S.R. 200
PD&E STUDY REEVALUATION

S.R. 200 PD&E Study Reevaluation

From U.S. 41 to N. of the Marion County Line
Citrus County, Florida
WPI Segment No. 257188 1
FAP No. FL62-020R

FINAL

LOCATION HYDRAULICS REPORT

Florida Department of Transportation
District 7, Tampa, Florida

March 2001
Revised June 2002

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Prepared by:

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Tampa, Florida

Prepared for:

Florida Department of Transportation

District 7, Tampa, Florida

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1.0 GENERAL PROJECT DESCRIPTION

1.1 INTRODUCTION

In November 1996, the Florida Department of Transportation (FDOT) received Federal Highway Administration's (FHWA) approval on a Project Development and Environment (PD&E) Study that evaluated improvement alternatives along the S.R. 200 corridor. The limits of the PD&E Study extended from U.S. 41 (S.R. 45) in Citrus County to C.R. 484 in Marion County, a length of approximately 12.9 miles. Following consideration of the future traffic demand, motorist safety and evacuation needs, it was recommended to widen the subject segment of S.R. 200 to a four-lane divided facility.

In accordance with Code 23 of Federal Regulations (CFR) Part 771.129, FDOT is currently conducting a PD&E Study Reevaluation for the segment of S.R. 200 which extends from U.S. 41 in Citrus County (Station 0+00) to just north of the Marion County Line (Station 352+07.04), a length of approximately 6.7 miles. The project is located in Sections 23, 14, 11 and 2 of Township 18S and Range 19E, Sections 35, 36 and 25 of Township 17S and Range 19E and Section 30 of Township 17S and Range 20E within Citrus County, Florida. In addition, the project is in FDOT Rainfall Zone 5 and is under the jurisdictions of the Southwest Florida Water Management District (SWFWMD), the Florida Department of Environmental Protection (FDEP), the United States Environmental Protection Agency (EPA) and the United States Army Corps of Engineers (ACOE). Figure 1 depicts the location and the limits of the Reevaluation study area.

This Reevaluation will use current data to re-assess the effects of implementing the recommendations of the original PD&E study and, where possible, will modify these recommendations to further minimize these effects. The project is identified as Work Program Item (WPI) Segment Number 257188 1 and Federal Aid Program (FAP) Number FL62-020R.

1.2 PURPOSE AND SCOPE

Executive Order 11988 "Floodplain Management", USDOT Order 5650.2, "Floodplain Management and Protection", and 23 CFR 650 mandate protection of floodplains and floodways. As outlined in the current version of Chapter 24 of the FDOT's PD&E Manual, these regulations are intended to "minimize highway encroachments within the 100-year base floodplain, where practicable, and to avoid supporting land use development which is incompatible with floodplains value". State and local floodplain criteria will be met.

The Location Hydraulics Report (LHR) and the Pond Sitting Report -presented in a separate document- are part of the documentations needed to complete the PD&E Study Reevaluation of the S.R. 200 project. This effort will reevaluate and update the previous LHR that was prepared by FDOT District 5 dated in December 1993. A copy of the previous LHR is included in Appendix A.

1.3 PROJECT DESCRIPTION

Within the limits of the reevaluation study area, S.R. 200 is a two-lane undivided rural facility centered within 100 feet of right-of-way. The existing typical section, in general, provides two 11-foot-wide travel lanes and four-foot-wide paved shoulders and drainage ditches on each side. This typical section is shown on Figure 2. The only variation to this typical section is from south of East Arbor Lakes Drive to north of North Apache Trail, a distance of 0.7 miles, where S.R. 200 has been recently widened to provide two 12-foot-wide through lanes, a center 13-foot-wide two-way left turn lane, 4-foot-wide paved shoulders and 5-foot-wide sidewalks behind the ditches.

From north of East Summit Lane to approximately East Sapphire Lane, the speed limit is 50 miles per hour (mph) and from this point to the end of the project, the posted speed limit is 55 mph. The existing plans, dated 1936, do not indicate a design speed for this roadway.

1.4 ORIGINAL PD&E STUDY PROPOSED TYPICAL SECTIONS

The original PD&E Study recommended a four-lane urban divided highway from East Apex Lane to Tiger Eye Drive, a four-lane rural divided highway from Tiger Eye Drive to the Withlacoochee River and a bridge four-lane typical section. These recommendations were consistent with the results of the future traffic conditions analyses that pointed to the need for widening S.R. 200 to a four-lane divided facility.

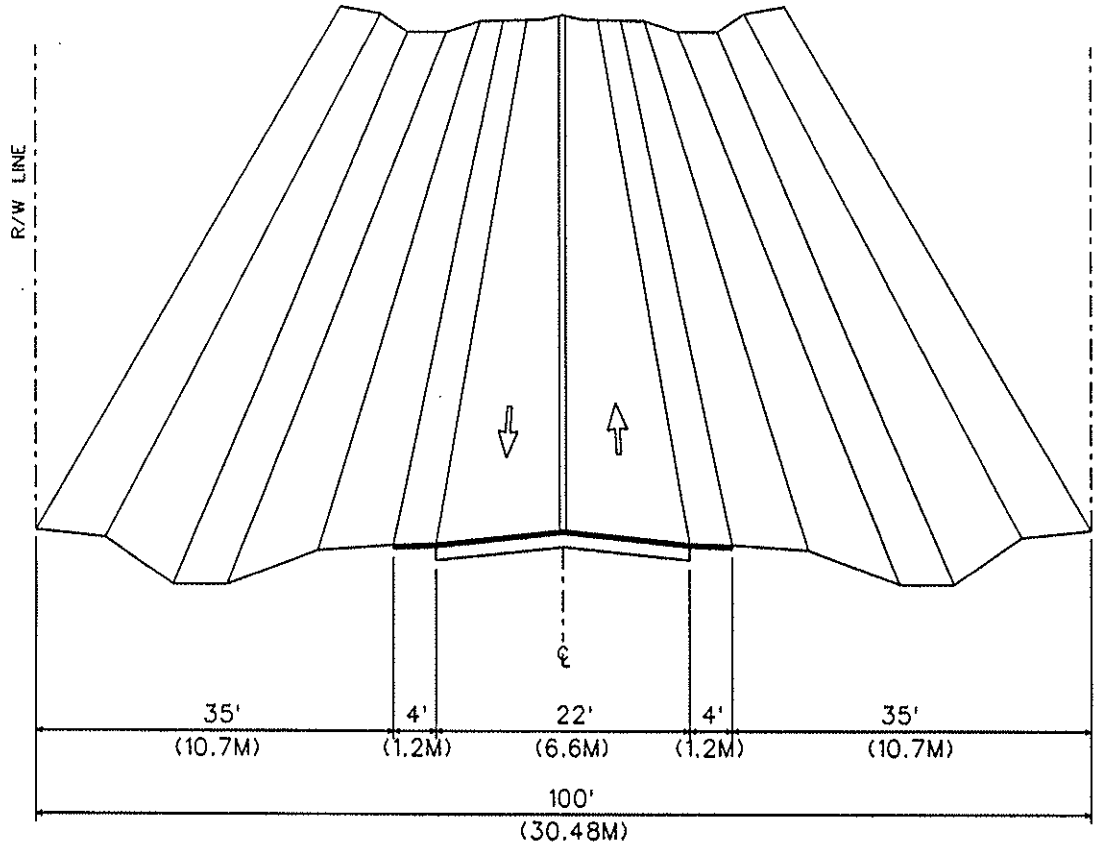
Figure 3 illustrates the urban, four-lane typical section that was recommended for the southern end of the project from U.S. 41 to East Lake Park Road. Figure 4 illustrates the rural, four-lane typical section that was recommended for the remainder of the project. Figure 5 illustrates the typical section recommendation for the bridge over Withlacoochee River. It should be noted that the spacing between the northbound and southbound bridges was inconsistent with the rural typical section median.

1.5 RECOMMENDED PROPOSED TYPICAL SECTIONS

The typical sections that are considered in this reevaluation for S.R. 200 are discussed in detail in a separate document, the "Typical Sections Memorandum". Figures 6 through 9 illustrate the typical sections recommended in this reevaluation for various segments of S.R. 200 from U.S. 41 to north of the Marion County Line.

1.5.1 Urban, Four-Lane Divided

Figure 6 presents the urban typical section. This typical section maintains the same design speed and fits within the existing 100-foot-wide right-of-way compared to the urban typical section recommended by the original PD&E Study.



NOTE: CONVERSIONS FROM ENGLISH TO METRIC UNITS ARE NOMINAL RATHER THAN EXACT

N.T.S.

S.R. 200
PD&E STUDY REEVALUATION

EXISTING TYPICAL SECTION

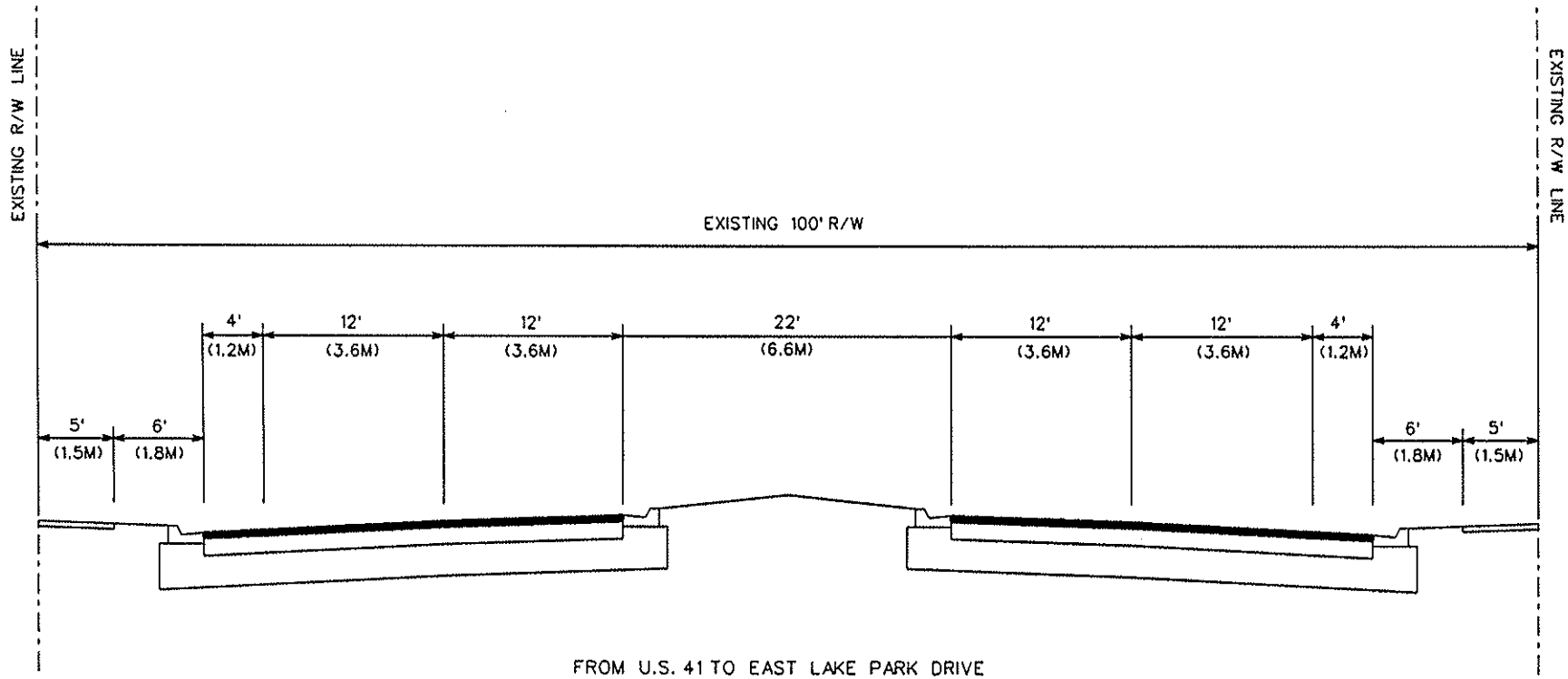
FIGURE 2

S.R. 200 PD&E STUDY
REEVALUATION

FROM U.S. 41 TO N. OF MARION COUNTY LINE

CITRUS COUNTY

WPI SEG. NO. 257188 1 ; FAP NO. FL62-020R



FROM U.S. 41 TO EAST LAKE PARK DRIVE

DESIGN SPEED 45 MPH (70km/h)

NOTE: CONVERSIONS FROM ENGLISH TO METRIC UNITS ARE NOMINAL RATHER THAN EXACT

N.T.S.

S.R. 200 PD&E STUDY REEVALUATION

ORIGINAL PD&E STUDY RECOMMEDATION FOR URBAN TYPICAL SECTION

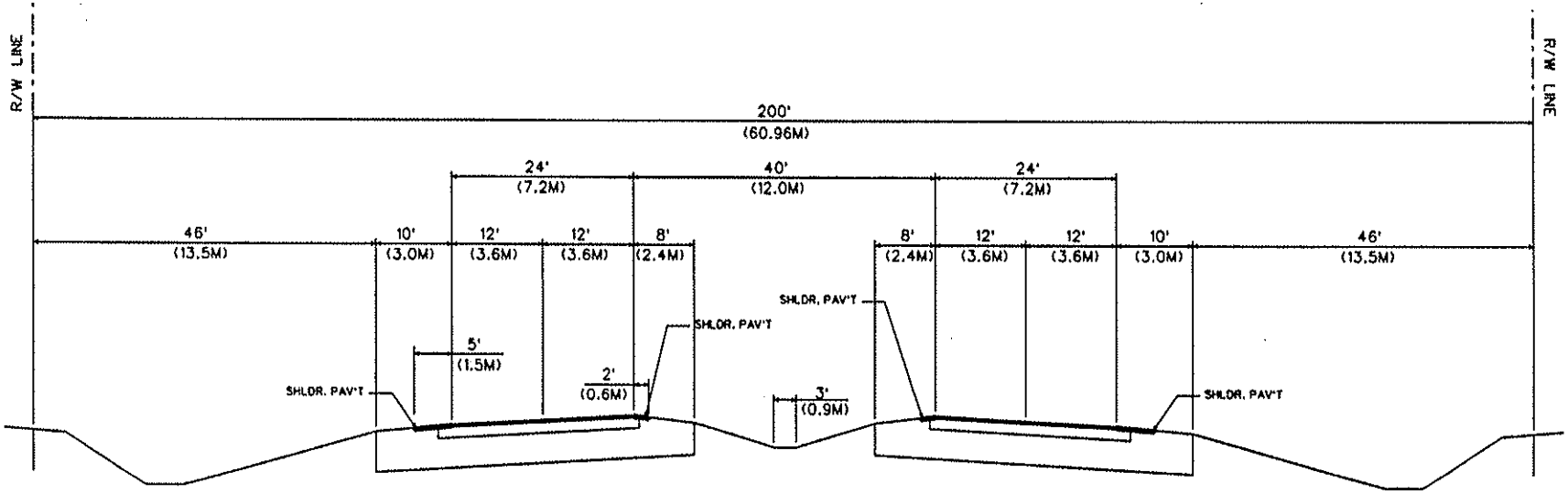
FIGURE 3

S.R. 200 PD&E STUDY REEVALUATION

FROM U.S. 41 TO N. OF MARION COUNTY LINE

CITRUS COUNTY

WPI SEG. NO. 257188 1 ; FAP NO. FL62-020R



FROM EAST LAKE PARK DRIVE
TO C.R. 484 IN MARION COUNTY

DESIGN SPEED 55 MPH (90km/h)

NOTE: CONVERSIONS FROM ENGLISH TO METRIC UNITS ARE NOMINAL RATHER THAN EXACT

N.T.S.

S.R. 200
PD&E STUDY REEVALUATION

ORIGINAL PD&E STUDY RECOMMEDATION FOR RURAL TYPICAL SECTION

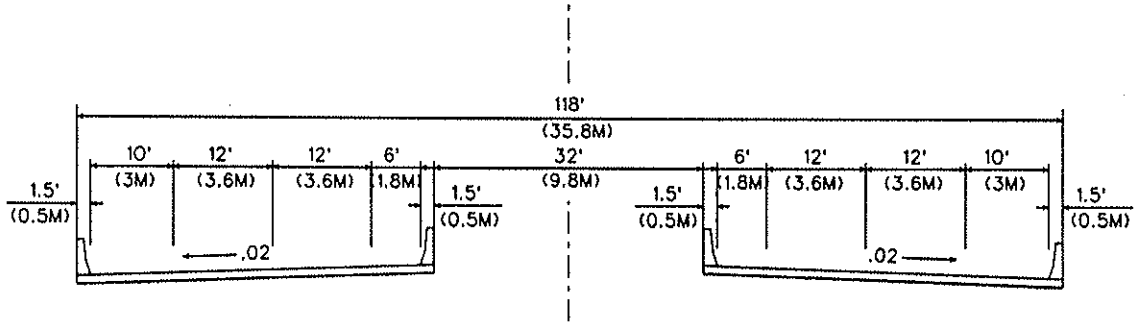
FIGURE 4

S.R. 200 PD&E STUDY REEVALUATION

FROM U.S. 41 TO N. OF MARION COUNTY LINE

CITRUS COUNTY

WPI SEG. NO. 257188 1 ; FAP NO. FL62-020R



BRIDGE OVER
WITHLACOOCHEE RIVER

DESIGN SPEED 55 MPH (90km/h)

NOTE: CONVERSIONS FROM ENGLISH TO METRIC UNITS ARE NOMINAL RATHER THAN EXACT

N.T.S.

S.R. 200
PD&E STUDY REEVALUATION

ORIGINAL PD&E STUDY
RECOMMEDATION FOR
BRIDGE TYPICAL SECTION

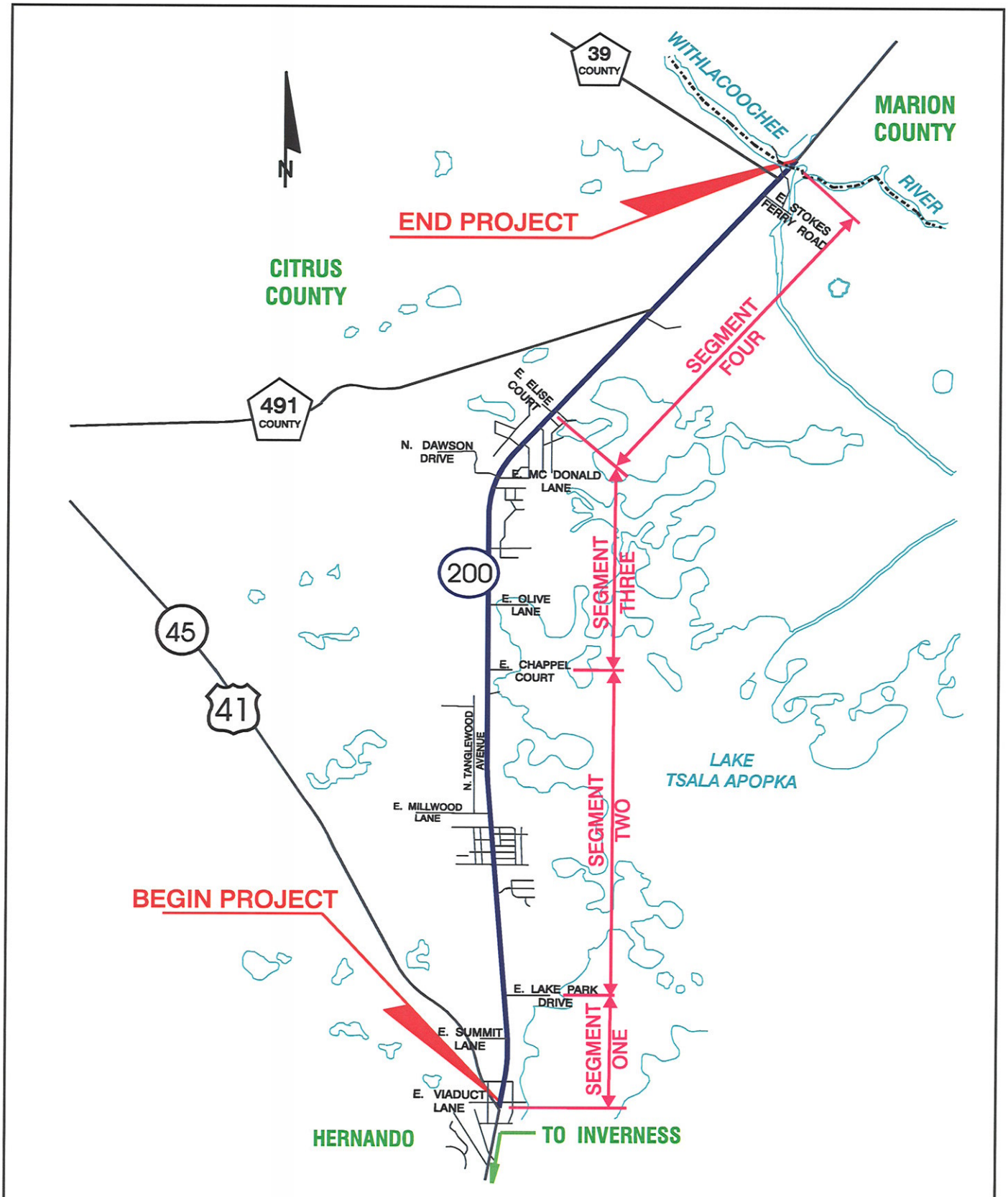
FIGURE 5

S.R. 200 PD&E STUDY
REEVALUATION

FROM U.S. 41 TO N. OF MARION COUNTY LINE

CITRUS COUNTY

WPI SEG. NO. 257188 1 ; FAP NO. FL62-020R

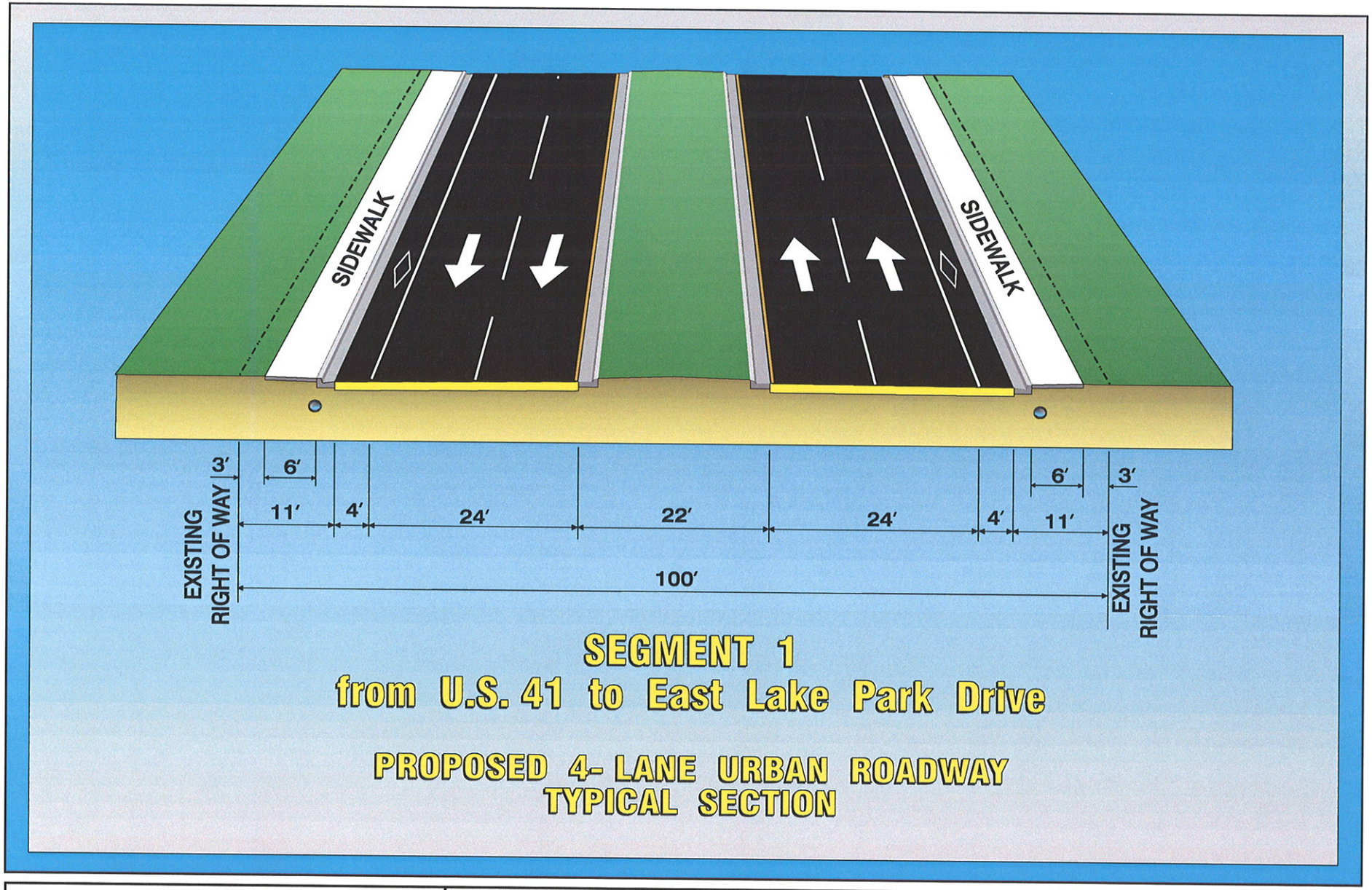


S.R. 200
PD&E STUDY REEVALUATION

PROJECT LOCATION MAP

FIGURE 1

S.R. 200 PD&E Study
Reevaluation
From U.S. 41 to N. of Marion County Line
Citrus County
WPI Seg. No. 257188 1; FAP No. FL62-020R

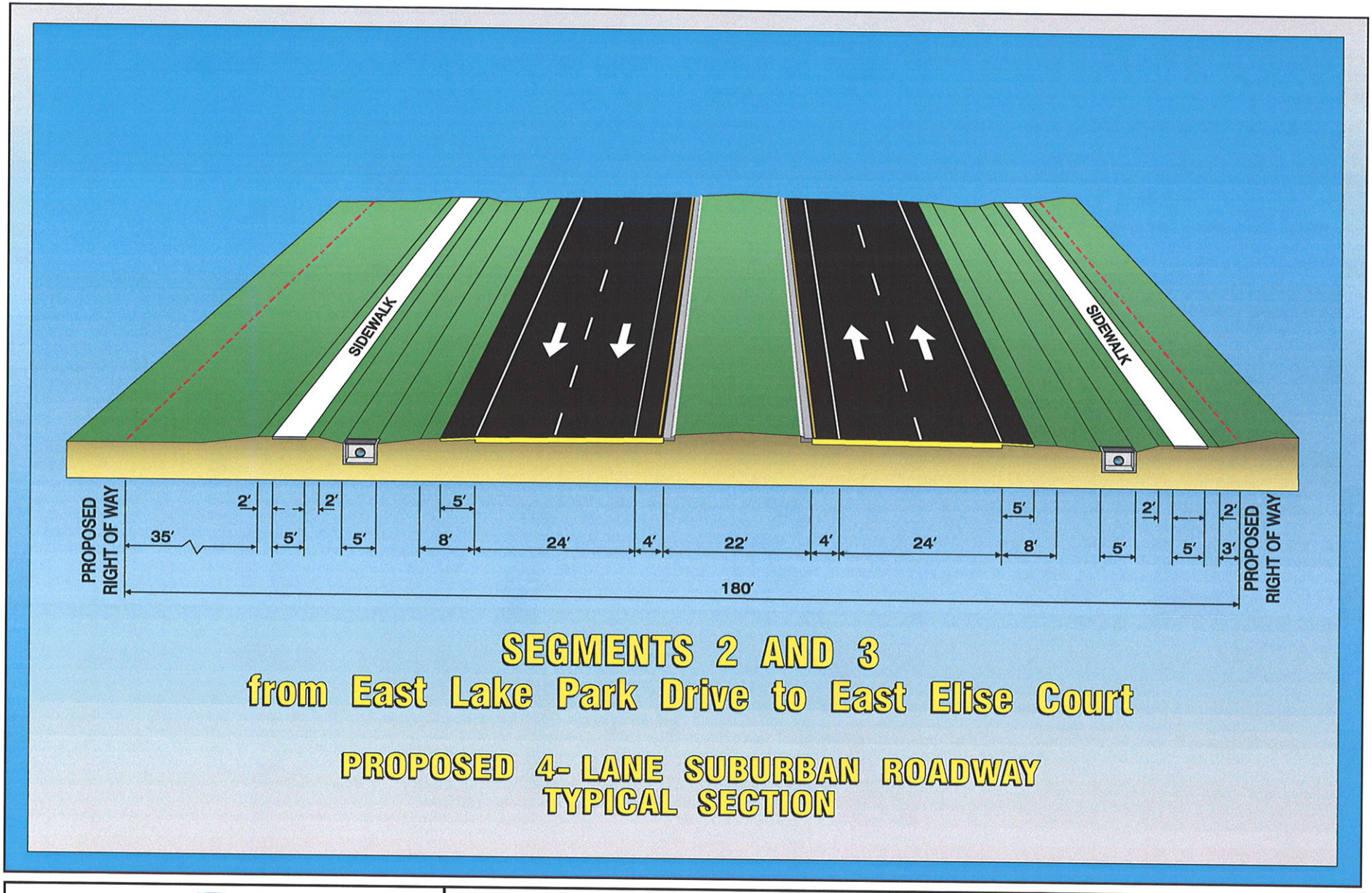


S.R. 200
PD&E STUDY REEVALUATION

PROPOSED FOUR-LANE
URBAN TYPIAL SECTION

FIGURE 6

S.R. 200 PD&E STUDY
REEVALUATION
FROM U.S. 41 TO N. OF MARION COUNTY LINE
CITRUS COUNTY
WPI SEG. NO. 257188 1; FAP NO. FL62-020R



SEGMENTS 2 AND 3
from East Lake Park Drive to East Elise Court

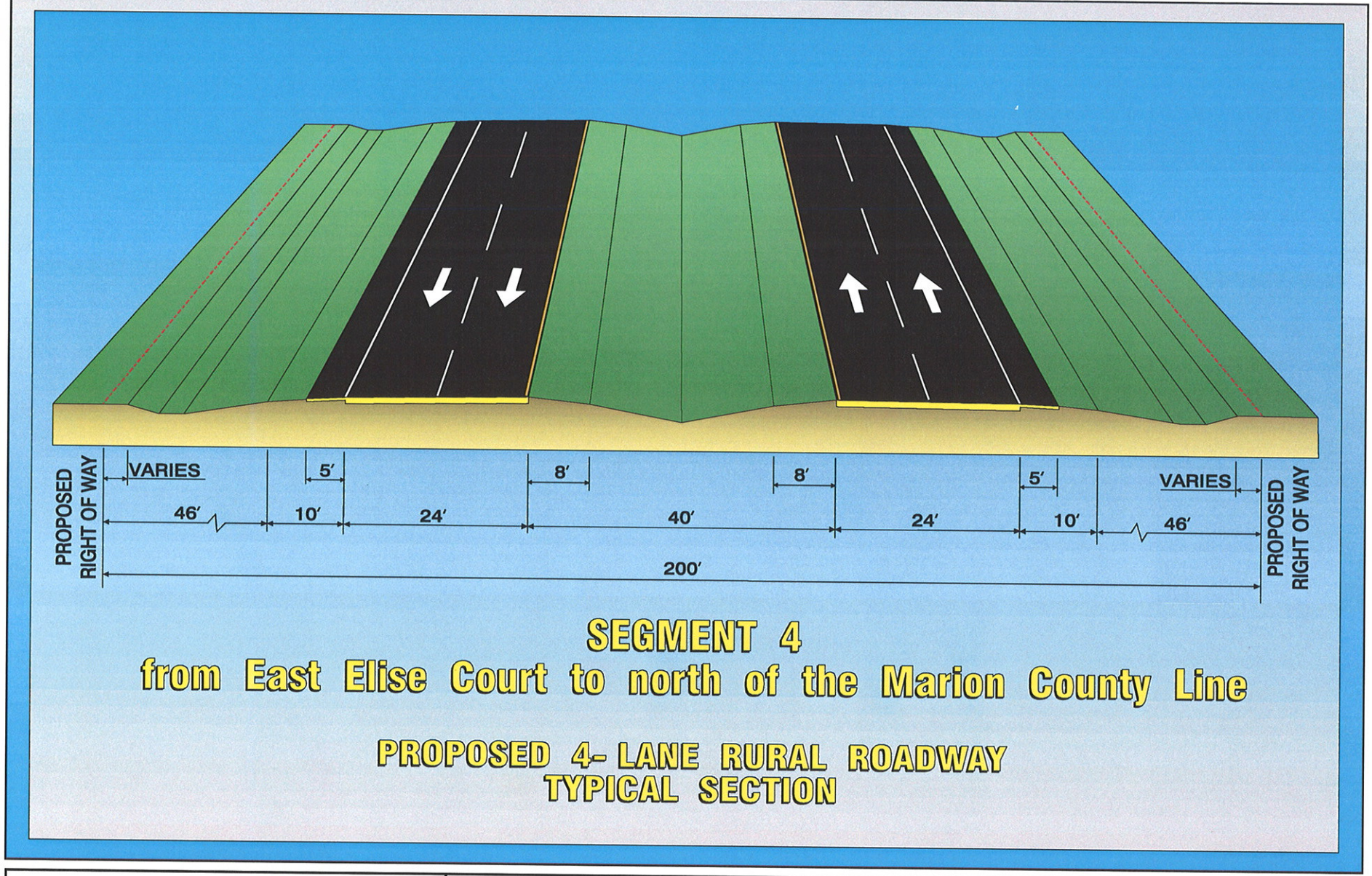
PROPOSED 4- LANE SUBURBAN ROADWAY TYPICAL SECTION

S.R. 200
PD&E STUDY REEVALUATION

PROPOSED FOUR-LANE
SUBURBAN TYPIAL SECTION

FIGURE 7

S.R. 200 PD&E STUDY
REEVALUATION
FROM U.S. 41 TO N. OF MARION COUNTY LINE
CITRUS COUNTY
WPI SEG. NO. 257188 1; FAP NO. FL62-020R

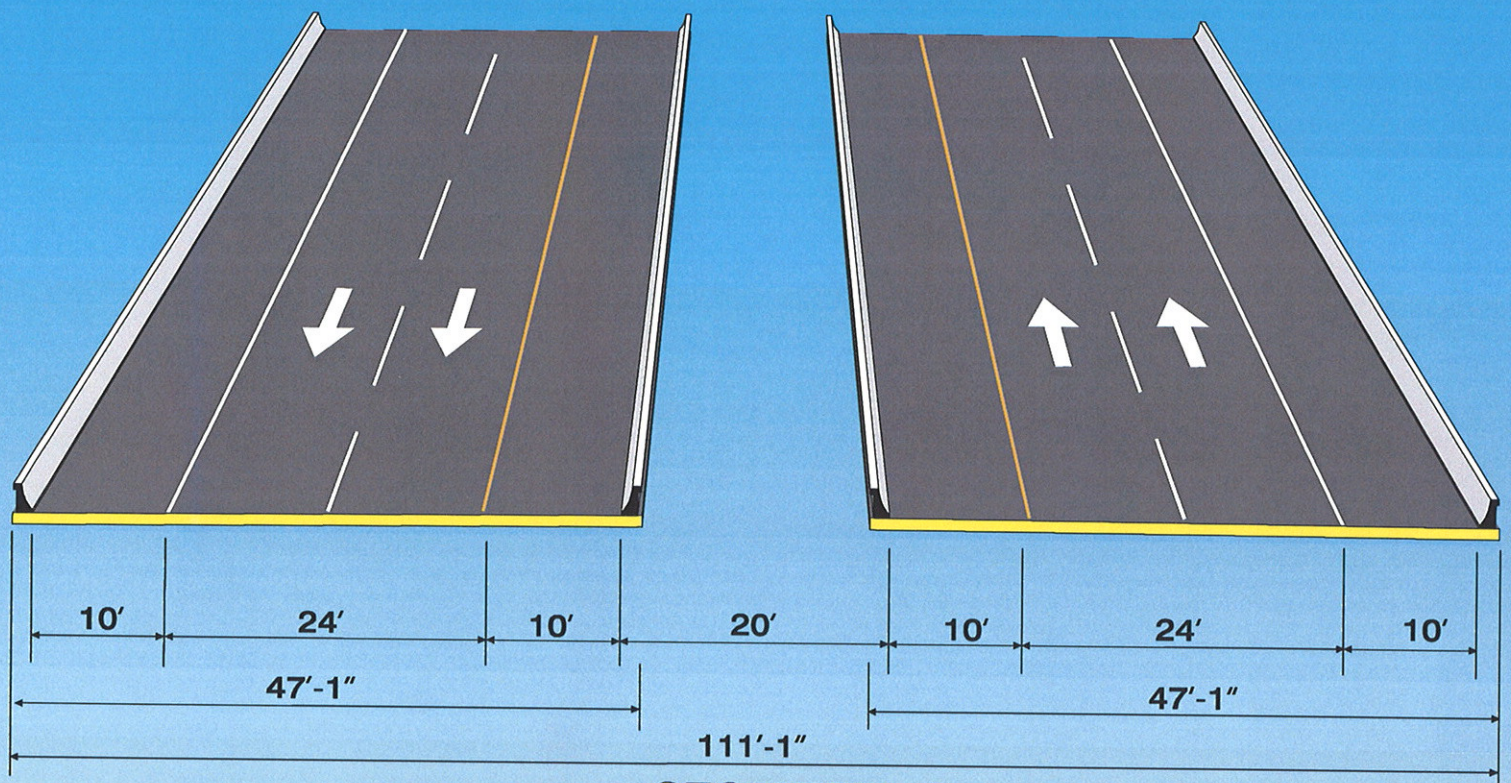


S.R. 200
PD&E STUDY REEVALUATION

PROPOSED FOUR-LANE
RURAL TYPIAL SECTION

FIGURE 8

S.R. 200 PD&E STUDY
REEVALUATION
FROM U.S. 41 TO N. OF MARION COUNTY LINE
CITRUS COUNTY
WPI SEG. NO. 257188 1; FAP NO. FL62-020R



SEGMENT 4
over the Withlacoochee River

PROPOSED 4- LANE BRIDGE
TYPICAL SECTION

S.R. 200 **PD&E STUDY REEVALUATION**	PROPOSED FOUR-LANE BRIDGE TYPIAL SECTION FIGURE 9	S.R. 200 PD&E STUDY REEVALUATION FROM U.S. 41 TO N. OF MARION COUNTY LINE CITRUS COUNTY WPI SEG. NO. 257188 1; FAP NO. FL62-020R

2.0 LAND USE

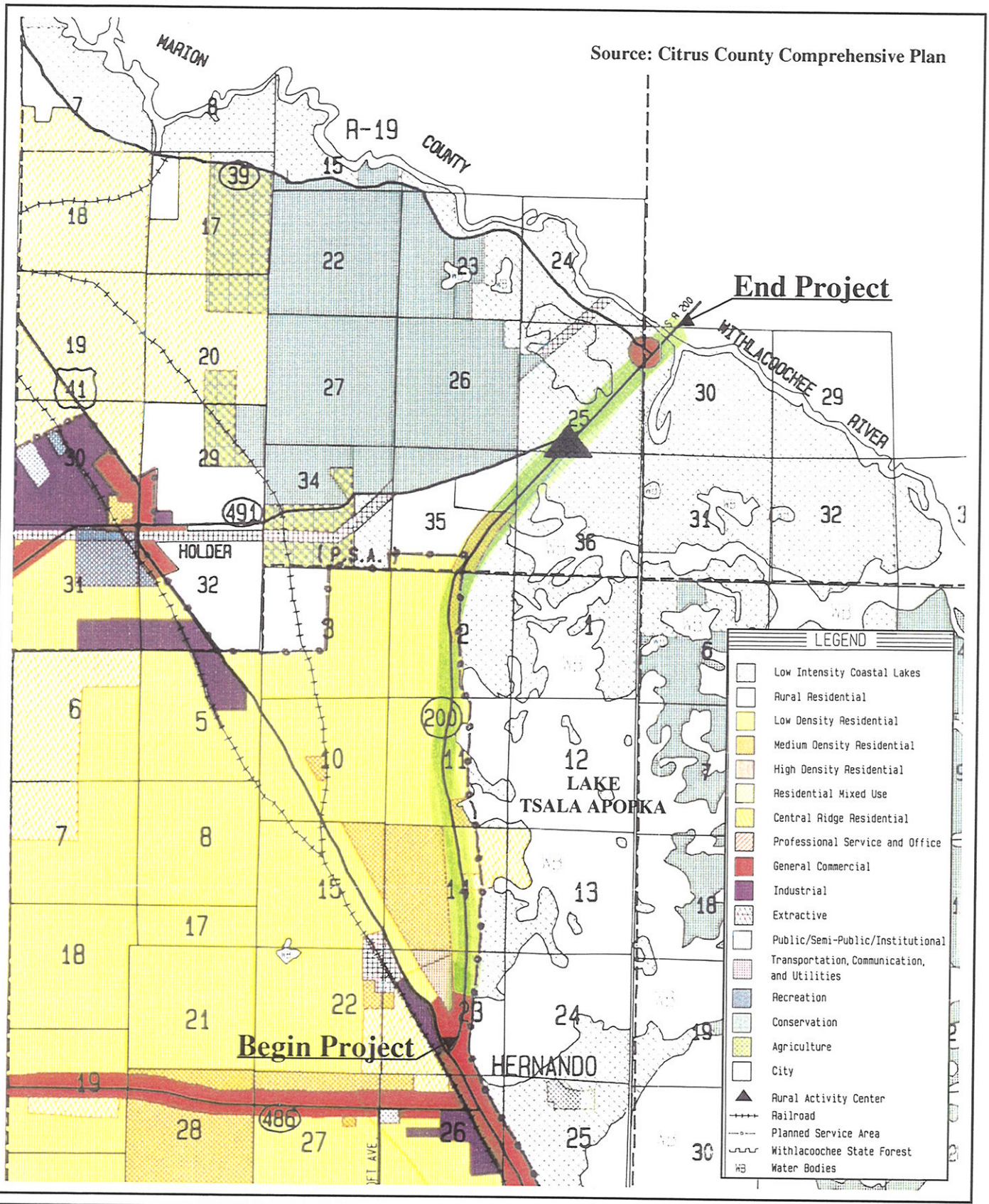
While Citrus County has been experiencing an extensive increase in population, much of the county is still rural in nature and a large percentage of the land is undeveloped.

2.1 EXISTING LAND USE

The land use along the project is primarily rural and open land. At the southern terminus of the project, in the vicinity of the Town of Hernando, the land use is mostly light commercial. In the vicinity of Apache Shores, where S.R. 200 has been widened, land use transitions to light residential and commercial areas. Convenience stores are dispersed throughout the project corridor.

2.2 FUTURE LAND USE

No significant changes of the land use are expected in the vicinity of the project areas. Based on the adopted Citrus County Generalized Future Land Use Map, residential land use is expected to increase in the vicinity of Apache Shores and in the proximity of the Town of Hernando. Figure 10 depicts the Generalized Future Land Use along the project corridor.



S.R. 200
PD&E STUDY REEVALUATION

GENERALIZED LAND USE MAP

FIGURE 10

S.R. 200 PD&E Study
Reevaluation
From U.S. 41 to N. of Marion County Line
Citrus County
WPI Seg. No. 257188 1; FAP No. FL62-020R

3.0 DESIGN INFORMATION

3.1 SOIL CONDITIONS

Review of the most recent publication of the US Department of Agriculture Soil Conservation Service (SCS) of Citrus County revealed twelve soil groups within the contributing drainage sub-basins. Table 2 provides the soil name, soil symbol, hydrologic soil group (HSG), seasonal high water (SHW) table depth and permeability rate, for the identified soil groups. The soil categories located within the project limits are illustrated on the Soils Map in Figure 11. Appendix B includes the related soils information.

TABLE 2
SOILS WITHIN THE CONTRIBUTING DRAINAGE SUB-BASINS

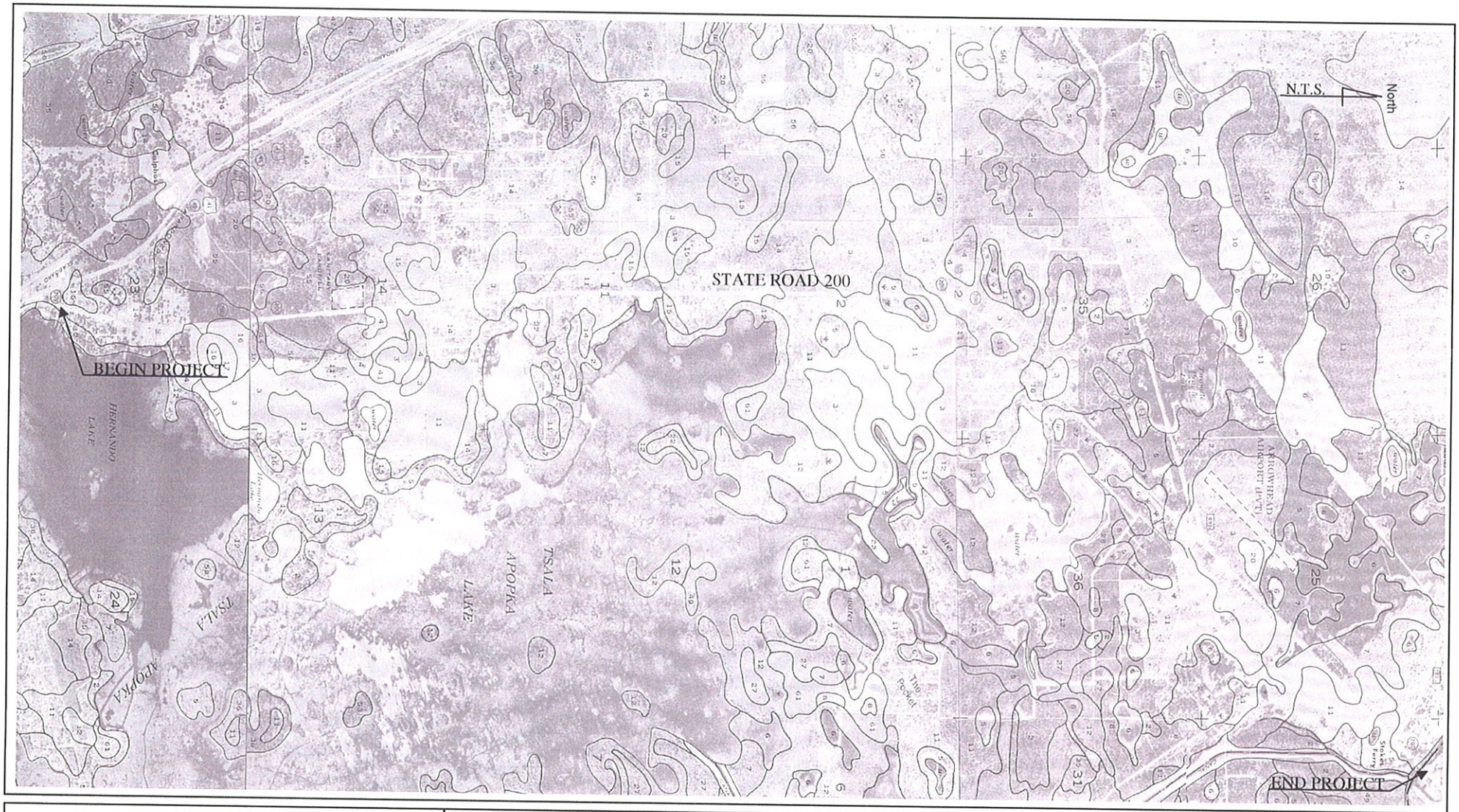
Soil Name	Soil Symbol	HSG	SHWT Depth (ft)	Permeability Rate (in/hr)
Adamsville fine sand	2	C	2.0 – 3.5	6.0 – 20.0
Candler fine sand	3	A	>6.0	6.0 – 20.0
Candler fine sand	4	A	>6.0	6.0 – 20.0
Basinger fine sand	5	B/D	0 – 1.0	6.0 – 20.0
Basinger fine sand, depressional	6	D	+2.0 – 1.0	6.0 – 20.0
Myakka fine sand	7	B/D	0 – 1.0	6.0 – 20.0 for 0" to 27" depth 0.6 – 6.0 for 27" to 55" depth 6.0 – 20.0 for 55" to 80" depth
Tavares fine sand	11	A	3.5 – 6.0	>6.0
Lake fine sand	14	A	>6.0	>6.0
Lake fine sand	15	A	>6.0	>6.0
Arredondo fine sand	16	A	>6.0	6.0 – 20.0
Pomello fine sand	27	C	2.0 – 3.5	>20.0 for 0" to 31" depth 2.0 – 6.0 for 31" to 52" depth
Udorthents*	55	N/A	N/A	N/A

*There are no data associated with the Udorthents Soil.

3.2 DESIGN INFORMATION SOURCES

The process of defining and developing the information base for the LHR included, but was not limited, to the following:

- Aerial Photos; flight date September 12, 2000.
- FDOT District 5 Location Hydraulics Report of S.R. 200; prepared December 1993.
- FDOT existing S.R. 200 roadway construction plans; prepared 1936.
- USGS Quadrangle Map; Stokes Ferry and Holder, Florida; dated 1954.
- SWFWMD contour maps.



S.R. 200
PD&E STUDY REEVALUATION

SOILS MAP

FIGURE 11

S.R. 200 PD&E Study
Reevaluation
From U.S. 41 to N. of Marion County Line
Citrus County
WPI Seg. No. 257188 1; FAP No. FL62-020R

- Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM) for Citrus County, Florida; dated August 15, 1984.
- FDOT Drainage Manual.
- FDOT Straight Line Diagram (SLD) of Road Inventory.
- Interviews, correspondence and site investigations.

3.3 DESIGN CRITERIA/PERMITTING AGENCY

State agencies that would issue permits for the proposed improvements include the SWFWMD, which requires an Environmental Resource Permit (ERP) for all dredge and fill activities conducted in areas either in or connected to Waters of the State, as outlined in *Chapter 62-4.48, Florida Administrative Code (FAC)*. SWFWMD also requires an ERP for the construction or alteration of any surface water system according to *Chapters 40D-4, 40D-40,* and *40D-400 FAC.* The intent is to regulate new systems and their impact on water quantity, water quality, wetlands and other environmental features, and to insure that discharges will meet applicable State Water Quality Standards as stated in *Chapter 62-3 and Section 62.4.242 FAC.* Coordination with the SWFWMD should occur during preliminary and final design to address stormwater management issues.

Federal agencies that may require permits for the proposed improvements include the ACOE and the EPA. The ACOE requires permits for dredge and fill activities in waters of the United States. EPA requires a Notice of Intent (NOI) for construction under the State of Florida General Permit for the National Pollutant Discharge Elimination System (NPDES) for construction impacts greater than five acres. This NOI will require a site-specific pollution prevention plan that incorporates current FDOT standards. Coordination with Federal agencies should occur during preliminary and/or final design of the proposed improvements.

4.0 EXISTING DRAINAGE FEATURES

The entire project is located within the Withlacoochee River drainage basin that is designated as a regulatory floodway. The sub-basin boundaries identified in the previously approved FDOT Report were not available. The existing drainage pattern and sub-basin boundaries were determined based on the existing FDOT construction plans, USGS quadrangle and SWFWMD maps. The quadrangle maps were used in lieu of the SWFWMD maps where no contour elevations were available.

4.1 SUB-BASIN CHARACTERISTICS

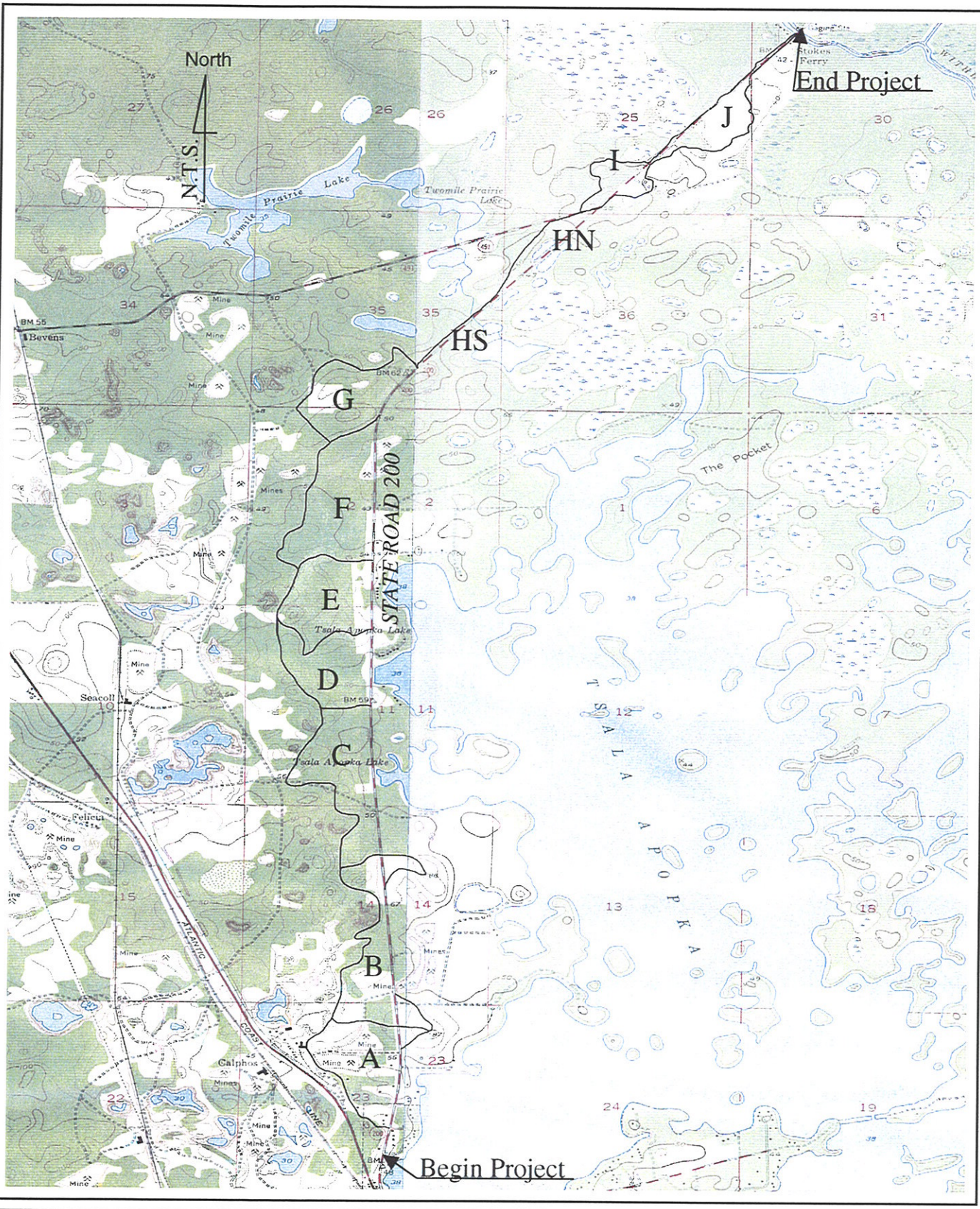
The project has been delineated into eleven sub-basins, identified as Sub-basins A through G. HS, HN, I and J. The overall drainage area contributing to S.R. 200 is shown on the Drainage Map in Figure 12. Within the immediate vicinity of S.R. 200, wetlands are very sparse and predominantly consist of isolated depressions. These wetlands are generally divided by low ridges over-topped in periods of excess rainfall. The overland flow eventually meanders through the wetlands, until it reaches a low area where it flows under S.R. 200 through cross drain culverts. Most of the stormwater runoff travels from west to east through commercial, residential, wetlands and open land. Drainage along the project corridor is accomplished with a combination of roadside ditches and sidedrain pipes that are located under driveways and roadways. The runoff is conveyed through cross drain culverts that outfall to Tsala Apopka Lake and the Withlacoochee River. The existing drainage systems within the project limits appear to function adequately.

As noted in the previously approved FDOT District 5 Report, the proposed improvements will have minimal impact to wetland areas identified along S.R. 200. To be consistent with permitting requirements of the SWFWMD, it is desirable to minimize, or avoid if possible, impacts to existing wetlands by keeping all proposed drainage systems such as conveyance, ponds and outfalls associated with the S.R. 200 improvements outside their jurisdictional limits.

4.2 EXISTING DRAINAGE STRUCTURES

Seven, 2-foot by 2-foot, concrete box culverts (CBC) and one double 10-foot by 6-foot CBC under cross S.R. 200 within the project limits and are identified as per their respective station location and shown in Table 3. In addition, the project includes a 299-foot bridge structure over the Withlacoochee River. A Bridge Hydraulics Report will be prepared in the design phase of this project. A field inspection on November 8, 2000 revealed that all of the 2-foot by 2-foot CBC do not meet current design standards due to the minimum size requirements. The double 10-foot by 6-foot CBC is in good condition and is suitable for lengthening and or other modifications. The SLD of Road Inventory is included in Appendix C.

A telephone conversation, included in Appendix D, with Mr. Don Higginbotham and Mr. Jerry Sanford of the FDOT Lecanto City Maintenance Office and a meeting with Mr. Curtis Karr, Citrus County Public Works Director, have indicated that there are no known flooding problems at the existing cross drains and conveyance systems along S.R. 200, between U.S. 41 and the Withlacoochee River at the Marion County Line.



S.R. 200
PD&E STUDY REEVALUATION

DRAINAGE MAP

FIGURE 12

S.R. 200 PD&E Study
Reevaluation
From U.S. 41 to N. of Marion County Line
Citrus County
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TABLE 3
EXISTING DRAINAGE STRUCTURES

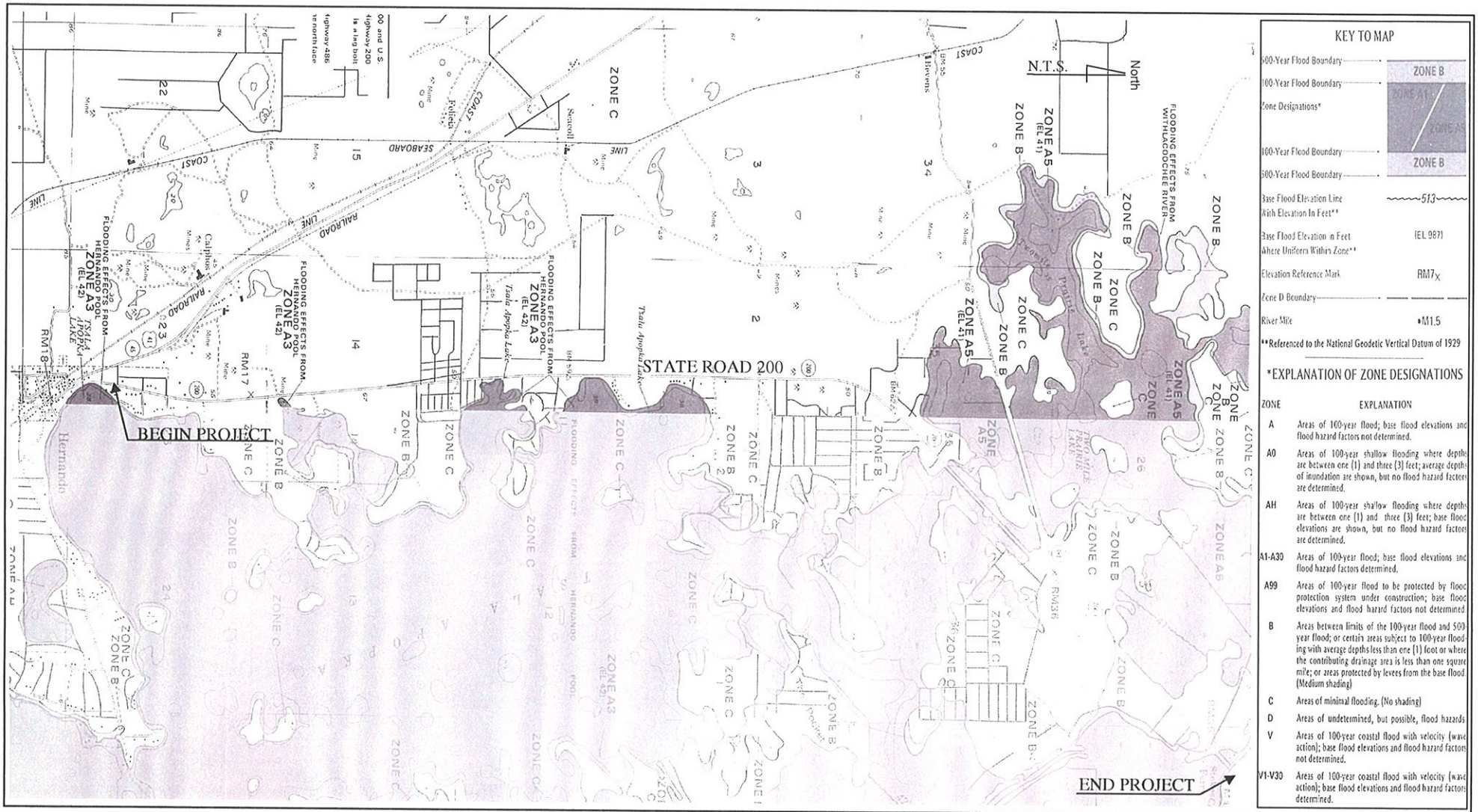
Station	Size ft	Length ft	Cross Drain Description
59+41.80	2 X 2 CBC	39.15	Concrete, straight square endwall. Dense woods on both sides; Replacement necessary.
73+31.60	2 X 2 CBC	40.15	Concrete, straight square endwall. Medium woods on both sides; Replacement necessary.
89+90.90	2 X 2 CBC	50.00	Concrete, straight square endwall; Replacement necessary.
119+14.90	2 X 2 CBC	61.63	Concrete, straight square endwall; dry contributing area; Connected to a storm sewer system.
129+30.20	2 X 2 CBC	54.00	Concrete, straight square endwall, heavy woods on both sides, equalizer; Replacement necessary.
167+90.70	2 X 2 CBC	41.05	Concrete, straight square endwall; dry contributing area; Replacement necessary.
200+40.40	2 X 2 CBC	69.67	Concrete, straight square endwall; dry contributing area; Connected to an existing outfall.
248+15.50	2 - 10 X 6 CBC	39.92	Concrete bridge culvert; Dry lake on west side, full lake on the east side. HW stands 2.5' above the flow line elevation.
272+89.90	2 X 2 CBC	52.40	Concrete, straight square endwall, equalizer with wetlands on both sides; Replacement necessary.
316+22.10	2 X 2 CBC	66.09	Concrete, straight square endwall, equalizer with medium woods on both sides; Replacement necessary.

4.3 FLOODPLAIN INVOLVEMENT AND CLASSIFICATION

The National Flood Insurance Program (NFIP), through the Federal Emergency Management Agency (FEMA), has established the 100-year base floodplain limits for Citrus County, which include the boundaries shown in the Flood Insurance Rate Maps (FIRM) referenced below for the S.R. 200 study area. The FIRMs for the study area include Community Panel Numbers 120063 0150 B and 120063 0175 B (dated August 15, 1984). Figure 13 indicates the limits of the FIRM 100- and 500-year floodplains within the study area.

Portions of the proposed roadway widening will encroach upon the 100-year base floodplain. Several depressional areas located within the vicinity of Sub-basin HS and J lie within the existing project right-of-way. The floodplain encroachments are both transverse and longitudinal. According to the preliminary estimates, the bridge replacement at the Withlacoochee River should be expected to impact approximately 0.1 acres, which is considered a minimal impact. However, the floodplain encroachment volume will be mitigated by excavating an equal volume of fill within the same sub-basin. Right-of-way constraints made avoidance of these base floodplain areas infeasible. The flood plain volume impact was estimated to be 2,448 yd^3 and 362 yd^3 for Sub-basins HS and J, respectively. The calculations are included in Appendix E.

The SWFWMD Environmental Resource Permit (ERP) Information Manual (Section 4.4, 10/96 version) states that no net encroachment into the floodplain, up to that encompassed by the 100-year event, which will adversely effect either conveyance, storage, water quality or adjacent lands will be allowed and required compensating storage shall be equivalently provided. There are no local floodplain criteria currently in effect. Compliance with "Historic Basin Storage" (Section 4.7, ERP) and "Offsite Lands" (Section 4.8, ERP) criteria will also be necessary. Therefore, floodplain-compensating storage will be provided as required by the SWFWMD.



S.R. 200
PD&E STUDY REEVALUATION

FEMA MAP

FIGURE 13

S.R. 200 PD&E Study
Reevaluation
From U.S. 41 to N. of Marion County Line
Citrus County
WPI Seg. No. 257188 1; FAP No. FL62-020R

5.0 PROPOSED DRAINAGE DESIGN

The proposed drainage system will be designed to convey stormwater runoff away from the roadway in the existing natural basin flow direction. It is expected that the proposed roadway drainage will convey runoff to stormwater management ponds located near the existing outfalls. Additional right-of-way to accommodate the stormwater management facilities will be needed. In addition, the widening of S.R. 200 from two to four lanes may require replacement of the existing storm sewer systems. Factors such as road profiles, cross slopes, inlet locations and existing pipe sizes will be evaluated during subsequent design phases to determine the suitability of the existing storm sewer systems for use with these improvements. Since the proposed improvements will replace the existing rural typical section with new rural, urban and suburban typical sections, it is anticipated that the final design may call for some existing cross drains to be incorporated into the proposed storm sewer drain systems. The offsite flow will be routed through back-of-sidewalk inlets in urban areas where fill is inevitable. None of the drainage patterns within the project limits will be altered by the proposed roadway improvements.

5.1 CROSS DRAINS

The S.R. 200 corridor crosses numerous drainage sub-basins. These drainage areas are served by several cross drain culverts that allow the passage of excess rainfall. Each of these cross drains was identified in the original PD&E Study. The analyses and design of these cross drains have been reevaluated and are presented with photographs in Appendix F of this report.

Existing culvert lengths, sizes and inverts were taken from the 1936 roadway construction plans. The tailwater equal to the crown of the existing culvert was used for the hydraulic analysis. Hydrological evaluation for the contributing drainage areas could not be determined due to lack of contour maps. Therefore, the analyses for the design flows were calculated based on a velocity of 6.0 feet per second (fps) for the 25-year storm event as discussed in the FDOT Drainage Manual. The proposed cross drain sizes evaluated in this report were taken from the approved original PD&E Study. The analysis was based on providing the required calculations and reevaluating the change in the headwater elevation for each culvert. It was determined that the proposed culvert sizes presented in the original PD&E Study will result to insignificant increase in headwater. Should the proposed structure sizes have varied from the original sizes, a more comprehensive analysis would have been performed. However, none was needed. This reevaluation concurs with the original study with one exception, the double 10-foot by 6-foot bridge culvert. In accordance with the previous study, it was suggested that the bridge culvert be extended and plugged in one barrel. This reevaluation study highly recommends extending the bridge culvert and also maintaining its cross sectional area.

The cross drains in the proposed condition were sized to convey the design flood, base flood and greatest flood using the Culvert Capacity Calculation Worksheets for HDS-5. The existing Cross Drains identified as 89+90 and 119+14 were incorporated into a storm sewer system due to a previous improvement along S.R. 200. Although, these culverts were sized as cross drains in this study to determine the headwater elevations for each, the design engineer during the design phase of

this project should evaluate their hydraulic adequacy, suitability and replacement/extension cost with respect to the entire storm sewer system that is associated with the individual culverts. A summary of the hydraulic flood data is included in Table 4.

5.2 SIDE STREET CULVERTS

There are several side street culverts that may be impacted depending on the selection of the alternative. These pipes cross under dedicated roadways and driveways. Replacements and/or modifications of these pipes will be evaluated during subsequent design phases.

TABLE 4
HYDRAULIC FLOOD DATA

CROSS DRAIN ID	SIZE in	LENGTH ft	STATION	DESIGN FLOOD 2% PROB. DISCHARGE cfs	DESIGN FLOOD 50 YR FREQ. STAGE ft	BASE FLOOD 1% PROB. DISCHARGE cfs	BASE FLOOD 100 YR FREQ. STAGE ft	OVERTOPPING FLOOD DISCHARGE cfs	OVERTOPPING FLOOD STAGE ft	OVERTOPPING FLOOD PROB. %	OVERTOPPING FLOOD FREQ. yr	GREATEST FLOOD DISCHARGE cfs	GREATEST FLOOD STAGE ft	GREATEST FLOOD PROB. %	GREATEST FLOOD FREQ. yr
59+41	30	120	59+41.80	29.00	53.90	33.60	54.43	38.30	55.02	0.75	133				
73+31	30	160	73+31.60	29.00	57.58	33.60	58.18	38.60	58.89	0.70	143				
89+90	36	160	89+90.90	29.00	67.05	33.60	67.26					57.10	68.70	0.2	500
119+14	48	160	119+14.90	29.00	41.12	33.60	41.26					57.10	42.04	0.2	500
129+30	36	160	129+30.20	29.00	48.10	33.60	48.31					57.10	49.75	0.2	500
167+90	48	160	167+90.70	29.00	49.45	33.60	49.59					57.10	50.37	0.2	500
200+40	36	160	200+40.40	29.00	33.30	33.60	33.51					57.10	34.95	0.2	500
248+15	2-10' x 6' CBC	160	248+15.50	873.00	44.38	1008.00	44.84	1018.00	44.88	0.95	105				
272+89	30	200	272+89.90	29.00	41.40	33.60	42.06	49.70	44.88	0.34	294				
316+22	48	200	316+22.10	29.00	39.92	33.60	40.06					57.10	40.87	0.2	500

Definitions:

Design Flood: The flood selected by FDOT to be utilized to assure a standard level of hydraulic performance

Base Flood: The flood having a 1% chance of being exceeded in any year. (100 yr. Frequency)

Overtopping Flood: The flood where flow occurs (A) over the highway, (B) over a watershed divide or, © thru emergency relief structures.

Greatest Flood: The most severe flood which can be predicted where overtopping is not practicable, normally one with a 0.2% chance of being exceeded in any year. (500 yr. Frequency)

6.0 RISK ASSESSMENT

It is anticipated that all of the existing 2-foot by 2-foot CBC will require replacement to meet the current design standards as a result of the proposed improvement to S.R. 200. The replacement of these cross drains will not significantly alter the hydraulic capacity of the existing culverts. The project will not cause adverse upstream or downstream impacts, nor will it cause any adverse floodplain impacts. ***"The proposed structure will perform hydraulically in a manner equal to or greater than the existing structure, and backwater surface elevations are not expected to increase. As a result, there will be no significant adverse impacts on natural and beneficial flood plain values. There will be no significant change in flood risks. The modifications to the drainage structure included in this project will result in an insignificant change in the capacity to carry floodwater. This change will cause minimal increases in flood heights and flood limits. These minimal increases will not result in any significant adverse impact on the natural and beneficial floodplain values or any significant change in flood risks or damage. There will not be a significant change in the potential for interruption or termination of emergency service or emergency evacuation routes. Therefore, it has been determined that this encroachment is not significant."*** In accordance with FDOT's *Standard Specifications for Road and Bridge Construction*, all Best Management Practices will be adhered to during the construction phase of the project for erosion control and water quality considerations. No significant long-term environmental impacts are foreseen as a result of construction of this project.

A risk evaluation for flooding was made for the improvements to S.R. 200 in accordance with Chapter 3 of the FDOT Drainage Manual, Volume 2A and Volume 6, Chapter 7, Section 3, Subsection 2 of the Federal Aid Highway Program Manual (FHPM 6-7-3-2). The project is classified as **Floodplain Category 4: Projects on Existing Alignment Involving Replacement of Existing Drainage Structures With No Record of Drainage Problems**. This project is on an existing alignment and with proper floodplain mitigation, will have no significant adverse impact on the natural and beneficial floodplain values, flood risk, or upstream or downstream areas and will not change the 100-year flood elevations.

LIST OF APPENDECIES

APPENDIX	TITLE
A	Previous Location Hydraulics Report
B	Excerpts From the SCS Soil Survey of Citrus County
C	FDOT Straight Line Diagram of Road Inventory
D	Correspondence
E	Floodplain Impact Volume Calculations
F	HDS-5 Culvert Capacity Calculation Worksheets for Existing & Proposed Culverts
G	Tables and Nomographs Design Aids

APPENDIX A

PREVIOUS LOCATION HYDRAULICS REPORT OF FDOT DISTRICT 5

LOCATION HYDRAULIC REPORT

DEPARTMENT OF TRANSPORTATION

SR 200

CITRUS COUNTY, FLORIDA

WORK PROGRAM ITEM NO. 5111615

STATE PROJECT NO.: 02040-1503

PREPARED BY:

MELONIE C. BARRINGTON
DRAINAGE ENGINEER
DISTRICT 5

SUPERVISED BY:

EDWARD R. PERSHE, P.E.
DRAINAGE ENGINEER
P. E. LICENSE NO. 36589

DECEMBER 1993


HERNANDO, APACHE SHORES, CANTERBURY LAKE EST.
RANGE 19 E
SEE MAP 17
RANGE 19 E | R 2
W
X
Y
TOWNSHIP 18 S
SEE MAP 25
PAGE AV
SEE MAP 36
CHAPPELL POINT
Adventure Island
OAKTON ST
OLDWOOD PT
TIMBERWOOD CT
SHALES CT
GOLDPEARL
TANGLEWOOD
GOLDEN VILLAGE
VILLAGE PL
DEWEY WY
HARDING TER
LOUIE PL
ALABASTER DR
DEARBORN DR
HEARTWOOD LN
ROSSI LN
CARLO PT
PINE DR
MAPLE TER
COTTONWOOD PT
REDWOOD AV
TANGLEWOOD AV
N CARL G. ROSE HWY
IVORY LN
RUBY LN
AGATE EMERALD
TIGER EYE DR
OPAL PT
ONYX PL
TOPAZ CT
TURQUOISE DR
SAPPHIRE LN
FLYING ARROW PATH
DIAMOND CIR
DIAMOND LN
GARNET LP
WILLOLA HTS.
Tsala
GREERS POINT
LONGBOW PT
APACHE SHORES
MILLWOOD LN
APACHE TRAIL
BEAR LN
DEER RUN
TOMAHAWK TER
CANOE TER
1-OAKWOOD ISLAND TER
2-WEBSTER ISLAND TER
3-BRIGGS ISLAND TER
4-GRASS ISLAND TER
5-ABBOR BLUFF WY
PEG PT
KATHY RD
CARNELL CT
BUFFALO LN
LARIAT LP
PONY EXPRESS LN
TUMBLE WEED TER
STETSON TER
BLACKBERRY LN
BLUEBERRY LN
DODGE TER
REMINGTON TER
WINCHESTER TER
CUSTER TER
BUCKSKIN LN
WAGON TRAIL
CANYON TER
PIONEER TER
RAWHIDE LN
CHAPARRAL LN
PINE DR
DESERT SAND TER
LARAMINE TER
TRAPPER TER
SPUR LN
FLORIDA AV
EAGLE TRAIL
HUNTERS LN
FISHERMANS LN
TEPEE LN
BRAVE LN
SQUAW VALLEY DR
CAMPFIRE CT
LANCE TER
FROLY PT
EAGLE TRAIL
APACHE TRAIL
VISTA TRAIL
LAKE VISTA TRAIL
LAKE BELLAMY LN
Apopka
ARBOR LAKES
LAKE TODD DR
LAKES DR
ARBOR COVE PARK TRAIL
HIDDEN COVE TRAIL
LAKE HERNANDO LN
LAKE VISTA TRAIL
BOAT RAMP & FISHING PIER
COWPOKE PT
ARBOR EDGE TER
ELWYN PT
MARY ANN LN
WITHLACOOCHEE STATE TRAIL
BREAKER PT
KEEPSAKE LN
34442
Lake
LAKE PARK
BLUEWATER DR
LASSO TER
ROSCOE RD
WELLS LN
THUNDERHILL LP
FARGO LN
PARK DR
WEBB PT
DANDY LP
RANCH PASS TER
ROSCOE RD
Oak Hammock Island
Anne's Island
3700N
LAKE PARK DR
Forest Lake
KENNETT DR
200
VENTURA VILLAGE
WOOD KNOLL LN
41
WILKINSONS EST.
SUMMIT LN
VENTURA VILLAGE CIR
SPARTA CT
TITAN CT
HERNANDO
SANDERS HTS.
MOUNT TRAIL
N CARL G. ROSE HWY
BECKETT CT
MARGATE CT
CHIVALRY CT
CANTERBURY LAKE EST.
CANNES PT
CAROLWOOD PT
HANDLER CT
BALMORAL CT
SHERLOCK PT
SWEET MEADOW CT
COVENTRY CT
LAMBETH PATH
STRATHAM PT
BERWICK CT
HERNANDO PLAZA SHOPPING CENTER
MAIDSTONE CT
CLUB HOUSE
FAREWELL PATH
FOLKESTONE CT
APPLEDORE WY
HYTHE PT
ATTEBURY PT
KITTERY PT
WAY
CHURCHILL PL
CANTERBURY LAKE DR
CROSSBOW PT
BRIGADOON CT
CHICHESTER CT
V.F.W. LN
PORTICO TER
VIADUCT LN
AQUAVIEW TER
LOUISE LN
APEX LN
HERNANDO CEM.
BOAT RAMPS & FISHING PIER
CITRUS COUNTY FIRE RESCUE HERNANDO VOL. FIRE DEPT. STATION 71
2700N
PARSON'S POINT
RUGBY TRAIL
EDWARD ISLAND PT
FRIENDSHIP MHP
TOMBER PT
BROWNS LAKESIDE EST.
KENT PT
BROWN PT
SPARKLE LN
PARSONS POINT RD
FORDHAM PL
HARVARD DR
VASSAR TER
PRINCETON LN
DARTMOUTH LN
RUTGERS TER
YALE LN
BUCKNELL LN
DUKE PT
LAKEFRONT PL
HERNANDO BEACH & PARK
LIBRARY
WATSON'S FISH CAMP MHP
HERCALA LN
MONARCH CT
CONSTANCE CT
MARCO CT
KELLERS EST.
AXELFORD CT
CALOMONDEN TER
POET PARK
HERNANDO CEM.
CANTERBURY LAKE DR
LEMON DR
LAKE PL
ORANGE DR
HERNANDO POST OFFICE
PARSONS POINT
ANVIL TER
MODERN CT
486
E NORVELL BRYANT HWY
LAS BRISAS
VERDE CT
LOMA PT
LOMA CT
LOMONTE CT
PAMELA CT
LEEBO PT
FATIMA ST
HAYES ST
2900E
HERNANDO ELEM.
ROTOR
BARN OWL PATH
WING PATH
BIRDS EST.
HARTLEY CT
SKEETER TER
OLEANDER LN
CHURCH AV
TODD PT
MEMORY PT
PARK PT
TREASURE PT
LANTERN TER
WEST POINT DR
AMHERST ST
PINECREST EST. MHP
IDLEWILD FISH CAMP
IDLEWILD MHP
HERNANDO CIVIC CLUB
SPOONER LN
BENTHAL CT
BITZER
MEADOWVIEW TER
BAYNARD LN
LAKEMEADOW LN
LUCY CT
CROFT MHP
LANGSPUR CT
FLORIDA AV
TROY LP
4700N
VAN NESS
CLOVERDALE TER
WARNER TER
RD
CROFT AV
WATKINS PT
HARLEY
SHIREY PT
LOURDES TER
ST
1700N
MAP 26
© MAPSource, St. Petersburg, FL

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I. INTRODUCTION

A. Purpose

The purpose of this report is to evaluate the hydraulic conditions along SR 200 between SR 45, (US-41) and the Withlacoochee River (Marion County line). This is a multi-lane reconstruction project approximately 6.7 miles in length. This report is part of a preliminary development and environmental study (P D & E Study) and resulting engineering report.

B. Project Description

Figure 1 shows the project location and limits of this study. The project study extends for a total of 6.681 miles from its southern-most terminus at the Withlacoochee River to the northern-most terminus, SR 45, US-41.

The existing SR 200 alignment is a 2-lane undivided rural arterial route, which is slowly becoming a moderate urban area. The existing roadway is comprised of a 24-foot wide asphalt pavement, 4-foot paved shoulders and roadside swales.

The proposed new alignment of the project will have a 4-lane rural typical comprised of (4) 12-foot driving lanes, a 48-foot grass median and 5 foot bottom width roadway ditches. The municipal typical consist of (4) 12-foot driving lanes, a 20-foot grass median, and a 5-foot sidewalk (see Appendix, Figure A).

The proposed storm sewer systems (Municipal Sections) will convey roadway runoff to the respective proposed retention/detention ponds, In fill sections, back of sidewalk DBIs will be tapped into the storm sewer main. The existing crossdrains were analyzed to determine the ability to convey the offsite drainage. Fifty percent of the structures were hydraulically adequate. However, due to the age of the existing structure (≈ 60 years), all culverts with the exception of the double 10 X 6 culvert will be placed throughout the entire project. The peaks and sags in this existing alignment for the most part, will be honored when grades are set in the design stage. The existing right-of-way is 100′ in width and will be extended to 200′ in the rural section.

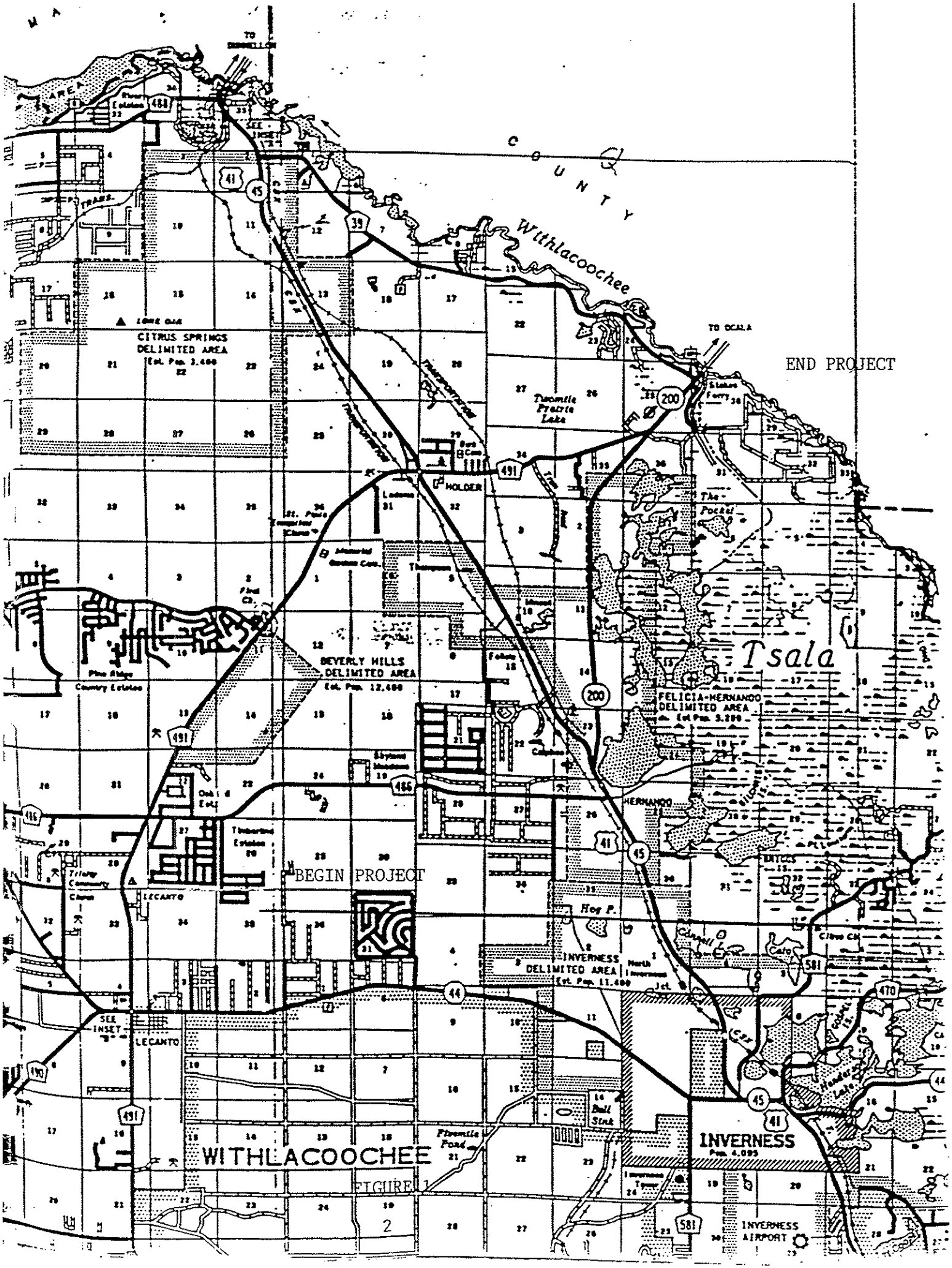

END PROJECT
BEGIN PROJECT
WITHLACOOCHEE
Withlacoochee
CITRUS SPRINGS
DELIMITED AREA
BEVERLY HILLS
DELIMITED AREA
FELICIA-HERNANDO
DELIMITED AREA
INVERNESS
DELIMITED AREA
INVERNESS
Tsala
LECANTO
HOLDER
HERNANDO
TO OCALA
INVERNESS
AIRPORT

FIGURE 1

C. Design Criteria/Permitting Agency

The roadway drainage for this project will be designed in accordance with current Florida Department of Transportation criteria as outlined in the following publications:

- FDOT Drainage Manual - 1992
- FDOT Roadway and Traffic Design Standard - 1990
- FDOT Standard Specifications for Road & Bridge Construction - 1991
- FDOT Design Memorandum
- FDOT 14-86 Administrative Code

In addition to designing with this criteria, the drainage system must also conform to the design criteria for any state or local agency which have permitting jurisdiction in the area. The project lies within the water quality/water quantity and wetland impact permitting control boundaries of the Southwest Florida Water Management Districts (SWFWMD). Some storm water runoff from the project outfalls into Tsala Apopka Lake, which is considered outstanding Florida water. The remainder outfalls to landlocked isolated depressions. Approximately 80% of the project is located in very pervious soil, therefore percolation ponds will be used in them. This project will fall under 3 types of criteria.

Criteria One (Open Basin/Percolation System)

- Design storm - 25-year/24-hour rainfall
- Rainfall - 8.5 in/hr
- Soil Conservation Services, Type II Florida modified rainfall distribution.
- Water Quality (on line):-
  Required treatment of runoff from the first 1/2 inch of rainfall. Runoff discharging directly into outstanding Florida waters shall be required to provide treatment for a volume 50 percent more than required for the selected treatment system.

  The drawn-down of this volume must occur within 72 hours.

Criteria Two (Closed Basin/Percolation System)

- Design storm - 100-year/24-hour rainfall
- Rainfall - 11.5 in/hr

- Soil Conservation Services, Type II Florida modified rainfall distribution.

- Water Quality:-
  Required treatment of runoff from the first 1/2 inch of rainfall.

Criteria Three (Open Basin/Wet Detention System)

- Design storm - 100-year/24-hour rainfall

- Rainfall 8.5 in/hr

- Soil Conservation Services, Type II Florida modified rainfall distribution.

- Water Quality:-
  Required treatment of runoff from the first 1-inch of rainfall. Runoff discharging directly into outstanding Florida waters shall be required to provide treatment for a volume 50 percent more than required for the selected treatment.

D. **Florida Flood Zone Designations**

From the FEMA Flood Insurance Rate Maps for Citrus County, flood zones for State Road 200 within the limits of this project are primarily in Zone C. Towards the southern portion of the project, there are some areas which encroach upon the 100-year Flood Zone A5 and Zone B. The stationing is as follows for 100-year flood plain encroachment:

From 1010+00 to 1015+00 (E & W)

Any encroachment due to Tsala Apopka Lake, will be eliminated in a new alignment.

Explanation of Zone Designations:

C - Areas of minimal flooding

A5 - Areas of 100-year flood; base flood elevations and flood hazards factors determined.

B - Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood. (Medium shading).

See figure 2 for exact locations of zone designations.

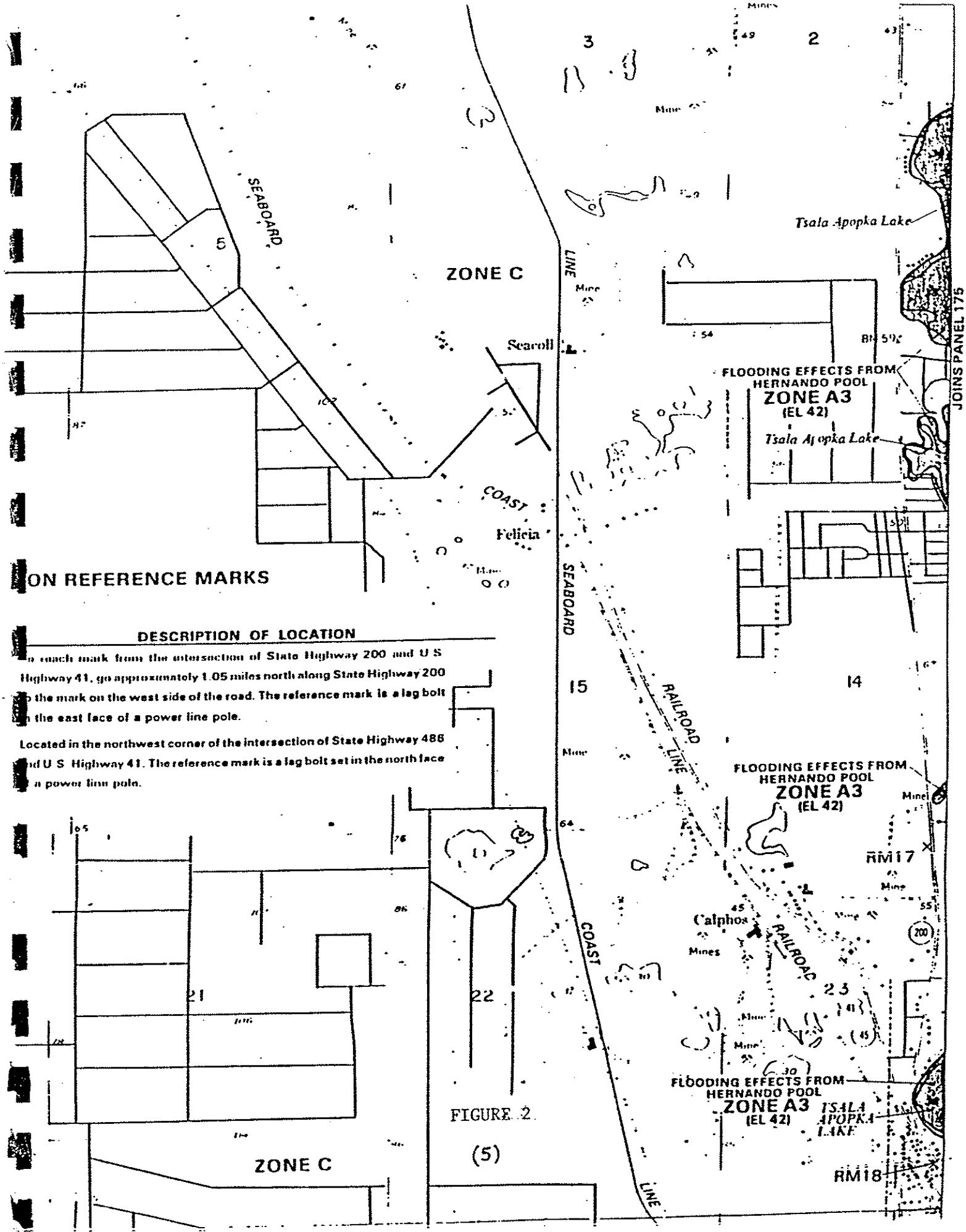
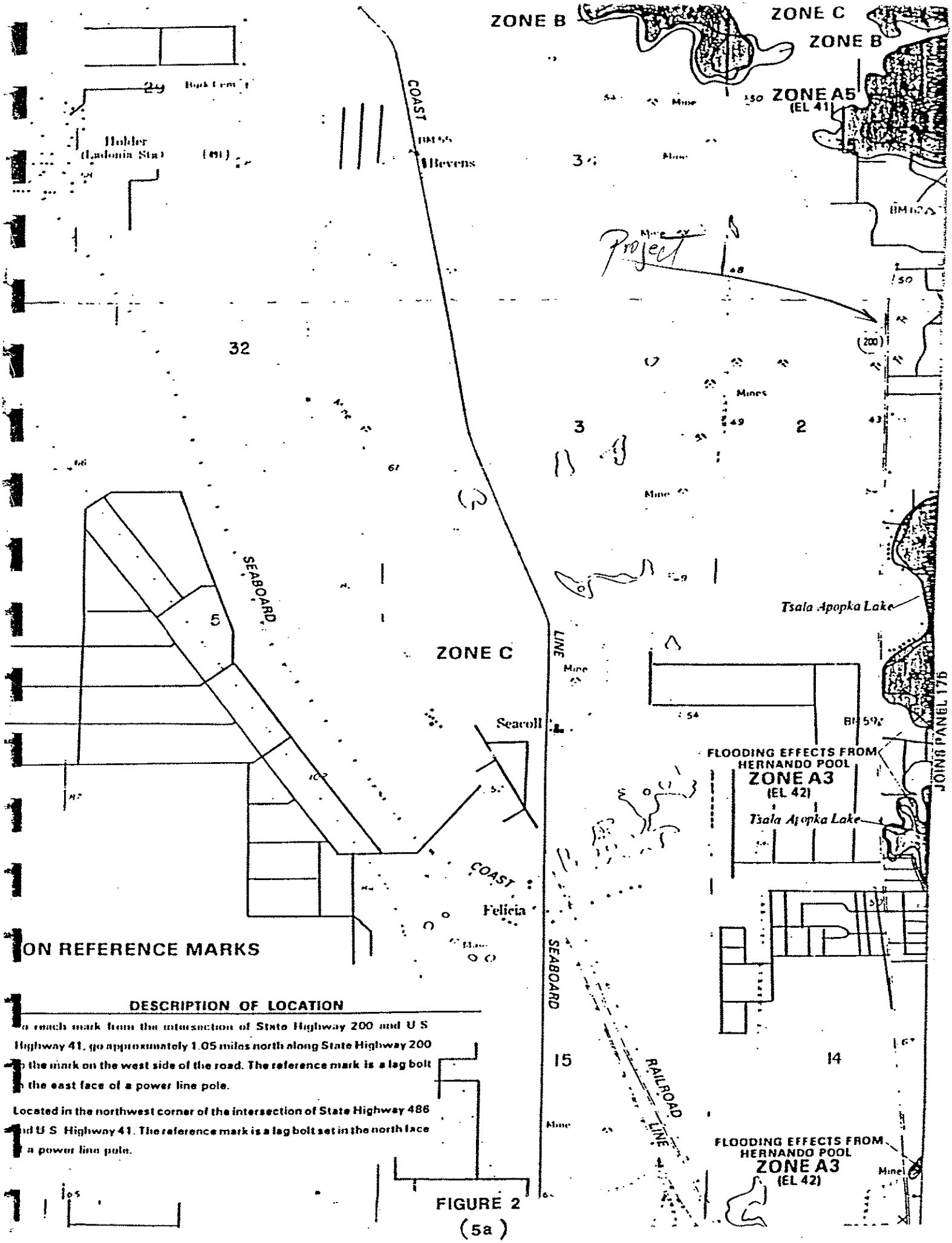

ON REFERENCE MARKS
DESCRIPTION OF LOCATION
o mark from the intersection of State Highway 200 and U S Highway 41, go approximately 1.05 miles north along State Highway 200 to the mark on the west side of the road. The reference mark is a lag bolt in the east face of a power line pole.
Located in the northwest corner of the intersection of State Highway 486 and U S Highway 41. The reference mark is a lag bolt set in the north face of a power line pole.
ZONE C
SEABOARD
COAST LINE
Searoll
Felicia
Tsala Apopka Lake
FLOODING EFFECTS FROM HERNANDO POOL
ZONE A3
(EL 42)
JOINS PANEL 175
RAILROAD
Calphos
RM17
RM18
TSALA APOPKA LAKE
3
2
5
15
14
21
22
23

FIGURE 2



ON REFERENCE MARKS

DESCRIPTION OF LOCATION

o reach mark from the intersection of State Highway 200 and U S Highway 41, go approximately 1.05 miles north along State Highway 200 the mark on the west side of the road. The reference mark is a lag bolt the east face of a power line pole.

Located in the northwest corner of the intersection of State Highway 486 nd U S Highway 41. The reference mark is a lag bolt set in the north face a power line pole.

FIGURE 2
(5a)

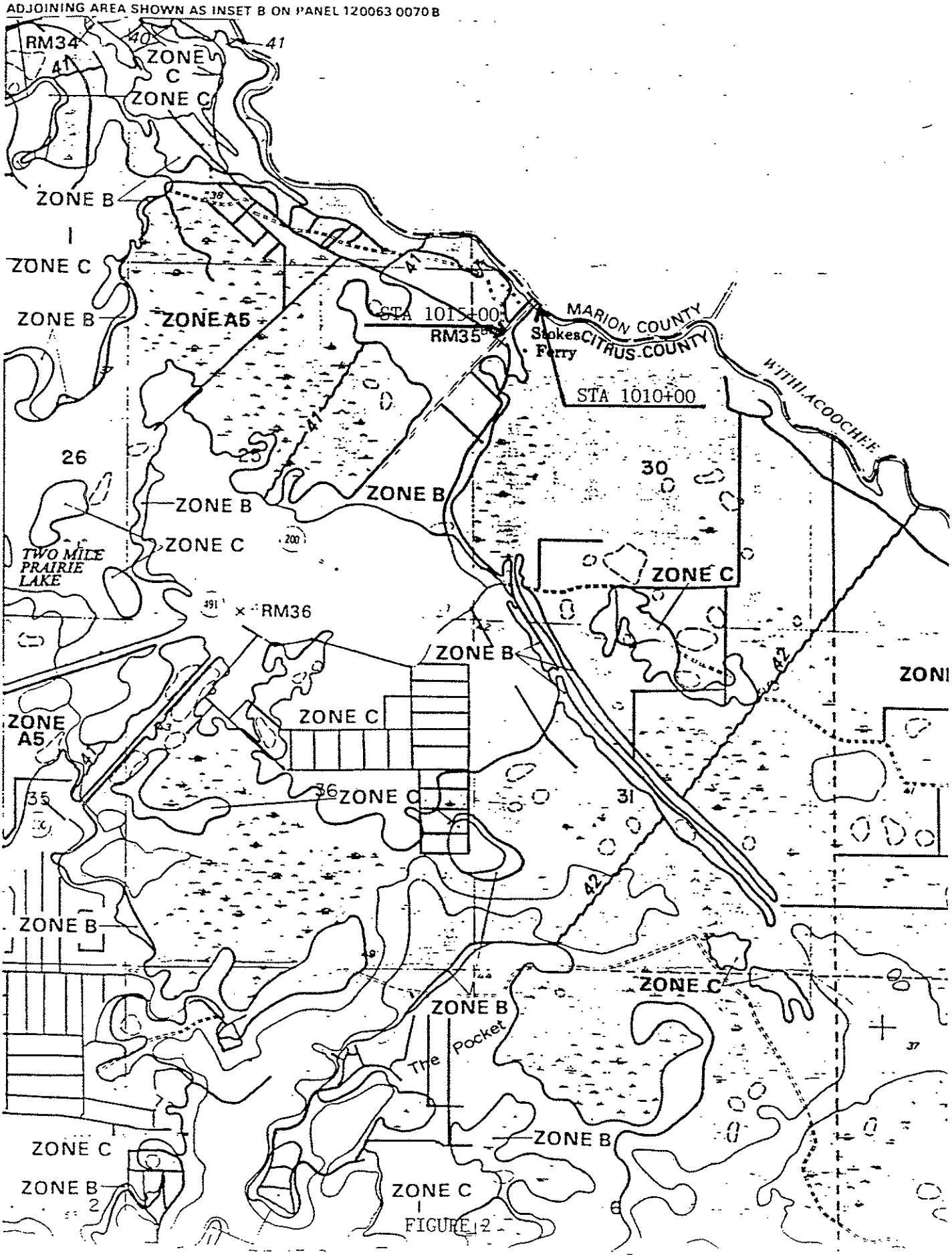

ADJOINING AREA SHOWN AS INSET B ON PANEL 120063 0070 B
RM34
ZONE C
ZONE C
ZONE B
ZONE C
ZONE B
ZONE A5
STA 1015+00
RM35
Stokes Ferry
MARION COUNTY
CITRUS COUNTY
WITHLACOOCHEE
STA 1010+00
26
25
ZONE B
ZONE B
30
ZONE C
TWO MILE PRAIRIE LAKE
ZONE C
RM36
ZONE B
ZONE C
ZONE A5
35
36
ZONE C
31
ZONE B
ZONE C
ZONE B
The Pocket
ZONE B
ZONE C
ZONE B
ZONE C

FIGURE 2

II. EXISTING CONDITIONS

In general, the project alignment cuts numerous small (less than 200 acres) contributing drainage areas. Presently, much of the project area can be considered rural. Development is expected to increase with the increase in travel capacity. Thus evaluation of the existing conditions description must take into account and recognize the potential for growth.

A. Existing Drainage Basin

1. Basin Description:

Drainage areas and basin boundaries were determined using USGS Quadrangle Maps (see Appendix), FDOT Drainage District Maps, Water Management District information and confirmation made by field investigations. Of the ten basins, 9 percolate through highly permeable type "A" soils and three areas are land locked basins I. D and A.

2. Soil Description:

Based on the Soil Conservation Service (SCS) most recent publication on Citrus County (1985), there are approximately eleven different types of soils along SR 200. The soil type and hydraulic soil group are described in Table 1.

TABLE I

SOIL CHARACTERISTICS

Soil Name	Type	Hydrologic Group	Permeability (In/Hr)	Water Table (ft)
(1) Lake (15)	FS	A	0-80 > 6	> 6
(2) Lake (14)	FS	A	0-80 > 6	> 6
(3) Tavares (11)	FS	A	0-3 } 3-80 } > 6	3.5 - 6
(4) Candler (3)	FS	A	0-72 6-20	> 6
(5) Candler (4)	FSS	A	0-80 6-20	> 6
(6) Adamsville (2)	FS	C	0-80 6-20	2 - 3.5
(7) Basinger (5)	FS	B/D	0-80 6-20	0-1
(8) Arrendondo (6)	FSS/LFS	A	0-65 6-20 65-80 04-.6	> 6
(9) Pomello (27)	FS	C	0-31 > 20 31-51 2-6	2-3.5
(10) Basinger (6)	FS	D	0-80 6-20	1 - 2
(11) Paola (8)	FS	A	0-80 > 20	3.5 - 6.0

NOTE: FS - Fine sand
FSS - Fine sand
LFS - Loamy fine sand

3. Structures Analysis

The largest existing crossdrain is a double 10 X 6 bridge culvert. The remaining crossdrains are 2 X 2 box culverts. See Table 2 for summary of existing crossings and recommendations.

The present route crosses numerous small drainage basins. These drainage areas are served by existing crossdrain culverts to permit the passage of excess rainfall. Each of these crossdrains were identified and evaluated as to its flow capacity. Due to the age of the existing 2 X 2 box culvert structures, they will be replaced with reinforced concrete pipe. Each replacement was analyzed to make sure its ability to convey excess rainfall is sufficient (see Table 3).

For discharge determinations rational runoff methods and rainfall intensity Zone 5 were used. Runoff coefficients ranging from .15 short grass prairie to .50 woods, light underbrush were employed.

Existing culvert lengths, sizes and elevations were taken from the old FDOT plan and profile drawing for SR 200 Federal Aid Project No. 84D. The tailwater levels for the design and storm events were assumed to be at the overt of each crossdrain.

Design flows were calculated using the rational method. Culvert analysis was done using FDOT, District 5 computer programs. The 50-year design frequency was used in culvert analysis (see supporting calculations).

TABLE 2

EXISTING DRAINAGE STRUCTURES

Station	Basin	Size	Description
1045+70	I	2 X 2 Box	Concrete, straight square endwall, equalizer with medium woods on both sides; Replacement necessary.
1089+00	D	2 X 2 Box	Concrete, straight square endwall, equalizer with wetlands on both sides; Replacement necessary.
1113+75	D	Double 10 X 6	Concrete bridge culvert; Dry lake on left side, full lake on right. HW stand 2.5' above FL. Due to the structure being oversized, one side needs to be plugged; Extension for single barrel is necessary.
1159+00	C	2 X 2 Box	Concrete, straight square endwall; 2/3 clogged; lake on E. side wetlands on west; Replacement necessary.
1194+00	H	2 X 2 Box	Concrete, straight square endwall; dry contributing area; Replacement necessary.

EXISTING DRAINAGE STRUCTURES CONT'D

Station	Basin	Size	Description
1232+50	B	2 X 2 Box	Concrete, straight square endwall, heavy woods both sides, equalizer. Replacement necessary.
1272+75	A	2 X 2 Box	Concrete, straight square endwall. Replacement necessary.
1288+00	A	2 X 2 Box	Concrete, straight square endwall. Medium woods both sides. Replacement necessary.
1302+50	A	2 X 2 Box	Concrete, straight square endwall. Dense woods both sides. Replacement necessary.
1355+40	E	18" pipe	Corrugated metal pipe with straight square endwall. Replacement necessary.

TABLE 3

PROPOSED DRAINAGE STRUCTURES

Station	Basin	Required Size (in)	Approximate Length (ft)
1045+70	I	48	160
1089+00	D	30	160
1107+00	D	30	160
1113+75	D	72	140' extension of 1/2 of the existing structure
1159+60	C	42	160
1161+00	C	36	160
1194+00	H	48	160
1216+00	G	36	160
1232+50	B	36	160
1242+75	B	48	160
1272+00	A	36	120
1288+46	A	30	120
1302+50	A	30	120
1329+00	F	42	120
1355+00	E	36	120

IV. RETENTION/DETENTION REQUIREMENTS

Combination pollution abatement retention and flow control detention storage ponds have been located and preliminary sized for purposes of identifying right-of-way requirements. The retention/detention ponds locations are shown on the following drainage tables. The ponds have been plotted at locations appearing most feasible in terms of hydraulic slope (near low points in road profiles). All attempts have been made to place these ponds for best service and least impact. See Table 4 for description.

All of the ponds except "A", "I", and "D" are located in open drainage basins. Ponds "I", "D" and "K" will adhere to criteria two, Ponds "A", "B", "C", "D", "F", "G", "H", "I", "J", will adhere to Criteria One. Pond K will adhere to Criteria Three. Please refer to pages 4 to 5 for criteria.

All the ponds were designed using (1-3.5) foot of live storage depth, 1-foot of freeboard, 4:1 side slopes and a 20-foot perimeter berm. (See supporting calculations for pond sizing and required treatment).

TABLE 4

PROPOSED DETENTION/RETENTION PONDS

Pond	Pond Location (Station)	Roadway Length Served (ft)	Overall Area Furnished (Acres)	30' Easement Required
E	1360+00 (RT)	Sta. 1358+00 to 1338+00	1.05	Y
F	1328+50 (RT)	Sta. 1338+00 to 1312+00	.93	Y
A	1296+60 (LT)	Sta. 1312+00 to 1262+00	1.49	Y
B	1223+70 (RT)	Sta. 1262+00 to 1222+00	1.17	Y
G	1219+00 (RT)	Sta. 1222+00 to 1206+00	1.17	Y
H	1188+20 (RT)	Sta. 1206+00 to 1185+00	.92	Y
C	1157+20 (RT)	Sta. 1185+00 to 1132+00	1.48	Y
D	1109+60 (RT)	Sta. 1132+00 to 1073+00	2.02	Y
I	1057+50 (LT)	Sta. 1073+00 to 1056+00	.77	Y
J	1035+80 (LT)	Sta. 1056+00 to 1026+00	1.24	Y
K	1025+00 (RT)	Sta. 1026+00 to 1010+00	2.1	Y

TABLE 5

PROPOSED DETENTION/RETENTION PONDS

(ALTERNATE)

Pond	Pond Location (Station)	Roadway Length Served (ft)	Overall Area Furnished (Acres)
E	1362+00 (L)	Sta. 1358+00 to 1338+00	.96
F	1340+00 (R)	Sta. 1338+00 to 1312+00	.96
A	1280+00 (L)	Sta. 1312+00 to 1262+00	1.49
B	1228+90 (R)	Sta. 1262+00 to 1222+00	1.17
G	1207+00 (L)	Sta. 1222+00 to 1206+00	.84
H	1182+50 (L)	Sta. 1206+00 to 1185+00	1.52
C	1170+80 (L)	Sta. 1185+00 to 1132+00	1.38
D	1079+00 (R)	Sta. 1032+00 to 1073+00	1.45
I	1053+00 (R)	Sta. 1073+00 to 1056+00	.77
J	1038+00 (R)	Sta. 1056+00 to 1026+00	1.24
K	1019+70 (L)	Sta. 1026+00 to 1010+00	1.75

RISK ASSESSMENT

A. Project Classification

The proposed improvements between Sta. 1010+00 to Sta. 1358+00±, can be classified in Category 6; Projects on Existing Alignment. This category excludes replacement activities that would reduce the hydraulic performance of existing facilities.

"The proposed structure will perform hydraulically in a manner equal to or greater than the existing structure, and backwater surface elevations are not expected to increase. As a result, there will be no significant adverse impacts on natural and beneficial flood plain values, there will be no significant change in flood risks, and there will be no significant change in the potential for interruption or termination of emergency service or emergency evacuation routes. Therefore, it has been determined that this encroachment is not significant".

B. Risk Evaluation

Review of Flood Plain Data and Hydraulic Analysis of crossdrain culverts, shows that the proposed roadway profile is above the 100-year event flood level. The proposed pavement will have a minimum clearance of two feet above the seasonal high water.

SUMMARY AND RECOMMENDATIONS

In general, it can be stated that the existing crossdrain culverts (2X2 box) will be upgraded with reinforced concrete pipe. These new structures were analyzed to ensure their ability to pass the design and predicted flows for the life of the project. After the replacement and headwall construction and additional maintenance work has been completed.

The summary and recommendations are discussed.

Station 1222+00 to Station 1358+00
Existing Alignment (with Proposed Curb & Gutter Typical):

This is an existing alignment. The proposed roadway will consist of four 12' driving lanes, 20-foot grass median, curb and gutter, and sidewalks. There will be four (4) retention/detention ponds spaced throughout the alignment (see Table 5), and seven proposed crossdrains (see Table 4).

Station 1222+00 to Station 1010+00
Existing Alignment (with Proposed Rural Typical):

This portion of the project consists of four 12' lanes, forty-three foot grass median, standard four-foot paved shoulders standard 5' ditch with 6:1 slopes. There will be seven (7) retention/detention ponds spaced throughout the alignment (see Table 5), and eight (8) proposed crossdrains (see Table 4).

The impact to the 100-year flood plain is small. However, any encroachment into the 100-year flood plain will be compensated for. Pond 1 will be used to replace the lost volume to this 6.681 mile section.

APPENDIX B

EXCERPTS FROM THE SCS SOIL SURVEY OF CITRUS COUNTY

United States Department of Agriculture

Soil Conservation Service

In cooperation with University of Florida, Institute of Food and Agricultural Sciences, Agricultural Experiment Stations and Soil Science Department, and Florida Department of Agriculture and Consumer Services

Soil Survey of Citrus County, Florida

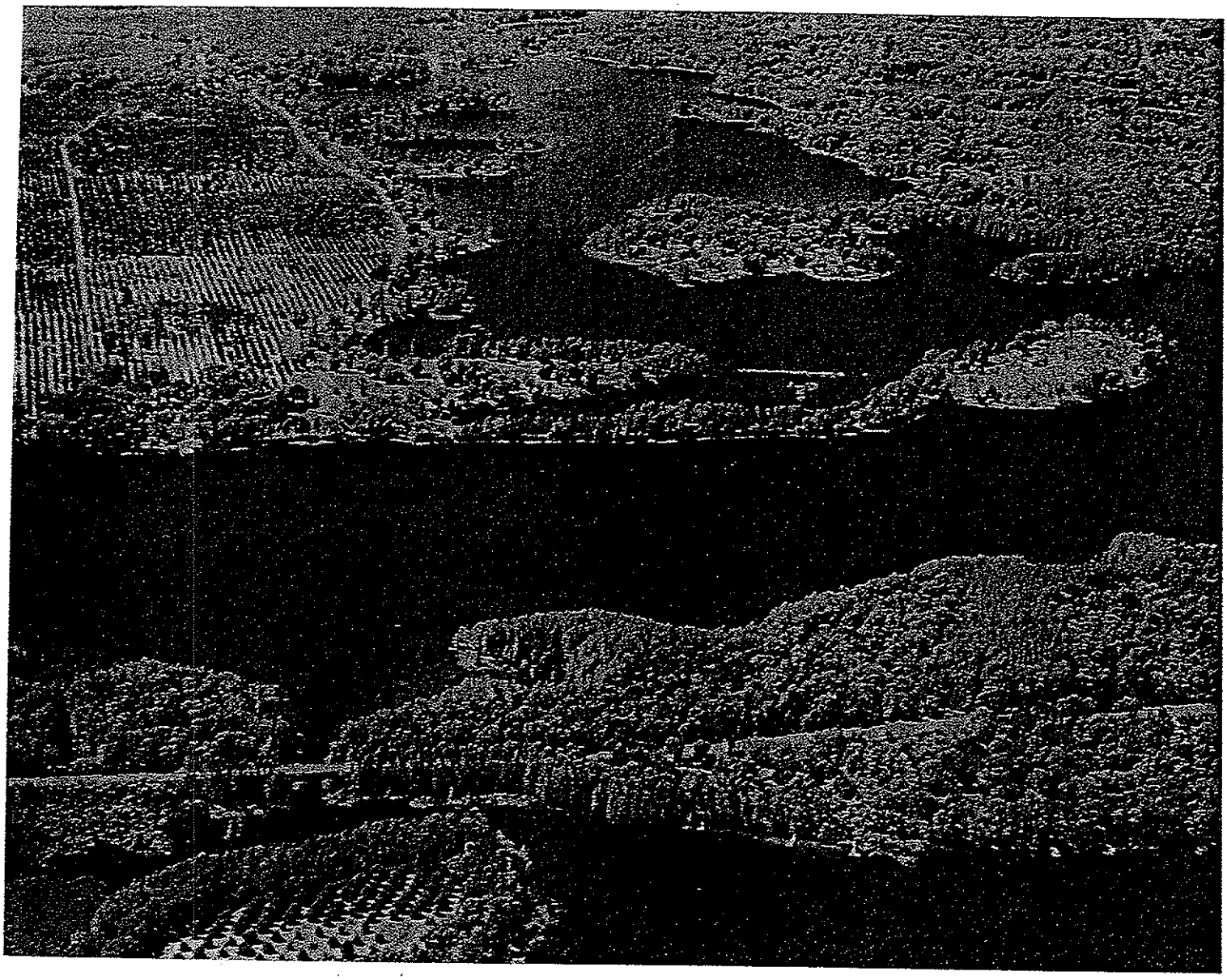


TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
									K	T		
	In	Pct	G/cc	In/hr	In/in	pH	mmho/cm					Pct
2----------	0-7	1-8	1.35-1.65	6.0-20	0.05-0.10	4.5-7.8	<2	Low--------	0.10	5	2	<2
Adamsville	7-80	1-7	1.35-1.65	6.0-20	0.03-0.08	4.5-7.8	<2	Low--------	0.10			
3----------	0-72	<3	1.35-1.55	6.0-20	0.04-0.08	4.5-6.0	<2	Low--------	0.10	5	2	.5-2
Candler	72-80	<3	1.50-1.65	6.0-20	0.02-0.06	4.5-6.0	<2	Low--------	0.10			
4----------	0-60	<3	1.35-1.55	6.0-20	0.04-0.08	4.5-6.0	<2	Low--------	0.10	5	2	.5-2
Candler	60-80	<3	1.50-1.65	6.0-20	0.02-0.06	4.5-6.0	<2	Low--------	0.10			
5----------	0-8	0-4	1.40-1.55	6.0-20	0.03-0.07	3.6-8.4	<2	Low--------	0.10	5	2	.5-2
Basinger	8-24	0-4	1.40-1.55	6.0-20	0.05-0.10	3.6-7.3	<2	Low--------	0.10			
	24-80	1-6	1.40-1.65	6.0-20	0.10-0.15	3.6-7.3	<2	Low--------	0.10			
	36-60	1-3	1.50-1.70	6.0-20	0.05-0.10	3.6-7.3	<2	Low--------	0.10			
6----------	0-19	0-4	1.40-1.55	6.0-20	0.05-0.10	3.6-7.3	<2	Low--------	0.10	5	2	1-8
Basinger	19-31	0-4	1.40-1.55	6.0-20	0.05-0.10	3.6-7.3	<2	Low--------	0.10			
	31-80	1-3	1.40-1.65	6.0-20	0.10-0.15	3.6-7.3	<2	Low--------	0.10			
	42-80	1-3	1.50-1.70	6.0-20	0.05-0.10	3.6-7.3	<2	Low--------	0.10			
7----------	0-27	<2	1.35-1.55	6.0-20	0.02-0.05	3.6-6.5	<2	Low--------	0.10	5	2	<2
Myakka	27-55	1-8	1.45-1.60	0.6-6.0	0.10-0.20	3.6-6.5	<2	Low--------	0.15			
	55-80	<2	1.48-1.70	6.0-20	0.02-0.10	3.6-6.5	<2	Low--------	0.10			
8----------	0-26	0-2	1.20-1.45	>20	0.02-0.05	3.6-7.3	<2	Low--------	0.10	5	1	<.5
Paola	26-80	0-2	1.45-1.60	>20	0.02-0.05	3.6-7.3	<2	Low--------	0.10			
	25-80	0-3	1.45-1.60	>20	0.02-0.05	3.6-7.3	<2	Low--------	0.10			
9, 10----------	0-80	0-5	1.30-1.65	6.0-20	0.02-0.05	4.5-7.8	<2	Low--------	0.10	5	2	1-5
Pompano												
11----------	0-3	0-4	1.25-1.60	>6.0	0.05-0.10	3.6-6.0	<2	Low--------	0.10	5	2	.5-2
Tavares	3-80	0-4	1.40-1.70	>6.0	0.02-0.05	3.6-6.0	<2	Low--------	0.10			
12----------	0-6	1-5	1.20-1.50	6.0-20	0.05-0.10	3.6-6.0	<2	Low--------	0.10	5	2	1-2
Immokalee	6-33	1-5	1.45-1.70	6.0-20	0.02-0.05	3.6-6.0	<2	Low--------	0.10			
	33-52	2-7	1.30-1.60	0.6-2.0	0.10-0.25	3.6-6.0	<2	Low--------	0.15			
	52-80	1-5	1.40-1.60	6.0-20	0.02-0.05	3.6-6.0	<2	Low--------	0.10			
13----------	0-38	---	0.22-0.38	6.0-20	0.30-0.50	4.5-6.5	<2	Low--------	-----	---	2	60-90
Okeelanta	38-80	1-5	1.30-1.55	6.0-20	0.05-0.10	5.1-7.8	<2	Low--------	0.15			
14, 15----------	0-80	1-3	1.45-1.65	>6.0	0.03-0.08	4.5-5.5	<2	Low--------	0.10	5	2	.5-1
Lake												
16----------	0-65	5-12	1.25-1.65	6.0-20	0.05-0.10	4.5-6.0	<2	Low--------	0.10	5	2	<2
Arredondo	65-80	15-40	1.55-1.70	0.04-0.6	0.15-0.20	4.5-6.0	<2	Low--------	0.24			
17----------	0-54	5-12	1.25-1.65	6.0-20	0.05-0.10	4.5-6.0	<2	Low--------	0.10	5	2	<2
Arredondo	54-57	10-18	1.45-1.60	2.0-6.0	0.08-0.15	4.5-6.0	<2	Low--------	0.20			
	57-80	15-40	1.55-1.70	0.04-0.6	0.15-0.20	4.5-6.0	<2	Low--------	0.24			
18----------	0-21	1-7	1.25-1.50	6.0-20	0.05-0.07	4.5-6.0	<2	Low--------	0.10	5	2	<2
Kendrick	21-45	15-25	1.55-1.70	0.6-6.0	0.10-0.15	4.5-6.0	<2	Low--------	0.24			
	45-80	20-40	1.55-1.75	0.06-2.0	0.12-0.20	4.5-6.0	<2	Low--------	0.32			

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
									K	T		
	In	Pct	G/cc	In/hr	In/in	pH	mmho/cm					Pct
19----------	0-26	1-7	1.25-1.50	6.0-20	0.05-0.07	4.5-6.0	<2	Low--------	0.10	5	2	<2
Kendrick	26-30	15-25	1.55-1.70	0.6-6.0	0.10-0.15	4.5-6.0	<2	Low--------	0.24			
	30-56	20-40	1.55-1.75	0.06-2.0	0.12-0.20	4.5-6.0	<2	Low--------	0.32			
	56-80	15-25	1.55-1.75	<0.0-2.0	0.12-0.15	4.5-6.0	<2	Low--------	0.32			
20*.												
Pits												
22.												
Quartzipsamments												
23:												
Weekiwachee-----	0-34	---	0.25-0.35	2.0-6.0	0.20-0.25	6.1-7.8	>16	Low--------	----	---	2	20-74
	34-38	1-7	1.50-1.65	2.0-6.0	0.10-0.15	6.1-7.8	>16	Low--------	0.10			
	38-41	---	---	---	---	---	---	----------	----			
	41	---	---	---	---	---	---	----------	----			
Durbin----------	0-80	---	0.20-0.50	6.0-20	0.20-0.25	3.6-7.3	>16	Low--------	----	2	2	40-65
24:												
Okeelanta-------	0-32	---	0.22-0.38	6.0-20	0.30-0.50	4.5-6.5	<2	Low--------	----	---	2	60-90
	32-80	1-5	1.30-1.55	6.0-20	0.05-0.10	5.1-7.8	<2	Low--------	0.15			
Lauderhill------	0-26	---	0.15-0.35	6.0-20	0.30-0.50	5.6-7.8	<2	Low--------	----	---	2	60-90
	26	---	---	---	---	---	---	----------	----			
Terra Ceia------	0-80	---	0.15-0.35	6.0-20	0.30-0.50	4.5-8.4	<2	Low--------	----	---	2	60-90
	65-80	2-10	1.35-1.50	6.0-20	0.02-0.08	4.5-8.4	<2	Low--------	----			
25----------	0-27	2-12	1.35-1.65	2.0-20	0.05-0.20	4.5-5.5	<2	Low--------	0.10	5	2	1-4
Lochloosa	27-37	13-20	1.55-1.70	0.6-6.0	0.10-0.15	4.5-5.5	<2	Low--------	0.24			
	37-48	15-35	1.55-1.70	0.6-0.2	0.12-0.15	4.5-5.5	<2	Low--------	0.28			
	48-63	20-45	1.60-1.70	0.06-0.2	0.13-0.18	4.5-5.5	<2	Low--------	0.28			
	63-80	15-35	1.55-1.70	0.06-0.2	0.10-0.15	4.5-5.5	<2	Low--------	0.28			
26:												
Williston-------	0-14	10-14	1.30-1.45	6.0-20	0.08-0.10	5.1-7.3	<2	Low--------	0.15	2	2	0-2
	14-24	35-55	1.60-1.70	0.2-0.6	0.14-0.18	6.1-7.8	<2	Moderate	0.28			
	24	---	---	---	---	---	---	----------	----			
Pedro-----------	0-15	1-5	1.36-1.55	6.0-20	0.03-0.08	5.1-6.5	<2	Low--------	0.10	1	2	.5-2
	15-18	20-35	1.55-1.70	2.0-6.0	0.10-0.15	6.1-7.8	<2	Low--------	0.28			
	18	---	---	---	---	---	---	----------	----			
Rock outcrop.												
27----------	0-31	<2	1.35-1.65	>20	0.02-0.05	4.5-6.0	<2	Very low	0.10	5	1	<1
Pomello	31-52	<2	1.45-1.60	2.0-6.0	0.10-0.30	4.5-6.0	<2	Very low	0.15			
	52-80	<2	1.35-1.65	6.0-20	0.02-0.05	4.5-6.0	<2	Very low	0.10			
28----------	0-7	1-2	1.30-1.50	6.0-20	0.05-0.10	4.5-8.4	<2	Low--------	0.10	4	2	.5-2
Redlevel	7-55	2-7	1.50-1.60	6.0-20	0.05-0.10	4.5-8.4	<2	Low--------	0.10			
	55	---	---	---	---	---	---	----------	----			
29----------	0-5	1-3	1.25-1.50	>20	0.04-0.10	4.5-6.5	<2	Low--------	0.10	5	2	.5-2
Astatula	5-80	1-3	1.45-1.60	>20	0.02-0.05	4.5-6.5	<2	Low--------	0.10			
30----------	0-2	1-3	1.25-1.50	>20	0.04-0.10	4.5-6.5	<2	Low--------	0.10	5	2	.5-2
Astatula	2-80	1-3	1.45-1.60	>20	0.02-0.05	4.5-6.5	<2	Low--------	0.10			

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
									K	T		
	In	Pct	G/cc	In/hr	In/in	pH	mmho/cm					Pct
31----------	0-8	1-5	1.20-1.50	6.0-20	0.08-0.12	3.6-6.5	<2	Low--------	0.10	5	2	<3
Sparr	8-45	1-5	1.45-1.70	6.0-20	0.05-0.08	3.6-6.5	<2	Low--------	0.10			
	45-51	15-32	1.55-1.80	0.6-2.0	0.10-0.15	3.6-6.5	<2	Low--------	0.20			
	51-80	12-38	1.55-1.80	0.06-0.6	0.10-0.18	3.6-6.5	<2	Low--------	0.24			
32:												
Candler----------	0-60	<3	1.35-1.55	6.0-20	0.04-0.08	4.5-6.0	<2	Low--------	0.10	5	2	.5-2
	60-80	<3	1.50-1.65	6.0-20	0.02-0.06	4.5-6.0	<2	Low--------	0.10			
	95-99	14-30	1.55-1.65	2.0-6.0	0.10-0.15	4.5-6.0	<2	Low--------	0.20			
Urban land.												
33----------	0-15	3-12	1.50-1.65	6.0-20	0.05-0.10	3.6-6.0	<2	Low--------	0.15	5	2	1-5
Micanopy	15-25	20-38	1.50-1.65	0.6-2.0	0.10-0.15	3.6-6.0	<2	Moderate	0.32			
	25-55	40-60	1.55-1.70	0.06-0.2	0.10-0.18	3.6-6.0	<2	High-------	0.28			
	55-63	25-38	1.55-1.70	0.06-0.2	0.10-0.15	3.6-6.0	<2	High-------	0.32			
35----------	0-8	1-5	1.20-1.50	6.0-20	0.08-0.12	3.6-6.5	<2	Low--------	0.10	5	2	<3
Sparr	8-61	1-5	1.45-1.70	6.0-20	0.05-0.08	3.6-6.5	<2	Low--------	0.10			
	61-71	15-32	1.55-1.80	0.6-2.0	0.10-0.15	3.6-6.5	<2	Low--------	0.20			
	71-80	12-38	1.55-1.80	0.06-0.6	0.10-0.18	3.6-6.5	<2	Low--------	0.24			
36----------	0-22	<5	1.25-1.50	6.0-20	0.02-0.07	4.5-6.0	<2	Low--------	0.10	5	2	2-8
EauGallie	22-53	1-8	1.45-1.60	0.6-6.0	0.15-0.25	4.5-6.5	<2	Low--------	0.15			
	53-80	13-31	1.55-1.70	0.06-2.0	0.10-0.20	4.5-7.8	<2	Low--------	0.20			
37:												
Matlacha---------	0-42	3-8	1.65-1.75	2.0-6.0	0.05-0.10	5.6-8.4	<2	Low--------	0.10	5	2	---
	42-60	1-2	1.40-1.65	6.0-20	0.03-0.05	5.6-7.3	<2	Low--------	0.17			
	60	---	---	---	---	---	---	----------	----			
Urban land.												
38:												
Rock outcrop.												
Homosassa--------	0-8	10-18	1.25-1.45	2.0-20	0.20-0.25	6.1-7.8	>16	Low--------	0.10	2	2	10-15
	8-21	3-12	1.45-1.60	2.0-20	0.10-0.15	6.1-7.8	>16	Low--------	0.17			
	21	---	---	---	---	---	---	----------	----			
Lacoochee--------	0-8	13-19	1.55-1.65	0.6-2.0	0.15-0.20	7.9-8.4	>16	Low--------	0.20	1	3	---
	8-13	3-12	1.50-1.65	2.0-6.0	0.10-0.15	6.6-8.4	>16	Low--------	0.17			
	13-21	---	---	---	---	---	---	----------	----			
	21	---	---	---	---	---	---	----------	----			
39:												
Wallandale------	0-2	<3	1.35-1.45	6.0-20	0.05-0.11	5.1-6.5	<2	Low--------	0.10	2	2	2-5
	2-6	<3	1.50-1.60	6.0-20	0.03-0.08	6.1-6.5	<2	Low--------	0.10			
	6-8	<3	1.50-1.60	0.6-6.0	0.03-0.08	5.6-8.4	<2	Low--------	0.10			
	8-10	<5	1.50-1.60	6.0-20	0.05-0.10	6.6-8.4	<2	Low--------	0.10			
	10	---	---	---	---	---	---	----------	----			
Rock outcrop.												
40----------	0-10	10-18	1.25-1.45	2.0-20	0.20-0.25	6.1-7.8	>16	Low--------	0.10	2	2	10-15
Homosassa	10-18	3-12	1.45-1.60	2.0-20	0.10-0.15	6.1-7.8	>16	Low--------	0.17			
	18-31	3-12	---	2.0-20	0.07-0.12	6.1-7.8	>16	Low--------	0.17			
	31-35	---	---	---	---	---	---	----------	----			
	35	---	---	---	---	---	---	----------	----			

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
									K	T		
	In	Pct	G/cc	In/hr	In/in	pH	mmho/cm					Pct
41----------	0-4	<3	1.35-1.55	6.0-20	0.04-0.08	4.5-6.0	<2	Low-------	0.10	5	2	.5-2
Candler	4-67	<3	1.50-1.65	6.0-20	0.02-0.06	4.5-6.0	<2	Low-------	0.10			
	67-80	3-8	1.50-1.65	6.0-20	0.05-0.08	4.5-6.0	<2	Low-------	0.10			
46----------	0-21	0-5	1.25-1.50	6.0-20	0.02-0.07	4.5-6.0	<2	Low-------	0.10	5	2	2-8
EauGallie	21-32	1-8	1.45-1.60	0.6-6.0	0.15-0.25	4.5-6.5	<2	Low-------	0.15			
	32-46	1-5	1.45-1.65	6.0-20	0.02-0.05	4.5-7.8	<2	Low-------	0.10			
	46-80	13-31	1.55-1.70	0.06-2.0	0.10-0.20	4.5-7.8	<2	Low-------	0.20			
47----------	0-13	3-13	1.15-1.55	6.0-20	0.08-0.15	5.1-7.3	<2	Low-------	0.15	5	2	1-5
Fort Meade	13-80	3-13	1.20-1.65	6.0-20	0.06-0.10	4.5-6.0	<2	Low-------	0.15			
48. Arents												
49:												
Terra Ceia------	0-80	---	0.15-0.35	6.0-20	0.30-0.50	4.5-8.4	<2	Low-------	----	2	2	>60
Okeelanta-------	0-27	---	0.15-0.35	6.0-20	0.20-0.45	6.6-7.3	<2	Low-------	----	---	2	60-85
	27-65	1-5	1.30-1.55	6.0-20	0.05-0.10	6.6-8.4	<2	Low-------	0.10			
50----------	0-45	2-6	1.55-1.75	2.0-6.0	0.03-0.10	4.5-6.0	<2	Low-------	0.10	5	2	.5-4
Kanapaha	45-72	15-32	1.50-1.65	0.06-0.6	0.10-0.15	4.5-6.0	<2	Low-------	0.24			
51:												
Boca----------	0-3	<2	1.30-1.55	6.0-20	0.05-0.10	5.1-8.4	<2	Low-------	0.10	5	2	1-3
	3-22	<2	1.50-1.60	6.0-20	0.02-0.05	5.1-8.4	<2	Low-------	0.17			
	22-32	14-30	1.55-1.65	0.6-2.0	0.10-0.15	5.1-8.4	<2	Low-------	0.20			
	32	---	---	---	---	---	---	----------	----			
Pineda----------	0-28	1-3	1.40-1.65	6.0-20	0.02-0.05	5.6-6.5	<2	Low-------	0.15	5	2	1-2
	28-42	17-35	1.65-1.75	0.06-0.2	0.10-0.15	6.6-7.8	<2	Low-------	0.24			
	42	---	---	---	---	---	---	----------	----			
52----------	0-14	2-8	1.30-1.45	6.0-20	0.10-0.15	5.1-8.4	<2	Low-------	0.10	5	2	2-10
Anclote	14-80	1-13	1.50-1.65	6.0-20	0.03-0.10	5.1-8.4	<2	Low-------	0.10			
53----------	0-5	<2	1.30-1.55	6.0-20	0.05-0.10	5.1-8.4	<2	Low-------	0.10	5	2	1-3
Boca	5-21	<2	1.50-1.60	6.0-20	0.02-0.05	5.1-8.4	<2	Low-------	0.17			
	21-38	14-30	1.55-1.65	0.6-2.0	0.10-0.15	5.1-8.4	<2	Low-------	0.20			
	38	---	---	---	---	---	---	----------	----			
54----------	0-50	<3	1.45-1.60	6.0-20	0.03-0.05	4.5-6.0	<2	Low-------	0.10	5	2	<2
Apopka	50-80	18-35	1.55-1.75	0.6-2.0	0.12-0.17	4.5-6.0	<2	Low-------	0.24			
55. Udorthents												
56----------	0-11	35-75	1.45-1.65	0.06-0.2	0.15-0.20	4.5-7.8	<2	High------	0.32	5	4	---
Lake	11-80	1-3	1.45-1.65	>6.0	0.03-0.08	4.5-5.5	<2	Low-------	0.10			
57----------	0-8	1-7	1.40-1.55	6.0-20	0.10-0.15	3.6-6.0	<2	Low-------	0.10	5	2	1-5
Ona	8-20	3-8	1.50-1.65	0.6-2.0	0.10-0.15	3.6-6.0	<2	Low-------	0.15			
	20-80	1-4	1.50-1.65	6.0-20	0.03-0.08	3.6-6.0	<2	Low-------	0.10			
58:												
Myakka----------	0-23	0-2	1.35-1.55	6.0-20	0.02-0.05	5.1-7.8	<2	Low-------	0.10	5	2	<2
	23-34	1-8	1.45-1.60	0.6-6.0	0.10-0.20	5.1-7.8	<2	Low-------	0.15			
	34-62	0-2	1.48-1.70	6.0-20	0.10-0.20	5.1-7.8	<2	Low-------	0.10			
	62	---	---	---	---	---	---	----------	----			

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
									K	T		
	In	Pct	G/cc	In/hr	In/in	pH	mmho/cm					Pct
58:												
EauGallie	0-25	<5	1.25-1.50	6.0-20	0.02-0.05	4.5-6.0	<2	Low	0.10	5	2	2-8
	25-33	1-8	1.45-1.60	0.6-6.0	0.05-0.10	4.5-6.5	<2	Low	0.15			
	33-57	1-5	1.45-1.65	6.0-20	0.02-0.05	5.1-7.8	<2	Low	0.10			
	57-63	13-31	1.55-1.70	0.2-6.0	0.10-0.15	5.1-7.8	<2	Low	0.20			
	63	---	---	---	---	---	---	---	---			
59	0-8	0-2	1.30-1.55	6.0-20	0.05-0.10	5.1-7.8	<2	Low	0.10	5	2	1-3
Boca	8-21	0-2	1.50-1.60	6.0-20	0.02-0.05	5.1-8.4	<2	Low	0.10			
	21-27	15-30	1.55-1.65	0.6-2.0	0.10-0.15	5.1-8.4	<2	Low	0.20			
	27	---	---	---	---	---	---	---	---			
60	0-5	2-8	1.35-1.45	6.0-20	0.05-0.10	5.6-8.4	<2	Low	0.10	2	2	<1
Broward	5-35	1-7	1.50-1.60	6.0-20	0.03-0.08	5.6-8.4	<2	Low	0.10			
	26	---	---	---	---	---	---	---	---			
61	0-14	<1	1.35-1.55	>20	0.02-0.08	3.6-6.0	<2	Low	0.10	5	2	<1
Orsino	14-80	<2	1.35-1.55	>20	0.02-0.08	3.6-6.0	<2	Low	0.10			
62	0-15	0-4	1.35-1.55	6.0-20	0.03-0.08	5.1-8.4	<2	Low	0.10	5	2	1-2
Malabar	15-44	1-5	1.35-1.70	6.0-20	0.05-0.10	5.1-8.4	<2	Low	0.10			
	44-80	12-25	1.55-1.75	<0.2	0.10-0.15	5.1-8.4	<2	Low	0.24			
63	0-15	2-8	1.35-1.45	6.0-20	0.05-0.08	4.5-6.5	<2	Low	0.10	5	2	1-4
Paisley	15-80	45-65	1.55-1.65	0.06-0.2	0.15-0.18	5.6-8.4	<2	High	0.28			
64	0-2	1-2	1.30-1.50	0.6-6.0	0.05-0.10	5.1-8.4	<2	Low	0.10	4	2	.5-2
Citronelle	2-9	2-5	1.50-1.60	0.6-6.0	0.05-0.10	5.1-8.4	<2	Low	0.10			
	9	---	---	---	---	---	---	---	---			

TABLE 15.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated]

Map symbol and soil name	Hydrologic group	Flooding			High water table			Bedrock		Subsidence		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Initial	Total	Uncoated steel	Concrete
					Ft			In		In	In		
2---------- Adamsville	C	None---------	---	---	2.0-3.5	Apparent	Jun-Nov	>60	---	---	---	Low-------	Moderate.
3, 4---------- Candler	A	None---------	---	---	>6.0	---	---	>60	---	---	---	Low-------	High.
5---------- Basinger	B/D	None---------	---	---	0-1.0	Apparent	Jun-Feb	>60	---	---	---	High------	Moderate.
6*---------- Basinger	D	None---------	---	---	+2-1.0	Apparent	Jun-Feb	>60	---	---	---	High------	Moderate.
7---------- Myakka	B/D	None---------	---	---	0-1.0	Apparent	Jun-Nov	>60	---	---	---	High------	High.
8---------- Paola	A	None---------	---	---	>6.0	---	---	>60	---	---	---	Low-------	High.
9---------- Pompano	B/D	None---------	---	---	0-1.0	Apparent	Jun-Nov	>60	---	---	---	High------	Moderate.
10*---------- Pompano	D	None---------	---	---	+2-1.0	Apparent	Jun-Feb	>60	---	---	---	High------	Moderate.
11---------- Tavares	A	None---------	---	---	3.5-6.0	Apparent	Jun-Dec	>60	---	---	---	Low-------	High.
12---------- Immokalee	B/D	None---------	---	---	0-1.0	Apparent	Jun-Nov	>60	---	---	---	High------	High.
13*---------- Okeelanta	B/D	None---------	---	---	+1-0	Apparent	Jun-Jan	>60	---	16-20	16-30	High------	Moderate.
14, 15---------- Lake	A	None---------	---	---	>6.0	---	---	>60	---	---	---	Low-------	High.
16, 17---------- Arredondo	A	None---------	---	---	>6.0	---	---	>60	---	---	---	Moderate	High.
18, 19---------- Kendrick	A	None---------	---	---	>6.0	---	---	>60	---	---	---	Moderate	High.

See footnote at end of table.

TABLE 15.--SOIL AND WATER FEATURES--Continued

Map symbol and soil name	Hydrologic group	Flooding			High water table			Bedrock		Subsidence		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Initial	Total	Uncoated steel	Concrete
					Ft			In		In	In		
20. Pits													
22. Quartzipsamments													
23:													
Weekiwachee	D	Frequent	Very long	Jan-Dec	0-0.5	Apparent	Jan-Dec	40-51	Hard	---	---	High	Low.
Durbin	D	Frequent	Very long	Jan-Dec	0-0.5	Apparent	Jan-Dec	>60	---	12-14	15-24	High	High.
24*:													
Okeelanta	B/D	None	---	---	+1-0	Apparent	Jun-Jan	>60	---	16-20	16-30	High	Moderate.
Lauderhill	B/D	None	---	---	+1-1.0	Apparent	Jun-Feb	20-40	Hard	8-12	16-36	High	Moderate.
Terra Ceia	B/D	None	---	---	+1-1.0	Apparent	Jan-Dec	>60	---	16-20	50-60	Moderate	Moderate.
25--- Lochloosa	C	None	---	---	2.5-5.0	Apparent	Jul-Oct	>60	---	---	---	High	High.
26:													
Williston	C	None	---	---	>6.0	---	---	20-40	Hard	---	---	High	Moderate.
Pedro	C	None	---	---	>6.0	---	---	10-30	Hard	---	---	Moderate	Moderate.
Rock outcrop.													
27--- Pomello	C	None	---	---	2.0-3.5	Apparent	Jul-Nov	>60	---	---	---	Low	High.
28--- Redlevel	C	None	---	---	2.0-3.0	Apparent	Jun-Nov	40-60	Hard	---	---	High	High.
29, 30--- Astatula	A	None	---	---	>6.0	---	---	>60	---	---	---	Low	High.
31--- Sparr	C	None	---	---	1.5-3.5	Apparent	Jul-Oct	>60	---	---	---	Moderate	High.

See footnote at end of table.

TABLE 15.--SOIL AND WATER FEATURES--Continued

Map symbol and soil name	Hydrologic group	Flooding			High water table			Bedrock		Subsidence		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Initial	Total	Uncoated steel	Concrete
					Ft			In		In	In		
32: Candler	A	None	---	---	>6.0	---	---	>60	---	---	---	Low	High.
Urban land.													
33 Micanopy	C	None	---	---	1.5-2.5	Perched	Jul-Nov	>60	---	---	---	High	High.
35 Sparr	C	None	---	---	1.5-3.5	Apparent	Jul-Oct	>60	---	---	---	Moderate	High.
36 EauGallie	B/D	None	---	---	0-1.0	Apparent	Jun-Oct	>60	---	---	---	High	Moderate.
37: Matlacha	C	None	---	---	2.0-3.0	Apparent	Jun-Oct	40-60	Hard	---	---	High	Low.
Urban land.													
38: Rock outcrop.													
Homosassa	D	Frequent	Very long	Jan-Dec	0-0.5	Apparent	Jan-Dec	23-40	Hard	---	---	High	Low.
Lacoochee	D	Frequent	Very long	Jan-Dec	0-0.5	Apparent	Jan-Dec	20-40	Hard	---	---	High	Low.
39: Hallandale	B/D	Rare	---	---	0-1.0	Apparent	Jun-Nov	7-20	Hard	---	---	High	Low.
Rock outcrop.													
40 Homosassa	D	Frequent	Very long	Jan-Dec	0-0.5	Apparent	Jan-Dec	23-40	Hard	---	---	High	Low.
41 Candler	A	None	---	---	>6.0	---	---	>60	---	---	---	Low	High.
46* EauGallie	D	None	---	---	+2-1.0	Apparent	Jun-Feb	>60	---	---	---	High	Moderate.
47 Fort Meade	A	None	---	---	>6.0	---	---	>60	---	---	---	Low	High.
48. Arents													

See footnote at end of table.

TABLE 15.--SOIL AND WATER FEATURES--Continued

Map symbol and soil name	Hydrologic group	Flooding			High water table			Bedrock		Subsidence		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Initial	Total	Uncoated steel	Concrete
					Ft			In		In	In		
49:													
Terra Ceia	D	Frequent	Long	Jun-Nov	0-1.0	Apparent	Jan-Dec	>60	---	16-20	50-60	Moderate	Moderate.
Okeelanta	D	Frequent	Very long	Mar-Sep	0-1.0	Apparent	Jan-Dec	>60	---	4-8	10-18	High	Moderate.
50--- Kanapaha	B/D	None	---	---	0-1.0	Apparent	Jul-Sep	>60	---	---	---	High	High.
51:													
Boca	B/D	None	---	---	0-1.0	Apparent	Jun-Feb	24-40	Hard	---	---	High	Moderate.
Pineda	B/D	None	---	---	0-1.0	Apparent	Jun-Nov	40-80	Hard	---	---	High	Low.
52*--- Anclote	D	None	---	---	+2-0	Apparent	Jun-Mar	>60	---	---	---	High	Moderate.
53--- Boca	B/D	None	---	---	0-1.0	Apparent	Jun-Feb	24-40	Hard	---	---	High	Moderate.
54--- Apopka	A	None	---	---	>6.0	---	---	>60	---	---	---	Moderate	High.
55. Udorthents													
56--- Lake	C	None	---	---	>6.0	---	---	>60	---	---	---	High	Moderate.
57--- Ona	B/D	None	---	---	0-1.0	Apparent	Jun-Nov	>60	---	---	---	High	High.
58:													
Myakka	B/D	None	---	---	0-1.0	Apparent	Jun-Oct	40-80	Hard	---	---	High	High.
EauGallie	B/D	None	---	---	0-1.0	Apparent	Jun-Oct	50-80	Hard	---	---	High	Moderate.
59*--- Boca	D	None	---	---	+2-1.0	Apparent	Jun-Feb	24-40	Hard	---	---	High	Moderate.
60--- Broward	C	None	---	---	1.5-2.5	Apparent	Jun-Nov	20-40	Hard	---	---	Low	Low.
61--- Orsino	A	None	---	---	3.5-5.0	Apparent	Jun-Dec	>60	---	---	---	Low	Moderate.

See footnote at end of table.

TABLE 15.--SOIL AND WATER FEATURES--Continued

Map symbol and soil name	Hydrologic group	Flooding			High water table			Bedrock		Subsidence		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Initial	Total	Uncoated steel	Concrete
					Ft			In		In	In		
62---------- Malabar	B/D	None---------	---	---	0-1.0	Apparent	Jun-Nov	>60	---	---	---	High------	Low.
63---------- Paisley	D	Rare---------	---	---	0-1.0	Apparent	Jun-Nov	>60	---	---	---	High------	Moderate.
64---------- Citronelle	D	None---------	---	---	2.0-3.0	Apparent	Jun-Sep	5-20	Hard	---	---	High------	High.

* In the "High water table--Depth" column, a plus sign preceding the range in depth indicates that the high water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

APPENDIX C

FDOT

STRAIGHT LINE DIAGRAM

OF

ROAD INVENTORY

DATE	10/17/1997	05/17/1999
BY	MAF	BCB/ DEN

	10/27/1997
	TEC/KSR

	10/27/1997
	TEC/ KSF

SLO RECD

STRAIGHT LINE DIAGRAM OF ROAD INVENTORY

FLORIDA DEPARTMENT OF TRANSPORTATION DISTRICT SEVEN PLANNING STATISTICS OFFICE

INT. OF US ROUTE NO	STATE ROAD NO.	COUNTY	SECTION	SHEET NO.	OF.
	SR 200	CITRUS	02040000	1	2

N CARL G ROSE HWY

45 41

0.000 OUTSIDE CITY & URBAN
x X-N CARL G ROSE HWY
x KSR 2C0

TANGENT FLORIDA AVE 0.000

ROADWAY FEATURES

A 0.051 E APEX LN 0.189 E LOUISE LN 0.309 E VIADUCT LN 0.438 E VFW LN 0.558 E SUMMIT LN 0.814

E LOUISE LN 0.309 E VIADUCT LN 0.438 E VFW LN 0.558 E WOOD KNOLL LN/ VENTURA VILLAGE ENTR (D) 0.929 E LAKE PARK DR 1.074 E ARBOR LAKE DR (D) 1.681 N FROLY PL 1.749 E CAMPFIRE CT 1.829 E BRAVE LN 1.887 E WAGON TRAIL 1.925 E FISHERMAN LN 1.959 E PONY EXPRESS LN 1.995

0.000 46.0' - 22.0'
2 - TL0' ROWY
2-4.0' PVD SHLD1
2-8.0' LWN SHLD2

ROADWAY COMPOSITION 0.000 28/FC-2

HORIZONTAL ALIGNMENT
PC-0.070
PI-0.152
PT-0.237
D-1°00'00.00"
Δ-41°37.00"
B-N31°19'07"E
B-N10°11'53"E
Δ-11°44'00"
PC-0.706
PI-0.847
B-N04°32'07"W

1.583 28/FC-2 | 25/FC-2 | 1.749 28/FC-4 | 28/FC-4

1.583 60.0' - 24.0'
2 - 12.0' ROWY
12.0' PVD MED
2-4.0' PVD SHLD1
2-8.0' LWN SHLD2

1.770 53.0' - 24.0'
2 - 12.0' ROWY
13.0' PTO MED
2-4.0' PVD SHLD1
2-4.0' LWN SHLD2

STRUCTURE DESCRIPTION
0.115 1-18" X 53' CSC
0.171 1-18" X 47' C
1.122 1-2'X 2'X 38' CBC
1.389 1-2'X 2'X 40' CBC
1.700 1-2'X 2'X 38' CBC

DISTRICT USE 0.000 SR 45/US 41 REFERENCE SECTION 02010000
CROSSDRAINS HAVE

FUNCTIONAL CLASSIFICATION 0.000 RURAL PRINCIPAL ARTERIAL -- OTHER

2 3 N CARL G ROSE HWY

ROADWAY FEATURES

E BUFFALO LN 2.067 E MILLWOOD LN 2.168 E EAGLE TRAIL 2.031 E BUFFALO LN 2.067 E DEER RUN LN 2.100 E BEAR LN 2.137 N APACHE TRAIL 2.173 N LONGBOW LP 2.272 E FLYING ARROW PATH 2.333 E SAPPHIRE LN 2.374 E RUBY LN 2.557 E IVORY LN 2.604 N TIGER EYE DR 2.665 E CHAPPELL CT 2.849 E OLIVE LN 3.389 E ADAMS ST 3.593 E DELIGHT ST 3.720

2.000 53.0' - 24.0'
2 - 12.0' ROWY
13.0' PTO MED
2-4.0' PVD SHLD1
2-4.0' LWN SHLD2

2.245 48.0' - 24.0'
2 - 12.0' ROWY
2-4.0' PVD SHLD1
2-8.0' LWN SHLD2

2.605 48.0' - 24.0'
2 - 12.0' ROWY
2-4.0' PVD SHLD1
2-8.0' PVD SHLD1

2.842 48.0' - 22.0'
2 - 11.0' ROWY
2-4.0' PVD SHLD1
2-8.0' LWN SHLD2

ROADWAY COMPOSITION 2.000 28/FC-4 | 28/FC-4 | 2.245 28/FC-4 | 2.272 28/FC-2

HORIZONTAL ALIGNMENT
B-N4°32'07"W
PC-2.333
PI-2.400
PT-2.504
D-0°30'00 CO
Δ-4°34'00"
B-N00°01'53"E
PC-3.870
PI-4.128
PT-4.318
D-2°00'00
Δ-42°00'00"
B-N42°01'53"E

STRUCTURE DESCRIPTION
2.449 1-2'X 2'X 34' CBC
3.478 1-2'X 2'X 41' CBC
3.792 1-2'X 2'X 70' CBC

DISTRICT USE 2.000 CROSSDRAINS HAVE NOT BEEN VERIFIED

FUNCTIONAL CLASSIFICATION 2.000 RURAL PRINCIPAL ARTERIAL -- OTHER

	INVENTORIED	INVENTORY REVISED			SLD REVISED		SLD SCALED
DATE	10/17/1997	08/17/1999			10/27/1997	10/27/1999	
BY	MAF	BCB/ DEN			TEE/RGR	TEH/ HSF	

STRAIGHT LINE DIAGRAM OF ROAD INVENTORY

FLORIDA DEPARTMENT OF TRANSPORTATION DISTRICT SEVEN PLANNING STATISTICS OFFICE

WEST ont. of US ROUTE NO	STATE ROAD NO.	COUNTY	SECTION	SHEET NO. / OF.
39	SR-200	CITRUS	02040000	2 / 2

NET SECTION LENGTH: 6.681

N CARL G ROSE HWY

491

ROADWAY FEATURES

E ORCHID ST 4.074 A
E MCDONALD LN 4.137 O
N DAWSON DR 4.148 A
E HILLTOP LP 4.360 A
N CHARLES TER 4.390 A
FIRE STATION #72 4.458 A
N BIRCH TER (D) 4.524 A
E ELISE CT 4.635 O
E CAMELOT PL 4.655 A
CREEK •021
E POSSELT DR 5.391 O
N LECANTO HWY 5.440 A
E WITHLACOOCHEE TRAIL 6.491 A
E STOKES PERRY RD 6.374 A
E SPRUCE DR 6.539 A
N OAK RIVER WAY 6.524 O
RIVER •008
6.681 EMP
WITHLACOOCHEE
CITRUS COUNTY
MARION COUNTY

45.0' - 22.0'
2 - 11.0' ROWY
2-4.0' PVD SHLD1
2-8.0' LWN SHL02

59.0' - 22.0'
2 - 11.0' ROWY
12.0' PVD MED
2-4.0' PVD SHLD1
2-8.0' LWN SHL02
6.379

45.0' - 22.0'
2 - 11.0' ROWY
2-4.0' PVD SHLD1
2-8.0' LWN SHL02
6.546

ROADWAY COMPOSITION: 28/FC-2 | 6.379 28/FC-2 | 6.546 28/FC-2 | 28/FC-2

HORIZONTAL ALIGNMENT: B-N42°01'53"E

STRUCTURE DESCRIPTION:
4.696 4.700 21' BR •021
5.172 1-2'X 2'X 32' CBC
5.589 1-2'X 2'X 68' CBC
6.625 6.681 39' BR •008

NOTE: EMP IN VICINITY OF COUNTY LINE.
ALL COUNTY LINES ARE APPROXIMATE AND ARE NOT SURVEYED.

DISTRICT USE: CROSSDRAINS HAVE NOT BEEN VERIFIED

FUNCTIONAL CLASSIFICATION: 4.0000 RURAL PRINCIPAL ARTERIAL -- OTHER

APPENDIX D

CORRESPONDENCE

ARCADIS GERAGHTY & MILLER

TELEPHONE CONVERSATION RECORD

DATE: December 4, 2001 TIME: 10:00 A.M. PROJECT: SR 200 PD&E

FROM: Sam Aref TO: Jerry Sanford

COMPANY: ARCADIS COMPANY: FDOT Licenso Maintenance office

TELE NO: 813. 961. 1921 TELE NO: 352. 527. 9350

RE: Flooding Issues

Jerry indicated that he does not believe there are drainage problems along the subject roadway. He did confirm, however, that he is not sure. He recommended to call Don Higinbotham. He stated that Don is very familiar with the area.

Note:

ARCADIS contacted Don Higinbotham on 2/5/01. Don indicated that there are no flooding problems.
The call to Jerry Sanford was a request from the FDOT District 7 Drainage Dept.

ARCADIS GERAGHTY & MILLER

TELEPHONE CONVERSATION RECORD

DATE: 2/5/2001 TIME: 9:15 A.M. PROJECT: SR 200 PD&E

FROM: Sam Aref TO: Don Higinbotham

COMPANY: ARCADIS COMPANY: FDOT Licanto Maintenance office

TELE NO: 813.961.1921 TELE NO: 352.527.9350

RE: Flooding Problems

According To Don Higinbotham, There are no flooding observed or reported along SR. 200 between US 41 and The Marion County line. Don suggested That This maybe due To high Sandy area. He did report, however, That Marion County is experiencing Some flooding in Their areas.

DRAINAGE
MEETING MINUTES
for
SR 200 PD&E Reevaluation
from US 41 to north of the Marion County Line

A meeting took place on the above referenced project at the FDOT District 7 Drainage Office on October 25, 2000. The subject of the meeting was to discuss methodology issues regarding the Location Hydraulics and Pond Siting Reports. In attendance were: Megan Arasteh, P.E., FDOT District Drainage Engineer and Sam Aref of ARCADIS Geraghty & Miller, Inc. The following subjects were discussed:

1 The limits of the project were identified from US 41 on the south terminus to north of the Marion County Line on the north terminus, as shown on the provided location map.

2 The project will include eleven sub-basins. ARCADIS Geraghty & Miller to contact SWFWMD to confirm open and closed basins.

3 Per the PD&E scope of work, a minimum of two and preferably three stormwater pond site alternatives shall be submitted for each basin. The pond designs will be based on the selected typical sections, which are currently under review. Supra-3 Model will be used for the pond designs. The calculated DHW for the 3-year storm event for the urban section, 10-year storm event for the rural section shall be less than the lowest edge of pavement elevation within the sub-basin in question to insure positive flow to the selected pond sites.

4 Megan suggested that wherever urban typical sections are considered, the offsite runoff should be accommodated for.

5 Per the PD&E scope of work, the alternative analyses for stormwater runoff will evaluate storage in stormwater ponds.

6 Water quality treatment will be based on 1 inch of runoff. However, if outfalling to Withlacoochee River and Tsala Apopka Lake, water quality treatment will be 1.5 and 2 times the initial treatment volume, respectively. SWFWMD considers Tsala Apopka Lake to be a sink hole and, therefore, the 2 times the initial treatment volume will be required.

7 Per the PD&E scope of work, a Bridge Hydraulics Report (BHR) will not be prepared for this project.

8 The preliminary cross-drain replacements and extensions will be based on the velocity of six feet per second as discussed in the FDOT Drainage Manual. The proposed cross drain sizes will be compared to the December 1993 PD&E study as part of the current PD&E reevaluation study.

9 During a separate phone conversation on November 9, 2000, between Megan Arasteh, Sam Aref and Panos Kontses, the drainage design for a future six-lane typical section was discussed. This

issue has arisen because FDOT District 5 has designed the drainage facilities for S.R. 200 in Marion County to accommodate a six-lane typical section even though the design plans show S.R. 200 as a four-lane facility. Megan, after consulting with Dwayne Kile, District Design Engineer, responded that the drainage facilities for S.R. 200 should be designed to accommodate the lane requirements suggested by the Long Range Transportation Plan (LRTP) of Citrus County. It should be noted that Citrus County has recently agreed to update its LRTP to include S.R. 200 as a four-lane facility. Therefore, it was agreed that the drainage facilities reflect the approved four-lane typical sections for this study.

THIS FORM IS INTENDED TO FACILITATE AND GUIDE THE DIALOGUE DURING A PREAPPLICATION MEETING BY PROVIDING A PARTIA "PROMPT LIST" OF DISCUSSION SUBJECTS. IT IS NOT A LIST OF REQUIREMENTS FOR SUBMITTAL BY THE APPLICANT.**

Southwest Florida Water Management District
Resource Regulation Division
ERP Preapplication Meeting PROMPT LIST

CT #

MEETING INFORMATION

Service Office/ Meeting Location: ☐ Bartow ☐ Brooksville ☐ Tampa ☐ Venice ☐ Other Location _____

Meeting Time: 9:00 A.M.

Meeting Date: 2/29/2000

Attendees:

	Name	Affiliation	Mailing Address	Phone Number
1.	Sam Aref	ARCADIS Geraghty & Miller	14497 N. Dale Mabry suite 115 Tampa 33618	264.3416
2.	Ramos Montes	ARCADIS Geraghty & Miller	14497 N. Dale Mabry suite 115 Tampa 33618	264.3459
3.				
4.				
5.				

Types of documents to be reviewed during the meeting:
- [X] Aerial Maps
- ☐ Soil Surveys
- ☐ Wildlife Surveys
- [X] FEMA Maps
- ☐ Drainage Calculations
- ☐ Title/Lease/Ownership
- ☐ Geotechnical Reports/Models
- ☐ Topographic Maps
- ☐ Const. Drawings/Site Plans
- ☐ Land Surveys
- [X] Wetland Surveys
- ☐ Other/ No Documents

PROJECT BACKGROUND AND HISTORICAL INFORMATION

Project Name: SR 200 PD&E Proposal

Project Location: County: Citrus; Section: See below; Twnshp; Range

Prior Onsite and Adjacent Property Permit Activity:

Onsite Permit/Activity	Permit, CT, or FI #	Prior Enq/ES
☐ WUP		
☐ Prior Surface Permit		
☐ Dredge and Fill		
☐ Enforcement Action		

Adjacent Property Permit #s
- ☐ WUP _____
- ☐ Surface _____
- ☐ Enq/ES/Hydro _____

Other Agency Involvement (circle all that apply)
(ACOE) EPA (DEP) DCA (FGFWFC) Dept of State Local Other

WUCA, MFL, MIA, or other area of resource concern (identify)

Ownership/Perpetual Control: ☐ Ownership ☐ Eminent Domain ☐ Specific use easements ☐ Environmental/Conservation easements ☐ Right-of-way easements ☐ Ingress/egress easements ☐ Transmission easements ☐ Drainage easements

Project Overview: ☐ Total Land acreage:_____ ☐ Project acreage:_____ ☐ Impervious acreage:_____ ☐ Wetlands acreage:_____ [X] Wetlands identified? (yes or no) ☐ Wetlands delineated/surveyed? (yes or no)

Notes/Comments:

Sections: 2, 11, 14 & 23 of TWP 18S & Range 19E
Sections: 25, 35 & 36 of TWP 17S & Range 19E
Section: 30 of TWP 17S & Range 20E

Southwest Florida Water Management District
Resource Regulation Division
ERP Preapplication Meeting PROMPT LIST

CT #

SITE INFORMATION DISCUSSION

Seasonal High Water Level (a.k.a., Seasonal High Ground Water Table):

1. ☐ Site topography
2. ☐ Soil surveys
3. ☐ Soils type calculations for dual classifications? ☐ Yes ☐ No
4. ☐ SHWL/SHGWT set by actual elevation (NGVD); or relative elevation (depth below land surface) (circle one)
5. ☐ Soil borings necessary, and at least 2 feet below proposed pond bottom elevation? ☐ Yes ☐ No
6. ☐ Ground penetrating radar from NRCS
7. ☐ NRCS SHWL/SHGWT determination
8. ☐ Sinkholes/Karst Formations
9. ☐ Field site visit is recommended? ☐ Yes ☐ No

Purpose(s)_____

Flood Plain and Tailwater Conditions:

10. ☐ Tailwater analysis and evaluations (i.e., stage/time data)
11. ☐ The project is within 100 year flood plain? ☐ Yes ☐ No
12. ☐ FEMA maps are provided? ☐ Yes ☐ No
13. ☐ FEMA panel No: _____
14. ☐ FEMA maps are best evidence available? ☐ Yes ☐ No
15. ☐ Other, better data needed? ☐ Yes ☐ No
15A. ☐ Do flood plain elevations need establishment for apparent flood hazard zones? ☐ Yes ☐ No

Adjacent Offsite Contributing Sources:

16. ☐ Identify offsite contributing sources
17. ☐ Discuss prior permitting history of adjacent projects
18. ☐ Identify historical activity on GIS

Receiving Waterbody:

19. ☐ Identify classification of receiving waterbody: OFW Class I (circle one)
20. ☐ Identify quantity capacity of receiving waterbody
21. ☐ Aquatic Preserve? ☐ Yes ☐ No

Sovereign Submerged Lands:

22. ☐ Has a title determination been made? ☐ Yes ☐ No
23. ☐ Does the project exceed the delegation authority thresholds in ss. 18-21.0051, F.A.C.? ☐ Yes ☐ No
23A. ☐ Can the project be reasonably expected to have heightened public concern because of potential effect on the environment, natural resources, or controversial nature or location? ☐ Yes ☐ No

Notes/Comments:

Southwest Florida Water Management District
Resource Regulation Division
ERP Preapplication Meeting PROMPT LIST

CT #

WATER QUANTITY DISCUSSION

Basin Description:	24. ☒ Open ☐ Closed ☐ Special Basin Criteria
Storm Event Information:	25. ☒ Designed Storm Event (25 and/or 100 years) 26. ☐ Rainfall depths for 25 and 100 year events
Pre/Post Volume:	27. ☐ Difference for closed basins (100 year storm event)
Pre/Post Discharge:	28. ☐ Discussion of raising or lowering groundwater levels 29. ☐ Discussion of 36 hour initial stage (DLW) 30. ☐ Discussion of necessity to maintain points/method of discharge 31. ☐ Discussion of effects of previously recorded drainage easements or permits (onsite and adjacent) 32. ☐ Pre/post discharge rates 33. ☐ Applicant proposes to lower groundwater? ☐ Yes ☐ No 34. ☐ If 33 marked yes, are drainage pumps planned? 35. ☐ If 33 marked yes, discuss radius of influence and drawdown calculations 36. ☐ If 33 marked yes, how will proposed system be effectively maintained to prevent adverse impacts ?
Range of Rates Discussed:	Pre/Post rates _____ Rainfall depths 25 year event _____ 36 hour DLW _____

Notes/Comments: Compensate
COMPENSATE FOR 100 YR FLOODPLAIN
ENCROACHMENT
TSALA APOPKA – Treat THAT DISCHARGE
TO VOLUME
IF DISCHARGE DIRECTLY INTO THE
LAKE – NO ATTENUATION

If discharge directly into the lake – No attenuation

Southwest Florida Water Management District
Resource Regulation Division
ERP Preapplication Meeting PROMPT LIST

CT #

WATER QUALITY DISCUSSION

Type of Water Quality Treatment: ☐ Wet Detention ☐ Wetland Treatment ☐ Dry Retention ☐ Effluent Filtration ☐ Other

Technical Characteristics:

37. ☐ Contributing area
38. ☐ Required volume
39. ☐ Provided volume
40. ☐ Fluctuation (hydroperiod elevations) ☐ Different from 18"? ☐ Yes ☐ No
41. ☐ Drawdown; OR residence time for "Conservation" design alternative
42. ☐ 35% Littoral & 1' Pool depth; OR "Conservation" design alternatives
43. ☐ Separate inflow/outflow
44. ☐ Mounding analysis
45. ☐ Filter drain calculations
46. ☐ Impacts to wetland hydroperiods
47. ☐ 2' Minimum filter material
48. ☐ Skimmers
49. ☐ Erosion controls
50. ☐ Special criteria (Outstanding Florida Waters)
51. ☐ Public road requirements
52. ☐ Equivalent treatment
53. ☐ Discussion of reporting cycles requires for treatment types

Non-Presumptive Treatment Alternatives (a.k.a., "Rule Alternative Equivalent Criteria[1]")

Notes/Comments:

[1] Sections 1.1, 1.3 and 5.1 of the "Basis of Review" (BOR) for Environmental Resource Permitting applications refer to "criteria flexibility," "other methods of meeting overall objectives," and "equivalent treatment" as alternative ways to demonstrate reasonable assurance of compliance with the ERP Conditions for Issuance of Permits. This introduces a concept of "Rule Alternative Equivalent Criteria," which means dimensional design and performance standards that are technically, scientifically and functionally equivalent to, and may be voluntarily substituted for, specific criteria already in District BOR Rules for determining compliance with the Conditions for Issuance of Permits. Using this concept, alternative criteria can be voluntarily used in the application IF the criteria: 1) are proven to be technically, scientifically and functionally equivalent to criteria already in the BOR, 2) are appropriate for the site conditions, and 3) are agreed to by the District on a case by case basis and prior to permitting.

Southwest Florida Water Management District
Resource Regulation Division
ERP Preapplication Meeting PROMPT LIST

CT #

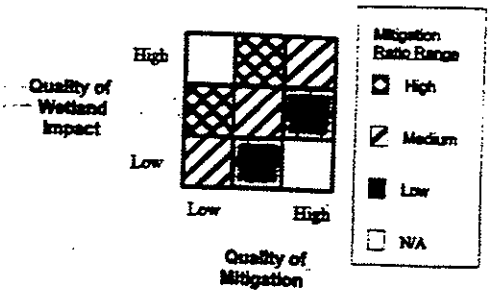
ENVIRONMENTAL DISCUSSION

Wetlands On the Proposed Site, or On Adjacent Properties: ☑ Yes ☐ No

Technical Characteristics:

54. ☑ Identification of wetlands on site
55. ☐ Identification of wetlands on adjacent properties
56. ☑ Known T&E species
57. ☐ Environmental easements
58. ☐ Preservation of wetlands and drawdown issues
59. ☐ Ponds/Ditch setbacks from wetlands
60. ☑ Elimination/Reduction strategies
61. ☐ Permanently impacted acres
62. ☐ Temporarily impacted acres
63. ☑ Secondary and cumulative impacts
64. ☑ Mitigation options
65. ☐ Mitigation acres/criteria
66. ☐ Wetland treatment and oil/grease
67. ☐ Maintenance requirements

Relationship between the quality of wetland impact, the quality of mitigation and the mitigation ratio range.



Site Visit and Verification:

68. ☑ ES site visit necessary? ☑ Yes ☐ No
69. ☑ Wetland verification necessary? ☑ Yes ☐ No
70. ☐ Seasonal High Water verification necessary? ☑ Yes ☐ No
71. ☐ Upland SHWL elevation verification necessary? ☐ Yes ☐ No
72. ☐ Normal Pool (NP)verification necessary? ☐ Yes ☐ No
73. ☐ Other _____? ☐ Yes ☐ No

Notes/Comments:

WITHLACOOCHEE RIVER — CFW — NEED WILDLIFE BRIDGE CROSSING FOR WILDLIFE.
— ALTERNATE AREAS TO SW MAY NEED WILDLIFE CROSSING WITHIN FIRST 2-3 MILES FROM BRIDGE
— SCRUB OAKS IN AREA OF CR 37 & 41
— NARROWING FLOODING — MAY ATTRACT OUTFALL CANAL
— NEED VEG. DEL.
— DOT MITIGATION BANK FOR MITIGATION
— SOV. LANDS — PUBLIC EASEMENT FOR BRIDGE IF NOT ALREADY IN PLACE

Southwest Florida Water Management District
Resource Regulation Division
ERP Preapplication Meeting PROMPT LIST

CT #

OPERATION AND MAINTENANCE, AND OTHER ISSUES FOR DISCUSSION

Necessary Permit Application Information:

74. ☐ Applicant ownership or perpetual control of entire project area
75. ☐ Name O&M entity
76. ☐ Specific O&M instructions
77. ☐ Homeowner Association documents
78. ☐ Coastal Zone management requirements
79. ☐ Division of Historic Resources

Notes/Comments:

ERP APPLICATION/REVIEW/APPROVAL DISCUSSIONS

Future Preapplication Meeting:

80. ☐ Will there be another preapplication meeting? ☐ Yes ☐ No
81. ☐ Field or Office Meeting: _____
82. ☐ Tentative Date: _____
83. ☐ Tentative Attendees: _____

Anticipated Permit Type and Fee Required:

☐ Conceptual ☐ Individual ☐ Standard General ☐ Standard General (minor) ☐ Noticed General
☐ Formal Modification ☐ Letter Modification ☐ Site Condition Assessment ☐ None ☐ Other

84. ☐ Estimated Fee $ [ ] ☐ ERP ☐ MSSW ☐ W.O.D. ☐ Exemption

Fast Track:

85. ☐ Is Fast Track appropriate? ☐ Yes ☐ No
86. ☐ Are applicant and consultant committed to the Fast Track process? ☐ Yes ☐ No

Some necessary conditions for Fast Track:

_____

_____

_____

Anticipated Permit Submittal Date:

When is permit needed?

☑ ERP Preapplication Meeting record and/or associated notes completed by: _____

☐ Copies provided to Attendees on this date: _____

DISCLAIMER: The District ERP preapplication meeting process is a service made available to the public to assist interested parties in preparing submittal of a permit application. Information shared at preapplication meetings is superseded by the actual permit application submittal. District permit decisions are based upon information submitted during the application process and Rules in effect at the time the application is complete.

WORKING DRAFT

auditPREform.0199.wpd 01/05/99

APPENDIX E

FLOODPLAIN IMPACT VOLUME CALCULATIONS

ARCADIS
GERAGHTY&MILLER

SUBJECT: Floodplain Impact Calculations

JOB NO: TF001173.0000

BY: Sam Aref
DATE: Dec. 17, 2001
CHKD:
DATE:

SUB-BASIN HS - FLOODPLAIN IMPACTS

Station	to	Station	Side	Length	Width	Area	Ex. Gr. EL	FEMA El.	FP Depth		Volume	
				ft	ft	ac	ft	ft	ft	ac-ft	cy	cf
24780.00		26350.00	Lt	1570.00	21.00	0.76	40.00	41.00	1.00	0.76	1,221.11	32,970.00
26350.00		27675.00	Lt	1325.00	25.00	0.76	40.00	41.00	1.00	0.76	1,226.85	33,125.00
Total						1.52				1.52	2,447.96	66,095.00

SUB-BASIN J - FLOODPLAIN IMPACTS

Station	to	Station	Side	Length	Width	Area	Ex. Gr. EL	FEMA El.	FP Depth		Volume	
				ft	ft	ac	ft	ft	ft	ac-ft	cy	cf
34975.00		35626.64	Lt	651.64	15.00	0.22	40.00	41.00	1.00	0.22	362.02	9,774.60
Total						0.22				0.22	362.02	9,774.60

APPENDIX F

HDS-5

CULVERT CAPACITY CALCULATION WORKSHEETS

FOR

EXISTING & PROPOSED CULVERTS

ARCADIS
GERAGHTY & MILLER

SUBJECT: SR 200; Existing CD 59+41.80

JOB NO: TF001173.0000

BY: Sam Aref
DATE: Dec. 12, 2000
CHKD:
DATE: 3/23/01

I. CROSS DRAIN CHARACTERISTICS

Box Located @ Station	59+41.80			
Box Size =	2	X	2	ft
Number of Barrels =	1			
Box Length =	39.15	ft		
Box X-Sectional Area =	4.00	sf		
Box Wetted Parameters =	8.00	ft		
Box Hydraulic Radius =	0.50	ft		
Manning's roughness =	0.012			
Flow Direction	East			
Upstream Invert =	50.69	ft		
Downstream Invert =	50.50	ft		
Entrance Coefficient =	0.2			
Critical Elevation =	55.02	ft		

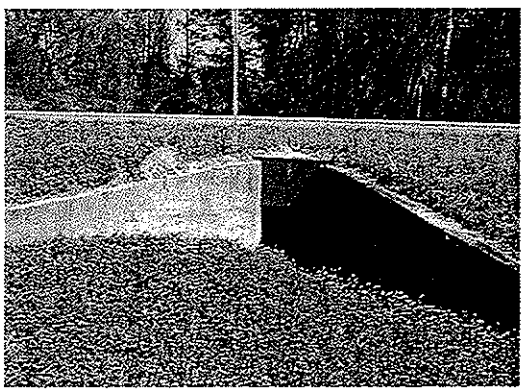
II. DETERMINE FLOWRATES (Q), Q = A x V

Assume	V(25 yr) =	6.00	ft/sec	
	Q(25 yr) =	24.00	cfs	
	Q(50 yr) =	29.00	cfs	see exceedence probability plot
	Q(100 yr) =	33.60	cfs	based on 1.4 x Q(25 yr)
	Q(500 yr) =	57.12	cfs	based on 1.7 x Q(100 yr)

III. DETERMINE TAILWATER

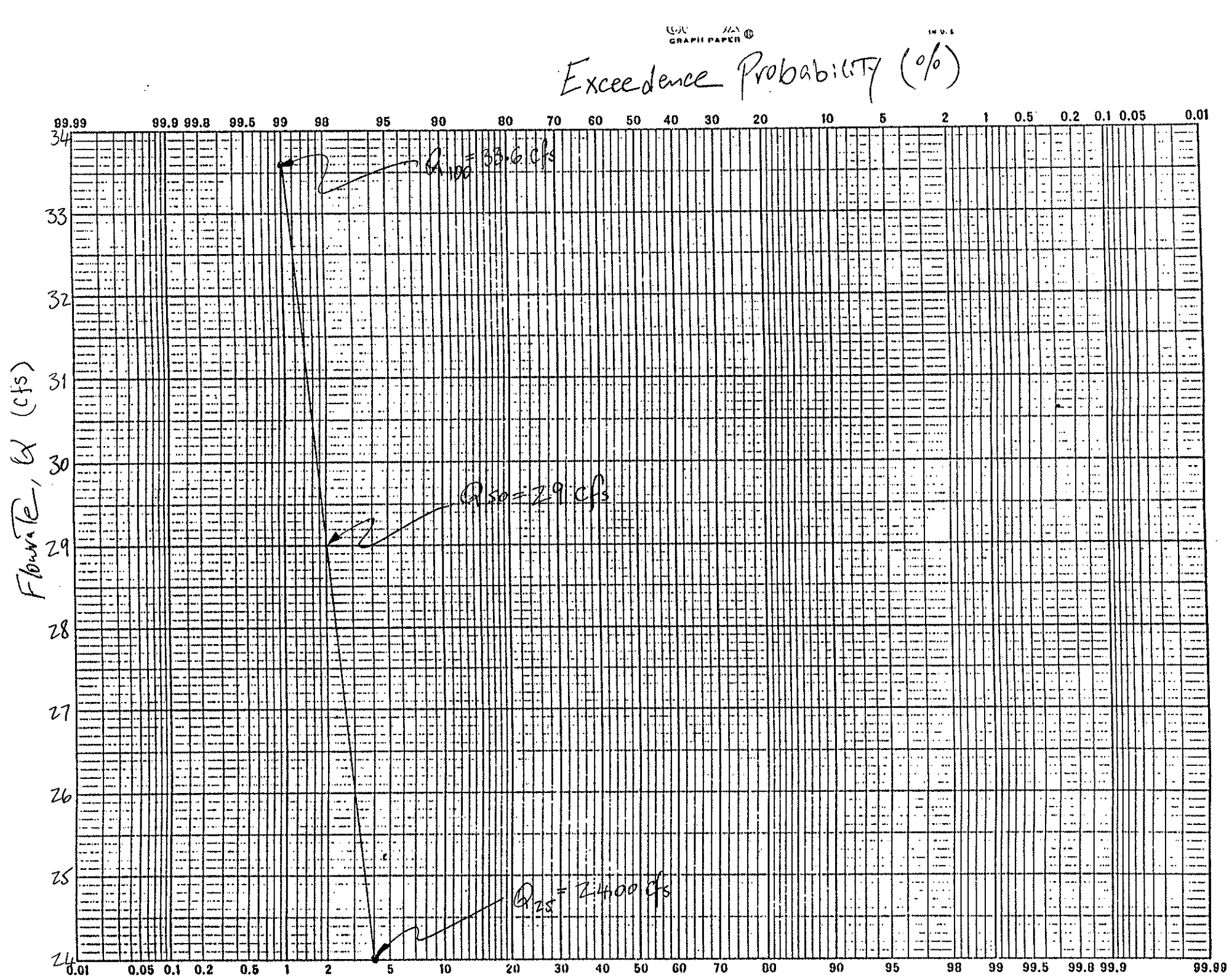
Use a tailwater equal to the crown of culvert
D/S invert + culvert height = 52.50 ft

IV. PHYSICAL APPEARANCE/CONDITION



Upstream end, west side of SR 200

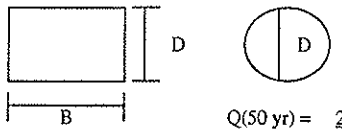
Downstream end, east side of SR 200


Exceedence Probability (%)
99.99 99.9 99.8 99.5 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01
34 33 32 31 30 29 28 27 26 25 24
Flowrate, Q (cfs)
Q_{100} = 33.6 cfs
Q_{50} = 29 cfs
Q_{25} = 24400 cfs

PROJECT: SR 200; Existing CD 59+41.80
Worksheet for Culvert Capacity Calculations

DESIGNER: Sam Aref
DATE: Dec. 12, 2000

HYDROLOGIC AND CHANNEL INFORMATION



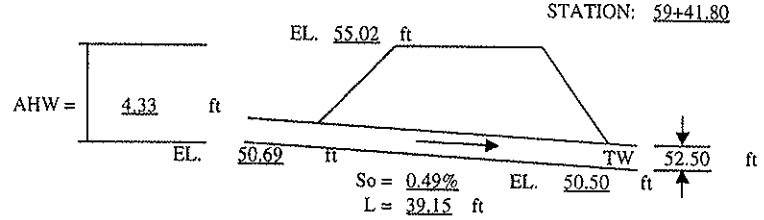
D = Diameter or Height
B = Span

Q(50 yr) = 29.0 cfs TW = 52.50 ft
Q(100 yr) = 33.6 cfs TW = 52.50 ft
Q(500 yr) = 57.1 cfs TW = 52.50 ft

(Q50 = DESIGN DISCHARGE)
(Q100 = CHECK DISCHARGE)

SKETCH

STATION: 59+41.80



LSo = 0.19

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE		HEADWATER COMPUTATIONS											CONTR-OLLING HW	OUTLET VELOCITY	PEAK STAGE
				INLET CONTROL			OUTLET CONTROL HW = H + DTW - LSo										
		D	B	Q/B	HW/D	HW	Ke	H	dc	(dc+D)/2	TW	DTW	LSo	HW			
	29.0	2.0	2.0	14.50	1.80	3.60	0.2	1.31	1.87	1.94	2.00	2.00	0.19	3.12	3.60	7.25	54.29
	33.6	2.0	2.0	16.80	2.17	4.33	0.2	1.77	2.07	2.03	2.00	2.03	0.19	3.61	4.33	8.40	55.02
	57.1	2.0	2.0	28.56	4.80	9.60	0.2	5.10	2.94	2.47	2.00	2.47	0.19	7.38	9.60	14.28	60.29

SUMMARY & RECOMMENDATIONS:

H @ Outlet Control = [1 + Ke + (29*n^2*L)/(Rh^1.33)] * ((Q/A)^2/(2*g))

Design by: Sam Aref

Checked by: P. Lowton

Approved by: _____

ARCADIS
GERAGHTY & MILLER

SUBJECT: SR 200; Proposed CD 59+41.80

JOB NO: TF001173.0000

BY: Sam Aref
DATE: Dec. 12, 2000
CHKD: P.E.
DATE: 3/23/01

I. CROSS DRAIN CHARACTERISTICS

Pipe Proposed @ Station	59+41.80	
Pipe Size =	30	in
Number of Barrels =	1	
Pipe Length =	120.00	ft
Pipe X-Sectional Area =	4.91	sf
Pipe Hydraulic Radius =	0.63	ft
Pipe Type	Reinforced concrete	
Manning's roughness =	0.012	
Flow Direction	East	
Upstream Invert =	51.00	ft
Downstream Invert =	50.41	ft
Entrance Coefficient =	0.5	
Critical Elevation =	55.02	ft

II. DETERMINE FLOWRATES (Q)

Q(50 yr) =	29.00	cfs
Q(100 yr) =	33.60	cfs
Q(500 yr) =	57.12	cfs

III. DETERMINE TAILWATER

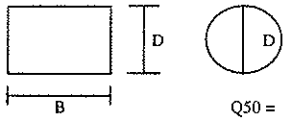
Use a tailwater equal to the existing crown of culvert

TW = 52.50 ft

PROJECT: SR 200; Proposed CD 59+41.80
Worksheet for Culvert Capacity Calculations

DESIGNER: Sam Aref
DATE: Dec. 12, 2000

HYDROLOGIC AND CHANNEL INFORMATION



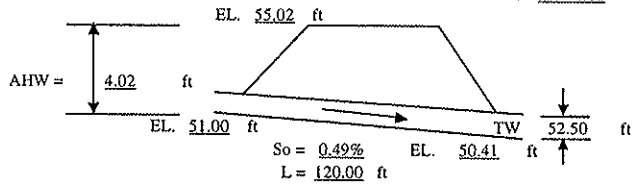
D = Diameter or Height
B = Span

Q50 = 29.0 cfs TW = 52.50 ft
Q100 = 33.6 cfs TW = 52.50 ft
Q500 = 57.1 cfs TW = 52.50 ft

(Q50 = DESIGN DISCHARGE)
(Q100 = CHECK DISCHARGE)

SKETCH

STATION: 59+41.80



LSo = 0.59

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE		HEADWATER COMPUTATIONS											CONTR-OLLING HW	OUTLET VELOCITY	PROPOSED PEAK STAGE	EXISTING PEAK STAGE	DIFF. IN STAGE
				INLET CONTROL			OUTLET CONTROL HW = H + DTW - LSo												
		D	B	Q/B	HW/D	HW	Ke	H	dc	(dc+D)/2	TW	DTW	LSo	HW					
	29.0	2.5	N/A	N/A	1.15	2.88	0.5	1.32	1.83	2.17	2.09	2.17	0.59	2.90	2.90	5.91	53.90	54.29	-0.39
	33.6	2.5	N/A	N/A	1.30	3.25	0.5	1.77	2.00	2.25	2.09	2.25	0.59	3.43	3.43	6.84	54.43	55.02	-0.59
	57.1	2.5	N/A	N/A	2.40	6.00	0.5	5.12	2.48	2.49	2.09	2.49	0.59	7.02	7.02	11.64	58.02	60.29	-2.27
	38.3	2.5	N/A	N/A	1.46	3.65	0.5	2.30	2.12	2.31	2.09	2.31	0.59	4.02	4.02	7.80	55.02			*

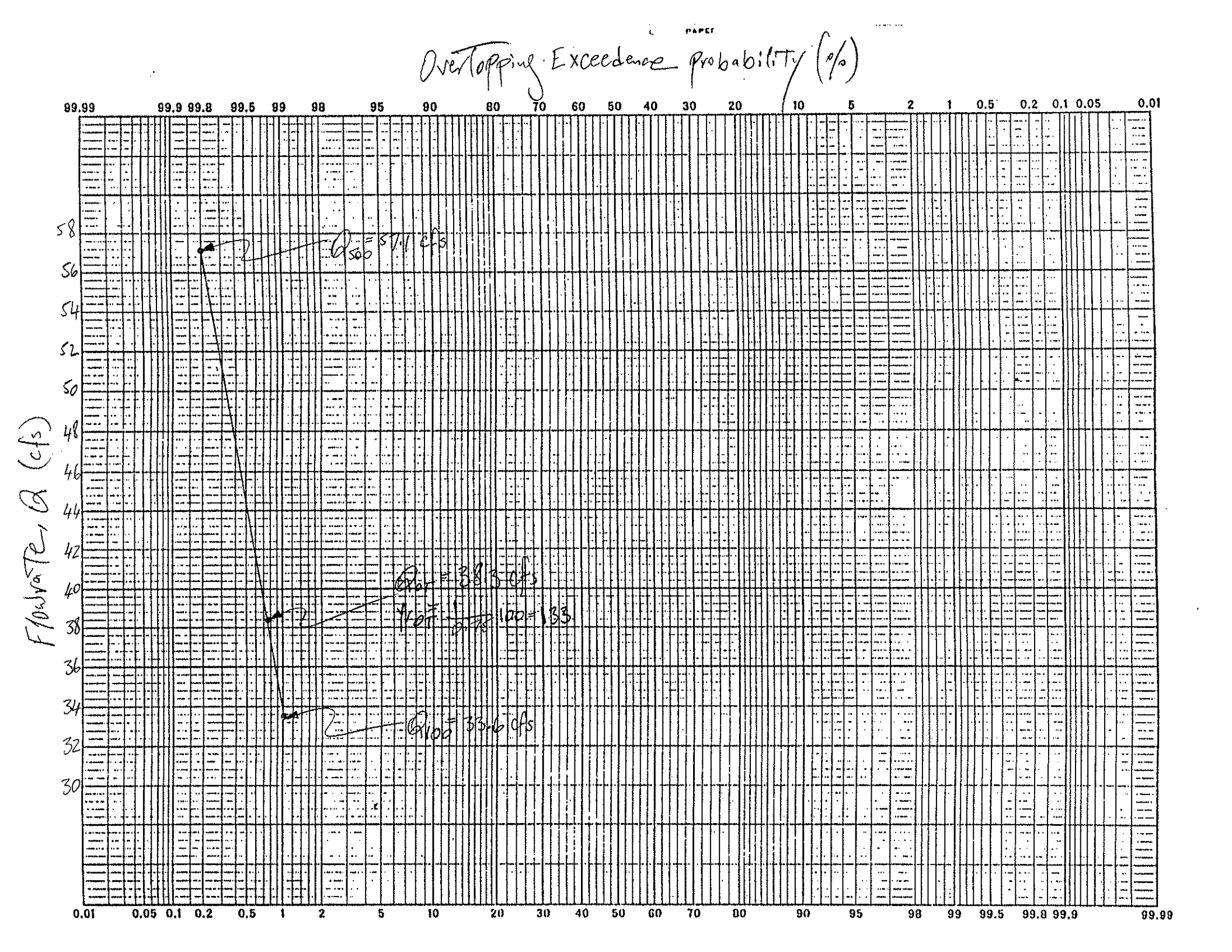
SUMMARY & RECOMMENDATIONS:
*Year of overtopping elevation = 133

H @ Outlet Control = [1 + Ke + (29*n^2*L)/(Rh^1.33)] * ((Q/A)^2/(2*g))

Design by: Sam Aref

Checked by:

Approved by: _____


Overtopping Exceedence probability (%)
99.99 99.9 99.8 99.5 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01
58 56 54 52 50 48 46 44 42 40 38 36 34 32 30
Flow rate, Q (cfs)
$Q_{500} = 57.11$ cfs
$Q_{100} = 38.15$ cfs
$Q_{100} = 33.46$ cfs
0.01 0.05 0.1 0.2 0.5 1 2 5 10 20 30 40 50 60 70 80 90 95 98 99 99.5 99.8 99.9 99.99

ARCADIS
GERAGHTY & MILLER

SUBJECT: SR 200; Existing CD 73+31.60

JOB NO: TF001173.0000

BY: Sam Aref
DATE: Dec. 12, 2000
CHKD: PK
DATE: 3/23/01

I. CROSS DRAIN CHARACTERISTICS

Box Located @ Station	73+31.60			
Box Size =	2	X	2	ft
Number of Barrels =	1			
Box Length =	40.15	ft		
Box X-Sectional Area =	4.00	sf		
Box Wetted Parameters =	8.00	ft		
Box Hydraulic Radius =	0.50	ft		
Manning's roughness =	0.012			
Flow Direction	East			
Upstream Invert =	54.14	ft		
Downstream Invert =	54.07	ft		
Entrance Coefficient =	0.2			
Critical Elevation =	58.89	ft		

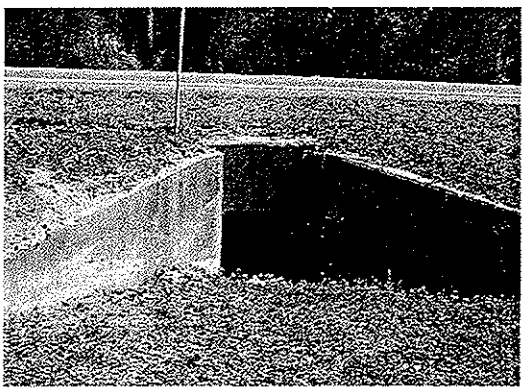
II. DETERMINE FLOWRATES (Q), Q = A x V

Assume	V(25 yr) =	6.00	ft/sec	
	Q(25 yr) =	24.00	cfs	
	Q(50 yr) =	29.00	cfs	see exceedence probability plot
	Q(100 yr) =	33.60	cfs	based on 1.4 x Q(25 yr)
	Q(500 yr) =	57.12	cfs	based on 1.7 x Q(100 yr)

III. DETERMINE TAILWATER

Use a tailwater equal to the crown of culvert
D/S invert + culvert height = 56.07 ft

IV. PHYSICAL APPEARANCE



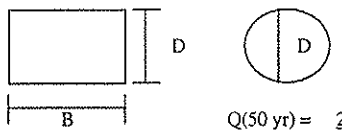
Upstream end, west side of SR 200

Downstream end, east side of SR 200

PROJECT: SR 200; Existing CD 73+31.60
Worksheet for Culvert Capacity Calculations

DESIGNER: Sam Aref
DATE: Dec. 12, 2000

HYDROLOGIC AND CHANNEL INFORMATION



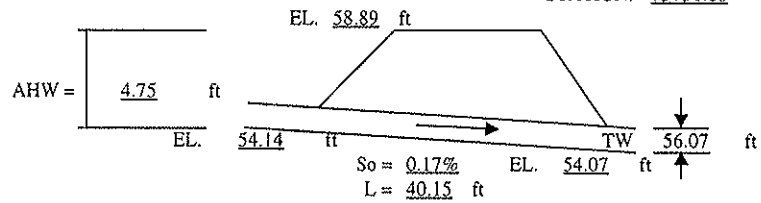
D = Diameter or Height
B = Span

Q(50 yr) = 29.0 cfs TW = 56.07 ft
Q(100 yr) = 33.6 cfs TW = 56.07 ft
Q(500 yr) = 57.1 cfs TW = 56.07 ft

(Q50 = DESIGN DISCHARGE)
(Q100 = CHECK DISCHARGE)

SKETCH

STATION: 73+31.60



LSo = 0.07

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE		HEADWATER COMPUTATIONS											CONTR-OLLING HW	OUTLET VELOCITY	PEAK STAGE
				INLET CONTROL			OUTLET CONTROL HW = H + DTW - LSo										
		D	B	Q/B	HW/D	HW	Ke	H	dc	(dc+D)/2	TW	DTW	LSo	HW			
	29.0	2.0	2.0	14.50	1.80	3.60	0.2	1.32	1.87	1.94	2.00	2.00	0.07	3.25	3.60	7.25	57.74
	33.6	2.0	2.0	16.80	2.17	4.33	0.2	1.78	2.07	2.03	2.00	2.03	0.07	3.74	4.33	8.40	58.47
	57.1	2.0	2.0	28.56	4.80	9.60	0.2	5.13	2.94	2.47	2.00	2.47	0.07	7.54	9.60	14.28	63.74

SUMMARY & RECOMMENDATIONS:

H @ Outlet Control = {1 + Ke + (29*n^2*L)/(Rh^1.33)} * ((Q/A)^2/(2*g))

Design by: Sam Aref

Checked by:

Approved by: _____

ARCADIS
GERAGHTY & MILLER

SUBJECT: SR 200; Proposed CD73+31.60

JOB NO: TF001173.0000

BY: Sam Aref
DATE: Dec. 12, 2000
CHKD: RK
DATE: 3/23/01

I. CROSS DRAIN CHARACTERISTICS

Pipe Proposed @ Station	73+31.60	
Pipe Size =	30	in
Number of Barrels =	1	
Pipe Length =	160.00	ft
Pipe X-Sectional Area =	4.91	sf
Pipe Hydraulic Radius =	0.63	ft
Pipe Type	Reinforced concrete	
Manning's roughness =	0.012	
Flow Direction	East	
Upstream Invert =	54.20	ft
Downstream Invert =	53.93	ft
Entrance Coefficient =	0.5	
Critical Elevation =	58.89	ft

II. DETERMINE FLOWRATES (Q)

Q(50 yr) =	29.00	cfs
Q(100 yr) =	33.60	cfs
Q(500 yr) =	57.12	cfs

III. DETERMINE TAILWATER

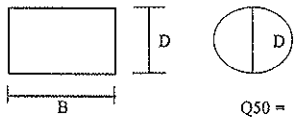
Use a tailwater equal to the existing crown of culvert

TW = 56.07 ft

PROJECT: SR 200; Proposed CD 73+31.60
Worksheet for Culvert Capacity Calculations

DESIGNER: Sam Aref
DATE: Dec. 12, 2000

HYDROLOGIC AND CHANNEL INFORMATION



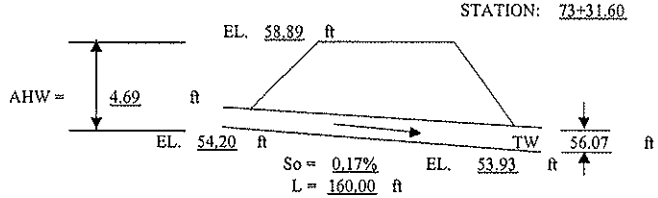
D = Diameter or Height
B = Span

Q50 = 29.0 cfs TW = 56.07 ft
Q100 = 33.6 cfs TW = 56.07 ft
Q500 = 57.1 cfs TW = 56.07 ft

(Q50 = DESIGN DISCHARGE)
(Q100 = CHECK DISCHARGE)

SKETCH

STATION: 73+31.60



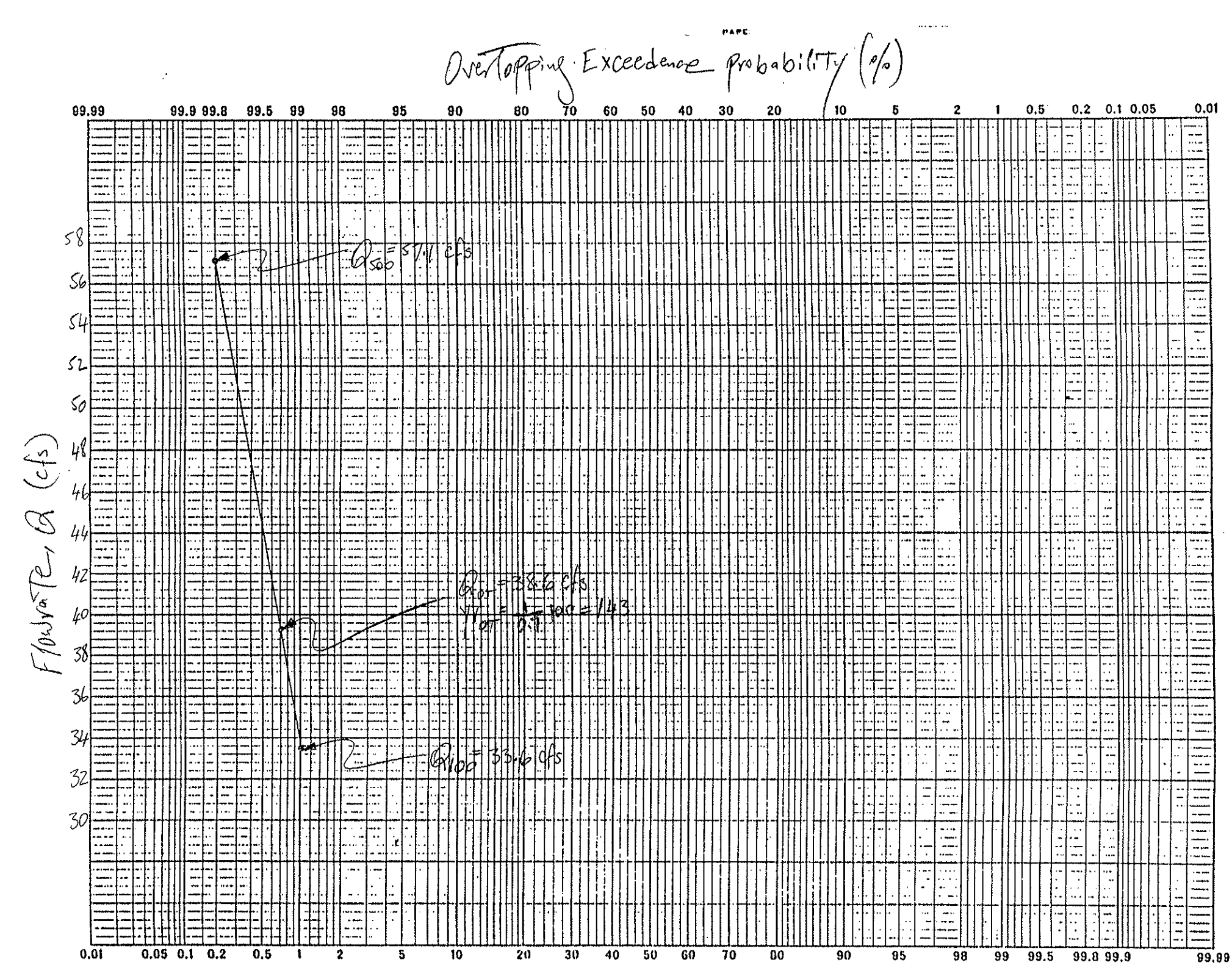
LSo = 0.27

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE		HEADWATER COMPUTATIONS										CONTR-OLLING HW	OUTLET VELOCITY	PROPOSED PEAK STAGE	EXISTING PEAK STAGE	DIFF. IN STAGE
				INLET CONTROL			OUTLET CONTROL HW = H + DTW - LSo											
		D	B	Q/B	HW/D	HW	Ke	H	dc	(dc+D)/2	TW	DTW	LSo	HW					
	29.0	2.5	N/A	N/A	1.15	2.88	0.5	1.49	1.83	2.17	2.14	2.17	0.27	3.38	3.38	5.91	57.58	57.74	-0.16
	33.6	2.5	N/A	N/A	1.30	3.25	0.5	2.00	2.00	2.25	2.14	2.25	0.27	3.98	3.98	6.84	58.18	58.47	-0.29
	57.1	2.5	N/A	N/A	2.40	6.00	0.5	5.78	2.48	2.49	2.14	2.49	0.27	8.00	8.00	11.64	62.20	63.74	-1.54
	38.6	2.5	N/A	N/A	1.50	3.75	0.5	2.64	2.15	2.33	2.14	2.33	0.27	4.69	4.69	7.86	58.89		

SUMMARY & RECOMMENDATIONS:
*Year of overtopping elevation = 143

H @ Outlet Control = [1 + Ke + (29*n^2*L)/(Rh^1.33)] * ((Q/A)^2/(2*g))

Design by: Sam Aref Checked by: Approved by:


Overtopping Exceedence Probability (%)
99.99 99.9 99.8 99.5 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01
58 56 54 52 50 48 46 44 42 40 38 36 34 32 30
Flowrate, Q (cfs)
Q_{500} = 57.1 cfs
Q_{OT} = 38.6 cfs
$W_{OT} = \frac{1}{0.7} 100 = 143$
Q_{100} = 33.6 cfs
0.01 0.05 0.1 0.2 0.5 1 2 5 10 20 30 40 50 60 70 80 90 95 98 99 99.5 99.8 99.9 99.99

ARCADIS
GERAGHTY & MILLER

SUBJECT: SR 200; Existing CD 89+90.90

JOB NO: TF001173.0000

BY: Sam Aref
DATE: Dec. 12, 2000
CHKD: P.K.
DATE: 3/23/01

I. CROSS DRAIN CHARACTERISTICS

Box Located @ Station	89+90.90			
Box Size =	2	X	2	ft
Number of Barrels =	1			
Box Length =	50.00	ft		
Box X-Sectional Area =	4.00	sf		
Box Wetted Parameters =	8.00	ft		
Box Hydraulic Radius =	0.50	ft		
Manning's roughness =	0.012			
Flow Direction	East			
Upstream Invert =	63.84	ft		
Downstream Invert =	63.01	ft		
Entrance Coefficient =	0.2			
Critical Elevation =	68.80	ft		

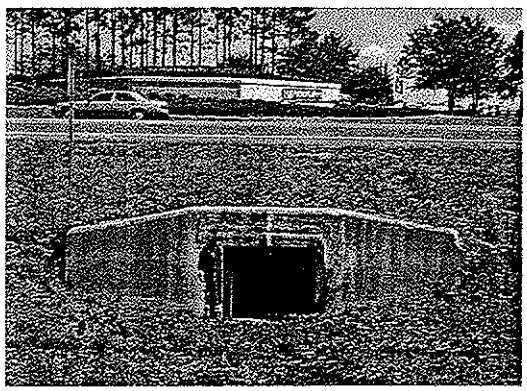
II. DETERMINE FLOWRATES (Q), Q = A x V

Assume	V(25 yr) =	6.00	ft/sec	
	Q(25 yr) =	24.00	cfs	
	Q(50 yr) =	29.00	cfs	see exceedence probability plot
	Q(100 yr) =	33.60	cfs	based on 1.4 x Q(25 yr)
	Q(500 yr) =	57.12	cfs	based on 1.7 x Q(100 yr)

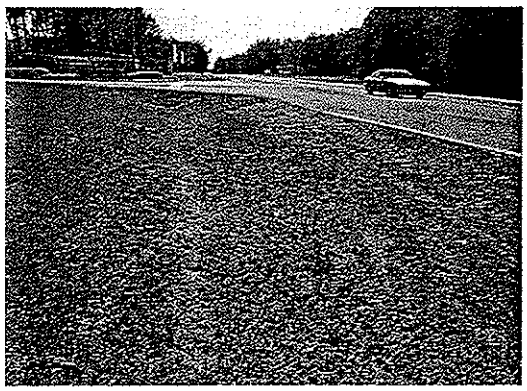
III. DETERMINE TAILWATER

Use a tailwater equal to the crown of culvert
D/S invert + culvert height = 65.01 ft

IV. PHYSICAL APPEARANCE/CONDITION



Upstream end, west side of SR 200

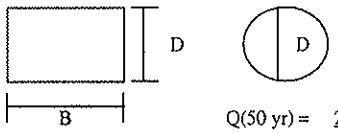


Downstream end east side of SR 200 is not visible
Possible connection through Arbor Lakes Subdivision

PROJECT: SR 200; Existing CD 89+90.90
Worksheet for Culvert Capacity Calculations

DESIGNER: Sam Aref
DATE: Dec. 12, 2000

HYDROLOGIC AND CHANNEL INFORMATION



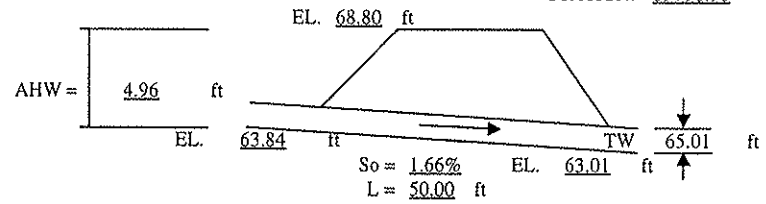
D = Diameter or Height
B = Span

Q(50 yr) = 29.0 cfs TW = 65.01 ft
Q(100 yr) = 33.6 cfs TW = 65.01 ft
Q(500 yr) = 57.1 cfs TW = 65.01 ft

(Q50 = DESIGN DISCHARGE)
(Q100 = CHECK DISCHARGE)

SKETCH

STATION: 89+90.90



LSo = 0.83

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE		HEADWATER COMPUTATIONS											CONTR-OLLING HW	OUTLET VELOCITY	PEAK STAGE
				INLET CONTROL			OUTLET CONTROL HW = H + DTW - LSo										
		D	B	Q/B	HW/D	HW	Ke	H	dc	(dc+D)/2	TW	DTW	LSo	HW			
	29.0	2.0	2.0	14.50	1.80	3.60	0.2	1.41	1.87	1.94	2.00	2.00	0.83	2.58	3.60	7.25	67.44
	33.6	2.0	2.0	16.80	2.17	4.33	0.2	1.89	2.07	2.03	2.00	2.03	0.83	3.09	4.33	8.40	68.17
	57.1	2.0	2.0	28.56	4.80	9.60	0.2	5.46	2.94	2.47	2.00	2.47	0.83	7.10	9.60	14.28	73.44

SUMMARY & RECOMMENDATIONS:

H @ Outlet Control = [1 + Ke + (29*n^2*L)/(Rh^1.33)] * ((Q/A)^2/(2*g))

Design by: Sam Aref

Checked by: P. Sam Aref

Approved by: _____

ARCADIS
GERAGHTY & MILLER

SUBJECT: SR 200; Existing CD 89+90.90

JOB NO: TF001173.0000

BY: Sam Aref
DATE: Dec. 12, 2000
CHKD: P.K.
DATE: 3/23/01

I. CROSS DRAIN CHARACTERISTICS

Box Located @ Station	89+90.90			
Box Size =	2	X	2	ft
Number of Barrels =	1			
Box Length =	50.00	ft		
Box X-Sectional Area =	4.00	sf		
Box Wetted Parameters =	8.00	ft		
Box Hydraulic Radius =	0.50	ft		
Manning's roughness =	0.012			
Flow Direction	East			
Upstream Invert =	63.84	ft		
Downstream Invert =	63.01	ft		
Entrance Coefficient =	0.2			
Critical Elevation =	68.80	ft		

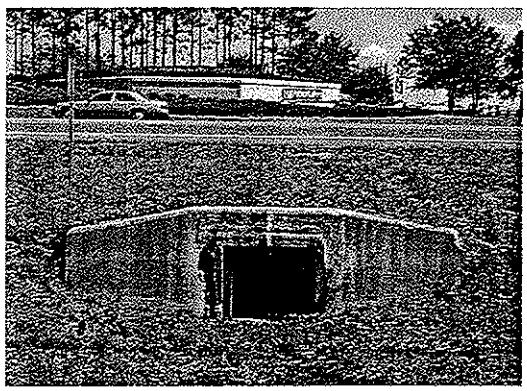
II. DETERMINE FLOWRATES (Q), Q = A x V

Assume	V(25 yr) =	6.00	ft/sec	
	Q(25 yr) =	24.00	cfs	
	Q(50 yr) =	29.00	cfs	see exceedence probability plot
	Q(100 yr) =	33.60	cfs	based on 1.4 x Q(25 yr)
	Q(500 yr) =	57.12	cfs	based on 1.7 x Q(100 yr)

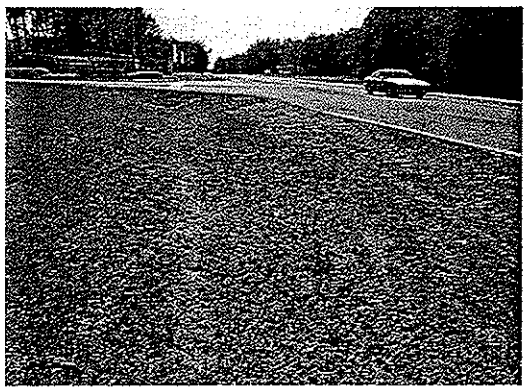
III. DETERMINE TAILWATER

Use a tailwater equal to the crown of culvert
D/S invert + culvert height = 65.01 ft

IV. PHYSICAL APPEARANCE/CONDITION



Upstream end, west side of SR 200



Downstream end east side of SR 200 is not visible
Possible connection through Arbor Lakes Subdivision

ARCADIS
GERAGHTY & MILLER

SUBJECT: SR 200; Proposed CD89+90.90

JOB NO: TF001173.0000

BY: Sam Aref
DATE: Dec. 12, 2000
CHKD: P.E.
DATE: 3/23/01

I. CROSS DRAIN CHARACTERISTICS

Pipe Proposed @ Station	89+90.90	
Pipe Size =	36	in
Number of Barrels =	1	
Pipe Length =	160.00	ft
Pipe X-Sectional Area =	7.07	sf
Pipe Hydraulic Radius =	0.75	ft
Pipe Type	Reinforced concrete	
Manning's roughness =	0.012	
Flow Direction	East	
Upstream Invert =	64.50	ft
Downstream Invert =	61.85	ft
Entrance Coefficient =	0.5	
Critical Elevation =	68.80	ft

II. DETERMINE FLOWRATES (Q)

Q(50 yr) =	29.00	cfs
Q(100 yr) =	33.60	cfs
Q(500 yr) =	57.12	cfs

III. DETERMINE TAILWATER

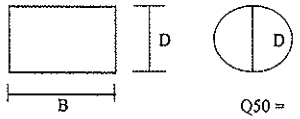
Use a tailwater equal to the existing crown of culvert

TW = 65.01 ft

PROJECT: SR 200; Proposed CD 89+90.90
Worksheet for Culvert Capacity Calculations

DESIGNER: Sam Aref
DATE: Dec. 12, 2000

HYDROLOGIC AND CHANNEL INFORMATION



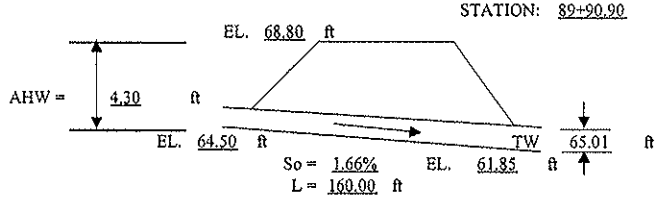
D = Diameter or Height
B = Span

Q50 = 29.0 cfs TW = 65.01 ft
Q100 = 33.6 cfs TW = 65.01 ft
Q500 = 57.1 cfs TW = 65.01 ft

(Q50 = DESIGN DISCHARGE)
(Q100 = CHECK DISCHARGE)

SKETCH

STATION: 89+90.90



LSo = 2.65

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE		HEADWATER COMPUTATIONS											CONTR-OLLING HW	OUTLET VELOCITY	PROPOSED PEAK STAGE	EXISTING PEAK STAGE	DIFF. IN STAGE
				INLET CONTROL			OUTLET CONTROL HW = H + DTW - LSo												
		D	B	Q/B	HW/D	HW	Ke	H	dc	(dc+D)/2	TW	DTW	LSo	HW					
	29.0	3.0	N/A	N/A	0.85	2.55	0.5	0.65	1.75	2.38	3.16	3.16	2.65	1.16	2.55	4.10	67.05	67.44	-0.39
	33.6	3.0	N/A	N/A	0.92	2.76	0.5	0.87	1.85	2.43	3.16	3.16	2.65	1.38	2.76	4.75	67.26	68.17	-0.91
	57.1	3.0	N/A	N/A	1.40	4.20	0.5	2.51	2.50	2.75	3.16	3.16	2.65	3.02	4.20	8.08	68.70	73.44	-4.74

SUMMARY & RECOMMENDATIONS:

H @ Outlet Control = [1 + Ke + (29*n^2*L)/(Rh^1.33)] * ((Q/A)^2/(2*g))

Design by: Sam Aref

Checked by:

Approved by: _____

ARCADIS
GERAGHTY & MILLER

SUBJECT: SR 200; Existing CD 119+14.90

JOB NO: TF001173.0000

BY: Sam Aref
DATE: Dec. 12, 2000
CHKD: P.K.
DATE: 2/23/01

I. CROSS DRAIN CHARACTERISTICS

Box Located @ Station	119+14.90				
Box Size =	2		X	2	ft
Number of Barrels =	1				
Box Length =	61.63	ft			
Box X-Sectional Area =	4.00	sf			
Box Wetted Parameters =	8.00	ft			
Box Hydraulic Radius =	0.50	ft			
Manning's roughness =	0.012				
Flow Direction	East				
Upstream Invert =	38.23	ft			
Downstream Invert =	38.20	ft			
Entrance Coefficient =	0.2				
Critical Elevation =	47.53	ft			

II. DETERMINE FLOWRATES (Q), Q = A x V

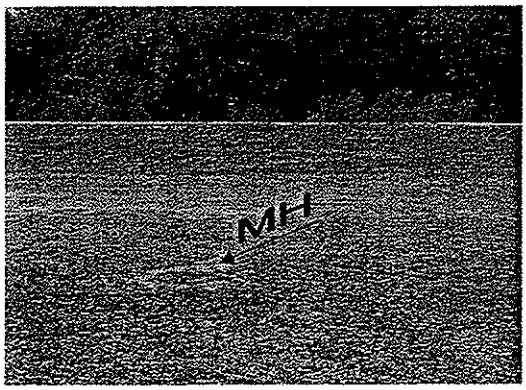
Assume	V(25 yr) =	6.00	ft/sec	
	Q(25 yr) =	24.00	cfs	
	Q(50 yr) =	29.00	cfs	see exceedence probability plot
	Q(100 yr) =	33.60	cfs	based on 1.4 x Q(25 yr)
	Q(500 yr) =	57.12	cfs	based on 1.7 x Q(100 yr)

III. DETERMINE TAILWATER

Use a tailwater equal to the crown of culvert
D/S invert + culvert height = 40.20 ft

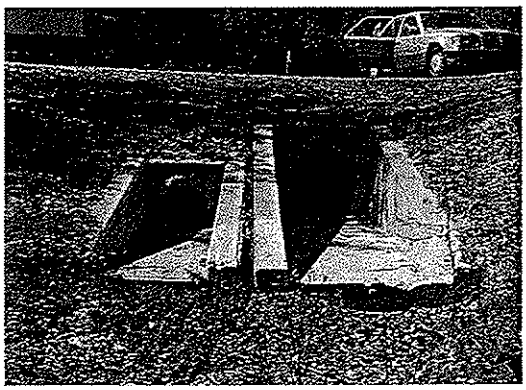
IV. PHYSICAL APPEARANCE/CONDITION

Upstream end, west side of SR 200



Cross drain connecting to MH, east side of SR 200

Downstream end, east side of SR 200

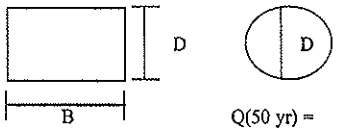


Downstream end, east side of SR 200

PROJECT: SR 200; Existing CD 119+14.90
Worksheet for Culvert Capacity Calculations

DESIGNER: Sam Aref
DATE: Dec. 12, 2000

HYDROLOGIC AND CHANNEL INFORMATION



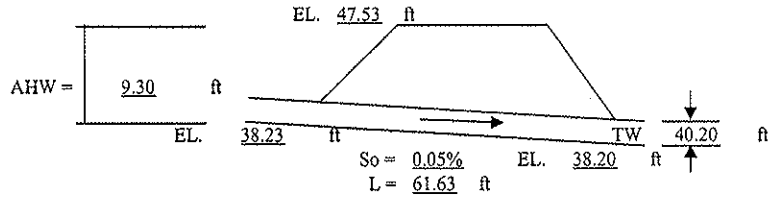
D = Diameter or Height
B = Span

Q(50 yr) = 29.0 cfs TW = 40.20 ft
Q(100 yr) = 33.6 cfs TW = 40.20 ft
Q(500 yr) = 57.1 cfs TW = 40.20 ft

(Q50 = DESIGN DISCHARGE)
(Q100 = CHECK DISCHARGE)

SKETCH

STATION: 119+14.90



LSo = 0.03

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE		HEADWATER COMPUTATIONS											CONTR-OLLING HW	OUTLET VELOCITY	PEAK STAGE
				INLET CONTROL			OUTLET CONTROL HW = H + DTW - LSo										
		D	B	Q/B	HW/D	HW	Ke	H	dc	(dc+D)/2	TW	DTW	LSo	HW			
	29.0	2.0	2.0	14.50	1.80	3.60	0.2	1.51	1.87	1.94	2.00	2.00	0.03	3.48	3.60	7.25	41.83
	33.6	2.0	2.0	16.80	2.17	4.33	0.2	2.02	2.07	2.03	2.00	2.03	0.03	4.03	4.33	8.40	42.56
	57.1	2.0	2.0	28.56	4.80	9.60	0.2	5.85	2.94	2.47	2.00	2.47	0.03	8.29	9.60	14.28	47.83

SUMMARY & RECOMMENDATIONS:

H @ Outlet Control = [1 + Ke + (29*n^2*L)/(Rh^1.33)] * ((Q/A)^2/(2*g))

Design by: Sam Aref Checked by: Approved by: _____

ARCADIS
GERAGHTY & MILLER

SUBJECT: SR 200; Proposed CD119+14.90

JOB NO: TF001173.0000

BY: Sam Aref
DATE: Dec. 12, 2000
CHKD: P.E.
DATE: 3/23/01

I. CROSS DRAIN CHARACTERISTICS

Pipe Proposed @ Station	119+14.90	
Pipe Size =	48	in
Number of Barrels =	1	
Pipe Length =	160.00	ft
Pipe X-Sectional Area =	12.57	sf
Pipe Hydraulic Radius =	1.00	ft
Pipe Type	Reinforced concrete	
Manning's roughness =	0.012	
Flow Direction	East	
Upstream Invert =	38.25	ft
Downstream Invert =	38.17	ft
Entrance Coefficient =	0.5	
Critical Elevation =	47.53	ft

II. DETERMINE FLOWRATES (Q)

Q(50 yr) =	29.00	cfs
Q(100 yr) =	33.60	cfs
Q(500 yr) =	57.12	cfs

III. DETERMINE TAILWATER

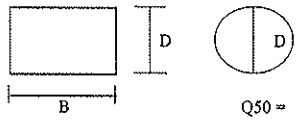
Use a tailwater equal to the existing crown of culvert

TW = 40.20 ft

PROJECT: SR 200; Proposed CD 119+14.90
Worksheet for Culvert Capacity Calculations

DESIGNER: Sam Aref
DATE: Dec. 12, 2000

HYDROLOGIC AND CHANNEL INFORMATION



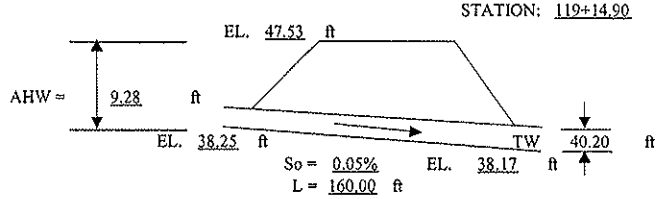
D = Diameter or Height
B = Span

Q50 = 29.0 cfs TW = 40.20 ft
Q100 = 33.6 cfs TW = 40.20 ft
Q500 = 57.1 cfs TW = 40.20 ft

(Q50 = DESIGN DISCHARGE)
(Q100 = CHECK DISCHARGE)

SKETCH

STATION: 119+14.90



LSo = 0.08

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE		HEADWATER COMPUTATIONS											CONTR-OLLING HW	OUTLET VELOCITY	PROPOSED PEAK STAGE	EXISTING PEAK STAGE	DIFF. IN STAGE
				INLET CONTROL			OUTLET CONTROL HW = H + DTW - LSo												
		D	B	Q/B	HW/D	HW	Ke	H	dc	(dc+D)/2	TW	DTW	LSo	HW					
	29.0	4.0	N/A	N/A	0.55	2.20	0.5	0.18	1.55	2.78	2.03	2.78	0.08	2.87	2.87	2.31	41.12	41.83	-0.71
	33.6	4.0	N/A	N/A	0.60	2.40	0.5	0.24	1.70	2.85	2.03	2.85	0.08	3.01	3.01	2.67	41.26	42.56	-1.30
	57.1	4.0	N/A	N/A	0.83	3.32	0.5	0.70	2.35	3.18	2.03	3.18	0.08	3.79	3.79	4.55	42.04	47.83	-5.79

SUMMARY & RECOMMENDATIONS:

H @ Outlet Control = [1 + Ke + (29*n^2*L)/(Rh^1.33)] * ((Q/A)^2/(2*g))

Design by: Sam Aref Checked by: Approved by:

ARCADIS
GERAGHTY & MILLER

SUBJECT: SR 200; Existing CD 129+30.20

JOB NO: TF001173.0000

BY: Sam Aref
DATE: Dec. 12, 2000
CHKD: P.L.
DATE: 3/23/01

I. CROSS DRAIN CHARACTERISTICS

Box Located @ Station	129+30.20			
Box Size =	2	X	2	ft
Number of Barrels =	1			
Box Length =	54.00	ft		
Box X-Sectional Area =	4.00	sf		
Box Wetted Parameters =	8.00	ft		
Box Hydraulic Radius =	0.50	ft		
Manning's roughness =	0.012			
Flow Direction	East			
Upstream Invert =	44.55	ft		
Downstream Invert =	43.59	ft		
Entrance Coefficient =	0.2			
Critical Elevation =	50.52	ft		

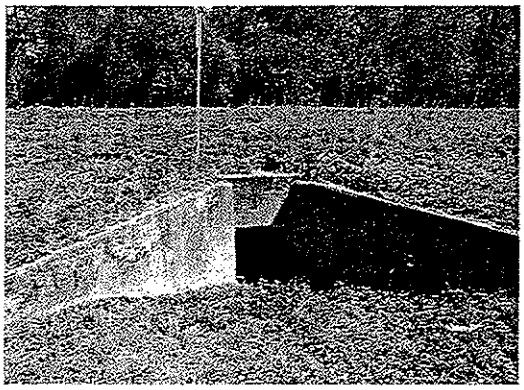
II. DETERMINE FLOWRATES (Q), Q = A x V

Assume	V(25 yr) =	6.00	ft/sec	
	Q(25 yr) =	24.00	cfs	
	Q(50 yr) =	29.00	cfs	see exceedence probability plot
	Q(100 yr) =	33.60	cfs	based on 1.4 x Q(25 yr)
	Q(500 yr) =	57.12	cfs	based on 1.7 x Q(100 yr)

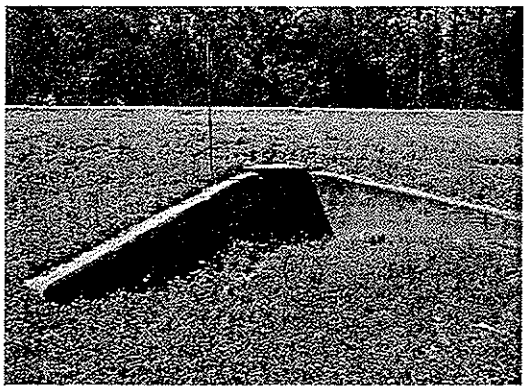
III. DETERMINE TAILWATER

Use a tailwater equal to the crown of culvert
D/S invert + culvert height = 45.59 ft

IV. PHYSICAL APPEARANCE/CONDITION



Upstream end, west side of SR 200

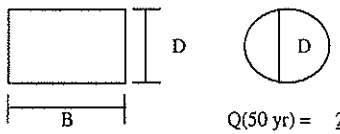


Downstream end, east side of SR 200

PROJECT: SR 200; Existing CD 129+30.20
Worksheet for Culvert Capacity Calculations

DESIGNER: Sam Aref
DATE: Dec. 12, 2000

HYDROLOGIC AND CHANNEL INFORMATION



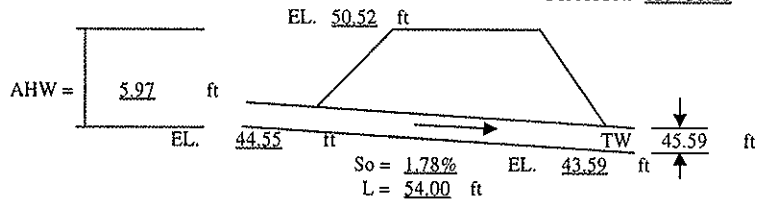
D = Diameter or Height
B = Span

Q(50 yr) = 29.0 cfs TW = 45.59 ft
Q(100 yr) = 33.6 cfs TW = 45.59 ft
Q(500 yr) = 57.1 cfs TW = 45.59 ft

(Q50 = DESIGN DISCHARGE)
(Q100 = CHECK DISCHARGE)

SKETCH

STATION: 129+30.20



LSo = 0.96

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE		HEADWATER COMPUTATIONS										CONTR-OLLING HW	OUTLET VELOCITY	PEAK STAGE
				INLET CONTROL			OUTLET CONTROL HW = H + DTW - LSo									
		D	B	Q/B	HW/D	HW	Ke	H	dc	(dc+D)/2	TW	DTW	LSo	HW			
	29.0	2.0	2.0	14.50	1.80	3.60	0.2	1.44	1.87	1.94	2.00	2.00	0.96	2.48	3.60	7.25	48.15
	33.6	2.0	2.0	16.80	2.17	4.33	0.2	1.94	2.07	2.03	2.00	2.03	0.96	3.01	4.33	8.40	48.88
	57.1	2.0	2.0	28.56	4.80	9.60	0.2	5.59	2.94	2.47	2.00	2.47	0.96	7.11	9.60	14.28	54.15

SUMMARY & RECOMMENDATIONS:

H @ Outlet Control = [1 + Ke + (29*n^2*L)/(Rh^1.33)] * ((Q/A)^2/(2*g))

Design by: Sam Aref
Checked by:
Approved by: _____

ARCADIS
GERAGHTY & MILLER

SUBJECT: SR 200; Proposed CD 129+30.20

JOB NO: TF001173.0000

BY: Sam Aref
DATE: Dec. 12, 2000
CHKD: P.E.
DATE: 3/23/01

I. CROSS DRAIN CHARACTERISTICS

Pipe Proposed @ Station	129+30.20	
Pipe Size =	36	in
Number of Barrels =	1	
Pipe Length =	160.00	ft
Pipe X-Sectional Area =	7.07	sf
Pipe Hydraulic Radius =	0.75	ft
Pipe Type	Reinforced concrete	
Manning's roughness =	0.012	
Flow Direction	East	
Upstream Invert =	45.55	ft
Downstream Invert =	42.70	ft
Entrance Coefficient =	0.5	
Critical Elevation =	50.52	ft

II. DETERMINE FLOWRATES (Q)

Q(50 yr) =	29.00	cfs
Q(100 yr) =	33.60	cfs
Q(500 yr) =	57.12	cfs

III. DETERMINE TAILWATER

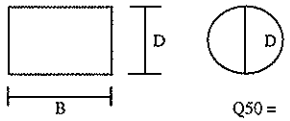
Use a tailwater equal to the existing crown of culvert

TW = 45.59 ft

PROJECT: SR 200; Proposed CD 129+30.20
Worksheet for Culvert Capacity Calculations

DESIGNER: Sam Aref
DATE: Dec. 12, 2000

HYDROLOGIC AND CHANNEL INFORMATION



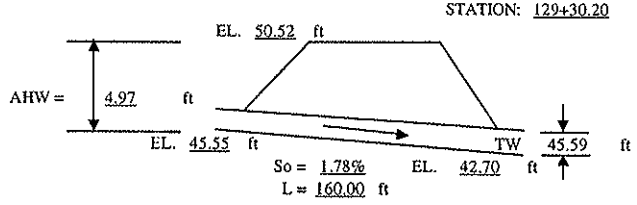
D = Diameter or Height
B = Span

Q50 = 29.0 cfs TW = 45.59 ft
Q100 = 33.6 cfs TW = 45.59 ft
Q500 = 57.1 cfs TW = 45.59 ft

(Q50 = DESIGN DISCHARGE)
(Q100 = CHECK DISCHARGE)

SKETCH

STATION: 129+30.20



LSo = 2.85

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE		HEADWATER COMPUTATIONS											CONTR-OLLING HW	OUTLET VELOCITY	PROPOSED PEAK STAGE	EXISTING PEAK STAGE	DIFF. IN STAGE
				INLET CONTROL			OUTLET CONTROL HW = H + DTW - LSo												
		D	B	Q/B	HW/D	HW	Ke	H	dc	(dc+D)/2	TW	DTW	LSo	HW					
	29.0	3.0	N/A	N/A	0.85	2.55	0.5	0.65	1.75	2.38	2.89	2.89	2.85	0.69	2.55	4.10	48.10	48.15	-0.05
	33.6	3.0	N/A	N/A	0.92	2.76	0.5	0.87	1.85	2.43	2.89	2.89	2.85	0.91	2.76	4.75	48.31	48.88	-0.57
	57.1	3.0	N/A	N/A	1.40	4.20	0.5	2.51	2.50	2.75	2.89	2.89	2.85	2.55	4.20	8.08	49.75	54.15	-4.40

SUMMARY & RECOMMENDATIONS:

H @ Outlet Control = [1 + Ke + (29*n^2*L)/(Rh^1.33)] * ((Q/A)^2/(2*g))

Design by: Sam Aref

Checked by:

Approved by: _____

ARCADIS
GERAGHTY & MILLER

SUBJECT: SR 200; Existing CD 167+90.70

JOB NO: TF001173.0000

BY: Sam Aref
DATE: Dec. 12, 2000
CHKD: P.L
DATE: 3/23/01

I. CROSS DRAIN CHARACTERISTICS

Box Located @ Station	167+90.70			
Box Size =	2	X	2	ft
Number of Barrels =	1			
Box Length =	41.05	ft		
Box X-Sectional Area =	4.00	sf		
Box Wetted Parameters =	8.00	ft		
Box Hydraulic Radius =	0.50	ft		
Manning's roughness =	0.012			
Flow Direction	East			
Upstream Invert =	46.77	ft		
Downstream Invert =	46.68	ft		
Entrance Coefficient =	0.2			
Critical Elevation =	50.74	ft		

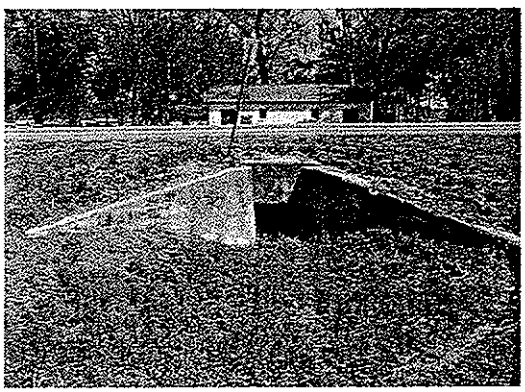
II. DETERMINE FLOWRATES (Q), Q = A x V

Assume	V(25 yr) =	6.00	ft/sec	
	Q(25 yr) =	24.00	cfs	
	Q(50 yr) =	29.00	cfs	see exceedence probability plot
	Q(100 yr) =	33.60	cfs	based on 1.4 x Q(25 yr)
	Q(500 yr) =	57.12	cfs	based on 1.7 x Q(100 yr)

III. DETERMINE TAILWATER

Use a tailwater equal to the crown of culvert
D/S invert + culvert height = 48.68 ft

IV. PHYSICAL APPEARANCE/CONDITION



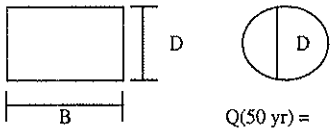
Upstream end, west side of SR 200

Downstream end, east side of SR 200

PROJECT: SR 200; Existing CD 167+90.70
Worksheet for Culvert Capacity Calculations

DESIGNER: Sam Aref
DATE: Dec. 12, 2000

HYDROLOGIC AND CHANNEL INFORMATION



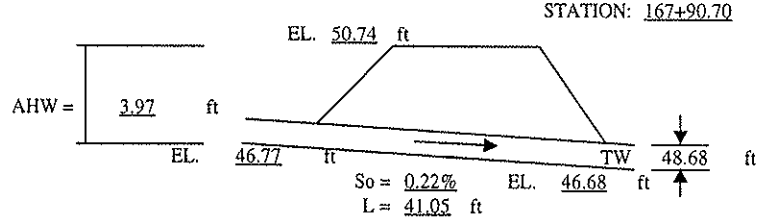
D = Diameter or Height
B = Span

Q(50 yr) = 29.0 cfs TW = 48.68 ft
Q(100 yr) = 33.6 cfs TW = 48.68 ft
Q(500 yr) = 57.1 cfs TW = 48.68 ft

(Q50 = DESIGN DISCHARGE)
(Q100 = CHECK DISCHARGE)

SKETCH

STATION: 167+90.70



LSo = 0.09

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE		HEADWATER COMPUTATIONS											CONTR-OLLING HW	OUTLET VELOCITY	PEAK STAGE
				INLET CONTROL			OUTLET CONTROL HW = H + DTW - LSo										
		D	B	Q/B	HW/D	HW	Ke	H	dc	(dc+D)/2	TW	DTW	LSo	HW			
	29.0	2.0	2.0	14.50	1.80	3.60	0.2	1.33	1.87	1.94	2.00	2.00	0.09	3.24	3.60	7.25	50.37
	33.6	2.0	2.0	16.80	2.17	4.33	0.2	1.79	2.07	2.03	2.00	2.03	0.09	3.73	4.33	8.40	51.10
	57.1	2.0	2.0	28.56	4.80	9.60	0.2	5.16	2.94	2.47	2.00	2.47	0.09	7.55	9.60	14.28	56.37

SUMMARY & RECOMMENDATIONS:

H @ Outlet Control = [1 + Ke + (29*n^2*L)/(Rh^1.33)] * ((Q/A)^2/(2*g))

Design by: Sam Aref

Checked by:

Approved by: _____

ARCADIS
GERAGHTY & MILLER

SUBJECT: SR 200; Proposed CD 167+90.70

JOB NO: TF001173.0000

BY: Sam Aref
DATE: Dec. 12, 2000
CHKD:
DATE: 3/23/01

I. CROSS DRAIN CHARACTERISTICS

Pipe Proposed @ Station	167+90.70	
Pipe Size =	48	in
Number of Barrels =	1	
Pipe Length =	160.00	ft
Pipe X-Sectional Area =	12.57	sf
Pipe Hydraulic Radius =	1.00	ft
Pipe Type	Reinforced concrete	
Manning's roughness =	0.012	
Flow Direction	East	
Upstream Invert =	46.85	ft
Downstream Invert =	46.50	ft
Entrance Coefficient =	0.5	
Critical Elevation =	50.74	ft

II. DETERMINE FLOWRATES (Q)

Q(50 yr) =	29.00	cfs
Q(100 yr) =	33.60	cfs
Q(500 yr) =	57.12	cfs

III. DETERMINE TAILWATER

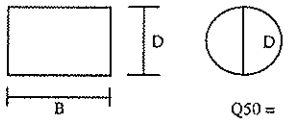
Use a tailwater equal to the existing crown of culvert

TW = 48.68 ft

PROJECT: SR 200; Proposed CD 167+90.70
Worksheet for Culvert Capacity Calculations

DESIGNER: Sam Aref
DATE: Dec. 12, 2000

HYDROLOGIC AND CHANNEL INFORMATION



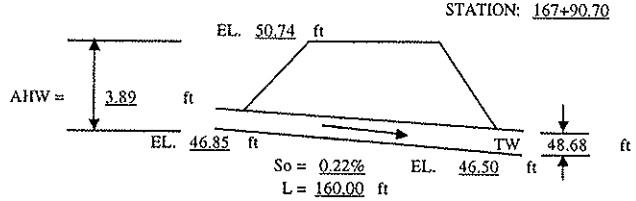
D = Diameter or Height
B = Span

Q50 = 29.0 cfs TW = 48.68 ft
Q100 = 33.6 cfs TW = 48.68 ft
Q500 = 57.1 cfs TW = 48.68 ft

(Q50 = DESIGN DISCHARGE)
(Q100 = CHECK DISCHARGE)

SKETCH

STATION: 167+90.70



LSo = 0.35

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE		HEADWATER COMPUTATIONS											CONTR-OLLING HW	OUTLET VELOCITY	PROPOSED PEAK STAGE	EXISTING PEAK STAGE	DIFF. IN STAGE
				INLET CONTROL			OUTLET CONTROL HW = H + DTW - LSo												
		D	B	Q/B	HW/D	HW	Ke	H	dc	(dc+D)/2	TW	DTW	LSo	HW					
	29.0	4.0	N/A	N/A	0.55	2.20	0.5	0.18	1.55	2.78	2.18	2.78	0.35	2.60	2.60	2.31	49.45	50.37	-0.92
	33.6	4.0	N/A	N/A	0.60	2.40	0.5	0.24	1.70	2.85	2.18	2.85	0.35	2.74	2.74	2.67	49.59	51.10	-1.51
	57.1	4.0	N/A	N/A	0.83	3.32	0.5	0.70	2.35	3.18	2.18	3.18	0.35	3.52	3.52	4.55	50.37	56.37	-6.00

SUMMARY & RECOMMENDATIONS:

H @ Outlet Control = [1 + Ke + (29*n^2*L)/(Rh^1.33)] * ((Q/A)^2/(2*g))

Design by: Sam Aref Checked by: Approved by: _____

ARCADIS
GERAGHTY & MILLER

SUBJECT: SR 200; Existing CD 200+40.40

JOB NO: TF001173.0000

BY: Sam Aref
DATE: Dec. 12, 2000
CHKD:
DATE: 3/23/01

I. CROSS DRAIN CHARACTERISTICS

Box Located @ Station	200+40.40			
Box Size =	2	X	2	ft
Number of Barrels =	1			
Box Length =	69.67	ft		
Box X-Sectional Area =	4.00	sf		
Box Wetted Parameters =	8.00	ft		
Box Hydraulic Radius =	0.50	ft		
Manning's roughness =	0.012			
Flow Direction	West			
Upstream Invert =	30.51	ft		
Downstream Invert =	30.04	ft		
Entrance Coefficient =	0.2			
Critical Elevation =	37.90	ft		

II. DETERMINE FLOWRATES (Q), Q = A x V

Assume	V(25 yr) =	6.00	ft/sec	
	Q(25 yr) =	24.00	cfs	
	Q(50 yr) =	29.00	cfs	see exceedence probability plot
	Q(100 yr) =	33.60	cfs	based on 1.4 x Q(25 yr)
	Q(500 yr) =	57.12	cfs	based on 1.7 x Q(100 yr)

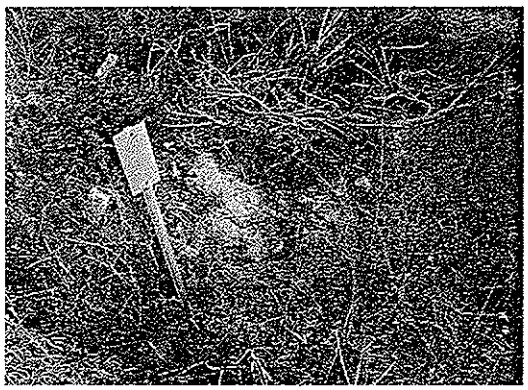
III. DETERMINE TAILWATER

Use a tailwater equal to the crown of culvert

D/S invert + culvert height = 32.04 ft

IV. PHYSICAL APPEARANCE/CONDITION

Upstream end, east side of SR 200



Downstream end, west side of SR 200

ARCADIS
GERAGHTY & MILLER

SUBJECT: SR 200; Proposed CD 200+40.40

JOB NO: TF001173.0000

BY: Sam Aref
DATE: Dec. 12, 2000
CHKD:
DATE: 12/23/00

I. CROSS DRAIN CHARACTERISTICS

Pipe Proposed @ Station	200+40.40	
Pipe Size =	36	in
Number of Barrels =	1	
Pipe Length =	160.00	ft
Pipe X-Sectional Area =	7.07	sf
Pipe Hydraulic Radius =	0.75	ft
Pipe Type	Reinforced concrete	
Manning's roughness =	0.012	
Flow Direction	West	
Upstream Invert =	30.75	ft
Downstream Invert =	29.68	ft
Entrance Coefficient =	0.5	
Critical Elevation =	37.90	ft

II. DETERMINE FLOWRATES (Q)

Q(50 yr) =	29.00	cfs
Q(100 yr) =	33.60	cfs
Q(500 yr) =	57.12	cfs

III. DETERMINE TAILWATER

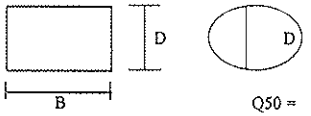
Use a tailwater equal to the existing crown of culvert

TW = 32.04 ft

PROJECT: SR 200; Proposed CD 200+40.40
Worksheet for Culvert Capacity Calculations

DESIGNER: Sam Aref
DATE: Dec. 12, 2000

HYDROLOGIC AND CHANNEL INFORMATION



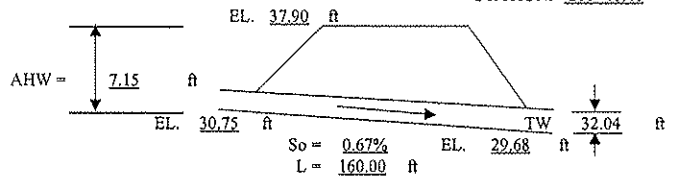
D = Diameter or Height
B = Span

Q50 = 29.0 cfs TW = 32.04 ft
Q100 = 33.6 cfs TW = 32.04 ft
Q500 = 57.1 cfs TW = 32.04 ft

(Q50 = DESIGN DISCHARGE)
(Q100 = CHECK DISCHARGE)

SKETCH

STATION: 200+40.40



LSo = 1.07

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE		HEADWATER COMPUTATIONS										CONTR-OLLING HW	OUTLET VELOCITY	PROPOSED PEAK STAGE	EXISTING PEAK STAGE	DIFF. IN STAGE
				INLET CONTROL			OUTLET CONTROL HW = H + DTW - LSo											
		D	B	Q/B	HW/D	HW	Ke	H	dc	(dc+D)/2	TW	DTW	LSo	HW					
	29.0	3.0	N/A	N/A	0.85	2.55	0.5	0.65	1.75	2.38	2.36	2.38	1.07	1.95	2.55	4.10	33.30	34.11	-0.81
	33.6	3.0	N/A	N/A	0.92	2.76	0.5	0.87	1.85	2.43	2.36	2.43	1.07	2.22	2.76	4.75	33.51	34.84	-1.33
	57.1	3.0	N/A	N/A	1.40	4.20	0.5	2.51	2.50	2.75	2.36	2.75	1.07	4.19	4.20	8.08	34.95	40.11	-5.16

SUMMARY & RECOMMENDATIONS:

H @ Outlet Control = [1 + Ke + (29*n^2*L)/(Rh^1.33)] * ((Q/A)^2/(2*g))

Design by: Sam Aref

Checked by:

Approved by: _____

ARCADIS
GERAGHTY & MILLER

SUBJECT: SR 200; Existing CD 248+15.50

JOB NO: TF001173.0000

BY: Sam Aref
DATE: Dec. 12, 2000
CHKD: PK
DATE: 3/23/01

I. CROSS DRAIN CHARACTERISTICS

Box Located @ Station	248+15.50			
Box Size =	10	X	6	ft
Number of Barrels =	2			
Box Length =	39.92	ft		
Box X-Sectional Area =	60.00	sf		
Box Wetted Parameters =	32.00	ft		
Box Hydraulic Radius =	1.88	ft		
Manning's roughness =	0.012			
Flow Direction	West			
Upstream Invert =	37.01	ft		
Downstream Invert =	36.99	ft		
Entrance Coefficient =	0.2			
Critical Elevation =	44.88	ft		

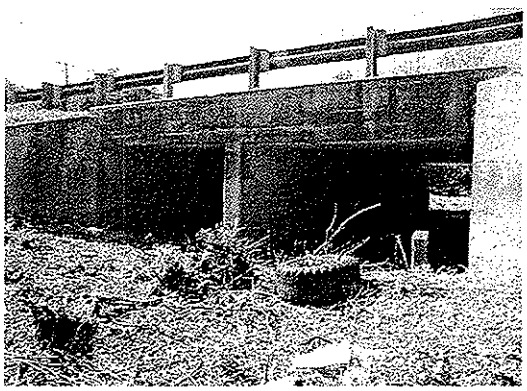
II. DETERMINE FLOWRATES (Q), Q = A x V

Assume	V(25 yr) =	6.00	ft/sec	
	Q(25 yr) =	720.00	cfs	
	Q(50 yr) =	873.00	cfs	see exceedence probability plot
	Q(100 yr) =	1008.00	cfs	based on 1.4 x Q(25 yr)
	Q(500 yr) =	1713.60	cfs	based on 1.7 x Q(100 yr)

III. DETERMINE TAILWATER

Use a tailwater equal to the crown of culvert
D/S invert + culvert height = 42.99 ft

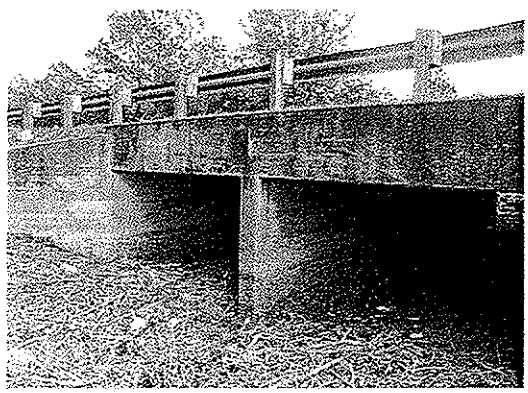
IV. PHYSICAL APPEARANCE/CONDITION



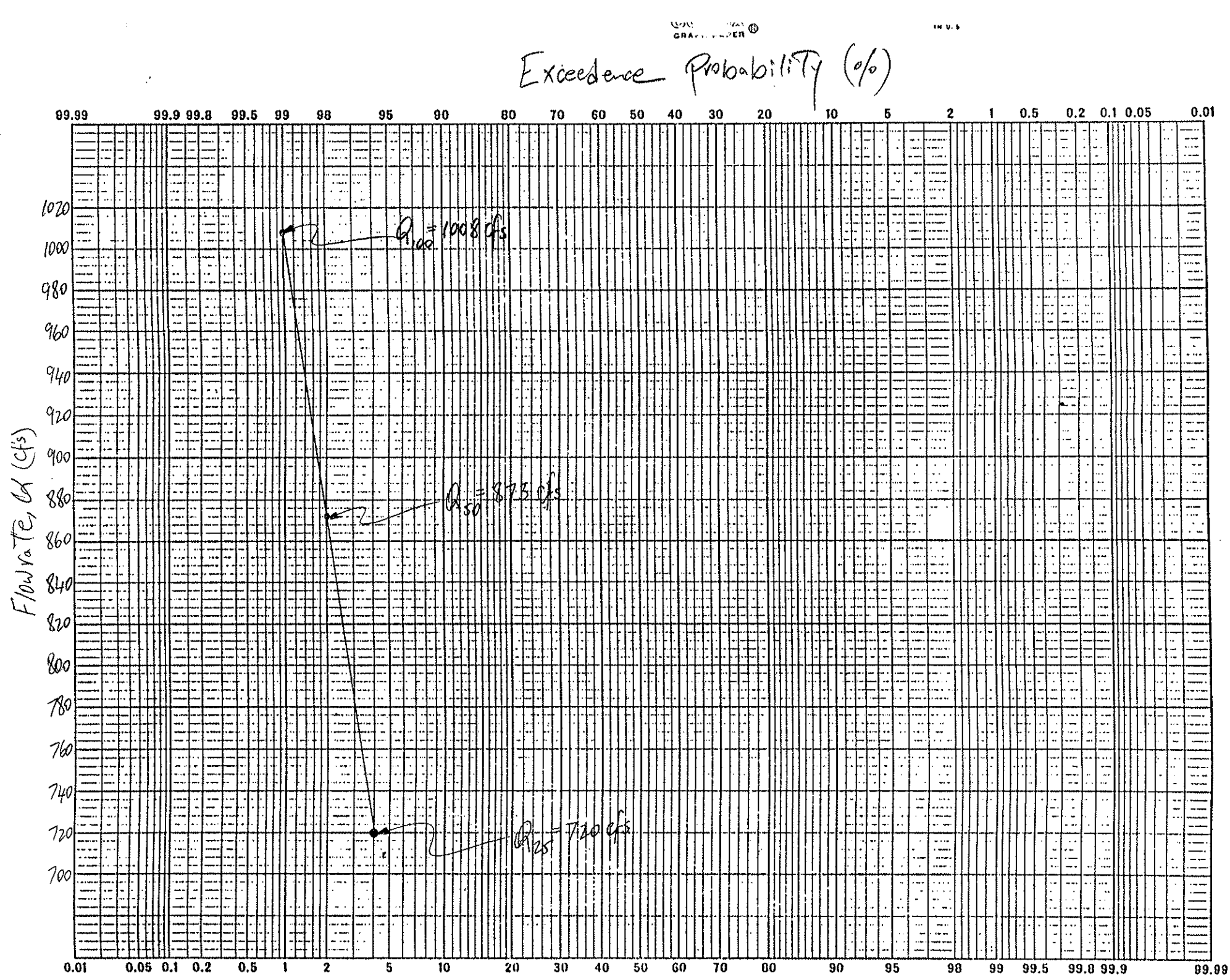
Upstream end, east side of SR 200

Upstream end, east side of SR 200

Downstream end, west side of SR 200



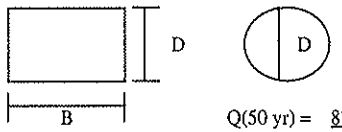
Downstream end, west side of SR 200


Exceedence Probability (%)
99.99 99.9 99.8 99.5 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01
1020 1000 980 960 940 920 900 880 860 840 820 800 780 760 740 720 700
Flowrate, Q (cfs)
Q_{100} = 1008 cfs
Q_{50} = 873 cfs
Q_{25} = 7120 cfs
0.01 0.05 0.1 0.2 0.5 1 2 5 10 20 30 40 50 60 70 80 90 95 98 99 99.5 99.8 99.9 99.99

PROJECT: SR 200; Existing CD 248+15.50
Worksheet for Culvert Capacity Calculations

DESIGNER: Sam Aref
DATE: Dec. 12, 2000

HYDROLOGIC AND CHANNEL INFORMATION



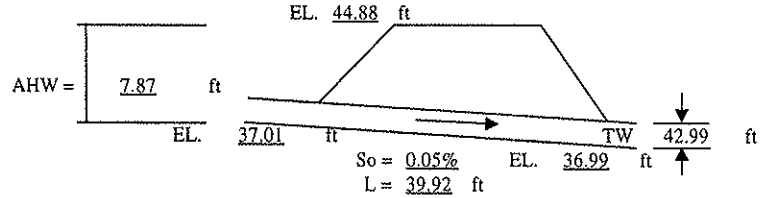
D = Diameter or Height
B = Span

Q(50 yr) = 873.0 cfs TW = 42.99 ft
Q(100 yr) = 1008.0 cfs TW = 42.99 ft
Q(500 yr) = 1713.6 cfs TW = 42.99 ft

(Q50 = DESIGN DISCHARGE)
(Q100 = CHECK DISCHARGE)

SKETCH

STATION: 248+15.50



LSo = 0.02

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE		HEADWATER COMPUTATIONS											CONTR-OLLING HW	OUTLET VELOCITY	PEAK STAGE
				INLET CONTROL			OUTLET CONTROL HW = H + DTW - LSo										
		D	B	Q/B	HW/D	HW	Ke	H	dc	(dc+D)/2	TW	DTW	LSo	HW			
	436.5	6.0	10.0	43.65	1.10	6.60	0.2	1.05	3.91	4.95	6.00	6.00	0.02	7.03	7.03	7.28	44.04
	504.0	6.0	10.0	50.40	1.25	7.50	0.2	1.39	4.30	5.15	6.00	6.00	0.02	7.37	7.50	8.40	44.51
	856.8	6.0	10.0	85.68	2.20	13.20	0.2	4.03	6.12	6.06	6.00	6.06	0.02	10.07	13.20	14.28	50.21

SUMMARY & RECOMMENDATIONS:

H @ Outlet Control = [1 + Ke + (29*n^2*L)/(Rh^1.33)] * ((Q/A)^2/(2*g))

Design by: Sam Aref

Checked by:

Approved by: _____

ARCADIS
GERAGHTY & MILLER

SUBJECT: SR 200; Extension of CD 248+15.50

JOB NO: TF001173.0000

BY: Sam Aref
DATE: Dec. 12, 2000
CHKD:
DATE: 3/23/01

I. CROSS DRAIN CHARACTERISTICS

Box Located @ Station	248+15.50			
Box Size =	10	X	6	ft
Number of Barrels =	2			
Box Length =	160.00	ft		
Box X-Sectional Area =	60.00	sf		
Box Wetted Parameters =	32.00	ft		
Box Hydraulic Radius =	1.88	ft		
Manning's roughness =	0.012			
Flow Direction	West			
Upstream Invert =	37.04	ft		
Downstream Invert =	36.96	ft		
Entrance Coefficient =	0.4			
Critical Elevation =	44.88	ft		

II. DETERMINE FLOWRATES (Q)

Q(50 yr) =	873.00	cfs
Q(100 yr) =	1008.00	cfs
Q(500 yr) =	1713.60	cfs

III. DETERMINE TAILWATER

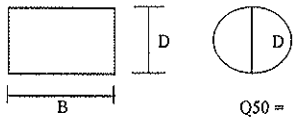
Use a tailwater equal to the existing crown of culvert

TW = 42.99 ft

PROJECT: SR 200; Extension of CD 248+15.50
Worksheet for Culvert Capacity Calculations

DESIGNER: Sam Aref
DATE: Dec. 12, 2000

HYDROLOGIC AND CHANNEL INFORMATION



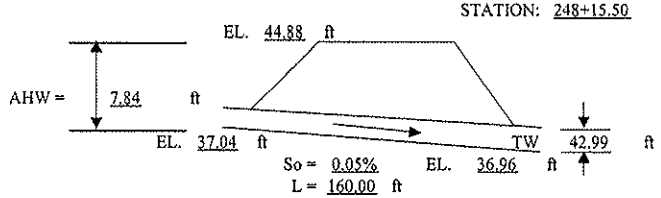
D = Diameter or Height
B = Span

Q50 = 873.0 cfs TW = 42.99 ft
Q100 = 1008.0 cfs TW = 42.99 ft
Q500 = 1713.6 cfs TW = 42.99 ft

(Q50 = DESIGN DISCHARGE)
(Q100 = CHECK DISCHARGE)

SKETCH

STATION: 248+15.50



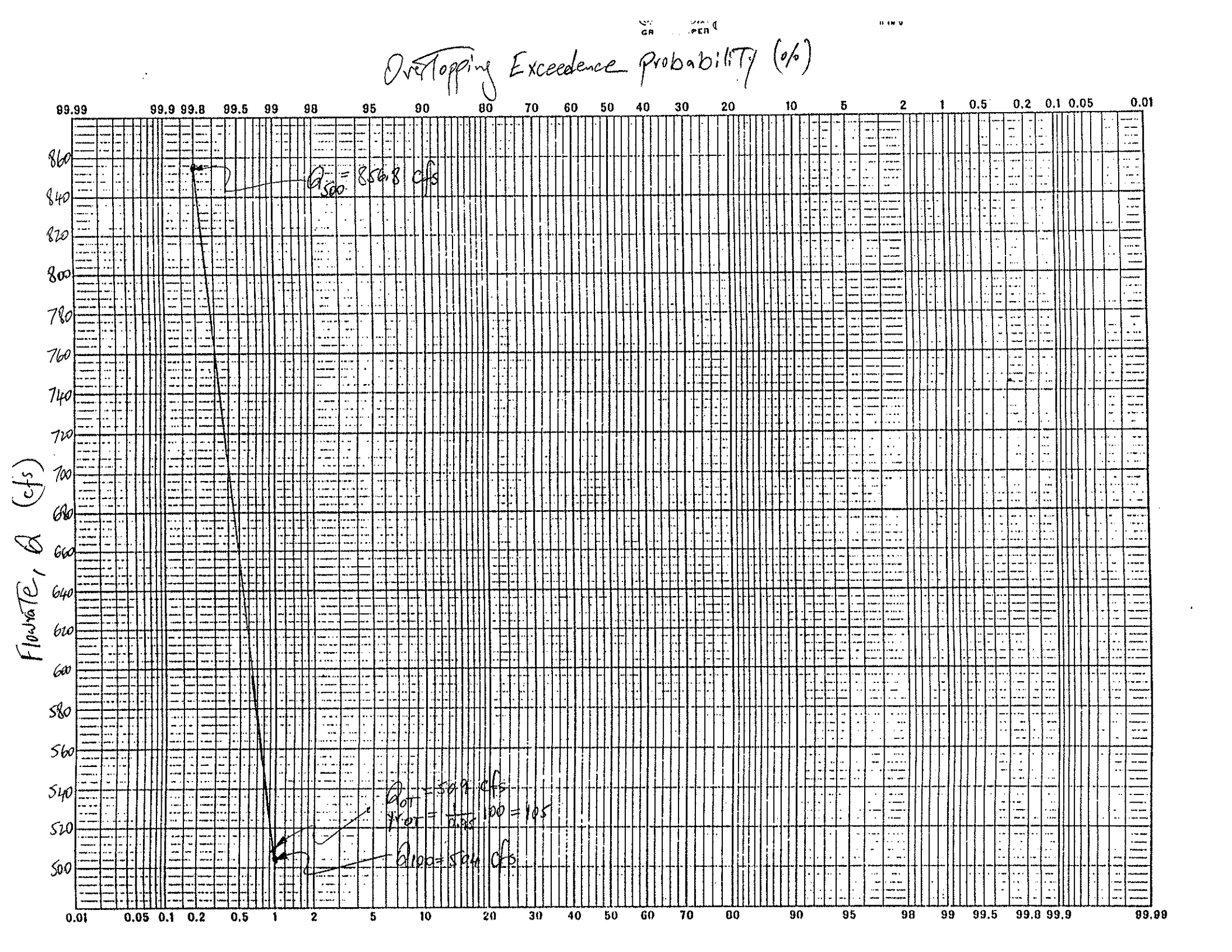
LSo = 0.08

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE		HEADWATER COMPUTATIONS											CONTR-OLLING HW	OUTLET VELOCITY	PROPOSED PEAK STAGE	EXISTING PEAK STAGE	DIFF. IN STAGE	
				INLET CONTROL			OUTLET CONTROL HW = H + DTW - LSo													
		D	B	Q/B	HW/D	HW	Ke	H	dc	(dc+D)/2	TW	DTW	LSo	HW						
	436.5	6.0	10.0	43.65	1.10	6.60	0.4	1.39	3.91	4.95	6.03	6.03	0.08	7.34	7.34	7.28	44.38	44.04	0.34	
	504.0	6.0	10.0	50.40	1.25	7.50	0.4	1.85	4.30	5.15	6.03	6.03	0.08	7.80	7.80	8.40	44.84	44.51	0.33	
	856.8	6.0	10.0	85.68	2.20	13.20	0.4	5.35	6.12	6.06	6.03	6.06	0.08	11.33	13.20	14.28	50.24	50.21	0.03	
	509.0	6.0	10.0	50.90	1.28	7.68	0.4	1.89	4.33	5.16	6.03	6.03	0.08	7.84	7.84	8.48	44.88			*

SUMMARY & RECOMMENDATIONS:
*Year of overtopping elevation = 105

H @ Outlet Control = [1 + Ke + (29*n^2*L)/(Rh^1.33)] * ((Q/A)^2/(2*g))

Design by: Sam Aref Checked by: R. Kontos Approved by: _____


Overtopping Exceedence Probability (%)
99.99 99.9 99.8 99.5 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01
860 840 820 800 780 760 740 720 700 680 660 640 620 600 580 560 540 520 500
Flowrate, Q (cfs)
Q_{500} = 856.8 cfs
Q_{OT} = 509.4 cfs
$\%_{OT} = \frac{1}{0.05} 100 = 105$
Q_{100} = 504.4 cfs
0.01 0.05 0.1 0.2 0.5 1 2 5 10 20 30 40 50 60 70 80 90 95 98 99 99.5 99.8 99.9 99.99

ARCADIS
GERAGHTY & MILLER

SUBJECT: SR 200; Existing CD 272+89.90

JOB NO: TF001173.0000

BY: Sam Aref
DATE: Dec. 12, 2000
CHKD: RK
DATE: 3/23/01

I. CROSS DRAIN CHARACTERISTICS

Box Located @ Station	272+89.90			
Box Size =	2	X	2	ft
Number of Barrels =	1			
Box Length =	52.40	ft		
Box X-Sectional Area =	4.00	sf		
Box Wetted Parameters =	8.00	ft		
Box Hydraulic Radius =	0.50	ft		
Manning's roughness =	0.012			
Flow Direction	equalizer			
Upstream Invert =	37.63	ft		
Downstream Invert =	37.61	ft		
Entrance Coefficient =	0.2			
Critical Elevation =	44.88	ft		

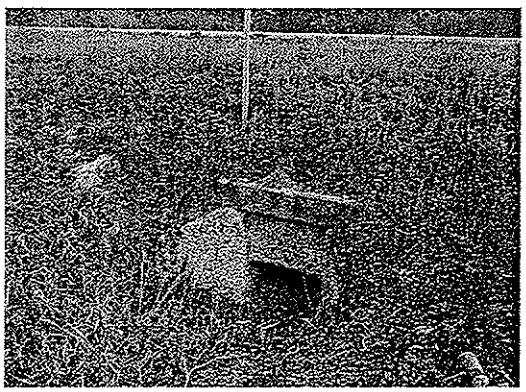
II. DETERMINE FLOWRATES (Q), Q = A x V

Assume	V(25 yr) =	6.00	ft/sec	
	Q(25 yr) =	24.00	cfs	
	Q(50 yr) =	29.00	cfs	see exceedence probability plot
	Q(100 yr) =	33.60	cfs	based on 1.4 x Q(25 yr)
	Q(500 yr) =	57.12	cfs	based on 1.7 x Q(100 yr)

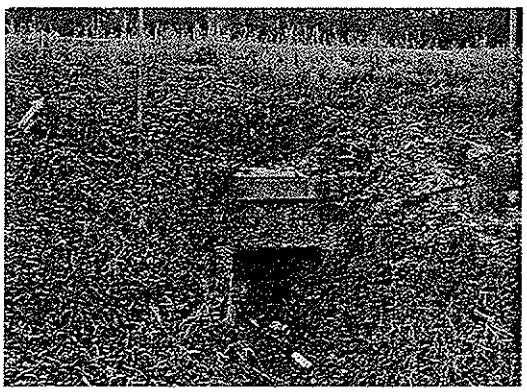
III. DETERMINE TAILWATER

Use a tailwater equal to the crown of culvert
D/S invert + culvert height = 39.61 ft

IV. PHYSICAL APPEARANCE/CONDITION



Equalizer culvert end, east side of SR 200

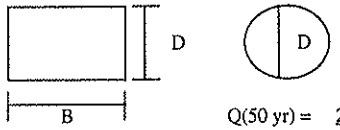


Equalizer culvert end, west side of SR 200

PROJECT: SR 200; Existing CD 272+89.90
Worksheet for Culvert Capacity Calculations

DESIGNER: Sam Aref
DATE: Dec. 12, 2000

HYDROLOGIC AND CHANNEL INFORMATION



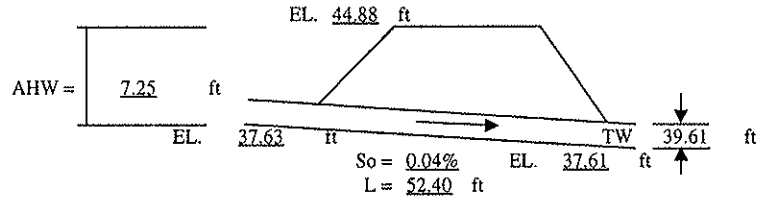
D = Diameter or Height
B = Span

Q(50 yr) = 29.0 cfs TW = 39.61 ft
Q(100 yr) = 33.6 cfs TW = 39.61 ft
Q(500 yr) = 57.1 cfs TW = 39.61 ft

(Q50 = DESIGN DISCHARGE)
(Q100 = CHECK DISCHARGE)

SKETCH

STATION: 272+89.90



LSo = 0.02

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE		HEADWATER COMPUTATIONS											CONTR-OLLING HW	OUTLET VELOCITY	PEAK STAGE
				INLET CONTROL			OUTLET CONTROL HW = H + DTW - LSo										
		D	B	Q/B	HW/D	HW	Ke	H	dc	(dc+D)/2	TW	DTW	LSo	HW			
	29.0	2.0	2.0	14.50	1.80	3.60	0.2	1.43	1.87	1.94	2.00	2.00	0.02	3.41	3.60	7.25	41.23
	33.6	2.0	2.0	16.80	2.17	4.33	0.2	1.92	2.07	2.03	2.00	2.03	0.02	3.93	4.33	8.40	41.96
	57.1	2.0	2.0	28.56	4.80	9.60	0.2	5.54	2.94	2.47	2.00	2.47	0.02	7.99	9.60	14.28	47.23

SUMMARY & RECOMMENDATIONS:

H @ Outlet Control = [1 + Ke + (29*n^2*L)/(Rh^1.33)] * ((Q/A)^2/(2*g))

Design by: Sam Aref

Checked by:

Approved by: _____

ARCADIS
GERAGHTY & MILLER

SUBJECT: SR 200; Proposed CD272+89.90

JOB NO: TF001173.0000

BY: Sam Aref
DATE: Dec. 12, 2000
CHKD: [illegible]
DATE: 3/23/01

I. CROSS DRAIN CHARACTERISTICS

Pipe Proposed @ Station	272+89.90	
Pipe Size =	30	in
Number of Barrels =	1	
Pipe Length =	200.00	ft
Pipe X-Sectional Area =	4.91	sf
Pipe Hydraulic Radius =	0.63	ft
Pipe Type	Reinforced concrete	
Manning's roughness =	0.012	
Flow Direction	equalizer	
Upstream Invert =	37.65	ft
Downstream Invert =	37.58	ft
Entrance Coefficient =	0.5	
Critical Elevation =	44.88	ft

II. DETERMINE FLOWRATES (Q)

Q(50 yr) =	29.00	cfs
Q(100 yr) =	33.60	cfs
Q(500 yr) =	57.12	cfs

III. DETERMINE TAILWATER

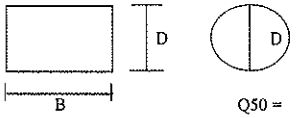
Use a tailwater equal to the existing crown of culvert

TW = 39.61 ft

PROJECT: SR 200; Proposed CD 272+89.90
Worksheet for Culvert Capacity Calculations

DESIGNER: Sam Aref
DATE: Dec. 12, 2000

HYDROLOGIC AND CHANNEL INFORMATION



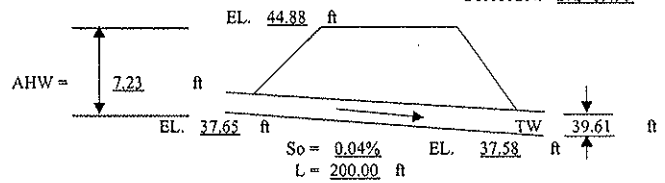
D = Diameter or Height
B = Span

Q50 = 29.0 cfs TW = 39.61 ft
Q100 = 33.6 cfs TW = 39.61 ft
Q500 = 57.1 cfs TW = 39.61 ft

(Q50 = DESIGN DISCHARGE)
(Q100 = CHECK DISCHARGE)

SKETCH

STATION: 272+89.90



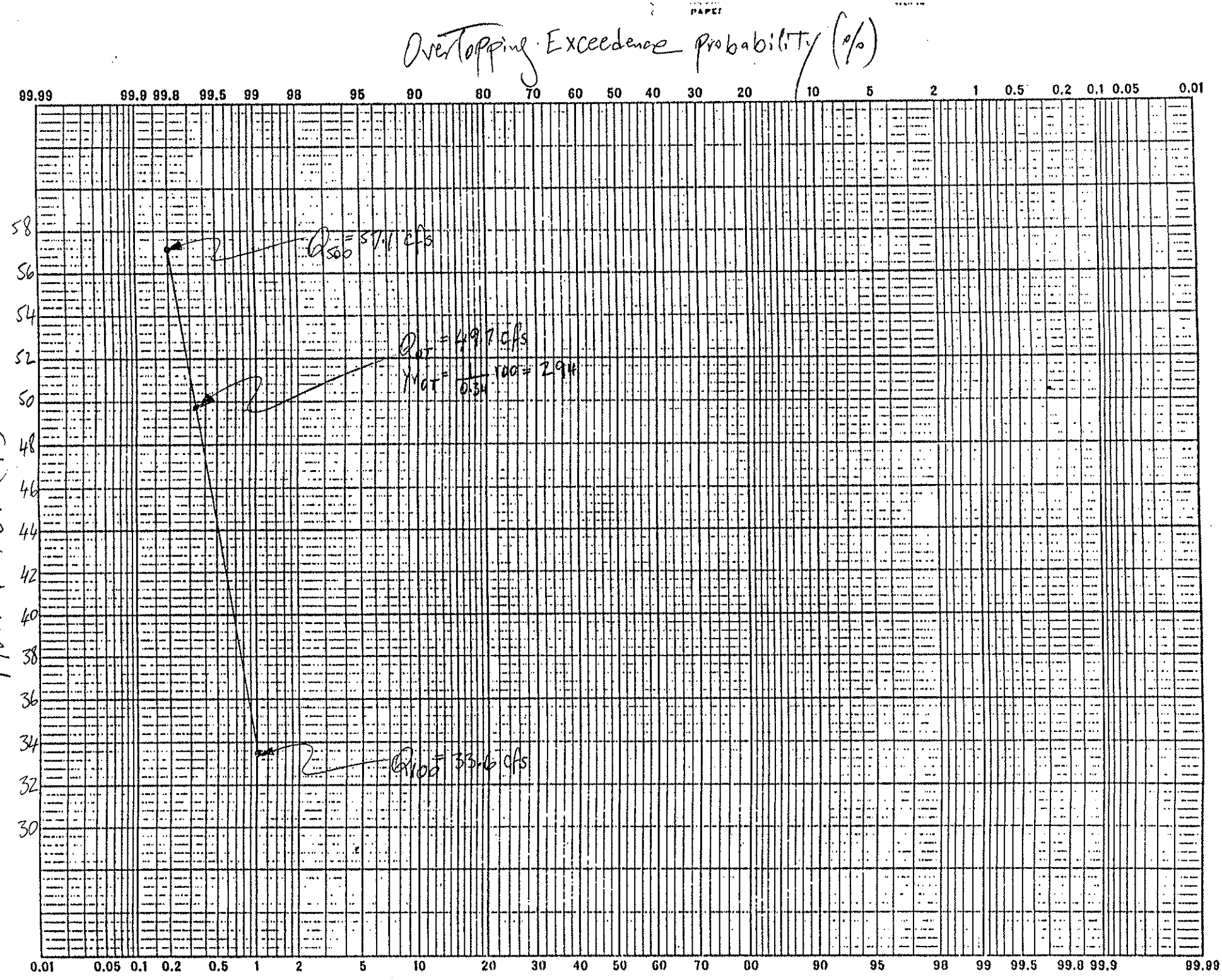
LSo = 0.07

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE		HEADWATER COMPUTATIONS											CONTR-OLLING HW	OUTLET VELOCITY	PROPOSED PEAK STAGE	EXISTING PEAK STAGE	DIFF. IN STAGE
				INLET CONTROL			OUTLET CONTROL HW = H + DTW - LSo												
		D	B	Q/B	HW/D	HW	Ke	H	dc	(dc+D)/2	TW	DTW	LSo	HW					
	29.0	2.5	N/A	N/A	1.15	2.88	0.5	1.66	1.83	2.17	2.03	2.17	0.07	3.75	3.75	5.91	41.40	41.23	0.17
	33.6	2.5	N/A	N/A	1.30	3.25	0.5	2.23	2.00	2.25	2.03	2.25	0.07	4.41	4.41	6.84	42.06	41.96	0.10
	57.1	2.5	N/A	N/A	2.40	6.00	0.5	6.43	2.48	2.49	2.03	2.49	0.07	8.85	8.85	11.64	46.50	47.23	-0.73
	49.7	2.5	N/A	N/A	2.00	5.00	0.5	4.87	2.36	2.43	2.03	2.43	0.07	7.23	7.23	10.12	44.88			*

SUMMARY & RECOMMENDATIONS:
*Year of overtopping elevation = 294

H @ Outlet Control = [1 + Ke + (29*n^2*L)/(Rh^1.33)] * ((Q/A)^2/(2*g))

Design by: Sam Aref Checked by: Approved by:


Overtopping Exceedence Probability (%)
99.99 99.9 99.8 99.5 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01
58 56 54 52 50 48 46 44 42 40 38 36 34 32 30
Flow rate, Q (cfs)
Q_{500} = 57.1 cfs
Q_{100} = 49.7 cfs
Y_{100} = 0.34
100 = 2.94
Q_{10} = 33.6 cfs
0.01 0.05 0.1 0.2 0.5 1 2 5 10 20 30 40 50 60 70 80 90 95 98 99 99.5 99.8 99.9 99.99

ARCADIS
GERAGHTY & MILLER

SUBJECT: SR 200; Existing CD 316+22.10

JOB NO: TF001173.0000

BY: Sam Aref
DATE: Dec. 12, 2000
CHKD:
DATE:

I. CROSS DRAIN CHARACTERISTICS

Box Located @ Station	316+22.10				
Box Size =	2		X	2	ft
Number of Barrels =	1				
Box Length =	66.09	ft			
Box X-Sectional Area =	4.00	sf			
Box Wetted Parameters =	8.00	ft			
Box Hydraulic Radius =	0.50	ft			
Manning's roughness =	0.012				
Flow Direction	equalizer				
Upstream Invert =	36.95	ft			
Downstream Invert =	36.95	ft			
Entrance Coefficient =	0.2				
Critical Elevation =	44.41	ft			

II. DETERMINE FLOWRATES (Q), Q = A x V

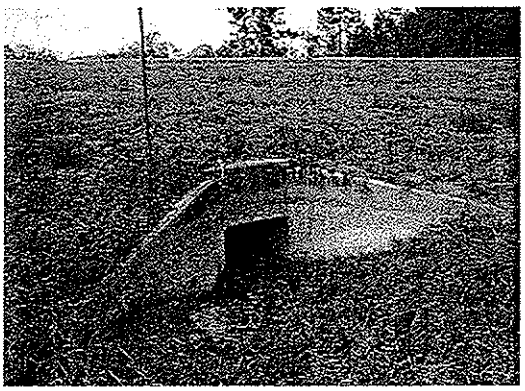
Assume	V(25 yr) =	6.00	ft/sec	
	Q(25 yr) =	24.00	cfs	
	Q(50 yr) =	29.00	cfs	see exceedence probability plot
	Q(100 yr) =	33.60	cfs	based on 1.4 x Q(25 yr)
	Q(500 yr) =	57.12	cfs	based on 1.7 x Q(100 yr)

III. DETERMINE TAILWATER

Use a tailwater equal to the crown of culvert
D/S invert + culvert height = 38.95 ft

IV. PHYSICAL APPEARANCE/CONDITION

Equalizer culvert end, east side of SR 200

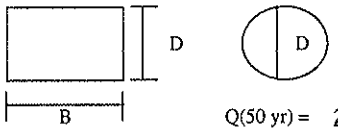


Equalizer culvert end, west side of SR 200

PROJECT: SR 200; Existing CD 316+22.10
Worksheet for Culvert Capacity Calculations

DESIGNER: Sam Aref
DATE: Dec. 12, 2000

HYDROLOGIC AND CHANNEL INFORMATION



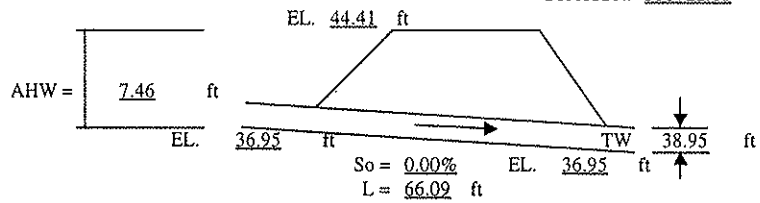
D = Diameter or Height
B = Span

Q(50 yr) = 29.0 cfs TW = 38.95 ft
Q(100 yr) = 33.6 cfs TW = 38.95 ft
Q(500 yr) = 57.1 cfs TW = 38.95 ft

(Q50 = DESIGN DISCHARGE)
(Q100 = CHECK DISCHARGE)

SKETCH

STATION: 316+22.10



LSo = 0.00

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE		HEADWATER COMPUTATIONS											CONTR-OLLING HW	OUTLET VELOCITY	PEAK STAGE
				INLET CONTROL			OUTLET CONTROL HW = H + DTW - LSo										
		D	B	Q/B	HW/D	HW	Ke	H	dc	(dc+D)/2	TW	DTW	LSo	HW			
	29.0	2.0	2.0	14.50	1.80	3.60	0.2	1.55	1.87	1.94	2.00	2.00	0.00	3.55	3.60	7.25	40.55
	33.6	2.0	2.0	16.80	2.17	4.33	0.2	2.08	2.07	2.03	2.00	2.03	0.00	4.11	4.33	8.40	41.28
	57.1	2.0	2.0	28.56	4.80	9.60	0.2	6.00	2.94	2.47	2.00	2.47	0.00	8.47	9.60	14.28	46.55

SUMMARY & RECOMMENDATIONS:

H @ Outlet Control = [1 + Ke + (29*n^2*L)/(Rh^1.33)] * ((Q/A)^2/(2*g))

Design by: Sam Aref

Checked by:

Approved by: _____

ARCADIS
GERAGHTY & MILLER

SUBJECT: SR 200; Proposed CD316+22.10

JOB NO: TF001173.0000

BY: Sam Aref
DATE: Dec. 12, 2000
CHKD:
DATE: 3/23/01

I. CROSS DRAIN CHARACTERISTICS

Pipe Proposed @ Station	316+22.10	
Pipe Size =	48	in
Number of Barrels =	1	
Pipe Length =	200.00	ft
Pipe X-Sectional Area =	12.57	sf
Pipe Hydraulic Radius =	1.00	ft
Pipe Type	Reinforced concrete	
Manning's roughness =	0.012	
Flow Direction	equalizer	
Upstream Invert =	36.95	ft
Downstream Invert =	36.95	ft
Entrance Coefficient =	0.5	
Critical Elevation =	44.41	ft

II. DETERMINE FLOWRATES (Q)

Q(50 yr) =	29.00	cfs
Q(100 yr) =	33.60	cfs
Q(500 yr) =	57.12	cfs

III. DETERMINE TAILWATER

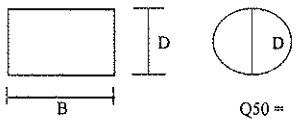
Use a tailwater equal to the existing crown of culvert

TW = 38.95 ft

PROJECT: SR 200; Proposed CD 316+22.10
Worksheet for Culvert Capacity Calculations

DESIGNER: Sam Aref
DATE: Dec. 12, 2000

HYDROLOGIC AND CHANNEL INFORMATION



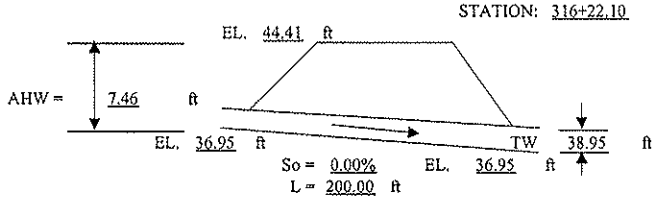
D = Diameter or Height
B = Span

Q50 = 29.0 cfs TW = 38.95 ft
Q100 = 33.6 cfs TW = 38.95 ft
Q500 = 57.1 cfs TW = 38.95 ft

(Q50 = DESIGN DISCHARGE)
(Q100 = CHECK DISCHARGE)

SKETCH

STATION: 316+22.10



LSo = 0.00

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE		HEADWATER COMPUTATIONS											CONTR-OLLING HW	OUTLET VELOCITY	PROPOSED PEAK STAGE	EXISTING PEAK STAGE	DIFF. IN STAGE
				INLET CONTROL			OUTLET CONTROL HW = H + DTW - LSo												
		D	B	Q/B	HW/D	HW	Ke	H	dc	(dc+D)/2	TW	DTW	LSo	HW					
	29.0	4.0	N/A	N/A	0.55	2.20	0.5	0.19	1.55	2.78	2.00	2.78	0.00	2.97	2.97	2.31	39.92	40.55	-0.63
	33.6	4.0	N/A	N/A	0.60	2.40	0.5	0.26	1.70	2.85	2.00	2.85	0.00	3.11	3.11	2.67	40.06	41.28	-1.22
	57.1	4.0	N/A	N/A	0.83	3.32	0.5	0.75	2.35	3.18	2.00	3.18	0.00	3.92	3.92	4.55	40.87	46.55	-5.68

SUMMARY & RECOMMENDATIONS:

H @ Outlet Control = [1 + Ke + (29*n^2*L)/(Rh^1.33)] * ((Q/A)^2/(2*g))

Design by: Sam Aref Checked by: Approved by:

APPENDIX G

TABLES & NOMOGRAPHS

DESIGN AIDS

Table 8-2
CULVERT ENTRANCE LOSS COEFFICIENTS
OUTLET CONTROL, FULL OR PARTIALLY FULL

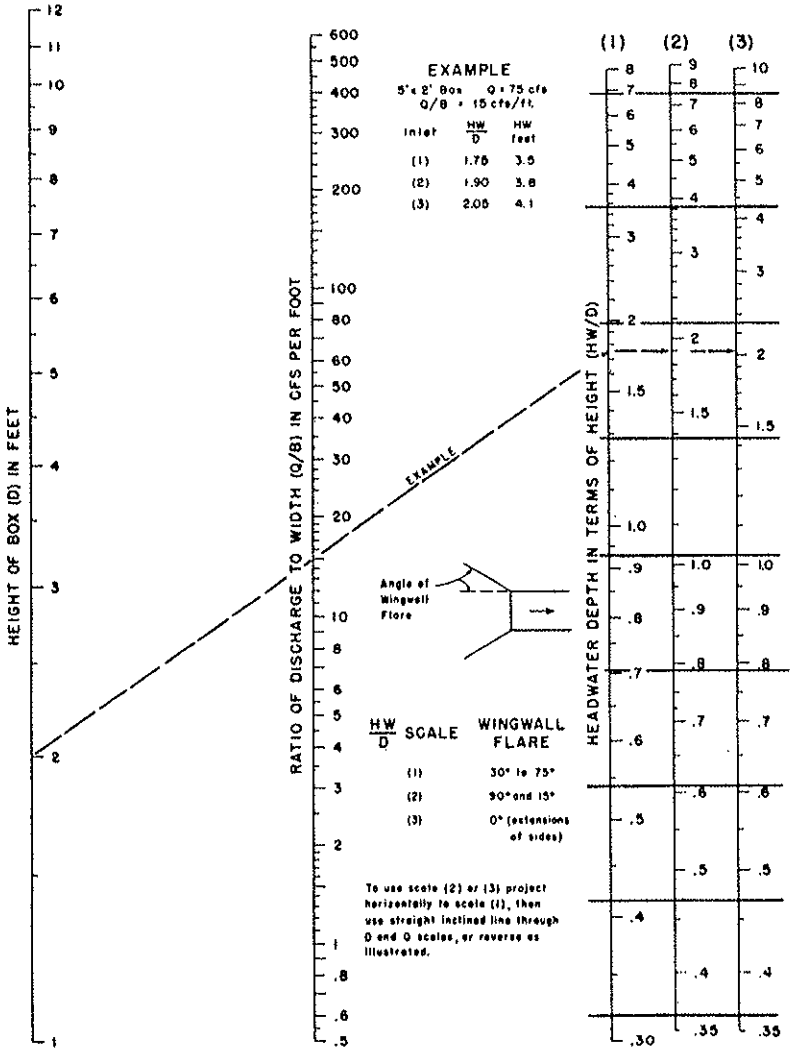
Type of Structure and Design of Entrance	Coefficient k_e
Pipe, Concrete	
Projecting from fill, socket end (groove-end)	0.2
Projecting from fill, square cut end	0.5
Straight headwall	
Socket end of pipe (groove-end)	0.2
Square-edge	0.5
Rounded (radius = 1/12D) (Indexes 250, 251, 252, 253, 255)	0.2
Mitered to conform to fill slope (Indexes 272, 273, 274)	0.7
End section conforming to fill slope[a]	0.5
Beveled edges, 33.7° or 45° bevels	0.2
Side- or slope-tapered inlet	0.2
Straight sand-cement (Index 258)	0.3
U-type with grate (Index 260)	0.7
U-type (Index 261)	0.5
Winged concrete (Index 266)	0.3
U-type sand-cement (Index 268)	0.5
Flared end concrete (Index 270)	0.5
Side drain, mitered with grate (Index 273)	1.0
Pipe or Pipe-Arch, Corrugated Metal	
Straight endwall--rounded (Radius=1/12 D) (Index 250)	0.2
Projecting from fill (no headwall)	0.9
Headwall or headwall and wingwalls, square-edge	0.5
Mitered to conform to fill slope (Indexes 272, 273, 274)	0.7
End section conforming to fill slope, paved or unpaved[a]	0.5
Beveled edges, 33.7° or 45° bevels	0.2
Side- or slope-tapered inlet	0.2
Box, Reinforced Concrete	
Headwall parallel to embankment (no wingwalls)	
Square-edged on three edges	0.5
Rounded on three edges to radius of 1/12 barrel dimension, or beveled edges on three sides (Index 290)	0.2
Wingwalls at 30° to 75° to barrel	
Square-edged at crown	0.4
Crown edge rounded to radius of 1/12 barrel dimension, or beveled top edge	0.2
Wingwalls at 10° to 25° to barrel, square-edged at crown	0.5
Wingwalls parallel (extension of sides)	
Square edged at crown	0.7
Side- or slope-tapered inlet	0.2

[a]End sections conforming to fill slope, made of either metal or concrete, are the sections commonly available from manufacturers. From limited hydraulic tests, they are equivalent in operation to a headwall in both inlet and outlet control. Some end sections incorporating a closed taper in their design have a superior hydraulic performance. These later sections can be designed using Figure 8-10 for circular pipe culverts.

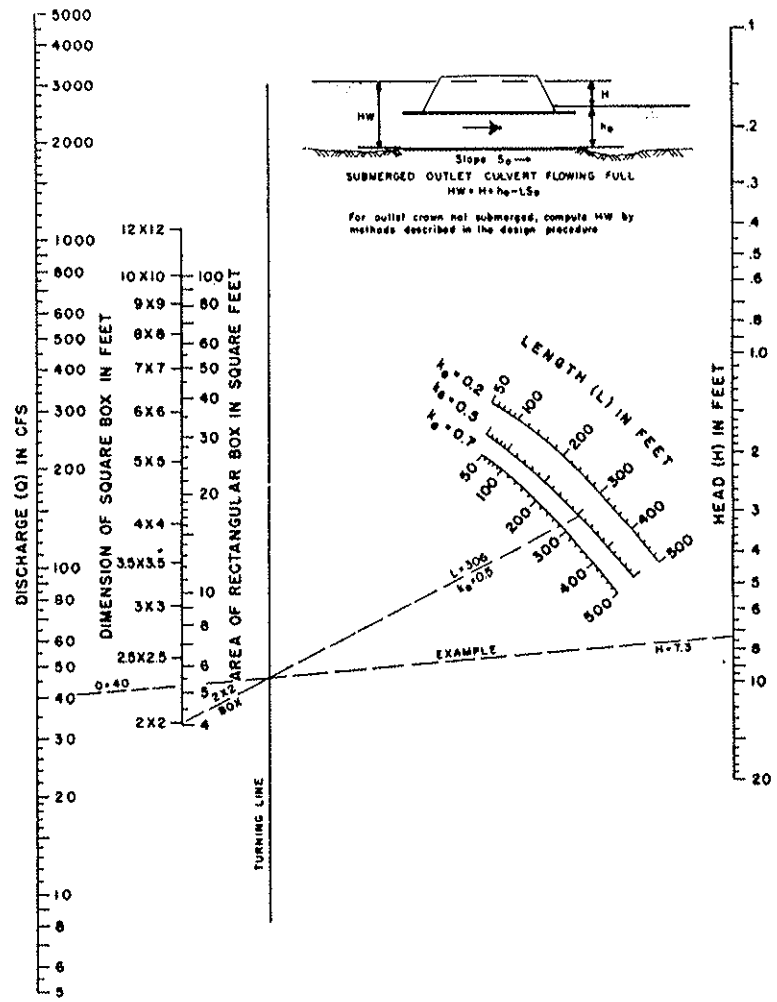
Note: Entrance head loss, $H_e = K_e \frac{v^2}{2g}$

Reference : USDOT, FHWA, HEC-5 (1965).

A) INLET CHART



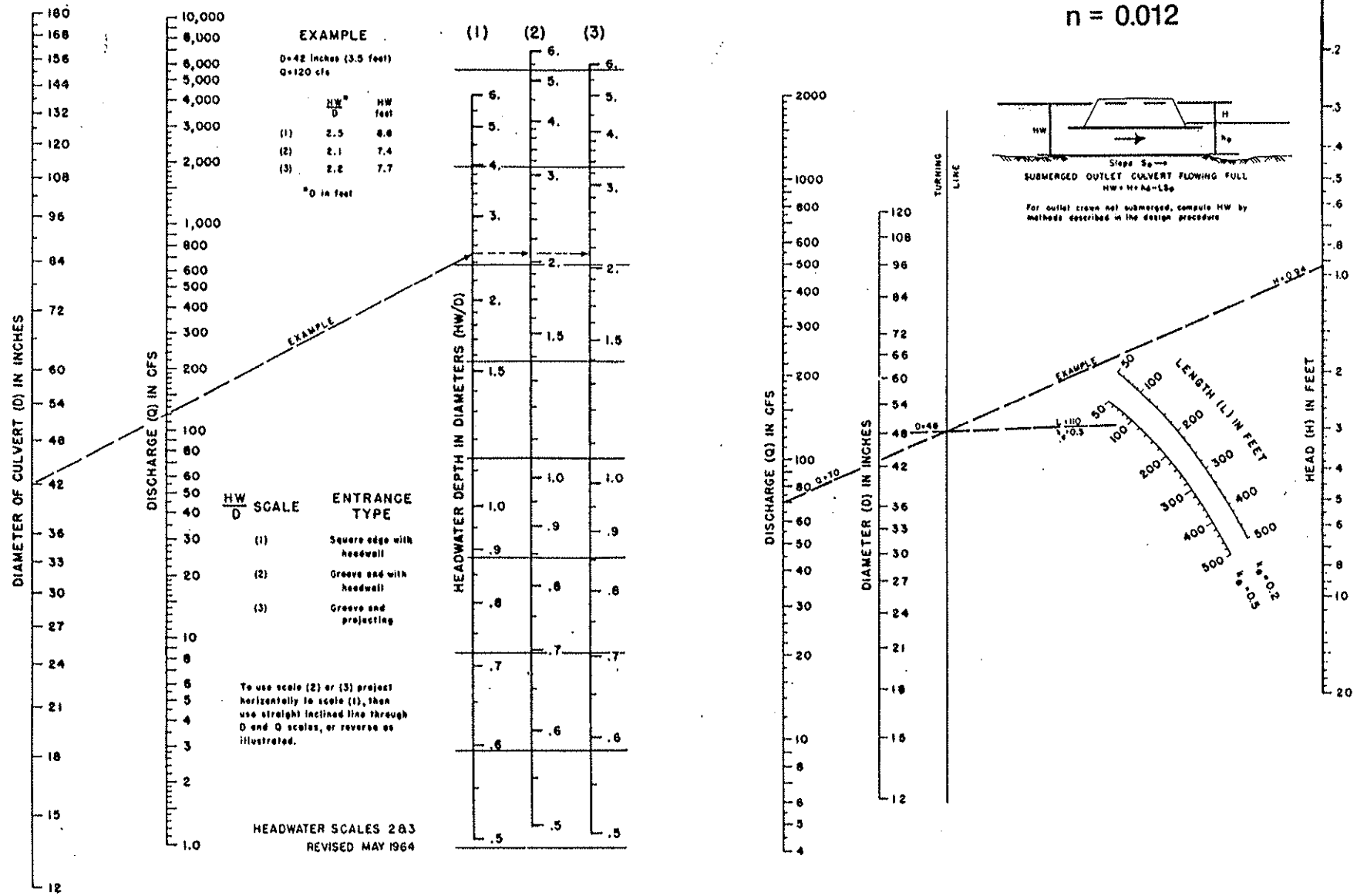
B) OUTLET CHART--Flowing Full, n = 0.012



Reference: USDOT, FHWA, HEC-5 (1965).

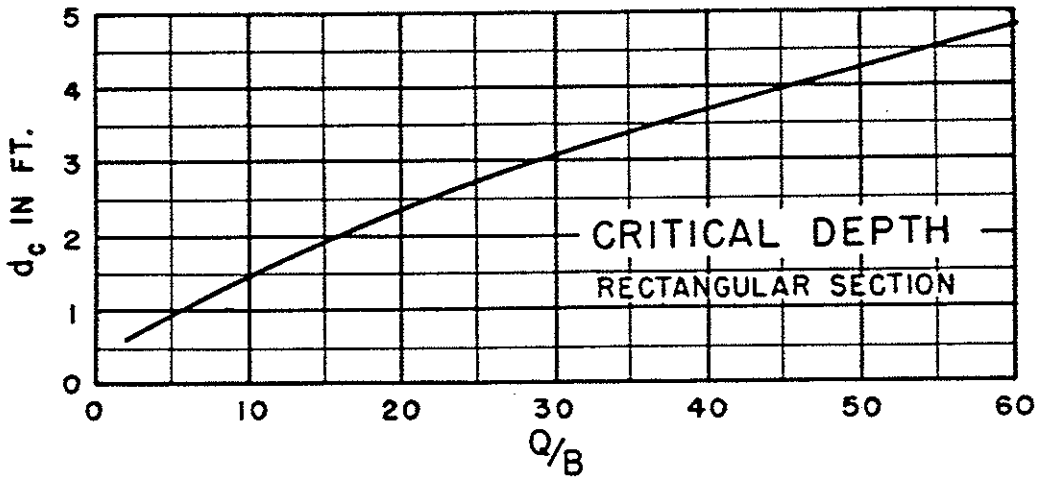
Standard Format: Span x Rise

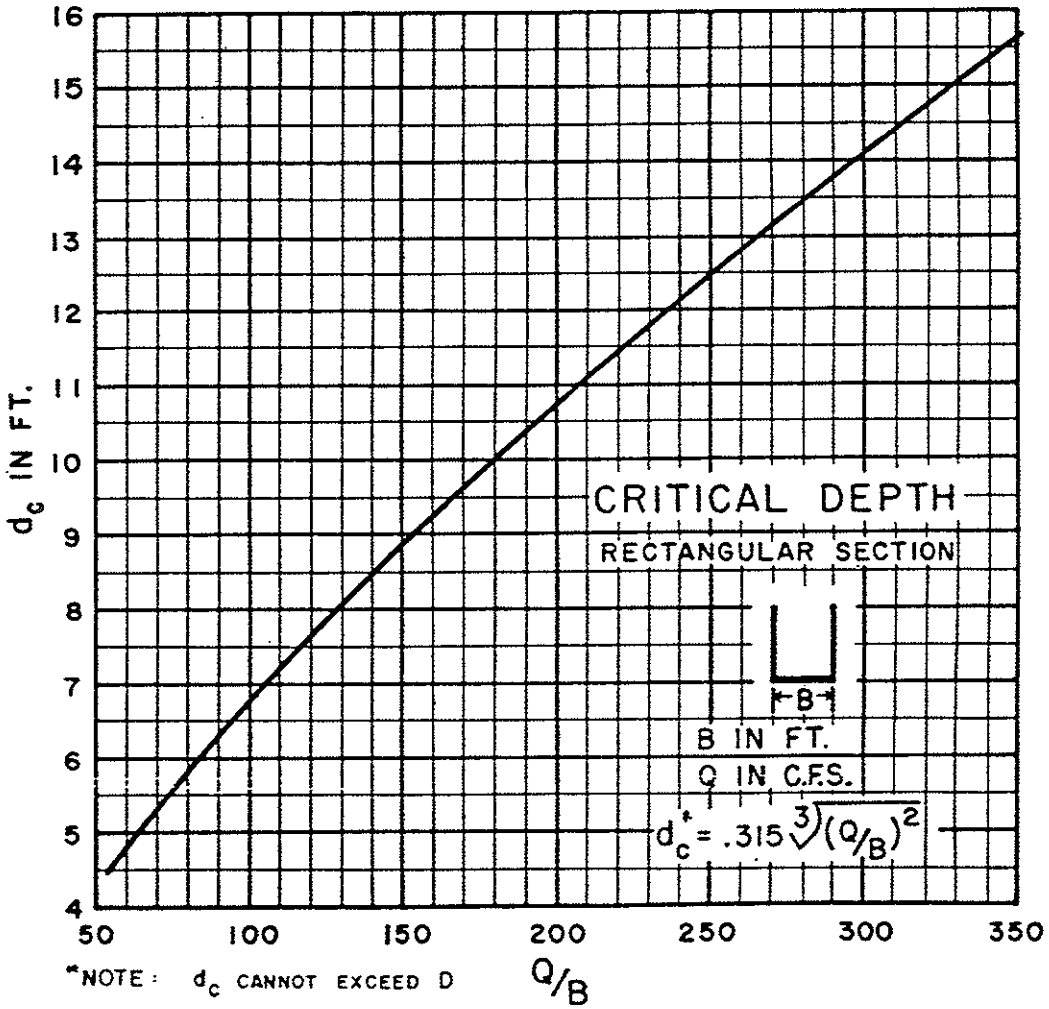
FIGURE 8-3
Inlet and Outlet Nomographs for Concrete Box Culverts



Reference: USDOT, FHWA, HEC-5 (1965).

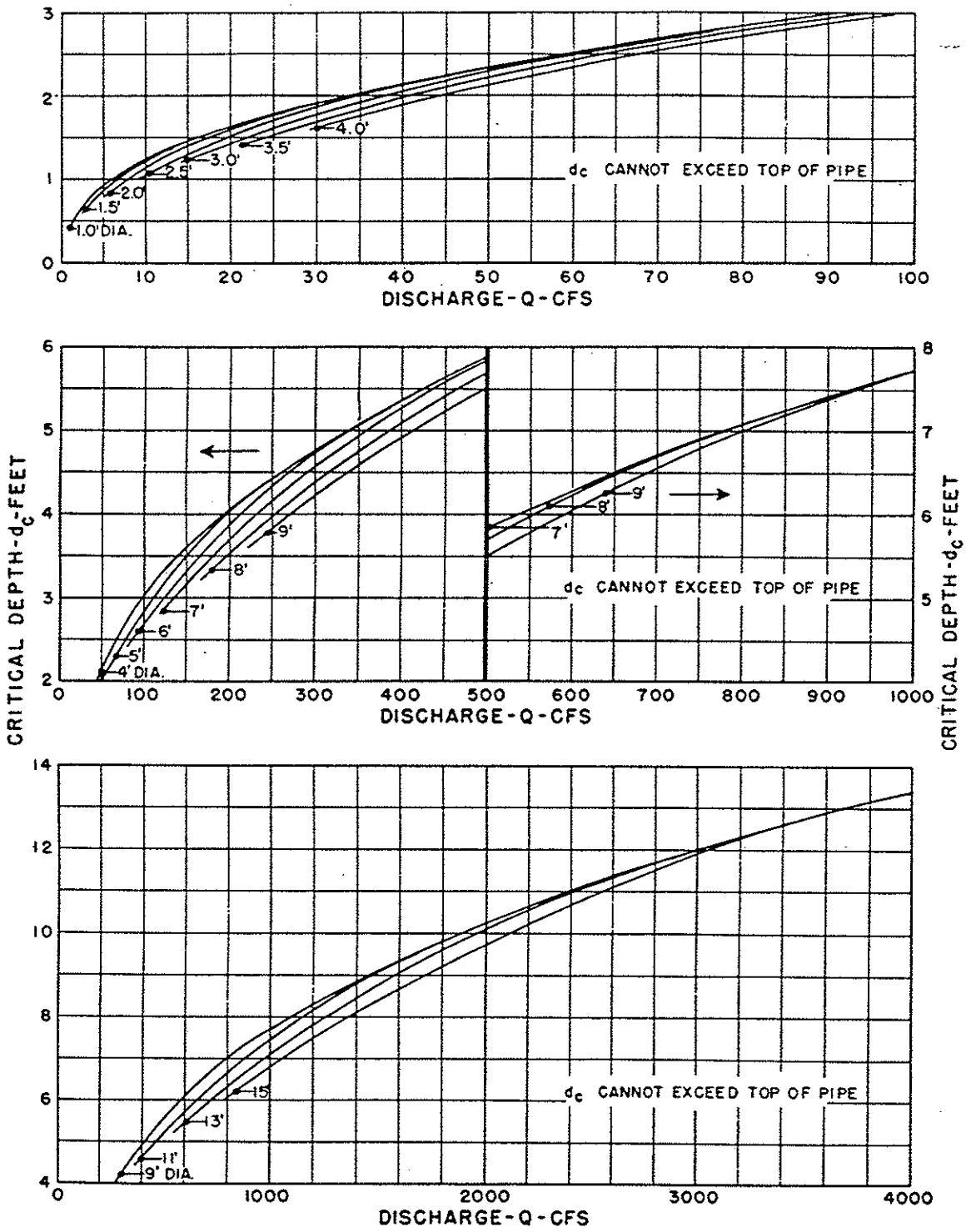
FIGURE 8-4
Inlet and Outlet Nomographs for Circular Concrete Pipe Culverts





Reference: USDOT, FHWA, HEC-5 (1965).

FIGURE 8-11
CRITICAL DEPTH CHART 1
Rectangular Section



Reference: USDOT, FHWA, HEC-5 (1965).

FIGURE 8-12
CRITICAL DEPTH CHART 2
Circular Pipe