL - WETLANDS MONITORING PLAN
CLASS I - STORMWATER POND

SECOND STUDY		DATE: 28 December 1994	
TRANSECT NUMBER: 5		FIELD INVESTIGATOR: Todd Wilkinson	
<u>Hydrology</u> Piezometer No. P-3	<u>Water Elevation</u> 116.1'	<u>Vegetation</u> Quadrat No. S-3	
GROUND COVER & SHRUBS			
<u>Species</u>	<u>Status</u>	<u>% Cover</u>	
Ilex glabra	U	40	
Magnolia virginiana	S	10	
Aronia arbutifolia	U	2	
Myrica cerifera	U	20	
Open		75	
VEGETATION IN GENERAL VICINITY			
<u>Species</u>	<u>Status</u>	<u>Relative Abundance</u>	
Pinus serotina	T	Dominant canopy	
Nyssa sylvatica var. biflora	S	Dense subcanopy	
Magnolia virginiana	S	Dense subcanopy	
Pinus elliotii	U	Dense subcanopy	
Myrica heterophylla	U	Dominant shrub & groundcover	
Myrica cerifera	U	Dominant shrub & groundcover	
Ilex glabra	U	Dominant shrub & groundcover	
WETLAND COMMUNITY TYPE. Pond Pine Seepage Slope			
NOTES. Little to no herbaceous coverage in this area.			

(tc\91-297.4\MRDEC.94)

TRAILRIDGE LANDFILL - WETLANDS MONITORING PLAN
CLASS I - STORMWATER POND

SECOND STUDY	DATE. 28 December 1994	
TRANSECT NUMBER: 1	FIELD INVESTIGATOR: Todd Wilkinson	
<u>Hydrology</u> Piezometer No P-1	<u>Water Elevation</u> 107.9'	<u>Vegetation</u> Quadrat No. S-1
GROUND COVER & SHRUBS		
<u>Species</u>	<u>Status*</u>	<u>% Cover</u>
VEGETATION IN GENERAL VICINITY		
<u>Species</u>	<u>Status</u>	<u>Relative Abundance</u>
Pinus elliottii	U	Planted/canopy
Ilex glabra	U	abundant
Magnolia virginiana	S	scattered in subcanopy
Smilax glauca	U	scattered
Smilax laurifolia	S	scattered
Ilex coriacea	T	abundant
WETLAND COMMUNITY TYPE: Planted Pine/Gallberry		
NOTES. Quadrat could not be located.		

* - S = Submerged, T = Transitional, U = Upland, I = Invisible

(tc\91-297 4\MRDec.94)

TRAILRIDGE LANDFILL - WETLANDS MONITORING PLAN
CLASS I - STORMWATER POND

SECOND STUDY	DATE: 28 December 1994
TRANSECT NUMBER: 1	FIELD INVESTIGATOR: Todd Wilkinson

<u>Hydrology</u> Piezometer No. P-2	<u>Water Elevation</u> 109.2'	<u>Vegetation</u> Quadrat No S-2
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GROUND COVER & SHRUBS		
<u>Species</u>	<u>Status</u>	<u>% Cover</u>
Ilex glabra	U	50
Aronia arbutifolia	U	5
Magnolia virginiana	S	20
Ilex coriacea	U	5
Open (pine needles)		40

VEGETATION IN GENERAL VICINITY		
<u>Species</u>	<u>Status</u>	<u>Relative Abundance</u>
Magnolia virginiana	S	Scattered in area
Pinus elliotii	U	Planted in rows
Nyssa sylvatica var. biflora	S	2 trees within 15'
Eriocaulon sp.	S	Scattered in groundcover
Aronia arbutifolia	U	Scattered in groundcover
Ilex glabra	U	Scattered in groundcover
Smilax laurifolia	S	Scattered in groundcover

WETLAND COMMUNITY TYPE: Planted Pine/Gallberry
--

NOTES.

(tc\91-297 4\MRDEC.94)

**TRAILRIDGE LANDFILL - WETLANDS MONITORING PLAN
CLASS I - STORMWATER POND**

SECOND STUDY		DATE: 28 December 1994	
TRANSECT NUMBER: 1		FIELD INVESTIGATOR: Todd Wilkinson	
<u>Hydrology</u> Piezometer No P-3	<u>Water Elevation</u> 109.2'	<u>Vegetation</u> Quadrat No. S-3	
GROUND COVER & SHRUBS			
<u>Species</u>	<u>Status</u>	<u>% Cover</u>	
Sphagnum sp	S	25	
Woodwardia areolata	T	50	
Osmunda cinnamomea	T	2	
Eriocaulon sp.	S	2	
Ilex glabra	U	25	
Smilax laurifolia	S	1	
Amphicarpum muhlenbergianum	U	5	
Open		20	
VEGETATION IN GENERAL VICINITY			
<u>Species</u>	<u>Status</u>	<u>Relative Abundance</u>	
Pinus elliottii	U	Planted in rows - stunted	
Magnolia virginiana	S	Sparse in canopy	
Ilex glabra	U	Scattered groundcover	
Eriocaulon sp.	S	Scattered groundcover	
Osmunda cinnamomea	T	Scattered groundcover	
Woodwardia areolata	T	Scattered groundcover	
WETLAND COMMUNITY TYPE: Planted Pine/Gallberry			
NOTES:			

(tc\91-297.4\MRDEC.94)

TRAILRIDGE LANDFILL - WETLANDS MONITORING PLAN
CLASS I - STORMWATER POND

SECOND STUDY	DATE: 28 December 1994
TRANSECT NUMBER: 1	FIELD INVESTIGATOR: Todd Wilkinson

<u>Hydrology</u> Piezometer No. P-4	<u>Water Elevation</u> 109 2'	<u>Vegetation</u> Quadrat No. S-4
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GROUND COVER & SHRUBS		
<u>Species</u>	<u>Status</u>	<u>% Cover</u>
Xyris jupicai	U	10
Amphicarpum muhlenbergianum	U	20
Eriocaulon sp.	S	5
Panicum sp.	U	25
Hypericum fasciculatum	T	10
Eleocharis sp.	S	0
Centella asiatica	T	10
Open		20

VEGETATION IN GENERAL VICINITY		
<u>Species</u>	<u>Status</u>	<u>Relative Abundance</u>
Smilax laurifolia	S	Scattered groundcover
Ilex glabra	U	Scattered groundcover
Xyris jupicai	U	Scattered groundcover
Pinus elliotii	U	Few - stunted
Myrica cerifera	U	Scattered in subcanopy
Nyssa sylvatica var. biflora	S	Scattered in subcanopy
Acer rubrum	T	Scattered in subcanopy

WETLAND COMMUNITY TYPE: Planted Pine/St. Johns Wort

NOTES. Soil saturated to surface.

(tc\91-297.4\MRDEC.94)

TRAILRIDGE LANDFILL - WETLANDS MONITORING PLAN
CLASS I - STORMWATER POND

SECOND STUDY		DATE. 28 December 1994	
TRANSECT NUMBER: 1		FIELD INVESTIGATOR: Todd Wilkinson	
<u>Hydrology</u> Piezometer No. P-5	<u>Water Elevation</u> 108 8'	<u>Vegetation</u> Quadrat No S-5	
GROUND COVER & SHRUBS			
<u>Species</u>	<u>Status</u>	<u>% Cover</u>	
Andropogon sp.	U	10	
Hypericum fasciculatum	T	10	
Aristida stricta	U	5	
Open		90	
VEGETATION IN GENERAL VICINITY			
<u>Species</u>	<u>Status</u>	<u>Relative Abundance</u>	
Pinus elliotii	U	Sparse in canopy	
Acer rubrum	T	Several in subcanopy	
Gordonia lasianthus	S	1 or 2 trees	
Ilex myrtifolia	S	1 tree	
Hypericum fasciculatum	T	Scattered in groundcover	
Ilex glabra	T	Scattered in groundcover	
Nyssa sylvatica var. biflora	S	2 saplings	
WETLAND COMMUNITY TYPE. Planted Pine/Gallberry			
NOTES. Pine canopy sparse near plot. Standing water within plot, 4" deep.			

* - S = Submerged, T = Transitional, V = Upland, I = Invisible

(tc91-297.4\MRDEC.94)

TRAILRIDGE LANDFILL - WETLANDS MONITORING PLAN
CLASS I - STORMWATER POND

SECOND STUDY	DATE: 28 December 1994
TRANSECT NUMBER: 2	FIELD INVESTIGATOR: Todd Wilkinson

<u>Hydrology</u> Piezometer No. P-1	<u>Water Elevation</u> 103.0'	<u>Vegetation</u> Quadrat No. S-1
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GROUND COVER & SHRUBS		
<u>Species</u>	<u>Status</u>	<u>% Cover</u>
Smilax laurifolia	S	5
Ilex glabra	U	25
Amphicarpum muhlenbergianum	U	40
Panicum sp.	T	50
Andropogon sp.	U	15
Eriocaulon sp.	S	10
Hypericum fasciculatum	T	5
Open		5

VEGETATION IN GENERAL VICINITY		
<u>Species</u>	<u>Status</u>	<u>Relative Abundance</u>
Nyssa sylvatica var biflora	S	A few saplings
Xyris juncea	U	Dominant groundcover
Eriocaulon sp	S	Dominant groundcover
Ilex glabra	U	Dominant groundcover
Hypericum fasciculatum	T	Dominant groundcover
Smilax laurifolia	S	Dominant groundcover
Lycopodium allopecuroides	U	Dominant groundcover

WETLAND COMMUNITY TYPE. Planted Pine/St. Johns Wort

NOTES: Vegetation in plot cleared when transect was re-established.

(tc91-297 4\MRDEC 94)

TRAILRIDGE LANDFILL - WETLANDS MONITORING PLAN
CLASS I - STORMWATER POND

SECOND STUDY		DATE: 28 December 1994	
TRANSECT NUMBER: 2		FIELD INVESTIGATOR: Todd Wilkinson	
<u>Hydrology</u> Piezometer No. P-2	<u>Water Elevation</u> 103.1'	<u>Vegetation</u> Quadrat No. S-2	
GROUND COVER & SHRUBS			
<u>Species</u>	<u>Status</u>	<u>% Cover</u>	
Ilex glabra	U	30	
Smilax laurifolia	S	20	
Sphagnum sp.	S	40	
Eriocaulon sp	S	20	
Centella asiatica	T	10	
Myrica cerifera	U	20	
VEGETATION IN GENERAL VICINITY			
<u>Species</u>	<u>Status</u>	<u>Relative Abundance</u>	
Hypericum fasciculatum	T	Dominant groundcover	
Smilax laurifolia	S	Dominant groundcover	
Ilex glabra	U	Dominant groundcover	
Ilex myrtifolia	S	Dominant subcanopy	
Eriocaulon sp.	S	Dominant groundcover	
Sphagnum sp.	S	Dominant groundcover	
Panicum sp.	U	Dominant groundcover	
Rhyncosphora sp	U	Dominant groundcover	
WETLAND COMMUNITY TYPE. Planted Pine/St. Johns Wort			
NOTES:			

(tc\91-297 4\MRDEC 94)

TRAILRIDGE LANDFILL - WETLANDS MONITORING PLAN
CLASS I - STORMWATER POND

SECOND STUDY	DATE. 28 December 1994
TRANSECT NUMBER. 2	FIELD INVESTIGATOR: Todd Wilkinson

<u>Hydrology</u> Piezometer No. P-3	<u>Water Elevation</u> 102.9'	<u>Vegetation</u> Quadrat No. S-3
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GROUND COVER & SHRUBS		
<u>Species</u>	<u>Status</u>	<u>% Cover</u>
Magnolia virginiana	S	40
Sphagnum sp.	S	80
Ilex glabra	U	15
Aristida stricta	U	20
Nyssa sylvatica var biflora	S	5
Eriocaulon sp	S	30
Open (water)		5

VEGETATION IN GENERAL VICINITY		
<u>Species</u>	<u>Status</u>	<u>Relative Abundance</u>
Nyssa sylvatica var. biflora	S	Scattered in canopy
Magnolia virginiana	S	Several small trees
Sphagnum sp	S	Several small trees
Erianthus sp.	U	Scattered groundcover
Cyrilla racemiflora	I	Scattered in subcanopy
Eriocaulon sp.	S	Scattered groundcover
Eleocharis sp.	S	Scattered groundcover

WETLAND COMMUNITY TYPE: Hardwood Swamp (Recently cut)

NOTES. Standing water in transect

(tc91-297.4\MRDEC.94)

TRAILRIDGE LANDFILL - WETLANDS MONITORING PLAN
CLASS I - STORMWATER POND

SECOND STUDY	DATE: 28 December 1994
TRANSECT NUMBER: 2	FIELD INVESTIGATOR: Todd Wilkinson

<u>Hydrology</u> Piezometer No. P-4	<u>Water Elevation</u> 103.1'	<u>Vegetation</u> Quadrat No. S-4
--	----------------------------------	--------------------------------------

GROUND COVER & SHRUBS		
<u>Species</u>	<u>Status</u>	<u>% Cover</u>
Persea Palustris	S	2 (1 sapling)
Sphagnum sp.	S	95

VEGETATION IN GENERAL VICINITY		
<u>Species</u>	<u>Status</u>	<u>Relative Abundance</u>
Ilex myrtifolia	S	Widely scattered
Acer rubrum	T	Widely scattered
Nyssa sylvatica var biflora	S	Dominant canopy
Taxodium distichum	S	Dominant canopy
Pinus elliotii	U	Dominant canopy
Magnolia virginiana	S	Dominant canopy
Serenoa repens	U	Near transect
Ilex glabra	U	Near transect
Myrica cerifera	U	Dominant groundcover
Sphagnum sp.	S	Dominant groundcover

WETLAND COMMUNITY TYPE

NOTES. Standing water in transect and square meter plot, 4"-6" deep.
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(tc91-297 4\MRDEC.94)

TRAILRIDGE LANDFILL - WETLANDS MONITORING PLAN
CLASS I - STORMWATER POND

SECOND STUDY	DATE: 28 December 1994	
TRANSECT NUMBER: 2	FIELD INVESTIGATOR: Todd Wilkinson	
<u>Hydrology</u> Piezometer No. P-5	<u>Water Elevation</u> 103.1'	<u>Vegetation</u> Quadrat No. S-5
GROUND COVER & SHRUBS		
<u>Species</u>	<u>Status</u>	<u>% Cover</u>
Magnolia virginiana	S	70
Nyssa sylvatica var. biflora	S	5
Sphagnum sp.	S	60
Rhynchospora sp.	U	
Aristida stricta	U	50
Ilex glabra	U	5
Open		5
VEGETATION IN GENERAL VICINITY		
<u>Species</u>	<u>Status</u>	<u>Relative Abundance</u>
Nyssa sylvatica var. biflora	S	Dominant canopy & subcanopy
Pinus elliotii	U	Dominant canopy & subcanopy
Magnolia virginiana	S	Dominant canopy & subcanopy
Taxodium distichum	S	Dominant canopy & subcanopy
Eriocaulon sp.	S	Scattered groundcover
Rhynchospora sp.	U	Scattered groundcover
Sarracenia minor	T	Scattered groundcover
WETLAND COMMUNITY TYPE: Hardwood Swamp (recently cut)		
NOTES: Standing water in transect and near plot.		

(tc\91-2974\MRDEC 94)

TRAILRIDGE LANDFILL - WETLANDS MONITORING PLAN
CLASS I - STORMWATER POND

SECOND STUDY		DATE: 28 December 1994	
TRANSECT NUMBER: 2		FIELD INVESTIGATOR: Todd Wilkinson	
<u>Hydrology</u> Piezometer No. P-6	<u>Water Elevation</u> 102.6'	<u>Vegetation</u> Quadrat No. S-6	
GROUND COVER & SHRUBS			
<u>Species</u>	<u>Status</u>	<u>% Cover</u>	
Ilex glabra	U	20	
Ilex coriacea	T	20	
Magnolia virginiana	S	2 trees	
Nyssa sylvatica var. biflora	S	1 tree	
Open		80	
VEGETATION IN GENERAL VICINITY			
<u>Species</u>	<u>Status</u>	<u>Relative Abundance</u>	
Ilex coriacea	T	Dominant vegetation	
Ilex myrtifolia	S	Dominant vegetation	
Magnolia virginiana	S	Dominant vegetation	
Pinus elliotti	U	Dominant vegetation	
WETLAND COMMUNITY TYPE. Hardwood Swamp (recently cut)			
NOTES:			

TRAILRIDGE LANDFILL - WETLANDS MONITORING PLAN
CLASS I - STORMWATER POND

SECOND STUDY		DATE: 28 December 1994	
TRANSECT NUMBER: 2		FIELD INVESTIGATOR: Todd Wilkinson	
<u>Hydrology</u> Piezometer No. P-7	<u>Water Elevation</u> 102.0'	<u>Vegetation</u> Quadrat No. S-7	
GROUND COVER & SHRUBS			
<u>Species</u>	<u>Status</u>	<u>% Cover</u>	
Ilex coriacea	T	10	
Ilex glabra	U	50	
Myrica heterophylla	U	5	
Sphagnum sp.	S	10	
Open		75	
VEGETATION IN GENERAL VICINITY			
<u>Species</u>	<u>Status</u>	<u>Relative Abundance</u>	
Pinus elliottii	U	Planted - sole canopy species	
Ilex glabra	U	Dominant groundcover	
Ilex coriacea	T	Dominant groundcover	
Smilax laurifolia	S	Dominant groundcover	
Vitis sp.	U	Dominant groundcover	
Pteridium aquilinum	U	Dominant groundcover	
WETLAND COMMUNITY TYPE: Planted Pine/Gallberry			
NOTES:			

(tc\91-297 4\MRDEC.94)

TRAILRIDGE LANDFILL - WETLANDS MONITORING PLAN
CLASS I - STORMWATER POND

SECOND STUDY	DATE: 28 December 1994	
TRANSECT NUMBER. 3	FIELD INVESTIGATOR: Todd Wilkinson	
<u>Hydrology</u> Piezometer No P-1	<u>Water Elevation</u> 105.3'	
<u>Vegetation</u> Quadrat No. S-1		
GROUND COVER & SHRUBS		
<u>Species</u>	<u>Status</u>	<u>% Cover</u>
Eriocaulon sp	S	50
Myrica heterophylla	U	10
Ilex glabra	U	10
Xyris lupicari	U	5
Ilex coriacea	T	10
Hypericum fasciculatum	T	10
Open		20
VEGETATION IN GENERAL VICINITY		
<u>Species</u>	<u>Status</u>	<u>Relative Abundance</u>
Persea palustris	S	A few trees
Nyssa sylvatica var. biflora	S	Scattered among canopy
Pinus elliotii	U	Dominant canopy
Acer rubrum	T	A few saplings
Ilex coriacea	T	Dominant groundcover
Ilex glabra	U	Dominant groundcover
Smilax lauriflora	S	Dominant groundcover
Lycopodium alopecuroides	U	Scattered among groundcover
WETLAND COMMUNITY TYPE: Planted Pine/St Johns Wort		
NOTES.		

* - Submerged, T = Transitional, V = Upland, I = Invisible

(tc\91-297 4\MRDEC 94)

TRAILRIDGE LANDFILL - WETLANDS MONITORING PLAN
CLASS I - STORMWATER POND

SECOND STUDY	DATE: 28 December 1994
TRANSECT NUMBER. 3	FIELD INVESTIGATOR: Todd Wilkinson

<u>Hydrology</u> Piezometer No. P-2	<u>Water Elevation</u> 103.9	<u>Vegetation</u> Quadrat No. S-2
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GROUND COVER & SHRUBS		
<u>Species</u>	<u>Status</u>	<u>% Cover</u>
Sarracenia minor	T	10
Sphagnum sp.	S	40
Eriocaulon sp.	S	5
Lycopodium alopecuroides	U	2
Ilex coriacea	T	5
Myrica heterophylla	U	5
Aristida stricta	U	30
Hypericum fasciculatum	T	2 shrubs
Smilax laurifolia	S	2
Open		15

VEGETATION IN GENERAL VICINITY		
<u>Species</u>	<u>Status</u>	<u>Relative Abundance</u>
Cyrilla racemiflora	I	Dominant canopy
Magnolia virginiana	S	Several large trees
Nyssa sylvatica var. biflora	S	Several saplings
Acer rubrum	T	A few trees
Smilax laurifolia	S	Dominant groundcover
Hypericum fasciculatum	T	Dominant groundcover
Myrica heterophylla	U	Dominant groundcover
Sphagnum sp.	S	Dominant groundcover

WETLAND COMMUNITY TYPE: Planted Pine/St. Johns Wort

NOTES Soils in plot saturated to the surface.
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(tc\91-297.4\MRDEC.94)

TRAILRIDGE LANDFILL - WETLANDS MONITORING PLAN
CLASS I - STORMWATER POND

SECOND STUDY		DATE: 28 December 1994	
TRANSECT NUMBER: 3		FIELD INVESTIGATOR: Todd Wilkinson	
<u>Hydrology</u> Piezometer No. P-3	<u>Water Elevation</u> 103.3'	<u>Vegetation</u> Quadrat No. S-3	

GROUND COVER & SHRUBS		
<u>Species</u>	<u>Status</u>	<u>% Cover</u>
Myrica heterophylla	U	20
Lyonia lucida	T	80
Ilex coriacea	T	30
Aronia arbutifolia	U	10
Sphagnum sp.	S	20
Acer rubrum	T	10
Magnolia virginiana	S	10
Open		10

VEGETATION IN GENERAL VICINITY		
<u>Species</u>	<u>Status</u>	<u>Relative Abundance</u>
Magnolia virginiana	S	30% - Canopy
Taxodium distichum	S	1 large tree
Persea palustris	S	30% - Canopy
Nyssa sylvatica var. biflora	S	30% - Canopy
Ilex coriacea	T	Dominant groundcover
Lyonia lucida	T	Dominant groundcover
Sphagnum sp	S	Dominant groundcover

WETLAND COMMUNITY TYPE. Hardwood Swamp (recently cut)

NOTES. Standing water in transect

(tc\91-297 4\MRDEC.94)

TRAILRIDGE LANDFILL - WETLANDS MONITORING PLAN
CLASS I - STORMWATER POND

SECOND STUDY	DATE. 28 December 1994	
TRANSECT NUMBER: 3	FIELD INVESTIGATOR: Todd Wilkinson	
<u>Hydrology</u> Piezometer No. P-4	<u>Water Elevation</u> 103.7'	<u>Vegetation</u> Quadrat No. S-4
GROUND COVER & SHRUBS		
<u>Species</u>	<u>Status</u>	<u>% Cover</u>
Sphagnum sp	S	100
Eriocaulon sp.	S	
Myrica heterophylla	U	5
Rhynchospora sp.	U	1
Lyonia lucida	T	5
VEGETATION IN GENERAL VICINITY		
<u>Species</u>	<u>Status</u>	<u>Relative Abundance</u>
Sphagnum sp.	S	Dominant groundcover
Andropogon sp.	U	Scattered groundcover
Nyssa sylvatica var. biflora	S	Dominant canopy
Myrica heterophylla	U	Scattered in groundcover
Lyonia lucida	T	Scattered in groundcover
Ilex myrtifolia	S	Scattered in subcanopy
WETLAND COMMUNITY TYPE. Hardwood Swamp (recently cut)		
NOTES Flowing channel at base of piezometer with common arrowhead (<i>Sagittaria latifolia</i>). Soil within plot saturated to the surface.		

* - Submerged, T = Transitional, V = Upland, I = Invisible

(tc\91-297.4\MRDEC 94)

TRAILRIDGE LANDFILL - WETLANDS MONITORING PLAN
CLASS I - STORMWATER POND

SECOND STUDY	DATE: 28 December 1994	
TRANSECT NUMBER: 3	FIELD INVESTIGATOR: Todd Wilkinson	
<u>Hydrology</u> Piezometer No P-5	<u>Water Elevation</u> 103.2'	<u>Vegetation</u> Quadrat No. S-5
GROUND COVER & SHRUBS		
<u>Species</u>	<u>Status</u>	<u>% Cover</u>
Groundcover:		
Sphagnum sp.	S	50
Cyperus or Carex sp.	T	80
Open		10
Subcanopy		
Ilex glabra	U	Several shrubs
Ilex coriacea	T	Several shrubs
Nyssa sylvatica var biflora	S	1 large sapling
Cyrilla racemiflora	I	1 small shrub
VEGETATION IN GENERAL VICINITY		
<u>Species</u>	<u>Status</u>	<u>Relative Abundance</u>
Magnolia virginiana	S	Dominant canopy
Nyssa sylvatica var. biflora	S	Dominant canopy
Taxodium distichum	S	Dominant canopy
Cyrilla racemiflora	I	Dominant subcanopy
Myrica heterophylla	U	Dominant groundcover
Smilax laurifolia	S	Dominant groundcover
Sphagnum sp.	S	Dominant groundcover
Eriocaulon sp.	S	Dominant groundcover
WETLAND COMMUNITY TYPE: Hardwood Swamp (recently cut)		
NOTES: Large area of standing water near piezometer.		

(tc\91-297 4\MRDEC.94)

TRAILRIDGE LANDFILL - WETLANDS MONITORING PLAN
CLASS I - STORMWATER POND

SECOND STUDY	DATE: 28 December 1994	
TRANSECT NUMBER. 3	FIELD INVESTIGATOR: Todd Wilkinson	
<u>Hydrology</u> Piezometer No. P-6	<u>Water Elevation</u> 102.82'	<u>Vegetation</u> Quadrat No. S-6
GROUND COVER & SHRUBS		
<u>Species</u>	<u>Status</u>	<u>% Cover</u>
Lyonia lucida	T	100
Cyrilla racemiflora	I	10
Aronia arbutifolia	U	5
Persea palustris	S	5
VEGETATION IN GENERAL VICINITY		
<u>Species</u>	<u>Status</u>	<u>Relative Abundance</u>
Pinus elliottii	U	Dominant canopy - in rows
Magnolia virginiana	S	Scattered among pines
Nyssa sylvatica var biflora	S	Scattered among pines
Lyonia lucida	T	Dominant groundcover
Serenoa repens	U	Scattered among <u>Lyonia</u>
Aronia arbutifolia	U	Scattered among <u>Lyonia</u>
Ilex glabra	U	Scattered among <u>Lyonia</u>
Ilex casine	S	Scattered among <u>Lyonia</u>
Cyrilla racemiflora	I	Scattered among <u>Lyonia</u>
WETLAND COMMUNITY TYPE Hardwood Swamp (recently cut)		
NOTES Plot very overgrown with <u>Lyonia</u> .		

(tc\91-297.4\MRDEC 94)

TRAILRIDGE LANDFILL - WETLANDS MONITORING PLAN
CLASS I - STORMWATER POND

SECOND STUDY		DATE: 28 December 1994	
TRANSECT NUMBER: 4		FIELD INVESTIGATOR: Todd Wilkinson	
<u>Hydrology</u> Piezometer No. P-1		<u>Water Elevation</u> 108.2'	
<u>Vegetation</u> Quadrat No. S-1			
GROUND COVER & SHRUBS			
<u>Species</u>	<u>Status</u>	<u>% Cover</u>	
Aristida stricta		10	
Lycopodium alopecuroides	U	1	
Woodwardia areolata	T	5	
Carex or Cyperus sp	T	50	
Dicanthelium sp.	U	30	
Eriocaulon sp.	S	15	
Myrica heterophylla	U	15	
Ilex glabra	U	30	
Hypericum fasciculatum	T	30	
Open		20	
VEGETATION IN GENERAL VICINITY			
<u>Species</u>	<u>Status</u>	<u>Relative Abundance</u>	
Pinus elliottii	U	Sparse - in rows	
Acer rubrum	T	Scattered among pines	
Nyssa sylvatica var. biflora	S	Scattered among pines	
Magnolia virginiana	S	Scattered among pines	
Hypericum fasciculatum	T	Dominant groundcover	
Myrica heterophylla	U	Dominant groundcover	
Smilax laurifolia	S	Dominant groundcover	
Aronia arbutifolia	U	Dominant groundcover	
Xyris jupicai	U	Groundcover	
Panicum sp.	U	Groundcover	
WETLAND COMMUNITY TYPE. Planted Pine/St. Johns Wort			
NOTES: Standing water/flow channel near plot.			

(tc\91-297 4\MRDEC.94)

TRAILRIDGE LANDFILL - WETLANDS MONITORING PLAN
CLASS I - STORMWATER POND

SECOND STUDY		DATE: 28 December 1994	
TRANSECT NUMBER: 4		FIELD INVESTIGATOR: Todd Wilkinson	
<u>Hydrology</u> Piezometer No. P-2	<u>Water Elevation</u> 107.7'	<u>Vegetation</u> Quadrat No. S-2	
GROUND COVER & SHRUBS			
<u>Species</u>	<u>Status</u>	<u>% Cover</u>	
Groundcover:			
Sarracenia minor	T	2	
Eriocaulon sp.	S	40	
Myrica heterophylla	U	10	
Sphagnum sp.	S	20	
Aristida stricta	U	10	
Ilex glabra	U	20	
Hypericum fasciculatum	T	30	
Nyssa sylvatica var. biflora	S	Scattered	
Open		60	
VEGETATION IN GENERAL VICINITY			
<u>Species</u>	<u>Status</u>	<u>Relative Abundance</u>	
Pinus elliottii	U	Scattered - planted in rows	
Nyssa sylvatica var. biflora	S	Mixed subcanopy	
Magnolia virginiana	S	Mixed subcanopy	
Ilex glabra	U	Groundcover	
Ilex coriacea	T	Groundcover	
Myrica heterophylla	U	Groundcover	
Hypericum fasciculatum	T	Groundcover	
WETLAND COMMUNITY TYPE: Planted Pine/St. Johns Wort			
NOTES:			

(tc\91-297.4\MRDEC.94)

TRAILRIDGE LANDFILL - WETLANDS MONITORING PLAN
CLASS I - STORMWATER POND

SECOND STUDY	DATE: 28 December 1994
TRANSECT NUMBER: 4	FIELD INVESTIGATOR: Todd Wilkinson

<u>Hydrology</u> Piezometer No. P-3	<u>Water Elevation</u> 109 0'	<u>Vegetation</u> Quadrat No. S-3
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GROUND COVER & SHRUBS		
<u>Species</u>	<u>Status</u>	<u>% Cover</u>
Ilex coriacea	T	100
Lyonia lucida	T	75
Magnolia virginiana	S	5

VEGETATION IN GENERAL VICINITY		
<u>Species</u>	<u>Status</u>	<u>Relative Abundance</u>
Pinus elliotti	U	Dominant canopy
Acer rubrum	T	Dominant canopy
Cyrilla racemiflora	U	Dominant canopy
Nyssa sylvatica var. biflora	S	Dominant canopy
Magnolia virginiana	S	Dominant canopy
Ilex coriacea	T	Dominant groundcover
Lyonia lucida	T	Dominant groundcover
Osmunda cinnamomea	T	Dominant groundcover

WETLAND COMMUNITY TYPE. Hardwood Swamp (recently cut)

NOTES Flowing water 2" in depth adjacent to piezometer.
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(tc\91-297.4\MRDEC 94)

TRAILRIDGE LANDFILL - WETLANDS MONITORING PLAN
CLASS I - STORMWATER POND

SECOND STUDY	DATE. 28 December 1994	
TRANSECT NUMBER. 6	FIELD INVESTIGATOR: Todd Wilkinson	
<u>Hydrology</u> Piezometer No P-1	<u>Water Elevation</u> 116.0'	<u>Vegetation</u> Quadrat No. S-1
GROUND COVER & SHRUBS		
<u>Species:</u> *Shrubs	<u>Status</u>	<u>% Cover</u>
Ilex glabra	U	100
Aronia arbutifolia	U	10
Open		75
VEGETATION IN GENERAL VICINITY		
<u>Species</u>	<u>Status</u>	<u>Relative Abundance</u>
Pinus elliotti	U	Dominant canopy
Persea palustris	S	Scattered subcanopy
Magnolia virginiana	S	Scattered subcanopy
Nyssa sylvatica var biflora	S	Scattered subcanopy
Ilex glabra	U	Dominant groundcover
Aronia arbutifolia	U	Dominant groundcover
Smilax laurifolia	S	Dominant groundcover
WETLAND COMMUNITY TYPE. Pond Pine Seepage Slope		
NOTES. *No real groundcover species present in quadrat.		

(tc\91-297 4\MRDEC 94)

**TRAILRIDGE LANDFILL - WETLANDS MONITORING PLAN
CLASS I - STORMWATER POND**

SECOND STUDY	DATE. 28 December 1994	
TRANSECT NUMBER: 6	FIELD INVESTIGATOR: Todd Wilkinson	

<u>Hydrology</u> Piezometer No P-2	<u>Water Elevation</u> 114.3'	<u>Vegetation</u> Quadrat No. S-2
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GROUND COVER & SHRUBS		
<u>Species</u>	<u>Status</u>	<u>% Cover</u>
Ilex coriacea	T	80
Open		100

VEGETATION IN GENERAL VICINITY		
<u>Species</u>	<u>Status</u>	<u>Relative Abundance</u>
Pinus serotina	T	Dominant canopy
Pinus elliotii	U	Dominant canopy
Nyssa sylvatica var. biflora	S	Dominant canopy
Acer rubrum	T	Dominant canopy
Persea palustris	S	Dominant canopy
Aronia arbutifolia	U	Dominant groundcover
Ilex coriacea	T	Dominant groundcover

WETLAND COMMUNITY TYPE: Pond Pine Seepage Slope

NOTES

**TRAILRIDGE LANDFILL - WETLANDS MONITORING PLAN
CLASS I - STORMWATER POND**

SECOND STUDY		DATE: 28 December 1994
TRANSECT NUMBER: 6		FIELD INVESTIGATOR: Todd Wilkinson
<u>Hydrology</u> Piezometer No. P-3	<u>Water Elevation</u> 114.1'	<u>Vegetation</u> Quadrat No S-3
GROUND COVER & SHRUBS		
<u>Species</u>	<u>Status</u>	<u>% Cover</u>
Leucothoe axillaris	T	30
Ilex coriacea	T	30
Nyssa sylvatica var. biflora	S	30
Open		80
VEGETATION IN GENERAL VICINITY		
<u>Species</u>	<u>Status</u>	<u>Relative Abundance</u>
Nyssa sylvatica var. biflora	S	50% Dominant canopy
Pinus serotina	T	Dominant canopy
Acer rubrum	T	Dominant canopy
Magnolia virginiana	S	Dominant canopy
Pinus elliotti	U	Dominant canopy
Lyonia lucida	T	Dominant groundcover
Leucothoe axillaris	T	Dominant groundcover
Ilex coriacea	T	Dominant groundcover
Woodwardia virginica	T	Dominant groundcover
Cyrilla racemiflora	I	Dominant canopy
WETLAND COMMUNITY TYPE: Hardwood Swamp (uncut)		
NOTES		

(tc\91-297.4\MRDEC.94)

TRAILRIDGE LANDFILL - WETLANDS MONITORING PLAN
CLASS I - STORMWATER POND

SECOND STUDY	DATE. 28 December 1994
TRANSECT NUMBER: 7	FIELD INVESTIGATOR: Todd Wilkinson

<u>Hydrology</u> Piezometer No. P-1	<u>Water Elevation</u> 112.0'	<u>Vegetation</u> Quadrat No. S-1
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GROUND COVER & SHRUBS		
<u>Species</u>	<u>Status</u>	<u>% Cover</u>
Ilex glabra	U	90
Smilax glauca	U	3
Smilax laurifolia	S	3
Dicanthelium sp.	U	5

VEGETATION IN GENERAL VICINITY		
<u>Species</u>	<u>Status</u>	<u>Relative Abundance</u>
Pinus elliotti	U	Dominant canopy
Magnolia virginiana	S	Dominant subcanopy
Persea palustris	S	Dominant subcanopy
Nyssa sylvatica var. biflora	S	Dominant subcanopy
Ilex glabra	U	Dominant groundcover
Smilax glauca	U	Dominant groundcover

WETLAND COMMUNITY TYPE: Planted Pine/Gallberry
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NOTES:

(tc\91-297 4\MRDEC.94)

TRAILRIDGE LANDFILL - WETLANDS MONITORING PLAN
CLASS I - STORMWATER POND

SECOND STUDY		DATE: 28 December 1994	
TRANSECT NUMBER: 7		FIELD INVESTIGATOR: Todd Wilkinson	
<u>Hydrology</u> Piezometer No. P-2	<u>Water Elevation</u> 110.9'	<u>Vegetation</u> Quadrat No. S-2	
GROUND COVER & SHRUBS			
<u>Species</u>	<u>Status</u>	<u>% Cover</u>	
Aronia arbutifolia	U	10	
Leucothoe axillaris	T	70	
Ilex glabra	U	20	
Smilax glauca	U	5	
Open		40	
VEGETATION IN GENERAL VICINITY			
<u>Species</u>	<u>Status</u>	<u>Relative Abundance</u>	
Pinus elliotii	U	Dominant canopy	
Ilex cassine	S	Dominant thick subcanopy	
Persea palustris	S	Dominant thick subcanopy	
Magnolia virginiana	S	Dominant thick subcanopy	
Ilex coriacea	T	Dominant shrub & groundcover	
Leucothoe axillaris	T	Dominant groundcover	
Nyssa sylvatica var. biflora (sapling)	S	Dominant shrub & groundcover	
Ilex glabra	U	Dominant groundcover	
Sphagnum sp	S	Dominant groundcover	
Eriocaulon sp.	S	Dominant groundcover	
WETLAND COMMUNITY TYPE: Planted Pine/Gallberry			
NOTES			

(tc\91-297.4\MRDEC.94)

TRAILRIDGE LANDFILL - WETLANDS MONITORING PLAN
CLASS I - STORMWATER POND

SECOND STUDY	DATE: 28 December 1994
TRANSECT NUMBER: 7	FIELD INVESTIGATOR: Todd Wilkinson

<u>Hydrology</u> Piezometer No. P-3	<u>Water Elevation</u> 110.4'	<u>Vegetation</u> Quadrat No. S-3
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GROUND COVER & SHRUBS		
<u>Species</u>	<u>Status</u>	<u>% Cover</u>
Persea palustris	S	30
Osmunda cinnamomea	T	5
Ilex glabra	U	5
Open		80
Nyssa sylvatica var. biflora	S	2 trees in quadrat
Persea palustris	S	2 saplings in quadrat

VEGETATION IN GENERAL VICINITY		
<u>Species</u>	<u>Status</u>	<u>Relative Abundance</u>
Nyssa sylvatica var. biflora	S	Dominant canopy
Pinus elliottii	U	Dominant canopy
Acer rubrum	T	Dominant canopy
Persea palustris	S	Dominant canopy
Ilex coriacea	T	Dominant subcanopy
Ilex glabra	U	Widely scattered
Leucothoe axillaris	T	Dominant groundcover

WETLAND COMMUNITY TYPE. Pond Pine Seepage Slope

NOTES:
