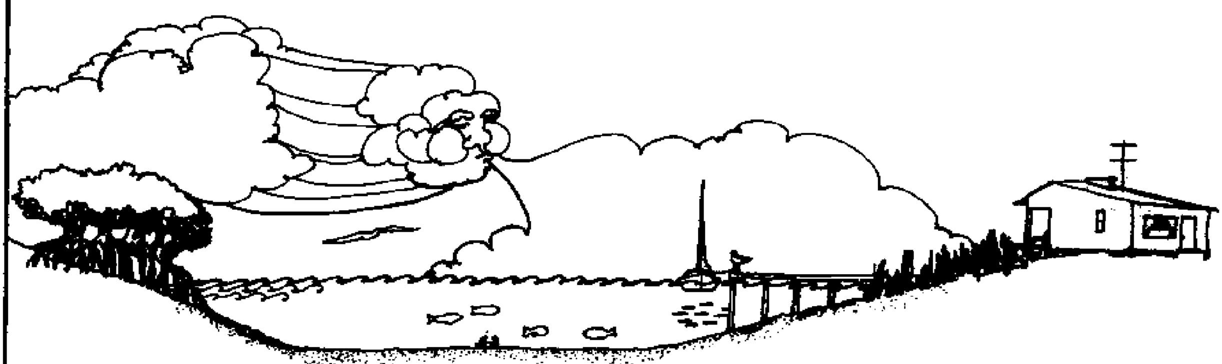
# Hydrodynamic Factors Involved in Finger Canal and Borrow Lake Flushing In Florida's Coastal Zone



Volume II of II



Final Report to
Sea Grant College Program
State University System of Florida

Project No. R/OE-4



Report HY-7801
HYDRAULIC LABORATORY

Department of Civil Engineering
University of Florida
Gainesville, FL 32611

Revised
August 1978

Volume II of II
Appendices A-K

# HYDRODYNAMIC FACTORS INVOLVED IN FINGER CANAL AND BORROW LAKE FLUSHING IN FLORIDA'S COASTAL ZONE

by

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Sponsored by

State University System of Florida
Sea Grant College Program

Project No. R/OE-4
Grant No. 04-6-158-44

Board of Regents of the State of Florida
University System
Project No. R5-516

Board of Commissioners of Palm Beach County
Resolution No. R-75-931

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# APPENDIX A

## SALINITY, TEMPERATURE, VELOCITY,

## and

## DYE CONCENTRATION MEASUREMENTS

LOXAHATCHEE NORTH CANAL

June 10-16, 1977

A.1

# SALINITY, VELOCITY

# and

# DISPERSION STUDY

# SALINITY, VELOCITY AND DISPERSION STUDY

Loxahatchee North Canal
June 10-16, 1977

Objective:

This study was conducted to obtain simultaneous data on water velocity, salinity and dye concentration which could be used to determine the movement of salinity currents and their effect, with wind and tide, on the dispersion of dye.

Tide Records:

| LOW TIDE | | HIGH TIDE | |
|---|---|---|---|
| Date | Time | Date | Time |
| 770613 | 0230 | 770613 | 0730 |
| | 1430 | | 2100 |
| 770614 | 0315 | 770614 | 0815 |
| | 1530 | | 2130 |
| 770615 | 0400 | 770615 | 1530 |

Current Meters:

Electromagnetic current meters were installed at stations 1+50, 10+50 and 21+00.

Dye Injection: Time: 770613 1123

75 ml of Rhodamine WT 20% solution mixed with 3/4 gallon of canal water was released and mixed across the canal at the surface at station 2+00. Wind was measured at 3.9 mph from East.

Sampling depth:

3 ft

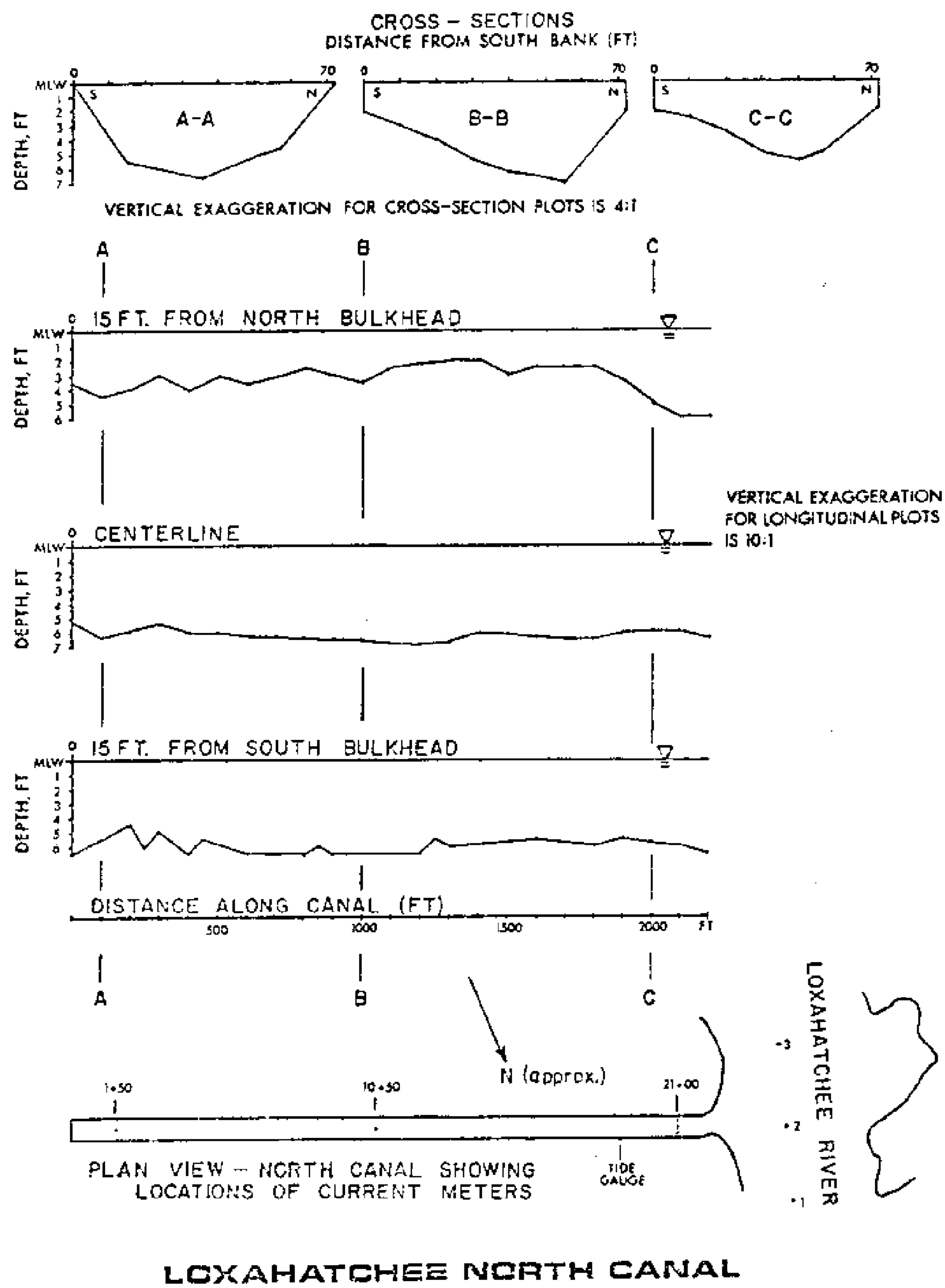


Figure A.1 - Cross-Sections and Plan View of Loxahatchee North Canal, June 1977.

# OBSERVATIONS AT 3-HOUR INTERVALS

NOTES

CEILING
UNL INDICATES UNLIMITED

WEATHER

- T TORNADO
- T THUNDERSTORM
- Q SQUALL
- R RAIN
- RW RAIN SHOWERS
- ZR FREEZING RAIN
- L DRIZZLE
- ZL FREEZING DRIZZLE
- S SNOW
- SP SNOW PELLETS
- IC ICE CRYSTALS
- SW SNOW SHOWERS
- SG SNOW GRAINS
- IP ICE PELLETS
- A HAIL
- F FOG
- IF ICE FOG
- GF GROUND FOG
- BD BLOWING DUST
- BN BLOWING SAND
- BS BLOWING SNOW
- BY BLOWING SPRAY
- K SMOKE
- H HAZE
- D DUST

WIND

DIRECTIONS ARE THOSE FROM WHICH THE WIND BLOWS. INDICATED IN TENS OF DEGREES FROM TRUE NORTH: I.E., 09 FOR EAST, 18 FOR SOUTH, 27 FOR WEST. ENTRY OF 00 IN THE DIRECTION COLUMN INDICATES CALM.

SPEED IS EXPRESSED IN KNOTS; MULTIPLY BY 1.15 TO CONVERT TO MILES PER HOUR.

STATION
WEST PALM BEACH FLA

YEAR & MONTH
77 06

U.S. DEPARTMENT OF COMMERCE
NATIONAL CLIMATIC CENTER
FEDERAL BUILDING
ASHEVILLE, N.C. 28801

AN EQUAL OPPORTUNITY EMPLOYER

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COM-210

Figure A.2 - Climatological three-hourly Observations for June, 1977.

A.2

# Vertical Profiles

# of

# Salinity, Longitudinal Velocity,

# and

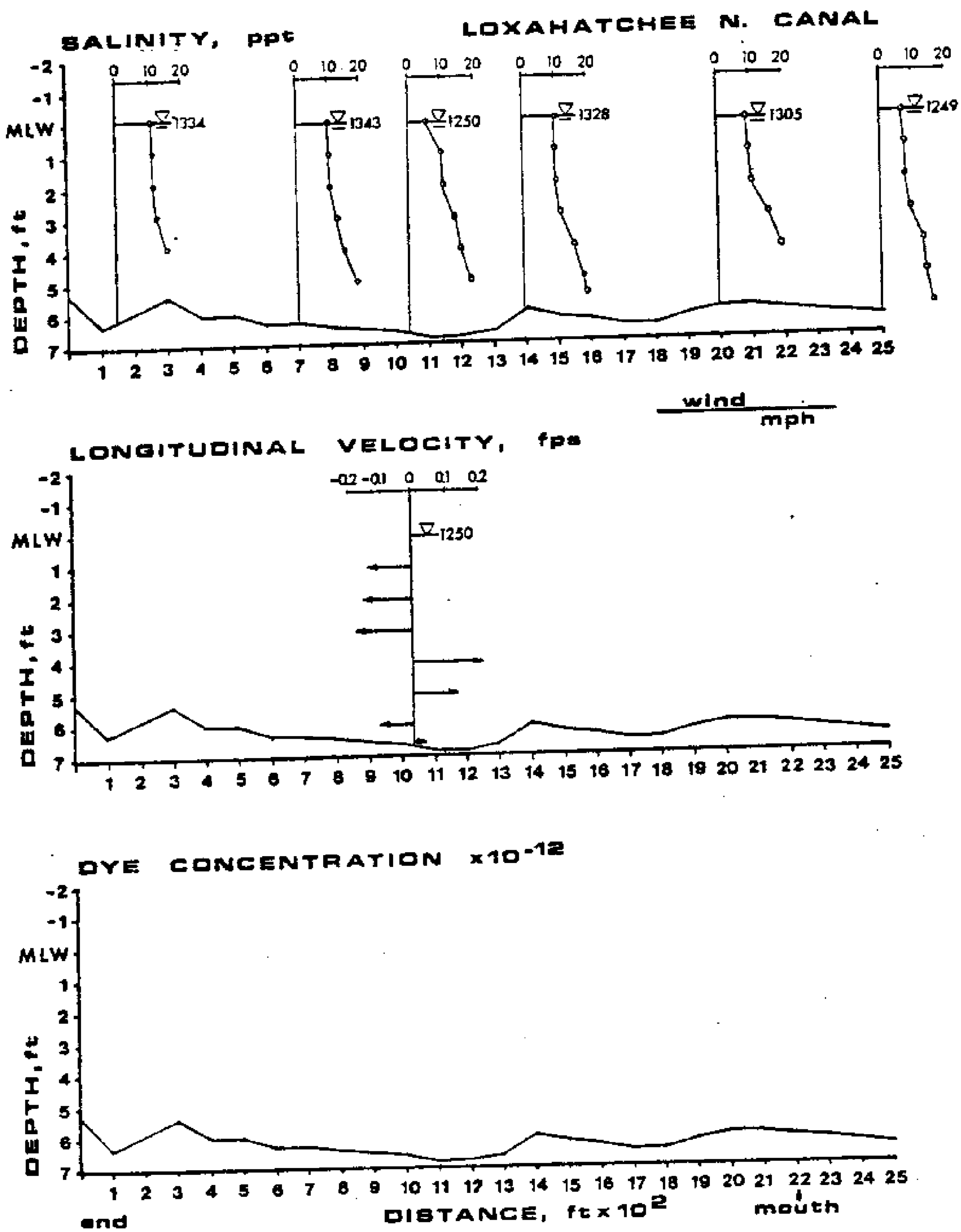
# Dye Concentration

## LOXAHATCHEE NORTH CANAL

## June 13-15, 1977

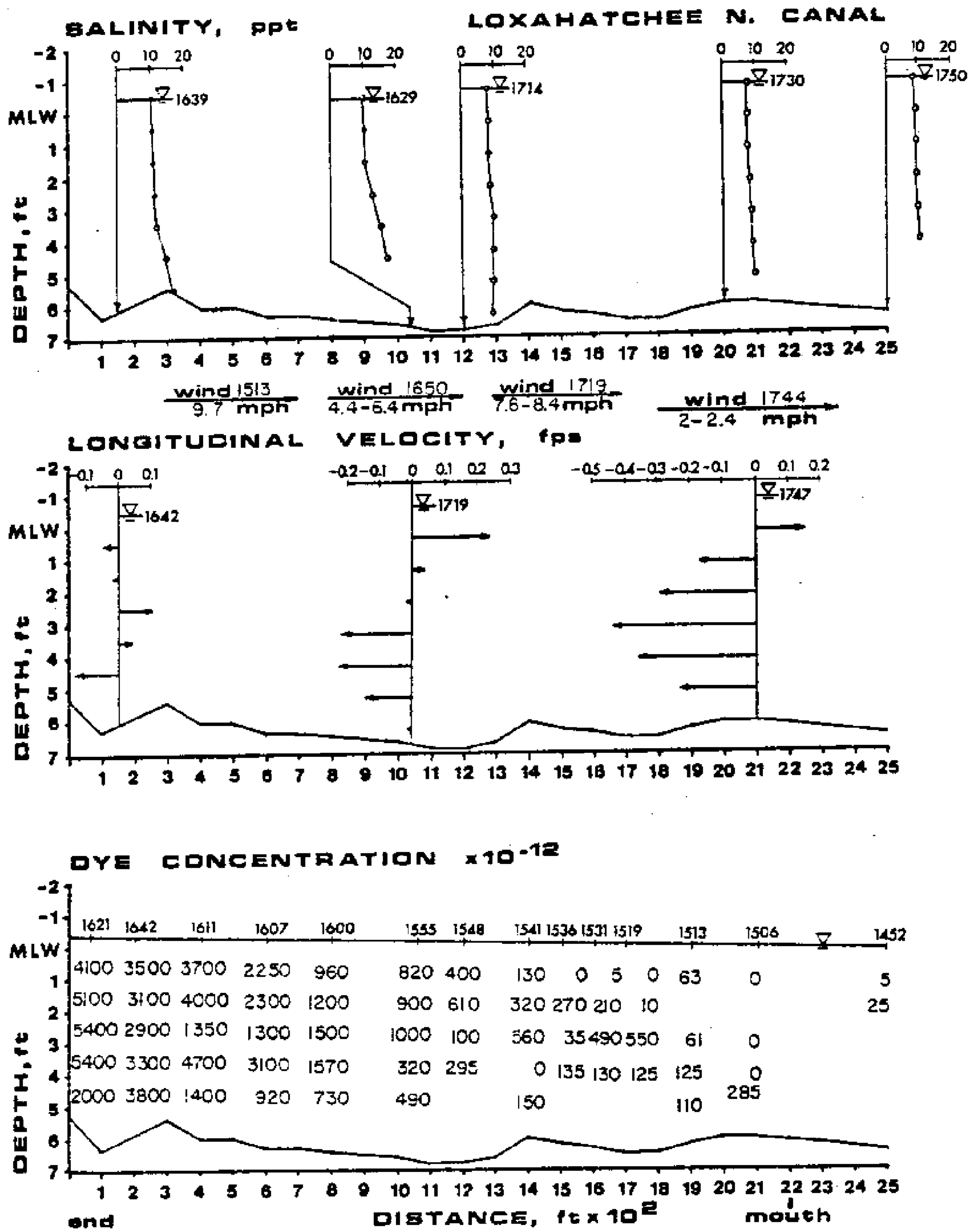
This section contains plotted results as follows:

| DATE | TIME SPAN | TIDE |
|---|---|---|
| 770613 | 1249 - 1334 | ebb |
| 770613 | 1452 - 1750 | flood |
| 770614 | 1043 - 1259 | ebb |
| 770614 | 1424 - 1603 | ebb |
| 770614 | 1536 - 1758 | flood |
| 770614 | 1758 - 1858 | flood |
| 770615 | 1201 - 1447 | ebb |
| 770615 | 1550 - 1700 | flood |



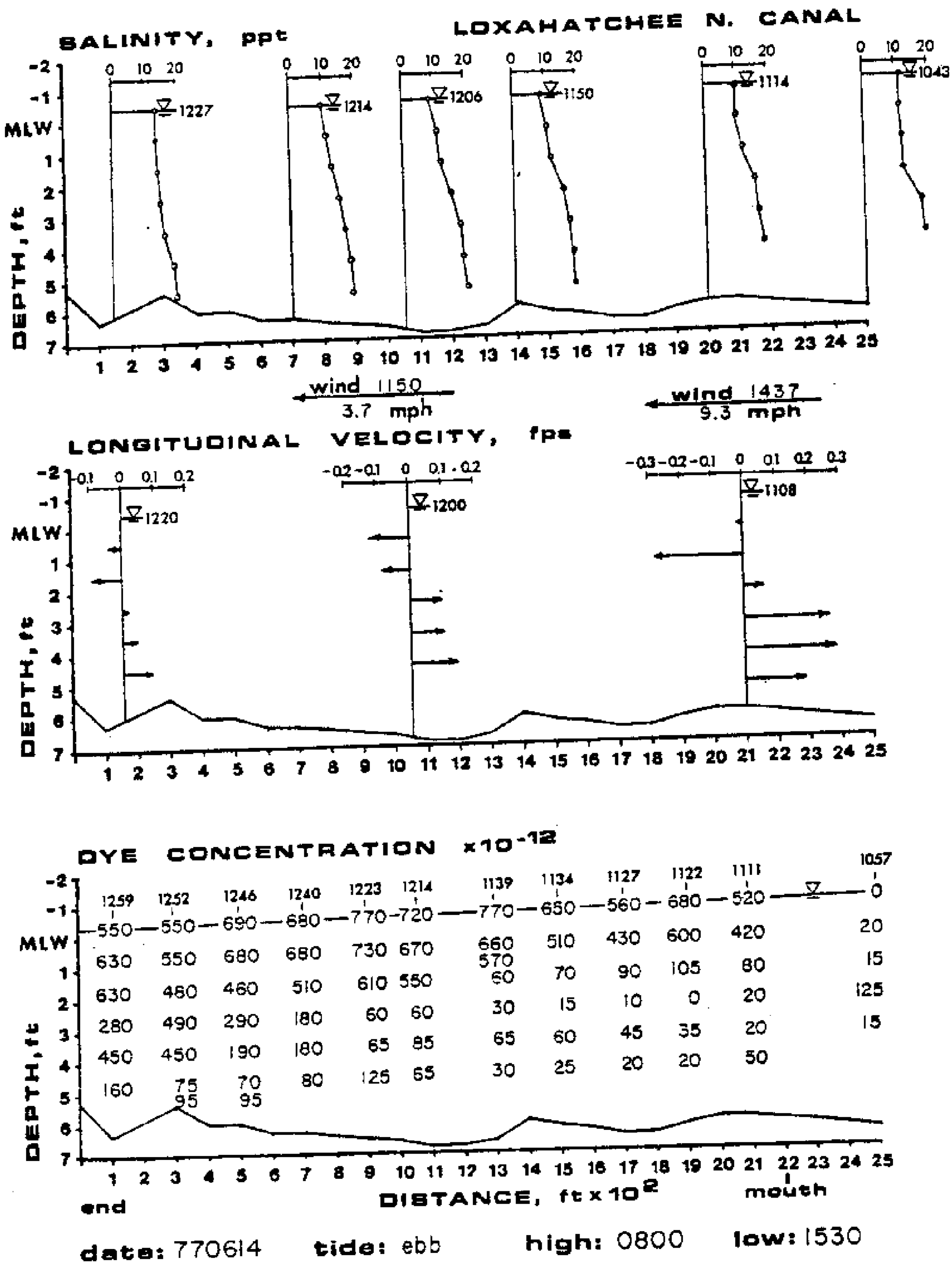

date: 770613 tide: ebb high: 0730 low: 1430

Time Span: 1249 - 1334

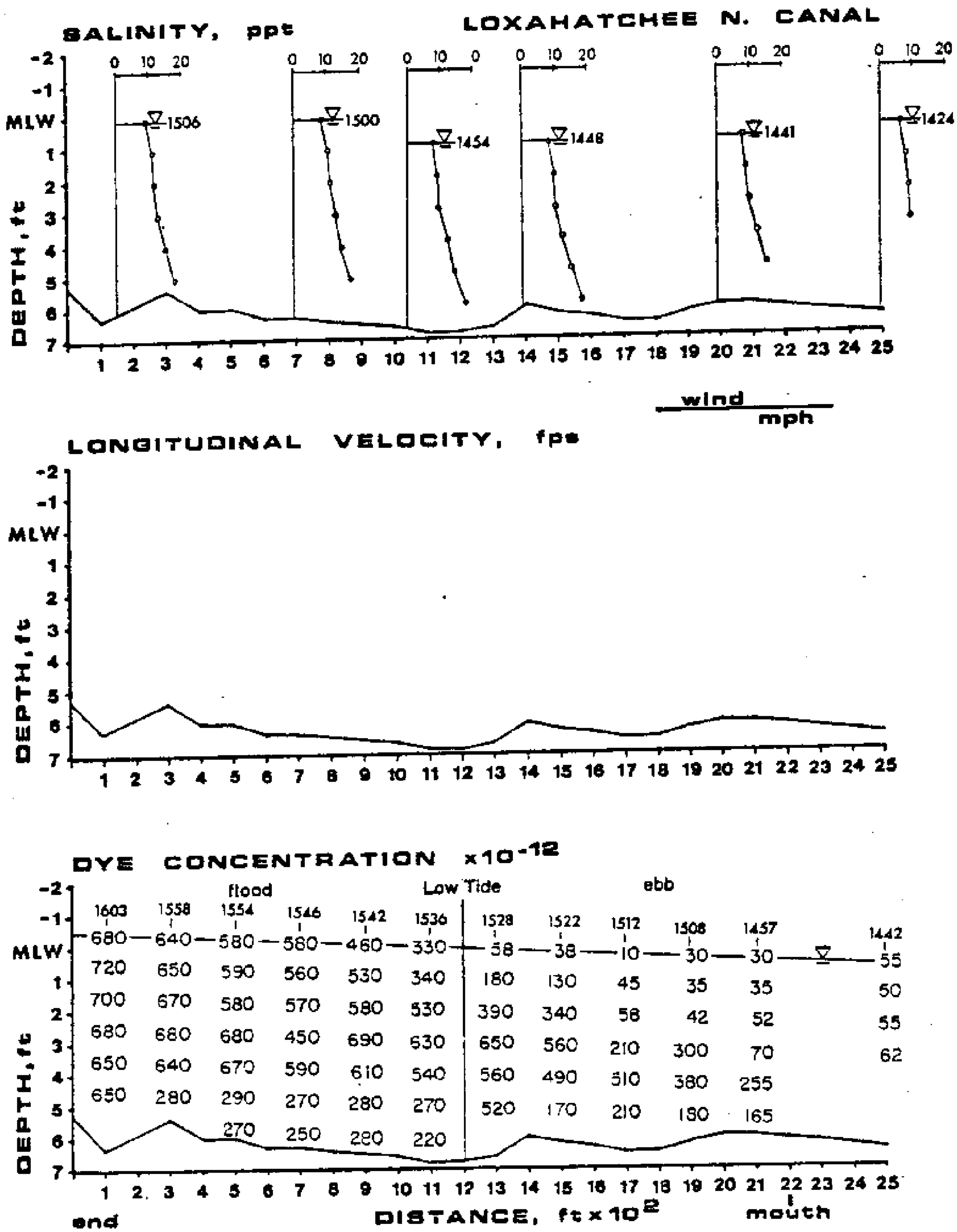



**date:** 770613 **tide:** flood **high:** 2030 **low:** 1430

Time Span: 1452 - 1750

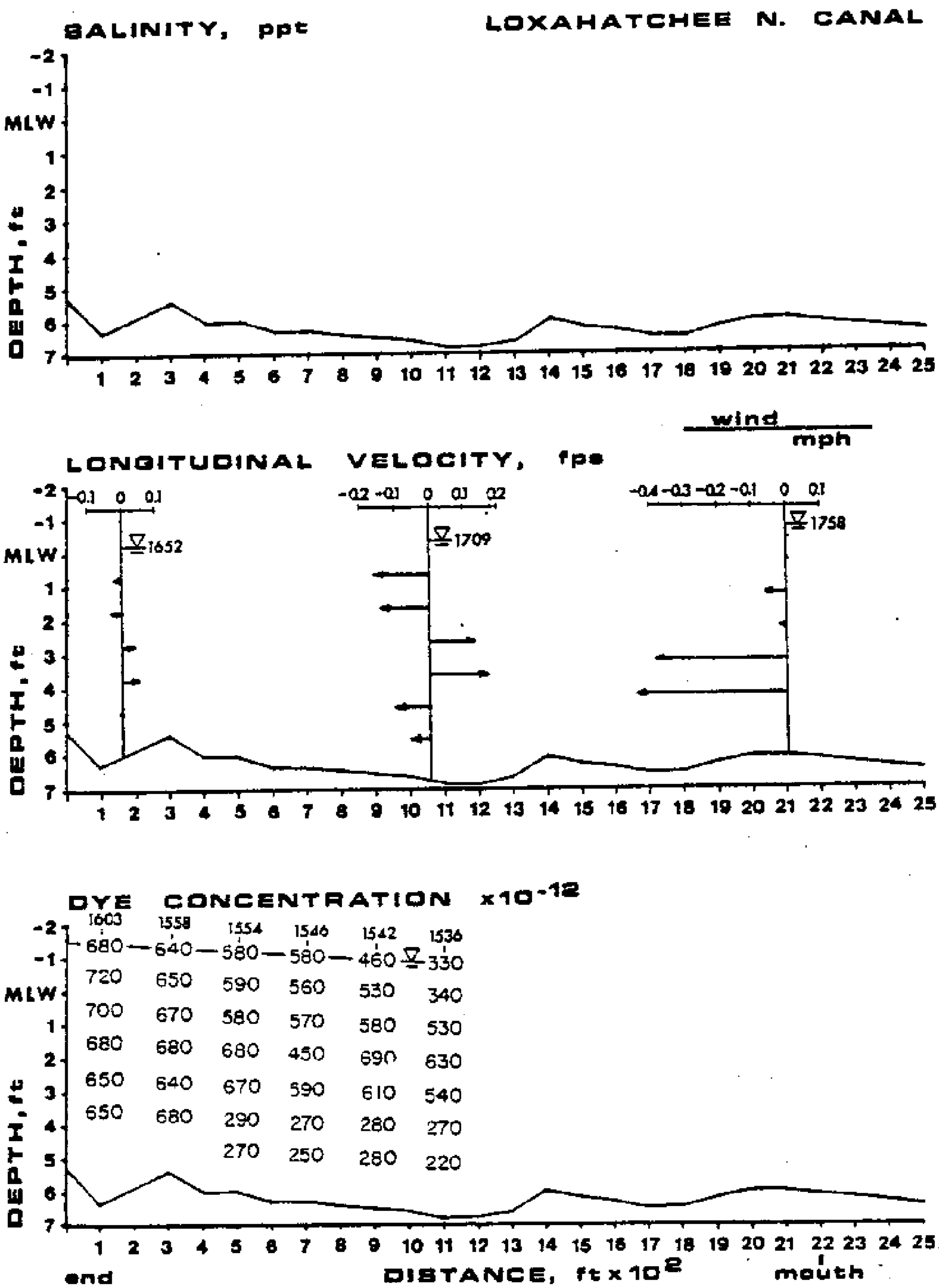



Time Span: 1043 - 1259



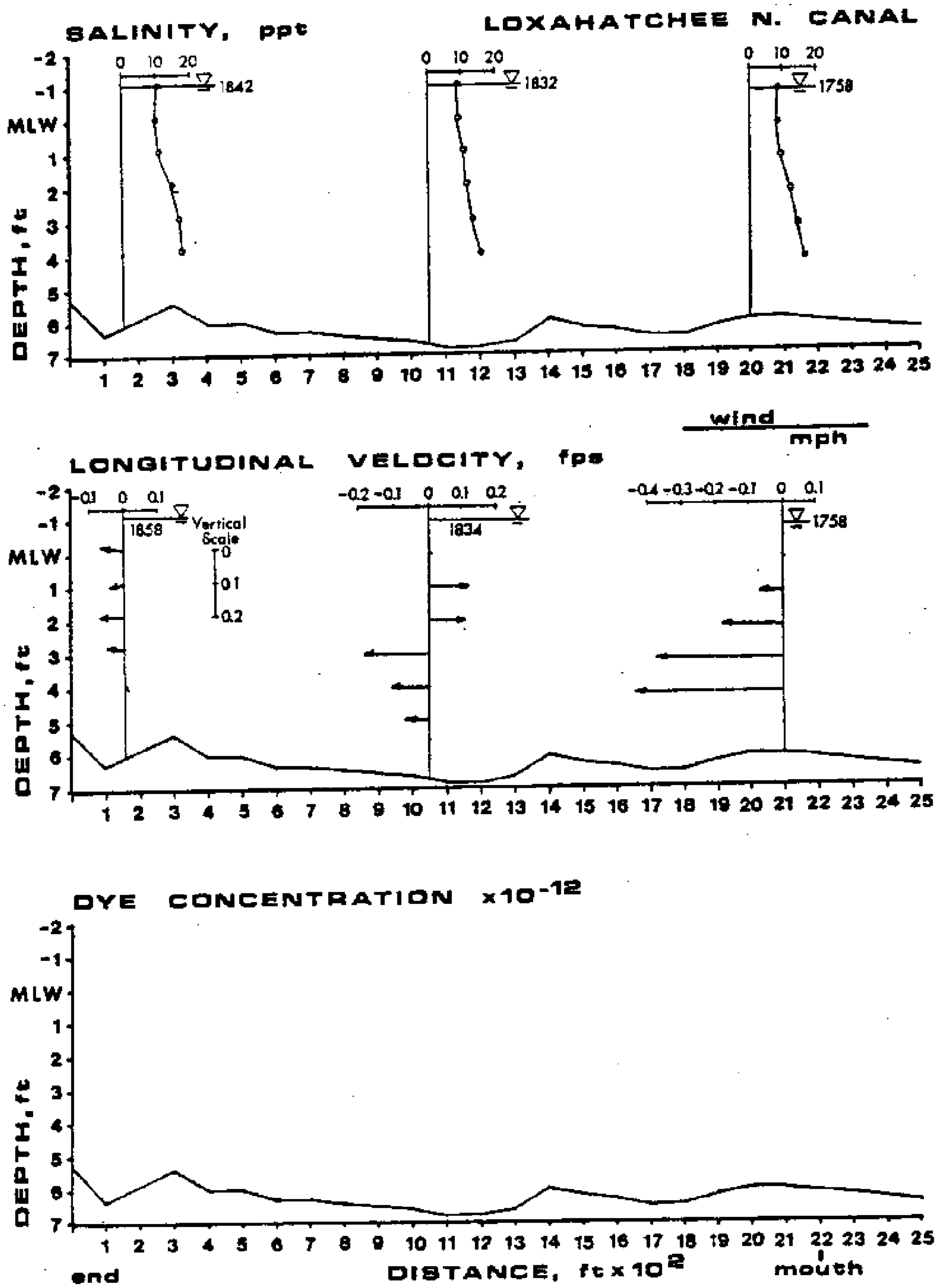

date: 770614 tide: ebb high: 0800 low: 1530

Time Span: 1424 - 1603



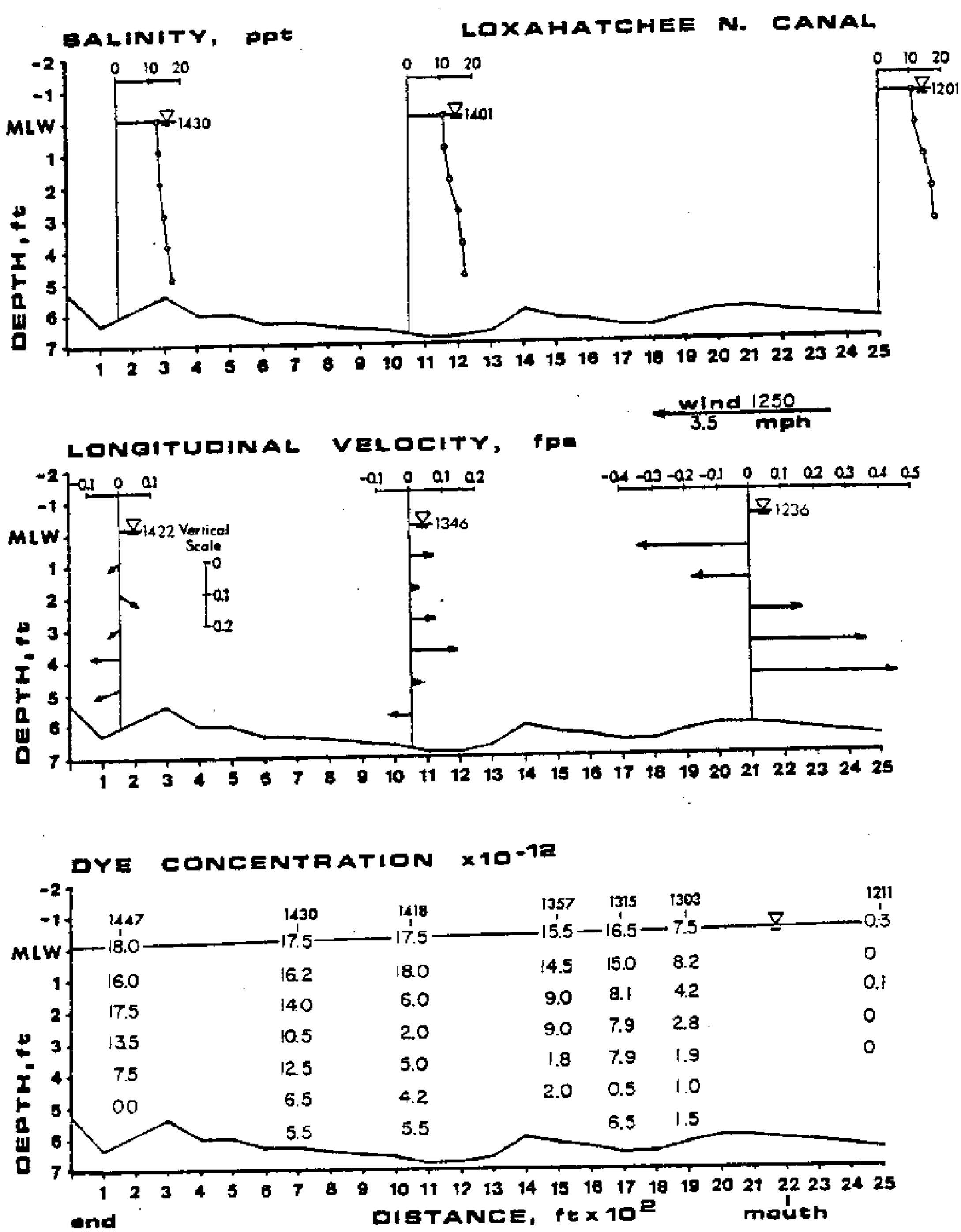

**date:** 770614 **tide:** flood **high:** 2100 **low:** 1530

Time Span: 1536 - 1758



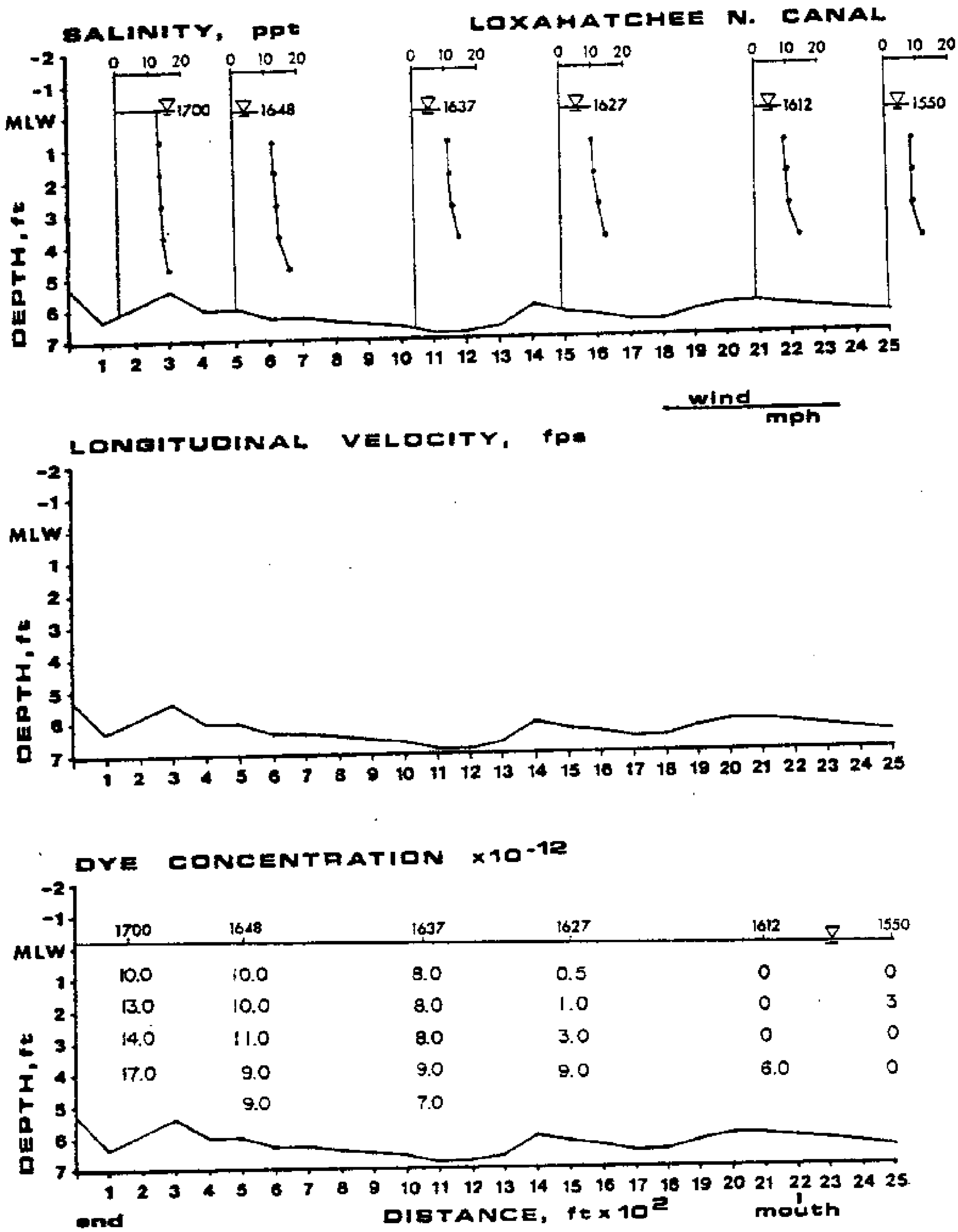

**date:** 770614 **tide:** flood **high:** 2100 **low:** 1530

Time Span: 1758 - 1858




**date:** 770615 **tide:** ebb **high:** 0830 **low:** 1530

Time Span: 1201 - 1447




**date:** 770615 **tide:** flood **high:** 2115 **low:** 1530

Time Span: 1550 - 1700

A.3

Vertical and Transverse

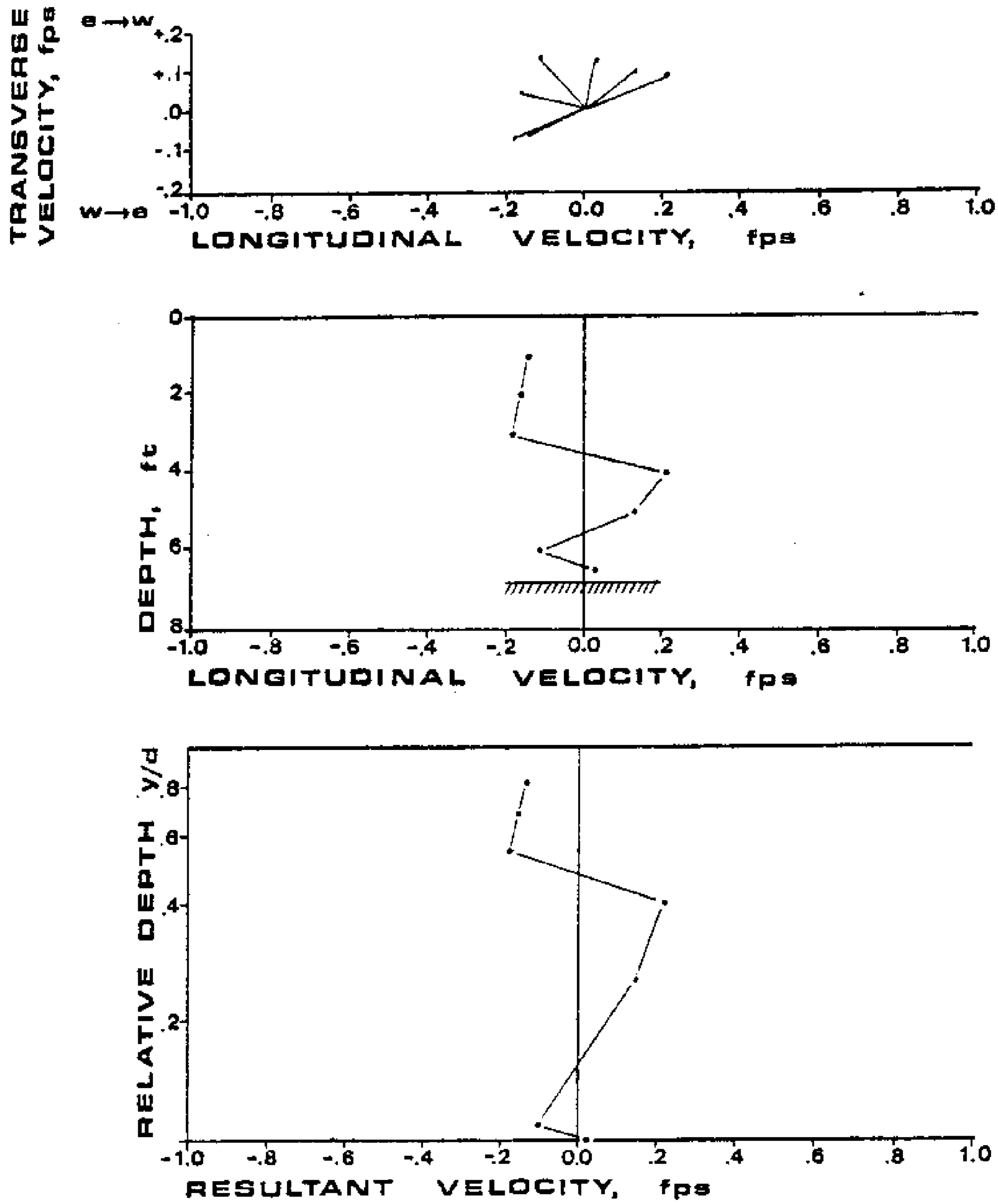
Velocity Profiles

This section contains plotted results as follows:

| DATE | TIME | PROFILE NUMBER |
|---|---|---|
| 770613 | 1246 | 10 + 50 |
| 770613 | 1642 | 1 + 50 |
| 770613 | 1642 | 1 + 50 |
| 770613 | 1719 | 10 + 50 |
| 770613 | 1737 | 21 + 00 (S) |
| 770613 | 1747 | 21 + 00 (MID) |
| 770613 | 1805 | 21 + 00 (N) |
| 770614 | 1108 | 21 + 00 (MID) |
| 770614 | 1128 | 21 + 00 (S) |
| 770614 | 1142 | 21 + 00 (N) |
| 770614 | 1200 | 10 + 50 |
| 770614 | 1220 | 1 + 50 |

| | | |
|---|---|---|
| 770614 | 1652 | 1 + 50 |
| 770614 | 1709 | 10 + 50 |
| 770614 | 1731 | 20 + 00 (S) |
| 770614 | 1758 | 20 + 00 (MID) |
| 770614 | 1809 | 20 + 00 (N) |
| 770614 | 1834 | 10 + 50 |
| 770614 | 1853 | 1 + 50 |
| 770614 | 1858 | 1 + 50 |
| 770615 | 1236 | 21 + 00 (MID) |
| 770615 | 1251 | 21 + 00 (N) |
| 770615 | 1251 | 21 + 00 (S) |
| 770615 | 1346 | 10 + 50 |
| 770615 | 1414 | 1 + 50 |
| 770615 | 1422 | 1 + 50 |

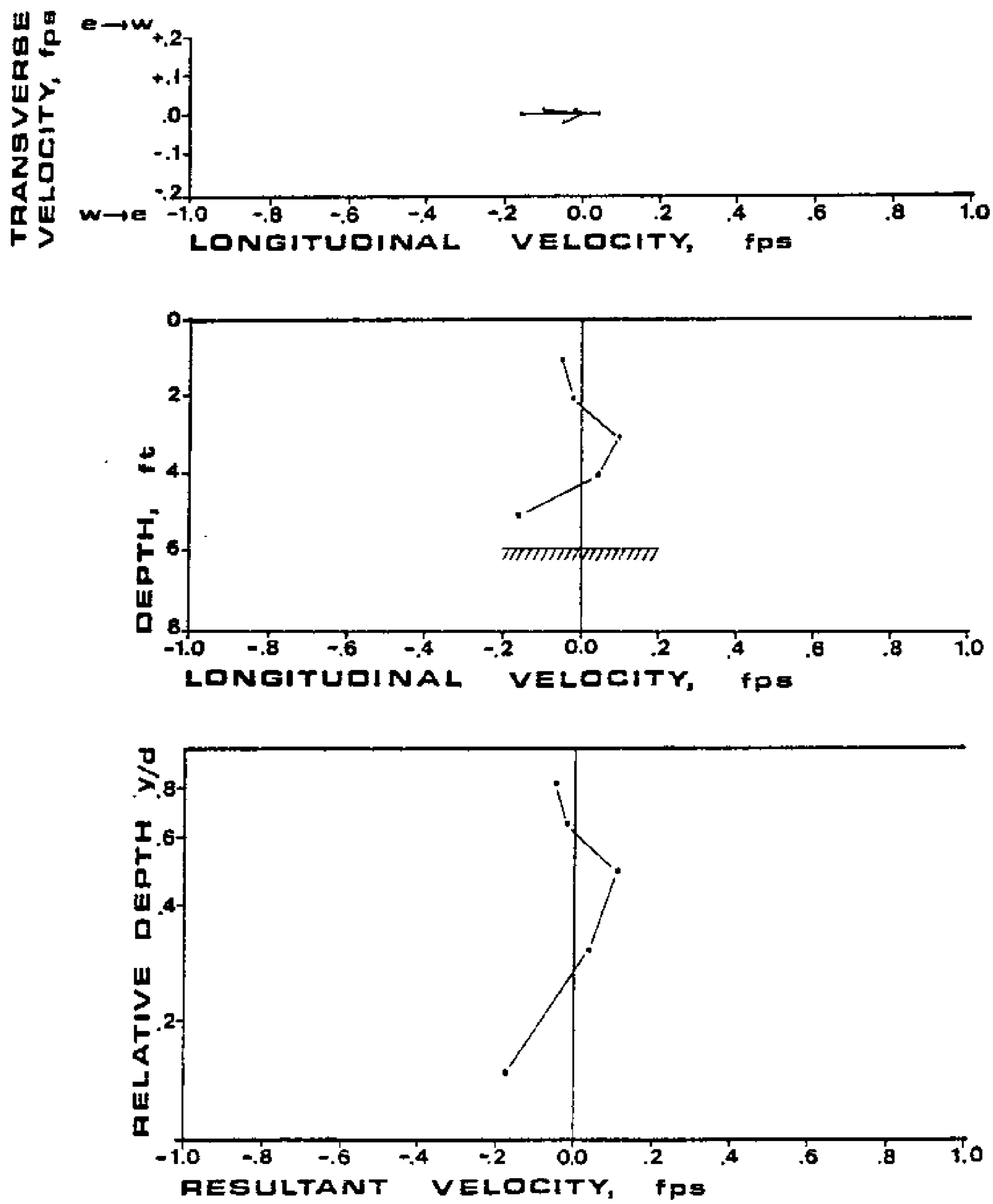
VELOCITY PROFILE NO. 10 + 50




LOCATION: LOXAHATCHEE N. CANAL

DATE: 770613 TIME: 1246 TIDE: EBB WIND: -

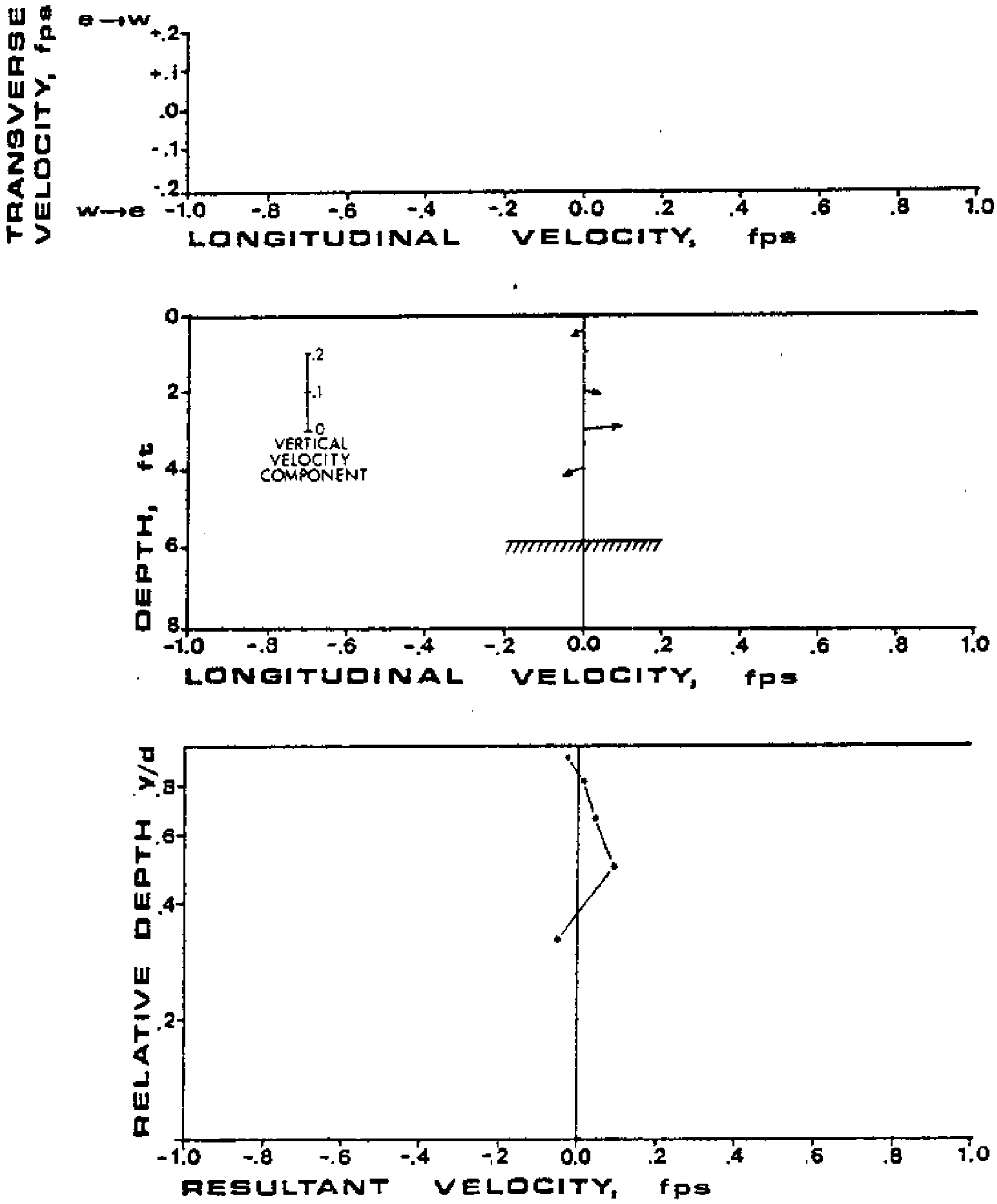
VELOCITY PROFILE NO. 1 + 50




LOCATION: LOXAHATCHEE N. CANAL

DATE: 770613 TIME: 1642 TIDE: FLOOD WIND: 5 mph

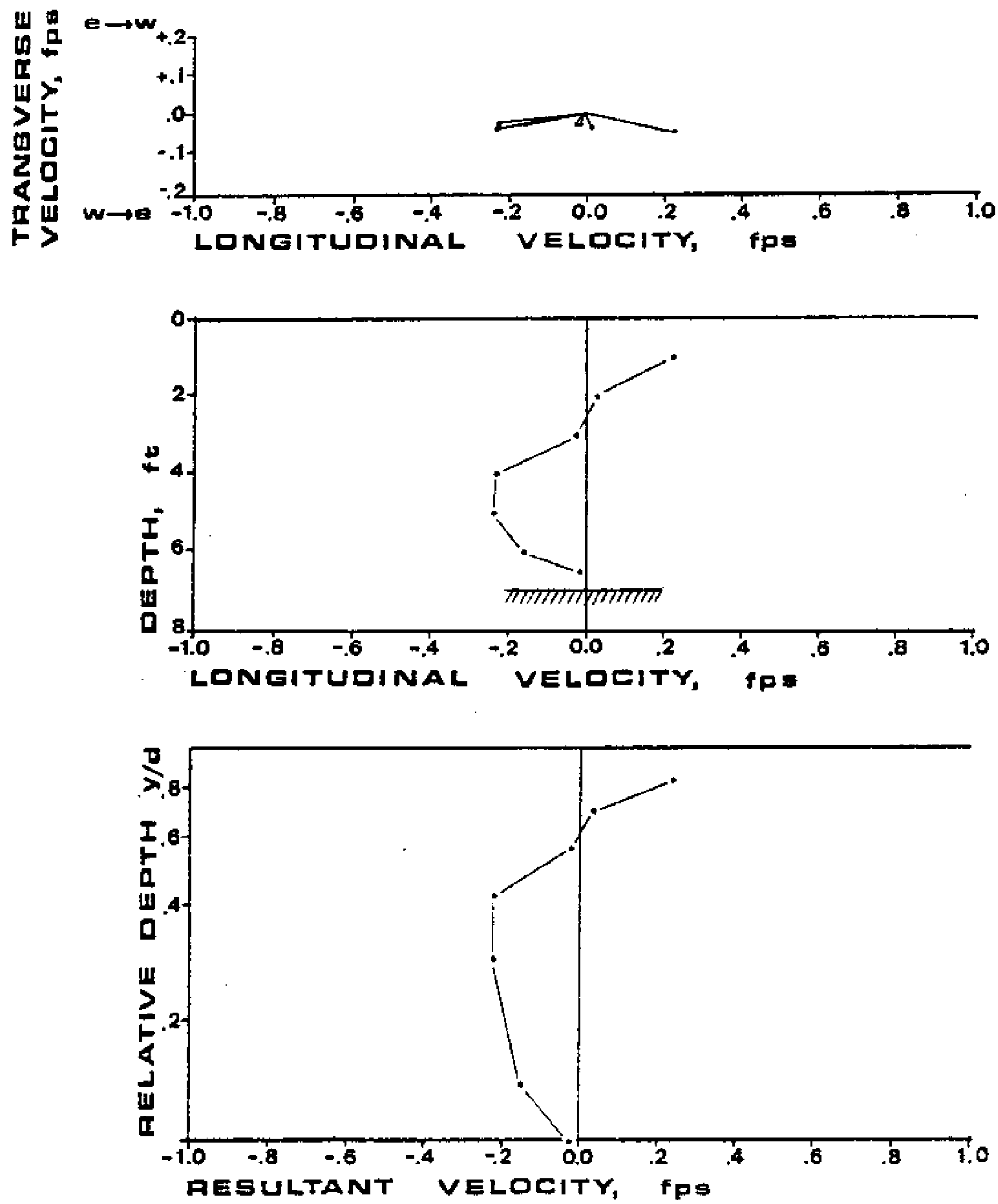
VELOCITY PROFILE NO. 1 + 50




LOCATION: LOXAHATCHEE N. CANAL

DATE: 770613 TIME: 1642 TIDE: FLOOD WIND: 5 mph

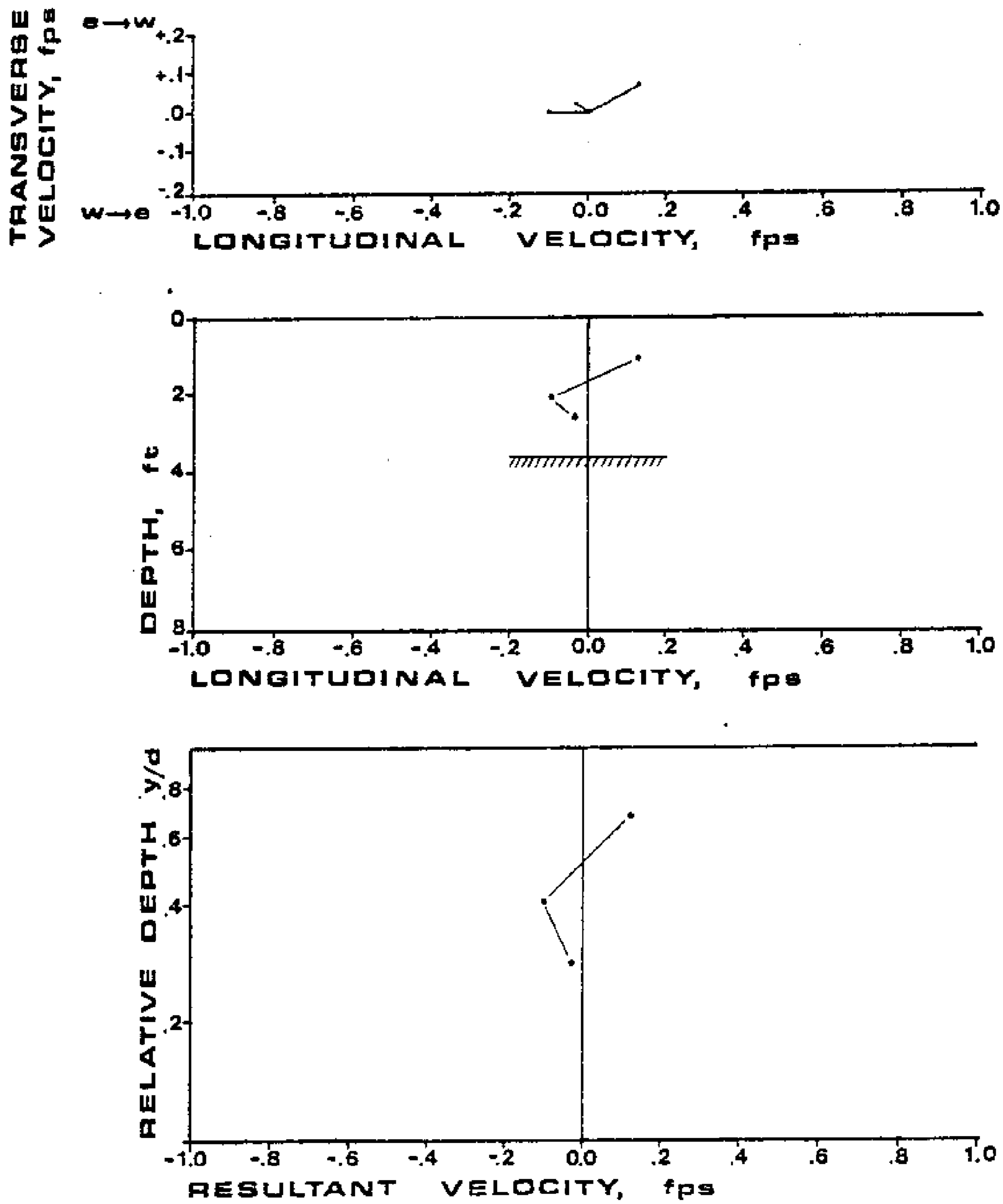
VELOCITY PROFILE NO. 10 + 50




LOCATION: LOXAHATCHEE N. CANAL

DATE: 770613 TIME: 1719 TIDE: FLOOD WIND: 8 mph

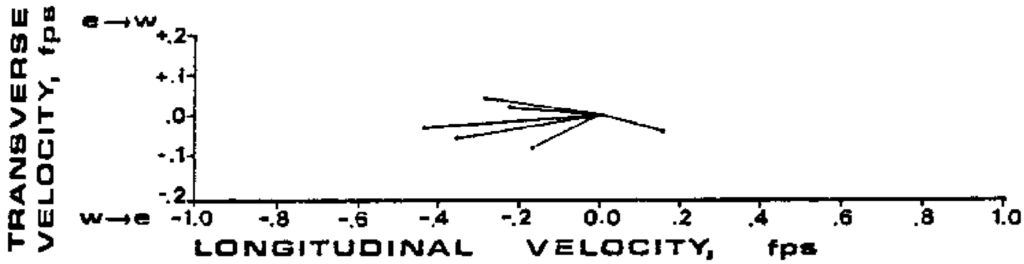
VELOCITY PROFILE NO. 21 + 00 (S)

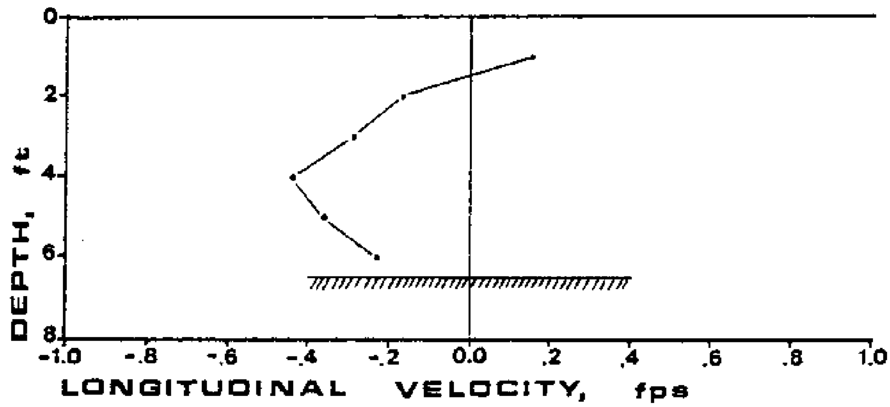


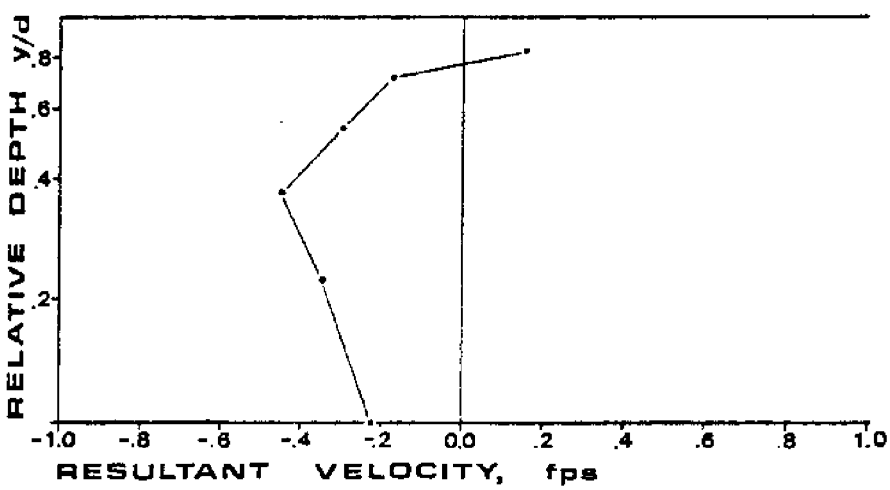

LOCATION: LOXAHATCHEE N. CANAL

DATE: 770613 TIME: 1737 TIDE: FLOOD WIND: 2 mph

VELOCITY PROFILE NO. 21 + 00 (MID)



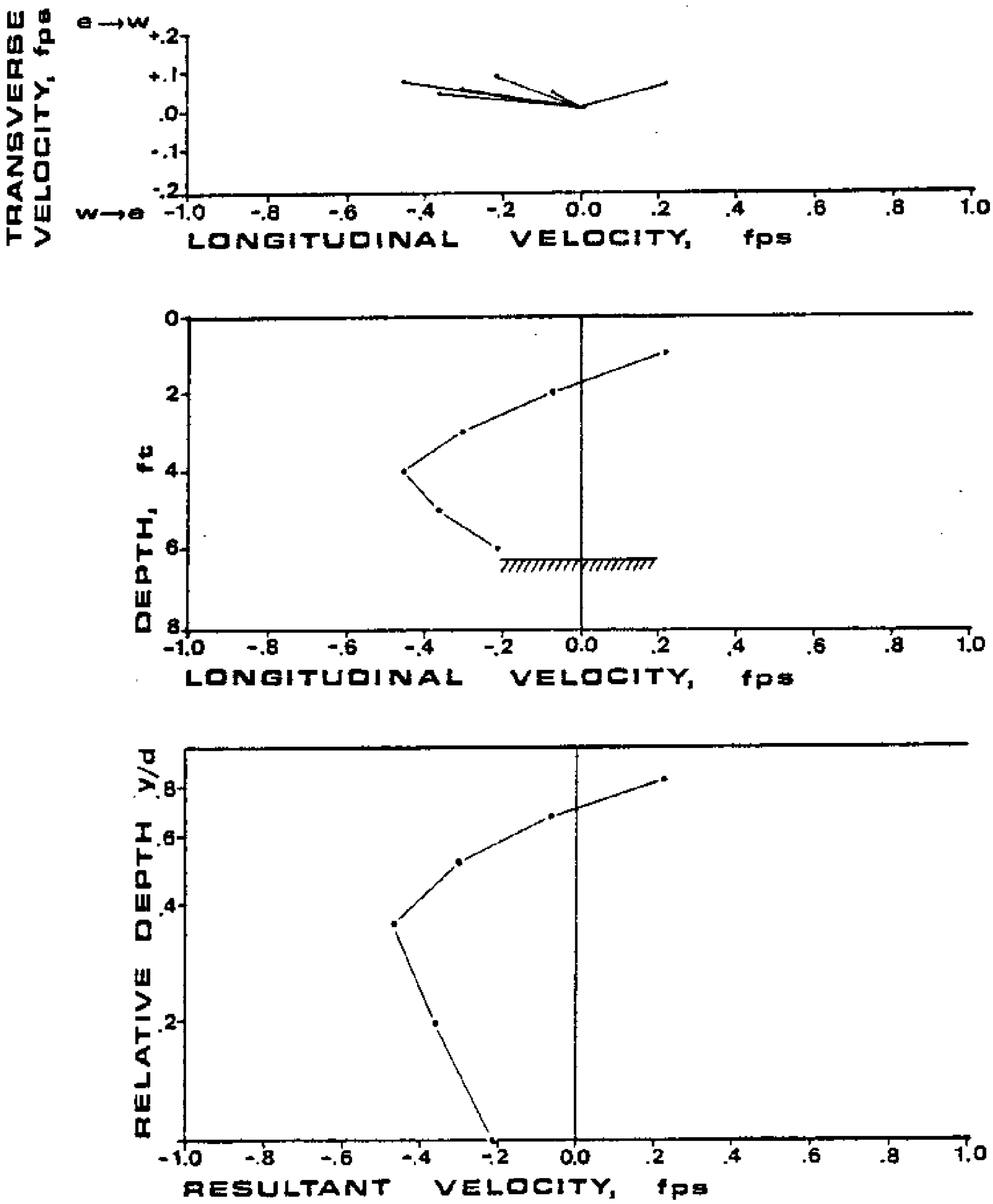




LOCATION: LOXAHATCHEE N. CANAL

DATE: 770613 TIME: 1747 TIDE: FLOOD WIND: 2 mph

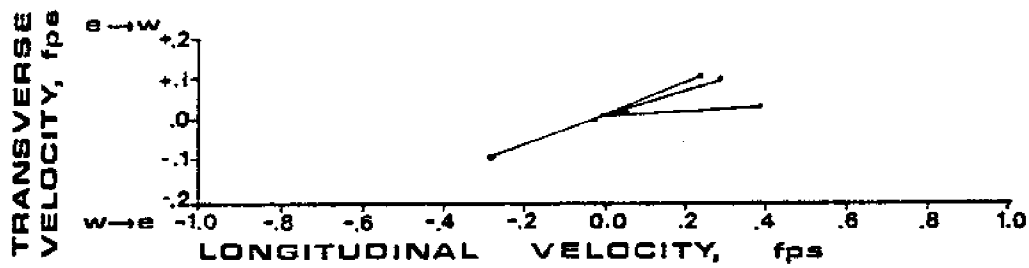
VELOCITY PROFILE NO. 21 + 00 (N)

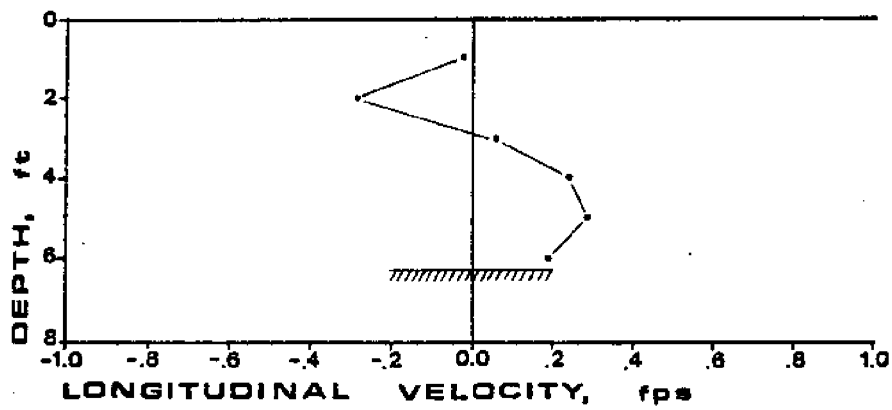


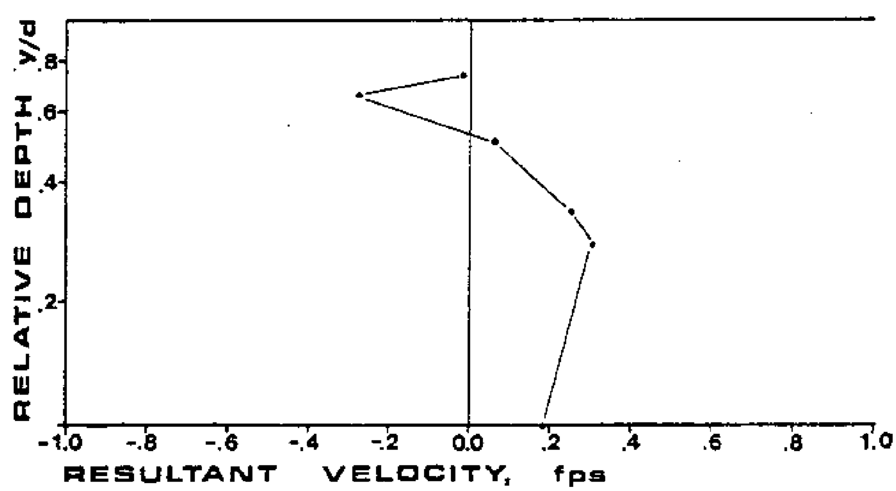

LOCATION: LOXAHATCHEE N. CANAL

DATE: 770613 TIME: 1805 TIDE: FLOOD WIND: -

VELOCITY PROFILE NO. 21 + 00 (MID)



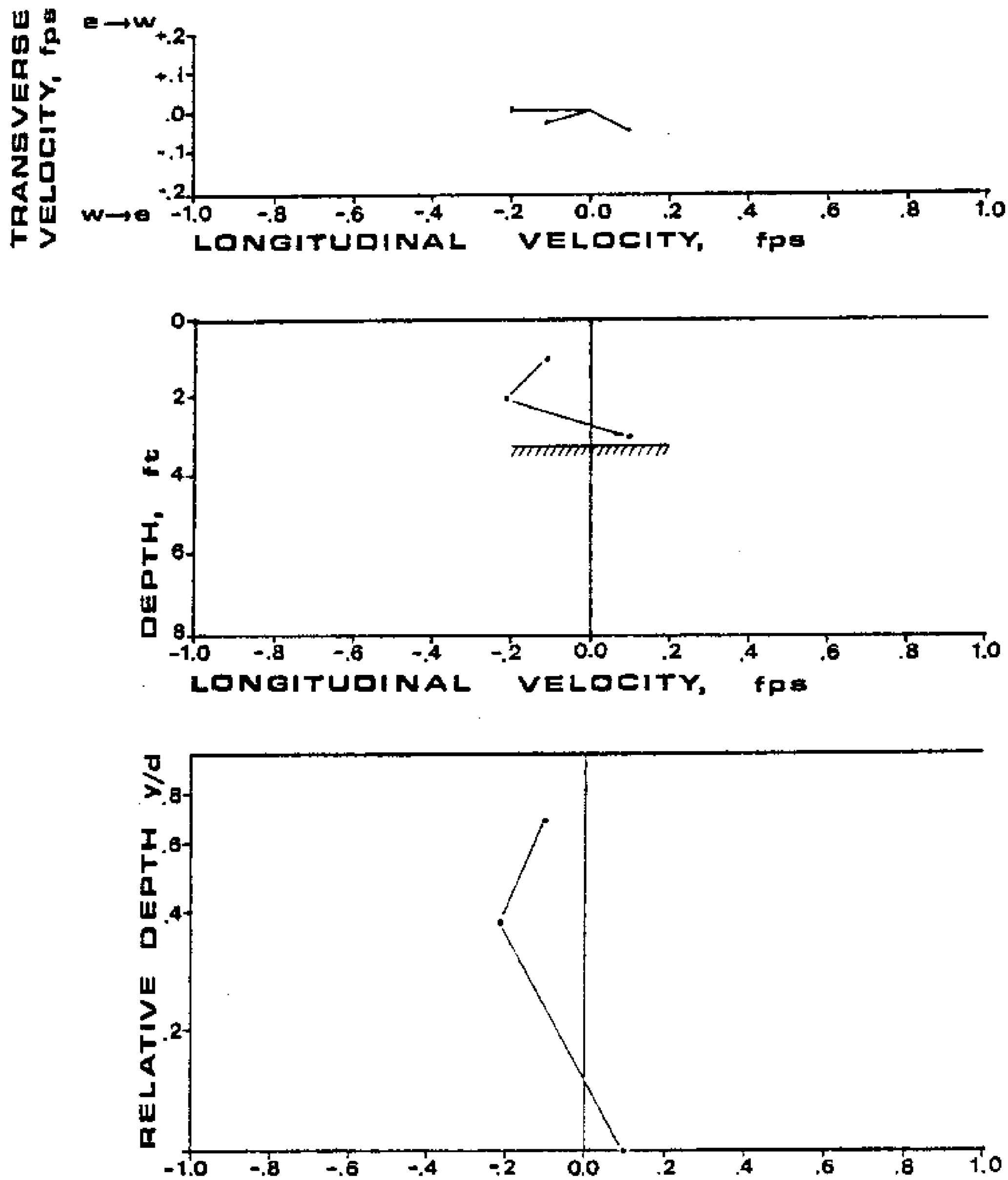




LOCATION: LOXAHATCHEE N. CANAL

DATE: 770614 TIME: 1108 TIDE: EBB WIND: 9 mph

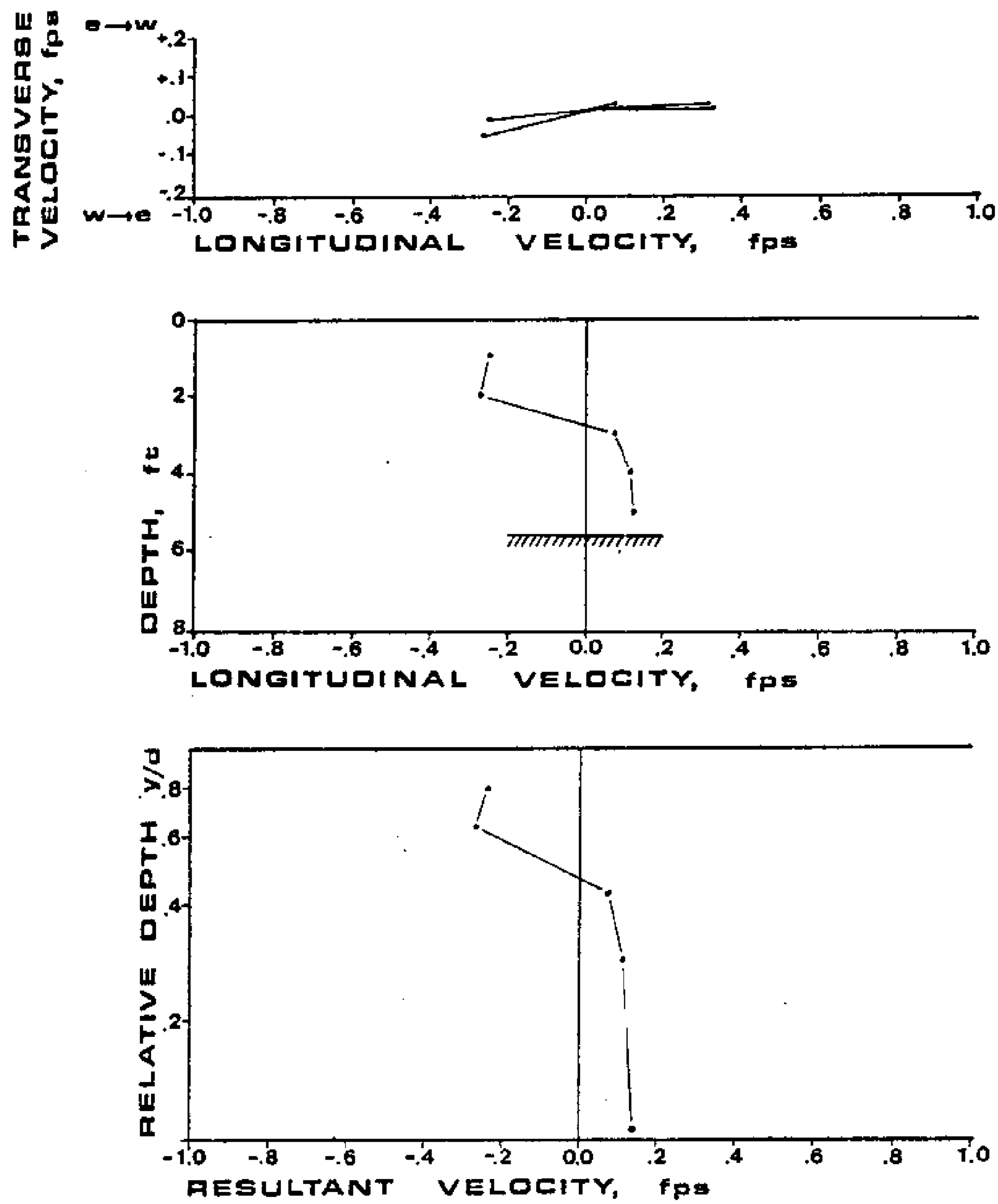
VELOCITY PROFILE NO. 21 + 00 (S)




LOCATION: LOXAHATCHEE N. CANAL

DATE: 770614 TIME: 1128 TIDE: EBB WIND: -

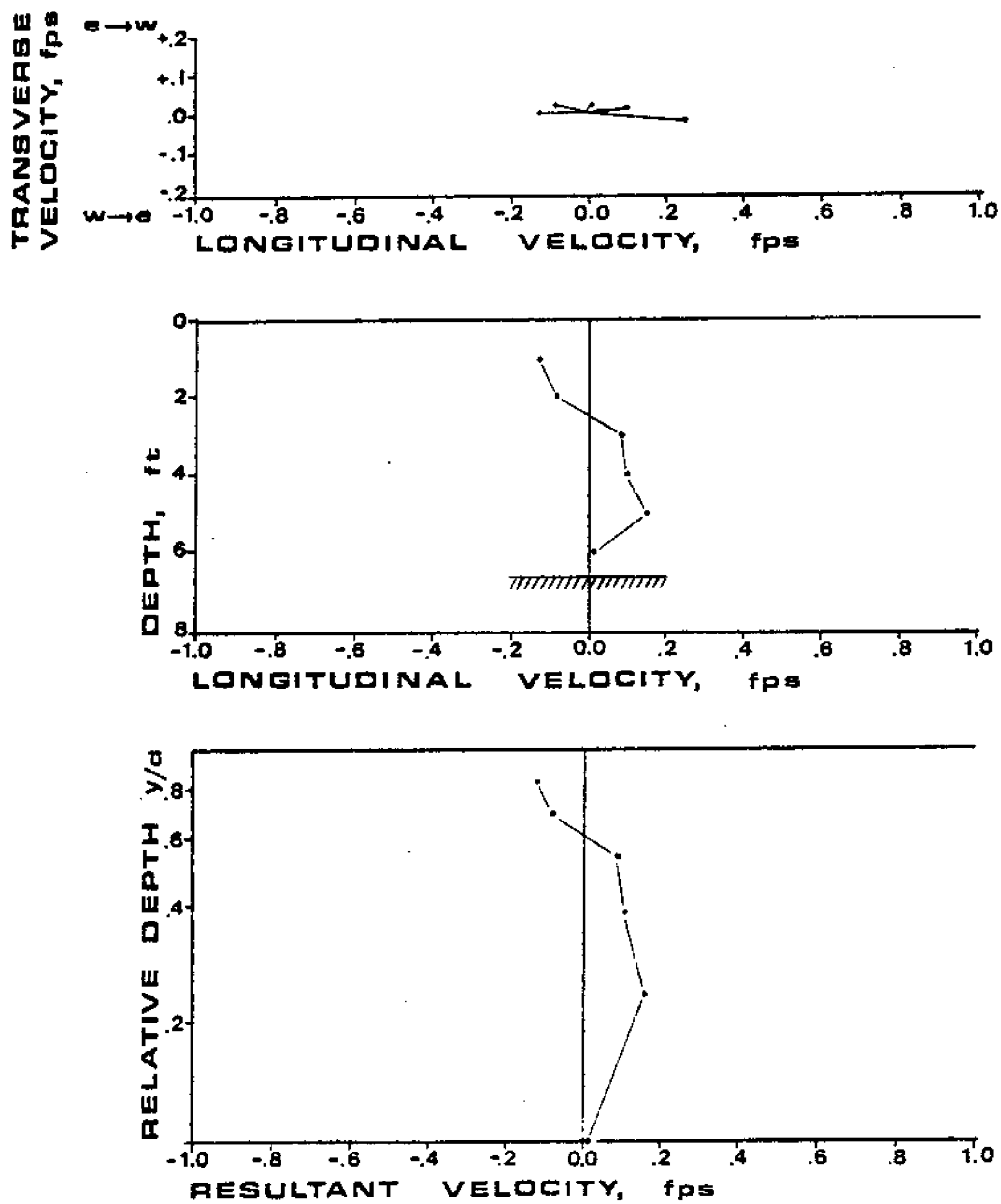
VELOCITY PROFILE NO. 21 + 00 (N)




LOCATION: LOXAHATCHEE N. CANAL

DATE: 770614 TIME: 1142 TIDE: EBB WIND: -

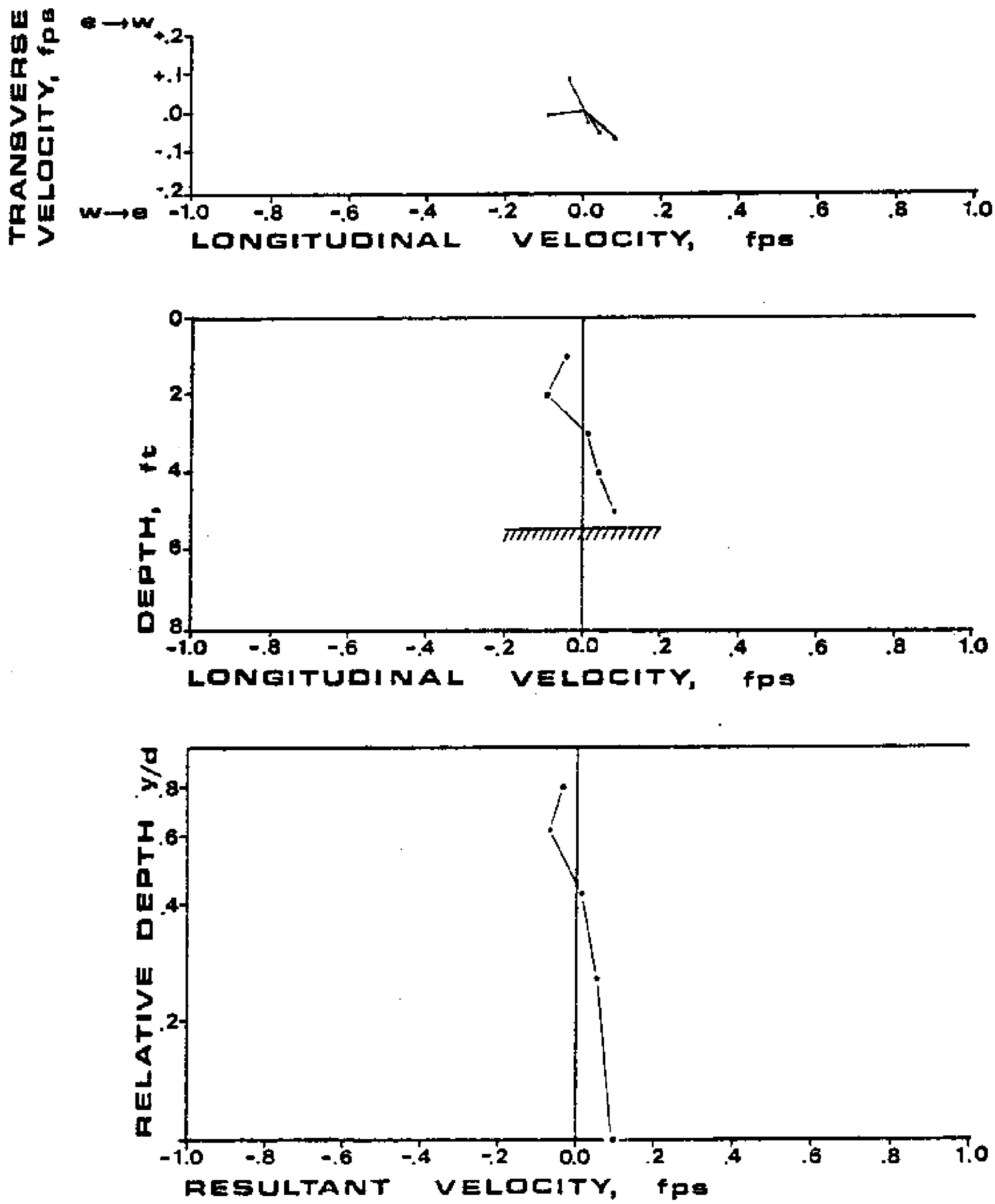
VELOCITY PROFILE NO. 10 + 50




LOCATION: LOXAHATCHEE N. CANAL

DATE: 770614 TIME: 1200 TIDE: EBB WIND: 4 mph

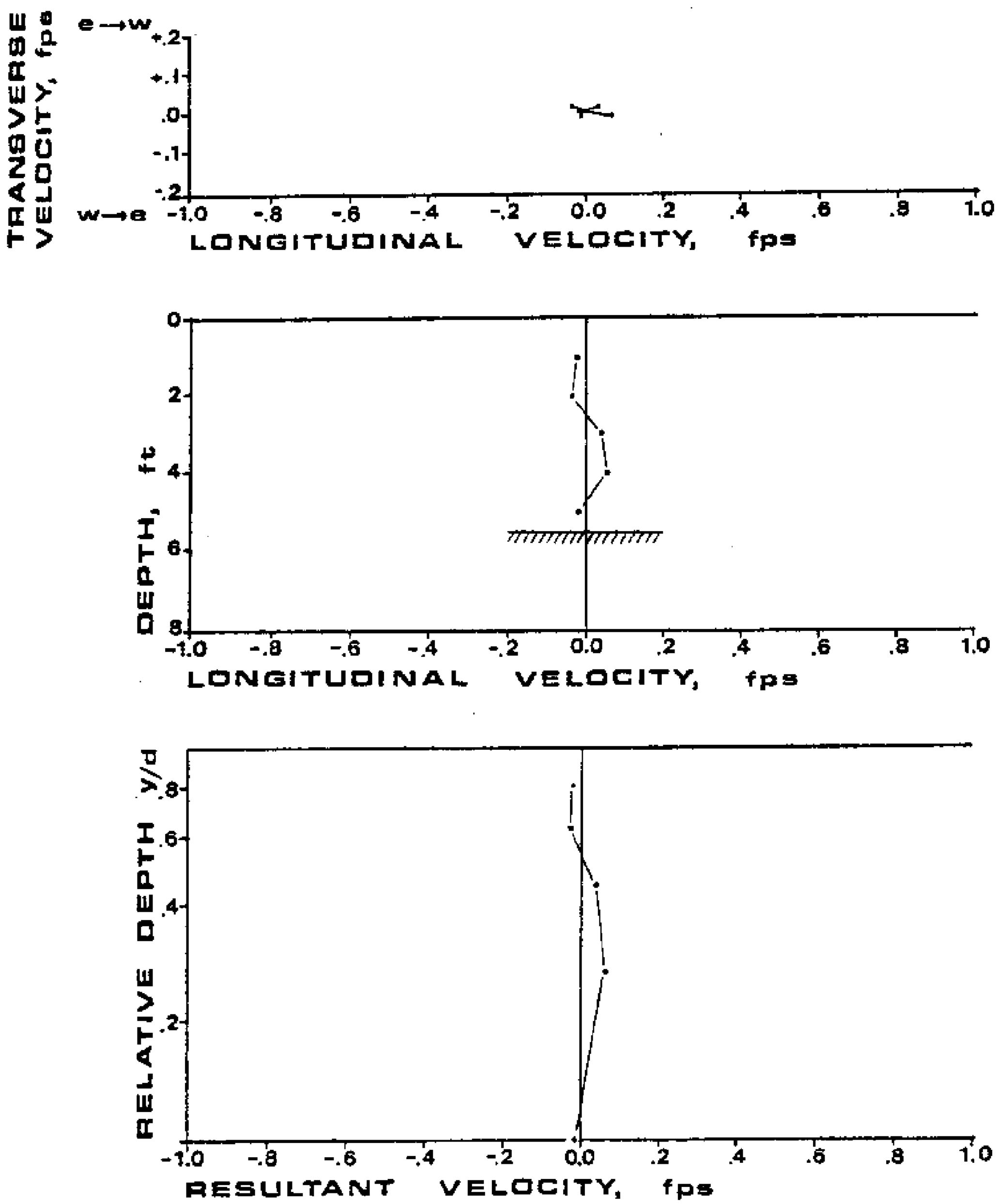
VELOCITY PROFILE NO. 1 + 50




LOCATION: LOXAHATCHEE N. CANAL

DATE: 770614 TIME: 1220 TIDE: EBB WIND: -

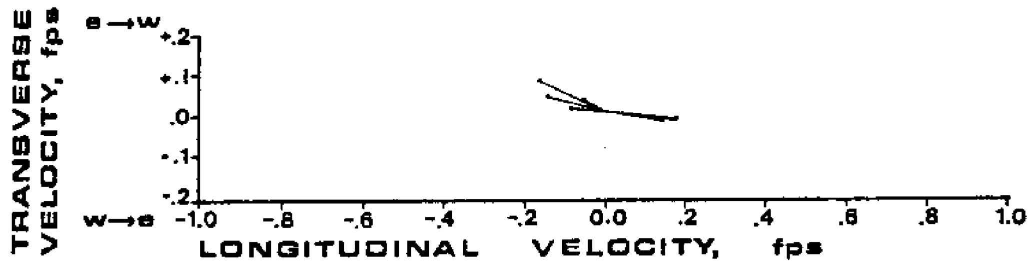
VELOCITY PROFILE NO. 1 + 50

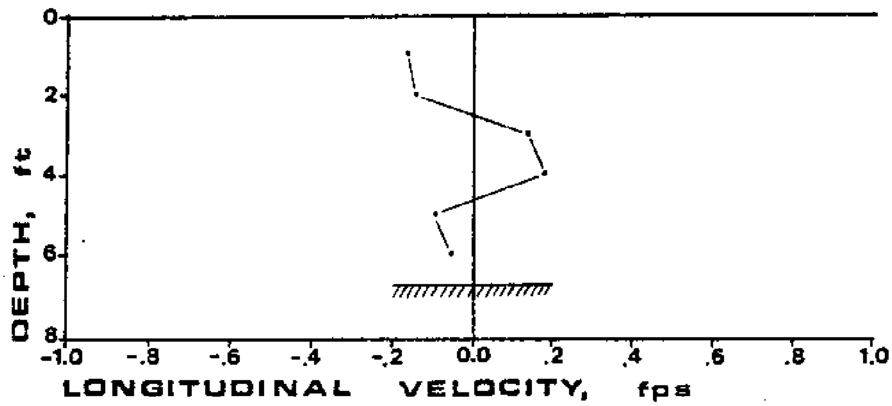


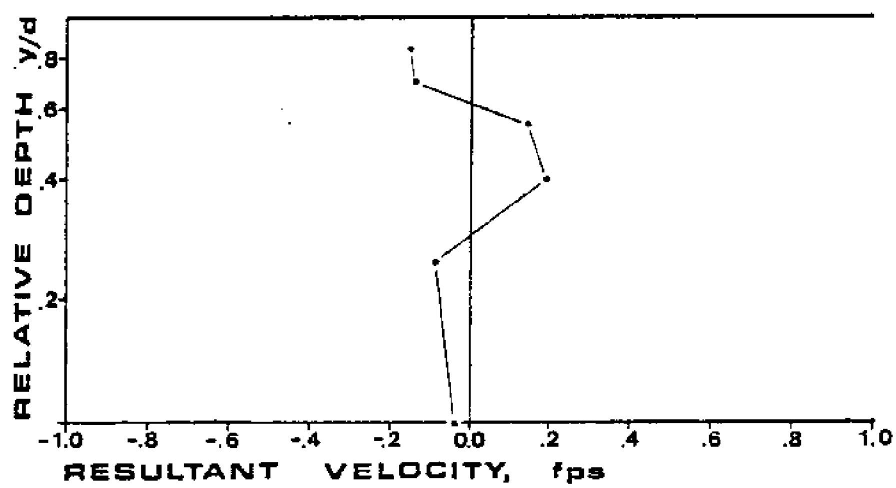

LOCATION: LOXAHATCHEE N. CANAL

DATE: 770614 TIME: 1652 TIDE: FLOOD WIND: -

VELOCITY PROFILE NO. 10 + 50



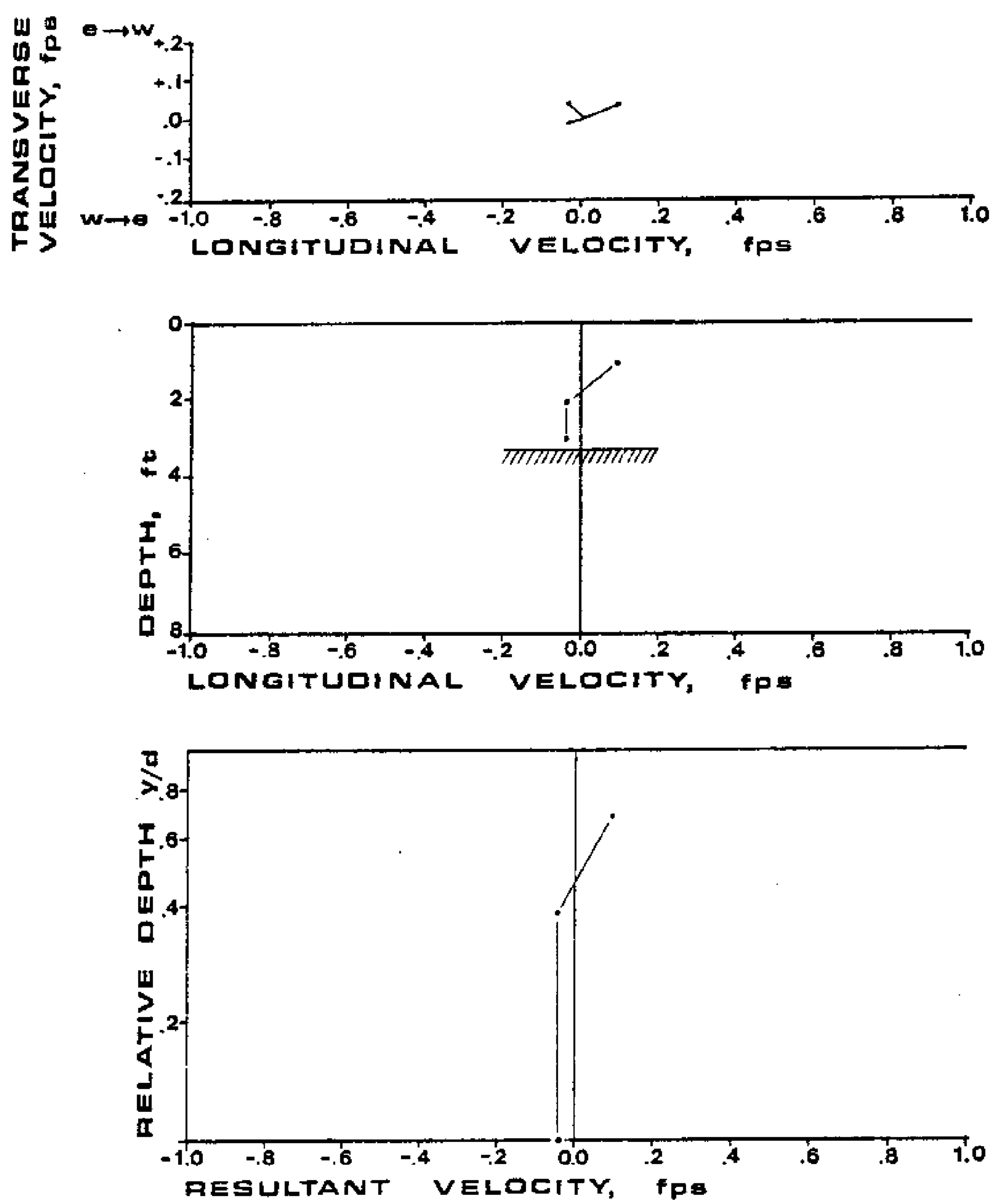




LOCATION: LOXAHATCHEE N. CANAL

DATE: 770614 TIME: 1709 TIDE: FLOOD WIND: -

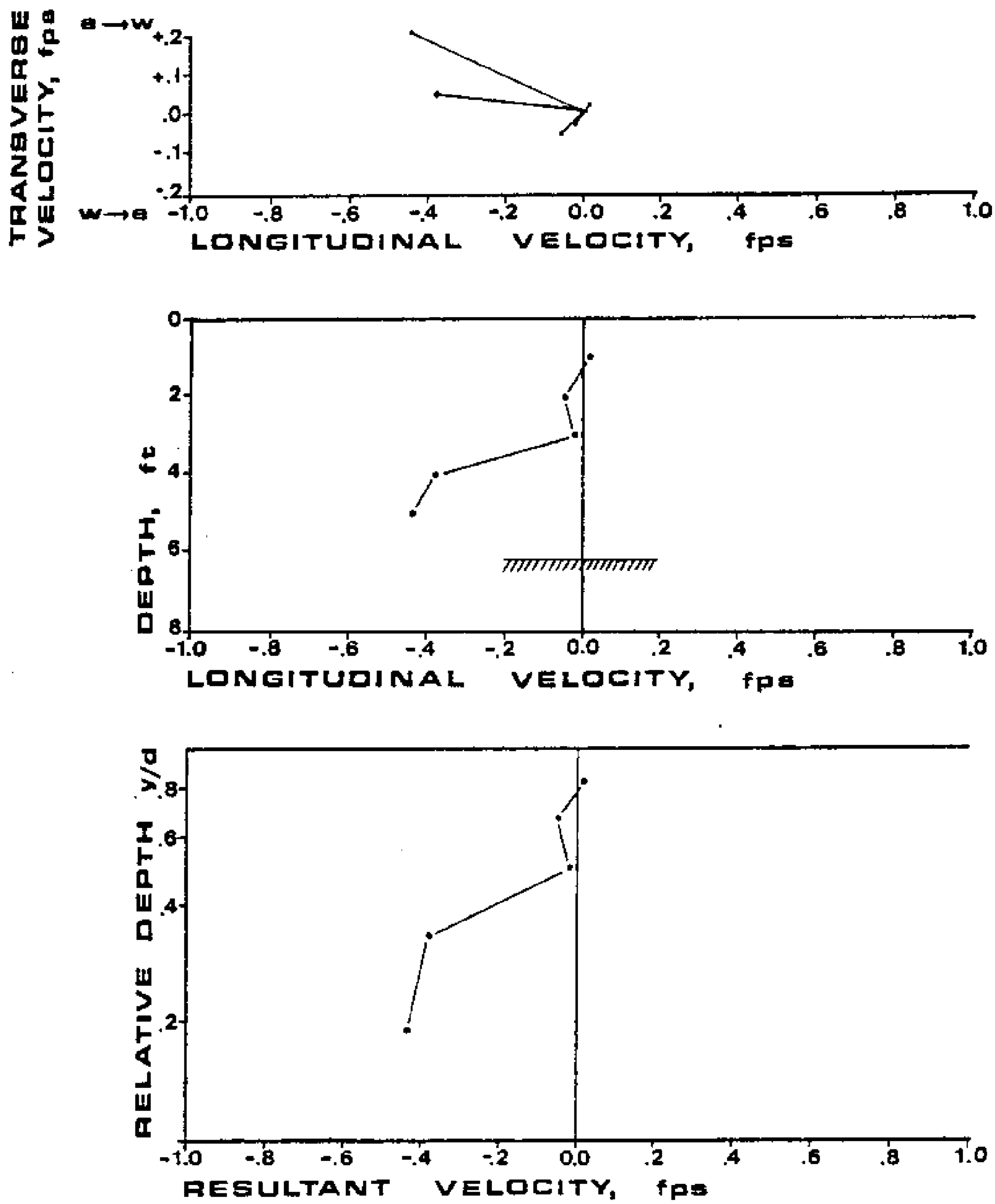
VELOCITY PROFILE NO. 20 + 00 (S)




LOCATION: LOXAHATCHEE N. CANAL

DATE: 770614 TIME: 1731 TIDE: FLOOD WIND: -

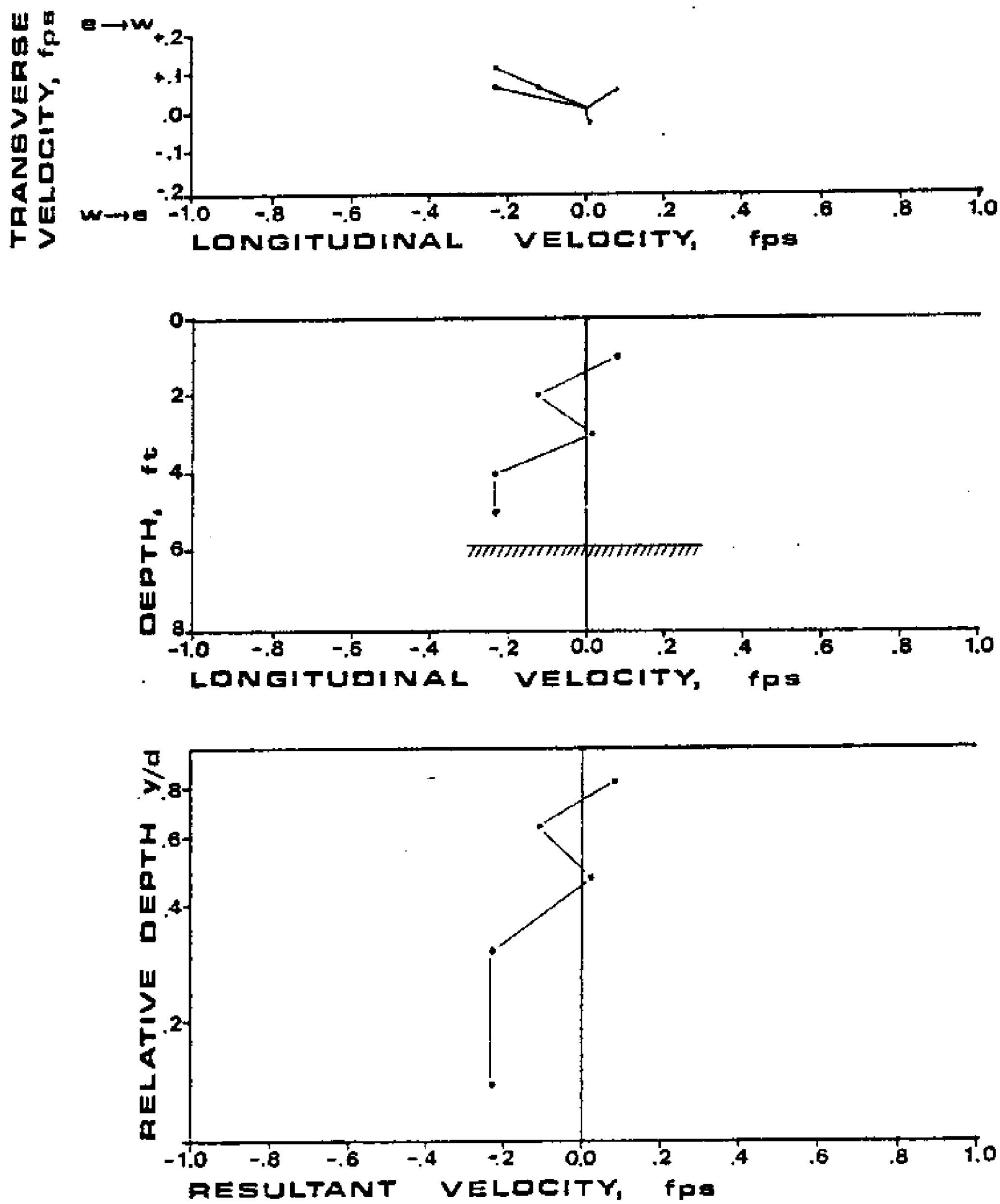
VELOCITY PROFILE NO. 20 + 00 (MID)




LOCATION: LOXAHATCHEE N. CANAL

DATE: 770614 TIME: 1758 TIDE: FLOOD WIND: -

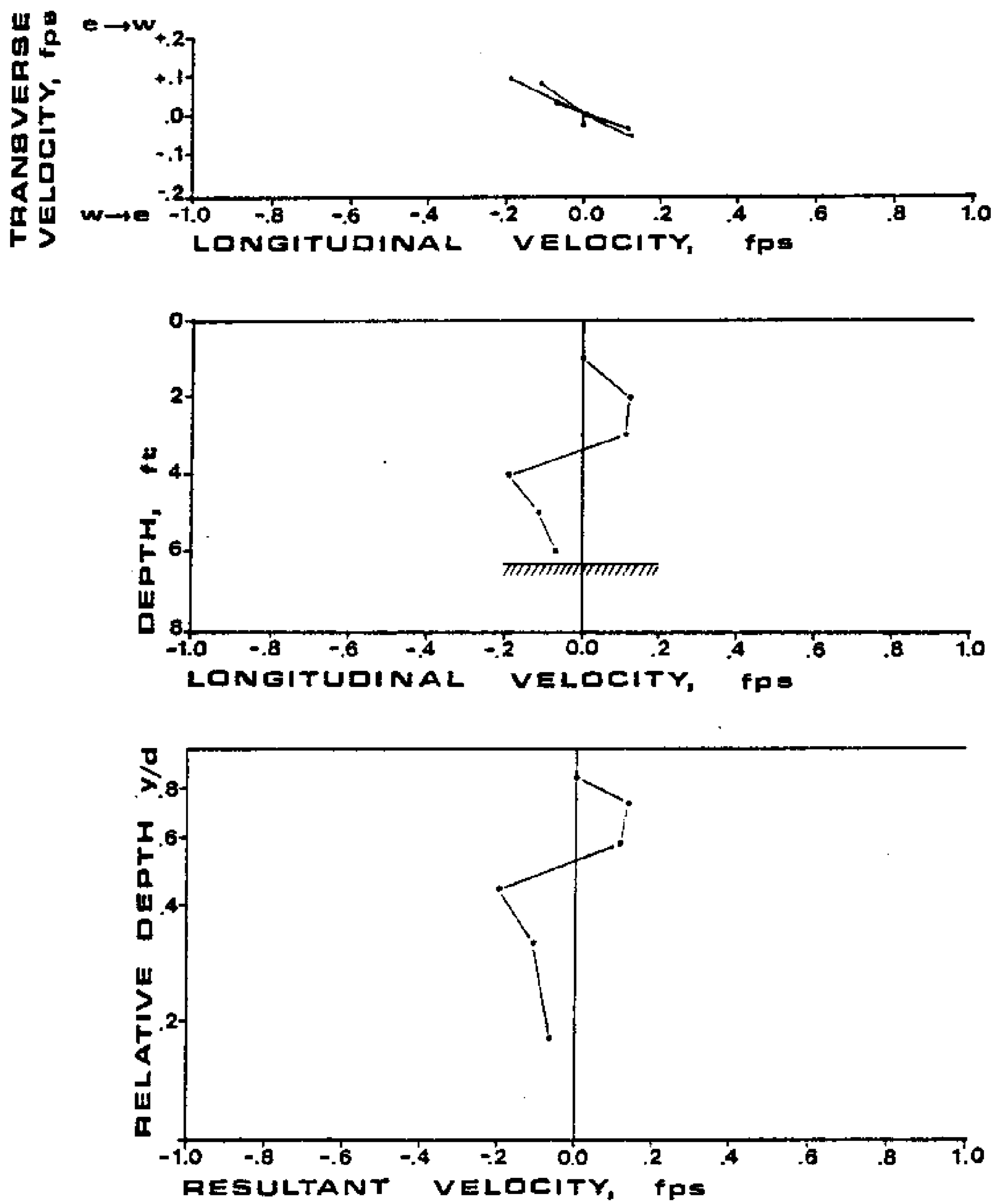
VELOCITY PROFILE NO. 20 + 00 (N)




LOCATION: LOXAHATCHEE N. CANAL

DATE: 770614 TIME: 1809 TIDE: FLOOD WIND: -

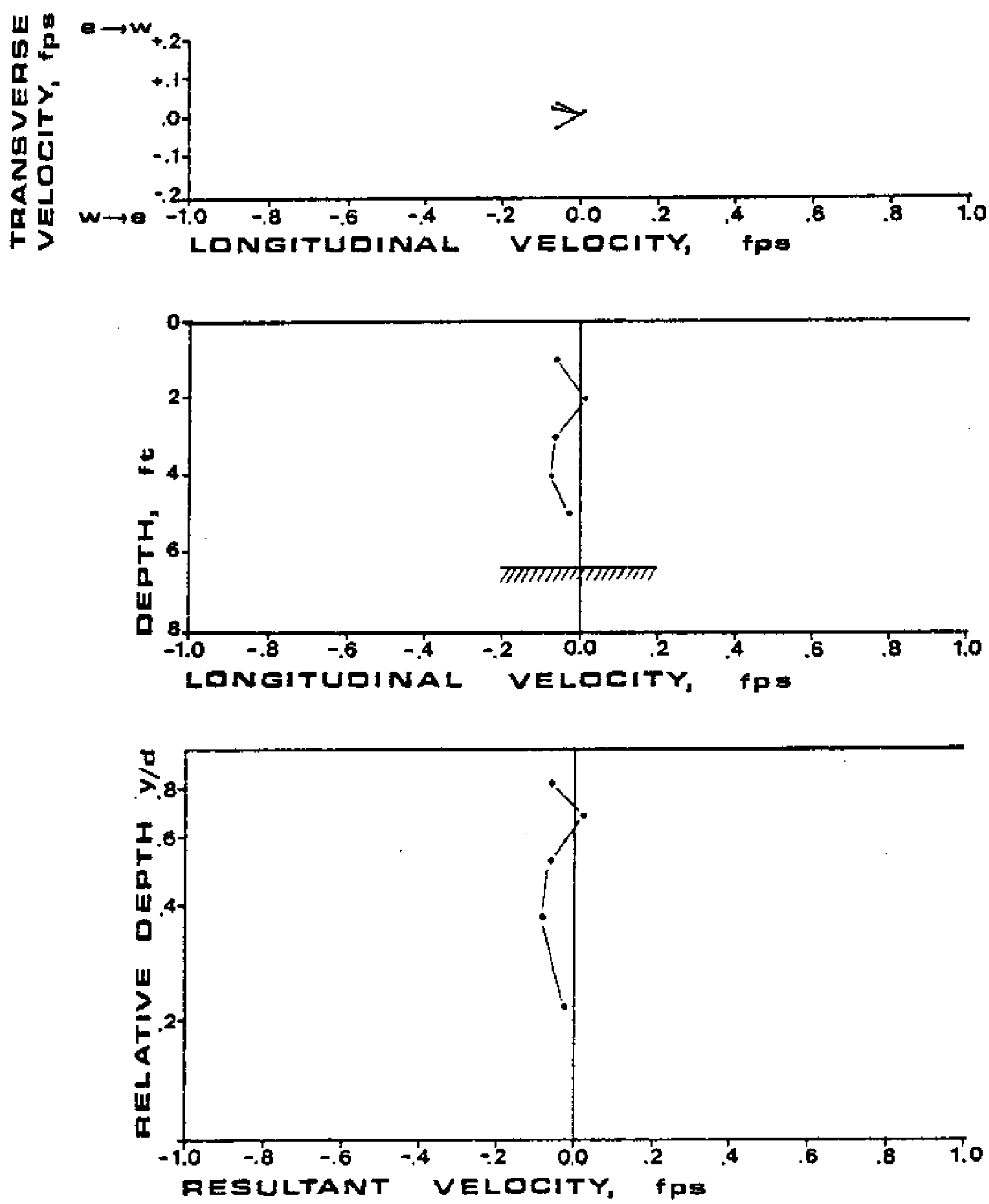
VELOCITY PROFILE NO. 10 + 50




LOCATION: LOXAHATCHEE N. CANAL

DATE: 770614 TIME: 1834 TIDE: FLOOD WIND: -

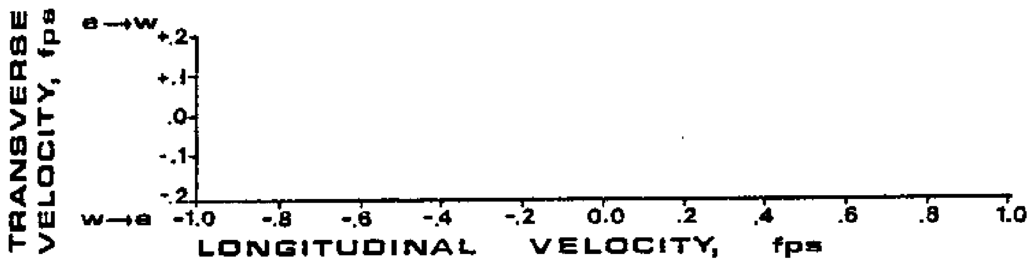
VELOCITY PROFILE NO. 1 + 50

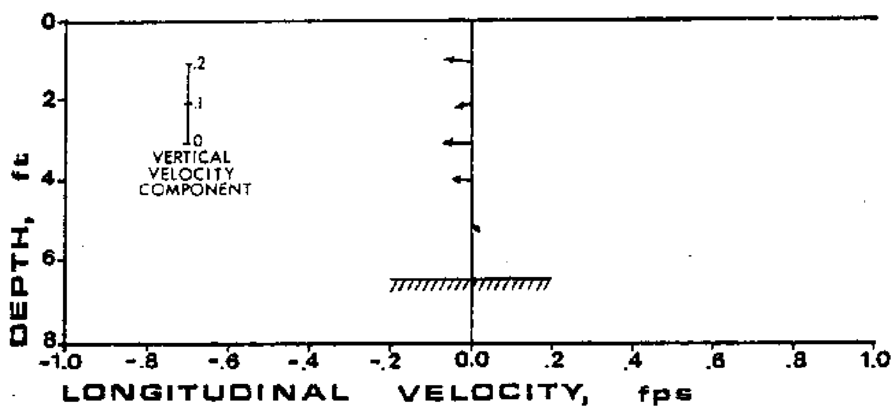


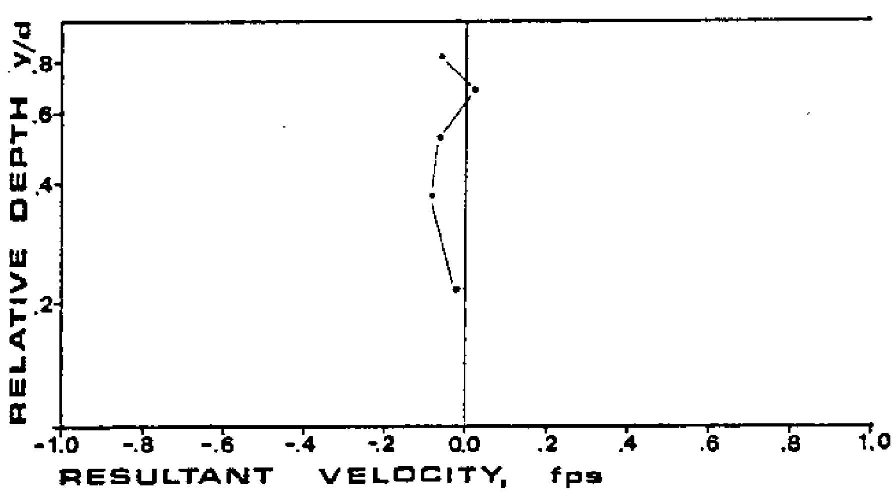

LOCATION: LOXAHATCHEE N. CANAL

DATE: 770614 TIME: 1853 TIDE: FLOOD WIND: -

VELOCITY PROFILE NO. 1 + 50



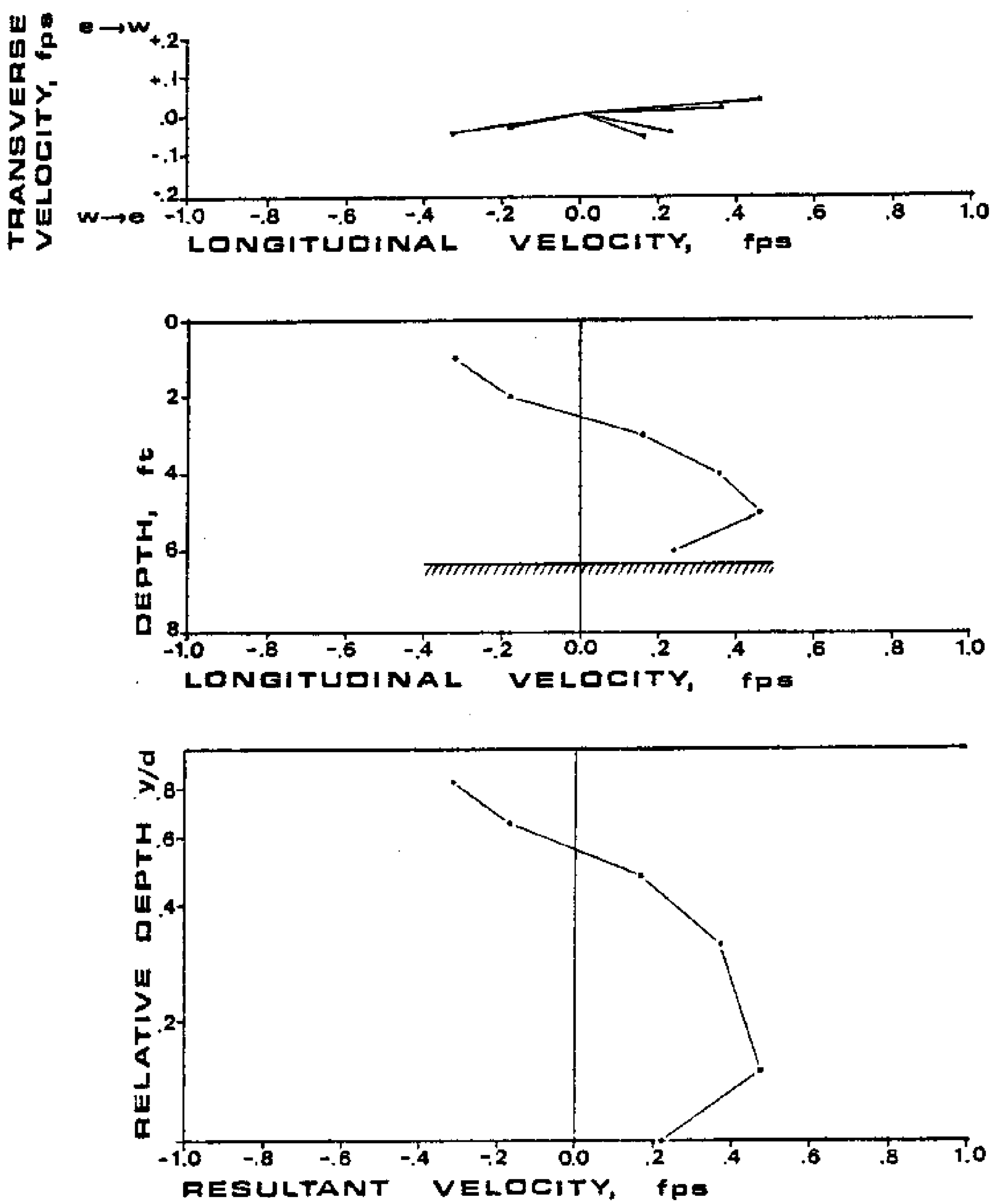




LOCATION: LOXAHATCHEE N. CANAL

DATE: 770614 TIME: 1858 TIDE: FLOOD WIND: -

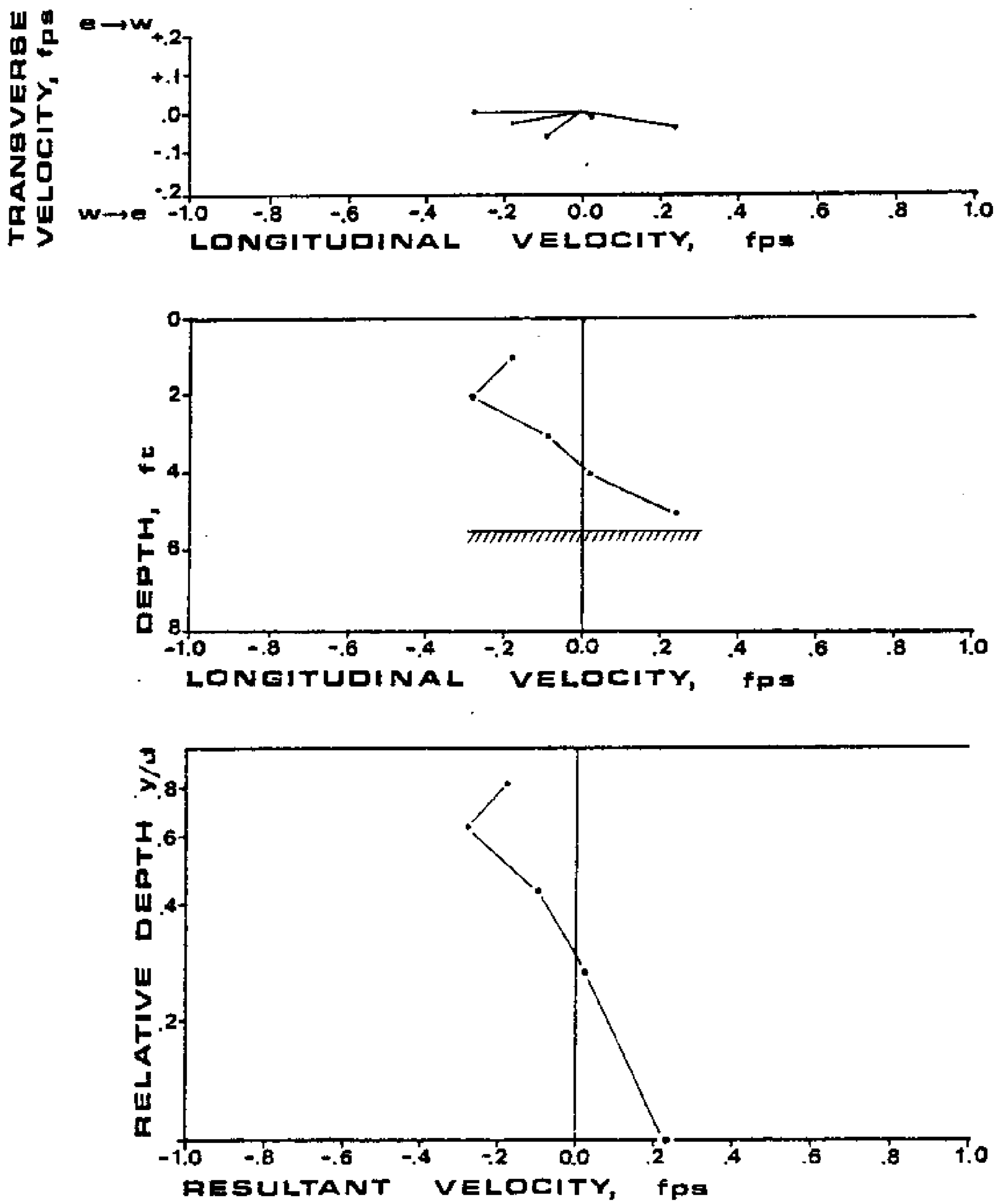
VELOCITY PROFILE NO. 21 + 00 (MID)




LOCATION: LOXAHATCHEE N. CANAL

DATE: 770615 TIME: 1236 TIDE: EBB WIND: 4 mph

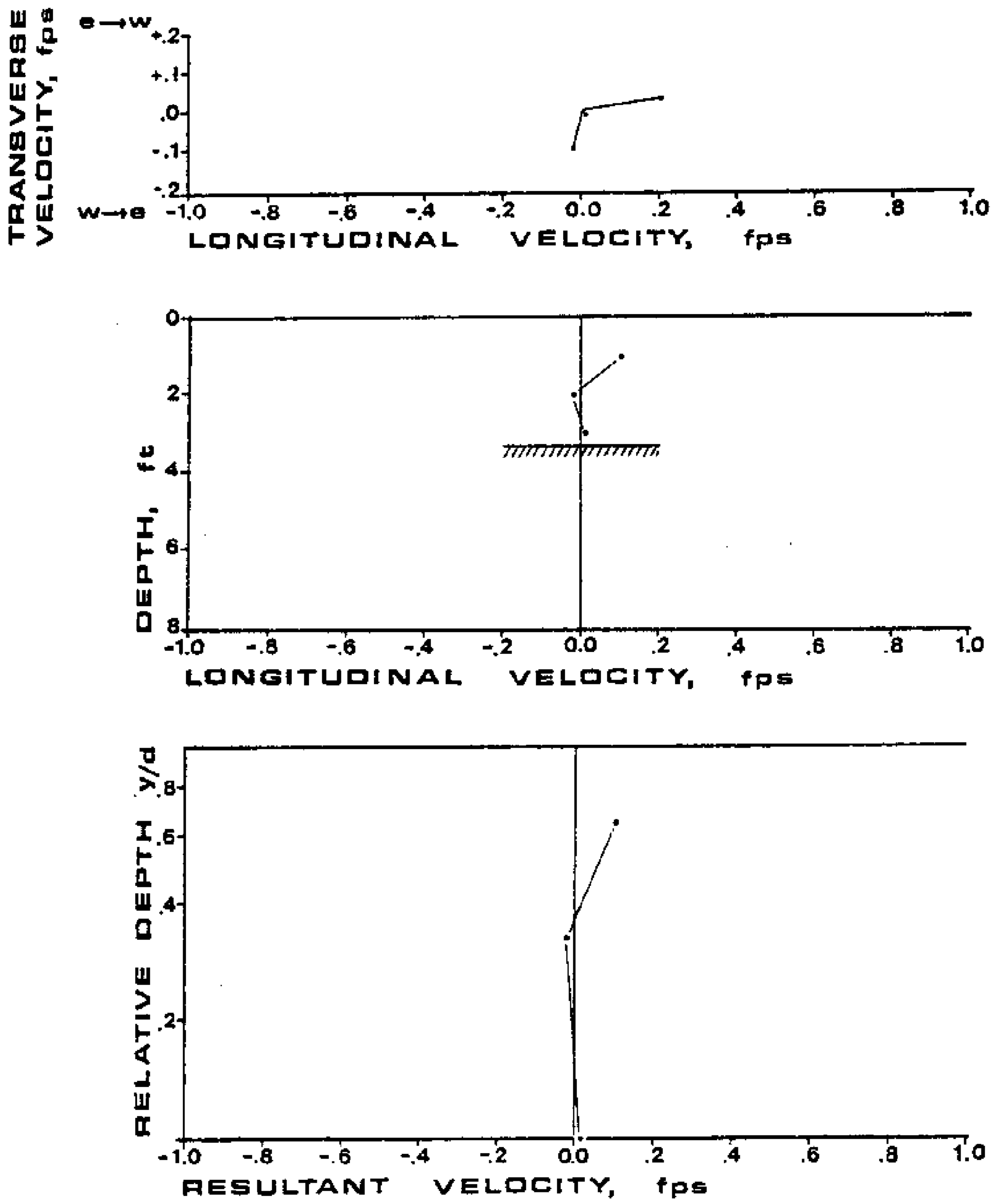
VELOCITY PROFILE NO. 21 + 00 (N)




LOCATION: LOXAHATCHEE N. CANAL

DATE: 770615 TIME: 1251 TIDE: EBB WIND: -

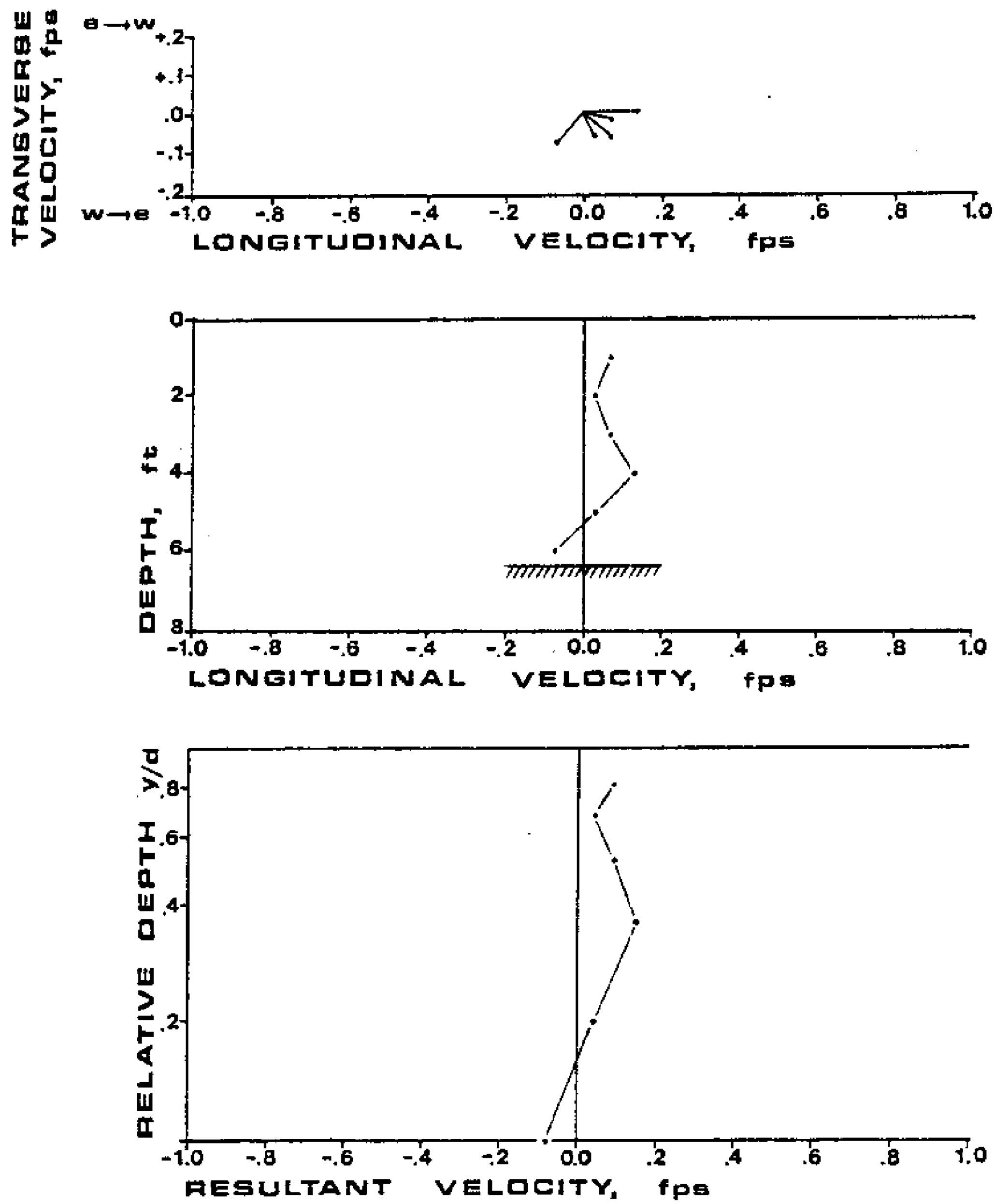
VELOCITY PROFILE NO. 21 + 00 (S)




LOCATION: LOXAHATCHEE N. CANAL

DATE: 770615 TIME: 1251 TIDE: EBB WIND: -

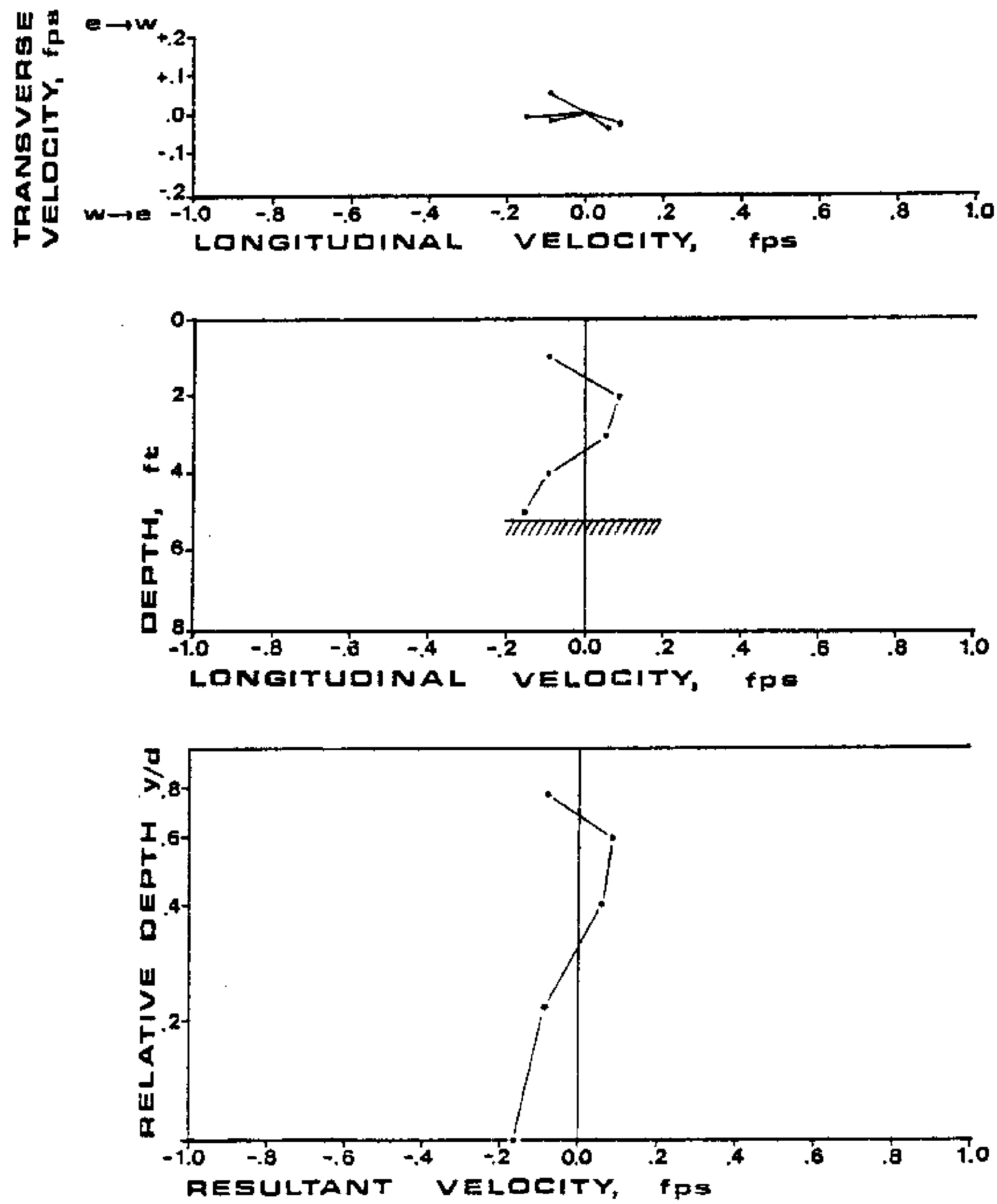
VELOCITY PROFILE NO. 10 + 50




LOCATION: LOXAHATCHEE N. CANAL

DATE: 770615 TIME: 1346 TIDE: EBB WIND: -

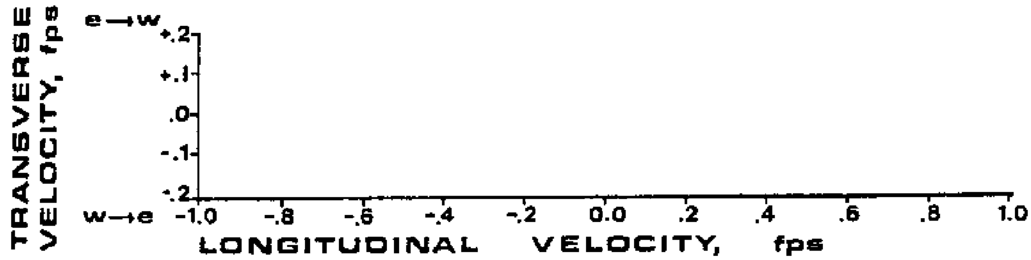
VELOCITY PROFILE NO. 1 + 50

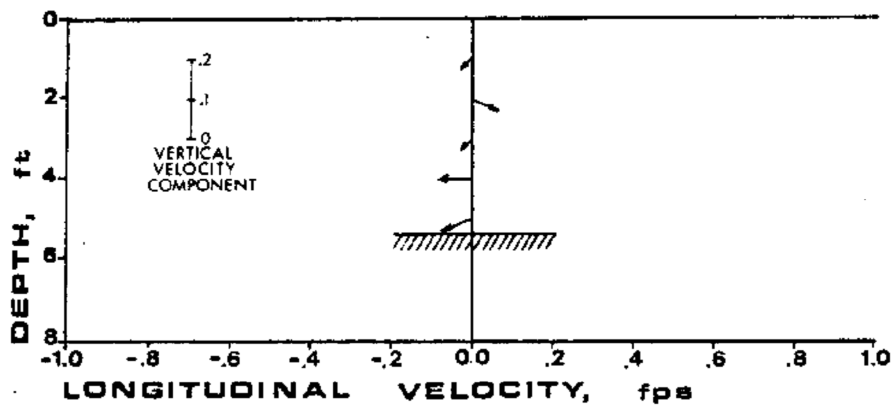


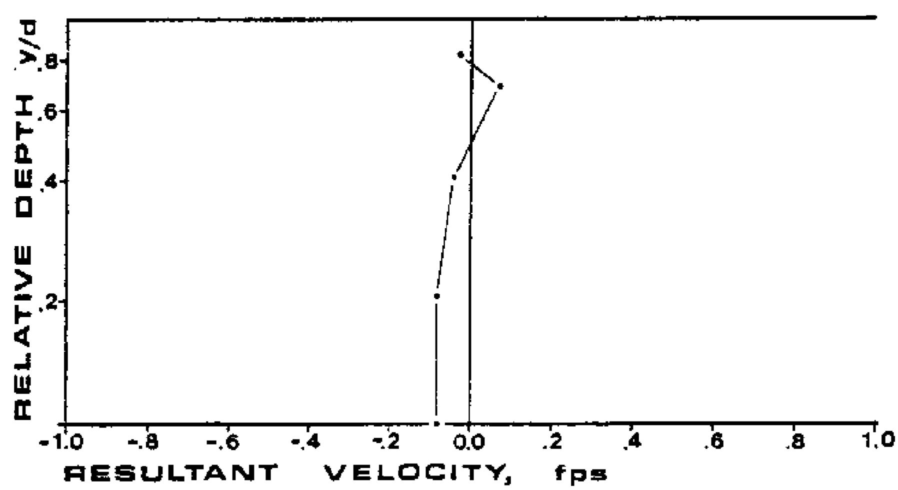

LOCATION: LOXAHATCHEE N. CANAL

DATE: 770615 TIME: 1414 TIDE: EBB WIND: -

VELOCITY PROFILE NO. 1 + 50




LOCATION: LOXAHATCHEE N. CANAL

DATE: 770615 TIME: 1422 TIDE: EBB WIND: -

# A.4

## Vertically Averaged

## Dye Concentration Measurements

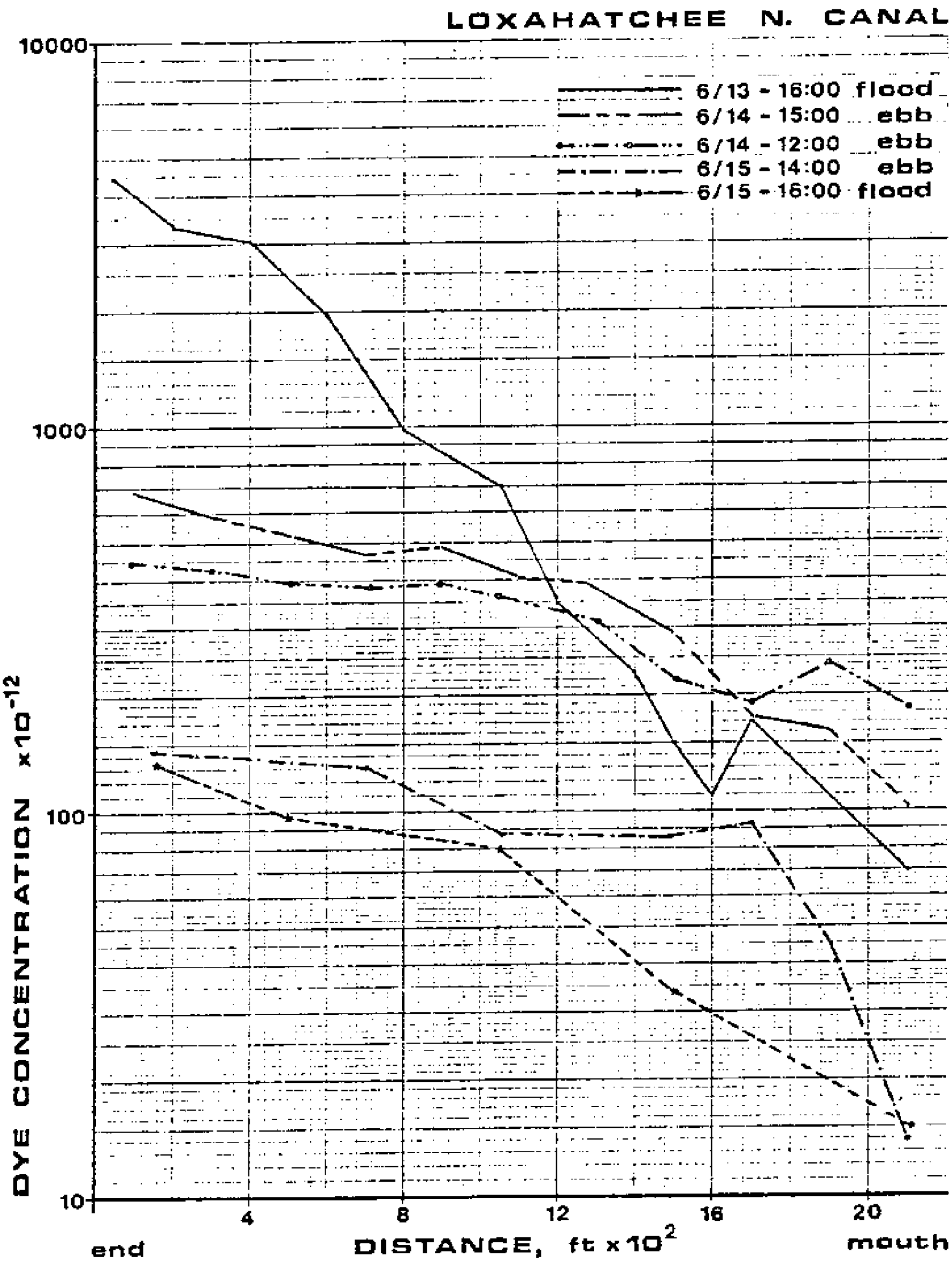



Figure A.3 - Vertically Averaged Longitudinal Dye Concentration Profiles

# APPENDIX B

# LONGITUDINAL DISPERSION STUDIES

at

57 ACRES SITE

PALM BEACH COUNTY

July and October 1977

B.1

Location Map

Canal Network Map

Canal Geometry

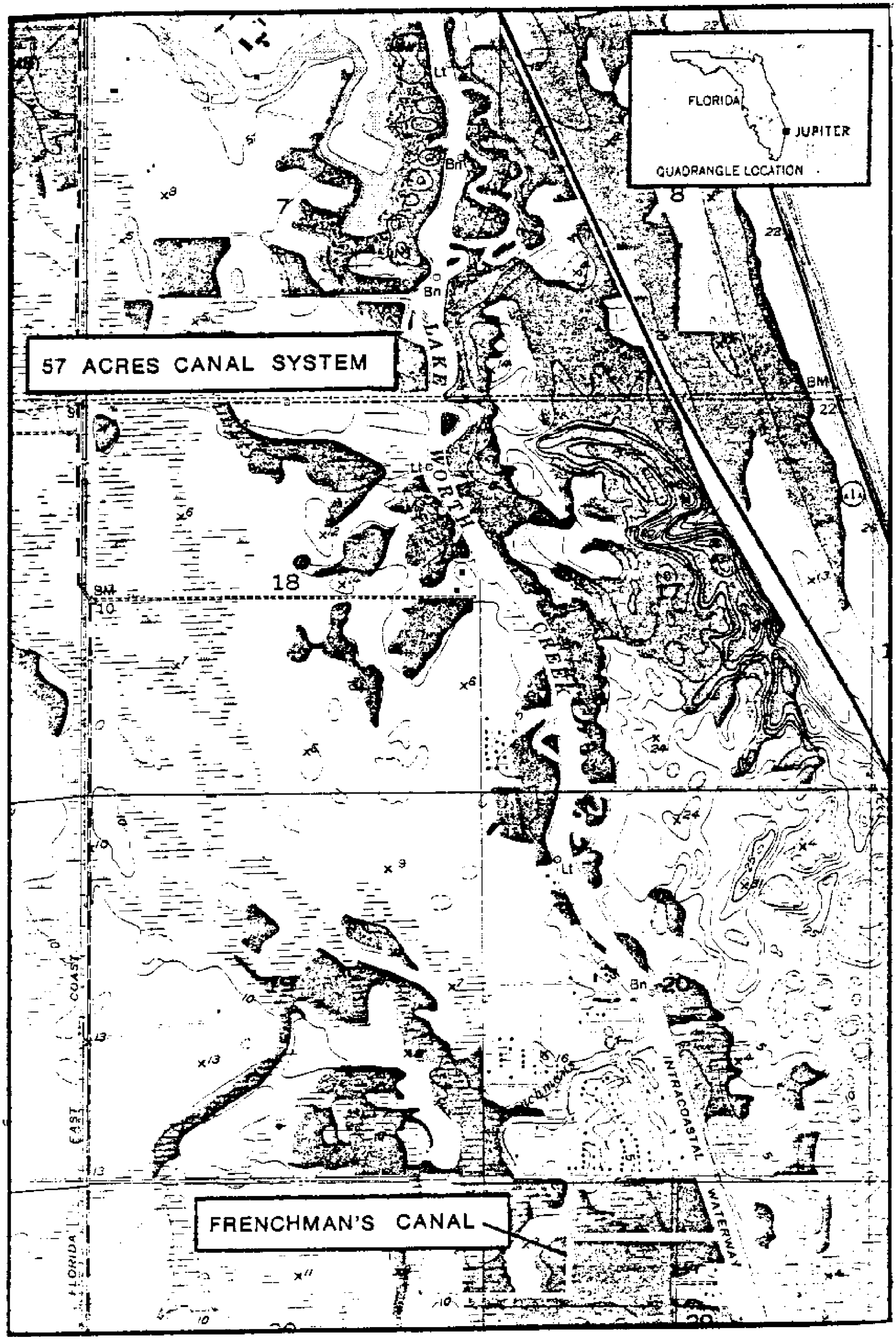



Figure B.1 - Location Map and Topography of 57 Acres Project Site.

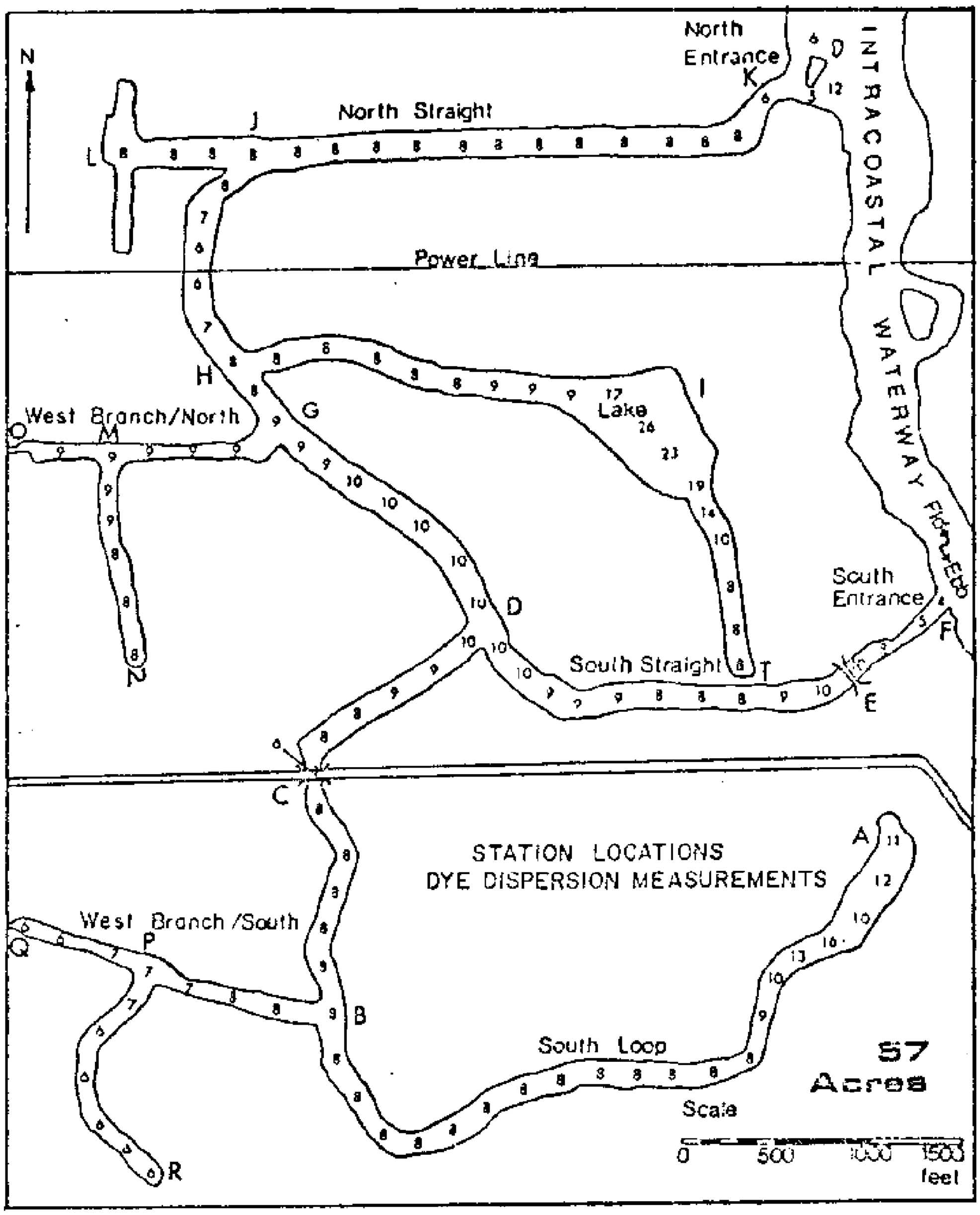



Figure B.2 - 57 Acres Site Plan Showing Bathymetry and Locations Used to Designate Reaches for Dye Dispersion Measurements.

Table B.1 - Lengths, Widths, and Mid-tide Depths of Canals in 57 Acres Network.

| REACH | L | B | $d_o$ |
|---|---|---|---|
| AZ | 1000 | 180 | 11.6 |
| ZB | 3430 | 100 | 8.0 |
| BP | 870 | 120 | 8.0 |
| PQ | 730 | 100 | 6.5 |
| PR | 1370 | 90 | 6.2 |
| BD | 2625 | 110 | 8.4 |
| DY | 2040 | 120 | 9.0 |
| YF | 600 | 95 | 7.0 |
| DG | 1545 | 120 | 10.0 |
| GM | 830 | 95 | 9.0 |
| MD | 430 | 90 | 9.0 |
| MN | 800 | 70 | 8.5 |
| GH | 365 | 115 | 8.5 |
| HI | 1630 | 110 | 8.0 |
| I | 950 | 340 | 19.0 |
| IT | 970 | 100 | 9.6 |
| HJ | 1265 | 125 | 7.0 |
| JL | 670 | 125 | 8.0 |
| JK | 2760 | 125 | 8.0 |

B.2

First Dispersion Study

July 18-22, 1977

# FIRST DISPERSION STUDY

57 Acres Project
July 18-22, 1977

Objective:

The first dispersion study was intended primarily as a test of the feasibility and utility of a centerline dye concentration measurement throughout the canal network over several tidal cycles.

Tide Records:

| LOW TIDE | | HIGH TIDE | |
|---|---|---|---|
| Date | Time | Date | Time |
| 770719 | 1830 | 770720 | 0030 |
| 770720 | 0630 | | 1230 |
| | 1935 | 770721 | 0105 |
| 770721 | 0715 | | 1335 |
| | 1935 | 770722 | 0145 |
| 770722 | 0755 | | 1405 |

Current Meters:

None

Dye Injection: Time: 770720 0040

1500 ml Rhodamine WT 20% solution released as point source about 400 ft. from dead-end of south loop, station A. Total weight of dye was calculated to be 0.78 lb. Dye was released at surface from a bottle and mixed with paddle. There was no wind.

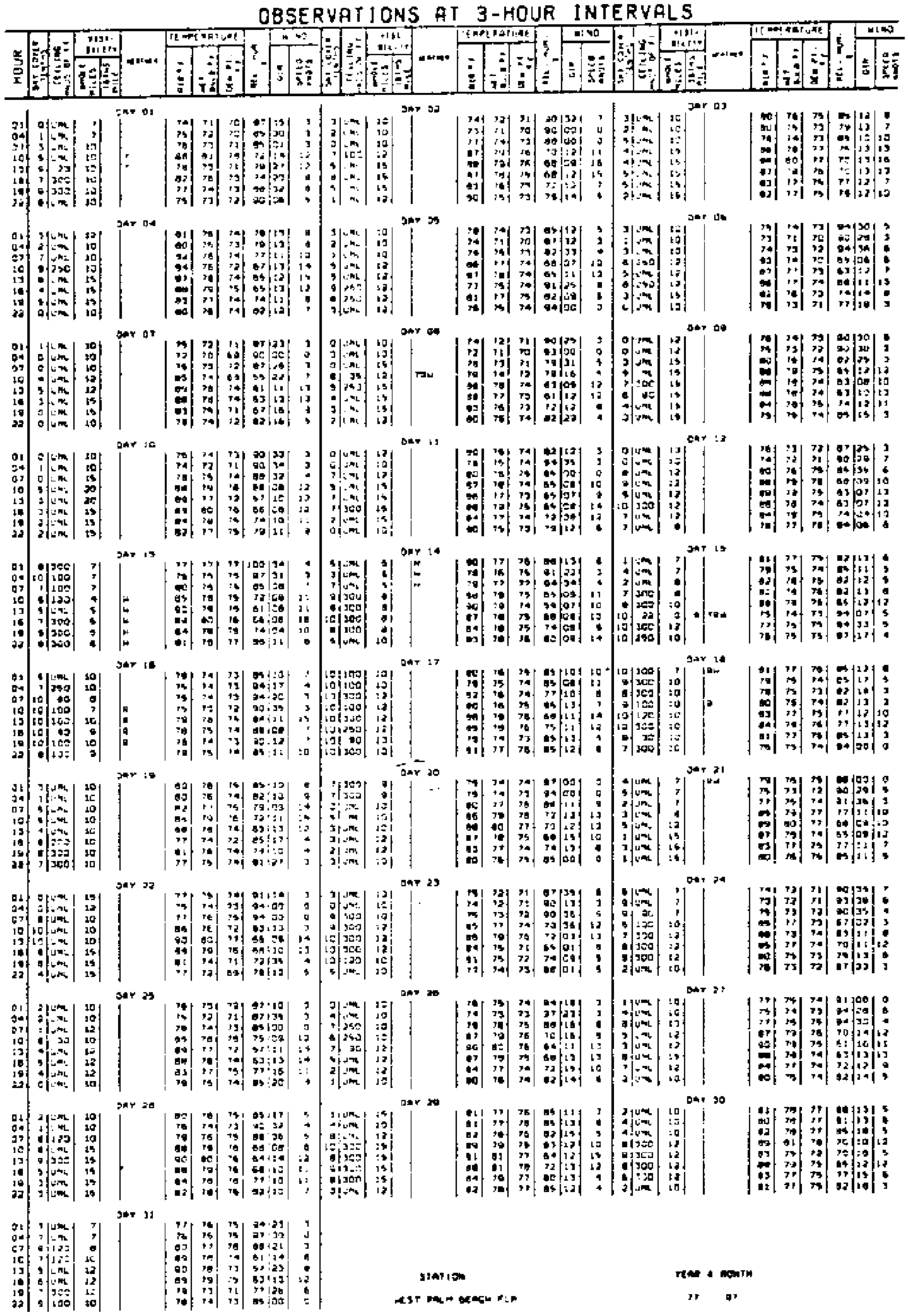
Dye sampling runs:

| HIGH TIDE Start Time | | Peak (ppb) |
|---|---|---|
| 770720 | 1347 | 140 |
| 770721 | 0005 | 105 |
| | 1335 | (Missed) |
| 770722 | 0222 | 52 |
| | 1402 | 45 |

| LOW TIDE Start Time | | Peak (ppb) |
|---|---|---|
| 770720 | 1940 | 135 |
| 770721 | 0809 | 105 |
| | 1933 | 42 |
| 770722 | 0807 | 50 |

Sampling Depth:

3 ft


OBSERVATIONS AT 3-HOUR INTERVALS

[illegible]

NOTES

CEILING
UNL INDICATES UNLIMITED

WEATHER

| | |
|---|---|
| + | TORNADO |
| T | THUNDERSTORM |
| Q | SQUALL |
| R | RAIN |
| RW | RAIN SHOWERS |
| ZR | FREEZING RAIN |
| L | DRIZZLE |
| ZL | FREEZING DRIZZLE |
| S | SNOW |
| SP | SNOW PELLETS |
| IC | ICE CRYSTALS |
| SW | SNOW SHOWERS |
| SG | SNOW GRAINS |
| IP | ICE PELLETS |
| A | HAIL |
| F | FOG |
| IF | ICE FOG |
| GF | GROUND FOG |
| BD | BLOWING DUST |
| BN | BLOWING SAND |
| BS | BLOWING SNOW |
| BY | BLOWING SPRAY |
| K | SMOKE |
| H | HAZE |
| D | DUST |

WIND

DIRECTIONS ARE THOSE FROM WHICH THE WIND BLOWS, INDICATED IN TENS OF DEGREES FROM TRUE NORTH; I.E., 09 FOR EAST, 18 FOR SOUTH, 27 FOR WEST. ENTRY OF 00 IN THE DIRECTION COLUMN INDICATES CALM.

SPEED IS EXPRESSED IN KNOTS; MULTIPLY BY 1.15 TO CONVERT TO MILES PER HOUR.

STATION
WEST PALM BEACH FLA

YEAR & MONTH
77 07

U.S. DEPARTMENT OF COMMERCE
NATIONAL CLIMATIC CENTER
FEDERAL BUILDING
ASHEVILLE, N.C. 28801

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U.S. DEPARTMENT OF COMMERCE
COM-210

Figure B.3 - Climatological Three-hourly Observations for July, 1977.

B.2.1

# FIRST DISPERSION STUDY

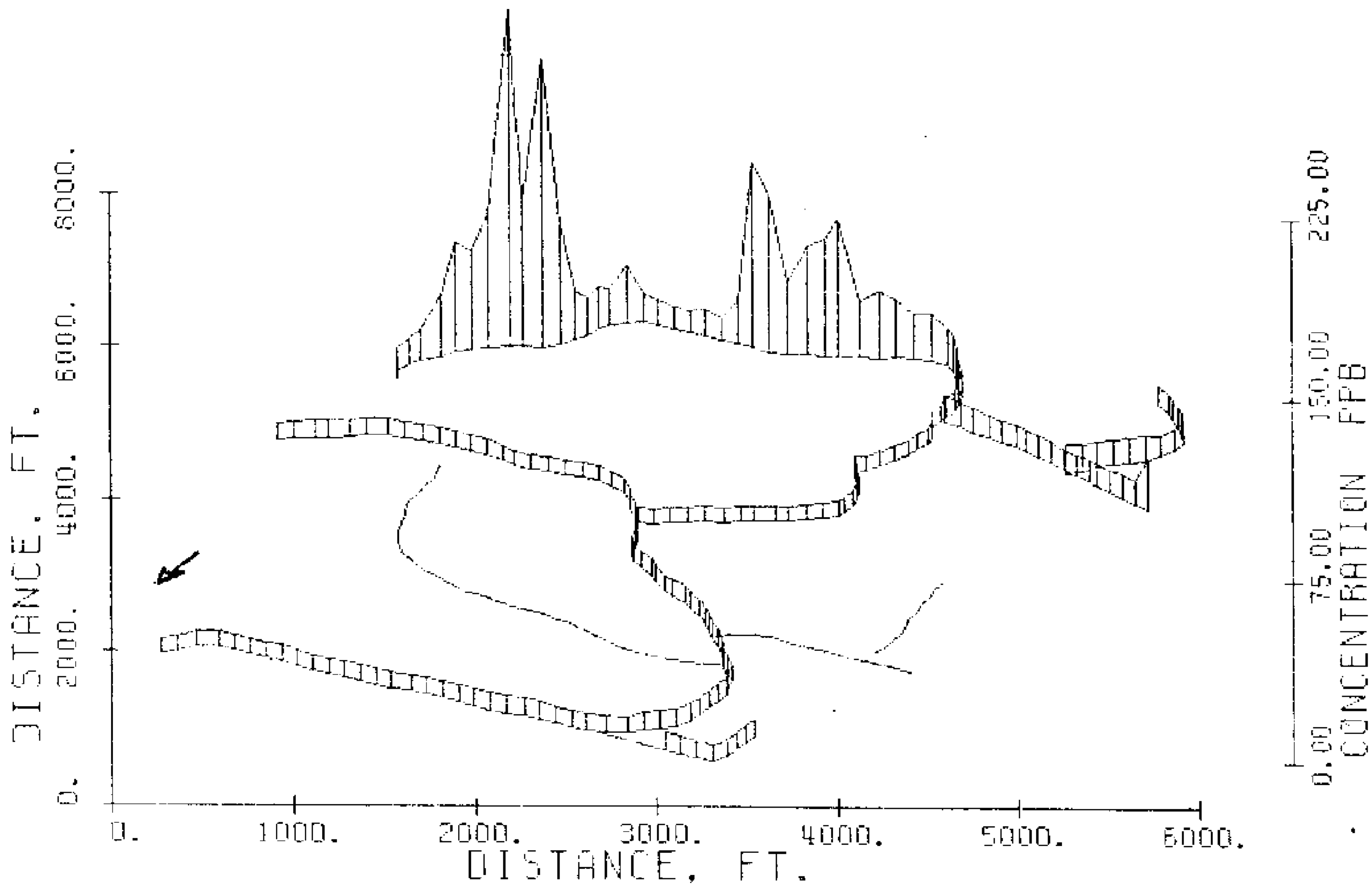
## 57 ACRES

July 19 through 23 1977

## THREE-DIMENSIONAL MEASURED DYE CONCENTRATION PLOTS

This section contains plotted results as follows:

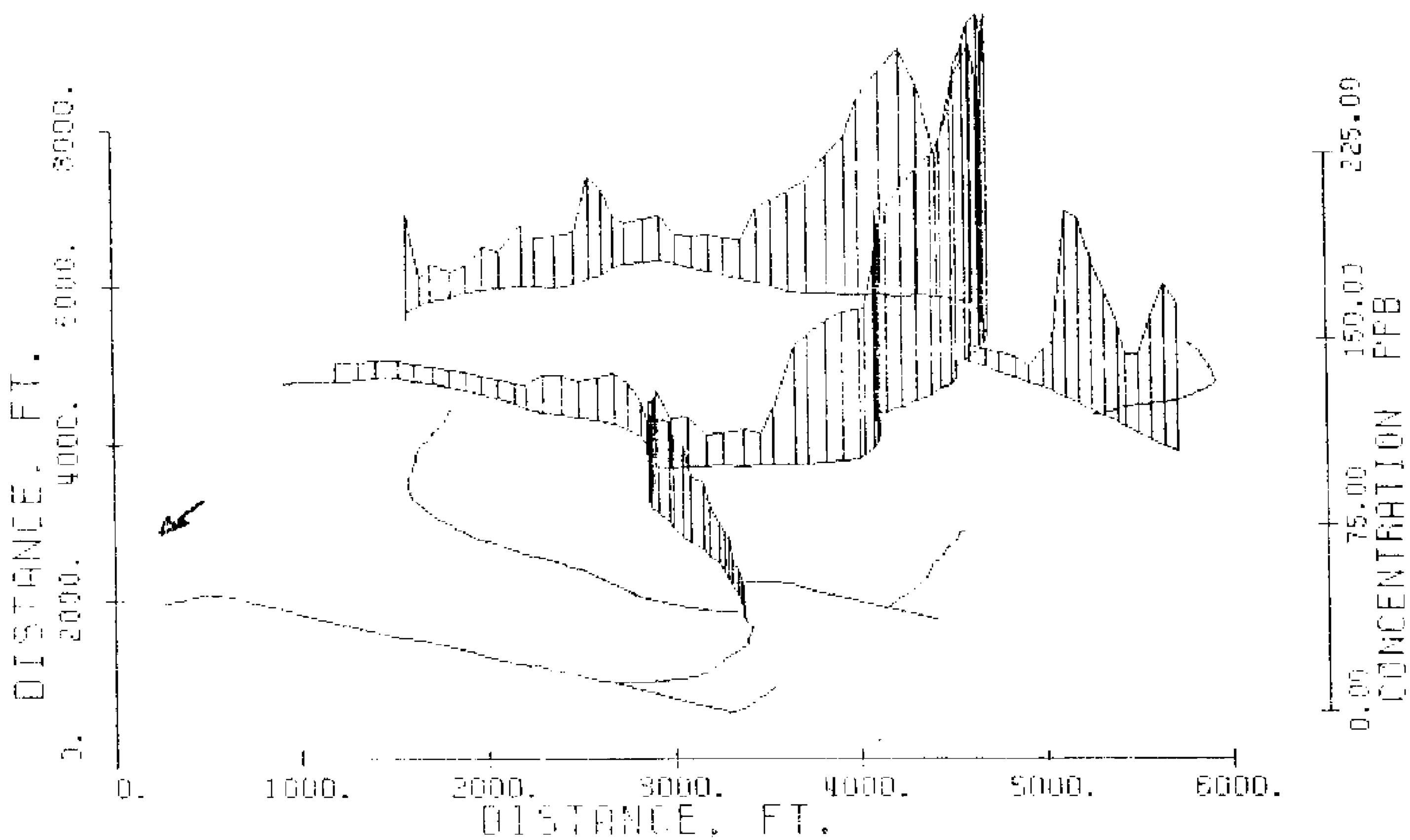
| DATE | TIDE | TIME |
|---|---|---|
| 770720 | High | 1230 |
| 770720 | Low | 1935 |
| 770721 | High | 0105 |
| 770721 | Low | 0715 |
| 770721 | High | 1325 |
| 770721 | Low | 1935 |
| 770722 | High | 0145 |
| 770722 | Low | 0755 |
| 770722 | High | 1405 |




MEASURED DYE CONCENTRATION AT 3 FT DEPTH ALONG CENTERLINE

57 ACRES CANAL SYSTEM, PALM BEACH COUNTY, FLORIDA

DATE: 770720. TIDE: HIGH. TIME: 1230. PEAK: 140 PPB

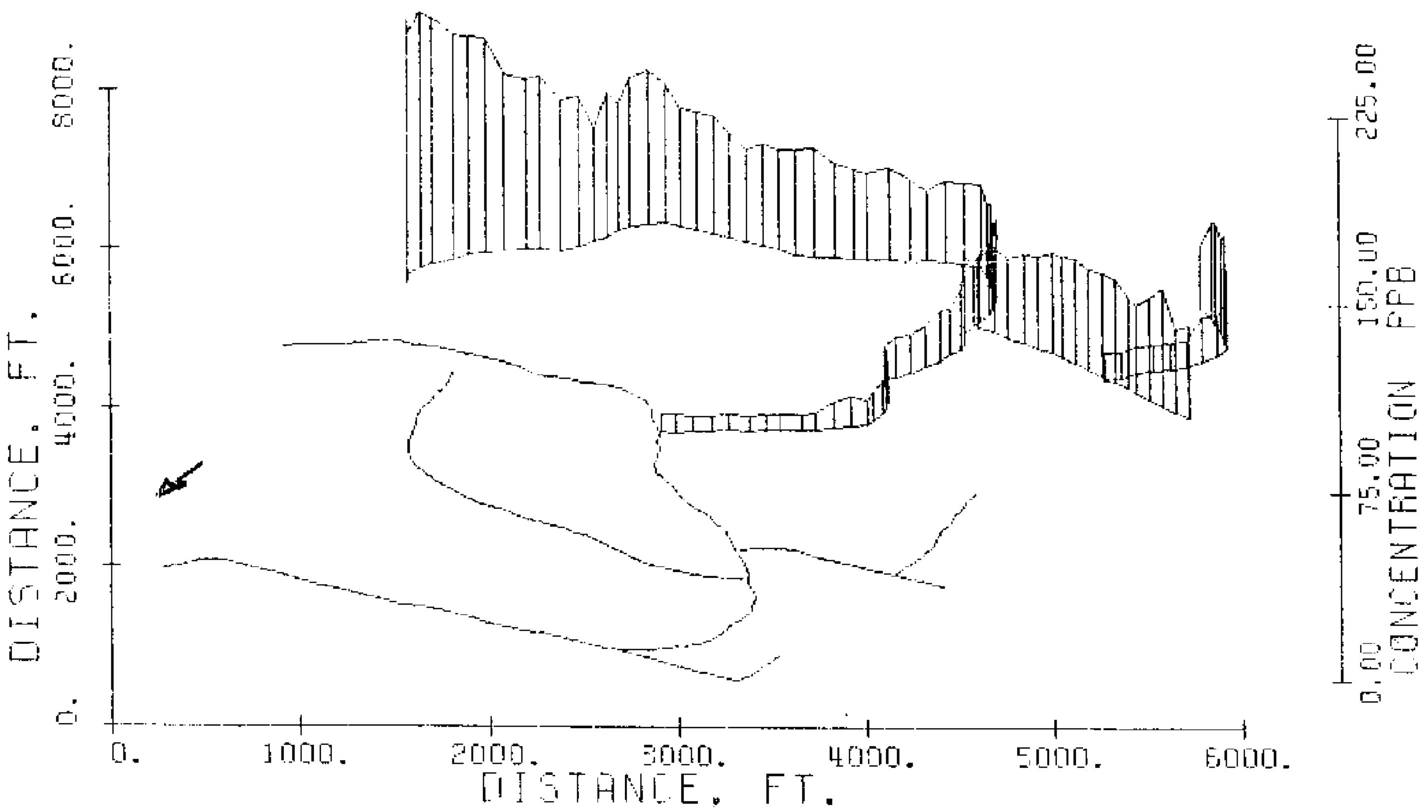



MEASURED DYE CONCENTRATION AT 3 FT DEPTH ALONG CENTERLINE

57 ACRES CANAL SYSTEM, PALM BEACH COUNTY, FLORIDA

DATE: 770720, TIDE: LOW, TIME: 1935, PEAK: 135 PPB

AZIMUTH= 210 DEGREES ELEVATION= 25 DEGREES

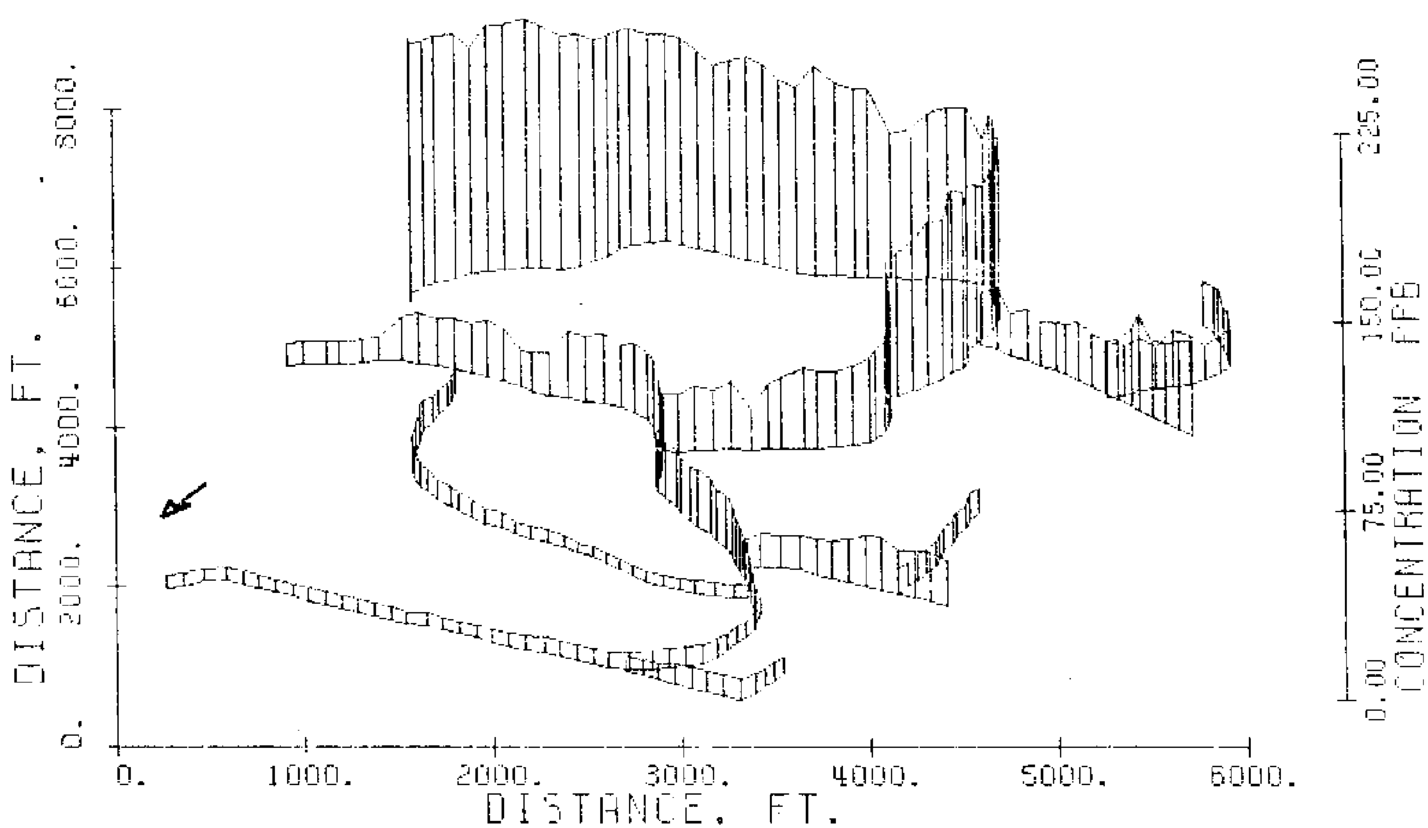



MEASURED DYE CONCENTRATION AT 3 FT DEPTH ALONG CENTERLINE

57 ACRES CANAL SYSTEM, PALM BEACH COUNTY, FLORIDA

DATE: 770721, TIDE: HIGH, TIME: 0105, PEAK: 105 PPB

AZIMUTH= 210 DEGREES ELEVATION= 25 DEGREES

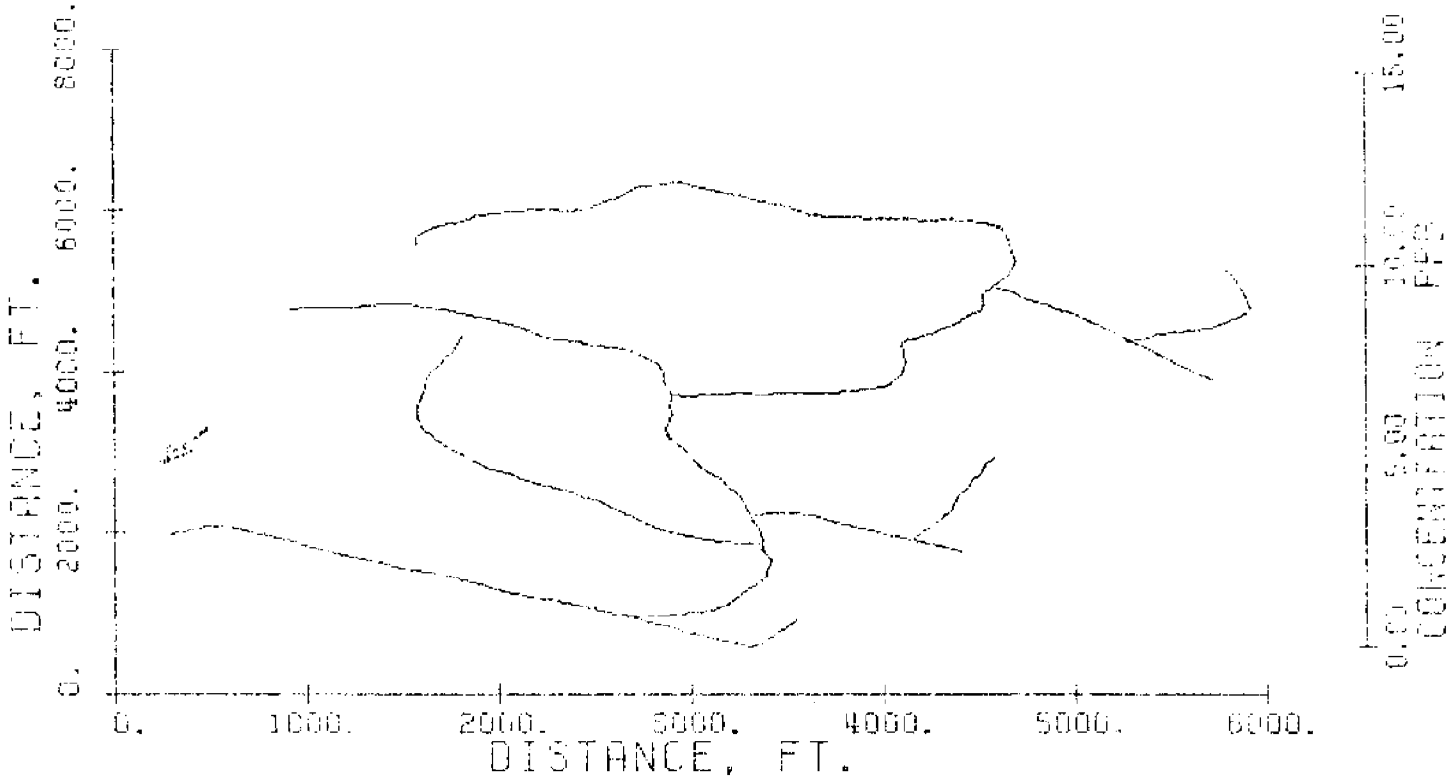



MEASURED DYE CONCENTRATION AT 3 FT DEPTH ALONG CENTERLINE

57 ACRES CANAL SYSTEM, PALM BEACH COUNTY, FLORIDA

DATE: 770721. TIDE: LOW. TIME: 0715. PEAK: 105 PPB

AZIMUTH= 210 DEGREES ELEVATION= 25 DEGREES

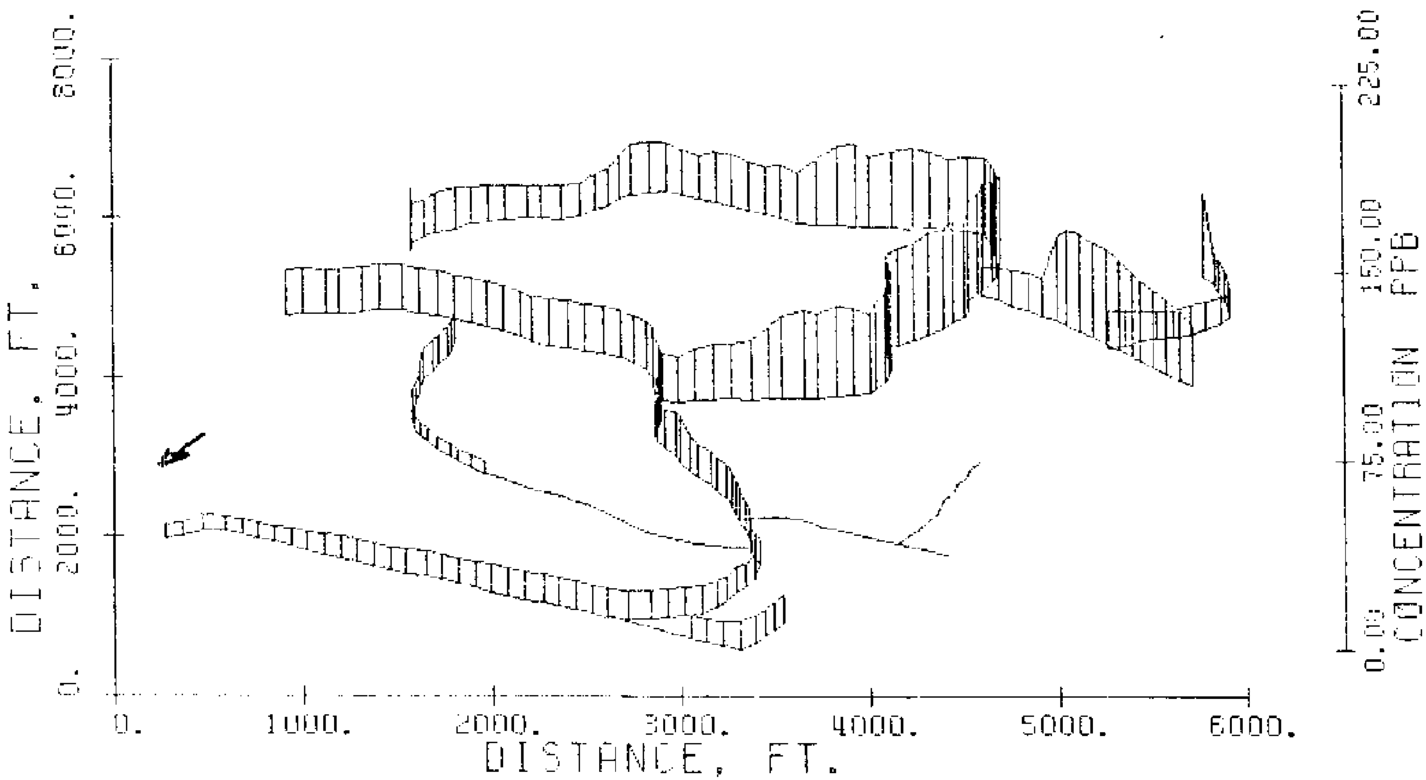



MEASURED DYE CONCENTRATION AT 3 FT DEPTH ALONG CENTERLINE

57 ACRES CANAL SYSTEM, PALM BEACH COUNTY, FLORIDA

DATE: 770721. TIDE: HIGH. TIME: 1325. PEAK: NO DATA

AZIMUTH- 210 DEGREES ELEVATION- 25 DEGREES

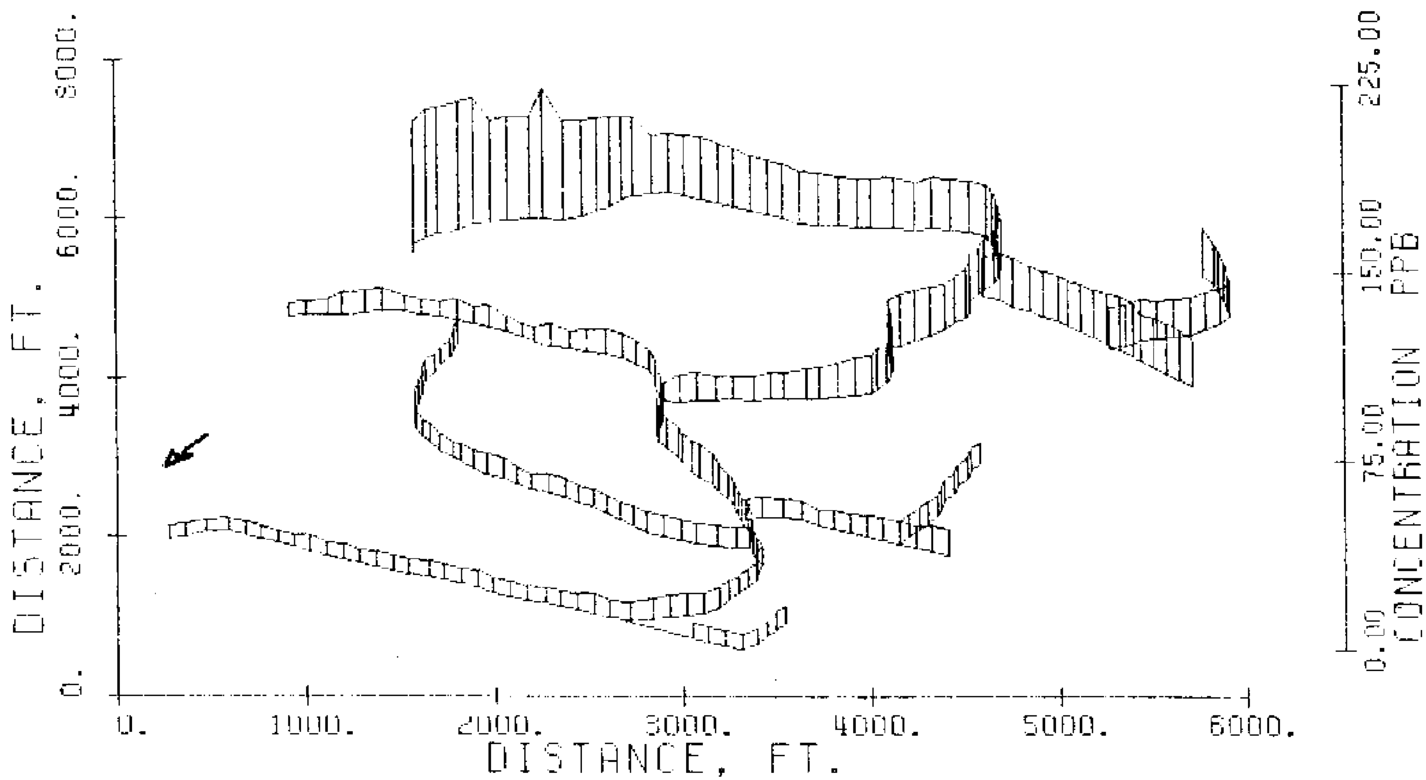



MEASURED DYE CONCENTRATION AT 3 FT DEPTH ALONG CENTERLINE

57 ACRES CANAL SYSTEM, PALM BEACH COUNTY, FLORIDA

DATE: 770721, TIDE: LOW, TIME: 1935, PEAK: 42 PPB

AZIMUTH= 210 DEGREES ELEVATION= 25 DEGREES

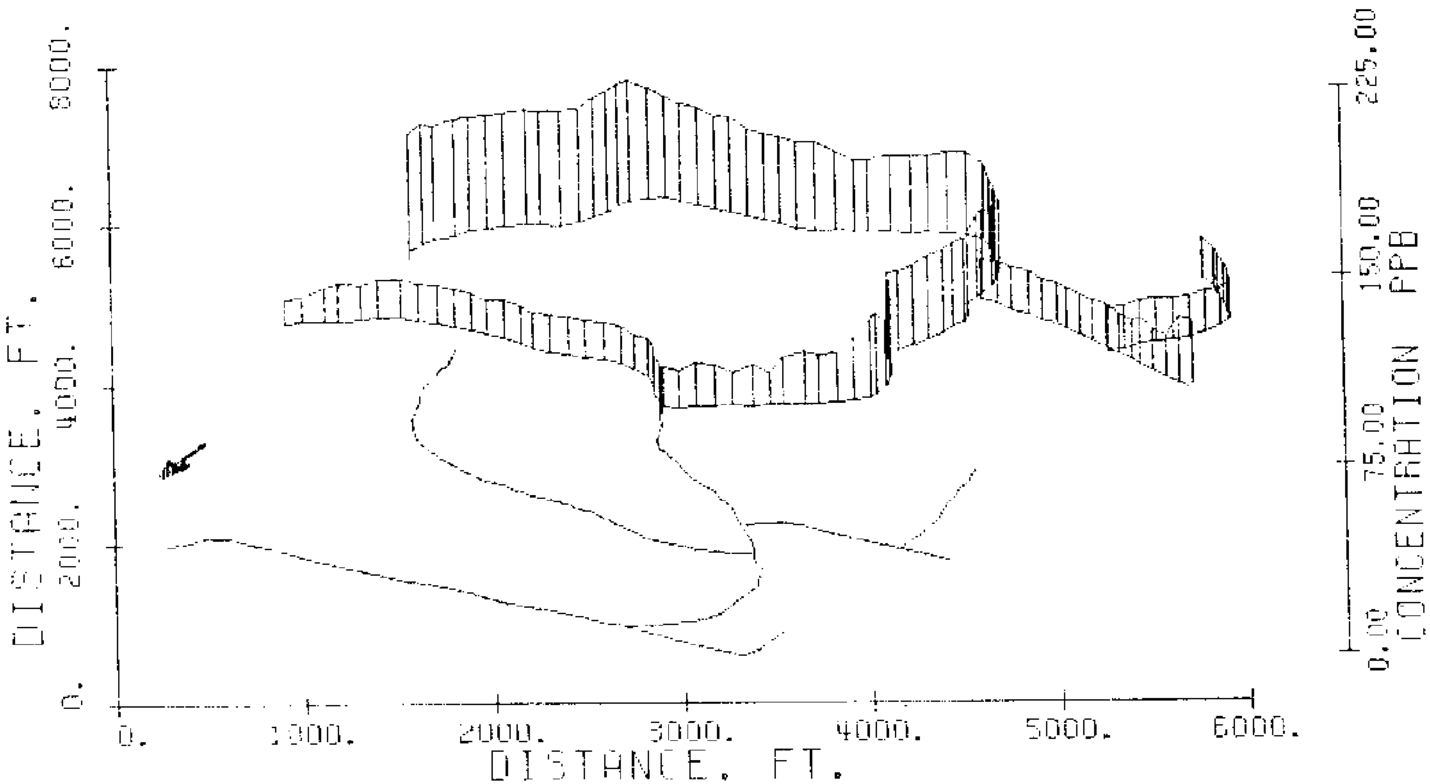



MEASURED DYE CONCENTRATION AT 3 FT DEPTH ALONG CENTERLINE

57 ACRES CANAL SYSTEM, PALM BEACH COUNTY, FLORIDA

DATE: 770722. TIDE: HIGH. TIME: 0145. PEAK: 52 PPB

AZIMUTH= 210 DEGREES ELEVATION= 25 DEGREES

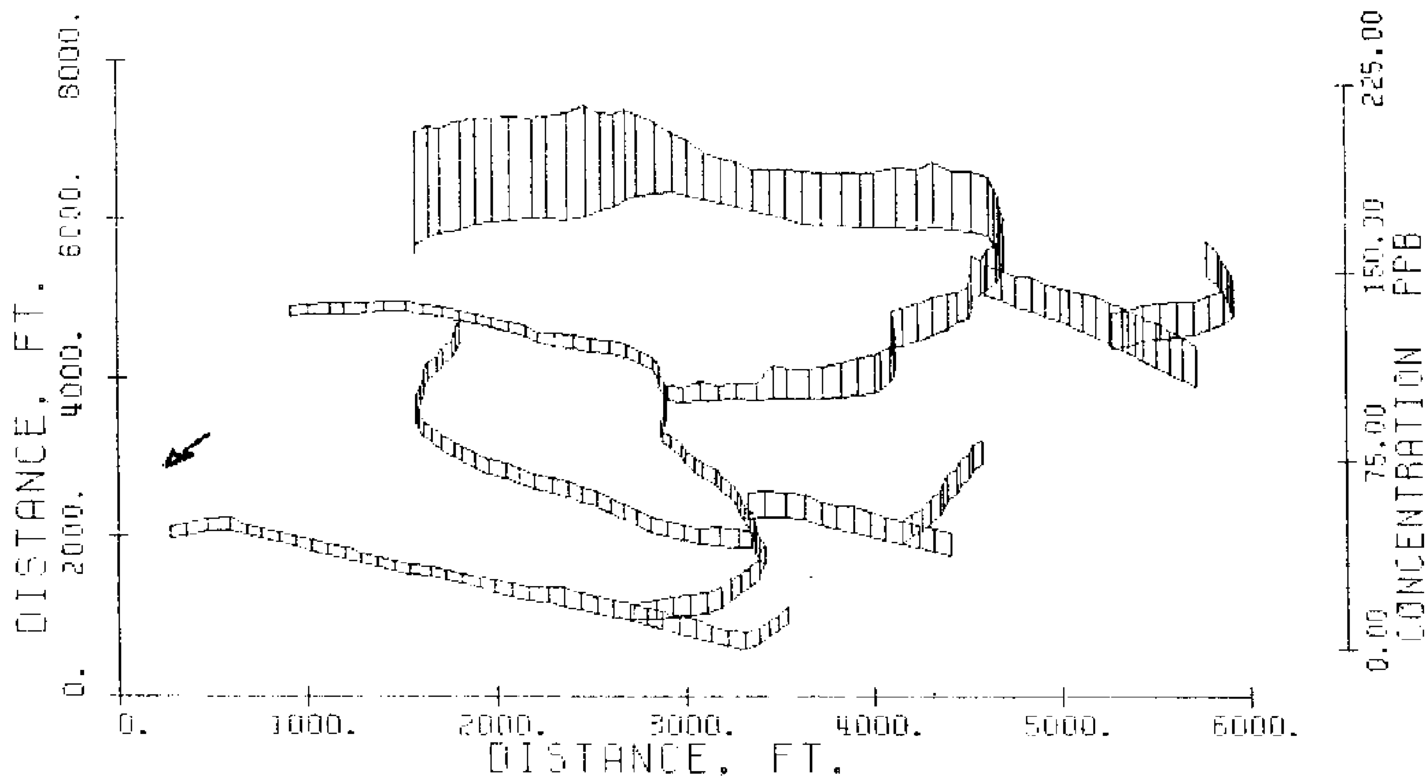



MEASURED DYE CONCENTRATION AT 3 FT DEPTH ALONG CENTERLINE

57 ACRES CANAL SYSTEM, PALM BEACH COUNTY, FLORIDA

DATE: 770722, TIDE: LOW, TIME: 0755, PEAK: 50 PPB

AZIMUTH= 210 DEGREES ELEVATION= 25 DEGREES




MEASURED DYE CONCENTRATION AT 3 FT DEPTH ALONG CENTERLINE

57 ACRES CANAL SYSTEM, PALM BEACH COUNTY, FLORIDA

DATE: 770722. TIDE: HIGH. TIME: 1405. PEAK: 45 PPB

AZIMUTH= 210 DEGREES ELEVATION= 25 DEGREES

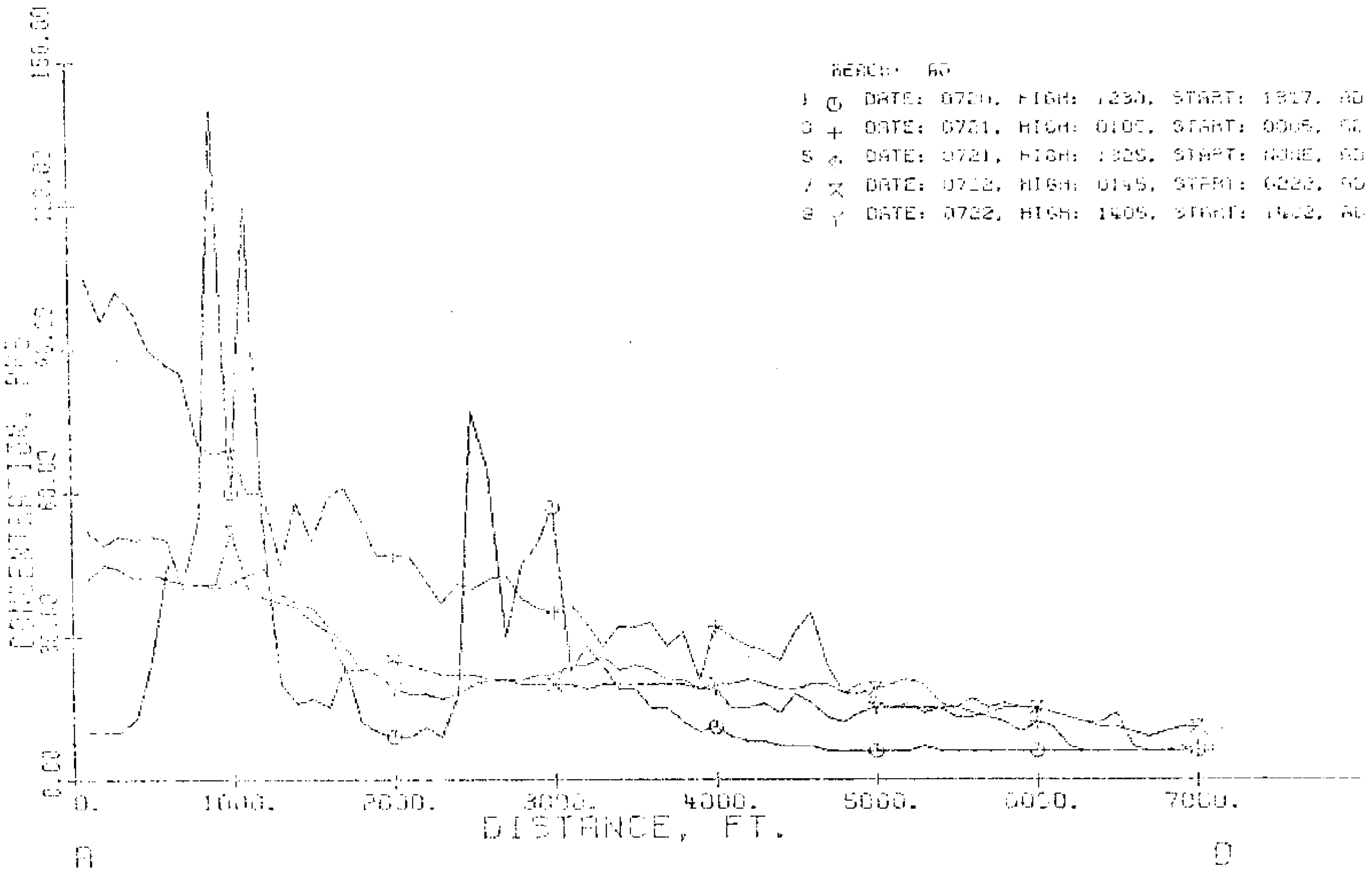
B.2.2

# FIRST DISPERSION STUDY

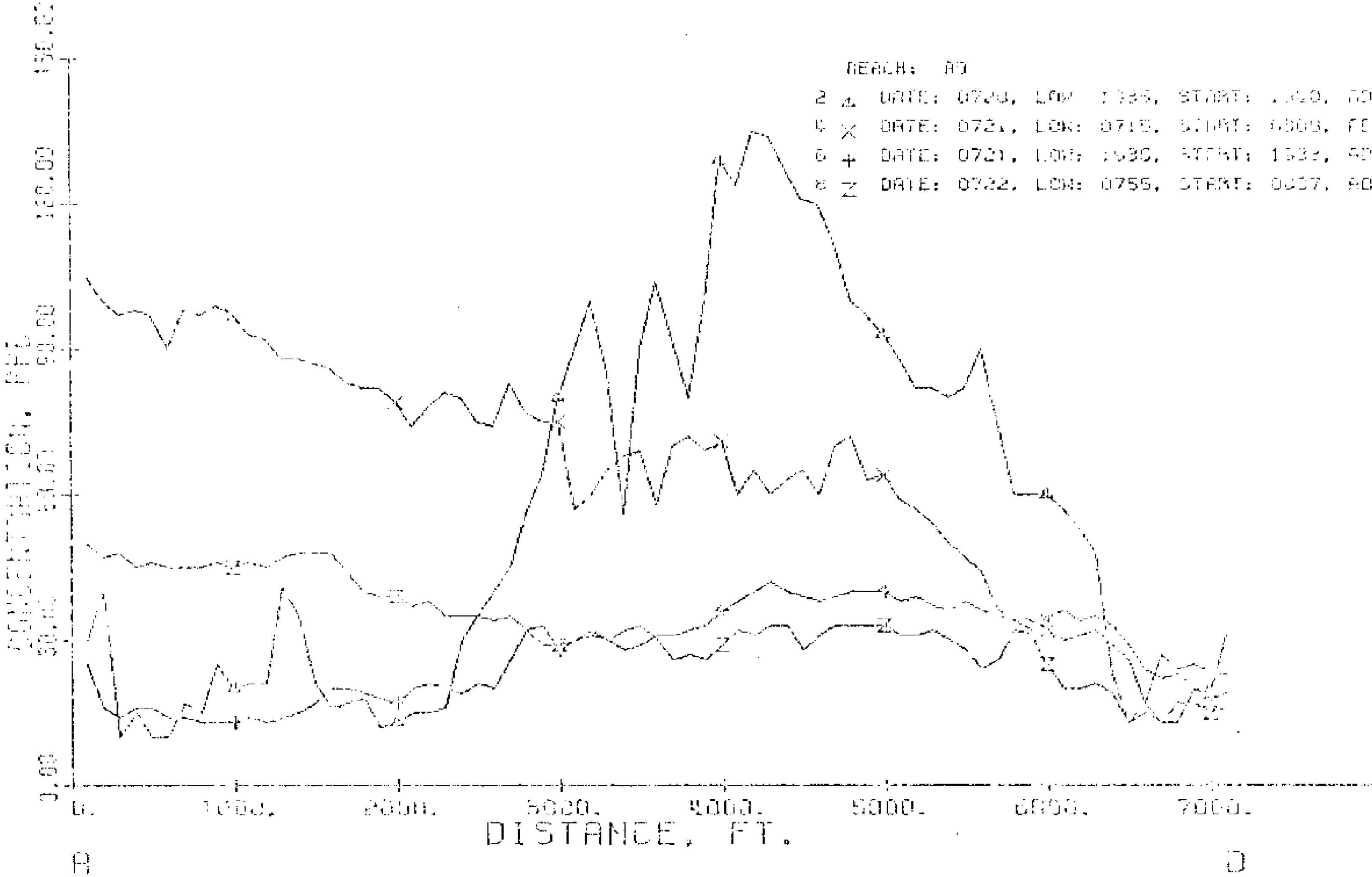
## TWO-DIMENSIONAL MEASURED DYE CONCENTRATION PLOTS

This section contains plotted results as follows:

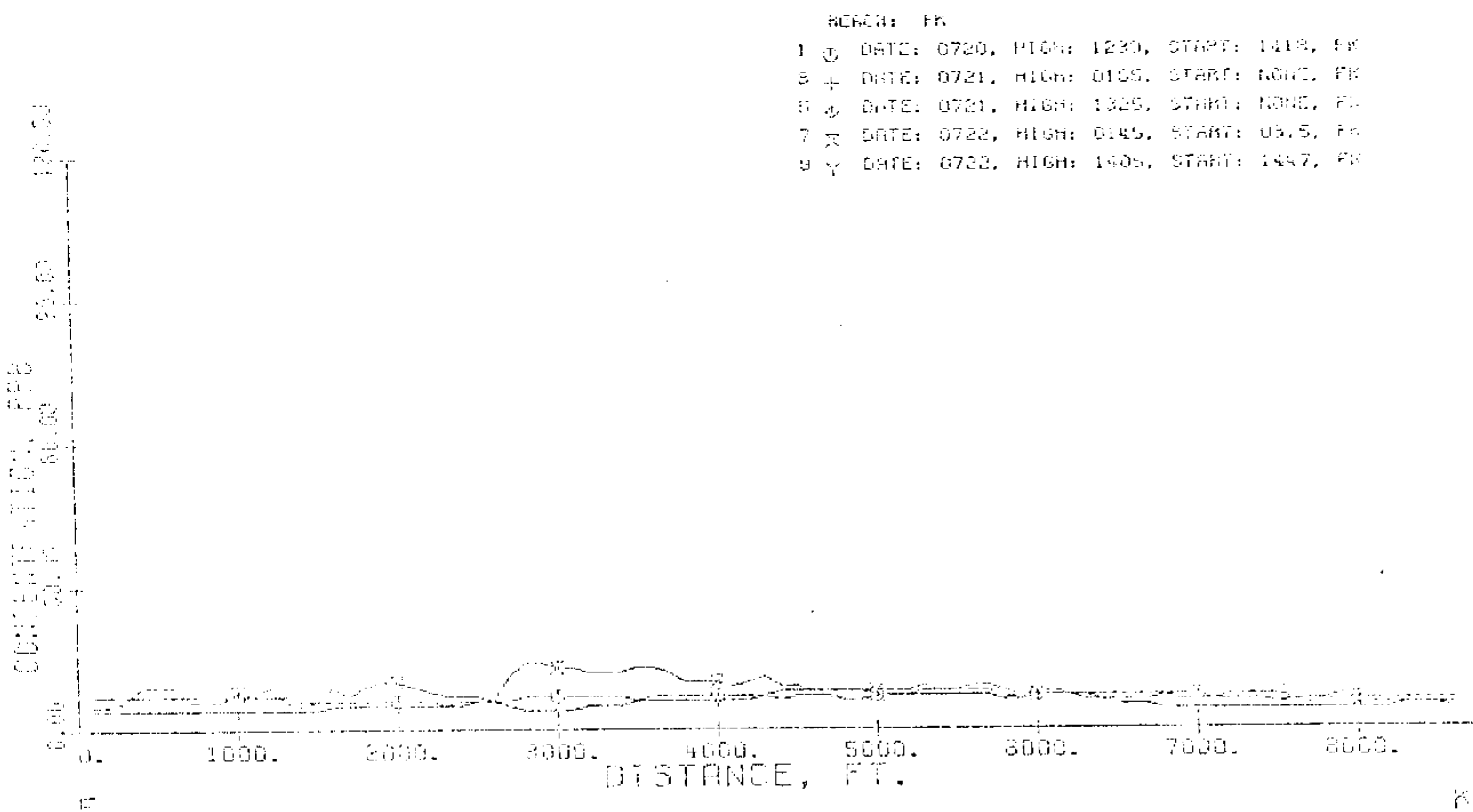
| REACH | TIDE |
|---|---|
| AD | High |
| AD | Low |
| FK | High |
| FK | Low |
| LJ | High and Low |
| TH | High and Low |
| NM | High and Low |
| OG | High and Low |
| RP | High and Low |
| QB | High and Low |



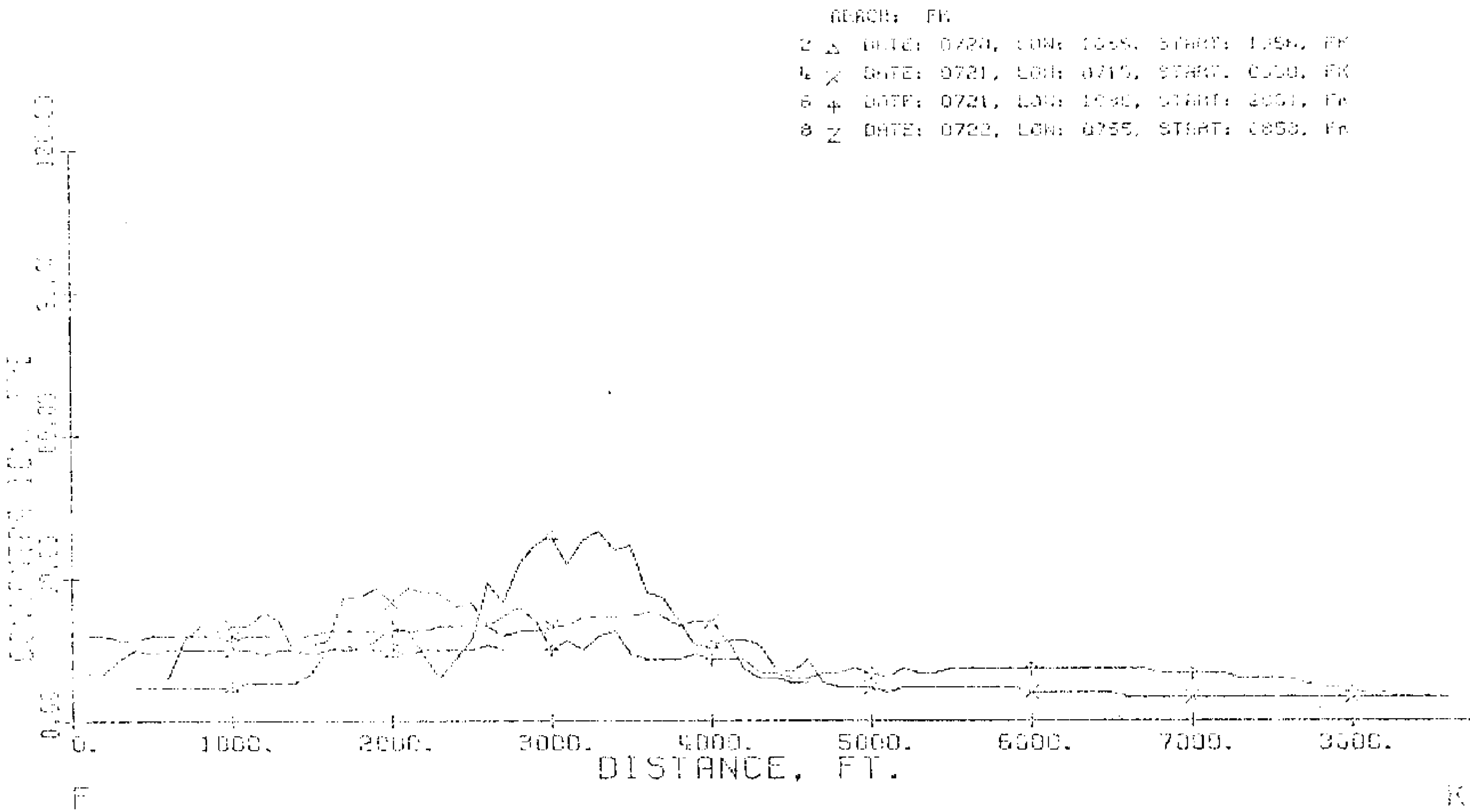

MEASURED DYE CONCENTRATION AT 3 FT DEPTH ALONG CENTERLINE
57 ACRES CANAL SYSTEM, PALM BEACH COUNTY, FLORIDA, JULY 1977



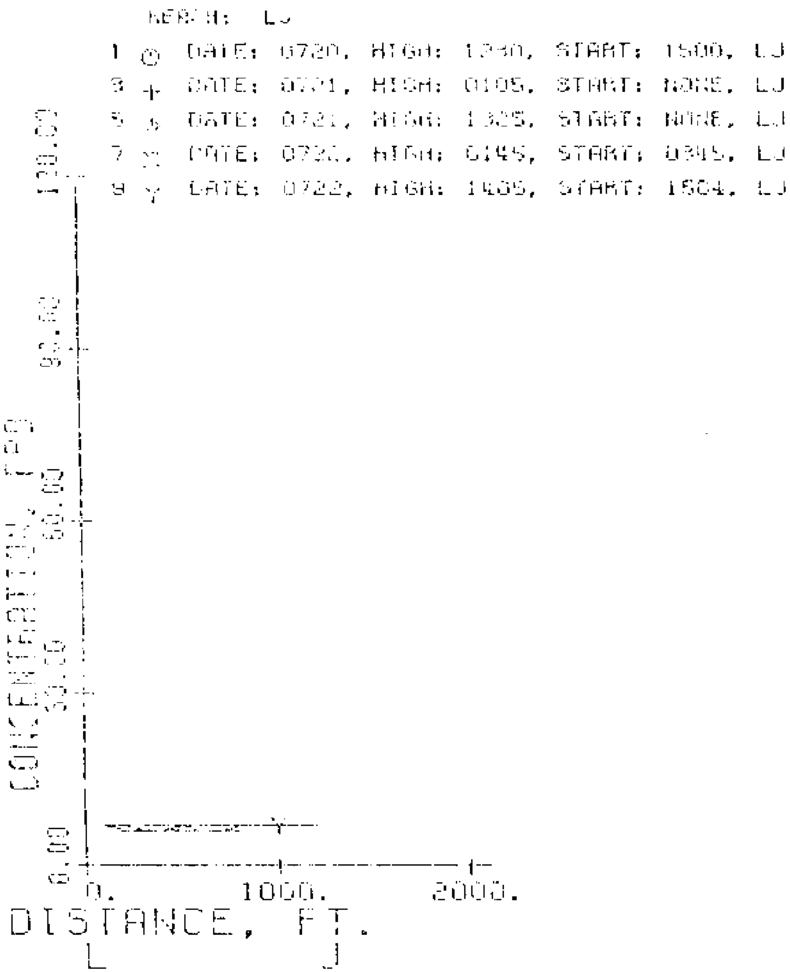

MEASURED DYE CONCENTRATION AT 3 FT DEPTH ALONG CENTERLINE
57 ACRES CANAL SYSTEM, PALM BEACH COUNTY, FLORIDA, JULY 1977

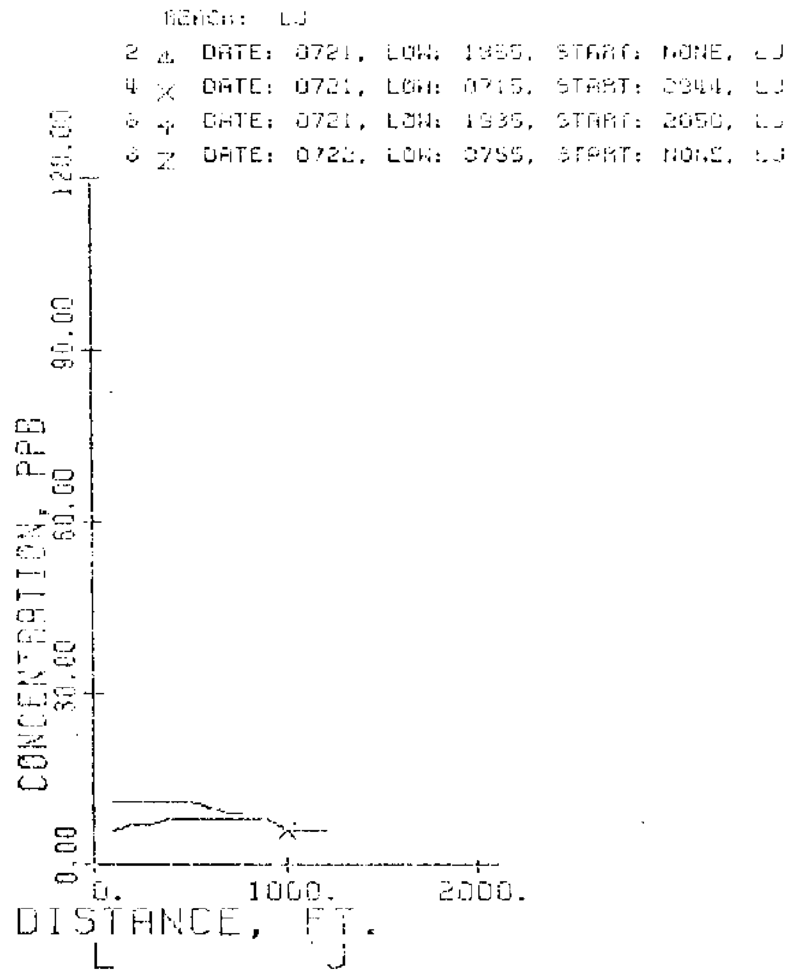



MEASURED D.O. CONCENTRATION AT 3 FT DEPTH ALONG CENTERLINE
OF [illegible] CANAL SYSTEM, PALM BEACH COUNTY, FLORIDA, JULY 1977

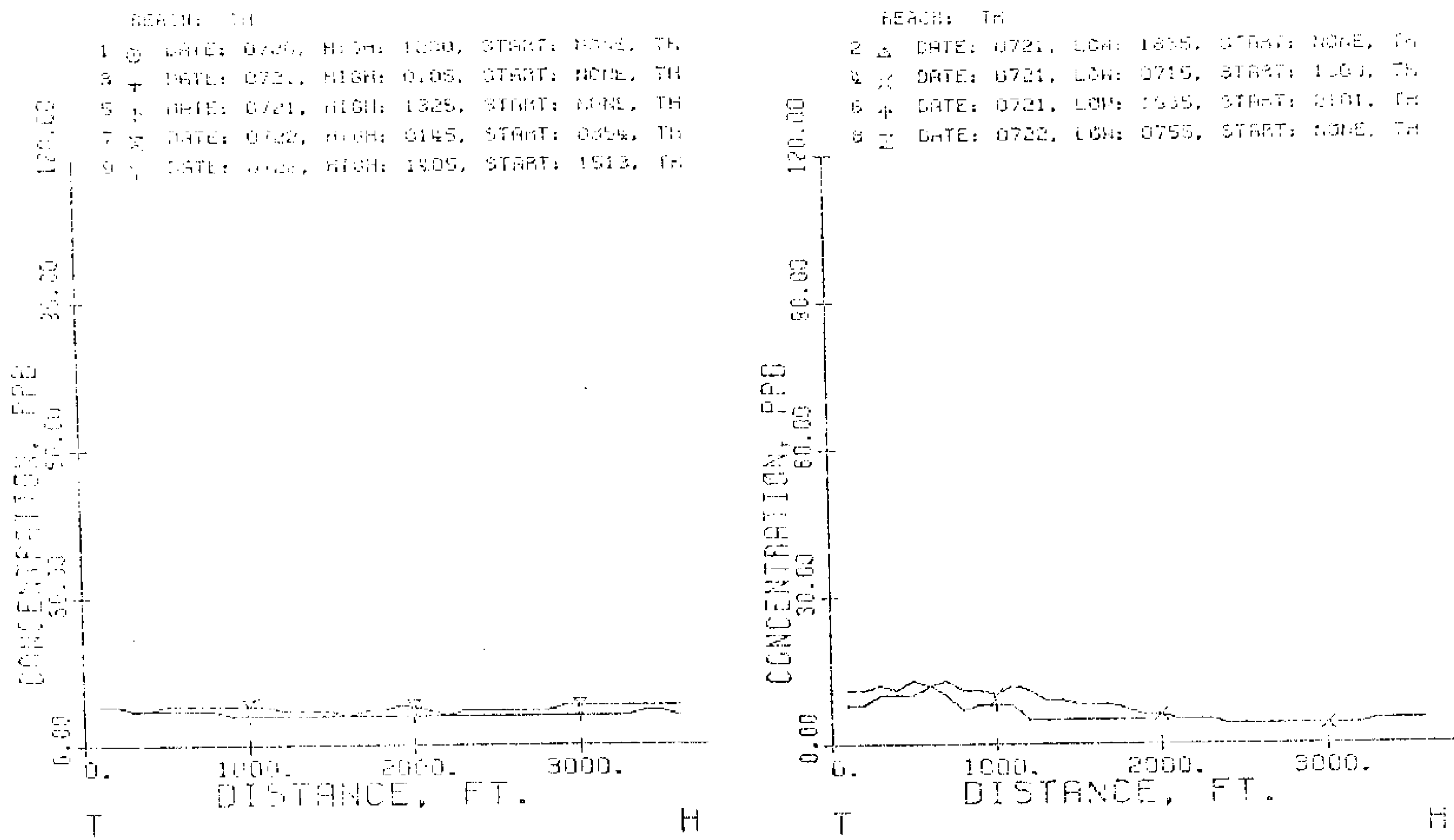



MEASURED DYE CONCENTRATION AT 3 FT DEPTH ALONG CENTERLINE
57 ACRES CANAL SYSTEM, PALM BEACH COUNTY, FLORIDA, JULY 1977

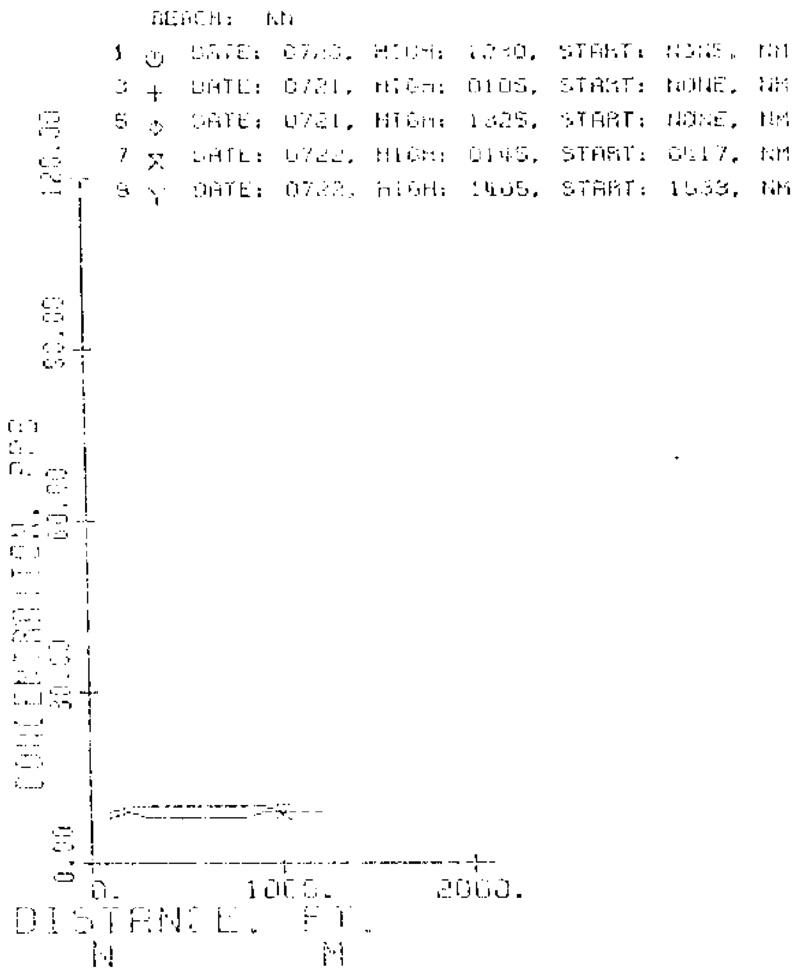


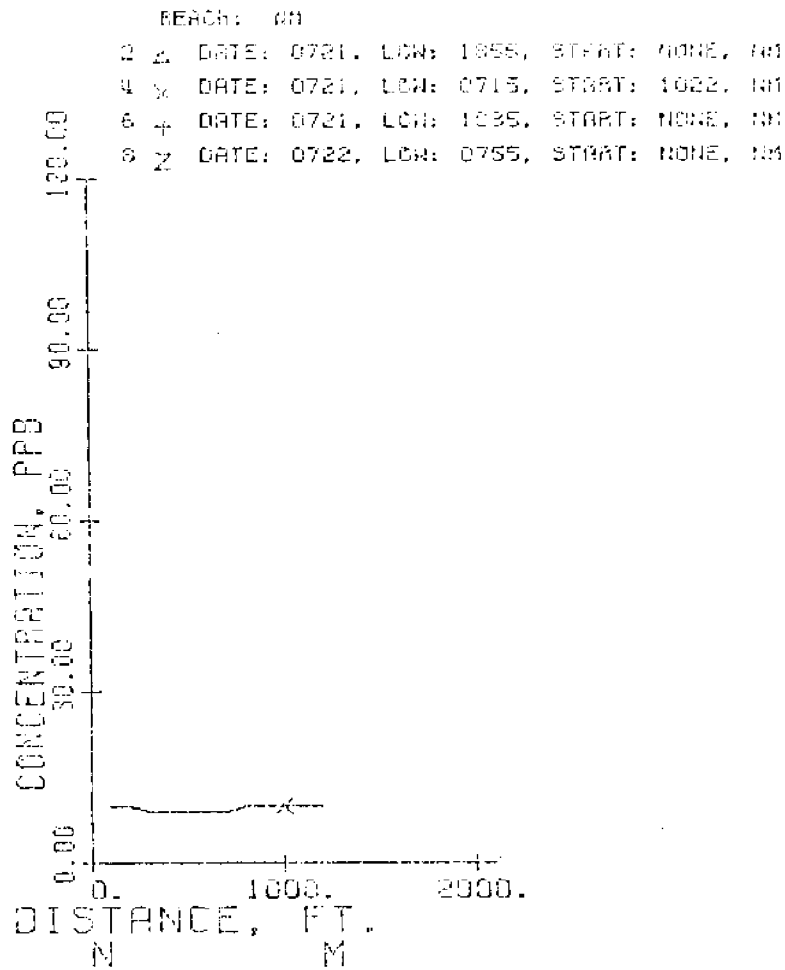




MEASURED DYE CONCENTRATION AT 3 FT DEPTH ALONG CENTERLINE
97 ACRES CANAL SYSTEM, PALM BEACH COUNTY, FLORIDA, JULY 1977

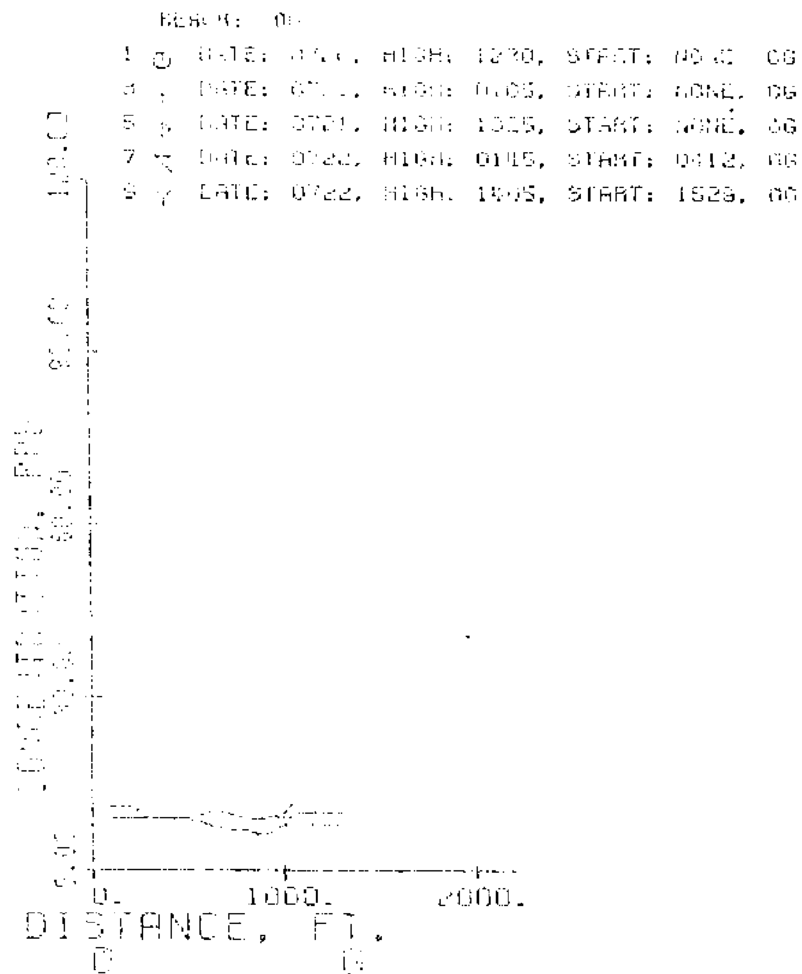


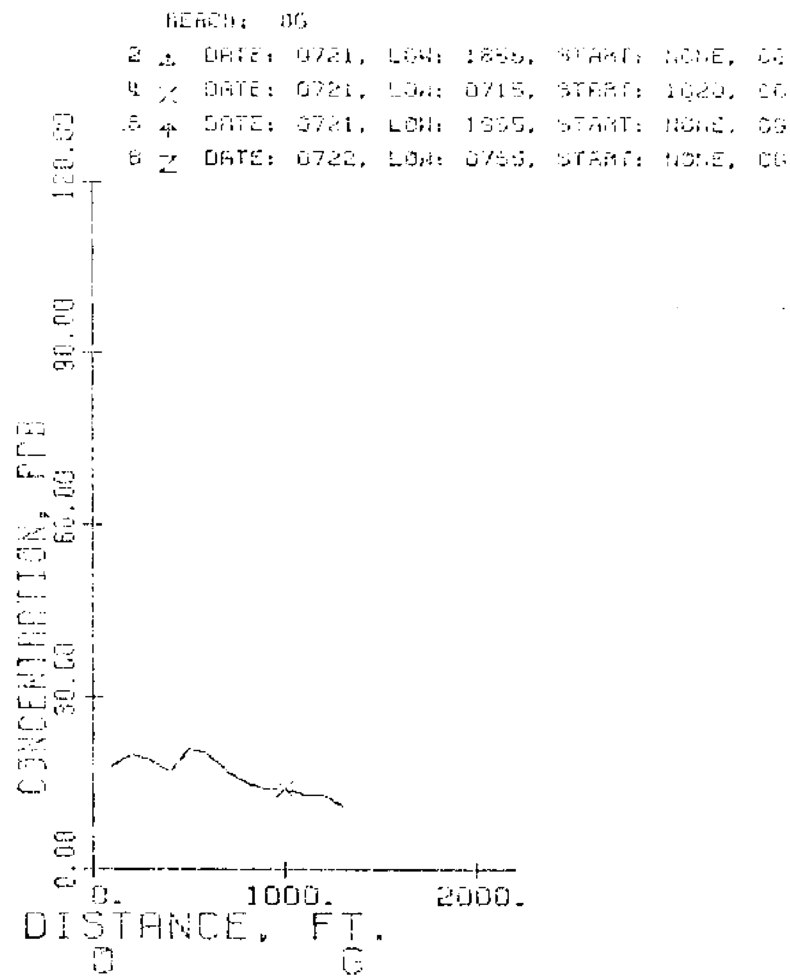

MEASURED D.F CONCENTRATION AT 3 FT DEPTH ALONG CENTERLINE
57 ACRES CANAL SYSTEM, PALM BEACH COUNTY, FLORIDA, JULY 1977



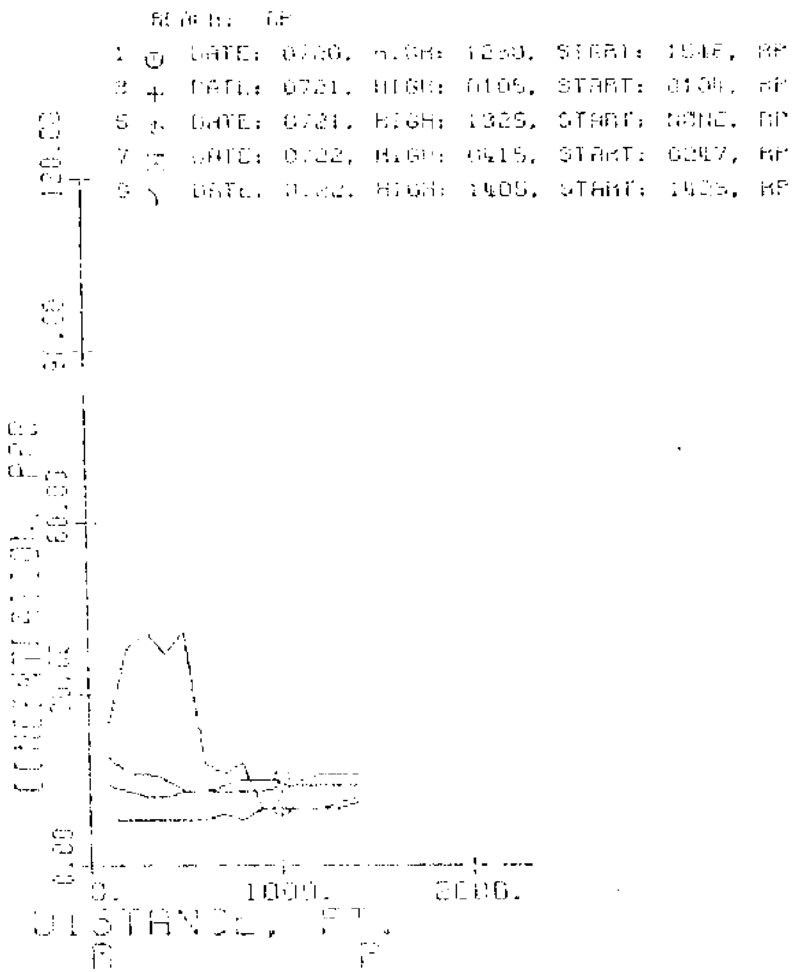



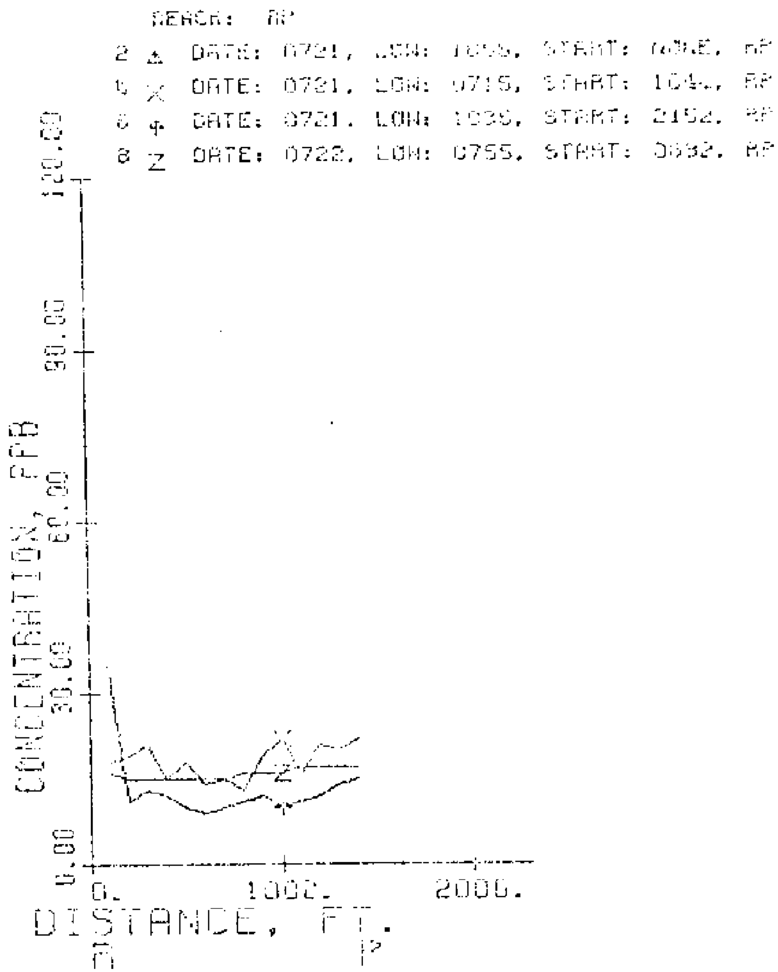

MEASURED DYE CONCENTRATION AT 3 FT DEPTH ALONG CENTERLINE
57 ACRES CANAL SYSTEM, PALM BEACH COUNTY, FLORIDA, JULY 1977



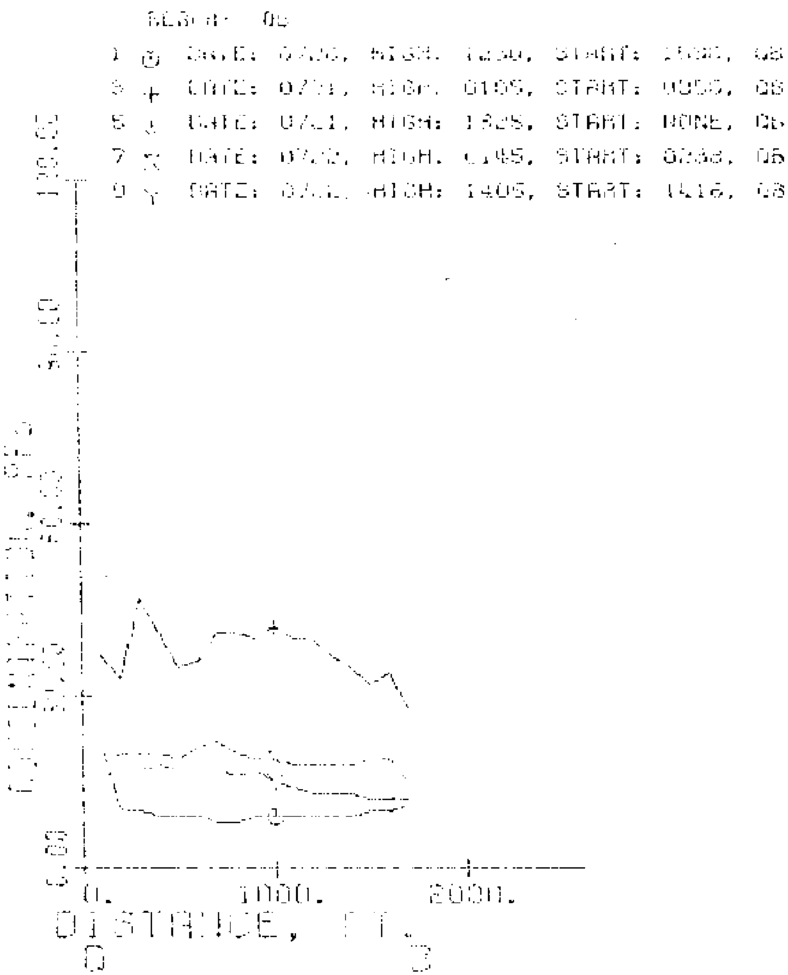



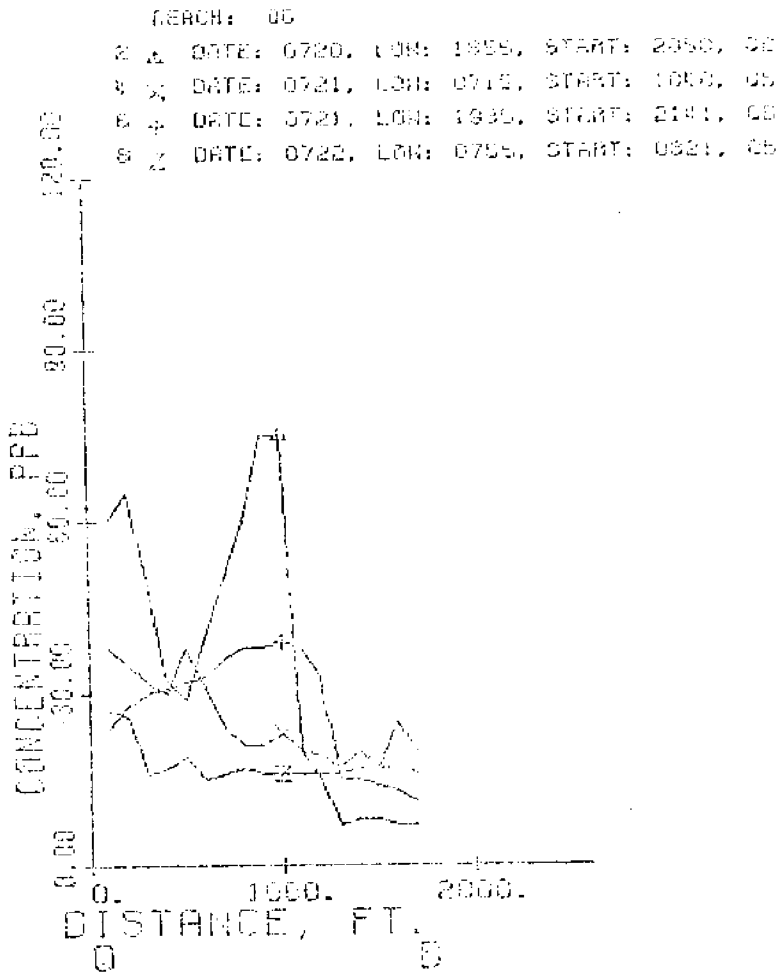

CONCENTRATION AT 3 FT DEPTH ALONG CENTERLINE
CANAL SYSTEM, PALM BEACH COUNTY, FLORIDA, JULY 1977




NEARSHORE DYE CONCENTRATION AT 3 FT DEPTH ALONG CENTERLINE
CANAL SYSTEM, PALM BEACH COUNTY, FLORIDA, JULY 1977




MEASURED DYE CONCENTRATION AT 3 FT DEPTH ALONG CENTERLINE
57 ACRES CANAL SYSTEM, PALM BEACH COUNTY, FLORIDA, JULY 1977

B.3

Second Dispersion Study

October 16-22, 1977

# SECOND DISPERSION STUDY

57 Acres Project
October 16-22, 1977

Objective:

The second dispersion study was intended primarily to obtain simultaneous measurements of tidal height, wind, water velocities, salinity, water temperature, and centerline dye concentration in order to relate dye dispersion to water circulation.

Tide Records:

| HIGH TIDE | | LOW TIDE | |
|---|---|---|---|
| Date | Time | Date | Time |
| 771019 | 1500 | 771019 | 2140 |
| 771020 | 0330 | 771020 | 0950 |
| | 1610 | | 2240 |
| 771021 | 0420 | 771021 | 1045 |

Current Meters:

Current meters were installed at stations 1, 2, and 3.

Dye Injection: Time: 771019 1500

1500 ml Rhodamine WT 20% solution released under pressure from a tank mixed with canal water at approximately 10-20 psi, through a 5/8 inch pvc pipe with three 1/4 inch holes spaced at one ft. intervals from end and capped. Dye released in 3 ft. surface layer on transect at tide gauge for approximately two minutes as boat was driven through dye cloud. Dye cloud was then mixed with compressed air and propeller for additional two minutes.

Dye sampling runs:

| LOW TIDE | | | HIGH TIDE | | |
|---|---|---|---|---|---|
| Start Time | | Peak (ppb) | Start Time | | Peak (ppb) |
| 771019 | 2210 | 10.0 | 771020 | 0401 | 5.4 |
| 771020 | 1102 | 5.7 | | 1641 | 2.9 |
| | 2308 | 5.3 | 771021 | 0428 | 2.2 |
| 771021 | 1139 | 3.0 | | | |

Sampling depth:

3 FT.

B.3.1

SECOND DISPERSION STUDY

57 ACRES

October 16 through 22 1977

THREE-DIMENSIONAL MEASURED DYE CONCENTRATION PLOTS

This section contains plotted results as follows:

| DATE | TIDE | TIME |
|---|---|---|
| 771019 | Low | 2140 |
| 771020 | High | 0330 |
| 771020 | Low | 0950 |
| 771020 | High | 1610 |
| 771020 | Low | 2240 |
| 771021 | High | 0420 |
| 771021 | Low | 1045 |

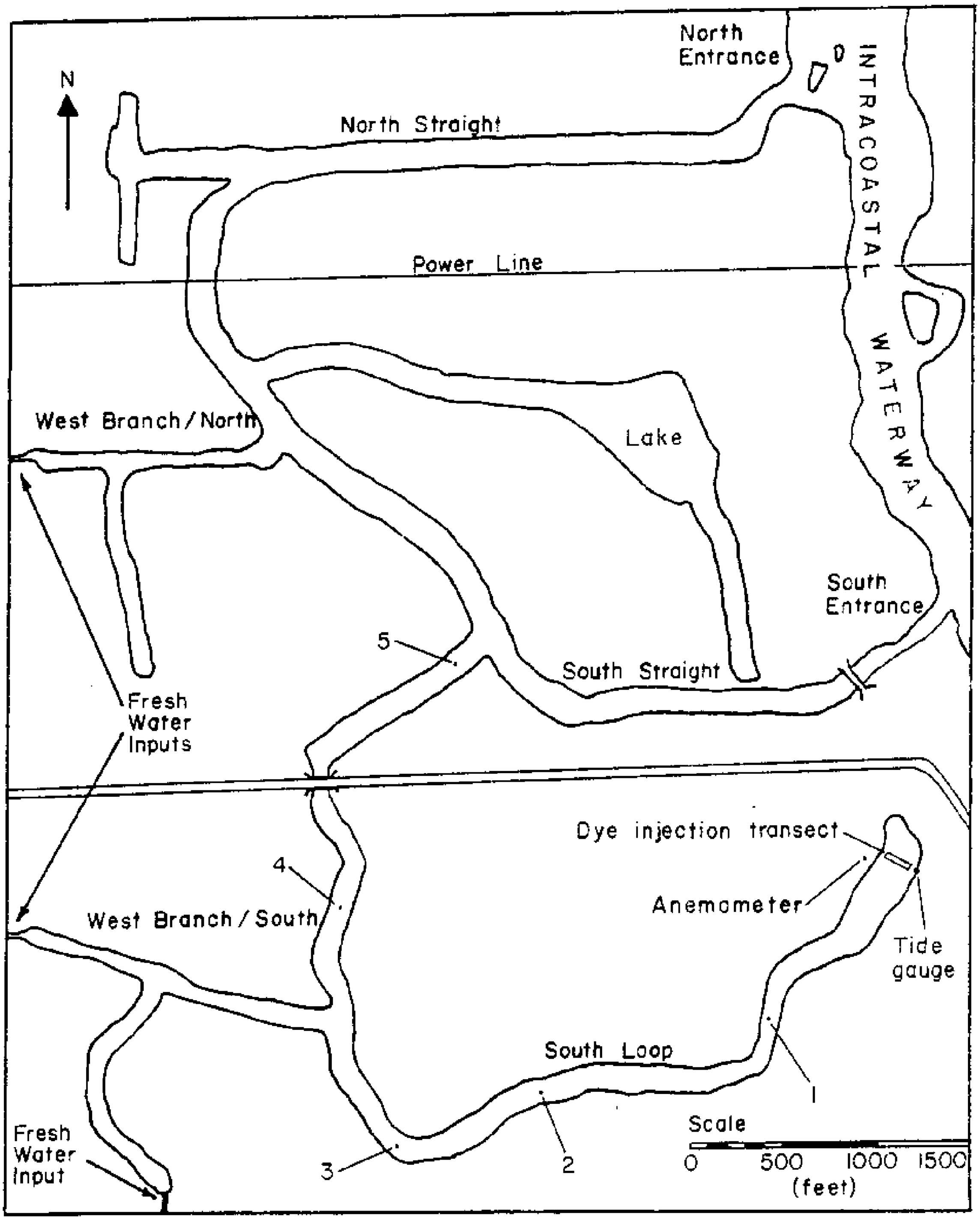



Figure B.4 - 57 Acres Site Plan Showing Location of Electromagnetic Current Meters for October 1977 Velocity, Salinity, and Water Temperature Measurements

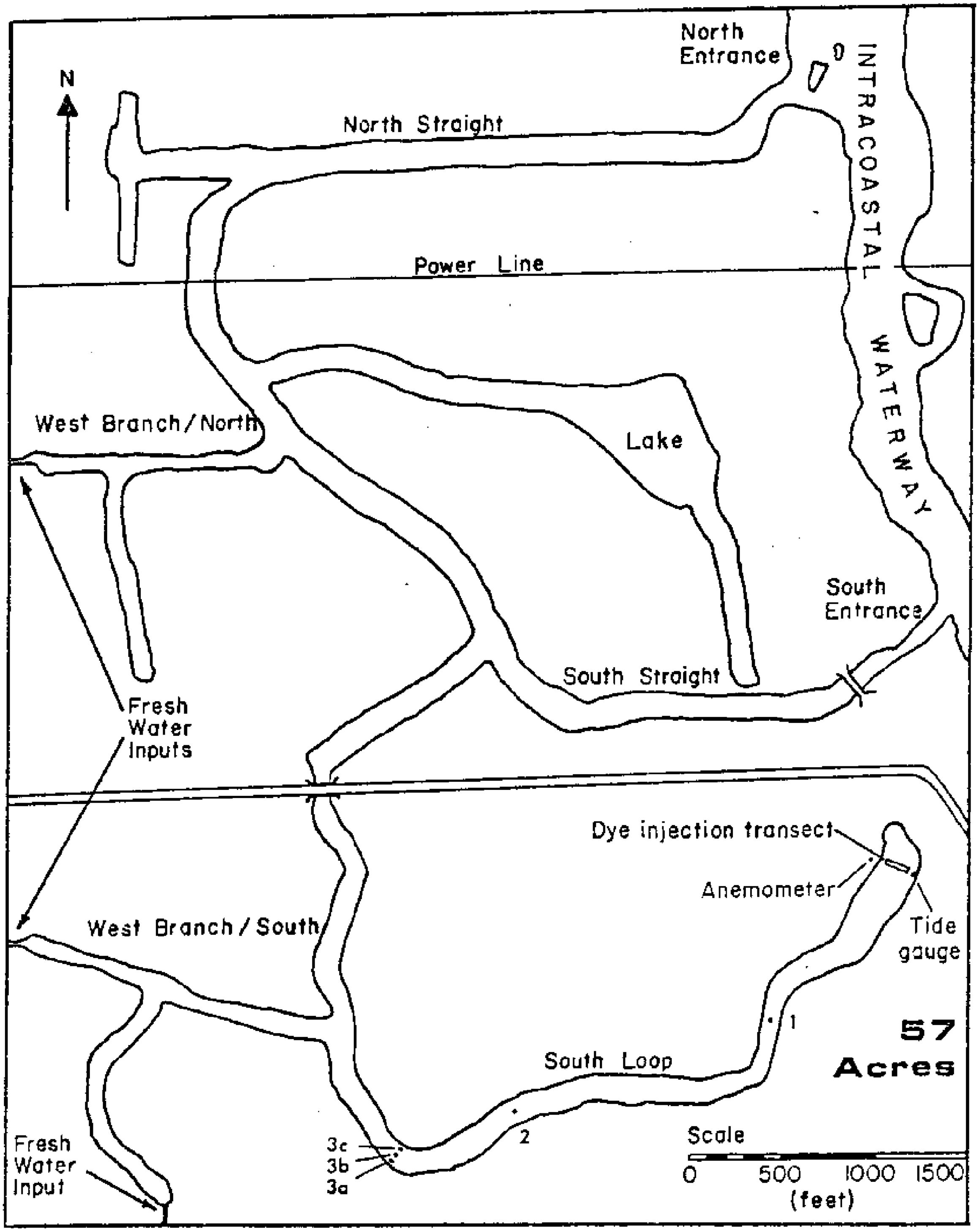



Figure B.5 - 57 Acres Site Plan Showing Location of Electromagnetic Current Meters for October 1977 Dye Dispersion Measurements

## OBSERVATIONS AT 3-HOUR INTERVALS

| HOUR | SKY COVER (TENTHS) | CEILING (HUNDREDS OF FT.) | VISIBILITY: WHOLE MILES | VISIBILITY: TENTHS MILE | WEATHER | TEMPERATURE: AIR °F | TEMPERATURE: WET BULB °F | TEMPERATURE: DEW PT. °F | REL. HUM. % | WIND: DIR | WIND: SPEED KNOTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| [illegible] | | | | | | | | | | | |

NOTES

CEILING

UNL INDICATES UNLIMITED

WEATHER

- T TORNADO
- T THUNDERSTORM
- Q SQUALL
- R RAIN
- RW RAIN SHOWERS
- ZR FREEZING RAIN
- L DRIZZLE
- ZL FREEZING DRIZZLE
- S SNOW
- SP SNOW PELLETS
- IC ICE CRYSTALS
- SW SNOW SHOWERS
- SG SNOW GRAINS
- IP ICE PELLETS
- A HAIL
- F FOG
- IF ICE FOG
- GF GROUND FOG
- BD BLOWING DUST
- BN BLOWING SAND
- BS BLOWING SNOW
- BY BLOWING SPRAY
- K SMOKE
- H HAZE
- D DUST

WIND

DIRECTIONS ARE THOSE FROM WHICH THE WIND BLOWS. INDICATED IN TENS OF DEGREES FROM TRUE NORTH: I.E., 09 FOR EAST, 18 FOR SOUTH, 27 FOR WEST. ENTRY OF 00 IN THE DIRECTION COLUMN INDICATES CALM.

SPEED IS EXPRESSED IN KNOTS; MULTIPLY BY 1.15 TO CONVERT TO MILES PER HOUR.

STATION: WEST PALM BEACH FLA

YEAR & MONTH: 77 10

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ASHEVILLE, N.C. 28801

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POSTAGE AND FEES PAID
U.S. DEPARTMENT OF COMMERCE
COM-210

Figure B.6 - Climatological Three-hourly Observations for October, 1977.

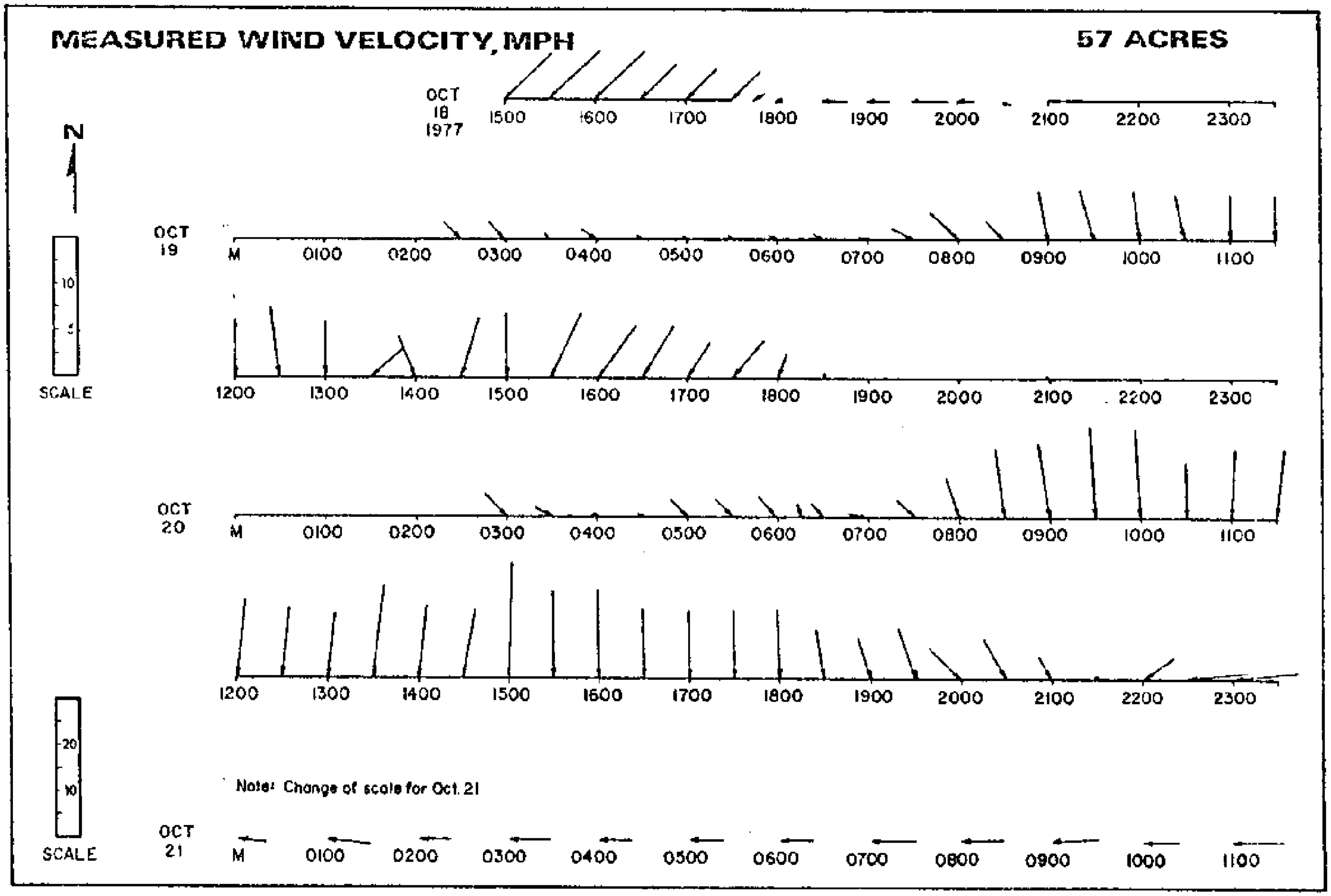
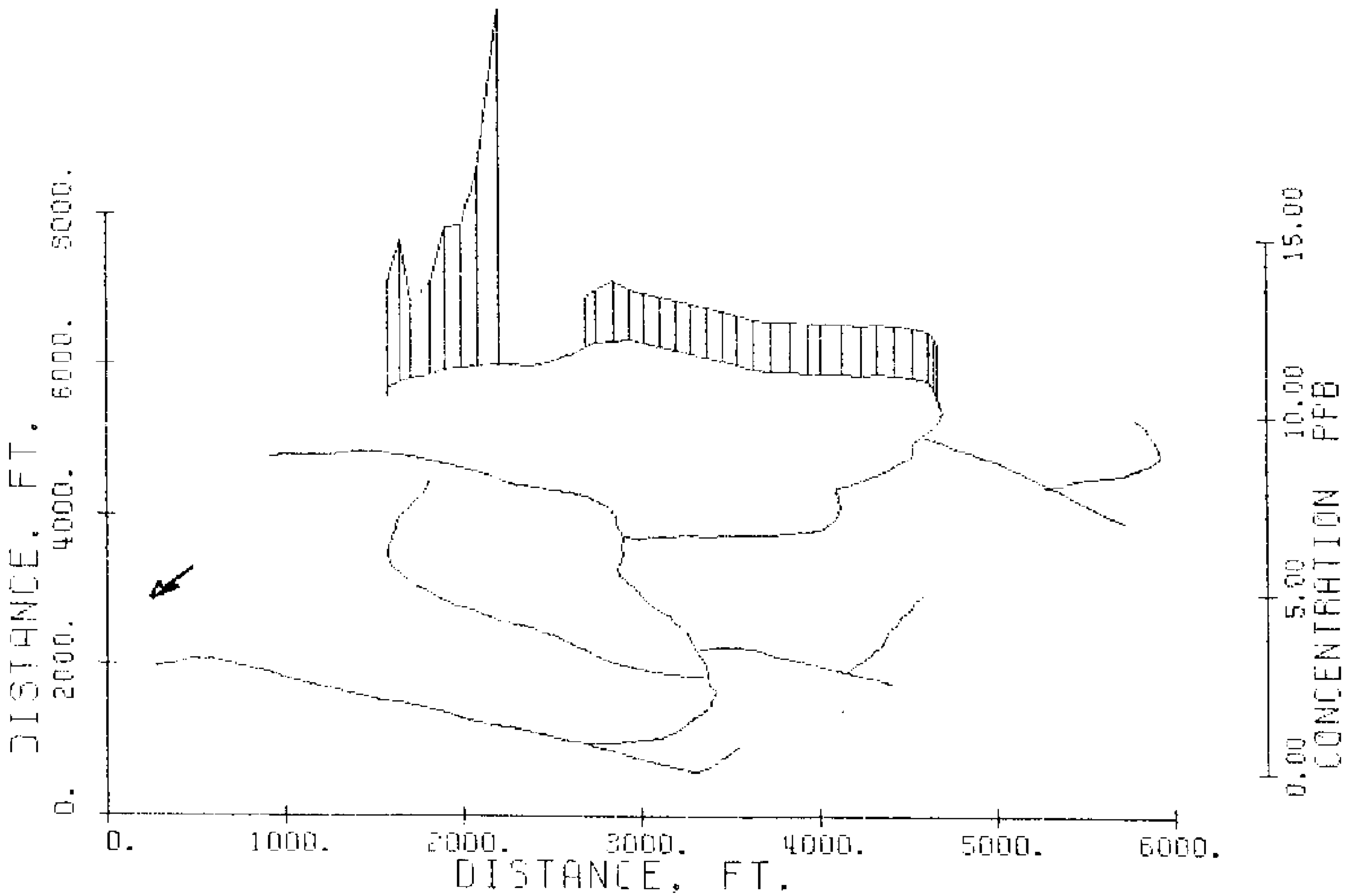


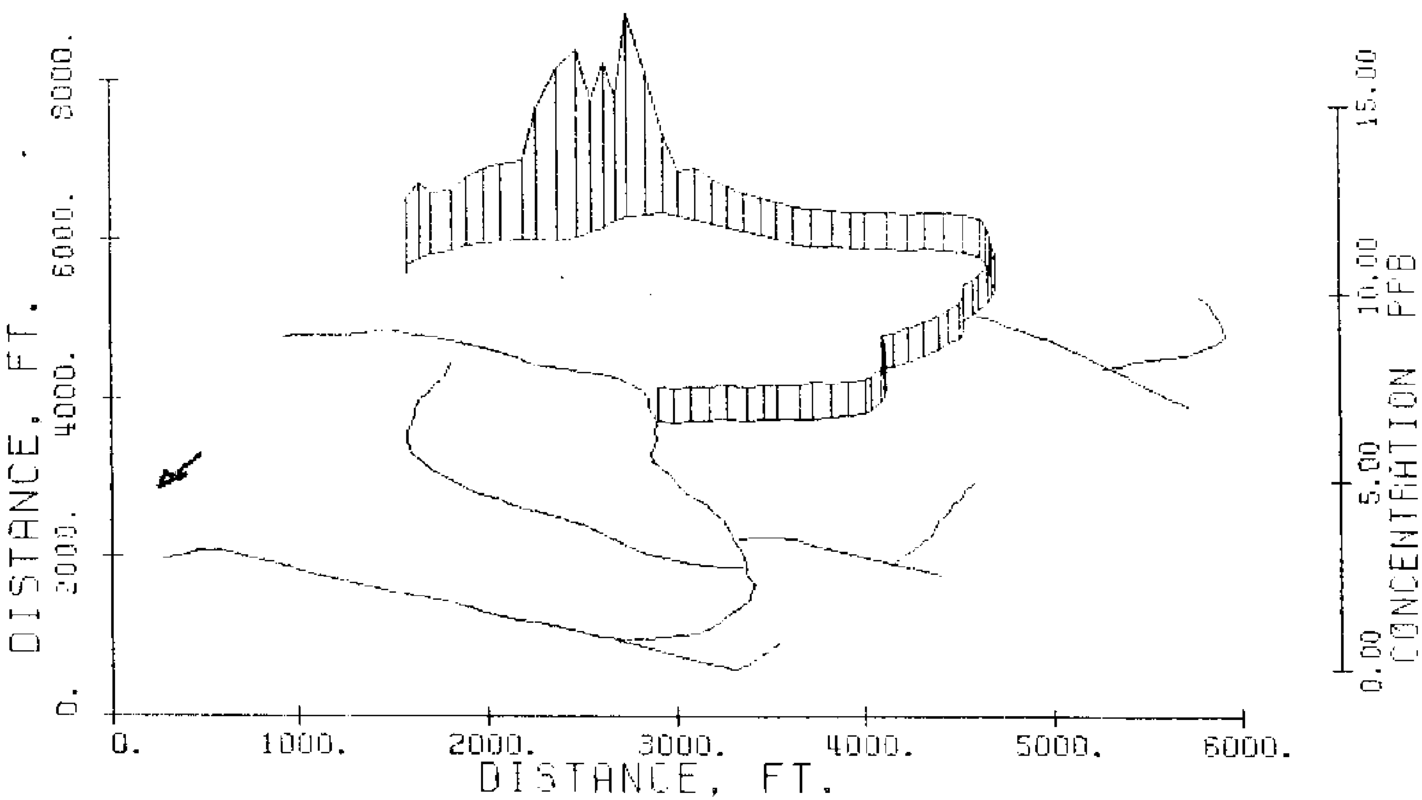

Figure B.7 - Measured Wind Velocity, 57 Acres Canal System, October 1977.



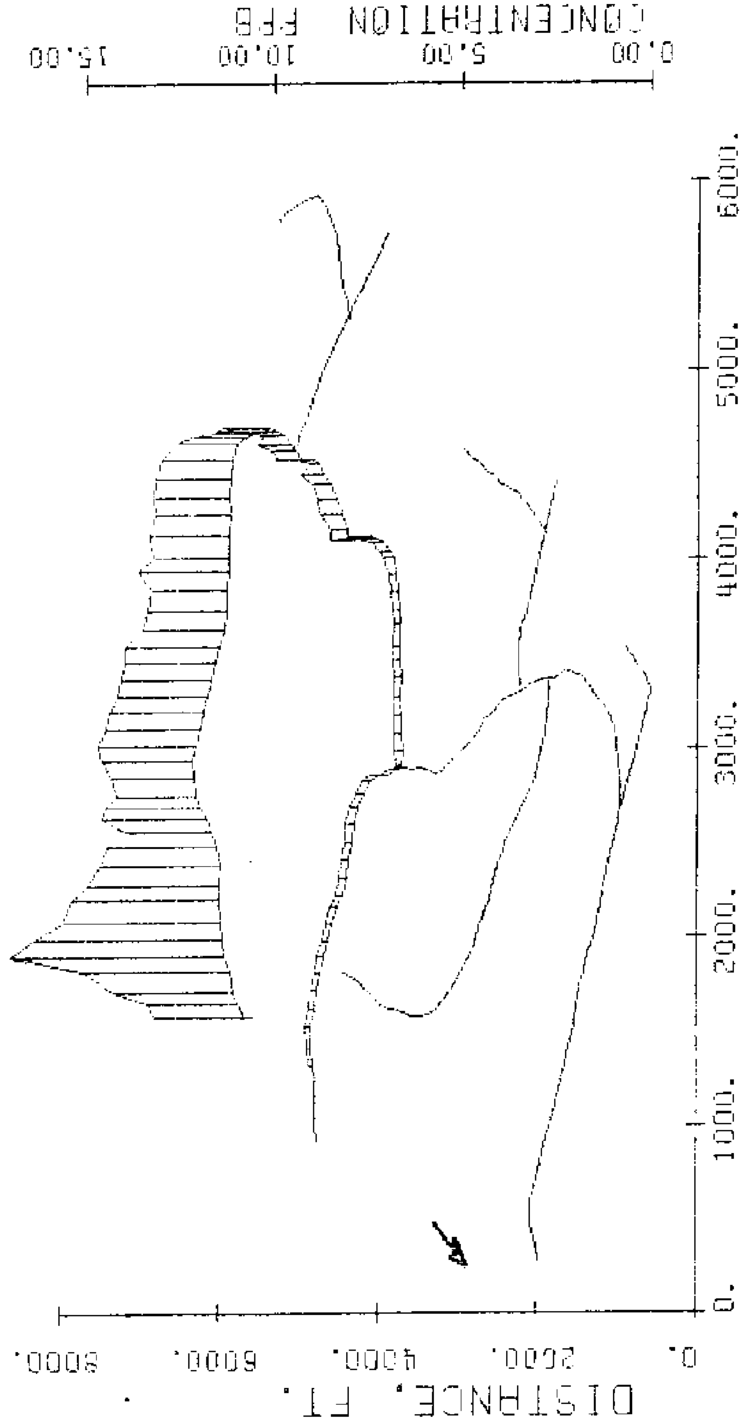

MEASURED DYE CONCENTRATION AT 3 FT DEPTH ALONG CENTERLINE

57 ACRES CANAL SYSTEM, PALM BEACH COUNTY, FLORIDA

DATE: 771019. TIDE: LOW. TIME: 2140. PEAK: 10.00 PPB




MEASURED DYE CONCENTRATION AT 3 FT DEPTH ALONG CENTERLINE
57 ACRES CANAL SYSTEM, PALM BEACH COUNTY, FLORIDA
DATE: 771020. TIDE: HIGH. TIME: 0330. PEAK: 5.40 PPB
AZIMUTH= 210 DEGREES ELEVATION= 25 DEGREES

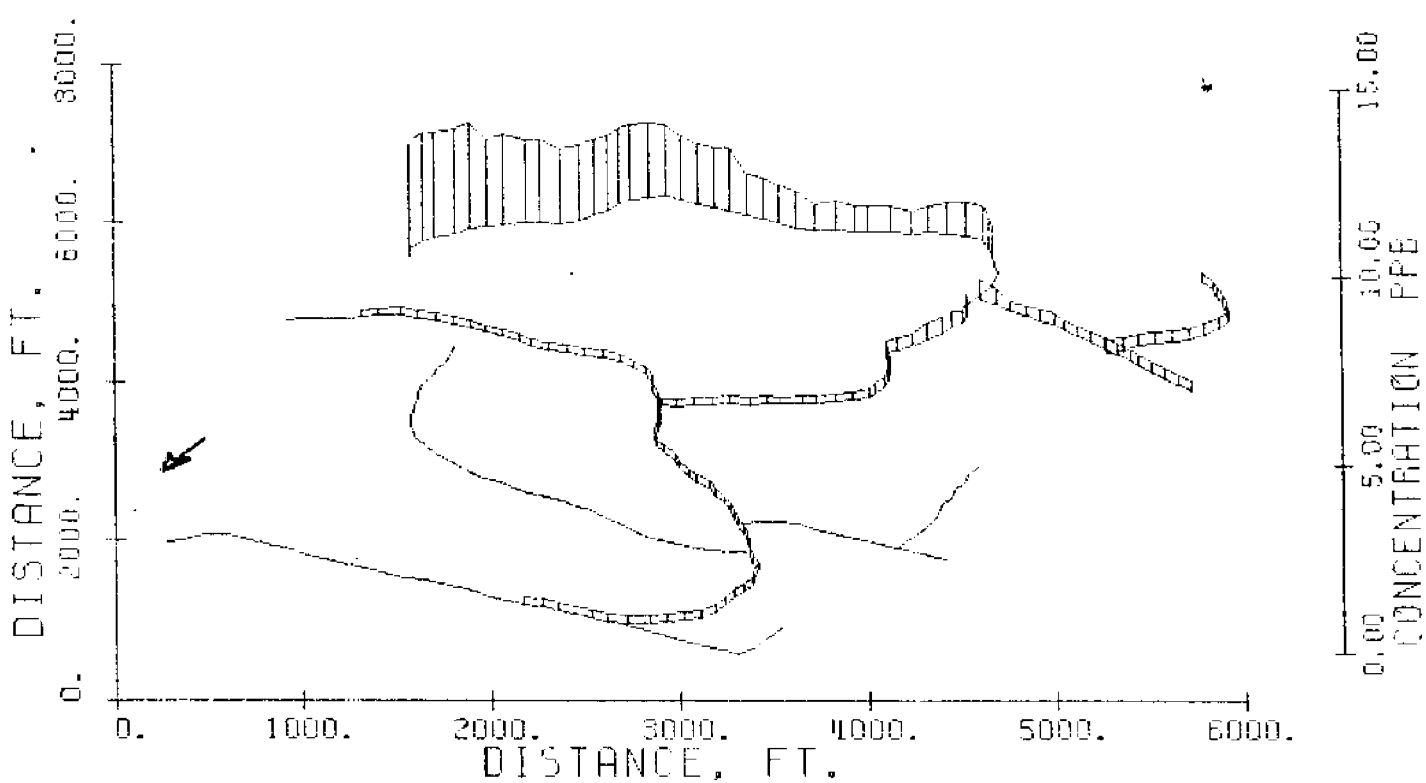



MEASURED DYE CONCENTRATION AT 3 FT DEPTH ALONG CENTERLINE

57 ACRES CANAL SYSTEM, PALM BEACH COUNTY, FLORIDA

DATE: 771020, TIDE: LOW, TIME: 0950, PEAK: 5.70 PPB

AZIMUTH= 210 DEGREES ELEVATION= 25 DEGREES

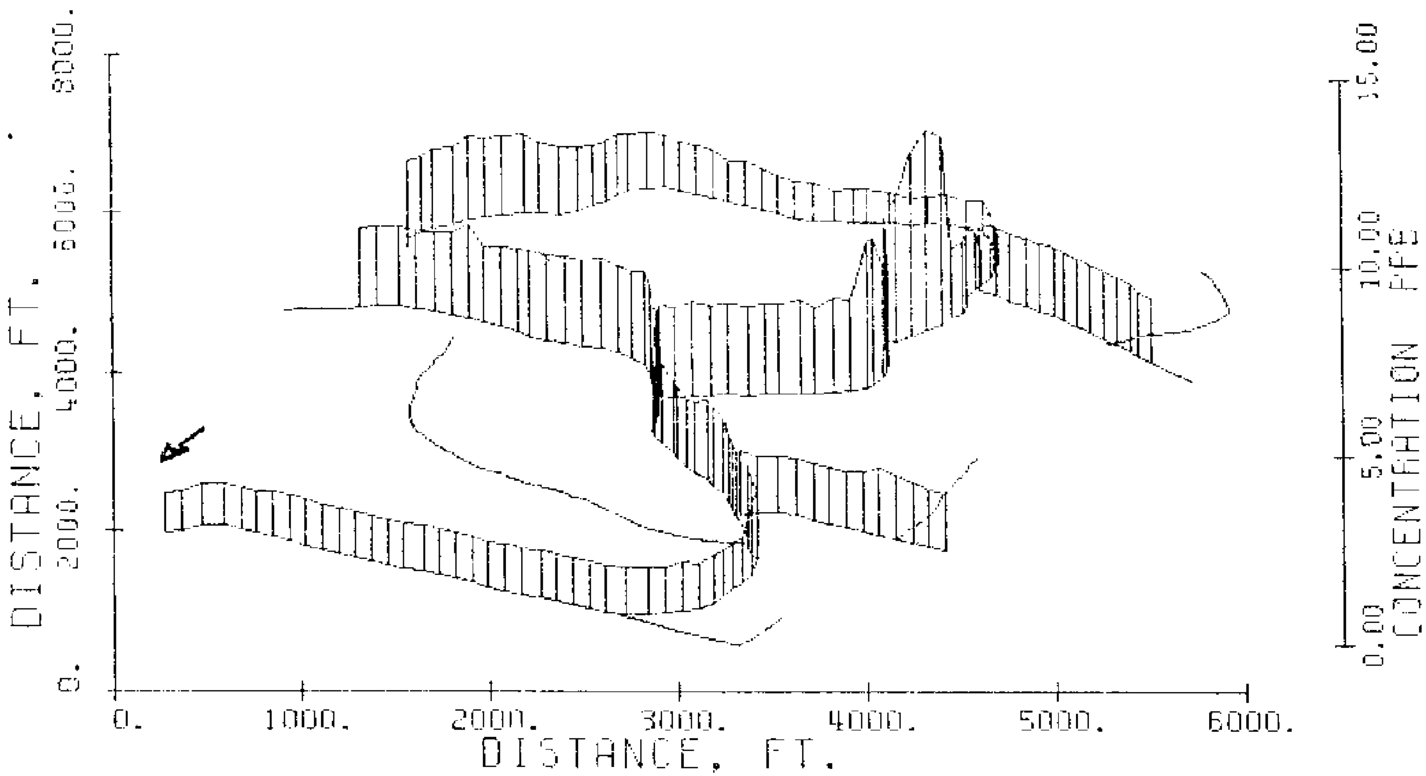



MEASURED DYE CONCENTRATION AT 3 FT DEPTH ALONG CENTERLINE

57 ACRES CANAL SYSTEM, PALM BEACH COUNTY, FLORIDA

DATE: 771020, TIDE: HIGH, TIME: 1610, PEAK: 2.90 PPB

AZIMUTH= 210 DEGREES ELEVATION= 25 DEGREES

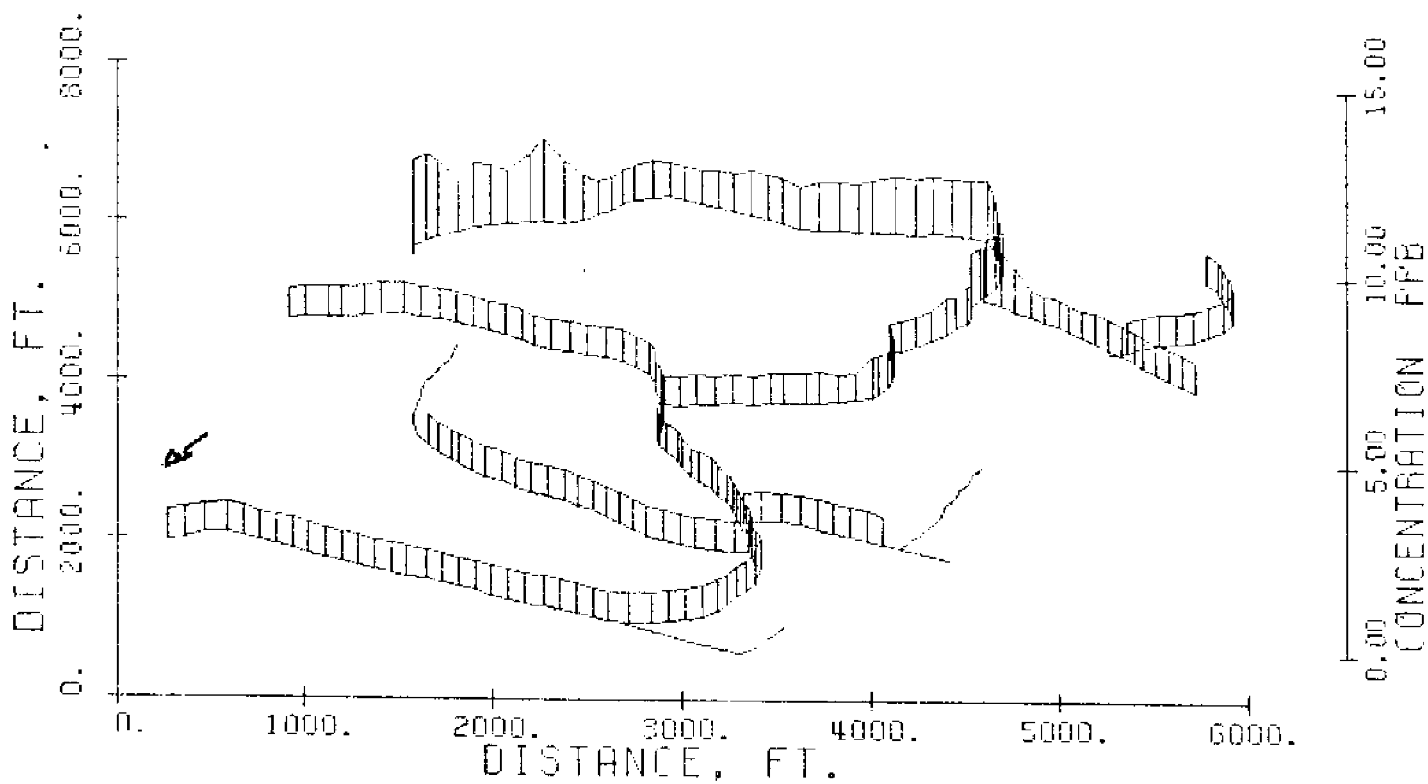



MEASURED DYE CONCENTRATION AT 3 FT DEPTH ALONG CENTERLINE

57 ACRES CANAL SYSTEM, PALM BEACH COUNTY, FLORIDA

DATE: 771020, TIDE: LOW, TIME: 2240, PEAK: 5.30 PPB

AZIMUTH= 210 DEGREES ELEVATION= 25 DEGREES

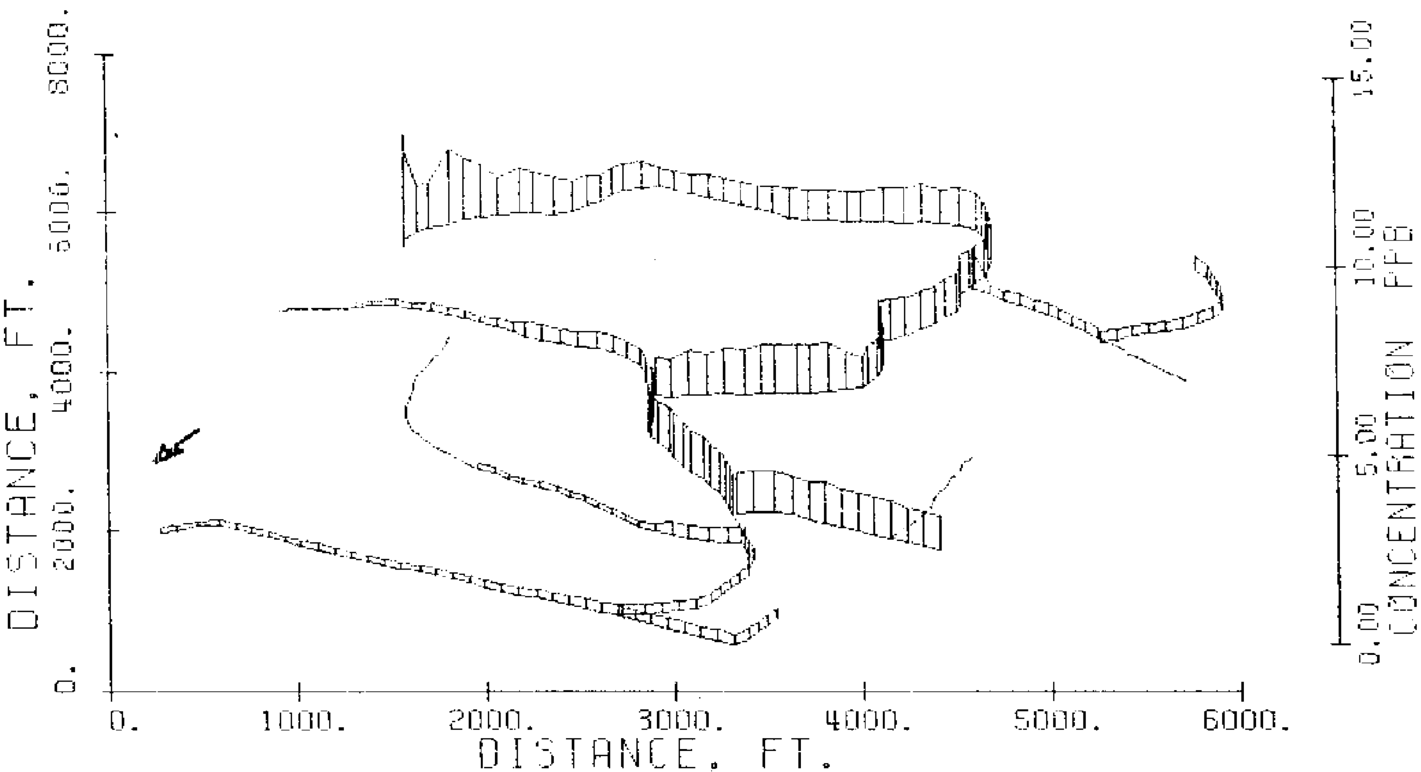



MEASURED DYE CONCENTRATION AT 3 FT DEPTH ALONG CENTERLINE

57 ACRES CANAL SYSTEM, PALM BEACH COUNTY, FLORIDA

DATE: 771021. TIDE: HIGH. TIME: 0420. PEAK: 2.20 PPB

AZIMUTH= 210 DEGREES ELEVATION= 25 DEGREES




MEASURED DYE CONCENTRATION AT 3 FT DEPTH ALONG CENTERLINE

57 ACRES CANAL SYSTEM, PALM BEACH COUNTY, FLORIDA

DATE: 771021, TIDE: LOW, TIME: 1045, PEAK: 3.00 PPB

AZIMUTH= 210 DEGREES ELEVATION= 25 DEGREES

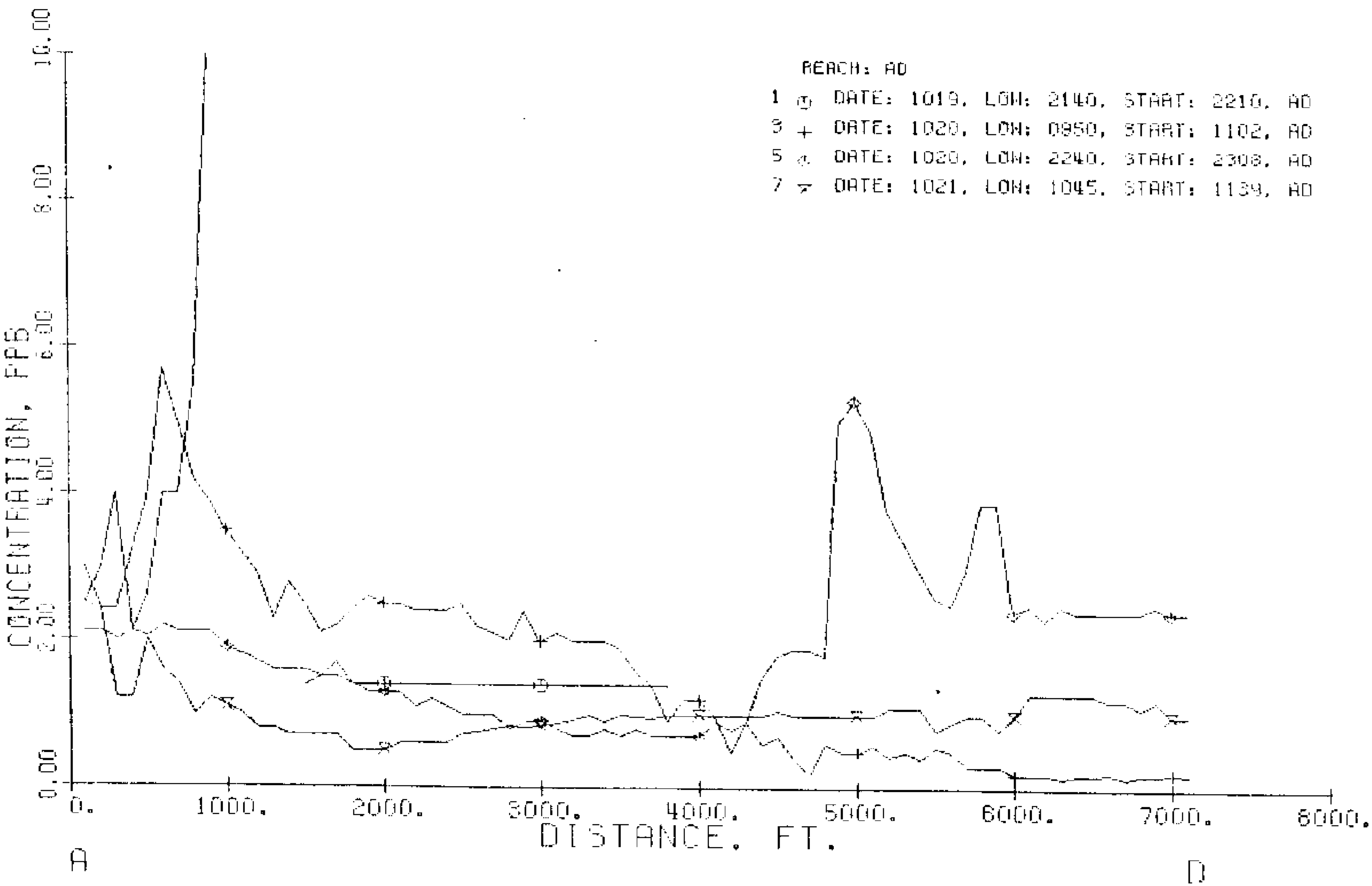
B.3.2

# SECOND DISPERSION STUDY

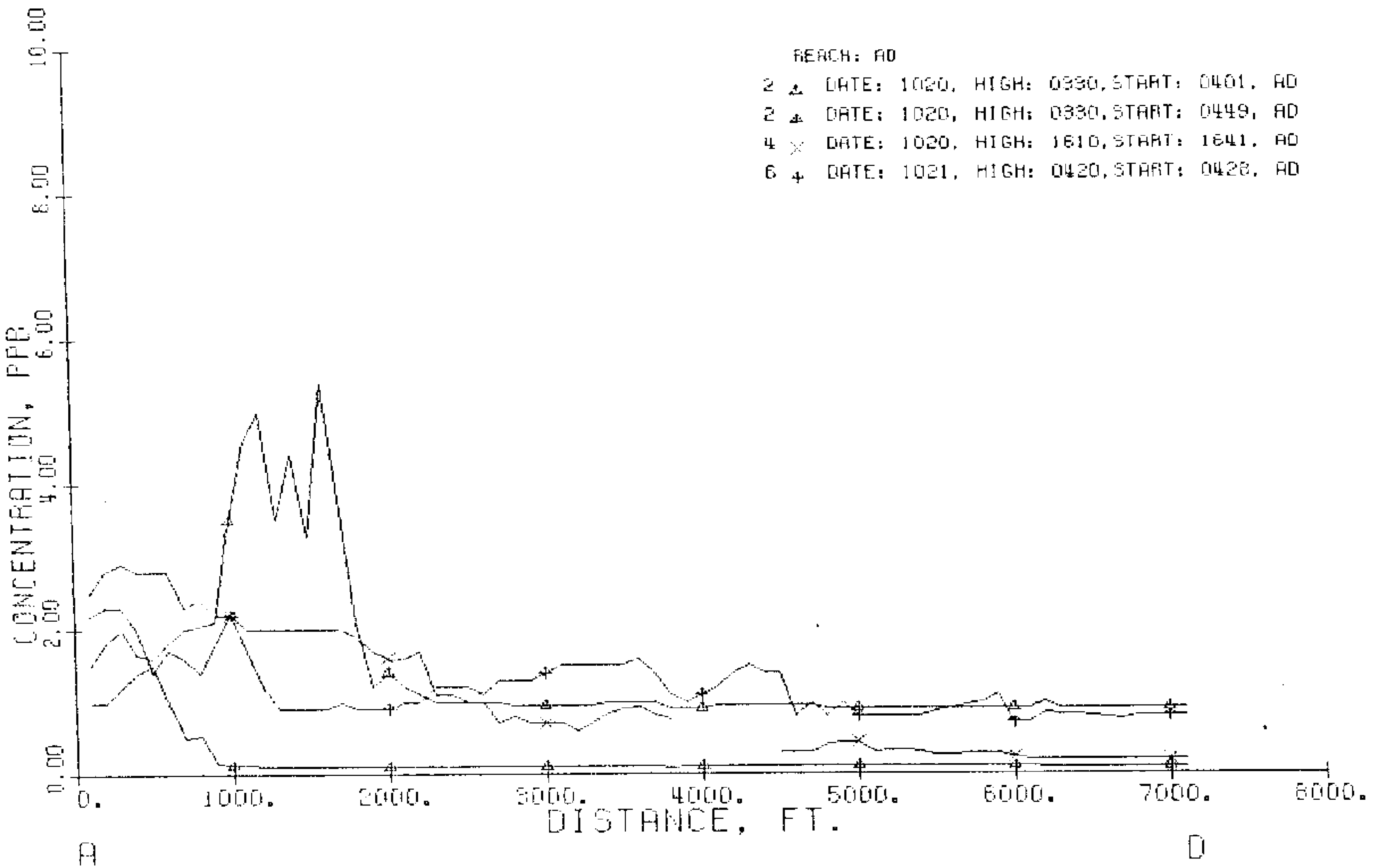
## TWO-DIMENSIONAL MEASURED DYE CONCENTRATION PLOTS

This section contains plotted results as follows:

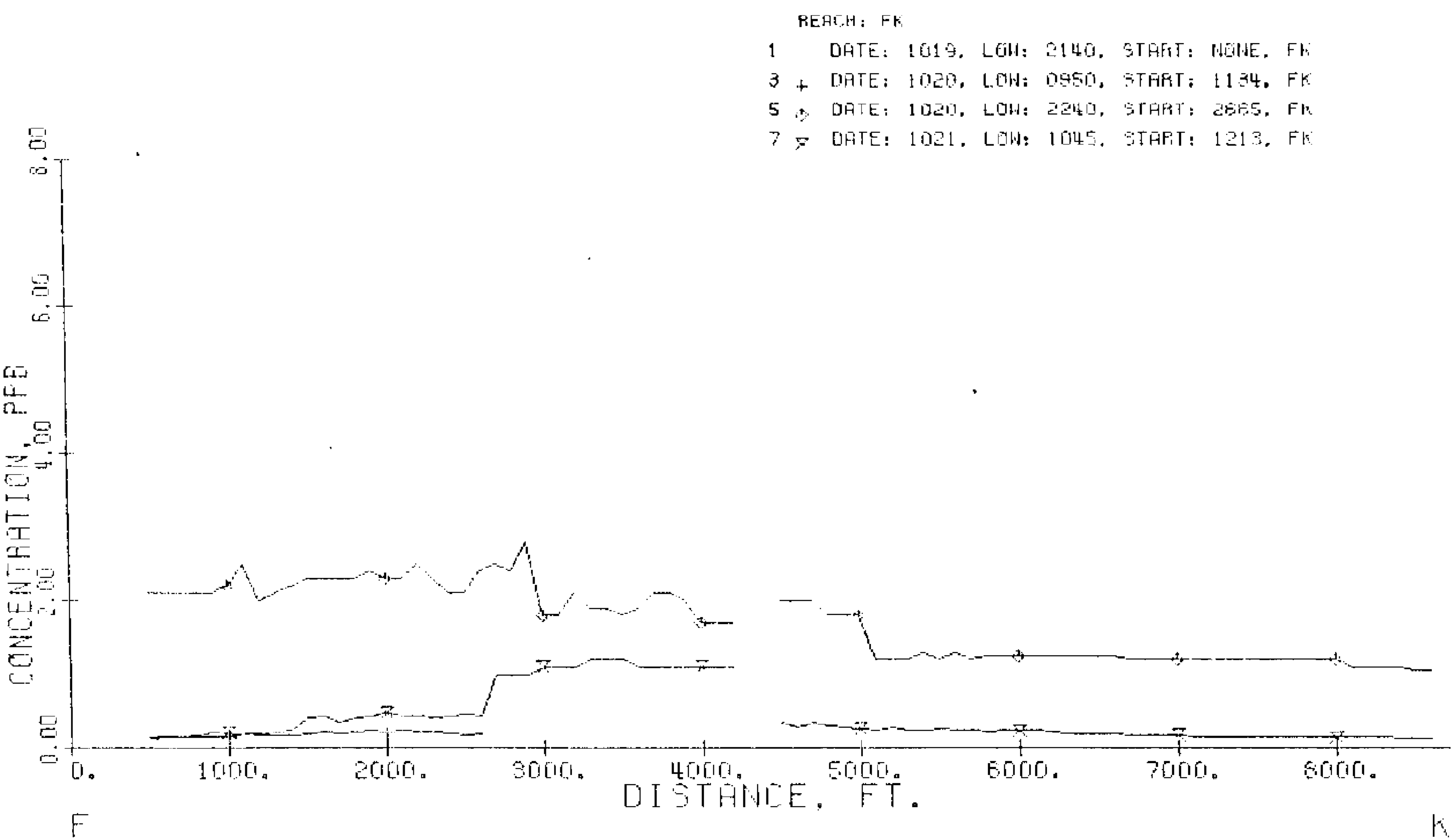
| REACH | TIDE |
|---|---|
| AD | Low |
| AD | High |
| FK | Low |
| FK | High |
| LJ | Low and High |
| TH | Low and High |
| OG | Low and High |
| RP | Low and High |
| QB | Low and High |



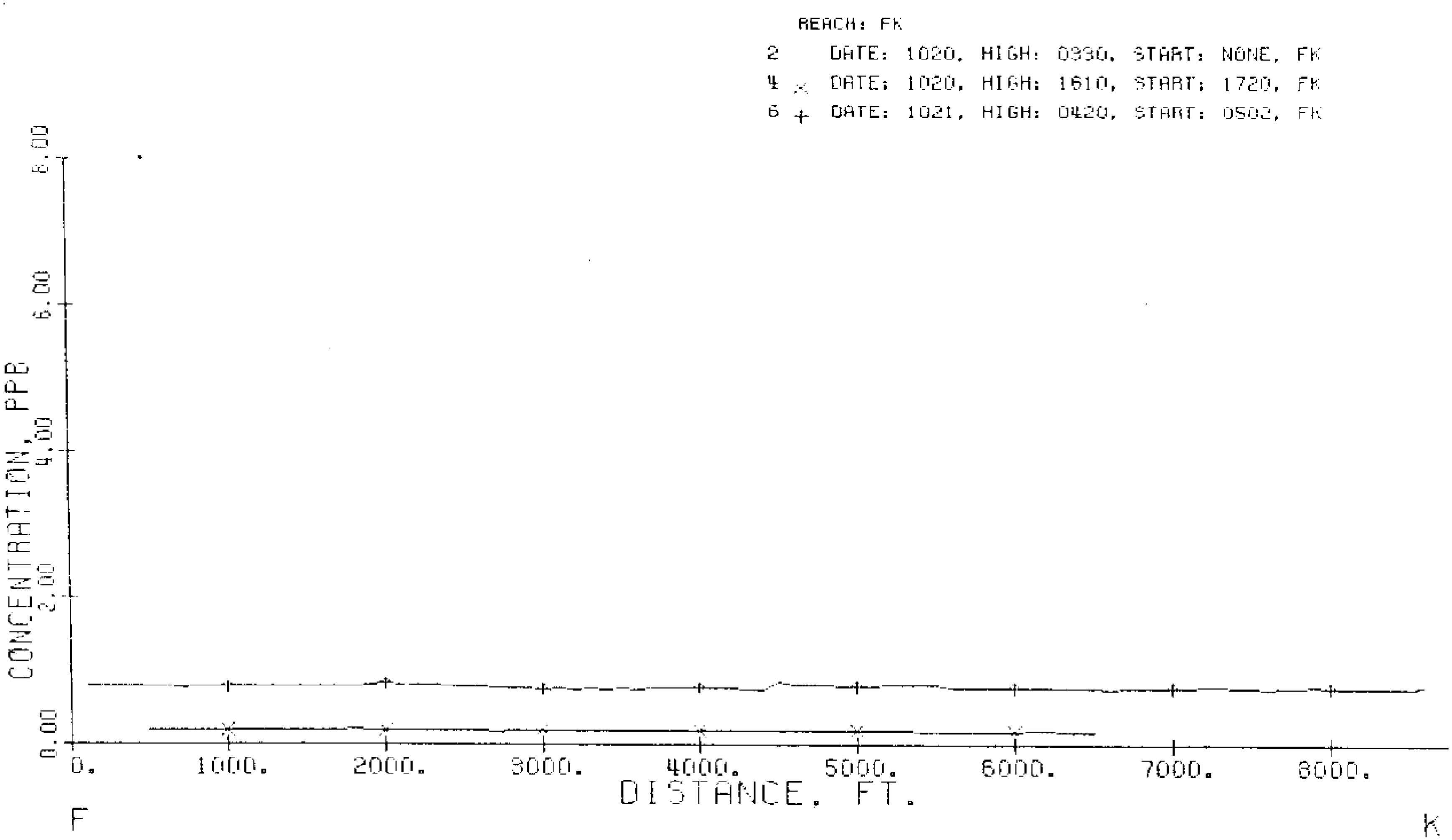

MEASURED DYE CONCENTRATION AT 3 FT DEPTH ALONG CENTERLINE
57 ACRES CANAL SYSTEM, PALM BEACH COUNTY, FLORIDA, OCTOBER 1977



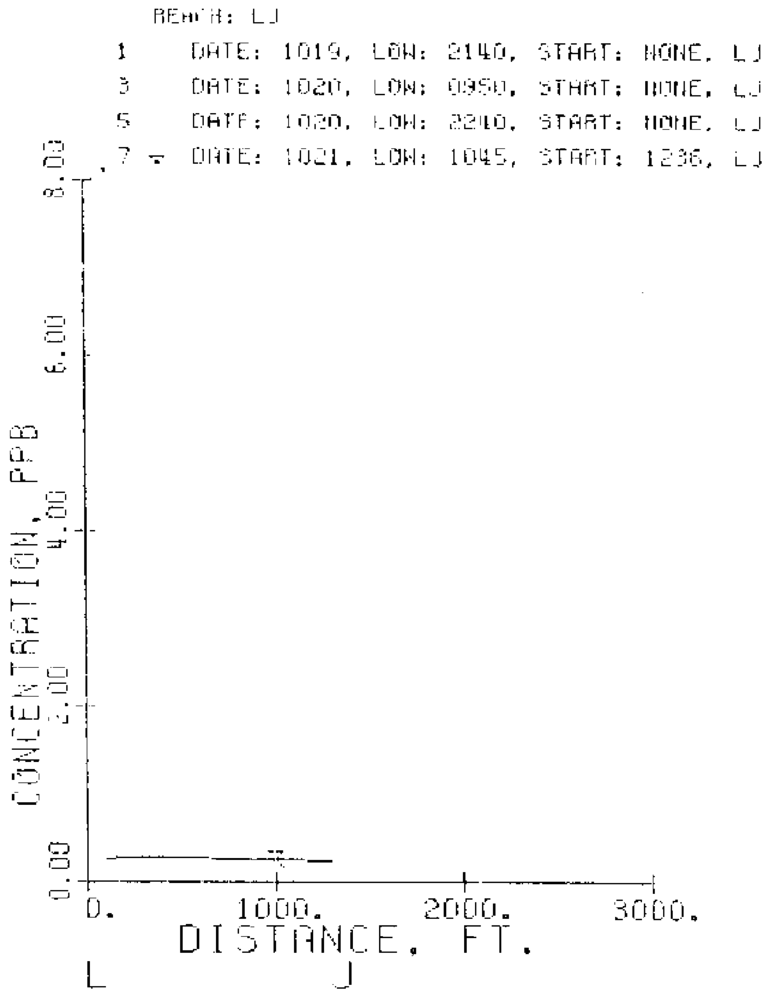

MEASURED D/C CONCENTRATION AT 3 FT DEPTH ALONG CENTERLINE
57 ACRES CANAL SYSTEM, PALM BEACH COUNTY, FLORIDA, OCTOBER 1977

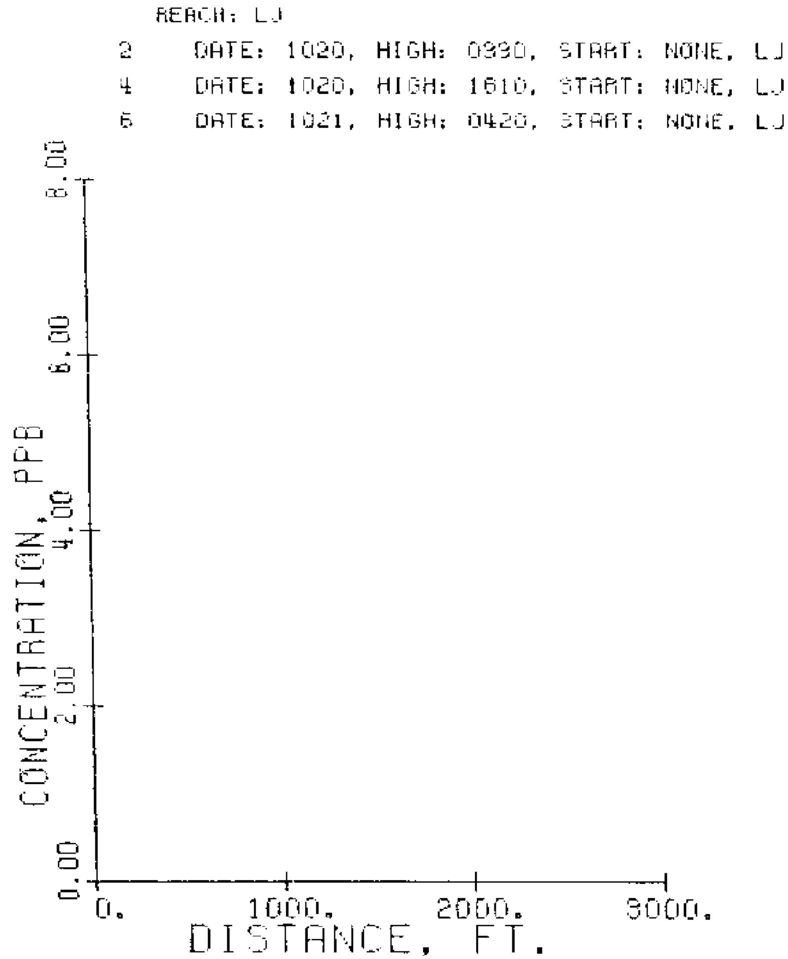



MEASURED DYE CONCENTRATION AT 3 FT DEPTH ALONG CENTERLINE
57 ACRES CANAL SYSTEM, PALM BEACH COUNTY, FLORIDA, OCTOBER 1977

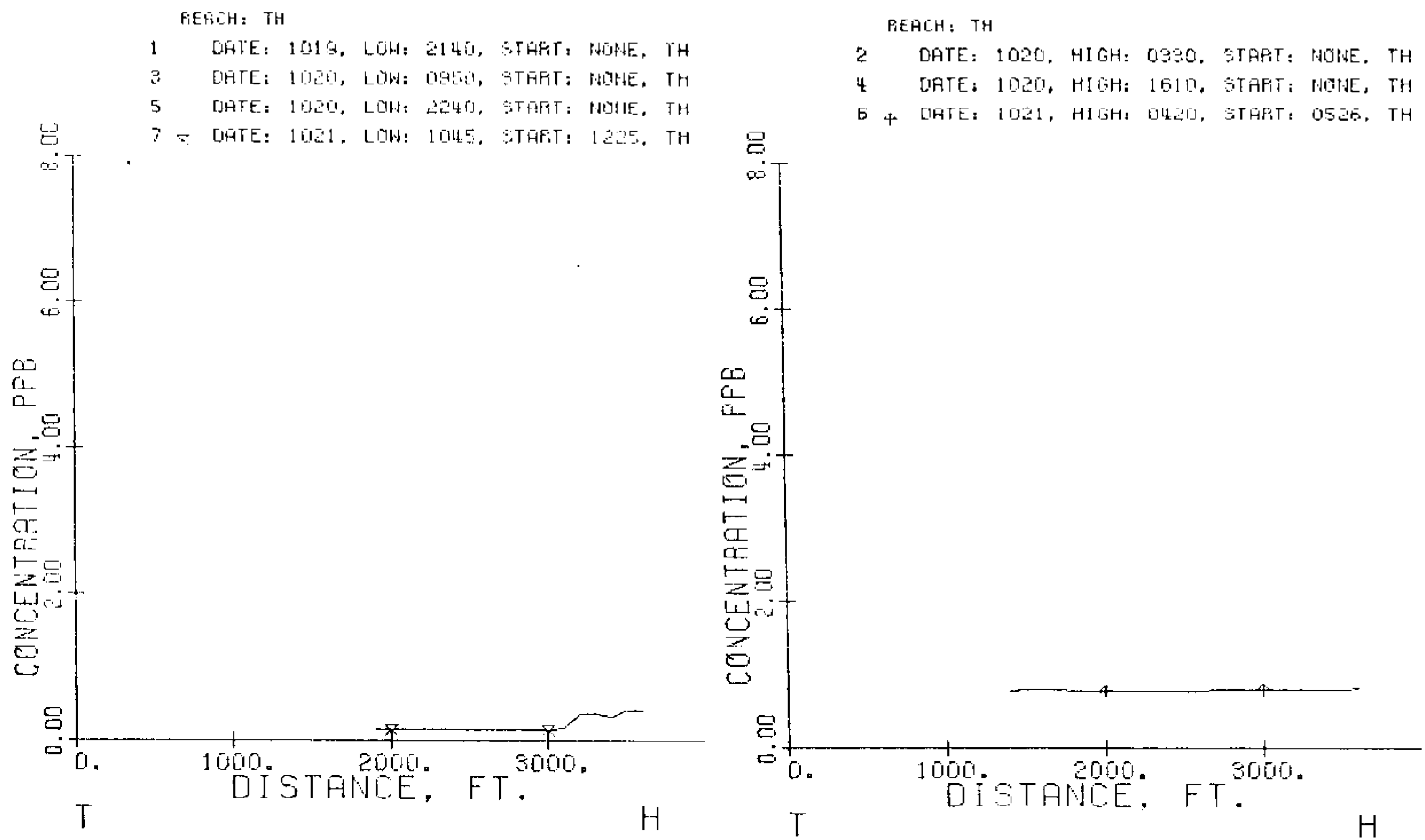



MEASURED DYE CONCENTRATION AT 3 FT DEPTH ALONG CENTERLINE
57 ACRES CANAL SYSTEM, PALM BEACH COUNTY, FLORIDA, OCTOBER 1977

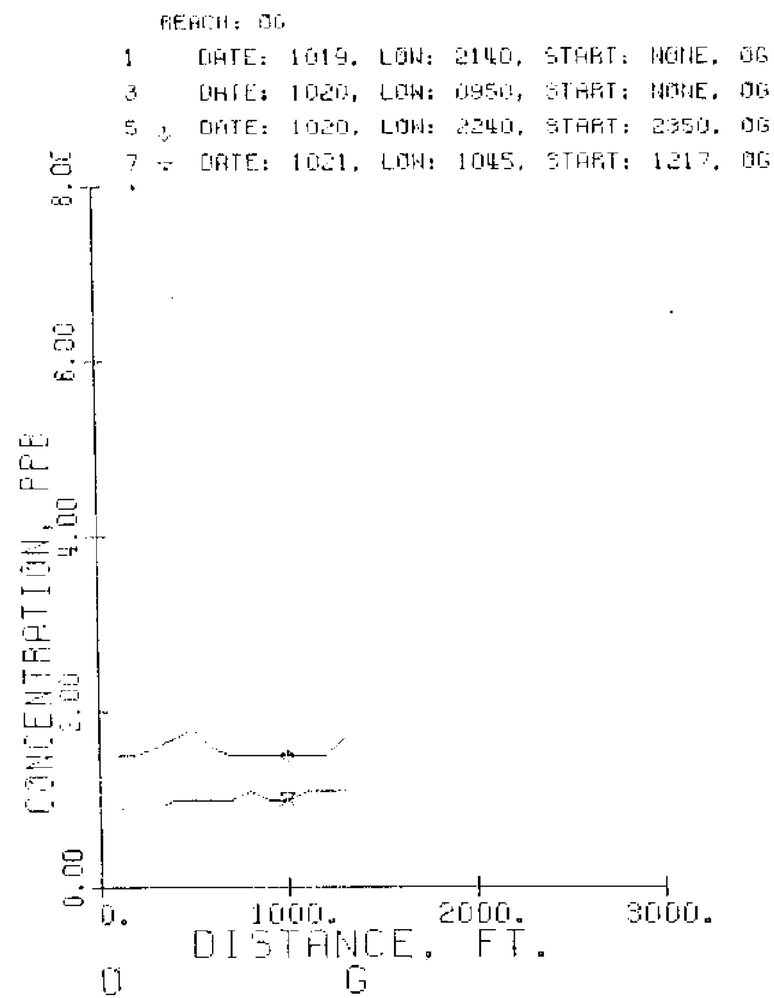


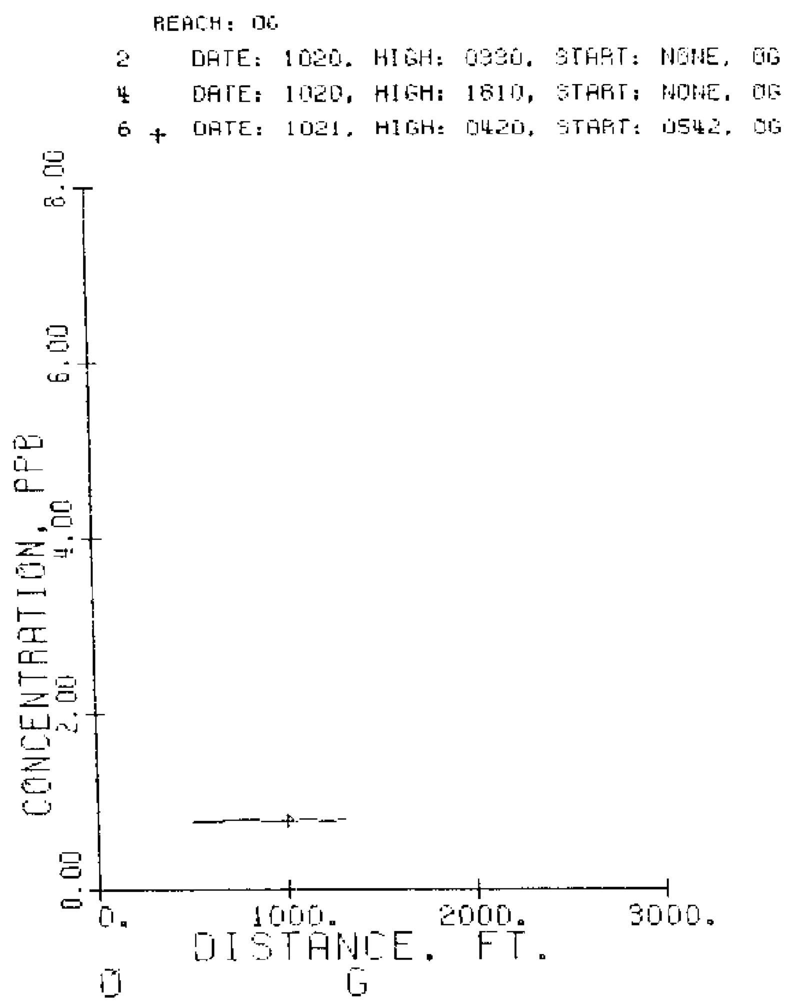




MEASURED DYE CONCENTRATION AT 3 FT DEPTH ALONG CENTERLINE
57 ACRES CANAL SYSTEM, PALM BEACH COUNTY, FLORIDA, OCTOBER 1977

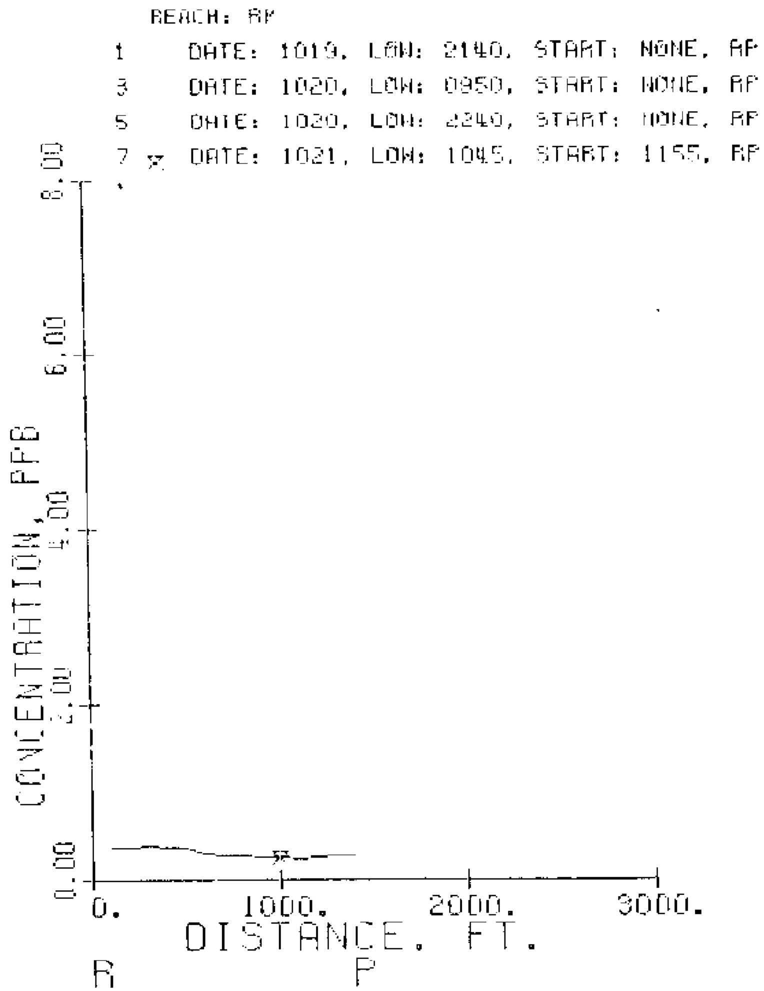


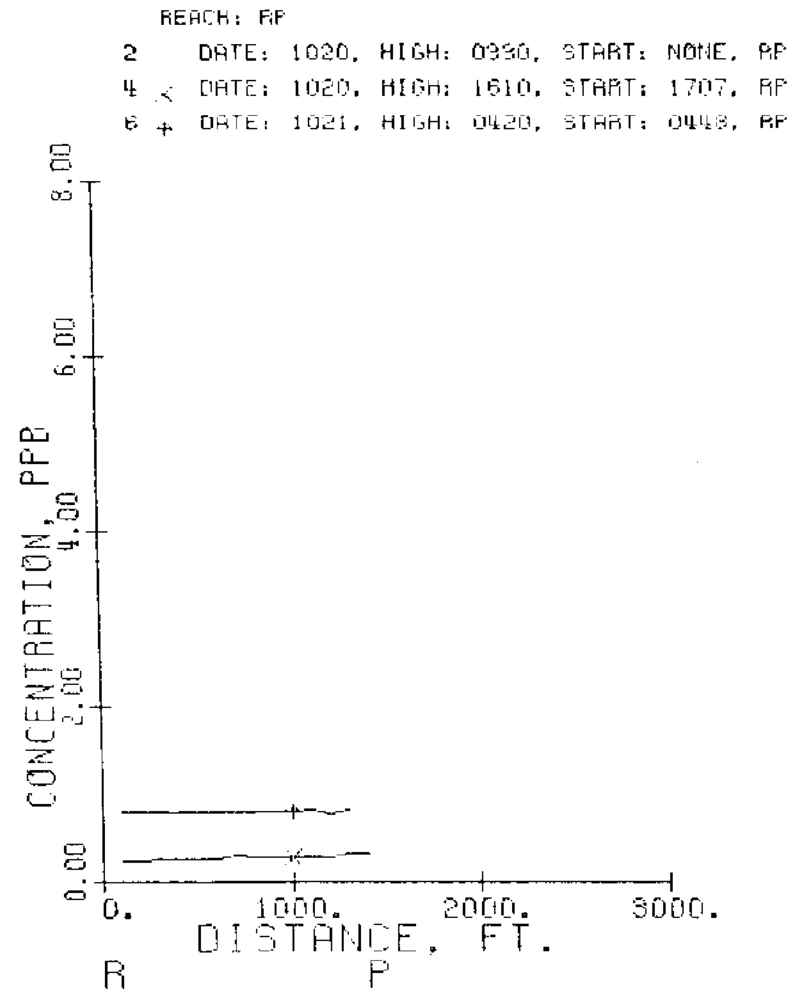

MEASURED DYE CONCENTRATION AT 3 FT DEPTH ALONG CENTERLINE
57 ACRES CANAL SYSTEM, PALM BEACH COUNTY, FLORIDA, OCTOBER 1977



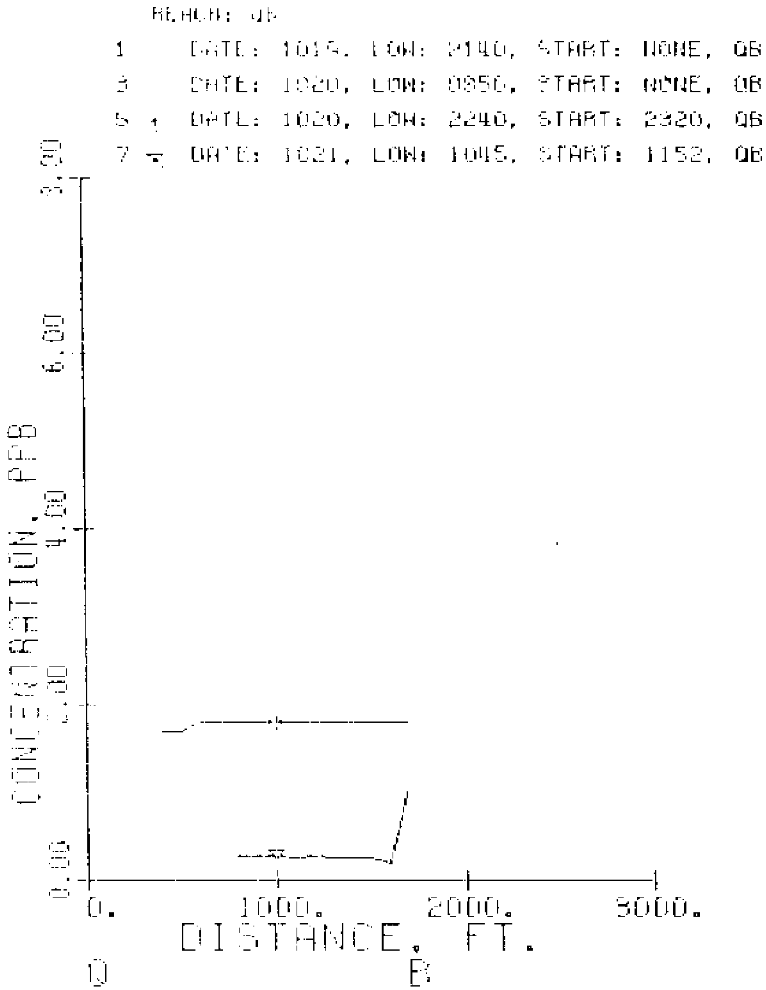



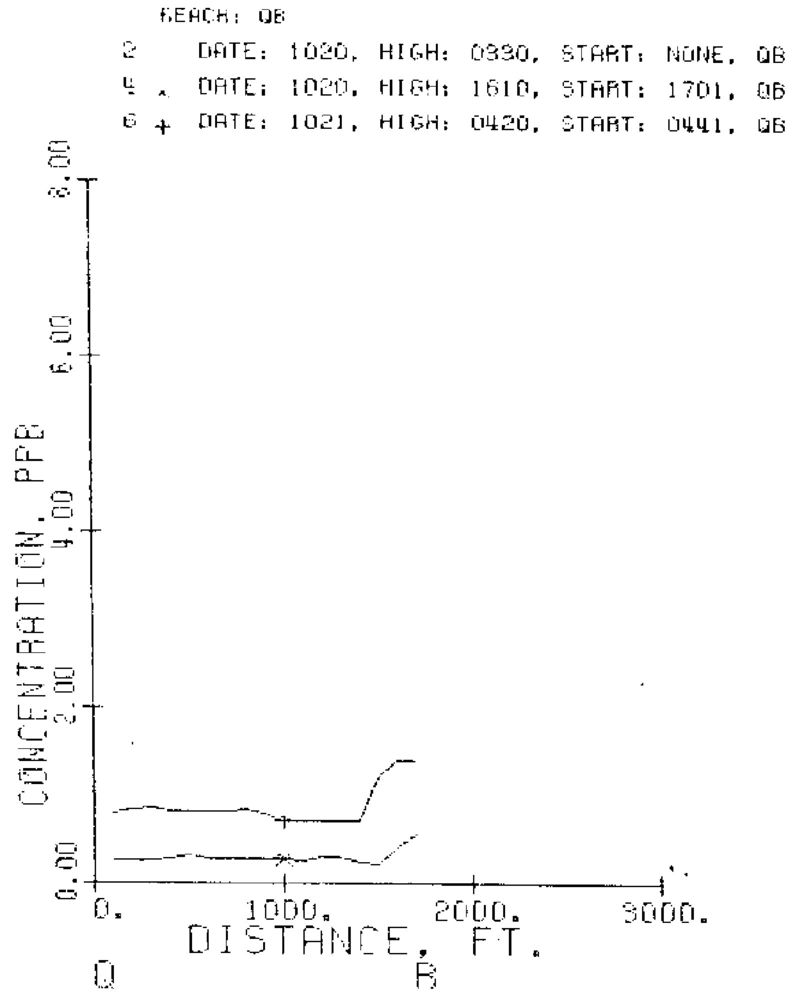

MEASURED DYE CONCENTRATION AT 3 FT DEPTH ALONG CENTERLINE
57 ACRES CANAL SYSTEM, PALM BEACH COUNTY, FLORIDA. OCTOBER 1977




MEASURED DYE CONCENTRATION AT 3 FT DEPTH ALONG CENTERLINE
57 ACRES CANAL SYSTEM, PALM BEACH COUNTY, FLORIDA, OCTOBER 1977




MEASURED DYE CONCENTRATION AT 3 FT DEPTH ALONG CENTERLINE
57 ACRES CANAL SYSTEM, PALM BEACH COUNTY, FLORIDA, OCTOBER 1977

# APPENDIX C

# COMPUTER PROGRAMS FOR DATA REDUCTION

C.1 NEWDYE

C.2 P57

C.3 SAL

C.1

NEWDYE

Two-Dimensional Plot

of

Centerline Dye Concentration

by

Reach

C.1.1

FLOW CHARTS

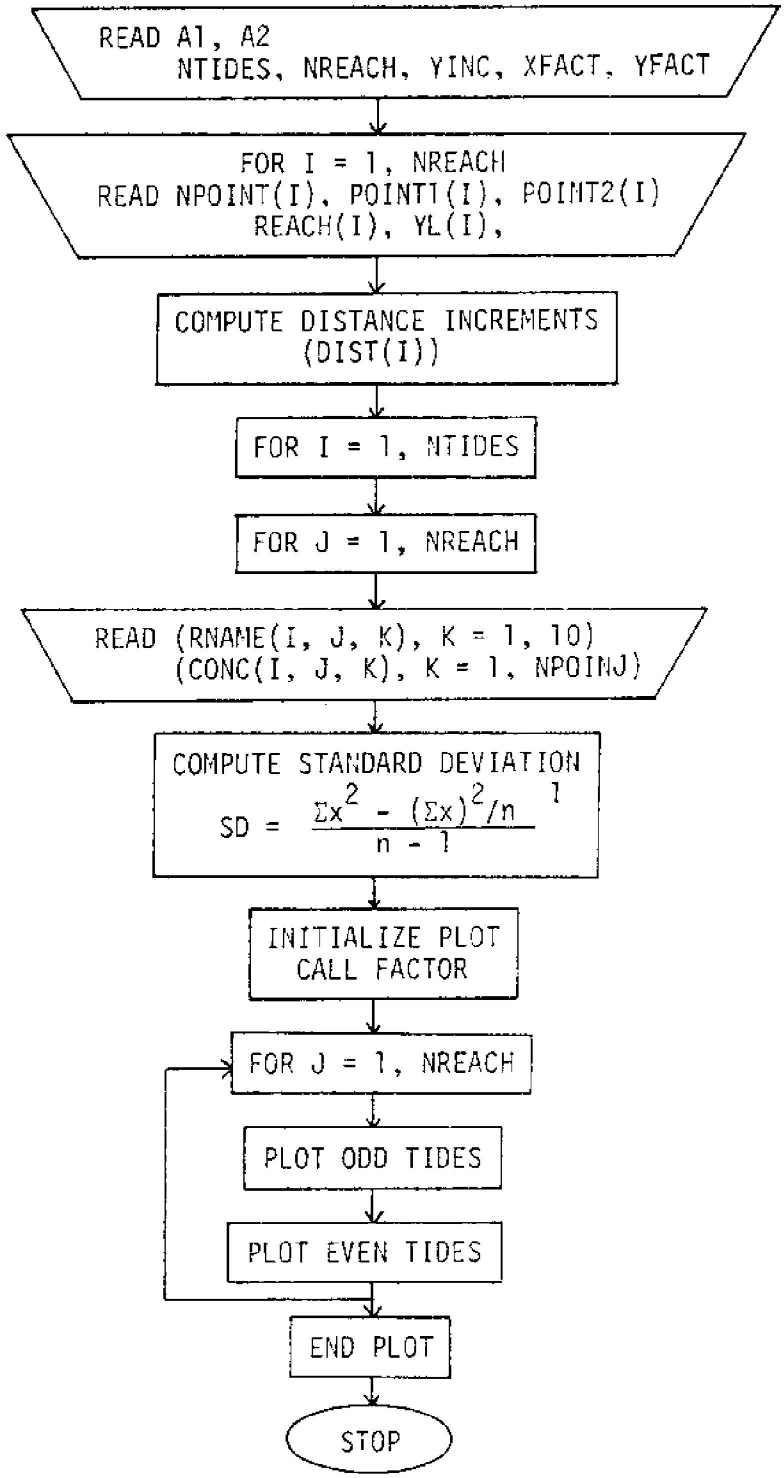
for

NEWDYE

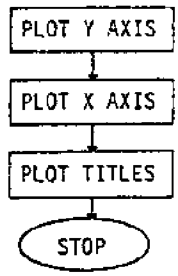
MYAXIS

MYPLOT

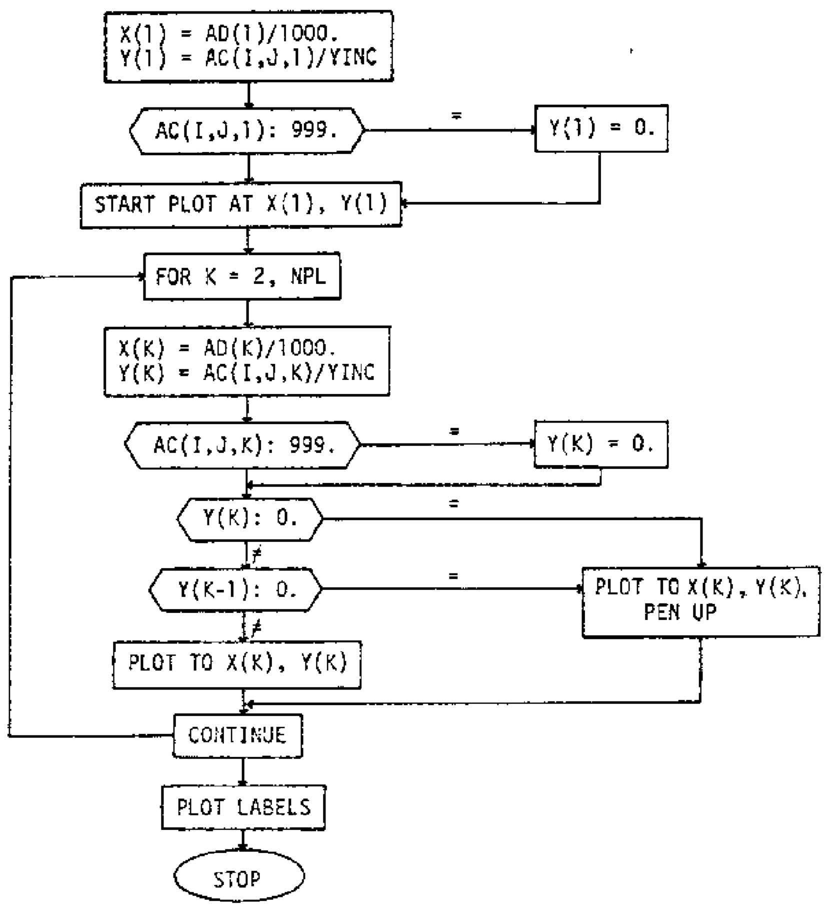
NEWDYE FLOWCHART



SUBROUTINE MYAXIS




SUBROUTINE MYPLOT



C.1.2

PROGRAM

for

NEWDYE

```
FORTRAN IV G LEVEL  21                MAIN              DATE = 78059          12/29/28

0001              DIMENSION  RNAME(10,10,20),CONC(10,10,90),DIST(90),NPOINT(10)
0002              DIMENSION POINT1(10),POINT2(10),REACHL(10),YL(10),XMAX(10)
0003              DIMENSION A1(20),A2(20)
0004              READ (5,1) A1,A2
0005            1 FORMAT (20A4)
0006              READ(5,2) NTIDES,NREACH,YINC,XFACT,YFACT
0007            2 FORMAT (2I5,3F5.2)
0008              READ (5,10)(NPOINT(I),I=1,NREACH)
0009           10 FORMAT (10I5)
0010              DO 100 I=1,NREACH
0011          100 READ (5,11) POINT1(I),POINT2(I),REACHL(I),YL(I)
0012           11 FORMAT (2A1,3X,2F5.1)
0013              DO 110 I=1,90
0014          110    DIST(I)=I*100
0015              WRITE (6,3) A1,A2
0016            3 FORMAT (1H ,20A4//1H ,20A4//)
0017              DO 200 I=1,NTIDES
0018              READ (5,12)
0019           12 FORMAT ( )
0020              DO 150 J=1,NREACH
0021              READ(5,13) (RNAME(I,J,K),K=1,10)
0022           13 FORMAT (8X,10A4)
0023              WRITE (6,5) NPOINT(J),I,(RNAME(I,J,K),K=1,10)
0024            5 FORMAT (1H ,'NUMBER OF POINTS: ',I3,',  TIDE NUMBER: ',I3//1H ,2X,
                 2    10A4//)
0025              WRITE (6,6)
0026            6 FORMAT (1H ,'CONCENTRATION VS. DISTANCE'//6(4X,'DIST',3X,'CONC')/)
0027                 NPOINJ=NPOINT(J)
0028              READ (5,14) (CONC(I,J,K),K=1,NPOINJ)
0029           14 FORMAT (8(4X,F6.0))
0030              WRITE (6,9)(DIST(K), CONC(I,J,K),K=1,NPOINJ)
0031            9 FORMAT (6(F8.0,F7.2))
            C
            C     STANDARD DEVIATION
            C
0032                 SC=0.
0033                 SC2=0.
0034                 NK=1
0035                 NCOUNT=0
0036          115 DO 120 K=NK,NPOINJ
0037                 KSAVE=K
0038              IF (CONC(I,J,K).EQ.999.) GO TO 130
0039                 NCOUNT=NCOUNT+1
0040                 SC=SC+CONC(I,J,K)
```

```
0041      120     SC2=SC2+CONC(I,J,K)*CONC(I,J,K)
0042           GO TO 140
0043      130     NZERO=0
0044           DO 131 L=KSAVE,NPOINJ
0045              LSAVE=L
0046           IF (CONC(I,J,L).NE.999.) GO TO 135
0047      131     NZERO=NZERO+1
0048           IF (KSAVE.NE.1) GO TO 140
0049              SD=0.
0050           GO TO 145
0051      135 IF (KSAVE.EQ.1) GO TO 137
0052              SLOPE =(CONC(I,J,LSAVE)-CONC(I,J,KSAVE-1))/(NZERO+1)
0053           DO 136 L=1,NZERO
0054              CONCI=CONC (I,J,KSAVE-1)+SLOPE*L
0055              SC=SC+CONCI
0056      136     SC2=SC2+CONCI*CONCI
0057              NCOUNT=NCOUNT+NZERO
0058      137     NK=LSAVE
0059           GO TO 115
0060      140     SCSQ=SC*SC
0061              SD=SQRT((SC2-SCSQ/NCOUNT)/(NCOUNT-1))
0062      145 WRITE (6,21) I,POINT1(J),POINT2(J),SD
0063       21 FORMAT(/1H ,'TIDE NO. = ',I2,5X,'REACH ',2A1,5X,'STD  DEV. = ',
             2    E11.4///)
0064      150 CONTINUE
0065      200 CONTINUE
        C
        C      PLOT GRAPHS
        C
0066              XTOTAL=0.
0067           DO 250 I=1,NREACH
0068              XMAX(I)=REACHL(I)+2.
0069           IF (XMAX(I).LE.7.) XMAX(I)=7.
0070      250     XTOTAL=XTOTAL+XMAX(I)
0071           CALL PLOTS (XTOTAL,20,0.0,1.0,.1,)
0072           CALL FACTOR (XFACT,YFACT)
0073           DO 300 J=1,NREACH
0074              XOFF=(XMAX(J)-REACHL(J))/2.
0075           CALL PLOT (XOFF,10.0,-3)
0076               XP1=REACHL(J)-3.8
0077           IF (XP1.LT..4) XP1=.4
0078           CALL MYAXIS (YL(J),YINC,REACHL(J),A1,A2,POINT1(J),POINT2(J),XP1)
0079              NPOINJ=NPOINT(J)
0080              G=0.
```

FORTRAN IV G LEVEL 2 MAIN DATE = 78059 12/29/28

```
          XP2=XP1-0.2
          XP3=XP1+0.2
      DO 260 I=1,NTIDES,2
  260 CALL MYPLOT (I,J,DIST,CONC,YINC,NPOINJ,G,XP1,XP2,XP3,RNAME)
      CALL PLOT (0.,-10., 3)
          G=0.
      CALL MYAXIS (YL(J),YINC,REACHL(J),A1,A2,POINT1(J),POINT2(J),XP1)
      DO 270 I=2,NTIDES,2
  270 CALL MYPLOT (I,J,DIST,CONC,YINC,NPOINJ,G,XP1,XP2,XP3,RNAME)
          XEND=XMAX(J)-XOFF
  300 CALL PLOT (XEND,0., 3)
      CALL PLOT (0,0,999)
      STOP
      END
```

```
      SUBROUTINE MYAXIS (YL,YINC,XL,A1,A2,POINT1,POINT2,XP1)
      DIMENSION A1(20),A2(20)
         AXISL=XL+.9
      CALL AXIS (0.,0.,'CONCENTRATION, PPB  ',20,YL,90.,0.,YINC)
      CALL PLOT (0.,0.,3)
      CALL PLOT (AXISL,0.,2)
         LXL=AXISL
         XAXIS=0.
      CALL PLOT (0.,-.05,3)
      CALL PLOT (0.,.05,2)
      CALL NUMBER (0.,-.20,.10,XAXIS,0.,0)
      DO 27 I=1,LXL
         XAXIS=XAXIS+1.
      CALL PLOT (XAXIS,-.05,3)
      CALL PLOT (XAXIS,.05,2)
         SLABEL=1000.*XAXIS
         XAXIS1=XAXIS-.2
   27 CALL NUMBER (XAXIS1,-.20,.10,SLABEL,0.,0)
         XTITLE=(XL-2.)/2.
         ATITLE=XL/2.-3.125
      CALL SYMBOL (XTITLE,-.40,.15,'DISTANCE, FT.',0.,13)
      CALL SYMBOL (ATITLE,-.80,.10,A1,0.,80)
      CALL SYMBOL (ATITLE,-1.0,.10,A2,0.,80)
      CALL SYMBOL (XP1,4.9,.075,'REACH:',0.,6)
         XP1A=XP1+.6
      CALL SYMBOL (XP1A,4.9,0.075,POINT1,0.,1)
         XP1A=XP1A+.075
      CALL SYMBOL (XP1A,4.9,.075,POINT2,0.,1)
      CALL SYMBOL (0.,-.60,.15,POINT1,0.,1)
      CALL SYMBOL (XL,-.60,.15,POINT2,0.,1)
      RETURN
      END
```

```
FORTRAN IV G LEVEL  21                MYPLOT              DATE = 78050          12/29/26

          SUBROUTINE MYPLOT (I,J,AD,AC,YINC,NPL,G,XP1,XP2,XP3,RNAME)
          DIMENSION AD(90),AC(10,10,90),RNAME(10,10,10),F(10),X(90),Y(90)
              X(1)=AD(1)/1000.
              Y(1)=AC(I,J,1)/YINC
          IF (AC(I,J,1).EQ.999.) Y(1)=0.
          CALL PLOT (X(1),Y(1),3)
          DO 30 K=2,NPL
              X(K)=AD(K)/1000.
              Y(K)=AC(I,J,K)/YINC
          IF(AC(I,J,K).EQ.999.) Y(K)=0.
          IF (Y(K).EQ.0.) GO TO 200
          IF (Y(K-1).EQ.0.) GO TO 200
          CALL PLOT (X(K),Y(K),2)
          GO TO 30
      200 CALL PLOT (X(K),Y(K),3)
       30 CONTINUE
              DO 210 K=10,NPL,10
          IF (Y(K).EQ.0.) GO TO 210
          CALL SYMBOL (X(K),Y(K),.08,I,0.,-1)
      210 CONTINUE
              G=G+1.
              YS=4.9-G*0.2
          CALL NUMBER (XP2,YS,.08,I,0.,-1)
          CALL SYMBOL (XP1,YS,.08,I,0.,-1)
          DO 54 K=1,10
       54 F(K)=RNAME (I,J,K)
          CALL SYMBOL (XP3,YS,.08,F,0.,39)
          RETURN
          END
```

C.1.3

INPUT LISTING

for

NEWDYE

(October 1977 data)

```
   MEASURED DYE CONCENTRATION AT 3 FT DEPTH ALONG CENTERLINE
57 ACRES CANAL SYSTEM, PALM BEACH COUNTY, FLORIDA, OCTOBER 1977
    4     8  2.0  1.0  .93
   71    17   14   86   13   12   36   12
AD      7.1   5.
QB      1.7   4.
RP      1.4   4.
FK      8.6   4.
DG      1.3   4.
NM      1.2   4.
TH      3.6   4.
LJ      1.2   4.
  DATE: 771019.  TIDE: LOW,  TIME: 2140.  PEAK: 10.00 PPB
 71  1  DATE: 1019. LOW: 2140. START: 2210. AD
1AD1  2.50     3.00     4.00     2.10     2.60     4.00     4.00     5.50
1AD2 10.00   999.     999.     999.     999.     999.       1.40     1.50
1AD3  1.70     1.40     1.40     1.40     1.40     1.40     1.40     1.40
1AD4  1.40     1.40     1.40     1.40     1.40     1.40     1.40     1.40
1AD5  1.40     1.40     1.40     1.40     1.40     1.40   999.     999.
1AD6999.     999.     999.     999.     999.     999.     999.     999.
1AD7999.     999.     999.     999.     999.     999.     999.     999.
1AD8999.     999.     999.     999.     999.     999.     999.     999.
1AD9999.     999.     999.     999.     999.     999.     999.        .
  0  1  DATE: 1019. LOW: 2140. START: NONE. QB
1QB1999.     999.     999.     999.     999.     999.     999.     999.
1QB2999.     999.     999.     999.     999.     999.     999.     999.
1QB3999.        .        .        .        .        .        .        .
  0  1  DATE: 1019. LOW: 2140. START: NONE. RP
1RP1999.     999.     999.     999.     999.     999.     999.     999.
1RP2999.     999.     999.     999.     999.     999.     999.     999.
  0  1  DATE: 1019. LOW: 2140. START: NONE. FK
1FK1999.     999.     999.     999.     999.     999.     999.     999.
1FK2999.     999.     999.     999.     999.     999.     999.     999.
1FK3999.     999.     999.     999.     999.     999.     999.     999.
1FK4999.     999.     999.     999.     999.     999.     999.     999.
1FK5999.     999.     999.     999.     999.     999.     999.     999.
1FK6999.     999.     999.     999.     999.     999.     999.     999.
1FK7999.     999.     999.     999.     999.     999.     999.     999.
1FK8999.     999.     999.     999.     999.     999.     999.     999.
1FK9999.     999.     999.     999.     999.     999.     999.     999.
1FKA999.     999.     999.     999.     999.     999.     999.     999.
1FKB999.     999.     999.     999.     999.     999.        .        .
  0  1  DATE: 1019. LOW: 2140. START: NONE. DG
1DG1999.     999.     999.     999.     999.     999.     999.     999.
1DG2999.     999.     999.     999.     999.        .        .        .
```

```
1MN1999.      999.      999.      999.      999.      999.      999.      999.
1MN2999.      999.      999.      999.      999.      999.      999.      999.
 0  1  DATE: 1019. LOW: 2140. START: NONE. TH
1TH1999.      999.      999.      999.      999.      999.      999.      999.
1TH2999.      999.      999.      999.      999.      999.      999.      999.
1TH3999.      999.      999.      999.      999.      999.      999.      999.
1TH4999.      999.      999.      999.      999.      999.      999.      999.
1TH5999.      999.      999.      999.         .         .         .         .
 0  1  DATE: 1019. LOW: 2140. START: NONE. LJ
1LJ1999.      999.      999.      999.      999.      999.      999.      999.
1LJ2999.      999.      999.      999.      999.         .         .         .
 DATE:   771020.  TIDE: HIGH.  TIME: 0330.  PEAK: 5.40 PPB
 71  2  DATE: 1020. HIGH: 0330.START: 0401. AD
2AD1  1.50     1.80      2.00      1.65      1.60      1.80      2.00      2.05
2AD2  2.10     3.50      4.60      5.00      3.50      4.40      3.30      5.40
2AD3  3.80     2.10      1.20      1.40      1.20      1.10      1.00      1.00
2AD4  1.00     1.00      1.00      0.95      0.95      0.95      0.95      0.95
2AD5  0.95     1.00      1.00      1.00      1.00      0.90      0.90      0.90
2AD6  0.95     0.95      0.95      0.95      0.95      0.95      0.95      0.90
2AD7  0.90     0.90      0.90      0.90      0.90      0.90      0.90      0.90
2AD8  0.90     0.90      0.90      0.90      0.90      1.00      0.90      0.90
2AD9  0.90     0.90      0.90      0.90      0.90      0.90      0.90         .
 0  2  DATE: 1020. HIGH: 0330. START: NONE. QB
2QB1999.      999.      999.      999.      999.      999.      999.      999.
2QB2999.      999.      999.      999.      999.      999.      999.      999.
2QB3999.         .         .         .         .         .         .         .
 0  2  DATE: 1020. HIGH: 0330. START: NONE. RP
2RP1999.      999.      999.      999.      999.      999.      999.      999.
2RP2999.      999.      999.      999.      999.      999.         .         .
 0  2  DATE: 1020. HIGH: 0330. START: NONE. FK
2FK1999.      999.      999.      999.      999.      999.      999.      999.
2FK2999.      999.      999.      999.      999.      999.      999.      999.
2FK3999.      999.      999.      999.      999.      999.      999.      999.
2FK4999.      999.      999.      999.      999.      999.      999.      999.
2FK5999.      999.      999.      999.      999.      999.      999.      999.
2FK6999.      999.      999.      999.      999.      999.      999.      999.
2FK7999.      999.      999.      999.      999.      999.      999.      999.
2FK8999.      999.      999.      999.      999.      999.      999.      999.
2FK9999.      999.      999.      999.      999.      999.      999.      999.
2FKA999.      999.      999.      999.      999.      999.      999.      999.
2FKB999.      999.      999.      999.      999.      999.         .         .
 0  2  DATE: 1020. HIGH: 0330. START: NONE. DG
2DG1999.      999.      999.      999.      999.      999.      999.      999.
2DG2999.      999.      999.      999.      999.      999.      999.      999.

2NM1999.      999.      999.      999.      999.      999.      999.      999.
2NM2999.      999.      999.      999.      999.         .         .         .
 0  2  DATE: 1020. HIGH: 0330. START: NONE. TH
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2TH1999.      999.      999.      999.      999.      999.      999.      999.
2TH2999.      999.      999.      999.      999.      999.      999.      999.
2TH3999.      999.      999.      999.      999.      999.      999.      999.
2TH4999.      999.      999.      999.      999.      999.      999.      999.
2TH5999.      999.      999.      999.      999.      999.       .         .
  0  2  DATE: 1020. HIGH: 0330. START: NONE. LJ
2LJ1999.      999.      999.      999.      999.      999.      999.      999.
2LJ2999.      999.      999.      999.      999.      999.      999.       .
 DATE: 771020.  TIDE: LOW.  TIME: 0950.  PEAK: 5.70 PPB
 71  3  DATE: 1020. LOW: 0950. START: 1102. AD
3AD1  2.50     2.40      2.40      3.20      3.90      5.70      5.00      4.20
3AD2  3.90     3.50      3.20      2.90      2.30      2.80      2.50      2.10
3AD3  2.20     2.40      2.60      2.50      2.50      2.40      2.40      2.40
3AD4  2.50     2.20      2.10      2.00      2.10      2.00      2.10      2.00
3AD5  2.00     2.00      1.90      1.60      1.40      0.90      1.20      1.20
3AD6  1.00     0.50      0.90      0.60      0.70      0.40      0.20      0.60
3AD7  0.50     0.50      0.57      0.43      0.50      0.40      0.55      0.49
3AD8  0.30     0.30      0.30      0.20      0.20      0.20      0.15      0.20
3AD9  0.20     0.22      0.15      0.20      0.20      0.22      0.19       .
  0  3  DATE: 1020. LOW: 0950. START: NONE. OB
3OB1999.      999.      999.      999.      999.      999.      999.      999.
3OB2999.      999.      999.      999.      999.      999.      999.      999.
3OB3999.       .         .         .         .         .         .         .
  0  3  DATE: 1020. LOW: 0950. START: NONE. RP
3RP1999.      999.      999.      999.      999.      999.      999.      999.
3RP2999.      999.      999.      999.      999.      999.       .         .
 26  3  DATE: 1020. LOW: 0950. START: 1134. FK
3FK1999.      999.      999.      999.      0.13      0.14    000.14      0.16
3FK2  0.16     0.16      0.19      0.17      0.17      0.18      0.19      0.21
3FK3  0.20     0.22      0.23      0.21      0.23      0.22      0.21      0.20
3FK4  0.18     0.19      999.      999.      999.      999.      999.      999.
3FK5999.      999.      999.      999.      999.      999.      999.      999.
3FK6999.      999.      999.      999.      999.      999.      999.      999.
3FK7999.      999.      999.      999.      999.      999.      999.      999.
3FK8999.      999.      999.      999.      999.      999.      999.      999.
3FK9999.      999.      999.      999.      999.      999.      999.      999.
3FKA999.      999.      999.      999.      999.      999.      999.      999.
3FKB999.      999.      999.      999.      999.      999.       .         .
  0  3  DATE: 1020. LOW: 0950. START: NONE. OG
3OG1999.      999.      999.      999.      999.      999.      999.      999.
3OG2999.      999.      999.      999.      999.      999.       .         .

3NM1999.      999.      999.      999.      999.      999.      999.      999.
3NM2999.      999.      999.      999.      999.      999.      999.      999.
  0  3  DATE: 1020. LOW: 0950. START: NONE. TH
3TH1999.      999.      999.      999.      999.      999.      999.      999.
3TH2999.      999.      999.      999.      999.      999.      999.      999.
3TH3999.      999.      999.      999.      999.      999.      999.      999.
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        01 MARCH 1978                    NERDC --- CARD LIST UTILITY

3TH4999.      999.      999.      999.      999.      999.      999.      999.
3TH5999.      999.      999.      999.      999.      999.        .         .
  0  3  DATE: 1020. LOW: 0950. START: NONE, LJ
3LJ1999.      999.      999.      999.      999.      999.      999.      999.
3LJ2999.      999.      999.      999.      999.        .         .         .
 DATE: 771020,  TIDE: HIGH,  TIME: 1610,  PEAK: 2.90 PPB
 71  4  DATE: 1020, HIGH: 1610.START: 1641, AD
4AD1  2.50      2.80      2.90      2.80      2.80      2.80      2.30      2.40
4AD2  2.20      2.20      2.00      2.00      2.00      2.00      2.00      2.00
4AD3  2.00      1.90      1.70      1.60      1.60      1.70      1.10      1.10
4AD4  1.00      1.00      0.70      0.80      0.70      0.70      0.70      0.60
4AD5  0.70      0.83      0.90      0.92      0.81      0.75      0.          .
4AD6999.      999.      999.      999.      0.30      0.30      0.30      0.40
4AD7  0.43      0.44      0.31      0.33      0.32      0.31      0.26      0.25
4AD8  0.27      0.29      0.27      0.23      0.20      0.20      0.19      0.19
4AD9  0.20      0.20      0.20      0.20      0.20      0.19      0.19        .
 17  4  DATE: 1020, HIGH: 1610, START: 1701, QB
4QB1  0.25      0.26      0.26      0.27      0.32      0.29      0.29      0.28
4QB2  0.27      0.27      0.25      0.30      0.31      0.23      0.22      0.41
4QB3  0.55        .         .         .         .         .         .         .
 13  4  DATE: 1020, HIGH: 1610, START: 1707, RP
4RP1  0.24      0.24      0.25      0.26      0.26      0.26      0.30      0.27
4RP2  0.27      0.28      0.29      0.29      0.32      0.32        .         .
 65  4  DATE: 1020, HIGH: 1610, START: 1720, FK
4FK1999.      999.      999.      999.      0.19      0.19      0.19      0.19
4FK2  0.19      000.19    0.19      0.19      0.19      0.19      0.19      0.19
4FK3  0.19      0.22      0.20      0.19      0.19      0.20      0.19      0.19
4FK4  0.19      0.19      0.18      0.19      0.19      0.20      0.19      0.19
4FK5  0.19      0.19      0.19      0.19      0.19      0.19      0.19      0.19
4FK6  0.19      0.19      0.20      0.19      0.19      0.19      0.19      0.19
4FK7  0.19      0.19      0.19      0.19      0.19      0.18      0.18      0.18
4FK8  0.18      0.18      0.18      0.18      0.19      0.19      0.18      0.18
4FK9  0.18      999.      999.      999.      999.      999.      999.      999.
4FKA999.      999.      999.      999.      999.      999.      999.      999.
4FKB999.      999.      999.      999.      999.      999.        .         .
  0  4  DATE: 1020, HIGH: 1610, START: NONE, OG
4OG1999.      999.      999.      999.      999.      999.      999.      999.
4OG2999.      999.      999.      999.      999.      999.      999.        .

4MN1999.      999.      999.      999.      999.      999.      999.      999.
4MN2999.      999.      999.      999.      999.      999.      999.      999.
  0  4  DATE: 1020, HIGH: 1610, START: NONE, TH
4TH1999.      999.      999.      999.      999.      999.      999.      999.
4TH2999.      999.      999.      999.      999.      999.      999.      999.
4TH3999.      999.      999.      999.      999.      999.      999.      999.
4TH4999.      999.      999.      999.      999.      999.      999.      999.
4TH5999.      999.      999.      999.        .         .         .         .
  0  4  DATE: 1020, HIGH: 1610, START: NONE, LJ
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         01  MARCH 1978                  NERDC --- CARD LIST UTILITY

4LJ1999.       999.       599.       999.       999.       999.       999,       999.
4LJ2999.       999.       999.       599.       999.       999.       999.          .
// EXEC PLOT
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C.1.4

PRINTOUT

of

July 1977 data

NEWDYE

MEASURED DYE CONCENTRATION AT 3 FT DEPTH ALONG CENTERLINE

57 ACRES CANAL SYSTEM, PALM BEACH COUNTY, FLORIDA, JULY 1977

NUMBER OF POINTS: 77, TIDE NUMBER: 1
DATE: 0720, HIGH: 1230, START: 1347, AD

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 10.00 | 200. | 10.00 | 300. | 10.00 | 400. | 13.00 | 500. | 25.00 | 600. | 45.00 |
| 700. | 41.00 | 800. | 55.00 | 900. | 140.00 | 1000. | 50.00 | 1100. | 120.00 | 1200. | 50.00 |
| 1300. | 20.00 | 1400. | 16.00 | 1500. | 17.00 | 1600. | 15.00 | 1700. | 24.00 | 1800. | 12.00 |
| 1900. | 70.00 | 2000. | 9.00 | 2100. | 9.00 | 2200. | 11.00 | 2300. | 9.00 | 2400. | 18.00 |
| 2500. | 77.00 | 2600. | 65.00 | 2700. | 30.00 | 2800. | 45.00 | 2900. | 49.00 | 3000. | 57.00 |
| 3100. | 23.00 | 3200. | 28.00 | 3300. | 24.00 | 3400. | 19.00 | 3500. | 19.00 | 3600. | 15.00 |
| 3700. | 15.00 | 3800. | 12.00 | 3900. | 10.00 | 4000. | 11.00 | 4100. | 9.00 | 4200. | 8.00 |
| 4300. | 8.00 | 4400. | 7.00 | 4500. | 7.00 | 4600. | 7.00 | 4700. | 6.00 | 4800. | 6.00 |
| 4900. | 6.00 | 5000. | 6.00 | 5100. | 6.00 | 5200. | 6.00 | 5300. | 7.00 | 5400. | 6.00 |
| 5500. | 6.00 | 5600. | 6.00 | 5700. | 6.00 | 5800. | 6.00 | 5900. | 6.00 | 6000. | 6.00 |
| 6100. | 6.00 | 6200. | 6.00 | 6300. | 6.00 | 6400. | 6.00 | 6500. | 6.00 | 6600. | 6.00 |
| 6700. | 6.00 | 6800. | 6.00 | 6900. | 6.00 | 7000. | 6.00 | 7100. | 6.00 | | |

TIDE NO. = 1    REACH AD    STD. DEV. = 0.2525E 02

NUMBER OF POINTS: 17, TIDE NUMBER: 1
DATE: 0720, HIGH: 1230, START: 1536, QB

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | [illegible].00 | 200. | 10.00 | 300. | 10.00 | 400. | 9.00 | 500. | 9.00 | 600. | 9.00 |
| 700. | 8.00 | 800. | 8.00 | 900. | 9.00 | 1000. | 9.00 | 1100. | 9.00 | 1200. | 9.00 |
| 1300. | 9.00 | 1400. | 9.00 | 1500. | 10.00 | 1600. | 10.00 | 1700. | 11.00 | | |

TIDE NO. = 1    REACH QB    STD. DEV. = 0.2947E 01

NUMBER OF POINTS: 16, TIDE NUMBER: 1

DATE: 0720, HIGH: 1230, START: 1546, RP

CONCENTRATION VS, DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 8.00 | 200. | 8.00 | 300. | 8.00 | 400. | 8.00 | 500. | 8.00 | 600. | 8.00 |
| 700. | 9.00 | 800. | 8.00 | 900. | 10.00 | 1000. | 10.00 | 1100. | 10.00 | 1200. | 10.00 |
| 1300. | 11.00 | 1400. | 12.00 | | | | | | | | |

TIDE NO. = 1 REACH RP STD. DEV. = 0.1351E 01

NUMBER OF POINTS: 86, TIDE NUMBER: 1
DATE: 0720, HIGH: 1230, START: 1418, FK

CONCENTRATION VS, DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 7.00 | 200. | 7.00 | 300. | 7.00 | 400. | 7.00 | 500. | 7.00 | 600. | 7.00 |
| 700. | 7.00 | 800. | 7.00 | 900. | 7.00 | 1000. | 7.00 | 1100. | 7.00 | 1200. | 7.00 |
| 1300. | 7.00 | 1400. | 6.00 | 1500. | 6.00 | 1600. | 6.00 | 1700. | 6.00 | 1800. | 6.00 |
| 1900. | 6.00 | 2000. | 6.00 | 2100. | 6.00 | 2200. | 6.00 | 2300. | 5.00 | 2400. | 6.00 |
| 2500. | 6.00 | 2600. | 6.00 | 2700. | 6.00 | 2800. | 7.00 | 2900. | 7.00 | 3000. | 7.00 |
| 3100. | 7.00 | 3200. | 7.00 | 3300. | 7.00 | 3400. | 7.00 | 3500. | 6.00 | 3600. | 7.00 |
| 3700. | 7.00 | 3800. | 7.00 | 3900. | 7.00 | 4000. | 7.00 | 4100. | 7.00 | 4200. | 7.00 |
| 4300. | 7.00 | 4400. | 6.00 | 4500. | 7.00 | 4600. | 7.00 | 4700. | 7.00 | 4800. | 6.00 |
| 4900. | 6.00 | 5000. | 7.00 | 5100. | 7.00 | 5200. | 7.00 | 5300. | 7.00 | 5400. | 7.00 |
| 5500. | 7.00 | 5600. | 7.00 | 5700. | 7.00 | 5800. | 6.00 | 5900. | 7.00 | 6000. | 7.00 |
| 6100. | 7.00 | 6200. | 7.00 | 6300. | 7.00 | 6400. | 7.00 | 6500. | 7.00 | 6600. | 7.00 |
| 6700. | 7.00 | 6800. | 7.00 | 6900. | 7.00 | 7000. | 7.00 | 7100. | 6.00 | 7200. | 7.00 |
| 7300. | 7.00 | 7400. | 7.00 | 7500. | 7.00 | 7600. | 6.00 | 7700. | 6.00 | 7800. | 6.00 |
| 7900. | 7.00 | 8000. | 6.00 | 8100. | 6.00 | 8200. | 6.00 | 8300. | 6.00 | 8400. | 6.00 |
| 8500. | 6.00 | 8600. | 6.00 | | | | | | | | |

TIDE NO. = 1 REACH FK STD. DEV. = 0.5067E 00

NUMBER OF POINTS: 13, TIDE NUMBER: 1
DATE: 0720, HIGH: 1230, START: NONE, OG

CONCENTRATION VS, DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 999.00 | 600. | 999.00 |
| 700. | 999.00 | 800. | 999.00 | 900. | 999.00 | 1000. | 999.00 | 1100. | 999.00 | 1200. | 999.00 |
| 1300. | 999.00 | | | | | | | | | | |

TIDE NO. = 1 REACH OK STD. DEV. = 0.0

NUMBER OF POINTS: 12. TIDE NUMBER: 1
DATE: 0720. HIGH: 1230. START: NONE. NM

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 999.00 | 600. | 999.00 |
| 700. | 999.00 | 800. | 999.00 | 900. | 999.00 | 1000. | 999.00 | 1100. | 999.00 | 1200. | 999.00 |

TIDE NO. = 1 REACH NM STD. DEV. = 0.0

NUMBER OF POINTS: 36. TIDE NUMBER: 1
DATE: 0720. HIGH: 1230. START: NONE. TH

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 999.00 | 600. | 999.00 |
| 700. | 999.00 | 800. | 999.00 | 900. | 999.00 | 1000. | 999.00 | 1100. | 999.00 | 1200. | 999.00 |
| 1300. | 999.00 | 1400. | 999.00 | 1500. | 999.00 | 1600. | 999.00 | 1700. | 999.00 | 1800. | 999.00 |
| 1900. | 999.00 | 2000. | 999.00 | 2100. | 999.00 | 2200. | 999.00 | 2300. | 999.00 | 2400. | 999.00 |
| 2500. | 999.00 | 2600. | 999.00 | 2700. | 999.00 | 2800. | 999.00 | 2900. | 999.00 | 3000. | 999.00 |
| 3100. | 999.00 | 3200. | 959.00 | 3300. | 999.00 | 3400. | 999.00 | 3500. | 999.00 | 3600. | 999.00 |

TIDE NO. = 1 REACH TH STD. DEV. = 0.0

NUMBER OF POINTS: 12. TIDE NUMBER: 1
DATE: 0720. HIGH: 1230. START: 1500. LJ

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 7.00 | 200. | 7.00 | 300. | 7.00 | 400. | 7.00 | 500. | 7.00 | 600. | 7.00 |
| 700. | 7.00 | 800. | 7.00 | 900. | 999.00 | 1000. | 999.00 | 1100. | 999.00 | 1200. | 999.00 |

TIDE NO. = 1 REACH LJ STD. DEV. = 0.0

NUMBER OF POINTS: 71. TIDE NUMBER: 2
DATE: 0720. LOW: 1935. START: 1940. AD

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 20.00 | 200. | 40.00 | 300. | 10.00 | 400. | 15.00 | 500. | 10.00 | 600. | 10.00 |
| 700. | 17.00 | 800. | 15.00 | 900. | 25.00 | 1000. | 20.00 | 1100. | 21.00 | 1200. | 21.00 |
| 1300. | 41.00 | 1400. | 35.00 | 1500. | 21.00 | 1600. | 16.00 | 1700. | 17.00 | 1800. | 18.00 |
| 1900. | 12.00 | 2000. | 13.00 | 2100. | 15.00 | 2200. | 15.00 | 2300. | 16.00 | 2400. | 30.00 |
| 2500. | 35.00 | 2600. | 40.00 | 2700. | 45.00 | 2800. | 56.00 | 2900. | 64.00 | 3000. | 80.00 |
| 3100. | 90.00 | 3200. | 100.00 | 3300. | 85.00 | 3400. | 56.00 | 3500. | 90.00 | 3600. | 104.00 |
| 3700. | 92.00 | 3800. | 80.00 | 3900. | 100.00 | 4000. | 129.00 | 4100. | 124.00 | 4200. | 135.00 |
| 4300. | 134.00 | 4400. | 27.00 | 4500. | 121.00 | 4600. | 120.00 | 4700. | 112.00 | 4800. | 100.00 |
| 4900. | 97.00 | 5000. | 93.00 | 5100. | 88.00 | 5200. | 82.00 | 5300. | 82.00 | 5400. | 80.00 |
| 5500. | 82.00 | 5600. | 90.00 | 5700. | 75.00 | 5800. | 60.00 | 5900. | 60.00 | 6000. | 60.00 |
| 6100. | 57.00 | 6200. | 53.00 | 6300. | 48.00 | 6400. | 23.00 | 6500. | 13.00 | 6600. | 15.00 |
| 6700. | 13.00 | 6800. | 13.00 | 6900. | 20.00 | 7000. | 20.00 | 7100. | 31.00 | | |

TIDE NO. = 2 REACH AD STD. DEV. = 0.3891E 02

NUMBER OF POINTS: 17. TIDE NUMBER: 2
DATE: 0720. LOW: 1855. START: 2050. QB

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 60.00 | 200. | 65.00 | 300. | 50.00 | 400. | 32.00 | 500. | 29.00 | 600. | 40.00 |
| 700. | 50.00 | 800. | 60.00 | 900. | 75.00 | 1000. | 75.00 | 1100. | 20.00 | 1200. | 15.00 |
| 1300. | 7.00 | 1400. | 8.00 | 1500. | 8.00 | 1600. | 7.00 | 1700. | 7.00 | | |

TIDE NO. = 2 REACH QB STD. DEV. = 0.2537E 02

NUMBER OF POINTS: 14, TIDE NUMBER: 2
DATE: 0720, LOW: 1855, START: NONE, RP

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 999.00 | 600. | 999.00 |
| 700. | 999.00 | 800. | 999.00 | 900. | 999.00 | 1000. | 999.00 | 1100. | 999.00 | 1200. | 999.00 |
| 1300. | 999.00 | 1400. | 999.00 | | | | | | | | |

TIDE NO. = 2 REACH RP STD. DEV. = 0.0

NUMBER OF POINTS: 86, TIDE NUMBER: 2
DATE: 0720, LOW: 1855, START: 1956, FK

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 7.00 | 500. | 7.00 | 600. | 7.00 |
| 700. | 7.00 | 800. | 7.00 | 900. | 7.00 | 1000. | 7.00 | 1100. | 8.00 | 1200. | 8.00 |
| 1300. | 8.00 | 1400. | 8.00 | 1500. | 10.00 | 1600. | 15.00 | 1700. | 16.00 | 1800. | 15.00 |
| 1900. | 17.00 | 2000. | 20.00 | 2100. | 19.00 | 2200. | 14.00 | 2300. | 9.00 | 2400. | 13.00 |
| 2500. | 17.00 | 2600. | 29.00 | 2700. | 25.00 | 2800. | 33.00 | 2900. | 37.00 | 3000. | 39.00 |
| 3100. | 33.00 | 3200. | 38.00 | 3300. | 40.00 | 3400. | 36.00 | 3500. | 37.00 | 3600. | 27.00 |
| 3700. | 26.00 | 3800. | 21.00 | 3900. | 16.00 | 4000. | 16.00 | 4100. | 17.00 | 4200. | 11.00 |
| 4300. | 9.00 | 4400. | 9.00 | 4500. | 8.00 | 4600. | 8.00 | 4700. | 999.00 | 4800. | 999.00 |
| 4900. | 999.00 | 5000. | 999.00 | 5100. | 999.00 | 5200. | 999.00 | 5300. | 999.00 | 5400. | 999.00 |
| 5500. | 999.00 | 5600. | 999.00 | 5700. | 999.00 | 5800. | 999.00 | 5900. | 999.00 | 6000. | 999.00 |
| 6100. | 999.00 | 6200. | 999.00 | 6300. | 999.00 | 6400. | 999.00 | 6500. | 999.00 | 6600. | 999.00 |
| 6700. | 999.00 | 6800. | 999.00 | 6900. | 999.00 | 7000. | 999.00 | 7100. | 999.00 | 7200. | 999.00 |
| 7300. | 999.00 | 7400. | 999.00 | 7500. | 999.00 | 7600. | 999.00 | 7700. | 999.00 | 7800. | 999.00 |
| 7900. | 999.00 | 8000. | 999.00 | 8100. | 999.00 | 8200. | 999.00 | 8300. | 999.00 | 8400. | 999.00 |
| 8500. | 999.00 | 8600. | 999.00 | | | | | | | | |

TIDE NO. = 2 REACH FK STD. DEV. = 0.1094E 02

NUMBER OF POINTS: 13. TIDE NUMBER: 2
DATE: 0721, LOW: 1855, START: NONE, OG

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100, | 999.00 | 200, | 999.00 | 300, | 999.00 | 400, | 999.00 | 500, | 999.00 | 600, | 999.00 |
| 700, | 999.00 | 800, | 999.00 | 900, | 999.00 | 1000, | 999.00 | 1100, | 999.00 | 1200, | 999.00 |
| 1300, | 999.00 | | | | | | | | | | |

TIDE NO. = 2 REACH OG STD. DEV. = 0.0

NUMBER OF POINTS: 12. TIDE NUMBER: 2
DATE: 0721, LOW: 1855, START: NONE, NM

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100, | 999.00 | 200, | 999.00 | 300, | 999.00 | 400, | 999.00 | 500, | 999.00 | 600, | 999.00 |
| 700, | 999.00 | 800, | 999.00 | 900, | 999.00 | 1000, | 999.00 | 1100, | 999.00 | 1200, | 999.00 |

TIDE NO. = 2 REACH NM STD. DEV. = 0.0

NUMBER OF POINTS: 36. TIDE NUMBER: 2
DATE: 0721, LOW: 1855, START: NONE, TH

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100, | 999.00 | 200, | 999.00 | 300, | 999.00 | 400, | 999.00 | 500, | 999.00 | 600, | 999.00 |
| 700, | 999.00 | 800, | 999.00 | 900, | 999.00 | 1000, | 999.00 | 1100, | 999.00 | 1200, | 999.00 |
| 1300, | 999.00 | 1400, | 999.00 | 1500, | 999.00 | 1600, | 999.00 | 1700, | 999.00 | 1800, | 999.00 |
| 1900, | 999.00 | 2000, | 999.00 | 2100, | 999.00 | 2200, | 999.00 | 2300, | 999.00 | 2400, | 999.00 |
| 2500, | 999.00 | 2600, | 999.00 | 2700, | 999.00 | 2800, | 999.00 | 2900, | 999.00 | 3000, | 999.00 |
| 3100, | 999.00 | 3200, | 999.00 | 3300, | 999.00 | 3400, | 999.00 | 3500, | 999.00 | 3600, | 999.00 |

TIDE NO. = 2 REACH TH STD. DEV. = 0.0

NUMBER OF POINTS: 12, TIDE NUMBER: 2
DATE: 0721, LOW: 1855, START: NONE, LJ

CONCENTRATION VS, DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100, | 999.00 | 200, | 999.00 | 300, | 999.00 | 400, | 999.00 | 500, | 999.00 | 600, | 999.00 |
| 700, | 999.00 | 800, | 999.00 | 900, | 999.00 | 1000, | 999.00 | 1100, | 999.00 | 1200, | 999.00 |

TIDE NO. = 2 REACH LJ STD. DEV. = 0.0

NUMBER OF POINTS: 71, TIDE NUMBER: 3
DATE: 0721, HIGH: 0105, START: 0005, AD

CONCENTRATION VS, DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100, | 105.00 | 200, | 96.00 | 300, | 102.00 | 400, | 98.00 | 500, | 90.00 | 600, | 87.00 |
| 700, | 85.00 | 800, | 70.00 | 900, | 68.00 | 1000, | 69.00 | 1100, | 60.00 | 1200, | 50.00 |
| 1300, | 45.00 | 1400, | 58.00 | 1500, | 50.00 | 1600, | 59.00 | 1700, | 6[illegible].00 | 1800, | 55.00 |
| 1900, | 47.00 | 2000, | 47.00 | 2100, | 47.00 | 2200, | 42.00 | 2300, | 37.00 | 2400, | 41.00 |
| 2500, | 40.00 | 2600, | 42.00 | 2700, | 43.00 | 2800, | 38.00 | 2900, | 36.00 | 3000, | 35.00 |
| 3100, | 37.00 | 3200, | 33.00 | 3300, | 28.00 | 3400, | 32.00 | 3500, | 32.00 | 3600, | 33.00 |
| 3700, | 28.00 | 3800, | 31.00 | 3900, | 21.00 | 4000, | 32.00 | 4100, | 30.00 | 4200, | 28.00 |
| 4300, | 27.00 | 4400, | 25.00 | 4500, | 31.00 | 4600, | 35.00 | 4700, | 24.00 | 4800, | 18.00 |
| 4900, | 20.00 | 5000, | 16.00 | 5100, | 15.00 | 5200, | 16.00 | 5300, | 14.00 | 5400, | 15.00 |
| 5500, | 15.00 | 5600, | 14.00 | 5700, | 13.00 | 5800, | 12.00 | 5900, | 10.00 | 6000, | 12.00 |
| 6100, | 11.00 | 6200, | 7.00 | 6300, | 6.00 | 6400, | 6.00 | 6500, | 6.00 | 6600, | 6.00 |
| 6700, | 5.00 | 6800, | 6.00 | 6900, | 6.00 | 7000, | 7.00 | 7100, | 7.00 | | |

TIDE NO. = 3 REACH AD STD. DEV. = 0.2621E 02

NUMBER OF POINTS: 17, TIDE NUMBER: 3
DATE: 0721, HIGH: 0105, START: 0056, OB

CONCENTRATION VS, DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 37.00 | 200. | 33.00 | 300. | 47.00 | 400. | 41.00 | 500. | 35.00 | 600. | 36.00 |
| 700. | 41.00 | 800. | 41.00 | 900. | 40.00 | 1000. | 42.00 | 1100. | 40.00 | 1200. | 40.00 |
| 1300. | 37.00 | 1400. | 35.00 | 1500. | 32.00 | 1600. | 34.00 | 1700. | 38.00 | | |

TIDE NO. = 3 REACH QB STD. DEV. = 0.4570E 01

NUMBER OF POINTS: 14. TIDE NUMBER: 3
DATE: 0721, HIGH: 0105, START: 0104, RP

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 25.00 | 200. | 38.00 | 300. | 41.00 | 400. | 37.00 | 500. | 41.00 | 600. | 18.00 |
| 700. | 16.00 | 800. | 18.00 | 900. | 10.00 | 1000. | 10.00 | 1100. | 10.00 | 1200. | 10.00 |
| 1300. | 10.00 | 1400. | 11.00 | | | | | | | | |

TIDE NO. = 3 REACH RP STD. DEV. = 0.1274E 02

NUMBER OF POINTS: 86. TIDE NUMBER: 3
DATE: 0721, HIGH: 0105, START: NONE, FK

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 999.00 | 600. | 999.00 |
| 700. | 999.00 | 800. | 999.00 | 900. | 999.00 | 1000. | 999.00 | 1100. | 999.00 | 1200. | 999.00 |
| 1300. | 999.00 | 1400. | 999.00 | 1500. | 999.00 | 1600. | 999.00 | 1700. | 999.00 | 1800. | 999.00 |
| 1900. | 999.00 | 2000. | 999.00 | 2100. | 999.00 | 2200. | 999.00 | 2300. | 999.00 | 2400. | 999.00 |
| 2500. | 999.00 | 2600. | 999.00 | 2700. | 999.00 | 2800. | 999.00 | 2900. | 999.00 | 3000. | 999.00 |
| 3100. | 999.00 | 3200. | 999.00 | 3300. | 999.00 | 3400. | 999.00 | 3500. | 999.00 | 3600. | 999.00 |
| 3700. | 999.00 | 3800. | 999.00 | 3900. | 999.00 | 4000. | 999.00 | 4100. | 999.00 | 4200. | 999.00 |
| 4300. | 999.00 | 4400. | 999.00 | 4500. | 999.00 | 4600. | 999.00 | 4700. | 999.00 | 4800. | 999.00 |
| 4900. | 999.00 | 5000. | 999.00 | 5100. | 999.00 | 5200. | 999.00 | 5300. | 999.00 | 5400. | 999.00 |
| 5500. | 999.00 | 5600. | 999.00 | 5700. | 999.00 | 5800. | 999.00 | 5900. | 999.00 | 6000. | 999.00 |
| 6100. | 999.00 | 6200. | 999.00 | 6300. | 999.00 | 6400. | 999.00 | 6500. | 999.00 | 6600. | 999.00 |
| 6700. | 999.00 | 6800. | 999.00 | 6900. | 999.00 | 7000. | 999.00 | 7100. | 999.00 | 7200. | 999.00 |
| 7300. | 999.00 | 7400. | 999.00 | 7500. | 999.00 | 7600. | 999.00 | 7700. | 999.00 | 7800. | 999.00 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 7900, | 999,00 | 8000, | 999,00 | 8100, | 999,00 | 8200, | 999,00 | 8300, | 999,00 | 8400, | 999,00 |
| 8500, | 999,00 | 8600, | 999,00 | | | | | | | | |

TIDE NO. = 3 REACH FK STD. DEV. = 0.0

NUMBER OF POINTS: 13, TIDE NUMBER: 3
DATE: 0721, HIGH: 0105, START: NONE, OG

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100, | 999,00 | 200, | 999,00 | 300, | 999,00 | 400, | 999,00 | 500, | 999,00 | 600, | 999,00 |
| 700, | 999,00 | 800, | 999,00 | 900, | 999,00 | 1000, | 999,00 | 1100, | 999,00 | 1200, | 999,00 |
| 1300, | 999,00 | | | | | | | | | | |

TIDE NO. = 3 REACH OG STD. DEV. = 0.0

NUMBER OF POINTS: 12, TIDE NUMBER: 3
DATE: 0721, HIGH: 0105, START: NONE, NM

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100, | 999,00 | 200, | 999,00 | 300, | 999,00 | 400, | 999,00 | 500, | 999,00 | 600, | 999,00 |
| 700, | 999,00 | 800, | 999,00 | 900, | 999,00 | 1000, | 999,00 | 1100, | 999,00 | 1200, | 999,00 |

TIDE NO. = 3 REACH NM STD. DEV. = 0.0

NUMBER OF POINTS: 36, TIDE NUMBER: 3
DATE: 0721, HIGH: 0105, START: NONE, TH

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100, | 999,00 | 200, | 999,00 | 300, | 999,00 | 400, | 999,00 | 500, | 999,00 | 600, | 999,00 |
| 700, | 999,00 | 800, | 999,00 | 900, | 999,00 | 1000, | 999,00 | 1100, | 999,00 | 200, | 999,00 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1300. | 999.00 | 1400. | 999.00 | 1500. | 999.00 | 1600. | 999.00 | 1700. | 999.00 | 1800. | 999.00 |
| 1900. | 999.00 | 2000. | 999.00 | 2100. | 999.00 | 2200. | 999.00 | 2300. | 999.00 | 2400. | 999.00 |
| 2500. | 999.00 | 2600. | 999.00 | 2700. | 999.00 | 2800. | 999.00 | 2900. | 999.00 | 3000. | 999.00 |
| 3100. | 999.00 | 3200. | 999.00 | 3300. | 999.00 | 3400. | 999.00 | 3500. | 999.00 | 3600. | 999.00 |

TIDE NO. = 3 REACH TH STD. DEV. = 0.0

NUMBER OF POINTS: 12. TIDE NUMBER: 3
DATE: 0721, HIGH: 0105, START: NONE, LJ

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 999.00 | 600. | 999.00 |
| 700. | 999.00 | 800. | 999.00 | 900. | 999.00 | 1000. | 999.00 | 1100. | 999.00 | 1200. | 999.00 |

TIDE NO. = 3 REACH LJ STD. DEV. = 0.0

NUMBER OF POINTS: 71. TIDE NUMBER: 4
DATE: 0721, LOW: 0715, START: 0809, AD

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 105.00 | 200. | 100.00 | 300. | 97.00 | 400. | 98.00 | 500. | 97.00 | 600. | 90.00 |
| 700. | 98.00 | 800. | 97.00 | 900. | 99.00 | 1000. | 97.00 | 1100. | 93.00 | 1200. | 92.00 |
| 1300. | 88.00 | 1400. | 88.00 | 1500. | 87.00 | 1600. | 86.00 | 1700. | 83.00 | 1800. | 82.00 |
| 1900. | 82.00 | 2000. | 79.00 | 2100. | 74.00 | 2200. | 78.00 | 2300. | 81.00 | 2400. | 80.00 |
| 2500. | 75.00 | 2600. | 74.00 | 2700. | 83.00 | 2800. | 77.00 | 2900. | 75.00 | 3000. | 75.00 |
| 3100. | 57.00 | 3200. | 60.00 | 3300. | 65.00 | 3400. | 68.00 | 3500. | 69.00 | 3600. | 58.00 |
| 3700. | 70.00 | 3800. | 72.00 | 3900. | 69.00 | 4000. | 71.00 | 4100. | 60.00 | 4200. | 65.00 |
| 4300. | 60.00 | 4400. | 63.00 | 4500. | 65.00 | 4600. | 60.00 | 4700. | 70.00 | 4800. | 72.00 |
| 4900. | 63.00 | 5000. | 64.00 | 5100. | 59.00 | 5200. | 57.00 | 5300. | 54.00 | 5400. | 50.00 |
| 5500. | 47.00 | 5600. | 44.00 | 5700. | 36.00 | 5800. | 35.00 | 5900. | 34.00 | 6000. | 32.00 |
| 6100. | 30.00 | 6200. | 31.00 | 6300. | 32.00 | 6400. | 29.00 | 6500. | 26.00 | 6600. | 17.00 |
| 6700. | 27.00 | 6800. | 24.00 | 6900. | 25.00 | 7000. | 23.00 | 7100. | 23.00 | | |

TIDE NO. = 4 REACH AD STD. DEV. = 0.2370E 02

NUMBER OF POINTS: 17. TIDE NUMBER: 4
DATE: 0721. LOW: 0715. START: 1040. QB

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 38.00 | 200. | 35.00 | 300. | 32.00 | 400. | 30.00 | 500. | 28.00 | 600. | 31.00 |
| 700. | 24.00 | 800. | 21.00 | 900. | 21.00 | 1000. | 23.00 | 1100. | 20.00 | 1200. | 19.00 |
| 1300. | 17.00 | 1400. | 20.00 | 1500. | 17.00 | 1600. | 25.00 | 1700. | 20.00 | | |

TIDE NO. = 4 REACH QB STD. DEV. = 0.7167E 01

NUMBER OF POINTS: 14. TIDE NUMBER: 4
DATE: 0721. LOW: 0715. START: 1044. RP

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 13.00 | 200. | 19.00 | 300. | 21.00 | 400. | 15.00 | 500. | 18.00 | 600. | 14.00 |
| 700. | 15.00 | 800. | 13.00 | 900. | 19.00 | 1000. | 22.00 | 1100. | 16.00 | 1200. | 21.00 |
| 1300. | 20.00 | 1400. | 22.00 | | | | | | | | |

TIDE NO. = 4 REACH RP STD. DEV. = 0.3025E 01

NUMBER OF POINTS: 86. TIDE NUMBER: 4
DATE: 0721. LOW: 0715. START: 0850. FK

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 9.00 | 200. | 9.00 | 300. | 9.00 | 400. | 9.00 | 500. | 9.00 | 600. | 9.00 |
| 700. | 17.00 | 800. | 20.00 | 900. | 19.00 | 1000. | 20.00 | 1100. | 20.00 | 1200. | 23.00 |
| 1300. | 21.00 | 1400. | 14.00 | 1500. | 16.00 | 1600. | 17.00 | 1700. | 26.00 | 1800. | 26.00 |
| 1900. | 28.00 | 2000. | 25.00 | 2100. | 28.00 | 2200. | 27.00 | 2300. | [illegible] | 2400. | 24.00 |
| 2500. | 25.00 | 2600. | 20.00 | 2700. | 18.00 | 2800. | 19.00 | 2900. | 19.00 | 3000. | 20.00 |
| 3100. | 20.00 | 3200. | 22.00 | 3300. | 22.00 | 3400. | 22.00 | 3500. | 22.00 | 3600. | 23.00 |
| 3700. | 22.00 | 3800. | 20.00 | 3900. | 21.00 | 4000. | 21.00 | 4100. | 17.00 | 4200. | 17.00 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 4300. | 16.00 | 4400. | 11.00 | 4500. | 10.00 | 4600. | 13.00 | 4700. | 8.00 | 4800. | 7.00 |
| 4900. | 7.00 | 5000. | 7.00 | 5100. | 6.00 | 5200. | 7.00 | 5300. | 7.00 | 5400. | 7.00 |
| 5500. | 7.00 | 5600. | 7.00 | 5700. | 7.00 | 5800. | 7.00 | 5900. | 7.00 | 6000. | 6.00 |
| 6100. | 6.00 | 6200. | 6.00 | 6300. | 6.00 | 6400. | 6.00 | 6500. | 6.00 | 6600. | 5.00 |
| 6700. | 5.00 | 6800. | 5.00 | 6900. | 5.00 | 7000. | 5.00 | 7100. | 5.00 | 7200. | 5.00 |
| 7300. | 5.00 | 7400. | 5.00 | 7500. | 5.00 | 7600. | 5.00 | 7700. | 5.00 | 7800. | 5.00 |
| 7900. | 5.00 | 8000. | 5.00 | 8100. | 5.00 | 8200. | 5.00 | 8300. | 5.00 | 8400. | 5.00 |
| 8500. | 5.00 | 8600. | 5.00 | | | | | | | | |

TIDE NO. = 4 REACH FK STD. DEV. = 0.7791E 01

NUMBER OF POINTS: 13. TIDE NUMBER: 4
DATE: 0721. LOW: 0715. START: 1020. OG

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 18.00 | 200. | 20.00 | 300. | 19.00 | 400. | 17.00 | 500. | 21.00 | 600. | 20.00 |
| 700. | 17.00 | 800. | 15.00 | 900. | 14.00 | 1000. | 14.00 | 1100. | 13.00 | 1200. | 13.00 |
| 1300. | 11.00 | | | | | | | | | | |

TIDE NO. = 4 REACH OG STD. DEV. = 0.3199E 01

NUMBER OF POINTS: 12. TIDE NUMBER: 4
DATE: 0721. LOW: 0715. START: 1022. NM

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 10.00 | 200. | 10.00 | 300. | 9.00 | 400. | 9.00 | 500. | 9.00 | 600. | 9.00 |
| 700. | 9.00 | 800. | 10.00 | 900. | 10.00 | 1000. | 10.00 | 1100. | 10.00 | 1200. | 10.00 |

TIDE NO. = 4 REACH NM STD. DEV. = 0.5149E 00

NUMBER OF POINTS: 36. TIDE NUMBER: 4
DATE: 0721. LOW: 0715. START: 1000. TH

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 8.00 | 200. | 8.00 | 300. | 10.00 | 400. | 10.00 | 500. | 10.00 | 600. | 12.00 |
| 700. | 13.00 | 800. | 11.00 | 900. | 11.00 | 1000. | 10.00 | 1100. | 12.00 | 1200. | 11.00 |
| 1300. | 9.00 | 1400. | 9.00 | 1500. | 8.00 | 1600. | 8.00 | 1700. | 8.00 | 1800. | 7.00 |
| 1900. | 6.00 | 2000. | 6.00 | 2100. | 5.00 | 2200. | 5.00 | 2300. | 5.00 | 2400. | 4.00 |
| 2500. | 4.00 | 2600. | 4.00 | 2700. | 4.00 | 2800. | 4.00 | 2900. | 4.00 | 3000. | 4.00 |
| 3100. | 4.00 | 3200. | 4.00 | 3300. | 5.00 | 3400. | 5.00 | 3500. | 5.00 | 3600. | 5.00 |

TIDE NO. = 4 REACH TH STD. DEV. = 0.2893E 01

NUMBER OF POINTS: 12. TIDE NUMBER: 4
DATE: 0721. LOW: 0715. START: 0944. LJ

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 6.00 | 200. | 7.00 | 300. | 7.00 | 400. | 8.00 | 500. | 8.00 | 600. | 8.00 |
| 700. | 8.00 | 800. | 8.00 | 900. | 8.00 | 1000. | 6.00 | 1100. | 6.00 | 1200. | 6.00 |

TIDE NO. = 4 REACH LJ STD. DEV. = 0.9374E 00

NUMBER OF POINTS: 71. TIDE NUMBER: 5
DATE: 0721. HIGH: 1325. START: NONE. AD

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 999.00 | 600. | 999.00 |
| 700. | 999.00 | 800. | 999.00 | 900. | 999.00 | 1000. | 999.00 | 1100. | 999.00 | 1200. | 999.00 |
| 1300. | 999.00 | 1400. | 999.00 | 1500. | 999.00 | 1600. | 999.00 | 1700. | 999.00 | 1800. | 999.00 |
| 1900. | 999.00 | 2000. | 999.00 | 2100. | 999.00 | 2200. | 999.00 | 2300. | 999.00 | 2400. | 999.00 |
| 2500. | 999.00 | 2600. | 999.00 | 2700. | 999.00 | 2800. | 999.00 | 2900. | 999.00 | 3000. | 999.00 |
| 3100. | 999.00 | 3200. | 999.00 | 3300. | 999.00 | 3400. | 999.00 | 3500. | 999.00 | 3600. | 999.00 |
| 3700. | 999.00 | 3800. | 999.00 | 3900. | 999.00 | 4000. | 999.00 | 4100. | 999.00 | 4200. | 999.00 |
| 4300. | 999.00 | 4400. | 999.00 | 4500. | 999.00 | 4600. | 999.00 | 4700. | 999.00 | 4800. | 999.00 |
| 4900. | 999.00 | 5000. | 999.00 | 5100. | 999.00 | 5200. | 999.00 | 5300. | 999.00 | 5400. | 999.00 |
| 5500. | 999.00 | 5600. | 999.00 | 5700. | 999.00 | 5800. | 999.00 | 5900. | 999.00 | 6000. | 999.00 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 6100. | 999.00 | 6200. | 999.00 | 6300. | 999.00 | 6400. | 999.00 | 6500. | 999.00 | 6600. | 999.00 |
| 6700. | 999.00 | 6800. | 999.00 | 6900. | 999.00 | 7000. | 999.00 | 7100. | 999.00 | | |

TIDE NO. = 5 REACH AO STD. DEV. = 0.0

NUMBER OF POINTS: 17, TIDE NUMBER: 5
DATE: 0721, HIGH: 1325, START: NONE, QB

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 999.00 | 600. | 999.00 |
| 700. | 999.00 | 800. | 999.00 | 900. | 999.00 | 1000. | 999.00 | 1100. | 999.00 | 1200. | 999.00 |
| 1300. | 999.00 | 1400. | 999.00 | 1500. | 999.00 | 1600. | 999.00 | 1700. | 999.00 | | |

TIDE NO. = 5 REACH QB STD. DEV. = 0.0

NUMBER OF POINTS: 14, TIDE NUMBER: 5
DATE: 0721, HIGH: 1325, START: NONE, RP

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 999.00 | 600. | 999.00 |
| 700. | 999.00 | 800. | 999.00 | 900. | 999.00 | 1000. | 999.00 | 1100. | 999.00 | 1200. | 999.00 |
| 1300. | 999.00 | 1400. | 999.00 | | | | | | | | |

TIDE NO. = 5 REACH RP STD. DEV. = 0.0

NUMBER OF POINTS: 86, TIDE NUMBER: 5
DATE: 0721, HIGH: 1325, START: NONE, FK

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 999.00 | 600. | 999.00 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 700, | 999.00 | 800, | 999.00 | 900, | 999.00 | 1000, | 999.00 | 1100, | 999.00 | 1200, | 999.00 |
| 1300, | 999.00 | 1400, | 999.00 | 1500, | 999.00 | 1600, | 999.00 | 1700, | 999.00 | 1800, | 999.00 |
| 1900, | 999.00 | 2000, | 999.00 | 2100, | 999.00 | 2200, | 999.00 | 2300, | 999.00 | 2400, | 999.00 |
| 2500, | 999.00 | 2600, | 999.00 | 2700, | 999.00 | 2800, | 999.00 | 2900, | 999.00 | 3000, | 999.00 |
| 3100, | 999.00 | 3200, | 999.00 | 3300, | 999.00 | 3400, | 999.00 | 3500, | 999.00 | 3600, | 999.00 |
| 3700, | 999.00 | 3800, | 999.00 | 3900, | 999.00 | 4000, | 999.00 | 4100, | 999.00 | 4200, | 999.00 |
| 4300, | 999.00 | 4400, | 999.00 | 4500, | 999.00 | 4600, | 999.00 | 4700, | 999.00 | 4800, | 999.00 |
| 4900, | 999.00 | 5000, | 999.00 | 5100, | 999.00 | 5200, | 999.00 | 5300, | 999.00 | 5400, | 999.00 |
| 5500, | 999.00 | 5600, | 999.00 | 5700, | 999.00 | 5800, | 999.00 | 5900, | 999.00 | 6000, | 999.00 |
| 6100, | 999.00 | 6200, | 999.00 | 6300, | 999.00 | 6400, | 999.00 | 6500, | 999.00 | 6600, | 999.00 |
| 6700, | 999.00 | 6800, | 999.00 | 6900, | 999.00 | 7000, | 999.00 | 7100, | 999.00 | 7200, | 999.00 |
| 7300, | 999.00 | 7400, | 999.00 | 7500, | 999.00 | 7600, | 999.00 | 7700, | 999.00 | 7800, | 999.00 |
| 7900, | 999.00 | 8000, | 999.00 | 8100, | 999.00 | 8200, | 999.00 | 8300, | 999.00 | 8400, | 999.00 |
| 8500, | 999.00 | 8600, | 999.00 | | | | | | | | |

TIDE NO. = 5 REACH FK STD. DEV. = 0.0

NUMBER OF POINTS: 13, TIDE NUMBER: 5
DATE: 0721, HIGH: 1325, START: NONE, OG

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100, | 999.00 | 200, | 999.00 | 300, | 999.00 | 400, | 999.00 | 500, | 999.00 | 600, | 999.00 |
| 700, | 999.00 | 800, | 999.00 | 900, | 999.00 | 1000, | 999.00 | 1100, | 999.00 | 200, | 999.00 |
| 1300, | 999.00 | | | | | | | | | | |

TIDE NO. = 5 REACH OG STD. DEV. = 0.0

NUMBER OF POINTS: 12, TIDE NUMBER: 5
DATE: 0721, HIGH: 1325, START: NONE, NM

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100, | 999.00 | 200, | 999.00 | 300, | 999.00 | 400, | 999.00 | 500, | 999.00 | 600, | 999.00 |
| 700, | 999.00 | 800, | 999.00 | 900, | 999.00 | 1000, | 999.00 | 1100, | 999.00 | 200, | 999.00 |

TIDE NO. = 5 REACH NM STD. DEV. = 0.0

NUMBER OF POINTS: 36. TIDE NUMBER: 5
DATE: 0721, HIGH: 1325, START: NONE, TH

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 999.00 | 600. | 999.00 |
| 700. | 999.00 | 800. | 999.00 | 900. | 999.00 | 1000. | 999.00 | 1100. | 999.00 | 1200. | 999.00 |
| 1300. | 999.00 | 1400. | 999.00 | 1500. | 999.00 | 1600. | 999.00 | 1700. | 999.00 | 1800. | 999.00 |
| 1900. | 999.00 | 2000. | 999.00 | 2100. | 999.00 | 2200. | 999.00 | 2300. | 999.00 | 2400. | 999.00 |
| 2500. | 999.00 | 2600. | 999.00 | 2700. | 999.00 | 2800. | 999.00 | 2900. | 999.00 | 3000. | 999.00 |
| 3100. | 999.00 | 3200. | 999.00 | 3300. | 999.00 | 3400. | 999.00 | 3500. | 999.00 | 3600. | 999.00 |

TIDE NO. = 5 REACH TH STD. DEV. = 0.0

NUMBER OF POINTS: 12. TIDE NUMBER: 5
DATE: 0721, HIGH: 1325, START: NONE, LJ

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 999.00 | 600. | 999.00 |
| 700. | 999.00 | 800. | 999.00 | 900. | 999.00 | 1000. | 999.00 | 1100. | 999.00 | 1200. | 999.00 |

TIDE NO. = 5 REACH LJ STD. DEV. = 0.0

NUMBER OF POINTS: 71. TIDE NUMBER: 6
DATE: 0721, LOW: 1935, START: 1933, AD

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 25.00 | 200. | 16.00 | 300. | 14.00 | 400. | 16.00 | 500. | 16.00 | 600. | 14.00 |
| 700. | 14.00 | 800. | 13.00 | 900. | 13.00 | 1000. | 13.00 | 1100. | 14.00 | 1200. | 13.00 |
| 1300. | 14.00 | 1400. | 15.00 | 1500. | 17.00 | 1600. | 20.00 | 1700. | 20.00 | 1800. | 19.00 |
| 1900. | 18.00 | 2000. | 17.00 | 2100. | 20.00 | 2200. | 21.00 | 2300. | 20.00 | 2400. | 19.00 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2500. | 21.00 | 2600. | 20.00 | 2700. | 26.00 | 2800. | 32.00 | 2900. | 33.00 | 3000. | 28.00 |
| 3100. | 30.00 | 3200. | 32.00 | 3300. | 30.00 | 3400. | 28.00 | 3500. | 29.00 | 3600. | 31.00 |
| 3700. | 31.00 | 3800. | 32.00 | 3900. | 33.00 | 4000. | 36.00 | 4100. | 38.00 | 4200. | 40.00 |
| 4300. | 42.00 | 4400. | 40.00 | 4500. | 39.00 | 4600. | 38.00 | 4700. | 39.00 | 4800. | 40.00 |
| 4900. | 40.00 | 5000. | 40.00 | 5100. | 38.00 | 5200. | 39.00 | 5300. | 37.00 | 5400. | 36.00 |
| 5500. | 38.00 | 5600. | 36.00 | 5700. | 35.00 | 5800. | 34.00 | 5900. | 32.00 | 6000. | 35.00 |
| 6100. | 36.00 | 6200. | 34.00 | 6300. | 35.00 | 6400. | 33.00 | 6500. | 29.00 | 6600. | 24.00 |
| 6700. | 22.00 | 6800. | 23.00 | 6900. | 20.00 | 7000. | 18.00 | 7100. | 19.00 | | |

TIDE NO. = 6 REACH AD STD. DEV. = 0.9319E 01

NUMBER OF POINTS: 17. TIDE NUMBER: 6
DATE: 0721. LOW: 1935. START: 2141. QB

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 24.00 | 200. | 28.00 | 300. | 30.00 | 400. | 31.00 | 500. | 32.00 | 600. | 33.00 |
| 700. | 36.00 | 800. | 38.00 | 900. | 38.00 | 1000. | 39.00 | 1100. | 38.00 | 1200. | 33.00 |
| 1300. | 15.00 | 1400. | 15.00 | 1500. | 14.00 | 1600. | 13.00 | 1700. | 11.00 | | |

TIDE NO. = 6 REACH QB STD. DEV. = 0.1008E 02

NUMBER OF POINTS: 14. TIDE NUMBER: 6
DATE: 0721. LOW: 1935. START: 2152. RP

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 33.00 | 200. | 11.00 | 300. | 13.00 | 400. | 12.00 | 500. | 10.00 | 600. | 9.00 |
| 700. | 10.00 | 800. | 11.00 | 900. | 12.00 | 1000. | 10.00 | 1100. | 11.00 | 1200. | 12.00 |
| 1300. | 14.00 | 1400. | 15.00 | | | | | | | | |

TIDE NO. = 6 REACH RP STD. DEV. = 0.5967E 01

NUMBER OF POINTS: 86. TIDE NUMBER: 6
DATE: 0721. LOW: 1935. START: 2004. FK

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 18.00 | 200. | 18.00 | 300. | 17.00 | 400. | 17.00 | 500. | 18.00 | 600. | 18.00 |
| 700. | 19.00 | 800. | 18.00 | 900. | 18.00 | 1000. | 17.00 | 1100. | 18.00 | 1200. | 18.00 |
| 1300. | 18.00 | 1400. | 18.00 | 1500. | 18.00 | 1600. | 19.00 | 1700. | 19.00 | 1800. | 19.00 |
| 1900. | 19.00 | 2000. | 19.00 | 2100. | 19.00 | 2200. | 19.00 | 2300. | 20.00 | 2400. | 20.00 |
| 2500. | 20.00 | 2600. | 20.00 | 2700. | 22.00 | 2800. | 24.00 | 2900. | 21.00 | 3000. | 15.00 |
| 3100. | 17.00 | 3200. | 15.00 | 3300. | 18.00 | 3400. | 19.00 | 3500. | 14.00 | 3600. | 13.00 |
| 3700. | 13.00 | 3800. | 13.00 | 3900. | 14.00 | 4000. | 13.00 | 4100. | 13.00 | 4200. | 13.00 |
| 4300. | 10.00 | 4400. | 10.00 | 4500. | 9.00 | 4600. | 9.00 | 4700. | 10.00 | 4800. | 10.00 |
| 4900. | 11.00 | 5000. | 10.00 | 5100. | 9.00 | 5200. | 11.00 | 5300. | 10.00 | 5400. | 10.00 |
| 5500. | 11.00 | 5600. | 11.00 | 5700. | 11.00 | 5800. | 11.00 | 5900. | 11.00 | 6000. | 11.00 |
| 6100. | 11.00 | 6200. | 11.00 | 6300. | 11.00 | 6400. | 11.00 | 6500. | 11.00 | 6600. | 11.00 |
| 6700. | 11.00 | 6800. | 10.00 | 6900. | 10.00 | 7000. | 10.00 | 7100. | 10.00 | 7200. | 10.00 |
| 7300. | 9.00 | 7400. | 9.00 | 7500. | 9.00 | 7600. | 9.00 | 7700. | 8.00 | 7800. | 7.00 |
| 7900. | 7.00 | 8000. | 6.00 | 8100. | 6.00 | 8200. | 6.00 | 8300. | 5.00 | 8400. | 6.00 |
| 8500. | 5.00 | 8600. | 5.00 | | | | | | | | |

TIDE NO. = 6 REACH FK STD. DEV. = 0.4734E 01

NUMBER OF POINTS: 13. TIDE NUMBER: 6
DATE: 0721. LOW: 1935. START: NONE. OG

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 999.00 | 600. | 999.00 |
| 700. | 999.00 | 800. | 999.00 | 900. | 999.00 | 1000. | 999.00 | 1100. | 999.00 | 1200. | 999.00 |
| 1300. | 999.00 | | | | | | | | | | |

TIDE NO. = 6 REACH OG STD. DEV. = 0.0

NUMBER OF POINTS: 12. TIDE NUMBER: 6
DATE: 0721. LOW: 1935. START: NONE. NM

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 999.00 | 600. | 999.00 |
| 700. | 999.00 | 800. | 999.00 | 900. | 999.00 | 1000. | 999.00 | 1100. | 999.00 | 1200. | 999.00 |

TIDE NO. = 6 REACH NM STD. DEV. = 0.0

NUMBER OF POINTS: 36, TIDE NUMBER: 6
DATE: 0721, LOW: 1935, START: 2101, TH

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 11.00 | 200. | 11.00 | 300. | 12.00 | 400. | 11.00 | 500. | 13.00 | 600. | 12.00 |
| 700. | 10.00 | 800. | 7.00 | 900. | 8.00 | 1000. | 8.00 | 1100. | 8.00 | 1200. | 5.00 |
| 1300. | 5.00 | 1400. | 5.00 | 1500. | 5.00 | 1600. | 5.00 | 1700. | 5.00 | 1800. | 5.00 |
| 1900. | 5.00 | 2000. | 999.00 | 2100. | 999.00 | 2200. | 999.00 | 2300. | 999.00 | 2400. | 999.00 |
| 2500. | 999.00 | 2600. | 999.00 | 2700. | 999.00 | 2800. | 999.00 | 2900. | 999.00 | 3000. | 999.00 |
| 3100. | 999.00 | 3200. | 999.00 | 3300. | 999.00 | 3400. | 999.00 | 3500. | 999.00 | 3600. | 999.00 |

TIDE NO. = 6 REACH TH STD. DEV. = 0.2990E 01

NUMBER OF POINTS: 12, TIDE NUMBER: 6
DATE: 0721, LOW: 1935, START: 2050, LJ

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 11.00 | 200. | 11.00 | 300. | 11.00 | 400. | 11.00 | 500. | 11.00 | 600. | 10.00 |
| 700. | 9.00 | 800. | 9.00 | 900. | 999.00 | 1000. | 999.00 | 1100. | 999.00 | 1200. | 999.00 |

TIDE NO. = 6 REACH LJ STD. DEV. = 0.9161E 00

NUMBER OF POINTS: 71, TIDE NUMBER: 7
DATE: 0722, HIGH: 0145, START: 0222, AD

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 52.00 | 200. | 49.00 | 300. | 51.00 | 400. | 50.00 | 500. | 51.00 | 600. | 50.00 |
| 700. | 40.00 | 800. | 41.00 | 900. | 41.00 | 1000. | 52.00 | 1100. | 40.00 | 1200. | 38.00 |
| 1300. | 37.00 | 1400. | 36.00 | 1500. | 33.00 | 1600. | 31.00 | 1700. | 23.00 | 1800. | 23.00 |
| 1900. | 24.00 | 2000. | 25.00 | 2100. | 24.00 | 2200. | 23.00 | 2300. | 22.00 | 2400. | 22.00 |
| 2500. | 22.00 | 2600. | 21.00 | 2700. | 21.00 | 2800. | 20.00 | 2900. | 20.00 | 3000. | 20.00 |
| 3100. | 20.00 | 3200. | 19.00 | 3300. | 20.00 | 3400. | 20.00 | 3500. | 20.00 | 3600. | 20.00 |
| 3700. | 20.00 | 3800. | 20.00 | 3900. | 19.00 | 4000. | 20.00 | 4100. | 20.00 | 4200. | 21.00 |
| 4300. | 20.00 | 4400. | 19.00 | 4500. | 19.00 | 4600. | 20.00 | 4700. | 20.00 | 4800. | 18.00 |
| 4900. | 18.00 | 5000. | 19.00 | 5100. | 20.00 | 5200. | 21.00 | 5300. | 20.00 | 5400. | 16.00 |
| 5500. | 15.00 | 5600. | 17.00 | 5700. | 15.00 | 5800. | 16.00 | 5900. | 15.00 | 6000. | 15.00 |
| 6100. | 14.00 | 6200. | 13.00 | 6300. | 12.00 | 6400. | 11.00 | 6500. | 11.00 | 6600. | 10.00 |
| 6700. | 9.00 | 6800. | 10.00 | 6900. | 11.00 | 7000. | 11.00 | 7100. | 8.00 | | |

TIDE NO. = 7 REACH AD STD. DEV. = 0.1175E 02

NUMBER OF POINTS: 17. TIDE NUMBER: 7
DATE: 0722. HIGH: 0145. START: 0238. QB

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 19.00 | 200. | 20.00 | 300. | 20.00 | 400. | 20.00 | 500. | 19.00 | 600. | 21.00 |
| 700. | 22.00 | 800. | 20.00 | 900. | 19.00 | 1000. | 19.00 | 1100. | 18.00 | 1200. | 18.00 |
| 1300. | 18.00 | 1400. | 18.00 | 1500. | 19.00 | 1600. | 19.00 | 1700. | 15.00 | | |

TIDE NO. = 7 REACH QB STD. DEV. = 0.1541E 01

NUMBER OF POINTS: 14. TIDE NUMBER: 7
DATE: 0722. HIGH: 0415. START: 0247. RP

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 19.00 | 200. | 16.00 | 300. | 16.00 | 400. | 15.00 | 500. | 13.00 | 600. | 13.00 |
| 700. | 14.00 | 800. | 15.00 | 900. | 15.00 | 1000. | 15.00 | 1100. | 15.00 | 1200. | 16.00 |
| 1300. | 16.00 | 1400. | 16.00 | | | | | | | | |

TIDE NO. = 7 REACH RP STD. DEV. = 0.1490E 01

NUMBER OF POINTS: 86. TIDE NUMBER: 7
DATE: 0722, HIGH: 0145, START: 0315, FK

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 5.00 | 200. | 5.00 | 300. | 6.00 | 400. | 9.00 | 500. | 9.00 | 600. | 9.00 |
| 700. | 6.00 | 800. | 6.00 | 900. | 6.00 | 1000. | 8.00 | 1100. | 7.00 | 1200. | 9.00 |
| 1300. | 6.00 | 1400. | 5.00 | 1500. | 6.00 | 1600. | 9.00 | 1700. | 7.00 | 1800. | 9.00 |
| 1900. | 10.00 | 2000. | 10.00 | 2100. | 9.00 | 2200. | 8.00 | 2300. | 7.00 | 2400. | 7.00 |
| 2500. | 7.00 | 2600. | 6.00 | 2700. | 11.00 | 2800. | 14.00 | 2900. | 14.00 | 3000. | 13.00 |
| 3100. | 13.00 | 3200. | 12.00 | 3300. | 12.00 | 3400. | 12.00 | 3500. | 13.00 | 3600. | 13.00 |
| 3700. | 12.00 | 3800. | 10.00 | 3900. | 10.00 | 4000. | 10.00 | 4100. | 9.00 | 4200. | 10.00 |
| 4300. | 11.00 | 4400. | 9.00 | 4500. | 9.00 | 4600. | 8.00 | 4700. | 8.00 | 4800. | 8.00 |
| 4900. | 8.00 | 5000. | 7.00 | 5100. | 7.00 | 5200. | 7.00 | 5300. | 8.00 | 5400. | 8.00 |
| 5500. | 8.00 | 5600. | 9.00 | 5700. | 9.00 | 5800. | 8.00 | 5900. | 7.00 | 6000. | 7.00 |
| 6100. | 8.00 | 6200. | 7.00 | 6300. | 6.00 | 6400. | 6.00 | 6500. | 6.00 | 6600. | 6.00 |
| 6700. | 5.00 | 6800. | 7.00 | 6900. | 6.00 | 7000. | 5.00 | 7100. | 6.00 | 7200. | 6.00 |
| 7300. | 6.00 | 7400. | 6.00 | 7500. | 5.00 | 7600. | 5.00 | 7700. | 5.00 | 7800. | 6.00 |
| 7900. | 5.00 | 8000. | 5.00 | 8100. | 5.00 | 8200. | 5.00 | 8300. | 5.00 | 8400. | 5.00 |
| 8500. | 5.00 | 8600. | 5.00 | | | | | | | | |

TIDE NO. = 7 REACH FK STD. DEV. = 0.2418E 01

NUMBER OF POINTS: 13. TIDE NUMBER: 7
DATE: 0722, HIGH: 0145, START: 0412, OG

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 11.00 | 200. | 11.00 | 300. | 9.00 | 400. | 9.00 | 500. | 9.00 | 600. | 8.00 |
| 700. | 7.00 | 800. | 7.00 | 900. | 6.00 | 1000. | 8.00 | 1100. | 9.00 | 1200. | 8.00 |
| 1300. | 8.00 | | | | | | | | | | |

TIDE NO. = 7 REACH OG STD. DEV. = 0.1446E 01

NUMBER OF POINTS: 12. TIDE NUMBER: 7

DATE: 0722, HIGH: 0145, START: 0417, NM

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 8.00 | 200. | 9.00 | 300. | 8.00 | 400. | 8.00 | 500. | 8.00 | 600. | 8.00 |
| 700. | 8.00 | 800. | 8.00 | 900. | 9.00 | 1000. | 9.00 | 1100. | 9.00 | 1200. | 9.00 |

TIDE NO. = 7 REACH NM STD. DEV. = 0.5149E 00

NUMBER OF POINTS: 36, TIDE NUMBER: 7
DATE: 0722, HIGH: 0145, START: 0354, TH

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 8.00 | 200. | 8.00 | 300. | 7.00 | 400. | 7.00 | 500. | 8.00 | 600. | 8.00 |
| 700. | 8.00 | 800. | 8.00 | 900. | 8.00 | 1000. | 8.00 | 1100. | 8.00 | 1200. | 7.00 |
| 1300. | 7.00 | 1400. | 7.00 | 1500. | 7.00 | 1600. | 6.00 | 1700. | 7.00 | 1800. | 7.00 |
| 1900. | 8.00 | 2000. | 8.00 | 2100. | 7.00 | 2200. | 6.00 | 2300. | 7.00 | 2400. | 7.00 |
| 2500. | 7.00 | 2600. | 7.00 | 2700. | 7.00 | 2800. | 7.00 | 2900. | 8.00 | 3000. | 8.00 |
| 3100. | 8.00 | 3200. | 8.00 | 3300. | 8.00 | 3400. | 8.00 | 3500. | 8.00 | 3600. | 8.00 |

TIDE NO. = 7 REACH TH STD. DEV. = 0.6088E 00

NUMBER OF POINTS: 12, TIDE NUMBER: 7
DATE: 0722, HIGH: 0145, START: 0345, LJ

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 7.00 | 200. | 7.00 | 300. | 6.00 | 400. | 6.00 | 500. | 6.00 | 600. | 6.00 |
| 700. | 6.00 | 800. | 6.00 | 900. | 999.00 | 1000. | 999.00 | 1100. | 999.00 | 1200. | 999.00 |

TIDE NO. = 7 REACH LJ STD. DEV. = 0.4629E 00

NUMBER OF POINTS: 71. TIDE NUMBER: 8
DATE: 0722, LOW: 0755, START: 0807, AD

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 50.00 | 200. | 47.00 | 300. | 48.00 | 400. | 45.00 | 500. | 46.00 | 600. | 45.00 |
| 700. | 45.00 | 800. | 45.00 | 900. | 46.00 | 1000. | 45.00 | 1100. | 46.00 | 1200. | 45.00 |
| 1300. | 47.00 | 1400. | 48.00 | 1500. | 48.00 | 1600. | 48.00 | 1700. | 44.00 | 1800. | 40.00 |
| 1900. | 39.00 | 2000. | 39.00 | 2100. | 37.00 | 2200. | 38.00 | 2300. | 35.00 | 2400. | 35.00 |
| 2500. | 35.00 | 2600. | 34.00 | 2700. | 35.00 | 2800. | 32.00 | 2900. | 29.00 | 3000. | 29.00 |
| 3100. | 30.00 | 3200. | 31.00 | 3300. | 30.00 | 3400. | 32.00 | 3500. | 33.00 | 3600. | 30.00 |
| 3700. | 26.00 | 3800. | 27.00 | 3900. | 26.00 | 4000. | 29.00 | 4100. | 32.00 | 4200. | 31.00 |
| 4300. | 33.00 | 4400. | 33.00 | 4500. | 28.00 | 4600. | 31.00 | 4700. | 33.00 | 4800. | 33.00 |
| 4900. | 33.00 | 5000. | 33.00 | 5100. | 31.00 | 5200. | 31.00 | 5300. | 32.00 | 5400. | 30.00 |
| 5500. | 29.00 | 5600. | 24.00 | 5700. | 26.00 | 5800. | 32.00 | 5900. | 31.00 | 6000. | 25.00 |
| 6100. | 20.00 | 6200. | 20.00 | 6300. | 21.00 | 6400. | 19.00 | 6500. | 13.00 | 6600. | 17.00 |
| 6700. | 13.00 | 6800. | 17.00 | 6900. | 17.00 | 7000. | 15.00 | 7100. | 16.00 | | |

TIDE NO. = 8 REACH AD STD. DEV. = 0.9711E 01

NUMBER OF POINTS: 17. TIDE NUMBER: 8
DATE: 0722, LOW: 0755, START: 0821, QB

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 27.00 | 200. | 26.00 | 300. | 16.00 | 400. | 17.00 | 500. | 19.00 | 600. | 15.00 |
| 700. | 16.00 | 800. | 17.00 | 900. | 16.00 | 1000. | 16.00 | 1100. | 16.00 | 1200. | 16.00 |
| 1300. | 16.00 | 1400. | 17.00 | 1500. | 17.00 | 1600. | 17.00 | 1700. | 16.00 | | |

TIDE NO. = 8 REACH QB STD. DEV. = 0.3445E 01

NUMBER OF POINTS: 14. TIDE NUMBER: 8
DATE: 0722, LOW: 0755, START: 0832, RP

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 16.00 | 200. | 15.00 | 300. | 15.00 | 400. | 15.00 | 500. | 15.00 | 600. | 15.00 |
| 700. | 15.00 | 800. | 16.00 | 900. | 16.00 | 1000. | 16.00 | 1100. | 17.00 | 200. | 17.00 |
| 1300. | 17.00 | 1400. | 17.00 | | | | | | | | |

TIDE NO. = 8     REACH RP     STD. DEV. = 0.8644E 00

NUMBER OF POINTS: 86, TIDE NUMBER: 8
DATE: 0722, LOW: 0755, START: 0858, FK

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 10.00 | 200. | 10.00 | 300. | 13.00 | 400. | 15.00 | 500. | 14.00 | 600. | 15.00 |
| 700. | 15.00 | 800. | 15.00 | 900. | 15.00 | 1000. | 15.00 | 1100. | 15.00 | 1200. | 14.00 |
| 1300. | 15.00 | 1400. | 15.00 | 1500. | 14.00 | 1600. | 15.00 | 1700. | 15.00 | 1800. | 15.00 |
| 1900. | 15.00 | 2000. | 15.00 | 2100. | 14.00 | 2200. | 15.00 | 2300. | 15.00 | 2400. | 15.00 |
| 2500. | 15.00 | 2600. | 16.00 | 2700. | 15.00 | 2800. | 999.00 | 2900. | 999.00 | 3000. | 999.00 |
| 3100. | 999.00 | 3200. | 999.00 | 3300. | 999.00 | 3400. | 999.00 | 3500. | 999.00 | 3600. | 999.00 |
| 3700. | 999.00 | 3800. | 999.00 | 3900. | 999.00 | 4000. | 999.00 | 4100. | 999.00 | 4200. | 999.00 |
| 4300. | 999.00 | 4400. | 999.00 | 4500. | 999.00 | 4600. | 999.00 | 4700. | 999.00 | 4800. | 999.00 |
| 4900. | 999.00 | 5000. | 999.00 | 5100. | 999.00 | 5200. | 999.00 | 5300. | 999.00 | 5400. | 999.00 |
| 5500. | 999.00 | 5600. | 999.00 | 5700. | 999.00 | 5800. | 999.00 | 5900. | 999.00 | 6000. | 999.00 |
| 6100. | 999.00 | 6200. | 999.00 | 6300. | 999.00 | 6400. | 999.00 | 6500. | 999.00 | 6600. | 999.00 |
| 6700. | 999.00 | 6800. | 999.00 | 6900. | 999.00 | 7000. | 999.00 | 7100. | 999.00 | 7200. | 999.00 |
| 7300. | 999.00 | 7400. | 999.00 | 7500. | 999.00 | 7600. | 999.00 | 7700. | 999.00 | 7800. | 999.00 |
| 7900. | 999.00 | 8000. | 999.00 | 8100. | 999.00 | 8200. | 999.00 | 8300. | 999.00 | 8400. | 999.00 |
| 8500. | 999.00 | 8600. | 999.00 | | | | | | | | |

TIDE NO. = 8     REACH FK     STD. DEV. = 0.1396E 01

NUMBER OF POINTS: 13, TIDE NUMBER: 8
DATE: 0722, LOW: 0755, START: NONE, OG

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 999.00 | 600. | 999.00 |
| 700. | 999.00 | 800. | 999.00 | 900. | 999.00 | 1000. | 999.00 | 1100. | 999.00 | 1200. | 999.00 |
| 1300. | 999.00 | | | | | | | | | | |

TIDE NO. = 8 REACH OG STD. DEV. = 0.0

NUMBER OF POINTS: 12. TIDE NUMBER: 8
DATE: 0722, LOW: 0755, START: NONE, NM

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 999.00 | 600. | 999.00 |
| 700. | 999.00 | 800. | 999.00 | 900. | 999.00 | 1000. | 999.00 | 1100. | 999.00 | 1200. | 999.00 |

TIDE NO. = 8 REACH NM STD. DEV. = 0.0

NUMBER OF POINTS: 36. TIDE NUMBER: 8
DATE: 0722, LOW: 0755, START: NONE, TH

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 999.00 | 600. | 999.00 |
| 700. | 999.00 | 800. | 999.00 | 900. | 999.00 | 1000. | 999.00 | 1100. | 999.00 | 1200. | 999.00 |
| 1300. | 999.00 | 1400. | 999.00 | 1500. | 999.00 | 1600. | 999.00 | 1700. | 999.00 | 1800. | 999.00 |
| 1900. | 999.00 | 2000. | 999.00 | 2100. | 999.00 | 2200. | 999.00 | 2300. | 999.00 | 2400. | 999.00 |
| 2500. | 999.00 | 2600. | 999.00 | 2700. | 999.00 | 2800. | 999.00 | 2900. | 999.00 | 3000. | 999.00 |
| 3100. | 999.00 | 3200. | 999.00 | 3300. | 999.00 | 3400. | 999.00 | 3500. | 999.00 | 3600. | 999.00 |

TIDE NO. = 8 REACH TH STD. DEV. = 0.0

NUMBER OF POINTS: 12. TIDE NUMBER: 8
DATE: 0722, LOW: 0755, START: NONE, LJ

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 999.00 | 600. | 999.00 |

700. 999.00    800. 999.00    900. 999.00    1000. 999.00    1100. 999.00    1200. 999.00

TIDE NO. = 8    REACH LJ    STD. DEV. = 0.0

NUMBER OF POINTS: 71, TIDE NUMBER: 9
DATE: 0722, HIGH: 1405, START: 1402, AD

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 42.00 | 200. | 45.00 | 300. | 44.00 | 400. | 42.00 | 500. | 43.00 | 600. | 42.00 |
| 700. | 41.00 | 800. | 41.00 | 900. | 40.00 | 1000. | 41.00 | 1100. | 43.00 | 1200. | 44.00 |
| 1300. | 39.00 | 1400. | 37.00 | 1500. | 36.00 | 1600. | 32.00 | 1700. | 28.00 | 1800. | 23.00 |
| 1900. | 22.00 | 2000. | 19.00 | 2100. | 18.00 | 2200. | 18.00 | 2300. | 17.00 | 2400. | 18.00 |
| 2500. | 20.00 | 2600. | 21.00 | 2700. | 21.00 | 2800. | 21.00 | 2900. | 22.00 | 3000. | 22.00 |
| 3100. | 24.00 | 3200. | 24.00 | 3300. | 26.00 | 3400. | 23.00 | 3500. | 24.00 | 3600. | 23.00 |
| 3700. | 21.00 | 3800. | 21.00 | 3900. | 19.00 | 4000. | 19.00 | 4100. | 15.00 | 4200. | 15.00 |
| 4300. | 16.00 | 4400. | 14.00 | 4500. | 18.00 | 4600. | 16.00 | 4700. | 13.00 | 4800. | 12.00 |
| 4900. | 14.00 | 5000. | 15.00 | 5100. | 15.00 | 5200. | 15.00 | 5300. | 15.00 | 5400. | 15.00 |
| 5500. | 13.00 | 5600. | 13.00 | 5700. | 14.00 | 5800. | 15.00 | 5900. | 15.00 | 6000. | 15.00 |
| 6100. | 14.00 | 6200. | 13.00 | 6300. | 12.00 | 6400. | 12.00 | 6500. | 14.00 | 6600. | 7.00 |
| 6700. | 6.00 | 6800. | 6.00 | 6900. | 7.00 | 7000. | 6.00 | 7100. | 6.00 | | |

TIDE NO. = 9    REACH AD    STD. DEV. = 0.1132E 02

NUMBER OF POINTS: 17, TIDE NUMBER: 9
DATE: 0722, HIGH: 1405, START: 1416, QB

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 00. | 16.00 | 200. | 17.00 | 300. | 17.00 | 400. | 18.00 | 500. | 17.00 | 600. | 17.00 |
| 700. | 17.00 | 800. | 16.00 | 900. | 17.00 | 1000. | 15.00 | 1100. | 14.00 | 1200. | 13.00 |
| 1300. | 13.00 | 1400. | 13.00 | 1500. | 12.00 | 1600. | 12.00 | 1700. | 12.00 | | |

TIDE NO. = 9    REACH QB    STD. DEV. = 0.2164E 01

NUMBER OF POINTS: 14, TIDE NUMBER: 9

DATE: 0722, HIGH: 1405, START: 1423, RP

CONCENTRATION VS, DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100, | 14,00 | 200, | 13,00 | 300, | 12,00 | 400, | 12,00 | 500, | 12,00 | 600, | 13,00 |
| 700, | 13,00 | 800, | 13,00 | 900, | 13,00 | 1000, | 14,00 | 1100, | 14,00 | 1200, | 14,00 |
| 1300, | 14,00 | 1400, | 14,00 | | | | | | | | |

TIDE NO. = 9 REACH RP STD. DEV. = 0.7263E 00

NUMBER OF POINTS: 86, TIDE NUMBER: 9
DATE: 0722, HIGH: 1405, START: 1447, FK

CONCENTRATION VS, DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100, | 4,00 | 200, | 4,00 | 300, | 4,00 | 400, | 4,00 | 500, | 4,00 | 600, | 4,00 |
| 700, | 4,00 | 800, | 4,00 | 900, | 4,00 | 1000, | 4,00 | 1100, | 4,00 | 1200, | 4,00 |
| 1300, | 4,00 | 1400, | 4,00 | 1500, | 4,00 | 1600, | 5,00 | 1700, | 5,00 | 1800, | 5,00 |
| 1900, | 5,00 | 2000, | 5,00 | 2100, | 5,00 | 2200, | 5,00 | 2300, | 5,00 | 2400, | 5,00 |
| 2500, | 6,00 | 2600, | 6,00 | 2700, | 5,00 | 2800, | 4,00 | 2900, | 4,00 | 3000, | 4,00 |
| 3100, | 4,00 | 3200, | 5,00 | 3300, | 5,00 | 3400, | 5,00 | 3500, | 6,00 | 3600, | 6,00 |
| 3700, | 6,00 | 3800, | 6,00 | 3900, | 6,00 | 4000, | 6,00 | 4100, | 6,00 | 4200, | 6,00 |
| 4300, | 7,00 | 4400, | 8,00 | 4500, | 8,00 | 4600, | 8,00 | 4700, | 8,00 | 4800, | 8,00 |
| 4900, | 8,00 | 5000, | 8,00 | 5100, | 8,00 | 5200, | 8,00 | 5300, | 9,00 | 5400, | 8,00 |
| 5500, | 8,00 | 5600, | 8,00 | 5700, | 8,00 | 5800, | 7,00 | 5900, | 6,00 | 6000, | 7,00 |
| 6100, | 7,00 | 6200, | 7,00 | 6300, | 7,00 | 6400, | 6,00 | 6500, | 5,00 | 6600, | 5,00 |
| 6700, | 5,00 | 6800, | 4,00 | 6900, | 4,00 | 7000, | 4,00 | 7100, | 4,00 | 7200, | 4,00 |
| 7300, | 4,00 | 7400, | 4,00 | 7500, | 4,00 | 7600, | 4,00 | 7700, | 4,00 | 7800, | 4,00 |
| 7900, | 4,00 | 8000, | 4,00 | 8100, | 4,00 | 8200, | 4,00 | 8300, | 5,00 | 8400, | 5,00 |
| 8500, | 5,00 | 8600, | 4,00 | | | | | | | | |

TIDE NO. = 9 REACH FK STD. DEV. = 0.1503E 01

NUMBER OF POINTS: 13, TIDE NUMBER: 9
DATE: 0722, HIGH: 1405, START: 1529, OG

CONCENTRATION VS, DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 9.00 | 200. | 9.00 | 300. | 9.00 | 400. | 9.00 | 500. | 9.00 | 600. | 10.00 |
| 700. | 10.00 | 800. | 9.00 | 900. | 9.00 | 1000. | 10.00 | 1100. | 10.00 | 1200. | 10.00 |
| 1300. | 10.00 | | | | | | | | | | |

TIDE NO. = 9 REACH OG STD. DEV. = 0.5189E 00

NUMBER OF POINTS: 12. TIDE NUMBER: 9
DATE: 0722. HIGH: 1405. START: 1533. NM

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 9.00 | 200. | 10.00 | 300. | 10.00 | 400. | 10.00 | 500. | 10.00 | 600. | 10.00 |
| 700. | 10.00 | 800. | 10.00 | 900. | 10.00 | 1000. | 9.00 | 1100. | 9.00 | 1200. | 9.00 |

TIDE NO. = 9 REACH NM STD. DEV. = 0.4924E 00

NUMBER OF POINTS: 36. TIDE NUMBER: 9
DATE: 0722. HIGH: 1405. START: 1513. TH

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 8.00 | 200. | 8.00 | 300. | 7.00 | 400. | 7.00 | 500. | 7.00 | 600. | 7.00 |
| 700. | 7.00 | 800. | 7.00 | 900. | 6.00 | 1000. | 6.00 | 1100. | 6.00 | 1200. | 6.00 |
| 1300. | 6.00 | 1400. | 6.00 | 1500. | 6.00 | 1600. | 6.00 | 1700. | 6.00 | 1800. | 6.00 |
| 1900. | 6.00 | 2000. | 6.00 | 2100. | 6.00 | 2200. | 6.00 | 2300. | 6.00 | 2400. | 6.00 |
| 2500. | 6.00 | 2600. | 6.00 | 2700. | 6.00 | 2800. | 6.00 | 2900. | 6.00 | 3000. | 6.00 |
| 3100. | 6.00 | 3200. | 6.00 | 3300. | 6.00 | 3400. | 7.00 | 3500. | 7.00 | 3600. | 6.00 |

TIDE NO. = 9 REACH TH STD. DEV. = 0.5855E 00

NUMBER OF POINTS: 12. TIDE NUMBER: 9
DATE: 0722. HIGH: 1405. START: 1504. LJ

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 7.00 | 200. | 6.00 | 300. | 6.00 | 400. | 6.00 | 500. | 7.00 | 600. | 6.00 |
| 700. | 6.00 | 800. | 7.00 | 900. | 7.00 | 1000. | 7.00 | 1100. | 7.00 | 1200. | 7.00 |

TIDE NO. = 9 REACH LJ STD. DEV. = 0.5149E 00

C.1.5

PRINTOUT

of

October 1977 data

NEWDYE

872 NEWDYE GO    FT06F001

MEASURED DYE CONCENTRATION AT 3 FT DEPTH ALONG CENTERLINE

57 ACRES CANAL SYSTEM, PALM BEACH COUNTY, FLORIDA, OCTOBER 1977

NUMBER OF POINTS: 71, TIDE NUMBER: 1
DATE: 1019, LOW: 2140, START: 2210, AD

CONCENTRATION VS, DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100, | 2.50 | 200, | 3.00 | 300, | 4.00 | 400, | 2.10 | 500, | 2.60 | 600, | 4.00 |
| 700, | 4.00 | 800, | 5.50 | 900, | 10.00 | 1000, | 999.00 | 1100, | 999.00 | 1200, | 999.00 |
| 1300, | 999.00 | 1400, | 999.00 | 1500, | 1.40 | 1600, | 1.50 | 1700, | 1.70 | 1800, | 1.40 |
| 1900, | 1.40 | 2000, | 1.40 | 2100, | 1.40 | 2200, | 1.40 | 2300, | 1.40 | 2400, | 1.40 |
| 2500, | 1.40 | 2600, | 1.40 | 2700, | 1.40 | 2800, | 1.40 | 2900, | 1.40 | 3000, | 1.40 |
| 3100, | 1.40 | 3200, | 1.40 | 3300, | 1.40 | 3400, | 1.40 | 3500, | 1.40 | 3600, | 1.40 |
| 3700, | 1.40 | 3800, | 1.40 | 3900, | 999.00 | 4000, | 999.00 | 4100, | 999.00 | 4200, | 999.00 |
| 4300, | 999.00 | 4400, | 999.00 | 4500, | 999.00 | 4600, | 999.00 | 4700, | 999.00 | 4800, | 999.00 |
| 4900, | 999.00 | 5000, | 999.00 | 5100, | 999.00 | 5200, | 999.00 | 5300, | 999.00 | 5400, | 999.00 |
| 5500, | 999.00 | 5600, | 999.00 | 5700, | 999.00 | 5800, | 999.00 | 5900, | 999.00 | 6000, | 999.00 |
| 6100, | 999.00 | 6200, | 999.00 | 6300, | 999.00 | 6400, | 999.00 | 6500, | 999.00 | 6600, | 999.00 |
| 6700, | 999.00 | 6800, | 999.00 | 6900, | 999.00 | 7000, | 999.00 | 7100, | 999.00 | | |

TIDE NO. = 1    REACH AD    STD. DEV. = 0.2154E 01

NUMBER OF POINTS: 17, TIDE NUMBER: 1
DATE: 1019, LOW: 2140, START: NONE, OB

CONCENTRATION VS, DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100, | 999.00 | 200, | 999.00 | 300, | 999.00 | 400, | 999.00 | 500, | 999.00 | 600, | 999.00 |
| 700, | 999.00 | 800, | 999.00 | 900, | 999.00 | 1000, | 999.00 | 1100, | 999.00 | 1200, | 999.00 |
| 1300, | 999.00 | 1400, | 999.00 | 1500, | 999.00 | 1600, | 999.00 | 1700, | 999.00 | | |

TIDE NO. = 1    REACH OB    STD. DEV. = 0.0

NUMBER OF POINTS: 14, TIDE NUMBER: 1

DATE: 1019, LOW: 2140, START: NONE, RP

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 999.00 | 600. | 999.00 |
| 700. | 999.00 | 800. | 999.00 | 900. | 999.00 | 1000. | 999.00 | 1100. | 999.00 | 1200. | 999.00 |
| 1300. | 999.00 | 1400. | 999.00 | | | | | | | | |

TIDE NO. = 1 REACH RP STD. DEV. = 0.0

NUMBER OF POINTS: 86. TIDE NUMBER: 1
DATE: 1019, LOW: 2140, START: NONE, FK

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 999.00 | 600. | 999.00 |
| 700. | 999.00 | 800. | 999.00 | 900. | 999.00 | 1000. | 999.00 | 1100. | 999.00 | 1200. | 999.00 |
| 1300. | 999.00 | 1400. | 999.00 | 1500. | 999.00 | 1600. | 999.00 | 1700. | 999.00 | 1800. | 999.00 |
| 1900. | 999.00 | 2000. | 999.00 | 2100. | 999.00 | 2200. | 999.00 | 2300. | 999.00 | 2400. | 999.00 |
| 2500. | 999.00 | 2600. | 999.00 | 2700. | 999.00 | 2800. | 999.00 | 2900. | 999.00 | 3000. | 999.00 |
| 3100. | 999.00 | 3200. | 999.00 | 3300. | 999.00 | 3400. | 999.00 | 3500. | 999.00 | 3600. | 999.00 |
| 3700. | 999.00 | 3800. | 999.00 | 3900. | 999.00 | 4000. | 999.00 | 4100. | 999.00 | 4200. | 999.00 |
| 4300. | 999.00 | 4400. | 999.00 | 4500. | 999.00 | 4600. | 999.00 | 4700. | 999.00 | 4800. | 999.00 |
| 4900. | 999.00 | 5000. | 999.00 | 5100. | 999.00 | 5200. | 999.00 | 5300. | 999.00 | 5400. | 999.00 |
| 5500. | 999.00 | 5600. | 999.00 | 5700. | 999.00 | 5800. | 999.00 | 5900. | 999.00 | 6000. | 999.00 |
| 6100. | 999.00 | 6200. | 999.00 | 6300. | 999.00 | 6400. | 999.00 | 6500. | 999.00 | 6600. | 999.00 |
| 6700. | 999.00 | 6800. | 999.00 | 6900. | 999.00 | 7000. | 999.00 | 7100. | 999.00 | 7200. | 999.00 |
| 7300. | 999.00 | 7400. | 999.00 | 7500. | 999.00 | 7600. | 999.00 | 7700. | 999.00 | 7800. | 999.00 |
| 7900. | 999.00 | 8000. | 999.00 | 8100. | 999.00 | 8200. | 999.00 | 8300. | 999.00 | 8400. | 999.00 |
| 8500. | 999.00 | 8600. | 999.00 | | | | | | | | |

TIDE NO. = 1 REACH FK STD. DEV. = 0.0

NUMBER OF POINTS: 13. TIDE NUMBER: 1
DATE: 1019, LOW: 2140, START: NONE, UG

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 999.00 | 600. | 999.00 |
| 700. | 999.00 | 800. | 999.00 | 900. | 999.00 | 1000. | 999.00 | 1100. | 999.00 | 1200. | 999.00 |
| 1300. | 999.00 | | | | | | | | | | |

TIDE NO. = 1 REACH OG STD. DEV. = 0.0

NUMBER OF POINTS: 12. TIDE NUMBER: 1

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 999.00 | 600. | 999.00 |
| 700. | 999.00 | 800. | 999.00 | 900. | 999.00 | 1000. | 999.00 | 1100. | 999.00 | 1200. | 999.00 |

TIDE NO. = 1 REACH NM STD. DEV. = 0.0

NUMBER OF POINTS: 36. TIDE NUMBER: 1
DATE: 1019. LOW: 2140. START: NONE. TH

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 999.00 | 600. | 999.00 |
| 700. | 999.00 | 800. | 999.00 | 900. | 999.00 | 1000. | 999.00 | 1100. | 999.00 | 1200. | 999.00 |
| 1300. | 999.00 | 1400. | 999.00 | 1500. | 999.00 | 1600. | 999.00 | 1700. | 999.00 | 1800. | 999.00 |
| 1900. | 999.00 | 2000. | 999.00 | 2100. | 999.00 | 2200. | 999.00 | 2300. | 999.00 | 2400. | 999.00 |
| 2500. | 999.00 | 2600. | 999.00 | 2700. | 999.00 | 2800. | 999.00 | 2900. | 999.00 | 3000. | 999.00 |
| 3100. | 999.00 | 3200. | 999.00 | 3300. | 999.00 | 3400. | 999.00 | 3500. | 999.00 | 3600. | 999.00 |

TIDE NO. = 1 REACH TH STD. DEV. = 0.0

NUMBER OF POINTS: 12. TIDE NUMBER: 1
DATE: 1019. LOW: 2140. START: NONE. LJ

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 999.00 | 600. | 999.00 |
| 700. | 999.00 | 800. | 999.00 | 900. | 999.00 | 1000. | 999.00 | 1100. | 999.00 | 1200. | 999.00 |

TIDE NO. = 1 REACH LJ STD. DEV. = 0.0

NUMBER OF POINTS: 71. TIDE NUMBER: 2
DATE: 1020. HIGH: 0330. START: 0401. AD

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 1.50 | 200. | 1.80 | 300. | 2.00 | 400. | 1.65 | 500. | 1.60 | 600. | 1.80 |
| 700. | 2.00 | 800. | 2.05 | 900. | 2.10 | 1000. | 3.50 | 1100. | 4.60 | 1200. | 5.00 |
| 1300. | 3.50 | 1400. | 4.40 | 1500. | 3.30 | 1600. | 5.40 | 1700. | 3.80 | 1800. | 2.10 |
| 1900. | 1.20 | 2000. | 1.40 | 2100. | 1.20 | 2200. | 1.10 | 2300. | 1.00 | 2400. | 1.00 |
| 2500. | 1.00 | 2600. | 1.00 | 2700. | 1.00 | 2800. | 0.95 | 2900. | 0.95 | 3000. | 0.95 |
| 3100. | 0.95 | 3200. | 0.95 | 3300. | 0.95 | 3400. | 1.00 | 3500. | 1.00 | 3600. | 1.00 |
| 3700. | 1.00 | 3800. | 0.90 | 3900. | 0.90 | 4000. | 0.90 | 4100. | 0.95 | 4200. | 0.95 |
| 4300. | 0.95 | 4400. | 0.95 | 4500. | 0.95 | 4600. | 0.95 | 4700. | 0.95 | 4800. | 0.90 |
| 4900. | 0.90 | 5000. | 0.90 | 5100. | 0.90 | 5200. | 0.90 | 5300. | 0.90 | 5400. | 0.90 |
| 5500. | 0.90 | 5600. | 0.90 | 5700. | 0.90 | 5800. | 0.90 | 5900. | 0.90 | 6000. | 0.90 |
| 6100. | 0.90 | 6200. | 1.00 | 6300. | 0.90 | 6400. | 0.90 | 6500. | 0.90 | 6600. | 0.90 |
| 6700. | 0.90 | 6800. | 0.90 | 6900. | 0.90 | 7000. | 0.90 | 7100. | 0.90 | | |

TIDE NO. = 2 REACH AD STD. DEV. = 0.1067E 01

NUMBER OF POINTS: 17. TIDE NUMBER: 2
DATE: 1020. HIGH: 0330. START: NONE. QB

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 999.00 | 600. | 999.00 |
| 700. | 999.00 | 800. | 999.00 | 900. | 999.00 | 1000. | 999.00 | 1100. | 999.00 | 1200. | 999.00 |
| 1300. | 999.00 | 1400. | 999.00 | 1500. | 999.00 | 1600. | 999.00 | 1700. | 999.00 | | |

TIDE NO. = 2 REACH QB STD. DEV. = 0.0

NUMBER OF POINTS: 14. TIDE NUMBER: 2
DATE: 1020, HIGH: 0330, START: NONE, RP

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 999.00 | 600. | 999.00 |
| 700. | 999.00 | 800. | 999.00 | 900. | 999.00 | 1000. | 999.00 | 1100. | 999.00 | 1200. | 999.00 |
| 1300. | 999.00 | 1400. | 999.00 | | | | | | | | |

TIDE NO. = 2 REACH RP STD. DEV. = 0.0

NUMBER OF POINTS: 86. TIDE NUMBER: 2
DATE: 1020. HIGH: 0330. START: NONE. FK

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 999.00 | 600. | 999.00 |
| 700. | 999.00 | 800. | 999.00 | 900. | 999.00 | 1000. | 999.00 | 1100. | 999.00 | 1200. | 999.00 |
| 1300. | 999.00 | 1400. | 999.00 | 1500. | 999.00 | 1600. | 999.00 | 1700. | 999.00 | 1800. | 999.00 |
| 1900. | 999.00 | 2000. | 999.00 | 2100. | 999.00 | 2200. | 999.00 | 2300. | 999.00 | 2400. | 999.00 |
| 2500. | 999.00 | 2600. | 999.00 | 2700. | 999.00 | 2800. | 999.00 | 2900. | 999.00 | 3000. | 999.00 |
| 3100. | 999.00 | 3200. | 999.00 | 3300. | 999.00 | 3400. | 999.00 | 3500. | 999.00 | 3600. | 999.00 |
| 3700. | 999.00 | 3800. | 999.00 | 3900. | 999.00 | 4000. | 999.00 | 4100. | 999.00 | 4200. | 999.00 |
| 4300. | 999.00 | 4400. | 999.00 | 4500. | 999.00 | 4600. | 999.00 | 4700. | 999.00 | 4800. | 999.00 |
| 4900. | 999.00 | 5000. | 999.00 | 5100. | 999.00 | 5200. | 999.00 | 5300. | 999.00 | 5400. | 999.00 |
| 5500. | 999.00 | 5600. | 999.00 | 5700. | 999.00 | 5800. | 999.00 | 5900. | 999.00 | 6000. | 999.00 |
| 6100. | 999.00 | 6200. | 999.00 | 6300. | 999.00 | 6400. | 999.00 | 6500. | 999.00 | 6600. | 999.00 |
| 6700. | 999.00 | 6800. | 999.00 | 6900. | 999.00 | 7000. | 999.00 | 7100. | 999.00 | 7200. | 999.00 |
| 7300. | 999.00 | 7400. | 999.00 | 7500. | 999.00 | 7600. | 999.00 | 7700. | 999.00 | 7800. | 999.00 |
| 7900. | 999.00 | 8000. | 999.00 | 8100. | 999.00 | 8200. | 999.00 | 8300. | 999.00 | 8400. | 999.00 |
| 8500. | 999.00 | 8600. | 999.00 | | | | | | | | |

TIDE NO. = 2 REACH FK STD. DEV. = 0.0

NUMBER OF POINTS: 13. TIDE NUMBER: 2
DATE: 1020, HIGH: 0330, START: NONE, DG

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 999.00 | 600. | 999.00 |
| 700. | 999.00 | 800. | 999.00 | 900. | 999.00 | 1000. | 999.00 | 1100. | 999.00 | 1200. | 999.00 |
| 1300. | 999.00 | | | | | | | | | | |

TIDE NO. = 2 REACH OG STD. DEV. = 0.0

NUMBER OF POINTS: 12. TIDE NUMBER: 2

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 999.00 | 600. | 999.00 |
| 700. | 999.00 | 800. | 999.00 | 900. | 999.00 | 1000. | 999.00 | 1100. | 999.00 | 1200. | 999.00 |

TIDE NO. = 2 REACH NM STD. DEV. = 0.0

NUMBER OF POINTS: 36. TIDE NUMBER: 2
DATE: 1020, HIGH: 0330, START: NONE, TH

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 999.00 | 600. | 999.00 |
| 700. | 999.00 | 800. | 999.00 | 900. | 999.00 | 1000. | 999.00 | 1100. | 999.00 | 1200. | 999.00 |
| 1300. | 999.00 | 1400. | 999.00 | 1500. | 999.00 | 1600. | 999.00 | 1700. | 999.00 | 1800. | 999.00 |
| 1900. | 999.00 | 2000. | 999.00 | 2100. | 999.00 | 2200. | 999.00 | 2300. | 999.00 | 2400. | 999.00 |
| 2500. | 999.00 | 2600. | 999.00 | 2700. | 999.00 | 2800. | 999.00 | 2900. | 999.00 | 3000. | 999.00 |
| 3100. | 999.00 | 3200. | 999.00 | 3300. | 999.00 | 3400. | 999.00 | 3500. | 999.00 | 3600. | 999.00 |

TIDE NO. = 2 REACH TH STD. DEV. = 0.0

NUMBER OF POINTS: 12, TIDE NUMBER: 2
DATE: 1020, HIGH: 0330, START: NONE, LJ

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 999.00 | 600. | 999.00 |
| 700. | 999.00 | 800. | 999.00 | 900. | 999.00 | 1000. | 999.00 | 1100. | 999.00 | 1200. | 999.00 |

TIDE NO. = 2 REACH LJ STD. DEV. = 0.0

NUMBER OF POINTS: 71, TIDE NUMBER: 3
DATE: 1020, LOW: 0950, START: 1102, AD

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 2.50 | 200. | 2.40 | 300. | 2.40 | 400. | 3.20 | 500. | 3.90 | 600. | 5.70 |
| 700. | 5.00 | 800. | 4.20 | 900. | 3.90 | 1000. | 3.50 | 1100. | 3.20 | 1200. | 2.90 |
| 1300. | 2.30 | 1400. | 2.80 | 1500. | 2.50 | 1600. | 2.10 | 1700. | 2.20 | 1800. | 2.40 |
| 1900. | 2.60 | 2000. | 2.50 | 2100. | 2.50 | 2200. | 2.40 | 2300. | 2.40 | 2400. | 2.40 |
| 2500. | 2.50 | 2600. | 2.20 | 2700. | 2.10 | 2800. | 2.00 | 2900. | 2.10 | 3000. | 2.00 |
| 3100. | 2.10 | 3200. | 2.00 | 3300. | 2.00 | 3400. | 2.00 | 3500. | 1.90 | 3600. | 1.60 |
| 3700. | 1.40 | 3800. | 0.90 | 3900. | 1.20 | 4000. | 1.20 | 4100. | 1.00 | 4200. | 0.50 |
| 4300. | 0.90 | 4400. | 0.60 | 4500. | 0.70 | 4600. | 0.40 | 4700. | 0.20 | 4800. | 0.60 |
| 4900. | 0.50 | 5000. | 0.50 | 5100. | 0.57 | 5200. | 0.43 | 5300. | 0.50 | 5400. | 0.40 |
| 5500. | 0.55 | 5600. | 0.49 | 5700. | 0.30 | 5800. | 0.30 | 5900. | 0.30 | 6000. | 0.20 |
| 6100. | 0.20 | 6200. | 0.20 | 6300. | 0.15 | 6400. | 0.20 | 6500. | 0.20 | 6600. | 0.22 |
| 6700. | 0.15 | 6800. | 0.20 | 6900. | 0.20 | 7000. | 0.22 | 7100. | 0.19 | | |

TIDE NO. = 3 REACH AD STD. DEV. = 0.1294E 01

NUMBER OF POINTS: 17, TIDE NUMBER: 3
DATE: 1020, LOW: 0950, START: NONE, QB

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 999.00 | 600. | 999.00 |
| 700. | 999.00 | 800. | 999.00 | 900. | 999.00 | 1000. | 999.00 | 1100. | 999.00 | 1200. | 999.00 |
| 1300. | 999.00 | 1400. | 999.00 | 1500. | 999.00 | 1600. | 999.00 | 1700. | 999.00 | | |

TIDE NO. = 3 REACH QB STD. DEV. = 0.0

NUMBER OF POINTS: 14. TIDE NUMBER: 3
DATE: 1020, LOW: 0950, START: NONE, RP

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 999.00 | 600. | 999.00 |
| 700. | 999.00 | 800. | 999.00 | 900. | 999.00 | 1000. | 999.00 | 1100. | 999.00 | 1200. | 999.00 |
| 1300. | 999.00 | 1400. | 999.00 | | | | | | | | |

TIDE NO. = 3 REACH RP STD. DEV. = 0.0

NUMBER OF POINTS: 86. TIDE NUMBER: 3
DATE: 1020, LOW: 0950, START: 1134, FK

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 0.13 | 600. | 0.14 |
| 700. | 0.14 | 800. | 0.16 | 900. | 0.16 | 1000. | 0.16 | 1100. | 0.19 | 1200. | 0.17 |
| 1300. | 0.17 | 1400. | 0.18 | 1500. | 0.19 | 1600. | 0.21 | 1700. | 0.20 | 1800. | 0.22 |
| 1900. | 0.23 | 2000. | 0.21 | 2100. | 0.23 | 2200. | 0.22 | 2300. | 0.21 | 2400. | 0.20 |
| 2500. | 0.18 | 2600. | 0.19 | 2700. | 999.00 | 2800. | 999.00 | 2900. | 999.00 | 3000. | 999.00 |
| 3100. | 999.00 | 3200. | 999.00 | 3300. | 999.00 | 3400. | 999.00 | 3500. | 999.00 | 3600. | 999.00 |
| 3700. | 999.00 | 3800. | 999.00 | 3900. | 999.00 | 4000. | 999.00 | 4100. | 999.00 | 4200. | 999.00 |
| 4300. | 999.00 | 4400. | 999.00 | 4500. | 999.00 | 4600. | 999.00 | 4700. | 999.00 | 4800. | 999.00 |
| 4900. | 999.00 | 5000. | 999.00 | 5100. | 999.00 | 5200. | 999.00 | 5300. | 999.00 | 5400. | 999.00 |
| 5500. | 999.00 | 5600. | 999.00 | 5700. | 999.00 | 5800. | 999.00 | 5900. | 999.00 | 6000. | 999.00 |
| 6100. | 999.00 | 6200. | 999.00 | 6300. | 999.00 | 6400. | 999.00 | 6500. | 999.00 | 6600. | 999.00 |
| 6700. | 999.00 | 6800. | 999.00 | 6900. | 999.00 | 7000. | 999.00 | 7100. | 999.00 | 7200. | 999.00 |
| 7300. | 999.00 | 7400. | 999.00 | 7500. | 999.00 | 7600. | 999.00 | 7700. | 999.00 | 7800. | 999.00 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 7900. | 999.00 | 8000. | 999.00 | 8100. | 999.00 | 8200. | 999.00 | 8300. | 999.00 | 8400. | 999.00 |
| 8500. | 999.00 | 8600. | 999.00 | | | | | | | | |

TIDE NO. = 3 REACH FK STD. DEV. = 0.2955E 01

NUMBER OF POINTS: 13. TIDE NUMBER: 3
DATE: 1020. LOW: 0950. START: NONE. OG

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 999.00 | 600. | 999.00 |
| 700. | 999.00 | 800. | 999.00 | 900. | 999.00 | 1000. | 999.00 | 1100. | 999.00 | 1200. | 999.00 |
| 1300. | 999.00 | | | | | | | | | | |

TIDE NO. = 3 REACH OG STD. DEV. = 0.0

NUMBER OF POINTS: 12. TIDE NUMBER: 3

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 999.00 | 600. | 999.00 |
| 700. | 999.00 | 800. | 999.00 | 900. | 999.00 | 1000. | 999.00 | 1100. | 999.00 | 1200. | 999.00 |

TIDE NO. = 3 REACH NM STD. DEV. = 0.0

NUMBER OF POINTS: 36. TIDE NUMBER: 3
DATE: 1020. LOW: 0950. START: NONE. TH

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 999.00 | 600. | 999.00 |
| 700. | 999.00 | 800. | 999.00 | 900. | 999.00 | 1000. | 999.00 | 1100. | 999.00 | 1200. | 999.00 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1300. | 999.00 | 1400. | 999.00 | 1500. | 999.00 | 1600. | 999.00 | 1700. | 999.00 | 1800. | 999.00 |
| 1900. | 999.00 | 2000. | 999.00 | 2100. | 999.00 | 2200. | 999.00 | 2300. | 999.00 | 2400. | 999.00 |
| 2500. | 999.00 | 2600. | 999.00 | 2700. | 999.00 | 2800. | 999.00 | 2900. | 999.00 | 3000. | 999.00 |
| 3100. | 999.00 | 3200. | 999.00 | 3300. | 999.00 | 3400. | 999.00 | 3500. | 999.00 | 3600. | 999.00 |

TIDE NO. = 3 REACH TH STD. DEV. = 0.0

NUMBER OF POINTS: 12. TIDE NUMBER: 3
DATE: 1020. LOW: 0950. START: NONE, LJ

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 999.00 | 600. | 999.00 |
| 700. | 999.00 | 800. | 999.00 | 900. | 999.00 | 1000. | 999.00 | 1100. | 999.00 | 1200. | 999.00 |

TIDE NO. = 3 REACH LJ STD. DEV. = 0.0

NUMBER OF POINTS: 71. TIDE NUMBER: 4
DATE: 1020. HIGH: 1610.START: 1641. AD

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 2.50 | 200. | 2.80 | 300. | 2.90 | 400. | 2.80 | 500. | 2.80 | 600. | 2.80 |
| 700. | 2.30 | 800. | 2.40 | 900. | 2.20 | 1000. | 2.20 | 1100. | 2.00 | 1200. | 2.00 |
| 1300. | 2.00 | 1400. | 2.00 | 1500. | 2.00 | 1600. | 2.00 | 1700. | 2.00 | 1800. | 1.90 |
| 1900. | 1.70 | 2000. | 1.60 | 2100. | 1.60 | 2200. | 1.70 | 2300. | 1.10 | 2400. | 1.10 |
| 2500. | 1.00 | 2600. | 1.00 | 2700. | 0.70 | 2800. | 0.80 | 2900. | 0.70 | 3000. | 0.70 |
| 3100. | 0.70 | 3200. | 0.60 | 3300. | 0.70 | 3400. | 0.83 | 3500. | 0.90 | 3600. | 0.92 |
| 3700. | 0.81 | 3800. | 0.75 | 3900. | 0.0 | 4000. | 0.0 | 4100. | 999.00 | 4200. | 999.00 |
| 4300. | 999.00 | 4400. | 999.00 | 4500. | 0.30 | 4600. | 0.30 | 4700. | 0.30 | 4800. | 0.40 |
| 4900. | 0.43 | 5000. | 0.44 | 5100. | 0.31 | 5200. | 0.33 | 5300. | 0.32 | 5400. | 0.31 |
| 5500. | 0.26 | 5600. | 0.25 | 5700. | 0.27 | 5800. | 0.29 | 5900. | 0.27 | 6000. | 0.23 |
| 6100. | 0.20 | 6200. | 0.20 | 6300. | 0.19 | 6400. | 0.19 | 6500. | 0.20 | 6600. | 0.20 |
| 6700. | 0.20 | 6800. | 0.20 | 6900. | 0.20 | 7000. | 0.19 | 7100. | 0.19 | | |

TIDE NO. = 4 REACH AD STD. DEV. = 0.8884E 00

NUMBER OF POINTS: 17, TIDE NUMBER: 4
DATE: 1020, HIGH: 1610, START: 1701, QB

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 0.25 | 200. | 0.26 | 300. | 0.26 | 400. | 0.27 | 500. | 0.32 | 600. | 0.29 |
| 700. | 0.29 | 800. | 0.28 | 900. | 0.27 | 1000. | 0.27 | 1100. | 0.25 | 1200. | 0.30 |
| 1300. | 0.31 | 1400. | 0.23 | 1500. | 0.22 | 1600. | 0.41 | 1700. | 0.55 | | |

TIDE NO. = 4 REACH QB STD. DEV. = 0.7811E 01

NUMBER OF POINTS: 14, TIDE NUMBER: 4
DATE: 1020, HIGH: 1610, START: 1707, RP

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 0.24 | 200. | 0.24 | 300. | 0.25 | 400. | 0.26 | 500. | 0.26 | 600. | 0.26 |
| 700. | 0.30 | 800. | 0.27 | 900. | 0.27 | 1000. | 0.28 | 1100. | 0.29 | 1200. | 0.29 |
| 1300. | 0.32 | 1400. | 0.32 | | | | | | | | |

TIDE NO. = 4 REACH RP STD. DEV. = 0.2624E 01

NUMBER OF POINTS: 86, TIDE NUMBER: 4
DATE: 1020, HIGH: 1610, START: 1720, FK

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 0.19 | 600. | 0.19 |
| 700. | 0.19 | 800. | 0.19 | 900. | 0.19 | 1000. | 0.19 | 1100. | 0.19 | 1200. | 0.19 |
| 1300. | 0.19 | 1400. | 0.19 | 1500. | 0.19 | 1600. | 0.19 | 1700. | 0.19 | 1800. | 0.22 |
| 1900. | 0.20 | 2000. | 0.19 | 2100. | 0.19 | 2200. | 0.20 | 2300. | 0.19 | 2400. | 0.19 |
| 2500. | 0.19 | 2600. | 0.19 | 2700. | 0.18 | 2800. | 0.19 | 2900. | 0.19 | 3000. | 0.20 |
| 3100. | 0.19 | 3200. | 0.19 | 3300. | 0.19 | 3400. | 0.19 | 3500. | 0.19 | 3600. | 0.19 |
| 3700. | 0.19 | 3800. | 0.19 | 3900. | 0.19 | 4000. | 0.19 | 4100. | 0.19 | 4200. | 0.19 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 4300. | 0.20 | 4400. | 0.19 | 4500. | 0.19 | 4600. | 0.19 | 4700. | 0.19 | 4800. | 0.19 |
| 4900. | 0.19 | 5000. | 0.19 | 5100. | 0.19 | 5200. | 0.19 | 5300. | 0.19 | 5400. | 0.18 |
| 5500. | 0.18 | 5600. | 0.18 | 5700. | 0.18 | 5800. | 0.18 | 5900. | 0.18 | 6000. | 0.18 |
| 6100. | 0.19 | 6200. | 0.19 | 6300. | 0.18 | 6400. | 0.18 | 6500. | 0.18 | 6600. | 999.00 |
| 6700. | 999.00 | 6800. | 999.00 | 6900. | 999.00 | 7000. | 999.00 | 7100. | 999.00 | 7200. | 999.00 |
| 7300. | 999.00 | 7400. | 999.00 | 7500. | 999.00 | 7600. | 999.00 | 7700. | 999.00 | 7800. | 999.00 |
| 7900. | 999.00 | 8000. | 999.00 | 8100. | 999.00 | 8200. | 999.00 | 8300. | 999.00 | 8400. | 999.00 |
| 8500. | 999.00 | 8600. | 999.00 | | | | | | | | |

TIDE NO. = 4 REACH FK STD. DEV. = 0.6273E 02

NUMBER OF POINTS: 13. TIDE NUMBER: 4
DATE: 1020. HIGH: 1610. START: NONE. DG

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 999.00 | 600. | 999.00 |
| 700. | 999.00 | 800. | 999.00 | 900. | 999.00 | 1000. | 999.00 | 1100. | 999.00 | 1200. | 999.00 |
| 1300. | 999.00 | | | | | | | | | | |

TIDE NO. = 4 REACH DG STD. DEV. = 0.0

NUMBER OF POINTS: 12. TIDE NUMBER: 4

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 999.00 | 600. | 999.00 |
| 700. | 999.00 | 800. | 999.00 | 900. | 999.00 | 1000. | 999.00 | 1100. | 999.00 | 1200. | 999.00 |

TIDE NO. = 4 REACH NM STD. DEV. = 0.0

NUMBER OF POINTS: 36. TIDE NUMBER: 4
DATE: 1020. HIGH: 1610. START: NONE. TH

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 999.00 | 600. | 999.00 |
| 700. | 999.00 | 800. | 999.00 | 900. | 999.00 | 1000. | 999.00 | 1100. | 999.00 | 1200. | 999.00 |
| 1300. | 999.00 | 1400. | 999.00 | 1500. | 999.00 | 1600. | 999.00 | 1700. | 999.00 | 1800. | 999.00 |
| 1900. | 999.00 | 2000. | 999.00 | 2100. | 999.00 | 2200. | 999.00 | 2300. | 999.00 | 2400. | 999.00 |
| 2500. | 999.00 | 2600. | 999.00 | 2700. | 999.00 | 2800. | 999.00 | 2900. | 999.00 | 3000. | 999.00 |
| 3100. | 999.00 | 3200. | 999.00 | 3300. | 999.00 | 3400. | 999.00 | 3500. | 999.00 | 3600. | 999.00 |

TIDE NO. = 4 REACH TH STD. DEV. = 0.0

NUMBER OF POINTS: 12. TIDE NUMBER: 4
DATE: 1020. HIGH: 1610. START: NONE. LJ

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 999.00 | 600. | 999.00 |
| 700. | 999.00 | 800. | 999.00 | 900. | 999.00 | 1000. | 999.00 | 1100. | 999.00 | 1200. | 999.00 |

TIDE NO. = 4 REACH LJ STD. DEV. = 0.0

NUMBER OF POINTS: 71. TIDE NUMBER: 5
DATE: 1020. LOW: 2240. START: 2308. AD

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 2.10 | 200. | 2.10 | 300. | 2.00 | 400. | 2.10 | 500. | 2.05 | 600. | 2.20 |
| 700. | 2.10 | 800. | 2.10 | 900. | 2.10 | 1000. | 1.90 | 1100. | 1.80 | 1200. | 1.70 |
| 1300. | 1.60 | 1400. | 1.60 | 1500. | 1.50 | 1600. | 1.50 | 1700. | 1.50 | 1800. | 1.40 |
| 1900. | 1.30 | 2000. | 1.30 | 2100. | 1.30 | 2200. | 1.10 | 2300. | 1.20 | 2400. | 1.10 |
| 2500. | 1.00 | 2600. | 1.00 | 2700. | 1.00 | 2800. | 0.80 | 2900. | 0.90 | 3000. | 0.90 |
| 3100. | 0.80 | 3200. | 0.70 | 3300. | 0.70 | 3400. | 0.80 | 3500. | 0.70 | 3600. | 0.80 |
| 3700. | 0.70 | 3800. | 0.70 | 3900. | 0.70 | 4000. | 0.70 | 4100. | 0.90 | 4200. | 0.80 |
| 4300. | 0.90 | 4400. | 1.50 | 4500. | 1.80 | 4600. | 1.90 | 4700. | 1.90 | 4800. | 1.80 |
| 4900. | 5.00 | 5000. | 5.30 | 5100. | 4.90 | 5200. | 3.80 | 5300. | 3.40 | 5400. | 3.00 |
| 5500. | 2.60 | 5600. | 2.50 | 5700. | 3.00 | 5800. | 3.90 | 5900. | 3.90 | 6000. | 2.40 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 6100. | 2.50 | 6200. | 2.30 | 6300. | 2.50 | 6400. | 2.40 | 6500. | 2.40 | 6600. | 2.40 |
| 6700. | 2.40 | 6800. | 2.40 | 6900. | 2.50 | 7000. | 2.40 | 7100. | 2.40 | | |

TIDE NO. = 5      REACH AD      STD. DEV. = 0.1051E 01

NUMBER OF POINTS: 17. TIDE NUMBER: 5
DATE: 1020. LOW: 2240. START: 2320. QB

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 1.70 | 500. | 1.70 | 600. | 1.80 |
| 700. | 1.80 | 800. | 1.80 | 900. | 1.80 | 1000. | 1.80 | 1100. | 1.80 | 1200. | 1.80 |
| 1300. | 1.80 | 1400. | 1.80 | 1500. | 1.80 | 1600. | 1.80 | 1700. | 1.80 | | |

TIDE NO. = 5      REACH QB      STD. DEV. = 0.3645E 01

NUMBER OF POINTS: 14. TIDE NUMBER: 5
DATE: 1020. LOW: 2240. START: NONE. RP

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 999.00 | 600. | 999.00 |
| 700. | 999.00 | 800. | 999.00 | 900. | 999.00 | 1000. | 999.00 | 1100. | 999.00 | 1200. | 999.00 |
| 1300. | 999.00 | 1400. | 999.00 | | | | | | | | |

TIDE NO. = 5      REACH RP      STD. DEV. = 0.0

NUMBER OF POINTS: 86. TIDE NUMBER: 5
DATE: 1020. LOW: 2240. START: 2665. FK

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 2.10 | 600. | 2.10 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 700. | 2.10 | 800. | 2.10 | 900. | 2.10 | 1000. | 2.20 | 1100. | 2.50 | 1200. | 2.00 |
| 1300. | 2.10 | 1400. | 2.20 | 1500. | 2.30 | 1600. | 2.70 | 1700. | 2.30 | 1800. | 2.30 |
| 1900. | 2.40 | 2000. | 2.30 | 2100. | 2.30 | 2200. | 2.50 | 2300. | 2.30 | 2400. | 2.10 |
| 2500. | 2.10 | 2600. | 2.40 | 2700. | 2.50 | 2800. | 2.40 | 2900. | 2.80 | 3000. | 1.80 |
| 3100. | 1.80 | 3200. | 2.10 | 3300. | 1.90 | 3400. | 1.90 | 3500. | 1.80 | 3600. | 1.90 |
| 3700. | 2.10 | 3800. | 2.10 | 3900. | 2.00 | 4000. | 1.70 | 4100. | 1.70 | 4200. | 1.70 |
| 4300. | 999.00 | 4400. | 999.00 | 4500. | 2.00 | 4600. | 2.00 | 4700. | 2.00 | 4800. | 1.80 |
| 4900. | 1.80 | 5000. | 1.80 | 5100. | 1.20 | 5200. | 1.20 | 5300. | 1.20 | 5400. | 1.30 |
| 5500. | 1.20 | 5600. | 1.30 | 5700. | 1.20 | 5800. | 1.25 | 5900. | 1.25 | 6000. | 1.25 |
| 6100. | 1.25 | 6200. | 1.25 | 6300. | 1.25 | 6400. | 1.25 | 6500. | 1.25 | 6600. | 1.25 |
| 6700. | 1.20 | 6800. | 1.20 | 6900. | 1.20 | 7000. | 1.20 | 7100. | 1.20 | 7200. | 1.20 |
| 7300. | 1.20 | 7400. | 1.20 | 7500. | 1.20 | 7600. | 1.20 | 7700. | 1.20 | 7800. | 1.20 |
| 7900. | 1.20 | 8000. | 1.20 | 8100. | 1.10 | 8200. | 1.10 | 8300. | 1.10 | 8400. | 1.10 |
| 8500. | 1.05 | 8600. | 1.05 | | | | | | | | |

TIDE NO. = 5 REACH FK STD. DEV. = 0.4873E 00

NUMBER OF POINTS: 13. TIDE NUMBER: 5
DATE: 1020. LOW: 2240. START: 2350. OG

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 1.50 | 200. | 1.50 | 300. | 1.60 | 400. | 1.70 | 500. | 1.80 | 600. | 1.60 |
| 700. | 1.50 | 800. | 1.50 | 900. | 1.50 | 1000. | 1.50 | 1100. | 1.50 | 1200. | 1.50 |
| 1300. | 1.70 | | | | | | | | | | |

TIDE NO. = 5 REACH OG STD. DEV. = 0.1032E 00

NUMBER OF POINTS: 12. TIDE NUMBER: 5

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 999.00 | 600. | 999.00 |
| 700. | 999.00 | 800. | 999.00 | 900. | 999.00 | 1000. | 999.00 | 1100. | 999.00 | 1200. | 999.00 |

TIDE NO. = 5 REACH NM STD. DEV. = 0.0

NUMBER OF POINTS: 36, TIDE NUMBER: 5
DATE: 1020, LOW: 2240, START: NONE, TH

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 999.00 | 600. | 999.00 |
| 700. | 999.00 | 800. | 999.00 | 900. | 999.00 | 1000. | 999.00 | 1100. | 999.00 | 1200. | 999.00 |
| 1300. | 999.00 | 1400. | 999.00 | 1500. | 999.00 | 1600. | 999.00 | 1700. | 999.00 | 1800. | 999.00 |
| 1900. | 999.00 | 2000. | 999.00 | 2100. | 999.00 | 2200. | 999.00 | 2300. | 999.00 | 2400. | 999.00 |
| 2500. | 999.00 | 2600. | 999.00 | 2700. | 999.00 | 2800. | 999.00 | 2900. | 999.00 | 3000. | 999.00 |
| 3100. | 999.00 | 3200. | 999.00 | 3300. | 999.00 | 3400. | 999.00 | 3500. | 999.00 | 3600. | 999.00 |

TIDE NO. = 5 REACH TH STD. DEV. = 0.0

NUMBER OF POINTS: 12, TIDE NUMBER: 5
DATE: 1020, LOW: 2240, START: NONE, LJ

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 999.00 | 600. | 999.00 |
| 700. | 999.00 | 800. | 999.00 | 900. | 999.00 | 1000. | 999.00 | 1100. | 999.00 | 1200. | 999.00 |

TIDE NO. = 5 REACH LJ STD. DEV. = 0.0

NUMBER OF POINTS: 71, TIDE NUMBER: 6
DATE: 1021, HIGH: 0420, START: 0428, AD

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 2.20 | 200. | 2.30 | 300. | 2.30 | 400. | 2.00 | 500. | 1.40 | 600. | 1.70 |
| 700. | 1.60 | 800. | 1.40 | 900. | 1.80 | 1000. | 2.20 | 1100. | 1.70 | 1200. | 1.20 |
| 1300. | 0.90 | 1400. | 0.90 | 1500. | 0.90 | 1600. | 0.90 | 1700. | 1.00 | 1800. | 0.90 |
| 1900. | 0.90 | 2000. | 0.90 | 2100. | 1.00 | 2200. | 1.00 | 2300. | 1.20 | 2400. | 1.20 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2500. | 1.20 | 2600. | 1.10 | 2700. | 1.30 | 2800. | 1.30 | 2900. | 1.70 | 3000. | 1.40 |
| 3100. | 1.50 | 3200. | 1.50 | 3300. | 1.50 | 3400. | 1.50 | 3500. | 1.50 | 3600. | 1.60 |
| 3700. | 1.40 | 3800. | 1.10 | 3900. | 1.00 | 4000. | 1.10 | 4100. | 1.20 | 4200. | 1.40 |
| 4300. | 1.50 | 4400. | 1.40 | 4500. | 1.40 | 4600. | 0.80 | 4700. | 1.00 | 4800. | 0.80 |
| 4900. | 1.00 | 5000. | 0.80 | 5100. | 0.80 | 5200. | 0.80 | 5300. | 0.80 | 5400. | 0.80 |
| 5500. | 0.85 | 5600. | 0.90 | 5700. | 0.95 | 5800. | 1.00 | 5900. | 1.10 | 6000. | 0.70 |
| 6100. | 0.70 | 6200. | 0.84 | 6300. | 0.82 | 6400. | 0.82 | 6500. | 0.79 | 6600. | 0.78 |
| 6700. | 0.75 | 6800. | 0.79 | 6900. | 0.79 | 7000. | 0.79 | 7100. | 0.79 | | |

TIDE NO. = 6 REACH AD STD. DEV. = 0.4059E 00

NUMBER OF POINTS: 17. TIDE NUMBER: 6
DATE: 1021. HIGH: 0420. START: 0441. QB

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 0.80 | 200. | 0.84 | 300. | 0.95 | 400. | 0.82 | 500. | 0.82 | 600. | 0.82 |
| 700. | 0.82 | 800. | 0.84 | 900. | 0.80 | 1000. | 0.70 | 1100. | 0.70 | 1200. | 0.70 |
| 1300. | 0.70 | 1400. | 0.70 | 1500. | 1.20 | 1600. | 1.40 | 1700. | 1.40 | | |

TIDE NO. = 6 REACH QB STD. DEV. = 0.2286E 00

NUMBER OF POINTS: 14. TIDE NUMBER: 6
DATE: 1021. HIGH: 0420. START: 0448. RP

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 0.80 | 200. | 0.80 | 300. | 0.80 | 400. | 0.80 | 500. | 0.80 | 600. | 0.79 |
| 700. | 0.80 | 800. | 0.75 | 900. | 0.80 | 1000. | 0.80 | 1100. | 0.81 | 1200. | 0.78 |
| 1300. | 0.81 | 1400. | 0.0 | | | | | | | | |

TIDE NO. = 6 REACH RP STD. DEV. = 0.2135E 00

NUMBER OF POINTS: 86. TIDE NUMBER: 6
DATE: 1021. HIGH: 0420. START: 0502. FK

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 0.80 | 200. | 0.80 | 300. | 0.80 | 400. | 0.79 | 500. | 0.80 | 600. | 0.80 |
| 700. | 0.78 | 800. | 0.79 | 900. | 0.80 | 1000. | 0.79 | 1100. | 0.80 | 1200. | 0.79 |
| 1300. | 0.80 | 1400. | 0.80 | 1500. | 0.80 | 1600. | 0.80 | 1700. | 0.80 | 1800. | 0.80 |
| 1900. | 0.82 | 2000. | 0.83 | 2100. | 0.82 | 2200. | 0.82 | 2300. | 0.82 | 2400. | 0.80 |
| 2500. | 0.80 | 2600. | 0.79 | 2700. | 0.78 | 2800. | 0.77 | 2900. | 0.77 | 3000. | 0.76 |
| 3100. | 0.77 | 3200. | 0.76 | 3300. | 0.77 | 3400. | 0.75 | 3500. | 0.77 | 3600. | 0.76 |
| 3700. | 0.78 | 3800. | 0.77 | 3900. | 0.78 | 4000. | 0.78 | 4100. | 0.77 | 4200. | 0.77 |
| 4300. | 0.75 | 4400. | 0.75 | 4500. | 0.85 | 4600. | 0.81 | 4700. | 0.81 | 4800. | 0.81 |
| 4900. | 0.80 | 5000. | 0.80 | 5100. | 0.79 | 5200. | 0.82 | 5300. | 0.82 | 5400. | 0.81 |
| 5500. | 0.82 | 5600. | 0.78 | 5700. | 0.77 | 5800. | 0.78 | 5900. | 0.78 | 6000. | 0.77 |
| 6100. | 0.77 | 6200. | 0.77 | 6300. | 0.77 | 6400. | 0.77 | 6500. | 0.78 | 6600. | 0.76 |
| 6700. | 0.77 | 6800. | 0.77 | 6900. | 0.77 | 7000. | 0.77 | 7100. | 0.77 | 7200. | 0.80 |
| 7300. | 0.80 | 7400. | 0.77 | 7500. | 0.78 | 7600. | 0.75 | 7700. | 0.77 | 7800. | 0.77 |
| 7900. | 0.80 | 8000. | 0.77 | 8100. | 0.78 | 8200. | 0.78 | 8300. | 0.78 | 8400. | 0.78 |
| 8500. | 0.78 | 8600. | 0.79 | | | | | | | | |

TIDE NO. = 6 REACH FK STD. DEV. = 0.2037E-01

NUMBER OF POINTS: 13. TIDE NUMBER: 6
DATE: 1021. HIGH: 0420. START: 0542. OG

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 0.77 | 600. | 0.78 |
| 700. | 0.79 | 800. | 0.79 | 900. | 0.78 | 1000. | 0.78 | 1100. | 0.79 | 1200. | 0.77 |
| 1300. | 0.80 | | | | | | | | | | |

TIDE NO. = 6 REACH OG STD. DEV. = 0.1001E-01

NUMBER OF POINTS: 12. TIDE NUMBER: 6

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 999.00 | 600. | 999.00 |
| 700. | 999.00 | 800. | 999.00 | 900. | 999.00 | 1000. | 999.00 | 1100. | 999.00 | 1200. | 999.00 |

TIDE NO. = 6 REACH NM STD. DEV. = 0.0

NUMBER OF POINTS: 36. TIDE NUMBER: 6
DATE: 1021. HIGH: 0420. START: 0526. TH

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 999.00 | 600. | 999.00 |
| 700. | 999.00 | 800. | 999.00 | 900. | 999.00 | 1000. | 999.00 | 1100. | 999.00 | 1200. | 999.00 |
| 1300. | 999.00 | 1400. | 0.78 | 1500. | 0.79 | 1600. | 0.79 | 1700. | 0.79 | 1800. | 0.78 |
| 1900. | 0.78 | 2000. | 0.78 | 2100. | 0.78 | 2200. | 0.78 | 2300. | 0.78 | 2400. | 0.78 |
| 2500. | 0.78 | 2600. | 0.78 | 2700. | 0.79 | 2800. | 0.79 | 2900. | 0.80 | 3000. | 0.80 |
| 3100. | 0.80 | 3200. | 0.80 | 3300. | 0.79 | 3400. | 0.79 | 3500. | 0.80 | 3600. | 0.81 |

TIDE NO. = 6 REACH TH STD. DEV. = 0.9302E-02

NUMBER OF POINTS: 12. TIDE NUMBER: 6
DATE: 1021. HIGH: 0420. START: NONE. LJ

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 999.00 | 600. | 999.00 |
| 700. | 999.00 | 800. | 999.00 | 900. | 999.00 | 1000. | 999.00 | 1100. | 999.00 | 1200. | 999.00 |

TIDE NO. = 6 REACH LJ STD. DEV. = 0.0

NUMBER OF POINTS: 71. TIDE NUMBER: 7
DATE: 1021. LOW: 1045. START: 1139. AD

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 3.00 | 200. | 2.40 | 300. | 1.20 | 400. | 1.20 | 500. | 2.00 | 600. | 1.60 |
| 700. | 1.40 | 800. | 1.00 | 900. | 1.20 | 1000. | 1.10 | 1100. | 1.00 | 1200. | 0.80 |
| 1300. | 0.80 | 1400. | 0.70 | 1500. | 0.70 | 1600. | 0.70 | 1700. | 0.70 | 1800. | 0.50 |
| 1900. | 0.50 | 2000. | 0.50 | 2100. | 0.60 | 2200. | 0.60 | 2300. | 0.60 | 2400. | 0.60 |
| 2500. | 0.74 | 2600. | 0.76 | 2700. | 0.79 | 2800. | 0.83 | 2900. | 0.81 | 3000. | 0.84 |
| 3100. | 0.89 | 3200. | 0.93 | 3300. | 0.98 | 3400. | 0.90 | 3500. | 0.98 | 3600. | 0.97 |
| 3700. | 0.95 | 3800. | 1.00 | 3900. | 1.00 | 4000. | 1.00 | 4100. | 1.00 | 4200. | 1.00 |
| 4300. | 1.00 | 4400. | 1.00 | 4500. | 1.05 | 4600. | 1.00 | 4700. | 1.00 | 4800. | 1.00 |
| 4900. | 1.00 | 5000. | 1.00 | 5100. | 1.00 | 5200. | 1.10 | 5300. | 1.10 | 5400. | 1.10 |
| 5500. | 0.80 | 5600. | 0.90 | 5700. | 1.00 | 5800. | 1.00 | 5900. | 0.80 | 6000. | 1.00 |
| 6100. | 1.30 | 6200. | 1.30 | 6300. | 1.30 | 6400. | 1.30 | 6500. | 1.30 | 6600. | 1.20 |
| 6700. | 1.20 | 6800. | 1.10 | 6900. | 1.20 | 7000. | 1.00 | 7100. | 1.00 | | |

TIDE NO. = 7 REACH AD STD. DEV. = 0.3852E 00

NUMBER OF POINTS: 17. TIDE NUMBER: 7
DATE: 1021. LOW: 1045. START: 1152. QB

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 999.00 | 600. | 999.00 |
| 700. | 999.00 | 800. | 0.28 | 900. | 0.27 | 1000. | 0.27 | 1100. | 0.26 | 1200. | 0.28 |
| 1300. | 0.26 | 1400. | 0.26 | 1500. | 0.25 | 1600. | 0.20 | 1700. | 0.05 | | |

TIDE NO. = 7 REACH QB STD. DEV. = 0.2512E 00

NUMBER OF POINTS: 14. TIDE NUMBER: 7
DATE: 1021. LOW: 1045. START: 1155. RP

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 0.37 | 200. | 0.37 | 300. | 0.38 | 400. | 0.36 | 500. | 0.37 | 600. | 0.30 |
| 700. | 0.29 | 800. | 0.28 | 900. | 0.26 | 1000. | 0.25 | 1100. | 0.23 | 1200. | 0.25 |
| 1300. | 0.27 | 1400. | 0.28 | | | | | | | | |

TIDE NO. = 7 REACH RP STD. DEV. = 0.5388E-01

NUMBER OF POINTS: 86. TIDE NUMBER: 7
DATE: 1021. LOW: 1045. START: 1213. FK

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 0.14 | 600. | 0.14 |
| 700. | 0.16 | 800. | 0.17 | 900. | 0.21 | 1000. | 0.20 | 1100. | 0.20 | 1200. | 0.19 |
| 1300. | 0.21 | 1400. | 0.24 | 1500. | 0.41 | 1600. | 0.43 | 1700. | 0.34 | 1800. | 0.41 |
| 1900. | 0.44 | 2000. | 0.47 | 2100. | 0.43 | 2200. | 0.42 | 2300. | 0.40 | 2400. | 0.44 |
| 2500. | 0.46 | 2600. | 0.42 | 2700. | 1.00 | 2800. | 1.00 | 2900. | 1.00 | 3000. | 1.10 |
| 3100. | 1.10 | 3200. | 1.10 | 3300. | 1.20 | 3400. | 1.20 | 3500. | 1.20 | 3600. | 1.10 |
| 3700. | 1.10 | 3800. | 1.10 | 3900. | 1.10 | 4000. | 1.10 | 4100. | 1.10 | 4200. | 1.10 |
| 4300. | 999.00 | 4400. | 999.00 | 4500. | 0.35 | 4600. | 0.27 | 4700. | 0.35 | 4800. | 0.30 |
| 4900. | 0.28 | 5000. | 0.26 | 5100. | 0.24 | 5200. | 0.27 | 5300. | 0.24 | 5400. | 0.24 |
| 5500. | 0.25 | 5600. | 0.24 | 5700. | 0.23 | 5800. | 0.22 | 5900. | 0.23 | 6000. | 0.23 |
| 6100. | 0.23 | 6200. | 0.22 | 6300. | 0.20 | 6400. | 0.19 | 6500. | 0.19 | 6600. | 0.19 |
| 6700. | 0.18 | 6800. | 0.18 | 6900. | 0.17 | 7000. | 0.17 | 7100. | 0.16 | 7200. | 0.16 |
| 7300. | 0.16 | 7400. | 0.16 | 7500. | 0.16 | 7600. | 0.16 | 7700. | 0.16 | 7800. | 0.14 |
| 7900. | 0.14 | 8000. | 0.14 | 8100. | 0.14 | 8200. | 0.14 | 8300. | 0.14 | 8400. | 0.13 |
| 8500. | 0.13 | 8600. | 0.13 | | | | | | | | |

TIDE NO. = 7 REACH FK STD. DEV. = 0.3581E 00

NUMBER OF POINTS: 13. TIDE NUMBER: 7
DATE: 1021. LOW: 1045. START: 1217. OG

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 0.90 | 200. | 0.90 | 300. | 0.90 | 400. | 1.00 | 500. | 1.00 | 600. | 1.00 |
| 700. | 1.00 | 800. | 1.10 | 900. | 1.00 | 1000. | 1.00 | 1100. | 1.10 | 1200. | 1.10 |
| 1300. | 1.10 | | | | | | | | | | |

TIDE NO. = 7 REACH OG STD. DEV. = 0.7596E 01

NUMBER OF POINTS: 12. TIDE NUMBER: 7

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 999.00 | 600. | 999.00 |
| 700. | 999.00 | 800. | 999.00 | 900. | 999.00 | 1000. | 999.00 | 1100. | 999.00 | 1200. | 999.00 |

TIDE NO. = 7    REACH NM    STD. DEV. = 0.0

NUMBER OF POINTS: 36. TIDE NUMBER: 7
DATE: 1021. LOW: 1045. START: 1225. TH

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 999.00 | 200. | 999.00 | 300. | 999.00 | 400. | 999.00 | 500. | 999.00 | 600. | 999.00 |
| 700. | 999.00 | 800. | 999.00 | 900. | 999.00 | 1000. | 999.00 | 1100. | 999.00 | 1200. | 999.00 |
| 1300. | 999.00 | 1400. | 999.00 | 1500. | 999.00 | 1600. | 999.00 | 1700. | 999.00 | 1800. | 999.00 |
| 1900. | 0.14 | 2000. | 0.14 | 2100. | 0.14 | 2200. | 0.14 | 2300. | 0.14 | 2400. | 0.14 |
| 2500. | 0.14 | 2600. | 0.14 | 2700. | 0.14 | 2800. | 0.14 | 2900. | 0.14 | 3000. | 0.14 |
| 3100. | 0.17 | 3200. | 0.36 | 3300. | 0.36 | 3400. | 0.33 | 3500. | 0.40 | 3600. | 0.41 |

TIDE NO. = 7    REACH TH    STD. DEV. = 0.1073E 00

NUMBER OF POINTS: 12. TIDE NUMBER: 7
DATE: 1021. LOW: 1045. START: 1236. LJ

CONCENTRATION VS. DISTANCE

| DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC | DIST | CONC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100. | 0.26 | 200. | 0.27 | 300. | 0.28 | 400. | 0.28 | 500. | 0.27 | 600. | 0.27 |
| 700. | 0.26 | 800. | 0.26 | 900. | 0.26 | 1000. | 0.26 | 1100. | 0.25 | 1200. | 0.24 |

TIDE NO. = 7    REACH LJ    STD. DEV. = 0.1156E 01

C.2

P57

THREE-DIMENSIONAL PLOT

of

CANAL NETWORK MAP

and

CENTERLINE DYE CONCENTRATIONS

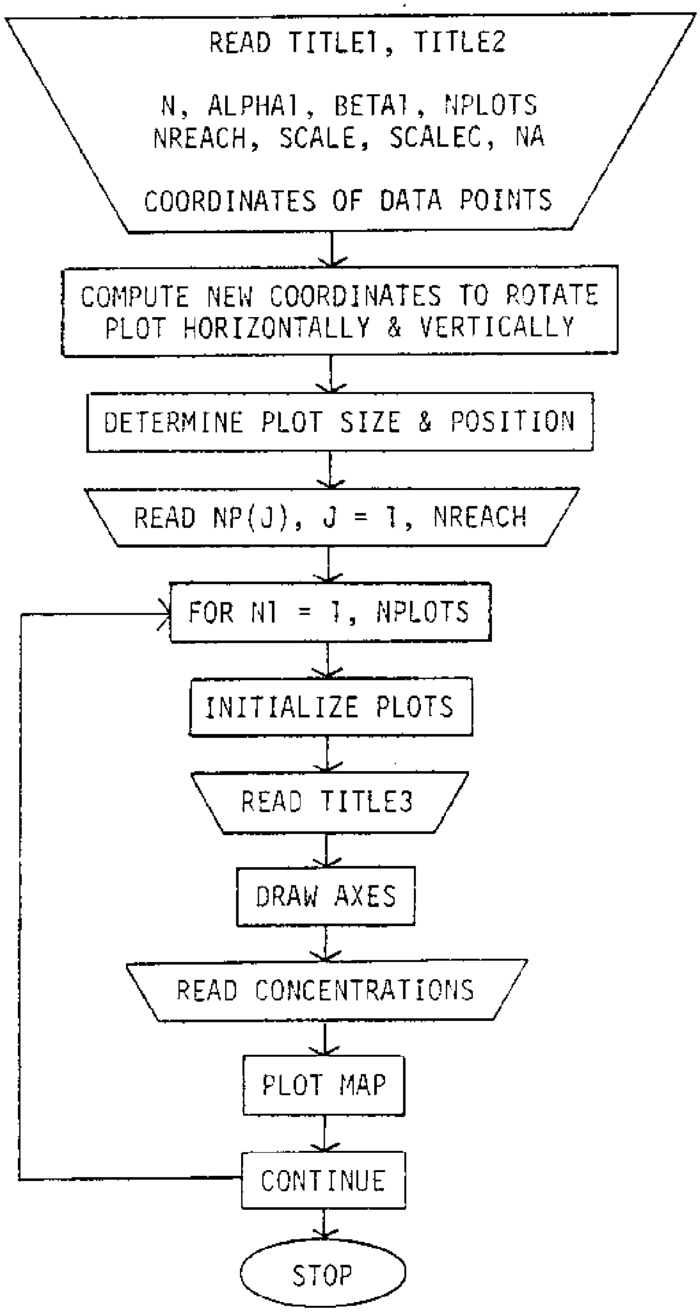
C.2.1

FLOW CHART

for

P57

P57 FLOWCHART



C.2.2

# PROGRAM LISTING

for

P57

```
57' P57       -FORT                    -SYSPRINT

FORTRAN IV G LEVEL  21                       MAIN                DATE = 78059          12/35/21

C
C      N=NUMBER OF POINTS TO BE PLOTTED
C       ALPHA1IS THE ANGLE OF HORIZONTAL ROTATION MEASURED COUNTER
C          CLOCKWISE IN DEGREES
C       BETA1 IS THE ANGLE OF ROTATION FROM THE HORIZONTAL MEASURED IN DEGREES
C      NPLOTS= NUMBER OF PLOTS DESIRED
C      NREACH=NUMBER OF REACHES
C      SCALE=COORDINATE POINTS PER INCH
C      SCALEC=CONCENTRATION PER INCH
C      NA=NUMBER OF DATA POINTS IN NORTH ARROW
C      NP=NUMBER OF POINTS IN EACH REACH
C
C      THERE MUST BE DATA VALUES FOR EACH DATA POINT
C
       DIMENSION TITLE1(15),TITLE2(15),TITLE3(15)
       DIMENSION X(300),Y(300),C(300),NP(15),XC(90),YC(90),CC(90)
       INTEGER PEN
       READ (5,3) TITLE1,TITLE2
     3 FORMAT (15A4,/15A4)
       READ (5,5) N,ALPHA1,BETA1,NPLOTS,NREACH,SCALE,SCALEC,NA
     5 FORMAT (I5,2F10.5,2I5,2F5.2,I5)
          NT=N+NA
       DO 4 L=1,NT
     4 READ(5,6) X(L),Y(L)
     6 FORMAT (10X,2F10.2)
C
C      CHANGE COORDINATES TO ROTATE AXIS HORIZONTALLY AND VERTICALLY
C
          ALPHA=ALPHA1*3.14159/180.
          BETA=BETA1*3.14159/180.
          XMIN=999.
          XMAX=-999.
          YMIN=999.
          YMAX=-999.
       DO 25 L=1,NT
          R=SQRT(X(L)*X(L)+Y(L)*Y(L))
          THETA=ATAN(Y(L)/X(L))
          THETA =THETA-ALPHA
          X(L)=R*COS(THETA)
          Y(L)=R*SIN(THETA)*SIN(BETA)
C
C      DETERMINE PLOT SIZE AND POSITION
C
       IF (X(L)-XMIN) 15,16,16
```

```
 15     XMIN=X(L)
 16 IF(X(L)-XMAX) 18,18,17
 17     XMAX=X(L)
 18 IF(Y(L)-YMIN) 19,20,20
 19     YMIN=Y(L)
 20 IF (Y(L)-YMAX) 25,25,21
 21     YMAX=Y(L)
 25 CONTINUE
        XL=(XMAX-XMIN)/SCALE+2.
        YL=(YMAX-YMIN)/SCALE+4.
        XOFF=1-XMIN/SCALE
        YOFF=3.-YMIN/SCALE
        XLTOT=NPLOTS*XL
        YLTOT=NPLOTS*YL
    READ (5,50)(NP(J),J=1,NREACH)
 50 FORMAT (8I5)
C
C   DRAW PLOTS
C
    CALL PLOTS (XLTOT,YLTOT,0,1,0.,YOFF)
C
C   DRAW AXES
C
    DO 100 NI=1,NPLOTS
    READ(5,200) TITLE3
200 FORMAT (15A4)
    CALL PLOT (XOFF,0.,-3)
        XSA=XMIN/SCALE-.25
        YSA=YMIN/SCALE-.25
        XLA=XMAX/SCALE
        YLA=YMAX/SCALE
        SCALEX=SCALE*100./3.
        SCALEY=SCALE*100./(3.*SIN(BETA))
        LXAXIS=XLA-XSA+1.
        XAXIS=LXAXIS+XSA
    CALL PLOT (XSA,YSA,3)
    CALL PLOT (XAXIS,YSA,2)
        SLABEL=0.
        YTICK1=YSA-.05
        YTICK2=YSA+.05
    CALL PLOT (XSA,YTICK1,3)
    CALL PLOT(KSA,YTICK2,2)
        YLABEL=YSA-.20
    CALL NUMBER (XSA,YLABEL,.10,SLABEL,0.,0)
```

```
0063            XAXIS=XSA
0064         DO 30 I=1,LXAXIS
0065            XAXIS=XAXIS+1.
0066         CALL PLCT (XAXIS,YTICK1,3)
0067         CALL PLOT (XAXIS,YTICK2,2)
0068            SLABEL=SLABFL+SCALEX
0069            XLABEL=(XAXIS .2)
0070      30 CALL NUMBER (XLABEL,YLABEL,.10,SLABEL,0.,0)
0071            XTITLE=(XLA-XSA-2.)/2.+XSA
0072            YTITLE=(YSA-.40)
0073         CALL SYMBOL (XTITLE,YTITLE,.15,'DISTANCE, FT,',0.,13)
0074            LYAXIS=(YLA-YSA)/(2000./SCALFY)+1.
0075            SLABEL=0.
0076            XTICK1=XSA-.05
0077            XTICK2=XSA+.05
0078         CALL PLOT (XTICK1,YSA,3)
0079         CALL PLCT (XTICK2,YSA,2)
0080            XLABFL=XSA-.20
0081         CALL NUMBER (XLABEL,YSA,.10,SLABEL,90.,0)
0082            YAXIS=YSA
0083         DO 31 I=1, LYAXIS
0084         CALL PLOT (XSA,YAXIS,3)
0085            YAXIS=YAXIS+2000./SCALEY
0086         CALL PLOT (XSA,YAXIS,2)
0087         CALL PLOT (XTICK1,YAXIS,3)
0088         CALL PLOT (XTICK2,YAXIS,2)
0089            SLABFL=SLABEL+2000.
0090            YLABEL=YAXIS-.2
0091      31 CALL NUMBER (XLABEL,YLABEL,.10,SLABEL,90.,0)
0092            XTITLE=XSA-.40
0093            YTITLE=(YLA-YSA-2.)/2.+YSA
0094         CALL SYMBOL (XTITLE,YTITLE,.15,'DISTANCE, FT,',90.,13)
        C
        C    PLOT MAF
        C
0095         CALL FACTOR (1/SCALE)
0096            XS=XMIN
0097            YS=YMIN-1.10*SCALE
0098            YS1=YS-.28 *SCALE
0099            YS2=YS1-.28*SCALE
0100            YS3=YS2-.28*SCALE
0101            SIZE=.10*SCALE
0102         CALL SYMBOL (XS,YS,SIZE,TITLE1,0,58)
0103         CALL SYMBOL (XS,YS1,SIZE,TITLE2,0,58)
```

```
      CALL SYMBOL (XS,YS2,SIZE,TITLE3,0,58)
      CALL SYMBOL (XS,YS3,SIZE,'AZIMUTH=        DEGREES',0,20)
         XS3=XS+.9*SCALE
      CALL NUMBER (XS3,YS3,SIZE,ALPHA1,0,-1)
         XS3=XS+3.*SCALE
      CALL SYMBOL (XS3,YS3,SIZE,'ELEVATION=        DEGREES',0,22)
         XS3=XS3+1.1*SCALE
      CALL NUMBER (XS3,YS3,SIZE,BETA1,0,-1)
         NORTHA=N+1
         PEN=3
      DO 51 J=NORTHA,NT
      CALL PLOT (X(J),Y(J),PEN,-2)
   51    PEN=2
         MPE=0
      DO 60 J=1,NREACH
         MP=MPE+1
         MPE=MPE+NP(J)
      READ (5,55)(C(K),K=MP,MPE)
   55 FORMAT (/(8(4X,F6.2)))
      WRITE (6,50) J
      WRITE (6,55) (C(K),K=MP,MPE)
         L=0
      DO 70 K=MP,MPE
         L=L+1
         XC(L)=X(K)
         YC(L)=Y(K)
         CC(L)=C(K)
      IF (CC(L).EQ.999.) CC(L)=0.
   70 CONTINUE
         YCC1=YC(1)
         XCC1=XC(1)
      CALL PLOT (XC(1),YC(1),3)
      DO 75 K=1,L
         YCC=YC(K)+CC(K)/SCALEC*SCALE
      CALL PLOT (XC(K),YC(K),2)
      CALL PLOT (XC(K),YCC,2)
      IF (YCC.EQ.YC(K)) GO TO 71
      IF (YCC1.EQ.YC(K-1)) GO TO 71
      CALL PLOT (XCC1,YCC1,2)
      CALL PLOT (XC(K),YC(K),3)
      GO TO 72
   71 CALL PLOT (XC(K),YC(K),2)
   72    YCC1=YCC
   75    XCC1=XC(K)
```

```
FORTRAN IV G LEVEL  21                MAIN            DATE = 78059          12/35/21

            60 CONTINUE
               CALL FACTOR (1.)
                  XSC=XMAX/SCALE+.60
                  YSC=YMIN/SCALE
               CALL AXIS (XSC,YSC,'CONCENTRATION  PPB',-18,3.0,90,0.0,SCALEC)
                  XEND=XL-XOFF
           100 CALL PLOT (XEND,0.,-3)
               CALL PLOT (0.,0.,999)
               STOP
               END
```

C.2.3

INPUT LISTING

for

P57

with

October 1977 data

```
// EXEC FORTGCG,PLOT=,CPTIONS='LINECNT=46'
MEASURED DYE CONCENTRATICN AT 3 FT DEPTH ALONG CENTERLINE
   57 ACRES CANAL SYSTEM, PALM BEACH COUNTY, FLORIDA
  261       210.       25.       3     8   30.    5.     6
             156.       74.                                    AD  1
             157.       72.                                    AD  2
             157.       68.                                    AD  3
             156.       66.                                    AD  4
             154.       63.                                    AD  5
             153.       60.                                    AD  6
             151.       58.                                    AD  7
             149.       56.                                    AD  8
             146.       54.                                    AD  9
             144.       53.                                    AD 10
             141.       52.                                    AD 11
             139.       49.                                    AD 12
             138.       46.                                    AD 13
             137.       44.                                    AD 14
             137.       40.                                    AD 15
             136.       38.                                    AD 16
             134.       36.                                    AD 17
             132.       34.                                    AD 18
             129.       34.                                    AD 19
             126.       34.                                    AD 20
             123.       34.                                    AD 21
             120.       34.                                    AD 22
             117.       34.                                    AD 23
             114.       34.                                    AD 24
             111.       34.                                    AD 25
             108.       34.                                    AD 26
             105.       33.                                    AD 27
             102.       32.                                    AD 28
              99.       31.                                    AD 29
              97.       30.                                    AD 30
              94.       28.                                    AD 31
              91.       27.                                    AD 32
              89.       25.                                    AD 33
              86.       24.                                    AD 34
              83.       23.                                    AD 35
              80.       23.                                    AD 36
              78.       25.                                    AD 37
              76.       27.                                    AD 38
              74.       30.                                    AD 39
              72.       32.                                    AD 40
              71.       35.                                    AD 41
              70.       38.                                    AD 42
              70.       41.                                    AD 43
              70.       43.                                    AD 44
```

01 MARCH 1978 NERDC --- CARD LIST UTILITY

| | | |
|---|---|---|
| 70. | 46. | AD 45 |
| 68. | 49. | AD 46 |
| 67. | 52. | AD 47 |
| 68. | 54. | AD 48 |
| 68. | 57. | AD 49 |
| 69. | 60. | AD 50 |
| 70. | 63. | AD 51 |
| 71. | 66. | AD 52 |
| 72. | 68. | AD 53 |
| 70. | 71. | AD 54 |
| 68. | 74. | AD 55 |
| 67. | 76. | AD 56 |
| 66. | 79. | AD 57 |
| 66. | 82. | AD 58 |
| 66. | 84. | AD 59 |
| 68. | 86. | AD 60 |
| 70. | 88. | AD 61 |
| 72. | 90. | AD 62 |
| 74. | 91. | AD 63 |
| 77. | 93. | AD 64 |
| 79. | 94. | AD 65 |
| 81. | 96. | AD 66 |
| 84. | 97. | AD 67 |
| 86. | 99. | AD 68 |
| 89. | 100. | AD 69 |
| 91. | 102. | AD 70 |
| 93. | 103. | AD 71 |
| 23. | 56. | QB 1 |
| 26. | 55. | QB 2 |
| 29. | 54. | QB 3 |
| 32. | 53. | QB 4 |
| 35. | 52. | QB 5 |
| 37. | 51. | QB 6 |
| 40. | 50. | QB 7 |
| 43. | 49. | QB 8 |
| 46. | 48. | QB 9 |
| 49. | 47. | QB 10 |
| 52. | 46. | QB 11 |
| 54. | 45. | QB 12 |
| 57. | 45. | QB 13 |
| 60. | 44. | QB 14 |
| 63. | 44. | QB 15 |
| 66. | 43. | QB 16 |
| 69. | 43. | QB 17 |
| 42. | 19. | RP 1 |
| 39. | 21. | RP 2 |
| 37. | 23. | RP 3 |
| 35. | 25. | RP 4 |

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|---|---|---|
| 33. | 27. | RP 5 |
| 31. | 30. | RP 6 |
| 31. | 33. | RP 7 |
| 32. | 36. | RP 8 |
| 33. | 39. | RP 9 |
| 35. | 41. | RP 10 |
| 37. | 43. | RP 11 |
| 39. | 45. | RP 12 |
| 40. | 48. | RP 13 |
| 42. | 50. | RP 14 |
| 161. | 105. | FK 1 |
| 159. | 103. | FK 1 |
| 156. | 101. | FK 2 |
| 154. | 100. | FK 3 |
| 151. | 98. | FK 4 |
| 149. | 96. | FK 5 |
| 146. | 94. | FK 6 |
| 143. | 94. | FK 7 |
| 140. | 93. | FK 8 |
| 137. | 93. | FK 9 |
| 134. | 93. | FK 10 |
| 131. | 93. | FK 11 |
| 128. | 93. | FK 12 |
| 125. | 93. | FK 13 |
| 122. | 94. | FK 14 |
| 119. | 94. | FK 15 |
| 116. | 93. | FK 16 |
| 113. | 93. | FK 17 |
| 110. | 92. | FK 18 |
| 107. | 92. | FK 19 |
| 104. | 93. | FK 20 |
| 101. | 94. | FK 21 |
| 99. | 96. | FK 22 |
| 97. | 99. | FK 23 |
| 95. | 101. | FK 24 |
| 93. | 104. | FK 25 |
| 92. | 106. | FK 26 |
| 90. | 109. | FK 27 |
| 89. | 111. | FK 28 |
| 88. | 114. | FK 29 |
| 86. | 117. | FK 30 |
| 84. | 118. | FK 31 |
| 81. | 120. | FK 32 |
| 79. | 122. | FK 33 |
| 76. | 124. | FK 34 |
| 74. | 125. | FK 35 |
| 71. | 126. | FK 36 |
| 69. | 128. | FK 37 |

| | | |
|---|---|---|
| 66. | 130. | FK 38 |
| 64. | 132. | FK 39 |
| 62. | 134. | FK 40 |
| 60. | 136. | FK 41 |
| 58. | 138. | FK 42 |
| 56. | 140. | FK 43 |
| 54. | 143. | FK 44 |
| 53. | 145. | FK 45 |
| 51. | 147. | FK 46 |
| 49. | 149. | FK 47 |
| 48. | 152. | FK 48 |
| 47. | 154. | FK 49 |
| 47. | 157. | FK 50 |
| 47. | 160. | FK 51 |
| 47. | 163. | FK 52 |
| 47. | 166. | FK 53 |
| 48. | 169. | FK 54 |
| 50. | 171. | FK 55 |
| 52. | 173. | FK 56 |
| 54. | 175. | FK 57 |
| 57. | 177. | FK 58 |
| 60. | 178. | FK 59 |
| 63. | 178. | FK 60 |
| 66. | 178. | FK 61 |
| 69. | 178. | FK 62 |
| 72. | 178. | FK 63 |
| 75. | 179. | FK 64 |
| 78. | 179. | FK 65 |
| 81. | 179. | FK 66 |
| 84. | 179. | FK 67 |
| 87. | 179. | FK 68 |
| 90. | 179. | FK 69 |
| 93. | 179. | FK 70 |
| 96. | 180. | FK 71 |
| 99. | 180. | FK 72 |
| 102. | 180. | FK 73 |
| 105. | 180. | FK 74 |
| 108. | 180. | FK 75 |
| 111. | 180. | FK 76 |
| 114. | 180. | FK 77 |
| 117. | 180. | FK 78 |
| 120. | 180. | FK 79 |
| 123. | 180. | FK 80 |
| 126. | 180. | FK 81 |
| 129. | 180. | FK 82 |
| 132. | 182. | FK 83 |
| 134. | 185. | FK 84 |
| 136. | 187. | FK 96 |

| | | |
|---|---|---|
| 25. | 131. | OG 2 |
| 28. | 131. | OG 3 |
| 31. | 131. | OG 4 |
| 34. | 131. | OG 5 |
| 37. | 131. | OG 6 |
| 40. | 131. | OG 7 |
| 43. | 131. | OG 8 |
| 46. | 131. | OG 9 |
| 49. | 131. | OG 10 |
| 52. | 131. | OG 11 |
| 55. | 132. | OG 12 |
| 58. | 133. | OG 13 |
| 60. | 135. | OG 14 |
| 38. | 98. | NM 1 |
| 38. | 101. | NM 2 |
| 37. | 104. | NM 3 |
| 37. | 107. | NM 4 |
| 36. | 110. | NM 5 |
| 36. | 113. | NM 6 |
| 35. | 116. | NM 7 |
| 34. | 119. | NM 8 |
| 34. | 122. | NM 9 |
| 34. | 125. | NM 10 |
| 34. | 128. | NM 11 |
| 34. | 131. | NM 12 |
| 133. | 100. | TH 2 |
| 132. | 103. | TH 3 |
| 131. | 106. | TH 4 |
| 131. | 109. | TH 5 |
| 130. | 112. | TH 6 |
| 130. | 115. | TH 7 |
| 129. | 118. | TH 8 |
| 128. | 120. | TH 9 |
| 127. | 123. | TH 10 |
| 126. | 126. | TH 11 |
| 124. | 129. | TH 12 |
| 122. | 132. | TH 13 |
| 120. | 134. | TH 14 |
| 118. | 135. | TH 15 |
| 115. | 137. | TH 16 |
| 112. | 138. | TH 17 |
| 110. | 139. | TH 18 |
| 107. | 140. | TH 19 |
| 104. | 141. | TH 20 |
| 101. | 141. | TH 21 |
| 98. | 142. | TH 22 |
| 95. | 142. | TH 23 |
| 92. | 142. | TH 24 |

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                 89.        142.                                                                   TH 25
                 86.        143.                                                                   TH 26
                 83.        143.                                                                   TH 27
                 80.        144.                                                                   TH 28
                 77.        145.                                                                   TH 29
                 74.        146.                                                                   TH 30
                 71.        147.                                                                   TH 31
                 68.        147.                                                                   TH 32
                 65.        147.                                                                   TH 33
                 62.        147.                                                                   TH 34
                 59.        146.                                                                   TH 35
                 56.        145.                                                                   TH 36
                 54.        144.                                                                   TH 37
                 35.        166.                                                                   JL  1
                 35.        169.                                                                   JL  2
                 35.        172.                                                                   JL  3
                 35.        175.                                                                   JL  4
                 36.        178.                                                                   JL  5
                 39.        178.                                                                   JL  6
                 42.        178.                                                                   JL  7
                 45.        178.                                                                   JL  8
                 48.        178.                                                                   JL  9
                 51.        178.                                                                   JL 10
                 54.        178.                                                                   JL 11
                 57.        178.                                                                   JL 12
                150.        150.                                                                   NORTH 1
                150.        160.                                                                   NORTH  2
                148.        158.                                                                   NORTH  3
                150.        164.                                                                   NORTH  4
                152.        158.                                                                   NORTH  5
                150.        160.                                                                   NORTH  6
  71    17    14    86    13    12    36    12
 DATE: 771019.  TIDE: LOW.  TIME: 2140.  PEAK: 10.00 PPB
 71  1  DATE: 1019. LOW: 2140. START: 2210. AD
1AD1  2.50       3.00       4.00       2.10       2.60       4.00       4.00       5.50
1AD2 10.00     999.       999.       999.       999.       999.         1.40       1.50
1AD3  1.70       1.40       1.40       1.40       1.40       1.40       1.40       1.40
1AD4  1.40       1.40       1.40       1.40       1.40       1.40       1.40       1.40
1AD5  1.40       1.40       1.40       1.40       1.40       1.40     999.       999.
1AD6999.       999.       999.       999.       999.       999.       999.       999.
1AD7999.       999.       999.       999.       999.       999.       999.       999.
1AD8999.       999.       999.       999.       999.       999.       999.       999.
1AD9999.       999.       999.       999.       999.       999.       999.          .
 0  1  DATE: 1019. LOW: 2140. START: NONE. QB
1QB1999.       999.       999.       999.       999.       999.       999.       999.
1QB2999.       999.       999.       999.       999.       999.       999.       999.
1QB3999.          .          .          .          .          .          .          .
 0  1  DATE: 1019. LOW: 2140. START: NONE. RP
```

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1RP1999.     999.     999.     999.     999.     999.     999.     999.
1RP2999.     999.     999.     999.     999.     999.     999.     999.
  0  1  DATE: 1019, LOW: 2140, START: NONE, FK
1FK1999.     999.     999.     999.     999.     999.     999.     999.
1FK2999.     999.     999.     999.     999.     999.     999.     999.
1FK3999.     999.     999.     999.     999.     999.     999.     999.
1FK4999.     999.     999.     999.     999.     999.     999.     999.
1FK5999.     999.     999.     999.     999.     999.     999.     999.
1FK6999.     999.     999.     999.     999.     999.     999.     999.
1FK7999.     999.     999.     999.     999.     999.     999.     999.
1FK8999.     999.     999.     999.     999.     999.     999.     999.
1FK9999.     999.     999.     999.     999.     999.     999.     999.
1FKA999.     999.     999.     999.     999.     999.     999.     999.
1FKB999.     999.     999.     999.     999.     999.       .        .
  0  1  DATE: 1019, LOW: 2140, START: NONE, OG
1OG1999.     999.     999.     999.     999.     999.     999.     999.
1OG2999.     999.     999.     999.     999.       .        .        .

1MN1999.     999.     999.     999.     999.     999.     999.     999.
1MN2999.     999.     999.     999.     999.     999.     999.     999.
  0  1  DATE: 1019, LOW: 2140, START: NONE, TH
1TH1999.     999.     999.     999.     999.     999.     999.     999.
1TH2999.     999.     999.     999.     999.     999.     999.     999.
1TH3999.     999.     999.     999.     999.     999.     999.     999.
1TH4999.     999.     999.     999.     999.     999.     999.     999.
1TH5999.     999.     999.     999.       .        .        .        .
  0  1  DATE: 1019, LOW: 2140, START: NONE, LJ
1LJ1999.     999.     999.     999.     999.     999.     999.     999.
1LJ2999.     999.     999.     999.     999.       .        .        .
 DATE:   771020,  TIDE: HIGH,  TIME: 0330,  PEAK: 5.40 PPB
 71  2  DATE: 1020, HIGH: 0330,START: 0401, AD
2AD1  1.50    1.80    2.00    1.65    1.60    1.80    2.00    2.05
2AD2  2.10    3.50    4.60    5.00    3.50    4.40    3.30    5.40
2AD3  3.80    2.10    1.20    1.40    1.20    1.10    1.00    1.00
2AD4  1.00    1.00    1.00    0.95    0.95    0.95    0.95    0.95
2AD5  0.95    1.00    1.00    1.00    1.00    0.90    0.90    0.90
2AD6  0.95    0.95    0.95    0.95    0.95    0.95    0.95    0.90
2AD7  0.90    0.90    0.90    0.90    0.90    0.90    0.90    0.90
2AD8  0.90    0.90    0.90    0.90    0.90    1.00    0.90    0.90
2AD9  0.90    0.90    0.90    0.90    0.90    0.90    0.90      .
  0  2  DATE: 1020, HIGH: 0330, START: NONE, QB
2QB1999.     999.     999.     999.     999.     999.     999.     999.
2QB2999.     999.     999.     999.     999.     999.     999.     999.
2QB3999.       .        .        .        .        .        .        .
  0  2  DATE: 1020, HIGH: 0330, START: NONE, RP
2RP1999.     999.     999.     999.     999.     999.     999.     999.
2RP2999.     999.     999.     999.     999.     999.       .        .
  0  2  DATE: 1020, HIGH: 0330, START: NONE, FK
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        01 MARCH 1978                     NERDC --- CARD LIST UTILITY

2FK1999.      999.      999.      999.      999.      999.      999.      999.
2FK2999.      999.      999.      999.      999.      999.      999.      999.
2FK3999.      999.      999.      999.      999.      999.      999.      999.
2FK4999.      999.      999.      999.      999.      999.      999.      999.
2FK5999.      999.      999.      999.      999.      999.      999.      999.
2FK6999.      999.      999.      999.      999.      999.      999.      999.
2FK7999.      999.      999.      999.      999.      999.      999.      999.
2FK8999.      999.      999.      999.      999.      999.      999.      999.
2FK9999.      999.      999.      999.      999.      999.      999.      999.
2FKA999.      999.      999.      999.      999.      999.      999.      999.
2FKB999.      999.      999.      999.      999.      999.         .         .
  0  2  DATE: 1020. HIGH: 0330. START: NONE, DG
2OG1999.      999.      999.      999.      999.      999.      999.      999.
2OG2999.      999.      999.      999.      999.      999.      999.      999.

2NM1999.      999.      999.      999.      999.      999.      999.      999.
2NM2999.      999.      999.      999.      999.         .         .         .
  0  2  DATE: 1020. HIGH: 0330. START: NONE. TH
2TH1999.      999.      999.      999.      999.      999.      999.      999.
2TH2999.      999.      999.      999.      999.      999.      999.      999.
2TH3999.      999.      999.      999.      999.      999.      999.      999.
2TH4999.      999.      999.      999.      999.      999.      999.      999.
2TH5999.      999.      999.      999.      999.      999.         .         .
  0  2  DATE: 1020. HIGH: 0330. START: NONE. LJ
2LJ1999.      999.      999.      999.      999.      999.      999.      999.
2LJ2999.      999.      999.      999.      999.      999.      999.         .
 DATE: 771020.  TIDE: LOW.  TIME: 0950.  PEAK: 5.70 PPB
 71  3  DATE: 1020. LOW: 0950. START: 1102, AD
3AD1  2.50     2.40      2.40      3.20      3.90      5.70      5.00      4.20
3AD2  3.90     3.50      3.20      2.90      2.30      2.80      2.50      2.10
3AD3  2.20     2.40      2.60      2.50      2.50      2.40      2.40      2.40
3AD4  2.50     2.20      2.10      2.00      2.10      2.00      2.10      2.00
3AD5  2.00     2.00      1.90      1.60      1.40      0.90      1.20      1.20
3AD6  1.00     0.50      0.90      0.60      0.70      0.40      0.20      0.60
3AD7  0.50     0.50      0.57      0.43      0.50      0.40      0.55      0.49
3AD8  0.30     0.30      0.30      0.20      0.20      0.20      0.15      0.20
3AD9  0.20     0.22      0.15      0.20      0.20      0.22      0.19         .
  0  3  DATE: 1020. LOW: 0950. START: NONE, QB
3QB1999.      999.      999.      999.      999.      999.      999.      999.
3QB2999.      999.      999.      999.      999.      999.      999.      999.
3QB3999.         .         .         .         .         .         .         .
  0  3  DATE: 1020. LOW: 0950. START: NONE. RP
3RP1999.      999.      999.      999.      999.      999.      999.      999.
3RP2999.      999.      999.      999.      999.      999.         .         .
 26  3  DATE: 1020. LOW: 0950. START: 1134. FK
3FK1999.      999.      999.      999.      0.13      0.14    000.14      0.16
3FK2  0.16     0.16      0.19      0.17      0.17      0.18      0.19      0.21
3FK3  0.20     0.22      0.23      0.21      0.23      0.22      0.21      0.20
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3FK4   0.18      0.19    999.     999.     999.     999.     999.     999.
3FK5999.     999.     999.     999.     999.     999.     999.     999.
3FK6999.     999.     999.     999.     999.     999.     999.     999.
3FK7999.     999.     999.     999.     999.     999.     999.     999.
3FK8999.     999.     999.     999.     999.     999.     999.     999.
3FK9999.     999.     999.     999.     999.     999.     999.     999.
3FKA999.     999.     999.     999.     999.     999.     999.     999.
3FKB999.     999.     999.     999.     999.     999.        .        .
  0   3  DATE: 1020. LOW: 0950. START: NONE. DG
3DG1999.     999.     999.     999.     999.     999.     999.     999.
3DG2999.     999.     999.     999.     999.     999.        .        .

3NM1999.     999.     999.     999.     999.     999.     999.     999.
3NM2999.     999.     999.     999.     999.     999.     999.     999.
  0   3  DATE: 1020. LOW: 0950. START: NONE. TH
3TH1999.     999.     999.     999.     999.     999.     999.     999.
3TH2999.     999.     999.     999.     999.     999.     999.     999.
3TH3999.     999.     999.     999.     999.     999.     999.     999.
3TH4999.     999.     999.     999.     999.     999.     999.     999.
3TH5999.     999.     999.     999.     999.     999.        .        .
  0   3  DATE: 1020. LOW: 0950. START: NONE. LJ
3LJ1999.     999.     999.     999.     999.     999.     999.     999.
3LJ2999.     999.     999.     999.     999.        .        .        .
// EXEC PLOT
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C.2.4

PRINTOUT

of

October 1977 data

P57

571 P57 GO FT06F001

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|---|---|---|---|---|---|---|---|
| 2.50 | 7.00 | 4.00 | 2.10 | 2.60 | 4.00 | 4.00 | 5.50 |
| 10.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 1.40 | 1.50 |
| 1.70 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 |
| 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 |
| 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 999.00 | 999.00 |
| 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 |
| 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 |
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| 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 |
| 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 |
| 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 |
| 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 |
| 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 |
| 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 |
| 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 |
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999.00     999.00     999.00     999.00
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999.00     999.00     999.00     999.00     999.00     999.00     999.00     999.00
999.00     999.00     999.00     999.00
1

  1.50       1.80       2.00       1.65       1.60       1.80       2.00       2.05
  2.10       3.50       4.60       5.00       3.50       4.40       3.70       5.40
  3.80       2.10       1.20       1.40       1.20       1.10       1.00       1.00
  1.00       1.00       1.00       0.95       0.95       0.95       0.95       0.95
  0.95       1.00       1.00       1.00       1.00       0.90       0.90       0.90
  0.95       0.95       0.95       0.95       0.95       0.95       0.95       0.90
  0.90       0.90       0.90       0.90       0.90       0.90       0.90       0.90
  0.90       0.90       0.90       0.90       0.90       1.00       0.90       0.90
  0.90       0.90       0.90       0.90       0.90       0.90       0.90
2

999.00     999.00     999.00     999.00     999.00     999.00     999.00     999.00
999.00     999.00     999.00     999.00     999.00     999.00     999.00     999.00
999.00
3

999.00     999.00     999.00     999.00     999.00     999.00     999.00     999.00
999.00     999.00     999.00     999.00     999.00     999.00
4

999.00     999.00     999.00     999.00     999.00     999.00     999.00     999.00
999.00     999.00     999.00     999.00     999.00     999.00     999.00     999.00
999.00     999.00     999.00     999.00     999.00     999.00     999.00     999.00
999.00     999.00     999.00     999.00     999.00     999.00     999.00     999.00
999.00     999.00     999.00     999.00     999.00     999.00     999.00     999.00
999.00     999.00     999.00     999.00     999.00     999.00     999.00     999.00
999.00     999.00     999.00     999.00     999.00     999.00     999.00     999.00
999.00     999.00     999.00     999.00     999.00     999.00     999.00     999.00
999.00     999.00     999.00     999.00     999.00     999.00     999.00     999.00
999.00     999.00     999.00     999.00     999.00     999.00     999.00     999.00
999.00     999.00     999.00     999.00     999.00     999.00
5

999.00     999.00     999.00     999.00     999.00     999.00     999.00     999.00
999.00     999.00     999.00     999.00     999.00
6
```

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 |
| 999.00 | 999.00 | 999.00 | 999.00 | | | | |

7

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 |
| 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 |
| 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 |
| 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 |
| 999.00 | 999.00 | 999.00 | 999.00 | | | | |

8

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 |
| 999.00 | 999.00 | 999.00 | 999.00 | | | | |

1

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 2.50 | 2.40 | 2.40 | 3.20 | 3.90 | 5.70 | 5.00 | 4.20 |
| 3.90 | 3.50 | 3.20 | 2.90 | 2.30 | 2.80 | 2.50 | 2.10 |
| 2.20 | 2.40 | 2.60 | 2.50 | 2.50 | 2.40 | 2.40 | 2.40 |
| 2.50 | 2.20 | 2.10 | 2.00 | 2.10 | 2.00 | 2.10 | 2.00 |
| 2.00 | 2.00 | 1.90 | 1.60 | 1.40 | 0.90 | 1.20 | 1.20 |
| 1.00 | 0.50 | 0.90 | 0.60 | 0.70 | 0.40 | 0.20 | 0.60 |
| 0.50 | 0.50 | 0.57 | 0.43 | 0.50 | 0.40 | 0.55 | 0.49 |
| 0.30 | 0.30 | 0.30 | 0.20 | 0.20 | 0.20 | 0.15 | 0.20 |
| 0.20 | 0.22 | 0.15 | 0.20 | 0.20 | 0.22 | 0.19 | |

2

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 |
| 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 |
| 999.00 | | | | | | | |

3

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 |
| 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | | |

4

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 999.00 | 999.00 | 999.00 | 999.00 | 0.13 | 0.14 | 0.14 | 0.16 |
| 0.16 | 0.16 | 0.19 | 0.17 | 0.17 | 0.18 | 0.19 | 0.21 |
| 0.20 | 0.22 | 0.23 | 0.21 | 0.23 | 0.22 | 0.21 | 0.20 |
| 0.18 | 0.19 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 |
| 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 |
| 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 |
| 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 |
| 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 |
| 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 |
| 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 |
| 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 5 | | | | | | | |
| 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 |
| 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | | | |
| 6 | | | | | | | |
| 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 |
| 999.00 | 999.00 | 999.00 | 999.00 | | | | |
| 7 | | | | | | | |
| 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 |
| 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 |
| 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 |
| 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 |
| 999.00 | 999.00 | 999.00 | 999.00 | | | | |
| 8 | | | | | | | |
| 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 | 999.00 |
| 999.00 | 999.00 | 999.00 | 999.00 | | | | |

# APPENDIX C.3

## SAL

Conversion of Conductivity

and

Temperature to Salinity

Conductivity Range: 2390 to 32,709

Temperature Range: 30 to 40 °C

Salinity Range: 1 to 15 ppt

```
315-SAL      -FORT     -          -SYSPRINT

FORTRAN IV G LEVEL  21                    MAIN                 DATE = 78087          18/24/56

                  C
                  C        CONDUCTIVITY RANGE: 2390 TO 32709 MICROMHOS/CM
                  C        TEMPERATURE RANGE: 30 TO 40 DEG. C
                  C
                  C        SOURCE: EXTRAPOLATED FROM TABLES PUBLISHED BY LAMOTTE CHEMICAL
                  C        PRODUCTS, INC.
                  C
0001                   DIMENSION C(15,11),CL(2,2),SL(2,2),T(11),S(15,11)
0002                   DIMENSION C1(15),C2(15),C3(15),C4(15),C5(15),C6(15),C7(15),C8(15),
                      1 C9(15),C10(15),C11(15),S1(15),S2(15),S3(15),S4(15),S5(15),S6(15),
                      2 S7(15),S8(15),S9(15),S10(15),S11(15)
0003                   DATA C1/2389.90,4497.60,6485.38,8400.31,10263.14,12094.26,
                      1 13881.81,15643.69,17381.71,19097.40,20784.64,22464.36,24129.31,
                      2 25779.33,27416.19/
0004                   DATA C2/2435.53,4583.67,6609.22,8560.22,10458.48,12331.73,
                      1 14146.97,15942.17,17713.10,19460.76,21177.63,22888.63,24584.71,
                      2 26265.21,27932.44/
0005                   DATA C3/2481.45,4670.33,6733.87,8721.12,10655.04,12572.37,
                      1 14413.86,16242.58,18046.63,19826.37,21572.95,23315.38,25042.78,
                      2 26753.90,28451.66/
0006                   DATA C4/2527.67,4757.58,6859.34,8883.01,10852.85,12816.31,
                      1 14682.47,16544.90,18382.29,20194.24,21970.58,23744.62,25503.51,
                      2 27245.37,28973.82/
0007                   DATA C5/2574.19,4845.43,6985.62,9045.87,11051.88,13063.67,
                      1 14952.81,16849.14,18720.08,20564.36,22370.50,24176.31,25966.88,
                      2 27739.60,29458.89/
0008                   DATA C6/2621.00,4933.86,7112.71,9209.71,11252.14,13314.57,
                      1 15224.86,17155.29,19060.00,20936.71,22772.71,24610.43,26432.86,
                      2 28236.57,30026.86/
0009                   DATA C7/2668.11,5022.88,7240.63,9374.53,11453.63,13569.13,
                      1 15498.63,17463.35,19402.04,21311.30,23177.19,25046.97,26901.43,
                      2 28736.26,30557.68/
0010                   DATA C8/2715.51,5112.50,7369.35,9540.31,11656.34,13827.47,
                      1 15774.11,17773.32,19746.21,21688.11,23583.91,25485.91,27372.58,
                      2 29238.63,31091.34/
0011                   DATA C9/2763.21,5202.71,7498.90,9707.06,11860.27,14089.71,
                      1 16051.31,18085.19,20092.50,22067.13,23992.87,25927.23,27846.29,
                      2 29743.67,31627.81/
0012                   DATA C10/2811.21,5293.52,7629.26,9874.76,12065.42,14355.96,
                      1 16330.23,18398.97,20440.91,22448.36,24404.05,26370.91,28322.53,
                      2 30251.35,32167.06/
0013                   DATA C11/2859.50,5384.93,7760.43,10043.43,12271.79,14626.36,
                      1 16610.86,18714.64,20791.43,22831.79,24817.43,26816.93,28801.29,
                      2 30761.64,32709.07/
```

```
      DATA T/30.,31.,32.,33.,34.,35.,36.,37.,38.,39.,40./
      DATA S1 /1.,2.,3.,4.,5.,6.,7.,8.,9.,10.,11.,12.,13.,14.,15./
      DATA S2 /1.,2.,3.,4.,5.,6.,7.,8.,9.,10.,11.,12.,13.,14.,15./
      DATA S3 /1.,2.,3.,4.,5.,6.,7.,8.,9.,10.,11.,12.,13.,14.,15./
      DATA S4 /1.,2.,3.,4.,5.,6.,7.,8.,9.,10.,11.,12.,13.,14.,15./
      DATA S5 /1.,2.,3.,4.,5.,6.,7.,8.,9.,10.,11.,12.,13.,14.,15./
      DATA S6 /1.,2.,3.,4.,5.,6.,7.,8.,9.,10.,11.,12.,13.,14.,15./
      DATA S7 /1.,2.,3.,4.,5.,6.,7.,8.,9.,10.,11.,12.,13.,14.,15./
      DATA S8 /1.,2.,3.,4.,5.,6.,7.,8.,9.,10.,11.,12.,13.,14.,15./
      DATA S9 /1.,2.,3.,4.,5.,6.,7.,8.,9.,10.,11.,12.,13.,14.,15./
      DATA S10/1.,2.,3.,4.,5.,6.,7.,8.,9.,10.,11.,12.,13.,14.,15./
      DATA S11/1.,2.,3.,4.,5.,6.,7.,8.,9.,10.,11.,12.,13.,14.,15./
      DO 5 I=1,15
      C(I,1)=C1(I)
      C(I,2)=C2(I)
      C(I,3)=C3(I)
      C(I,4)=C4(I)
      C(I,5)=C5(I)
      C(I,6)=C6(I)
      C(I,7)=C7(I)
      C(I,8)=C8(I)
      C(I,9)=C9(I)
      C(I,10)=C10(I)
      C(I,11)=C11(I)
      S(I,1)=S1(I)
      S(I,2)=S2(I)
      S(I,3)=S3(I)
      S(I,4)=S4(I)
      S(I,5)=S5(I)
      S(I,6)=S6(I)
      S(I,7)=S7(I)
      S(I,8)=S8(I)
      S(I,9)=S9(I)
      S(I,10)=S10(I)
    5 S(I,11)=S11(I)
      READ (5,20) NP
   20 FORMAT (I3)
      DO 4 K=1,NP
      READ (5,1) TEMP,COND
    1 FORMAT (F5.1,F10.1)
      DO 11 J=1,2
      IT=TEMP-30.0
      IT=IT+J
      DO 10 I=2,15
```

```
0058            IF (CCND.GT.C(I,IT)) GO TO 10
0059            CL(1,J)=C(I,IT)
0060            CL(2,J)=C(I-1,IT)
0061            SL(2,J)=S(I-1,IT)
0062            GO TO 11
0063         10 CCNTINUE
0064         11 CONTINUE
           C   INTERPOLATE
0065            SAL1=(CCND-CL(2,1))/(CL(1,1)-CL(2,1))+SL(2,1)
0066            SAL2=(COND-CL(2,2))/(CL(1,2)-CL(2,2))+SL(2,2)
0067            IT=TEMP-30.
0068            SAL=(TEMP-T(IT+1))*(SAL2-SAL1)+SAL1
0069          4 WRITE (6,3) TEMP,COND,SAL
0070          3 FORMAT (1H0,'TEMP= ',F5.1,', COND= ',F6.0,', SAL= ',F6.2)
0071        999 STCP
0072            END
```

# APPENDIX D

# USER'S MANUAL

CANNET3D, a program designed to simulate mass transport in low energy tidal canal networks, has been programmed in FORTRAN IV (Level G) for solution on an AMDAHL 470, a machine which is entirely compatible with IBM 360 and 370 series machines, at the Northeast Regional Data Center, Gainesville, Florida. An explanation of FORTRAN language and formats can be found in the manual IBM System/360 and System/370, FORTRAN IV Language [1974].

Once a canal system has been schematized as described in Chapter 6, and time and spatial increments have been chosen to meet stability and convergence criteria, as outlined in Chapter 7, an input card deck is prepared for the program as described below. The cards as they appear in order in the program, are listed giving the variables to be read in, in terms of program names, and their format. This is followed by a listing in alphabetical order of these variables, giving a description and an order magnitude if applicable. This comprises Section D.1.

Section D.2 discusses the limits of the model in terms of array storage area specified, and how this can be extended. Section D.3 discusses the output from the model.

## D.1 Input Data Cards

| Type of Data | Content of Card | Condition/Comment | Format | No. of Cards |
|---|---|---|---|---|
| Title | Title #1 | | 20A4 | 1 |
| Title | Title #2 | | 20A4 | 1 |
| Initial | NTESTS | NTESTS sets of data below and required. | I5 | 1 |
| Initial | T, NDT, DTH, NPRINT, NPLOT | | F10.0, I5, F10.0, 2I5 | 1 |
| Initial | CMAX, VMAX, DXMIN, DXSC | | 4F10.0 | 1 |
| Initial | AMP, CRW, KX, KY, KZ, EO, NZ | | 7F10.0 | 1 |
| Initial | NREACH, NJUNC, NLAKE, NTES, NLAYY, NLAYZ | | 6I5 | 1 |
| Initial | OPT3, OPT6, OPT7, OPT8 | | 4I5 | 1 |
| Reach Geometry | NDV, NJU, NJD, OPTI, OPT4 | First 5 columns for reach number | 5X, 5I5 | 1 } NREACH |
| Reach Geometry | RL, RB, RDO, RSL, RSR, RANG, RNK, RDECAY | | 8F10.0 | 1 } NREACH |
| Geometry | DX(I), I = 1, NDV | IF OPTI = 1 | 8F10.0 | NDV/8 } NREACH |

D.1 - continued.

| Type of Data | Content of Card | Condition/Comment | Format | No. of Cards |
|---|---|---|---|---|
| Junction | DXJN, DYJN, DOJN, NRU, NRD, NRL, NRR | First 5 columns for junction number IF NJUNC + NLAKE > 0 | 5X, 3F10.0, 4I5 | NJUNC + NLAKE |
| Tidal Entrance | TAU (I), I = 1, NTES | | 8F10.0 | NTES/8 |
| Lateral Inflow | OPT2, NR, NDX, NC, CQI, CCI | CQI, CCI = 0, if OPT2 = 1 | 4I5,2F10.0 | No. of Inflows |
| | -1 | Terminates inflow cards | I5 | 1 |
| Decay | NR, NDX, NC, DEC | | 3I5, F10.0 | No. of decays |
| | -1 | Terminates decay cards | I5 | 1 |
| Bend | NR, NDX, BR, BL | | 2I2, 2F10.0 | No. of bends |
| | -1 | Terminates bend data | I5 | 1 |
| Salt wedge | DSM, RHOF, RHOS, U4TE | IF OPT8 = 1 | 4F10.0 | 1 |
| Initial data in reach | C(NC), NC = 1, $NLAYY^2 \cdot NLAYZ \cdot NDV$ | IF OPT4 = 1 | 9F8.D | NREACH sets of (NLAVY·NLAYZ·NDV)/9 |
| Initial data in junction | CJ(NJC), NJC = 1 $NLAVY^2 \cdot NLAYZ$ | IF OPT5 = 1 | 9F8.0 | NJUNC + NLAKE sets of $(NLAYY^2 \cdot NLAYZ)/9$ |
| Interpolation | WTIME, INTERP | IF OPT6 and/or OPT7 = 1 (if OPT7 = 0, WTIME = 0) | F10.0, I5 | 1 |

D.1 - continued.

| Type of Data | Content of Card | Condition/Comment | Format | No. of Cards |
|---|---|---|---|---|
| Time | COSINE, WS, WANGLE | IF OPT6 and/or OPT7 = 1 (if OPT6 = 0, COSINE = 0) (if OPT7 = 0, WS, WANG = 0) | 3F10.0 | 1 |
| Transient Solution | COSINE, WS, WANGLE | IF OPT6 and/or OPT7 = 1 (if OPT6 = 0, COSINE = 0) (if OPT7 = 0, WS, WANG = 0) | 3F10.0 | 1 } (NDT-1)/INTERP |
| | QIV(IQ), CIV(IQ), IQ = 1, NIQ | NIQ = no. of varying lateral inflows | 8F10.0 | NIQ/8 } (NDT-1)/INTERP |

AMP - tidal amplitude in feet.

BL - length of bend in feet.

BR - radius of bend in feet.

C(*) - initial concentrations in reach cells in ppm.

CCI - constant concentration of lateral inflow in ppm (OPT = 1).

CIV(*) - concentration of lateral inflow in ppm (OPT = 1).

CJ(*) - initial concentration in junction and lake cells in ppm.

CMAX - maximum concentration anticipated in network. This is a parameter for graph plotting. If CMAX is exceeded, an error will be generated and no plot appears. Also for neatness for the display, CMAX/5 should give a reasonable number for a display heading.

COSINE - elevation of tide from mean sea level in feet.

CQI - constant lateral inflow rate in cu ft/hr/ft. (OPT = 0).

CRW - background concentration in ppm.

DEC - decay coefficient in cell in 1/hr.

DSM - depth to saltwater interface from sea level at mid tide in feet.

DTH - time interval in hours.

DX(*) - longitudinal cell length in segment of a reach in feet.

DXJN(*) - longitudinal length of junction in feet.

DXMIN - minimum value of DX(*) in canal network in feet.

DXSC - suitable length scale for graph plots in feet.

DXJN(*) - lateral width of junction in feet.

EO - background dispersion coefficient in $ft^2$/sec. (0.0005).

INTERP - If OPT6 and/or OPT7 = 0, this parameters interpolates between data points of the original data set. This is to eliminate having to redefine a data set if the time interval was originally too large. If INTERP is changed, NDT must be also.

KX - dimensionless longitudinal dispersion coefficient in $ft^2$/sec, (≃0.1).

KY - dimensionless lateral dispersion coefficient in $ft^2$/sec, (≃0.01).

KZ - dimensionless vertical dispersion coefficient in $ft^2$/sec, (≃0.0001).

NC - number of cell in cross-section (bottom left - top right).

NDT - number of time steps in simulation.

NDV - stored in NDIV(*), the number of longitudinal segments in a reach.

NDX - number of segment in reach from dead-end of that reach.

NJD(*) - assigned number of junction at downstream end of reach.

NJU(*) - assigned number of junction at upstream end of reach, (=1 for dead-end, = reach number of adjacent reach meeting a null point).

NJUNC - number of internal junctions in network (excludes dead-ends, null points, lakes and tidal entrances).

NLAKE - number of lakes in system (at upward limits).

NLAYY - number of lateral layers in system.

NLAYZ - number of vertical layers in system.

NPLOT - number of time steps between plots, (if NPLOT>NDT no plots are generated).

NPRINT - number of time steps between written data outputs.

NR - assigned number of reach.

NREACH - number of reaches in system.

NDR(*) - assigned number of downstream reach at junction.

NRL(*) - assigned number of left branch at junction.

NRR(*) - assigned number of right branch at junction.

NRU(*) - assigned number of upstream reach at junction.

NTES - number of tidal entrances in system.

NTESTS - number of simulations to be run consecutively. All the data must be read in again for each run.

NZ - vertical momentum transfer coefficient in $ft^2/sec$, (≃0.002).

OPT1 - spatial increment option. If OPT1 = 0 the reach is subdivided into NDV equal segments, DX(*). If OPT1 = 0 the DX(*) are read in.

OPT2 - lateral inflow option. If OPT2 = 0, the lateral inflow rate, COI, and its concentration, CCI, are constant for the simulation. If OPT2 = 1, the lateral inflow and/or its concentration are variable and are red in throughout the simulation.

OPT3 - initial tidal condition option. If OPT3 = 1, the simulation begins at high tide. If OPT3 = -1, the simulation begins at low tide. OPT3 only has an effect when OPT6 = 0. If OPT6 = 1, OPT3 can take any value.

OPT4 - initial conditions in reach option. If OPT4 = 0, the initial concentrations in each cell of the reach are set to the background concentration, CRW. If OPT4 = 1, they are read in.

OPT5 - initial conditions in junction option. If OPT5 = 0, the initial concentrations in each cell of the junction are set to the background concentration, CRW. If OPT5 = 1, they are read in.

OPT6 - tidal elevations option. If OPT6 = 0, the tidal elevations from mean sea level are generated as a cosine distribution with amplitude AMP and frequently, $2\pi/T$, where T is the tidal period. If OPT6 = 1, they are read in every INTERP time intervals.

OPT7 - wind option. If OPT7 = 0, the wind speed, WS, and direction, WANG, are constant. If OPT7 = 1, they are read in every INTERP time intervals.

OPT8 - salt wedge option. If OPT8 = 0, no salt wedge is present. If OPT8 = 1, a salt wedge is present and the simulation must begin at low tide, no matter whether the tidal elevations are generated or read in.

QIV(*) - variable lateral inflow rate in cu ft/hr/ft.

RANG(*) - reach alignment angle in degrees.

RB(*) - reach bottom width in feet.

RDECAY(*) - reach constant decay decay coefficient in 1/hr.

RDO(*) - mean tidal depth in reach in feet.

RHOF - density of freshwater in slugs/cu ft, (=1.94).

RHOS - density of saltwater in slugs/ cu ft, (=1.99).

RL(*) - reach length in feet.

RNK(*) - value of Nikuradse's equivalent sand roughness in reach in feet.

RSL(*) - inverse side slope of left bank of reach.

RSR(*) - inverse side slope of right bank of reach.

T - tidal period in hours, (≐12.42 hrs).

TAU(*) - tidal entrance concentration decay coefficient in 1/hr.

VMAX - maximum velocity anticipated in network at time of plot. VMAX/2 should give a reasonable number for a display heading.

WANG - wind direction in degrees.

WS - wind speed in mph.

WTIME - time over which wind speeds are averaged in hours.

## D.2 Program Area

The arrays used in CANNET3D are such that the program, listed in Appendix E, can handle 50 reaches, 50 junctions, 2000 reach cells, 1000 junction cells, 6 lateral layers, 6 vertical layers, 5 tidal entrances, 50 constant and 50 variable lateral inflows, 100 cell constant decay coefficients. The user may wish to change array size by simply modifying the DIMENSION and COMMON statement cards at the beginnings of the main program and subroutines.

## D.3 Output Description

The output from the program is well documented. Input data is printed first, followed by descriptions of the junctions, tidal entrances, lateral inflows, cell constant decay coefficients and bends.

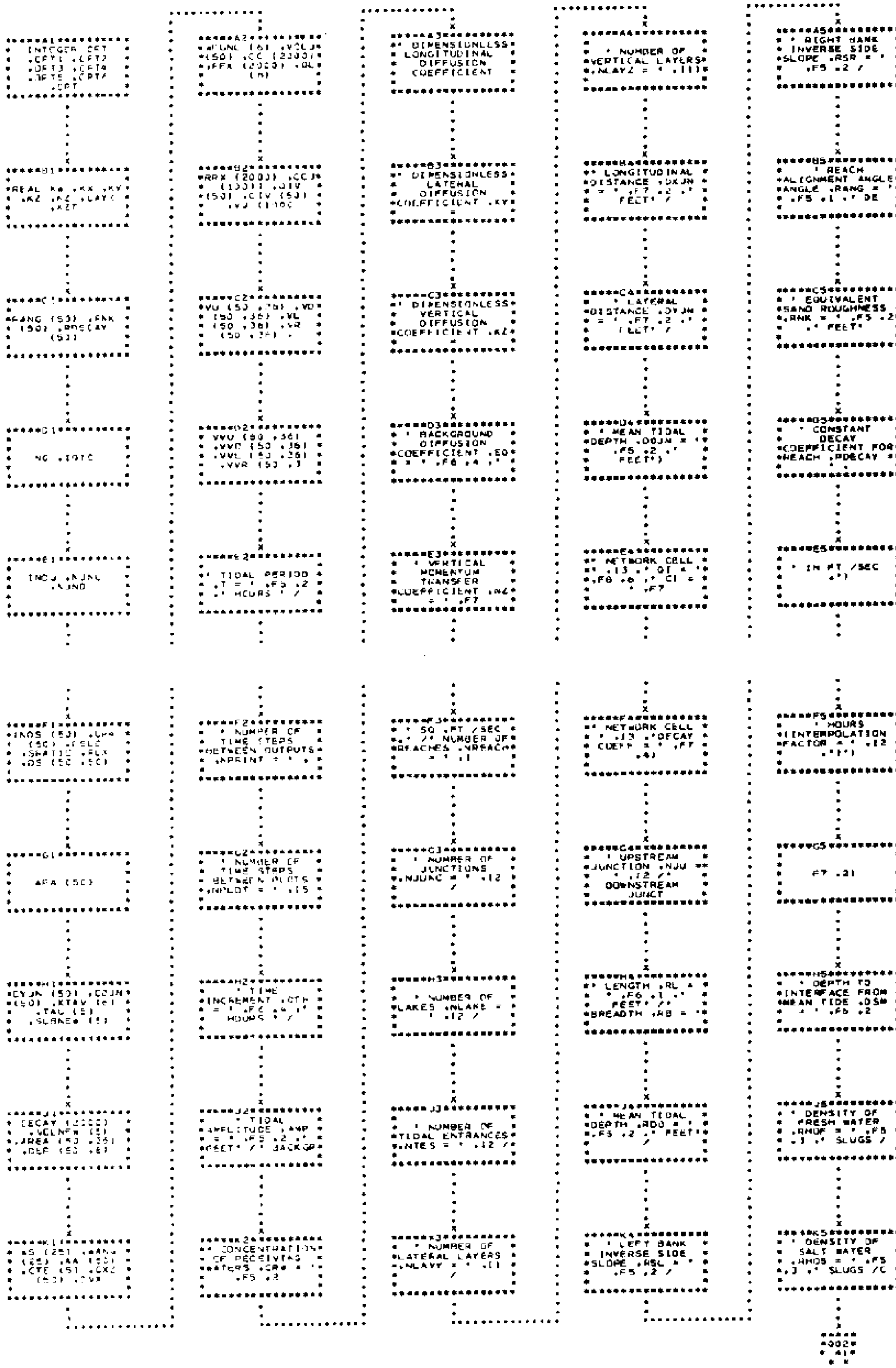
Then, written output is generated every NPRINT time steps and comprises the time, tidal elevation, wind speed and direction, followed by concentrations and velocities for each reach, and the concentrations in the junctions. The subroutine WRITIT also produces this information at the completion of the simulation.

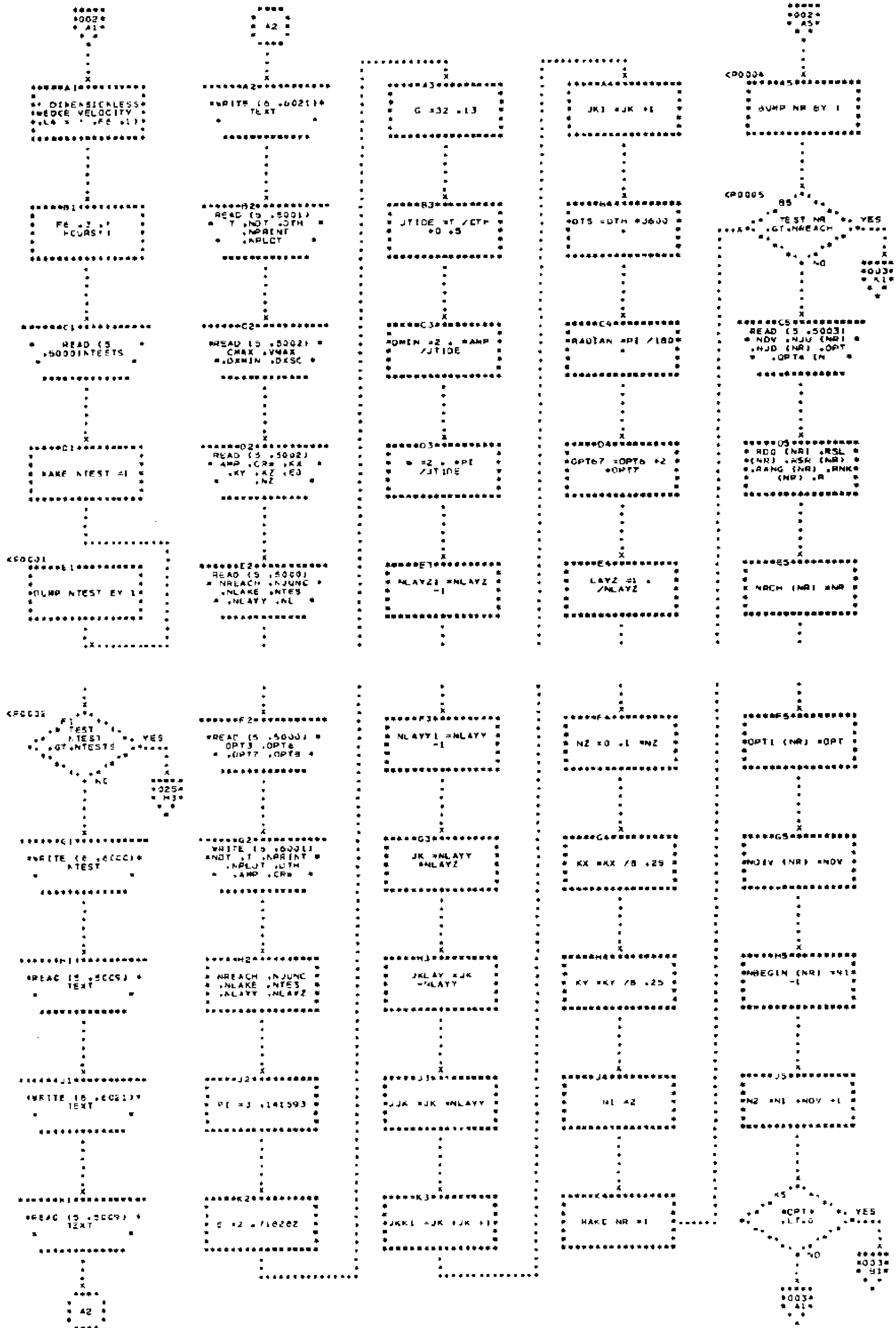
Graph plots are produced every NPLOT time intervals by the subroutine SHOWIT, unless NPLOT > NDT, in which case no plots drawn. For each reach, the longitudinal concentration profiles and velocity profiles in each layer, and layer averaged values, are produced.

# APPENDIX E

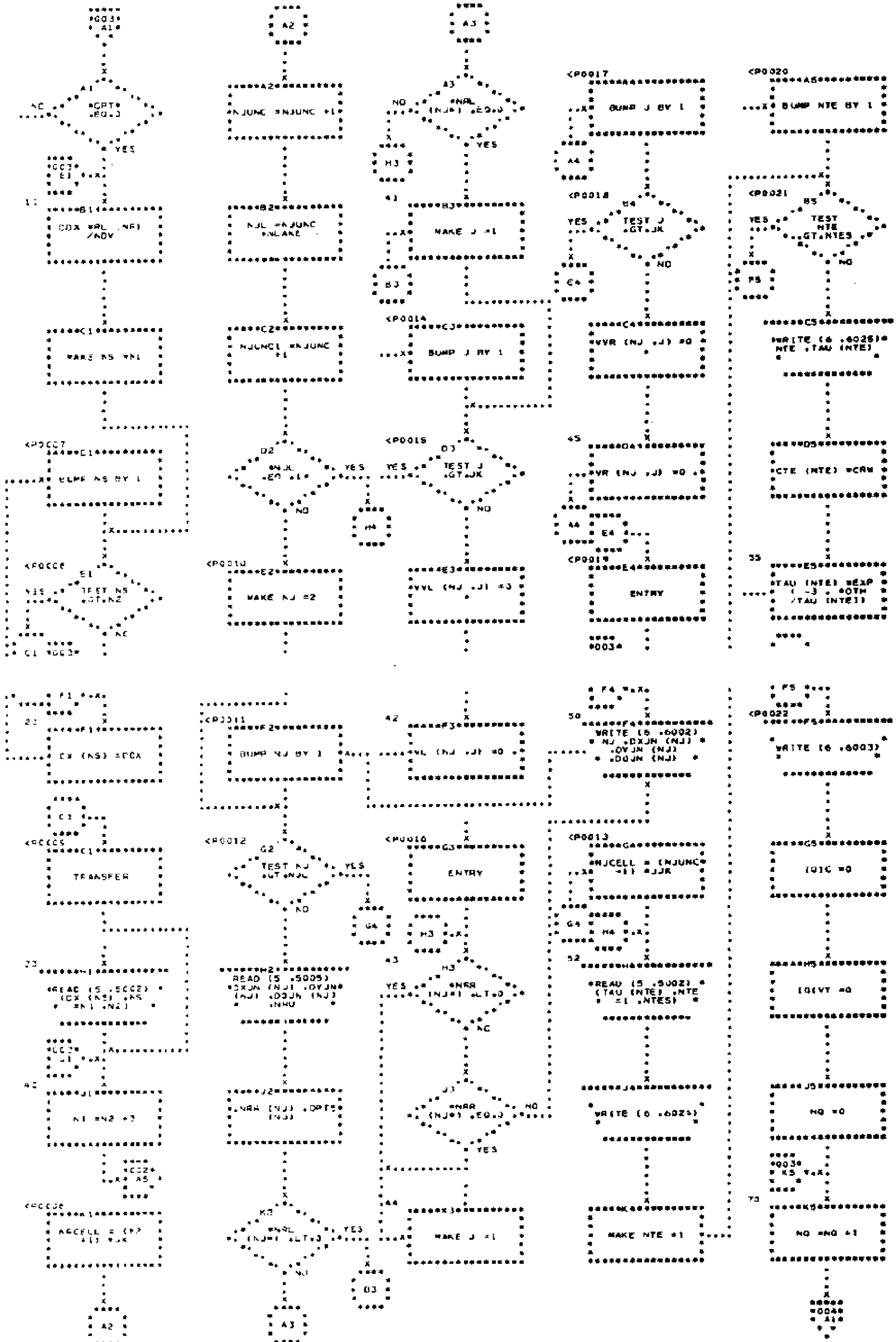
## FLOW CHART FOR THE COMPUTER PROGRAM

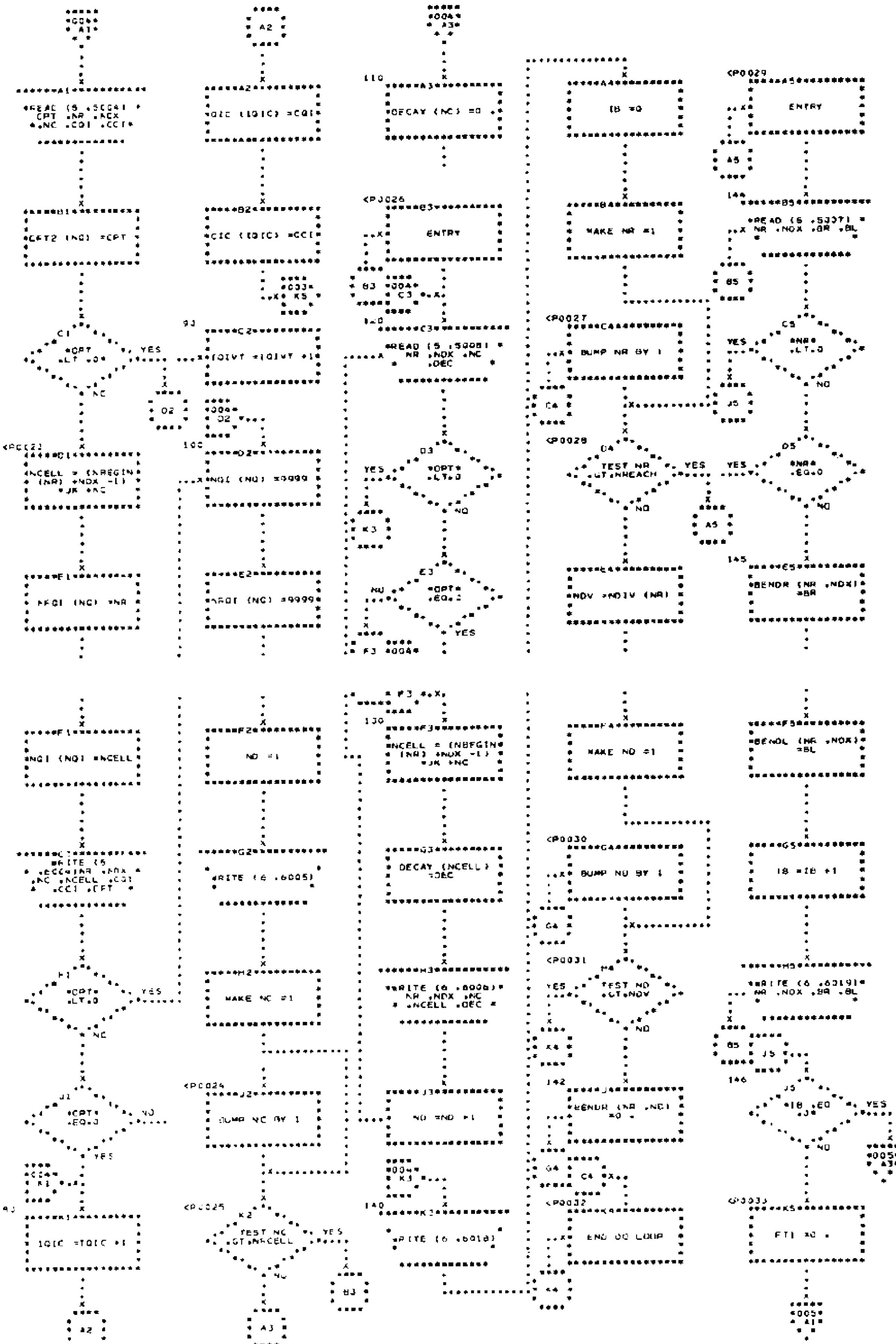
This appendix contains a flow chart produced using a utility program of the Northeast Regional Data Center, Gainesville, Florida, for the program, CANNET3D, a program designed to simulate mass transport in low energy tidal canal networks using a method of second moments.

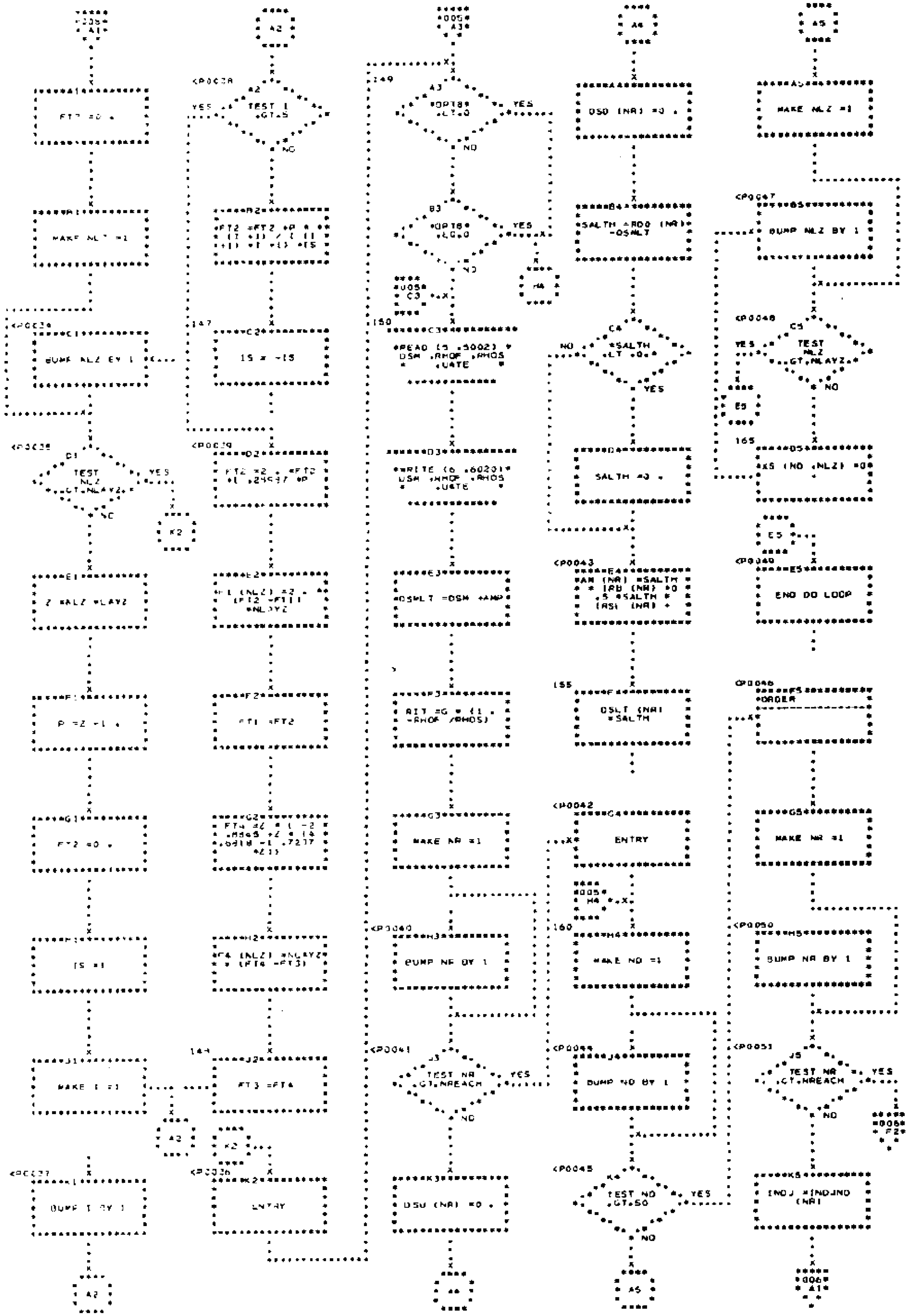

DIMENSIONLESS LONGITUDINAL DIFFUSION COEFFICIENT
NUMBER OF VERTICAL LAYERS
RIGHT BANK INVERSE SIDE SLOPE
LONGITUDINAL DISTANCE
REACH ALIGNMENT ANGLE
DIMENSIONLESS VERTICAL DIFFUSION COEFFICIENT
LATERAL DISTANCE
EQUIVALENT SAND ROUGHNESS
BACKGROUND DIFFUSION COEFFICIENT
MEAN TIDAL DEPTH
CONSTANT DECAY COEFFICIENT FOR REACH
TIDAL PERIOD
VERTICAL MOMENTUM TRANSFER COEFFICIENT
NETWORK CELL
IN FT /SEC
NUMBER OF TIME STEPS BETWEEN OUTPUTS
NUMBER OF REACHES
HOURS INTERPOLATION FACTOR
NUMBER OF TIME STEPS BETWEEN PLOTS
NUMBER OF JUNCTIONS
UPSTREAM JUNCTION
DOWNSTREAM JUNCT
TIME INCREMENT
NUMBER OF LAKES
DEPTH TO INTERFACE FROM MEAN TIDE
TIDAL AMPLITUDE
NUMBER OF TIDAL ENTRANCES
MEAN TIDAL DEPTH
DENSITY OF FRESH WATER
CONCENTRATION OF RECEIVING WATERS
NUMBER OF LATERAL LAYERS
LEFT BANK INVERSE SIDE SLOPE
DENSITY OF SALT WATER

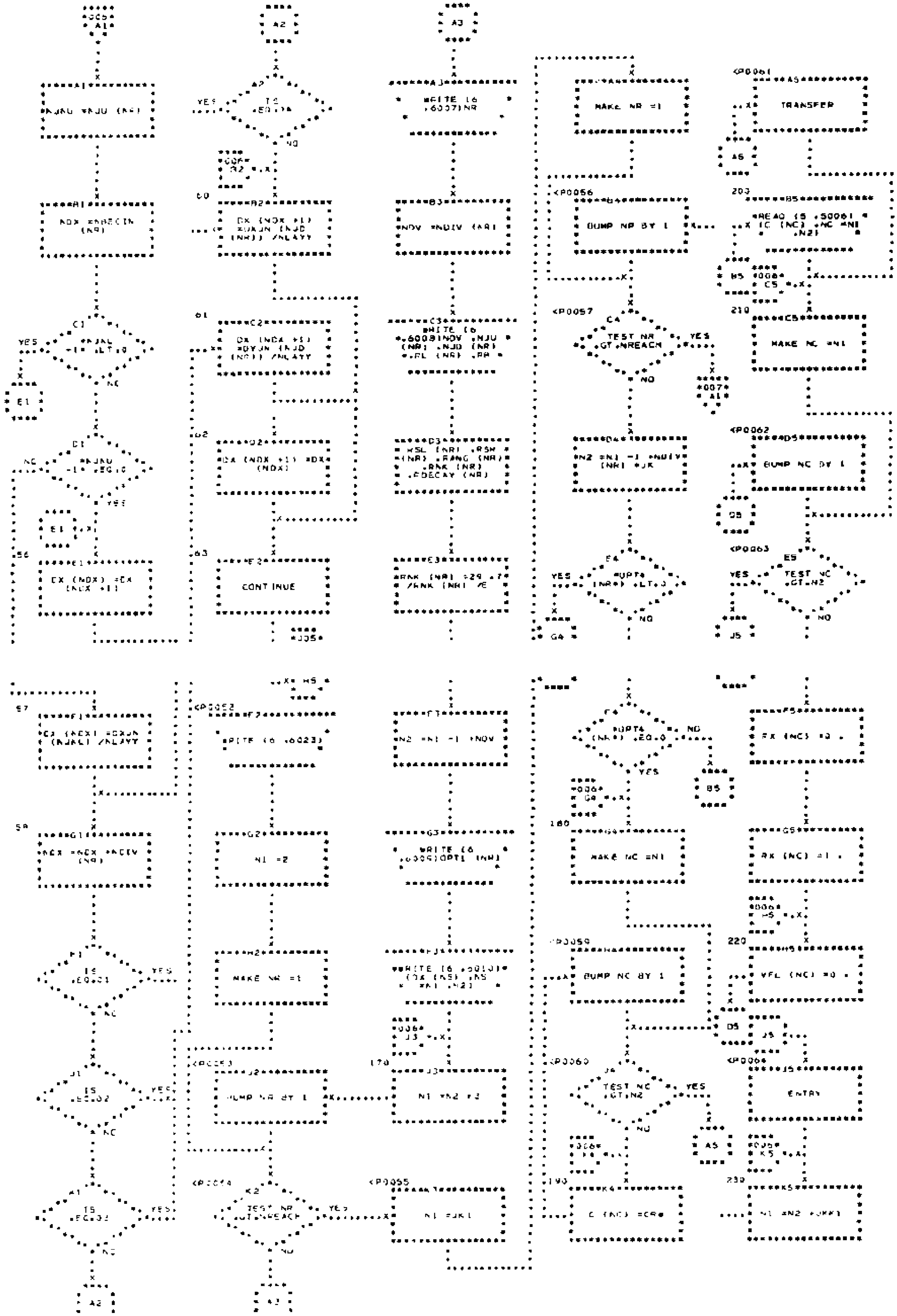


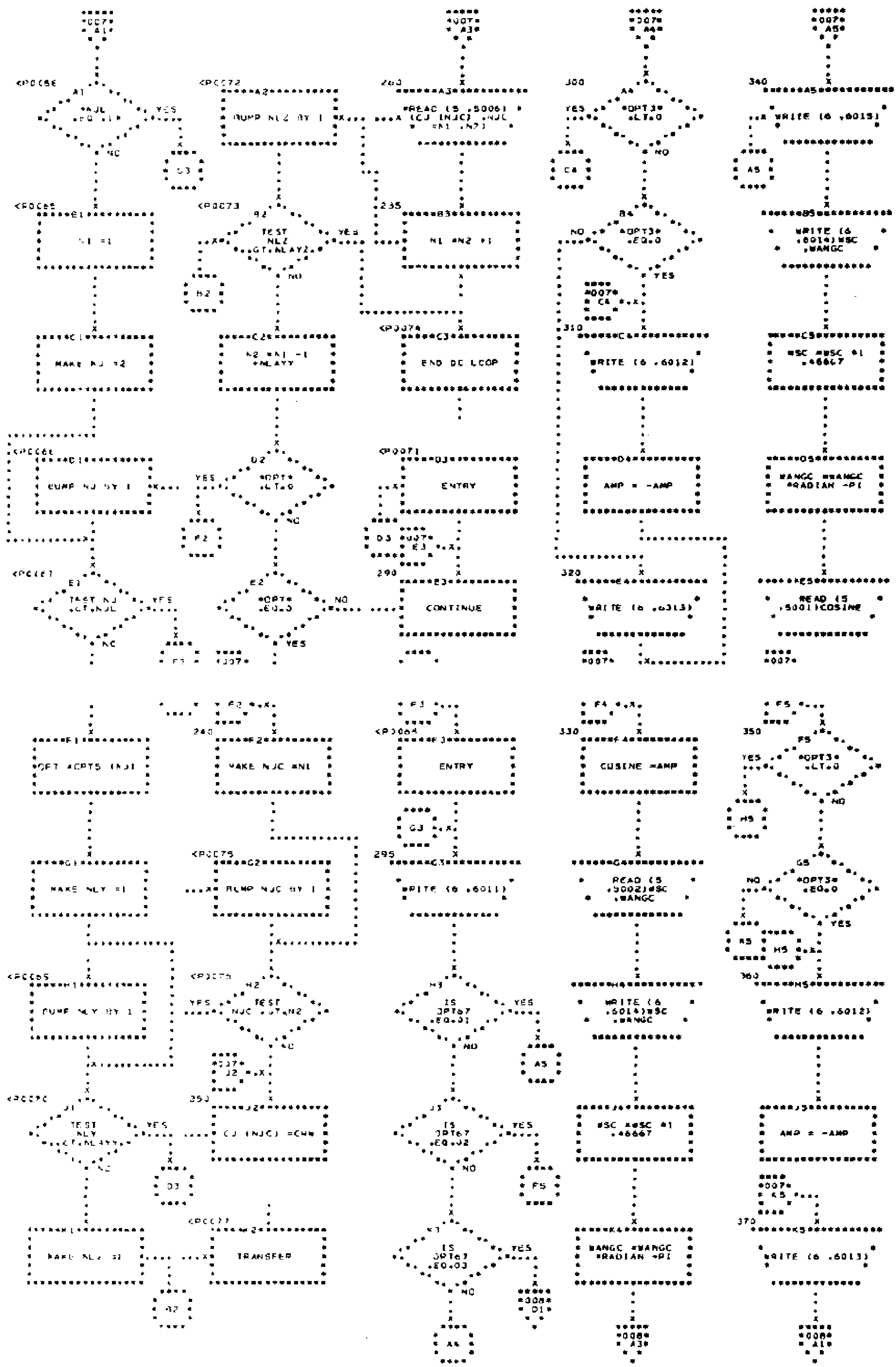
002 A1
A2
002 A5
DIMENSIONLESS WEDGE VELOCITY
READ (5 ,5001) T ,NOT ,DTH ,NPRINT ,NPLOT
G =32 .13
BUMP NR BY 1
TEST NR .GT.NREACH
YES
NO
003 K1
JTIDE =T /CTH +0 .5
DTS =DTH *3600
READ (5 ,5002) CMAX ,VMAX ,DXMIN ,DXSC
RADIAN =PI /180
READ (5 ,5003) NDV ,NJU (NR) ,NJD (NR) ,OPT ,OPT4 (N
MAKE NTEST =1
READ (5 ,5002) AMP ,CR ,KX ,KY ,KZ ,E0 ,NZ
OPT67 =OPT6 +2 *OPT7
BUMP NTEST BY 1
READ (5 ,5000) NREACH ,NJUNC ,NLAKE ,NTES ,NLAYY ,NL
NLAYZ1 =NLAYZ -1
LAYZ =1 ./NLAYZ
NRCH (NR) =NR
F1
TEST NTEST .GT.NTESTS
025 H3
READ (5 ,5000) OPT3 ,OPT6 ,OPT7 ,OPT8
NLAYY1 =NLAYY -1
NZ =0 .1 *NZ
OPT1 (NR) =OPT
JK =NLAYY *NLAYZ
KX =KX /8 .25
NDIV (NR) =NDV
READ (5 ,5009) TEXT
NREACH ,NJUNC ,NLAKE ,NTES ,NLAYY ,NLAYZ
KY =KY /8 .25
NBEGIN (NR) =N1 -1
PI =3 .141593
JJK =JK *NLAYY
N1 =2
N2 =N1 +NDV +1
E =2 .718282
JKK1 =JK +JK +1
MAKE NR =1
K5
OPT .LT.0
003 B1
003 A1

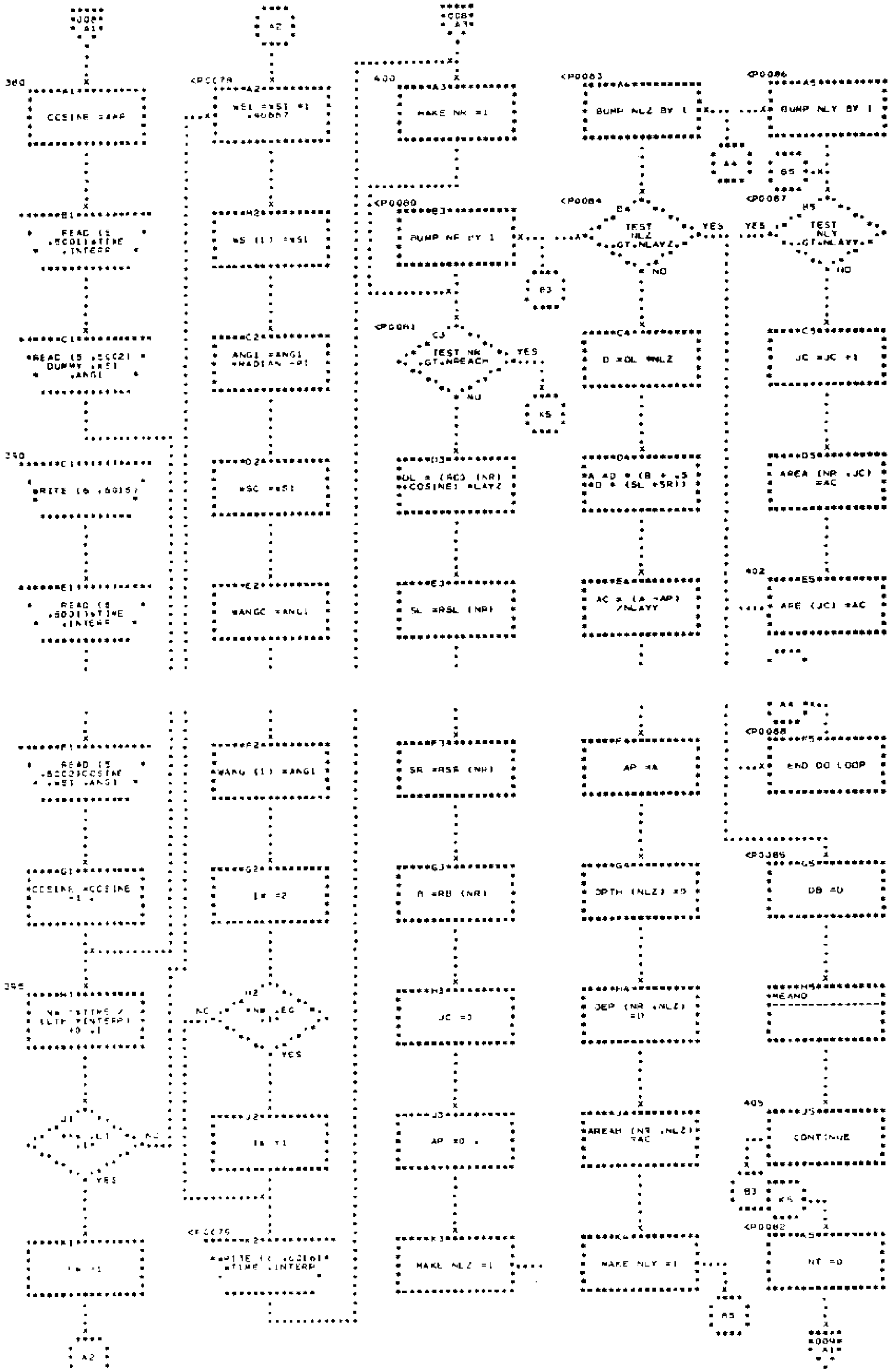

NJUNC =NJUNC +1
BUMP J BY 1
BUMP NTE BY 1
MAKE J =1
TEST J .GT.JK
TEST NTE .GT.NTES
MAKE NS =N1
VVR (NJ ,J) =0
WRITE (6 ,6025) NTE ,TAU (NTE)
BUMP NS BY 1
TEST J .GT.JK
VR (NJ ,J) =0
CTE (NTE) =CRM
TEST NS .GT.N2
MAKE NJ =2
VVL (NJ ,J) =3
ENTRY
TAU (NTE) =EXP ( -3 , 4OTH /TAU (NTE))
DX (NS) =DDX
BUMP NJ BY 1
VL (NJ ,J) =0
WRITE (6 ,6002) NJ ,DXJN (NJ) ,DYJN (NJ) ,DDJN (NJ)
WRITE (6 ,6003)
TRANSFER
TEST NJ .GT.NJL
ENTRY
NJCELL = (NJUNC +1) *JJK
IQIC =0
READ (5 ,5005) DXJN (NJ) ,DYJN (NJ) ,DDJN (NJ) ,NHU
READ (5 ,5002) (TAU (NTE) ,NTE =1 ,NTES)
IQEVT =0
WRITE (6 ,6024)
NQ =0
MAKE J =1
MAKE NTE =1
NQ =NQ +1

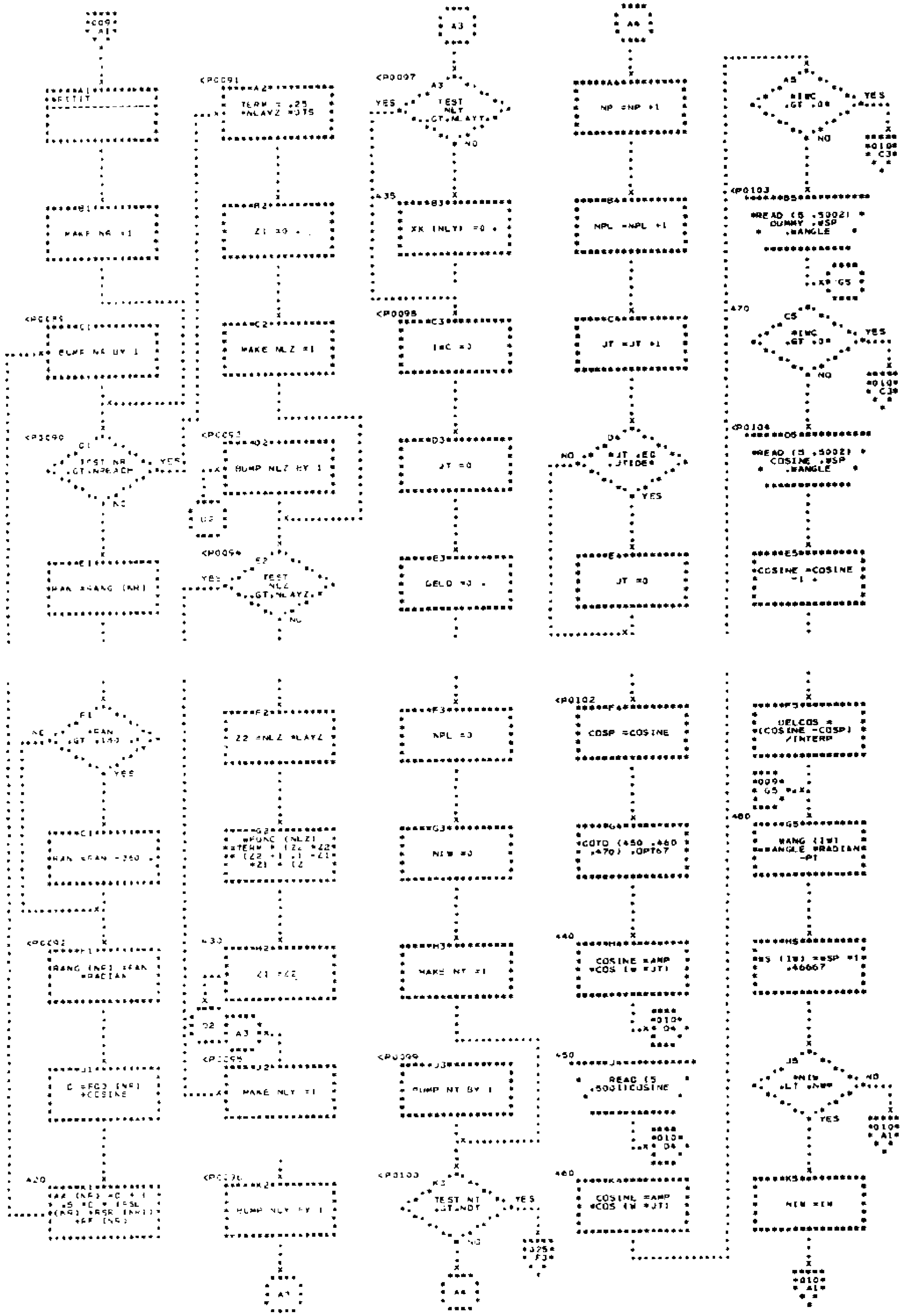




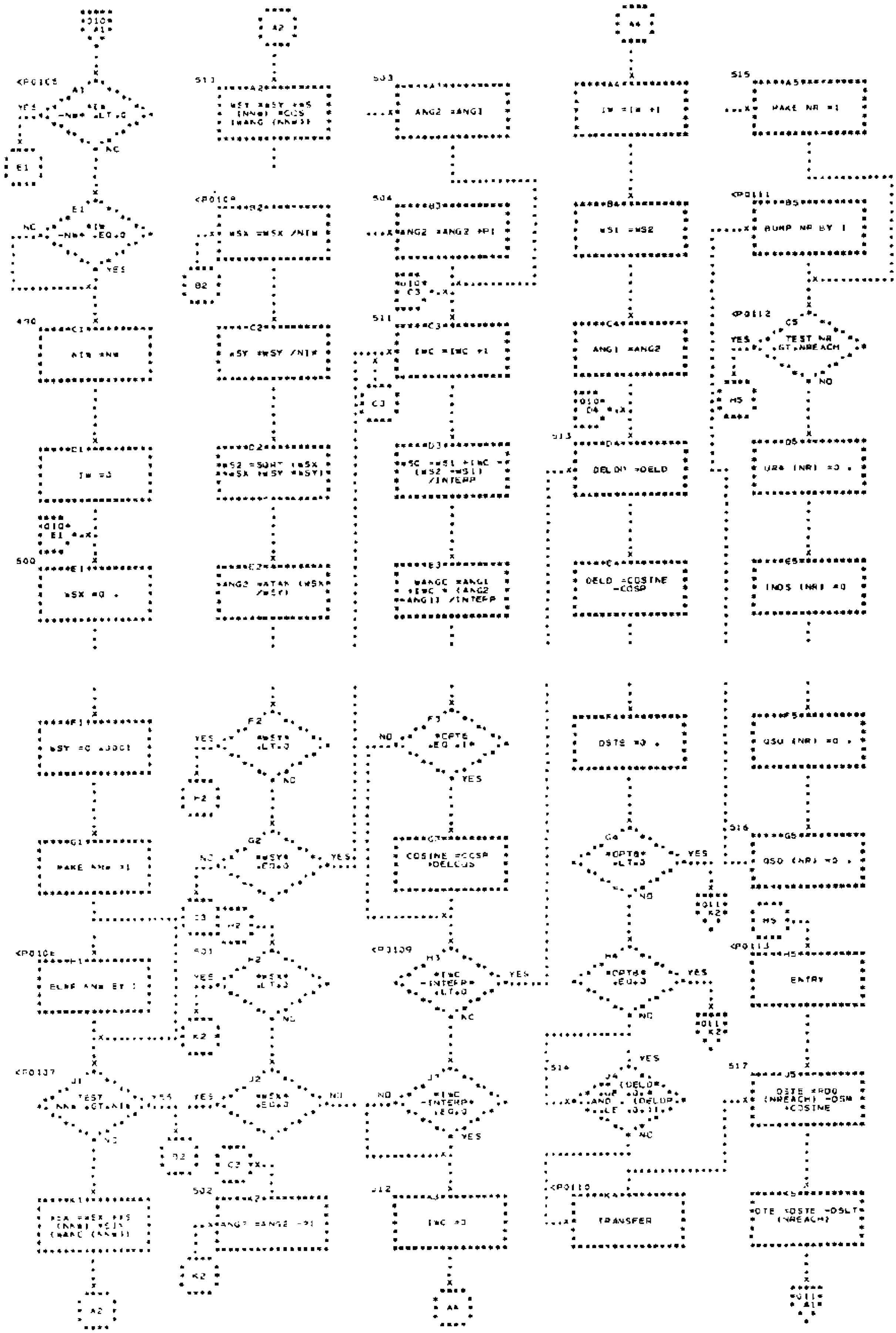

WRITE (6 ,6007)NR
MAKE NR =1
TRANSFER
NDV =NDIV (NR)
BUMP NR BY 1
TEST NR .GT.NREACH
TEST NC .GT.N2
MAKE NC =N1
BUMP NC BY 1
CONTINUE
WRITE (6 ,6023)
MAKE NR =1
BUMP NR BY 1
TEST NR .GT.NREACH
MAKE NC =N1
ENTRY

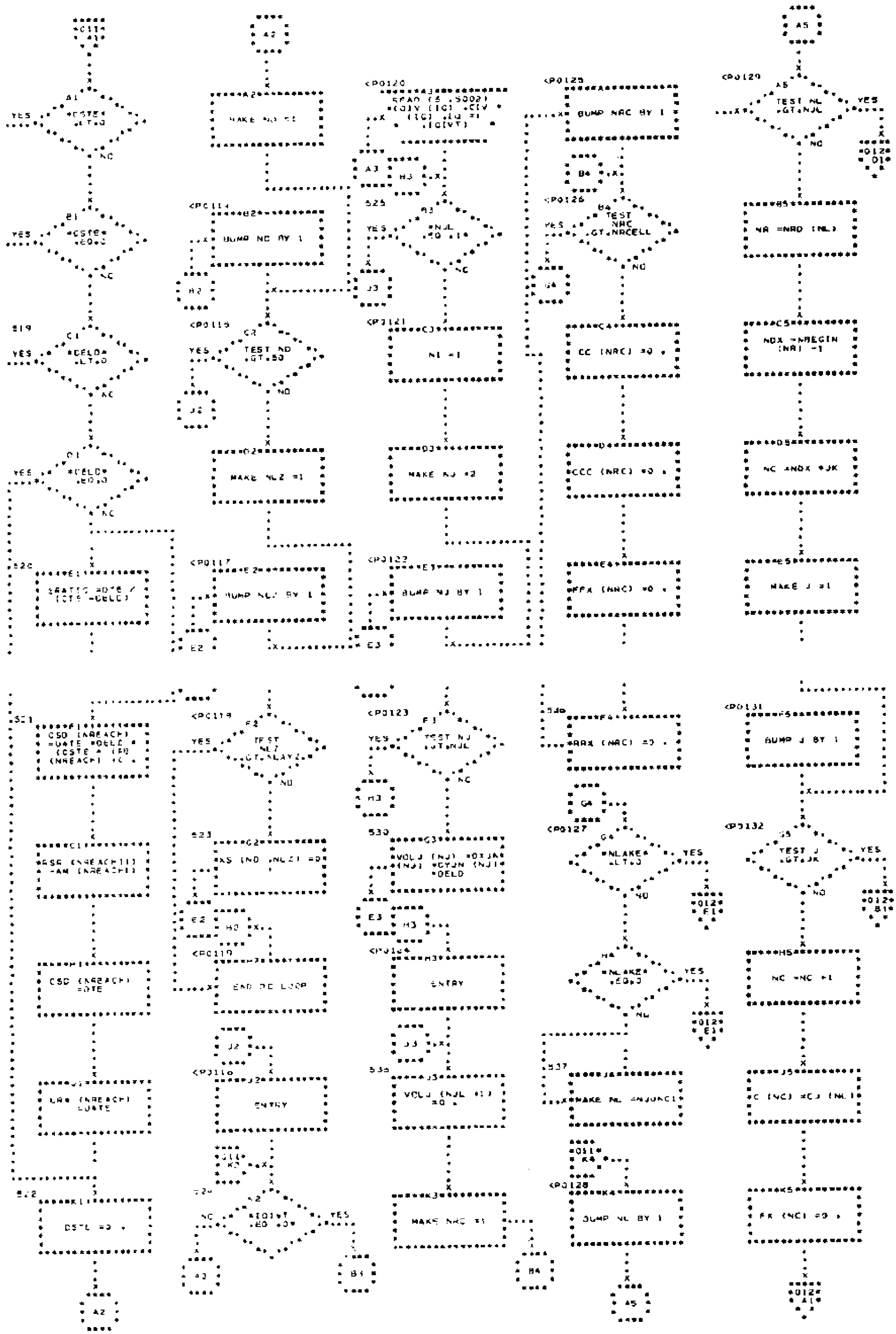

BUMP NLZ BY 1
READ (5 ,5006) (CJ (NJC) ,NJC =N1 ,N2)
WRITE (6 ,6015)
NI =1
TEST NLZ .GT.NLAYZ.
N1 =N2 +1
WRITE (6 ,6014)WSC ,WANGC
MAKE NJ =2
N2 =N1 -1 +NLAYY
END DO LOOP
WRITE (6 ,6012)
WSC =WSC +1 .46667
BUMP NJ BY 1
ENTRY
AMP = -AMP
WANGC =WANGC *RADIAN -PI
TEST NJ .GT.NJL
CONTINUE
WRITE (6 ,6013)
READ (5 ,5001)COSINE
MAKE NJC =NI
COSINE =AMP
MAKE NLY =1
BUMP NJC BY 1
WRITE (6 ,6011)
READ (5 ,5002)WSC ,WANGC
BUMP NLY BY 1
TEST NJC .GT.N2
CJ (NJC) =CHW
TEST NLY .GT.NLAYY
TRANSFER
AMP = -AMP

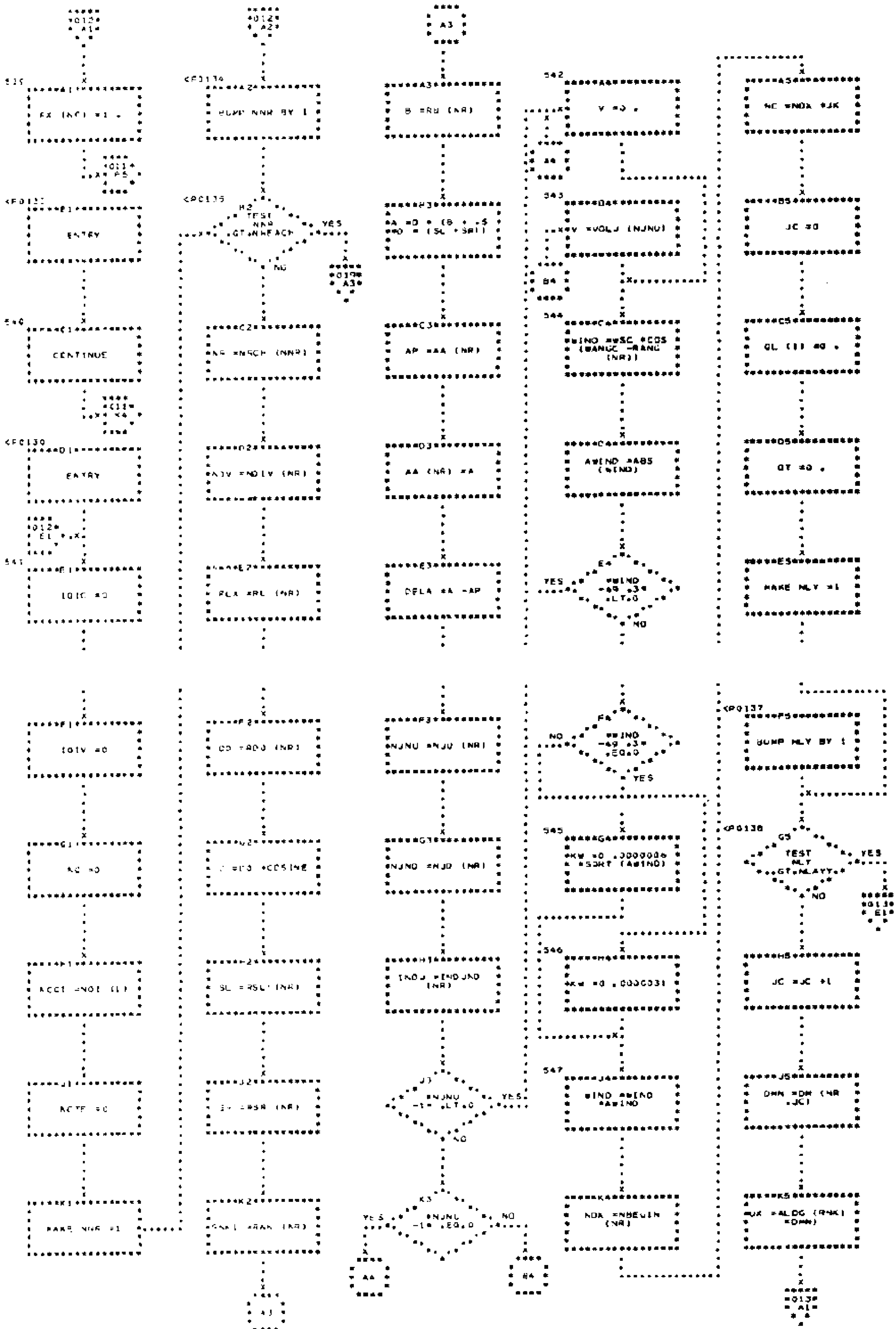

MAKE NR =1
BUMP NLZ BY 1
BUMP NLY BY 1
BUMP NR BY 1
TEST NR .GT.NREACH
TEST NLZ .GT.NLAYZ
TEST NLY .GT.NLAYY
SL =RSL (NR)
SR =RSR (NR)
AP =A
JC =0
AP =0
MAKE NLZ =1
MAKE NLY =1
JC =JC +1
ARE (JC) =AC
END DO LOOP
DB =0
CONTINUE
NT =0



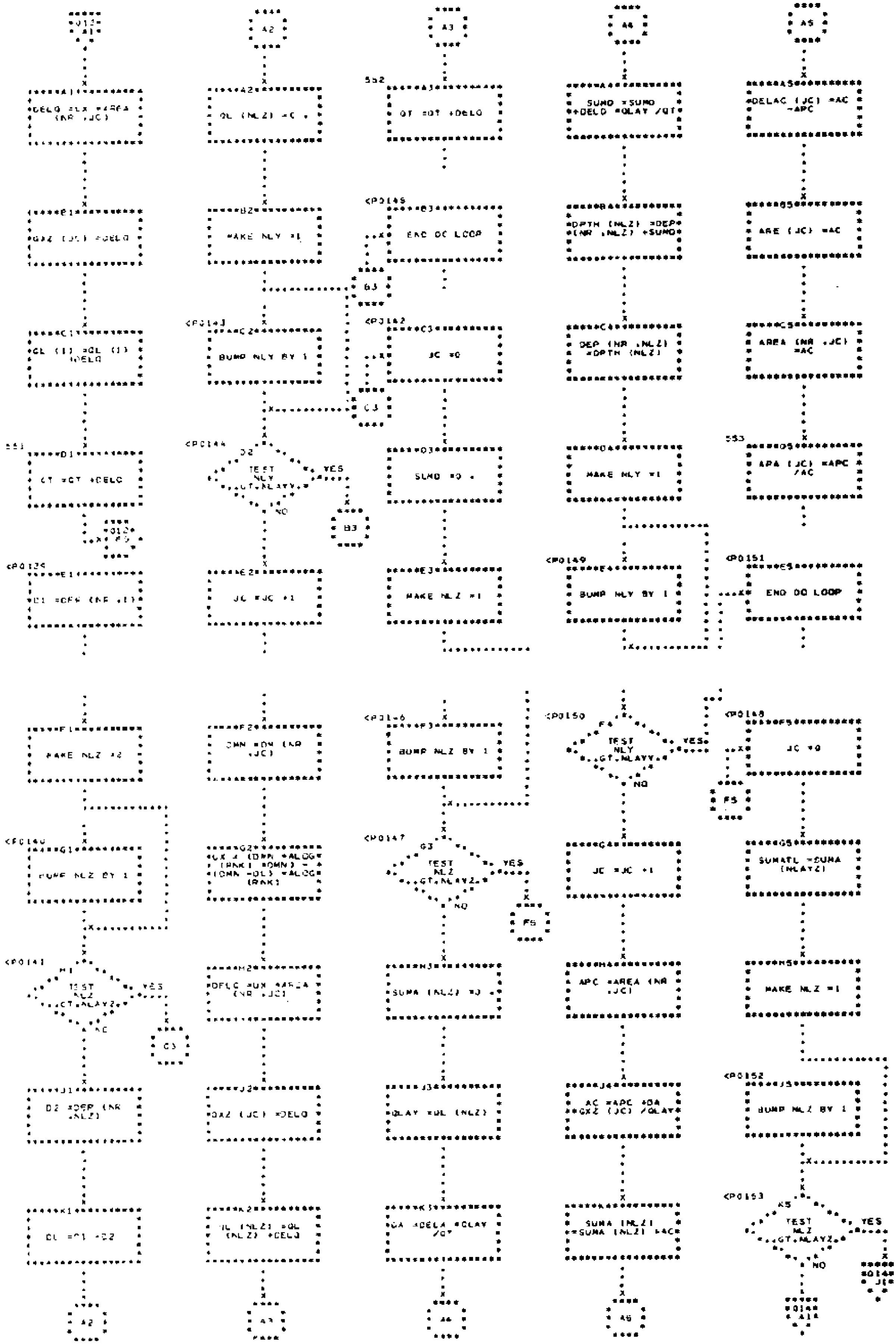
TEST NR .GT.NREACH
BUMP NR BY 1
MAKE NR =1
TERM = .25 *NLAYZ *375
MAKE NLZ =1
BUMP NLZ BY 1
TEST NLZ .GT.NLAYZ
Z2 =NLZ *LAYZ
Z1 =Z2
MAKE NLY =1
BUMP NLY BY 1
TEST NLY .GT.NLAYY
IWC =0
JT =0
NPL =0
NEW =0
MAKE NT =1
BUMP NT BY 1
TEST NT .GT.NDT
NP =NP +1
NPL =NPL +1
JT =JT +1
JT .EQ .JTIDE
JT =0
COSP =COSINE
GOTO (450 ,460 ,470) ,OPT67
COSINE =AMP *COS (W *JT)
READ (5 ,5001)COSINE
IWC .GT .0
READ (5 ,5002) DUMMY ,WSP ,WANGLE
READ (5 ,5002) COSINE ,WSP ,WANGLE
COSINE =COSINE *1 +
DELCOS = (COSINE -COSP) /INTERP
WANG (IW) = WANGLE *RADIAN -PI
WS (IW) =WSP *1.46667
NEW .LT .NWW
NEW =NEW
YES
NO

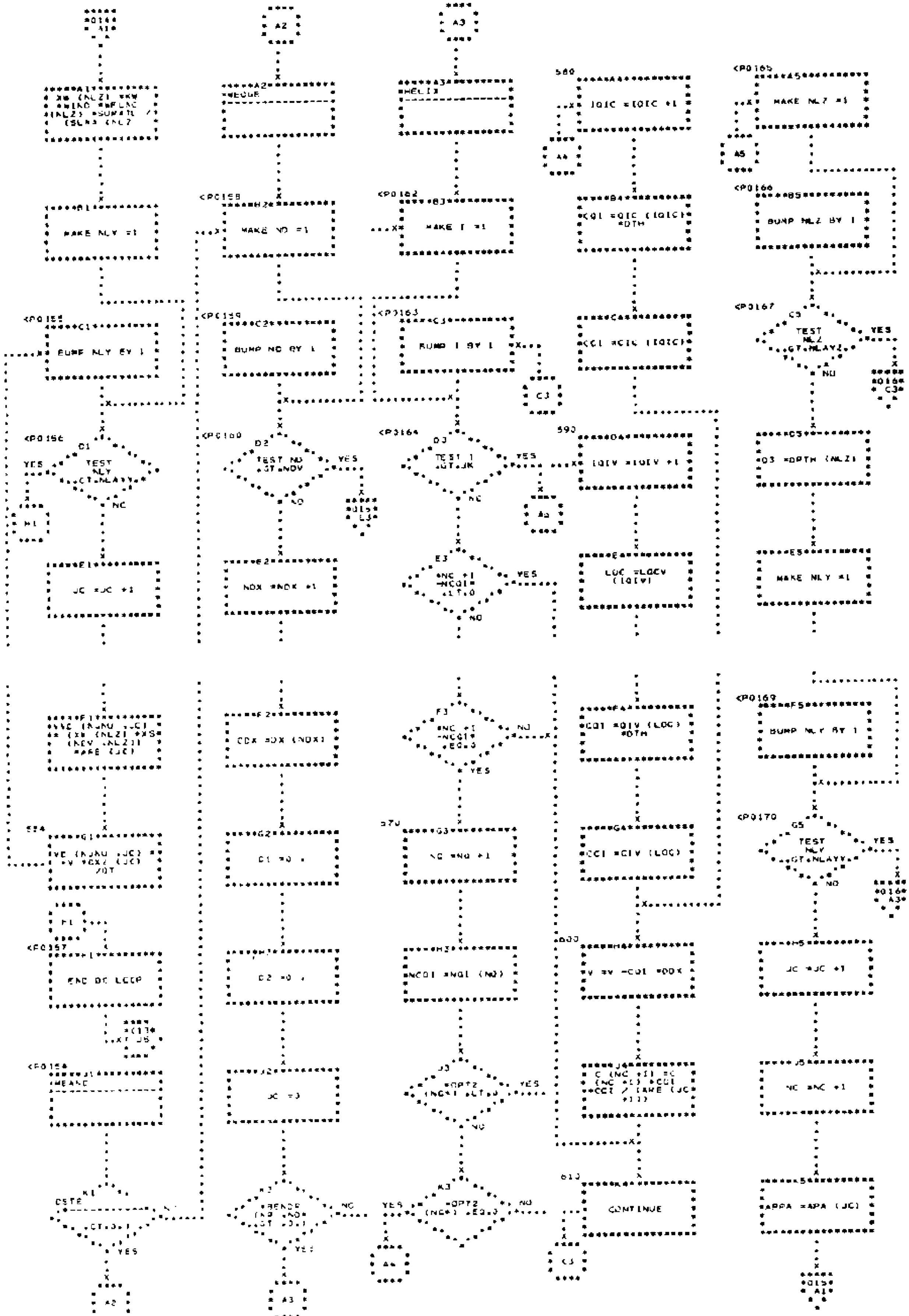


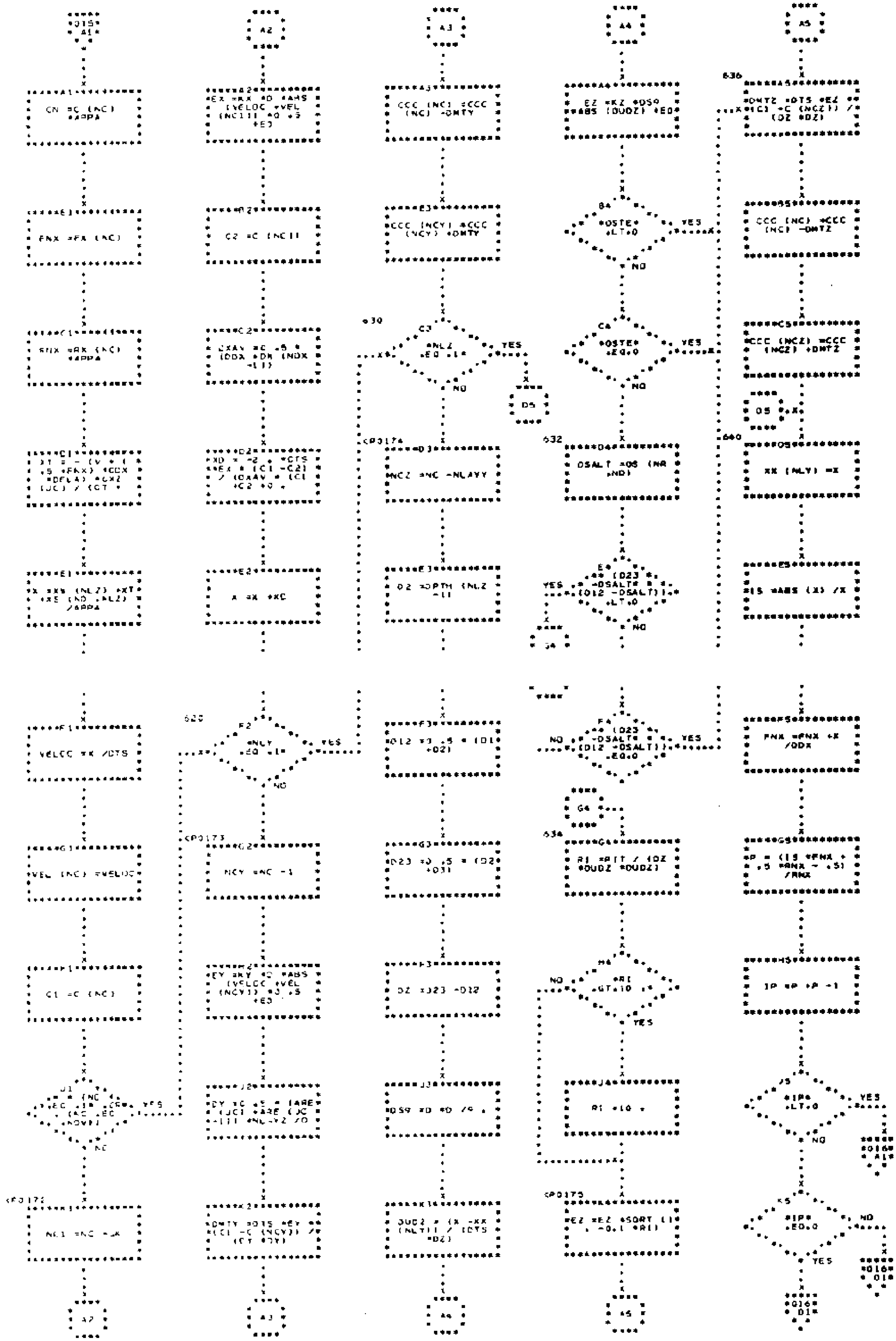


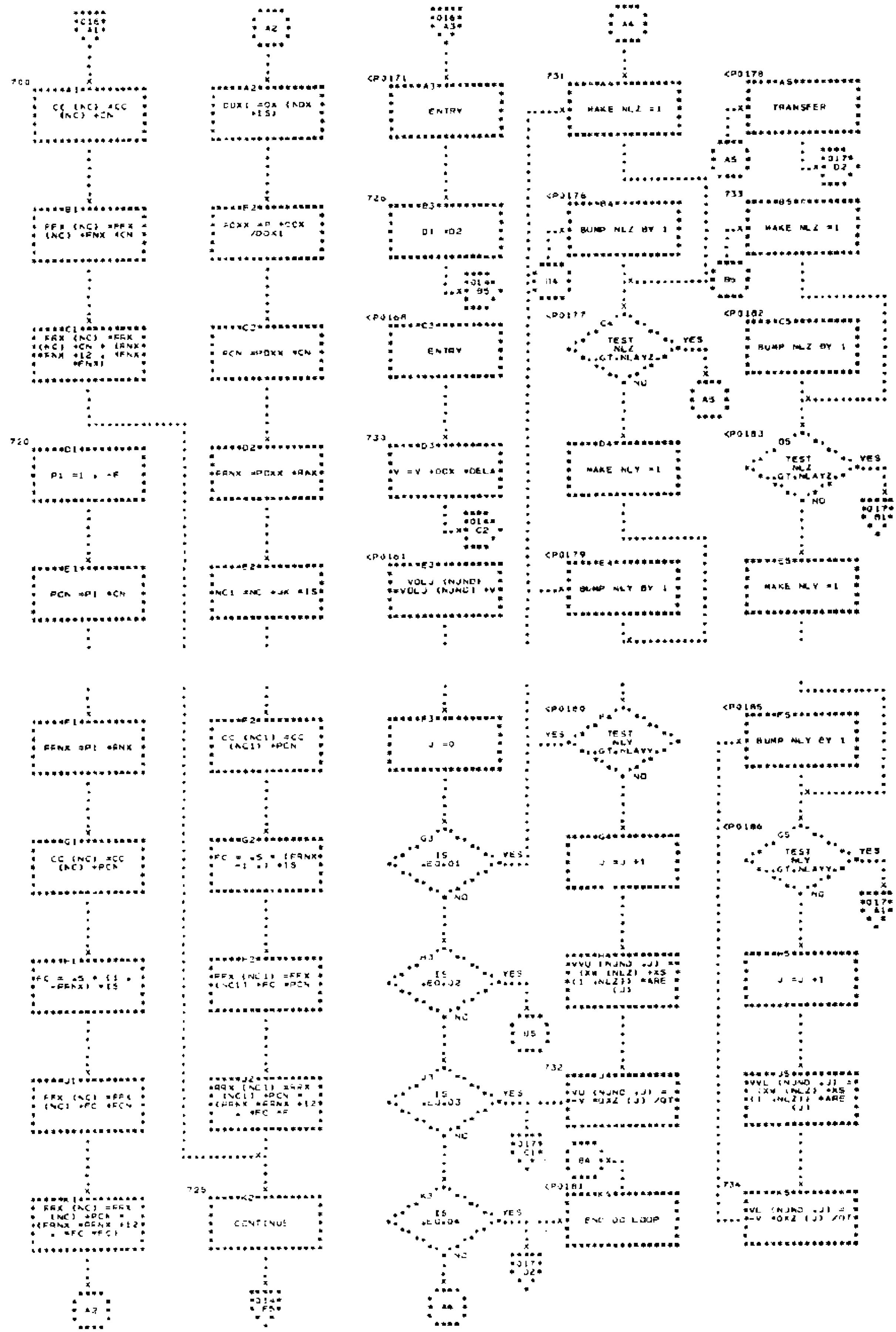


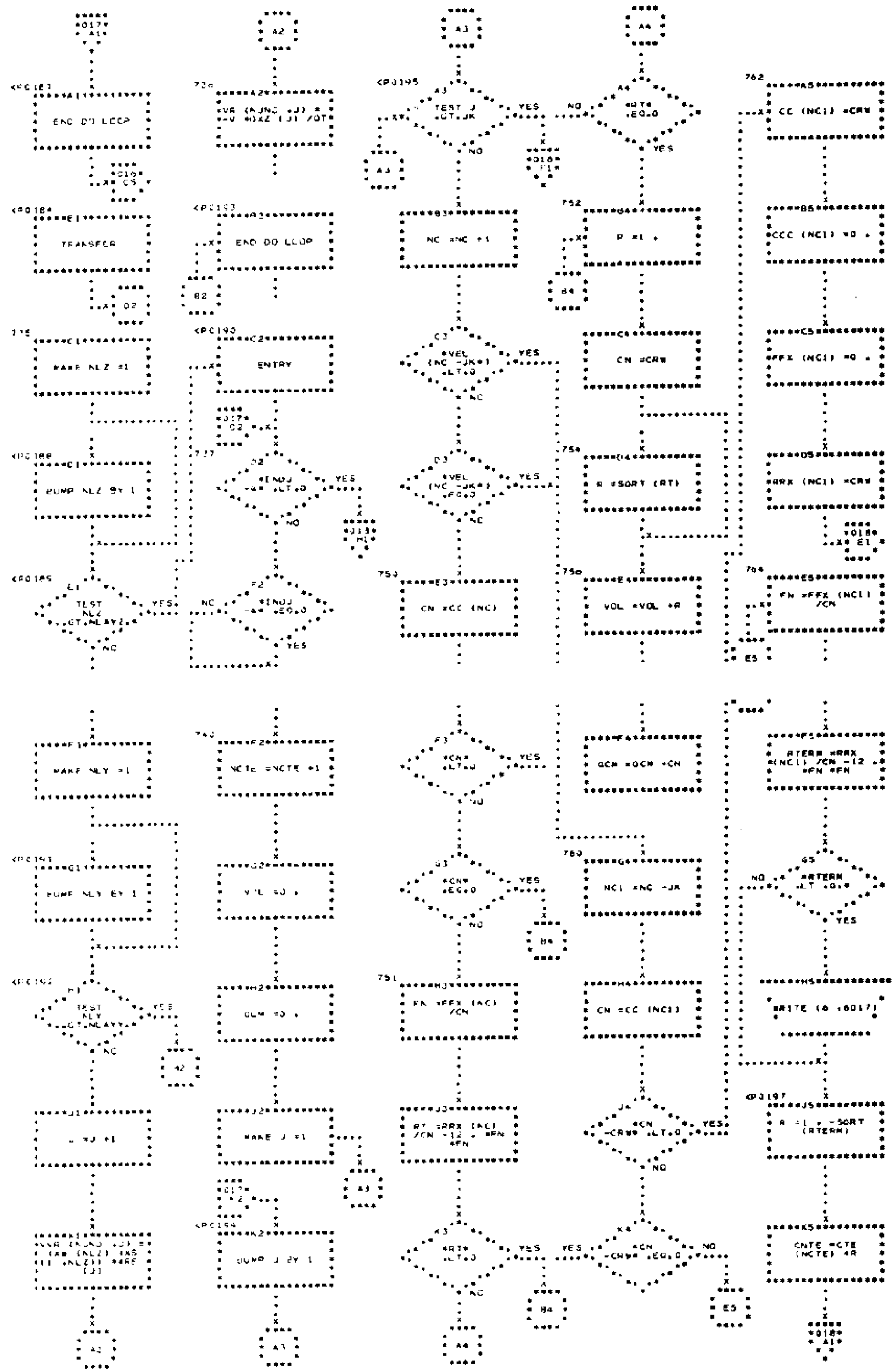
A3
BUMP NNR BY 1
B =RB (NR)
V =0 .
NC =NDX *JK
ENTRY
TEST NNR .GT.NREACH
YES
NO
V =VOLJ (NJNU)
JC =0
CONTINUE
AP =AA (NR)
GL (I) =0 .
ENTRY
AA (NR) =A
A*IND =ABS (*IND)
GT =0 .
DELA =A -AP
MAKE NLY =1
BUMP NLY BY 1
NJNU =NJU (NR)
NJNO =NJD (NR)
KW =0 .0000031
TEST NLY .GT.NLAYY
JC =JC +1
DNN =DN (NR .JC)
NDX =NBEGIN (NR)
UX =ALOG (RNK) *DNN
MAKE NNR =1
A4
B4

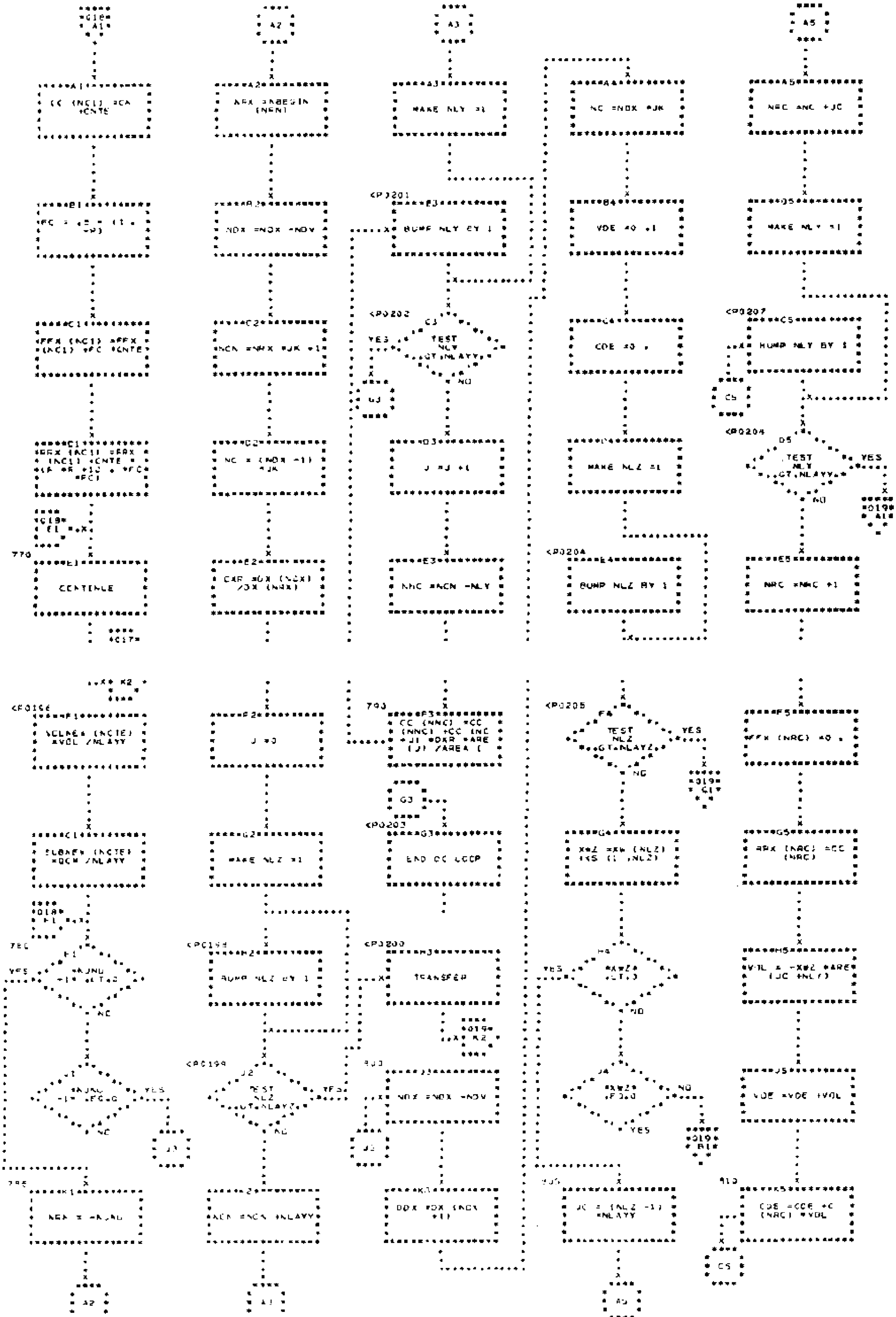

A1
DELO =LX *AREA (NR ,JC)
GXZ (JC) =DELO
GL (I) =GL (I) +DELO
CT =CT +DELO
E1 =DEP (NR ,I)
MAKE NLZ =2
BUMP NLZ BY 1
TEST NLZ .GT.NLAYZ
D2 =DEP (NR ,NLZ)
DL =D1 -D2
A2
QL (NLZ) =C
MAKE NLY =1
BUMP NLY BY 1
TEST NLY .GT.NLAYY
JC =JC +1
OMN =OM (NR ,JC)
DELC =UX *AREA (NR ,JC)
GXZ (JC) =DELO
A3
QT =QT +DELO
END DO LOOP
JC =0
SUMD =0
MAKE NLZ =1
BUMP NLZ BY 1
TEST NLZ .GT.NLAYZ
SUMA (NLZ) =0
QLAY =QL (NLZ)
DA =DELA *QLAY /QT
A4
SUMD =SUMD +DELO *QLAY /QT
DPTH (NLZ) =DEP (NR ,NLZ) +SUMD
DEP (NR ,NLZ) =DPTH (NLZ)
MAKE NLY =1
BUMP NLY BY 1
TEST NLY .GT.NLAYY
JC =JC +1
APC =AREA (NR ,JC)
AC =APC +DA *GXZ (JC) /QLAY
SUMA (NLZ) =SUMA (NLZ) +AC
A5
DELAC (JC) =AC -APC
ARE (JC) =AC
AREA (NR ,JC) =AC
APA (JC) =APC /AC
END DO LOOP
JC =0
SUMATL =SUMA (NLAYZ)
MAKE NLZ =1
BUMP NLZ BY 1
TEST NLZ .GT.NLAYZ
YES
NO

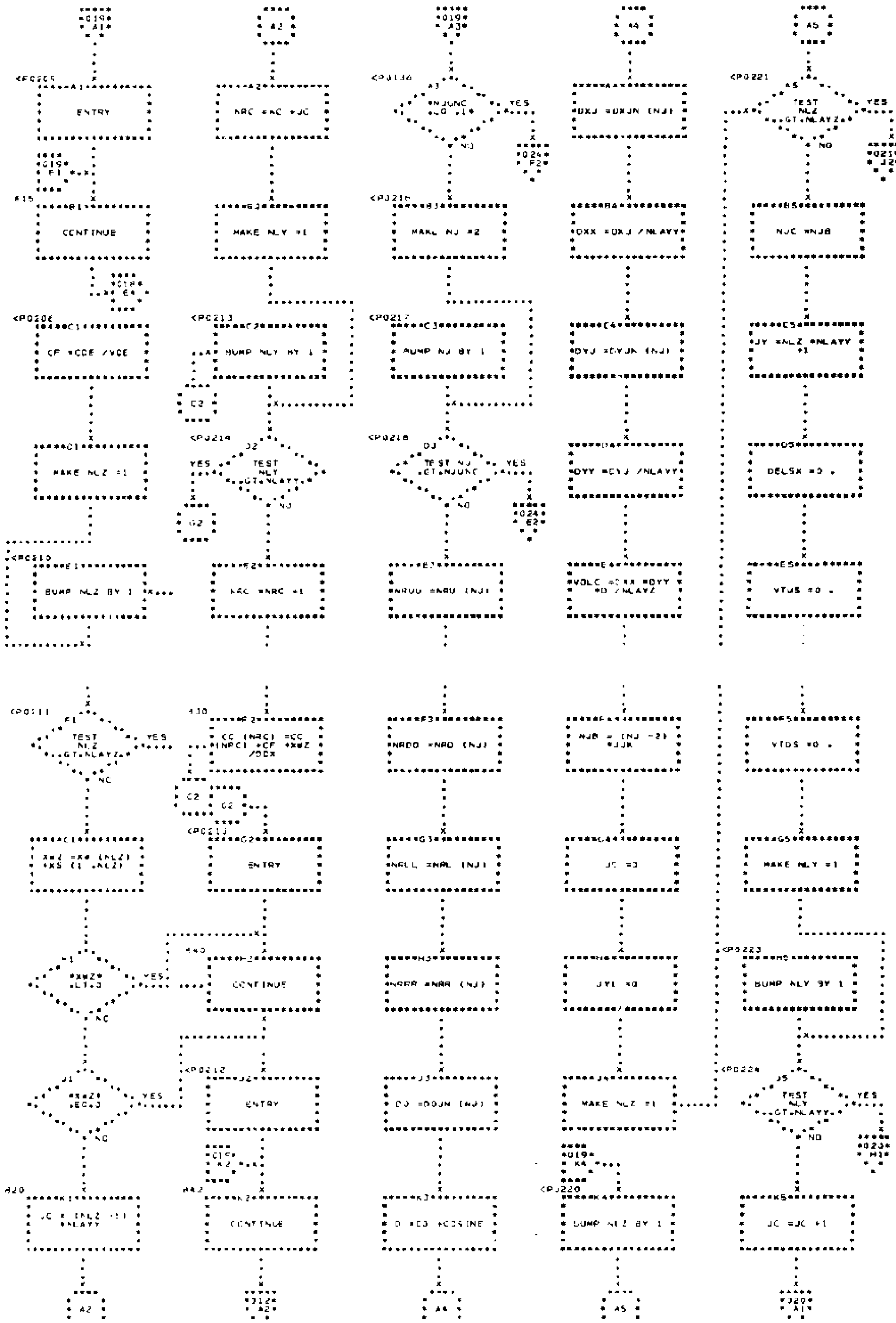


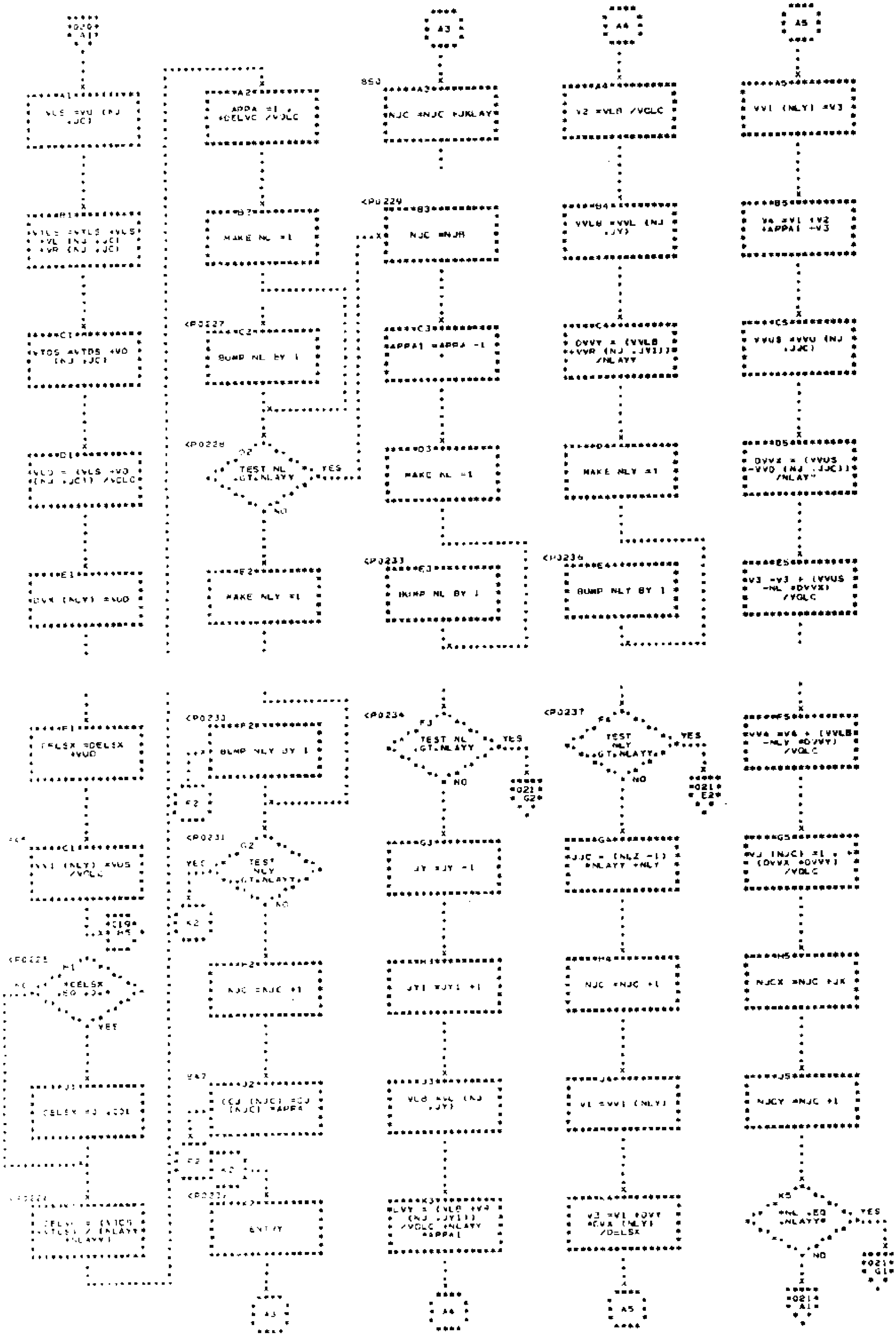

A2
A3
A4
A5
CCC (NC) =CCC (NC) -DNTY
FNX =FX (NC)
C2 =C (NC1)
CCC (NC) =CCC (NC) -DNTZ
NCZ =NC -NLAYY
XX (NLY) =X
X =X +XC
VELCC =X /DTS
NCY =NC -1
DZ =D23 -D12
YES
NO

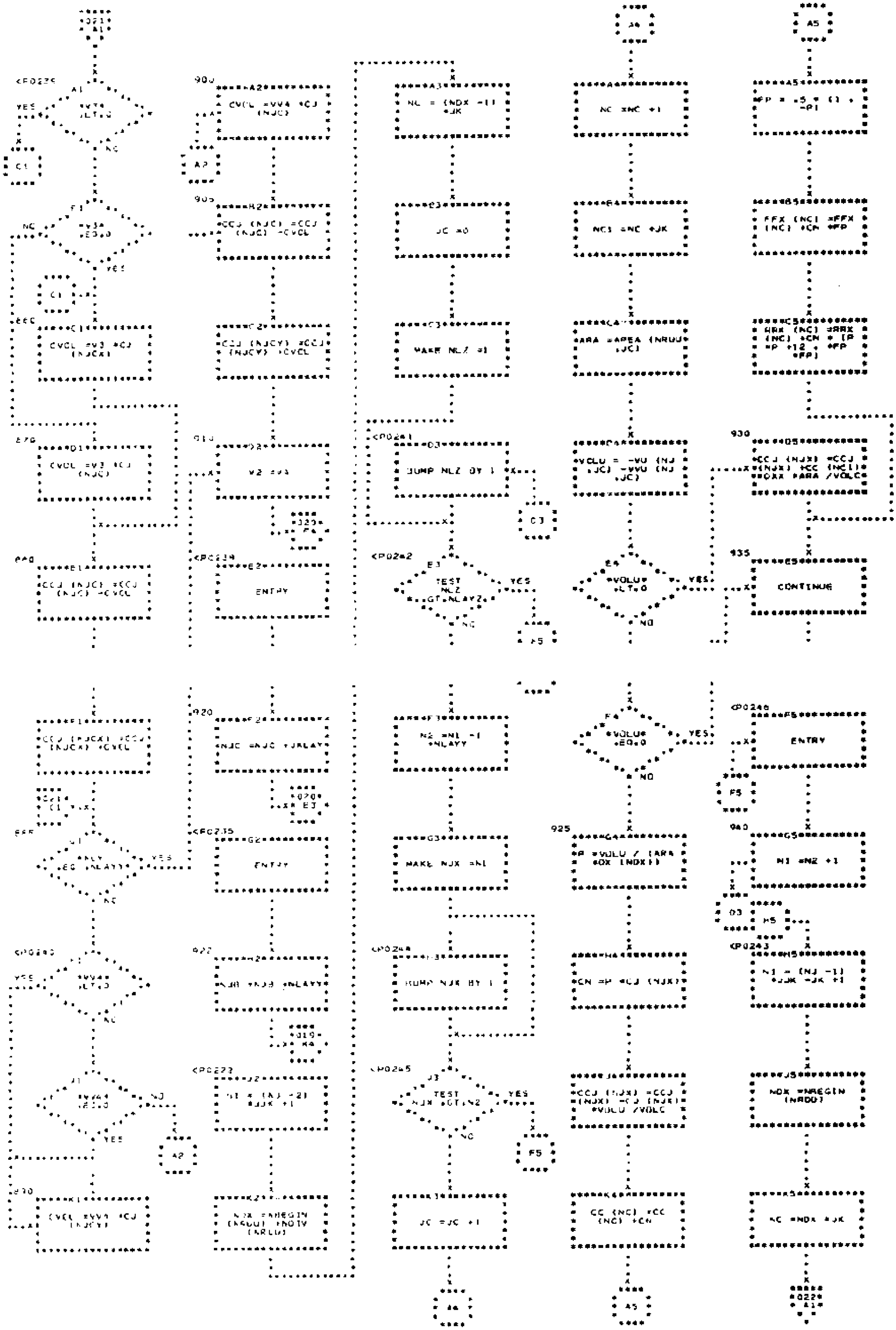



END DO LOOP
TRANSFER
MAKE NLZ =1
BUMP NLZ BY 1
TEST NLZ
ENTRY
TEST J
NC =NC +1
R =SORT (RT)
VOL =VOL +R
MAKE NLY =1
BUMP NLY BY 1
TEST NLY
MAKE J =1
BUMP J BY 1
NCTE =NCTE +1
NCI =NC -JK
WRITE (6 ,6017)
YES
NO

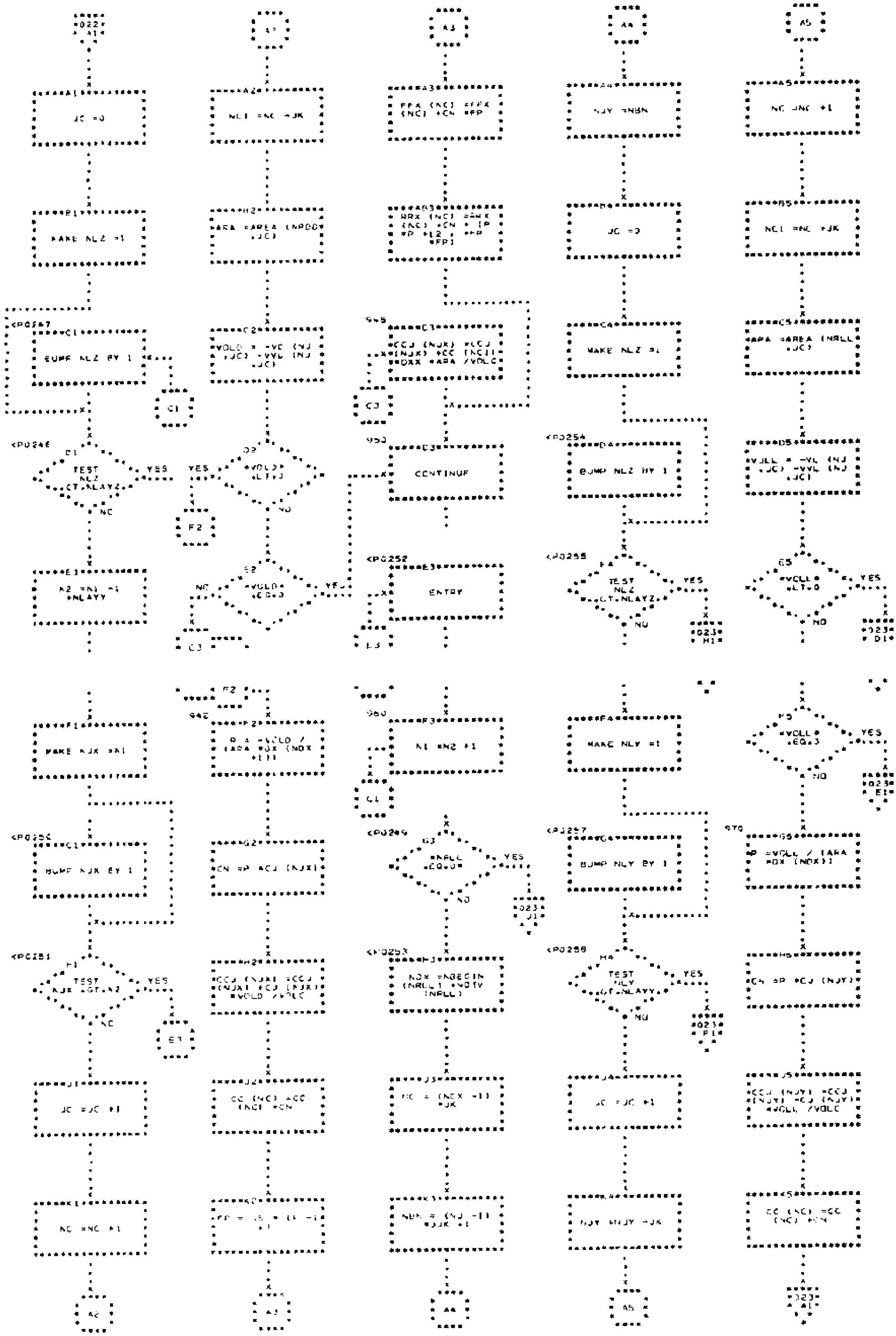

MAKE NLY =1
NC =NOX *JK
BUMP NLY BY 1
VDE =0 +1
MAKE NLY =1
TEST NLY .GT.NLAYY
CDE =0 +
BUMP NLY BY 1
MAKE NLZ =1
TEST NLY .GT.NLAYY
CONTINUE
BUMP NLZ BY 1
NHC =NCN -NLY
NRC =NRC +1
J =0
TEST NLZ .GT.NLAYZ
MAKE NLZ =1
END CC LOOP
BUMP NLZ BY 1
TRANSFER
NOX =NOX +NOV
TEST NLZ .GT.NLAYZ
NCN =NCN *NLAYY
VDE =VDE +VOL

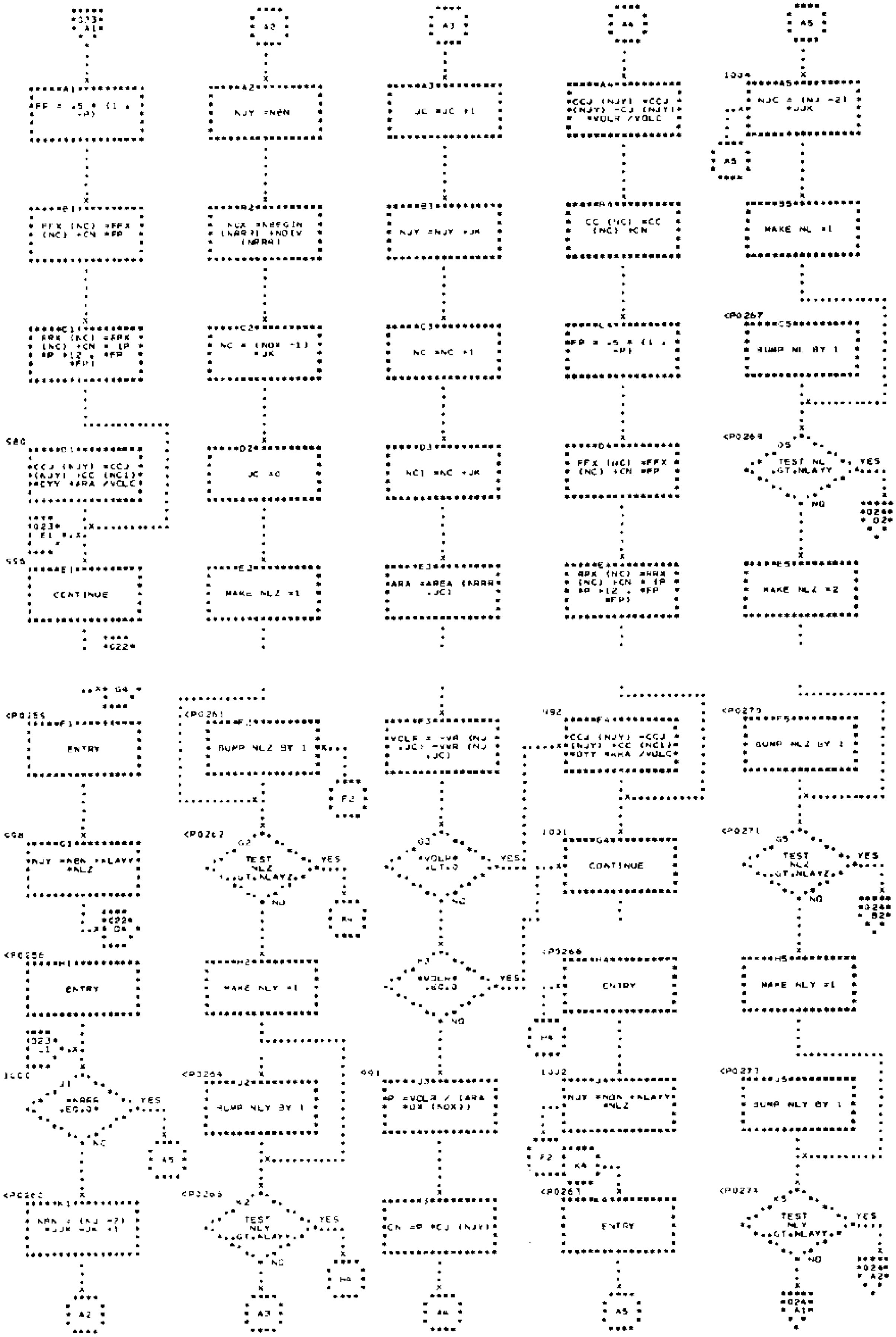


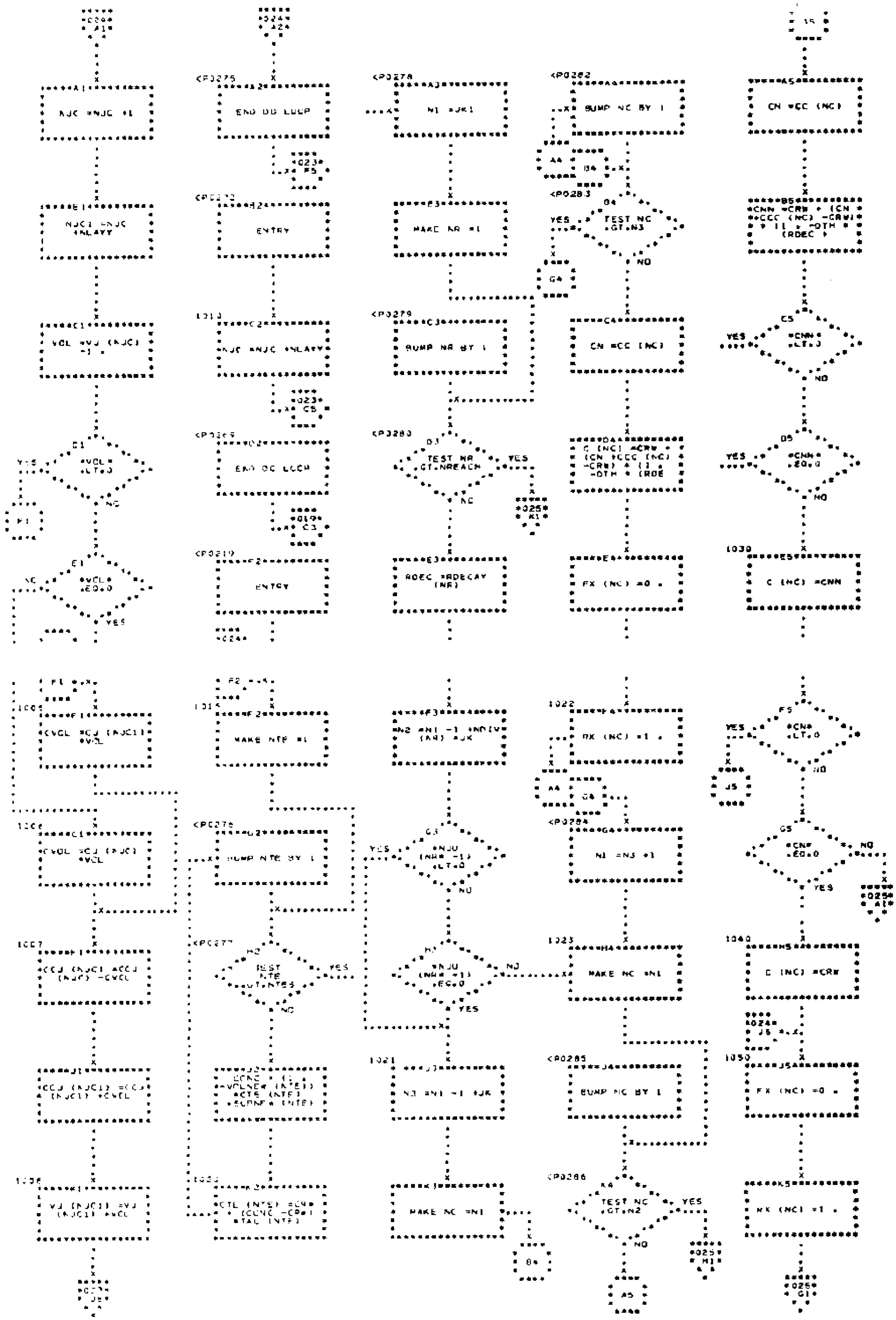

A3
A4
A5
850
NJC =NJC +JKLAY
V2 =VLB /VCLC
VV1 (NLY) =V3
APPA =1 +DELVC /VCLC
MAKE NL =1
NJC =NJB
VVLB =VVL (NJ ,JY)
V4 =V1 +V2 +APPA1 +V3
BUMP NL BY 1
APPA1 =APPA -1
VVUS =VVU (NJ ,JJC)
TEST NL .GT.NLAYY
YES
NO
MAKE NL =1
MAKE NLY =1
MAKE NLY =1
BUMP NL BY 1
BUMP NLY BY 1
BUMP NLY BY 1
TEST NL .GT.NLAYY
TEST NLY .GT.NLAYY
JY =JY +1
NJC =NJC +1
JY1 =JY1 +1
NJC =NJC +1
NJCX =NJC +JK
NJCY =NJC +1
V1 =VV1 (NLY)
ENTRY
A5
A4
A3

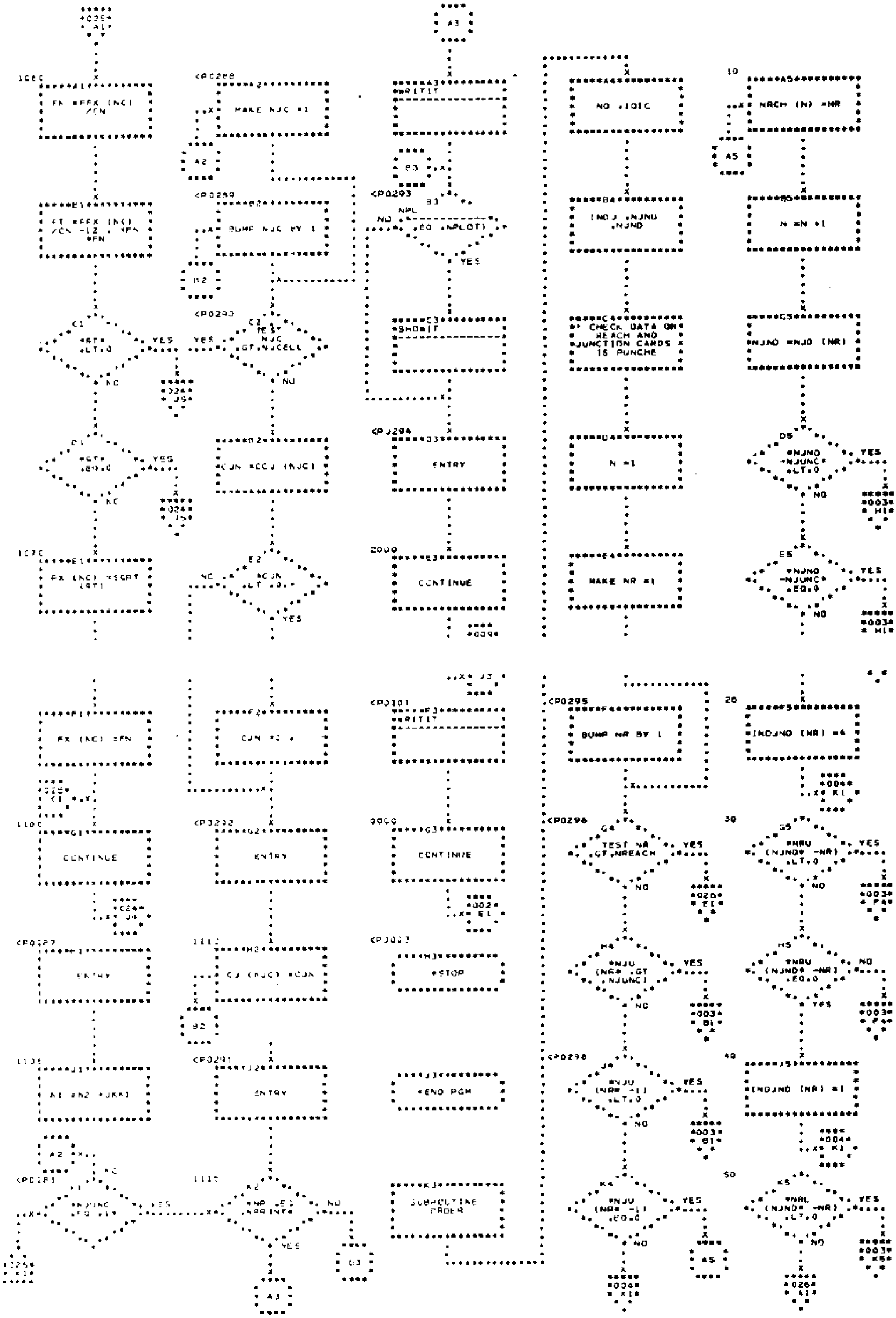


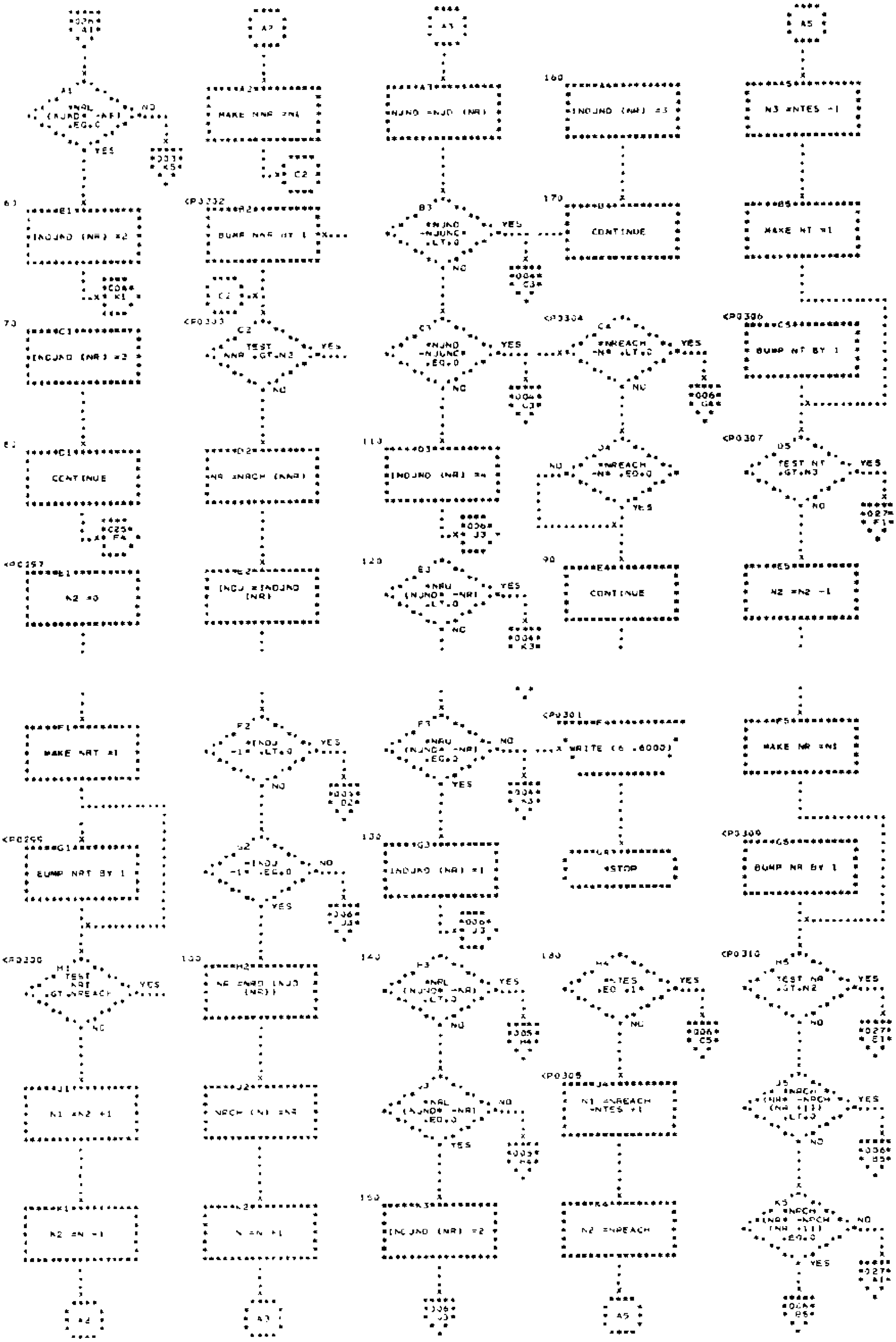
ENTRY
CONTINUE
TEST NLZ .GT.NLAYZ
TEST NJX .GT.N2
MAKE NLZ =1
BUMP NLZ BY 1
MAKE NJX =N1
BUMP NJX BY 1
JC =0
JC =JC +1
NC =NC +1
NC1 =NC +JK
*VOLU* .LT.0
*VOLU* .EQ.0
NJC =NJC +JKLAY
V2 =V3

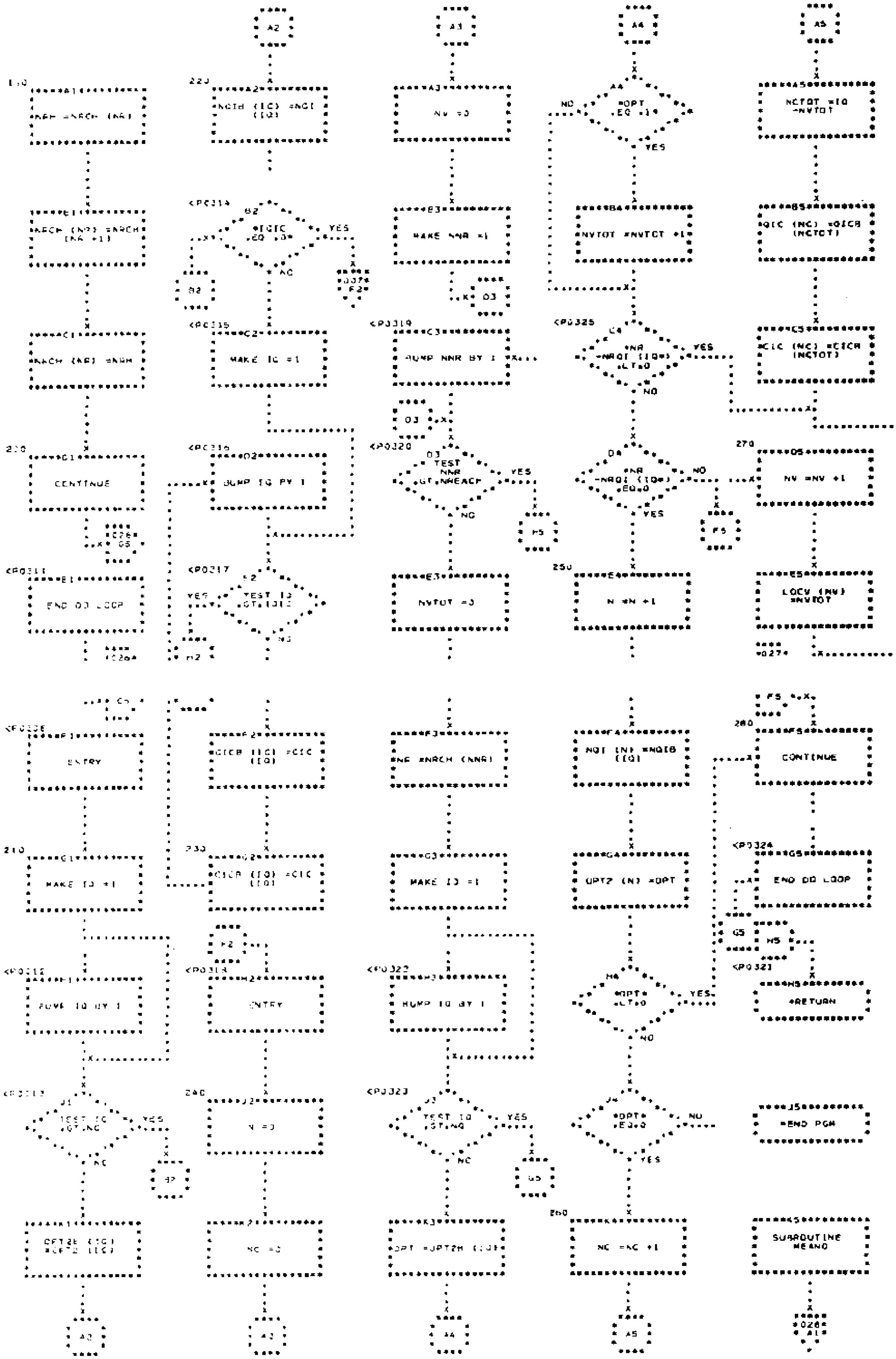

JC =0
MAKE NLZ =1
BUMP NLZ BY 1
TEST NLZ
CONTINUE
ENTRY
MAKE NJX =1
BUMP NJX BY 1
MAKE NLY =1
BUMP NLY BY 1
TEST NLY
JC =JC +1
NC =NC +1
YES
NO

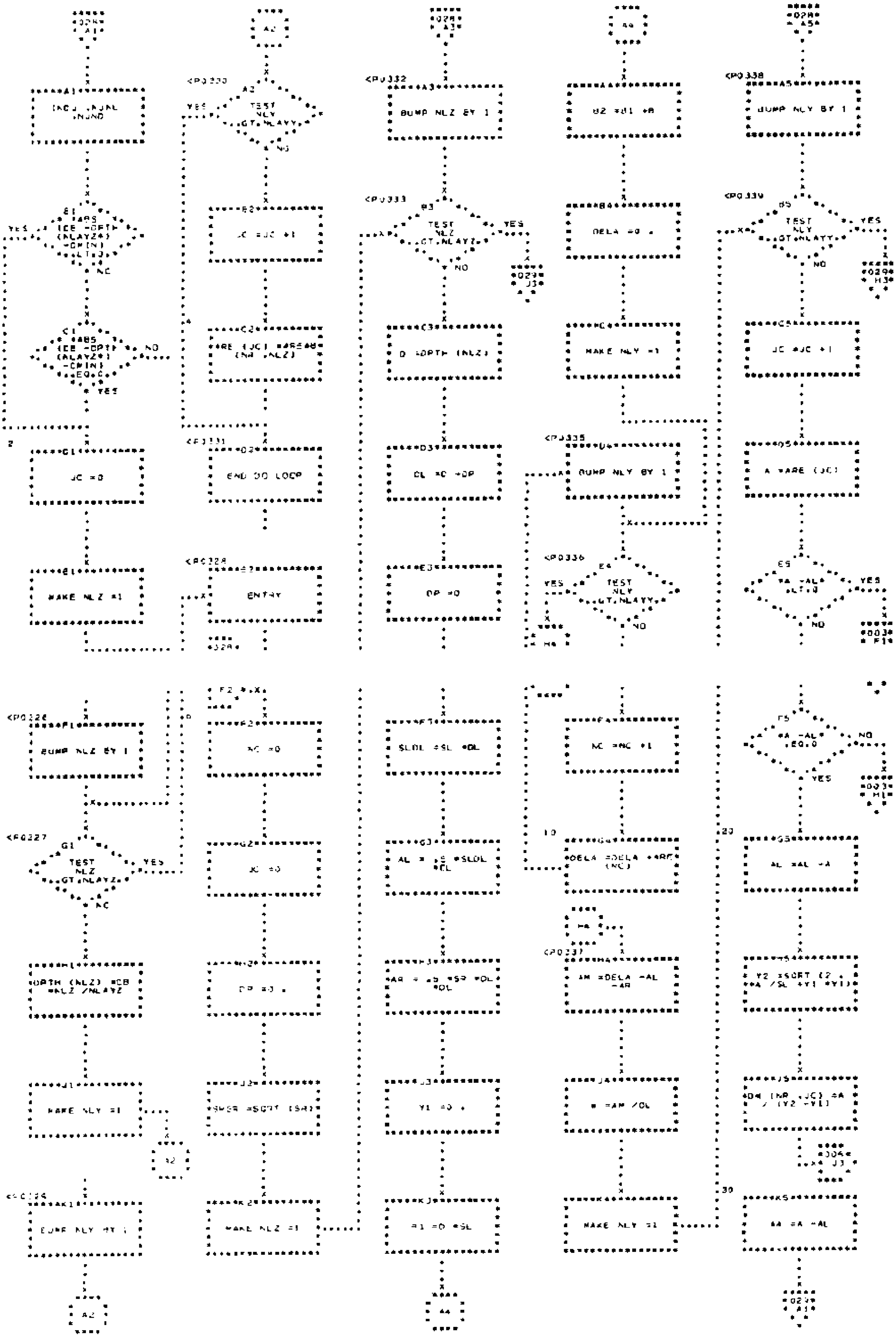

NJY =NEN
JC =JC +1
MAKE NL =1
NJY =NJY +JK
NC =NC +1
BUMP NL BY 1
JC =0
TEST NL .GT.NLAYY
CONTINUE
MAKE NLZ =1
MAKE NLZ =2
ENTRY
BUMP NLZ BY 1
CONTINUE
TEST NLZ .GT.NLAYZ
MAKE NLY =1
BUMP NLY BY 1
TEST NLY .GT.NLAYY
YES
NO

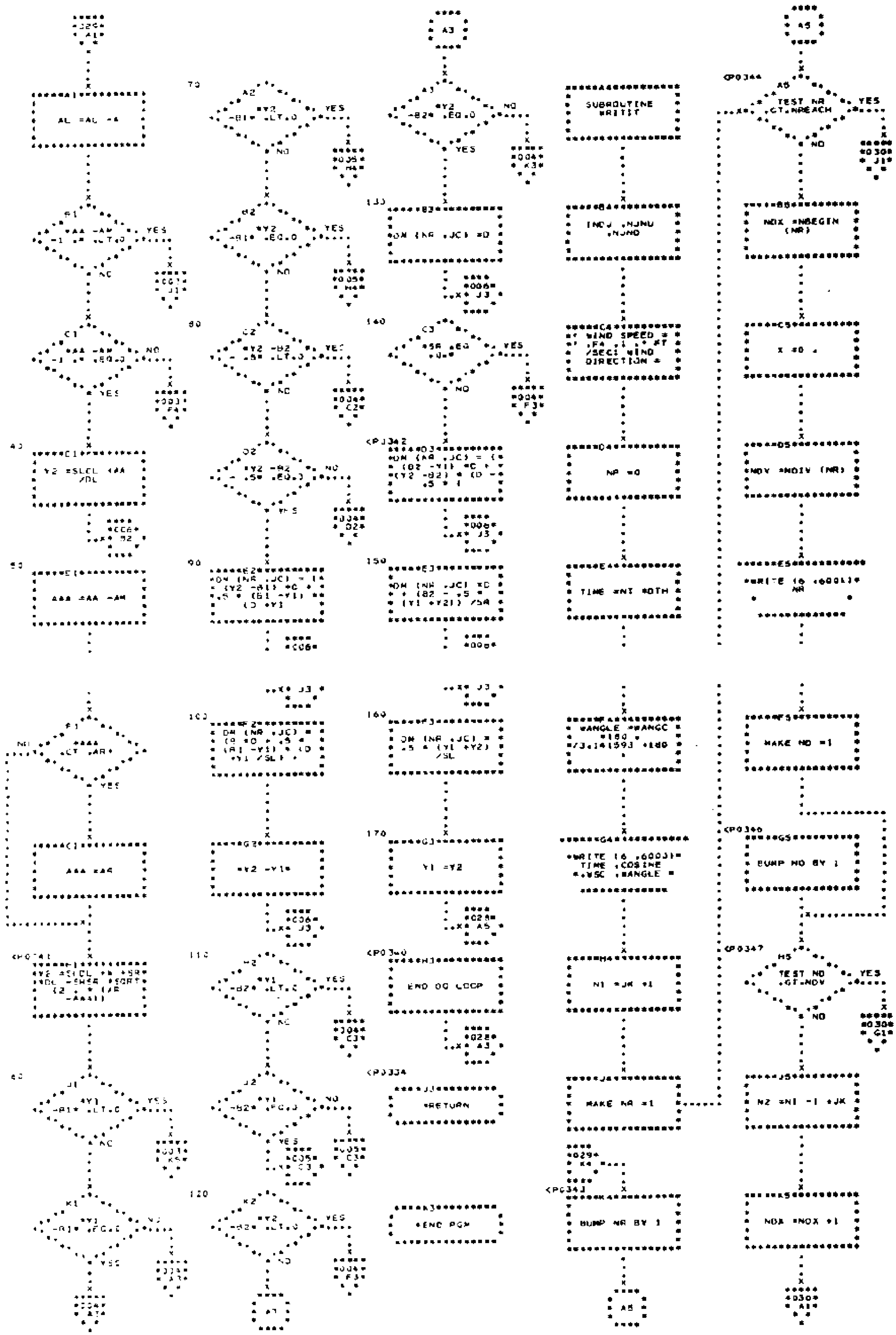

END DO LOOP
ENTRY
BUMP NC BY 1
CN =CC (NC)
MAKE NR =1
TEST NC .GT.N3
YES
NO
BUMP NR BY 1
TEST NR .GT.NREACH
RDEC =RDECAY (NR)
FX (NC) =0.
C (NC) =CNN
MAKE NTE =1
RX (NC) =1.
N1 =N3 +1
BUMP NTE BY 1
MAKE NC =N1
C (NC) =CRW
FX (NC) =0.
BUMP NC BY 1
MAKE NC =N1
TEST NC .GT.N2
RX (NC) =1.

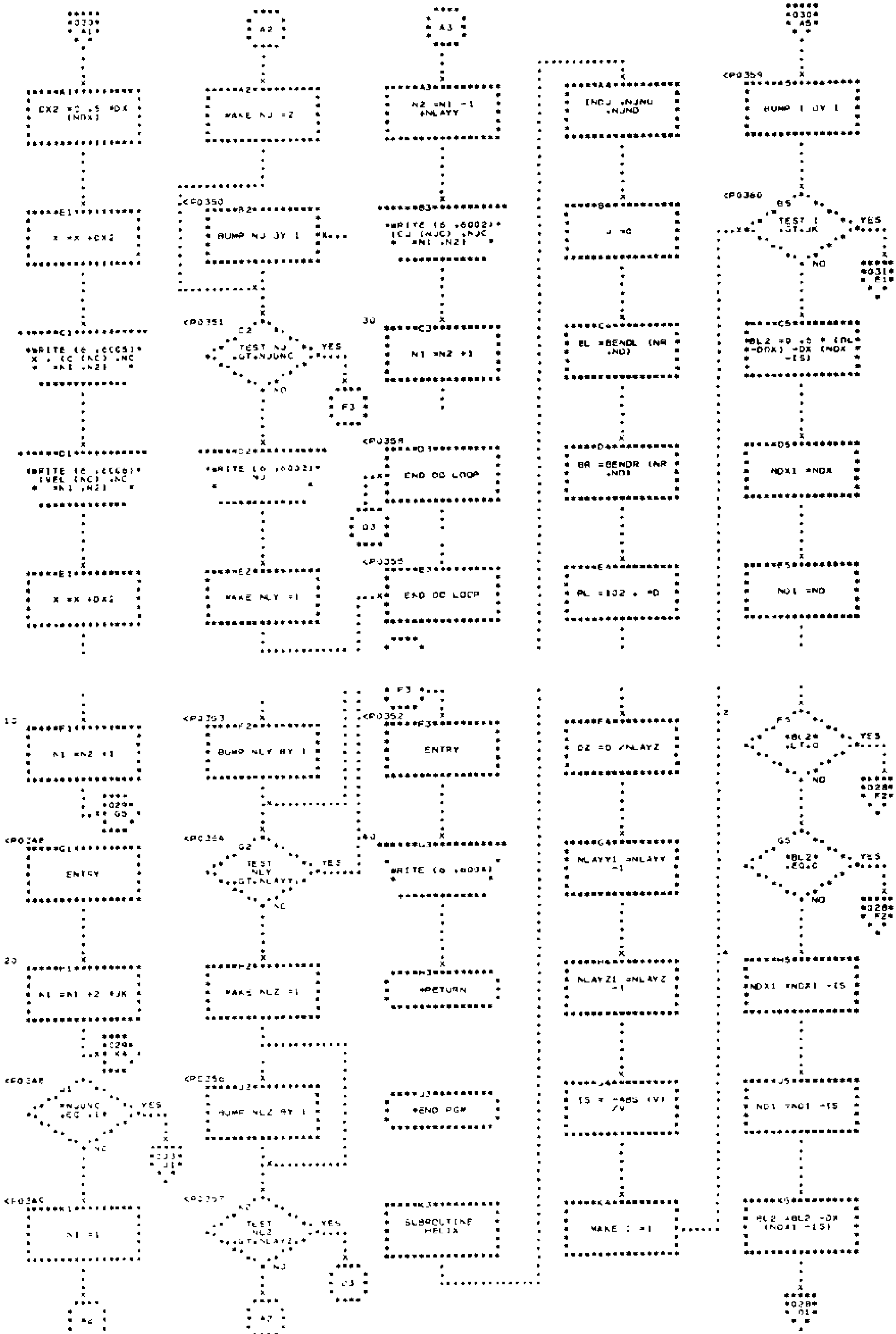

FN =FFX (NC) /CN
FT =FFX (NC) /CN -12 , =FN
FX (NC) =SQRT (ST)
FX (NC) =FN
CONTINUE
ENTRY
MAKE NJC =1
BUMP NJC BY 1
TEST NJC .GT.NJCELL
CJN =CCJ (NJC)
CJN .LT.0.
CJN =2.
ENTRY
CJ (NJC) =CJN
ENTRY
NP .EQ. NPRINT
WRITIT
NPL .EQ.NPLOT
SHOWIT
ENTRY
CONTINUE
WRITIT
CONTINUE
STOP
END PGM
SUBROUTINE ORDER
NO .IOIC
(NOJ .NJNO) =NJND
CHECK DATA ON REACH AND JUNCTION CARDS IS PUNCHE
N =1
MAKE NR =1
BUMP NR BY 1
TEST NR .GT.NREACH
NJU (NR) .GT. NJUNC)
NJU (NR -1) .LT.0
NJU (NR -1) .EQ.0
NRCH (N) =NR
N =N +1
NJNO =NJD (NR)
NJNO -NJUNC .LT.0
NJNO -NJUNC .EQ.0
INDJNO (NR) =4
NRU (NJNO -NR) .LT.0
NRU (NJNO -NR) .EQ.0
INDJNO (NR) =1
NRL (NJNO -NR) .LT.0
YES
NO


MAKE NT =1
BUMP NT BY 1
N3 =NTES -1
N2 =NN2 -1
MAKE NR =N1
BUMP NR BY 1
CONTINUE
STOP
WRITE (6 ,6000)
MAKE NRT =1
BUMP NRT BY 1
N2 =0
N2 =NREACH
N1 =N2 +1
INDJND (NR) =2
INDJND (NR) =3
INDJND (NR) =4
INDJND (NR) =1
NR =NRCH (NNR)
NRCH (N) =NR
YES
NO

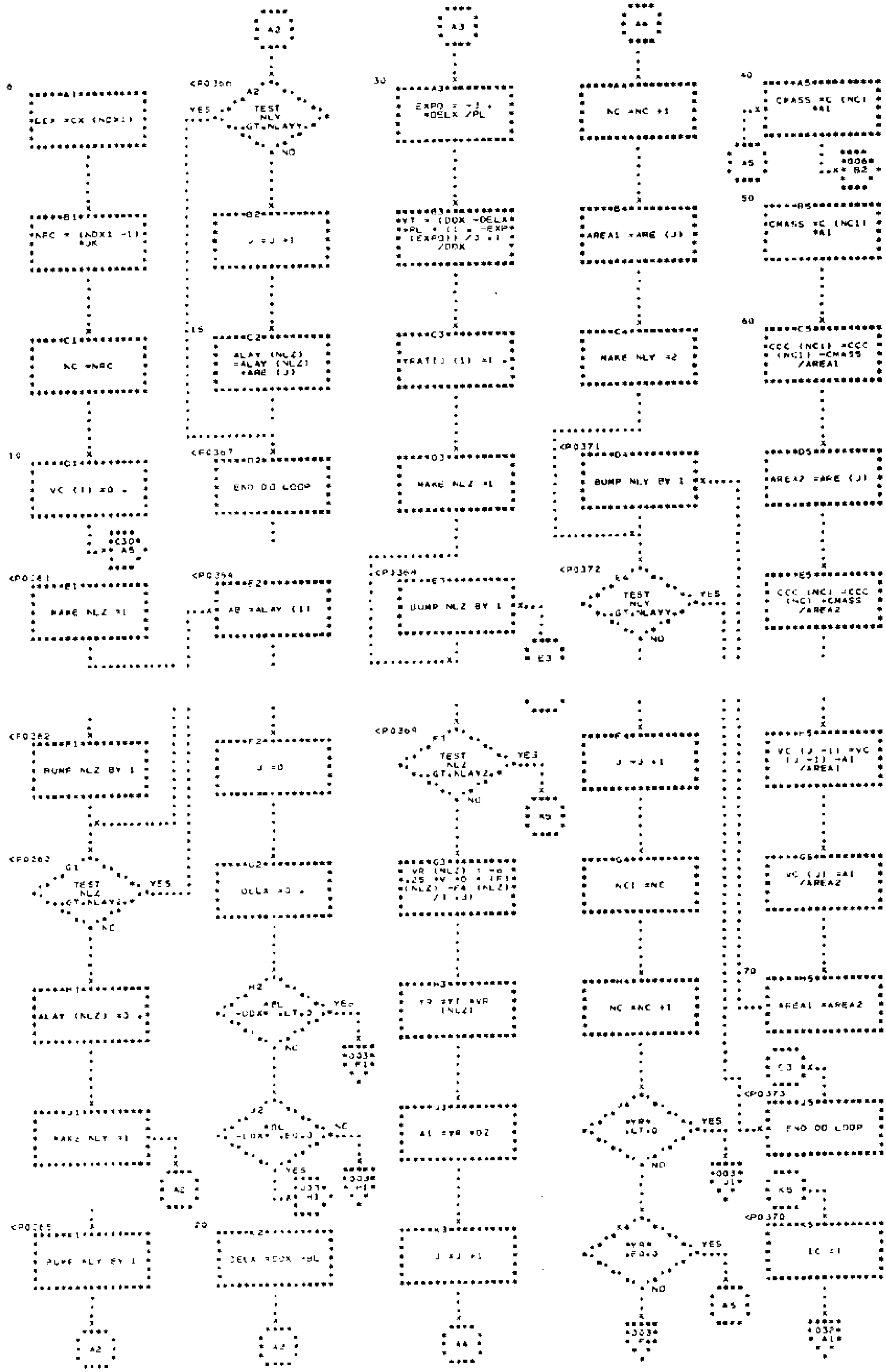

A2
A3
A4
A5
NV =0
OPT .EQ. 1
NO
YES
NCTOT =IQ -NVTOT
MAKE NNR =1
NVTOT =NVTOT +1
QIC (NC) =QICB (NCTOT)
MAKE IQ =1
BUMP NNR BY 1
CIC (NC) =CICB (NCTOT)
BUMP IQ BY 1
TEST NNR .GT.NREACH
NV =NV +1
CONTINUE
END DO LOOP
NVTOT =0
N =N +1
LOCV (NV) =NVTOT
ENTRY
NE =NRCH (NNR)
CONTINUE
MAKE IJ =1
OPTZ (N) =OPT
END DO LOOP
ENTRY
BUMP IQ BY 1
RETURN
TEST IQ .GT.NQ
OPT .EQ.0
N =0
END PGM
NC =0
NC =NC +1
SUBROUTINE MEANO

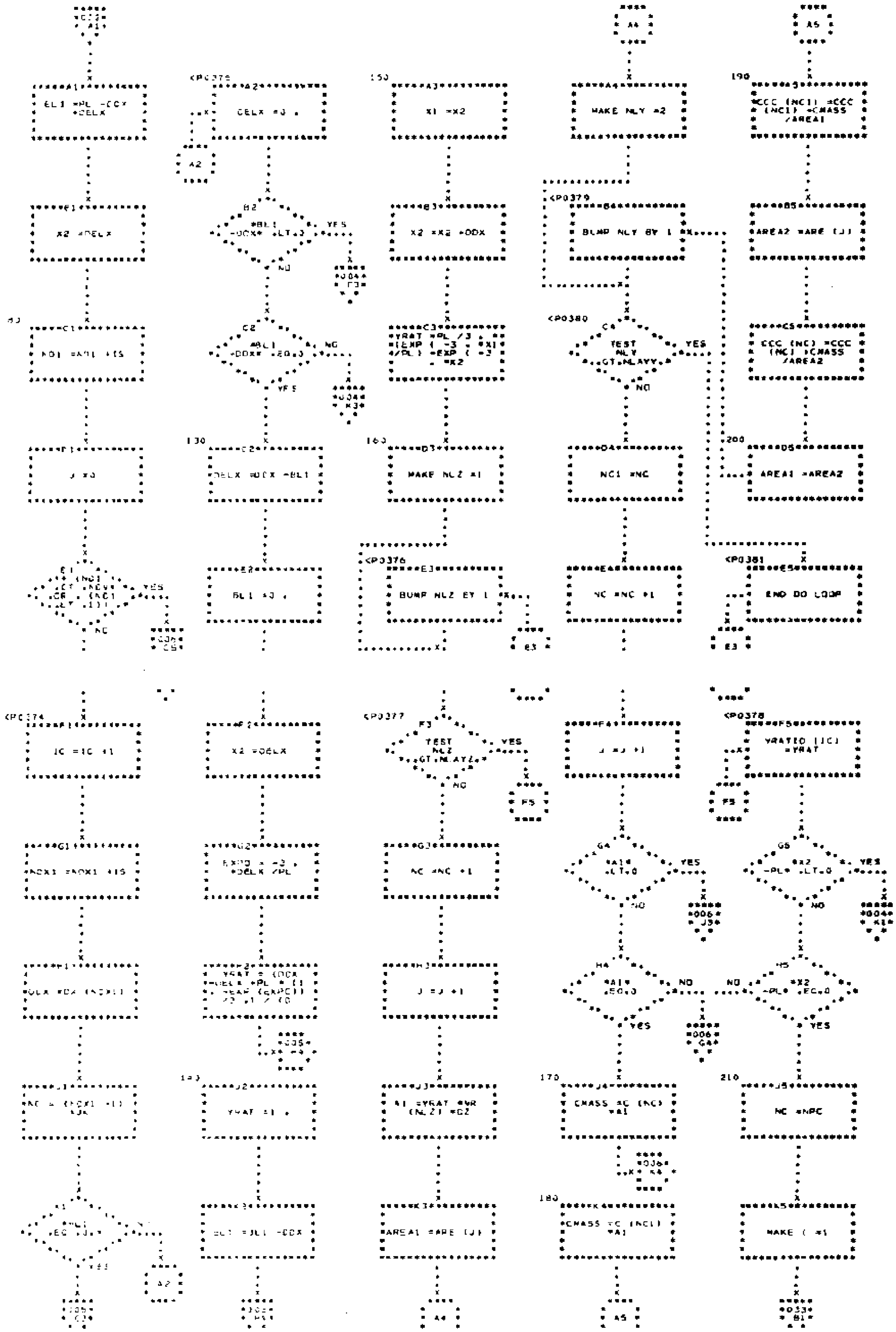

BUMP NLZ BY 1
B2 =B1 +B
BUMP NLY BY 1
TEST NLY GT.NLAYY
TEST NLZ GT.NLAYZ
DELA =0.
END DO LOOP
ENTRY
BUMP NLZ BY 1
TEST NLZ GT.NLAYZ
MAKE NLY =1
MAKE NLZ =1
Y1 =0.
AL =AL +A
YES
NO

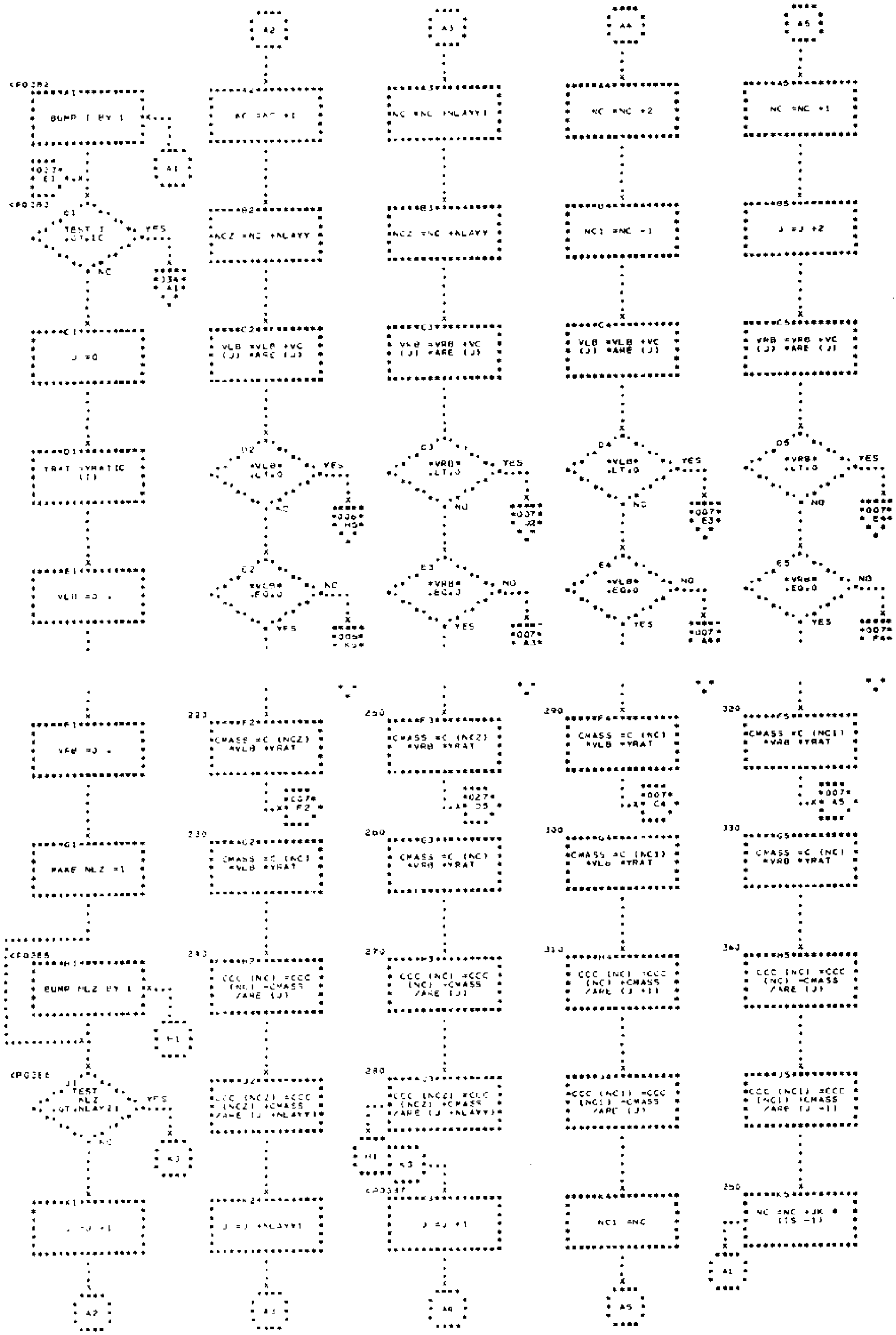

SUBROUTINE WRITIT
TEST NR .GT.NREACH
NOX =NBEGIN (NR)
WIND SPEED = ,F4 .1 ,' FT /SEC) WIND DIRECTION =
NR =0
NOV =NDIV (NR)
TIME =NI *DTH
WANGLE =WANGC *180 /3.141593 +180
MAKE NO =1
BUMP NO BY 1
TEST NO .GT.NOV
MAKE NR =1
BUMP NR BY 1
NOX =NOX +1
END DO LOOP
RETURN
END PGM

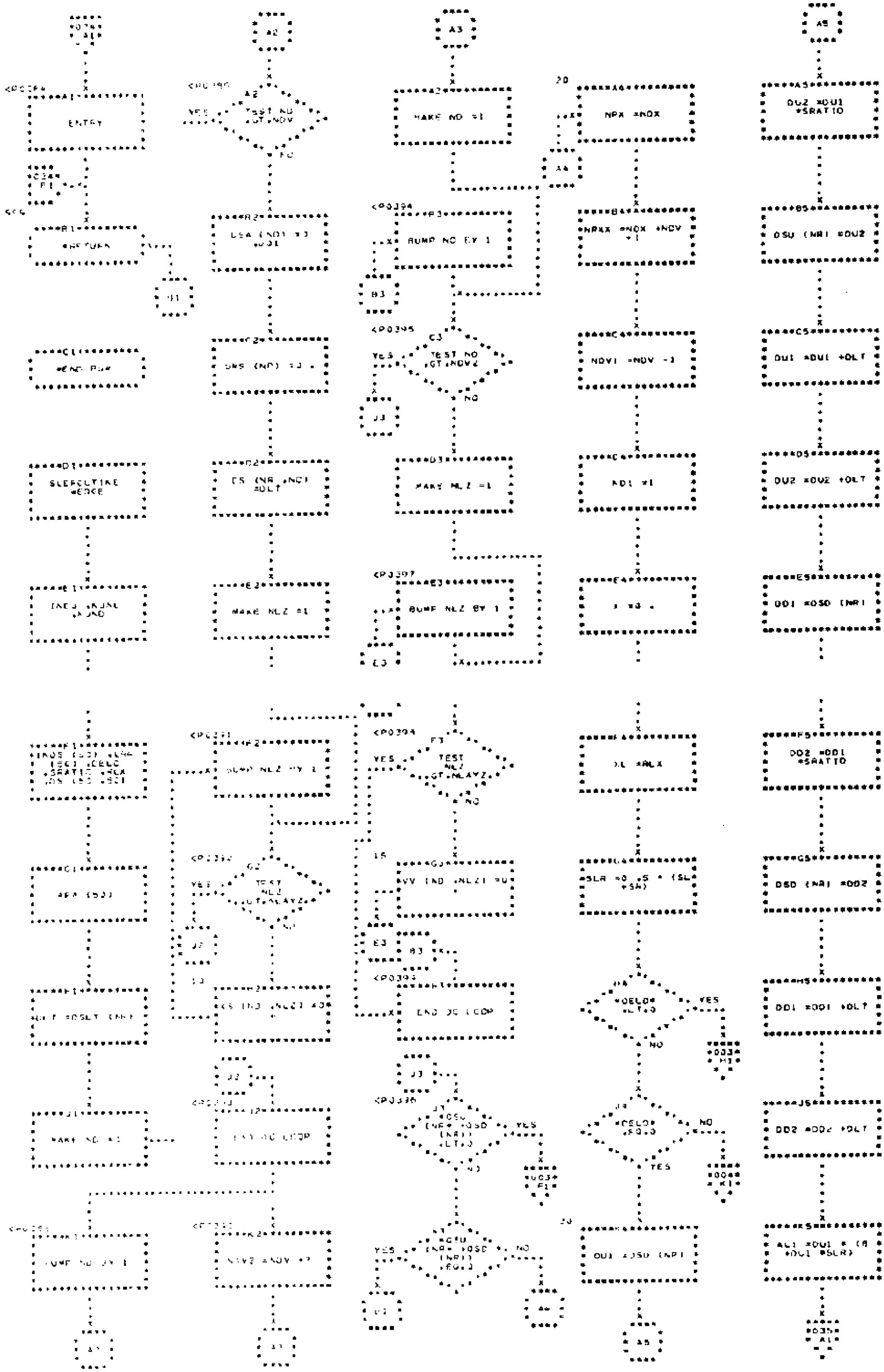


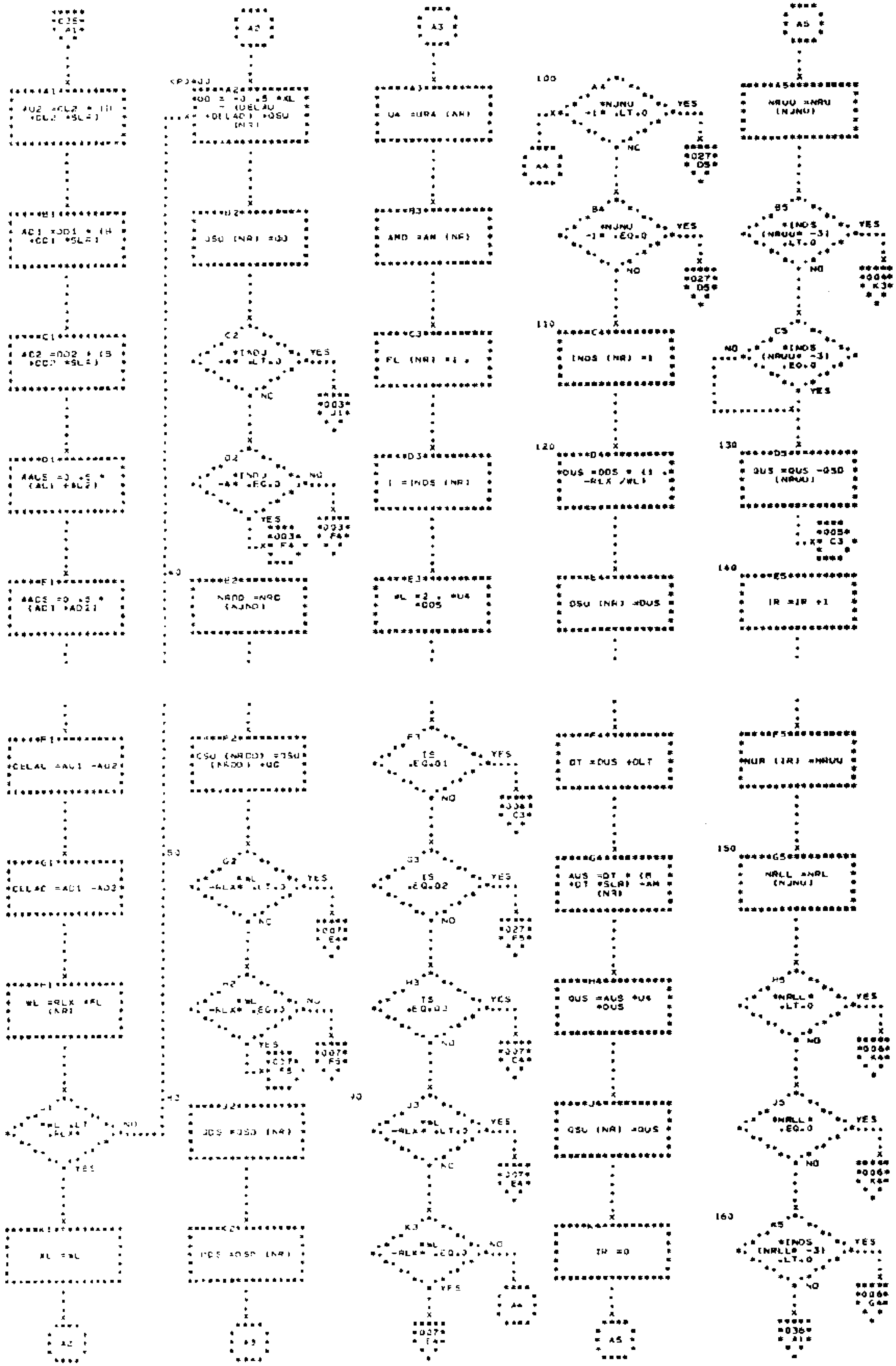
BUMP NJ BY 1
TEST NJ .GT.NJUNC
END DO LOOP
ENTRY
WRITE (6 ,6002)
N1 =N2 +1
MAKE NLY =1
BUMP NLY BY 1
TEST NLY .GT.NLAYY
MAKE NLZ =1
BUMP NLZ BY 1
TEST NLZ .GT.NLAYZ
RETURN
END PGM
SUBROUTINE HELIX
J =0
EL =BENDL (NR ,ND)
BR =BENDR (NR ,ND)
DZ =D /NLAYZ
NLAYY1 =NLAYY -1
NLAYZ1 =NLAYZ -1
IS = ABS (V) /V
MAKE I =1
BUMP I BY 1
TEST I .GT.JK
NDX1 =NDX
ND1 =ND
BL2 .LT.0
BL2 .EQ.0
NDX1 =NDX1 -IS
ND1 =ND1 -IS
BL2 =BL2 -DX (NDX1 -IS)
X =X +DX2
N1 =N2 +1
N1 =1
YES
NO



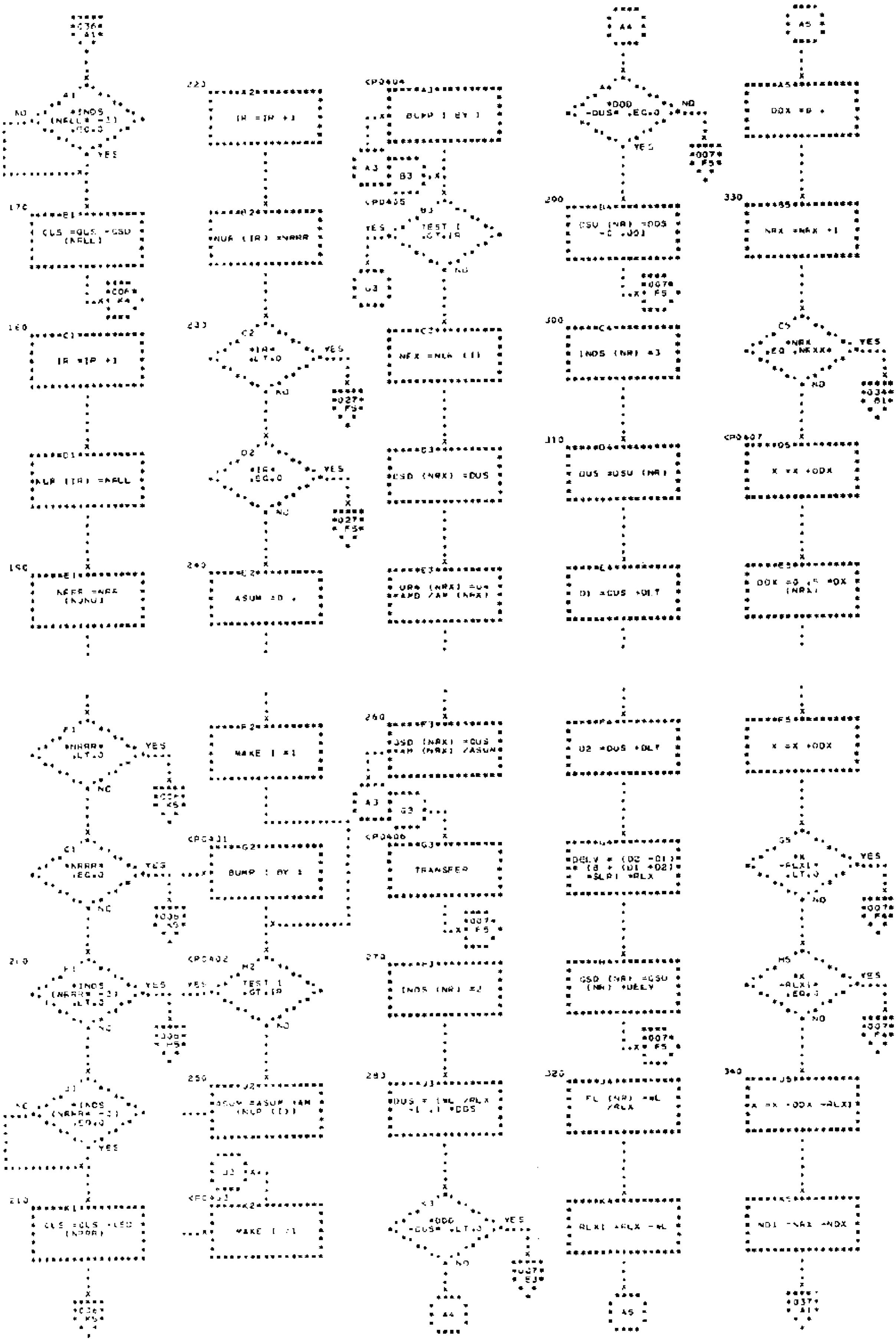

A1
CELX =0 .
A2
X1 =X2
MAKE NLY =2
A4
A5
190
CCC (NC1) =CCC (NC1) +CHASS /AREA1
X2 =DELX
YES
NO
X2 =X2 +DDX
BUMP NLY BY 1
AREA2 =ARE (J)
YES
NO
TEST NLY .GT.NLAYY
YES
NO
CCC (NC) =CCC (NC) +CHASS /AREA2
MAKE NLZ =1
NC1 =NC
AREA1 =AREA2
BUMP NLZ BY 1
NC =NC +1
END DO LOOP
E3
X2 =DELX
TEST NLZ .GT.NLAYZ
YES
NO
F5
YRATIO (IC) =YRAT
NC =NC +1
YES
NO
YES
NO
J =J +1
NO
YES
NO
YES
CHASS =C (NC) *A1
NC =NPC
AREA1 =ARE (J)
CHASS =C (NC1) *A1
MAKE I =1
A2
A4
A5

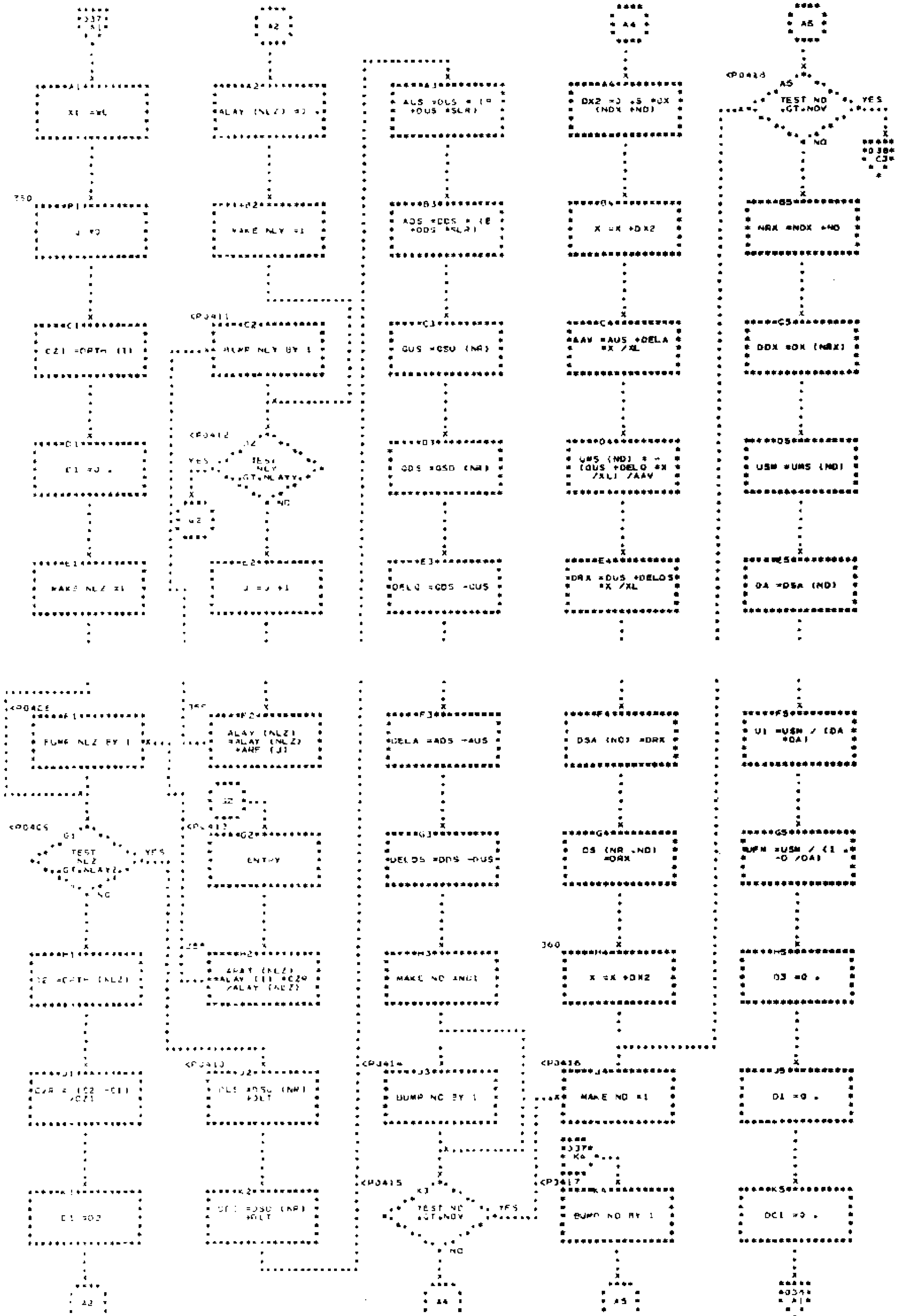


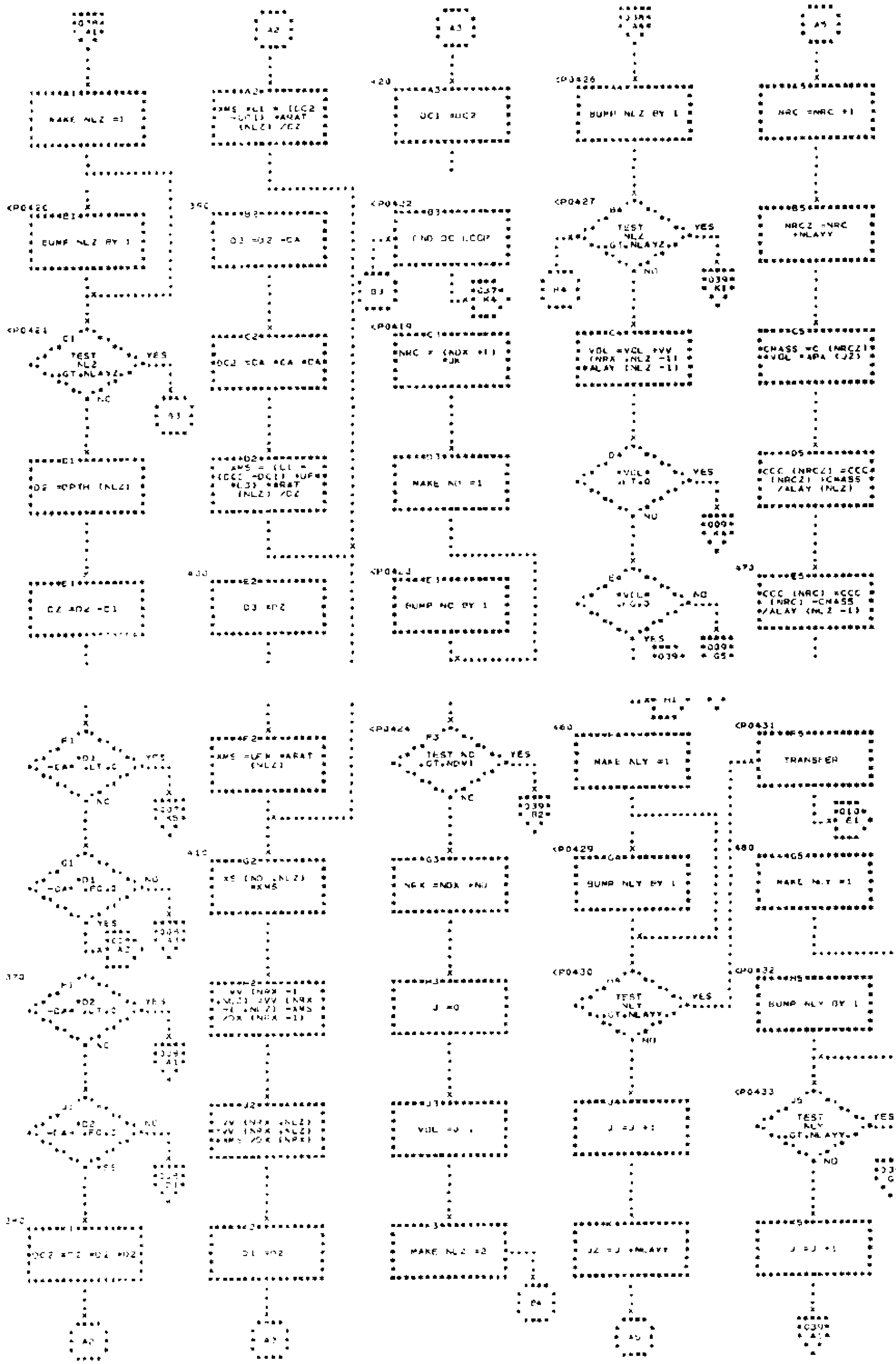

A2
A3
A5
ENTRY
TEST NO GT NDV
YES
NO
MAKE NO =1
NPX =NDX
DU2 =DU1 *SRATIO
RETURN
BUMP NO BY 1
NPXX =NDX +NDV +1
DSU (NR) =DU2
TEST NO GT NDV2
NDV1 =NDV -1
DU1 =DU1 +DLT
MAKE NLZ =1
DU2 =DU2 +DLT
BUMP NLZ BY 1
DD1 =DSD (NR)
DD2 =DD1 *SRATIO
TEST NLZ GT NLAYZ
DSD (NR) =DD2
END DO LOOP
DD1 =DD1 +DLT
DD2 =DD2 +DLT
DU1 =DSD (NR)
AL1 =DU1 * (R *DU1 *SLR)

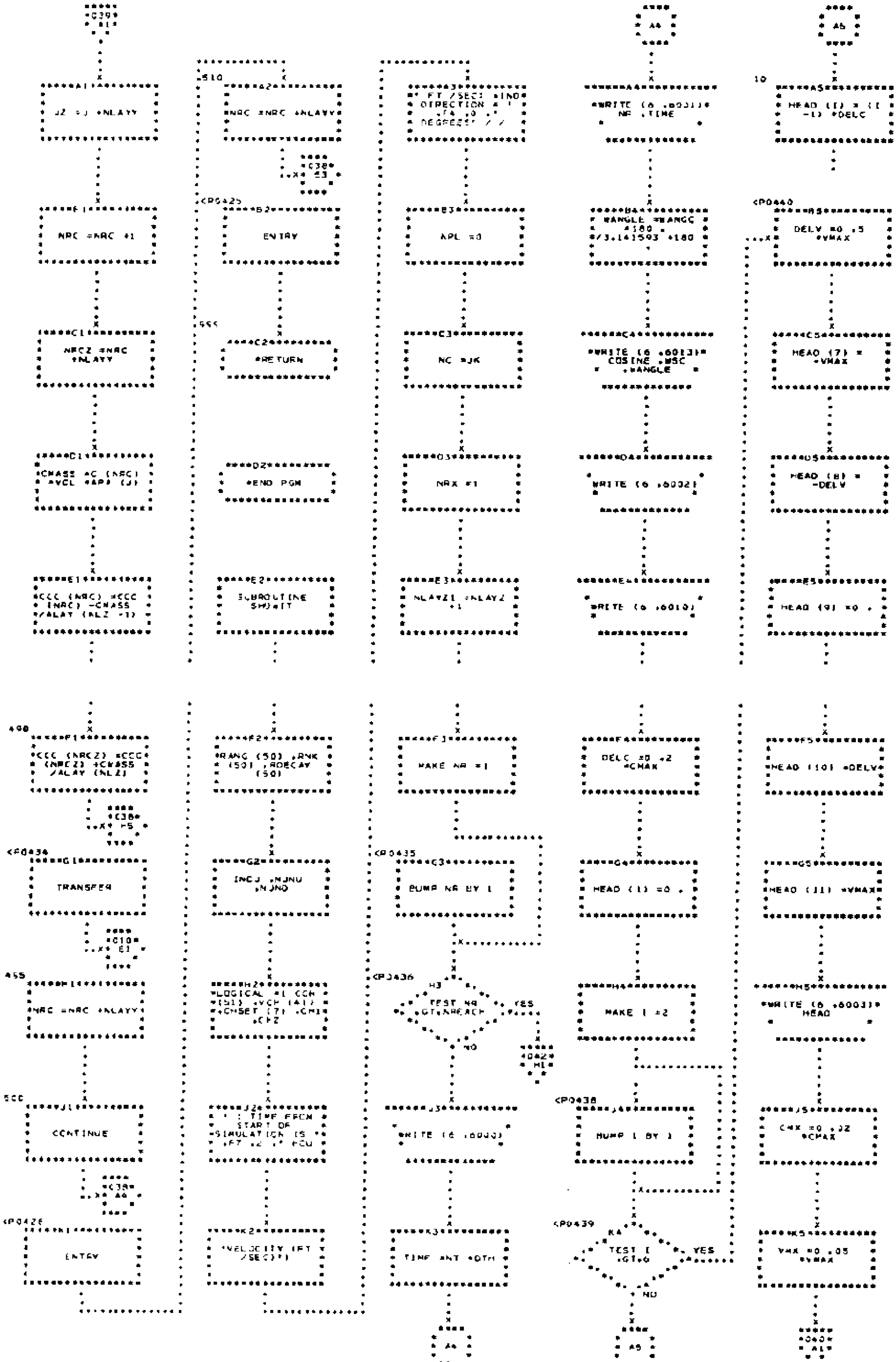


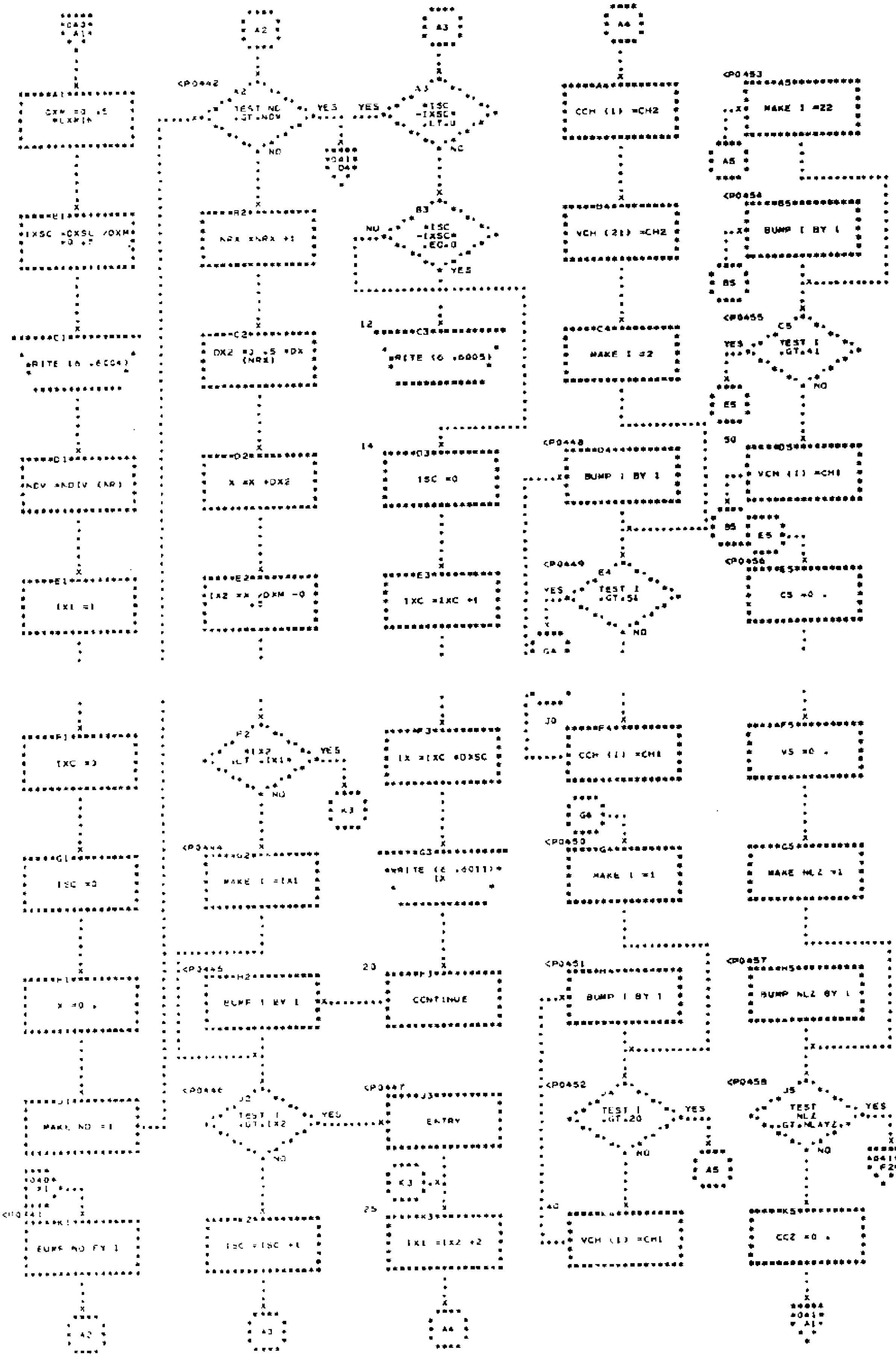
A5
NRUU =NRU (NJNU)
INOS (NR) =1
OSU (NR) =OUS
IR =IR +1
OT =OUS +OLT
OUS =AUS +U4 +OUS
OSU (NR) =OUS
IR =0
NRLL =NRL (NJNU)
YES
NO

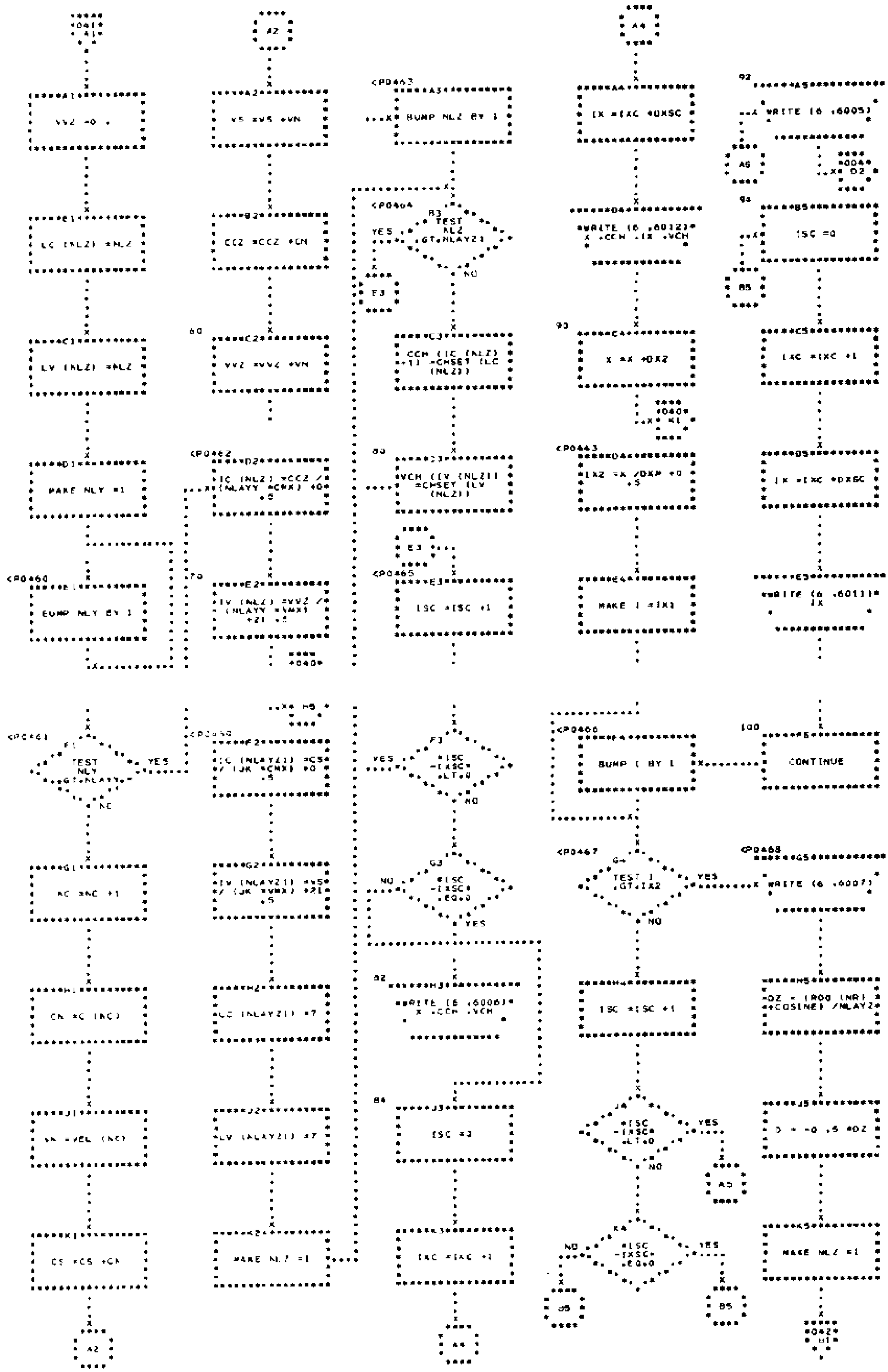


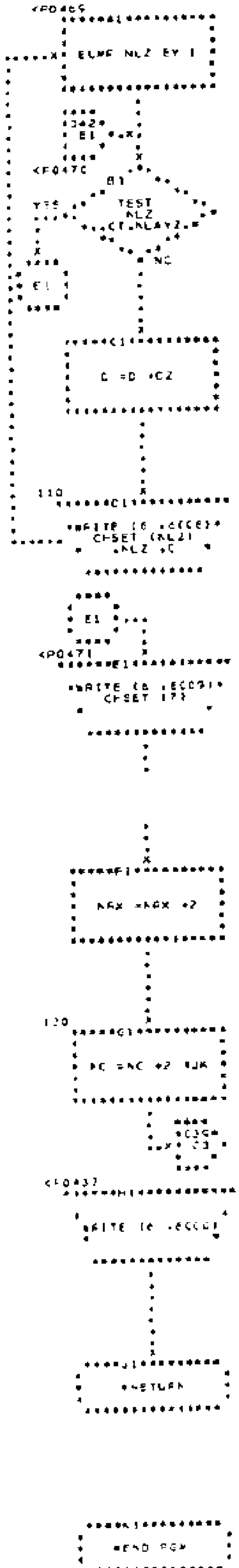

TEST NO .GT.NOV
DX2 =0 .5 *DX (NDX +ND)
X =X +DX2
NRX =NDX +ND
DDX =DX (NRX)
USM =UMS (ND)
DA =DSA (ND)
DSA (ND) =DRX
MAKE ND =ND1
X =X +DX2
MAKE ND =1
BUMP ND BY 1
BUMP NO BY 1
D3 =0 .
D1 =0 .
DC1 =0 .
ENTRY
DELA =ADS -AUS
GUS =GSU (NR)
GDS =GSD (NR)


MAKE NLZ =1
BUMP NLZ BY 1
TEST NLZ .GT.NLAYZ
DZ =DPTH (NLZ)
DC1 =DC2
END DC LOOP
NRC = (NDX +1) *JK
MAKE NC =1
BUMP NC BY 1
BUMP NLZ BY 1
TEST NLZ .GT.NLAYZ
NRC =NRC +1
NRCZ =NRC +NLAYY
TEST NC .GT.NDVI
MAKE NLY =1
TRANSFER
BUMP NLY BY 1
TEST NLY .GT.NLAYY
MAKE NLY =1
BUMP NLY BY 1
TEST NLY .GT.NLAYY
J =0
J =J +1
MAKE NLZ =2
J =J +1
YES
NO


C39 A1
JZ =J +NLAYY
NRC =NRC +1
NRCZ =NRC +NLAYY
CHASS =C (NRC) *VCL *APF (J)
CCC (NRC) =CCC (NRC) -CHASS /ALAY (NLZ -1)
490
CCC (NRCZ) =CCC (NRCZ) +CHASS /ALAY (NLZ)
C38 F5
CP0434
TRANSFER
C10 E1
455
NRC =NRC +NLAYY
500
CONTINUE
C38 A4
CP0426
ENTRY
510
NRC =NRC +NLAYY
C38 E3
CP0425
ENTRY
555
RETURN
END PGM
SUBROUTINE SHU+IT
RANG (50) ,RNK (50) ,ROECAY (50)
INCJ ,NJNU ,NJNO
LOGICAL =L CCH (51) ,VCH (41) ,CHSET (7) ,CHI ,CHZ
: TIME FROM START OF SIMULATION IS FT ,2 ,' FCU
VELOCITY (FT /SEC)
FT /SEC) WIND DIRECTION = F4 ,0 ,' DEGREES) / /
APL =0
NC =JK
NRX =1
NLAYZ1 =NLAYZ +1
MAKE NR =1
CP0435
BUMP NR BY 1
CP0436
H3
TEST NR .GT.NREACH
YES
NO
C42 H1
WRITE (6 ,6000)
TIME ANT +DTH
A4
WRITE (6 ,6001) NR ,TIME
ANGLE =ANGC *180 ./3.141593 +180
WRITE (6 ,6013) COSINE ,WSC ,ANGLE
WRITE (6 ,6002)
WRITE (6 ,6010)
DELC =0 ,2 *CHAX
HEAD (1) =0 .
MAKE I =2
CP0438
BUMP I BY 1
CP0439
K4
TEST I .GT.6
YES
NO
A5
10
HEAD (I) = (I -1) *DELC
CP0440
DELV =0 .5 *VMAX
HEAD (7) = VMAX
HEAD (8) = DELV
HEAD (9) =0 .
HEAD (10) =DELV
HEAD (11) =VMAX
WRITE (6 ,6003) HEAD
CHX =0 ,02 *CMAX
VMX =0 ,05 *VMAX
C40 A1


A2
A3
A4
CP0442
TEST NC .GT.NCV
YES
NO
CCH (1) =CH2
CP0453
MAKE I =22
A5
VCH (21) =CH2
CP0454
BUMP I BY 1
B5
NRX =NRX +1
DX2 =J .5 *DX (NRX)
X =X +DX2
MAKE I =2
CP0455
TEST I .GT.41
E5
ISC =0
CP0448
BUMP I BY 1
VCH (I) =CH1
CP0449
TEST I .GT.51
CP0456
CS =0 .
IXC =IXC +1
IXC =0
IX =IXC +DXSC
CCH (I) =CH1
VS =0 .
MAKE I =1
MAKE NLZ =1
ISC =0
MAKE I =IX1
X =0 .
BUMP I BY 1
CONTINUE
CP0451
BUMP I BY 1
CP0457
BUMP NLZ BY 1
CP0446
TEST I .GT.IX2
CP0447
ENTRY
CP0452
TEST I .GT.20
CP0458
TEST NLZ .GT.NLAYZ
BUMP NO BY 1
ISC =ISC +1
IX1 =IX2 +2
VCH (I) =CH1
CCZ =0 .


041 A1
A2
A4
A1
VVZ =0 .
A2
VS =VS +VN
CP0463 A3
BUMP NLZ BY 1
A4
IX =IXC +DXSC
92 A5
WRITE (6 ,6005)
A6
004 D2
B1
LC (NLZ) =NLZ
B2
CCZ =CCZ +CN
CP0464 B3
TEST NLZ .GT.NLAYZ1
YES
NO
E3
B4
WRITE (6 ,6012) X ,CCH ,IX ,VCH
94 B5
ISC =0
B5
C1
LV (NLZ) =NLZ
60 C2
VVZ =VVZ +VN
C3
CCH (IC (NLZ) +1) =CHSET (LC (NLZ))
90 C4
X =X +DXZ
040 K1
C5
IXC =IXC +1
D1
MAKE NLY =1
CP0462 D2
IC (NLZ) =CCZ / (NLAYY *CMX) +0 .5
80 D3
VCH (IV (NLZ)) =CHSET (LV (NLZ))
CP0443 D4
IXZ =X /DXM +0 .5
D5
IX =IXC +DXSC
E3
CP0460 E1
BUMP NLY BY 1
70 E2
IV (NLZ) =VVZ / (NLAYY =VMX) +Z) .5
040
H5
CP0465 E3
ISC =ISC +1
E4
MAKE I =IX1
E5
WRITE (6 ,6011) IX
CP0461 F1
TEST NLY .GT.NLAYY
YES
NO
CP0459 F2
IC (NLAYZ1) =CS / (JK *CMX) +0 .5
F3
ISC -IXSC .LT.0
YES
NO
CP0466 F4
BUMP I BY 1
100 F5
CONTINUE
G1
NC =NC +1
G2
IV (NLAYZ1) =VS / (JK *VMX) +Z1 .5
G3
ISC -IXSC .EQ.0
NO
YES
CP0467 G4
TEST I .GT.IX2
YES
NO
CP0468 G5
WRITE (6 ,6007)
H1
CN =C (NC)
H2
LC (NLAYZ1) =7
82 H3
WRITE (6 ,6006) X ,CCH ,VCH
H4
ISC =ISC +1
H5
DZ = (ROO (NR) *COSINE) /NLAYZ
J1
VN =VEL (NC)
J2
LV (NLAYZ1) =7
84 J3
ISC =3
J4
ISC -IXSC .LT.0
YES
NO
A5
J5
D = -0 .5 *DZ
K1
CS =CS +CN
K2
MAKE NLZ =1
K3
IXC =IXC +1
K4
ISC -IXSC .EQ.0
NO
YES
B5
B5
K5
MAKE NLZ =1
A2
A4
042 B1


TEST
NLZ
NC
E1
110
120

# APPENDIX F

## PROGRAM LISTING

This appendix contains a listing of the computer program, CANNET3D, a program designed to simulate mass transport in low energy tidal canal networks using a method of second moments.

```
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
C                                                                              C
C        CANNET3D IS A PROGRAM TO SIMULATE THREE-DIMENSIONAL MASS TRANSPORT    C
C        IN LOW ENERGY TIDAL FINGER CANAL NETWORKS, CONSISTING OF PRISMATIC    C
C        CHANNELS WITH TRAPEZOIDAL CROSS-SECTIONS. THE PROGRAM INCORPORATES    C
C        DEAD-ENDS, JUNCTIONS, LAKES, MULTIPLE TIDAL ENTRANCES, AND CAN        C
C        MODEL TRANSIENT CONDITIONS DUE TO TIDES, WIND INDUCED CIRCULATION,    C
C        SALT WEDGE INDUCED DENSITY CURRENTS, BENDS, LATERAL INFLOW, AND       C
C        DECAY. THE SOLUTION TECHNIQUE IS A METHOD OF SECOND MOMENTS, USING    C
C        A FLEXIBLE CELL STRUCTURE.                                            C
C        THE PROGRAM WAS DEVELOPED AT THE HYDRAULIC LABORATORY, DEPARTMENT     C
C        OF CIVIL ENGINEERING, UNIVERSITY OF FLORIDA, GAINESVILLE, FL 32611    C
C                                                                              C
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
      INTEGER OPT,OPT1,OPT2,OPT3,OPT4,OPT5,OPT6,OPT67,OPT7,OPT8,OPT9
      REAL KW,KX,KY,KZ,NZ,LAYZ,KZT
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
C                                                                              C
C        GENERAL NOTATION TO IDENTIFY MOST ARRAYS AND VARIABLES                C
C                                                                              C
C        A...       -    AREA                                                  C
C        C...       -    CONCENTRATION                                         C
C        D...       -    DEPTH                                                 C
C        E...       -    DISPERSION COEFFICIENT                                C
C        F...       -    CENTRE OF MASS                                        C
C        I...       -    COUNTER OR INDICATOR                                  C
C        K...       -    DIMENSIONLESS COEFFICIENT                             C
C        N...       -    NUMBER OF                                             C
C        R...       -    WIDTH OF DISTRIBUTION OR REACH GEOMETRY VARIABLE      C
C        X...       -    LONGITUDINAL DISPLACEMENT                             C
C        V...       -    TIDAL PRISM VOLUME                                    C
C                                                                              C
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
      COMMON/BL1/ OPT1(50),RL(50),RB(50),RDO(50),RSL(50),RSR(50),
     $   RANG(50),RNK(50),RDECAY(50)
      COMMON/BL2/ NRCH(50),NJU(50),NJD(50),INDJND(50),NTES
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      COMMON/BL3/  NRU(50),NRD(50),NRL(50),NRR(50)
      COMMON/BL4/  DPTH(6),DM(50,36),DB,AREAB(50,6),DMIN
      COMMON/BL5/  ARE(50),SL,SR,B,V,D,DX(500),DTS,DDX,NBEGIN(50)
      COMMON/BL6/  OPT2(100),NRQI(100),NQI(100),QIC(50),CIC(50),LOCV(50),
     $    NQ,IQIC
      COMMON/BL7/  FX(2000),RX(2000),VEL(2000),CJ(1000),NT,DTH,NP
      COMMON/BL8/  C(2000),COSINE,CCC(2000),A,WSC,WANGC
      COMMON/BL9/  NREACH,JK,NJUNC,NLAYY,NLAYZ,NR,ND,NDV,NDIV(50),NDX,
     $    INCJ,NJNU,NJND
      COMMON/BL10/ BENDR(50,50),BENDL(50,50),F1(6),F4(6)
      COMMON/BL11/ DSLT(50),XS(50,6),QSU(50),QSD(50),DSU(50),DSD(50),
     $    INDS(50),UR4(50),DELD,SRATIO,RLX,DS(50,50),FL(50),AM(50),
     $    APA(50)
      COMMON/BL12/ NPL,CMAX,VMAX,DXMIN,DXSC
      DIMENSION OPT4(50),OPT5(50),DXJN(50),XW(6),
     $    DYJN(50),DOJN(50),XTAV(6),TAU(5),SUBNEW(5),TEXT(20),
     $    DECAY(2000),VOLNEW(5),AREA(50,36),DEP(50,6),
     $    WS(25),WANG(25),AA(50),CTE(5),QXZ(50),DVX(10),VV1(10),SUMA(6),
     $    WFUNC(6),VOLJ(50),CC(2000),FFX(2000),QL(6),XX(10),DELAC(50),
     $    RRX(2000),CCJ(1000),QIV(50),CIV(50),VJ(1000),VSUM(10),
     $    VU(50,36),VD(50,36),VL(50,36),VR(50,36),
     $    VVU(50,36),VVD(50,36),VVL(50,36),VVR(50,36)
 5000 FORMAT(6I5)
 5001 FORMAT(F10.0,I5,F10.0,2I5)
 5002 FORMAT(8F10.0)
 5003 FORMAT(5X,5I5/8F10.0)
 5004 FORMAT(4I5,2F10.0)
 5005 FORMAT(5X,3F10.0,5I5)
 5006 FORMAT(9F8.0)
 5007 FORMAT(2I5,2F10.0)
 5008 FORMAT(3I5,F10.0)
 5009 FORMAT(20A4)
 6000 FORMAT(' NUMBER OF TEST,NTEST= ',I2/)
 6001 FORMAT(/' NUMBER OF TIME INCREMENTS,NDT= ',I5/
     $    ' TIDAL PERIOD,T= ',F5.2,' HOURS '/
     $    ' NUMBER OF TIME STEPS BETWEEN OUTPUTS,NPRINT= ',I5/
     $    ' NUMBER OF TIME STEPS BETWEEN PLOTS,NPLOT= ',I5/
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     $    ' TIME INCREMENT,DTH= ',F6.4,' HOURS '/
     $    ' TIDAL AMPLITUDE,AMP= ',F5.2,' FEET'/' BACKGROUND',
     $    ' CONCENTRATION OF RECEIVING WATERS,CRW= ',F5.2,' P.P.M.'/
     $    ' DIMENSIONLESS LONGITUDINAL DIFFUSION COEFFICIENT,KX= ',F6.3/
     $    ' DIMENSIONLESS LATERAL DIFFUSION COEFFICIENT,KY= ',F6.3/
     $    ' DIMENSIONLESS VERTICAL DIFFUSION COEFFICIENT,KZ= ',F6.4/
     $    ' BACKGROUND DIFFUSION COEFFICIENT,EO= ',F6.4,' SQ.FT./SEC.'/
     $    ' VERTICAL MOMENTUM TRANSFER COEFFICIENT,NZ= ',F7.5,
     $    ' SQ.FT/SEC.'/' NUMBER OF REACHES,NREACH= ',I3/
     $    ' NUMBER OF JUNCTIONS,NJUNC= ',I2/
     $    ' NUMBER OF LAKES,NLAKE= ',I2/
     $    ' NUMBER OF TIDAL ENTRANCES,NTES= ',I2/
     $    ' NUMBER OF LATERAL LAYERS,NLAYY= ',I1/
     $    ' NUMBER OF VERTICAL LAYERS,NLAYZ= ',I1)
6002 FORMAT(//' DATA FOR JUNCTION NUMBER ',I2,':'/
     $    ' LONGITUDINAL DISTANCE,DXJN= ',F7.2,' FEET'/
     $    ' LATERAL DISTANCE,DYJN= ',F7.2,' FEET'/
     $    ' MEAN TIDAL DEPTH,DOJN= ',F5.2,' FEET')
6003 FORMAT(/' LATERAL INFLOWS:')
6004 FORMAT(' REACH ',I2,' SECTION ',I2,' SECTION CELL ',I2,
     $    ' NETWORK CELL ',I3,' QI= ',F8.6,' CI= ',F7.2,' OPTION= ',I1)
6005 FORMAT(/' DECAY DATA:')
6006 FORMAT(' REACH ',I2,' SECTION ',I2,' SECTION CELL ',I2,
     $    ' NETWORK CELL ',I3,'DECAY COEFF= ',F7.4)
6007 FORMAT(//' DATA FOR REACH NUMBER ',I2,':')
6008 FORMAT (' NUMBER OF DIVISIONS ALONG REACH,NDIV= ',I2/
     $    ' UPSTREAM JUNCTION,NJU= ',I2/' DOWNSTREAM JUNCTION,NJD= ',I2/
     $    ' LENGTH,RL= ',F6.1,' FEET'/' BREADTH,RB= ',F5.1,' FEET'/
     $    ' MEAN TIDAL DEPTH,RDO= ',F5.2,' FEET'/
     $    ' LEFT BANK INVERSE SIDE SLOPE,RSL= ',F5.2/
     $    ' RIGHT BANK INVERSE SIDE SLOPE,RSR= ',F5.2/
     $    ' REACH ALIGNMENT ANGLE ANGLE,RANG= ',F5.1,' DEGREES'/
     $    ' EQUIVALENT SAND ROUGHNESS,RNK= ',F5.2,' FEET'/
     $    ' CONSTANT DECAY COEFFICIENT FOR REACH,RDECAY= ',F8.5,' /HOUR')
6009 FORMAT (' LONGITUDINAL SPATIAL INCREMENTS,DX (OPT1= ' ,I2,'):')
```

```
6010 FORMAT (12(1X,F6.2))
6011 FORMAT(1H1,'CONCENTRATIONS IN P.P.M. AND LONGITUDINAL VELOCITIES',
    $     ' IN FT/SEC.')
6012 FORMAT(/' HARMONIC TIDE STARTING AT LOW TIDE')
6013 FORMAT(/' HARMONIC TIDE STARTING AT HIGH TIDE')
6014 FORMAT(' CONSTANT WIND OF ',F5.2,' M.P.H. AT ',F5.1,' DEGREES')
6015 FORMAT(/' DIGITIZED TIDAL DATA')
6016 FORMAT(' DIGITIZED WIND SPEED AND ANGLE AVERAGED OVER ',F5.2,
    $     ' HOURS (INTERPOLATION FACTOR= ',I2,')')
6017 FORMAT(' ERROR: DX IN TIDAL ENTRANCE REACH TOO SMALL')
6018 FORMAT(/' BEND DATA:')
6019 FORMAT(' REACH ',I2,' SECTION ',I2,' RADIUS ',F7.2,' LENGTH ',
    $     F7.2)
6020 FORMAT(/' SALINE WEDGE DATA:'/
    $     ' DEPTH TO INTERFACE FROM MEAN TIDE,DSM= ',F6.2,' FEET'/
    $     ' DENSITY OF FRESH WATER,RHOF= ',F5.3,' SLUGS/CU.FT.'/
    $     ' DENSITY OF SALT WATER,RHOS= ',F5.3,' SLUGS/CU.FT.'/
    $     ' DIMENSIONLESS WEDGE VELOCITY,U4= ',F6.1)
6021 FORMAT(1X,20A4)
6023 FORMAT(1H1)
6024 FORMAT(/' TIDAL ENTRANCE DATA:')
6025 FORMAT(' TIME DECAY COEFFICIENT FOR TIDAL ENTRANCE ',I1,' = ',
    $     F6.3,' HOURS')
C
C         READ IN CONSTANTS
C         AMP        -     TIDAL AMPLITUDE
C         CRW        -     BACKGROUND CONCENTRATION OF RECIEVING WATER
C         DTH        -     TIME INCREMENT IN HOURS
C         E0         -     BACKGROUND DISPERSION COEFFICIENT
C         KW         -     WIND COEFFICIENT
C         KX         -     DIMENSIONLESS LONGITUDIAL DIFFUSION COEFFICIENT
C         KY         -     DIMENSIONLESS LATERAL DIFFUSION COEFFICIENT
C         KZ         -     DIMENSIONLESS VERTICAL DIFFUSION COEFFICIENT
C         NDT        -     NUMBER OF TIME INCREMENTS
C         NJUNC      -     NUMBER OF INTERNAL JUNCTIONS IN NETWORK
C         NLAKE      -     NUMBER OF LAKES
C         NLAYY      -     NUMBER OF LATERAL LAYERS
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```
C         NLAYZ       -     NUMBER OF VERTICAL LAYERS
C         NPLOT       -     NUMBER OF TIME INCREMENTS BETWEEN PLOTS
C         NPRINT      -     NUMBER OF TIME INCREMENTS BETWEEN OUTPUTS
C         NREACH      -     NUMBER OF REACHES IN NETWORK
C         NTES        -     NUMBER OF TIDAL ENTRANCES
C         NTESTS      -     NUMBER OF TEST RUNS
C         NZ          -     VERTICAL MOMENTUM TRANSFER COEFFICIENT
C         OPT3        -     OPT3= 1: START AT HIGH TIDE OR EBB TIDE
C                     -     OPT3=-1: START AT LOW TIDE OR FLOOD TIDE
C         OPT6        -     OPT6=0: HARMONIC TIDE
C                     -     OPT6=1: READ IN TIDAL DIFERENCES FROM MEAN TIDAL LEVEL
C         OPT7        -     OPT7=0: CONSTANT WIND SPEED AND DIRECTION
C                     -     OPT7=1: READ IN WIND SPEEDS AND DIRECTIONS
C         OPT8        -     OPT8=0: NO SALT WEDGE
C                     -     OPT8=1: SALT WEDGE PRESENT
C         T           -     TIDAL PERIOD IN HOURS
      READ(5,5000)NTESTS
      DO 9999 NTEST=1,NTESTS
      WRITE(6,6000) NTEST
      READ(5,5009) TEXT
      WRITE(6,6021) TEXT
      READ(5,5009) TEXT
      WRITE(6,6021) TEXT
      READ(5,5001) T,NDT,DTH,NPRINT,NPLOT
      READ(5,5002) CMAX,VMAX,DXMIN,DXSC
      READ(5,5002) AMP,CRW,KX,KY,KZ,E0,NZ
      READ(5,5000) NREACH,NJUNC,NLAKE,NTES,NLAYY,NLAYZ
      READ(5,5000) OPT3,OPT6,OPT7,OPT8
      WRITE(6,6001) NDT,T,NPRINT,NPLOT,DTH,AMP,CRW,KX,KY,KZ,E0,NZ,
     $   NREACH,NJUNC,NLAKE,NTES,NLAYY,NLAYZ
C
C         SET UP PROGRAM CONSTANTS
C
          PI=3.141593
          E=2.718282
```

```
      G=32.13
      JTIDE=T/DTH+0.5
      DMIN=2.*AMP/JTIDE
      W=2.*PI/JTIDE
      NLAYZ1=NLAYZ-1
      NLAYY1=NLAYY-1
      JK=NLAYY*NLAYZ
      JKLAY=JK-NLAYY
      JJK=JK*NLAYY
      JKK1=JK+JK+1
      JK1=JK+1
      DTS=DTH*3600.
      RADIAN=PI/180.
      OPT67=OPT6+2*OPT7
      LAYZ=1./NLAYZ
      NZ=0.1*NZ
      KX=KX/8.25
      KY=KY/8.25
C
C     READ IN REACH DATA AND SET UP CELLS
C
C     DX(*)        -     DISTANCE INCREMENT
C     NBEGIN(*) -        POINTER TO BEGINNING OF REACH
C     NDIV(*)      -     NUMBER OF DIVISIONS ALONG REACH
C     NJD(*)       -     NUMBER OF DOWNSTREAM JUNCTION
C     NJU(*)       -     NUMBER OF UPSTREAM JUNCTION
C     NR,NRCH(*)-        NUMBER OF REACH
C     OPT1         -     OPT1= 0: EQUAL DIVISIONS CALCULATED
C                  -     OPT1= 1: UNEQUAL DIVISIONS READ IN
C                  -     OPT1=-1: OPTION CHANGED FROM UNEQUAL TO EQUAL DIVISONS
C     OPT4         -     OPT4=0: INITIAL CONCENTRATIONS IN REACH ARE BACKGROUND
C                  -     OPT4=1: READ IN INITIAL CONCENTRATIONS IN REACH
C     RANG(*)      -     REACH ALIGNMENT ANGLE
C     RE(*)        -     REACH BREADTH
C     RDECAY(*) -        CONSTANT DECAY COEFFICIENT FOR REACH
C     RDO(*)       -     REACH MEAN TIDAL DEPTH
C     RL(*)        -     REACH LENGTH
```

```
C         RNK(*)      -     REACH EQUIVALENT SAND ROUGHNESS
C         RSL(*)      -     REACH LEFT BANK INVERSE SIDE SLOPE
C         RSR(*)      -     REACH RIGHT BANK INVERSE SIDE SLOPE
C
          N1=2
       DO 40 NR=1,NREACH
       READ(5,5003) NDV,NJU(NR),NJD(NR),OPT,OPT4(NR),RL(NR),RB(NR),
     $    RDO(NR),RSL(NR),RSR(NR),RANG(NR),RNK(NR),RDECAY(NR)
          NRCH(NR)=NR
          OPT1(NR)=OPT
          NDIV(NR)=NDV
          NBEGIN(NR)=N1-1
          N2=N1+NDV-1
       IF (OPT)10,10,30
   10     DDX=RL(NR)/NDV
       DO 20 NS=N1,N2
   20     DX(NS)=DDX
       GO TO 40
   30  READ(5,5002)(DX(NS),NS=N1,N2)
   40     N1=N2+3
          NRCELL=(N2+1)*JK
C
C         READ IN JUNCTION DATA
C
C         DXJN(*)     -     LONGITUDINAL LENGTH OF JUNCTION
C         DYJN(*)     -     LATERAL LENGTH OF JUNCTION
C         DOJN(*)     -     MEAN TIDAL DEPTH IN JUNCTION
C         NRD(*)      -     NUMBER OF DOWNSTREAM REACH
C         NRL(*)      -     NUMBER OF LEFT REACH
C         NRR(*)      -     NUMBER OF RIGHT REACH
C         NRU(*)      -     NUMBER OF UPSTREAM REACH
C         OPT5(*)     -     OPT5=0: INITIAL CONCENTRATION IN JUNCTION IS BACKGROUND
C                     -     OPT5=1: READ IN INITIAL CONCENTRATIONS IN JUNCTION
C        VL(*),VR(*)-       TIDAL PRISM VOLUMES IN LEFT AND RIGHT BRANCHES
C      VVL(*),VVR(*)-       CONVECTIVE VOLUME OF WIND INTO JUNCTION FROM LEFT AND
```

```
C                              RIGHT BRANCHES
C
         NJUNC=NJUNC+1
         NJL=NJUNC+NLAKE
         NJUNC1=NJUNC+1
      IF(NJL.EQ.1) GOTO 52
      DO 50 NJ=2,NJL
      READ(5,5005) DXJN(NJ),DYJN(NJ),DOJN(NJ),NRU(NJ),NRD(NJ),NRL(NJ)
     $    ,NRR(NJ),CPT5(NJ)
      IF(NRL(NJ)) 41,41,43
   41 DO 42 J=1,JK
         VVL(NJ,J)=0.
   42    VL(NJ,J)=0.
   43 IF(NRR(NJ)) 44,44,50
   44 DO 45 J=1,JK
         VVR(NJ,J)=0.
   45    VR(NJ,J)=0.
   50 WRITE(6,6002) NJ,DXJN(NJ),DYJN(NJ),DOJN(NJ)
         NJCELL=(NJUNC-1)*JJK
C
C        READ IN TIDAL ENTRANCE DATA
C
C        CTE(*)     -     CONCENTRATION AT TIDAL ENTRANCE
C        TAU(*)     -     TIDAL ENTRANCE TIME DECAY COEFFICIENT
C
   52 READ(5,5002) (TAU(NTE),NTE=1,NTES)
      WRITE(6,6024)
      DO 55 NTE=1,NTES
      WRITE(6,6025) NTE,TAU(NTE)
         CTE(NTE)=CRW
   55    TAU(NTE)=EXP(-3.*DTH/TAU(NTE))
C
C        READ IN AND LOCATE LATERAL INFLOWS
C
C        CIC(*)     -     CONSTANT LATERAL INFLOW CONCENTRATION
C        NC         -     NUMBER OF CROSS-SECTIONAL CELL IN REACH
C        NDX        -     NUMBER OF SECTION
```

```
C           NQI(*)      -     NUMBER OF CELL CONTAINING LATERAL INFLOW
C           NRCI        -     NUMBER OF REACH CONTAINING LATERAL INFLOW
C           NR          -     NUMBER OF CANAL
C           OPT2(*)     -     OPT2= 0: CONSTANT LATERAL INFLOW
C                       -     OPT2= 1: VARIABLE LATERAL INFLOW
C                       -     OPT2=-1: END OF DATA
C           QCI(*)      -     CONSTANT LATERAL INFLOW RATE
C
      WRITE(6,6003)
         IQIC=0
         IQIVT=0
         NQ=0
   70    NQ=NQ+1
      READ(5,5004) OPT,NR,NDX,NC,CQI,CCI
         OPT2(NQ)=OPT
      IF(OPT.LT.0) GOTO 100
         NCELL=(NBEGIN(NR)+NDX-1)*JK+NC
         NRCI(NQ)=NR
         NQI(NQ)=NCELL
      WRITE(6,6004)NR,NDX,NC,NCELL,CQI,CCI,OPT
      IF(OPT) 100,80,90
   80    IQIC=IQIC+1
         QIC(IQIC)=CQI
         CIC(IQIC)=CCI
      GOTO 70
   90    IQIVT=IQIVT+1
      GOTO 70
  100    NQI(NQ)=9999
         NRCI(NQ)=9999
C
C           READ IN AND LOCATE DECAY DATA
C
C           DECAY(*)    -     DECAY COEFFICIENT
C           NC          -     NUMBER OF CROSS-SECTIONAL CELL IN REACH
C           NDE(*)      -     NUMBER OF CELL CONTAINING DECAY TERM
```

```
C          NDX          -     NUMBER OF SECTION
C          NR           -     NUMBER OF REACH
C                       -     NR=-1: END OF DATA
C
           ND=1
        WRITE(6,6005)
        DO 110 NC=1,NRCELL
  110      DECAY(NC)=0.
  120   READ(5,5008) NR,NDX,NC,DEC
        IF (OPT)140,130,130
  130      NCELL=(NBEGIN(NR)+NDX-1)*JK+NC
           DECAY(NCELL)=DEC
        WRITE(6,6006) NR,NDX,NC,NCELL,DEC
           ND=ND+1
        GOTO 120
C
C          READ IN AND LOCATE BENDS
C
C          BENDR(*,*)-    RADIUS OF BEND
C          BENDL(*,*)-    CENTER-LINE LENGTH OF BEND
C         F1(*),F4(*)-    ROZOVSKII'S FUNCTIONS
C
  140   WRITE(6,6018)
           IB=0
        DO 142 NR=1,NREACH
           NDV=NDIV(NR)
        DO 142 ND=1,NDV
  142      BENDR(NR,ND)=0.
  144   READ(5,5007) NR,NDX,BR,BL
        IF(NR) 146,146,145
  145      BENDR(NR,NDX)=BR
           BENDL(NR,NDX)=BL
           IB=IB+1
        WRITE(6,6019) NR,NDX,BR,BL
        GOTO 144
  146   IF(IB.EQ.0) GOTO 149
           FT1=0.
```

```
      FT3=0.
      DO 148 NLZ=1,NLAYZ
      Z=NLZ*LAYZ
      P=Z-1.
      FT2=0.
      IS=1
      DO 147 I=1,5
      FT2=FT2+P**(I+1)/((I+1)*I*I)*IS
  147 IS=-IS
      FT2=2.*FT2+1.28987*P
      F1(NLZ)=2.*(FT2-FT1)*NLAYZ
      FT1=FT2
      FT4=Z*(-2.8845+Z*(4.6818-1.7297*Z))
      F4(NLZ)=NLAYZ*(FT4-FT3)
  148 FT3=FT4
C
C     SET UP INITIAL SALINE CONDITIONS
C
C     DSM       -   ELEVATION OF INTERFACE BELOW MEAN SEA LEVEL
C     RHOF      -   DENSITY OF FRESHWATER
C     RHOS      -   DENSITY OF SALTWATER
C     DSLT(*)   -   ELEVATION OF INTERFACE AT LOW TIDE
C     XS(*,*)   -   DISTANCE MOVED BY DENSITY CURRENT
C     U4TE      -   VALUE OF U4 AT TIDAL ENTRANCE
C
  149 IF(OPT8) 160,160,150
  150 READ(5,5002) DSM,RHOF,RHOS,U4TE
      WRITE(6,6020) DSM,RHOF,RHOS,U4TE
      DSMLT=DSM+AMP
      RIT=G*(1.-RHOF/RHOS)
      DO 155 NR=1,NREACH
      DSU(NR)=0.
      DSD(NR)=0.
      SALTH=RDO(NR)-DSMLT
      IF(SALTH.LT.0.) SALTH=0.
```

```
      AM(NR)=SALTH*(RB(NR)+0.5*SALTH*(RSL(NR)+RSR(NR)))
155   DSLT(NR)=SALTH
160 DO 165 ND=1,50
    DO 165 NLZ=1,NLAYZ
165   XS(ND,NLZ)=0.
C
C     ORDER REACHES FROM UPSTREAM TO TIDAL ENTRANCES
C
    CALL ORDER
C
C     SET UP BUFFER CELLS AT ENDS OF REACHES
C
    DO 63 NR=1,NREACH
      INDJ=INDJND(NR)
      NJNU=NJU(NR)
      NDX=NBEGIN(NR)
    IF(NJNU-1) 56,56,57
 56   DX(NDX)=DX(NDX+1)
    GOTO 58
 57   DX(NDX)=DXJN(NJNU)/NLAYY
 58   NDX=NDX+NDIV(NR)
    GOTO (60,61,61,62), INDJ
 60   DX(NDX+1)=DXJN(NJD(NR))/NLAYY
    GOTO 63
 61   DX(NDX+1)=DYJN(NJD(NR))/NLAYY
    GOTO 63
 62   DX(NDX+1)=DX(NDX)
 63 CONTINUE
C
C     WRITE CANAL DATA
C
    WRITE(6,6023)
      N1=2
    DO 170 NR=1,NREACH
    WRITE (6,6007)NR
      NDV=NDIV(NR)
    WRITE (6,6008)NDV,NJU(NR),NJD(NR),RL(NR),RB(NR),RDO(NR),
```

```
     $    RSL(NR),RSR(NR),RANG(NR),RNK(NR),RDECAY(NR)
          RNK(NR)=29.7/RNK(NR)/E
          N2=N1-1+NDV
        WRITE (6,6009)OPT1(NR)
        WRITE (6,6010)(DX(NS),NS=N1,N2)
  170     N1=N2+3
C
C         INITIALIZE ARRAYS IN REACHES
C
C         C(*)        -    CONCENTRATION
C         F(*)        -    CENTER OF MASS
C         R(*)        -    WIDTH OF DISTRIBUTION
C         VEL(*)      -    LONGITUDINAL VELOCITY
C
          N1=JK1
      DO 230 NR=1,NREACH
          N2=N1-1+NDIV(NR)*JK
      IF (OPT4(NR))180,180,200
  180 DO 190 NC=N1,N2
  190     C(NC)=CRW
          GO TO 210
  200 READ(5,5006)(C(NC),NC=N1,N2)
  210 DO 220 NC=N1,N2
          FX(NC)=0.
          RX(NC)=1.
  220     VEL(NC)=0.
  230     N1=N2+JKK1
C
C         INITIALIZE ARRAYS IN JUNCTIONS
C
C         CJ(*)       -    CONCENTRATION IN JUNCTION
C         FJ(*)       -    CENTER OF MASS
C         RJ(*)       -    WIDTH OF MASS
C
      IF(NJL.EQ.1) GOTO 295
```

```
      N1=1
      DO 290 NJ=2,NJL
      OPT=OPTS(NJ)
      DO 285 NLY=1,NLAYY
      DO 285 NLZ=1,NLAYZ
      N2=N1-1+NLAYY
      IF (OPT) 240,240,260
  240 DO 250 NJC=N1,N2
  250 CJ(NJC)=CRW
      GOTO 285
  260 READ(5,5006) (CJ(NJC),NJC=N1,N2)
  285 N1=N2+1
  290 CONTINUE
C
C        SET INITIAL WIND AND TIDE CONDITIONS
C
C        COSINE     -    DIFFERENCE BETWEEN WATER SURFACE ELEVATION AND MEAN TIDE
C        INTERP     -    INTERPOLATION FACTOR BETWEEN DATA POINTS
C        WS(*)      -    WIND SPEED
C        WANG(*)    -    WIND ANGLE
C        WSC        -    CONSTANT WIND SPEED
C        WANGC      -    CONSTANT WIND ANGLE
C        WTIME      -    AVERAGING TIME OF WIND DATA
C
  295 WRITE (6,6011)
      GOTO (340,350,390),OPT67
  300 IF (OPT3)310,310,320
  310 WRITE (6,6012)
       AMP=-AMP
      GOTO 330
  320 WRITE (6,6013)
  330  COSINE=AMP
      READ (5,5002)WSC,WANGC
      WRITE (6,6014)WSC,WANGC
       WSC=WSC*1.46667
       WANGC=WANGC*RADIAN-PI
      GOTO 400
```

```
340 WRITE (6,6015)
    WRITE (6,6014)WSC,WANGC
       WSC=WSC*1.46667
       WANGC=WANGC*RADIAN-PI
    READ (5,5001)COSINE
    GOTO 400
350 IF (OPT3)360,360,370
360 WRITE (6,6012)
       AMP=-AMP
    GOTO 380
370 WRITE (6,6013)
380    COSINE=AMP
    READ(5,5001)WTIME,INTERP
    READ(5,5002) DUMMY,WS1,ANG1
    GOTO 395
390 WRITE(6,6015)
    READ(5,5001)WTIME,INTERP
    READ (5,5002)COSINE,WS1,ANG1
       COSINE=COSINE-1.
395    NW=WTIME/(DTH*INTERP)+0.1
    IF(NW.LT.1) NW=1
       WS1=WS1*1.46667
       WS(1)=WS1
       ANG1=ANG1*RADIAN-PI
       WSC=WS1
       WANGC=ANG1
       WANG(1)=ANG1
       IW=2
    IF(NW.EQ.1)IW=1
    WRITE (6,6016) WTIME,INTERP
C
C          SET UP CELL AREAS AND MEAN DEPTHS
C
C  AREA(*,*),ARE(*)-     CROSS-SECTIONAL AREAS OF CELLS IN REACH
C  DEP(*,*),DPTH(*)-     DEPTH TO LAYERS IN REACH
```

```
C
  400 DO 405 NR=1,NREACH
          DL=(RDO(NR)+COSINE)*LAYZ
          SL=RSL(NR)
          SR=RSR(NR)
          B=RE(NR)
          JC=0
          AP=0.
      DO 402 NLZ=1,NLAYZ
          D=DL*NLZ
          A=D*(B+.5*D*(SL+SR))
          AC=(A-AP)/NLAYY
          AP=A
          DPTH(NLZ)=D
          DEF(NR,NLZ)=D
          AREAB(NR,NLZ)=AC
      DO 402 NLY=1,NLAYY
          JC=JC+1
          AREA(NR,JC)=AC
  402     ARE(JC)=AC
          DB=D
      CALL MEAND
  405 CONTINUE
C
C         WRITE INITIAL CONCENTRATION DISTRIBUTION
C
          NT=0
      CALL WRITIT
C
C         SET UP INITIAL ARRAYS AND VARIABLES
C
C         AA(*)      -     PREVIOUS CROSS-SECTIONAL AREA
C         WFUNC(*)   -     WIND FUNCTION
C
      DO 420 NR=1,NREACH
          RAN=RANG(NR)
      IF(RAN.GT.180.) RAN=RAN-360.
```

```
          RANG(NR)=RAN*RADIAN
          D=RDO(NR)+COSINE
  420     AA(NR)=D*(.5*D*(RSL(NR)+RSR(NR))+RB(NR))
          TERM=.25*NLAYZ*DTS
          Z1=0.
       DO 430 NLZ=1,NLAYZ
          Z2=NLZ*LAYZ
          WFUNC(NLZ)=TERM*(Z2*Z2*(Z2-1.)-Z1*Z1*(Z1-1.))
  430     Z1=Z2
       DO 435 NLY=1,NLAYY
  435     XX(NLY)=0.
          IWC=0
          JT=0
          DELD=0.
          NPL=0
          NIW=0
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
C                                                                              C
C         BEGIN TRANSIENT SOLUTION                                             C
C                                                                              C
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
       DO 2000 NT=1,NDT
          NP=NP+1
          NPL=NPL+1
          JT=JT+1
        IF(JT.EQ.JTIDE) JT=0
          COSP=COSINE
C
C         SET UP WIND AND TIDAL CONDITIONS
C
C         COSINE     -    ELEVATION OF WATER SURFACE FROM MEAN SEA LEVEL
C         COSP       -    VALUE OF COSINE AT PREVIOUS TIME STEP
C         DELD       -    INCREASE IN DEPTH IN TIME INTERVAL
C         DELDP      -    VALUE OF DELD AT PREVIOUS TIME STEP
C
```

```
      GOTO(450,460,470),OPT67
440      COSINE=AMP*COS(W*JT)
      GOTO 513
450   READ (5,5001)COSINE
      GOTO 513
460      COSINE=AMP*COS(W*JT)
      IF(IWC.GT.0) GOTO 511
      READ(5,5002) DUMMY,WSP,WANGLE
      GOTO 480
470   IF(IWC.GT.0) GOTO 511
      READ(5,5002) COSINE,WSP,WANGLE
         COSINE=COSINE-1.
         DELCOS=(COSINE-COSP)/INTERP
480      WANG(IW)=WANGLE*RADIAN-PI
         WS(IW)=WSP*1.46667
      IF(NIW.LT.NW) NIW=IW
      IF(IW-NW)500,490,490
490      NIW=NW
         IW=0
500      WSX=0.
         WSY=0.0001
      DO 510 NNW=1,NIW
         WSX=WSX+WS(NNW)*SIN(WANG(NNW))
510      WSY=WSY+WS(NNW)*COS(WANG(NNW))
         WSX=WSX/NIW
         WSY=WSY/NIW
         WS2=SQRT(WSX*WSX+WSY*WSY)
         ANG2=ATAN(WSX/WSY)
      IF(WSY) 501,511,511
501   IF(WSX) 502,503,504
502      ANG2=ANG2-PI
      GOTO 511
503      ANG2=ANG1
      GOTO 511
504      ANG2=ANG2+PI
511      IWC=IWC+1
         WSC=WS1+IWC*(WS2-WS1)/INTERP
```

```
          WANGC=ANG1+IWC*(ANG2-ANG1)/INTERP
      IF(OPT6.EQ.1) COSINE=COSP+DELCOS
      IF(IWC-INTERP) 513,512,512
  512     IWC=0
          IW=IW+1
          WS1=WS2
          ANG1=ANG2
  513     DELDP=DELD
          DELD=COSINE-COSP
C
C         SET  INITIAL  SALINE  CONDITIONS
C
C         DTE        -    ELEVATION OF INTERFACE FROM LOW TIDE VALUE AT TIDAL ENT.
C         DSLT(*)    -    LOW TIDE ELEVATIONS OF INTERFACE
C         DSTE       -    ELEVATION OF INTERFACE AT TIDAL ENTRANCE
C         DSD(*)     -    ELEVATION OF INTERFACE AT DOWNSTREAM SECTION OF REACH
C         DSU(*)     -    ELEVATION OF INTERFACE AT UPSTREAM SECTION OF REACH
C         QSD(*)     -    VOLUME TRANSPORT THROUGH DOWNSTREAM SECTION OF REACH
C         QSU(*)     -    VOLUME TRANSPORT THROUGH UPSTREAM SECTION OF REACH
C
          DSTE=0.
      IF(OPT8) 524,524,514
  514 IF((DELD.GE.0.).AND.(DELDP.LE.0.)) GOTO 515
      GOTO 517
  515 DO 516 NR=1,NREACH
          UR4(NR)=0.
          INCS(NR)=0
          QSU(NR)=0.
  516     QSD(NR)=0.
  517     DSTE=RDO(NREACH)-DSM+COSINE
          DTE=DSTE-DSLT(NREACH)
      IF(DSTE) 522,522,519
  519 IF(DELD) 520,522,521
  520     SRATIO=DTE/(DTE-DELD)
      GOTO 524
```

```
521     QSD(NREACH)=U4TE*DELD*(DSTE*(RB(NREACH)+0.5*DSTE*(RSL(NREACH)+
   $    RSR(NREACH)))-AM(NREACH))
        DSD(NREACH)=DTE
        UR4(NREACH)=U4TE
      GOTO 524
522     DSTE=0.
      DO 523 ND=1,50
      DO 523 NLZ=1,NLAYZ
523     XS(ND,NLZ)=0.
C
C       READ LATERAL INFLOW DATA
C
C       CIV(*)     -    VARIABLE LATERAL INFLOW CONCENTRATION
C       QIV(*)     -    VARIABLE LATERAL INFLOW RATE
C
524   IF(IQIVT.EQ.0) GOTO 525
      READ(5,5002) (QIV(IQ),CIV(IQ),IQ=1,IQIVT)
C
C       INITIALIZE ARRAYS FOR TIME STEP
C
C       CC(*)      -    STORES CONVECTED MASS IN CELL
C       CCC(*)     -    STORES DISPERSED MASS IN CELL
C       FFX(*)     -    STORES CENTRE OF MASS IN CELL
C       RRX(*)     -    STORES SECOND MOMENT OF DISTRIBUTION
C       VOLJ(*)    -    TIDAL PRISM VOLUME IN JUNCTION
C
525   IF(NJL.EQ.1) GOTO 535
        N1=1
      DO 530 NJ=2,NJL
530     VOLJ(NJ)=DXJN(NJ)*DYJN(NJ)*DELD
535     VOLJ(NJL+1)=0.
      DO 536 NRC=1,NRCELL
        CC(NRC)=0.
        CCC(NRC)=0.
        FFX(NRC)=0.
536     RRX(NRC)=0.
C
```

```
C         SET UP LAKE CONCENTRATIONS
C
      IF(NLAKE) 541,541,537
  537 DO 540 NL=NJUNC1,NJL
         NR=NRD(NL)
         NDX=NBEGIN(NR)-1
         NC=NDX*JK
      DO 539 J=1,JK
         NC=NC+1
         C(NC)=CJ(NL)
         FX(NC)=0.
  539    RX(NC)=1.
  540 CONTINUE
C
C         SET CONSTANTS AND INITIALIZE COUNTERS FOR TIME STEP
C
C         IQIC      -    CONSTANT LATERAL INFLOW COUNTER
C         IQIV      -    VARIABLE LATERAL INFLOW COUNTER
C         NQ        -    LATERAL INFLOW COUNTER
C         NCTE      -    TIDAL ENTRANCE COUNTER
C
  541    IQIC=0
         IQIV=0
         NQ=0
         NCCI=NQI(1)
         NCTE=0
      DO 642 NNR=1,NREACH
C
C         CONSTANTS FOR REACH
C
         NR=NRCH(NNR)
         NDV=NDIV(NR)
         RLX=RL(NR)
         D0=RD0(NR)
         D=D0+CCSINE
```

```
          SL=RSL(NR)
          SR=RSR(NR)
          RNK1=RNK(NR)
          B=RB(NR)
          A=D*(B+.5*D*(SL+SR))
          AP=AA(NR)
          AA(NR)=A
          DELA=A-AP
          NJNU=NJU(NR)
          NJND=NJD(NR)
          INCJ=INDJND(NR)
      IF(NJNU-1) 542,542,543
  542     V=0.
      GOTO 544
  543     V=VOLJ(NJNU)
  544     WIND=WSC*COS(WANGC-RANG(NR))
          AWIND=ABS(WIND)
      IF(WIND-49.3) 545,546,546
  545     KW=0.0000006*SQRT(AWIND)
      GOTO 547
  546     KW=0.0000031
  547     WIND=WINC*AWIND
C
C         INITIALIZE COUNTERS FOR REACH
C
C         NC          -     NUMBER CF CELL IN SYSTEM
C         NDX         -     NUMBER OF SEGMENT IN SYSTEM
C         J,JC        -     NUMBER OF CELL IN CROSS-SECTION
C
          NDX=NBEGIN(NR)
          NC=NDX*JK
          JC=0
C
C         CALCULATE THE CHANGE IN CROSS-SECTIONAL AREAS OF CELLS IN REACH DUE TO
C         TIDAL VELOCITIES
C
C         APA(*)      -     RATE OF CHANGE OF CROSS-SECTIONAL AREA OF CELL
```

```
C         VD(*)       -     TIDAL PRISM VOLUME IN REACH DOWNSTREAM OF JUNCTION
C         VVD(*,*)    -     CONVECTIVE VOLUME OF WIND INTO DOWNSTREAM REACH FROM JN.
C
          QL(1)=0.
          QT=0.
       DO 551 NLY=1,NLAYY
          JC=JC+1
          DMN=DM(NR,JC)
          UX=ALOG(RNK1*DMN)
          DELQ=UX*AREA(NR,JC)
          QXZ(JC)=DELQ
          QL(1)=QL(1)+DELQ
  551     QT=QT+DELQ
          D1=DEP(NR,1)
       DO 552 NLZ=2,NLAYZ
          D2=DEP(NR,NLZ)
          DL=D1-D2
          QL(NLZ)=0.
       DO 552 NLY=1,NLAYY
          JC=JC+1
          DMN=DM(NR,JC)
          UX=(DMN*ALOG(RNK1*DMN)-(DMN-DL)*ALOG(RNK1*(DMN-DL)))/DL
          DELQ=UX*AREA(NR,JC)
          QXZ(JC)=DELQ
          QL(NLZ)=QL(NLZ)+DELQ
  552     QT=QT+DELQ
          JC=0
          SUMD=0.
       DO 553 NLZ=1,NLAYZ
          SUMA(NLZ)=0.
          QLAY=QL(NLZ)
          CA=DELA*QLAY/QT
          SUMD=SUMD+DELD*QLAY/QT
          DPTH(NLZ)=DEP(NR,NLZ)+SUMD
          DEP(NR,NLZ)=DPTH(NLZ)
```

```
      DO 553 NLY=1,NLAYY
         JC=JC+1
         APC=AREA(NR,JC)
         AC=APC+DA*QXZ(JC)/QLAY
         SUMA(NLZ)=SUMA(NLZ)+AC
         DELAC(JC)=AC-APC
         ARE(JC)=AC
         AREA(NR,JC)=AC
  553    APA(JC)=APC/AC
         JC=0
         SUMATL=SUMA(NLAYZ)
      DO 554 NLZ=1,NLAYZ
         XW(NLZ)=KW*WIND*WFUNC(NLZ)*SUMATL/(SUMA(NLZ)*NZ)
      DO 554 NLY=1,NLAYY
         JC=JC+1
         VVC(NJNU,JC)=(XW(NLZ)+XS(NDV,NLZ))*ARE(JC)
  554    VD(NJNU,JC)=-V*QXZ(JC)/QT
      CALL MEAND
C
C        SALINE WEDGE
C
         IF(DSTE.GT.0.) CALL WEDGE
C
C        SIMULATION PROCEEDS THROUGH SEGMENTS OF REACH NR
C
      DO 730 ND=1,NDV
         NDX=NDX+1
         DDX=DX(NDX)
         D1=0.
         D2=0.
         JC=0
C
C        SECCNDARY CURRENT
C
       IF(BENDR(NR,ND).GT.0.) CALL HELIX
C
C        LATERAL INFLOW
```

```
C
      DO 610 I=1,JK
      IF(NC+I-NCQI) 610,570,610
  570    NQ=NQ+1
         NCQI=NQI(NQ)
      IF(OPT2(NQ)) 580,580,590
  580    IQIC=IQIC+1
         CQI=QIC(IQIC)*DTH
         CCI=CIC(IQIC)
      GOTO 600
  590    IQIV=IQIV+1
         LOC=LOCV(IQIV)
         CQI=QIV(LOC)*DTH
         CCI=CIV(LOC)
  600    V=V-CQI*DDX
         C(NC+I)=C(NC+I)+CQI*CCI/(ARE(JC+I))
  610 CONTINUE
C
C        SIMULATION PROCEEDS THROUGH CROSS-SECTIONAL CELLS OF SEGMENT ND
C
C        XT         -     DISTANCE MOVED DUE TO TIDE
C        XW(*)      -     DISTANCE MOVED DUE TO WIND
C        XS(*,*)    -     DISTANCE MOVED DUE TO DENSITY CURRENT
C
      DO 726 NLZ=1,NLAYZ
         D3=DPTH(NLZ)
      DO 725 NLY=1,NLAYY
         JC=JC+1
         NC=NC+1
         APPA=APA(JC)
         CN=C(NC)*APPA
         FNX=FX(NC)
         RNX=RX(NC)*APPA
         XT=-(V+(.5+FNX)*DDX*DELA)*QXZ(JC)/(QT*ARE(JC))+0.001
         X=XW(NLZ)+XT+XS(ND,NLZ)/APPA
```

```
      VELOC=X/DTS
      VEL(NC)=VELOC
      C1=C(NC)
C
C     LONGITUDINAL DIFFUSION VELOCITY
C
C     EX          -    LONGITUDINAL DISPERSION COEFFICIENT
C     XD          -    DISTANCE MOVED DUE TO DISPERSION VELOCITY
C
      IF((NC.EQ.1).OR.(ND.EQ.NDV)) GOTO 620
      NC1=NC-JK
      EX=KX*D*ABS(VELOC+VEL(NC1))*0.5+E0
      C2=C(NC1)
      DXAV=0.5*(DDX+DX(NDX-1))
      XD=-2.*DTS*EX*(C1-C2)/(DXAV*(C1+C2+0.00001))
      X=X+XD
C
C     LATERAL DIFFUSIONAL MASS TRANSFER
C
C     EY          -    LATERAL DISPERSION COEFFICIENT
C
  620 IF(NLY.EQ.1) GOTO 630
      NCY=NC-1
      EY=KY*D*ABS(VELOC+VEL(NCY))*0.5+E0
      DY=0.5*(ARE(JC)+ARE(JC-1))*NLAYZ/D
      DMTY=DTS*EY*(C1-C(NCY))/(DY*DY)
      CCC(NC)=CCC(NC)-DMTY
      CCC(NCY)=CCC(NCY)+DMTY
C
C     VERTICAL DIFFUSIONAL MASS TRANSFER
C
C     VERTICAL DISPERSION COEFFICIENT
C     RICHARDSON NUMBER
C
  630 IF(NLZ.EQ.1) GOTO 640
      NCZ=NC-NLAYY
      D2=DPTH(NLZ-1)
```

```
      D12=0.5*(D1+D2)
      D23=0.5*(D2+D3)
      DZ=D23-D12
      DS9=D*D/9.
      DUDZ=(X-XX(NLY))/(DTS*DZ)
      EZ=KZ*DS9*ABS(DUDZ)+E0
      IF(DSTE) 636,636,632
632   CSALT=DS(NR,ND)
      IF((D23-DSALT)*(D12-DSALT)) 634,636,636
634   RI=RIT/(DZ*DUDZ*DUDZ)
      IF(RI.GT.10.) RI=10.
      EZ=EZ*SQRT(1.-0.1*RI)
636   DMTZ=DTS*EZ*(C1-C(NCZ))/(DZ*DZ)
      CCC(NC)=CCC(NC)-DMTZ
      CCC(NCZ)=CCC(NCZ)+DMTZ
640   XX(NLY)=X
C
C     LONGITUDINAL TRANSFER BETWEEN CELLS, CONSERVING MOMENTS
C
      IS=ABS(X)/X
      FNX=FNX+X/DDX
      P=(IS*FNX+.5*RNX-.5)/RNX
      IP=P+P-1
      IF(IP)700,720,720
700   CC(NC)=CC(NC)+CN
      FFX(NC)=FFX(NC)+FNX*CN
      RRX(NC)=RRX(NC)+CN*(RNX*RNX+12.*FNX*FNX)
      GOTO 725
720   P1=1.-P
      PCN=P1*CN
      PRNX=P1*RNX
      CC(NC)=CC(NC)+PCN
      FC=.5*(1.-PRNX)*IS
      FFX(NC)=FFX(NC)+FC*PCN
      RRX(NC)=RRX(NC)+PCN*(PRNX*PRNX+12.*FC*FC)
```

```
      DDX1=DX(NDX+IS)
      PDXX=P*DDX/DDX1
      PCN=PDXX*CN
      PRNX=PDXX*RNX
      NC1=NC+JK*IS
      CC(NC1)=CC(NC1)+PCN
      FC=.5*(PRNX-1.)*IS
      FFX(NC1)=FFX(NC1)+FC*PCN
      RRX(NC1)=RRX(NC1)+PCN*(PRNX*PRNX+12.*FC*FC)
  725 CONTINUE
  726 D1=D2
  730 V=V+DDX*DELA
      VOLJ(NJND)=VOLJ(NJND)+V
      J=0
      GOTO (731,733,735,737), INDJ
  731 DO 732 NLZ=1,NLAYZ
      DO 732 NLY=1,NLAYY
      J=J+1
      VVU(NJND,J)=(XW(NLZ)+XS(1,NLZ))*ARE(J)
  732 VU(NJND,J)=-V*QXZ(J)/QT
      GOTO 737
  733 DO 734 NLZ=1,NLAYZ
      DO 734 NLY=1,NLAYY
      J=J+1
      VVL(NJND,J)=(XW(NLZ)+XS(1,NLZ))*ARE(J)
  734 VL(NJND,J)=-V*QXZ(J)/QT
      GOTO 737
  735 DO 736 NLZ=1,NLAYZ
      DO 736 NLY=1,NLAYY
      J=J+1
      VVR(NJND,J)=(XW(NLZ)+XS(1,NLZ))*ARE(J)
  736 VR(NJND,J)=-V*QXZ(J)/QT
C
C         FLOW INTO RECEIVING WATERS
C
  737 IF(INDJ-4) 780,740,740
  740 NCTE=NCTE+1
```

```
         VOL=0.
         QCM=0.
      DO 770 J=1,JK
         NC=NC+1
      IF(VEL(NC-JK)) 760,760,750
750      CN=CC(NC)
      IF(CN) 752,752,751
751      FN=FFX(NC)/CN
         RT=RRX(NC)/CN-12.*FN*FN
      IF(RT) 752,752,754
752      R=1.
         CN=CRW
      GOTO 756
754      R=SQRT(RT)
756      VOL=VOL+R
         QCM=QCM+CN
      GOTO 770
760      NC1=NC-JK
         CN=CC(NC1)
      IF(CN-CRW) 762,762,764
762      CC(NC1)=CRW
         CCC(NC1)=0.
         FFX(NC1)=0.
         RRX(NC1)=CRW
      GOTO 770
764      FN=FFX(NC1)/CN
         RTERM=RRX(NC1)/CN-12.*FN*FN
      IF(RTERM.LT.0.) WRITE(6,6017)
         R=1.-SQRT(RTERM)
         CNTE=CTE(NCTE)*R
         CC(NC1)=CN+CNTE
         FC=.5*(1.-R)
         FFX(NC1)=FFX(NC1)+FC*CNTE
         RRX(NC1)=RRX(NC1)+CNTE*(R*R+12.*FC*FC)
770   CONTINUE
```

```
        VOLNEW(NCTE)=VOL/NLAYY
        SUBNEW(NCTE)=QCM/NLAYY
  780 IF(NJNU-1) 785,800,842
C
C          TRANSFER ACROSS NULL POINT
C
  785   NRN=-NJNU
        NRX=NBEGIN(NRN)
        NDX=NDX-NDV
        NCN=NRX*JK+1
        NC=(NDX-1)*JK
        DXR=DX(NDX)/DX(NRX)
        J=0
      DO 790 NLZ=1,NLAYZ
        NCN=NCN+NLAYY
      DO 790 NLY=1,NLAYY
        J=J+1
        NNC=NCN-NLY
  790   CC(NNC)=CC(NNC)+CC(NC+J)*DXR*ARE(J)/AREA(NRN,J)
      GOTO 842
C
C          INDUCED VERTICAL FLOW AT DEAD-ENDS
C
  800   NDX=NDX-NDV
        DDX=DX(NDX+1)
        NC=NDX*JK
        VDE=0.1
        CDE=0.
      DO 815 NLZ=1,NLAYZ
        XWZ=XW(NLZ)+XS(1,NLZ)
      IF(XWZ) 805,815,815
  805   JC=(NLZ-1)*NLAYY
        NRC=NC+JC
      DO 810 NLY=1,NLAYY
        NRC=NRC+1
        FFX(NRC)=0.
        RRX(NRC)=CC(NRC)
```

```
          VOL=-XWZ*ARE(JC+NLY)
          VDE=VDE+VOL
  810     CDE=CDE+C(NRC)*VOL
  815 CONTINUE
          CF=CDE/VDE
      DO 840 NLZ=1,NLAYZ
          XWZ=XW(NLZ)+XS(1,NLZ)
      IF(XWZ) 840,840,820
  820     JC=(NLZ-1)*NLAYY
          NRC=NC+JC
      DO 830 NLY=1,NLAYY
          NRC=NRC+1
  830     CC(NRC)=CC(NRC)+CF*XWZ/DDX
  840 CONTINUE
  842 CONTINUE
C
C         FLOW IN AND FROM JUNCTION
C
      IF(NJUNC.EQ.1) GOTO 1015
      DO 1010 NJ=2,NJUNC
          NRUU=NRU(NJ)
          NRDD=NRD(NJ)
          NRLL=NRL(NJ)
          NRRR=NRR(NJ)
          DO=DOJN(NJ)
          D=DO+DCSINE
          DXJ=DXJN(NJ)
          DXX=DXJ/NLAYY
          DYJ=DYJN(NJ)
          DYY=DYJ/NLAYY
          VOLC=DXX*DYY*D/NLAYZ
          NJB=(NJ-2)*JJK
          JC=0
          JY1=0
      DO 922 NLZ=1,NLAYZ
```

```
      NJC=NJB
      JY=NLZ*NLAYY+1
      DELSX=0.
      VTUS=0.
      VTCS=0.
      DO 845 NLY=1,NLAYY
      JC=JC+1
      VUS=VU(NJ,JC)
      VTUS=VTUS+VUS+VL(NJ,JC)+VR(NJ,JC)
      VTDS=VTCS+VD(NJ,JC)
      VUD=(VUS-VD(NJ,JC))/VOLC
      DVX(NLY)=VUD
      DELSX=DELSX+VUD
845   VV1(NLY)=VUS/VOLC
      IF(DELSX.EQ.0.) DELSX=0.001
      DELVC=(VTDS-VTUS)/(NLAYY*NLAYY)
      APPA=1.+DELVC/VOLC
      DO 850 NL=1,NLAYY
      DO 847 NLY=1,NLAYY
      NJC=NJC+1
847   CCJ(NJC)=CJ(NJC)*APPA
850   NJC=NJC+JKLAY
      NJC=NJB
      APPA1=APPA-1.
      DO 920 NL=1,NLAYY
      JY=JY-1
      JY1=JY1+1
      VLB=VL(NJ,JY)
      DVY=(VLB+VR(NJ,JY1))/VOLC+NLAYY*APPA1
      V2=VLB/VOLC
      VVLB=VVL(NJ,JY)
      DVVY=(VVLB+VVR(NJ,JY1))/NLAYY
      DO 910 NLY=1,NLAYY
      JJC=(NLZ-1)*NLAYY+NLY
      NJC=NJC+1
      V1=VV1(NLY)
      V3=V1+DVY*DVX(NLY)/DELSX
```

```
          VV1(NLY)=V3
          V4=V1+V2+APPA1-V3
          VVUS=VVU(NJ,JJC)
          DVVX=(VVUS-VVD(NJ,JJC))/NLAYY
          V3=V3+(VVUS-NL*DVVX)/VOLC
          VV4=V4+(VVLB-NLY*DVVY)/VOLC
          VJ(NJC)=1.+(DVVX+DVVY)/VOLC
          NJCX=NJC+JK
          NJCY=NJC+1
      IF(NL.EQ.NLAYY) GOTO 885
      IF(V3) 860,860,870
  860     CVOL=V3*CJ(NJCX)
      GOTO 880
  870     CVOL=V3*CJ(NJC)
  880     CCJ(NJC)=CCJ(NJC)-CVOL
          CCJ(NJCX)=CCJ(NJCX)+CVOL
  885 IF(NLY.EQ.NLAYY) GOTO 910
      IF(VV4) 890,890,900
  890     CVOL=VV4*CJ(NJCY)
      GOTO 905
  900     CVOL=VV4*CJ(NJC)
  905     CCJ(NJC)=CCJ(NJC)-CVOL
          CCJ(NJCY)=CCJ(NJCY)+CVOL
  910     V2=V4
  920     NJC=NJC+JKLAY
  922     NJB=NJB+NLAYY
C
C         FLOW TO AND FROM UPSTREAM REACH
C
          N1=(NJ-2)*JJK+1
          NDX=NBEGIN(NRUU)+NDIV(NRUU)
          NC=(NDX-1)*JK
          JC=0
      DO 940 NLZ=1,NLAYZ
          N2=N1-1+NLAYY
```

```
      DO 935 NJX=N1,N2
         JC=JC+1
         NC=NC+1
         NC1=NC+JK
         ARA=AREA(NRUU,JC)
         VOLU=-VU(NJ,JC)-VVU(NJ,JC)
      IF(VOLU) 930,935,925
  925    P=VOLU/(ARA*DX(NDX))
         CN=P*CJ(NJX)
         CCJ(NJX)=CCJ(NJX)-CJ(NJX)*VOLU/VOLC
         CC(NC)=CC(NC)+CN
         FP=.5*(1.-P)
         FFX(NC)=FFX(NC)+CN*FP
         RRX(NC)=RRX(NC)+CN*(P*P+12.*FP*FP)
      GOTO 935
  930    CCJ(NJX)=CCJ(NJX)+CC(NC1)*DXX*ARA/VOLC
  935 CONTINUE
  940    N1=N2+1
C
C        FLOW TO AND FROM DOWNSTREAM REACH
C
         N1=(NJ-1)*JJK-JK+1
         NDX=NBEGIN(NRDD)
         NC=NDX*JK
         JC=0
      DO 960 NLZ=1,NLAYZ
         N2=N1-1+NLAYY
      DO 950 NJX=N1,N2
         JC=JC+1
         NC=NC+1
         NC1=NC-JK
         ARA=AREA(NRDD,JC)
         VOLD=-VD(NJ,JC)-VVD(NJ,JC)
      IF(VOLD) 942,950,945
  942    P=-VOLD/(ARA*DX(NDX+1))
         CN=P*CJ(NJX)
         CCJ(NJX)=CCJ(NJX)+CJ(NJX)*VOLD/VOLC
```

```
         CC(NC)=CC(NC)+CN
         FP=.5*(F-1.)
         FFX(NC)=FFX(NC)+CN*FP
         RRX(NC)=RRX(NC)+CN*(P*P+12.*FP*FP)
      GOTO 950
  945    CCJ(NJX)=CCJ(NJX)+CC(NC1)*DXX*ARA/VOLC
  950 CONTINUE
  960    N1=N2+1
C
C
C        FLOW TO AND FROM LEFT BRANCH
C
      IF (NRLL.EQ.0) GOTO 1000
         NDX=NBEGIN(NRLL)+NDIV(NRLL)
         NC=(NDX-1)*JK
         NBN=(NJ-1)*JJK+1
         NJY=NBN
         JC=0
      DO 998 NLZ=1,NLAYZ
      DO 995 NLY=1,NLAYY
         JC=JC+1
         NJY=NJY-JK
         NC=NC+1
         NC1=NC+JK
         ARA=AREA(NRLL,JC)
         VOLL=-VL(NJ,JC)-VVL(NJ,JC)
      IF(VOLL) 980,995,970
  970    P=VOLL/(ARA*DX(NDX))
         CN=P*CJ(NJY)
         CCJ(NJY)=CCJ(NJY)-CJ(NJY)*VOLL/VOLC
         CC(NC)=CC(NC)+CN
         FP=.5*(1.-P)
         FFX(NC)=FFX(NC)+CN*FP
         RRX(NC)=RRX(NC)+CN*(P*P+12.*FP*FP)
      GOTO 995
```

```
  980     CCJ(NJY)=CCJ(NJY)+CC(NC1)*DYY*ARA/VOLC
  995 CONTINUE
  998     NJY=NBN+NLAYY*NLZ
C
C         FLOW TO AND FROM RIGHT BRANCH
C
 1000 IF (NRRR.EQ.0) GOTO 1004
          NBN=(NJ-2)*JJK-JK+1
          NJY=NBN
          NDX=NBEGIN(NRRR)+NDIV(NRRR)
          NC=(NDX-1)*JK
          JC=0
      DO 1002 NLZ=1,NLAYZ
      DO 1001 NLY=1,NLAYY
          JC=JC+1
          NJY=NJY+JK
          NC=NC+1
          NC1=NC+JK
          ARA=AREA(NRRR,JC)
          VOLR=-VR(NJ,JC)-VVR(NJ,JC)
      IF(VOLR) 992,1001,991
  991     P=VOLR/(ARA*DX(NDX))
          CN=P*CJ(NJY)
          CCJ(NJY)=CCJ(NJY)-CJ(NJY)*VOLR/VOLC
          CC(NC)=CC(NC)+CN
          FP=.5*(1.-P)
          FFX(NC)=FFX(NC)+CN*FP
          RRX(NC)=RRX(NC)+CN*(P*P+12.*FP*FP)
      GOTO 1001
  992     CCJ(NJY)=CCJ(NJY)+CC(NC1)*DYY*ARA/VOLC
 1001 CONTINUE
 1002     NJY=NBN+NLAYY*NLZ
C
C         BALANCE VOLUMES IN JUNCTION
C
 1004     NJC=(NJ-2)*JJK
      DO 1010 NL=1,NLAYY
```

```
      DO 1008 NLZ=2,NLAYZ
      DO 1008 NLY=1,NLAYY
         NJC=NJC+1
         NJC1=NJC+NLAYY
         VOL=VJ(NJC)-1.
      IF(VOL) 1005,1005,1006
 1005    CVOL=CJ(NJC1)*VOL
      GOTO 1007
 1006    CVOL=CJ(NJC)*VOL
 1007    CCJ(NJC)=CCJ(NJC)-CVOL
         CCJ(NJC1)=CCJ(NJC1)+CVOL
 1008    VJ(NJC1)=VJ(NJC1)+VOL
 1010    NJC=NJC+NLAYY
C
C        FLOOD FLOW FROM TIDAL ENTRANCES
C
 1015 DO 1020 NTE=1,NTES
         CONC=(1.-VOLNEW(NTE))*CTE(NTE)+SUBNEW(NTE)
 1020    CTE(NTE)=CRW+(CONC-CRW)*TAU(NTE)
         N1=JK1
      DO 1105 NR=1,NREACH
         RDEC=RDECAY(NR)
         N2=N1-1+NDIV(NR)*JK
      IF(NJL(NR)-1) 1021,1021,1023
 1021    N3=N1-1+JK
      DO 1022 NC=N1,N3
         CN=CC(NC)
         C(NC)=CRW+(CN+CCC(NC)-CRW)*(1.-DTH*(RDEC+DECAY(NC)))
         FX(NC)=0.
 1022    RX(NC)=1.
         N1=N3+1
 1023 DO 1100 NC=N1,N2
         CN=CC(NC)
         CNN=CRW+(CN+CCC(NC)-CRW)*(1.-DTH*(RDEC+DECAY(NC)))
      IF(CNN) 1040,1040,1030
```

```
1030    C(NC)=CNN
     IF(CN) 1050,1050,1060
1040    C(NC)=CRW
1050    FX(NC)=0.
        RX(NC)=1.
     GOTO 1100
1060    FN=FFX(NC)/CN
        RT=RRX(NC)/CN-12.*FN*FN
     IF(RT) 1050,1050,1070
1070    RX(NC)=SQRT(RT)
        FX(NC)=FN
1100 CONTINUE
1105    N1=N2+JKK1
     IF(NJUNC.EQ.1) GOTO 1115
     DO 1110 NJC=1,NJCELL
        CJN=CCJ(NJC)
     IF(CJN.LT.0.) CJN=0.
1110    CJ(NJC)=CJN
1115 IF(NP.EQ.NPRINT) CALL WRITIT
     IF(NPL.EQ.NPLOT) CALL SHOWIT
2000 CONTINUE
     CALL WRITIT
9999 CONTINUE
     STOP
     END
```

```
      SUBROUTINE ORDER
      COMMON/BL2/ NRCH(50),NJU(50),NJD(50),INDJND(50),NTES
      COMMON/BL6/ CPT2(100),NRQI(100),NQI(100),QIC(50),CIC(50),LOCV(50),
     $   NQ,IQIC
      COMMON/BL9/ NREACH,JK,NJUNC,NLAYY,NLAYZ,NR,ND,NDV,NDIV(50),NDX,
     $   INDJ,NJNU,NJND
      DIMENSION CPT2B(100),NQIB(100),QICB(50),CICB(50)
 6000 FORMAT(' PROGRAM HALTED DUE TO DATA ERROR'/
     $   ' CHECK DATA ON REACH AND JUNCTION CARDS IS PUNCHED CORRECTLY')
C
C     THIS SUBROUTINE REORDERS THE CANAL NETWORK
C     PUTTING CANALS UPSTREAM OF JUNCTIONS FIRST
C
C        INDJND(*) -     INDICATES TYPE OF BRANCH JOINING DOWNSTREAM JUNCTION
C                  -     1 INDICATES UPSTREAM REACH
C                  -     2 INDICATES LEFT BRANCH
C                  -     3 INDICATES RIGHT BRANCH
C                  -     4 INDICATES REACH UPSTREAM OF A TIDAL ENTRANCE
C        NREACH    -     NUMBER OF REACHES IN NETWORK
C        NRCH(*)   -     NUMBER OF REACH AFTER ORDERING
C        NJD(*)    -     NUMBER OF DOWNSTREAM JUNCTION
C        NJU(*)    -     NUMBER OF UPSTREAM JUNCTION
C        NRL(*)    -     NUMBER OF REACH LEFT OF JUNCTION
C        NRD(*)    -     NUMBER OF REACH DOWNSTREAM OF JUNCTION
C        NRU(*)    -     NUMBER OF REACH UPSTREAM OF JUNCTION
C
         N=1
      DO 80 NR=1,NREACH
      IF(NJU(NR).GT.NJUNC) GOTO 10
      IF(NJU(NR)-1) 10,10,80
   10    NRCH(N)=NR
         N=N+1
         NJND=NJD(NR)
      IF(NJND-NJUNC) 30,30,20
   20    INDJND(NR)=4
```

```
      GOTO 80
   30 IF(NRL(NJND)-NR) 50,40,50
   40    INDJND(NR)=1
      GOTO 80
   50 IF(NRL(NJND)-NR) 70,60,70
   60    INDJND(NR)=2
      GOTO 80
   70    INDJND(NR)=3
   80 CONTINUE
         N2=0
      DO 90 NRT=1,NREACH
         N1=N2+1
         N2=N-1
      DO 170 NNR=N1,N2
         NR=NRCH(NNR)
         INDJ=INDJND(NR)
      IF(INDJ-1) 100,100,170
  100    NR=NRD(NJD(NR))
         NRCH(N)=NR
         N=N+1
         NJNC=NJD(NR)
      IF(NJND-NJUNC) 120,120,110
  110    INDJND(NR)=4
      GOTO 170
  120 IF(NRL(NJND)-NR) 140,130,140
  130    INDJND(NR)=1
      GOTO 170
  140 IF(NRL(NJND)-NR) 160,150,160
  150    INDJND(NR)=2
      GOTO 170
  160    INDJND(NR)=3
  170 CONTINUE
      IF(NREACH-N) 180,90,90
   90 CONTINUE
      WRITE(6,6000)
      STOP
C
```

```
C          ORDER TICAL ENTRANCES
C
  180 IF(NTES.EQ.1) GOTO 210
          N1=NREACH-NTES+1
          N2=NREACH
          N3=NTES-1
      DO 200 NT=1,N3
          N2=N2-1
      DO 200 NR=N1,N2
      IF(NRCH(NR)-NRCH(NR+1)) 200,200,190
  190     NRH=NRCH(NR)
          NRCH(NR)=NRCH(NR+1)
          NRCH(NR)=NRH
  200 CONTINUE
C
C          ORDER LATERAL INFLOWS
C
  210 DO 220 IQ=1,NQ
          OPT2E(IQ)=OPT2(IQ)
  220     NQIE(IQ)=NQI(IQ)
      IF(IQIC.EQ.0) GOTO 240
      DO 230 IQ=1,IQIC
          QICB(IQ)=QIC(IQ)
  230     CICB(IQ)=CIC(IQ)
  240     N=0
          NC=0
          NV=0
      DO 280 NNR=1,NREACH
          NVTOT=0
          NR=NRCH(NNR)
      DO 280 IQ=1,NQ
          OPT=OPT2E(IQ)
      IF(OPT.EQ.1) NVTOT=NVTOT+1
      IF(NR-NRQI(IQ)) 280,250,280
  250     N=N+1
```

```
      NQI(N)=NGIE(IC)
      OPT2(N)=OPT
   IF(OPT) 280,260,270
260   NC=NC+1
      NCTOT=IQ-NVTOT
      QIC(NC)=QICB(NCTOT)
      CIC(NC)=CICB(NCTOT)
   GOTO 280
270   NV=NV+1
      LOCV(NV)=NVTOT
280 CONTINUE
   RETURN
   END
```

```
      SUBROUTINE MEAND
      COMMON/BL4/ DPTH(6),DM(50,36),DB,AREAB(50,6),DMIN
      COMMON/BL9/ NREACH,JK,NJUNC,NLAYY,NLAYZ,NR,ND,NDV,NDIV(50),NDX,
     $    INDJ,NJNU,NJND
C
C         THIS SUBROUTINE CALCULATES THE MEAN DEPTH ASSOCIATED WITH EACH CELL
C
C         ARE(*)     - CROSS-SECTIONAL AREA OF CELL IN REACH
C         DM(*,*)    -    MEAN DEPTH OF FLOW ASSOCIATED WITH CELL IN REACH
C
      IF(ABS(DB-DPTH(NLAYZ))-DMIN) 2,6,6
    2     JC=0
      DO 4 NLZ=1,NLAYZ
          DPTH(NLZ)=DB*NLZ/NLAYZ
      DO 4 NLY=1,NLAYY
      JC=JC+1
    4     ARE(JC)=AREAB(NR,NLZ)
    6     NC=0
          JC=0
          DP=0.
          SRSR=SQRT(SR)
      DO 170 NLZ=1,NLAYZ
          D=DPTH(NLZ)
          DL=D-DP
          DP=D
          SLDL=SL*DL
          AL=.5*SLDL*DL
          AR=.5*SR*DL*DL
          Y1=0.
          B1=D*SL
          B2=B1+B
          DELA=0.
      DO 10 NLY=1,NLAYY
          NC=NC+1
   10     DELA=DELA+ARE(NC)
```

```
      AM=DELA-AL-AR
      W=AM/DL
    DO 170 NLY=1,NLAYY
      JC=JC+1
      A=ARE(JC)
    IF(A-AL) 20,20,30
 20   AL=AL-A
      Y2=SQRT(2.*A/SL+Y1*Y1)
      DM(NR,JC)=A/(Y2-Y1)
    GOTO 170
 30   AA=A-AL
      AL=AL-A
    IF(AA-AM-1.) 40,40,50
 40   Y2=SLDL+AA/DL
    GOTO 60
 50   AAA=AA-AM
    IF(AAA.GT.AR) AAA=AR
      Y2=SLDL+W+SR*DL-SRSR*SQRT(2.*(AR-AAA))
 60 IF(Y1-B1) 70,110,110
 70 IF(Y2-B1) 160,160,80
 80 IF(Y2-B2-.5) 90,90,100
 90   DM(NR,JC)=((Y2-B1)*D+.5*(B1-Y1)*(D+Y1/SL))/(Y2-Y1)
    GOTO 170
100   DM(NR,JC)=(B*D+.5*(B1-Y1)*(D+Y1/SL)+(Y2-B2)*(D-.5*(Y2-B2)/SR))/
   $  (Y2-Y1)
    GOTO 170
110 IF(Y1-B2) 120,150,150
120 IF(Y2-B2) 130,130,140
130   DM(NR,JC)=D
    GOTO 170
140 IF(SR.EQ.0.) GOTO 130
      DM(NR,JC)=((B2-Y1)*D+(Y2-B2)*(D-.5*(Y2-B2)/SR))/(Y2-Y1)
    GOTO 170
150   DM(NR,JC)=D+(B2-.5*(Y1+Y2))/SR
    GOTO 170
160   DM(NR,JC)=.5*(Y1+Y2)/SL
170   Y1=Y2
```

```
RETURN
END
```

```
      SUBROUTINE WRITIT
      COMMON/BL5/  ARE(50),SL,SR,B,V,D,DX(500),DTS,DDX,NBEGIN(50)
      COMMON/BL8/  C(2000),COSINE,CCC(2000),A,WSC,WANGC
      COMMON/BL9/  NREACH,JK,NJUNC,NLAYY,NLAYZ,NR,ND,NDV,NDIV(50),NDX,
     $     INDJ,NJNU,NJND
 6000 FORMAT(/' TIME ',F7.2,' HOURS: TIDAL DIFFERENCE= ',F6.3,' FEET'/
     $ ' WIND SPEED= ',F4.1,' FT/SEC: WIND DIRECTION= ',F4.0,' DEGREES')
 6001 FORMAT(' REACH NUMBER ',I2,':')
 6002 FORMAT(1X,15(F8.3))
 6003 FORMAT(' JUNCTION NUMBER ',I2,':')
 6004 FORMAT(1X,90('*'))
 6005 FORMAT(' X=',F7.1,'/C/',15(F8.3))
 6006 FORMAT(8X,'/VEL/',15(F8.3))
C
C        THIS SUBROUTINE WRITES OUT THE RESULTS EVERY NPRINT STEPS AND AT THE
C        END OF THE SIMULATION
C
         NP=0
         TIME=NT*DTH
         WANGLE=WANGC*180./3.141593+180.
      WRITE(6,6000) TIME,COSINE,WSC,WANGLE
         N1=JK+1
      DO 20 NR=1,NREACH
         NDX=NBEGIN(NR)
         X=0.
         NDV=NDIV(NR)
      WRITE(6,6001) NR
      DO 10 ND=1,NDV
         N2=N1-1+JK
         NDX=NDX+1
         DX2=0.5*DX(NDX)
         X=X+DX2
      WRITE(6,6005) X,(C(NC),NC=N1,N2)
      WRITE(6,6006) (VEL(NC),NC=N1,N2)
         X=X+DX2
```

```
10  N1=N2+1
20      N1=N1+2*JK
    IF(NJUNC.EQ.1)  GOTO 40
        N1=1
    DO  30  NJ=2,NJUNC
    WRITE(6,6003) NJ
    DO  30  NLY=1,NLAYY
    CO  30  NLZ=1,NLAYZ
        N2=N1-1+NLAYY
    WRITE(6,6002) (CJ(NJC),NJC=N1,N2)
30      N1=N2+1
40  WRITE(6,6004)
    RETURN
    END
```

```
      SUBROUTINE HELIX
      COMMON/BL5/ ARE(50),SL,SR,B,V,D,DX(500),DTS,DDX,NBEGIN(50)
      COMMON/BL9/ NREACH,JK,NJUNC,NLAYY,NLAYZ,NR,ND,NDV,NDIV(50),NDX,
     $   INDJ,NJNU,NJND
      COMMON/BL10/ BENDR(50,50),BENDL(50,50),F1(6),F4(6)
      DIMENSION VC(36),YRATIO(20),ALAY(6),VR(6)
 7000 FORMAT(4(1X,I5),5(1X,F12.4))
C
C        THIS SUBROUTINE CALCULATES THE RADIAL FLOW BETWEEN CELLS DUE TO BENDS
C        BASED ON ROZOVSKII'S THEORY
C
C        NOTE: BR<0 INDICATES BEND TO RIGHT
C              BR>0 INDICATES BEND TO LEFT
C
C        LATERAL TRANSFER IN CELLS AT CROWN OF BEND
C
         J=0
         BL=BENDL(NR,ND)
         BR=BENDR(NR,ND)
         PL=102.*D
         DZ=D/NLAYZ
         NLAYY1=NLAYY-1
         NLAYZ1=NLAYZ-1
         IS=-ABS(V)/V
      DO 10 I=1,JK
         BL2=0.5*(BL-DDX)-DX(NDX-IS)
         NDX1=NDX
         ND1=ND
    2 IF(BL2) 6,6,4
    4    NDX1=NDX1-IS
         ND1=ND1-IS
         BL2=BL2-DX(NDX1-IS)
      GOTO 2
    6    DDX=DX(NDX1)
         NRC=(NDX1-1)*JK
```

```
      NC=NRC
10    VC(I)=0.
   DO 15 NLZ=1,NLAYZ
      ALAY(NLZ)=0.
   DO 15 NLY=1,NLAYY
      J=J+1
15    ALAY(NLZ)=ALAY(NLZ)+ARE(J)
      AB=ALAY(1)
      J=0
      DELX=0.
   IF(BL-DDX) 20,30,30
20    DELX=DDX-BL
30    EXPO=-3.*DELX/PL
      YT=(DDX-DELX+PL*(1.-EXP(EXPO))/3.)/DDX
      YRATIO(1)=1.
   DO 70 NLZ=1,NLAYZ
      VR(NLZ)=-6.25*V*D*(F1(NLZ)-F4(NLZ)/3.3)*AB/(A*BR*ALAY(NLZ))
      YR=YT*VR(NLZ)
      A1=YR*DZ
      J=J+1
      NC=NC+1
      AREA1=ARE(J)
   DO 70 NLY=2,NLAYY
      J=J+1
      NC1=NC
      NC=NC+1
   IF(YR) 40,40,50
40    CMASS=C(NC)*A1
   GOTO 60
50    CMASS=C(NC1)*A1
60    CCC(NC1)=CCC(NC1)-CMASS/AREA1
      AREA2=ARE(J)
      CCC(NC)=CCC(NC)+CMASS/AREA2
      VC(J-1)=VC(J-1)-A1/AREA1
      VC(J)=A1/AREA2
70    AREA1=AREA2
C
```

```
C        LATERAL TRANSFER IN ADJACENT SEGMENTS IN DIRECTION OF FLOW
C
         IC=1
         BL1=BL-DDX+DELX
         X2=DELX
   80    ND1=ND1+IS
         J=C
      IF((ND1.GT.NDV).OR.(ND1.LT.1)) GOTO 210
         IC=IC+1
         NDX1=NDX1+IS
         DDX=DX(NDX1)
         NC=(NDX1-1)*JK
      IF(BL1.EQ.0.) GOTO 150
         DELX=0.
      IF(BL1-DDX) 130,130,140
  130    DELX=DDX-BL1
         BL1=0.
         X2=DELX
         EXPO=-3.*DELX/PL
         YRAT=(DDX-DELX+PL*(1.-EXP(EXPO))/3.)/(DDX*YT)
      GOTO 160
  140    YRAT=1.
         BL1=BL1-DDX
      GOTO 160
  150    X1=X2
         X2=X2+DDX
         YRAT=PL/3.*(EXP(-3.*X1/PL)-EXP(-3.*X2/PL))/(YT*DDX)
  160 DO 200 NLZ=1,NLAYZ
         NC=NC+1
         J=J+1
         A1=YRAT*VR(NLZ)*DZ
         AREA1=ARE(J)
      DO 200 NLY=2,NLAYY
         NC1=NC
         NC=NC+1
```

```
      J=J+1
      IF(A1) 170,170,180
170      CMASS=C(NC)*A1
      GOTO 190
180      CMASS=C(NC1)*A1
190      CCC(NC1)=CCC(NC1)-CMASS/AREA1
         AREA2=ARE(J)
         CCC(NC)=CCC(NC)+CMASS/AREA2
200      AREA1=AREA2
         YRATIO(IC)=YRAT
      IF(X2-PL) 80,210,210
C
C        VERTICAL TRANSFER IN EDGE CELLS
C
210      NC=NRC
      DO 350 I=1,IC
         J=0
         YRAT=YRATIO(I)
         VLB=0.
         VRB=0.
      DO 280 NLZ=1,NLAYZ1
         J=J+1
         NC=NC+1
         NCZ=NC+NLAYY
         VLB=VLB+VC(J)*ARE(J)
      IF(VLB) 220,220,230
220      CMASS=C(NCZ)*VLB*YRAT
      GOTO 240
230      CMASS=C(NC)*VLB*YRAT
240      CCC(NC)=CCC(NC)-CMASS/ARE(J)
         CCC(NCZ)=CCC(NCZ)+CMASS/ARE(J+NLAYY)
         J=J+NLAYY1
         NC=NC+NLAYY1
         NCZ=NC+NLAYY
         VRB=VRB+VC(J)*ARE(J)
      IF(VRB) 250,250,260
250      CMASS=C(NCZ)*VRB*YRAT
```

```
      GOTO 270
260      CMASS=C(NC)*VRB*YRAT
270      CCC(NC)=CCC(NC)-CMASS/ARE(J)
280      CCC(NCZ)=CCC(NCZ)+CMASS/ARE(J+NLAYY)
         J=J+1
         NC=NC+2
         NC1=NC-1
         VLE=VLB+VC(J)*ARE(J)
      IF(VLB) 290,290,300
290      CMASS=C(NC)*VLB*YRAT
      GOTO 310
300      CMASS=C(NC1)*VLB*YRAT
310      CCC(NC)=CCC(NC)+CMASS/ARE(J+1)
         CCC(NC1)=CCC(NC1)-CMASS/ARE(J)
         NC1=NC
         NC=NC+1
         J=J+2
         VRB=VRB+VC(J)*ARE(J)
      IF(VRB) 320,320,330
320      CMASS=C(NC1)*VRB*YRAT
      GOTO 340
330      CMASS=C(NC)*VRB*YRAT
340      CCC(NC)=CCC(NC)-CMASS/ARE(J)
         CCC(NC1)=CCC(NC1)+CMASS/ARE(J-1)
350      NC=NC+JK*(IS-1)
999   FETURN
      END
```

PRINT FEPEATED EY OPERATOR

```
      SUBROUTINE WEDGE
      COMMON/BL3/ NRU(50),NRD(50),NRL(50),NRR(50)
      COMMON/BL5/ ARE(50),SL,SR,B,V,D,DX(500),DTS,DDX,NBEGIN(50)
      COMMON/BL7/ FX(2000),RX(2000),VEL(2000),CJ(1000),NT,DTH,NP
      COMMON/BL8/ C(2000),COSINE,CCC(2000),A,WSC,WANGC
      COMMON/BL9/ NREACH,JK,NJUNC,NLAYY,NLAYZ,NR,ND,NDV,NDIV(50),NDX,
     $   INDJ,NJNU,NJND
      COMMON/BL11/ DSLT(50),XS(50,6),QSU(50),QSD(50),DSU(50),DSD(50),
     $   INDS(50),UR4(50),DELD,SRATIO,RLX,DS(50,50),FL(50),AM(50),
     $   APA(50)
      DIMENSION VV(50,6),UMS(50),NUR(3),DSA(50),ALAY(6),ARAT(6)
 7000 FORMAT(4(1X,I5),5(1X,F12.4))
 7001 FORMAT(11(1X,F10.4))
C
C        THIS SUBROUTINE CALCULATES THE VELOCITY FIELD ASSOCIATED WITH THE
C        MOVEMENT OF A SALINE WEDGE IN A REACH
C
         DLT=DSLT(NR)
      DO 10 ND=1,NDV
         DSA(ND)=0.001
         UMS(ND)=0.
         DS(NR,ND)=DLT
      DO 10 NLZ=1,NLAYZ
   10    XS(ND,NLZ)=0.
         NDV2=NDV+2
      DO 15 ND=1,NDV2
      DO 15 NLZ=1,NLAYZ
   15    VV(ND,NLZ)=0.
      IF(QSU(NR)+QSD(NR)) 20,999,20
   20    NPX=NDX
         NRXX=NDX+NDV+1
         NDV1=NDV-1
         ND1=1
         X=0.
         XL=RLX
```

```
      SLR=0.5*(SL+SR)
C
C     EBB TIDE CONDITIONS
C
      IF(DELD) 30,30,80
   30 DU1=DSU(NR)
      DU2=DU1*SRATIO
      DSL(NR)=DU2
      DU1=DU1+DLT
      DU2=DU2+DLT
      DD1=DSD(NR)
      DD2=DD1*SRATIO
      DSD(NR)=DD2
      DD1=DD1+DLT
      DD2=DD2+DLT
      AU1=DU1*(B+DU1*SLR)
      AU2=DU2*(B+DU2*SLR)
      AD1=DD1*(B+DD1*SLR)
      AD2=DD2*(B+DD2*SLR)
      AAUS=0.5*(AU1+AU2)
      AADS=0.5*(AD1+AD2)
      DELAU=AU1-AU2
      DELAD=AD1-AD2
      WL=RLX*FL(NR)
      IF(WL.LT.RLX) XL=WL
      QQ=-0.5*XL*(DELAU+DELAD)+QSU(NR)
      QSD(NR)=QQ
      IF(INCJ-4) 40,50,50
   40 NRDD=NRD(NJND)
      QSL(NRDD)=QSU(NRDD)+QQ
   50 IF(WL-RLX) 320,350,350
C
C     FLOOD TIDE CONDITIONS
C
   80 QDS=QSD(NR)
      DDS=DSD(NR)
      U4=UR4(NR)
```

```
      AMC=AM(NR)
      FL(NR)=1.
      I=INDS(NR)
      WL=2.*U4*DDS
    GOTO (120,280,310), I
 90 IF(WL-RLX) 320,320,100
100 IF(NJNU-1) 270,270,110
110   INDS(NR)=1
120   DUS=DDS*(1.-RLX/WL)
      DSU(NR)=DUS
      DT=DUS+DLT
      AUS=DT*(B+DT*SLR)-AM(NR)
      QUS=AUS*U4*DUS
      QSU(NR)=QUS
      IR=0
      NRUU=NRU(NJNU)
    IF(INDS(NRUU)-3) 140,130,130
130   QUS=QUS-QSD(NRUU)
    GOTO 150
140   IR=IR+1
      NUR(IR)=NRUU
150   NRLL=NRL(NJNU)
    IF(NRLL) 190,190,160
160 IF(INDS(NRLL)-3) 180,170,170
170   QUS=QUS-QSD(NRLL)
    GOTO 190
180   IR=IR+1
      NUR(IR)=NRLL
190   NRRR=NRR(NJNU)
    IF(NRRR) 230,230,200
200 IF(INDS(NRRR)-3) 220,210,210
210   QUS=QUS-QSD(NRRR)
    GOTO 230
220   IR=IR+1
      NUR(IR)=NRRR
```

```
230 IF(IR) 280,280,240
240     ASUM=0.
    DO 250 I=1,IF
250     ASUM=ASUM+AM(NUR(I))
    DO 260 I=1,IR
        NRX=NUR(I)
        DSD(NRX)=DUS
        UR4(NRX)=U4*AMD/AM(NRX)
260     QSD(NRX)=CUS*AM(NRX)/ASUM
    GOTO 350
270     INDS(NR)=2
280     DUS=(WL/RLX-1.)*DDS
    IF(DDC-DUS) 290,290,350
290     DSL(NR)=DDS-0.001
    GOTO 350
300     INDS(NR)=3
310     DUS=DSU(NF)
        D1=DUS+DLT
        D2=DDS+DLT
        DELV=(D2-D1)*(B+(D1+D2)*SLR)*RLX
        QSD(NR)=QSU(NR)+DELV
C
C       CALCULATE DISTANCE MOVED BY MASS IN EACH CELL OF REACH
C
    GOTO 350
320     FL(NR)=WL/RLX
        RLX1=RLX-WL
        DDX=0.
330     NRX=NRX+1
    IF(NRX.EQ.NRXX) GOTO 999
        X=X+DDX
        DDX=0.5*DX(NRX)
        X=X+DDX
    IF(X-RLX1) 330,330,340
340     X=X-DDX-RLX1
        ND1=NRX-NCX
        XL=WL
```

```
350       J=0
          DZ1=DPTH(1)
          D1=0.
      DO 358 NLZ=1,NLAYZ
          D2=DPTH(NLZ)
          D2R=(D2-D1)/DZ1
          D1=D2
          ALAY(NLZ)=0.
      DO 355 NLY=1,NLAYY
          J=J+1
355       ALAY(NLZ)=ALAY(NLZ)+ARE(J)
358       ARAT(NLZ)=ALAY(1)*DZR/ALAY(NLZ)
          DUS=DSU(NR)+DLT
          DDS=DSD(NR)+DLT
          AUS=DUS*(B+DUS*SLR)
          ADS=DDS*(B+DDS*SLR)
          QUS=QSU(NR)
          QDS=QSD(NR)
          DELQ=QDS-QUS
          DELA=ADS-AUS
          DELDS=DDS-DUS
      DO 360 ND=ND1,NDV
          DX2=0.5*DX(NDX+ND)
          X=X+DX2
          AAV=AUS+DELA*X/XL
          UMS(ND)=-(QUS+DELQ*X/XL)/AAV
          DRX=DUS+DELDS*X/XL
          CSA(ND)=DRX
          DS(NR,ND)=DRX
360       X=X+DX2
      DO 420 ND=1,NDV
          NRX=NDX+ND
          DDX=DX(NRX)
          USM=UMS(ND)
          DA=DSA(ND)
```

```
      U1=USM/(DA*DA)
      UFM=USM/(1.-D/DA)
      D3=0.
      D1=0.
      DC1=0.
      DO 420 NLZ=1,NLAYZ
      D2=DPTH(NLZ)
      DZ=D2-D1
      IF(D1-DA) 370,400,400
  370 IF(D2-DA) 380,380,390
  380 DC2=D2*D2*D2
      XMS=U1*(DC2-DC1)*ARAT(NLZ)/DZ
      GOTO 410
  390 D3=D2-DA
      DC2=DA*DA*DA
      XMS=(U1*(DC2-DC1)+UFM*D3)*ARAT(NLZ)/DZ
      GOTO 410
  400 D3=DZ
      XMS=UFM*ARAT(NLZ)
  410 XS(ND,NLZ)=XMS
      VV(NRX-1,NLZ)=VV(NRX-1,NLZ)-XMS/DX(NRX-1)
      VV(NRX,NLZ)=VV(NRX,NLZ)+XMS/DX(NRX)
      D1=D2
  420 DC1=DC2
C
C     COMPUTE UPWARD INDUCED FLOW
C
      NRC=(NDX+1)*JK
      DO 510 ND=1,NDV1
      NRX=NDX+ND
      J=0
      VOL=0.
      DO 500 NLZ=2,NLAYZ
      VOL=VOL+VV(NRX,NLZ-1)*ALAY(NLZ-1)
      IF(VOL) 460,495,480
  460 DO 470 NLY=1,NLAYY
      J=J+1
```

```
          JZ=J+NLAYY
          NRC=NRC+1
          NRCZ=NRC+NLAYY
          CMASS=C(NRCZ)*VOL*APA(JZ)
          CCC(NRCZ)=CCC(NRCZ)+CMASS/ALAY(NLZ)
470       CCC(NRC)=CCC(NRC)-CMASS/ALAY(NLZ-1)
      GOTO 500
480   DO 490 NLY=1,NLAYY
          J=J+1
          JZ=J+NLAYY
          NRC=NRC+1
          NRCZ=NRC+NLAYY
          CMASS=C(NRC)*VOL*APA(J)
          CCC(NRC)=CCC(NRC)-CMASS/ALAY(NLZ-1)
490       CCC(NRCZ)=CCC(NRCZ)+CMASS/ALAY(NLZ)
      GOTO 500
495       NRC=NRC+NLAYY
500   CONTINUE
510       NRC=NRC+NLAYY
999   RETURN
      END
```

```
      SUBROUTINE SHOWIT
      COMMON/BL1/ CPTI(50),RL(50),RB(50),RDO(50),RSL(50),RSR(50),
      COMMON/BL4/ DPTH(6),DM(50,36),DB,AREAB(50,6),DMIN
      COMMON/BL5/ ARE(50),SL,SR,B,V,O,DX(500),DTS,DDX,NBEGIN(50)
      COMMON/BL7/ FX(2000),RX(2000),VEL(2000),CJ(1000),NT,DTH,NP
      COMMON/BL8/ C(2000),COSINE,CCC(2000),A,WSC,WANGC
      COMMON/BL9/ NREACH,JK,NJUNC,NLAYY,NLAYZ,NR,ND,NDV,NDIV(50),NDX,
     $   INDJ,NJNU,NJND
      COMMON/BL12/ NPL,CMAX,VMAX,DXMIN,DXSC
      LOGICAL*1 CCH(51),VCH(41),CHSET(7),CH1,CH2
      DIMENSION HEAD(11),LC(7),LV(7),IC(8),IV(8)
C
C        THIS SUBROUTINE PLOTS OUT THE DATA FOR EACH REACH AS GRAPHS OF
C        CONCENTRATION AND VELOCITY VERSUS DISTANCE IN EACH LAYER, AND
C        VERTICALLY AVERAGED
C
 6000 FORMAT(1H1)
 6001 FORMAT(' PLOTS FOR REACH NUMBER ',I2,
     $   ' : TIME FROM START OF SIMULATION IS ',F7.2,' HOURS')
 6002 FORMAT(6X,'DIST',15X,'CONCENTRATIONS (P.P.M.)',15X,'DIST',14X,
     $   'VELOCITY (FT/SEC)')
 6003 FORMAT(7X,11(F5.1,5X))
 6004 FORMAT( 10X,'+',5(9('-'),'+'),4X,'0-',3X,4('+',9('-')),'+')
 6005 FORMAT(10X,'|',79X,'|')
 6006 FORMAT(2X,F7.1,'-',51A1,9X,41A1)
 6007 FORMAT(///)
 6008 FORMAT(5X,A1,' = LAYER ',I1,' (Z=',F4.1,' FT)')
 6009 FORMAT(5X,A1,' = AVERAGE OVER LAYERS')
 6010 FORMAT(6X,'(FT)',53X,'(FT)')
 6011 FORMAT(10X,'|',51X,I4,'-',23X,'|')
 6012 FORMAT(2X,F7.1,'-',51A1,1X,I4,'-',3X,41A1)
 6013 FORMAT(27X,': TIDAL DIFFERENCE= ',F6.3,' FEET: WIND SPEED= ',F4.1,
     $   ' FT/SEC: WIND DIRECTION= ',F4.0,' DEGREES'///)
      NPL=0
      NC=JK
```

```
      NRX=1
      NLAYZ1=NLAYZ+1
   CATA CHSET,CH1,CH2/'*','0','X','$','I','.','A',' ','|'/
   DO 120 NR=1,NREACH
   WRITE(6,6300)
      TIME=NT*DTH
   WRITE(6,6001) NR,TIME
      WANGLE=WANGC*180./3.141593+180.
   WRITE(6,6013) COSINE,WSC,WANGLE
   WRITE(6,6002)
   WRITE(6,6010)
      DELC=0.2*CMAX
      HEAD(1)=0.
   DO 10 I=2,6
10    HEAD(I)=(I-1)*DELC
      DELV=0.5*VMAX
      HEAD(7)=-VMAX
      HEAD(8)=-DELV
      HEAD(9)=0.
      HEAD(10)=DELV
      HEAD(11)=VMAX
      WRITE(6,6003) HEAD
      CMX=0.02*CMAX
      VMX=0.05*VMAX
      DXM=0.5*DXMIN
      IXSC=DXSC/DXM+0.5
   WRITE(6,6004)
      NDV=NDIV(NR)
      IX1=1
      IXC=0
      ISC=0
      X=0.
   DO 90 ND=1,NDV
      NRX=NRX+1
      DX2=0.5*DX(NRX)
      X=X+DX2
      IX2=X/DXM-0.5
```

```
      IF(IX2.LT.IX1) GOTO 25
      CO 20  I=IX1, IX2
         ISC=ISC+1
      IF(ISC-IXSC) 12,14,14
   12 WRITE(6,6005)
      GOTO 20
   14    ISC=0
         IXC=IXC+1
         IX=IXC*DXSC
      WRITE(6,6011) IX
   20 CONTINUE
   25    IX1=IX2+2
         CCH(1)=CH2
         VCH(21)=CH2
      CO 30  I=2,51
   30    CCH(I)=CH1
      DO 40  I=1,20
   40    VCH(I)=CH1
      DO 50  I=22,41
   50    VCH(I)=CH1
         CS=0.
         VS=0.
      CO 70  NLZ=1,NLAYZ
         CCZ=0.
         VVZ=0.
         LC(NLZ)=NLZ
         LV(NLZ)=NLZ
      DO 60  NLY=1,NLAYY
         NC=NC+1
         CN=C(NC)
         VN=VEL(NC)
         CS=CS+CN
         VS=VS+VN
         CCZ=CCZ+CN
   60    VVZ=VVZ+VN
```

```
      IC(NLZ)=CCZ/(NLAYY*CMX)+0.5
 70   IV(NLZ)=VVZ/(NLAYY*VMX)+21.5
      IC(NLAYZ1)=CS/(JK*CMX)+0.5
      IV(NLAYZ1)=VS/(JK*VMX)+21.5
      LC(NLAYZ1)=7
      LV(NLAYZ1)=7
   DO 80 NLZ=1,NLAYZ1
      CCH(IC(NLZ)+1)=CHSET(LC(NLZ))
 80   VCH(IV(NLZ))=CHSET(LV(NLZ))
      ISC=ISC+1
   IF(ISC-IXSC) 82,84,84
 82 WRITE(6,6006) X,CCH,VCH
   GOTO 90
 84   ISC=0
      IXC=IXC+1
      IX=IXC*DXSC
   WRITE(6,6012) X,CCH,IX,VCH
 90   X=X+DX2
      IX2=X/DXM+0.5
   DO 100 I=IX1,IX2
      ISC=ISC+1
   IF(ISC-IXSC) 92,94,94
 92 WRITE(6,6005)
   GOTO 100
 94   ISC=0
      IXC=IXC+1
      IX=IXC*DXSC
   WRITE(6,6011) IX
100 CONTINUE
   WRITE(6,6007)
      DZ=(RDO(NR)+COSINE)/NLAYZ
      D=-0.5*DZ
   DO 110 NLZ=1,NLAYZ
      D=D+DZ
110 WRITE(6,6008) CHSET(NLZ),NLZ,D
   WRITE(6,6009) CHSET(7)
      NRX=NRX+2
```

```
120     NC=NC+2*JK
      WRITE(6,6000)
      RETURN
      END
```

# APPENDIX G

## COMPUTER RESULTS FOR 57 ACRES OCTOBER STUDY CASE

This appendix contains the output produced by CANNET3D, a program designed to simulate mass transport in low energy tidal canal networks, for the October, 1977 study of the 57 Acres system.

```
336-CANNET3D-GO       -       -FT06F001


NUMBER OF TEST,NTEST=  1

57 ACRES CANAL SITE, JUPITER, FLORIDA
SIMULATION OF OCTOBER 1977 FIELD STUDY

NUMBER OF TIME INCREMENTS,NDT=    584
TIDAL PERIOD,T= 12.42 HOURS
NUMBER OF TIME STEPS BETWEEN OUTPUTS,NPRINT=     80
NUMBER OF TIME STEPS BETWEEN PLOTS,NPLOT=    292
TIME INCREMENT,DTH= 0.0625 HOURS
TIDAL AMPLITUDE,AMP=  1.15 FEET
BACKGROUND CONCENTRATION OF RECEIVING WATERS,CRW=  0.20 P.P.M.
DIMENSIONLESS LONGITUDINAL DIFFUSION COEFFICIENT,KX=  0.100
DIMENSIONLESS LATERAL DIFFUSION COEFFICIENT,KY=  0.100
DIMENSIONLESS VERTICAL DIFFUSION COEFFICIENT,KZ= 0.0005
BACKGROUND DIFFUSION COEFFICIENT,EO= 0.0005 SQ.FT./SEC.
VERTICAL MOMENTUM TRANSFER COEFFICIENT,NZ= 0.00200 SQ.FT/SEC.
NUMBER OF REACHES,NREACH=    5
NUMBER OF JUNCTIONS,NJUNC=  2
NUMBER OF LAKES,NLAKE=  0
NUMBER OF TIDAL ENTRANCES,NTES=  1
NUMBER OF LATERAL LAYERS,NLAYY= 1
NUMBER OF VERTICAL LAYERS,NLAYZ= 3


DATA FOR JUNCTION NUMBER  2:
LONGITUDINAL DISTANCE,DXJN=  350.00 FEET
LATERAL DISTANCE,DYJN=  130.00 FEET
MEAN TIDAL DEPTH,DOJN=  8.00 FEET


DATA FOR JUNCTION NUMBER  3:
LONGITUDINAL DISTANCE,DXJN=  130.00 FEET
LATERAL DISTANCE,DYJN=  130.00 FEET
MEAN TIDAL DEPTH,DOJN=  7.00 FEET

TIDAL ENTRANCE DATA:
TIME DECAY COEFFICIENT FOR TIDAL ENTRANCE 1 =  6.210 HOURS

LATERAL INFLOWS:

DECAY DATA:

BEND DATA:
```

```
DATA FCR REACH NUMBER  1:
NUMBER OF DIVISIONS ALCNG REACH,NDIV= 42
UPSTREAM JUNCTION,NJU=  1
DOWNSTREAM JUNCTICN,NJD=  2
LENGTH,RL= 4200.0 FEET
BREADTH,RB=  65.0 FEET
MEAN TIDAL DEPTH,RD0=  8.00 FEET
LEFT EANK INVERSE SIDE SLOPE,RSL=  3.00
RIGHT EANK INVERSE SIDE SLOPE,RSR=  3.00
REACH ALIGNMENT ANGLE ANGLE,RANG= 240.0 DEGREES
EQUIVALENT SAND ROUGHNESS,RNK= 15.00 FEET
CONSTANT DECAY COEFFICIENT FOR REACH,RDECAY=  0.0      /HOUR
LONGITUDINAL SPATIAL INCREMENTS,DX (OPT1=  0):
100.00 100.00 100.00 100.00 100.00 100.00 100.00 100.00 100.00 100.00 100.00 100.00
100.00 100.00 100.00 100.00 100.00 100.00 100.00 100.00 100.00 100.00 100.00 100.00
100.00 100.00 100.00 100.00 100.00 100.00 100.00 100.00 100.00 100.00 100.00 100.00
100.00 100.00 100.00 100.00 100.00 100.00

DATA FCR REACH NUMBER  2:
NUMBER OF DIVISIONS ALONG REACH,NDIV= 13
UPSTREAM JUNCTION,NJU=  1
DOWNSTREAM JUNCTICN,NJD=  3
LENGTH,RL= 1300.0 FEET
BREADTH,RB=  50.0 FEET
MEAN TIDAL DEPTH,RD0=  6.20 FEET
LEFT EANK INVERSE SIDE SLOPE,RSL=  3.00
RIGHT EANK INVERSE SIDE SLOPE,RSR=  3.00
REACH ALIGNMENT ANGLE ANGLE,RANG= 340.0 DEGREES
EQUIVALENT SAND ROUGHNESS,RNK= 15.00 FEET
CONSTANT DECAY COEFFICIENT FOR REACH,RDECAY=  0.0      /HOUR
LONGITUDINAL SPATIAL INCREMENTS,DX (OPT1=  0):
100.00 100.00 100.00 100.00 100.00 100.00 100.00 100.00 100.00 100.00 100.00 100.00
100.CC

DATA FCR REACH NUMBER  3:
NUMBER OF DIVISIONS ALONG REACH,NDIV=  7
UPSTREAM JUNCTICN,NJU=  1
DOWNSTREAM JUNCTICN,NJD=  3
LENGTH,RL=  700.0 FEET
BREADTH,RB=  50.0 FEET
MEAN TIDAL DEPTH,RD0=  6.30 FEET
LEFT EANK INVERSE SIDE SLOPE,RSL=  3.00
RIGHT EANK INVERSE SIDE SLOPE,RSR=  3.00
```

```
REACH ALIGNMENT ANGLE ANGLE,RANG= 110.0 DEGREES
EQUIVALENT SAND ROUGHNESS,RNK= 15.00 FEET
CONSTANT DECAY COEFFICIENT FOR REACH,RDECAY=  0.0      /HOUR
LONGITUDINAL SPATIAL INCREMENTS,DX (OPT1=  0):
100.00 100.00 100.00 100.00 100.00 100.00 100.00

DATA FOR REACH NUMBER  4:
NUMBER OF DIVISIONS ALONG REACH,NDIV=  9
UPSTREAM JUNCTION,NJU=  3
DOWNSTREAM JUNCTION,NJD=  2
LENGTH,RL=  900.0 FEET
BREADTH,RB=  60.0 FEET
MEAN TIDAL DEPTH,RD0=  7.70 FEET
LEFT BANK INVERSE SIDE SLOPE,RSL=  3.00
RIGHT BANK INVERSE SIDE SLOPE,RSR=  3.00
REACH ALIGNMENT ANGLE ANGLE,RANG= 110.0 DEGREES
EQUIVALENT SAND ROUGHNESS,RNK= 15.00 FEET
CONSTANT DECAY COEFFICIENT FOR REACH,RDECAY=  0.0      /HOUR
LONGITUDINAL SPATIAL INCREMENTS,DX (OPT1=  0):
100.00 100.00 100.00 100.00 100.00 100.00 100.00 100.00 100.00

DATA FOR REACH NUMBER  5:
NUMBER OF DIVISIONS ALONG REACH,NDIV= 15
UPSTREAM JUNCTION,NJU=  2
DOWNSTREAM JUNCTION,NJD=  4
LENGTH,RL= 2500.0 FEET
BREADTH,RB=  70.0 FEET
MEAN TIDAL DEPTH,RD0=  8.00 FEET
LEFT BANK INVERSE SIDE SLOPE,RSL=  2.00
RIGHT BANK INVERSE SIDE SLOPE,RSR=  4.00
REACH ALIGNMENT ANGLE ANGLE,RANG=  30.0 DEGREES
EQUIVALENT SAND ROUGHNESS,RNK= 15.00 FEET
CONSTANT DECAY COEFFICIENT FOR REACH,RDECAY=  0.0      /HOUR
LONGITUDINAL SPATIAL INCREMENTS,DX (OPT1=  0):
166.67 166.67 166.67 166.67 166.67 166.67 166.67 166.67 166.67 166.67 166.67 166.67
166.67 166.67 166.67
```

```
CONCENTRATIONS IN P.P.M. AND LONGITUDINAL VELOCITIES IN FT/SEC.

DIGITIZED TIDAL DATA
DIGITIZED WIND SPEED AND ANGLE AVERAGED OVER  6.00 HOURS (INTERPOLATION FACTOR=  8)

TIME     0.0  HOURS: TIDAL DIFFERENCE= -1.150 FEET
WIND SPEED=  0.0 FT/SEC: WIND DIRECTION=    0. DEGREES
REACH NUMBER  1:
X=    50.0/C/   0.200     0.200     2.000
        /VEL/   0.0       0.0       0.0
X=   150.0/C/   0.200     0.200     2.500
        /VEL/   0.0       0.0       0.0
X=   250.0/C/   0.200     0.200     3.000
        /VEL/   0.0       0.0       0.0
X=   350.0/C/   0.200     0.200     4.000
        /VEL/   0.0       0.0       0.0
X=   450.0/C/   0.200     0.200     2.100
        /VEL/   0.0       0.0       0.0
X=   550.0/C/   0.200     0.200     2.600
        /VEL/   0.0       0.0       0.0
X=   650.0/C/   0.200     0.200     4.000
        /VEL/   0.0       0.0       0.0
X=   750.0/C/   0.200     0.200     4.000
        /VEL/   0.0       0.0       0.0
X=   850.0/C/   0.200     0.200     5.500
        /VEL/   0.0       0.0       0.0
X=   950.0/C/   0.200     0.200    10.000
        /VEL/   0.0       0.0       0.0
X=  1050.0/C/   0.200     0.200    10.000
        /VEL/   0.0       0.0       0.0
X=  1150.0/C/   0.200     0.200    10.000
        /VEL/   0.0       0.0       0.0
X=  1250.0/C/   0.200     0.200    10.000
        /VEL/   0.0       0.0       0.0
X=  1350.0/C/   0.200     0.200    10.000
        /VEL/   0.0       0.0       0.0
X=  1450.0/C/   0.200     0.200     3.000
        /VEL/   0.0       0.0       0.0
X=  1550.0/C/   0.200     0.200     1.400
        /VEL/   0.0       0.0       0.0
X=  1650.0/C/   0.200     0.200     1.500
        /VEL/   0.0       0.0       0.0
X=  1750.0/C/   0.200     0.200     1.700
        /VEL/   0.0       0.0       0.0
X=  1850.0/C/   0.200     0.200     1.400
        /VEL/   0.0       0.0       0.0
X=  1950.0/C/   0.200     0.200     1.400
        /VEL/   0.0       0.0       0.0
```

```
X=  2050.0/C/     0.200     0.200     1.400
         /VEL/    0.0       0.0       0.0
X=  2150.0/C/     0.200     0.200     1.400
         /VEL/    0.0       0.0       0.0
X=  2250.0/C/     0.200     0.200     1.400
         /VEL/    0.0       0.0       0.0
X=  2350.0/C/     0.200     0.200     1.400
         /VEL/    0.0       0.0       0.0
X=  2450.0/C/     0.200     0.200     1.400
         /VEL/    0.0       0.0       0.0
X=  2550.0/C/     0.200     0.200     1.400
         /VEL/    0.0       0.0       0.0
X=  2650.0/C/     0.200     0.200     1.400
         /VEL/    0.0       0.0       0.0
X=  2750.0/C/     0.200     0.200     1.400
         /VEL/    0.0       0.0       0.0
X=  2850.0/C/     0.200     0.200     1.400
         /VEL/    0.0       0.0       0.0
X=  2950.0/C/     0.200     0.200     1.400
         /VEL/    0.0       0.0       0.0
X=  3050.0/C/     0.200     0.200     1.400
         /VEL/    0.0       0.0       0.0
X=  3150.0/C/     0.200     0.200     1.400
         /VEL/    0.0       0.0       0.0
X=  3250.0/C/     0.200     0.200     1.400
         /VEL/    0.0       0.0       0.0
X=  3350.0/C/     0.200     0.200     1.400
         /VEL/    0.0       0.0       0.0
X=  3450.0/C/     0.200     0.200     1.400
         /VEL/    0.0       0.0       0.0
X=  3550.0/C/     0.200     0.200     1.400
         /VEL/    0.0       0.0       0.0
X=  3650.0/C/     0.200     0.200     1.400
         /VEL/    0.0       0.0       0.0
X=  3750.0/C/     0.200     0.200     1.400
         /VEL/    0.0       0.0       0.0
X=  3850.0/C/     0.200     0.200     1.400
         /VEL/    0.0       0.0       0.0
X=  3950.0/C/     0.200     0.200     1.200
         /VEL/    0.0       0.0       0.0
X=  4050.0/C/     0.200     0.200     1.000
         /VEL/    0.0       0.0       0.0
X=  4150.0/C/     0.200     0.200     0.800
         /VEL/    0.0       0.0       0.0
REACH NUMBER   2:
X=    50.0/C/     0.200     0.200     0.200
         /VEL/    0.0       0.0       0.0
X=   150.0/C/     0.200     0.200     0.200
```

```
         /VEL/     0.0       0.0       0.0
X=   250.0/C/      0.200     0.200     0.200
         /VEL/     0.0       0.0       0.0
X=   350.0/C/      0.200     0.200     0.200
         /VEL/     0.0       0.0       0.0
X=   450.0/C/      0.200     0.200     0.200
         /VEL/     0.0       0.0       0.0
X=   550.0/C/      0.200     0.200     0.200
         /VEL/     0.0       0.0       0.0
X=   650.0/C/      0.200     0.200     0.200
         /VEL/     0.0       0.0       0.0
X=   750.0/C/      0.200     0.200     0.200
         /VEL/     0.0       0.0       0.0
X=   850.0/C/      0.200     0.200     0.200
         /VEL/     0.0       0.0       0.0
X=   950.0/C/      0.200     0.200     0.200
         /VEL/     0.0       0.0       0.0
X=  1050.0/C/      0.200     0.200     0.200
         /VEL/     0.0       0.0       0.0
X=  1150.0/C/      0.200     0.200     0.200
         /VEL/     0.0       0.0       0.0
X=  1250.0/C/      0.200     0.200     0.200
         /VEL/     0.0       0.0       0.0
REACH NUMBER   3:
X=    50.0/C/      0.200     0.200     0.200
         /VEL/     0.0       0.0       0.0
X=   150.0/C/      0.200     0.200     0.200
         /VEL/     0.0       0.0       0.0
X=   250.0/C/      0.200     0.200     0.200
         /VEL/     0.0       0.0       0.0
X=   350.0/C/      0.200     0.200     0.200
         /VEL/     0.0       0.0       0.0
X=   450.0/C/      0.200     0.200     0.200
         /VEL/     0.0       0.0       0.0
X=   550.0/C/      0.200     0.200     0.200
         /VEL/     0.0       0.0       0.0
X=   650.0/C/      0.200     0.200     0.200
         /VEL/     0.0       0.0       0.0
REACH NUMBER   4:
X=    50.0/C/      0.200     0.200     0.200
         /VEL/     0.0       0.0       0.0
X=   150.0/C/      0.200     0.200     0.200
         /VEL/     0.0       0.0       0.0
X=   250.0/C/      0.200     0.200     0.200
         /VEL/     0.0       0.0       0.0
X=   350.0/C/      0.200     0.200     0.200
         /VEL/     0.0       0.0       0.0
X=   450.0/C/      0.200     0.200     0.200
```

```
        /VEL/     0.0       0.0       0.0
X=   550.0/C/     0.200     0.200     0.200
        /VEL/     0.0       0.0       0.0
X=   650.0/C/     0.200     0.200     0.200
        /VEL/     0.0       0.0       0.0
X=   750.0/C/     0.200     0.200     0.200
        /VEL/     0.0       0.0       0.0
X=   850.0/C/     0.200     0.200     0.200
        /VEL/     0.0       0.0       0.0
REACH NUMBER   5:
X=    83.3/C/     0.200     0.200     0.200
        /VEL/     0.0       0.0       0.0
X=   250.0/C/     0.200     0.200     0.200
        /VEL/     0.0       0.0       0.0
X=   416.7/C/     0.200     0.200     0.200
        /VEL/     0.0       0.0       0.0
X=   583.3/C/     0.200     0.200     0.200
        /VEL/     0.0       0.0       0.0
X=   750.0/C/     0.200     0.200     0.200
        /VEL/     0.0       0.0       0.0
X=   916.7/C/     0.200     0.200     0.200
        /VEL/     0.0       0.0       0.0
X=  1083.3/C/     0.200     0.200     0.200
        /VEL/     0.0       0.0       0.0
X=  1250.0/C/     0.200     0.200     0.200
        /VEL/     0.0       0.0       0.0
X=  1416.7/C/     0.200     0.200     0.200
        /VEL/     0.0       0.0       0.0
X=  1583.3/C/     0.200     0.200     0.200
        /VEL/     0.0       0.0       0.0
X=  1750.0/C/     0.200     0.200     0.200
        /VEL/     0.0       0.0       0.0
X=  1916.7/C/     0.200     0.200     0.200
        /VEL/     0.0       0.0       0.0
X=  2083.3/C/     0.200     0.200     0.200
        /VEL/     0.0       0.0       0.0
X=  2250.0/C/     0.200     0.200     0.200
        /VEL/     0.0       0.0       0.0
X=  2416.7/C/     0.200     0.200     0.200
        /VEL/     0.0       0.0       0.0
JUNCTION NUMBER   2:
    0.200
    0.200
    0.200
JUNCTION NUMBER   3:
    0.200
    0.200
    0.200
```

********************************************************************************************

TIME 5.00 HOURS: TIDAL DIFFERENCE= -0.050 FEET
WIND SPEED= 0.9 FT/SEC: WIND DIRECTION= 307. DEGREES
REACH NUMBER 1:

| | | | |
|---|---|---|---|
| X= 50.0/C/ | 0.598 | 0.794 | 1.088 |
| /VEL/ | 0.000 | 0.001 | 0.001 |
| X= 150.0/C/ | 0.723 | 0.975 | 1.361 |
| /VEL/ | 0.000 | 0.002 | 0.003 |
| X= 250.0/C/ | 0.921 | 1.283 | 1.840 |
| /VEL/ | 0.001 | 0.004 | 0.005 |
| X= 350.0/C/ | 0.719 | 0.952 | 1.259 |
| /VEL/ | 0.001 | 0.005 | 0.006 |
| X= 450.0/C/ | 0.764 | 1.052 | 1.529 |
| /VEL/ | 0.001 | 0.007 | 0.008 |
| X= 550.0/C/ | 0.968 | 1.356 | 1.928 |
| /VEL/ | 0.002 | 0.008 | 0.010 |
| X= 650.0/C/ | 1.321 | 1.915 | 2.895 |
| /VEL/ | 0.002 | 0.010 | 0.012 |
| X= 750.0/C/ | 1.977 | 2.944 | 4.437 |
| /VEL/ | 0.002 | 0.011 | 0.014 |
| X= 850.0/C/ | 2.311 | 3.304 | 4.837 |
| /VEL/ | 0.002 | 0.013 | 0.015 |
| X= 950.0/C/ | 2.355 | 3.350 | 4.910 |
| /VEL/ | 0.003 | 0.014 | 0.017 |
| X= 1050.0/C/ | 2.012 | 2.848 | 4.023 |
| /VEL/ | 0.003 | 0.016 | 0.019 |
| X= 1150.0/C/ | 1.194 | 1.445 | 1.615 |
| /VEL/ | 0.003 | 0.017 | 0.021 |
| X= 1250.0/C/ | 0.651 | 0.717 | 0.820 |
| /VEL/ | 0.003 | 0.019 | 0.023 |
| X= 1350.0/C/ | 0.507 | 0.661 | 0.832 |
| /VEL/ | 0.004 | 0.020 | 0.024 |
| X= 1450.0/C/ | 0.463 | 0.604 | 0.795 |
| /VEL/ | 0.004 | 0.022 | 0.026 |
| X= 1550.0/C/ | 0.467 | 0.582 | 0.761 |
| /VEL/ | 0.004 | 0.023 | 0.028 |
| X= 1650.0/C/ | 0.463 | 0.580 | 0.760 |
| /VEL/ | 0.004 | 0.025 | 0.030 |
| X= 1750.0/C/ | 0.460 | 0.579 | 0.761 |
| /VEL/ | 0.005 | 0.026 | 0.032 |
| X= 1850.0/C/ | 0.461 | 0.578 | 0.760 |
| /VEL/ | 0.005 | 0.028 | 0.034 |
| X= 1950.0/C/ | 0.461 | 0.578 | 0.760 |
| /VEL/ | 0.005 | 0.029 | 0.035 |
| X= 2050.0/C/ | 0.462 | 0.578 | 0.759 |
| /VEL/ | 0.006 | 0.031 | 0.037 |
| X= 2150.0/C/ | 0.462 | 0.578 | 0.759 |

| | | | |
|---|---|---|---|
| /VEL/ | 0.006 | 0.032 | 0.039 |
| X= 2250.0/C/ | 0.462 | 0.578 | 0.759 |
| /VEL/ | 0.006 | 0.034 | 0.041 |
| X= 2350.0/C/ | 0.463 | 0.578 | 0.758 |
| /VEL/ | 0.006 | 0.035 | 0.043 |
| X= 2450.0/C/ | 0.463 | 0.578 | 0.758 |
| /VEL/ | 0.007 | 0.037 | 0.044 |
| X= 2550.0/C/ | 0.463 | 0.577 | 0.758 |
| /VEL/ | 0.007 | 0.038 | 0.046 |
| X= 2650.0/C/ | 0.463 | 0.577 | 0.757 |
| /VEL/ | 0.007 | 0.040 | 0.048 |
| X= 2750.0/C/ | 0.464 | 0.578 | 0.758 |
| /VEL/ | 0.007 | 0.041 | 0.050 |
| X= 2850.0/C/ | 0.464 | 0.578 | 0.761 |
| /VEL/ | 0.008 | 0.043 | 0.052 |
| X= 2950.0/C/ | 0.456 | 0.570 | 0.744 |
| /VEL/ | 0.008 | 0.044 | 0.053 |
| X= 3050.0/C/ | 0.432 | 0.536 | 0.682 |
| /VEL/ | 0.008 | 0.046 | 0.055 |
| X= 3150.0/C/ | 0.387 | 0.464 | 0.557 |
| /VEL/ | 0.009 | 0.047 | 0.057 |
| X= 3250.0/C/ | 0.331 | 0.363 | 0.374 |
| /VEL/ | 0.009 | 0.048 | 0.059 |
| X= 3350.0/C/ | 0.287 | 0.279 | 0.244 |
| /VEL/ | 0.009 | 0.050 | 0.061 |
| X= 3450.0/C/ | 0.259 | 0.242 | 0.213 |
| /VEL/ | 0.009 | 0.051 | 0.063 |
| X= 3550.0/C/ | 0.240 | 0.229 | 0.210 |
| /VEL/ | 0.010 | 0.053 | 0.064 |
| X= 3650.0/C/ | 0.225 | 0.219 | 0.207 |
| /VEL/ | 0.010 | 0.054 | 0.066 |
| X= 3750.0/C/ | 0.213 | 0.211 | 0.204 |
| /VEL/ | 0.010 | 0.056 | 0.068 |
| X= 3850.0/C/ | 0.206 | 0.206 | 0.202 |
| /VEL/ | 0.010 | 0.057 | 0.070 |
| X= 3950.0/C/ | 0.202 | 0.202 | 0.201 |
| /VEL/ | 0.011 | 0.059 | 0.072 |
| X= 4050.0/C/ | 0.200 | 0.201 | 0.200 |
| /VEL/ | 0.011 | 0.060 | 0.073 |
| X= 4150.0/C/ | 0.200 | 0.200 | 0.200 |
| /VEL/ | 0.011 | 0.062 | 0.075 |
| REACH NUMBER | 2: | | |
| X= 50.0/C/ | 0.200 | 0.200 | 0.201 |
| /VEL/ | 0.000 | 0.001 | 0.001 |
| X= 150.0/C/ | 0.200 | 0.200 | 0.200 |
| /VEL/ | 0.000 | 0.003 | 0.003 |
| X= 250.0/C/ | 0.200 | 0.200 | 0.200 |
| /VEL/ | 0.000 | 0.005 | 0.006 |

```
X=   350.0/C/   0.200    0.200    0.200
        /VEL/   0.001    0.007    0.008
X=   450.0/C/   0.200    0.200    0.200
        /VEL/   0.001    0.009    0.011
X=   550.0/C/   0.200    0.200    0.200
        /VEL/   0.001    0.011    0.013
X=   650.0/C/   0.200    0.200    0.200
        /VEL/   0.001    0.013    0.015
X=   750.0/C/   0.200    0.200    0.200
        /VEL/   0.001    0.014    0.018
X=   850.0/C/   0.200    0.200    0.200
        /VEL/   0.001    0.016    0.020
X=   950.0/C/   0.200    0.200    0.200
        /VEL/   0.001    0.018    0.023
X=  1050.0/C/   0.200    0.200    0.200
        /VEL/   0.001    0.020    0.025
X=  1150.0/C/   0.200    0.200    0.200
        /VEL/   0.001    0.022    0.028
X=  1250.0/C/   0.200    0.200    0.200
        /VEL/   0.002    0.024    0.030
REACH NUMBER   3:
X=    50.0/C/   0.200    0.201    0.200
        /VEL/  -0.000    0.001    0.001
X=   150.0/C/   0.200    0.200    0.200
        /VEL/  -0.000    0.003    0.004
X=   250.0/C/   0.200    0.200    0.200
        /VEL/   0.000    0.005    0.006
X=   350.0/C/   0.200    0.200    0.200
        /VEL/   0.000    0.006    0.009
X=   450.0/C/   0.200    0.200    0.200
        /VEL/   0.000    0.008    0.011
X=   550.0/C/   0.200    0.200    0.200
        /VEL/   0.000    0.010    0.013
X=   650.0/C/   0.200    0.200    0.200
        /VEL/   0.001    0.012    0.016
REACH NUMBER   4:
X=    50.0/C/   0.200    0.200    0.200
        /VEL/   0.005    0.029    0.036
X=   150.0/C/   0.200    0.200    0.200
        /VEL/   0.005    0.030    0.037
X=   250.0/C/   0.200    0.200    0.200
        /VEL/   0.005    0.032    0.039
X=   350.0/C/   0.200    0.200    0.200
        /VEL/   0.005    0.033    0.041
X=   450.0/C/   0.200    0.199    0.199
        /VEL/   0.006    0.035    0.043
X=   550.0/C/   0.200    0.200    0.200
        /VEL/   0.006    0.037    0.045
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X=   650.0/C/     0.200     0.200     0.200
          /VEL/     0.006     0.038     0.047
X=   750.0/C/     0.200     0.200     0.200
          /VEL/     0.006     0.040     0.049
X=   850.0/C/     0.200     0.200     0.200
          /VEL/     0.007     0.041     0.051
REACH NUMBER   5:
X=    83.3/C/     0.200     0.200     0.200
          /VEL/     0.012     0.067     0.081
X=   250.0/C/     0.200     0.200     0.200
          /VEL/     0.013     0.069     0.084
X=   416.7/C/     0.200     0.200     0.200
          /VEL/     0.013     0.071     0.087
X=   583.3/C/     0.200     0.200     0.200
          /VEL/     0.014     0.074     0.090
X=   750.0/C/     0.200     0.200     0.200
          /VEL/     0.014     0.076     0.093
X=   916.7/C/     0.200     0.200     0.200
          /VEL/     0.014     0.079     0.096
X=  1083.3/C/     0.200     0.200     0.200
          /VEL/     0.015     0.081     0.099
X=  1250.0/C/     0.200     0.200     0.200
          /VEL/     0.015     0.084     0.102
X=  1416.7/C/     0.200     0.200     0.200
          /VEL/     0.016     0.086     0.105
X=  1583.3/C/     0.200     0.200     0.200
          /VEL/     0.016     0.089     0.108
X=  1750.0/C/     0.200     0.200     0.200
          /VEL/     0.017     0.091     0.111
X=  1916.7/C/     0.200     0.200     0.200
          /VEL/     0.017     0.094     0.114
X=  2083.3/C/     0.200     0.200     0.200
          /VEL/     0.018     0.096     0.117
X=  2250.0/C/     0.200     0.200     0.200
          /VEL/     0.018     0.099     0.120
X=  2416.7/C/     0.200     0.200     0.200
          /VEL/     0.018     0.101     0.123
JUNCTION NUMBER   2:
    0.200
    0.200
    0.200
JUNCTION NUMBER   3:
    0.200
    0.200
    0.200
**************************************************************************

TIME   10.00 HOURS: TIDAL DIFFERENCE= -2.050 FEET
```

WIND SPEED= 5.0 FT/SEC: WIND DIRECTION= 332. DEGREES

REACH NUMBER 1:

| | | | |
|---|---|---|---|
| X= 50.0/C/ | 0.789 | 0.837 | 0.878 |
| /VEL/ | 0.000 | 0.001 | 0.001 |
| X= 150.0/C/ | 0.901 | 0.925 | 0.953 |
| /VEL/ | 0.000 | 0.002 | 0.003 |
| X= 250.0/C/ | 1.057 | 1.099 | 1.121 |
| /VEL/ | 0.001 | 0.004 | 0.004 |
| X= 350.0/C/ | 1.166 | 1.268 | 1.330 |
| /VEL/ | 0.001 | 0.005 | 0.006 |
| X= 450.0/C/ | 1.025 | 1.170 | 1.279 |
| /VEL/ | 0.001 | 0.006 | 0.007 |
| X= 550.0/C/ | 1.034 | 1.047 | 1.091 |
| /VEL/ | 0.001 | 0.008 | 0.009 |
| X= 650.0/C/ | 1.219 | 1.129 | 1.101 |
| /VEL/ | 0.002 | 0.009 | 0.011 |
| X= 750.0/C/ | 1.564 | 1.380 | 1.315 |
| /VEL/ | 0.002 | 0.011 | 0.012 |
| X= 850.0/C/ | 2.069 | 1.717 | 1.583 |
| /VEL/ | 0.002 | 0.012 | 0.014 |
| X= 950.0/C/ | 2.541 | 2.137 | 1.934 |
| /VEL/ | 0.002 | 0.014 | 0.016 |
| X= 1050.0/C/ | 2.928 | 2.637 | 2.459 |
| /VEL/ | 0.003 | 0.015 | 0.017 |
| X= 1150.0/C/ | 3.071 | 3.080 | 3.049 |
| /VEL/ | 0.003 | 0.016 | 0.019 |
| X= 1250.0/C/ | 2.632 | 3.260 | 3.450 |
| /VEL/ | 0.003 | 0.018 | 0.021 |
| X= 1350.0/C/ | 2.425 | 3.162 | 3.551 |
| /VEL/ | 0.003 | 0.019 | 0.022 |
| X= 1450.0/C/ | 2.010 | 2.926 | 3.452 |
| /VEL/ | 0.004 | 0.021 | 0.024 |
| X= 1550.0/C/ | 1.602 | 2.604 | 3.228 |
| /VEL/ | 0.004 | 0.022 | 0.026 |
| X= 1650.0/C/ | 1.215 | 2.154 | 2.810 |
| /VEL/ | 0.004 | 0.024 | 0.027 |
| X= 1750.0/C/ | 0.899 | 1.597 | 2.164 |
| /VEL/ | 0.005 | 0.025 | 0.029 |
| X= 1850.0/C/ | 0.658 | 1.081 | 1.456 |
| /VEL/ | 0.005 | 0.026 | 0.031 |
| X= 1950.0/C/ | 0.609 | 0.750 | 0.923 |
| /VEL/ | 0.005 | 0.028 | 0.032 |
| X= 2050.0/C/ | 0.588 | 0.624 | 0.670 |
| /VEL/ | 0.005 | 0.029 | 0.034 |
| X= 2150.0/C/ | 0.587 | 0.615 | 0.629 |
| /VEL/ | 0.006 | 0.031 | 0.036 |
| X= 2250.0/C/ | 0.584 | 0.623 | 0.652 |
| /VEL/ | 0.006 | 0.032 | 0.037 |

| | | | |
|---|---|---|---|
| X= 2350.0/C/ | 0.580 | 0.616 | 0.651 |
| /VEL/ | 0.006 | 0.034 | 0.039 |
| X= 2450.0/C/ | 0.578 | 0.606 | 0.634 |
| /VEL/ | 0.006 | 0.035 | 0.041 |
| X= 2550.0/C/ | 0.577 | 0.601 | 0.623 |
| /VEL/ | 0.007 | 0.036 | 0.042 |
| X= 2650.0/C/ | 0.577 | 0.601 | 0.621 |
| /VEL/ | 0.007 | 0.038 | 0.044 |
| X= 2750.0/C/ | 0.578 | 0.601 | 0.622 |
| /VEL/ | 0.007 | 0.039 | 0.046 |
| X= 2850.0/C/ | 0.578 | 0.601 | 0.623 |
| /VEL/ | 0.007 | 0.041 | 0.047 |
| X= 2950.0/C/ | 0.578 | 0.601 | 0.622 |
| /VEL/ | 0.008 | 0.042 | 0.049 |
| X= 3050.0/C/ | 0.578 | 0.601 | 0.622 |
| /VEL/ | 0.008 | 0.044 | 0.051 |
| X= 3150.0/C/ | 0.578 | 0.601 | 0.622 |
| /VEL/ | 0.008 | 0.045 | 0.052 |
| X= 3250.0/C/ | 0.575 | 0.601 | 0.622 |
| /VEL/ | 0.008 | 0.046 | 0.054 |
| X= 3350.0/C/ | 0.568 | 0.599 | 0.621 |
| /VEL/ | 0.009 | 0.048 | 0.056 |
| X= 3450.0/C/ | 0.555 | 0.595 | 0.620 |
| /VEL/ | 0.009 | 0.049 | 0.057 |
| X= 3550.0/C/ | 0.536 | 0.589 | 0.619 |
| /VEL/ | 0.009 | 0.051 | 0.059 |
| X= 3650.0/C/ | 0.516 | 0.581 | 0.615 |
| /VEL/ | 0.009 | 0.052 | 0.061 |
| X= 3750.0/C/ | 0.496 | 0.571 | 0.611 |
| /VEL/ | 0.010 | 0.053 | 0.062 |
| X= 3850.0/C/ | 0.475 | 0.559 | 0.606 |
| /VEL/ | 0.010 | 0.055 | 0.064 |
| X= 3950.0/C/ | 0.455 | 0.547 | 0.599 |
| /VEL/ | 0.010 | 0.056 | 0.065 |
| X= 4050.0/C/ | 0.434 | 0.534 | 0.592 |
| /VEL/ | 0.010 | 0.058 | 0.067 |
| X= 4150.0/C/ | 0.413 | 0.520 | 0.584 |
| /VEL/ | 0.011 | 0.059 | 0.069 |
| REACH NUMBER | 2: | | |
| X= 50.0/C/ | 0.209 | 0.210 | 0.209 |
| /VEL/ | 0.009 | 0.011 | -0.017 |
| X= 150.0/C/ | 0.204 | 0.205 | 0.202 |
| /VEL/ | 0.009 | 0.013 | -0.014 |
| X= 250.0/C/ | 0.200 | 0.200 | 0.199 |
| /VEL/ | 0.009 | 0.015 | -0.012 |
| X= 350.0/C/ | 0.200 | 0.200 | 0.201 |
| /VEL/ | 0.009 | 0.018 | -0.009 |
| X= 450.0/C/ | 0.200 | 0.200 | 0.200 |

| | | | |
|---|---|---|---|
| /VEL/ | 0.009 | 0.020 | -0.007 |
| X= 550.0/C/ | 0.200 | 0.200 | 0.200 |
| /VEL/ | 0.009 | 0.022 | -0.004 |
| X= 650.0/C/ | 0.200 | 0.200 | 0.200 |
| /VEL/ | 0.010 | 0.024 | -0.001 |
| X= 750.0/C/ | 0.200 | 0.200 | 0.200 |
| /VEL/ | 0.010 | 0.026 | 0.001 |
| X= 850.0/C/ | 0.200 | 0.200 | 0.200 |
| /VEL/ | 0.010 | 0.029 | 0.004 |
| X= 950.0/C/ | 0.200 | 0.200 | 0.200 |
| /VEL/ | 0.010 | 0.031 | 0.006 |
| X= 1050.0/C/ | 0.200 | 0.200 | 0.200 |
| /VEL/ | 0.010 | 0.033 | 0.009 |
| X= 1150.0/C/ | 0.200 | 0.200 | 0.200 |
| /VEL/ | 0.010 | 0.035 | 0.012 |
| X= 1250.0/C/ | 0.200 | 0.200 | 0.200 |
| /VEL/ | 0.010 | 0.038 | 0.014 |
| REACH NUMBER | 3: | | |
| X= 50.0/C/ | 0.206 | 0.206 | 0.207 |
| /VEL/ | -0.004 | -0.004 | 0.010 |
| X= 150.0/C/ | 0.201 | 0.203 | 0.204 |
| /VEL/ | -0.004 | -0.002 | 0.013 |
| X= 250.0/C/ | 0.200 | 0.200 | 0.199 |
| /VEL/ | -0.004 | 0.000 | 0.015 |
| X= 350.0/C/ | 0.200 | 0.200 | 0.200 |
| /VEL/ | -0.004 | 0.003 | 0.018 |
| X= 450.0/C/ | 0.200 | 0.200 | 0.200 |
| /VEL/ | -0.004 | 0.005 | 0.020 |
| X= 550.0/C/ | 0.200 | 0.200 | 0.200 |
| /VEL/ | -0.004 | 0.007 | 0.023 |
| X= 650.0/C/ | 0.200 | 0.200 | 0.200 |
| /VEL/ | -0.003 | 0.009 | 0.025 |
| REACH NUMBER | 4: | | |
| X= 50.0/C/ | 0.200 | 0.200 | 0.200 |
| /VEL/ | -0.000 | 0.023 | 0.041 |
| X= 150.0/C/ | 0.200 | 0.200 | 0.200 |
| /VEL/ | -0.000 | 0.024 | 0.043 |
| X= 250.0/C/ | 0.200 | 0.200 | 0.200 |
| /VEL/ | 0.000 | 0.026 | 0.045 |
| X= 350.0/C/ | 0.200 | 0.200 | 0.200 |
| /VEL/ | 0.000 | 0.027 | 0.047 |
| X= 450.0/C/ | 0.200 | 0.200 | 0.200 |
| /VEL/ | 0.001 | 0.029 | 0.048 |
| X= 550.0/C/ | 0.200 | 0.200 | 0.200 |
| /VEL/ | 0.001 | 0.030 | 0.050 |
| X= 650.0/C/ | 0.200 | 0.200 | 0.200 |
| /VEL/ | 0.001 | 0.032 | 0.052 |
| X= 750.0/C/ | 0.200 | 0.200 | 0.200 |

```
        /VEL/     0.001     0.033     0.054
X=   650.0/C/     0.200     0.200     0.200
        /VEL/     0.002     0.035     0.056
REACH NUMBER   5:
X=    83.3/C/     0.260     0.355     0.414
        /VEL/     0.014     0.066     0.071
X=   250.0/C/     0.263     0.333     0.391
        /VEL/     0.014     0.068     0.073
X=   416.7/C/     0.244     0.311     0.365
        /VEL/     0.015     0.071     0.076
X=   583.3/C/     0.229     0.285     0.334
        /VEL/     0.015     0.073     0.079
X=   750.0/C/     0.217     0.259     0.298
        /VEL/     0.016     0.075     0.082
X=   916.7/C/     0.209     0.235     0.263
        /VEL/     0.016     0.078     0.084
X=  1083.3/C/     0.204     0.217     0.234
        /VEL/     0.016     0.080     0.087
X=  1250.0/C/     0.202     0.207     0.215
        /VEL/     0.017     0.082     0.090
X=  1416.7/C/     0.201     0.203     0.206
        /VEL/     0.017     0.085     0.093
X=  1583.3/C/     0.200     0.202     0.203
        /VEL/     0.018     0.087     0.095
X=  1750.0/C/     0.200     0.201     0.202
        /VEL/     0.018     0.090     0.098
X=  1916.7/C/     0.200     0.201     0.201
        /VEL/     0.019     0.092     0.101
X=  2083.3/C/     0.200     0.200     0.200
        /VEL/     0.019     0.094     0.103
X=  2250.0/C/     0.200     0.200     0.200
        /VEL/     0.019     0.097     0.106
X=  2416.7/C/     0.200     0.200     0.200
        /VEL/     0.020     0.099     0.109
JUNCTION NUMBER   2:
   0.228
   0.370
   0.426
JUNCTION NUMBER   3:
   0.200
   0.200
   0.200
**************************************************************************************

TIME    15.00 HOURS: TIDAL DIFFERENCE=  0.100 FEET
WIND SPEED= 11.4 FT/SEC: WIND DIRECTION=    6. DEGREES
REACH NUMBER   1:
X=    50.0/C/     1.015     0.976     0.914
```

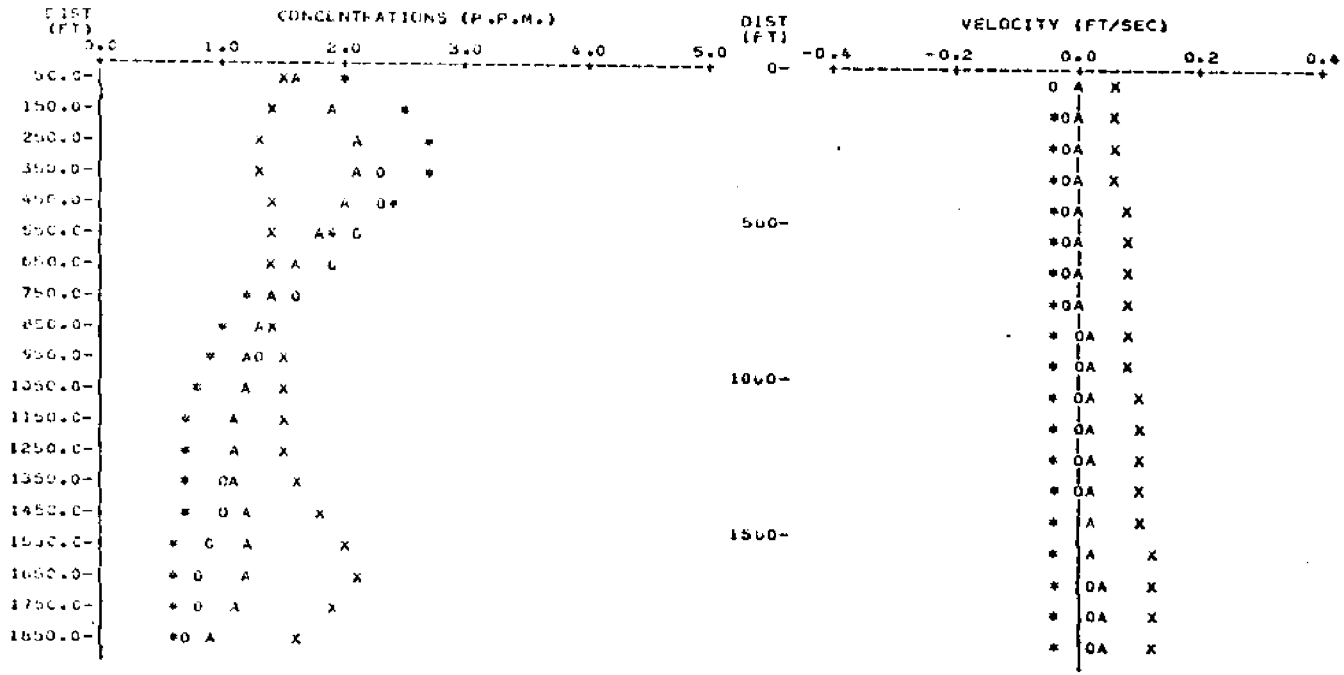
| | | | | |
|---|---|---|---|---|
| | /VEL/ | -0.036 | -0.026 | 0.039 |
| X= | 150.0/C/ | 1.192 | 1.161 | 0.905 |
| | /VEL/ | -0.036 | -0.028 | 0.036 |
| X= | 250.0/C/ | 1.102 | 1.098 | 0.993 |
| | /VEL/ | -0.037 | -0.031 | 0.033 |
| X= | 350.0/C/ | 1.121 | 1.170 | 1.190 |
| | /VEL/ | -0.037 | -0.033 | 0.030 |
| X= | 450.0/C/ | 1.388 | 1.499 | 1.169 |
| | /VEL/ | -0.038 | -0.036 | 0.027 |
| X= | 550.0/C/ | 1.661 | 2.064 | 1.256 |
| | /VEL/ | -0.038 | -0.038 | 0.024 |
| X= | 650.0/C/ | 2.417 | 2.664 | 1.742 |
| | /VEL/ | -0.038 | -0.040 | 0.021 |
| X= | 750.0/C/ | 2.657 | 3.003 | 2.412 |
| | /VEL/ | -0.039 | -0.043 | 0.018 |
| X= | 850.0/C/ | 3.034 | 2.971 | 3.030 |
| | /VEL/ | -0.039 | -0.045 | 0.015 |
| X= | 950.0/C/ | 2.886 | 2.582 | 3.149 |
| | /VEL/ | -0.040 | -0.048 | 0.012 |
| X= | 1050.0/C/ | 2.478 | 1.961 | 2.799 |
| | /VEL/ | -0.040 | -0.050 | 0.009 |
| X= | 1150.0/C/ | 1.972 | 1.380 | 2.148 |
| | /VEL/ | -0.041 | -0.052 | 0.006 |
| X= | 1250.0/C/ | 1.510 | 1.008 | 1.265 |
| | /VEL/ | -0.041 | -0.055 | 0.003 |
| X= | 1350.0/C/ | 1.143 | 0.604 | 0.822 |
| | /VEL/ | -0.042 | -0.057 | 0.000 |
| X= | 1450.0/C/ | 0.876 | 0.689 | 0.691 |
| | /VEL/ | -0.042 | -0.060 | -0.003 |
| X= | 1550.0/C/ | 0.708 | 0.631 | 0.643 |
| | /VEL/ | -0.042 | -0.062 | -0.005 |
| X= | 1650.0/C/ | 0.628 | 0.609 | 0.614 |
| | /VEL/ | -0.043 | -0.065 | -0.008 |
| X= | 1750.0/C/ | 0.605 | 0.603 | 0.606 |
| | /VEL/ | -0.043 | -0.067 | -0.011 |
| X= | 1850.0/C/ | 0.602 | 0.602 | 0.605 |
| | /VEL/ | -0.044 | -0.070 | -0.014 |
| X= | 1950.0/C/ | 0.601 | 0.601 | 0.604 |
| | /VEL/ | -0.044 | -0.072 | -0.017 |
| X= | 2050.0/C/ | 0.598 | 0.598 | 0.603 |
| | /VEL/ | -0.045 | -0.074 | -0.020 |
| X= | 2150.0/C/ | 0.596 | 0.593 | 0.601 |
| | /VEL/ | -0.045 | -0.077 | -0.023 |
| X= | 2250.0/C/ | 0.554 | 0.586 | 0.594 |
| | /VEL/ | -0.046 | -0.079 | -0.026 |
| X= | 2350.0/C/ | 0.550 | 0.575 | 0.585 |
| | /VEL/ | -0.046 | -0.082 | -0.029 |
| X= | 2450.0/C/ | 0.584 | 0.544 | 0.572 |

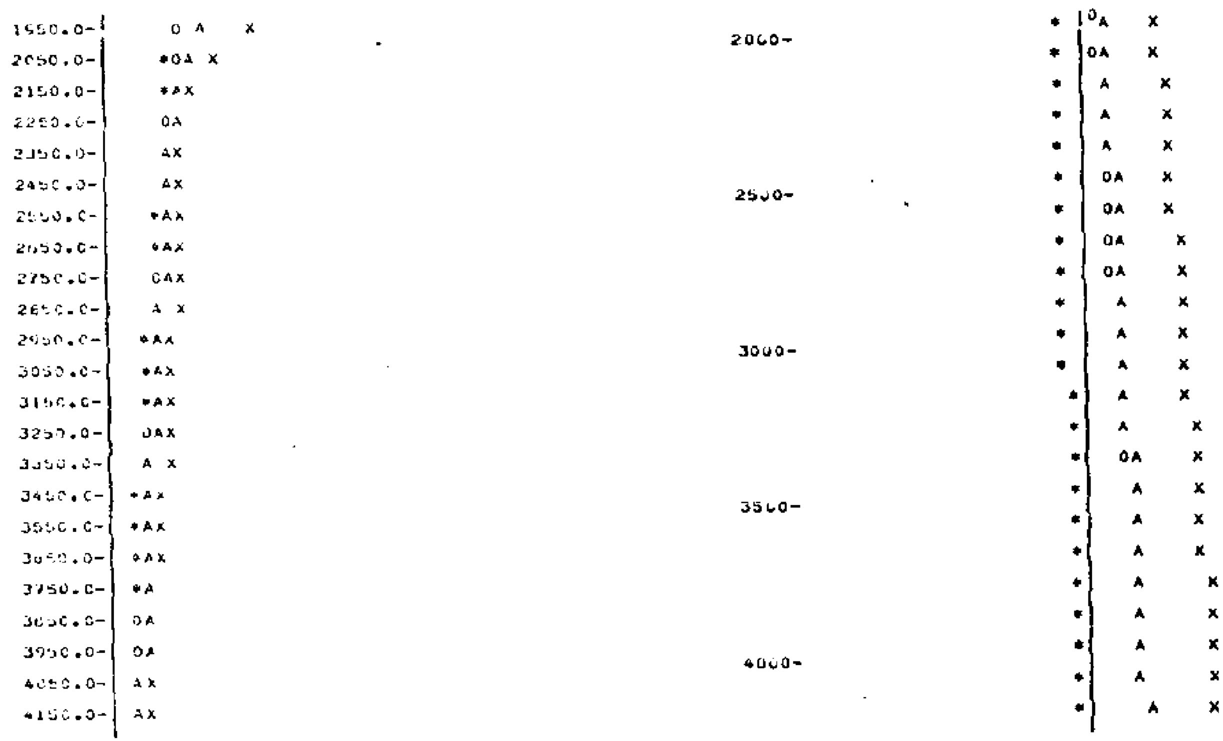
| | | | |
|---|---|---|---|
| /VEL/ | -0.046 | -0.084 | -0.032 |
| X= 2550.0/C/ | 0.571 | 0.505 | 0.526 |
| /VEL/ | -0.047 | -0.087 | -0.035 |
| X= 2650.0/C/ | 0.555 | 0.478 | 0.466 |
| /VEL/ | -0.047 | -0.089 | -0.038 |
| X= 2750.0/C/ | 0.537 | 0.456 | 0.432 |
| /VEL/ | -0.048 | -0.091 | -0.041 |
| X= 2850.0/C/ | 0.518 | 0.433 | 0.411 |
| /VEL/ | -0.048 | -0.094 | -0.044 |
| X= 2950.0/C/ | 0.497 | 0.407 | 0.387 |
| /VEL/ | -0.049 | -0.096 | -0.047 |
| X= 3050.0/C/ | 0.473 | 0.381 | 0.360 |
| /VEL/ | -0.049 | -0.099 | -0.050 |
| X= 3150.0/C/ | 0.449 | 0.354 | 0.333 |
| /VEL/ | -0.050 | -0.101 | -0.053 |
| X= 3250.0/C/ | 0.425 | 0.329 | 0.305 |
| /VEL/ | -0.050 | -0.104 | -0.056 |
| X= 3350.0/C/ | 0.400 | 0.306 | 0.280 |
| /VEL/ | -0.050 | -0.106 | -0.059 |
| X= 3450.0/C/ | 0.375 | 0.285 | 0.259 |
| /VEL/ | -0.051 | -0.108 | -0.062 |
| X= 3550.0/C/ | 0.355 | 0.266 | 0.243 |
| /VEL/ | -0.051 | -0.111 | -0.065 |
| X= 3650.0/C/ | 0.323 | 0.252 | 0.230 |
| /VEL/ | -0.052 | -0.113 | -0.068 |
| X= 3750.0/C/ | 0.280 | 0.242 | 0.225 |
| /VEL/ | -0.052 | -0.116 | -0.070 |
| X= 3850.0/C/ | 0.258 | 0.234 | 0.221 |
| /VEL/ | -0.053 | -0.118 | -0.073 |
| X= 3950.0/C/ | 0.255 | 0.227 | 0.214 |
| /VEL/ | -0.053 | -0.121 | -0.076 |
| X= 4050.0/C/ | 0.252 | 0.222 | 0.209 |
| /VEL/ | -0.054 | -0.123 | -0.079 |
| X= 4150.0/C/ | 0.246 | 0.217 | 0.205 |
| /VEL/ | -0.054 | -0.126 | -0.082 |
| REACH NUMBER | 2: | | |
| X= 50.0/C/ | 0.201 | 0.201 | 0.201 |
| /VEL/ | 0.112 | 0.068 | -0.114 |
| X= 150.0/C/ | 0.201 | 0.201 | 0.201 |
| /VEL/ | 0.111 | 0.065 | -0.118 |
| X= 250.0/C/ | 0.201 | 0.201 | 0.201 |
| /VEL/ | 0.111 | 0.062 | -0.122 |
| X= 350.0/C/ | 0.201 | 0.201 | 0.201 |
| /VEL/ | 0.111 | 0.059 | -0.126 |
| X= 450.0/C/ | 0.202 | 0.202 | 0.200 |
| /VEL/ | 0.111 | 0.056 | -0.130 |
| X= 550.0/C/ | 0.202 | 0.202 | 0.198 |
| /VEL/ | 0.111 | 0.053 | -0.133 |

| | | | |
|---|---|---|---|
| X= 650.0/C/ | 0.203 | 0.202 | 0.204 |
| /VEL/ | 0.110 | 0.050 | -0.137 |
| X= 750.0/C/ | 0.203 | 0.202 | 0.221 |
| /VEL/ | 0.110 | 0.047 | -0.141 |
| X= 850.0/C/ | 0.202 | 0.203 | 0.234 |
| /VEL/ | 0.110 | 0.043 | -0.145 |
| X= 950.0/C/ | 0.201 | 0.205 | 0.244 |
| /VEL/ | 0.110 | 0.040 | -0.149 |
| X= 1050.0/C/ | 0.201 | 0.208 | 0.255 |
| /VEL/ | 0.110 | 0.037 | -0.153 |
| X= 1150.0/C/ | 0.201 | 0.211 | 0.264 |
| /VEL/ | 0.110 | 0.034 | -0.157 |
| X= 1250.0/C/ | 0.202 | 0.215 | 0.271 |
| /VEL/ | 0.109 | 0.031 | -0.161 |
| REACH NUMBER 3: | | | |
| X= 50.0/C/ | 0.204 | 0.204 | 0.204 |
| /VEL/ | -0.004 | -0.004 | 0.002 |
| X= 150.0/C/ | 0.201 | 0.201 | 0.201 |
| /VEL/ | -0.004 | -0.007 | -0.002 |
| X= 250.0/C/ | 0.200 | 0.200 | 0.200 |
| /VEL/ | -0.004 | -0.010 | -0.006 |
| X= 350.0/C/ | 0.200 | 0.200 | 0.200 |
| /VEL/ | -0.005 | -0.013 | -0.010 |
| X= 450.0/C/ | 0.200 | 0.200 | 0.200 |
| /VEL/ | -0.005 | -0.016 | -0.013 |
| X= 550.0/C/ | 0.200 | 0.200 | 0.199 |
| /VEL/ | -0.005 | -0.019 | -0.017 |
| X= 650.0/C/ | 0.205 | 0.225 | 0.247 |
| /VEL/ | -0.005 | -0.022 | -0.021 |
| REACH NUMBER 4: | | | |
| X= 50.0/C/ | 0.246 | 0.298 | 0.324 |
| /VEL/ | -0.011 | -0.049 | -0.054 |
| X= 150.0/C/ | 0.262 | 0.293 | 0.300 |
| /VEL/ | -0.012 | -0.052 | -0.057 |
| X= 250.0/C/ | 0.272 | 0.283 | 0.273 |
| /VEL/ | -0.012 | -0.055 | -0.060 |
| X= 350.0/C/ | 0.277 | 0.271 | 0.249 |
| /VEL/ | -0.013 | -0.057 | -0.063 |
| X= 450.0/C/ | 0.278 | 0.259 | 0.233 |
| /VEL/ | -0.013 | -0.060 | -0.066 |
| X= 550.0/C/ | 0.280 | 0.250 | 0.226 |
| /VEL/ | -0.013 | -0.062 | -0.069 |
| X= 650.0/C/ | 0.273 | 0.240 | 0.218 |
| /VEL/ | -0.014 | -0.065 | -0.072 |
| X= 750.0/C/ | 0.259 | 0.228 | 0.210 |
| /VEL/ | -0.014 | -0.067 | -0.075 |
| X= 850.0/C/ | 0.250 | 0.219 | 0.205 |
| /VEL/ | -0.015 | -0.070 | -0.078 |

```
REACH NUMBER   5:
X=    83.3/C/    0.246    0.219    0.202
        /VEL/    0.083   -0.037   -0.251
X=   250.0/C/    0.247    0.214    0.201
        /VEL/    0.082   -0.041   -0.255
X=   416.7/C/    0.239    0.209    0.201
        /VEL/    0.082   -0.045   -0.260
X=   583.3/C/    0.227    0.206    0.200
        /VEL/    0.081   -0.049   -0.265
X=   750.0/C/    0.217    0.203    0.200
        /VEL/    0.080   -0.053   -0.270
X=   916.7/C/    0.210    0.202    0.200
        /VEL/    0.079   -0.057   -0.275
X=  1083.3/C/    0.205    0.201    0.200
        /VEL/    0.079   -0.061   -0.280
X=  1250.0/C/    0.202    0.200    0.200
        /VEL/    0.078   -0.065   -0.285
X=  1416.7/C/    0.201    0.200    0.200
        /VEL/    0.077   -0.069   -0.290
X=  1583.3/C/    0.200    0.200    0.200
        /VEL/    0.076   -0.073   -0.294
X=  1750.0/C/    0.200    0.200    0.200
        /VEL/    0.076   -0.077   -0.299
X=  1916.7/C/    0.200    0.200    0.200
        /VEL/    0.075   -0.081   -0.304
X=  2083.3/C/    0.200    0.200    0.200
        /VEL/    0.074   -0.085   -0.309
X=  2250.0/C/    0.200    0.200    0.200
        /VEL/    0.073   -0.089   -0.314
X=  2416.7/C/    0.200    0.200    0.200
        /VEL/    0.073   -0.093   -0.319
JUNCTICN NUMBER   2:
    0.242
    0.213
    0.204
JUNCTICN NUMBER   3:
    0.203
    0.241
    0.276
*******************************************************************************************
```

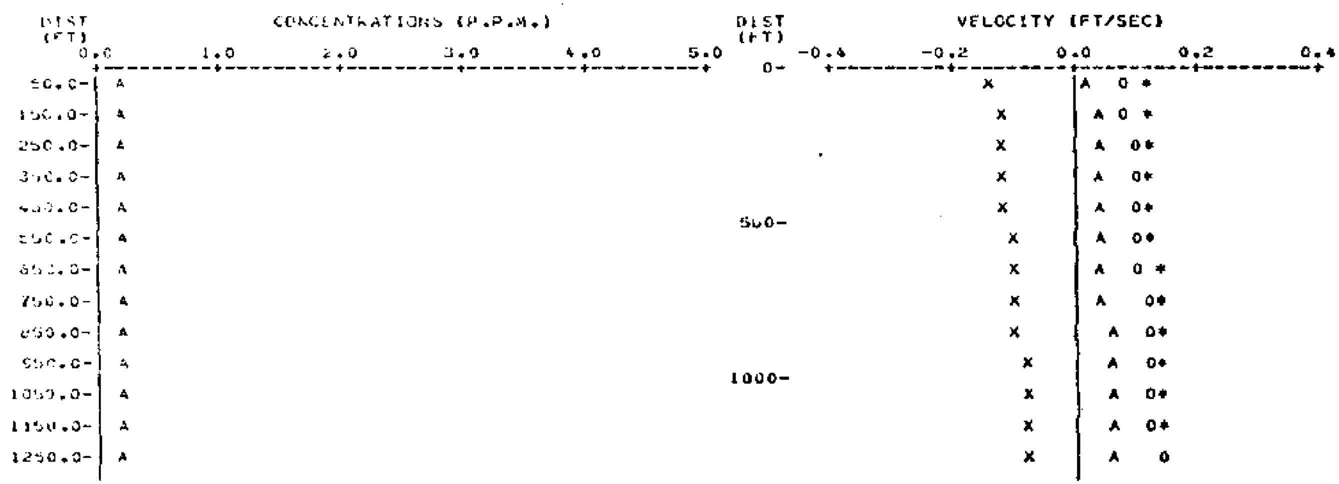
PLOTS FOR REACH NUMBER 1 : TIME FROM START OF SIMULATION IS 18.25 HOURS
: TIDAL DIFFERENCE= -0.050 FEET; WIND SPEED= 12.5 FT/SEC; WIND DIRECTION= 8. DEGREES






* = LAYER 1 (Z= 1.3 FT)
0 = LAYER 2 (Z= 4.0 FT)
X = LAYER 3 (Z= 6.6 FT)
A = AVERAGE OVER LAYERS

PLOTS FOR REACH NUMBER 2 : TIME FROM START OF SIMULATION IS 18.25 HOURS
: TIDAL DIFFERENCE= -0.050 FEET: WIND SPEED= 12.5 FT/SEC: WIND DIRECTION= 0. DEGREES



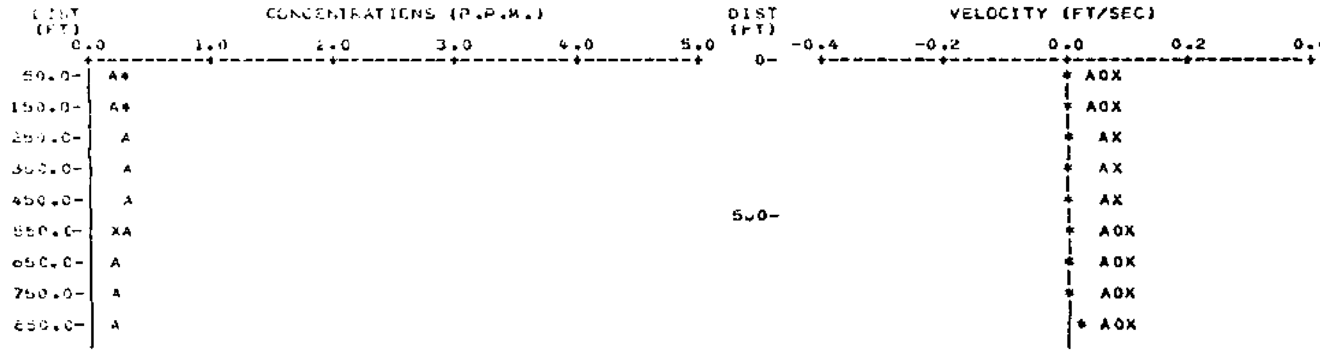

* = LAYER 1 (Z= 1.0 FT)
O = LAYER 2 (Z= 3.1 FT)
X = LAYER 3 (Z= 5.1 FT)
A = AVERAGE OVER LAYERS

PLOTS FOR REACH NUMBER 3 : TIME FROM START OF SIMULATION IS 18.25 HOURS
: TIDAL DIFFERENCE= -0.050 FEET: WIND SPEED= 12.5 FT/SEC: WIND DIRECTION= 8. DEGREES

```
 DIST              CONCENTRATIONS (P.P.M.)               DIST              VELOCITY (FT/SEC)
 (FT)                                                    (FT)
      0.0       1.0       2.0       3.0       4.0       5.0     -0.4      -0.2       0.0       0.2       0.4
      +---------+---------+---------+---------+---------+   0-   +---------+---------+---------+---------+
 50.0-| A                                                                           A
      |                                                                             I
150.0-| A                                                                           AX
      |                                                                             I
250.0-| A                                                                           AX
      |                                                                             I
350.0-| A                                                                           AX
      |                                                                             I
450.0-| A                                                                           *A
      |                                                      500-                   I
550.0-| A                                                                           *A
      |                                                                             I
650.0-| A                                                                           *AX
      |                                                                             I
```

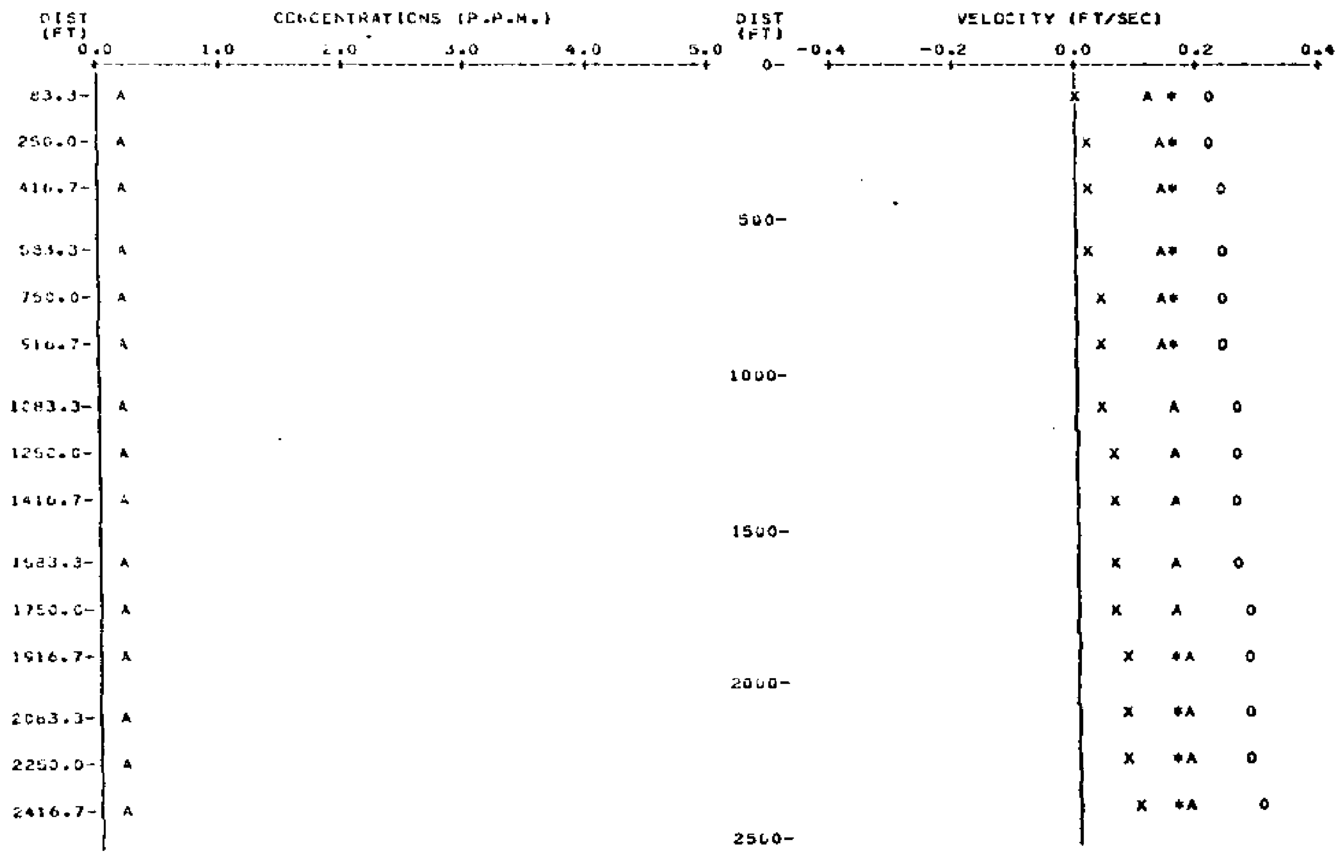
* = LAYER 1 (Z= 1.0 FT)
O = LAYER 2 (Z= 3.1 FT)
X = LAYER 3 (Z= 5.2 FT)
A = AVERAGE OVER LAYERS

PLOTS FOR REACH NUMBER 4 : TIME FROM START OF SIMULATION IS 18.25 HOURS
: TIDAL DIFFERENCE= -0.050 FEET; WIND SPEED= 12.5 FT/SEC; WIND DIRECTION= 8. DEGREES




* = LAYER 1 (Z= 1.3 FT)
O = LAYER 2 (Z= 3.8 FT)
X = LAYER 3 (Z= 6.4 FT)
A = AVERAGE OVER LAYERS

PLOTS FOR REACH NUMBER 5 : TIME FROM START OF SIMULATION IS 18.25 HOURS
: TIDAL DIFFERENCE= -0.050 FEET; WIND SPEED= 12.5 FT/SEC; WIND DIRECTION= 8. DEGREES




* = LAYER 1 (Z= 1.3 FT)
O = LAYER 2 (Z= 4.0 FT)
X = LAYER 3 (Z= 6.6 FT)
A = AVERAGE OVER LAYERS

TIME 20.00 HOURS: TIDAL DIFFERENCE= -0.900 FEET
WIND SPEED= 11.1 FT/SEC: WIND DIRECTION= 0. DEGREES
REACH NUMBER 1:

| | | | |
|---|---|---|---|
| X= 50.0/C/ | 2.340 | 2.022 | 2.026 |
| /VEL/ | -0.018 | -0.013 | 0.027 |
| X= 150.0/C/ | 2.458 | 2.170 | 1.978 |
| /VEL/ | -0.017 | -0.010 | 0.030 |
| X= 250.0/C/ | 2.287 | 2.127 | 1.881 |
| /VEL/ | -0.017 | -0.007 | 0.033 |
| X= 350.0/C/ | 2.013 | 2.009 | 1.784 |
| /VEL/ | -0.016 | -0.005 | 0.037 |
| X= 450.0/C/ | 1.719 | 1.843 | 1.694 |
| /VEL/ | -0.016 | -0.002 | 0.040 |
| X= 550.0/C/ | 1.457 | 1.693 | 1.615 |
| /VEL/ | -0.015 | 0.001 | 0.044 |
| X= 650.0/C/ | 1.251 | 1.522 | 1.552 |
| /VEL/ | -0.015 | 0.004 | 0.047 |
| X= 750.0/C/ | 1.097 | 1.368 | 1.501 |
| /VEL/ | -0.014 | 0.007 | 0.050 |
| X= 850.0/C/ | 0.996 | 1.270 | 1.463 |
| /VEL/ | -0.014 | 0.010 | 0.054 |
| X= 950.0/C/ | 0.936 | 1.199 | 1.430 |
| /VEL/ | -0.013 | 0.013 | 0.057 |
| X= 1050.0/C/ | 0.894 | 1.142 | 1.396 |
| /VEL/ | -0.013 | 0.015 | 0.061 |
| X= 1150.0/C/ | 0.864 | 1.105 | 1.358 |
| /VEL/ | -0.012 | 0.018 | 0.064 |
| X= 1250.0/C/ | 0.843 | 1.086 | 1.323 |
| /VEL/ | -0.012 | 0.021 | 0.068 |
| X= 1350.0/C/ | 0.822 | 1.070 | 1.302 |
| /VEL/ | -0.011 | 0.024 | 0.071 |
| X= 1450.0/C/ | 0.802 | 1.059 | 1.309 |
| /VEL/ | -0.011 | 0.027 | 0.074 |
| X= 1550.0/C/ | 0.782 | 1.048 | 1.329 |
| /VEL/ | -0.010 | 0.030 | 0.078 |
| X= 1650.0/C/ | 0.760 | 1.034 | 1.335 |
| /VEL/ | -0.010 | 0.033 | 0.081 |
| X= 1750.0/C/ | 0.732 | 1.021 | 1.324 |
| /VEL/ | -0.009 | 0.035 | 0.085 |
| X= 1850.0/C/ | 0.702 | 1.010 | 1.329 |
| /VEL/ | -0.008 | 0.038 | 0.088 |
| X= 1950.0/C/ | 0.668 | 0.997 | 1.377 |
| /VEL/ | -0.008 | 0.041 | 0.091 |
| X= 2050.0/C/ | 0.632 | 0.972 | 1.459 |
| /VEL/ | -0.007 | 0.044 | 0.095 |
| X= 2150.0/C/ | 0.594 | 0.929 | 1.530 |

| | | | |
|---|---|---|---|
| /VEL/ | -0.007 | 0.047 | 0.098 |
| X= 2250.0/C/ | 0.556 | 0.867 | 1.547 |
| /VEL/ | -0.006 | 0.050 | 0.102 |
| X= 2350.0/C/ | 0.519 | 0.790 | 1.487 |
| /VEL/ | -0.006 | 0.052 | 0.105 |
| X= 2450.0/C/ | 0.486 | 0.709 | 1.353 |
| /VEL/ | -0.005 | 0.055 | 0.108 |
| X= 2550.0/C/ | 0.456 | 0.633 | 1.168 |
| /VEL/ | -0.005 | 0.058 | 0.112 |
| X= 2650.0/C/ | 0.430 | 0.570 | 0.966 |
| /VEL/ | -0.004 | 0.061 | 0.115 |
| X= 2750.0/C/ | 0.407 | 0.523 | 0.784 |
| /VEL/ | -0.004 | 0.064 | 0.119 |
| X= 2850.0/C/ | 0.387 | 0.492 | 0.654 |
| /VEL/ | -0.003 | 0.067 | 0.122 |
| X= 2950.0/C/ | 0.364 | 0.471 | 0.585 |
| /VEL/ | -0.003 | 0.070 | 0.126 |
| X= 3050.0/C/ | 0.341 | 0.452 | 0.558 |
| /VEL/ | -0.002 | 0.072 | 0.129 |
| X= 3150.0/C/ | 0.323 | 0.435 | 0.545 |
| /VEL/ | -0.002 | 0.075 | 0.132 |
| X= 3250.0/C/ | 0.310 | 0.418 | 0.532 |
| /VEL/ | -0.001 | 0.078 | 0.136 |
| X= 3350.0/C/ | 0.299 | 0.403 | 0.519 |
| /VEL/ | -0.001 | 0.081 | 0.139 |
| X= 3450.0/C/ | 0.287 | 0.388 | 0.508 |
| /VEL/ | -0.000 | 0.084 | 0.143 |
| X= 3550.0/C/ | 0.277 | 0.374 | 0.497 |
| /VEL/ | 0.000 | 0.087 | 0.146 |
| X= 3650.0/C/ | 0.266 | 0.360 | 0.485 |
| /VEL/ | 0.001 | 0.090 | 0.149 |
| X= 3750.0/C/ | 0.257 | 0.346 | 0.473 |
| /VEL/ | 0.001 | 0.092 | 0.153 |
| X= 3850.0/C/ | 0.248 | 0.332 | 0.460 |
| /VEL/ | 0.002 | 0.095 | 0.156 |
| X= 3950.0/C/ | 0.241 | 0.319 | 0.447 |
| /VEL/ | 0.002 | 0.098 | 0.160 |
| X= 4050.0/C/ | 0.235 | 0.307 | 0.433 |
| /VEL/ | 0.003 | 0.101 | 0.163 |
| X= 4150.0/C/ | 0.233 | 0.295 | 0.418 |
| /VEL/ | 0.003 | 0.104 | 0.167 |
| REACH NUMBER | 2: | | |
| X= 50.0/C/ | 0.228 | 0.228 | 0.228 |
| /VEL/ | 0.087 | 0.070 | -0.114 |
| X= 150.0/C/ | 0.229 | 0.229 | 0.226 |
| /VEL/ | 0.087 | 0.074 | -0.109 |
| X= 250.0/C/ | 0.229 | 0.229 | 0.226 |
| /VEL/ | 0.087 | 0.078 | -0.105 |

| | | | |
|---|---|---|---|
| X= 350.0/C/ | 0.230 | 0.229 | 0.225 |
| /VEL/ | 0.087 | 0.082 | -0.100 |
| X= 450.0/C/ | 0.230 | 0.229 | 0.224 |
| /VEL/ | 0.087 | 0.086 | -0.095 |
| X= 550.0/C/ | 0.230 | 0.228 | 0.223 |
| /VEL/ | 0.088 | 0.089 | -0.090 |
| X= 650.0/C/ | 0.231 | 0.228 | 0.223 |
| /VEL/ | 0.088 | 0.093 | -0.085 |
| X= 750.0/C/ | 0.231 | 0.228 | 0.222 |
| /VEL/ | 0.088 | 0.097 | -0.081 |
| X= 850.0/C/ | 0.231 | 0.227 | 0.220 |
| /VEL/ | 0.088 | 0.101 | -0.076 |
| X= 950.0/C/ | 0.230 | 0.226 | 0.219 |
| /VEL/ | 0.089 | 0.105 | -0.071 |
| X= 1050.0/C/ | 0.228 | 0.225 | 0.217 |
| /VEL/ | 0.089 | 0.109 | -0.066 |
| X= 1150.0/C/ | 0.226 | 0.223 | 0.215 |
| /VEL/ | 0.089 | 0.113 | -0.062 |
| X= 1250.0/C/ | 0.223 | 0.221 | 0.213 |
| /VEL/ | 0.089 | 0.117 | -0.057 |
| REACH NUMBER | 3: | | |
| X= 50.0/C/ | 0.204 | 0.202 | 0.205 |
| /VEL/ | -0.007 | -0.003 | 0.011 |
| X= 150.0/C/ | 0.199 | 0.203 | 0.203 |
| /VEL/ | -0.006 | 0.000 | 0.016 |
| X= 250.0/C/ | 0.200 | 0.200 | 0.200 |
| /VEL/ | -0.006 | 0.004 | 0.021 |
| X= 350.0/C/ | 0.200 | 0.200 | 0.200 |
| /VEL/ | -0.006 | 0.008 | 0.025 |
| X= 450.0/C/ | 0.199 | 0.200 | 0.200 |
| /VEL/ | -0.006 | 0.012 | 0.030 |
| X= 550.0/C/ | 0.207 | 0.202 | 0.200 |
| /VEL/ | -0.005 | 0.016 | 0.035 |
| X= 650.0/C/ | 0.212 | 0.205 | 0.201 |
| /VEL/ | -0.005 | 0.019 | 0.039 |
| REACH NUMBER | 4: | | |
| X= 50.0/C/ | 0.228 | 0.216 | 0.212 |
| /VEL/ | 0.002 | 0.050 | 0.075 |
| X= 150.0/C/ | 0.249 | 0.220 | 0.213 |
| /VEL/ | 0.003 | 0.053 | 0.079 |
| X= 250.0/C/ | 0.255 | 0.227 | 0.216 |
| /VEL/ | 0.003 | 0.056 | 0.083 |
| X= 350.0/C/ | 0.261 | 0.233 | 0.220 |
| /VEL/ | 0.004 | 0.059 | 0.086 |
| X= 450.0/C/ | 0.264 | 0.242 | 0.224 |
| /VEL/ | 0.004 | 0.062 | 0.090 |
| X= 550.0/C/ | 0.263 | 0.257 | 0.231 |
| /VEL/ | 0.005 | 0.065 | 0.093 |

```
X=   650.0/C/    0.258   0.267   0.246
       /VEL/     0.005   0.068   0.097
X=   750.0/C/    0.249   0.267   0.265
       /VEL/     0.006   0.071   0.101
X=   850.0/C/    0.241   0.260   0.274
       /VEL/     0.006   0.074   0.104
REACH NUMBER   5:
X=    83.3/C/    0.239   0.274   0.270
       /VEL/     0.092   0.183   0.056
X=   250.0/C/    0.233   0.259   0.217
       /VEL/     0.093   0.188   0.062
X=   416.7/C/    0.226   0.245   0.216
       /VEL/     0.094   0.193   0.067
X=   583.3/C/    0.219   0.234   0.212
       /VEL/     0.095   0.197   0.073
X=   750.0/C/    0.214   0.225   0.210
       /VEL/     0.096   0.202   0.079
X=   916.7/C/    0.211   0.218   0.208
       /VEL/     0.096   0.207   0.084
X=  1083.3/C/    0.209   0.213   0.207
       /VEL/     0.097   0.212   0.090
X=  1250.0/C/    0.208   0.210   0.206
       /VEL/     0.098   0.216   0.096
X=  1416.7/C/    0.207   0.208   0.206
       /VEL/     0.099   0.221   0.101
X=  1583.3/C/    0.208   0.207   0.206
       /VEL/     0.100   0.226   0.107
X=  1750.0/C/    0.209   0.207   0.206
       /VEL/     0.101   0.230   0.113
X=  1916.7/C/    0.211   0.207   0.206
       /VEL/     0.102   0.235   0.118
X=  2083.3/C/    0.214   0.208   0.207
       /VEL/     0.102   0.240   0.124
X=  2250.0/C/    0.216   0.209   0.207
       /VEL/     0.103   0.245   0.129
X=  2416.7/C/    0.218   0.210   0.207
       /VEL/     0.104   0.249   0.135
JUNCTION NUMBER   2:
   0.242
   0.265
   0.333
JUNCTION NUMBER   3:
   0.214
   0.215
   0.211
*****************************************************************************

TIME    25.00 HOURS: TIDAL DIFFERENCE= -1.100 FEET
```

WIND SPEED= 4.0 FT/SEC: WIND DIRECTION= 42. DEGREES

REACH NUMBER 1:

| | | | | |
|---|---|---|---|---|
| X= 50.0 | /C/ | 2.197 | 2.183 | 2.170 |
| | /VEL/ | -0.007 | -0.007 | 0.007 |
| X= 150.0 | /C/ | 2.201 | 2.172 | 2.175 |
| | /VEL/ | -0.007 | -0.011 | 0.002 |
| X= 250.0 | /C/ | 2.070 | 2.042 | 2.092 |
| | /VEL/ | -0.008 | -0.015 | -0.002 |
| X= 350.0 | /C/ | 1.894 | 1.866 | 1.934 |
| | /VEL/ | -0.009 | -0.019 | -0.007 |
| X= 450.0 | /C/ | 1.716 | 1.689 | 1.764 |
| | /VEL/ | -0.010 | -0.023 | -0.011 |
| X= 550.0 | /C/ | 1.554 | 1.531 | 1.605 |
| | /VEL/ | -0.010 | -0.026 | -0.016 |
| X= 650.0 | /C/ | 1.418 | 1.402 | 1.468 |
| | /VEL/ | -0.011 | -0.030 | -0.020 |
| X= 750.0 | /C/ | 1.312 | 1.306 | 1.362 |
| | /VEL/ | -0.012 | -0.034 | -0.025 |
| X= 850.0 | /C/ | 1.236 | 1.238 | 1.286 |
| | /VEL/ | -0.012 | -0.038 | -0.029 |
| X= 950.0 | /C/ | 1.181 | 1.187 | 1.231 |
| | /VEL/ | -0.013 | -0.042 | -0.034 |
| X= 1050.0 | /C/ | 1.138 | 1.148 | 1.189 |
| | /VEL/ | -0.014 | -0.046 | -0.039 |
| X= 1150.0 | /C/ | 1.105 | 1.117 | 1.154 |
| | /VEL/ | -0.015 | -0.049 | -0.043 |
| X= 1250.0 | /C/ | 1.078 | 1.090 | 1.125 |
| | /VEL/ | -0.015 | -0.053 | -0.048 |
| X= 1350.0 | /C/ | 1.055 | 1.067 | 1.100 |
| | /VEL/ | -0.016 | -0.057 | -0.052 |
| X= 1450.0 | /C/ | 1.035 | 1.048 | 1.080 |
| | /VEL/ | -0.017 | -0.061 | -0.057 |
| X= 1550.0 | /C/ | 1.018 | 1.034 | 1.067 |
| | /VEL/ | -0.017 | -0.065 | -0.061 |
| X= 1650.0 | /C/ | 1.004 | 1.024 | 1.059 |
| | /VEL/ | -0.018 | -0.069 | -0.066 |
| X= 1750.0 | /C/ | 0.991 | 1.011 | 1.050 |
| | /VEL/ | -0.019 | -0.073 | -0.070 |
| X= 1850.0 | /C/ | 0.978 | 0.994 | 1.035 |
| | /VEL/ | -0.019 | -0.076 | -0.075 |
| X= 1950.0 | /C/ | 0.963 | 0.977 | 1.017 |
| | /VEL/ | -0.020 | -0.080 | -0.080 |
| X= 2050.0 | /C/ | 0.946 | 0.962 | 1.006 |
| | /VEL/ | -0.021 | -0.084 | -0.084 |
| X= 2150.0 | /C/ | 0.928 | 0.952 | 1.004 |
| | /VEL/ | -0.022 | -0.088 | -0.089 |
| X= 2250.0 | /C/ | 0.912 | 0.942 | 1.002 |
| | /VEL/ | -0.022 | -0.092 | -0.093 |

```
X= 2350.0/C/     0.856    0.923    0.988
       /VEL/    -0.023   -0.096   -0.098
X= 2450.0/C/     0.879    0.890    0.953
       /VEL/    -0.024   -0.099   -0.102
X= 2550.0/C/     0.856    0.839    0.893
       /VEL/    -0.024   -0.103   -0.107
X= 2650.0/C/     0.824    0.774    0.814
       /VEL/    -0.025   -0.107   -0.111
X= 2750.0/C/     0.782    0.702    0.725
       /VEL/    -0.026   -0.111   -0.116
X= 2850.0/C/     0.731    0.628    0.637
       /VEL/    -0.027   -0.115   -0.121
X= 2950.0/C/     0.673    0.561    0.559
       /VEL/    -0.027   -0.119   -0.125
X= 3050.0/C/     0.615    0.506    0.500
       /VEL/    -0.028   -0.122   -0.130
X= 3150.0/C/     0.560    0.466    0.461
       /VEL/    -0.029   -0.126   -0.134
X= 3250.0/C/     0.511    0.439    0.440
       /VEL/    -0.029   -0.130   -0.139
X= 3350.0/C/     0.471    0.416    0.410
       /VEL/    -0.030   -0.134   -0.143
X= 3450.0/C/     0.438    0.379    0.366
       /VEL/    -0.031   -0.138   -0.148
X= 3550.0/C/     0.412    0.355    0.347
       /VEL/    -0.031   -0.142   -0.152
X= 3650.0/C/     0.391    0.347    0.343
       /VEL/    -0.032   -0.145   -0.157
X= 3750.0/C/     0.375    0.339    0.338
       /VEL/    -0.033   -0.149   -0.162
X= 3850.0/C/     0.362    0.332    0.332
       /VEL/    -0.034   -0.153   -0.166
X= 3950.0/C/     0.347    0.325    0.326
       /VEL/    -0.034   -0.157   -0.171
X= 4050.0/C/     0.312    0.319    0.319
       /VEL/    -0.035   -0.161   -0.175
X= 4150.0/C/     0.294    0.316    0.311
       /VEL/    -0.036   -0.165   -0.180
REACH NUMBER     2:
X=   50.0/C/     0.227    0.227    0.227
       /VEL/     0.001   -0.002   -0.005
X=  150.0/C/     0.227    0.227    0.227
       /VEL/     0.001   -0.007   -0.011
X=  250.0/C/     0.227    0.227    0.227
       /VEL/     0.000   -0.012   -0.018
X=  350.0/C/     0.227    0.227    0.227
       /VEL/     0.000   -0.018   -0.024
X=  450.0/C/     0.227    0.227    0.227
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         /VEL/   -0.000   -0.023   -0.031
X=   550.0/C/     0.227    0.227    0.227
         /VEL/   -0.CC1   -0.028   -0.037
X=   650.0/C/     0.227    0.226    0.226
         /VEL/   -0.001   -0.034   -0.044
X=   750.0/C/     0.227    0.226    0.225
         /VEL/   -0.001   -0.039   -0.050
X=   85C.0/C/     0.226    0.225    0.223
         /VEL/   -0.002   -0.044   -0.056
X=   950.0/C/     0.225    0.222    0.219
         /VEL/   -0.002   -0.050   -0.063
X=  1050.C/C/     0.224    0.220    0.217
         /VEL/   -0.002   -0.055   -0.069
X=  1150.0/C/     0.222    0.219    0.218
         /VEL/   -0.002   -0.060   -0.076
X=  1250.0/C/     0.221    0.220    0.219
         /VEL/   -0.C03   -0.066   -0.082
REACH NUMBER   3:
X=    5C.C/C/     0.202    0.202    0.202
         /VEL/    0.000   -0.002   -0.004
X=   150.0/C/     0.202    0.202    0.202
         /VEL/    0.000   -0.007   -0.010
X=   250.0/C/     0.201    0.201    0.201
         /VEL/   -0.000   -0.013   -0.017
X=   350.0/C/     0.200    0.200    0.200
         /VEL/   -0.001   -0.018   -0.023
X=   45C.C/C/     0.200    0.202    0.204
         /VEL/   -0.001   -0.023   -0.029
X=   55C.C/C/     0.204    0.211    0.213
         /VEL/   -0.C01   -0.028   -0.036
X=   650.0/C/     0.212    0.218    0.218
         /VEL/   -0.C02   -0.033   -0.042
REACH NUMBER   4:
X=    50.0/C/     0.223    0.226    0.226
         /VEL/   -0.012   -0.C74   -0.090
X=   150.0/C/     0.226    0.229    0.226
         /VEL/   -0.C12   -0.078   -0.094
X=   25C.0/C/     0.229    0.230    0.238
         /VEL/   -0.013   -0.082   -0.099
X=   35C.C/C/     0.233    0.253    0.296
         /VEL/   -0.014   -0.086   -0.104
X=   450.0/C/     0.241    0.299    0.335
         /VEL/   -0.014   -0.090   -0.109
X=   550.0/C/     0.253    0.316    0.336
         /VEL/   -0.015   -0.094   -0.114
X=   650.0/C/     0.264    0.317    0.330
         /VEL/   -0.016   -0.098   -0.118
X=   750.0/C/     0.279    0.318    0.323
```

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          /VEL/   -0.016   -0.102   -0.123
X=   850.0/C/      0.256    0.317    0.313
          /VEL/   -0.017   -0.106   -0.128
REACH NUMBER   5:
X=    83.3/C/      0.303    0.280    0.253
          /VEL/   -0.025   -0.166   -0.213
X=   250.0/C/      0.295    0.260    0.237
          /VEL/   -0.026   -0.172   -0.221
X=   416.7/C/      0.284    0.245    0.227
          /VEL/   -0.027   -0.178   -0.229
X=   583.3/C/      0.273    0.235    0.221
          /VEL/   -0.029   -0.185   -0.236
X=   750.0/C/      0.259    0.227    0.216
          /VEL/   -0.030   -0.191   -0.244
X=   916.7/C/      0.245    0.220    0.210
          /VEL/   -0.031   -0.198   -0.251
X=  1083.3/C/      0.233    0.214    0.204
          /VEL/   -0.032   -0.204   -0.259
X=  1250.0/C/      0.224    0.208    0.201
          /VEL/   -0.033   -0.210   -0.266
X=  1416.7/C/      0.218    0.204    0.201
          /VEL/   -0.034   -0.217   -0.274
X=  1583.3/C/      0.213    0.203    0.200
          /VEL/   -0.036   -0.223   -0.281
X=  1750.0/C/      0.210    0.202    0.200
          /VEL/   -0.037   -0.229   -0.289
X=  1916.7/C/      0.208    0.201    0.200
          /VEL/   -0.038   -0.236   -0.296
X=  2083.3/C/      0.205    0.200    0.200
          /VEL/   -0.039   -0.242   -0.304
X=  2250.0/C/      0.201    0.200    0.200
          /VEL/   -0.040   -0.248   -0.312
X=  2416.7/C/      0.200    0.200    0.200
          /VEL/   -0.042   -0.255   -0.319
JUNCTION NUMBER   2:
    0.292
    0.314
    0.304
JUNCTION NUMBER   3:
    0.221
    0.221
    0.220
*************************************************************************************

TIME    30.00 HOURS: TIDAL DIFFERENCE= -0.050 FEET
WIND SPEED= 10.7 FT/SEC: WIND DIRECTION=  92. DEGREES
REACH NUMBER   1:
X=    50.0/C/     1.329    1.520    1.485
```

| | | | | |
|---|---|---|---|---|
| | /VEL/ | -0.070 | -0.049 | 0.083 |
| X= | 150.0/C/ | 1.245 | 1.450 | 1.518 |
| | /VEL/ | -0.070 | -0.047 | 0.085 |
| X= | 250.0/C/ | 1.201 | 1.417 | 1.571 |
| | /VEL/ | -0.070 | -0.046 | 0.087 |
| X= | 350.0/C/ | 1.163 | 1.385 | 1.625 |
| | /VEL/ | -0.070 | -0.044 | 0.089 |
| X= | 450.0/C/ | 1.130 | 1.352 | 1.676 |
| | /VEL/ | -0.069 | -0.043 | 0.090 |
| X= | 550.0/C/ | 1.102 | 1.318 | 1.720 |
| | /VEL/ | -0.069 | -0.041 | 0.092 |
| X= | 650.0/C/ | 1.077 | 1.283 | 1.753 |
| | /VEL/ | -0.069 | -0.040 | 0.094 |
| X= | 750.0/C/ | 1.053 | 1.247 | 1.769 |
| | /VEL/ | -0.069 | -0.039 | 0.096 |
| X= | 850.0/C/ | 1.030 | 1.208 | 1.764 |
| | /VEL/ | -0.068 | -0.037 | 0.098 |
| X= | 950.0/C/ | 1.009 | 1.167 | 1.734 |
| | /VEL/ | -0.068 | -0.036 | 0.099 |
| X= | 1050.0/C/ | 0.989 | 1.126 | 1.682 |
| | /VEL/ | -0.068 | -0.034 | 0.101 |
| X= | 1150.0/C/ | 0.969 | 1.088 | 1.607 |
| | /VEL/ | -0.067 | -0.033 | 0.103 |
| X= | 1250.0/C/ | 0.946 | 1.051 | 1.506 |
| | /VEL/ | -0.067 | -0.031 | 0.105 |
| X= | 1350.0/C/ | 0.914 | 1.016 | 1.390 |
| | /VEL/ | -0.067 | -0.030 | 0.107 |
| X= | 1450.0/C/ | 0.873 | 0.978 | 1.281 |
| | /VEL/ | -0.067 | -0.028 | 0.109 |
| X= | 1550.0/C/ | 0.823 | 0.937 | 1.196 |
| | /VEL/ | -0.066 | -0.027 | 0.110 |
| X= | 1650.0/C/ | 0.765 | 0.891 | 1.132 |
| | /VEL/ | -0.066 | -0.025 | 0.112 |
| X= | 1750.0/C/ | 0.706 | 0.840 | 1.085 |
| | /VEL/ | -0.066 | -0.024 | 0.114 |
| X= | 1850.0/C/ | 0.648 | 0.789 | 1.046 |
| | /VEL/ | -0.066 | -0.022 | 0.116 |
| X= | 1950.0/C/ | 0.593 | 0.739 | 1.012 |
| | /VEL/ | -0.065 | -0.021 | 0.118 |
| X= | 2050.0/C/ | 0.542 | 0.691 | 0.980 |
| | /VEL/ | -0.065 | -0.019 | 0.119 |
| X= | 2150.0/C/ | 0.497 | 0.644 | 0.950 |
| | /VEL/ | -0.065 | -0.018 | 0.121 |
| X= | 2250.0/C/ | 0.459 | 0.600 | 0.921 |
| | /VEL/ | -0.064 | -0.016 | 0.123 |
| X= | 2350.0/C/ | 0.428 | 0.561 | 0.893 |
| | /VEL/ | -0.064 | -0.015 | 0.125 |
| X= | 2450.0/C/ | 0.402 | 0.526 | 0.863 |

| | | | |
|---|---|---|---|
| /VEL/ | -0.064 | -0.013 | 0.127 |
| X= 2550.0/C/ | 0.361 | 0.494 | 0.830 |
| /VEL/ | -0.064 | -0.012 | 0.128 |
| X= 2650.0/C/ | 0.364 | 0.464 | 0.799 |
| /VEL/ | -0.063 | -0.010 | 0.130 |
| X= 2750.0/C/ | 0.349 | 0.437 | 0.769 |
| /VEL/ | -0.063 | -0.009 | 0.132 |
| X= 2850.0/C/ | 0.335 | 0.411 | 0.734 |
| /VEL/ | -0.063 | -0.007 | 0.134 |
| X= 2950.0/C/ | 0.319 | 0.387 | 0.688 |
| /VEL/ | -0.063 | -0.006 | 0.136 |
| X= 3050.0/C/ | 0.305 | 0.364 | 0.631 |
| /VEL/ | -0.062 | -0.004 | 0.138 |
| X= 3150.0/C/ | 0.294 | 0.342 | 0.568 |
| /VEL/ | -0.062 | -0.003 | 0.139 |
| X= 3250.0/C/ | 0.288 | 0.324 | 0.507 |
| /VEL/ | -0.062 | -0.001 | 0.141 |
| X= 3350.0/C/ | 0.284 | 0.313 | 0.455 |
| /VEL/ | -0.062 | 0.000 | 0.143 |
| X= 3450.0/C/ | 0.281 | 0.301 | 0.416 |
| /VEL/ | -0.061 | 0.002 | 0.145 |
| X= 3550.0/C/ | 0.280 | 0.293 | 0.388 |
| /VEL/ | -0.061 | 0.003 | 0.147 |
| X= 3650.0/C/ | 0.279 | 0.287 | 0.363 |
| /VEL/ | -0.061 | 0.005 | 0.148 |
| X= 3750.0/C/ | 0.278 | 0.282 | 0.340 |
| /VEL/ | -0.060 | 0.006 | 0.150 |
| X= 3850.0/C/ | 0.278 | 0.277 | 0.326 |
| /VEL/ | -0.060 | 0.008 | 0.152 |
| X= 3950.0/C/ | 0.277 | 0.273 | 0.317 |
| /VEL/ | -0.060 | 0.009 | 0.154 |
| X= 4050.0/C/ | 0.276 | 0.269 | 0.309 |
| /VEL/ | -0.060 | 0.011 | 0.156 |
| X= 4150.0/C/ | 0.274 | 0.266 | 0.301 |
| /VEL/ | -0.059 | 0.012 | 0.158 |
| REACH NUMBER | 2: | | |
| X= 50.0/C/ | 0.227 | 0.227 | 0.227 |
| /VEL/ | -0.011 | -0.006 | 0.013 |
| X= 150.0/C/ | 0.227 | 0.227 | 0.227 |
| /VEL/ | -0.011 | -0.004 | 0.015 |
| X= 250.0/C/ | 0.227 | 0.227 | 0.227 |
| /VEL/ | -0.011 | -0.002 | 0.017 |
| X= 350.0/C/ | 0.227 | 0.229 | 0.227 |
| /VEL/ | -0.010 | -0.000 | 0.020 |
| X= 450.0/C/ | 0.226 | 0.225 | 0.227 |
| /VEL/ | -0.010 | 0.002 | 0.022 |
| X= 550.0/C/ | 0.225 | 0.226 | 0.226 |
| /VEL/ | -0.010 | 0.004 | 0.025 |

```
X=   650.0/C/    0.223     0.224     0.225
          /VEL/  -0.010     0.005     0.027
X=   750.0/C/    0.222     0.222     0.223
          /VEL/  -0.010     0.007     0.029
X=   850.0/C/    0.221     0.221     0.221
          /VEL/  -0.010     0.009     0.032
X=   950.0/C/    0.222     0.221     0.220
          /VEL/  -0.010     0.011     0.034
X=  1050.0/C/    0.227     0.224     0.221
          /VEL/  -0.010     0.013     0.037
X=  1150.0/C/    0.240     0.235     0.226
          /VEL/  -0.010     0.015     0.039
X=  1250.0/C/    0.236     0.247     0.242
          /VEL/  -0.009     0.017     0.041
REACH NUMBER     3:
X=    50.0/C/    0.257     0.257     0.256
          /VEL/   0.106     0.070    -0.110
X=   150.0/C/    0.257     0.256     0.252
          /VEL/   0.106     0.072    -0.108
X=   250.0/C/    0.256     0.253     0.249
          /VEL/   0.107     0.073    -0.106
X=   350.0/C/    0.250     0.245     0.247
          /VEL/   0.107     0.075    -0.103
X=   450.0/C/    0.241     0.236     0.247
          /VEL/   0.107     0.077    -0.101
X=   550.0/C/    0.230     0.230     0.248
          /VEL/   0.107     0.079    -0.098
X=   650.0/C/    0.221     0.228     0.249
          /VEL/   0.107     0.081    -0.096
REACH NUMBER     4:
X=    50.0/C/    0.224     0.241     0.239
          /VEL/   0.103     0.097    -0.076
X=   150.0/C/    0.225     0.240     0.237
          /VEL/   0.103     0.098    -0.074
X=   250.0/C/    0.227     0.241     0.235
          /VEL/   0.103     0.100    -0.072
X=   350.0/C/    0.229     0.242     0.234
          /VEL/   0.104     0.101    -0.071
X=   450.0/C/    0.231     0.243     0.233
          /VEL/   0.104     0.103    -0.069
X=   550.0/C/    0.232     0.242     0.233
          /VEL/   0.104     0.105    -0.067
X=   650.0/C/    0.234     0.241     0.235
          /VEL/   0.104     0.106    -0.065
X=   750.0/C/    0.236     0.244     0.242
          /VEL/   0.105     0.108    -0.063
X=   850.0/C/    0.240     0.249     0.255
          /VEL/   0.105     0.109    -0.061
```

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REACH NUMBER  5:
X=    83.3/C/    0.270     0.254     0.247
        /VEL/    0.028     0.078     0.062
X=   250.0/C/    0.249     0.243     0.218
        /VEL/    0.028     0.080     0.065
X=   416.7/C/    0.238     0.229     0.211
        /VEL/    0.028     0.082     0.068
X=   583.3/C/    0.231     0.223     0.209
        /VEL/    0.029     0.085     0.071
X=   750.0/C/    0.224     0.218     0.207
        /VEL/    0.029     0.087     0.074
X=   916.7/C/    0.217     0.213     0.205
        /VEL/    0.030     0.090     0.077
X=  1083.3/C/    0.212     0.209     0.203
        /VEL/    0.030     0.092     0.080
X=  1250.0/C/    0.208     0.206     0.202
        /VEL/    0.031     0.095     0.083
X=  1416.7/C/    0.206     0.204     0.201
        /VEL/    0.031     0.097     0.086
X=  1583.3/C/    0.204     0.203     0.201
        /VEL/    0.032     0.100     0.089
X=  1750.0/C/    0.203     0.202     0.201
        /VEL/    0.032     0.102     0.092
X=  1916.7/C/    0.202     0.201     0.200
        /VEL/    0.033     0.105     0.095
X=  2083.3/C/    0.201     0.201     0.200
        /VEL/    0.033     0.107     0.098
X=  2250.0/C/    0.200     0.200     0.200
        /VEL/    0.033     0.110     0.101
X=  2416.7/C/    0.200     0.200     0.200
        /VEL/    0.034     0.112     0.104
JUNCTION NUMBER  2:
    0.271
    0.254
    0.267
JUNCTION NUMBER  3:
    0.223
    0.241
    0.249
*********************************************************************************************

TIME    35.00 HOURS: TIDAL DIFFERENCE= -2.050 FEET
WIND SPEED= 12.3 FT/SEC: WIND DIRECTION=  89. DEGREES
REACH NUMBER  1:
X=    50.0/C/    1.167     1.195     1.187
        /VEL/   -0.071    -0.070     0.128
X=   150.0/C/    1.148     1.189     1.190
        /VEL/   -0.071    -0.069     0.130
```

| | | | | |
|---|---|---|---|---|
| X= | 250.0/C/ | 1.129 | 1.183 | 1.194 |
| | /VEL/ | -0.071 | -0.067 | 0.132 |
| X= | 350.0/C/ | 1.108 | 1.175 | 1.196 |
| | /VEL/ | -0.070 | -0.066 | 0.133 |
| X= | 450.0/C/ | 1.084 | 1.166 | 1.198 |
| | /VEL/ | -0.070 | -0.065 | 0.135 |
| X= | 550.0/C/ | 1.058 | 1.154 | 1.197 |
| | /VEL/ | -0.070 | -0.063 | 0.137 |
| X= | 650.0/C/ | 1.031 | 1.142 | 1.196 |
| | /VEL/ | -0.069 | -0.062 | 0.138 |
| X= | 750.0/C/ | 1.004 | 1.129 | 1.194 |
| | /VEL/ | -0.069 | -0.060 | 0.140 |
| X= | 850.0/C/ | 0.977 | 1.114 | 1.190 |
| | /VEL/ | -0.069 | -0.059 | 0.142 |
| X= | 950.0/C/ | 0.950 | 1.100 | 1.186 |
| | /VEL/ | -0.069 | -0.058 | 0.143 |
| X= | 1050.0/C/ | 0.924 | 1.085 | 1.180 |
| | /VEL/ | -0.068 | -0.056 | 0.145 |
| X= | 1150.0/C/ | 0.900 | 1.070 | 1.174 |
| | /VEL/ | -0.068 | -0.055 | 0.147 |
| X= | 1250.0/C/ | 0.876 | 1.054 | 1.167 |
| | /VEL/ | -0.068 | -0.053 | 0.148 |
| X= | 1350.0/C/ | 0.854 | 1.039 | 1.159 |
| | /VEL/ | -0.068 | -0.052 | 0.150 |
| X= | 1450.0/C/ | 0.832 | 1.024 | 1.150 |
| | /VEL/ | -0.067 | -0.050 | 0.152 |
| X= | 1550.0/C/ | 0.811 | 1.009 | 1.141 |
| | /VEL/ | -0.067 | -0.049 | 0.153 |
| X= | 1650.0/C/ | 0.791 | 0.994 | 1.131 |
| | /VEL/ | -0.067 | -0.048 | 0.155 |
| X= | 1750.0/C/ | 0.771 | 0.979 | 1.121 |
| | /VEL/ | -0.067 | -0.046 | 0.156 |
| X= | 1850.0/C/ | 0.750 | 0.963 | 1.110 |
| | /VEL/ | -0.066 | -0.045 | 0.158 |
| X= | 1950.0/C/ | 0.731 | 0.947 | 1.099 |
| | /VEL/ | -0.066 | -0.043 | 0.160 |
| X= | 2050.0/C/ | 0.712 | 0.931 | 1.088 |
| | /VEL/ | -0.066 | -0.042 | 0.161 |
| X= | 2150.0/C/ | 0.694 | 0.915 | 1.076 |
| | /VEL/ | -0.066 | -0.040 | 0.163 |
| X= | 2250.0/C/ | 0.676 | 0.899 | 1.064 |
| | /VEL/ | -0.065 | -0.039 | 0.165 |
| X= | 2350.0/C/ | 0.660 | 0.883 | 1.051 |
| | /VEL/ | -0.065 | -0.038 | 0.166 |
| X= | 2450.0/C/ | 0.643 | 0.867 | 1.038 |
| | /VEL/ | -0.065 | -0.036 | 0.168 |
| X= | 2550.0/C/ | 0.627 | 0.850 | 1.024 |
| | /VEL/ | -0.065 | -0.035 | 0.170 |

```
X= 2650.0/C/     0.611     0.835     1.011
         /VEL/  -0.064    -0.033     0.171
X= 2750.0/C/     0.595     0.818     0.997
         /VEL/  -0.064    -0.032     0.173
X= 2850.0/C/     0.580     0.801     0.982
         /VEL/  -0.064    -0.030     0.175
X= 2950.0/C/     0.565     0.784     0.967
         /VEL/  -0.064    -0.029     0.176
X= 3050.0/C/     0.550     0.767     0.952
         /VEL/  -0.063    -0.028     0.178
X= 3150.0/C/     0.535     0.750     0.937
         /VEL/  -0.063    -0.026     0.180
X= 3250.0/C/     0.520     0.733     0.921
         /VEL/  -0.063    -0.025     0.181
X= 3350.0/C/     0.505     0.715     0.904
         /VEL/  -0.062    -0.023     0.183
X= 3450.0/C/     0.489     0.696     0.887
         /VEL/  -0.062    -0.022     0.185
X= 3550.0/C/     0.472     0.677     0.870
         /VEL/  -0.062    -0.020     0.186
X= 3650.0/C/     0.453     0.658     0.851
         /VEL/  -0.062    -0.019     0.188
X= 3750.0/C/     0.430     0.637     0.832
         /VEL/  -0.061    -0.018     0.190
X= 3850.0/C/     0.403     0.616     0.812
         /VEL/  -0.061    -0.016     0.191
X= 3950.0/C/     0.371     0.592     0.791
         /VEL/  -0.061    -0.015     0.193
X= 4050.0/C/     0.333     0.569     0.770
         /VEL/  -0.061    -0.013     0.195
X= 4150.0/C/     0.291     0.517     0.746
         /VEL/  -0.060    -0.012     0.196
REACH NUMBER    2:
X=   50.0/C/     0.227     0.227     0.227
         /VEL/  -0.005    -0.005     0.012
X=  150.0/C/     0.227     0.227     0.227
         /VEL/  -0.005    -0.003     0.015
X=  250.0/C/     0.227     0.230     0.228
         /VEL/  -0.005    -0.000     0.017
X=  350.0/C/     0.226     0.224     0.226
         /VEL/  -0.005     0.002     0.020
X=  450.0/C/     0.227     0.227     0.226
         /VEL/  -0.005     0.004     0.022
X=  550.0/C/     0.226     0.227     0.227
         /VEL/  -0.004     0.006     0.025
X=  650.0/C/     0.225     0.226     0.226
         /VEL/  -0.004     0.009     0.028
X=  750.0/C/     0.225     0.225     0.226
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          /VEL/   -0.004    0.011    0.030
X=   850.0/C/      0.224    0.225    0.225
          /VEL/   -0.004    0.013    0.033
X=   950.0/C/      0.224    0.224    0.225
          /VEL/   -0.004    0.015    0.035
X=  1050.0/C/      0.225    0.225    0.225
          /VEL/   -0.004    0.017    0.038
X=  1150.0/C/      0.225    0.225    0.225
          /VEL/   -0.004    0.020    0.041
X=  1250.0/C/      0.230    0.226    0.225
          /VEL/   -0.004    0.022    0.043
REACH NUMBER   3:
X=    50.0/C/      0.239    0.239    0.239
          /VEL/    0.073    0.083   -0.149
X=   150.0/C/      0.239    0.239    0.238
          /VEL/    0.073    0.085   -0.146
X=   250.0/C/      0.239    0.239    0.238
          /VEL/    0.073    0.087   -0.144
X=   350.0/C/      0.240    0.239    0.239
          /VEL/    0.074    0.089   -0.141
X=   450.0/C/      0.240    0.239    0.240
          /VEL/    0.074    0.091   -0.139
X=   550.0/C/      0.241    0.240    0.243
          /VEL/    0.074    0.093   -0.136
X=   650.0/C/      0.241    0.241    0.248
          /VEL/    0.074    0.096   -0.134
REACH NUMBER   4:
X=    50.0/C/      0.241    0.243    0.276
          /VEL/    0.088    0.112   -0.118
X=   150.0/C/      0.241    0.248    0.293
          /VEL/    0.088    0.113   -0.116
X=   250.0/C/      0.242    0.254    0.319
          /VEL/    0.088    0.115   -0.114
X=   350.0/C/      0.244    0.263    0.353
          /VEL/    0.088    0.116   -0.112
X=   450.0/C/      0.246    0.275    0.395
          /VEL/    0.089    0.118   -0.111
X=   550.0/C/      0.249    0.291    0.451
          /VEL/    0.089    0.119   -0.109
X=   650.0/C/      0.254    0.311    0.518
          /VEL/    0.089    0.121   -0.107
X=   750.0/C/      0.260    0.337    0.590
          /VEL/    0.089    0.122   -0.105
X=   850.0/C/      0.268    0.367    0.662
          /VEL/    0.090    0.124   -0.104
REACH NUMBER   5:
X=    83.3/C/      0.294    0.414    0.619
          /VEL/    0.030    0.083    0.040
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X=   250.0/C/    0.322    0.415    0.532
        /VEL/    0.031    0.085    0.043
X=   416.7/C/    0.329    0.407    0.490
        /VEL/    0.031    0.087    0.046
X=   583.3/C/    0.329    0.395    0.458
        /VEL/    0.032    0.090    0.049
X=   750.0/C/    0.324    0.382    0.432
        /VEL/    0.032    0.092    0.051
X=   916.7/C/    0.312    0.368    0.407
        /VEL/    0.033    0.094    0.054
X=  1083.3/C/    0.297    0.350    0.378
        /VEL/    0.033    0.097    0.057
X=  1250.0/C/    0.282    0.328    0.346
        /VEL/    0.033    0.099    0.060
X=  1416.7/C/    0.269    0.306    0.315
        /VEL/    0.034    0.102    0.062
X=  1583.3/C/    0.257    0.287    0.292
        /VEL/    0.034    0.104    0.065
X=  1750.0/C/    0.248    0.272    0.277
        /VEL/    0.035    0.106    0.068
X=  1916.7/C/    0.240    0.262    0.268
        /VEL/    0.035    0.109    0.071
X=  2083.3/C/    0.234    0.254    0.260
        /VEL/    0.036    0.111    0.073
X=  2250.0/C/    0.228    0.247    0.252
        /VEL/    0.036    0.113    0.076
X=  2416.7/C/    0.222    0.239    0.243
        /VEL/    0.036    0.116    0.079
JUNCTICN NUMBER  2:
   0.268
   0.407
   0.713
JUNCTICN NUMBER  3:
   0.241
   0.241
   0.253
***************************************************************************************
```
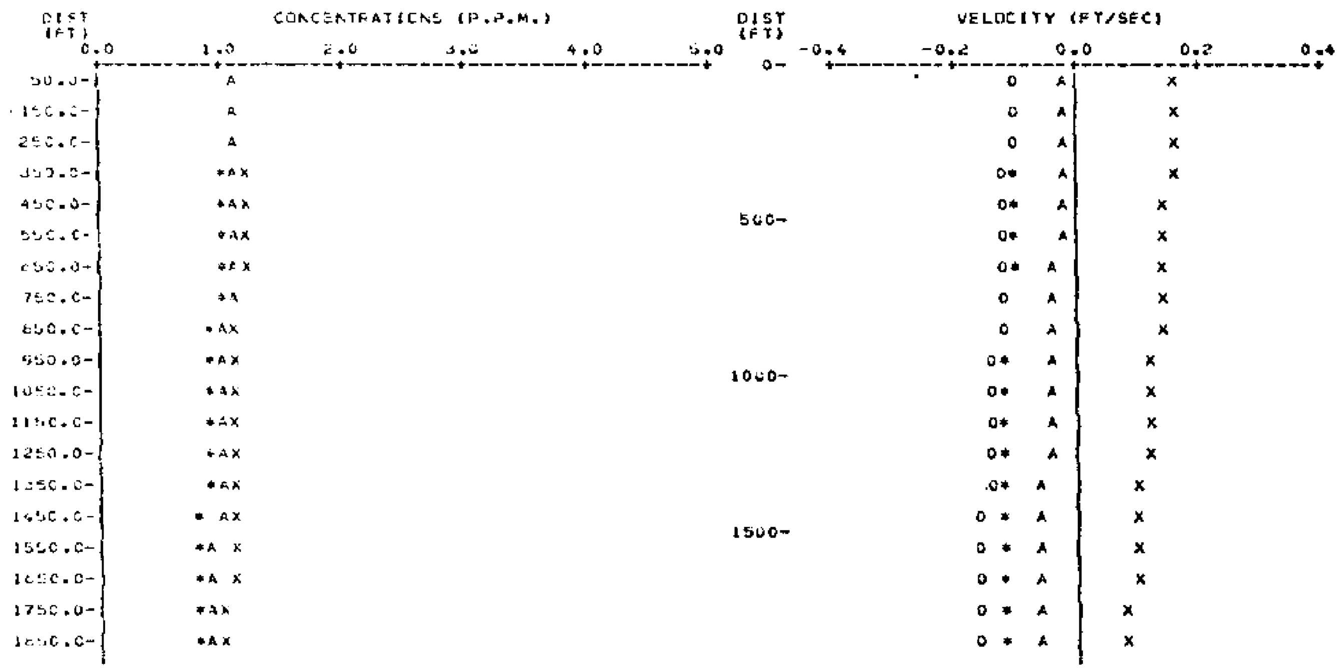
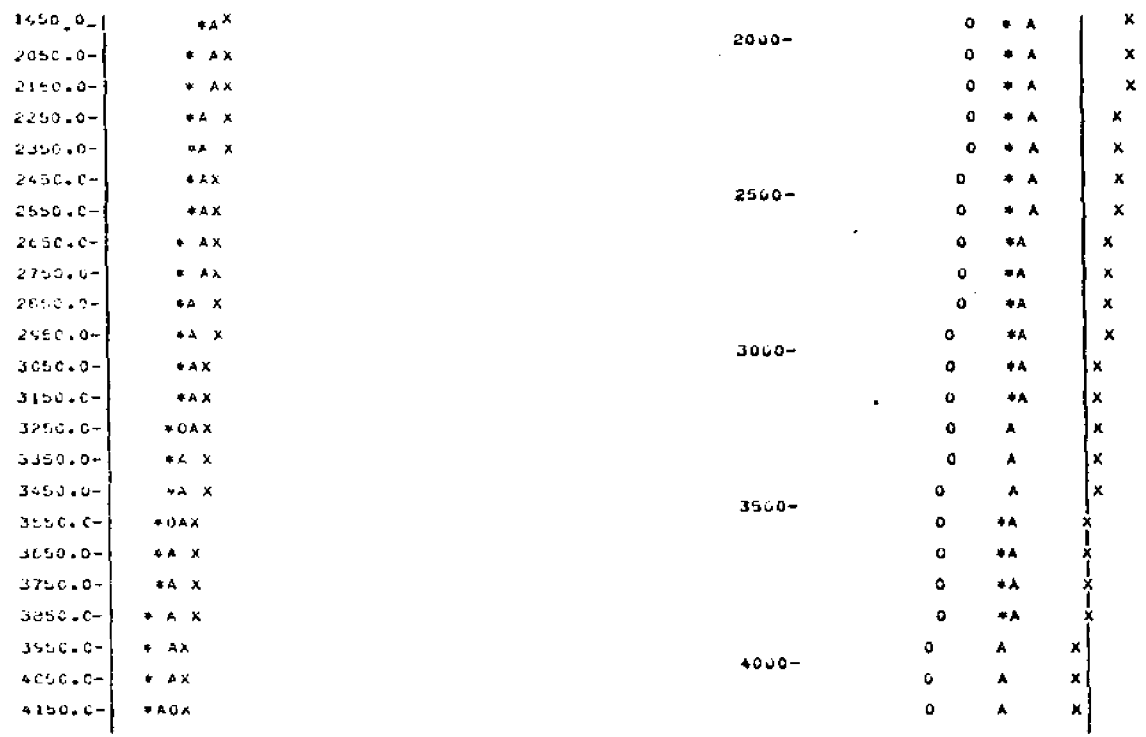
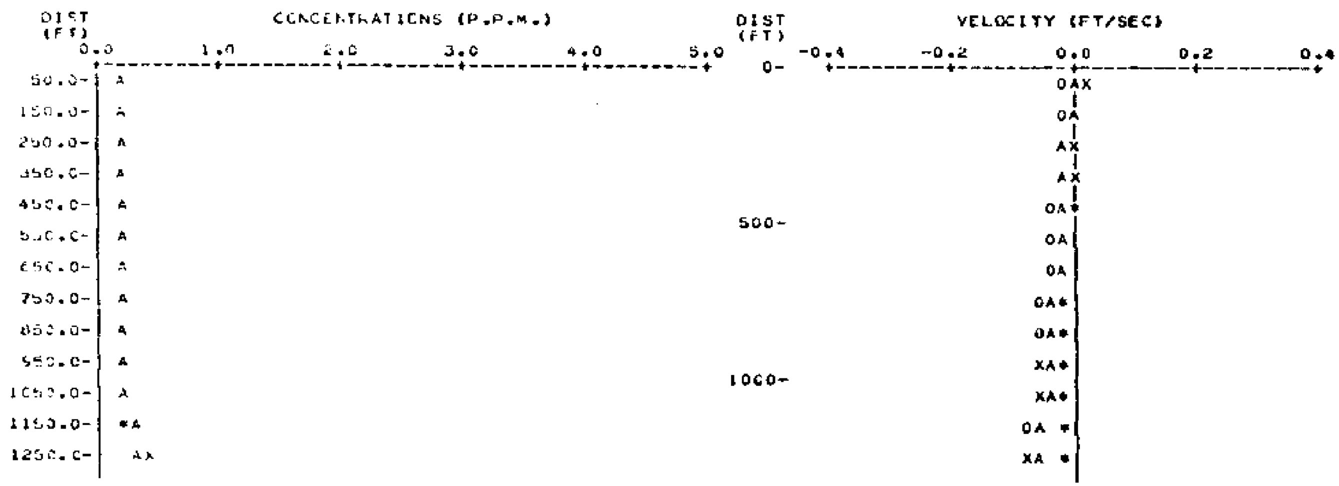

PLOTS FOR REACH NUMBER 1 : TIME FROM START OF SIMULATION IS 36.50 HOURS
: TIDAL DIFFERENCE= -1.650 FEET; WIND SPEED= 13.9 FT/SEC; WIND DIRECTION= 89. DEGREES






* = LAYER 1 (Z= 1.1 FT)
O = LAYER 2 (Z= 3.2 FT)
X = LAYER 3 (Z= 5.3 FT)
A = AVERAGE OVER LAYERS

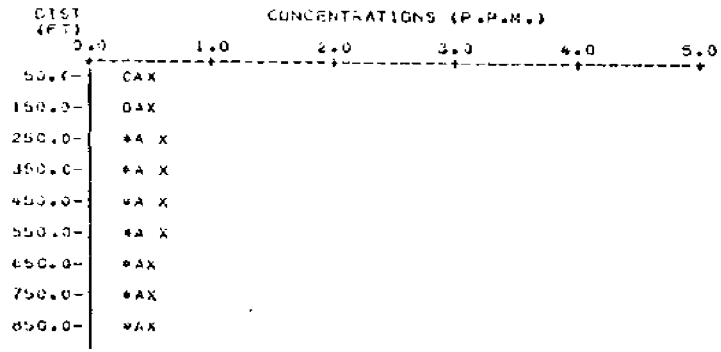
PLOTS FOR REACH NUMBER 2 : TIME FROM START OF SIMULATION IS 36.50 HOURS
: TIDAL DIFFERENCE= -1.650 FEET; WIND SPEED= 13.9 FT/SEC; WIND DIRECTION= 89. DEGREES

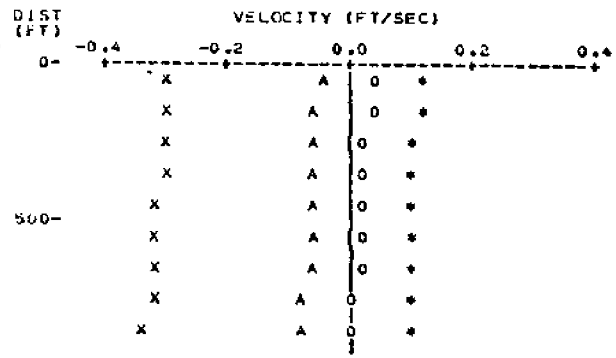



* = LAYER 1 (Z= 0.8 FT)
O = LAYER 2 (Z= 2.3 FT)
X = LAYER 3 (Z= 3.8 FT)
A = AVERAGE OVER LAYERS

```
PLOTS FOR REACH NUMBER  3 : TIME FROM START OF SIMULATION IS   36.50 HOURS
                          : TIDAL DIFFERENCE= -1.650 FEET; WIND SPEED= 13.9 FT/SEC; WIND DIRECTION=  89. DEGREES

  DIST              CONCENTRATIONS (P.P.M.)                    DIST             VELOCITY (FT/SEC)
  (FT)                                                         (FT)
      0.0       1.0       2.0       3.0       4.0       5.0         -0.4      -0.2       0.0       0.2       0.4
      +---------+---------+---------+---------+---------+      0-    +---------+---------+---------+---------+
 50.0-| *A                                                                     X         A    O*
150.0-| OA                                                                    X          A    O*
250.0-| *A                                                                    X          A    O*
350.0-| *A                                                                    X          A    O*
450.0-| *AX                                                                  X          A|   O *
550.0-| *AX                                                    500-          X          A|   O *
650.0-| *A X                                                                 X          A|   O *

 * = LAYER 1 (Z= 0.8 FT)
 O = LAYER 2 (Z= 2.3 FT)
 X = LAYER 3 (Z= 3.5 FT)
 A = AVERAGE OVER LAYERS
```

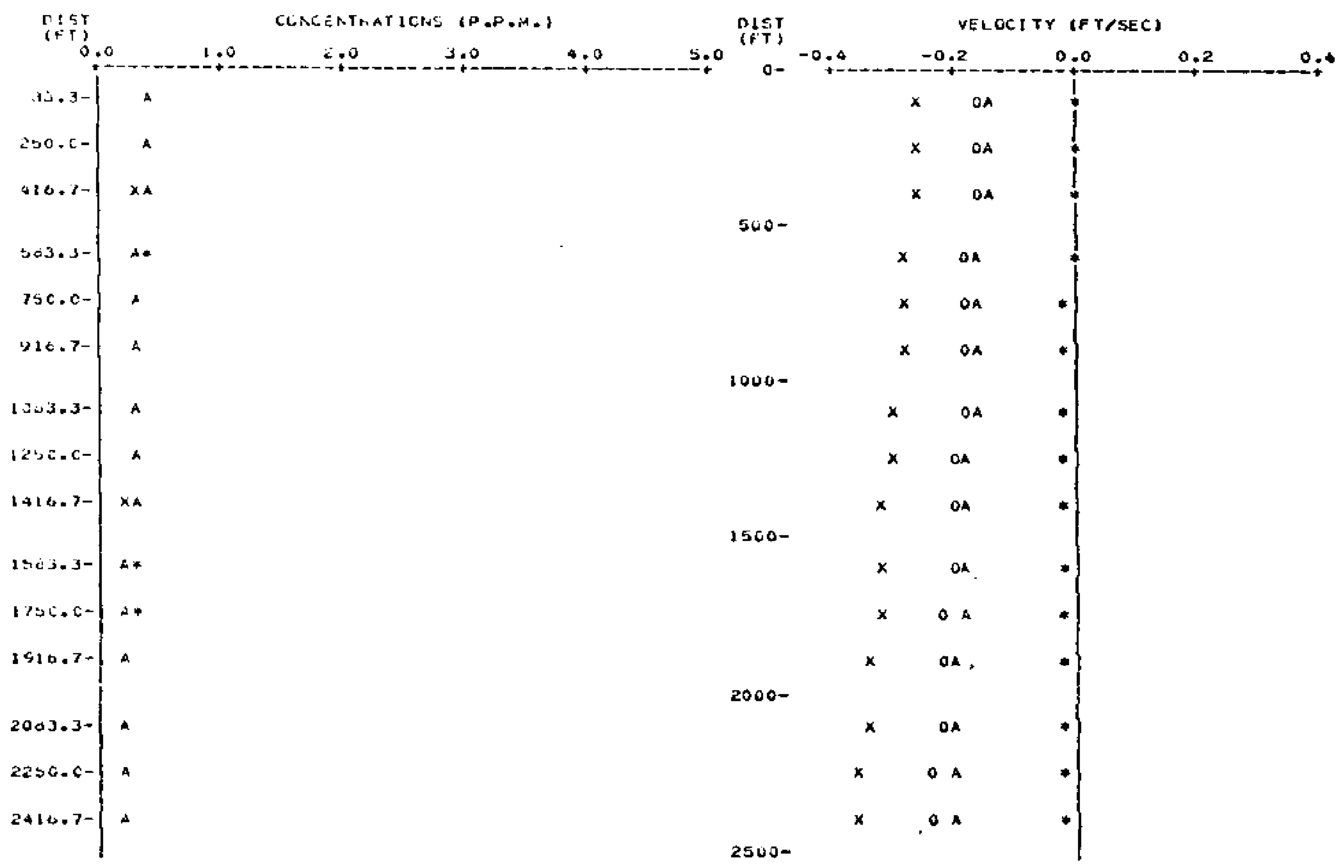
PLOTS FOR REACH NUMBER 4 : TIME FROM START OF SIMULATION IS 36.50 HOURS
: TIDAL DIFFERENCE= -1.650 FEET; WIND SPEED= 13.9 FT/SEC; WIND DIRECTION= 89. DEGREES




* = LAYER 1 (Z= 1.0 FT)
O = LAYER 2 (Z= 3.0 FT)
X = LAYER 3 (Z= 5.0 FT)
A = AVERAGE OVER LAYERS

PLOTS FOR REACH NUMBER 5 : TIME FROM START OF SIMULATION IS 36.50 HOURS
: TIDAL DIFFERENCE= -1.650 FEET; WIND SPEED= 13.9 FT/SEC; WIND DIRECTION= 89. DEGREES




* = LAYER 1 (Z= 1.1 FT)
O = LAYER 2 (Z= 3.2 FT)
X = LAYER 3 (Z= 5.3 FT)
A = AVERAGE OVER LAYERS

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TIME    36.50 HOURS: TIDAL DIFFERENCE= -1.650 FEET
WINC SPEED= 13.9 FT/SEC: WIND DIRECTION=  89. DEGREES
REACH NUMBER   1:
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# APPENDIX H

Letters From

JACKSONVILLE DISTRICT, CORPS OF ENGINEERS

and

FISH AND WILDLIFE SERVICE

in response to

SNYDER OCEANOGRAPHY SERVICES

Inquiry

SNYDER
OCEANOGRAPHY
SERVICES

Snyder Oceanography Services and the Department of Civil and Coastal Engineering of the University of Florida are jointly seeking funding from the Department of the Interior to conduct a research program to develop design methods for assuring maintenance of water quality and circulation in canals and canal systems.

This specific research will culminate in an engineering design manual to be used both for design of new canals and the evaluation of these designs for permitting purposes. The manual will also be valuable in rectifying environmental problems in certain existing canals.

It would be helpful if your office, as a potential user of the engineering design manual, would comment on the need for the research required to advance our knowledge of canal performances to the point where such a manual could be produced. Your suggestions would also be welcome as to content and to any particular problems of concern to your office. A copy of the tentative table of contents is enclosed.

We would appreciate your expeditious reply.

Sincerely yours,

Robert M. Snyder, P.E.

bss

*Post Office Box* [illegible] • *Jupiter, Florida 3345*[illegible] • *Telephone (305)* [illegible]

# CANAL DESIGN MANUAL

## VALUE OF CANALS

Aesthetic
Recreational
Utilitarian
Economic
Ecological

## HISTORIAL OVERVIEW

Typical Florida Canal Systems
Quality of Canal Waters
Special Problems

## CONDITIONS NOT CONDUCIVE TO GOOD CANAL DESIGN

Ecological
Hydrological
Geographical
Hydrodynamic

## A METHODICAL APPROACH TO GOOD CANAL DESIGN

Hydrology of Site and Surrounding Area
Biology of Adjacent Waters
Water Quality and Pollution Sources
Flow Characteristics
Deposition & Erosion
Tidal Dynamics
Winds and Other Physical Parameters
Entrance Design
Preliminary Layout
Combining Optimum Land Use with Water Quality Criteria
Evaluating Environmental Impact

## ENGINEERING METHODS

Analytical Studies
Field Measurements
Model Studies

## DEVICES & STRUCTURES

## APPENDIXES

Subject Bibliography

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT. CORPS OF ENGINEERS
P. O. BOX 4970
JACKSONVILLE. FLORIDA 32201

SAJKS

17 December 1974

Mr. Robert M. Snyder, P. E.
Snyder Oceanography Services
P. O. Box 98
Jupiter, Florida 33458

Dear Mr. Snyder:

With reference to your letter of 4 December 1974, we feel there is very definitely a need for developing a design manual for maintenance of water quality and circulation in canals and canal systems. In spite of the great deal of evidence of water quality problems associated with residential canals, there still seems to be a high demand by the public for waterfront residences. Canal systems afford waterfront living and water access to many more people than could be accommodated on natural shorelines. Our job is not only to consider the environmental problems associated with proposed works in or connecting to navigable waters, but to evaluate the "other side" which includes the applicant's desire for waterfront living and boating access. For this reason it sometimes becomes difficult to decide what is in the best overall public interest. If techniques could be developed to assure water quality in residential canal systems, we see no reason why such canals should be totally outlawed as seems to be the current tendency on the part of some agencies and environmental groups.

Normally canals and/or artificial waterbodies are prone to environmental problems unless special (usually expensive) precautions are taken to insure circulation and means for removal of suspended and dissolved materials are provided. Nature provides removal of materials by various methods such as vegetation and cyclic flows thus allowing oxidation and aerobic decomposition to accelerate the cleanup process. It would seem to us that techniques could be developed to design and maintain artificial canals by similar means that nature provides for natural waterways.

Based on the above this office would have a definite need and use for an engineering design manual of the type you have outlined in your letter. The tentative table of contents attached thereto is very general and could represent a solid approach to the problem.

Sincerely yours,

B. N. Goode

B. N. GOODE
Chief, Regulatory Branch

United States Department of the Interior
FISH AND WILDLIFE SERVICE
17 EXECUTIVE PARK DRIVE, N. E.
ATLANTA, GEORGIA 30329

MAR 14 1975

Mr. Robert M. Snyder, P.E.
Snyder Oceanography Services
P.O. Box 98
Jupiter, Florida 33458

Dear Mr. Snyder:

This is in response to your letter of December 4, 1974, requesting our comments concerning the need for research required to advance knowledge of canal performance. The Fish and Wildlife Service would welcome an expansion of the existing information concerning canal systems and their relationship to both long- and short-term maintenance of environmental quality. We would certainly wish to obtain copies of the design manual which you anticipate producing. Our specific suggestions as to research needs follow and are keyed to the points in the tentative table of contents provided with your letter.

VALUE OF CANALS

Aesthetic

This is probably the most subjective of the categories listed under the VALUE topic. We believe, however, that orthodox concepts of design aesthetics would, in general, favor curved or serpentine configurations over the conventional arrow-straight form taken by most residential canals in Florida and elsewhere in the southeast. We suspect that real-estate entrepreneurs are not unaware of this rather obvious esthetic preference. The preference for the straight canal probably derives from economic considerations, i.e. waterfront siting of the maximum number of near-identical rectangular building lots.

Stabilization of canal banks with conventional bulkheads, in our view, conveys a strong impression of artificiality to canal design, in addition to the ecological disadvantages such structures usually present. Sloping riprap is, in our view, generally preferable to vertical bulkheading, both on aesthetic grounds and because of the additional surface area that it provides for attached organisms.

Recreational

Proper canal design can result in provision of some fishery habitat and thus augment recreational fishing opportunity to some degree. The degree to which these sport fishery benefits are available will depend, in part, upon the type of shoreline development present. A dense concentration of docks and boats along the shoreline inhibits fisherman access from the water. However, our general observation has been that serious fishermen having access to watercraft do not purposefully enter residential canal systems for sport fishing purposes, preferring instead the adjacent natural waters. Fishing in most such canals appears to be done chiefly from the banks and most often by means of casually monitored set lines. Most canal-front lotowners in Florida seem to have learned that the sport fishery benefits of artificial canals are very limited.

Ecological

The ecological value of canals must first be considered in terms of what resources were displaced by canal construction. Conventional canals, excavated through productive wetland fish and wildlife habitat, will, in our view, never replace the values destroyed by their construction. This is particularly true in the case of wetland real estate development, where spoil generated by canal excavation is deposited on adjacent wetlands to provide building sites. Thus, even when some measure of biological productivity can be demonstrated from canals, the net impact upon the resource base may be a loss. The badly degraded water quality (chronically low dissolved oxygen values, production of hydrogen sulfide, high biological oxygen demand) in many canals makes them unsuitable as habitat for desirable wildlife, as well as being an arrant liability to the natural waters with which they connect.

Canals cut into upland areas formerly supporting insignificant or only moderately productive terrestrial fish and wildlife habitat may, with proper design, become more productive than the pre-existing upland. Proper design will include considerations of depth, flushing, cross-sectional configuration, shoreline stabilization methodology, land runoff control, and other characteristics as discussed in some detail below.

## HISTORICAL OVERVIEW

### Typical Florida Canal Systems

We suggest that this category should include at least the following general types:

1. short (less than 1,000 feet long) relatively shallow (-8 feet mean low water (mlw) or less) dead-end canals connecting directly with open estuarine waters and receiving the full benefit of maximum available tidal differential at the canal mouth;

2. canals of the same general type as in 1 above but substantially shallower (-6 feet mlw or less);

3. canals of the same general type as in 1 above but substantially deeper (-12 feet or greater);

4. long (2,000 feet or greater) canals of types otherwise having the general characteristics of canals described in 1-3 above;

5. extremely large and labyrinthine deep-dredged dead-end canal systems such as are prominent in the Charlotte Harbor, Pine Island Sound, and Fort Myers vicinities;

6. canal systems of the general types outlined in 1-5 above but located in dominantly marine (as opposed to brackish water or estuarine) localities, such as the Florida Keys or Ten Thousand Islands; and,

7. flow-through canal systems, i.e., nondead-end types, wherever this scarce commodity can be found.

### Special Problems

Some of the special problems affecting environmental quality related to canal design in existing systems are:

1. the unevenness of canal bottoms often occurring as a result of hydraulic dredging. Deep, poorly-flushed bottom depressions act as nutrient traps and serve as foci for anaerobic decomposition;

2. excessive overall depth, precluding light penetration to deeper waters. Under such conditions, rooted vegetation cannot grow on the bottom. The entire bottom of such canals may function as nutrient traps;

3. disparity between deep canal waters and shallower receiving waters. In such cases a sill is present at the canal mouth, impeding tidal exchange beyond the depth of the receiving waters. In addition, the deeper saline waters brought into the upper reaches of the canals by seasonally high tidal action becomes trapped beneath an overlying stratum of lower salinity water. The trapped saline layer becomes stagnant and depleted in dissolved oxygen; and,

4. degradation of water quality through influx of upland street and lawn drainage, i.e., urban runoff. Ideally, these contaminants should be collected and routed away from any canals having poor flushing characteristics. Such engineering is, unfortunately the exception rather than the rule in Florida residential canals.

## CONDITIONS NOT CONDUCIVE TO GOOD CANAL DESIGN

### Ecological

We do not have any evidence to demonstrate that any artificial canal yet devised by existing technology will equal the biological productivity of coastal tidal marshes or mangrove swamps. Consequently, the presence of such wetlands on a given site many be generally regarded as contraindicating, on biological grounds, the construction of any canal system. Stated more plainly, a canal design requiring dredging of productive wetlands is a biologically undesirable canal design. This does not mean that no canal should ever be constructed in wetlands. Public interest could require otherwise. In such an instance, design should be such as to minimize adverse ecological impact. The following is a partial list of factors we believe to be inimical to good design:

1. excavation to depths in excess of the photic zone (zone of light penetration), in excess of the depth of receiving waters (see Special Problems above), or in excess of the depth required for adequate flushing and exchange;

2. vertical, or "box-cut" canal banks. This configuration reduces availability of shallow-water fish and wildlife habitat along the shoreline;

3. irregularly contoured canal bottoms, as discussed under Special Problems above;

4. grading of adjacent land to permit direct discharge of polluted runoff into canals. This is a fatal defect of many canal systems. Retention ponds or swales should be provided to handle urban or agricultural runoff. Direct input to canals should be held to the absolute minimum;

5. "dead-end" design. The ecological liabilities of this type of canal design are so well known that we will not recite them here. Some shallow, relatively short dead-end canals may maintain satisfactory water quality. However, virtually any flow-through canal is ecologically superior to a dead-end canal of comparable length, depth, etc.;

6. siting of canals adjacent to septic tanks and drainfields. Recent studies by the U.S. Environmental Protection Agency (EPA) have documented that septic tank-drainfield effluent can leach into adjacent canals with astonishing rapidity. The implications of this upon water quality are obvious. We suggest you contact the EPA regional office in Atlanta for specific details of their studies;

7. placement of canal openings where boat traffic to and from the canals will cause erosion of adjacent or opposite natural shorelines;

8. incision into a shallow freshwater aquifer. This accelerates loss of freshwater to sea and/or intrusion of saline water into the freshwater supplies of coastal areas; and,

9. failure to set aside adequate disposal sites to accommodate maintenance dredging spoil. Ideally, disposal sites should be located in upland areas of low biological productivity.

Hydrological

It would appear more appropriate to include this as a subcategory under "Ecological." In any case, we suggest that you solicit the views of the U.S. Geological Survey, Subdistrict Office, Miami, Florida, for their views on this aspect of canal design, and for information as to hydrodynamic and geologic parameters as well.

## A METHODICAL APPROACH TO GOOD CANAL DESIGN

### Hydrology of Site and Surrounding Area

In order to locate a canal so as to minimize environmental degradation, the canal route should be selected so as to avoid the most biologically productive areas, either wetland or upland. Segmentation of habitat should be discouraged by locating the canal route near the margins of the least productive vegetative zones but generally not at the ecotonal boundaries between zones.

One hydrological feature that should be incorporated into canal designs where possible is the linkage of opposite ends of the canal with waters having sufficient differential in tidal periodicities to force a substantial flow through the canal at high and low tides. Unfortunately, few sites offer such an advantage to planners. Islands lying adjacent to the ocean on one side and forming semienclosed bays on the opposite side are particularly conducive to this strategy, due to the tidal differential created by the tidal dampening effect of the islands upon the waters of the bays.

Biology of Adjacent Waters

The entrances of canals and their associated offshore channels or entrance routes should be situated and marked so as to encourage navigation interests to utilize the least destructive offshore approach to canal entrances. Boat traffic across shallow grass flats should especially be discouraged. Canal openings to adjacent waters should also be so located as to minimize the extent of channel dredging across shallow productive bottoms.

Water Quality and Pollution Sources

This design factor is addressed above under "VALUE OF CANALS" and "Special Problems."

Flow Characteristics

We are not certain what this subject relates to. If tidal flow is meant, we refer you to our observations in the above subcategory, "Hydrology of Site and Surrounding Areas."

Deposition and Erosion

With proper contouring and stabilization of canal banks, erosion can be adequately controlled. Again, we emphasize our preference for riprap as opposed to conventional bulkheading.

Deposition of sediments (and the accompanying necessity of maintenance dredging) is common to poorly-flushed systems that accumulate organic materials and other particulate matter carried by runoff waters. Some sediments derive from canal bank erosion. This particular problem is also avoided by adequate bank stabilization or contouring. The optimum slope of canal banks for erosion control varies with soil type, water velocity, and drainage characteristics, and is a determination that we feel should be made by engineers, not biologists.

Tidal Dynamics

This factor has been discussed above under "Hydrology of Site and Surrounding Areas" and "Special Problems."

Winds and Other Physical Parameters

Where significant prevailing winds are present, canal orientation should be such as to favor the wind-driven circulation of water from canals to receiving waters. Orientation of dead-end canals to permit wind-driven waters to be driven into the canals may result in an influx of floating seagrasses or other floating plant materials that enter canals, decay, and increase the biological oxygen demand of canal waters and sediments. This observation also applies to boat basins.

Consequently, we recommend an orientation that permits the prevailing wind to sweep across the interior of the boat basin and toward the receiving waters beyond.

Entrance Design

The locations of canal entrances should be selected to minimize destruction of fish and wildlife habitat. This is generally accomplished by siting the canal entrance where it will traverse the smallest amount of productive wetland vegetation or shallow productive bottom substrate. However, if the canal opens to an offshore channel, the combined impact of canal and channel routes must be considered in minimizing damages.

If entrances are to be structurally stabilized, sloping riprap is generally preferred, on biological grounds, in favor of vertical surfaces, for bulkheads or groins. Either means of shoreline stabilization should be installed so as not to cause erosion in adjacent areas by wave reflection or interruption of longshore sand transport.

The above remarks do not address all of the categories in your outline, and thus are by no means comprehensive. We hope, however, that we have been of assistance in pointing out some of the areas of most significance to fish and wildlife resources that should be carefully considered in the design of artificial canals. We would appreciate your letting us know when your manual becomes available.

Sincerely yours,

Ray R. Vaughn

Deputy Regional Director

APPENDIX I

# 57 Acres Hydrograph

Prepared for

Royal American Realty Company
Lake Park, Florida

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November 1975

# FIGURES AND TABLES

# NOTATION

| | | |
|---|---|---|
| A | - | drainage basin area, $mi^2$. |
| CN | - | curve number. |
| D | - | duration of storm, hrs. |
| H | - | difference in elevation between the highest point and the outflow, ft. |
| i | - | rainfall intensity, ins/hr. |
| L | - | length of longest route to the outflow, ft. |
| P | - | design rainfall depth, ins. |
| q | - | hydrograph discharge, cfs. |
| $q_c$ | - | hydrograph discharge for Q = 1 in., cfs/in |
| $q_p$ | - | hydrograph peak discharge for Q = 1 in., cfs/in |
| Q | - | synthesized hydrograph runoff, ins. |
| t | - | time, hrs. |
| $T_c$ | - | time of concentration, hrs. |
| $T_o$ | - | duration of rainfall excess, hrs. |
| $T_p$ | - | time to peak, hrs. |
| Rev $T_p$ | - | revised time to peak, hrs. |
| u | - | velocity of overland flow, fps. |

## Introduction

Two hydrographs have been synthesized for the 57 Acres project site at the location of the freshwater inputs to the system. These hydrographs represent the outflow for a 25-yr, 24-hr storm and a 100-yr, 6-hr storm over the area specified on a portion of the soils map of Palm Beach County (see Figure I-1). Each hydrograph is given as three curves, for curve number 63, 80 and 94, which span the expected variability of runoff for Antecedent Moisture Conditions (AMC) I, II and III respectively.

"Soil Survey Interpretations" from a special report by the Soil Conservation Service [1975] for the various soil types delineated on the 5-72 edition of the Soil Survey Field Sheet for Palm Beach County, USDA-SCS Fort Worth, Texas, show that all soil types within the drainage basin are Type D (see Table I-1). Using Table 9.1 in SCS [1972] entitled "Runoff curve numbers for hydrologic soil-cover complexes", under the category "pasture or range", the curve numbers vary from 80 to 89 for good to poor hydrologic conditions. It is apparent that the range of possibly-applicable curve numbers is more dependent upon AMC than upon the soil type for the 57 Acres project site drainage basin. Accordingly, using Table 5.3 from Hjelmfelt and Cassidy [1975] entitled "Estimation of curve number for various antecedent moisture conditions", curve numbers 63 (AMC I) and 94 (AMC III) were selected for the limiting hydrographs.

## Method

The Soil Conservation Service (SCS) method (for explanation, see Viesman et al [1972]), has been used to generate the hydrographs.

For each of the three selected curve numbers, a hydrograph was generated for the drainage basin shown in Figure I-1. As can be seen from the figure, the drainage basin has two fresh water outflows, and because the drainage area for each is not well defined, the assumption is made that each has an equal outflow discharge. Thus the two outflows are replaced by a single outflow located mid-way between the two existing ones.

From Figure I-1, it can be seen from the contours, that drainage is towards the Intracoastal Waterway and in fact, drainage ditches in this area flow approximately Northeast. Thus, it was decided that the longest distance that the water takes to reach the single outflow is the longest straight line to the outflow point in the drainage basin. This distance (symbol, L) was measured to be 13,600 ft. Furthermore, the drainage basin was considered as one zone contributing to the outflow, instead of several zones each lagged by their respective times to concentration.

Hydrograph Calculations

Refer to example 8-1 on page 277 of Viesman, et al [1972] for the procedure used in deriving these hydrographs. Below is a sample derivation of the 100-yr, 6-hr storm for curve number, CN = 63.

1. *Area Factor:*

   Total drainage basin area, A = 2826 acres

   $= 4.42 \text{ mi}^2$.

   No adjustment is necessary since the area is less than $10 \text{ mi}^2$.

2. *Duration Adjustment*

The time of concentration, $T_c$, is given from Figure 15.2 of the Soils Conservation Service Handbook [1972]. Defining the land type as between "short grass pasture" and "trash fallow", velocities lie between 0.06 and 0.14 fps (extrapolating the lines). Thus taking a velocity of 0.1 fps, the time of concentration is given by [SCS, 1972]

$$T_c = \frac{1}{3600u} \text{ hrs}$$

$$= \frac{13600}{3600 \times 0.1} \text{ hrs}$$

$$= 37.8 \text{ hrs}$$

No adjustment is necessary as the duration of the rainfall, D, is D(= 6 hrs) $\leq$ 6 hrs

3. *Direct runoff, Q:*

$$P = iD$$

where

$P$ = design rainfall depth, in

$i$ = rainfall intensity, in/hr

= 1.60 in/hr

$D$ = duration of storm, hr

= 6 hr.

Therefore, P = 1.60 x 6

= 9.60 in.

Enter Figure 8-4 [Viesman, et al, 1972] with P = 9.60 in and CN = 63, Q = 5.0 in.

4. *Hydrograph Family:*

Enter Figure 8-6 [Viesman, et al, 1972] with CN = 63 and P = 9.60 in and read hydrograph family number 3.

5. *Duration of Rainfall Excess:*

Enter Figure 8-7 [Viesman, et al, 1972] with P = 9.6 in and CN = 63 and read

$$T_o = 4.6 \text{ hr.}$$

6. *Time to Peak, $T_p$:*

$$T_p = 0.7\ T_c$$

$$= 26.5 \text{ hr.}$$

7. *$T_o/T_p$ Ratio:*

$$\frac{T_o}{T_p} = \frac{4.6}{26.0}$$

$$= 0.17$$

8. *Revised $T_o/T_p$ and Revised $T_p$:*

From Table 8-4 [Viesman, et al, 1972] it can be seen that

$$\left(\frac{T_o}{T_p}\right)_{rev} = 1$$

is the only available choice. However, from the way in which the table is formed, this choice is clearly inaccurate as the revised $T_p$ will be 4.6 instead of 26.5. Thus, Table 8-5 [Viesman, et al 1972] may be extrapolated based on the ratio of hydrograph peak values. This was done in all six calculations.

9. *Unit Discharge (per inch) $q_p$:*

$$q_p = \frac{484A}{T_p}$$

$$= \frac{484 \times 4.42 \text{ cfs}}{26.0}$$

$$= 80.7 \text{ cfs/in}$$

10. *Total Peak Flow*

$$Qq_p = 5.0 \times 82.28 \text{ cfs}$$

$$= 404 \text{ cfs.}$$

11. From selected hydrograph family in Table 8-5 [Viesman, et al, 1972] multiply $t/T_p$ by revised $T_p$ to obtain t in hours (see Table I-3 and I-4).

12. From the selected hydrograph family in Table 8-5 [Viesman, et al, 1972] multiply each value of the $q_c/q_p$ column by $Qq_p$ to obtain values of $q_c$ in cfs (see Tables I-3 and I-4).

The above method has been repeated for each of the six hydrographs, for two different durations and three different curve numbers. The values calculated are listed in Table I-2 and the hydrographs developed in Tables I-3 and I-4. The resulting hydrographs are then drawn in Figures I-2 and I-3 and summarized in Table I-5.

Summary

The hydrographs for a 25-yr, 24-hr storm and a 100-yr, 6 hr storm are attached (see Figures I-2 and I-3). The differences in peaks for CN = 63 and CN = 94 are 184 cfs and 121 cfs respectively. As stated in the introduction, the discharge for each outflow is half the calculated value, as the two outflows were replaced by one for the purposes of calculation. The results are summarized in Table I-5.

References (Appendix I)


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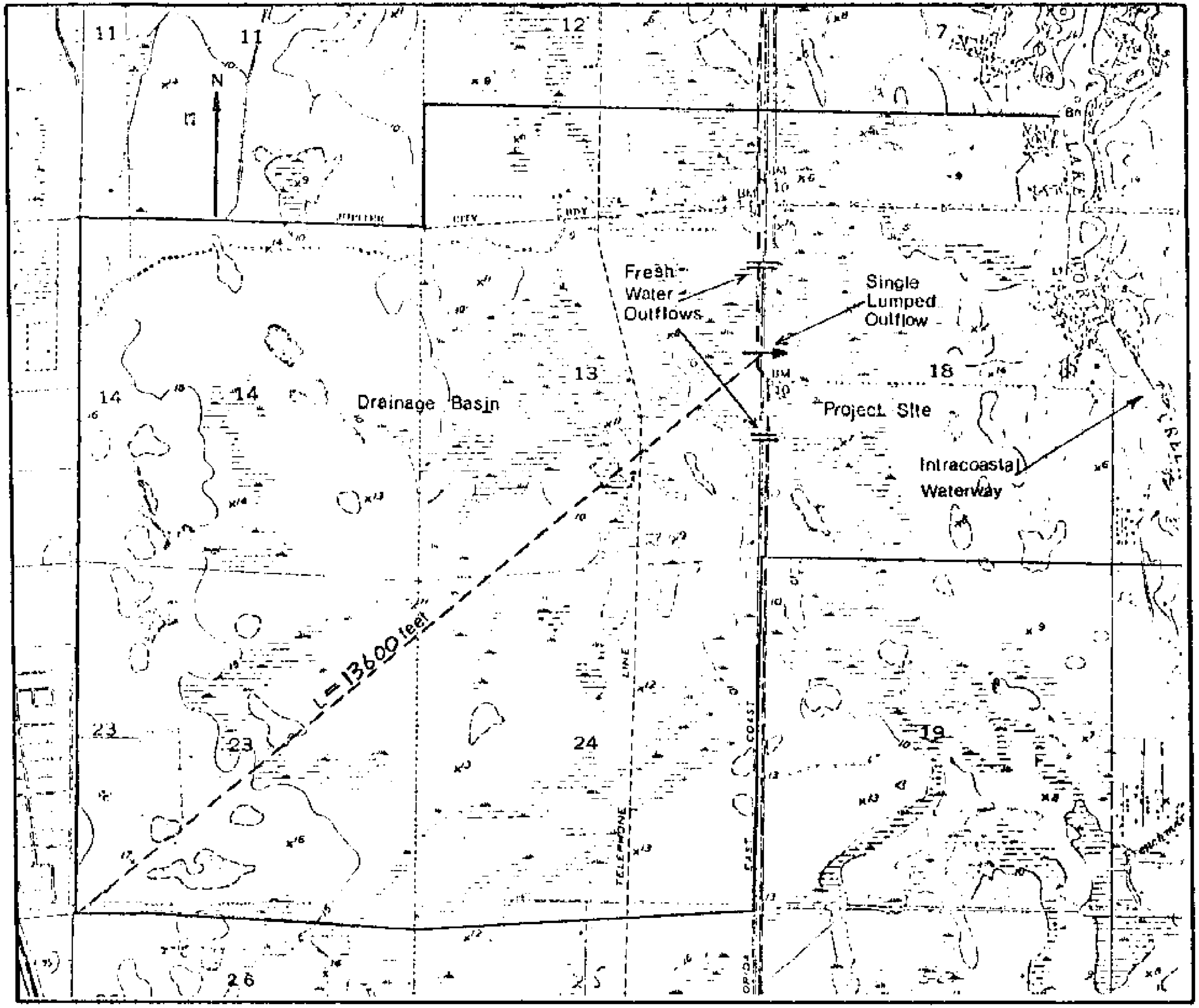


Figure I.1 Map of 57 Acres Drainage Basin.

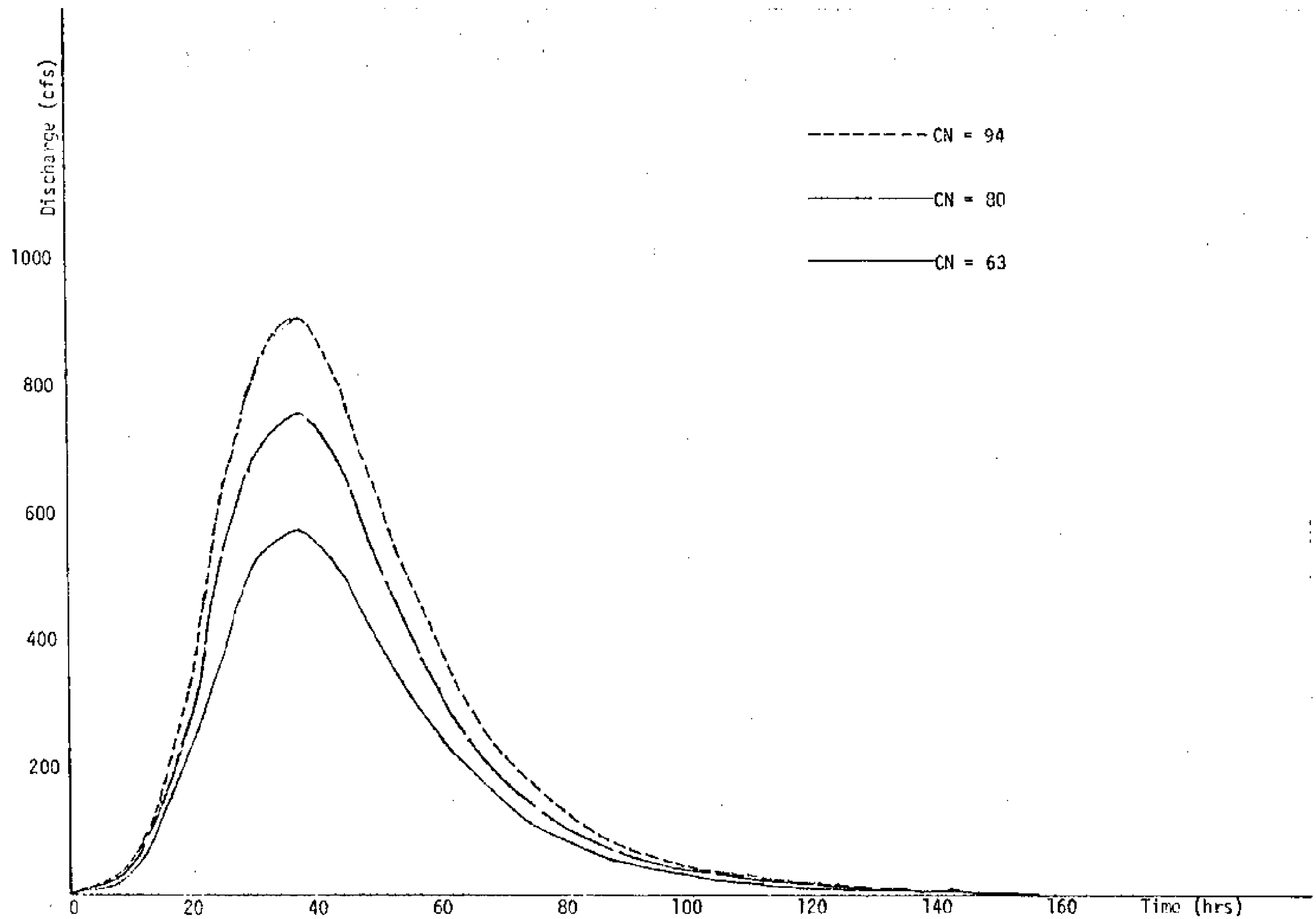


Figure I.2 Hydrographs for 25-Year, 24-Hour Storm.

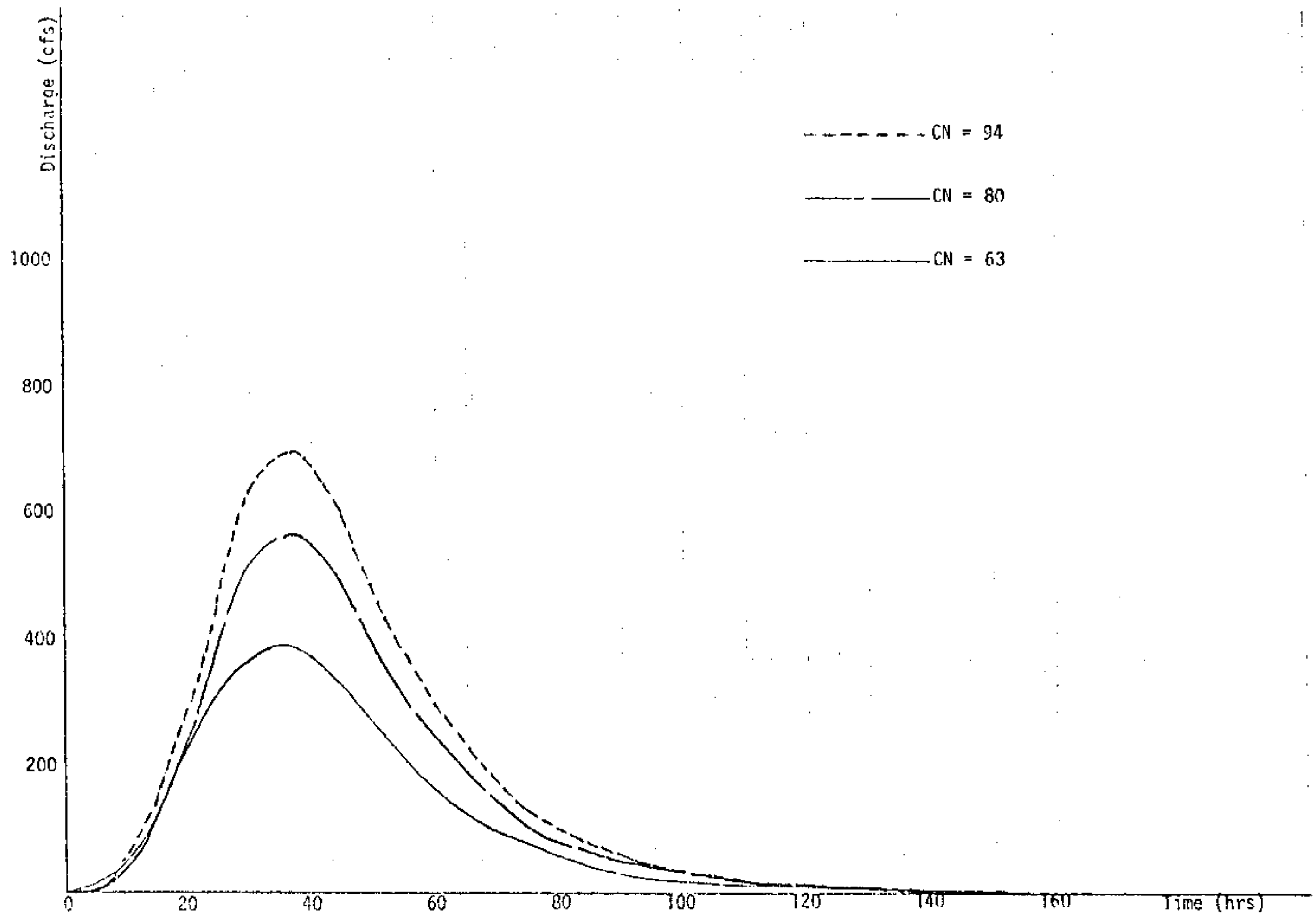


Figure I.3 Hydrographs for 100-Year, 6-Hour Storm.

Table I-1 - Major Soils of the 57 Acres Drainage Basin.

| Soil Type[1] | Number[1] | Hydrologic Group[1] |
|---|---|---|
| Anclote fine sand | 3 | D |
| Basinger fine sand | 5 | A/D[2] |
| Basinger and Myakka sands | 6 | A/D |
| Immokalee fine sand | 44 | A/D |
| Sanibel muck | 52 | A/D |
| Myakka sand | 60 | A/D |

Notes:

1. Based on "Soil Survey Interpretations (see Reference Number 1).
2. Presently group D. Can be converted to group A using drainage ditches.

Table I-2 - Hydrograph Parameters.

| CN | Storm | i (in/hr) | $T_c$ (hr) | A ($mi^2$) | P (in) | Q (in) | Family | $T_o$ (hr) | $T_p$ (hr) | $T_o/T_p$ | $q_p$ (cfs/in) | $Qq_p$ (cfs) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 63 | 25 yr 24 hr | .51 | 37.8 | 4.42 | 12.24 | 7.3 | 2 | 4.8 | 26.5 | 0.18 | 80.7 | 589 |
| 80 | 25 yr 24 hr | .51 | 37.8 | 4.42 | 12.24 | 9.7 | 2 | 5.4 | 26.5 | 0.20 | 80.7 | 783 |
| 94 | 25 yr 24 hr | .51 | 37.8 | 4.42 | 12.24 | 11.6 | 1 | 5.9 | 26.5 | 0.22 | 80.7 | 936 |
| 63 | 100 yr 6 hr | 1.6 | 37.8 | 4.42 | 9.6 | 5.0 | 3 | 4.6 | 26.5 | 0.17 | 80.7 | 404 |
| 80 | 100 yr 6 hr | 1.6 | 37.8 | 4.42 | 9.6 | 7.2 | 2 | 5.2 | 26.5 | 0.20 | 80.7 | 581 |
| 94 | 100 yr 6 hr | 1.6 | 37.8 | 4.42 | 9.6 | 8.8 | 1 | 5.7 | 26.5 | 0.22 | 80.7 | 710 |

Table I-3 - Hydrographs for 25-yr, 24 hr Storm.

| | CN = 63<br>Family = 2<br>$Qq_p$ = 589 cfs<br>$(q_c/q_p)$max=0.975 | | CN = 80<br>Family = 2<br>$Qq_p$ = 783 cfs<br>$(q_c/q_p)$max=0.970 | | CN = 94<br>Family = 1<br>$Qq_p$ = 936 cfs<br>$(q_c/q_p)$max=0.980 | |
|---|---|---|---|---|---|---|
| Line No. | t (hrs) | $q_c$ (cfs) | t (hrs) | $q_c$ (cfs) | t (hrs) | $q_c$ (cfs) |
| 1 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 |
| 2 | 7.4 | 17 | 7.4 | 22 | 7.4 | 29 |
| 3 | 14.8 | 110 | 14.8 | 146 | 14.8 | 151 |
| 4 | 22.3 | 311 | 22.3 | 412 | 22.3 | 476 |
| 5 | 29.7 | 520 | 29.7 | 688 | 29.7 | 804 |
| 6 | 37.1 | 574 | 37.1 | 759 | 37.1 | 908 |
| 7 | 44.5 | 500 | 44.5 | 661 | 44.5 | 782 |
| 8 | 51.9 | 357 | 51.9 | 472 | 51.9 | 572 |
| 9 | 59.7 | 247 | 59.7 | 326 | 59.7 | 392 |
| 10 | 66.8 | 167 | 66.8 | 221 | 66.8 | 260 |
| 11 | 74.2 | 108 | 74.2 | 142 | 74.2 | 174 |
| 12 | 81.6 | 73 | 81.6 | 97 | 81.6 | 116 |
| 13 | 89.0 | 51 | 89.0 | 67 | 89.0 | 79 |
| 14 | 96.5 | 34 | 96.5 | 45 | 96.5 | 52 |
| 15 | 103.9 | 22 | 103.9 | 29 | 103.9 | 36 |
| 16 | 111.3 | 15 | 111.3 | 20 | 111.3 | 24 |
| 17 | 118.7 | 10 | 118.7 | 13 | 118.7 | 16 |
| 18 | 126.1 | 6 | 126.1 | 8 | 126.1 | 9 |
| 19 | 133.6 | 3 | 133.6 | 3 | 133.6 | 5 |
| 20 | 141.0 | 1 | 141.0 | 2 | 141.0 | 2 |
| 21 | 148.0 | 1 | 148.0 | 1 | 148.0 | 1 |
| 22 | 155.8 | 0 | 155.8 | 0 | 155.8 | 0 |

Table I-4 - Hydrographs for 100-yr, 6-hr Storm.

| | CN = 63<br>Family = 3<br>$Qq_c$ = 404 cfs<br>$(q_c/q_p)$max=0.965 | | CN = 80<br>Family = 2<br>$Qq_c$ = 581 cfs<br>$(q_c/q_p)$max=0.975 | | CN = 96<br>Family = 1<br>$Qq_c$ = 710 cfs<br>$(q_c/q_p)$max=0.980 | |
|---|---|---|---|---|---|---|
| Line No. | t (hrs) | $q_c$ (cfs) | t (hrs) | $q_c$ (cfs) | t (hrs) | $q_c$ (cfs) |
| 1 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 |
| 2 | 7.0 | 22 | 7.4 | 17 | 7.4 | 20 |
| 3 | 13.8 | 101 | 16.8 | 109 | 16.8 | 134 |
| 4 | 20.7 | 241 | 22.3 | 307 | 22.3 | 377 |
| 5 | 27.6 | 352 | 29.7 | 513 | 29.7 | 631 |
| 6 | 34.5 | 390 | 37.1 | 566 | 37.1 | 696 |
| 7 | 41.3 | 359 | 44.5 | 492 | 44.5 | 605 |
| 8 | 48.2 | 287 | 51.9 | 352 | 51.9 | 432 |
| 9 | 55.1 | 204 | 59.7 | 243 | 59.7 | 299 |
| 10 | 62.0 | 141 | 66.8 | 165 | 66.8 | 202 |
| 11 | 68.9 | 99 | 74.2 | 106 | 74.2 | 131 |
| 12 | 75.8 | 69 | 81.6 | 72 | 81.6 | 89 |
| 13 | 82.7 | 48 | 89.0 | 50 | 89.0 | 61 |
| 14 | 89.6 | 32 | 96.5 | 33 | 96.5 | 41 |
| 15 | 96.5 | 22 | 103.9 | 22 | 103.9 | 27 |
| 16 | 103.4 | 16 | 111.3 | 15 | 111.3 | 18 |
| 17 | 110.2 | 11 | 118.7 | 10 | 118.7 | 12 |
| 18 | 117.1 | 7 | 126.1 | 6 | 126.1 | 7 |
| 19 | 124.0 | 5 | 133.6 | 3 | 133.6 | 3 |
| 20 | 130.9 | 3 | 141.0 | 1 | 141.0 | 2 |
| 21 | 137.8 | 1 | 148.0 | 1 | 148.0 | 1 |
| 22 | 144.7 | 1 | 155.0 | 0 | 155.0 | 0 |
| 23 | 151.6 | 0 | | | | |

Table I-5 - Summary of Hydrograph Data.

| Storm | Rainfall Intensity i (ins/hr) | Curve Number (CN) | Peak Discharge (cfs) | Peak Discharge for each of the outflows (cfs) |
|---|---|---|---|---|
| 25-year, 24-hour | 0.51 | 63 | 574 | 287 |
| 25-year, 24-hour | 0.51 | 80 | 759 | 380 |
| 25-year, 24-hours | 0.51 | 94 | 908 | 454 |
| 100-year, 6-hour | 1.6 | 63 | 390 | 195 |
| 100-year, 6-hour | 1.6 | 80 | 566 | 283 |
| 100-year, 6-hour | 1.6 | 94 | 696 | 348 |

# APPENDIX J

# BIBLIOGRAPHY

of

MATERIAL RELATED TO

THE RATIONAL APPROACH

to

RESIDENTIAL CANAL DESIGN

and

CONSTRUCTION

# INDEX BY SECTION

# BIBLIOGRAPHY OF MATERIAL RELATED TO THE RATIONAL APPROACH TO RESIDENTIAL CANAL DESIGN AND CONSTRUCTION

This bibliography is separated into 14 general areas of investigation. The rational approach to residential canal design is, of necessity, a multidisciplinary approach, based on information developed in many specialty areas. The bibliographic subjects are keyed accordingly so that those involved in a specialty area may more readily direct their attention to the appropriate reports. There is obvious cross-over between areas just as there is in the rational approach to residential canal design.

With the exception of 2 or 3 reports, for which abstracts are on file, all references listed in this bibliography were selected from, and are available in, the Snyder Oceanography Services private library.

## CONTENTS

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# APPENDIX K

# WATER QUALITY

and

SEDIMENTOLOGICAL INDICATORS

of

FLUSHING EFFICIENCY

in

SOME DREDGED CANALS

of

SOUTH FLORIDA

# WATER QUALITY AND SEDIMENTOLOGICAL INDICATORS OF FLUSHING EFFICIENCY IN SOME DREDGED CANALS OF SOUTH FLORIDA.

BY

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University of Florida

Sponsored by Florida Sea Grant and performed in conjunction with the Hydraulics Laboratory of the Department of Civil Engineering as a part of Project 04-6-158-44, "Hydrodynamic Factors Involved in Finger Canal and Borrow Lake Flushing in Florida's Coastal Zone."

February, 1978

## I. INTRODUCTION

The work reported here is from a sub-project within the larger Sea-Grant project entitled "Hydrodynamic Factors Involved in Finger Canal and Borrow Lake Flushing in Florida's Coastal Zone." The object of the overall project, (Morris and Christensen, 1976, p.1) " . . . is to develop a rational, objective procedure for the design and evaluation of finger canal systems and borrow lakes. The basic criteria for such a design should take into account the existing environmental conditions in the vicinity of the site and should insure that the development of the canal, or the existence of a borrow, is an improvement on the environment as a whole (or at very least maintains the status quo)."

It is the intent of this subproject to develop information concerning the latter part of these objectives, specifically the environmental and geologic conditions at the canal sites, particularly with regard to water quality in the canals and their potential effect on the shallow aquifer system, if any. The source and character of the fine grained sediments that tend to accumulate in canals during and after dredging is also being investigated.

Using geographic priorites established by the overall project, data and samples were collected during 1976 and 1977 in the following canal systems of South Florida:

1) 57 Acres canal system near Jupiter, Palm Beach Co.
2) Loxahatchee River canals west of Tequesta, Martin Co.
3) Punta Gorda Isles, Charlotte Co.
4) Port Charlotte Isles, Charlotte Co.

In each canal system, vertical profiles of dissolved oxygen, salinity, and temperature versus depth were made, with additional measurements of pH, water color, and turbidity at selected stations. The nature of the canal walls was examined in pits dug at numerous points, and samples of the natural sediment, the spoil, and bottom sediments were collected at many sites. Comparative samples were taken in the nearby natural waterways and in upland areas tributary to the canals. Large water samples (10 gallon) were collected at a number of stations and filtered to concentrate the suspensate for identification of particle types and sources.

## II. RESULTS FOR SPECIFIC CANALS

### A. Salinity, Temperature, Turbidity and Dissolved Oxygen in Canals and Adjacent Open Water Bodies (Data are listed in Table 1).

1. 57 Acres Canal System

(a) Salinity and temperature were measured in situ with a Beckman RS5 Induction Salinometer calibrated against a coil of known resistance and a mercury thermometer. Turbidity was measured in situ with a Hydro-Products model 612-S Transmissometer calibrated against an air standard. Summer and winter series of measurements were made to provide insight into the movement of water masses in the canals and to observe seasonal differences. Water column stations are located on Figures 1 and 2. As it turned out, the salinity and temperature values and patterns of distribution were markedly different in the two seasons. Salinity and temperature profiles of individual stations are plotted in Fig. 3 to 35 and cross sections in Fig. 36 to 41.

(1) During the June 1976 sampling period, the Intracoastal Waterway (ICW) contained water with a salinity of 28.4 to 28.8 ‰ and temperature of 29.0 to 29.2°C (Station

57 ACRES CANAL SYSTEM
JUPITER, PALM BEACH COUNTY, FLA.

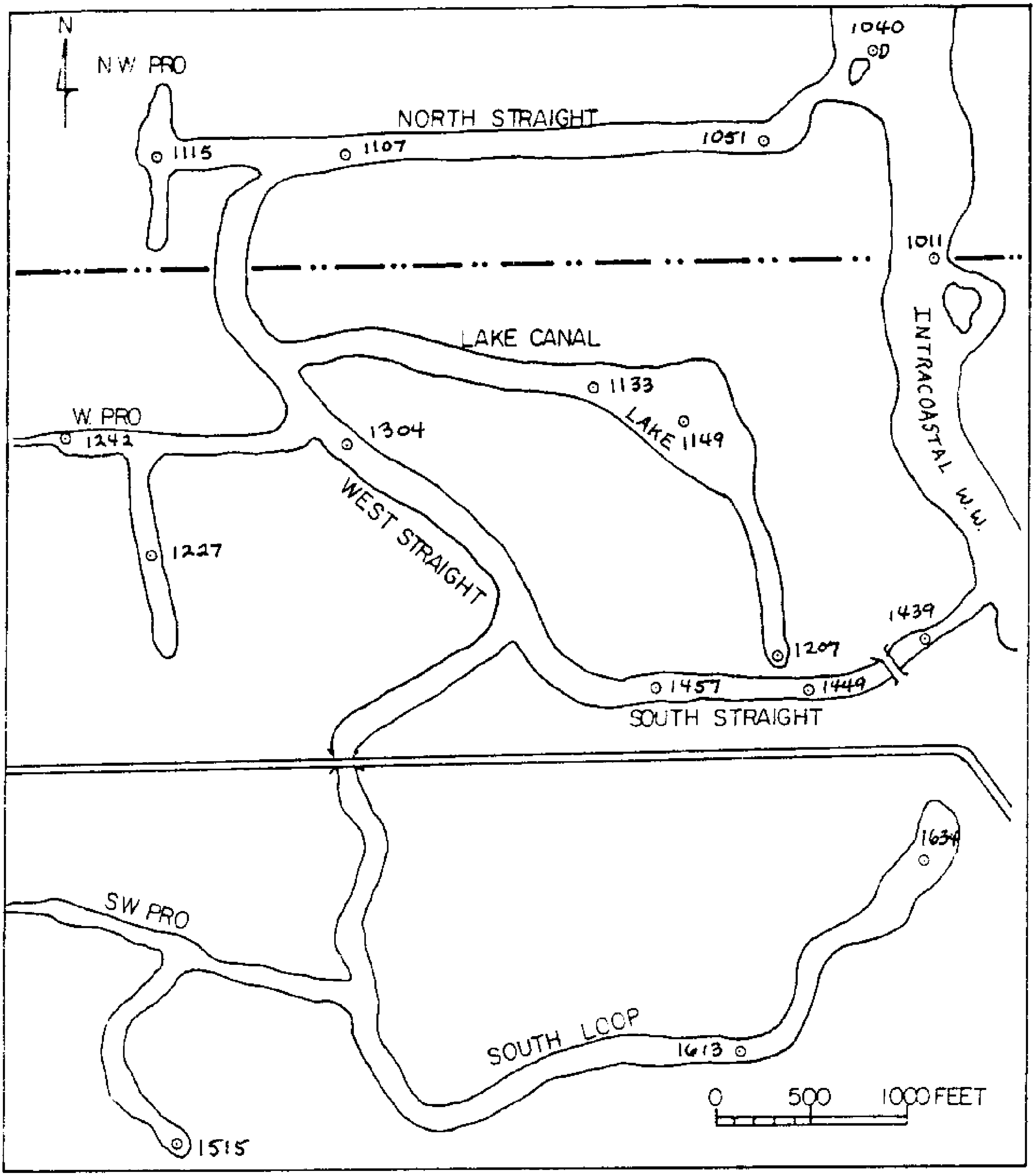



Figure 1. Location map and stations occupied on June 16, 1976. All station numbers should be preceeded by 061676-_____. Digits in figure indicate time of sampling.

57 ACRES CANAL SYSTEM
JUPITER, PALM BEACH COUNTY, FLA.

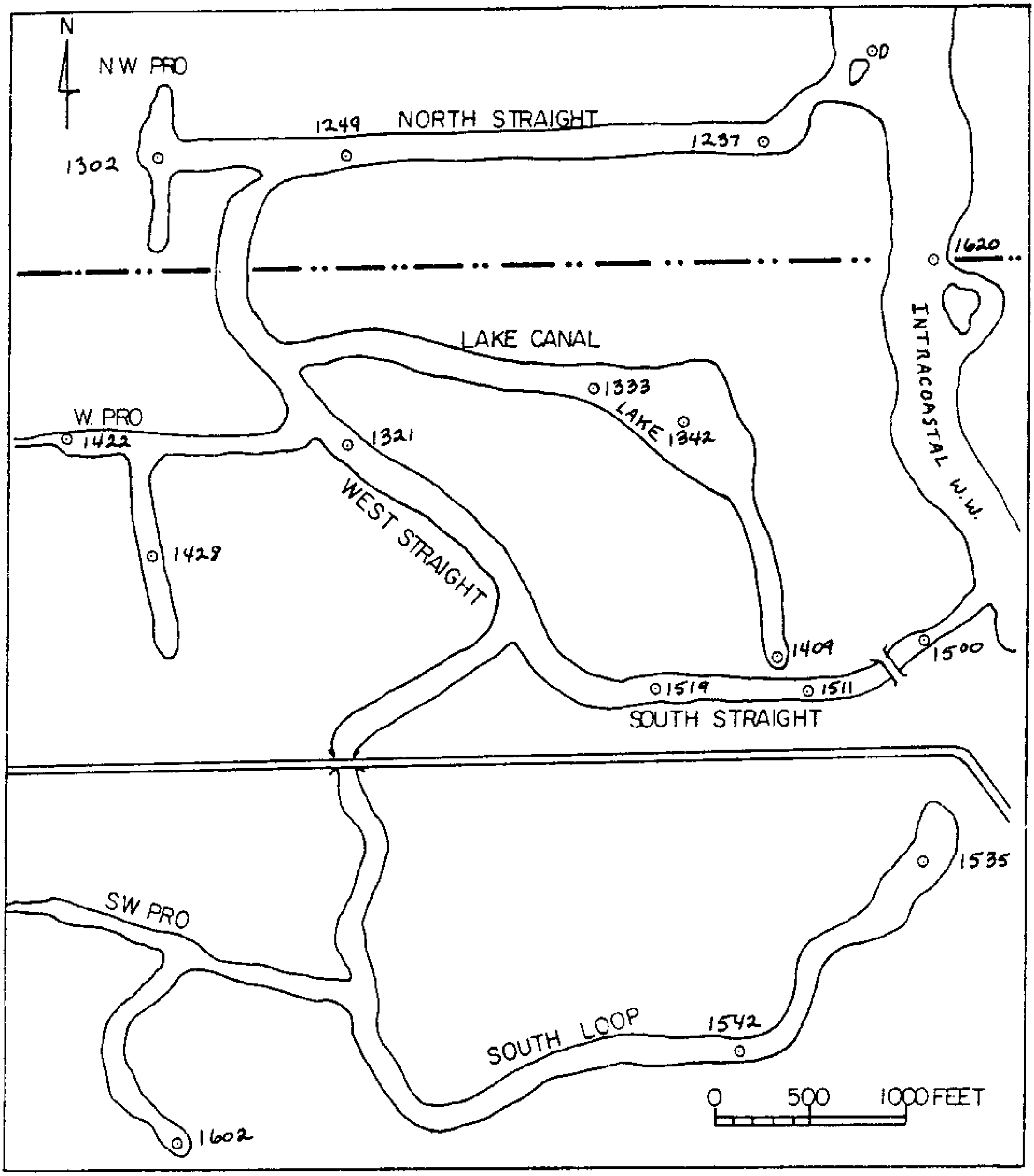



Figure 2. Location map and stations occupied on February 14, 1977. All station numbers should be preceeded by 021477-_____. Digits in figure indicate time of sampling.

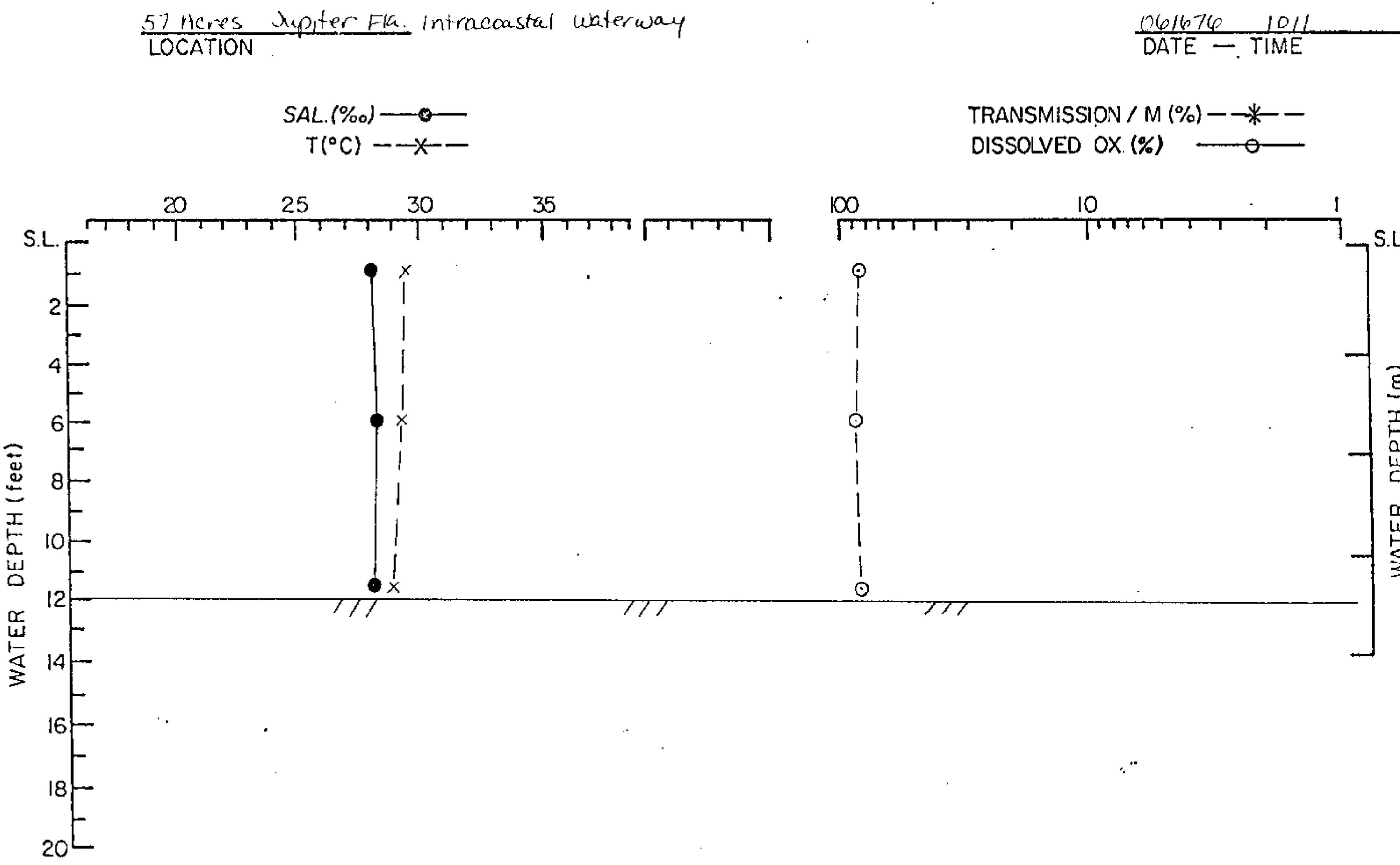



Figure 3. Salinity, temperature, oxygen saturation profile at Station 061676-1011.

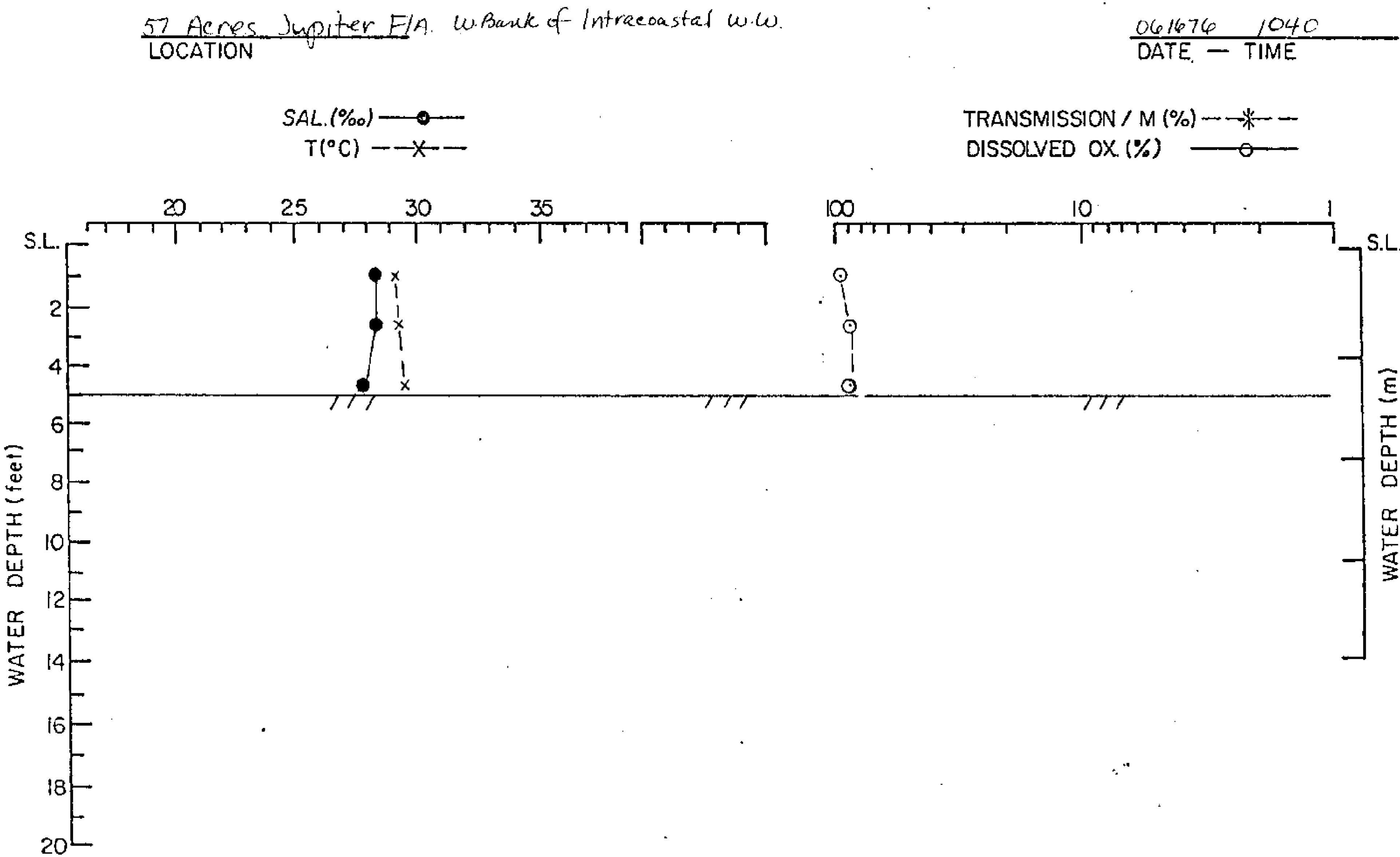



Figure 4. Salinity, temperature, oxygen saturation profile at Station 061676-1040.

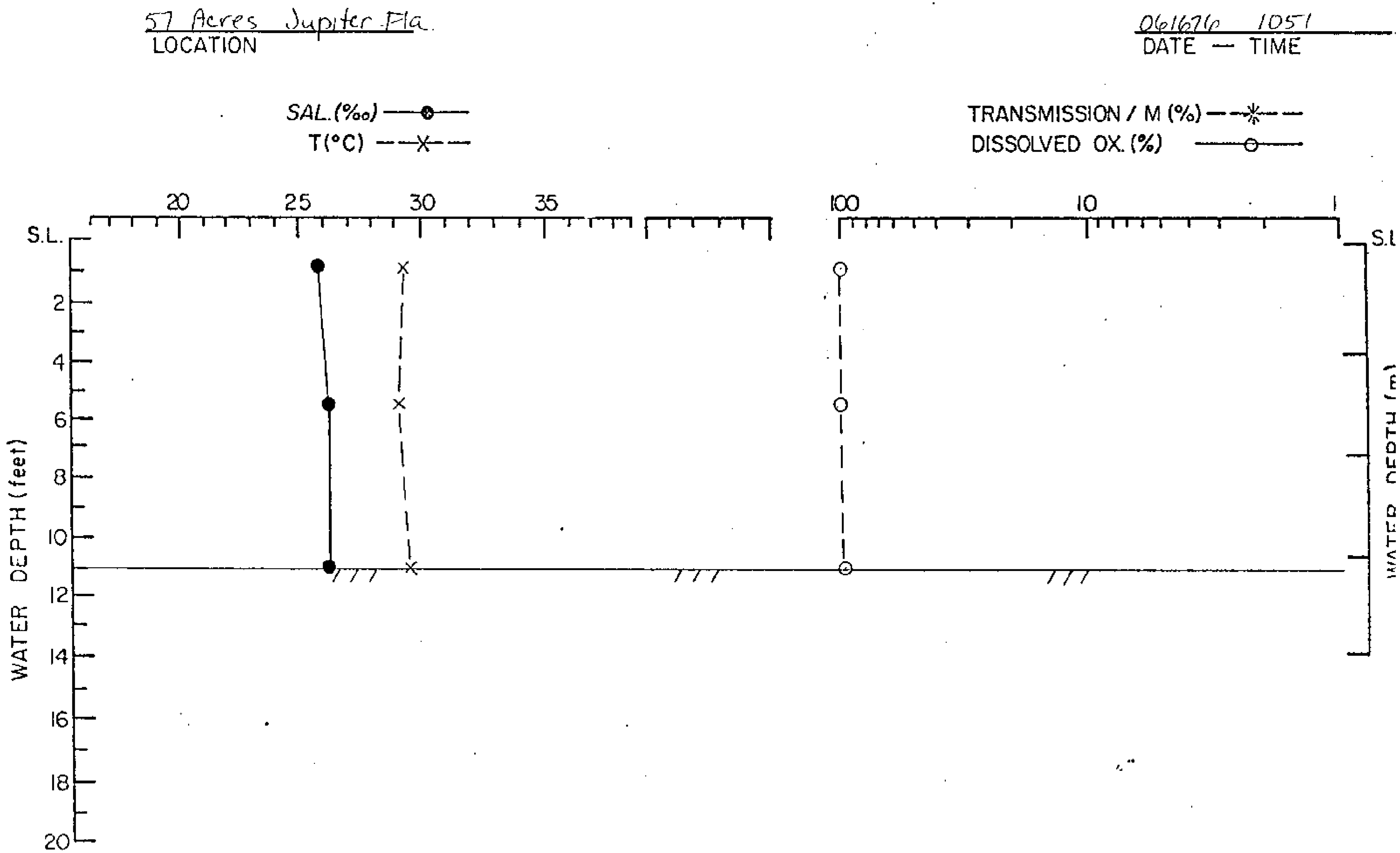



Figure 5. Salinity, temperature, oxygen saturation profile at Station 061676-1051.

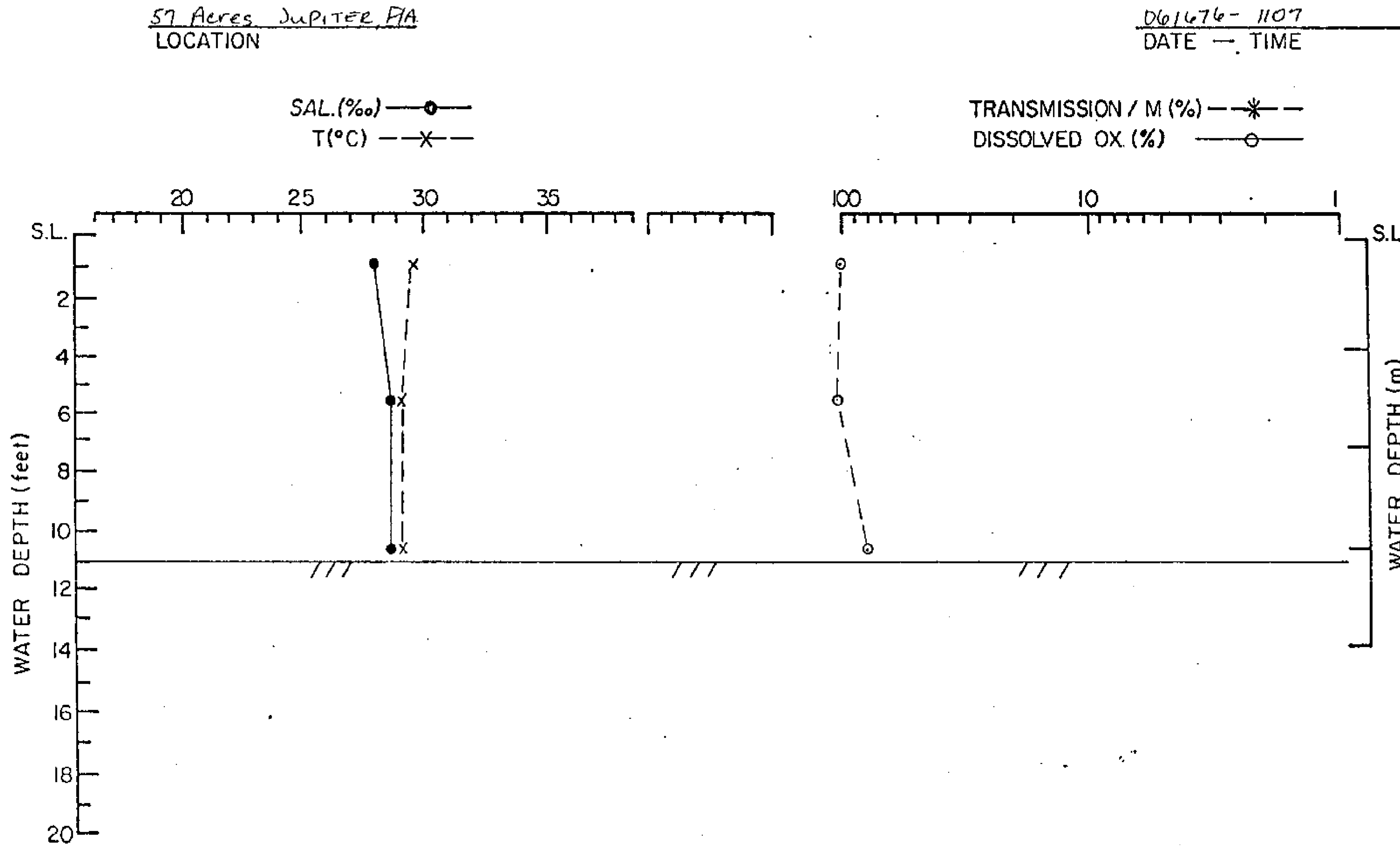



Figure 6. Salinity, temperature, oxygen saturation profile at Station 061676-1107.

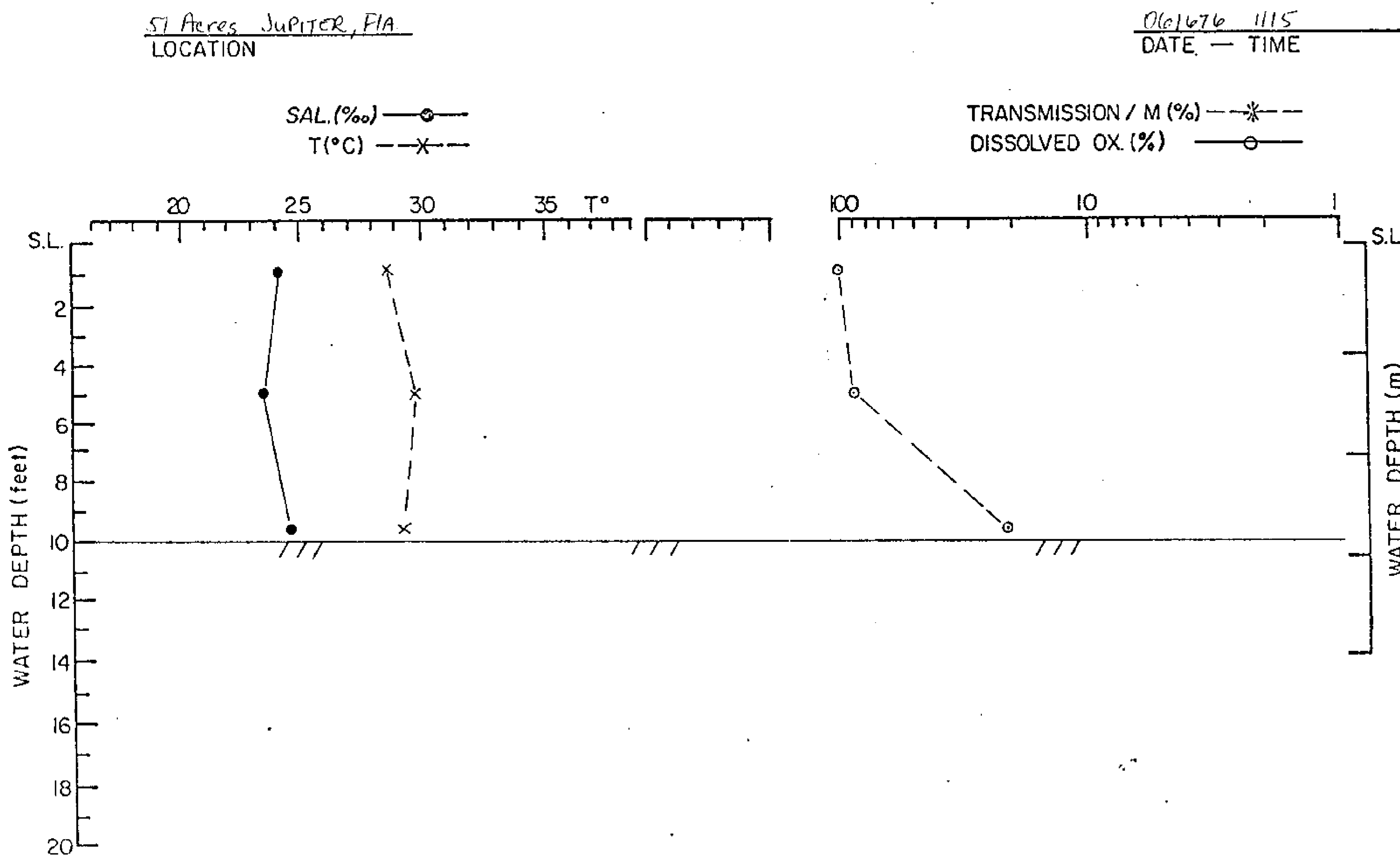



Figure 7. Salinity, temperature, oxygen saturation profile at Station 061676-1115.

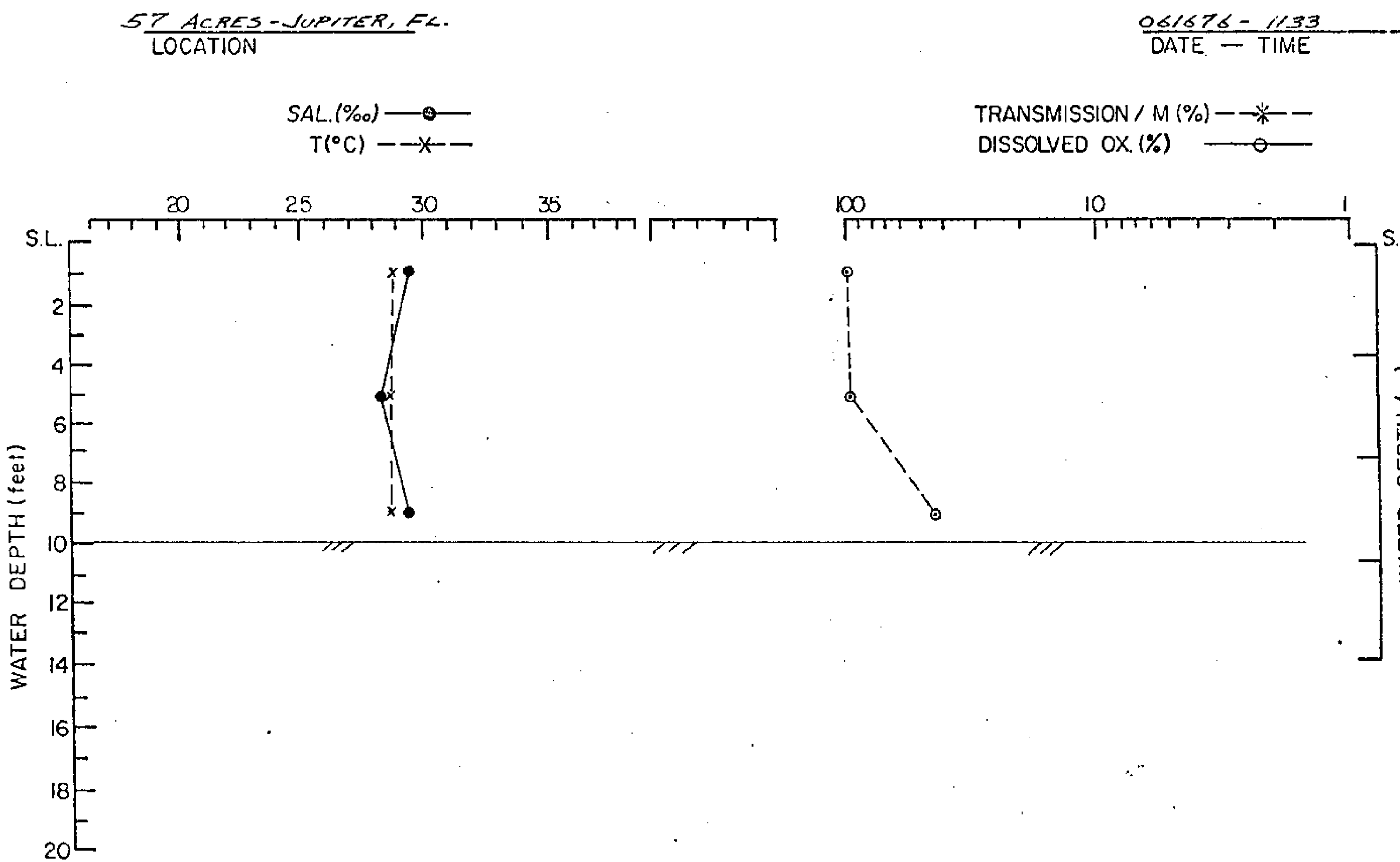



Figure 8. Salinity, temperature, oxygen saturation profile at Station 061676-1133.

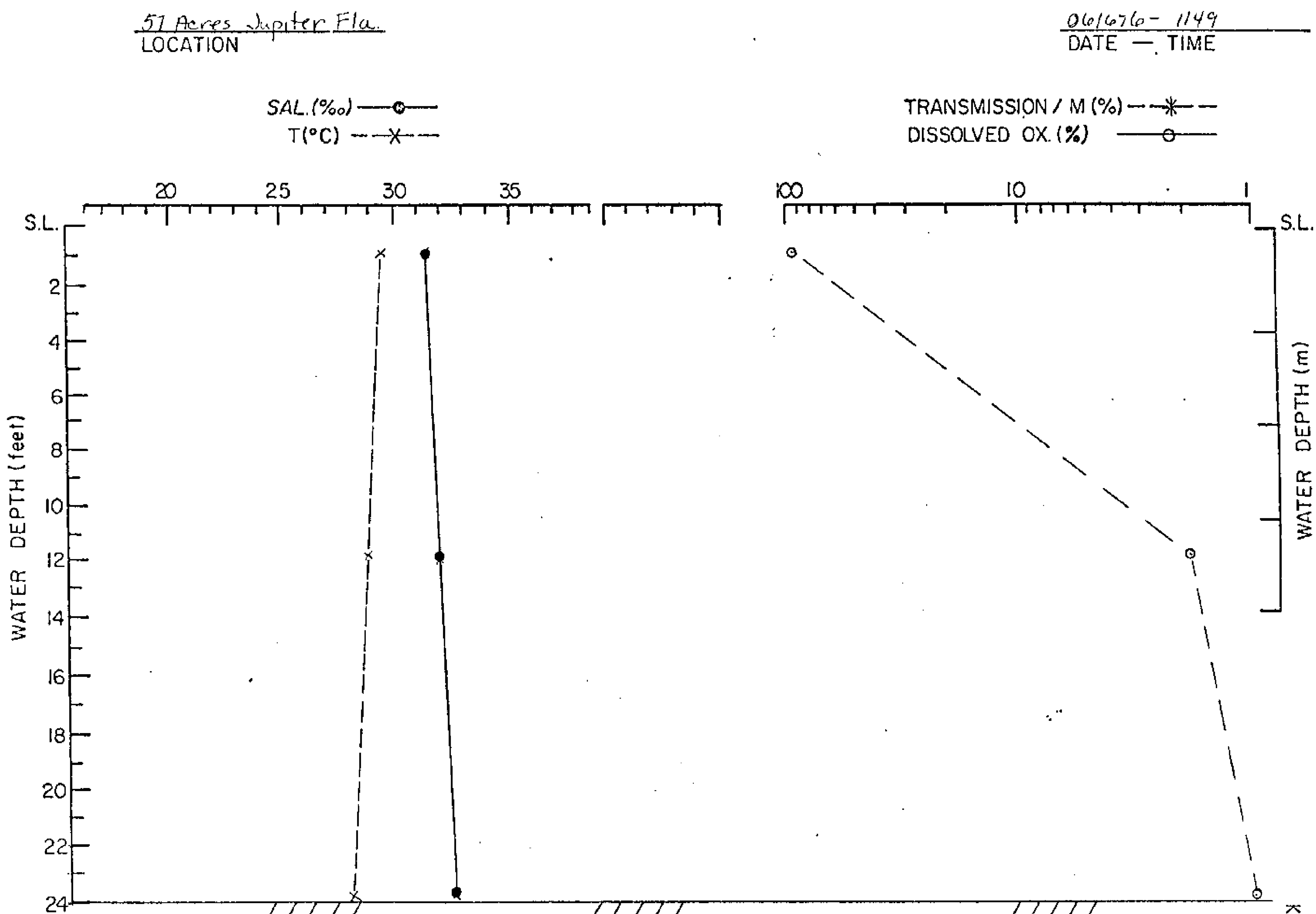



Figure 9. Salinity, temperature, oxygen saturation profile at Station 061676-1149.

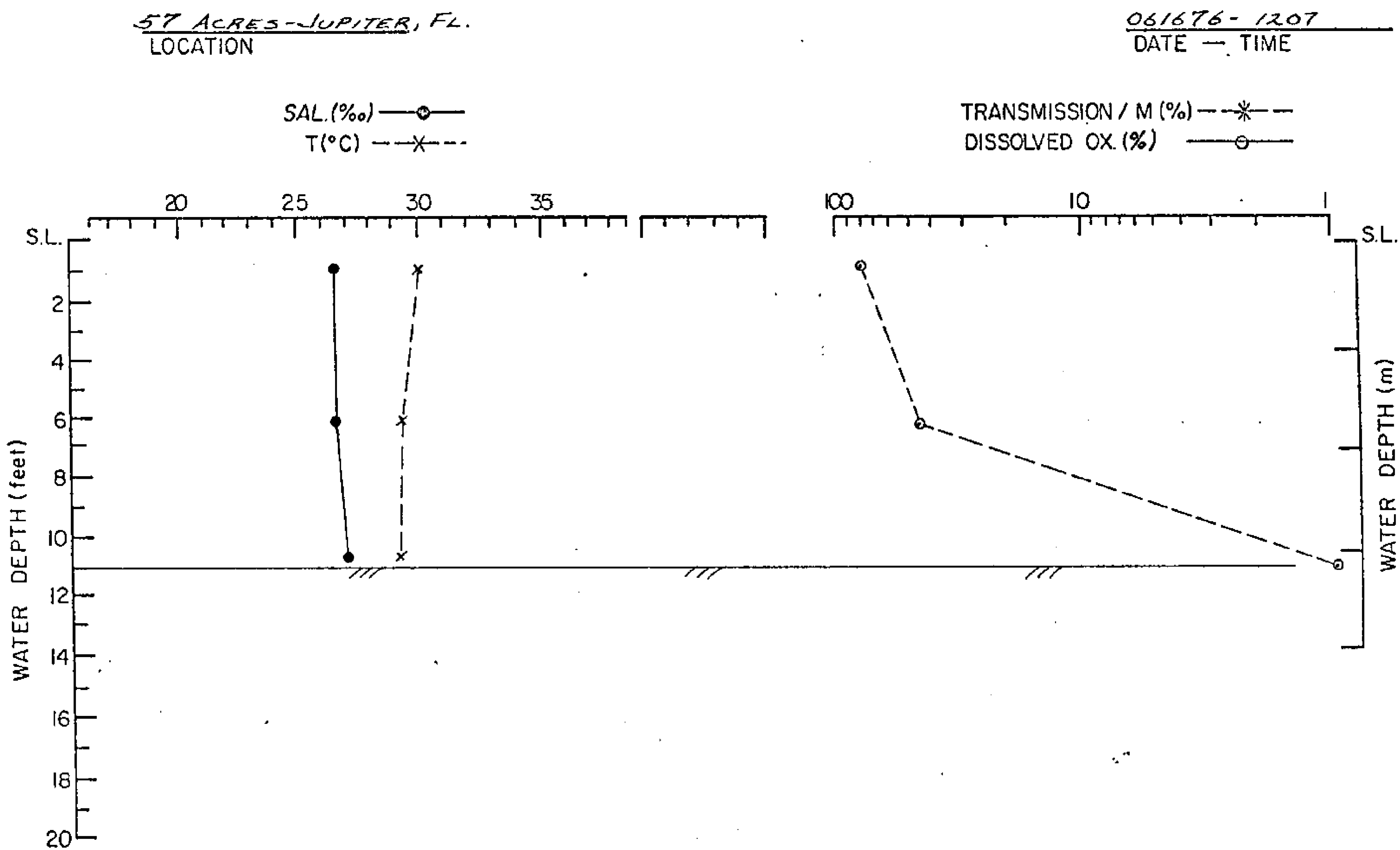



Figure 10. Salinity, temperature, oxygen saturation profile at Station 061676-1207.

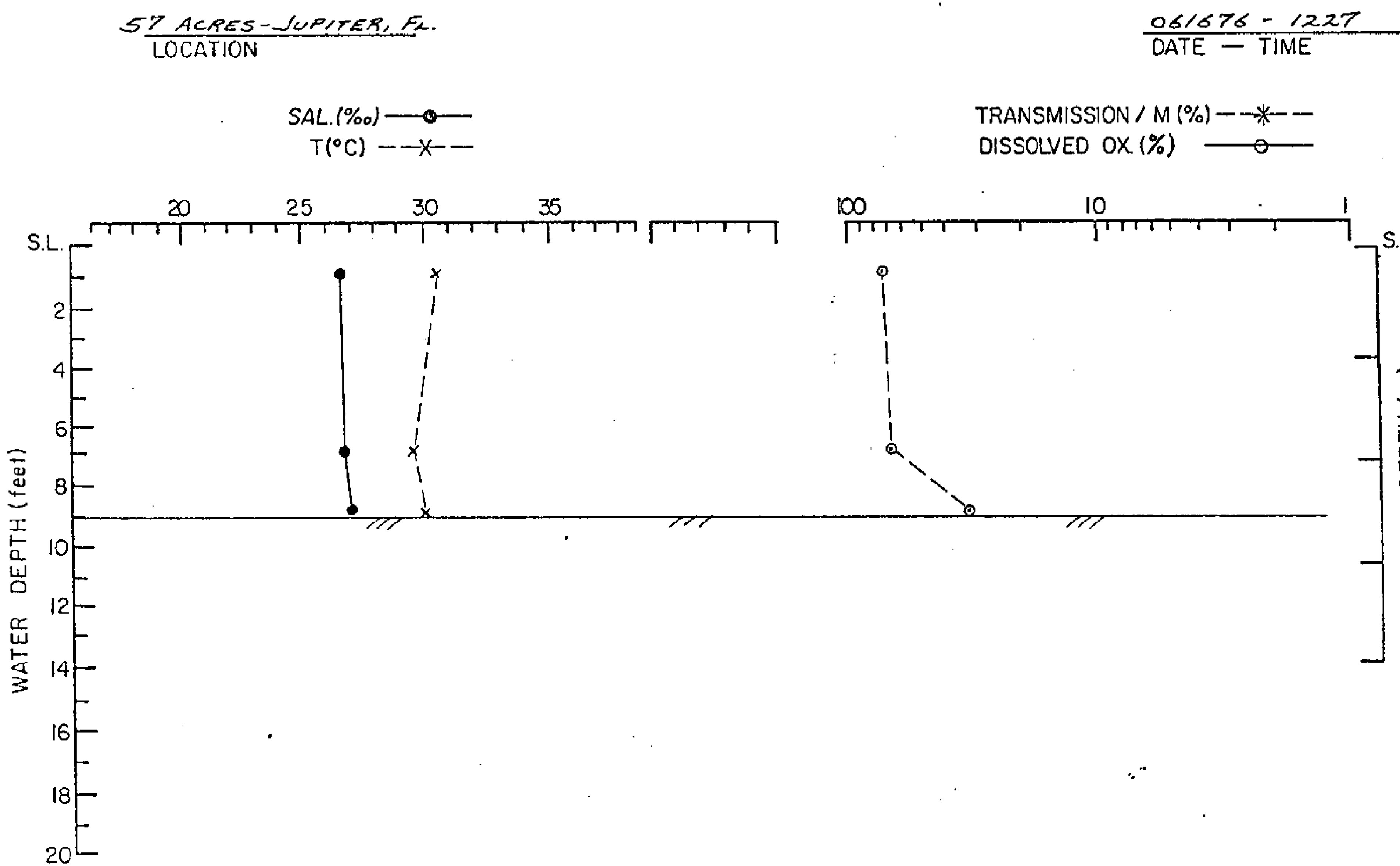



Figure 11. Salinity, temperature, oxygen saturation profile at Station 061676-1227.

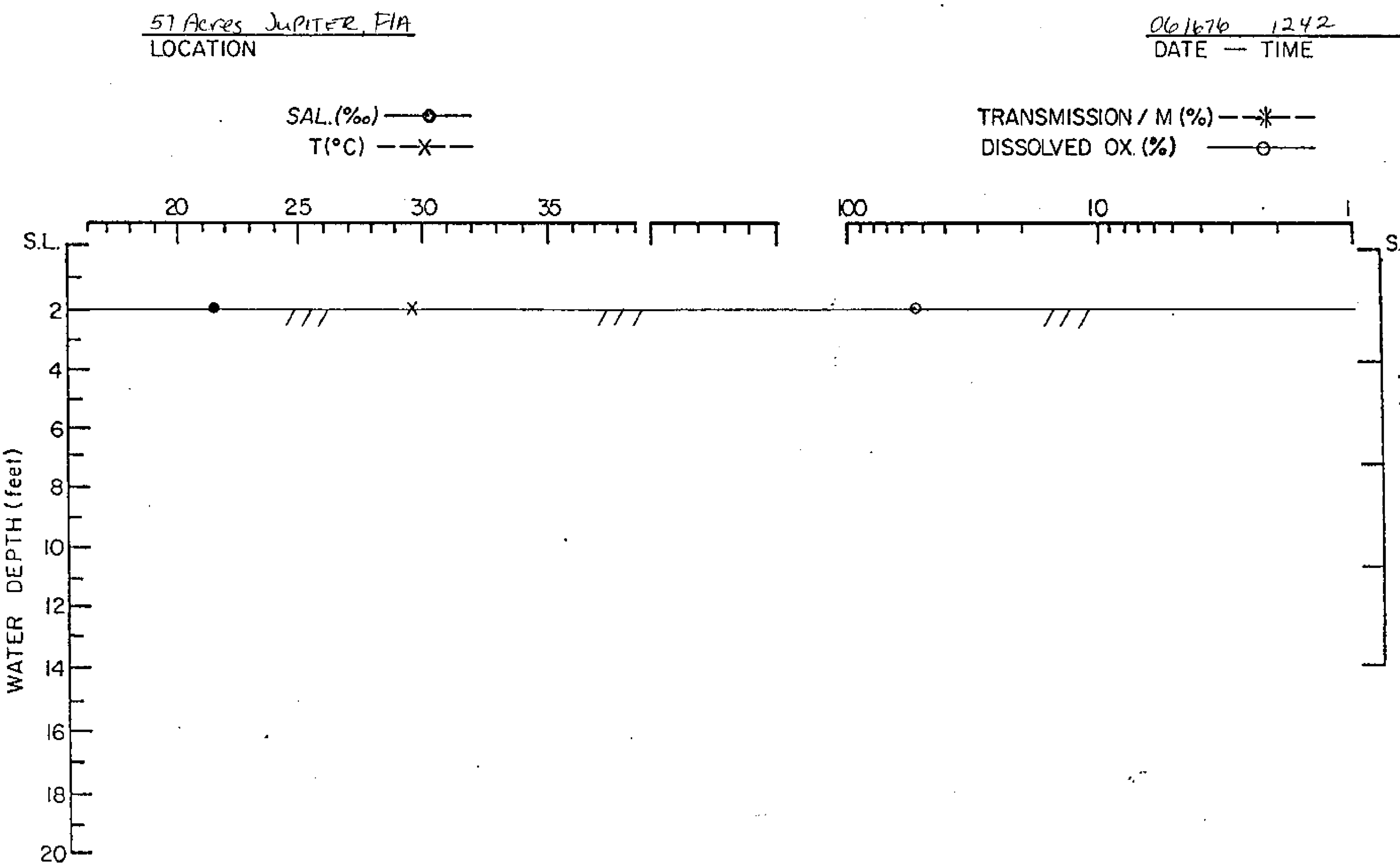



Figure 12. Salinity, temperature, oxygen saturation profile at Station 061676-1242.

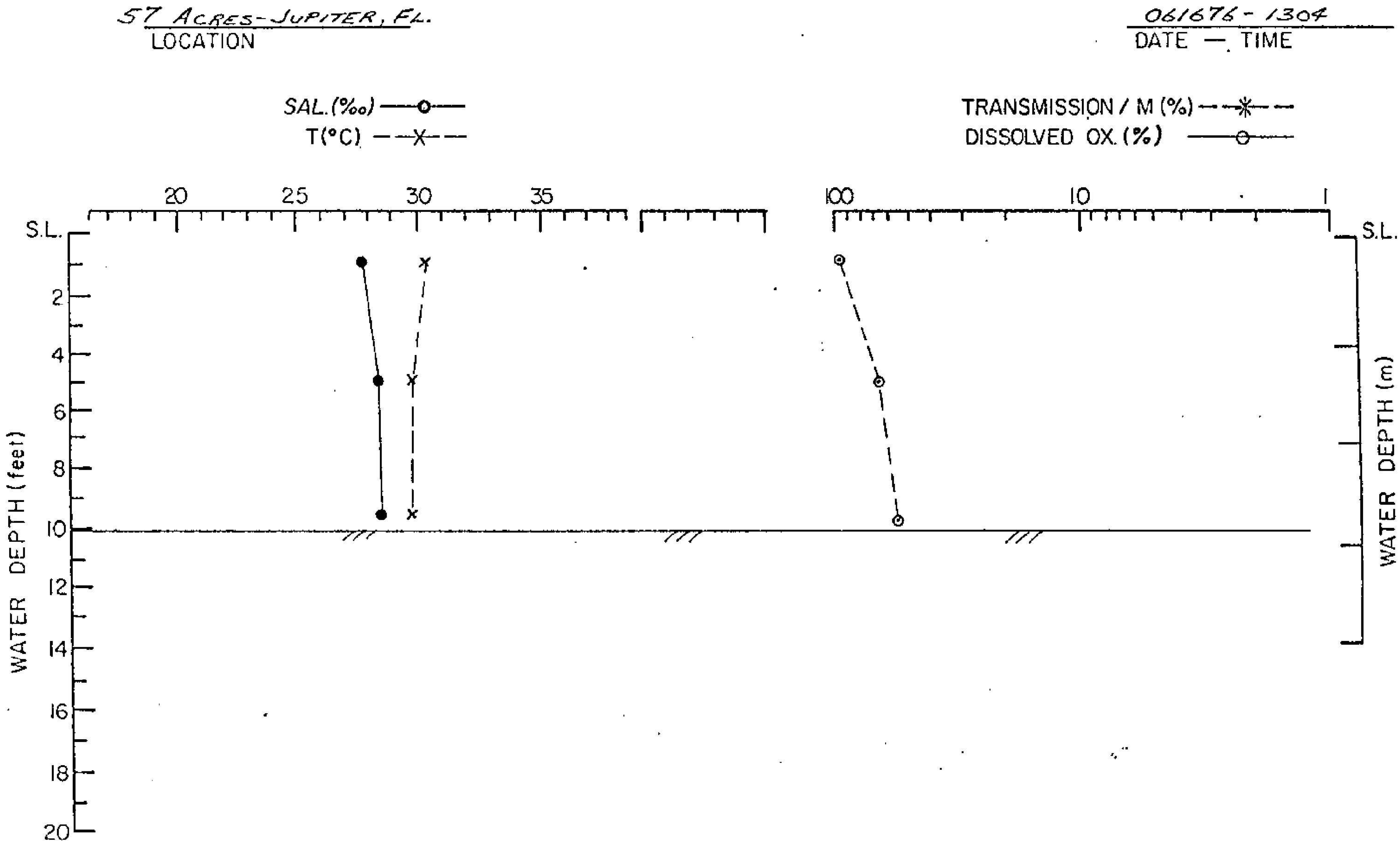



Figure 13. Salinity, temperature, oxygen saturation profile at Station 061676-1304.

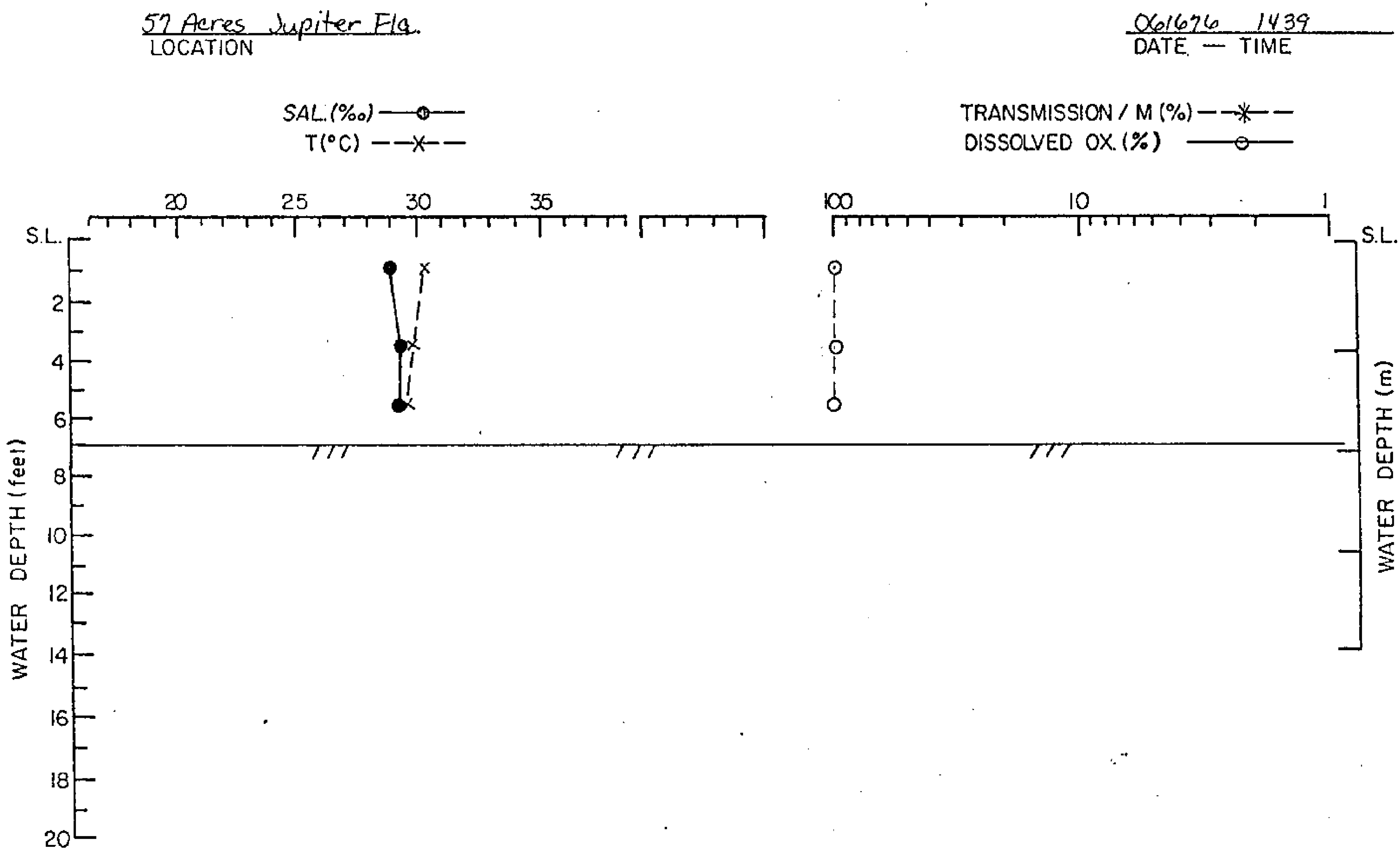



Figure 14. Salinity, temperature, oxygen saturation profile at Station 061676-1439.

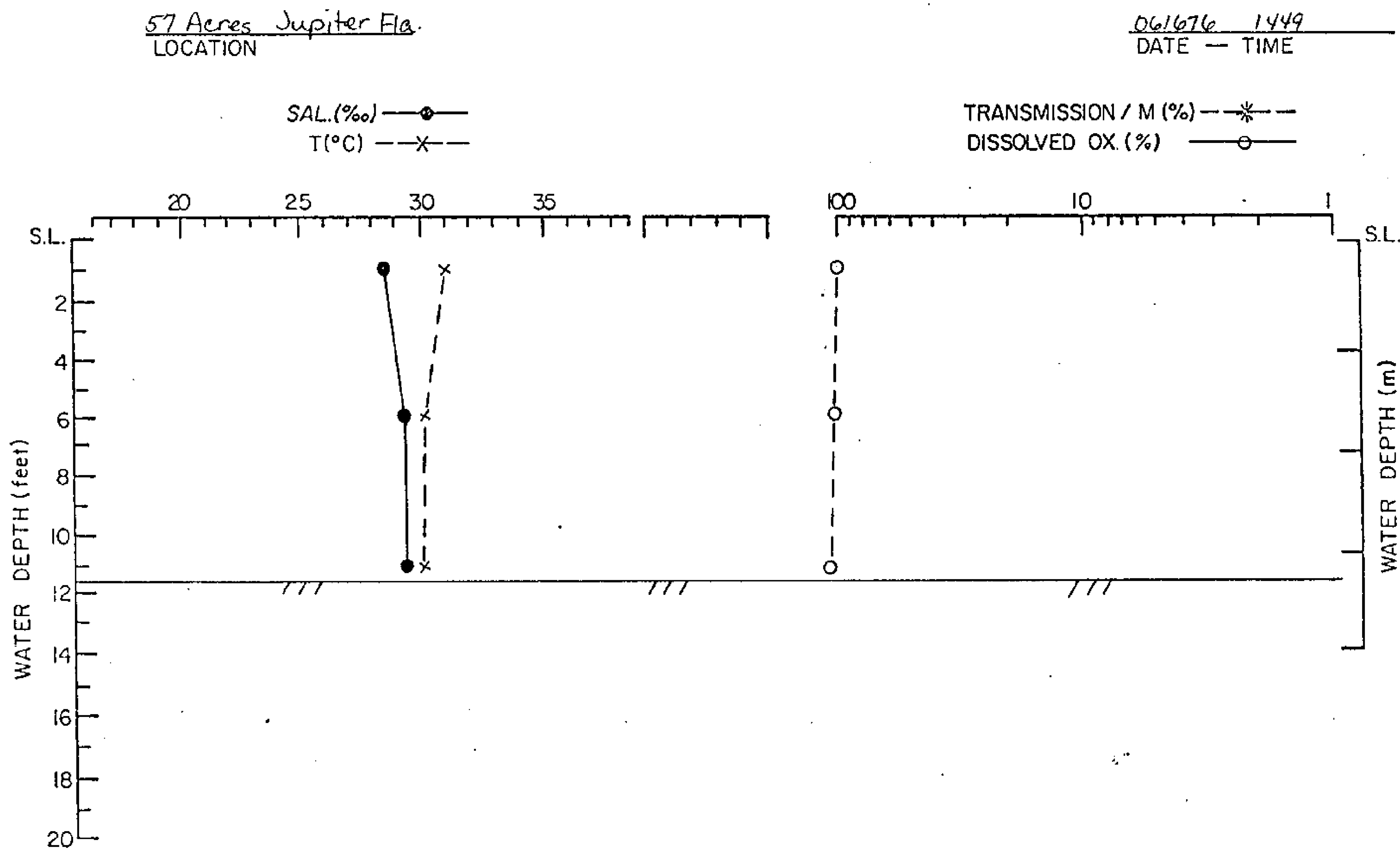



Figure 15. Salinity, temperature, oxygen saturation profile at Station 061676-1449.

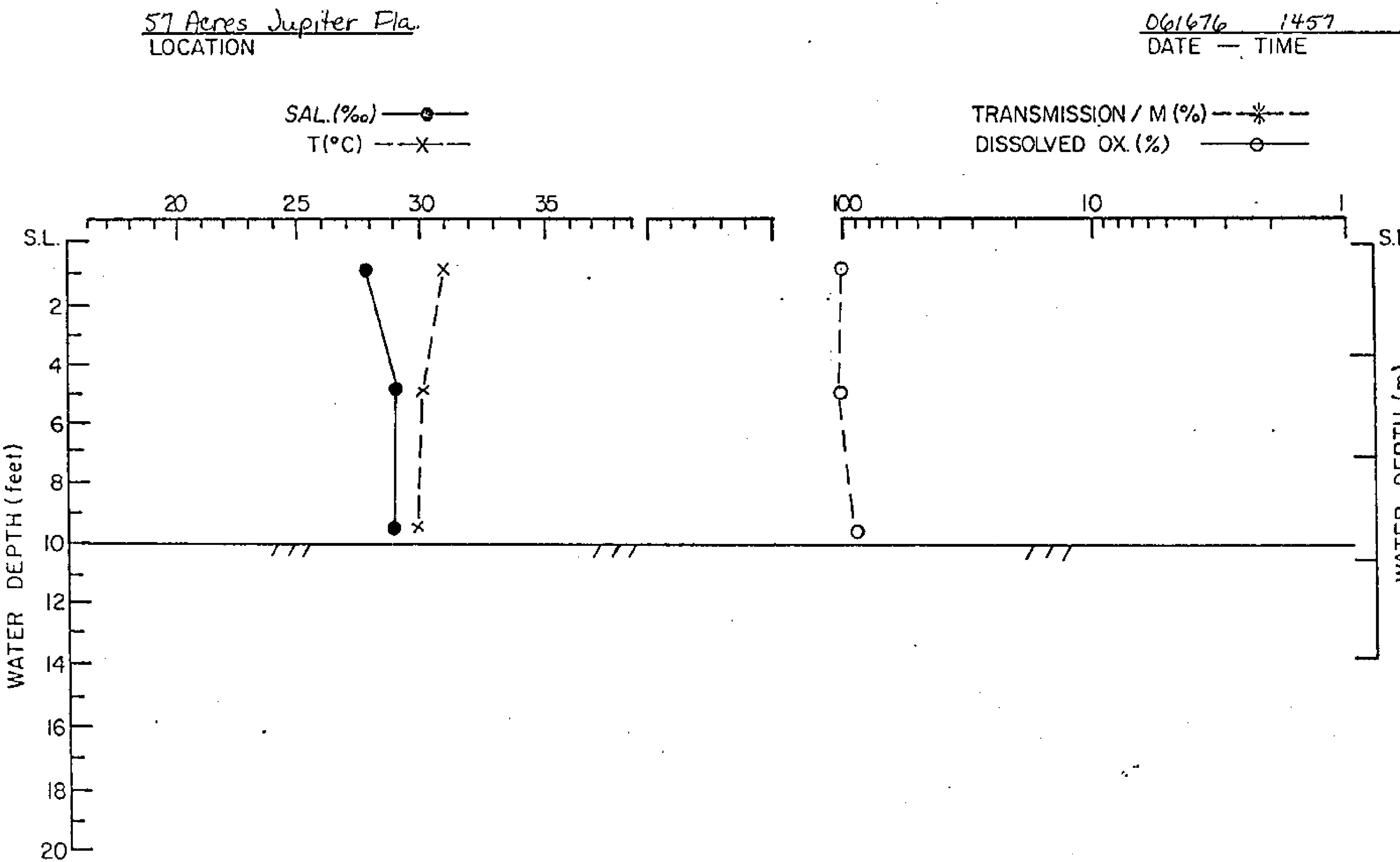



Figure 16. Salinity, temperature, oxygen saturation profile at Station 061676-1457.

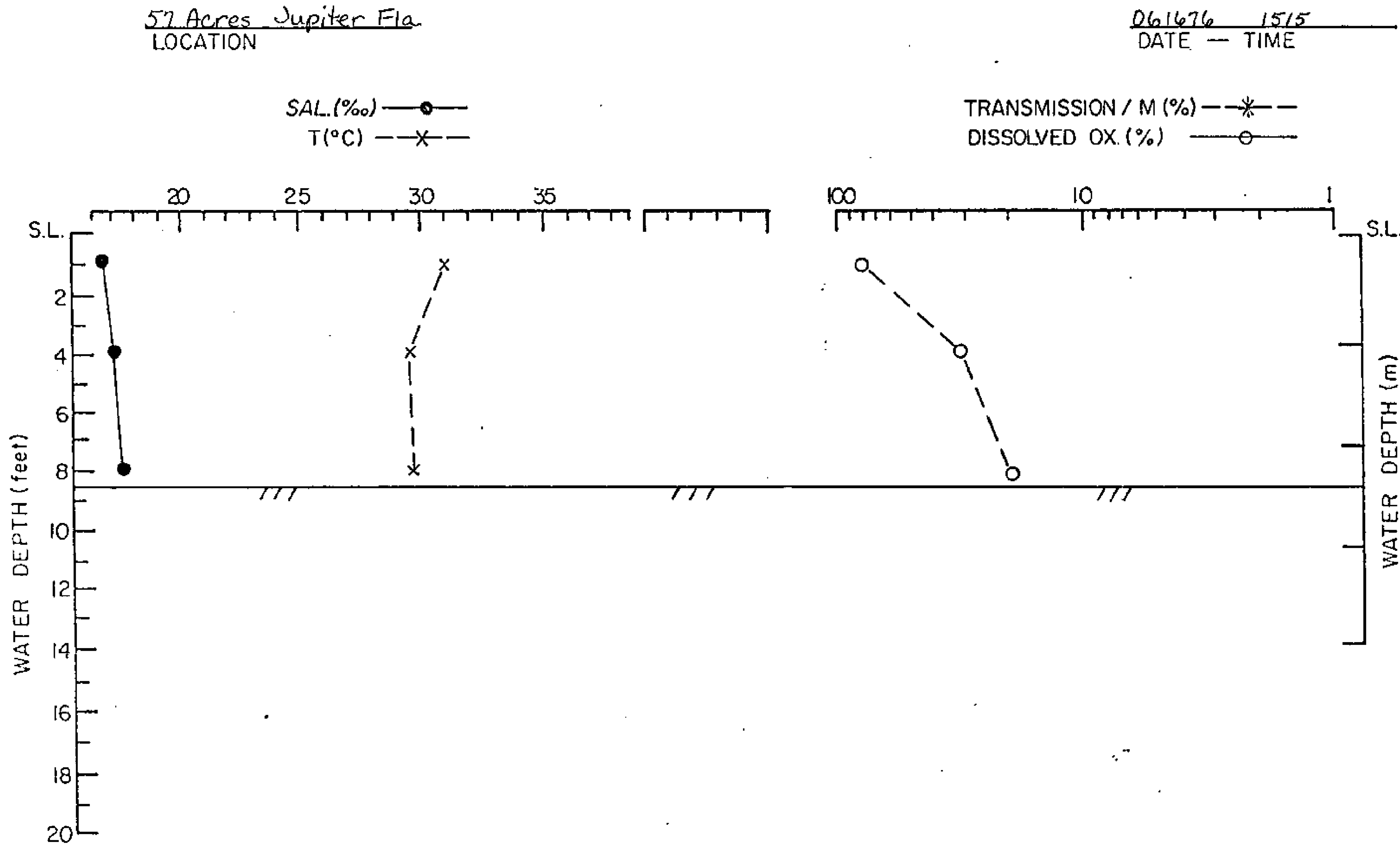



Figure 17. Salinity, temperature, oxygen saturation profile at Station 061676-1515.

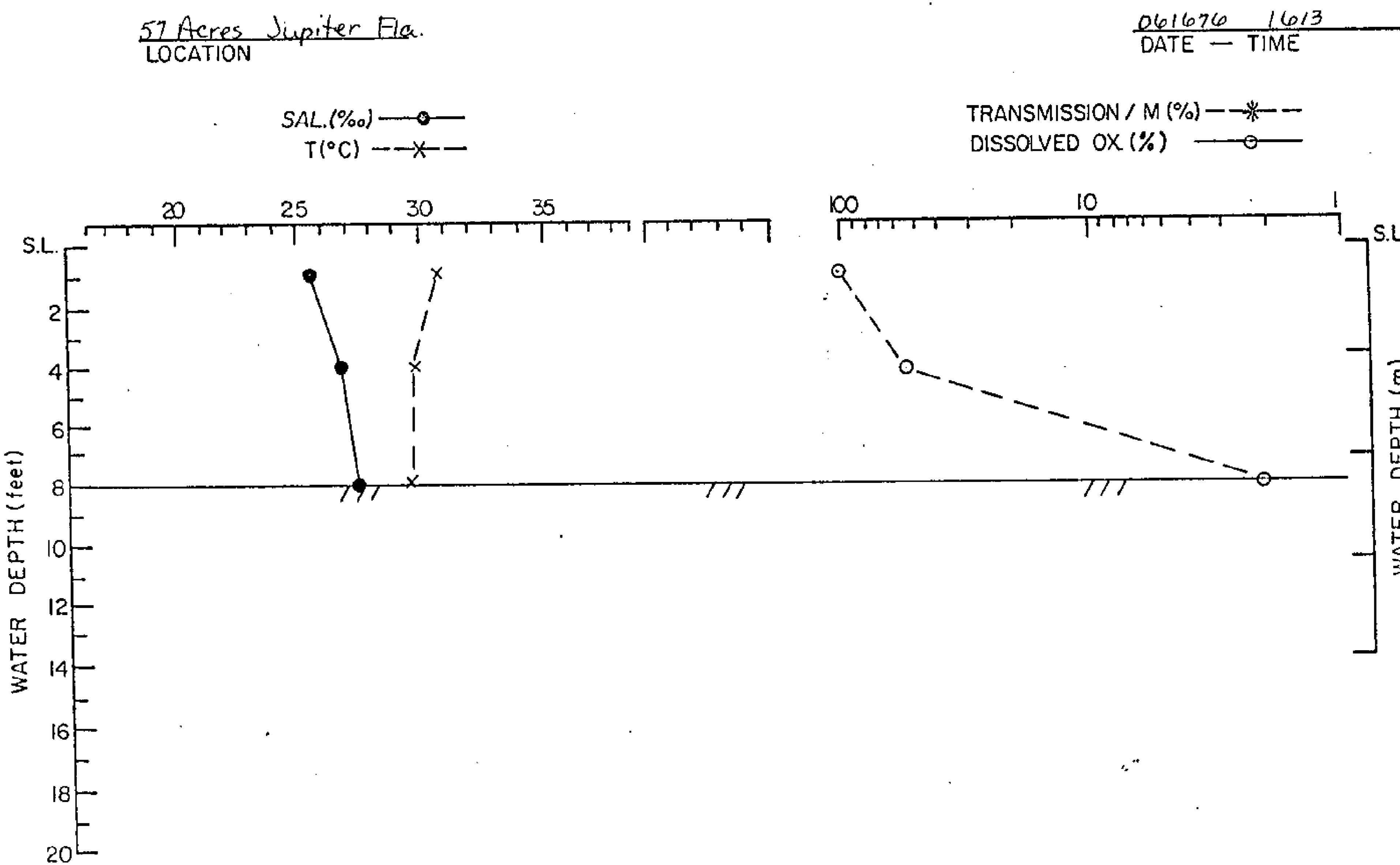



Figure 18. Salinity, temperature, oxygen saturation profile at Station 061676-1613.

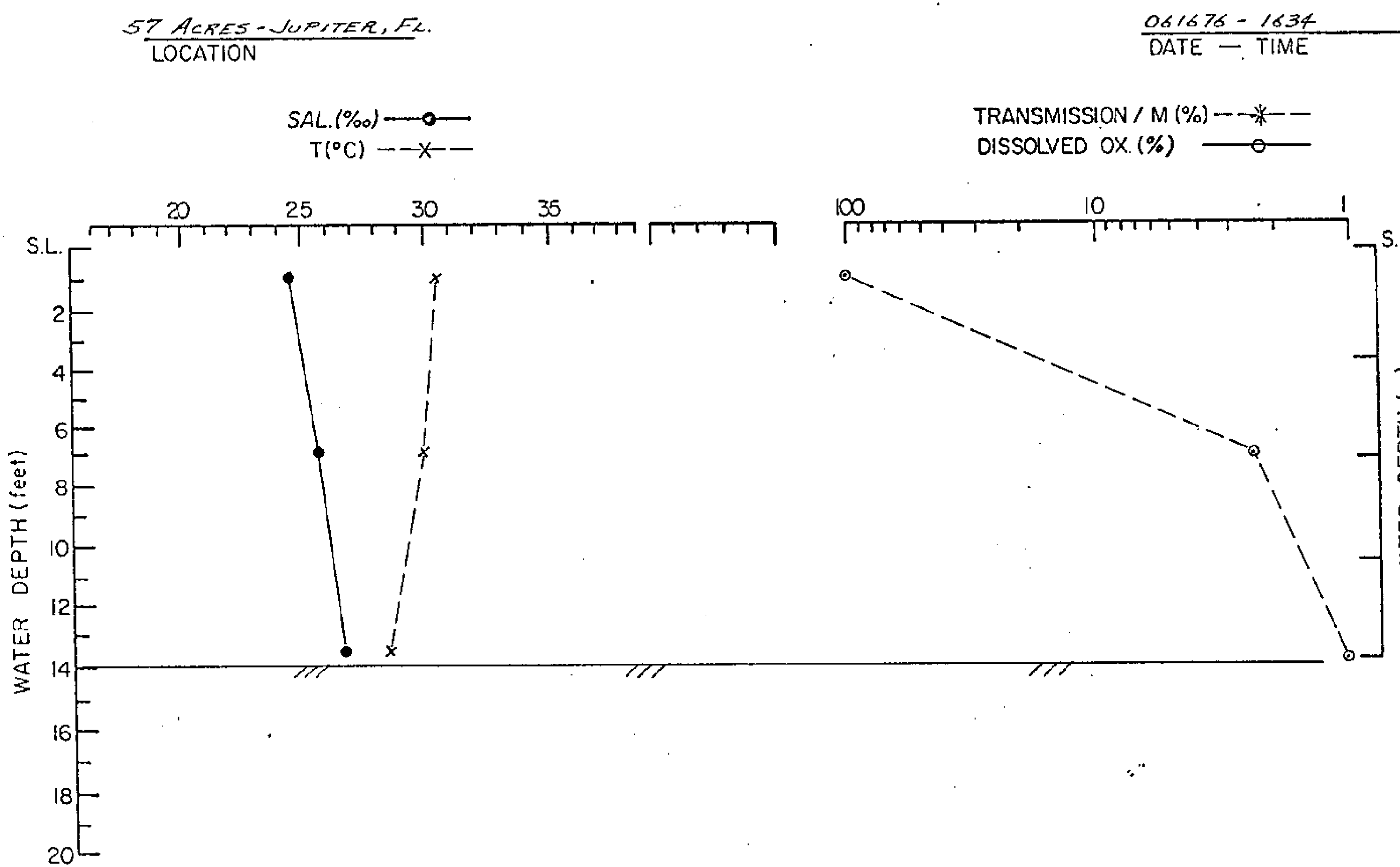



Figure 19. Salinity, temperature, oxygen saturation profile at Station 061676-1634.

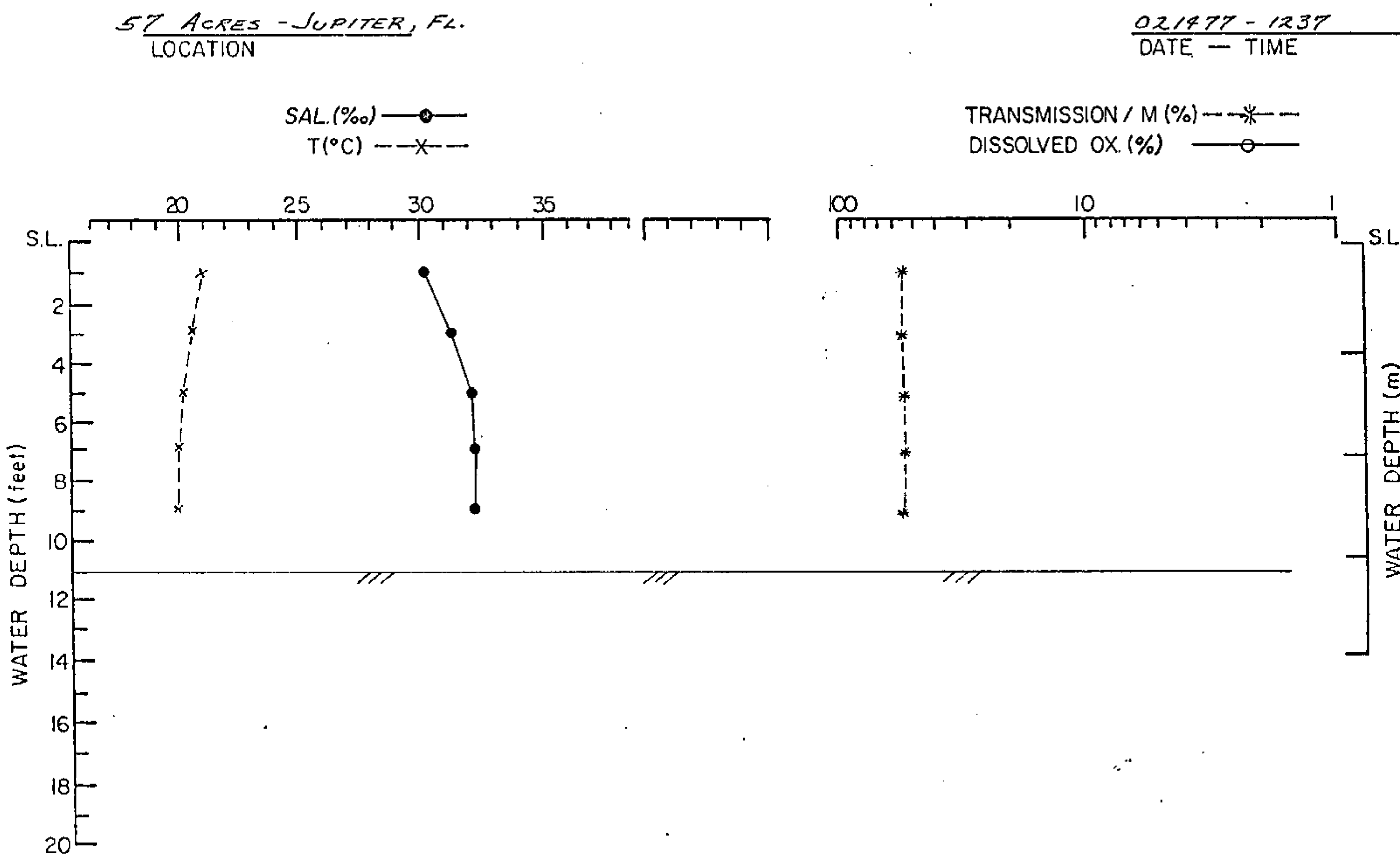



Figure 20. Salinity, temperature, and transmissivity profile at Station 021477-1237.

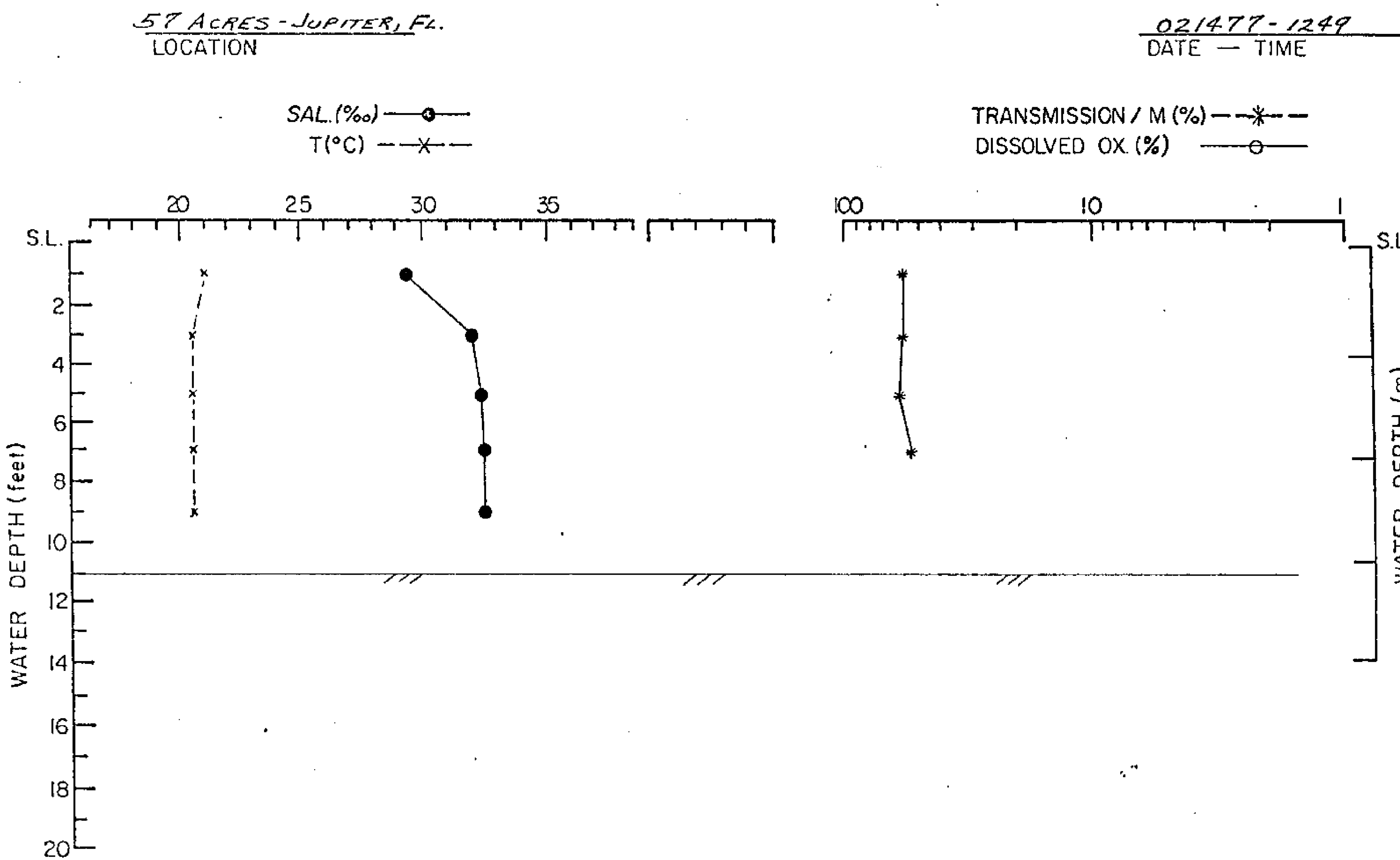



Figure 21. Salinity, temperature, and tramsmissivity profiles at Station 021477-1249.

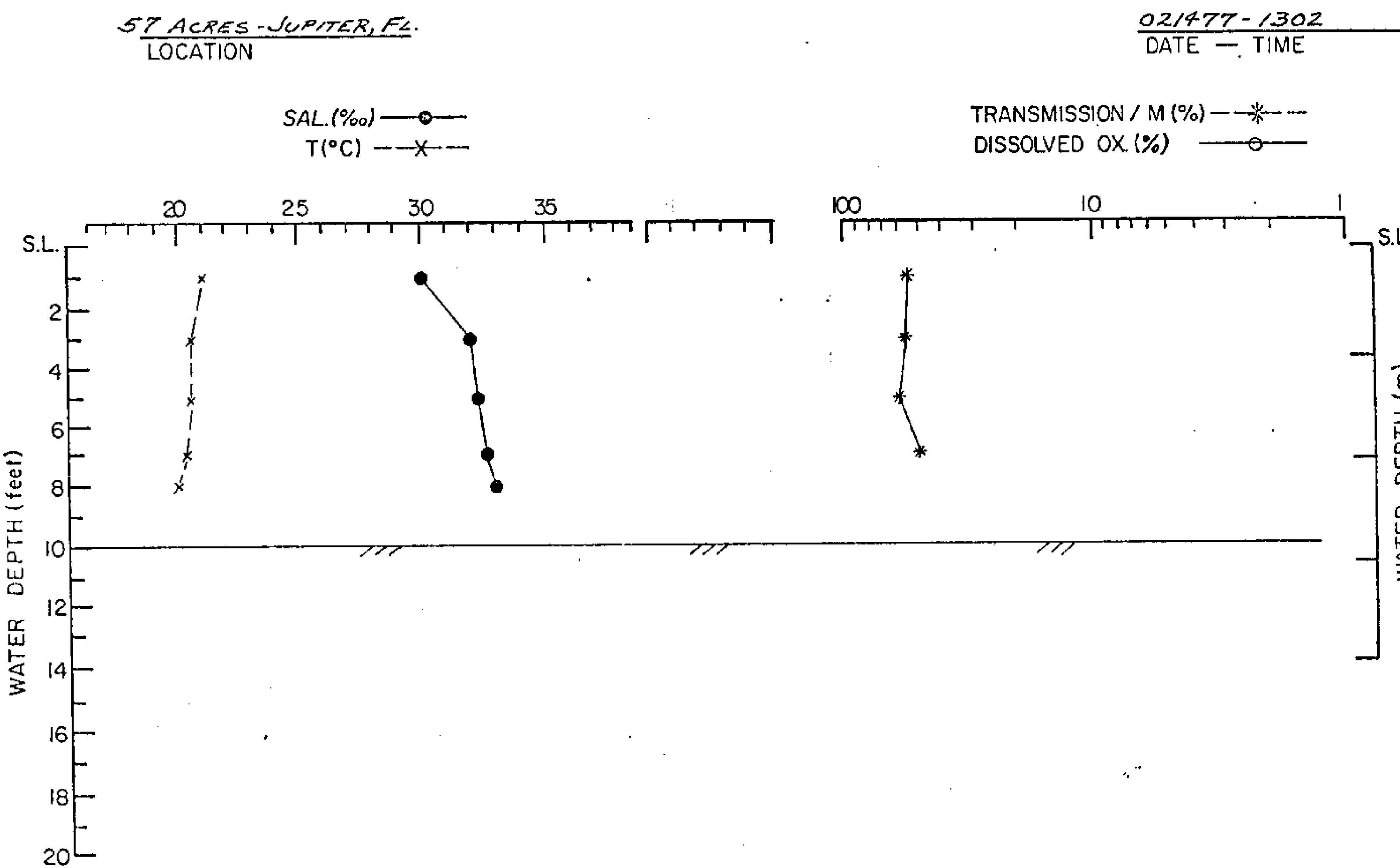



Figure 22. Salinity, temperature, and transmissivity profile at Station 021477-1302.

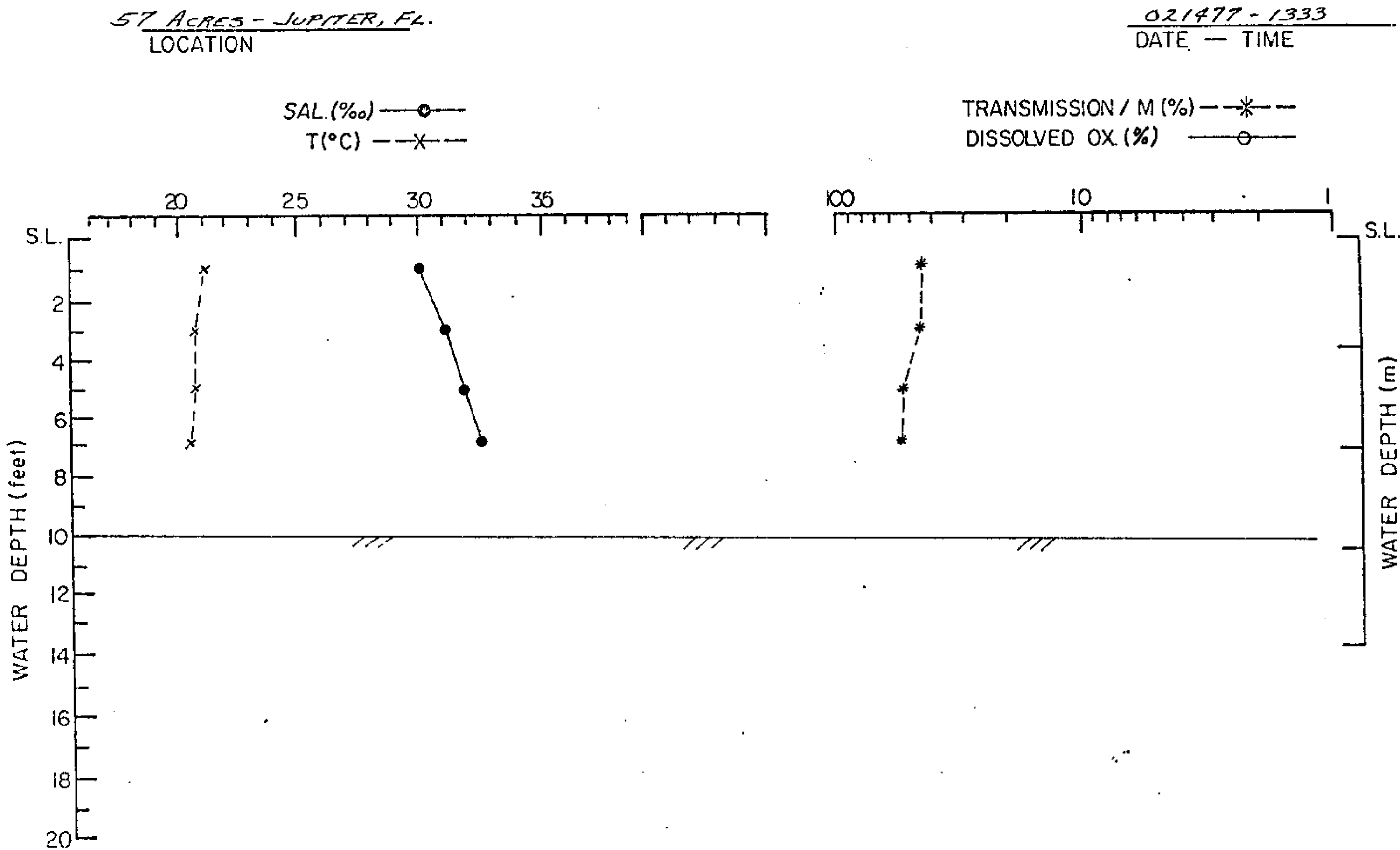



Figure 23. Salinity, temperature, and transmissivity profile at Station 021477-1333.

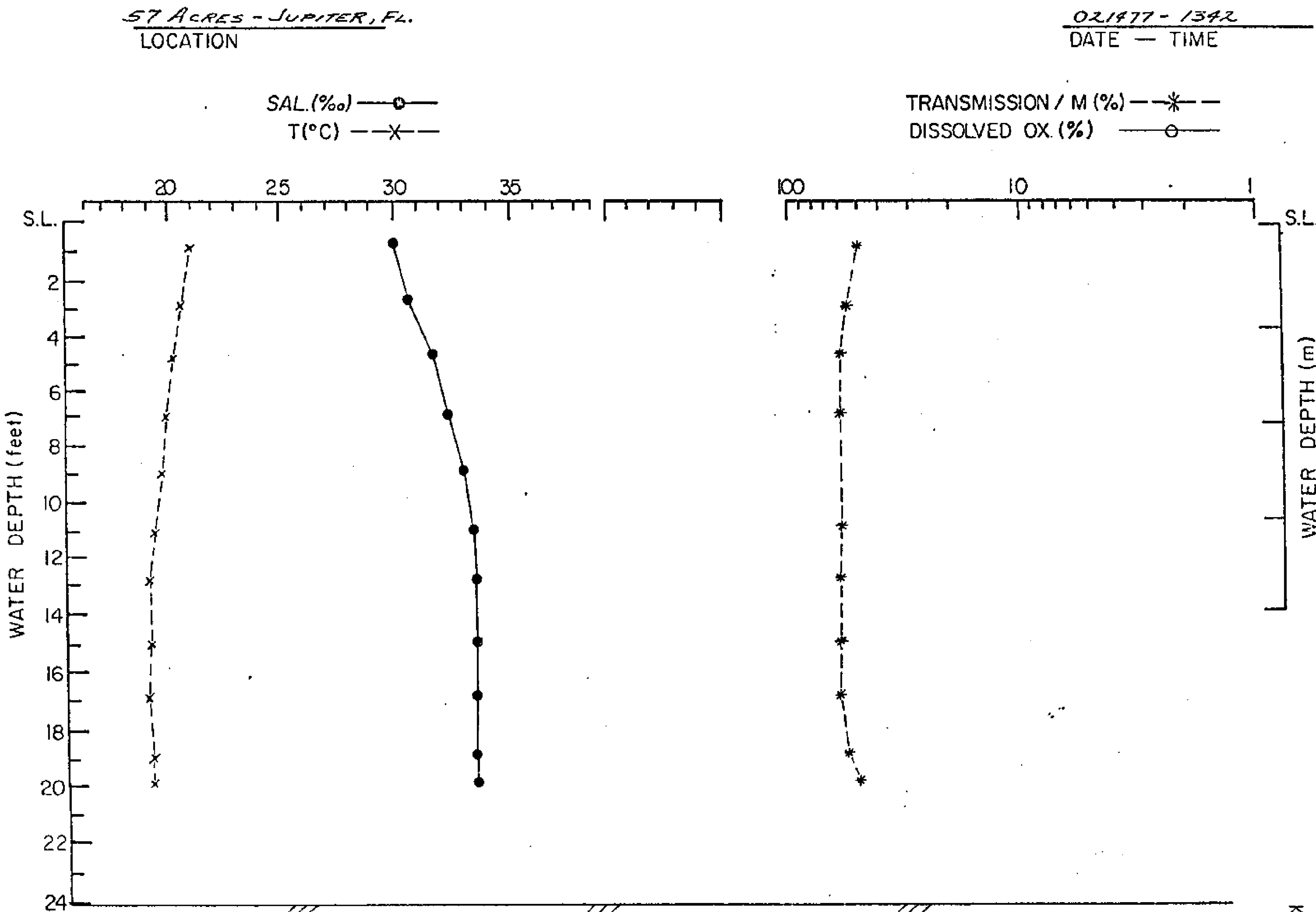



Figure 24. Salinity, temperature, and transmissivity profile at Station 021477-1342.

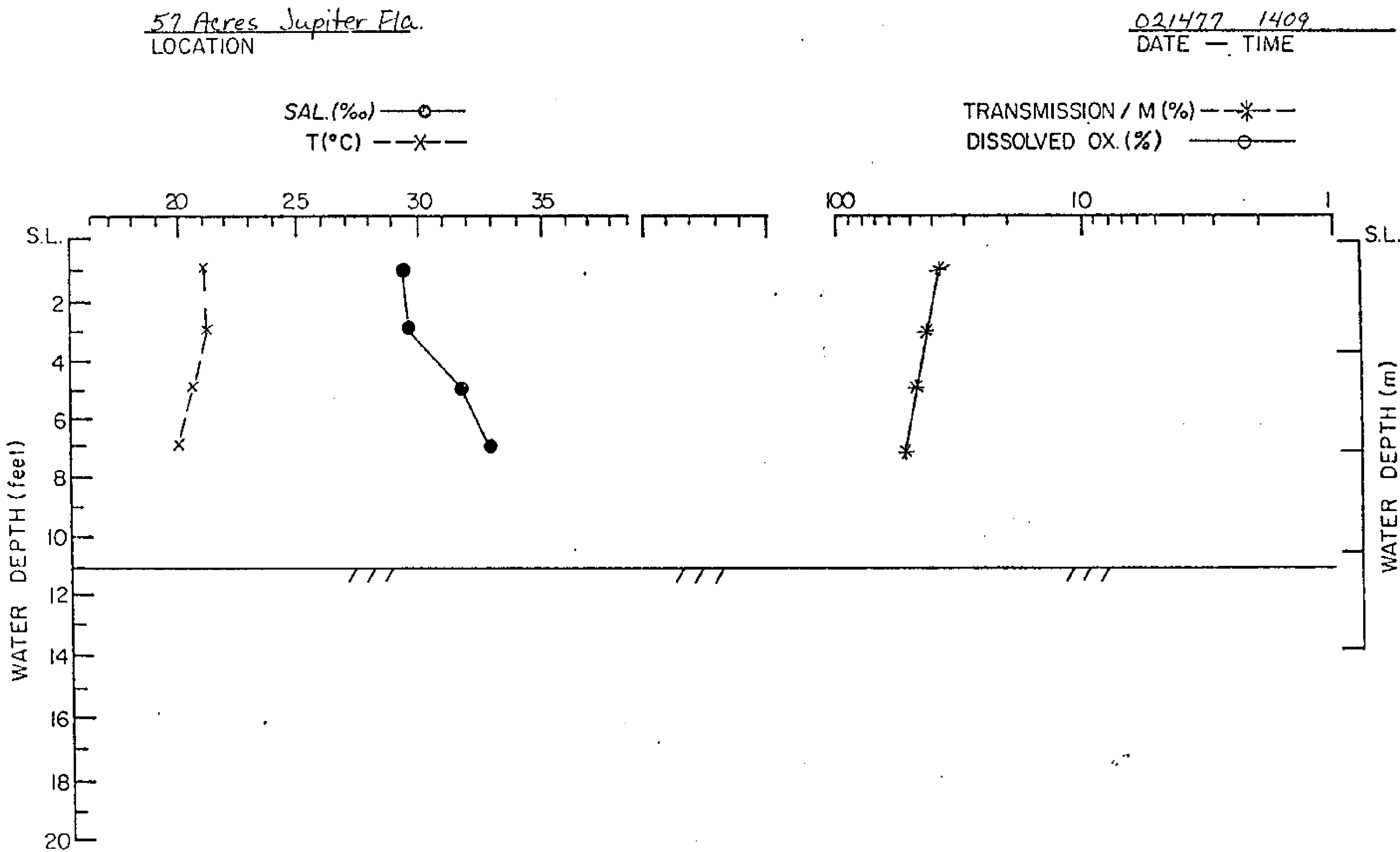



Figure 25. Salinity, temperature, and transmissivity profile at Station 021477-1409.

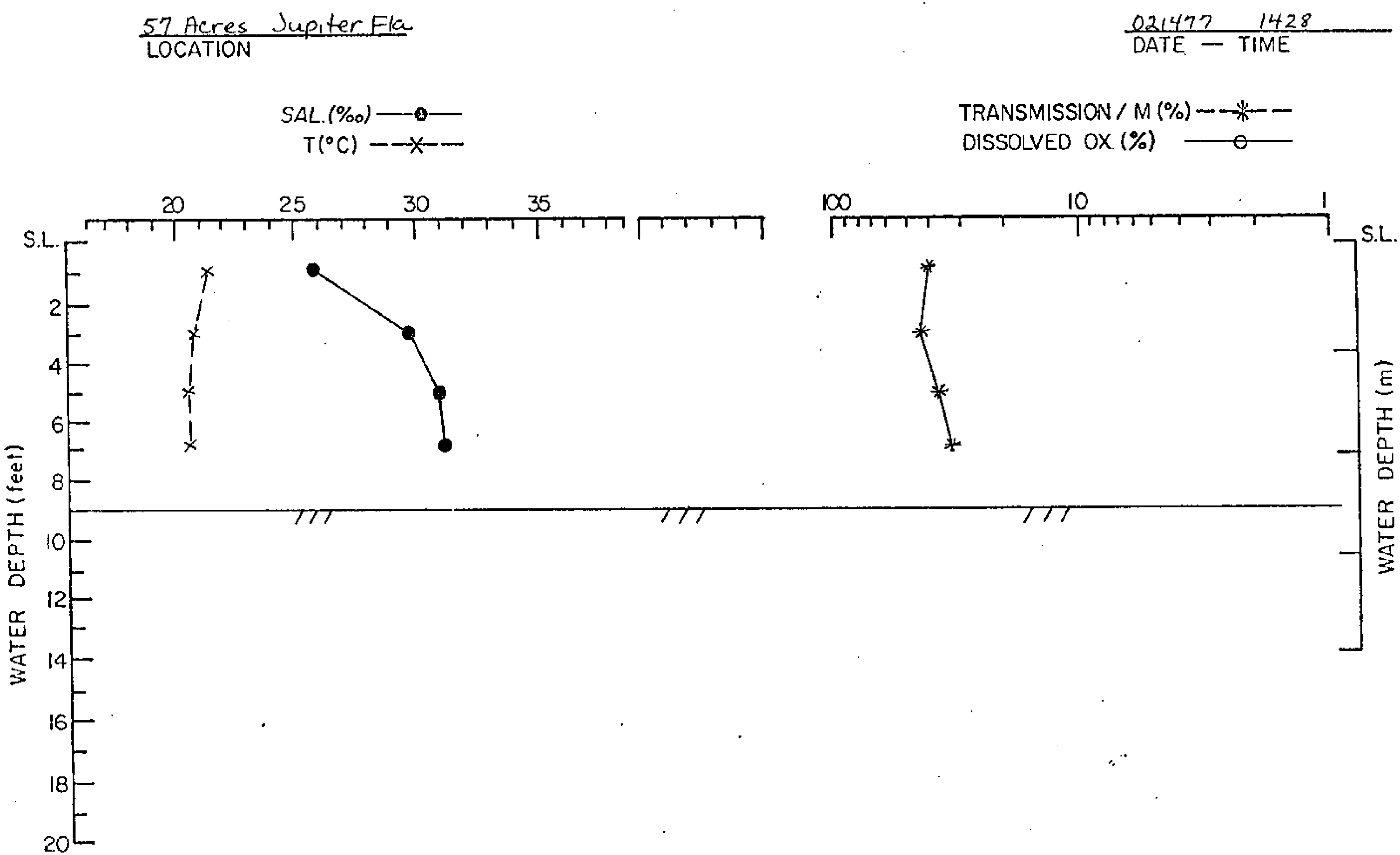



Figure 26. Salinity, temperature, and transmissivity profile at Station 021477-1428.

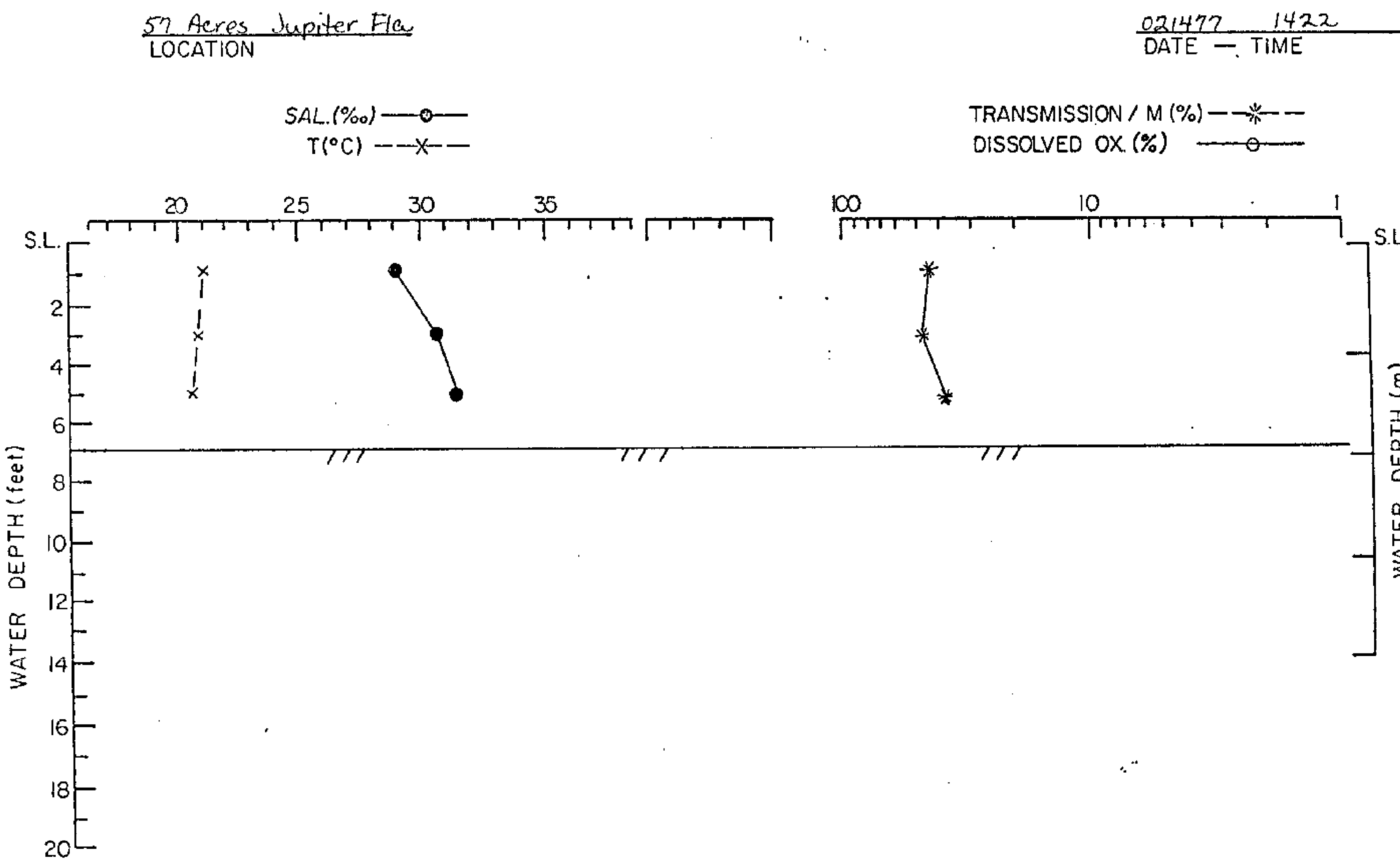



Figure 27. Salinity, temperature, and transmissivity profile at Station 021477-1422.

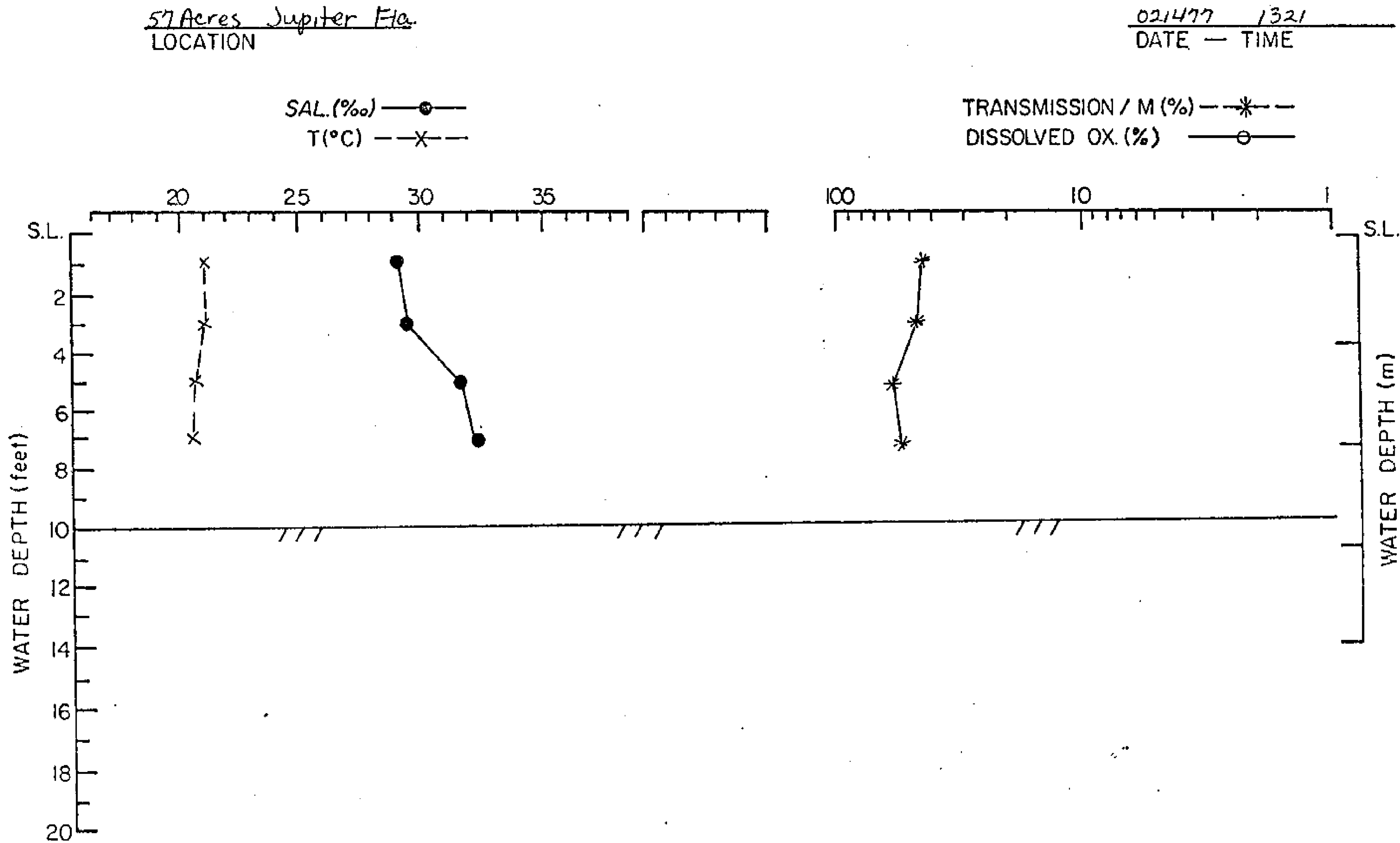



Figure 28. Salinity, temperature, and transmissivity profile at Station 021477-1321.

K-

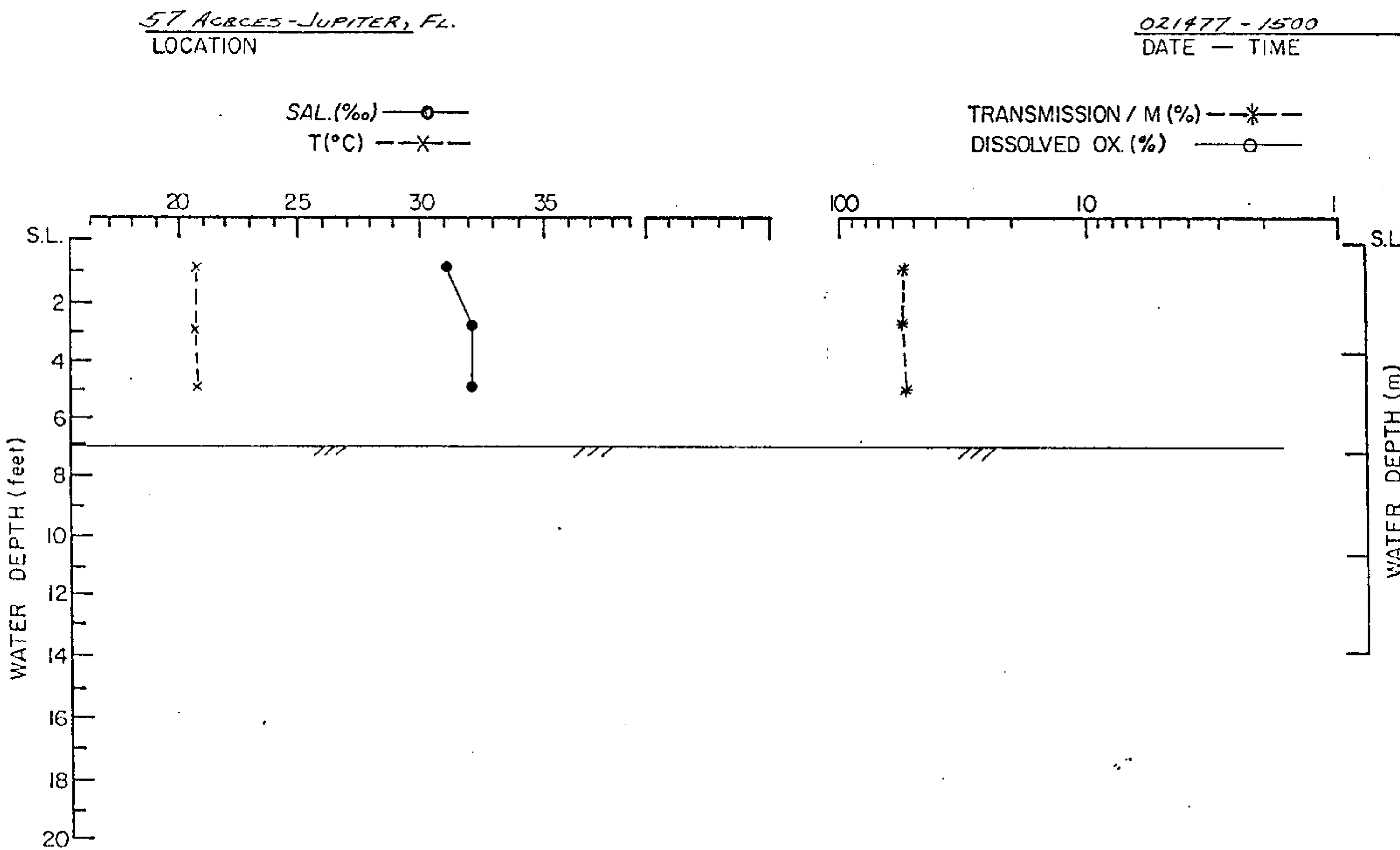



Figure 29. Salinity, temperature and transmissivity profile at Station 021477-1500.

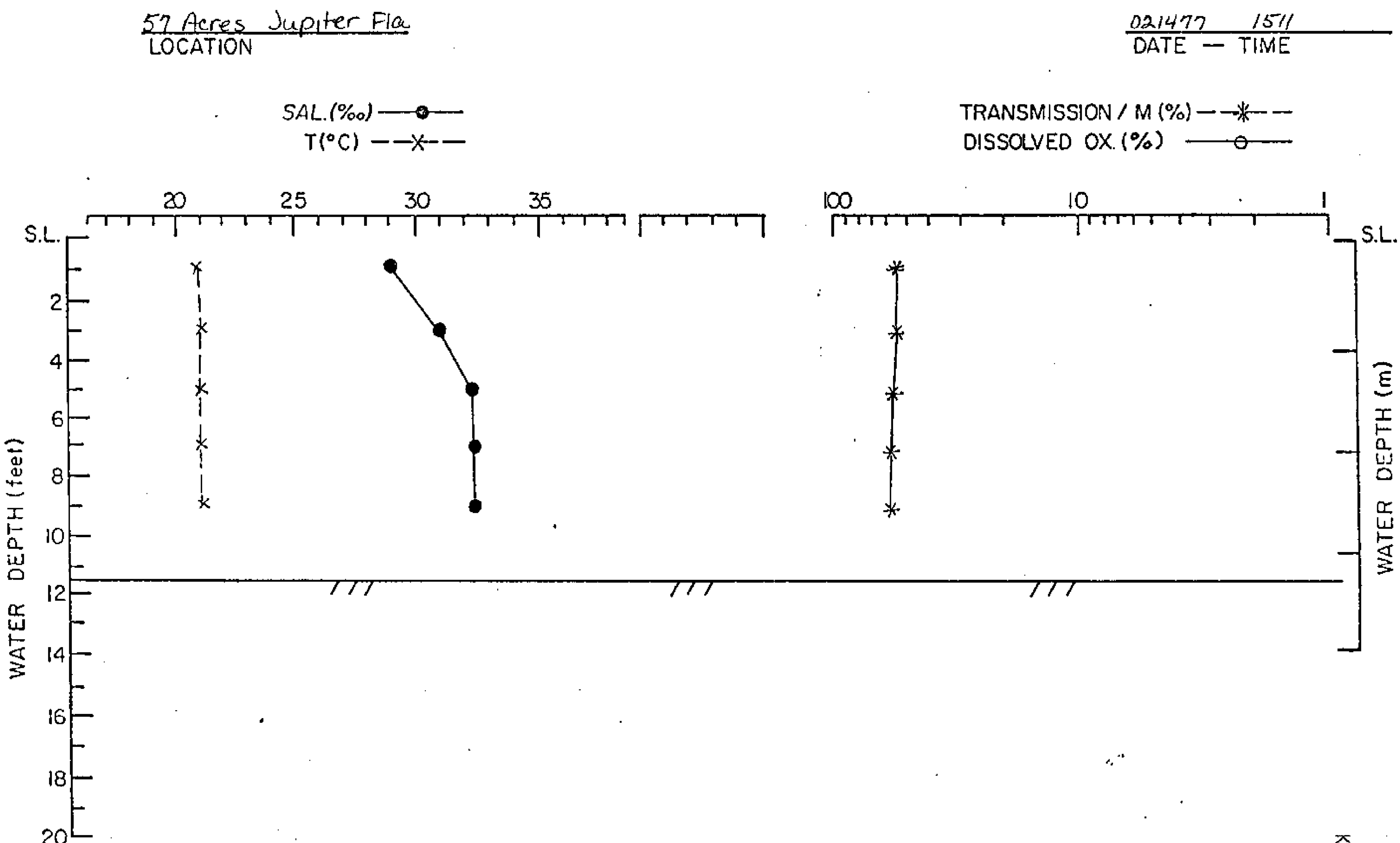



Figure 30. Salinity, temperature, and transmissivity profile at Station 021477-1511.

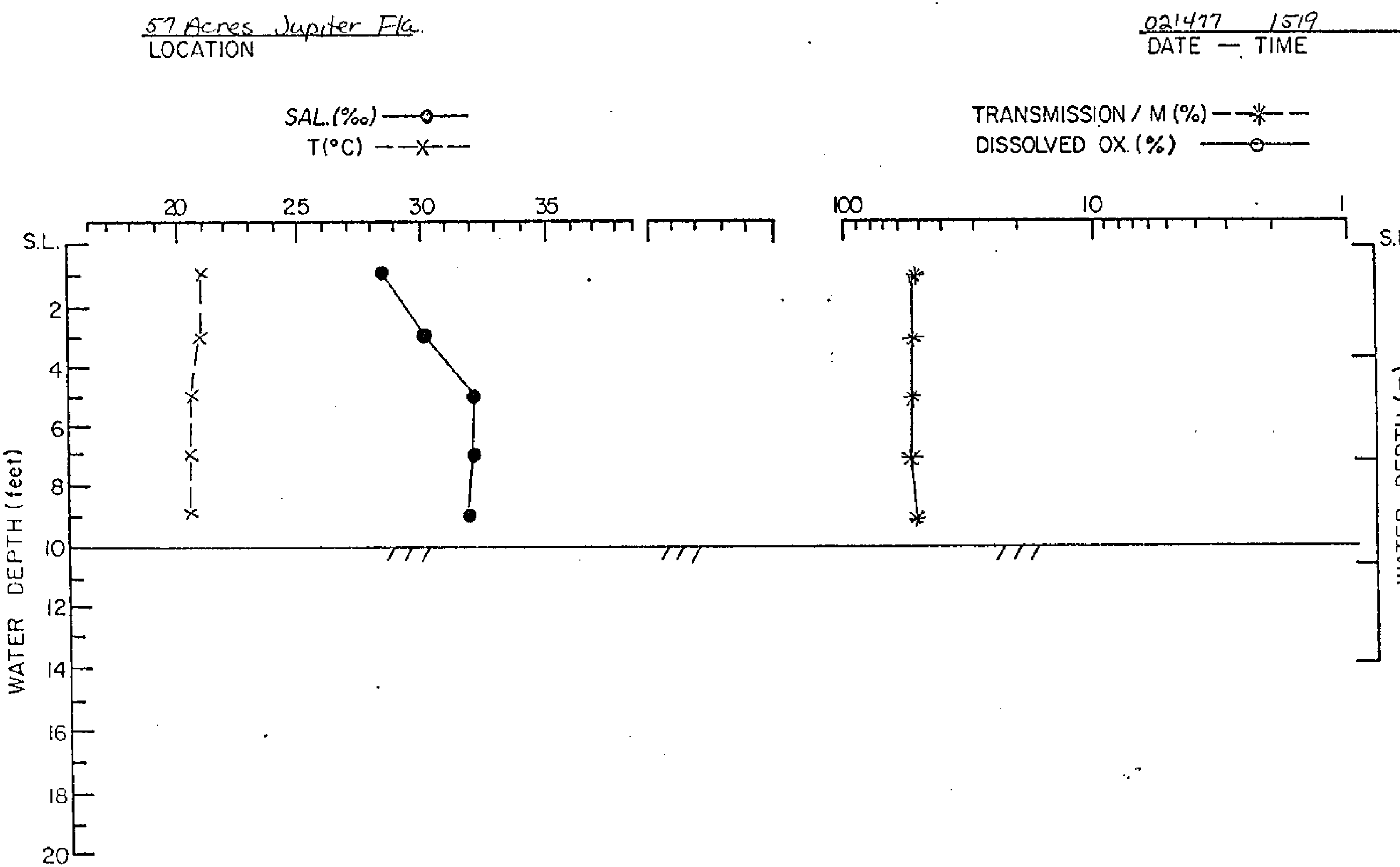



Figure 31. Salinity, temperature, and transmissivity profile at Station 021477-1519.

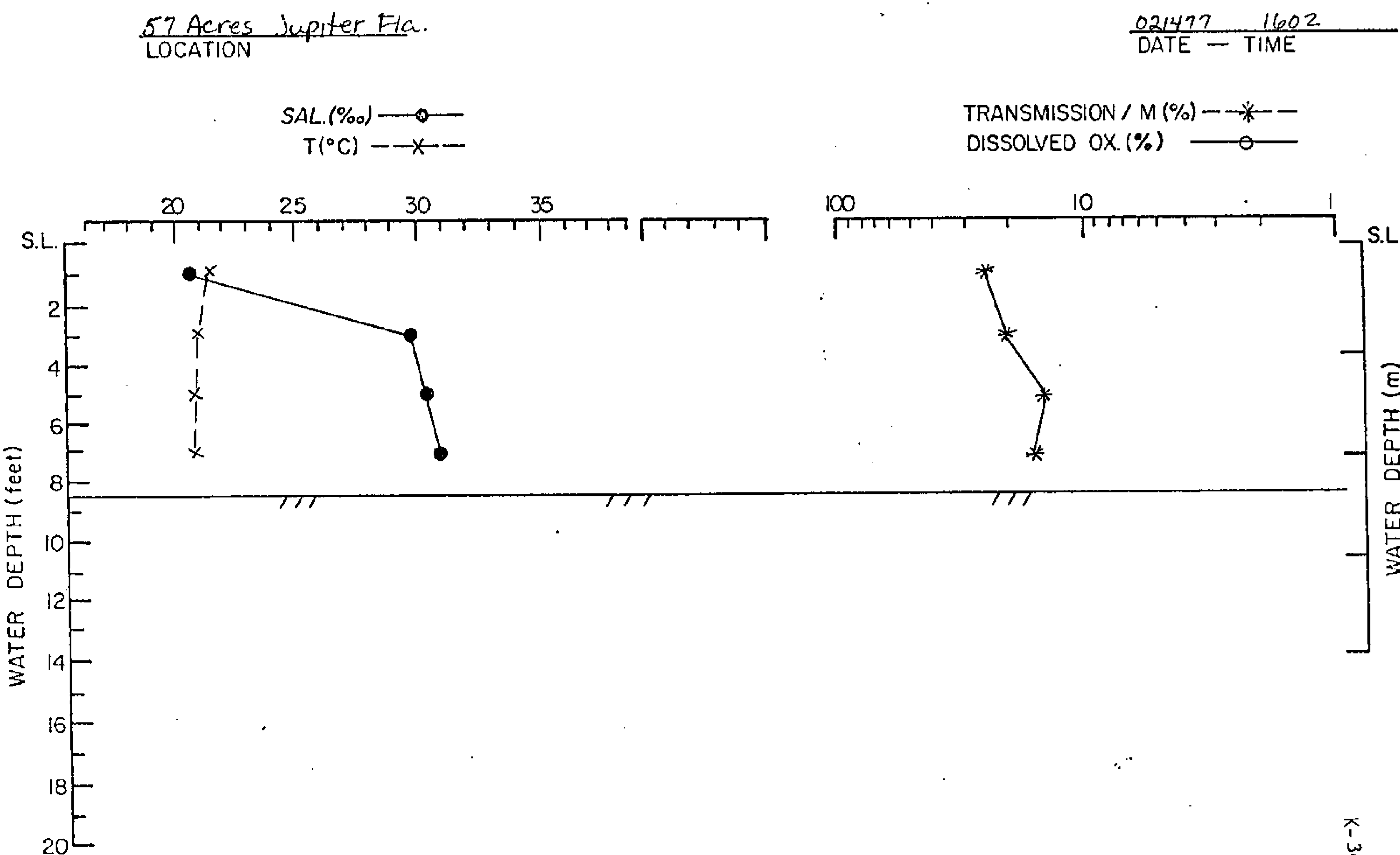



Figure 32. Salinity, temperature, and transmissivity profile at Station 021477-1602.

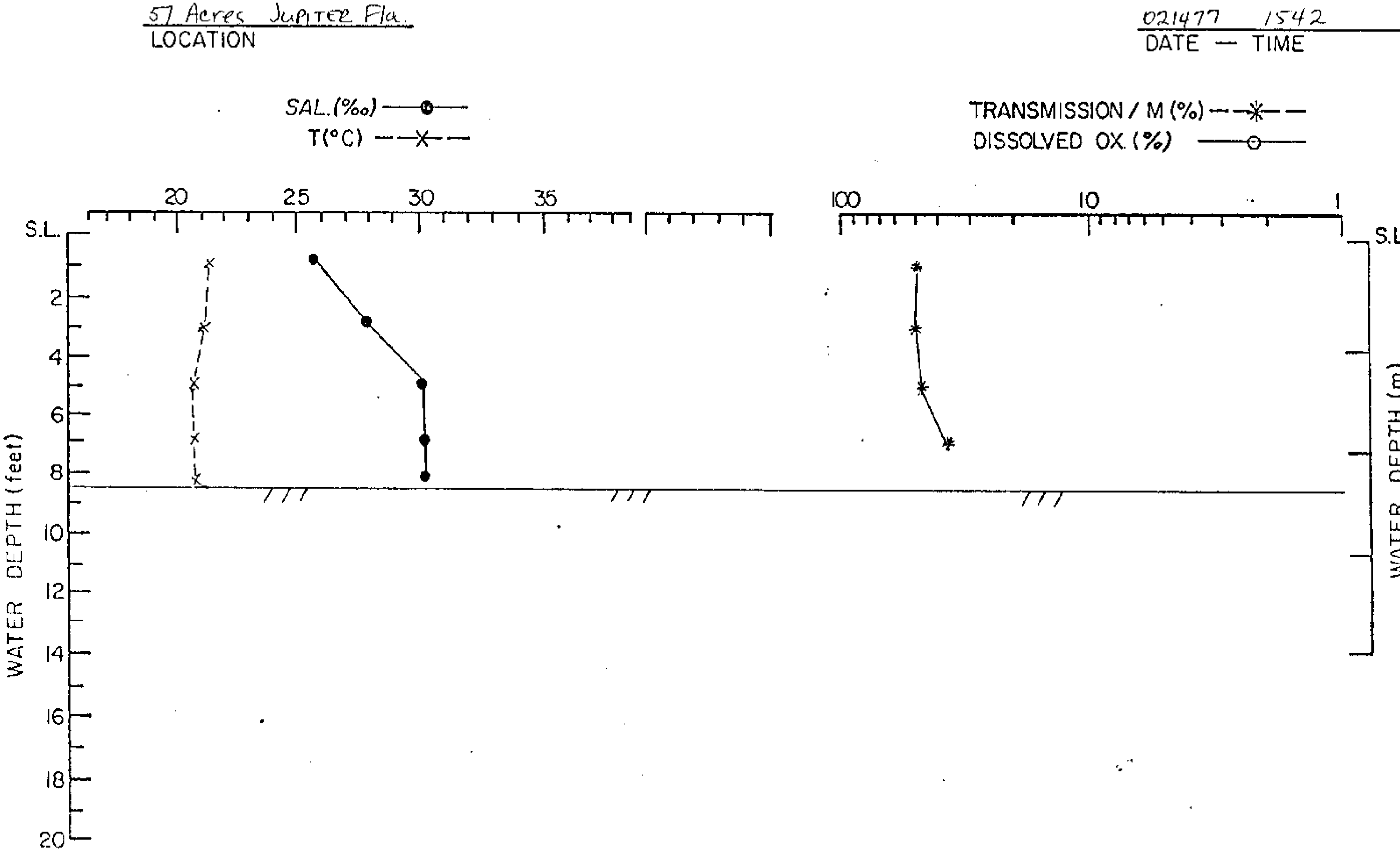



Figure 33. Salinity, temperature and transmissivity profile at Station 021477-1542.

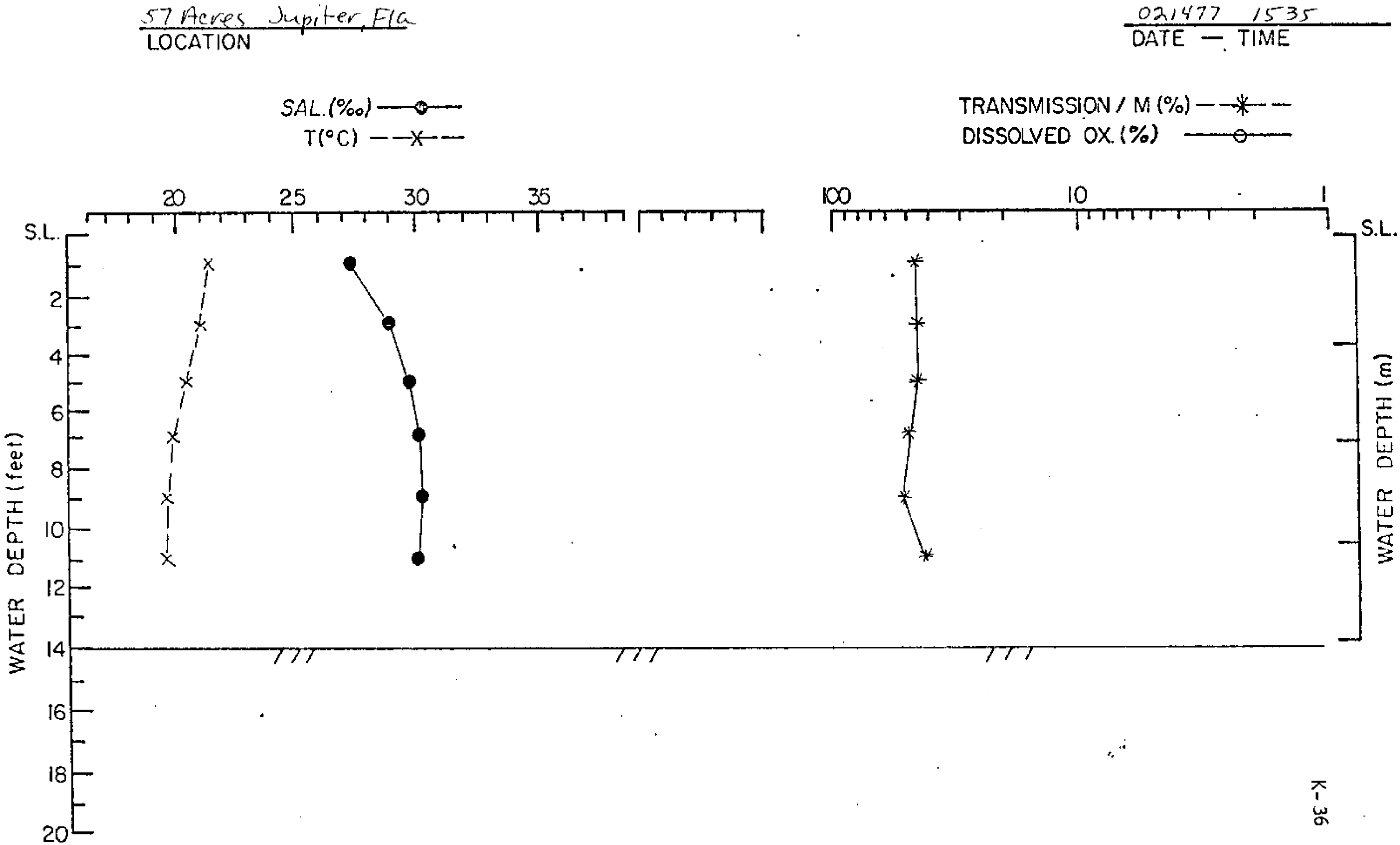



Figure 34. Salinity, temperature, and transmissivity profile at Station 021477-1535.

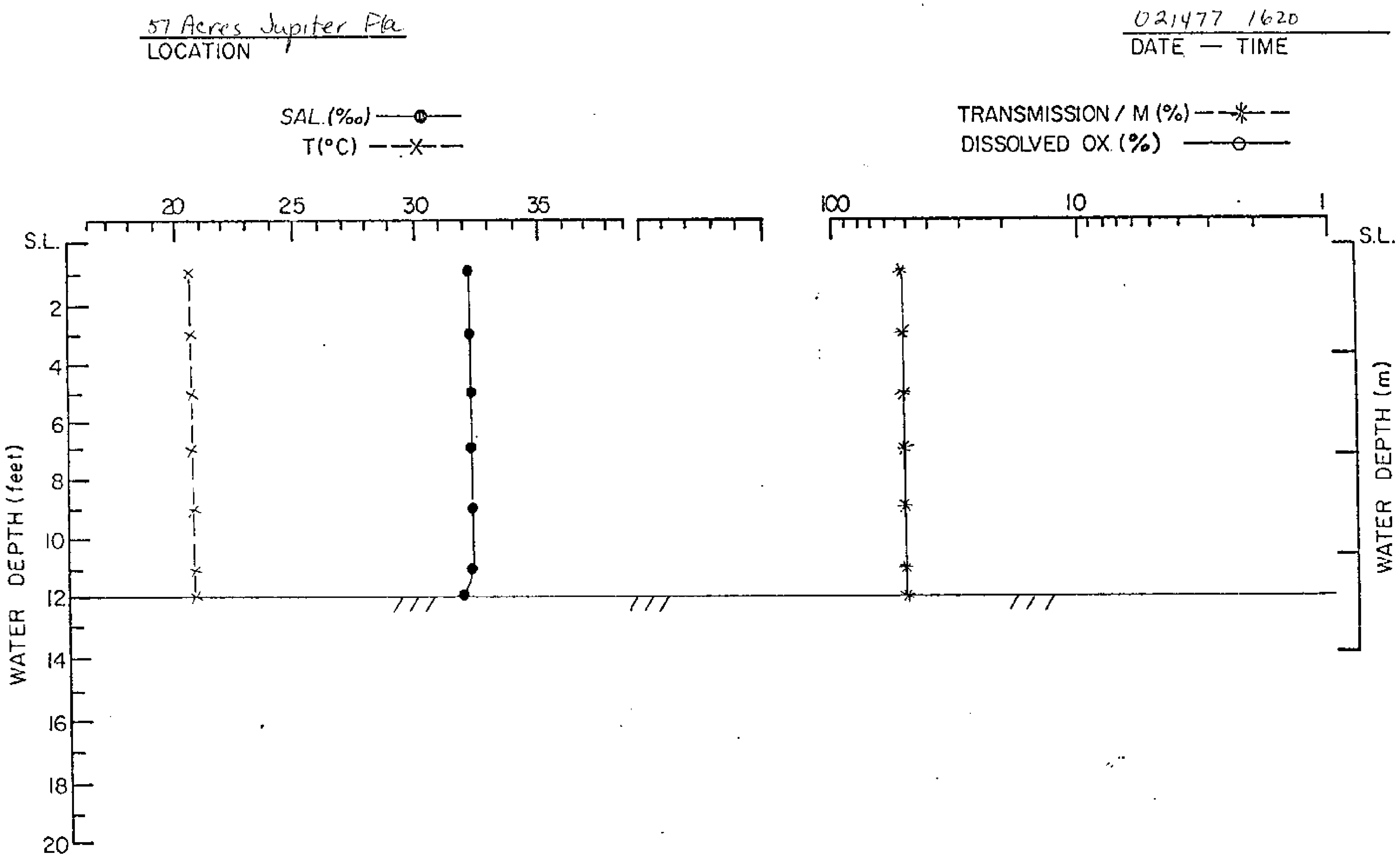



Figure 35. Salinity, temperature and transmissivity profile at Station 021477-1620.

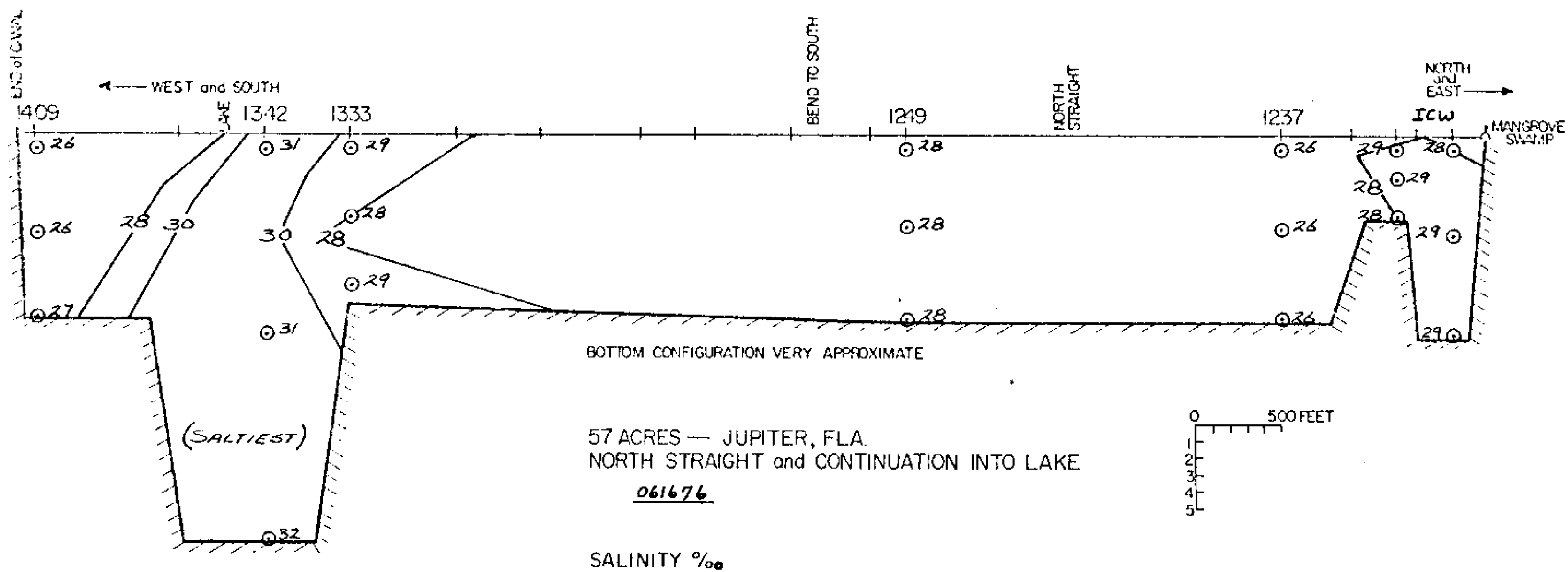



Figure 36. Salinity cross-section of part of 57 Acres canal system on June 16, 1976.

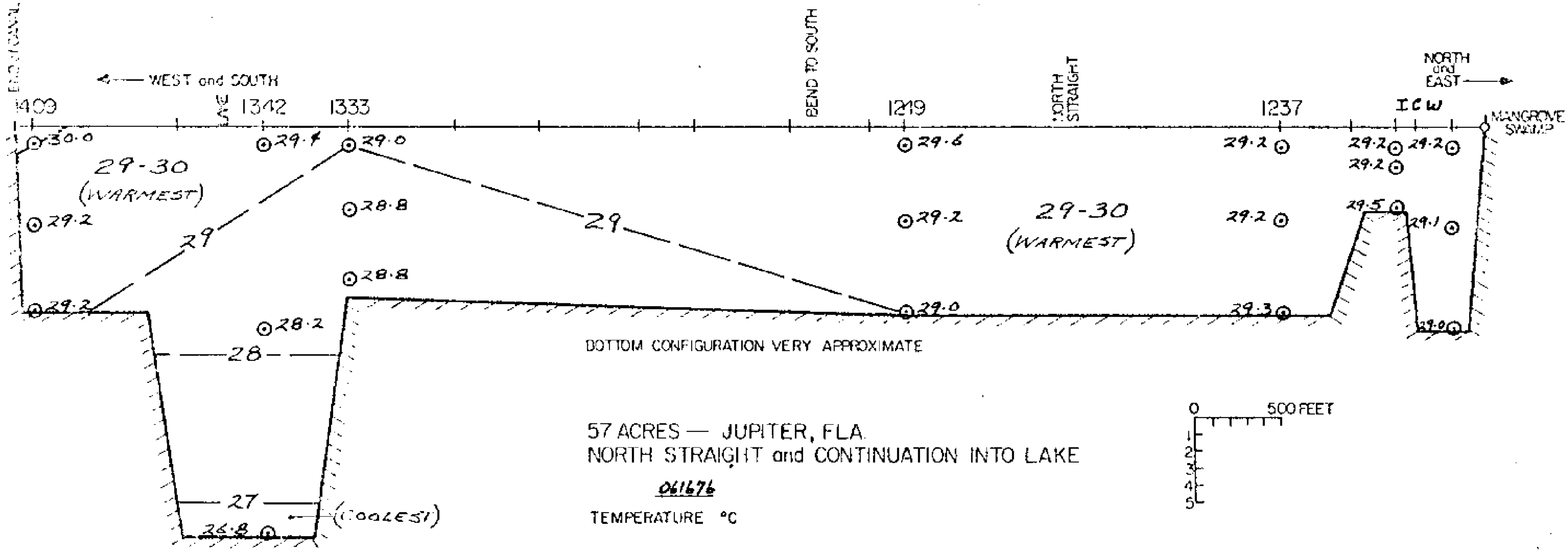



Figure 37. Temperature cross-section of part of 57 Acres canal system on June 16, 1976.

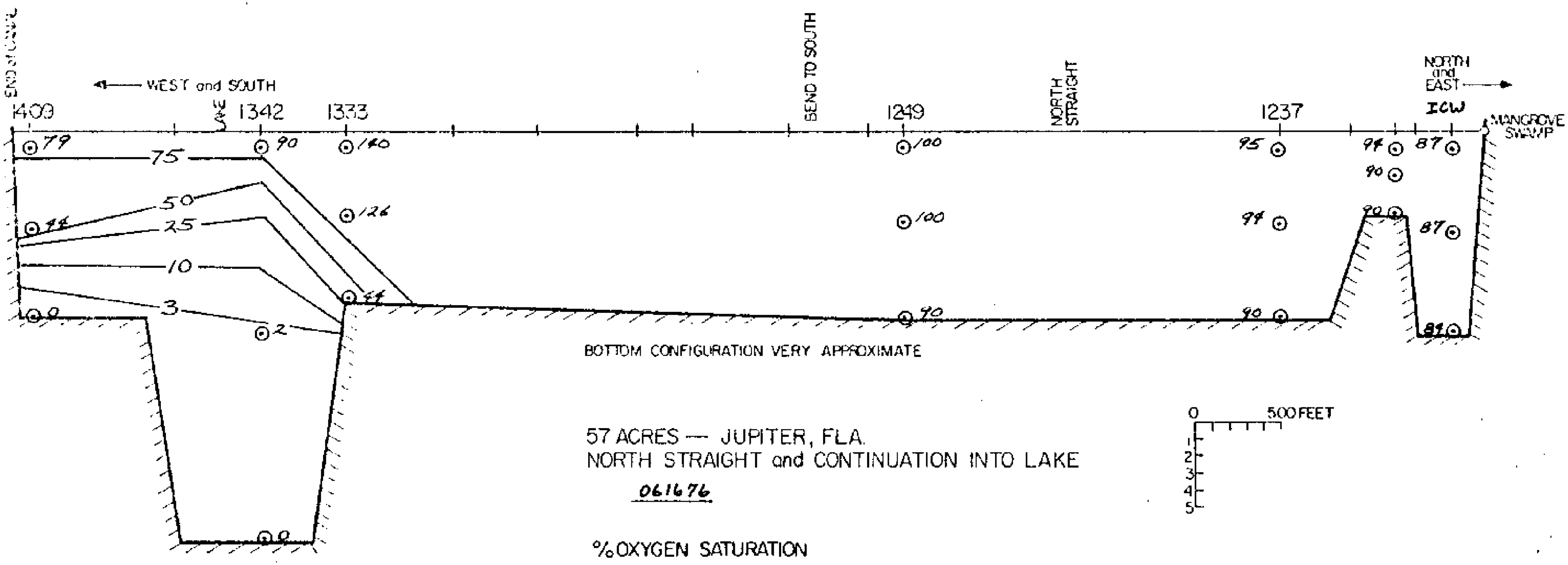



Figure 38. Oxygen saturation cross-section of part of 57 Acres canal system on June 16, 1976.

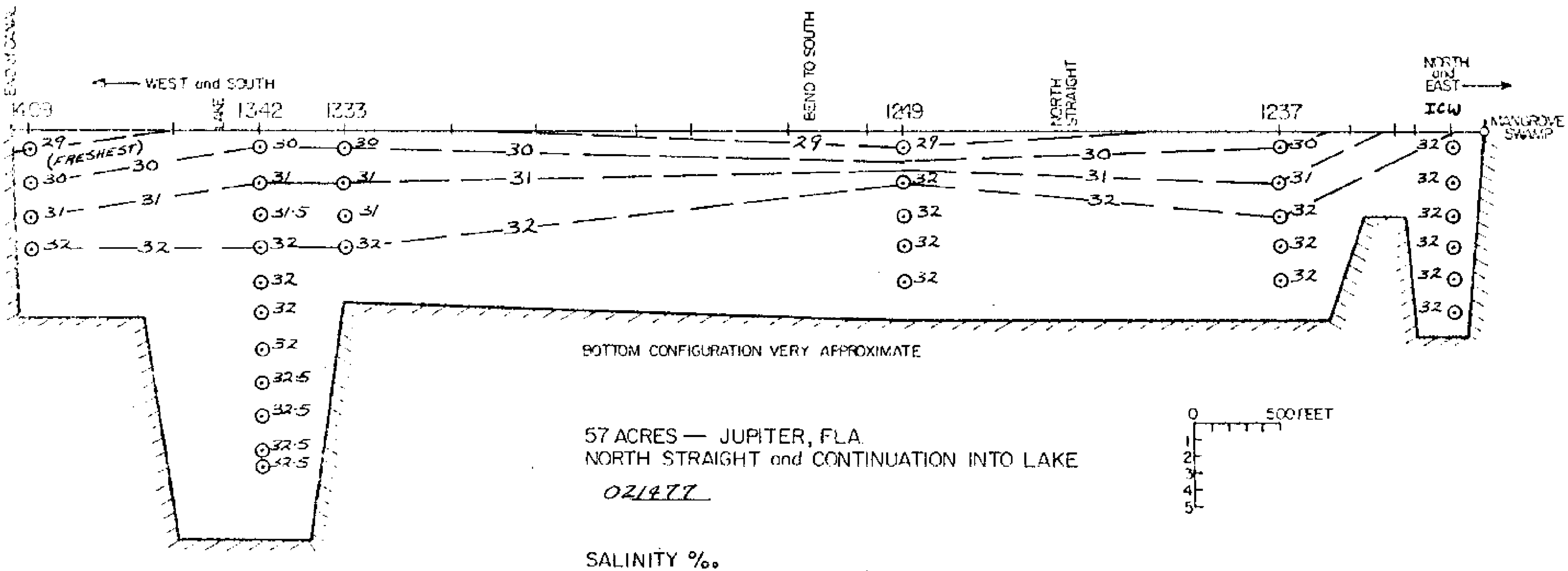



Figure 39. Salinity cross-section of part of 57 Acres canal system on February 14, 1977.

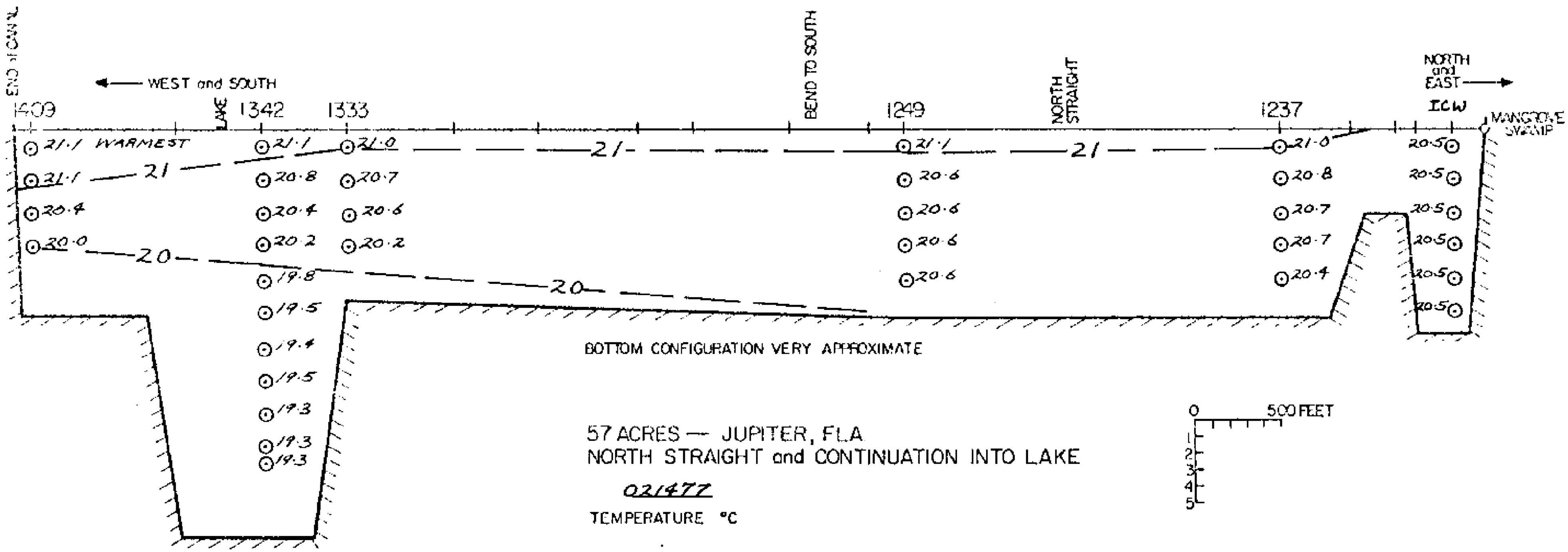



Figure 40. Temperature cross-section of part of 57 Acres canal system on February 14, 1977.

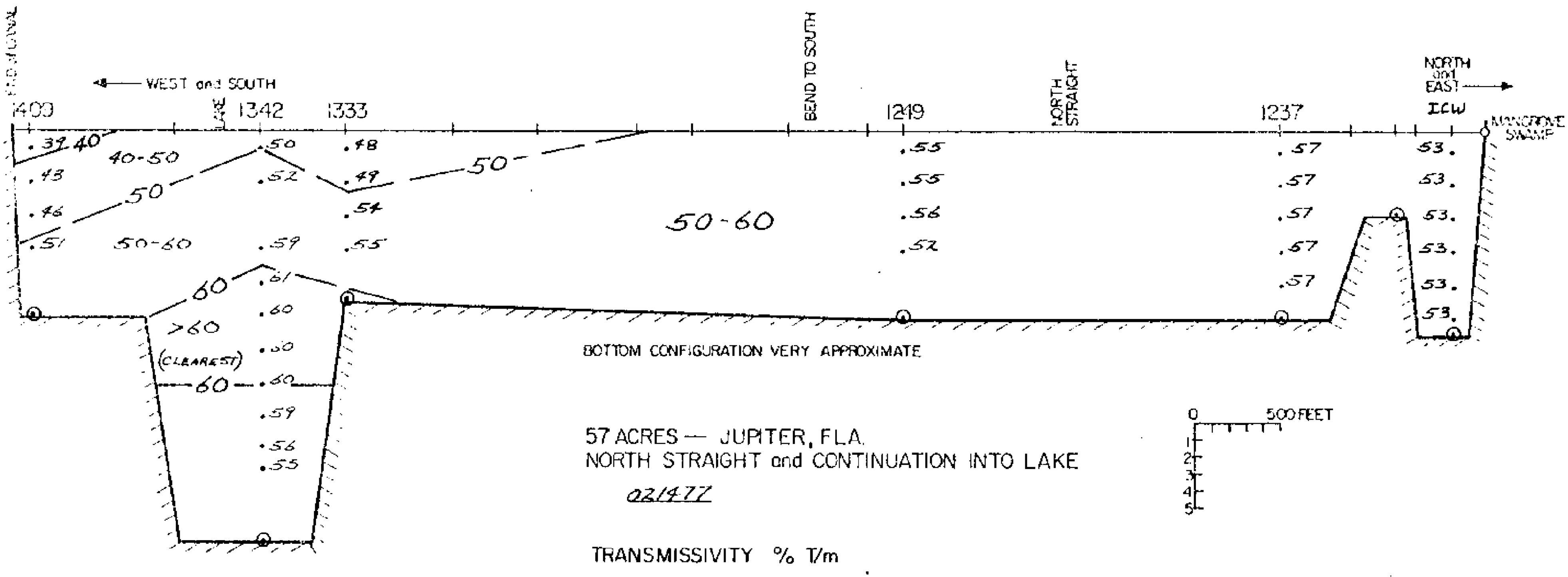



Figure 41. Transmissivity cross-section of part of 57 Acres canal system on February 14, 1977.

TABLE 1. Salinity, Temperature, Dissolved Oxygen, and Other Parameters at Stations in Canals and Adjacent Water Bodies.

| STATION No. (Date-Time) | Depth (ft.) Spl. | Depth (ft.) Total | Salin. (%) | Temp. (°C) | Dissolved Oxygen ppm | Dissolved Oxygen %sat | Turbidity T/m % | Turbidity Turb NTU | Turbidity Filt mg/l | Water Color | pH | Wind From (°) | Wind Speed (k) | Secchi Disc. (ft) | Location and Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 061676-1011 | 1 | 12 | 28.4 | 29.2 | 5.4 | 87 | | | | 16 | 8.05 | 090 | 15 | | Intracoastal WW. Mkr "19" adjacent to 57 Acres Canal System |
| | 6 | 12 | 28.8 | 29.1 | 5.4 | 87 | | | | | | | | | |
| | 12 | 12 | 28.7 | 29.0 | 5.2 | 84 | | | | | | | | | |
| 061676-1040 | 1 | 5 | 28.8 | 29.2 | 5.8 | 94 | | | | | | | | | Intracoastal W.W. - West Bank adjacent 57 Acres Canal syst. |
| | 2.5 | 5 | 28.8 | 29.2 | 5.6 | 90 | | | | | | | | | |
| | 5 | 5 | 28.3 | 29.4 | 5.6 | 90 | | | | | | | | | |
| 061676-1051 | 1 | 11 | 25.8 | 29.2 | 5.9 | 95 | | | | 16 | 8.05 | | | | 57 Acres Canal System |
| | 5.5 | 11 | 26.0 | 29.2 | 5.8 | 94 | | | | | | | | | |
| | 11 | 11 | 25.7 | 29.3 | 5.6 | 90 | | | | | | | | | |
| 061676-1107 | 1 | 11 | 28.0 | 29.6 | 6.2 | 100 | | | | | | | | | " |
| | 5.5 | 11 | 28.3 | 29.0 | 6.2 | 100 | | | | | | | | | |
| | 11 | 11 | 28.4 | 29.0 | 5.6 | 90 | | | | | | | | | |
| 061676-1115 | 1 | 10 | 24.0 | 28.9 | 6.9 | 111 | | | | | | | | | " |
| | 5 | 10 | 23.8 | 29.3 | 5.5 | 89 | | | | | | | | | |
| | 10 | 10 | 24.4 | 28.9 | 1.3 | 21 | | | | | | | | | |
| 061676-1133 | 1 | 10 | 29.3 | 29.0 | 8.7 | 140 | | | | 16 | 8.05 | | | | " |
| | 5 | 10 | 28.3 | 28.8 | 7.8 | 126 | | | | | | | | | |
| | 9 | 10 | 29.3 | 28.8 | 2.7 | 44 | | | | | | | | | |
| 061676-1149 | 1 | 24 | 31.1 | 29.4 | 5.6 | 90 | | | | | | | | | " |
| | 12 | 24 | 31.5 | 28.2 | 0.1 | 2 | | | | | | | | | |
| | 24 | 24 | 32.3 | 26.8 | 0.0 | 0 | | | | | | | | | |
| 061676-1207 | 1 | 11 | 26.3 | 30.0 | 4.8 | 79 | | | | | | | | | " |
| | 6 | 11 | 26.3 | 29.2 | 2.7 | 44 | | | | | | | | | |
| | 11 | 11 | 26.6 | 29.2 | 0.0 | 0 | | | | | | | | | |
| 061676-1227 | 1 | 9 | 26.5 | 30.2 | 4.6 | 75 | | | | 18 | <7.7 | | | | " |
| | 5 | 9 | 26.8 | 29.5 | 4.0 | 66 | | | | | | | | | |
| | 9 | 9 | 26.8 | 29.6 | 1.8 | 30 | | | | | | | | | |
| 061676-1242 | 2 | 2 | 21.3 | 29.9 | 3.4 | 56 | | | | 18 | <7.7 | | | | " |
| 061676-1304 | 1 | 10 | 27.9 | 30.0 | 5.6 | 92 | | | | | 8.05 | | | | " |
| | 5 | 10 | 28.2 | 29.6 | 4.2 | 69 | | | | | | | | | |
| | 10 | 10 | 28.3 | 29.4 | 3.8 | 61 | | | | | | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 061676-1439 | 1 | 7 | 29.0 | 30.2 | 7.1 | 116 | 8.2 | | | 57 Acres Canal System |
| | 3.5 | 7 | 29.3 | 29.9 | 6.9 | 108 | | | | |
| | 7 | 7 | 29.3 | 29.7 | 6.4 | 100 | | | | |
| 061676-1449 | 1 | 11.5 | 28.7 | 30.8 | 7.2 | 120 | | | | " |
| | 6 | 11.5 | 29.2 | 29.9 | 6.5 | 107 | | | | |
| | 11.5 | 11.5 | 29.2 | 29.7 | 5.9 | 97 | | | | |
| 061676-1457 | 1 | 10 | 27.9 | 30.9 | 7.1 | 118 | | | | " |
| | 5 | 10 | 28.6 | 29.9 | 7.0 | 115 | | | | |
| | 10 | 10 | 28.7 | 29.6 | 5.6 | 92 | | | | |
| 061676-1515 | 1 | 8.5 | 16.5 | 31.0 | 4.8 | 80 | | | | " |
| | 4 | 8.5 | 16.8 | 29.8 | 1.8 | 30 | | | | |
| | 8.5 | 8.5 | 16.8 | 29.7 | 1.6 | 26 | | | | |
| 061676-1613 | 1 | 8.5 | 25.7 | 30.8 | 7.2 | 120 | | | | " |
| | 4 | 8.5 | 26.3 | 30.0 | 3.3 | 54 | | | | |
| | 8.5 | 8.5 | 26.4 | 29.8 | 0.2 | 3 | | | | |
| 061676-1634 | 1 | 14 | 24.8 | 30.4 | 8.3 | 136 | | | | " |
| | 7 | 14 | 25.3 | 29.6 | 0.2 | 3 | | | | |
| | 14 | 14 | 26.0 | 28.1 | 0.0 | 0 | | | | |
| 061776-0935 | 0 | -- | | | 1.3 | 21 | | 0 | 0 | " . Seep from Peat at canal edge. |
| | 0 | 1 | | | 4.3 | 70 | | | | " . Canal surface water. |
| 061776-1455 | 1 | 7 | 6.4 | 28.7 | 5.9 | 95 | | 120 | 12 | Loxahatchee - N. Canal |
| | 3.5 | 7 | 6.4 | 28.7 | 5.0 | 81 | | | | |
| | 7 | 7 | 6.4 | 29.0 | 3.3 | 53 | | | | |
| 061776-1520 | 1 | 8.5 | 7.1 | 30.1 | 6.9 | 113 | | | | " |
| | 4 | 8.5 | 7.2 | 29.3 | 5.8 | 94 | | | | |
| | 8.5 | 8.5 | 7.2 | 28.7 | 1.9 | 31 | | | | |
| 061776-1534 | 1 | 7.5 | 6.0 | 30.9 | 6.3 | 105 | | | | " |
| | 3.5 | 7.5 | 6.1 | 30.5 | 6.1 | 102 | | | | |
| | 7.5 | 7.5 | 6.2 | 29.5 | 5.3 | 87 | | | | |
| 061776-1547 | 1 | 5.5 | 4.7 | 31.1 | 5.4 | 90 | | | | In Loxahatchee R. Adj. to canals |
| | 2.5 | 5.5 | 4.7 | 30.9 | 5.1 | 85 | | | | |
| | 5.5 | 5.5 | 4.8 | 29.4 | 5.1 | 82 | | | | |
| 061776-1555 | 1 | 7.5 | 11.2 | 31.2 | 9.1 | 152 | | | | Loxahatchee - S. Canal |
| | 3.5 | 7.5 | 11.4 | 29.8 | 8.2 | 134 | | | | |
| | 7.5 | 7.5 | 11.1 | 28.2 | 0.3 | 5 | | | | |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 061776-1618 | 1 | 9 | 13.3 | 31.7 | 8.3 | 141 | | | | | | | Loxahatchee - |
| | 4.5 | 9 | 13.7 | 29.5 | 6.4 | 103 | | | | | | | S. Canal |
| | 9 | 9 | 14.0 | 28.7 | 0.6 | 10 | | | | | | | |
| 061778-1632 | 1 | 9 | 13.4 | 31.5 | 7.5 | 127 | | | | | | | " |
| | 4.5 | 9 | 13.8 | 29.5 | 5.5 | 90 | | | | | | | |
| | 8.5 | 9 | 14.0 | 29.3 | 0.5 | 8 | | | | | | | |
| 071076-0923 | 1 | 18 | 22.0 | 28.9 | 5.8 | 94 | 2.3 | 19 | 8.05 | 135 | 2 | 4.5 | Punta Gorda Isles- |
| | 3 | 18 | 24.4 | 29.3 | 2.4 | 39 | | | | | | | Sunfish Cove Canal |
| | 5 | 18 | 25.1 | 29.3 | 1.2 | 19 | | | | | | | |
| | 8 | 18 | 25.6 | 29.1 | 0.3 | 5 | | | | | | | |
| | 10 | 18 | 26.3 | 29.0 | 0.2 | 3 | | | | | | | |
| | 14 | 18 | 29.8 | 27.8 | 0.2 | 3 | | | | | | | |
| | 15 | 18 | 32.0 | 27.3 | 0.2 | 3 | | | | | | | |
| | 16 | 18 | 33.9 | 26.8 | 0.2 | 3 | | | | | | | |
| | 17 | 18 | 31.7 | 27.4 | 0.2 | 3 | | | | | | | |
| 071076-1037 | 1 | 14 | 19.7 | 29.9 | 7.8 | 128 | | 19 | | | | 4.0 | " |
| | 2 | 14 | 20.7 | 29.3 | 6.2 | 100 | | | | | | | |
| | 3 | 14 | 23.2 | 29.6 | 3.3 | 54 | | | | | | | |
| | 5 | 14 | 24.9 | 29.5 | 2.9 | 47 | | | | | | | |
| | 8 | 14 | 25.2 | 29.3 | 1.8 | 29 | | | | | | | |
| | 10 | 14 | 25.5 | 29.2 | 0.0 | 0 | | | | | | | |
| | 12 | 14 | 26.8 | 29.2 | 0.0 | 0 | | | | | | | |
| | 13 | 14 | 28.3 | 28.9 | 0.0 | 0 | | | | | | | |
| 071076-1105 | 1 | 11.5 | 19.4 | 29.6 | | | | 20 | | | | 4.0 | " |
| | 2 | 11.5 | 22.4 | 29.3 | | | | | | | | | |
| | 3 | 11.5 | 23.4 | 29.3 | | | | | | | | | |
| | 5 | 11.5 | 24.5 | 29.2 | | | | | | | | | |
| | 8 | 11.5 | 24.9 | 29.1 | | | | | | | | | |
| | 10 | 11.5 | 26.3 | 29.2 | | | | | | | | | |
| | 10.5 | 11.5 | 26.4 | 29.2 | | | | | | | | | |
| 071076-1126 | 1 | 7 | 21.2 | 29.7 | 11.9 | 195 | 5.4 | 20 | 8.5 | | | 3.5 | Peace R. 0.25 mi. |
| | 2 | 7 | 23.4 | 29.7 | 7.3 | 120 | | | | | | | off Sunfish Cove |
| | 3 | 7 | 24.1 | 29.5 | 6.2 | 102 | | | | | | | Canal, Punta Gorda |
| | 5 | 7 | | | 5.8 | 94 | | | | | | | Isles |
| | 6 | 7 | 24.5 | 29.3 | 5.7 | 92 | | | | | | | |
| 071076-1209 | 1 | 5 | 17.1 | 30.9 | 12.2 | 203 | | 20 | | 240 | 8 | 2.5 | Peace R. 0.25 mi |
| | 2 | 5 | 17.1 | 30.0 | 13.2 | 216 | | | | | | | off Bangsberg W.W. |
| | 3 | 5 | 17.3 | 29.0 | 11.0 | 177 | | | | | | | Port Charlotte Isle |
| | 4 | 5 | 17.5 | 28.5 | 9.2 | 148 | | | | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 071076-1228 | 1 | 11 | 16.9 | 31.0 | 10.0 | 167 | | | | 3.0 | Port Charlotte Isles Bangsberg Waterway |
| | 2 | 11 | 17.1 | 30.5 | 9.9 | 165 | | | | | |
| | 3 | 11 | 18.0 | 29.6 | 8.9 | 161 | | | | | |
| | 5 | 11 | 20.1 | 28.6 | 5.1 | 82 | | | | | |
| | 6 | 11 | | | 4.5 | 73 | | | | | |
| | 7 | 11 | | | 4.1 | 76 | | | | | |
| | 8 | 11 | 24.6 | 29.6 | 0.4 | 7 | | | | | |
| | 10 | 11 | 26.3 | 29.4 | 0.2 | 3 | | | | | |
| 071076-1249 | 1 | 13.5 | 16.8 | 31.7 | 11.4 | 193 | | | | 3.0 | " |
| | 2 | 13.5 | 17.1 | 30.6 | 11.2 | 187 | | | | | |
| | 3 | 13.5 | 17.3 | 29.7 | 10.1 | 166 | | | | | |
| | 4 | 13.5 | | | 8.0 | 129 | | | | | |
| | 5 | 13.5 | 19.6 | 29.4 | 6.0 | 97 | | | | | |
| | 6 | 13.5 | | | 4.5 | 74 | | | | | |
| | 7 | 13.5 | 22.4 | 29.8 | 3.2 | 52 | | | | | |
| | 8 | 13.5 | 24.8 | 29.7 | 0.1 | 2 | | | | | |
| | 9 | 13.5 | 25.3 | 29.8 | 0.1 | 2 | | | | | |
| | 10 | 13.5 | 25.9 | 29.4 | 0.0 | 0 | | | | | |
| | 12 | 13.5 | 27.7 | 28.4 | 0.0 | 0 | | | | | |
| 071076-1310 | 1 | 11 | 16.8 | 32.6 | 11.8 | 203 | 20 | 8.5 | | 3.0 | " |
| | 2 | 11 | 16.8 | 32.3 | 11.8 | 203 | | | | | |
| | 3 | 11 | 16.8 | 31.1 | 8.1 | 135 | | | | | |
| | 4 | 11 | | | 6.6 | 108 | | | | | |
| | 5 | 11 | 19.9 | 29.8 | 6.1 | 100 | | | | | |
| | 6 | 11 | | | 3.9 | 64 | | | | | |
| | 7 | 11 | | | 0.7 | 11 | | | | | |
| | 8 | 11 | 24.9 | 30.0 | 0.2 | 3 | | | | | |
| | 9 | 11 | | | 0.2 | 3 | | | | | |
| | 10 | 11 | 26.8 | 29.2 | 0.1 | 2 | | | | | |
| 071076-1406 | 1 | 12 | 18.2 | 31.0 | 8.3 | 138 | | | | 3.0 | Port Charlotte Isle Undeveloped Canal West of Bangsberg Waterway |
| | 2 | 12 | 18.4 | 30.1 | 7.2 | 118 | | | | | |
| | 3 | 12 | 18.9 | 29.4 | 6.0 | 97 | | | | | |
| | 4 | 12 | | | 4.6 | 74 | | | | | |
| | 5 | 12 | 19.9 | 29.3 | 4.2 | 68 | | | | | |
| | 6 | 12 | | | 3.6 | 59 | | | | | |
| | 7 | 12 | | | 3.2 | 52 | | | | | |
| | 8 | 12 | 21.9 | 29.7 | 1.3 | 21 | | | | | |
| | 9 | 12 | | | 0.9 | 3 | | | | | |
| | 10 | 12 | 26.7 | 29.2 | 0.2 | 3 | | | | | |
| | 11 | 12 | 25.4 | 29.4 | 0.2 | 3 | | | | | |
| 091876-0859 | 1 | | | | | | 1.73 | | 0 | | Intracoastal WW Mkr "18". S. of Jupiter |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 091876-0911 | 1 | | | | | 1.28 | | 0 | | ICW, Mkr "21" So. of Jupiter |
| 091876-0934 | 1 | | | | | 1.18 | | 0 | | 57 Ac. Canal E End of South Loop at Stat. 061676-1634 |
| 091876-0951 | 1 | | | | | 1.13 | | 0 | | 57 Ac. Can. S. End of S.W. Proj. at Stat. 061676-1515 |
| 091876-1006 | 1 | | | | | 0.89 | | 0 | | 57 Ac. Can. Center of Lake at Station 061676-1149 |
| 091876-1015 | 1 | | | | | 1.40 | | 0 | | 57 Ac. Can. W. End of N. Straight at Stat. 061676-1107 |
| 091876-1427 | 1 | | 34.0 (by refract) | | | 0.53 | | 0 | | In Jupiter Inlet, Strong Flood Tide |
| 021477-1237 | 1 | 10 | 30.3 | 21.0 | 57 | | 270 | 6 | 0.0 | Same loc. as Stat. 061676-1051 |
| | 3 | 10 | 31.3 | 20.8 | 57 | | | | | |
| | 5 | 10 | 31.8 | 20.7 | 57 | | | | | |
| | 7 | 10 | 31.9 | 20.7 | 57 | | | | | |
| | 9 | 10 | 31.9 | 20.4 | 57 | | | | | |
| 021477-1249 | 1 | 9 | 29.5 | 21.1 | 55 | | | | | Same loc. as Stat. 061676-1107 |
| | 3 | 9 | 31.6 | 20.6 | 55 | | | | | |
| | 5 | 9 | 31.9 | 20.6 | 56 | | | | | |
| | 7 | 9 | 32.0 | 20.6 | 52 | | | | | |
| | 9 | 9 | 32.0 | 20.6 | | | | | | |
| 021477-1302 | 1 | 9 | 29.9 | 21.0 | 55 | | | | | Same loc. as Stat. 061676-1115 |
| | 3 | 9 | 31.6 | 20.5 | 57 | | | | | |
| | 5 | 9 | 31.9 | 20.6 | 58 | | | | | |
| | 7 | 9 | 32.1 | 20.3 | 50 | | | | | |
| | 8 | 9 | 32.5 | 20.0 | | | | | | |
| 021477-1321 | 1 | 8 | 29.2 | 21.0 | 43 | | | | | Same loc. as Stat. 061676-1304 |
| | 3 | 8 | 29.4 | 21.0 | 47 | | | | | |
| | 5 | 8 | 31.3 | 20.6 | 54 | | | | | |
| | 7 | 8 | 31.8 | 20.4 | 52 | | | | | |
| 021477-1333 | 1 | 8 | 30.0 | 21.0 | 48 | | | | | Same loc. as Stat. 061676-1133 |
| | 3 | 8 | 30.8 | 20.7 | 49 | | | | | |
| | 5 | 8 | 31.3 | 20.6 | 54 | | | | | |
| | 7 | 8 | 31.9 | 20.2 | 55 | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 021477-1342 | 1 | 21 | 30.0 | 21.1 | 50 | Same loc. as Stat. 061676-1149 |
| | 3 | 21 | 30.6 | 20.8 | 52 | |
| | 5 | 21 | 31.5 | 20.4 | 55 | |
| | 7 | 21 | 31.8 | 20.2 | 59 | |
| | 9 | 21 | 32.2 | 19.8 | | |
| | 11 | 21 | 32.4 | 19.5 | 60 | |
| | 13 | 21 | 32.4 | 19.4 | | |
| | 15 | 21 | 32.5 | 19.5 | | |
| | 17 | 21 | 32.5 | 19.3 | | |
| | 19 | 21 | 32.5 | 19.3 | | |
| | 20 | 21 | 32.5 | 19.3 | 55 | |
| 021477-1409 | 1 | 9 | 29.4 | 21.1 | 39 | Same loc. as Stat. 061676-1207 |
| | 3 | 9 | 29.6 | 21.1 | 43 | |
| | 5 | 9 | 31.2 | 20.4 | 46 | |
| | 7 | 9 | 31.7 | 20.0 | 51 | |
| 021477-1422 | 1 | 6 | 29.2 | 20.9 | 44 | Same loc. as Stat. 061676-1242 |
| | 3 | 6 | 30.3 | 20.6 | 46 | |
| | 5 | 6 | 31.0 | 20.4 | 43 | |
| 021477-1428 | 1 | 8 | 26.0 | 21.2 | 40 | Same loc. as Stat. 061676-1227 |
| | 3 | 8 | 29.7 | 20.6 | 43 | |
| | 5 | 8 | 30.7 | 20.3 | 39 | |
| | 7 | 8 | 30.9 | 20.3 | 36 | |
| 021477-1500 | 1 | 6 | 31.1 | 20.6 | 53 | Same loc. as Stat. 061676-1439 |
| | 3 | 6 | 31.8 | 20.5 | 54 | |
| | 5 | 6 | 31.8 | 20.5 | 53 | |
| 021477-1511 | 1 | 9 | 29.0 | 20.6 | 53 | Same loc. as Stat. 061676-1449 |
| | 3 | 9 | 30.5 | 20.8 | 52 | |
| | 5 | 9 | 31.8 | 20.6 | 55 | |
| | 7 | 9 | 31.8 | 20.6 | 54 | |
| | 9 | 9 | 31.9 | 20.6 | | |
| 021477-1519 | 1 | 9 | 28.5 | 21.0 | 53 | Same loc. as Stat. 061676-1457 |
| | 3 | 9 | 30.1 | 20.9 | 53 | |
| | 5 | 9 | 31.7 | 20.5 | 53 | |
| | 7 | 9 | 31.8 | 20.5 | 53 | |
| | 9 | 9 | 31.7 | 20.5 | 51 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 021477-1535 | 1 | 12 | 27.3 | 21.2 | 49 | Same loc. as Stat. 061676-1634 |
| | 3 | 12 | 28.8 | 20.9 | 49 | |
| | 5 | 12 | 29.7 | 20.3 | 48 | |
| | 7 | 12 | 29.9 | 19.9 | 51 | |
| | 9 | 12 | 29.9 | 19.8 | 53 | |
| | 11 | 12 | 29.8 | 19.7 | 48 | |
| 021477-1542 | 1 | 9 | 25.9 | 21.3 | 52 | Same loc. as Stat. 061676-1613 |
| | 3 | 9 | 27.6 | 21.1 | 51 | |
| | 5 | 9 | 30.1 | 20.6 | 49 | |
| | 7 | 9 | 30.1 | 20.6 | 40 | |
| | 9 | 9 | 30.1 | 20.6 | | |
| 021477-1602 | 1 | 7 | 20.5 | 21.1 | 27 | Same loc. as Stat. 061676-1515 |
| | 3 | 7 | 29.2 | 20.6 | 23 | |
| | 5 | 7 | 29.8 | 20.6 | 17 | |
| | 7 | 7 | 30.1 | 20.5 | 18 | |
| 021477-1620 | 1 | 15 | 32.2 | 20.5 | 53 | Intracoastal W.W. of 57 Acres Canal System. Same loc. as Stat. 061676-1011 |
| | 3 | 15 | 32.1 | 20.5 | 53 | |
| | 5 | 15 | 32.1 | 20.5 | 53 | |
| | 7 | 15 | 32.1 | 20.5 | 53 | |
| | 9 | 15 | 32.1 | 20.5 | 53 | |
| | 11 | 15 | 32.1 | 20.5 | 53 | |
| | 13 | 15 | 31.8 | 20.4 | 53 | |

061676-1011). The water column was well mixed, without significant stratification (Fig. 3-4).

Proceeding into the North Straight part of the canal system, the surface water became fresher by about 1‰ while maintaining the same temperature nearly all the way to the Lake . However, profiles indicate only a very weak stratification pattern.

In the Lake, which is dredged to 24 feet, about twice the depth of the ICW or the North Straight, the water was significantly more saline (32‰ max) than the ICW (28-29‰) or the North Straight (26-28‰). With depth, the Lake water evidenced both salinity and temperature stratification, though the gradient was weak (Sta. 061676-1149, Fig. 9, 36, and 37). The source of the relatively saline (32‰) bottom water posed a problem, as it was more saline than any tributary known definitely at that time. However, the February 1977 (Sta. 021477-1620; Fig. 35) sampling showed that during the winter, the ICW increases in salinity to 32‰ and is in direct communication with the lake bottom water (Fig. 39). This point is discussed at greater length below.

Proceeding further into the canal system the summer waters became somewhat fresher and warmer than the Lake. The observed minimum salinity, 16.5‰, and miximum temperature, 31°C, were at station 061676-1515, a dead end canal at the southwestern extremity of the system (Fig. 17). Numerous small perched springs were observed along the canal banks in this canal segment, evidently drainage from the surrounding sandy pine barrens.

A small amount of freshwater surface runoff also was entering the canal through the two culverts at the western end of the property. At station 061676-1242 this influx depressed the salinity to 21‰.

(2) <u>During the February 1977 sampling period</u>, water temperatures at every station were about 9°C colder than in the summer, and salinities were 1 to 6‰ greater at the same depths. In addition, at canal stations vertical stratification was much better developed in the winter (Fig. 39, 40, and 41).

The ICW (Station 021477-1620; Fig. 35) contained 32.2 ‰, 20.5°C water, exhibiting no vertical stratification. However, proceeding into the canal system at the same stations as in the summer, the canal water was observed to form a relatively cold, saline wedge that was continuous along the bottom to the Lake and beyond (Fig. 39 and 40). In fact, bottom water with close salinity and temperature similarity to the ICW was found at all stations except those in the most isolated dead end segments at the western and southern extremities (*i.e.*, except at Stations 021477-1422, 1428, 1535, 1542 and 1602). Thus, a direct route for entry of relatively saline water into the deep Lake bottom seems proven, and it is apparent that the saline Lake bottom water is a relict from previous winters (and perhaps droughts) when the ICW reaches a salinity maximum and penetrates into the Lake as a saline wedge. This explanation is reinforced by the observations of Land, et al. (1973, p. 28) concerning the El Rio canal at Boca Raton in the southern part of the same county,

> "When rainfall is about normal, sufficient flow over the control causes the chloride content to be approximately the same on the upstream as on the downstream side. Several times between October 1970 and April 1971, high tides topped the weir, which caused salt water to become trapped in the bottom of the controlled reach of the canal.
>
> "During the prolonged droughts of 1970-71, pumping in the Boca Raton well field diverted the trapped salty water from the canal into the aquifer and toward the pumping well; this resulted in temporarily curtailed use of several wells. Subsequent freshening of the aquifer occurred after the rainy season of 1971 began."

Also, Land, et al. (1973, p. 27-28) noted that, " . . . Reduced flows in Loxahatchee River, due mainly to Canal 18 diversion from the Loxahatchee Slough into the Southwest Fork and irrigation operations, have permitted sea water to advance up the river. In the past, high flows effectively kept sea water in the vicinity of the river's mouth. Sea water now extends several miles upstream."

It is also possible that solar evaporation, with consequent sinking of the higher density saline water into the canal deeps, occurs in the summer. However, the evidence for this is less conclusive than for winter introduction from the ICW.

The principal detrimental effect of the saline bottom water is to increase the potential rate of salt water intrusion into the shallow aquifer. This is enhanced both beacuse of the increased density of the saline bottom water and because the deeply-dredged holes increase the exposure of the aquifer to intrusion. Improved canal design criteria should include consideration of the degradational effect of holes dredged well below the threshold depth, as they have commonly been constructed in Florida.

During the February 1977 measurements, surface waters were observed to be slightly fresher inland, reaching minima at the same locations as in the summer. Thus, at the southwestern dead-end projection (021477-1602), surface water salinity was only 20.5‰, versus 32.2‰ in the ICW. This fresher water was also slightly warmer and more turbid than ICW water, and a distinct fresher-warmer-more turbid surface water layer could be recognized through most of the canal system. This wedge pinched out before reaching the ICW (Fig. 39, 40 and 41).

(b) Dissolved oxygen (D.O.) is perhaps the single most important factor controlling the distribution of aquatic animal life. Therefore, it is considered here to be the best overall indication of water quality in the canal systems and is also a good indicator of the efficiency of canal flushing. D.O. was measured *in situ* with a YSI Model 51A meter, using moist ambient air for calibration at each station, and correcting for salinity, temperature, and elevation as necessary. Results have in all cases be converted to percent oxygen saturation using standard tables for the solubility of oxygen in sea water; this procedure minimizes the effect of seasonal variations in temperature and allows direct comparison from area to area.

Typically the shallow open water bodies (natural or otherwise) adjacent to the canals are near oxygen saturation at all depths. Wide, open bodies such as the Peace River estuary at Punta Gorda, subject to frequent wind and tidal agitation, are particularly well oxygenated and frequently supersaturated from top to bottom. Such areas can support large animal populations throughout the water column as well as numerous bottom dwellers.

The narrow Intracoastal Waterway adjacent to the 57 Acres canal project is slightly less oxygenated than the Peace River. Oxygen saturation decreased from 87% at the surface to 84% at the bottom (Fig. 3 and 35). However, tidal flushing is still quite good, and negligible oxygen stratification was noted. The canal receives considerable oxygen depleted drainage from mangrove swamps, and is protected from wind stirring; thus its D.O. is less than more open natural water bodies.

Proceeding into the 57 Acres canal system, oxygen saturation in the surface water remains high, similar to that in the open waters (Fig. 10). However, at depth oxygen declines dramatically, reaching 0% in bottom waters toward the inner end of the canals (Fig. 38 and 42). The oxygen depletion results, of course, from poor flushing of the bottom waters of dead end canals, particularly when the inner parts are dredged well below the threshold depth into open water (e.g., Fig. 9).

In the complex 57 Acres canal system, the oxygen saturation of bottom waters decreases progressively with distance from the nearest entrance to the Intracoastal Waterway (Fig. 42). The relationship between distance from an entrance and oxygen saturation is nearly linear (Fig. 43). It suggests that decline of oxygen saturation in the bottom waters is a function of residence time near the canal bottom, and it is probably due to respiratory depletion plus the oxygen demand of organic matter in the suspended and bottom sediments. Organic matter is abundant in some of the canal bottom muds, reaching 26.4% in the extreme inner end (Fig. 44); such sediments normally exhibit high oxygen demand.

Part of the 57 Acres canal system is open to the Intracoastal Waterway at both ends, forming a circulation loop that is flushed by tidal action. Bottom waters in this loop exhibit much higher oxygen saturations than do dead end parts of the systems; however, the bottom waters in the part of loop farthest from the Intracoastal Waterway do show some decline. For example, station 061676-1304 declines from 92% at the surface to 61% at the bottom, coincident with a small increase in

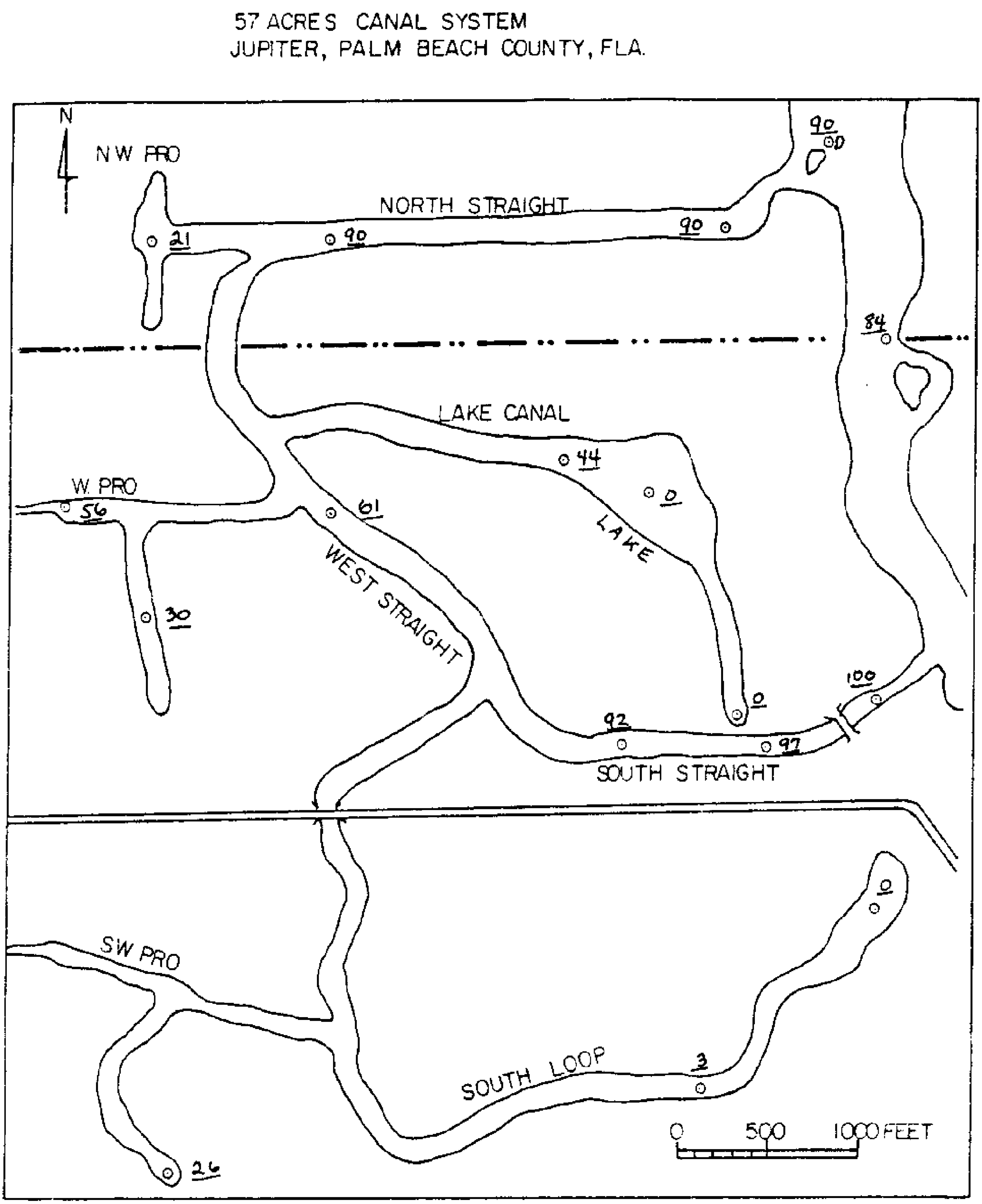



Figure 42. Oxygen saturation of water within 1 ft. of bottom on June 16, 1976.

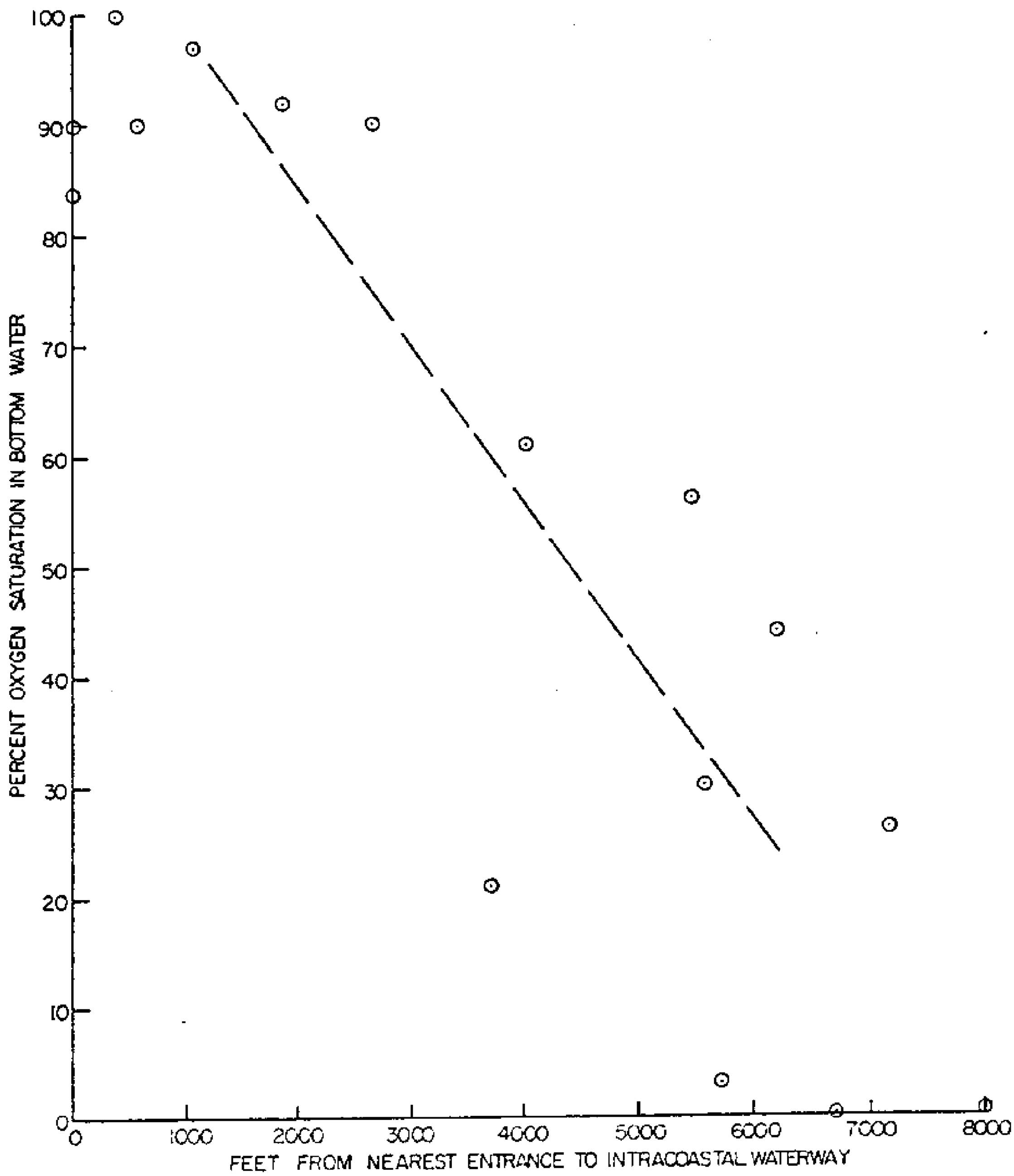



Figure 43. Relation of oxygen saturation in bottom water to distance from nearest entrance to Intracoastal Waterway, 57 Acres canal system, June 16-17, 1976.

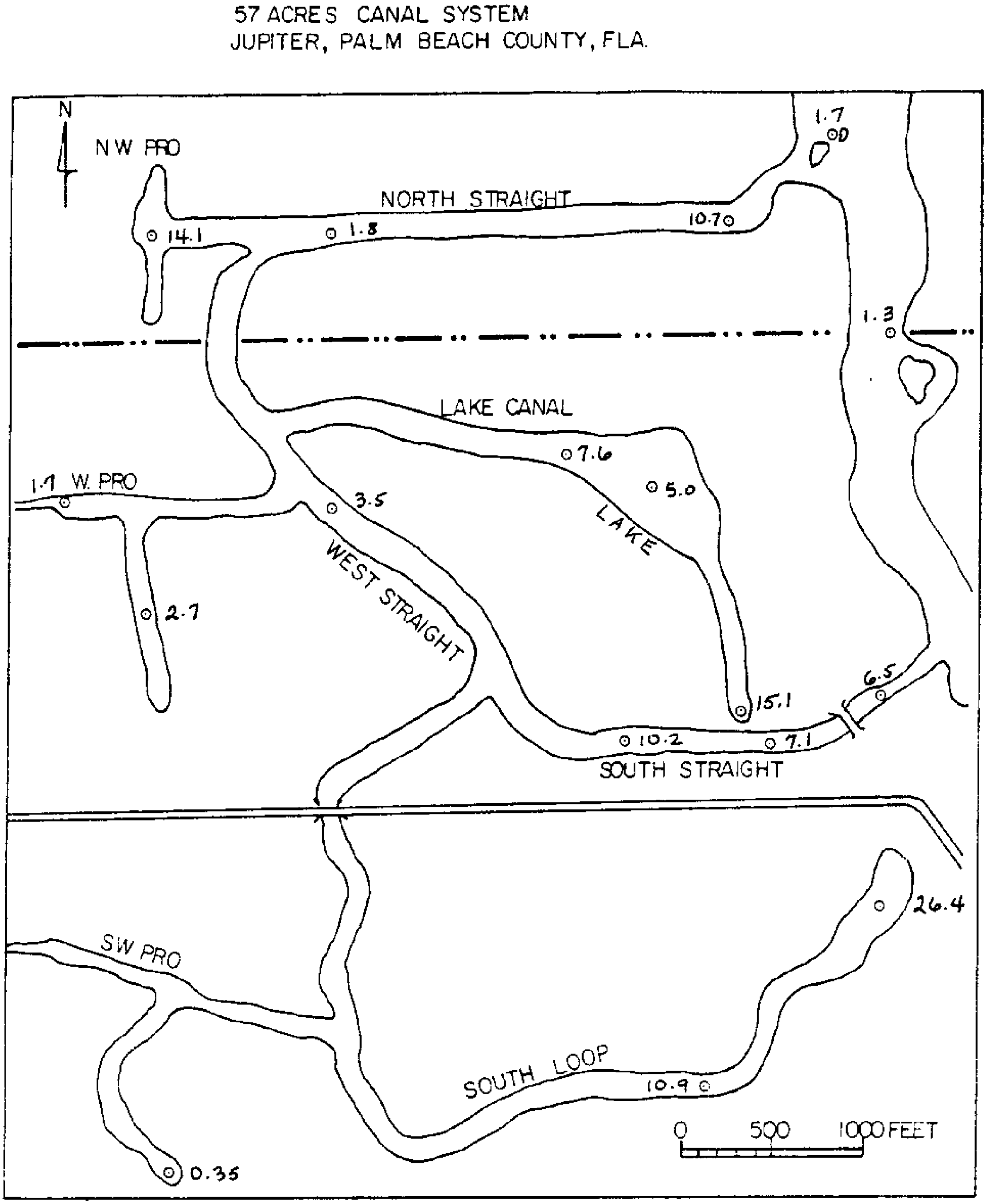



Figure 44. Organic matter (%) in bottom sediments.

water density (Fig. 13).

Oxygen depletion of canal bottom water should not be taken _a priori_ as an indication of pollution from septic tanks or similar sources. In fact, the 57 Acres canal system is completely undeveloped and without sources of pollution; not one structure has been built or one septic tank installed, and there is no sewage discharge or significant wastedisposal operation entering the canals. However, oxygen depletion _does_ indicate poor circulation and introduces at least one potential environmental problem, specifically fish kills in the canals.

In canals with oxygen-depleted bottom waters fish can inhabit only the oxygenated upper layer. If the oxygen depleted bottom water is driven as a body to the surface, mass mortality of organisms can result. A similar phenomenon has long been known in natural water bodies that have pockets of oxygen depleted bottom waters (_e.g._, Chesapeake Bay). The kills are associated with wind conditions that lead to upwelling; in canals this would most likely occur with strong winds parallel to the canal axis, blowing surface waters out of the canal and causing upwelling of bottom water near the canal head. A persistent fish kill in a Key Largo canal is, I believe, of this origin. The potential for this type of fish kill seems quite good in some of the canals being investigated, as the oxygenated surface layer is frequently only 2 to 4 feet thick. A common method of dredge-fill canal construction, with a long straight stretch and a deep basin directly at the inner dead end, would seem to be conducive to upwelling of oxygen-poor waters. Thus, an element of improved canal construction should be to minimize dredging of deep pockets near canal heads or in other locations conducive to upwelling.

The observed coincidence between relatively high salinity and low dissolved oxygen in deep holes has been reported in large natural water bodies hydrologically analogous to the canals. For example, Lake Maracaibo, Venezuela (Redfield, 1958, p. 970-71), where seawater enters the lake over a threshold and collects in depressions during an annual season of deficient rainfall, and in the Norwegian fjords (Strøm, 1939, p. 356-61), where it is also attributed to sea water occasionally "spilling" inward over the threshold. In the latter case influx of relatively dense water (either through salinity increase and/or temperature decrease) displaces the oxygen depleted bottom water and causes mass mortality of organisms in the upper part of the water column. Another natural body analogous to the canals is the Black Sea (Smirnow, 1958), where the saline bottom water enters over the sill from the Mediterranean Sea; Black Sea waters contain no oxygen from 500-700 feet to the bottom near 6000 feet.

2. Loxahatchee River Canals

Two short residential canals extend eastward from the

Loxahatchee River in SW Martin County (Fig. 45) The North Canal has vertical concrete seawalls in place, but no houses or other structures had been built at the time of sampling. Some erosion of the sandy spoil through gaps in the seawalls was noted.

The South Canal is even less developed, and was without concrete seawalls; the dirt banks slope directly into the canal. The area between the North and South was being used as a trash dump; and some trash was falling into the South Canal, especially at its inner end.

Salinity, temperature, and dissolved oxygen values in the Loxahatchee River indicated slight stratification, noticeable mostly in the temperature profile (Fig. 49, Sta. 061776-1547). Proceeding into the North Canal, slight changes occur in all three parameters:

(a) salinity increases by approximately 2 %.

(b) Temperature decreases by less than 1° C

(c) bottom water is only 30-50% oxygen-saturated in the canal vs. 82% in the river.

However, stratification remains weak except in the D.O. profiles (Fig. 46-48 and 50-52).

The differences in salinity and temperature indicate that interchange between the river and canal is sluggish; this allows time for the bottom canal water to become partially depleted of oxygen. However,

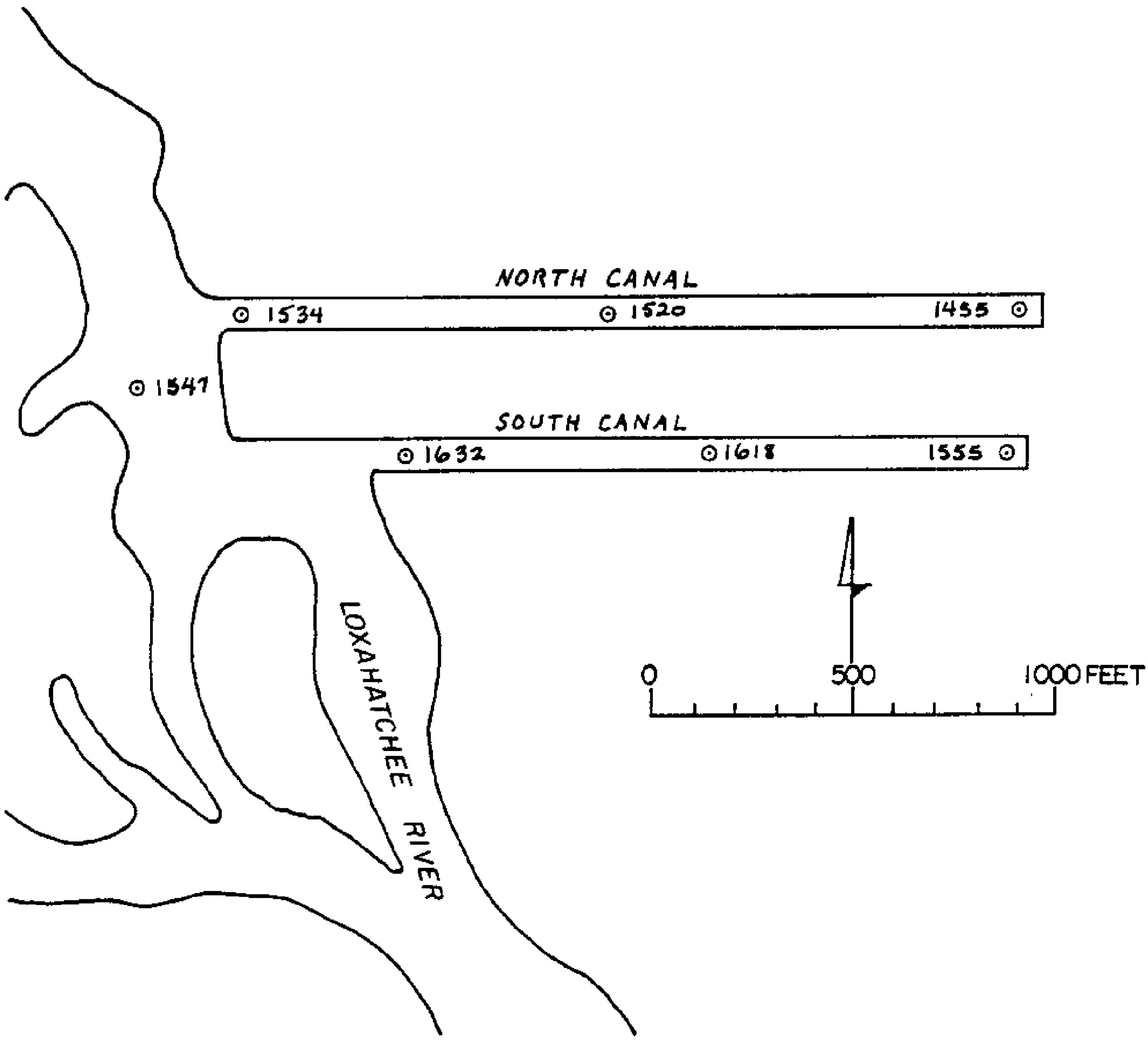



Figure 45. Location map and stations occupied on June 17, 1976. Loxahatchee River canals.

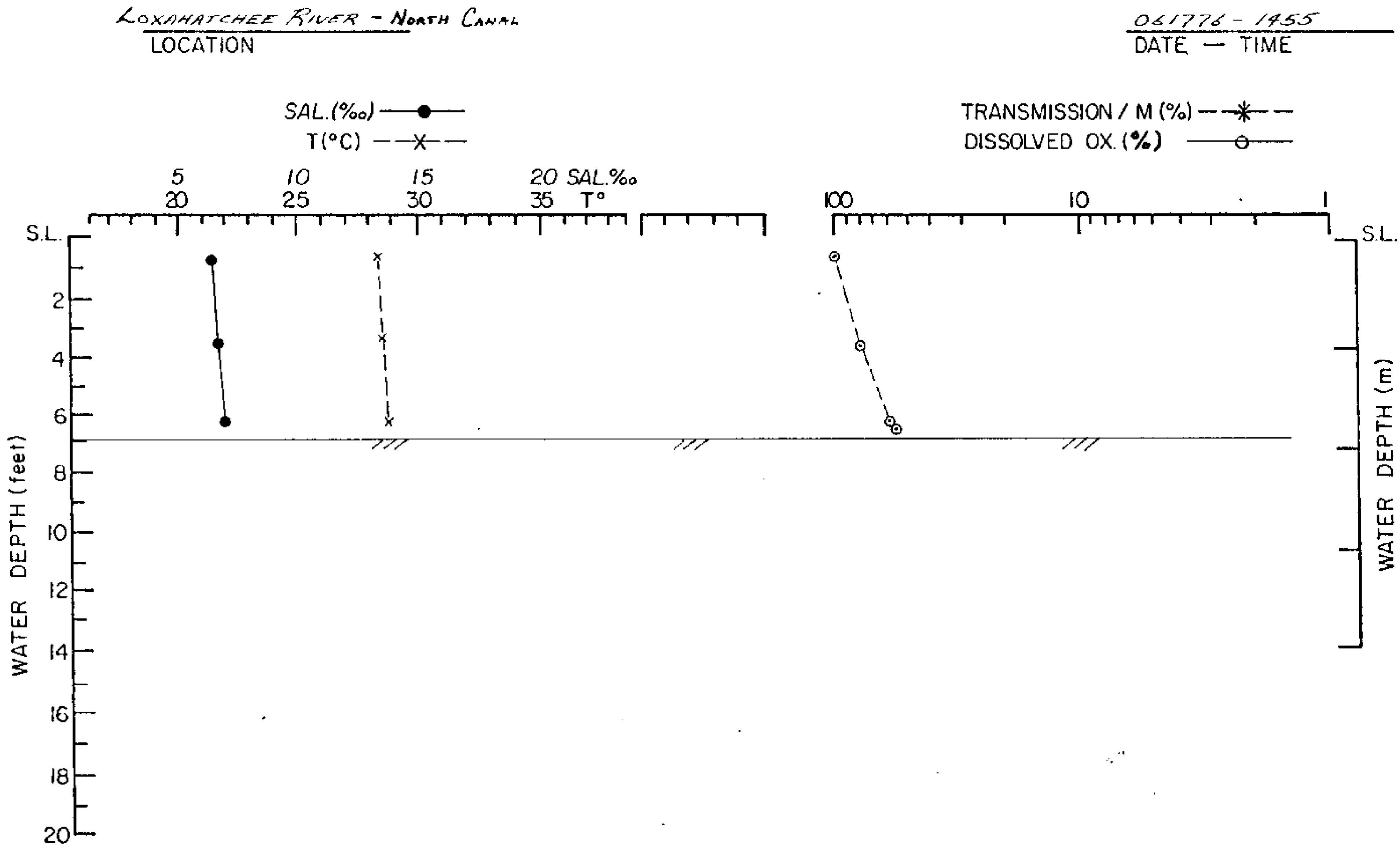



Figure 46. Salinity, temperature, oxygen saturation profile of Station 061776-1455.

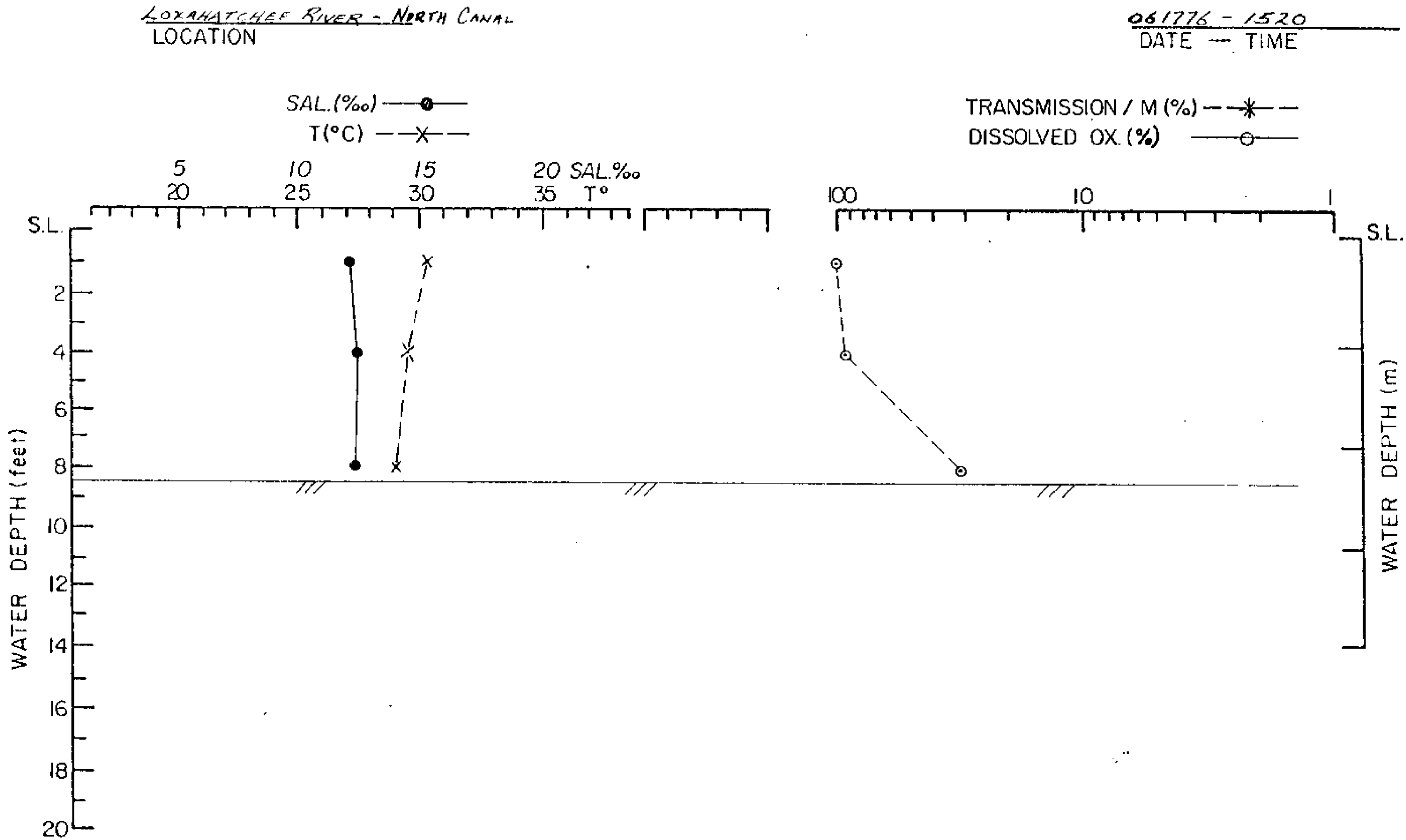



Figure 47. Salinity, temperature, oxygen saturation profile of Station 061776-1520.

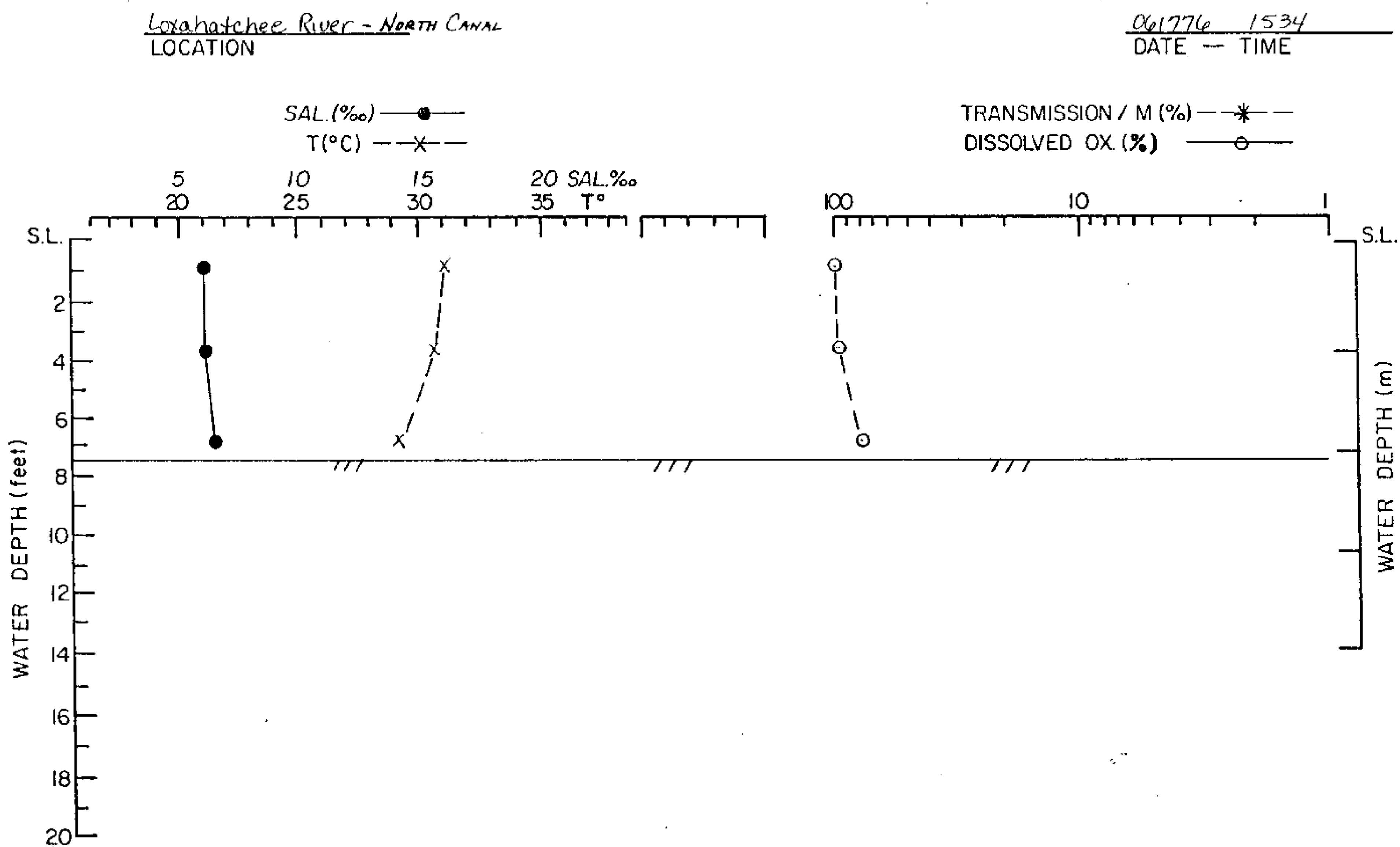



Figure 48. Salinity, temperature, oxygen saturation profile of Station 061776-1534.

Loxahatchee River
LOCATION

061776 1547
DATE — TIME

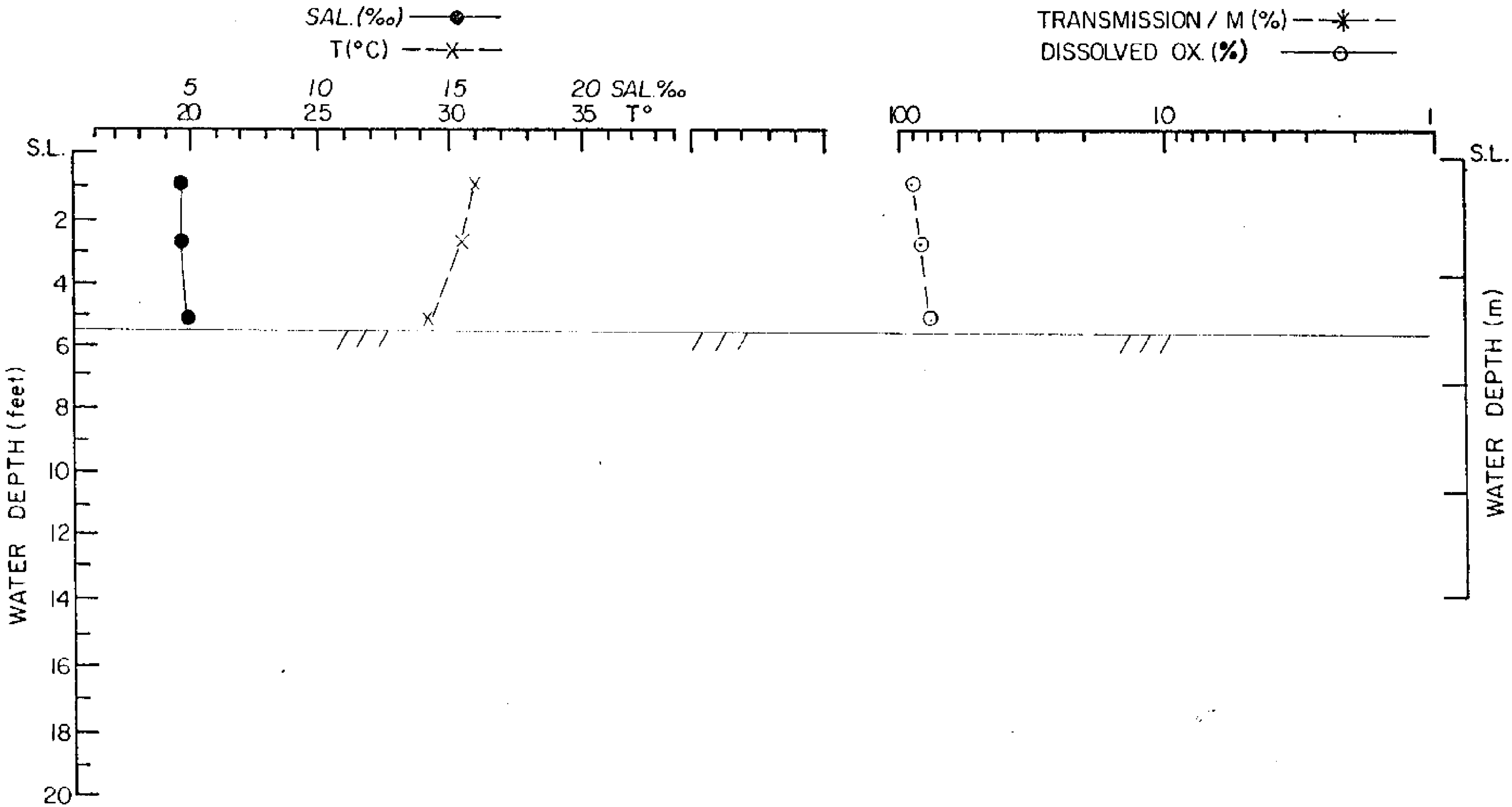



Figure 49. Salinity, temperature, oxygen saturation profile of Station 061776-1547.

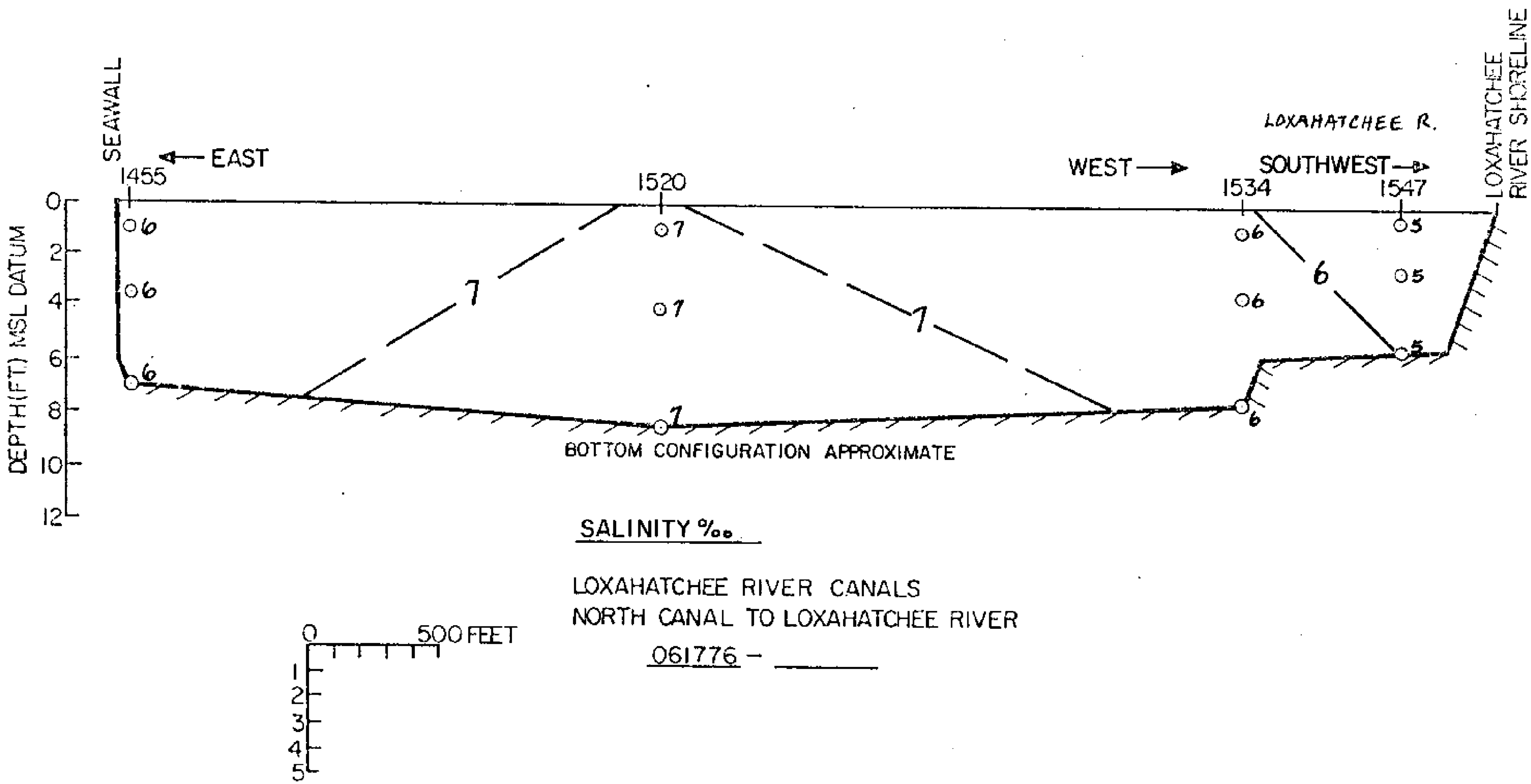



Figure 50. Salinity cross-section of North Loxahatchee River canal on June 17, 1976.

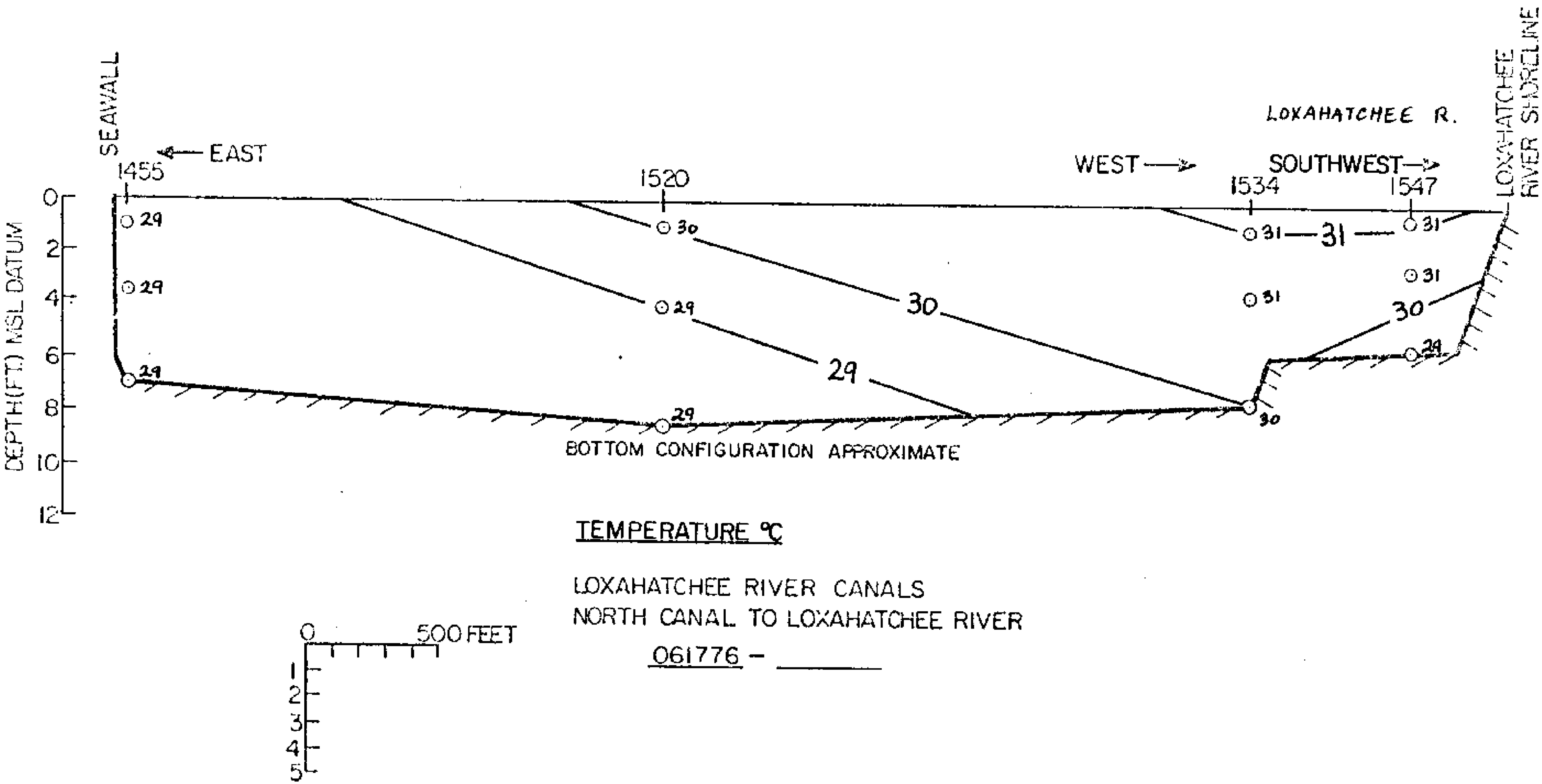



Figure 51. Temperature cross-section of North Loxahatchee River canal on June 17, 1976.

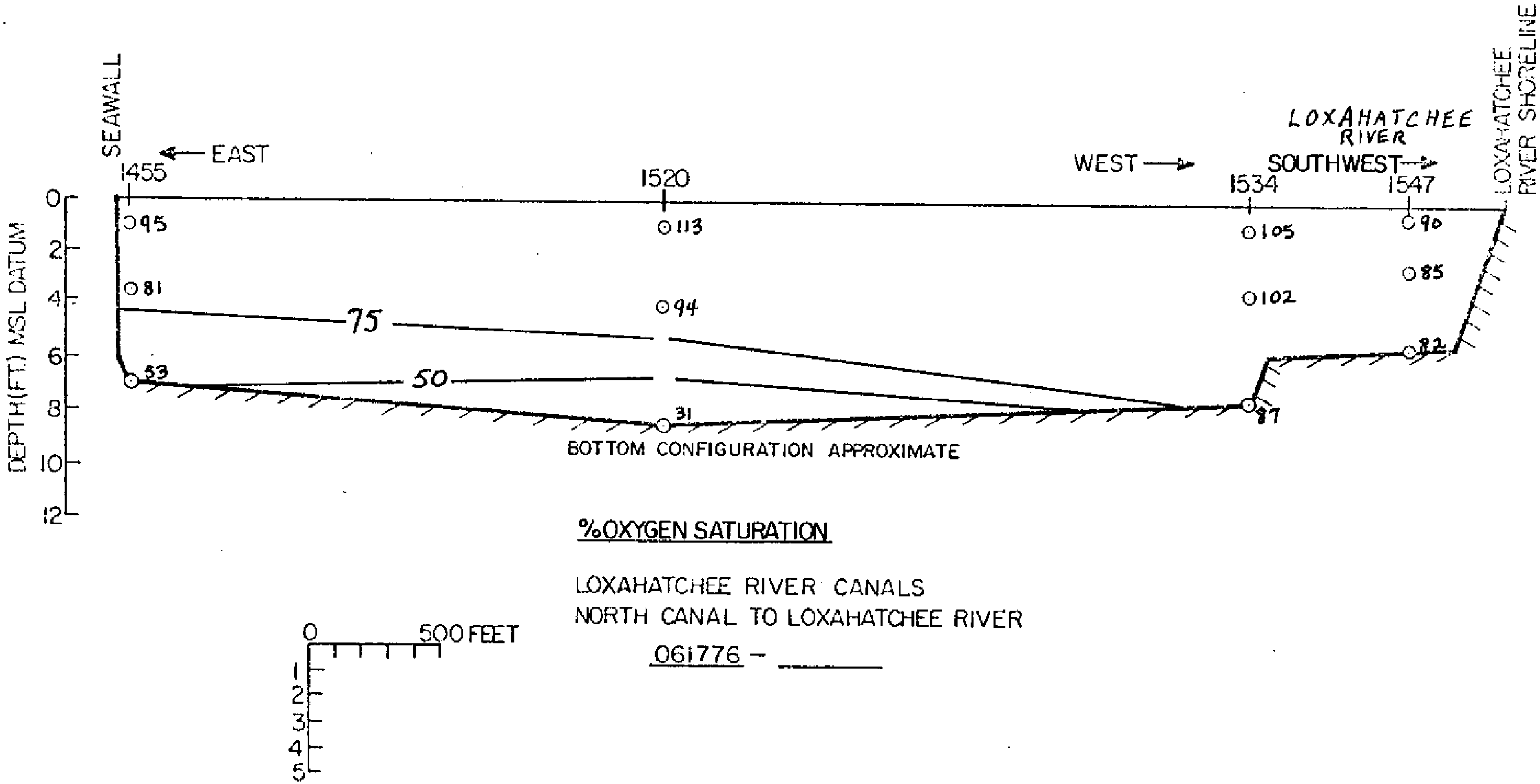



Figure 52. Oxygen saturation cross-section of North Loxahatchee River canal on June 17, 1976.

the D. O. remains higher than most of the other canal systems and would not seem to pose an important environmental problem.

The undeveloped South Canal, parallel and within approximately 400 feet of the North Canal, is surprisingly different in salinity and D. O.. Salinity is 11-14‰ in the South Canal vs 6-7‰ in the North Canal; D. O. saturation in the bottom water is only 5-10% vs 30-50% in the North (Fig. 53-58). Both canals were measured within a 2 hour time span and the instruments were double checked to assure validity; both canals had 7-9 foot depths and similar longitudinal profiles. The observed salinity differences do not seem firmly explicable by the observations in hand. However, the lower D. O. may possibly be related to the greater surface influx of swamp water in the unbulkheaded South Canal or perhaps by leaching of the trash dump. Neither of these hypotheses can be proved, and the best conclusion is that flushing is poorer in the South Canal, allowing more time for oxygen depletion. The higher salinity water may be a relict from previous lower river stages when a salt wedge may have penetrated upriver. A similiar relict situation for the higher salinity water in the deep 57 Acres canal system "Lake" has been described in an earlier section.

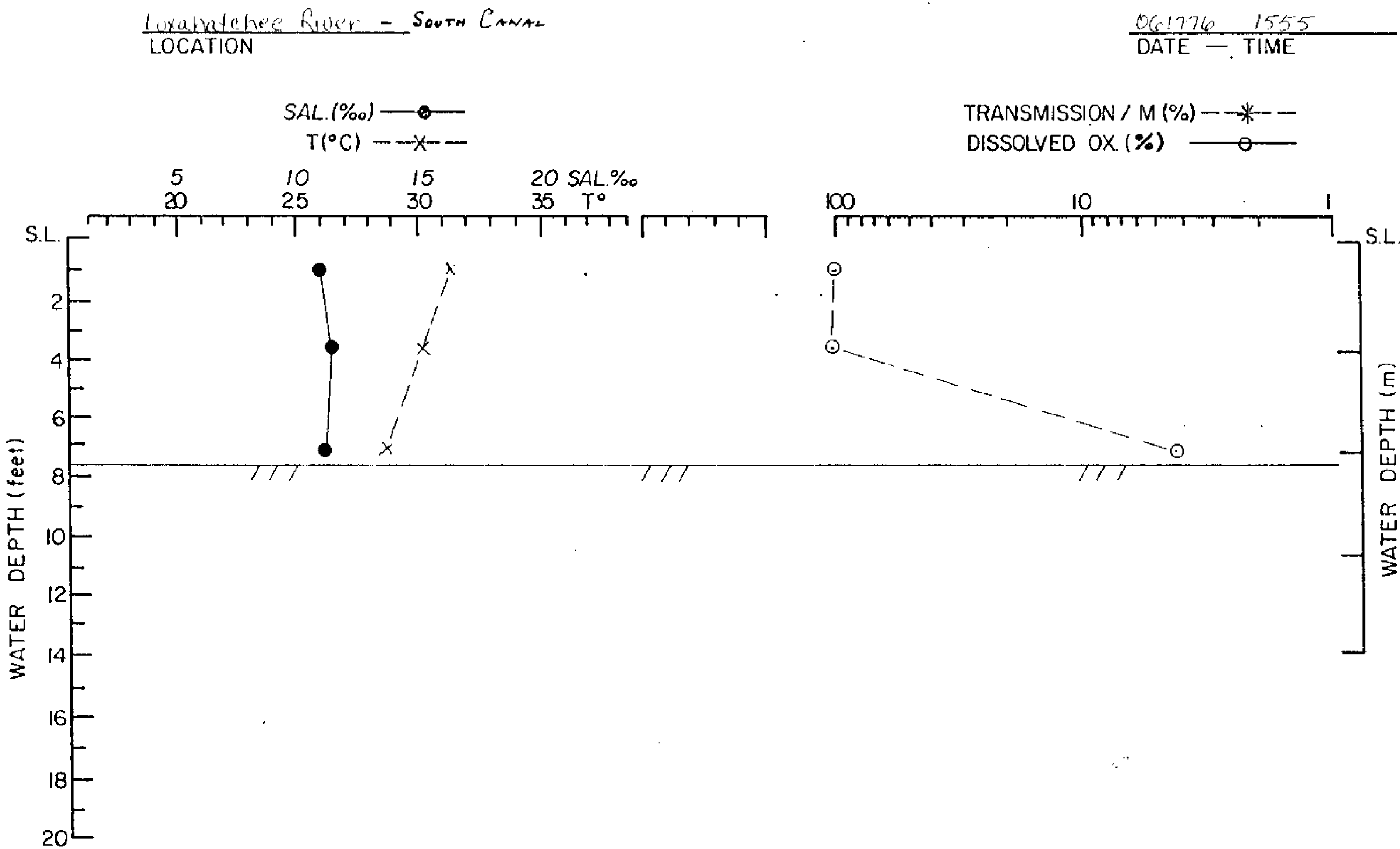



Figure 53. Salinity, temperature, oxygen saturation profiles at Station 061776-1555.

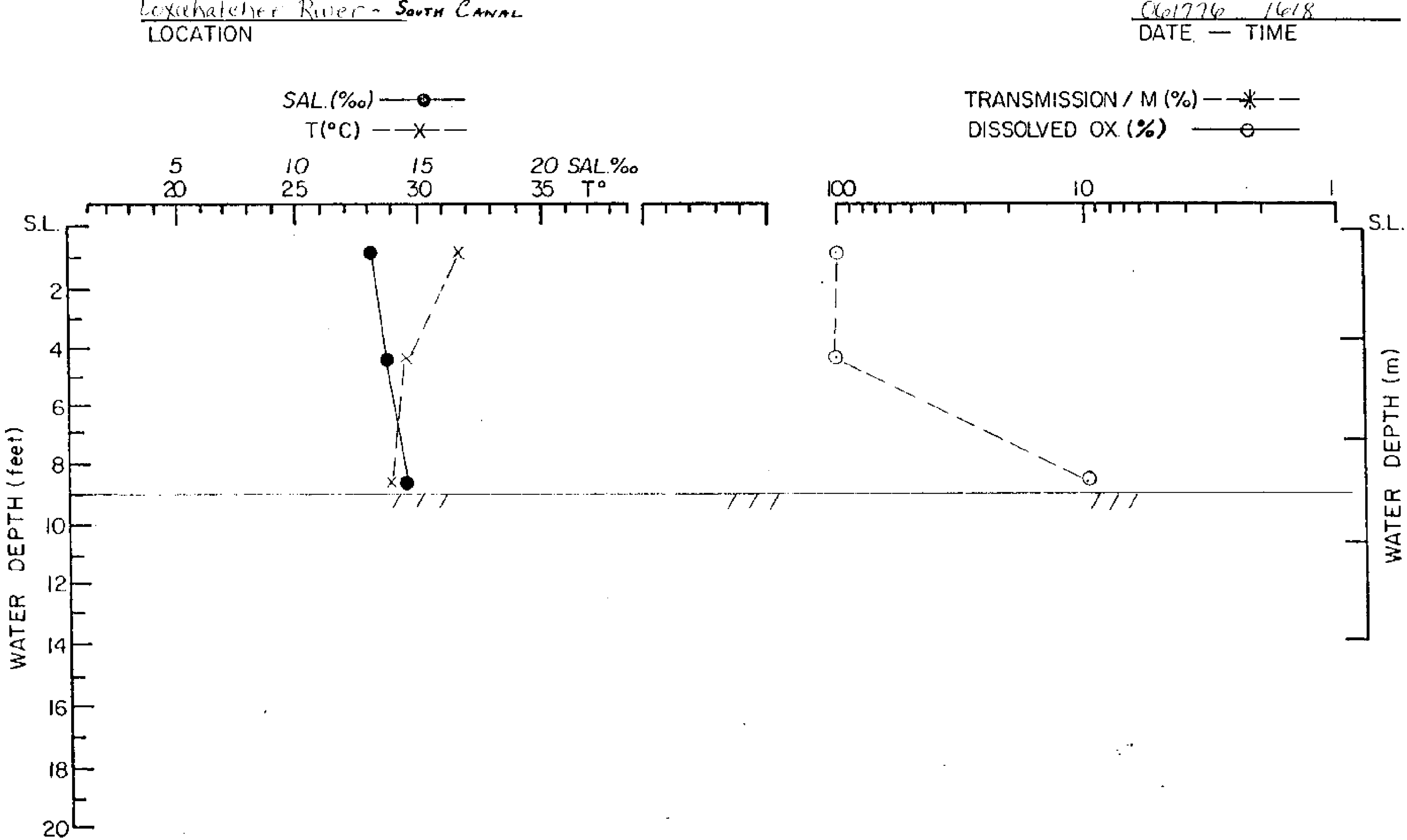



Figure 54. Salinity, temperature, oxygen saturation profiles at Station 061776-1618.

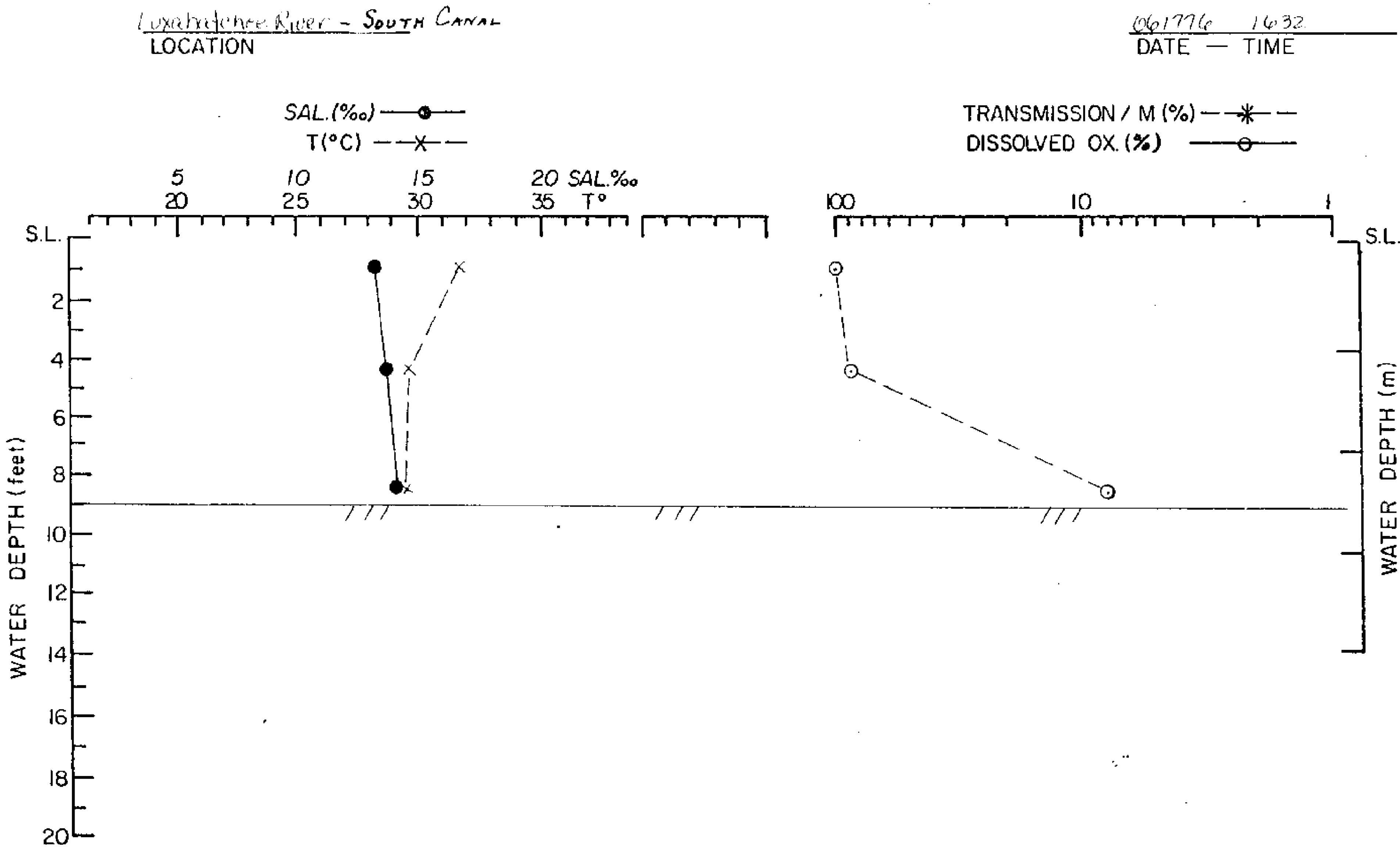



Figure 55. Salinity, temperature, oxygen saturation profiles at Station 061776-1632.

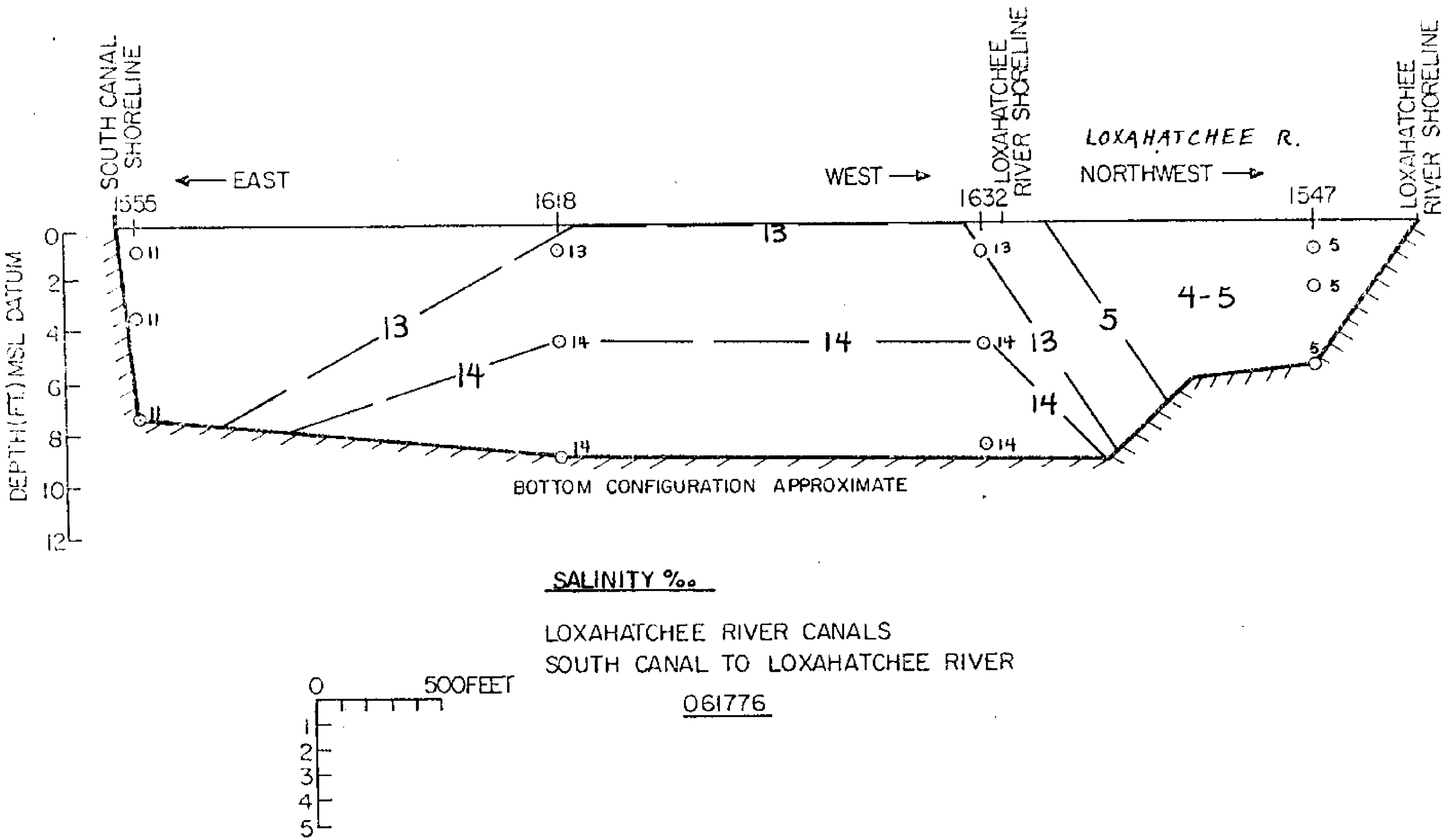



Figure 56. Salinity cross-section, Loxahatchee River to South Canal, June 17, 1976.

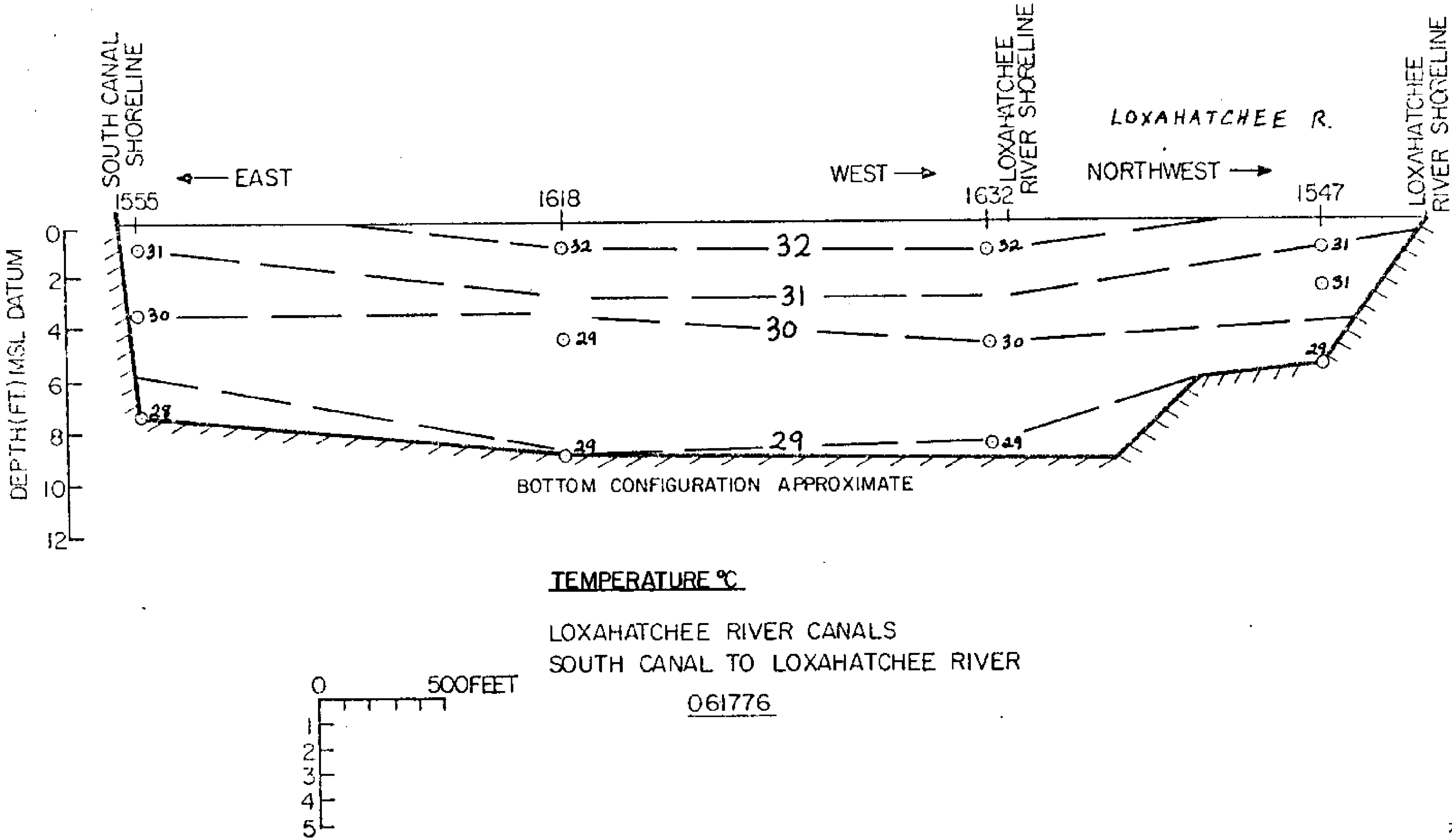



Figure 57. Temperature cross-section, Loxahatchee River to South Canal, June 17, 1976.

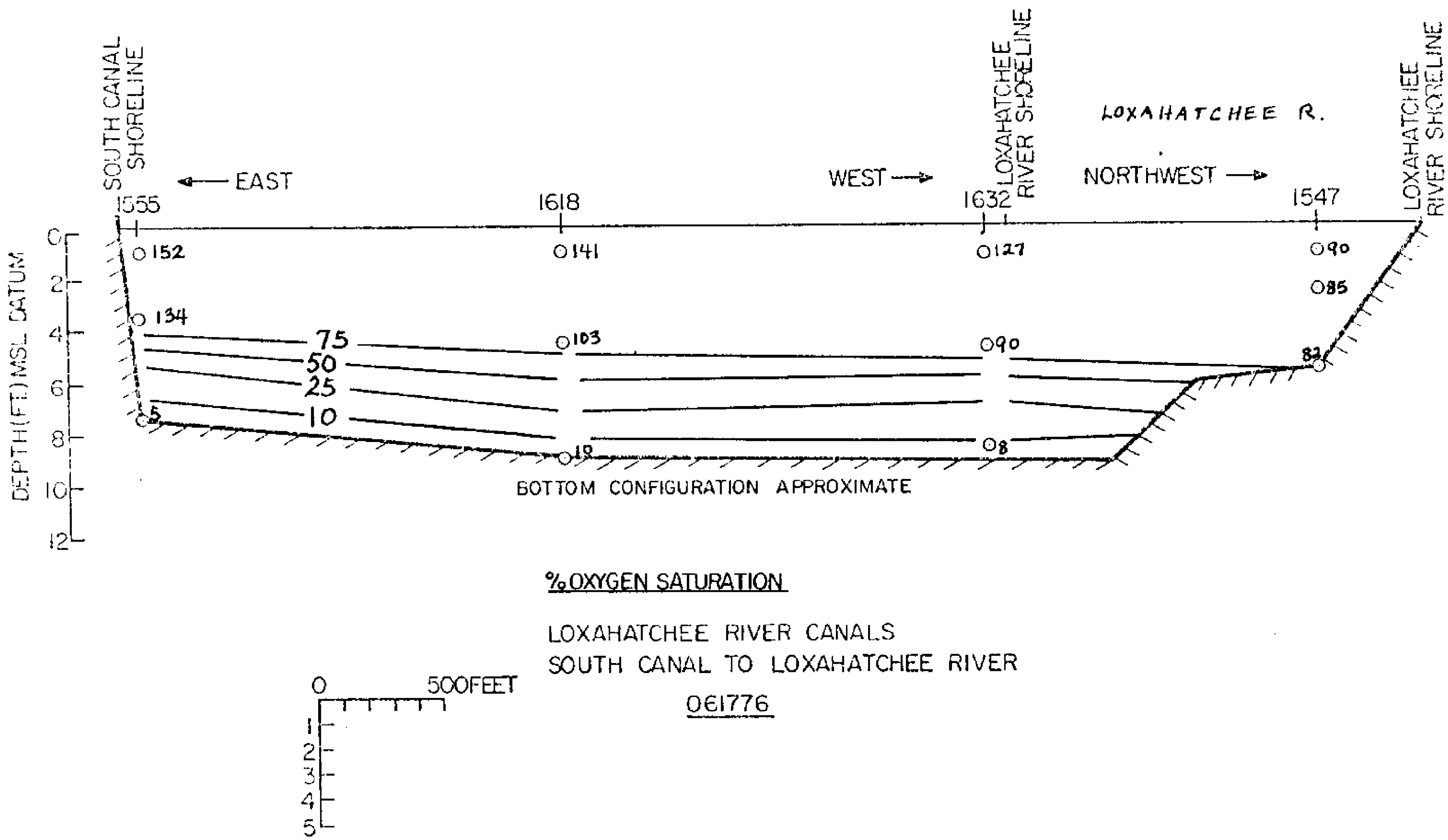



Figure 58. Oxygen saturation cross-section, Loxahatchee River to South Canal, June 17, 1976.

Again, it is interesting that flushing seems better in the canal with concrete bulkheads than one with sloping sandy sides.

3. Port Charlotte Isles - Bangsberg Waterway

Bangsberg Waterway is one of a large number of residential canals in the Port Charlotte development project. It is 2100 feet long, straight, deadended and oriented slightly west of N - S. The sides have been bulkheaded with concrete sheet piling, and the bottom is dredged to almost 14 feet MSL, or approximately 9 feet deeper than the adjacent Peace River Estuary. All of the residential lots are fully developed with thick St. Augustine grass carpets, palms, and lush ornamental vegetation. Street drainage enters through concrete culverts; otherwise little drainage enters. Trash from yard maintenance was ponded near the canal head.

Sample locations are indicated on Figure 59. Vertical S-T-DO profiles are shown on Figures 60 through 63, and cross sections on Figures 64 to 66.

The Peace River is a shallow, well-mixed, brackish, highly oxygenated water body, with negligible stratification Proceeding into the canal, the depth increases abruptly at the entrance, and landward from this point strong stratification exists in salinity, temperature, and oxygen saturation.

Salinity increased from near 17‰ at the surface, to approximately 27‰ in the deep canal bottom. Simultaneously, temperature declined from 31-32°C at the surface to 28-29°

2. Loxahatchee River Canals

The natural bottom of the Loxahatchee River adjacent to the canals is composed of fine to coarse sand, moderately well sorted, with subrounded and polished or frosted grains. Carbonaceous plant remains are common. Organic matter made up 6.45% of the sample, whereas $CaCO_3$ is essentially absent (0.09%).

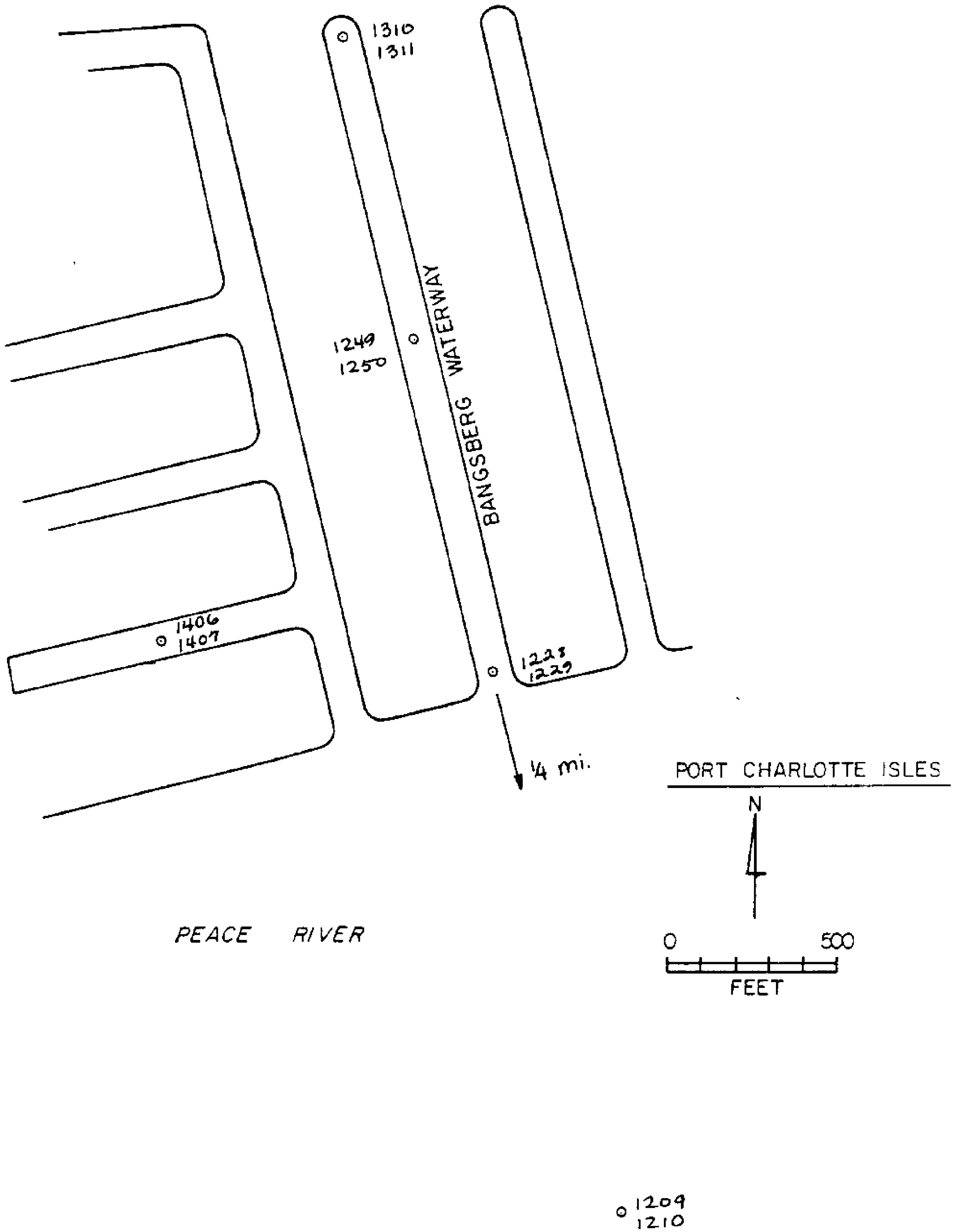
Proceeding in to the canals, the bottom sediment becomes much finer grained and can be described as a silt mud, sandy, and with much plant debris. Organic matter in the inner half of the North Canal averages 35%, and in the South Canal it averages 22%. $CaCO_3$ averages 0.11% in the North and 0.16% in the South Canal.

The finer sediments coincide with the deeper (9-10 ft.) canal bottoms, which act as sediment traps for the suspended material arriving from the river. The small amount of $CaCO_3$ represents the skeletal remains of foraminifera and mollusks living in the upper oxygenated parts of the canal and river water column. As is discussed more fully later, the clay mineral composition of the canal silts is similar to the suspended and bottom sediment of the river, from which the fines were evidently derived by lateral transport. Because of dredging, bulkheading, and trash deposition, the character of the natural bank materials could not be determined.

3. Port Charlotte Isles - Bangsberg Waterway

Sediment on the natural Peace River bottom is dominantly

Figure 59. Location map and stations occupied on July 10, 1976 in Port Charlotte Isles. Station numbers should be preceeded by 071076-____. Digits on figure are times of sampling.



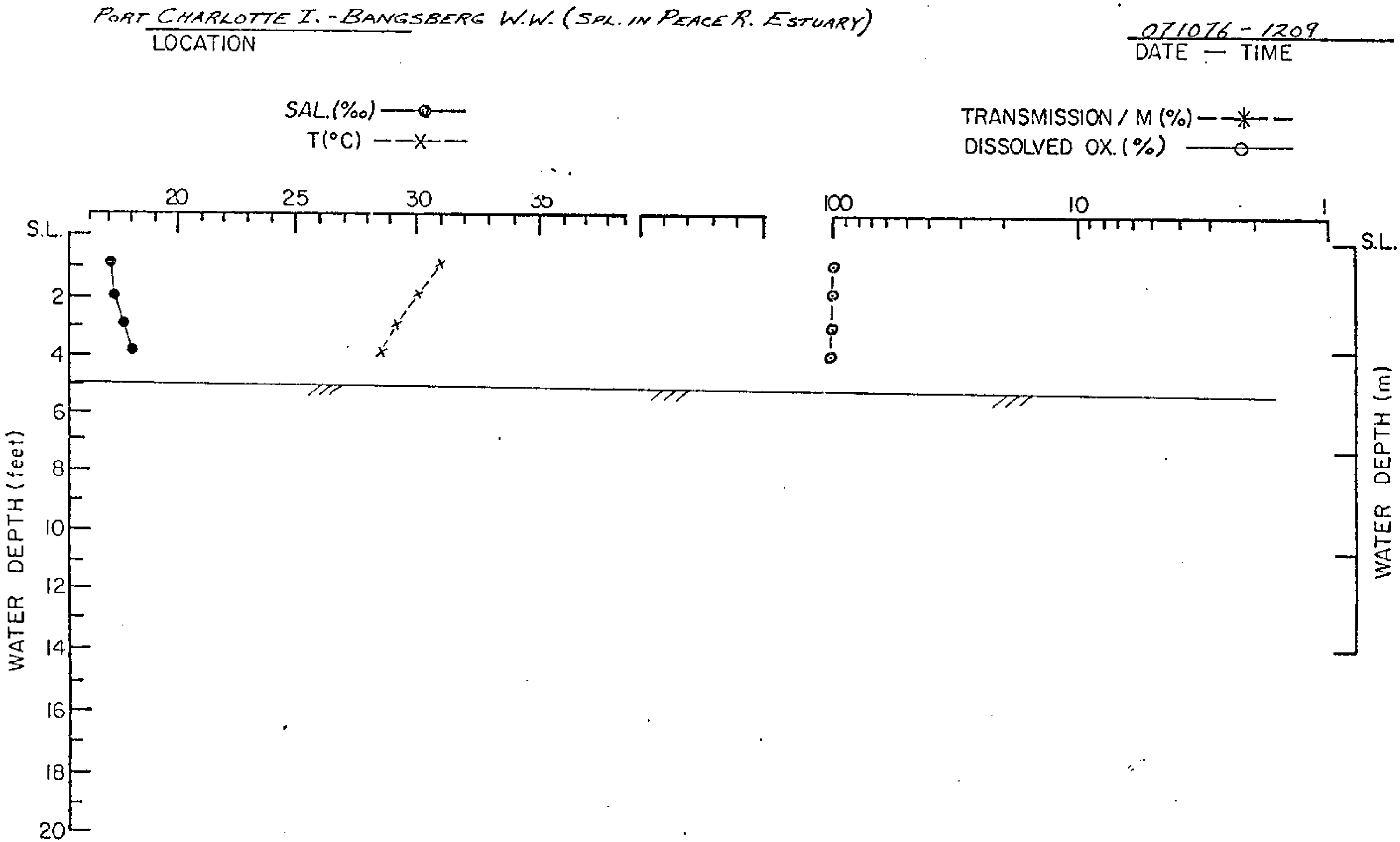



Figure 60. Salinity, temperature, and oxygen saturation profile of Station 071076-1209.

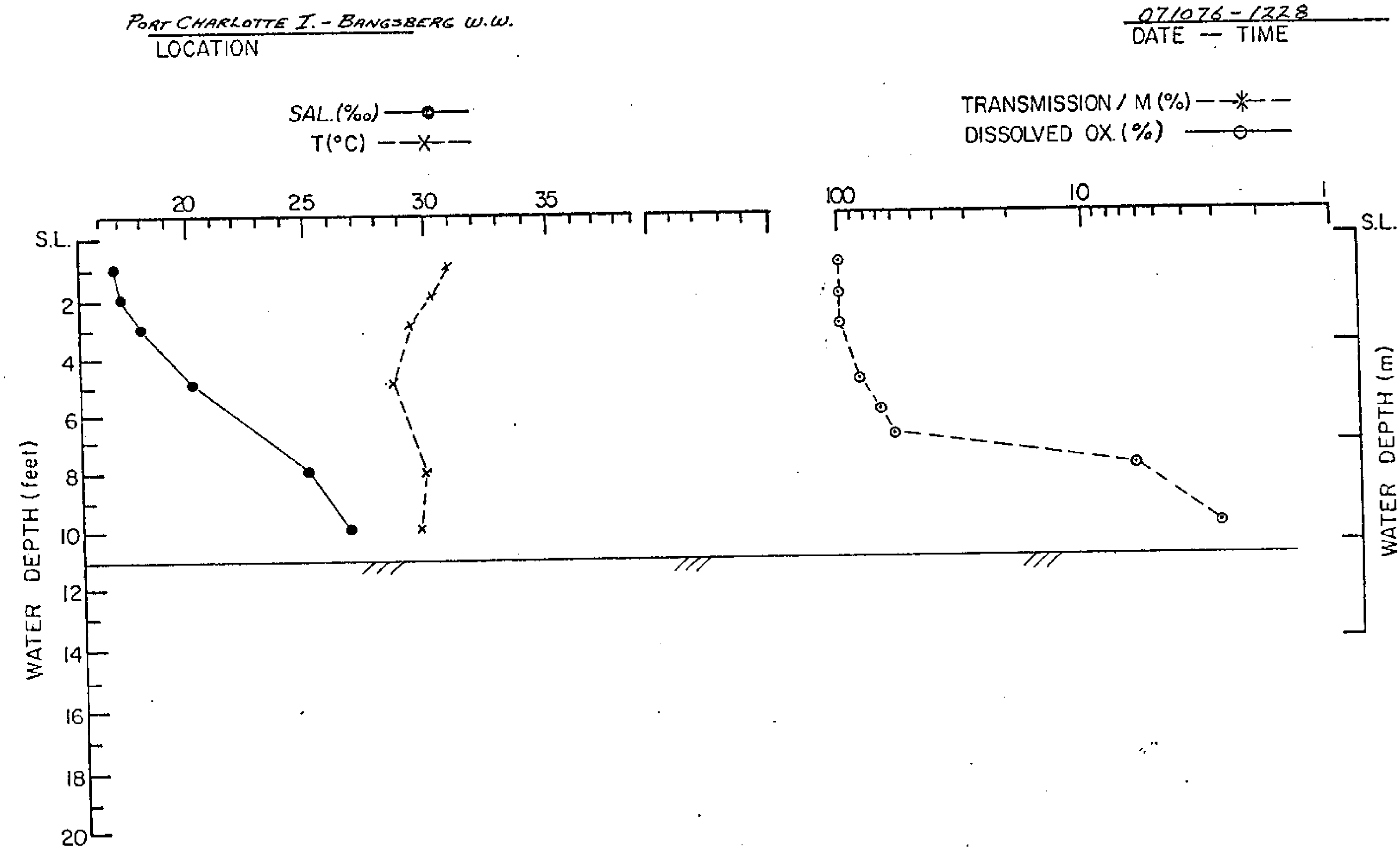



Figure 61. Salinity, temperature, and oxygen saturation profile of Station 071076-1228.

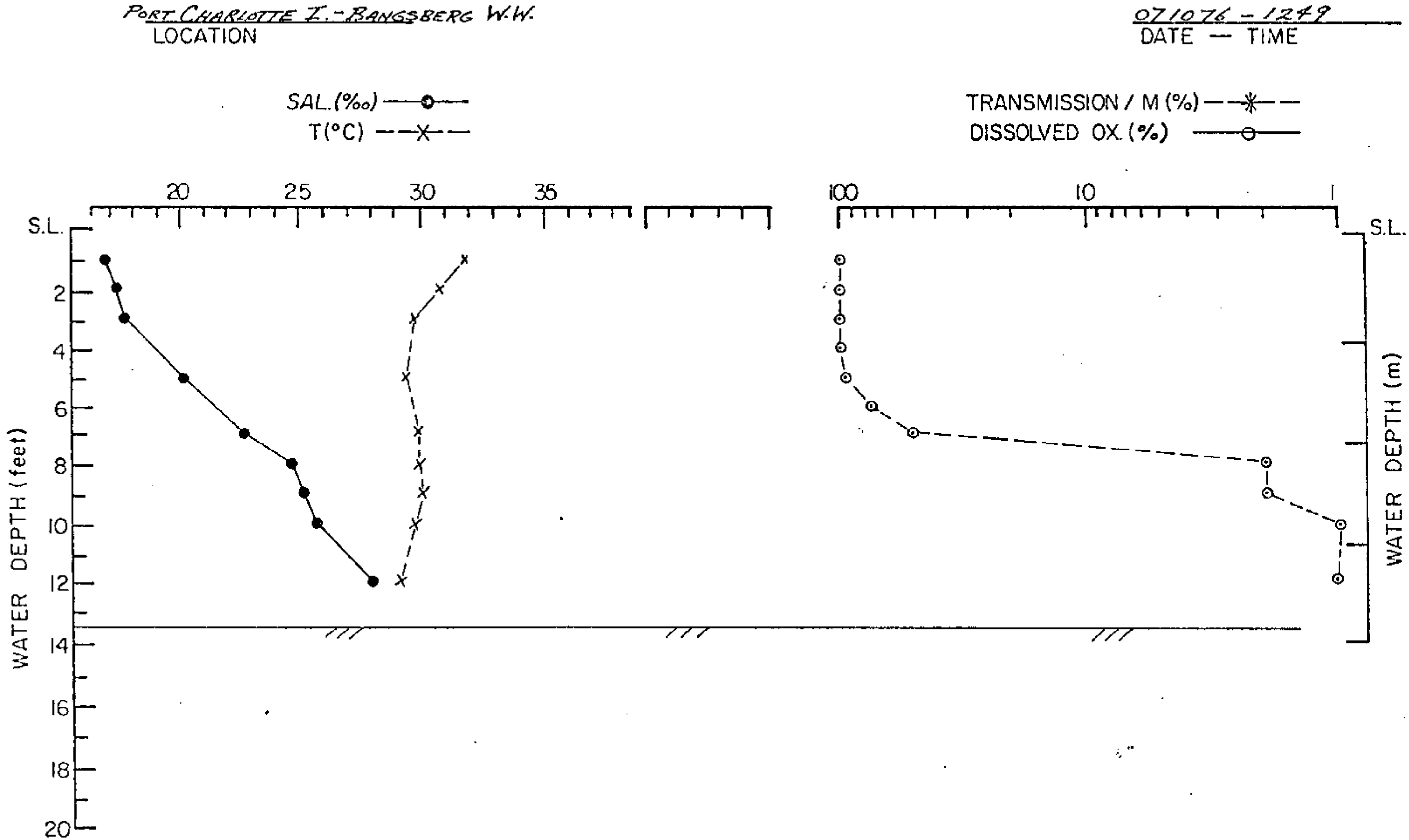



Figure 62. Salinity, temperature, and oxygen saturation profile of Station 071076-1249.

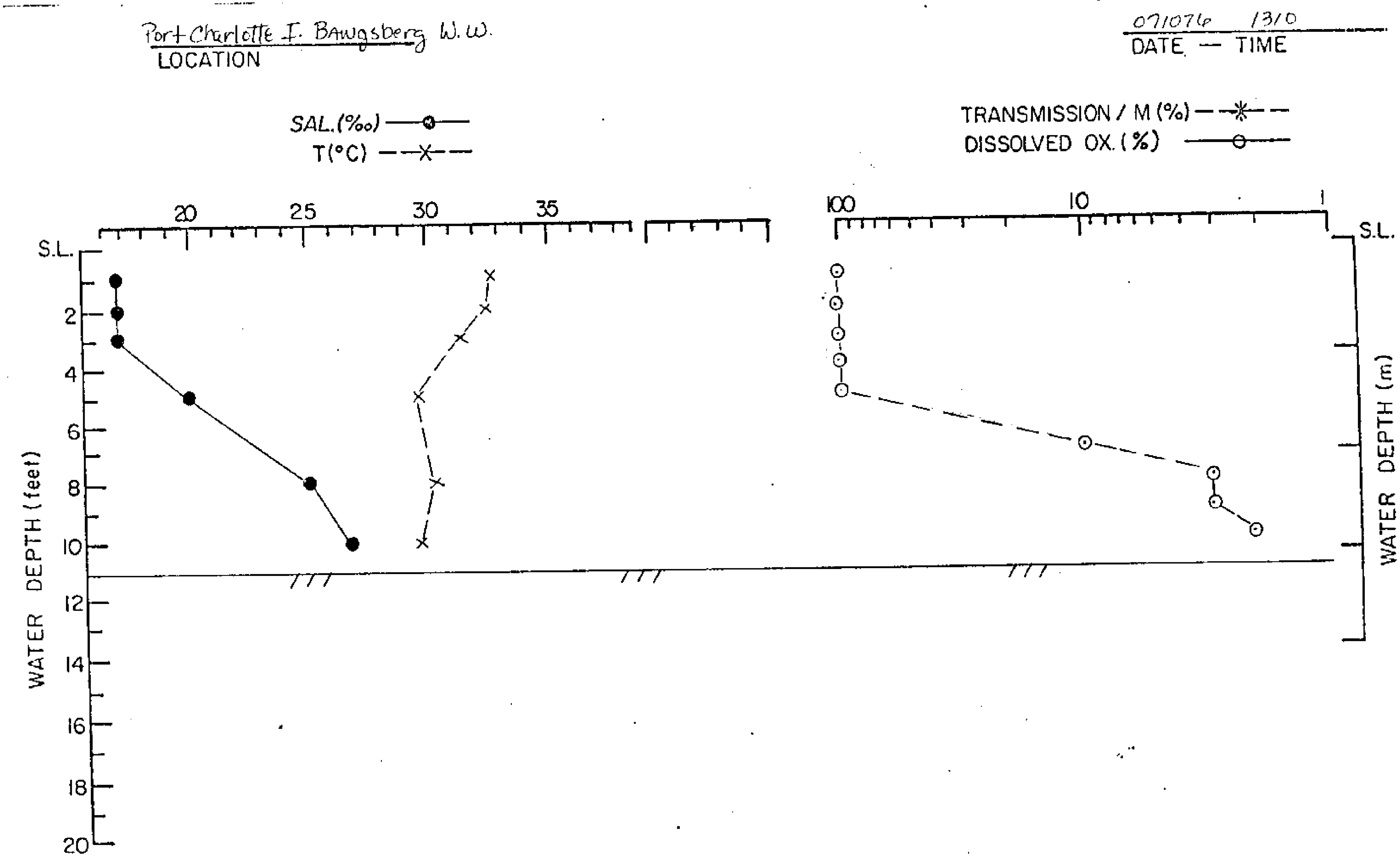



Figure 63. Salinity, temperature, and oxygen saturation profile of Station 071076-1310

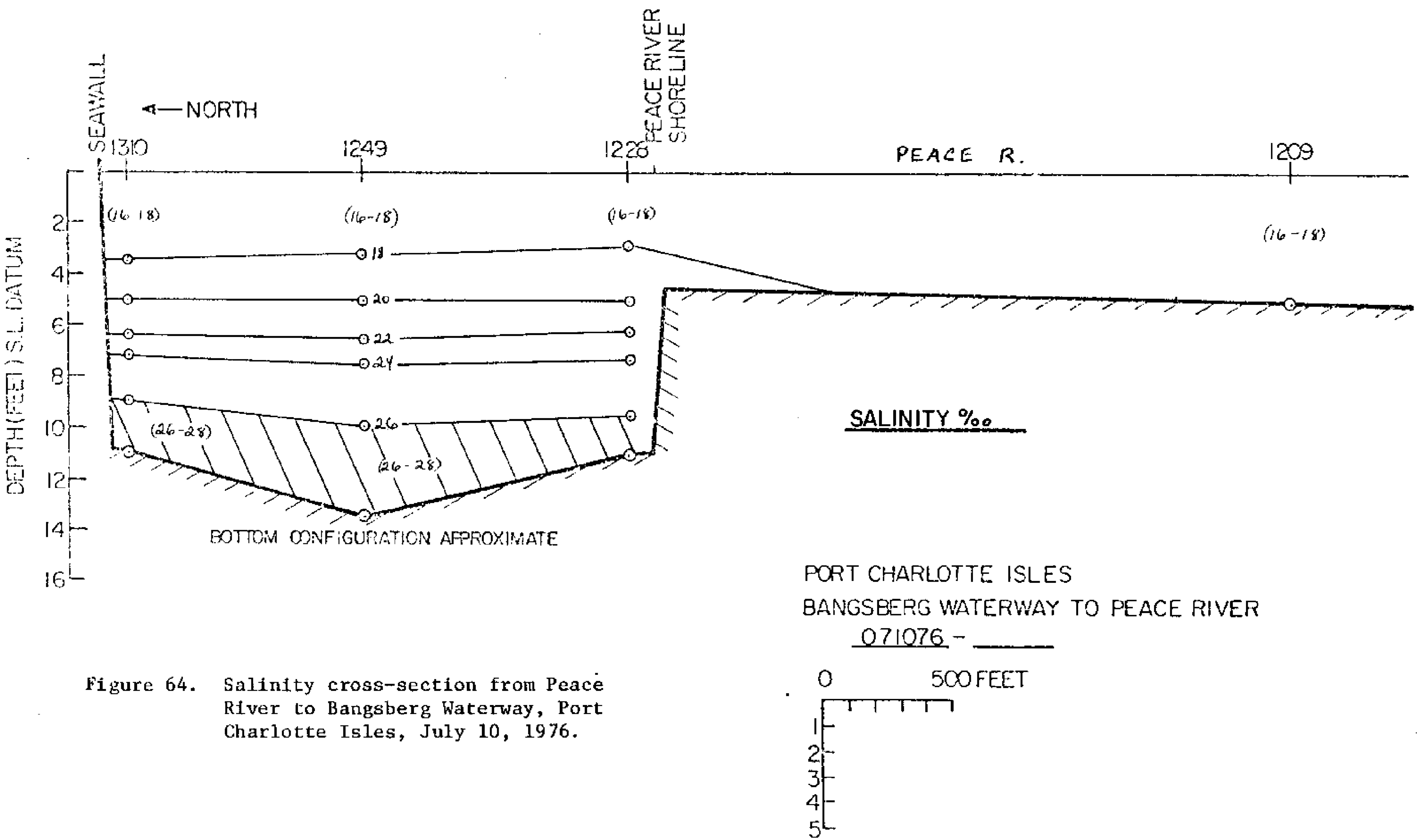



Figure 64. Salinity cross-section from Peace River to Bangsberg Waterway, Port Charlotte Isles, July 10, 1976.

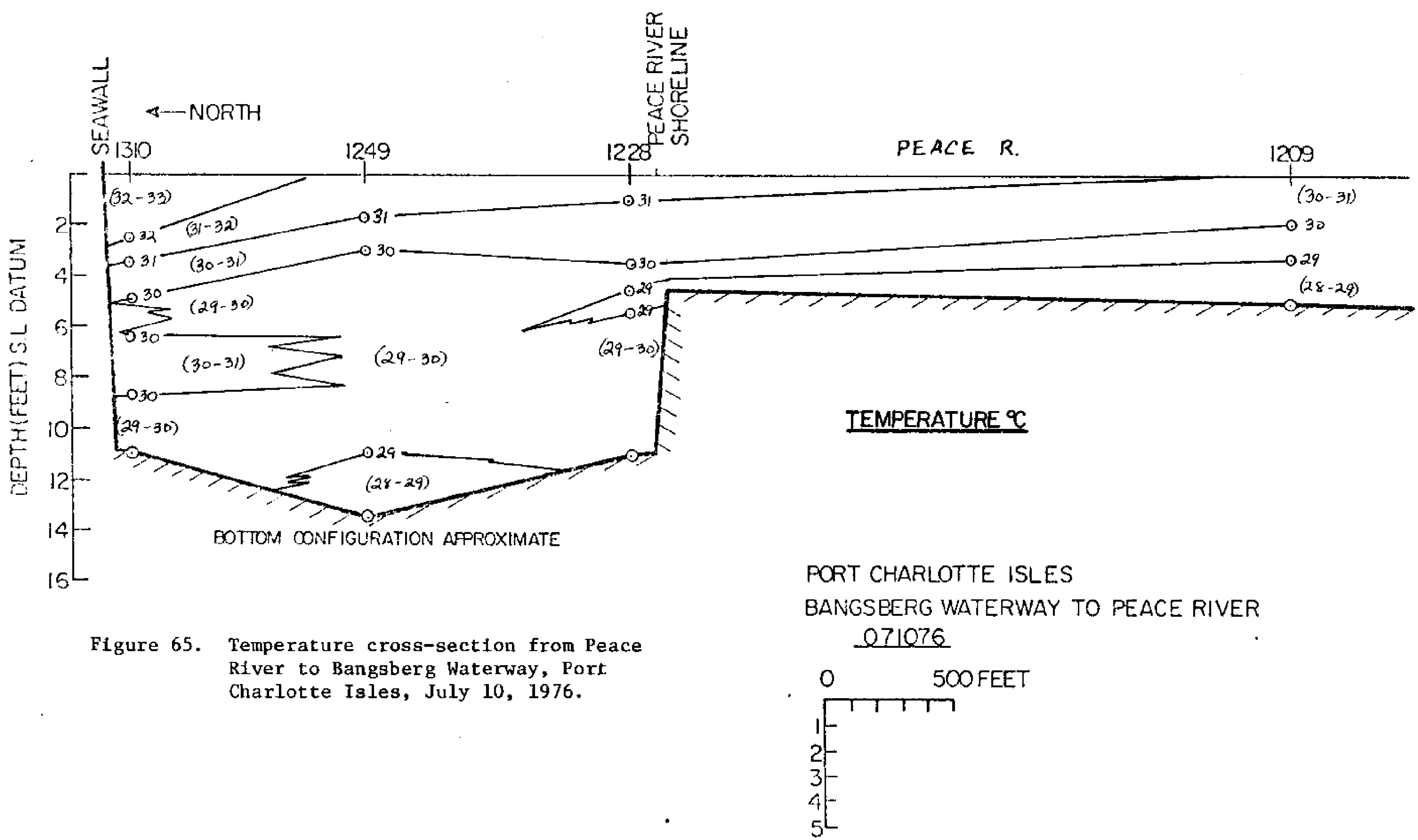



Figure 65. Temperature cross-section from Peace River to Bangsberg Waterway, Port Charlotte Isles, July 10, 1976.

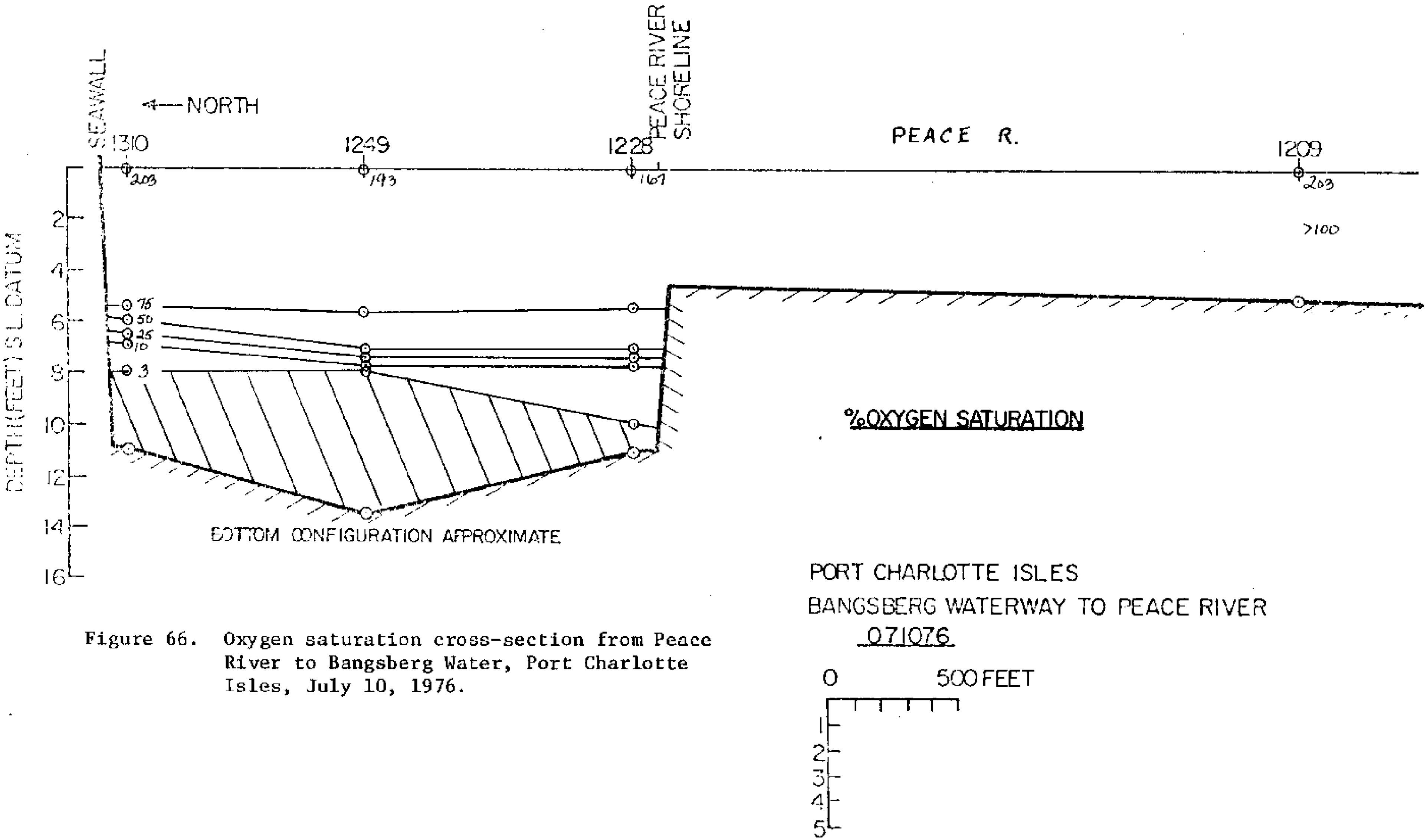



Figure 66. Oxygen saturation cross-section from Peace River to Bangsberg Water, Port Charlotte Isles, July 10, 1976.

at depth. The relatively saline water is interpreted as relict from periods when the river is temporarily more saline, as was mentioned in the 57 Acres canal system and elsewhere. Because the few analyses available indicate the shallow aquifer generally to contain only 1-7%, with a known maximum near the coast of 12% (Sutcliffe, 1975, p. 27, 30, 35), it is very unlikely that the saline canal water is produced by upconing from the aquifer; it is, in fact, much more likely that the canal bottom water is contaminating the shallow aquifer. Salt water intrusion of this type has made the shallow aquifer unusable over much of this general area.

The Peace River was supersaturated with oxygen, reaching 216% at station 071076-1209. Upper canal waters are similarly saturated (167-203%); however, below the 5 foot canal entrance depth ("sill depth"), oxygen declined rapidly, to 0% at the bottom at station 071076-1249.

Obviously, flushing is ineffective in the deep canal bottom, allowing ponding of relict saline water, and time for complete oxygen depletion of the bottom waters.

Similar stratification and oxygen depletion was noted at station 071076-1406 (Fig. 67), which is in a separate, completely undeveloped canal 900 feet west of Bangsberg Waterway. That canal was 12 feet deep, with the lower 4 feet having only 3% oxygen saturation and a salinity of 25-27% . Thus, the stratification is unrelated to construction of houses or sewage disposal, but to the trapping effect of the deeply dredged canals.

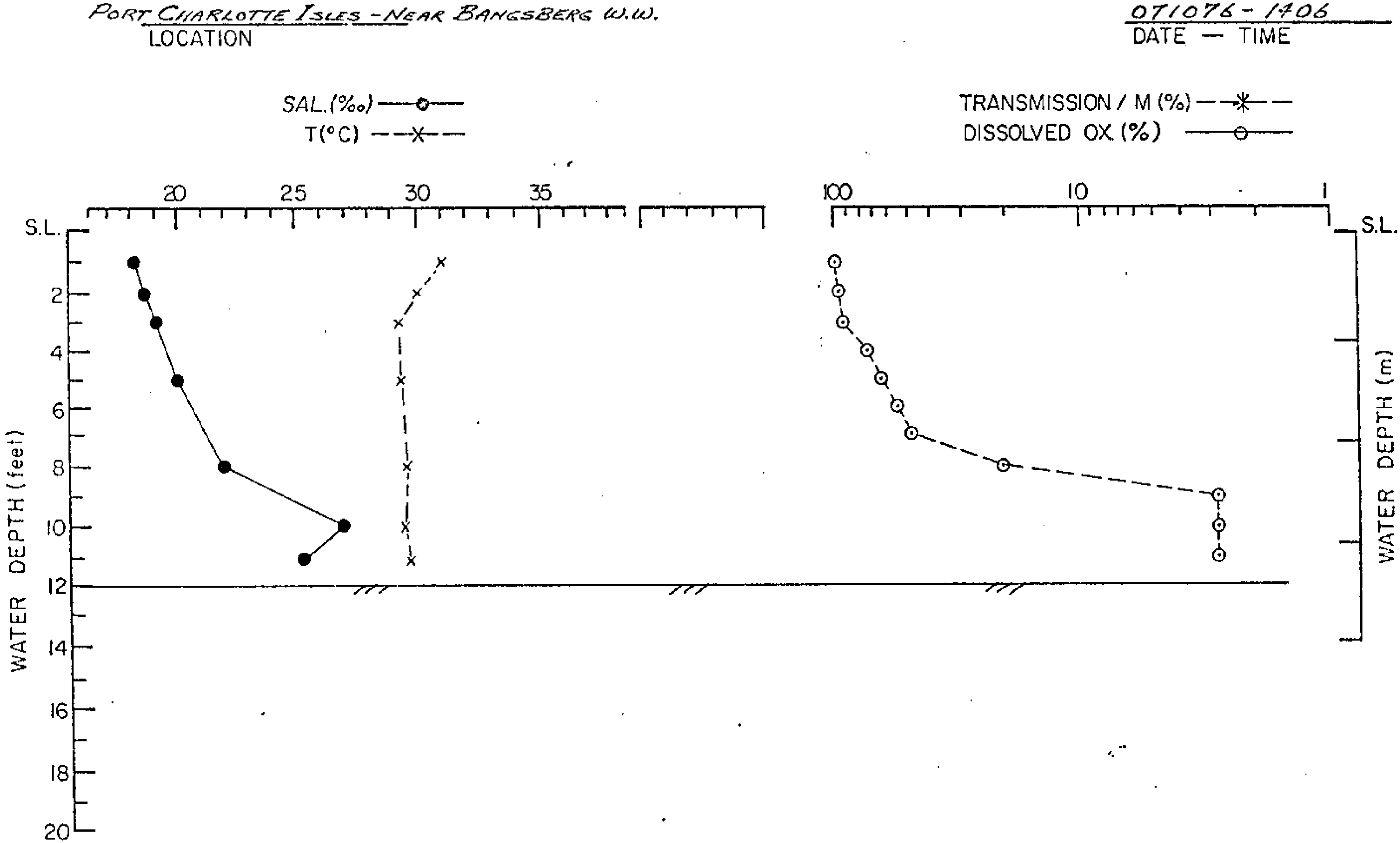



Figure 67. Salinity, temperature, and oxygen saturation profile of Station 071076-1406.

4. Punta Gorda Isles - Sunfish Cove Canal

Punta Gorda Isles has been under development since 1958, and activity has centered on dredge-fill operations on a mangrove covered point approximately 3 miles west of the town of Punta Gorda. The canals, bulkheaded in concrete, are developed, with lush, manicured St. Augustine grass lawns fronting the canals. Streets drain into the canals through 18 inch culverts, but there is no obvious other source of local contamination, and the canals contained no visible trash. All the houses are on central sewage and water supply.

Canals are typically dredged to 12 feet MSL, although deeper parts exist; the inner end of Sunfish Cove Canal is 18 feet deep. The adjacent Peace Rive Estuary is about 7 feet deep.

Boat traffic is encouraged to move slowly in the canals. This is primarily to reduce wakes, but also has the effect of reducing mixing between the anoxic deep canal water and the oxygenated surface water.

Sunfish Cove Canal extends 3600 feet southward from the Peace River (Fig. 68). It is straight except for a 45 degree turn to the SE at about the midpoint; the deepest segment, 18 feet, is SE from the turn, at its dead end. During sampling, it was free of trash or other debris and seemed quite clean.

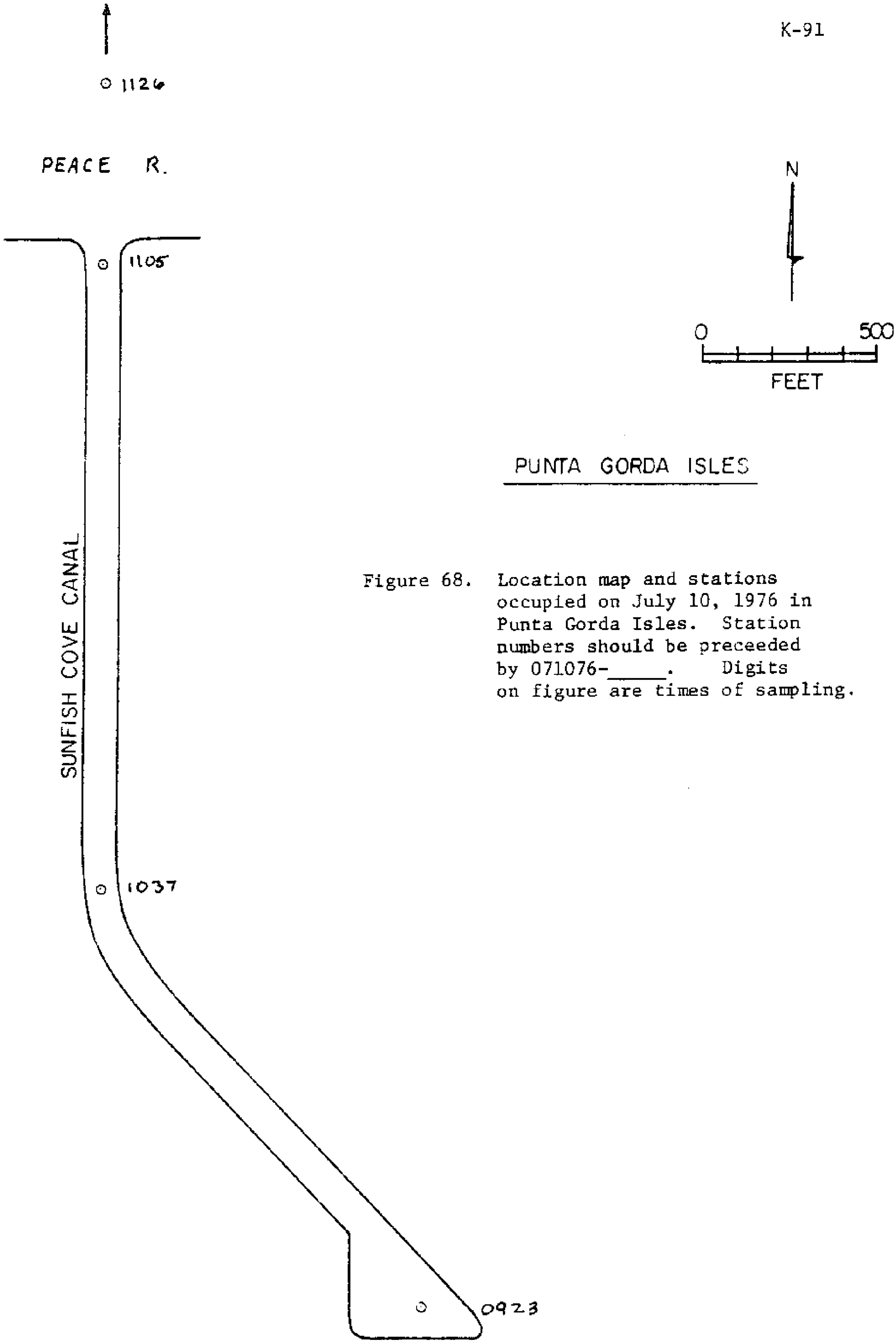



Figure 68. Location map and stations occupied on July 10, 1976 in Punta Gorda Isles. Station numbers should be preceeded by 071076-_____. Digits on figure are times of sampling.

The Peace River Estuary, one-fourth mile off the canal entrance (Station 071076-1126; Fig. 69), is 7 feet deep. It is nearly saturated with oxygen thoughout this depth, ranging from 195% at the surface to 92% at the bottom. Temperature is also nearly constant (29.7-29.3°C), but salinity increases significantly with depth from 21.2 to to 24.5‰. Thus, this side of the Estuary was more saline than the Port Charlotte side, where salinity ranged from 17.1 to 17.5‰. The salinity difference was not due to the tidal state as only 45 minutes elapsed between the two river stations and the tide was flooding thoughout, reaching a spring high two hours later. Thus, it is apparent that the main river flow was directed toward the Port Charlotte side.

Proceeding into the Sunfish Cove Canal, temperature, and D. O. showed only insignificant changes at the surface. However, pronounced stratification must be relict from periods when the river is more saline, for the same reasons previously mentioned for the Port Charlotte and 57 Acres canal systems.

B. Characteristics of Bottom and Bank Materials in Canals and Adjacent Open Water Bodies

1. 57 Acres Canal System

(a) Grain Size and Composition (Tables 2 and 3).

The canals are dredged into a sequence of unconsolidated Holocene sandy and peaty sediments that dip gently eastward. The sandier layers in the canal banks contain 99% sand, less than 1% silt and clay, 1% organic matter, and 0% $CaCO_3$, whereas, the peats

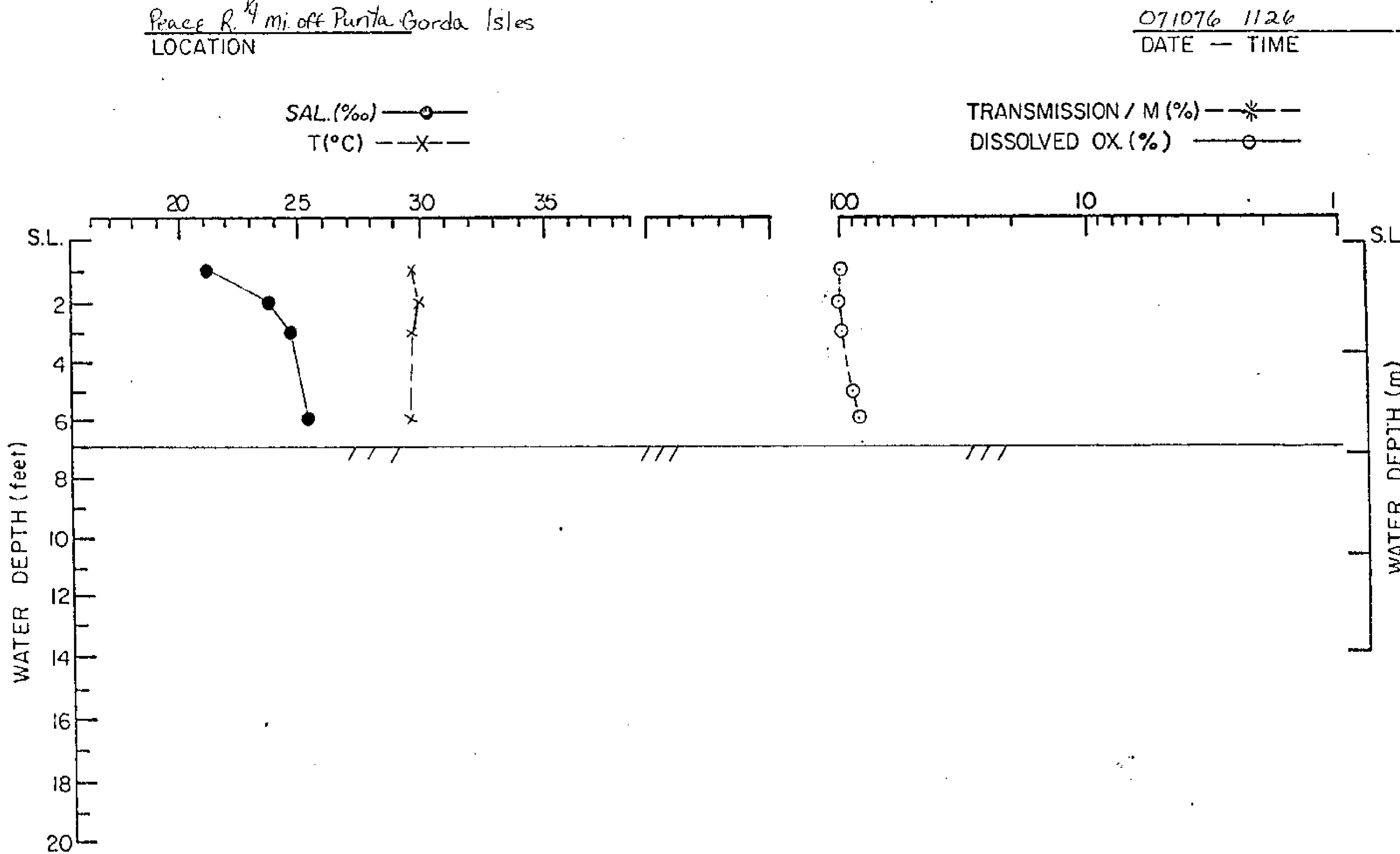



Figure 69. Salinity, temperature, and oxygen saturation profile of Station 071076-1126.

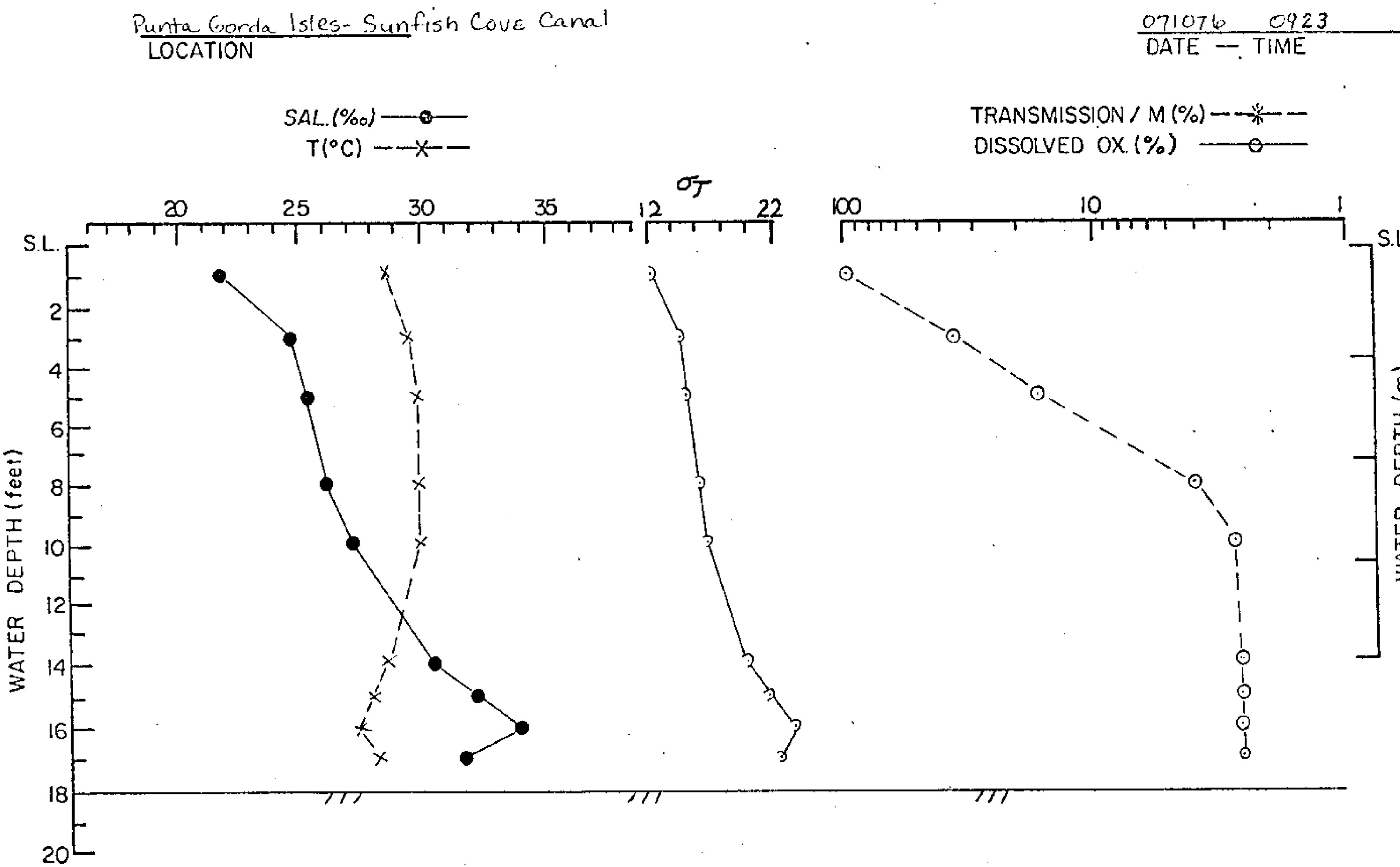



Figure 70. Salinity, temperature, and oxygen saturation profile of Station 071076-0923.

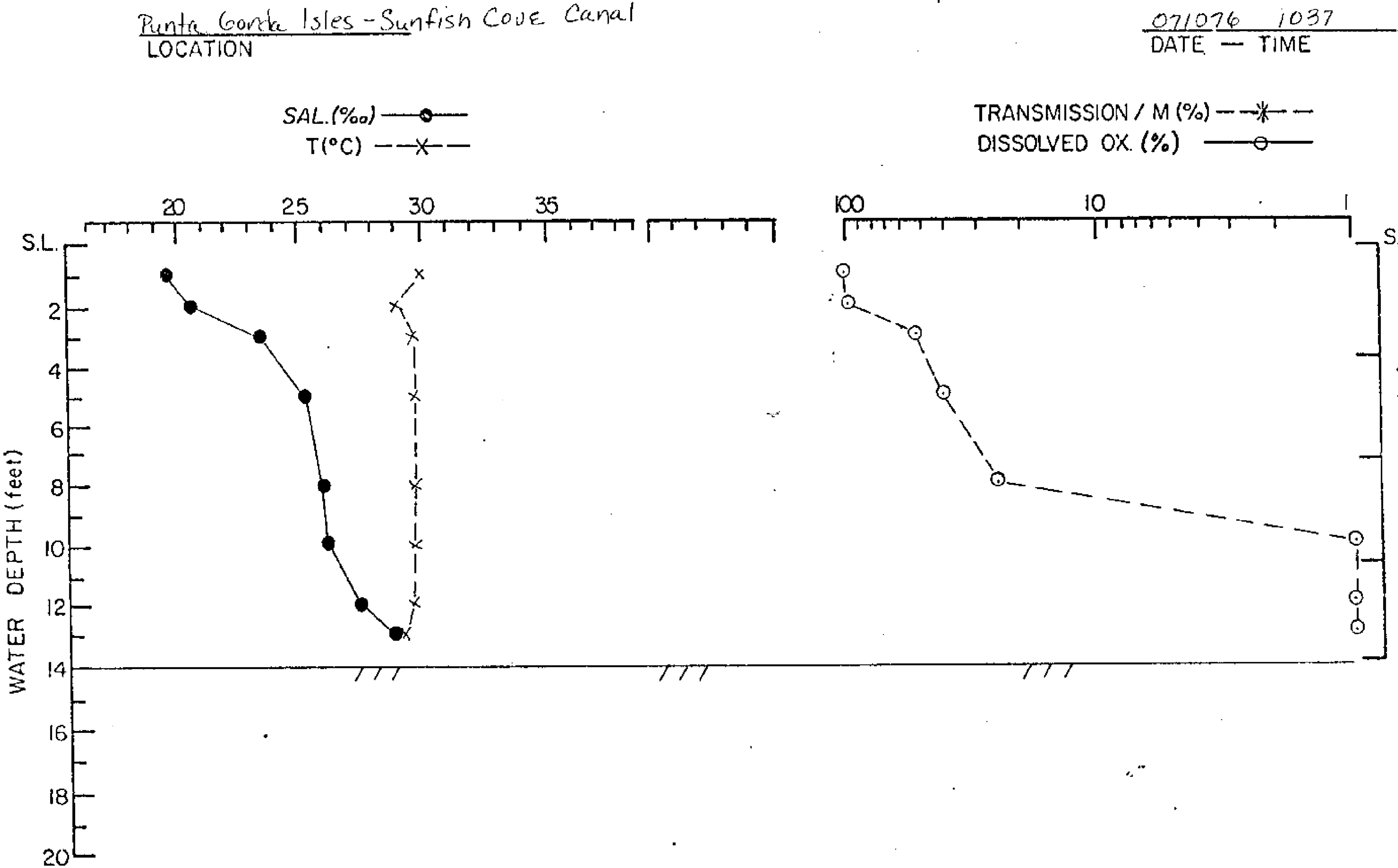



Figure 71. Salinity, temperature, and oxygen saturation profile of Station 071076-1037.

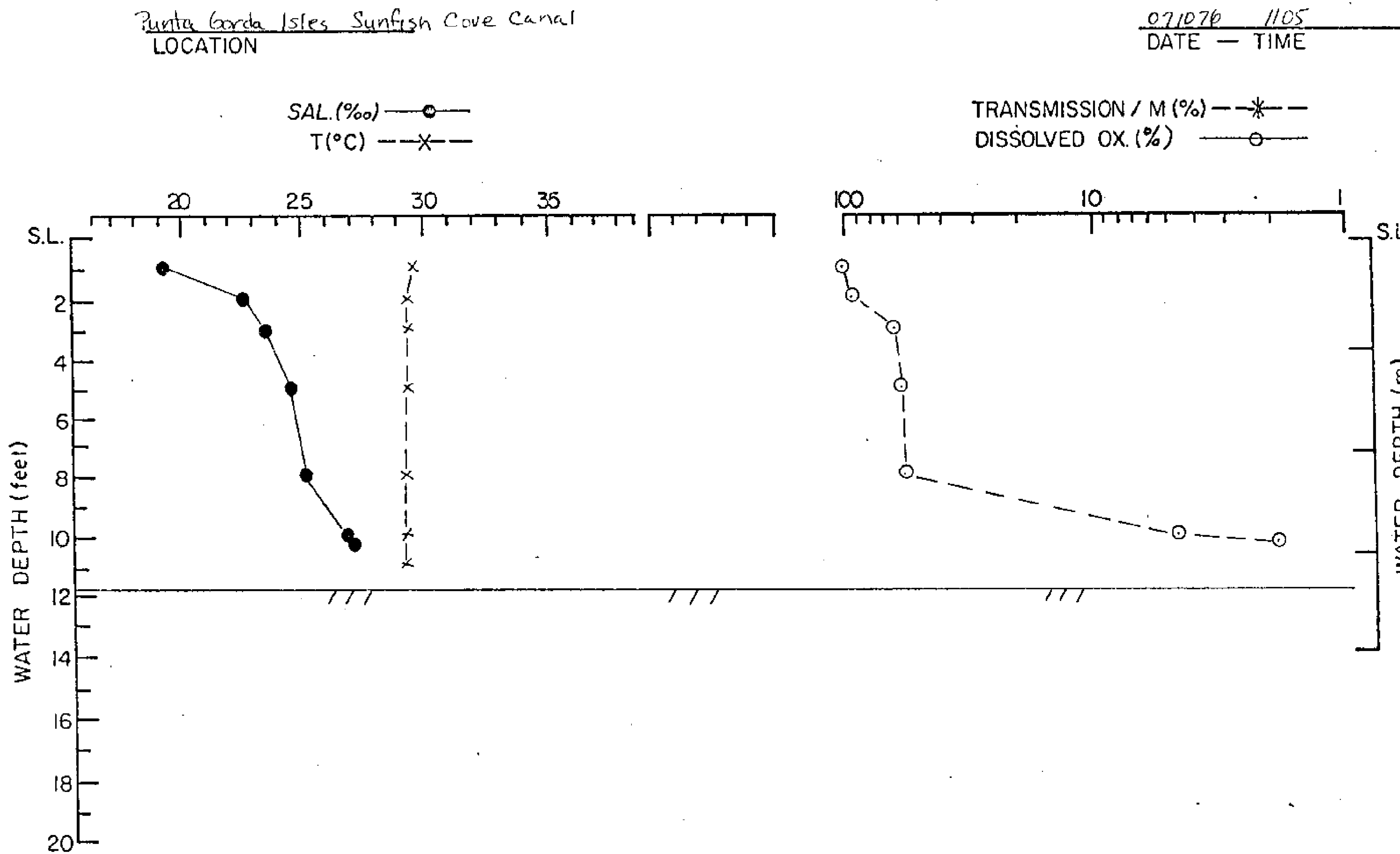



Figure 72. Salinity, temperature, and oxygen saturation profile of Station 071076-1105.

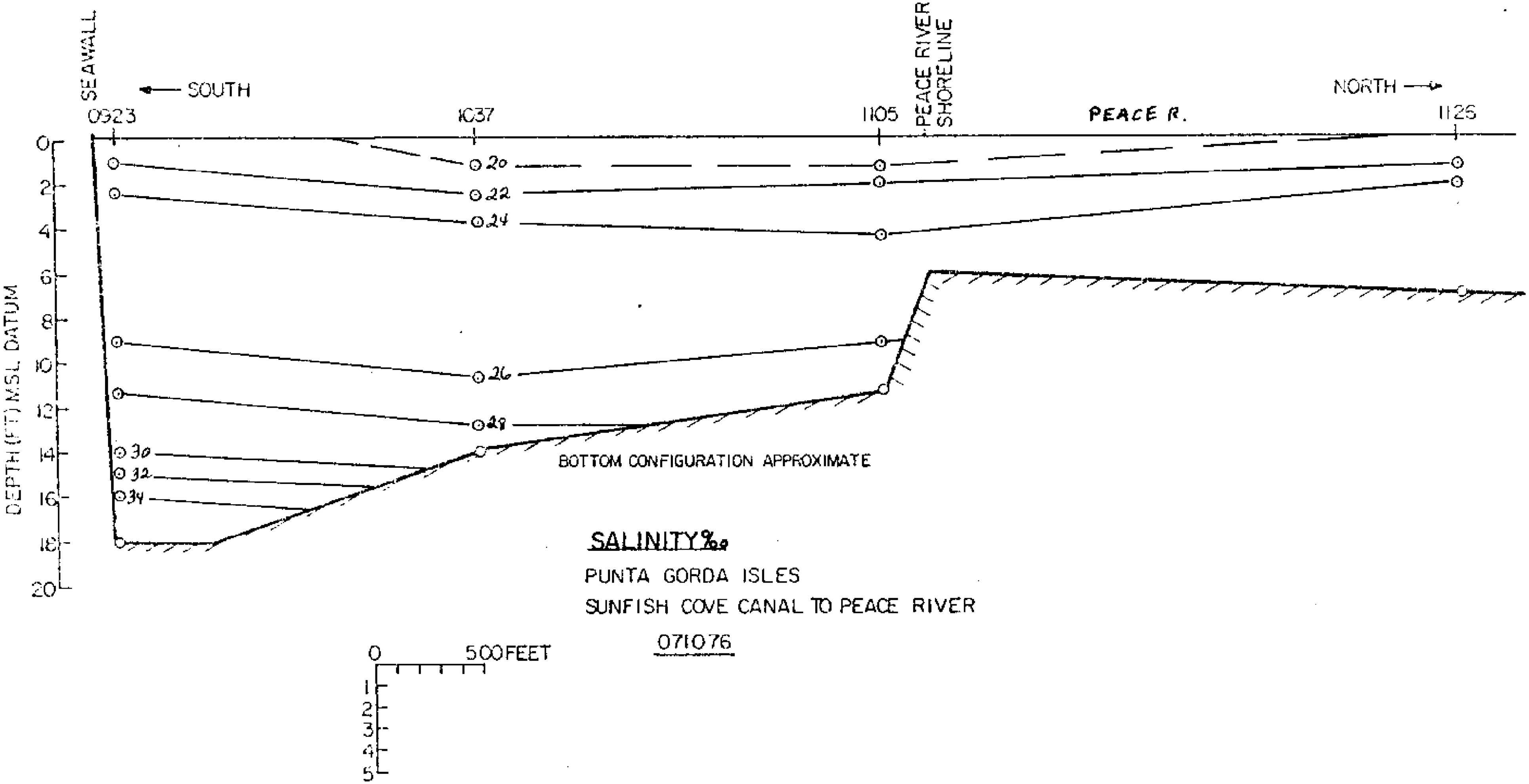



Figure 73. Salinity cross-section from Peace River to Sunfish Cove canal, Punta Gorda Isles, July 10, 1976.

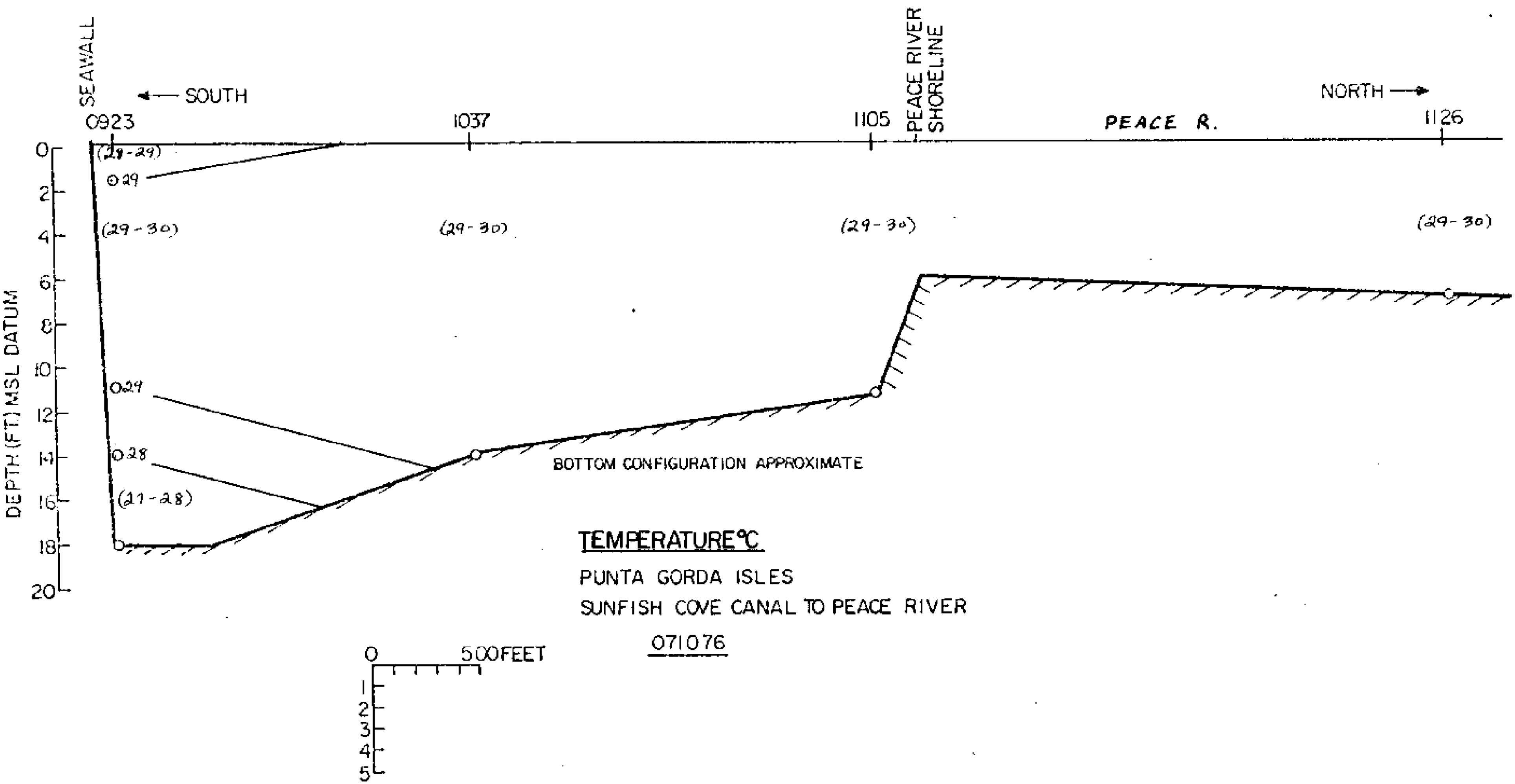



Figure 74. Temperature cross-section from Peace River to Sunfish Cove canal, Punta Gorda Isles, July 10, 1976.

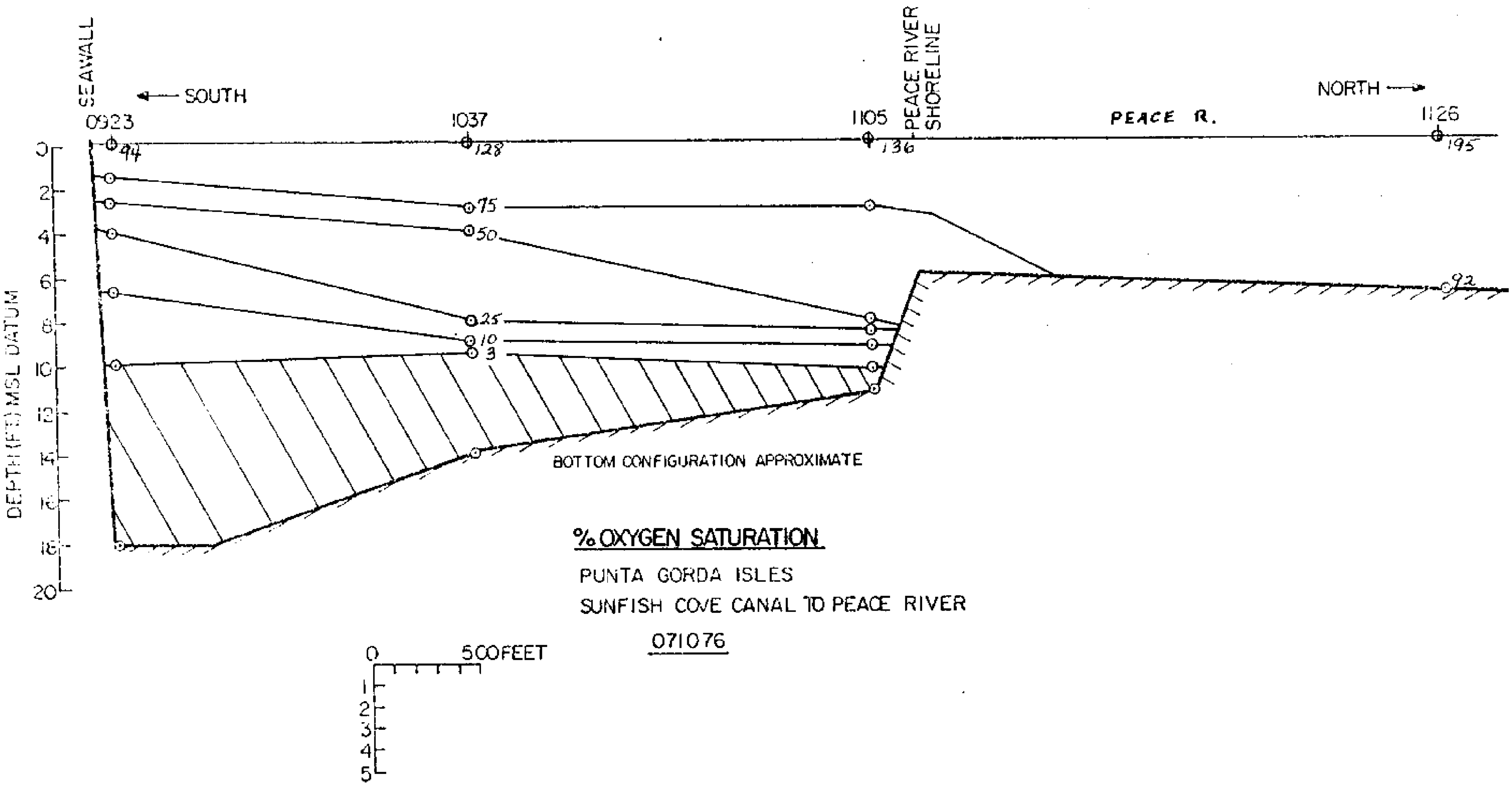



Figure 75. Oxygen saturation cross-section from Peace River to Sunfish Cove canal, Punta Gorda Isles, July 10, 1976.

TABLE 2. Size and Other Parameters of Bottom and Bank Materials from the 57 Acres Canal System and Vicinity.

| Sample No. (Location) | "Folk Parameters" Md (μ) | Md (φ) | Mz (φ) | $\sigma_I$ (φ) | $Sk_I$ | Kg | Sand (%) >62μ | Silt & Clay (%) <62μ | Organic Matter (%) | $CaCO_3$ (%) |
|---|---|---|---|---|---|---|---|---|---|---|
| A. Intra-coastal W.W. Bottom Sed. | | | | | | | | | | |
| 061676-1011 | | | | | | | 43 | 57 | 1 | <1 |
| -1040 | | | | | | | 41 | 59 | 2 | 3 |
| B. Canal Bottom Sed. | | | | | | | | | | |
| 061676-1051 | | | | | | | 27 | 73 | 11 | 4 |
| -1107 | 26 | 5.3 | 5.8 | 1.8 | 0.4 | 0.9 | 12 | 88 | 2 | <1 |
| -1115 | | | | | | | 12 | 88 | 14 | 2 |
| -1133 | | | | | | | 18 | 82 | 8 | <1 |
| -1149 | 21 | 5.6 | 6.0 | 1.8 | 0.5 | 0.9 | 5 | 95 | 5 | 1 |
| -1207 | | | | | | | 26 | 74 | 15 | 1 |
| -1227 | | | | | | | 54 | 46 | 3 | <1 |
| -1242 | | | | | | | 33 | 67 | 1 | <1 |
| -1304 | 17 | 5.9 | 6.2 | 2.2 | 0.3 | 1.0 | 6 | 94 | 4 | 2 |
| -1439 | | | | | | | 40 | 60 | 6 | 1 |
| -1449 | | | | | | | 32 | 68 | 7 | 2 |
| -1457 | | | | | | | 40 | 60 | 10 | 1 |
| -1515 | | | | | | | 5 | 95 | 29 | <1 |
| -1613 | 20 | 5.7 | 6.2 | 2.2 | 0.4 | 0.9 | 6 | 94 | 18 | 0 |
| -1634 | | | | | | | 12 | 88 | 45 | 6 |
| C. Dredge Spoil | | | | | | | | | | |
| 061776-1129a | 177 | 2.5 | 2.4 | 0.4 | -0.5 | 1.3 | 100 | 0 | 1 | 0 |
| -1212a | 190 | 2.4 | 2.2 | 0.6 | -0.4 | 1.1 | 100 | 0 | 1 | 0 |
| -1247a | 287 | 1.8 | 1.9 | 0.9 | 0.0 | 0.7 | 99 | 1 | 1 | 0 |
| -1515a | 287 | 1.8 | 1.8 | 0.7 | 0.0 | 0.8 | 100 | 0 | <1 | 0 |
| D. Natural Sdy Banks | | | | | | | | | | |
| 061676-1129c | 250 | 2.0 | 1.9 | 0.7 | -0.2 | 0.8 | 99 | 1 | <1 | <1 |
| -1212c | 233 | 2.1 | 2.0 | 0.8 | -0.2 | 0.9 | 100 | 0 | <1 | 0 |
| -1247b | 218 | 2.2 | 2.2 | 0.8 | -0.1 | 0.7 | 99 | 1 | <1 | <1 |
| -1515b | 190 | 2.4 | 2.3 | 0.7 | -0.4 | 1.0 | 99 | 1 | <1 | <1 |

TABLE 3. Average Size and Other Parameters of Bottom and Bank Materials from the 57 Acres Canal System and Vicinity

| | η | Average % (±s) | | | |
|---|---|---|---|---|---|
| | | Sand | Silt & Clay | Organic Matter | $CaCO_3$ |
| Intracoastal Waterway Bottom Sediments | 2 | 42(±1) | 58(±1) | 1.5(±1) | 2(±1) |
| Canal Bottom Sediments | 15 | 22(±15) | 78(±15) | 12 (±12) | 2(±1) |
| Natural Sandy Banks | 4 | 99(±0.5) | <1(±0.5) | 1 (±0) | 0(±0) |
| Dredge Spoil | 4 | 100(±0.5) | <1(±0.5) | <1 (±0) | 1(±0.5) |

contain up to 68% organic matter and no $CaCO_3$. Relative proportions of sand and peat beds vary greatly and in all proportions though the canal system.

The dredge spoil is very similar to the sandy bank materials in size and in lacking organic matter and $CaCO_3$. Both materials can be described as find to medium sands, moderately to well sorted, producing size frequency curves that are coarse to strongly coarse skewed, and platykurtic to mesokurtic. Both materials are clean sands, deficient in fine particles; the median diameter averages 0.2 mm.

In contrast, the canal bottoms are much finer grained, organic rich, and contain a few percent of $CaCO_3$ (Fig. 76-82). The average canal bottom sediment can be described as an organic silt mud, with a median diameter of 0.021 mm. poorly to very poorly sorted, with a size frequency curve that is strongly fine skewed, and mesokurtic.

The canal bottom muds also differ somewhat from bottom sediment in the Intracoastal Waterway. The waterway sediments are sandy muds with average organic contents of less than 2%, in contrast to the 12% average in the canal bottoms.

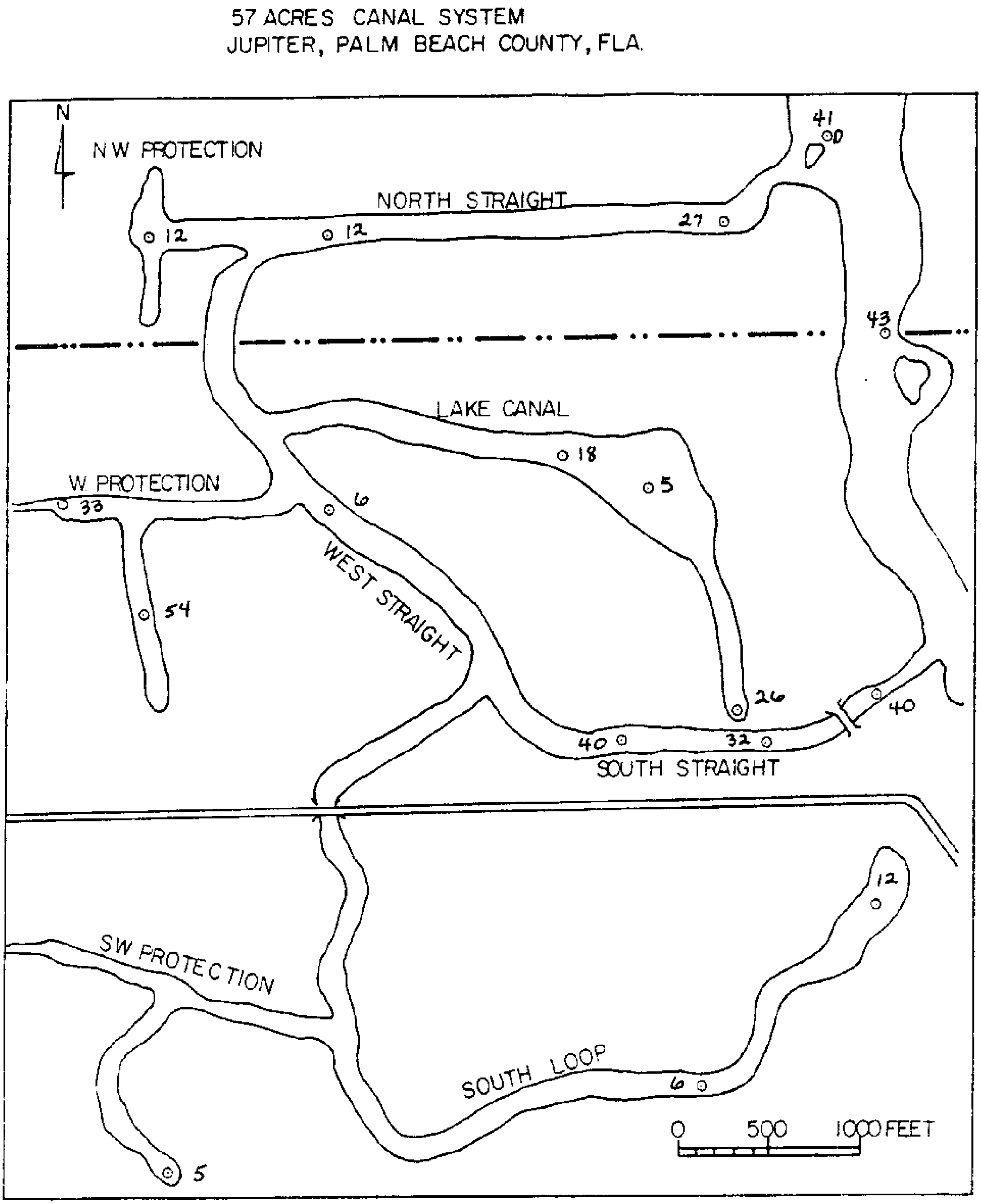



Figure 76. Percent sand in bottom sediment, 57 Acres canal system.

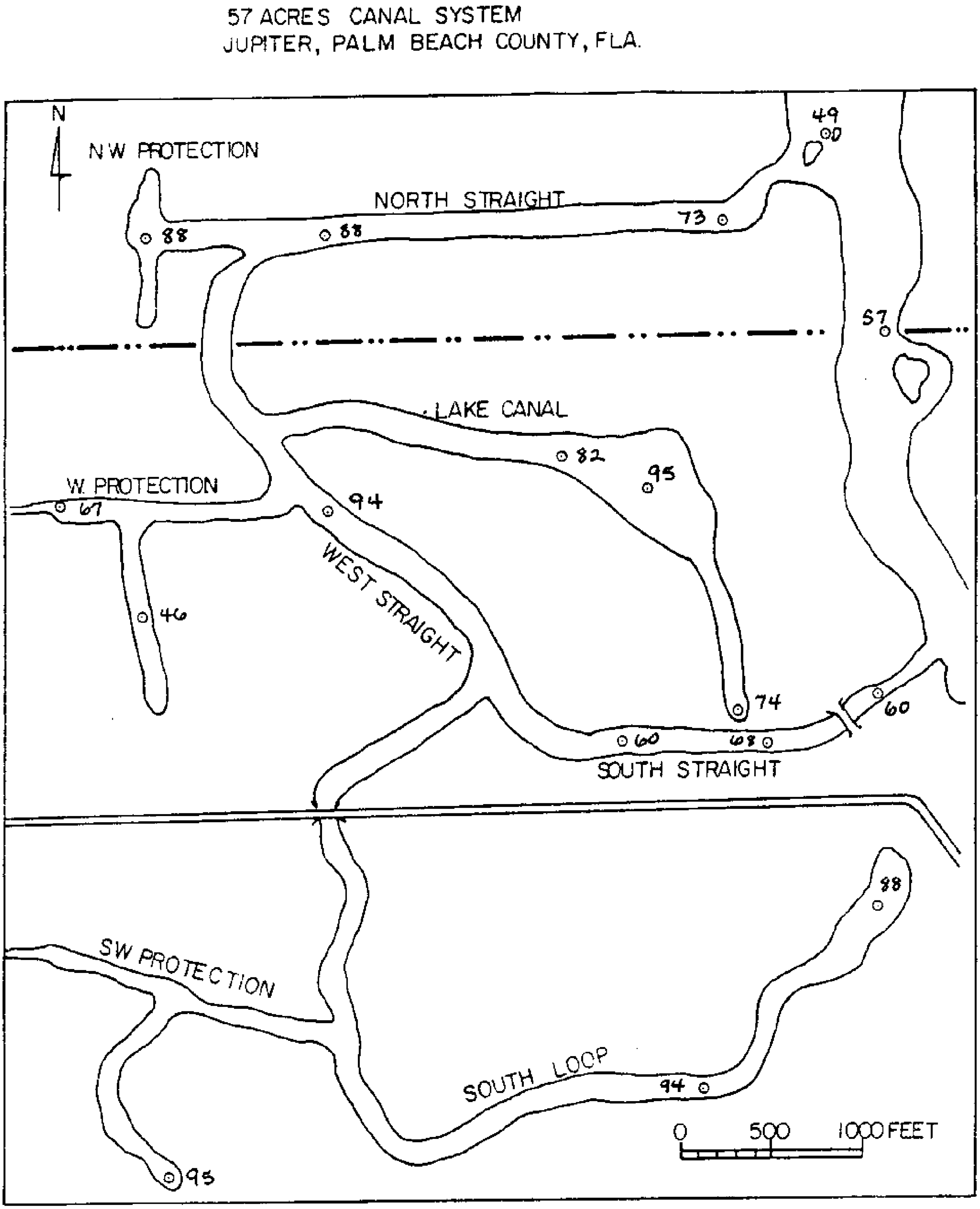
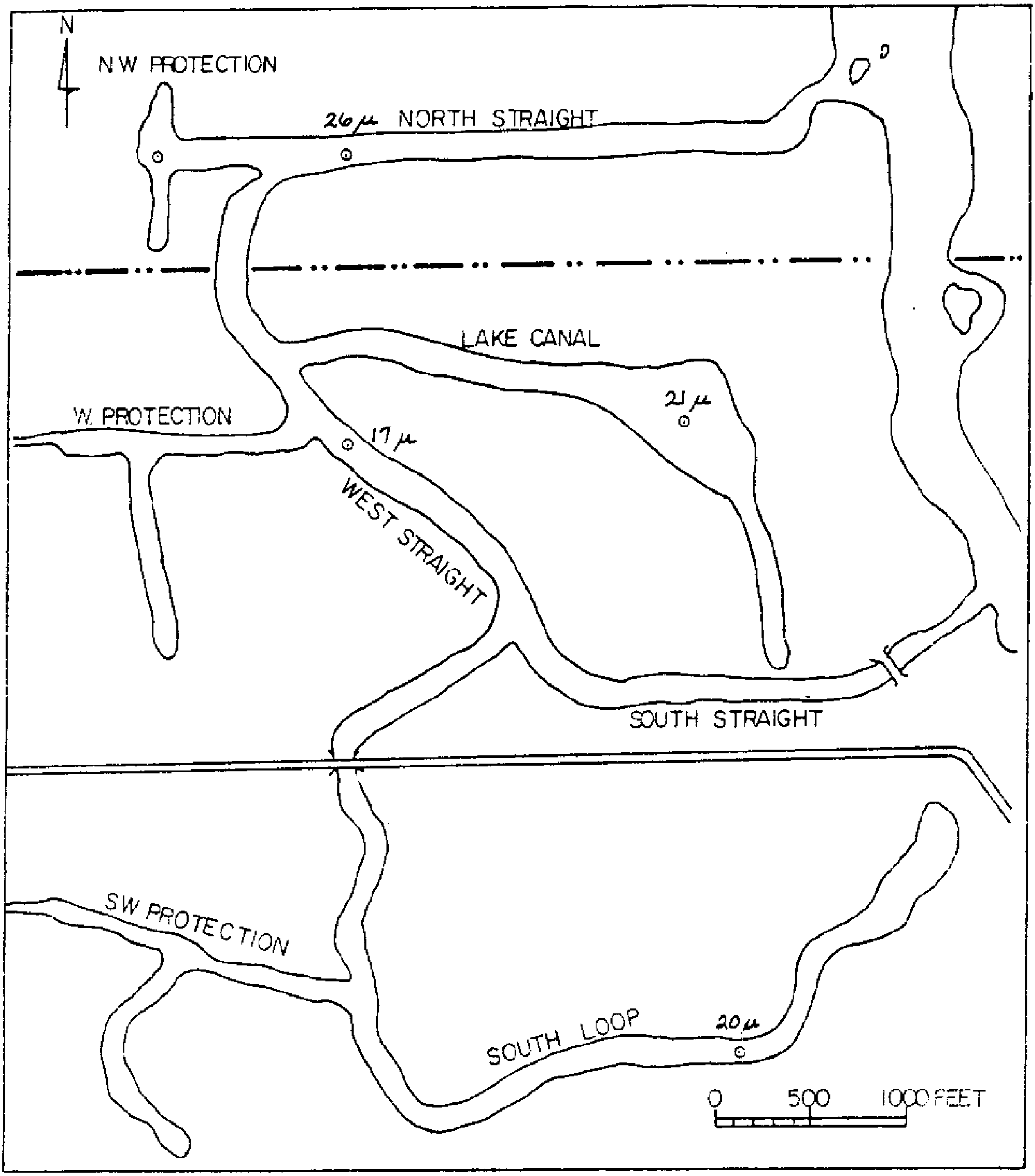



Figure 77. Percent silt and clay in bottom sediment, 57 Acres canal system.

57 ACRES CANAL SYSTEM
JUPITER, PALM BEACH COUNTY, FLA.




μ = 0.001 mm

Figure 78. Median diameter of bottom sediment (in microns), 57 Acres canal system.

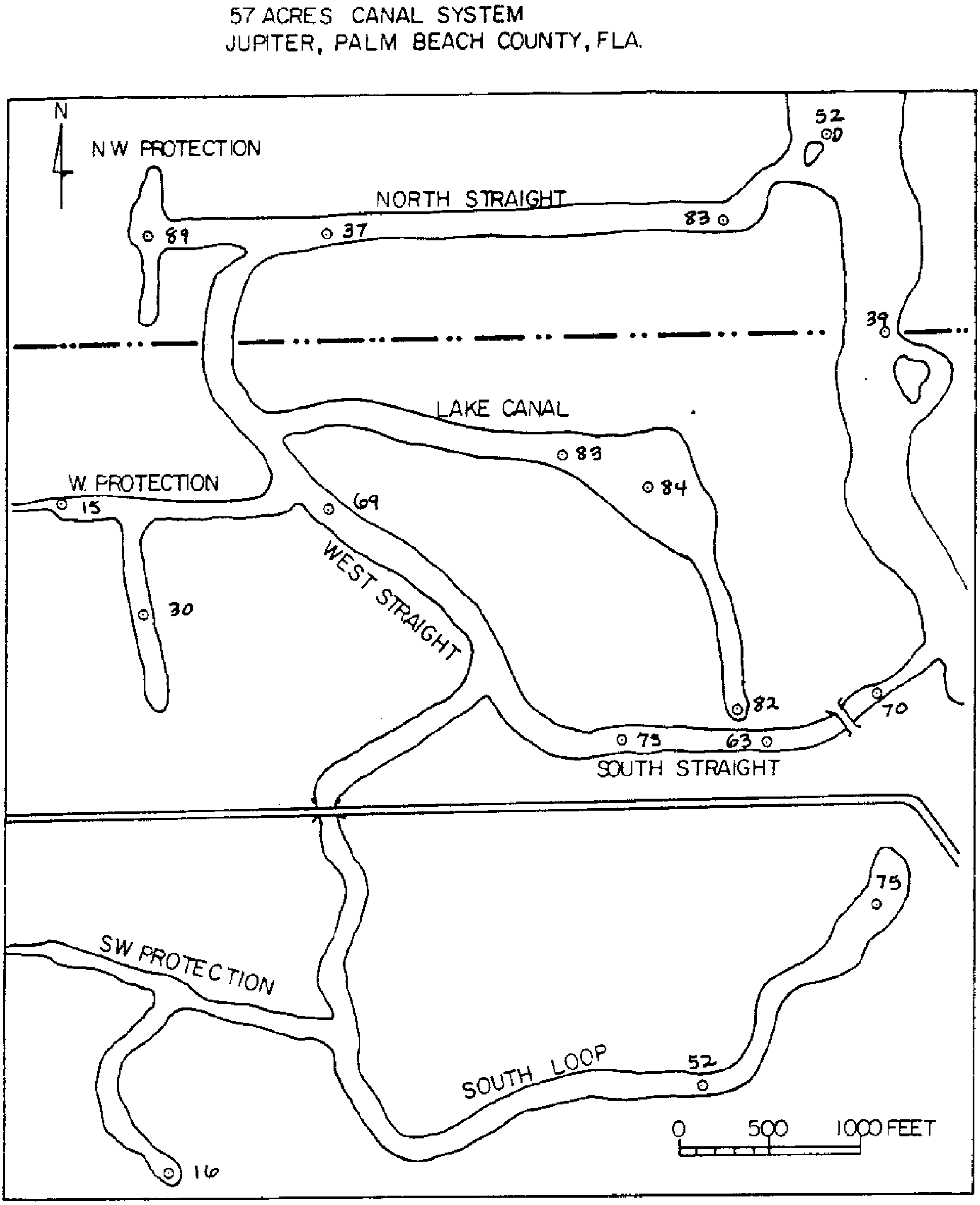



Figure 79. Percent moisture content of bottom sediments (weight loss at 105°C), 57 Acres canal system.

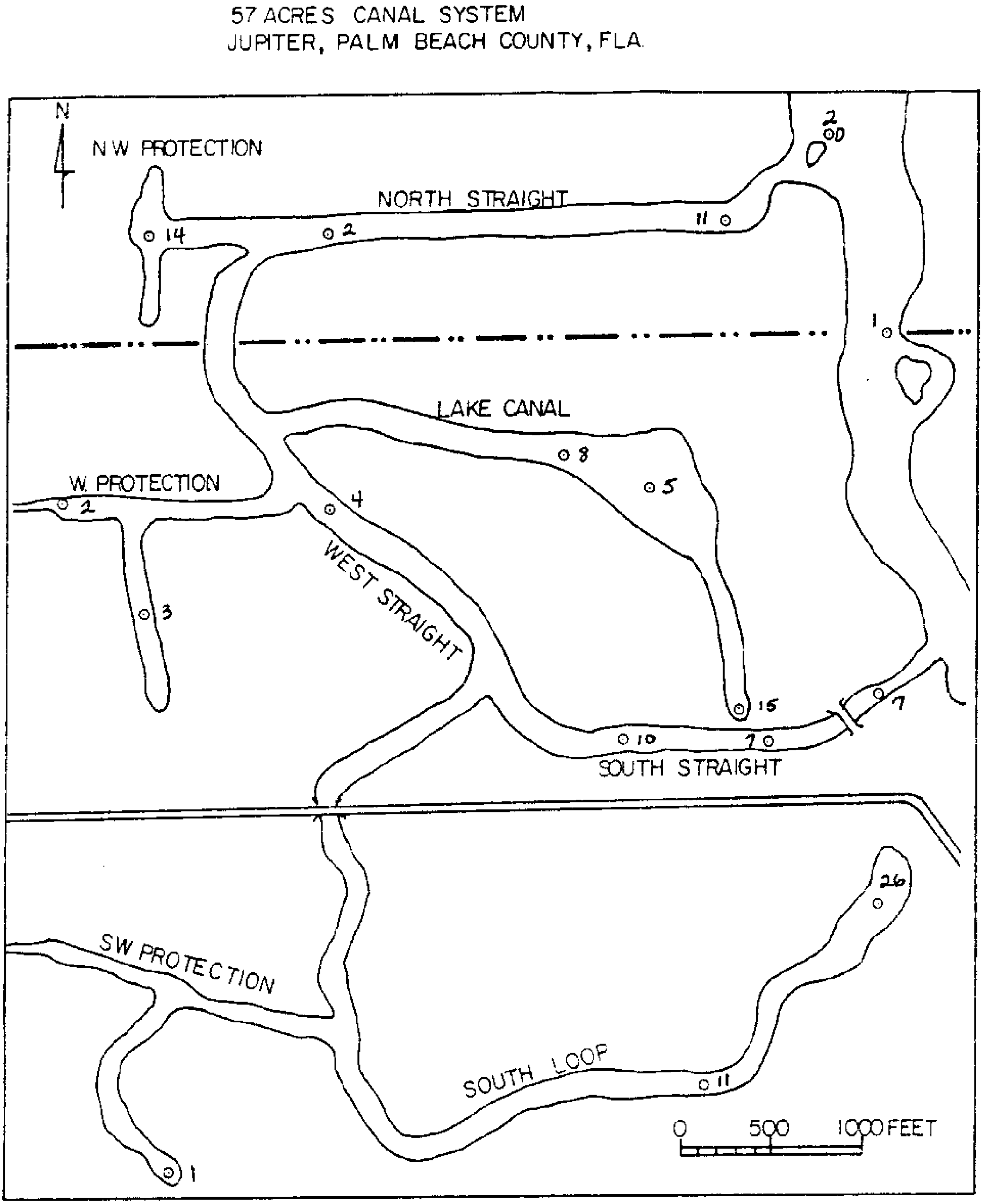



Figure 80. Percent organic matter in bottom sediments (weight loss between 105°C and 550°C), 57 Acres canal system.

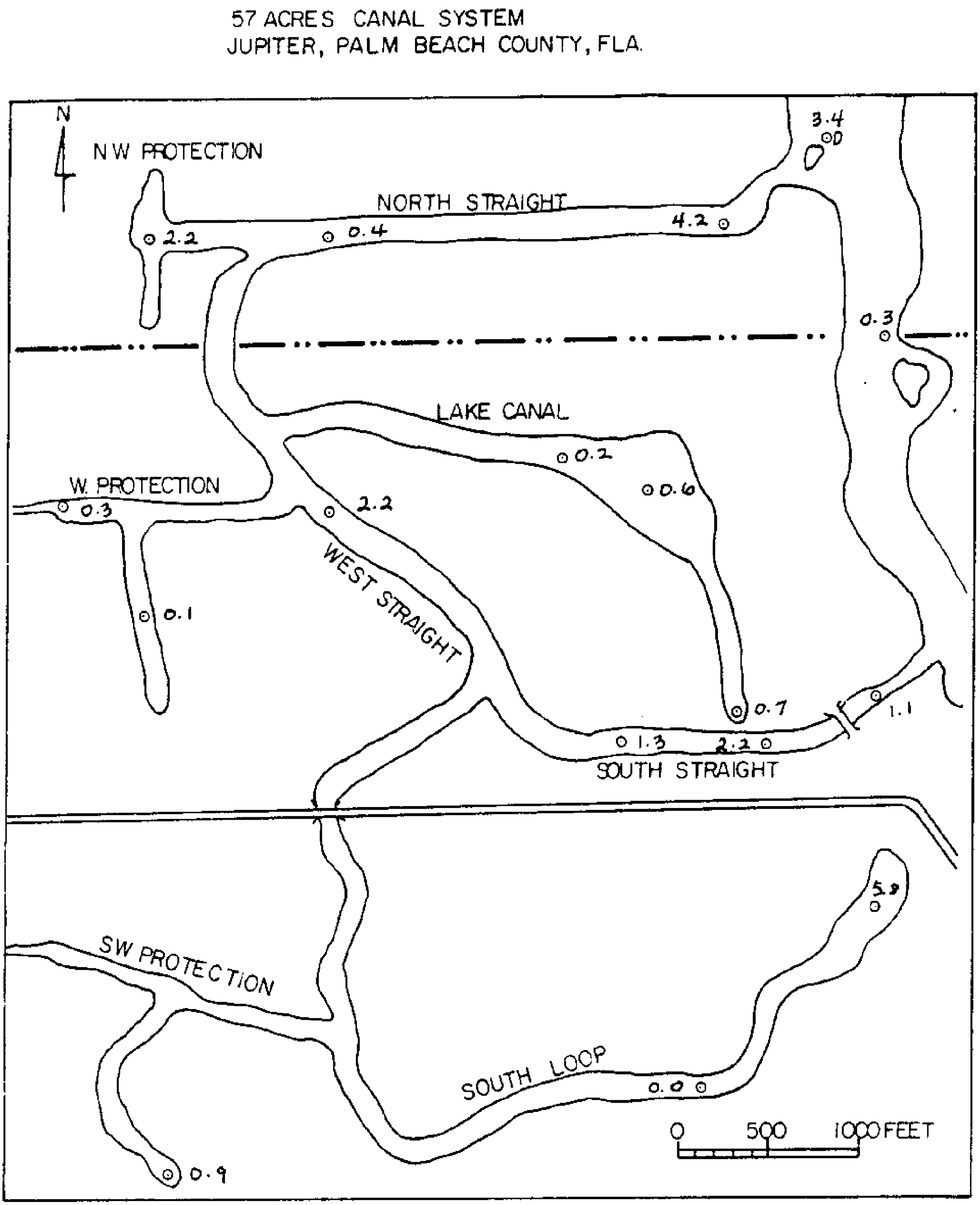



Figure 81. Percent $CaCO_3$ in bottom sediments (by volume of $CO_2$ generated with 50% HCl), 57 Acres canal system.

57 ACRES CANAL SYSTEM
JUPITER, PALM BEACH COUNTY, FLA.

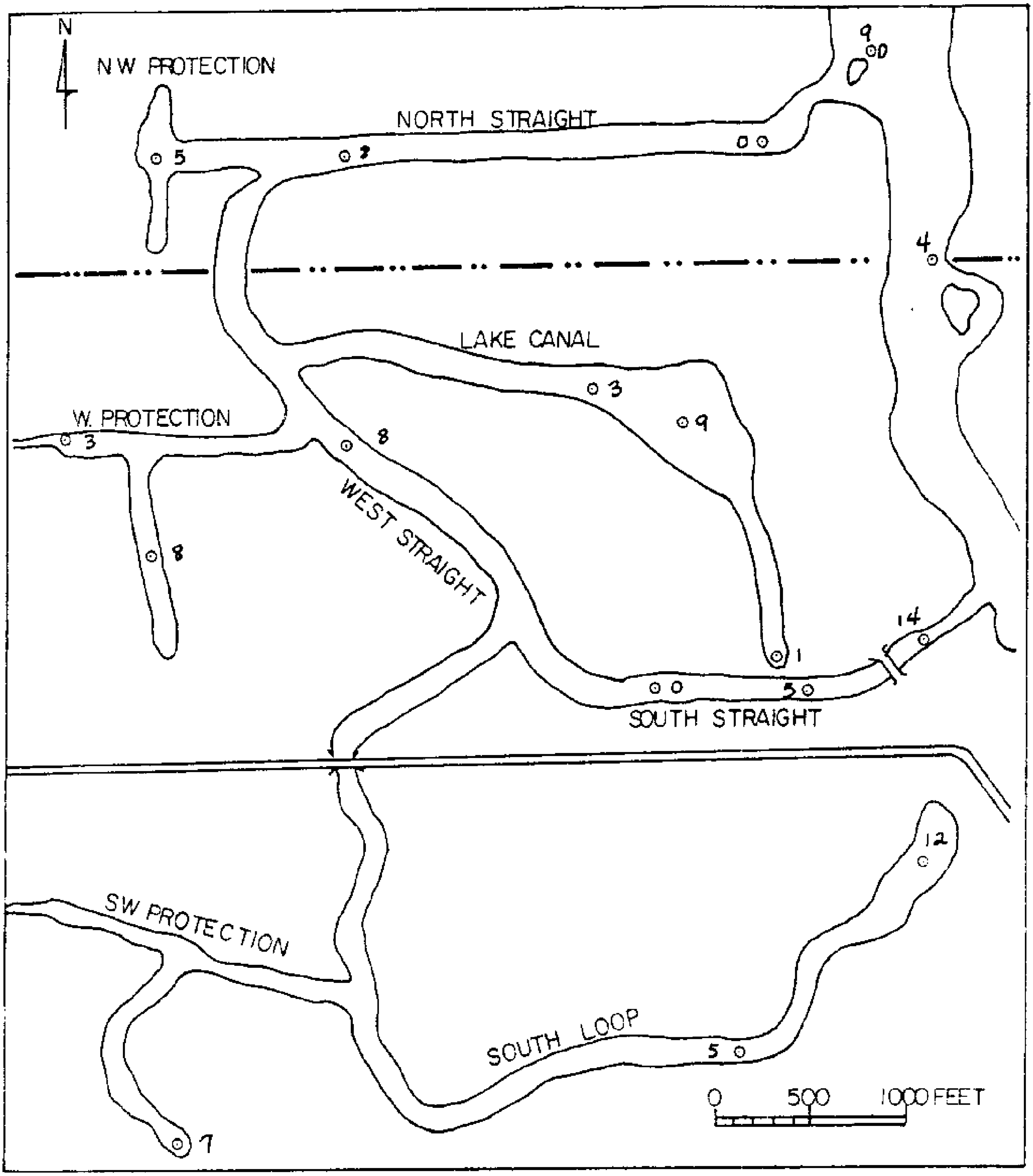



Figure 82. Number of diatoms per 100 grains counted, 57 Acres canal system. Bottom sediments.

sand, fine-coarse grained, poorly sorted, and pale grayish orange in color. In contrast, the canal bottoms are floored with organic-rich sandy silt, medium dark gray in color. Organic matter increases from 2.5% in the river sediments to 9-21% in the canal muds. The canal muds contain up to 1% $CaCO_3$; this represents skeletal remains of planktonic organisms from the upper water column, plus parts of the oysters and barnacles that foul seawells and pilings along the canal.

The lithologic changes parallel the changes in bottom topography and water quality previously noted. It is once again evident that the deeply-dredged canal bottom is acting as a trap for fine, organic-rich debris, both transported from the Peace River and generated in the oxygenated upper layers of the canal water column.

4. Punta Gorda Isles - Sunfish Cove Canal

Bottom sediment in the Peace River 1/4 mile off the canal was very fine-medium grained sand, pale grayish orange in color. However, inside the canals the sediment is an organic-rich sandy silt, medium dark gray in color. Paralleling the lithologic changes, organic matter increased from 3.3% in the estuary, to 5.4% at the canal entrance, to 17.8% at the inner dead end of the canal (Figure 84). Once again, it is evident that the canal is acting as a sediment trap for fine grained, organic-rich materials with a high demand for dissolved oxygen.

$CaCO_3$ in the river was near zero, as it was on the Port

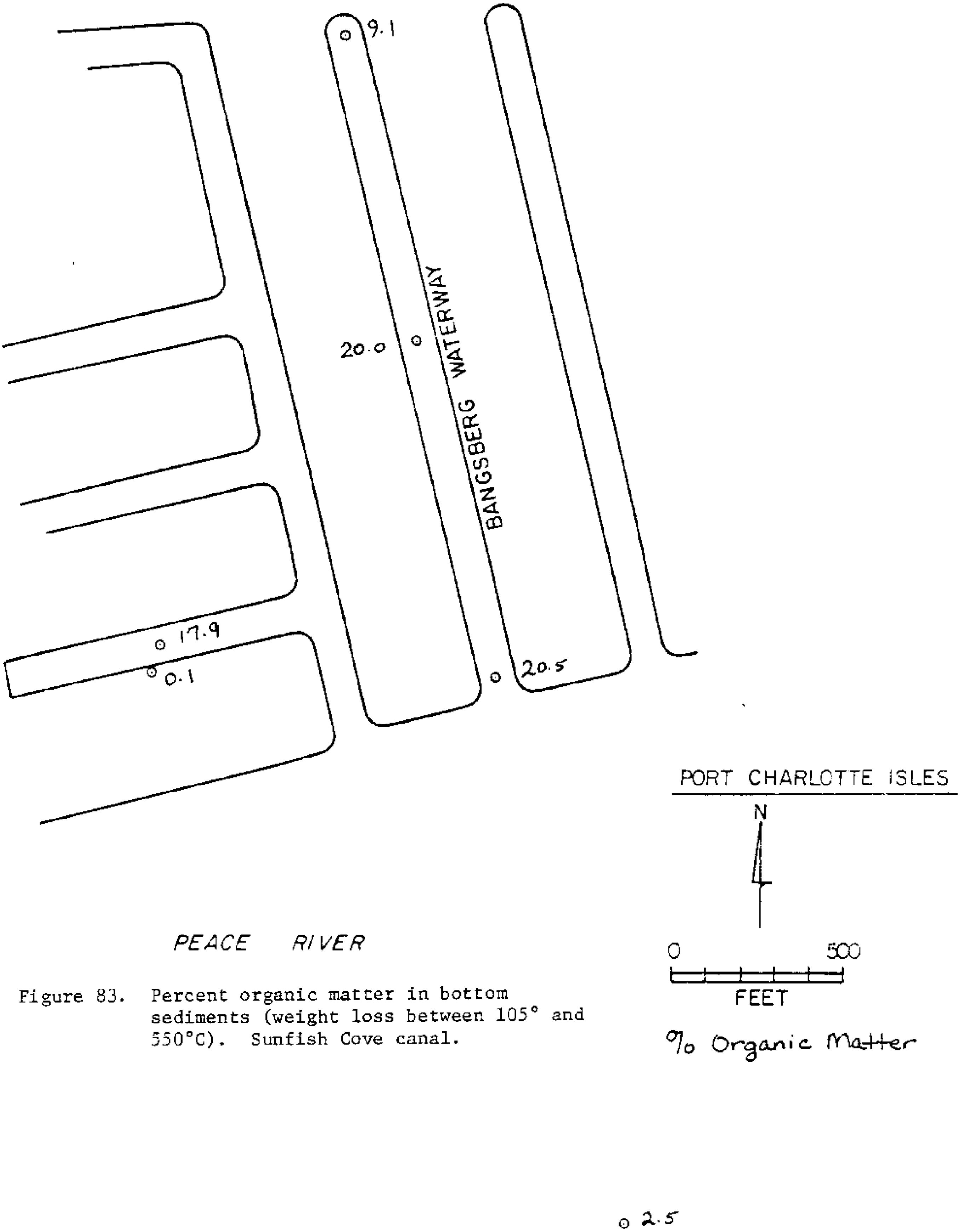



Figure 83. Percent organic matter in bottom sediments (weight loss between 105° and 550°C). Sunfish Cove canal.

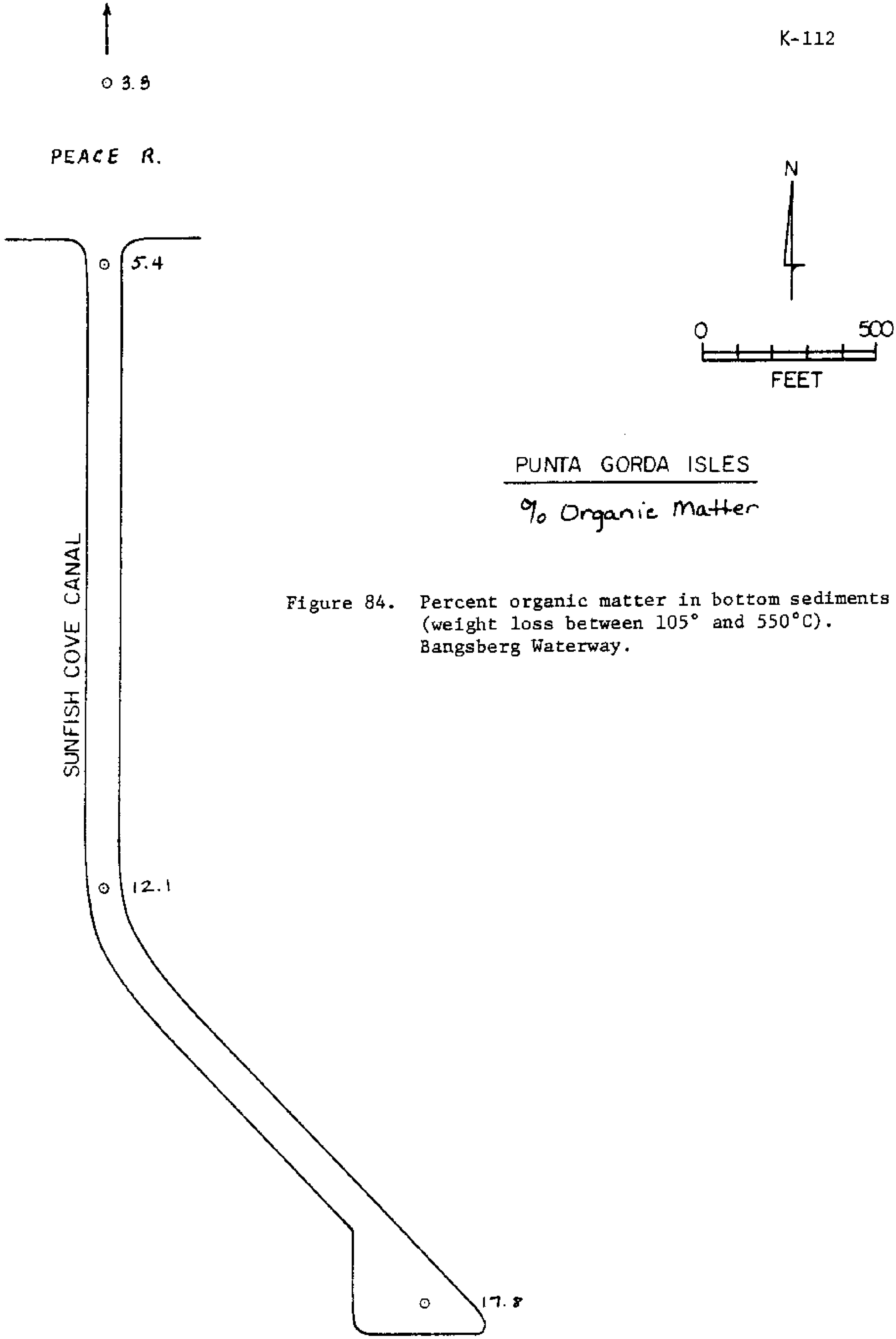



Figure 84. Percent organic matter in bottom sediments (weight loss between 105° and 550°C). Bangsberg Waterway.

Charlotte side. However, in the canal $CaCO_3$ values ranged from up to 8.8% at the inner dead end. Evidently the $CaCO_3$ was derived from barnacles and oysters fouling the canal sides and from planktonic organisms living in the upper water column.

## C. Sources of Fine Grain Sediments in Canal Bottoms

### 1. 57 Acres System

The compositions of the less than two micron clay mineral fractions of 39 bottom and bank samples are listed in Table 4, and areal distributions of the two most abundant components (montmorillonite and kaolinite) are shown in Figures 85-88.

Clays from the canal bottom sediments are relatively rich in montmorillonite (usually 60-75%), with smaller amounts of kaolinite (usually 16-26%). The remainder of the clay mineral suite is illite (<1 to 8%) plus an unresolved vermiculite-chlorite complex (6-23%).

Bank samples differ significantly from the canal bottom materials. The banks contain much less montmorillonite, typically less than 10%, and more kaolinite, usually 43-73%.

Thus, it is highly improbable that much of the canal bottom clay minerals was derived by winnowing of fines from the exposed natural banks materials. However, with this possibility eliminated, the source of the clays is still unclear. The clay minerals in the Intracoastal Waterway sediments contain too little montmorillonite to match the canal bottom muds, and this is also true of the sandy spoil from the canal dredging. The most likely alternative seems to be that some older strata that are relatively rich in montmorillonite were penetrated by hydraulic dredging in the deep (24 ft.) lake area. During the construction phase, turbid water from that source could have been distributed through most of the canal system; because the present sedimentation rate is very low, the relict clays from the construction phase

TABLE 4. Clay Mineral Compositions -- 57 Acres Canal System, Palm Beach County, Florida

| Sample No. | Locations (see Fig. 1) Remarks, etc. | Composition of Clay Mineral Fraction (+10%) | | | | | Organic Matter (%) | $CaCO_3$ (%) | Moisture Content (105°C) (%) |
|---|---|---|---|---|---|---|---|---|---|
| | | Kaol. | Ill. | Verm. + Chl. | Mont. | Other | | | |
| A. Bottom Samples | | | | | | | | | |
| 061676-1011 | Intracoastal Waterway | 35 | 7 | 25 | 33 | | 1 | 0.3 | 39 |
| -1040 | ICW-N. Straight Entr. | 27 | 4 | 20 | 49 | | 2 | 3.4 | 52 |
| -1051 | N. Straight-E. End | 18 | 1 | 11 | 70 | | 11 | 4.2 | 83 |
| -1107 | N. Straight-Center | 26 | <1 | 6 | 67 | | 2 | 0.4 | 37 |
| -1115 | N. Straight-Dead End | 17 | 1 | 8 | 74 | | 14 | 2.2 | 89 |
| -1133 | Lake-Entrance | * | | | | | 8 | 0.2 | 83 |
| -1149 | Lake-Center | * | | | | | 5 | 0.6 | 84 |
| -1207 | Lake-Dead End | 38 | 6 | 23 | 33 | | 15 | 0.7 | 82 |
| -1227 | W. Projection | 26 | 2 | 12 | 60 | | 3 | 0.1 | 30 |
| -1242 | W. Projection-Inlet | 30 | 8 | 35 | 28 | | 2 | 0.3 | |
| -1304 | W. Loop | 16 | 1 | 9 | 75 | | 4 | 2.2 | 69 |
| -1439 | S. Straight | 24 | 2 | 9 | 65 | | 7 | 1.1 | 70 |
| -1449 | S. Straight | 21 | <1 | 9 | 69 | | 7 | 2.2 | 63 |
| -1457 | S. Straight | 36 | 5 | 14 | 45 | | 10 | 1.3 | 75 |
| -1515 | S.W. Projection | 45 | 2 | 18 | 34 | | <1 | 0.9 | |
| -1613 | S. Loop | 73 | 1 | 21 | 5 | | 11 | 0.0 | 52 |
| -1634 | S. Loop-Dead End | * | | | | | 26 | 5.8 | 75 |
| B. Bank Samples | | | | | | | | | |
| 061776-0935 | Peat | 67 | 5 | 19 | 10 | | 40.2 | 0.4 | 83 |
| -0937 | Sandy Spoil | 59 | 5 | 32 | 5 | | 0.4 | 0.0 | 27 |
| -1002 | Undisturbed Sand | 71 | 6 | 18 | 6 | | 0.1 | 0.1 | |
| -1012 | Clayey Sand in Peat | 17 | 1 | 4 | 3 | 1(Gibb.) | 0.7 | 0.0 | |
| -1129a | Sandy Spoil | * | | | | | 0.6 | 0.0 | 27 |
| -1129b | Peaty Sand | 53 | 7 | 33 | 7 | | 6.6 | 0.1 | 39 |
| -1129c | Undisturbed Sand | 17 | 2 | 78 | 3 | | 0.1 | 0.2 | 30 |
| -1212a | Sandy Spoil | 48 | 2 | 48 | 2 | | * | 0.0 | 5 |
| -1212b | Undisturbed Sand | * | | | | | 1.0 | 0.0 | 0.7 |

(continued)

*Insufficient Material or Otherwise Not Determined.

TABLE 4 (continued)

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 061776-1212c | Undisturbed Sand | 43 | 13 | 43 | 0 | 0.5 | 0.0 | 0.3 |
| -1247a | Sandy Spoil | 76 | 4 | 16 | 4 | 0.5 | 0.0 | 0.5 |
| -1247b | Undisturbed Sand | * | | | | 0.1 | 0.1 | 0.2 |
| -1247c | Peaty Sand | 68 | 1 | 29 | 3 | 2.5 | 0.0 | 4 |
| -1306a | Undisturbed Sand | 59 | 8 | 27 | 6 | 0.1 | 0.0 | 35 |
| -1306b | Peaty Sand | * | | | | 1.7 | 0.0 | 10 |
| -1515a | Sand in Wash | * | | | | 0.1 | 0.0 | 31 |
| -1515b | Undisturbed Sd. in Pit | * | | | | 0.2 | 0.3 | 16 |
| -1515c | Peaty Sand | 74 | 6 | 17 | 4 | * | * | 15 |
| -1613a | Peaty Sand | * | | | | 4.1 | 0.0 | 25 |
| -1613b | Undisturbed Sand | * | | | | 0.6 | 0.2 | 5 |
| 091876-1242 | Intracoastal WW at Mkr. 21 | 33 | 0 | 33 | 33 | * | | |
| -1504 | Reddish Sd. from B-Horiz. | 21 | 8 | 63 | 8 | * | * | |

*Insufficient Material or Otherwise Not Determined.

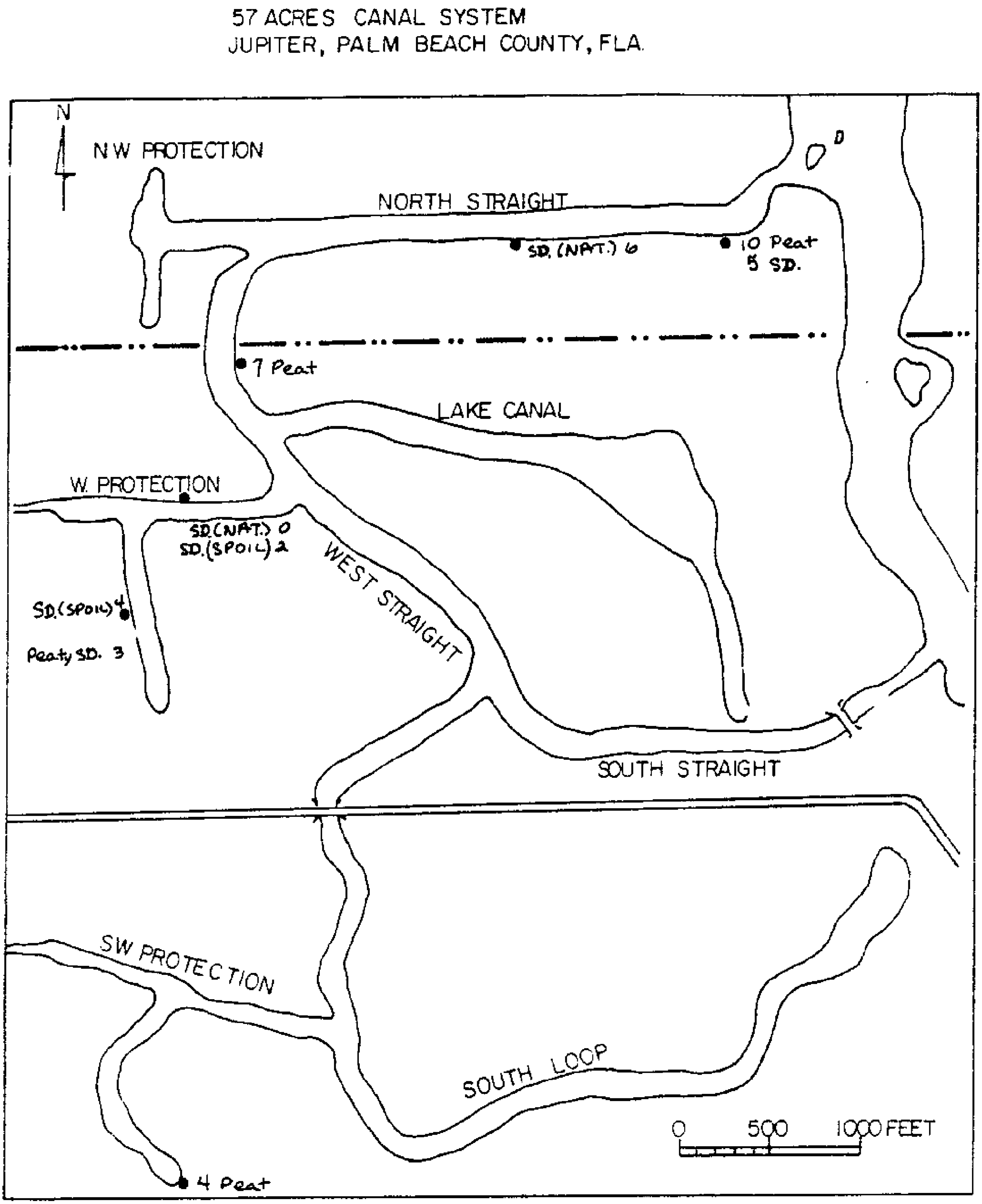



Figure 85. Montmorillonite in bank samples (% of the clay mineral fraction), 57 Acres canal system.

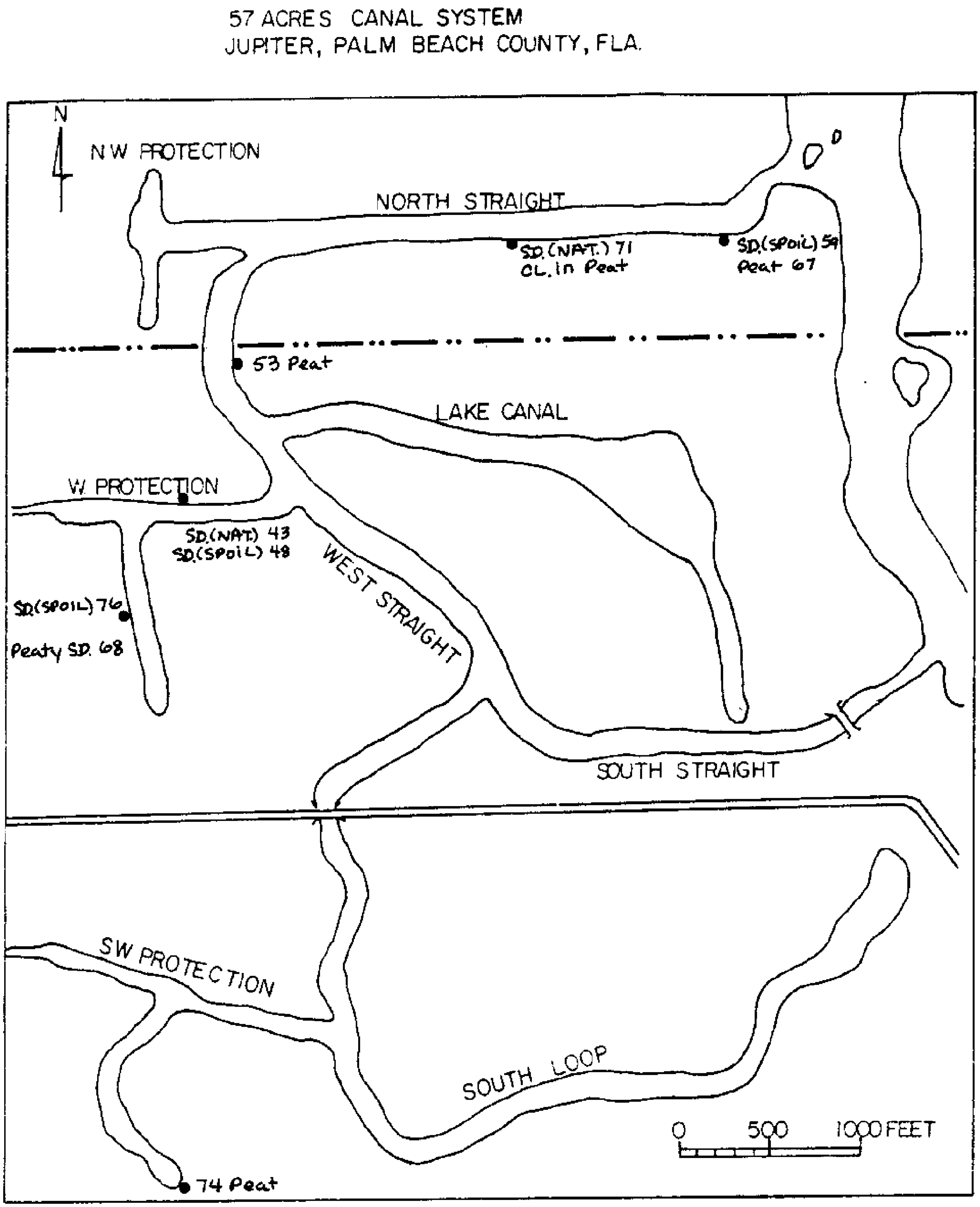
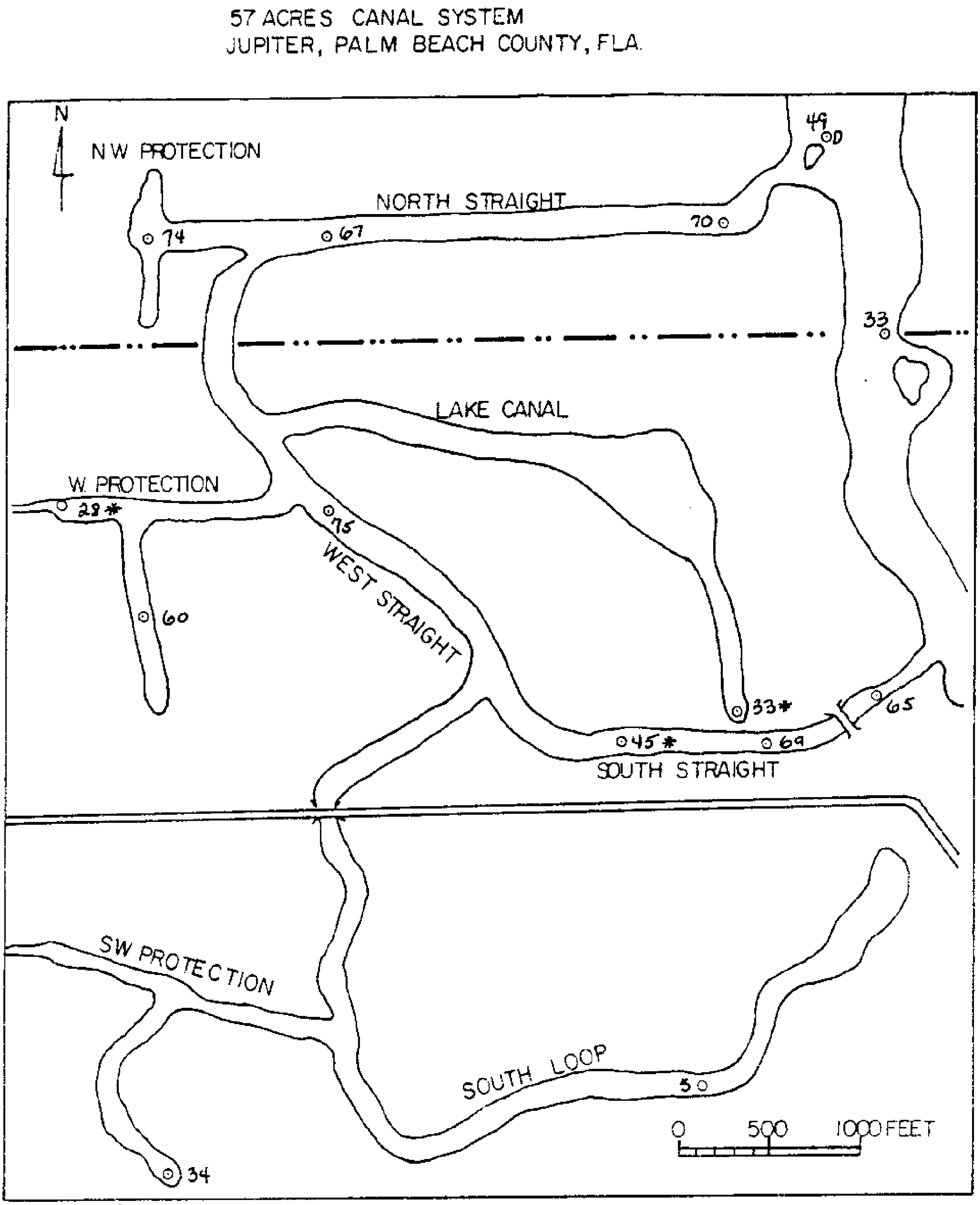
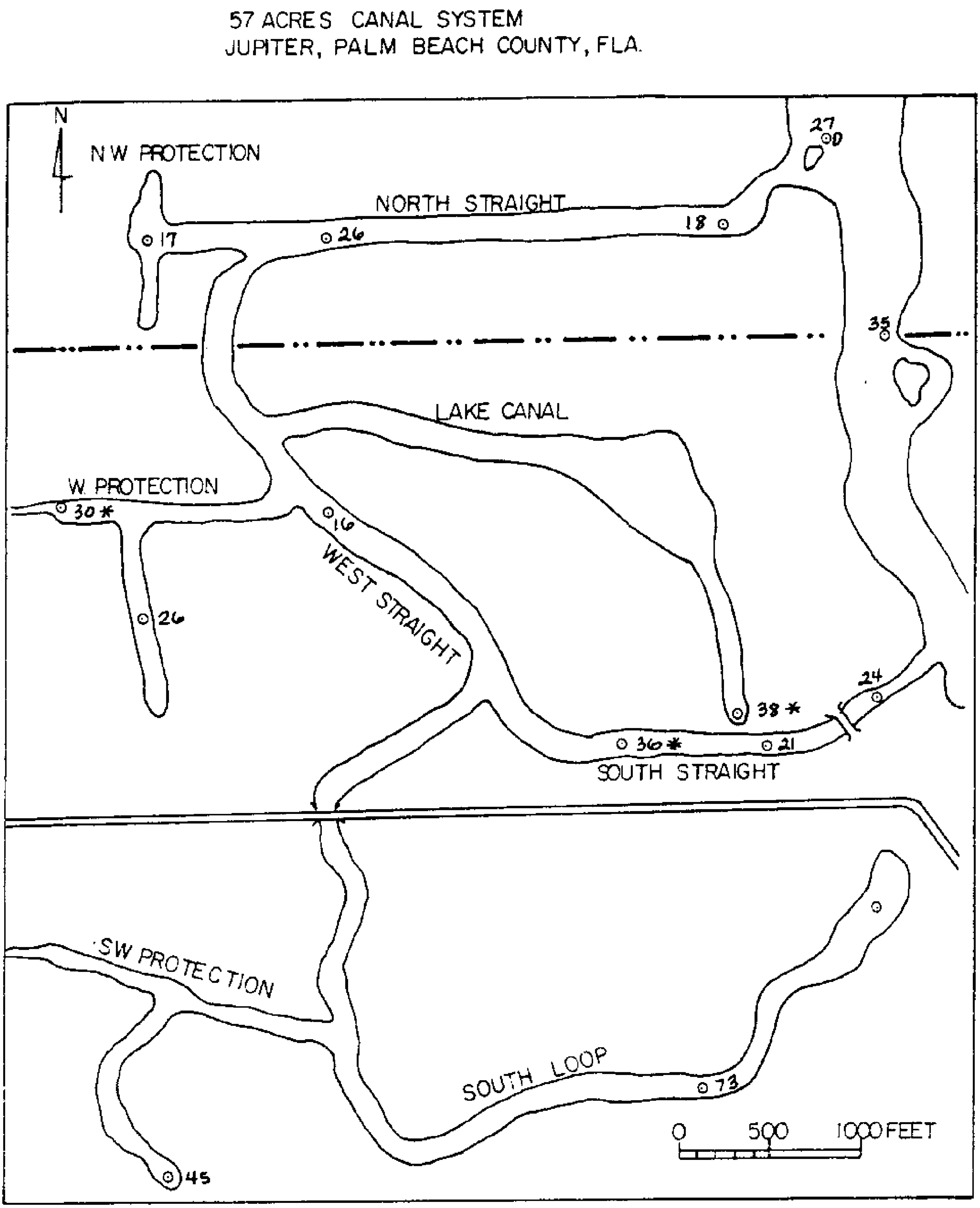



Figure 86. Kaolinite in bank samples (% of the clay mineral fraction), 57 Acres canal system.




*: Weak Pattern

Figure 87. Montmorillonite in bottom sediments (% of the clay mineral fraction), 57 Acres canal system.




* = Weak Pattern

Figure 88. Kaolinite in bottom sediments (% of the clay mineral fraction), 57 Acres canal system.

would be still essentially at the surface of the canal bottoms, where they were penetrated by the grab sampler. The south loop, a long, curved dead end projection, was apparently more isolated from the suspended "lake" sediment of the construction phase, and the clay mineralogy of the bottom sediment in the south loop closely resembles that of the bank materials.

The hypothesis above is reasonable in terms of past experience of two types:

(a) Pensacola Bay contains a "halo" relatively montmorillonitic bottom sediment surrounding the highly dredged areas near the Naval Air Station. There, depths of 33 to 35 feet were hydraulically dredged to produce maneuvering areas for aircraft carriers and other large ships (Griffin, 1972, p. 8-12; Alexander et al, 1973, p. 109-112). No other source for the montmorillonitic clay was likely.

Analogous distributions have also been noted during dredging in Tampa Bay and the upper Florida Keys (Griffin, 1976).

(b) Two samples of pre-Recent clay 150 to 280 cm deep in a core from the swampy area east of the study area yielded 82 to 96% montmorillonite. Because the general dip of the beds is easterly, it is reasonable that beds of similar type may be present beneath the 57 Acres canal system.

This possibility could not be checked further because no deeper cores could be obtained in the canal area.

In the 57 Acres canal bottom sediments, the % montmorillonite increases as the sediment becomes finer grained (Fig. 89). In contrast % kaolinite and % vermiculite-chlorite both increase as the sediment coarsens (Figures 90 and 91).

2. Loxahatchee River Canals

The clay mineral suites of five canal bottom samples (averaged), one river bottom, and one river suspended sediment are indicated below:

| | | % of the clay mineral suite | | | |
|---|---|---|---|---|---|
| | n | K | I | V+C | M |
| Average canal bottom | 5 | 29 (± 7) | 1 (± 1) | 9 (± 1) | 62(± 8) |
| Lox. River (bottom) | 1 | 29 | 1 | 10 | 60 |
| Lox. River (suspended) | 1 | 22 | 3 | 19 | 56 |

It is apparent that no significant difference exists between the clay mineral fractions of the river and the canal samples. On the other hand, the sandy bank materials contain an average of 60% kaolinite, 4% illite, 25% vermiculite-chlorite, and less than 10% montmorillonite. Thus, the banks could not have yielded the type of clay in the canal bottoms, and it must have come from settlement of the suspended load of the Loxahatchee River. The situation here differs from that of the 57

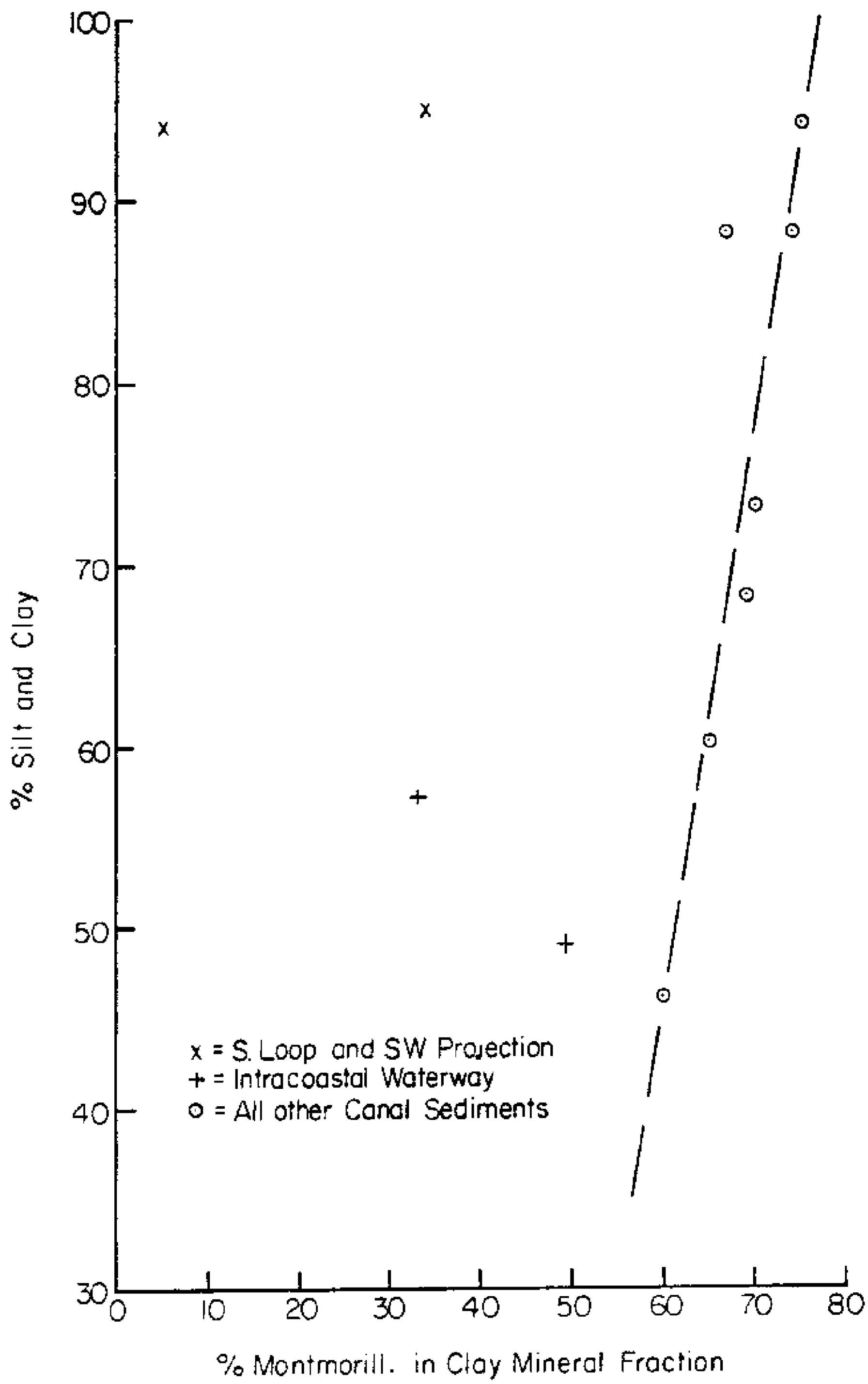



Figure 89. Montmorrilonite versus percent silt and clay. Bottom sediments. 57 Acres canal system.

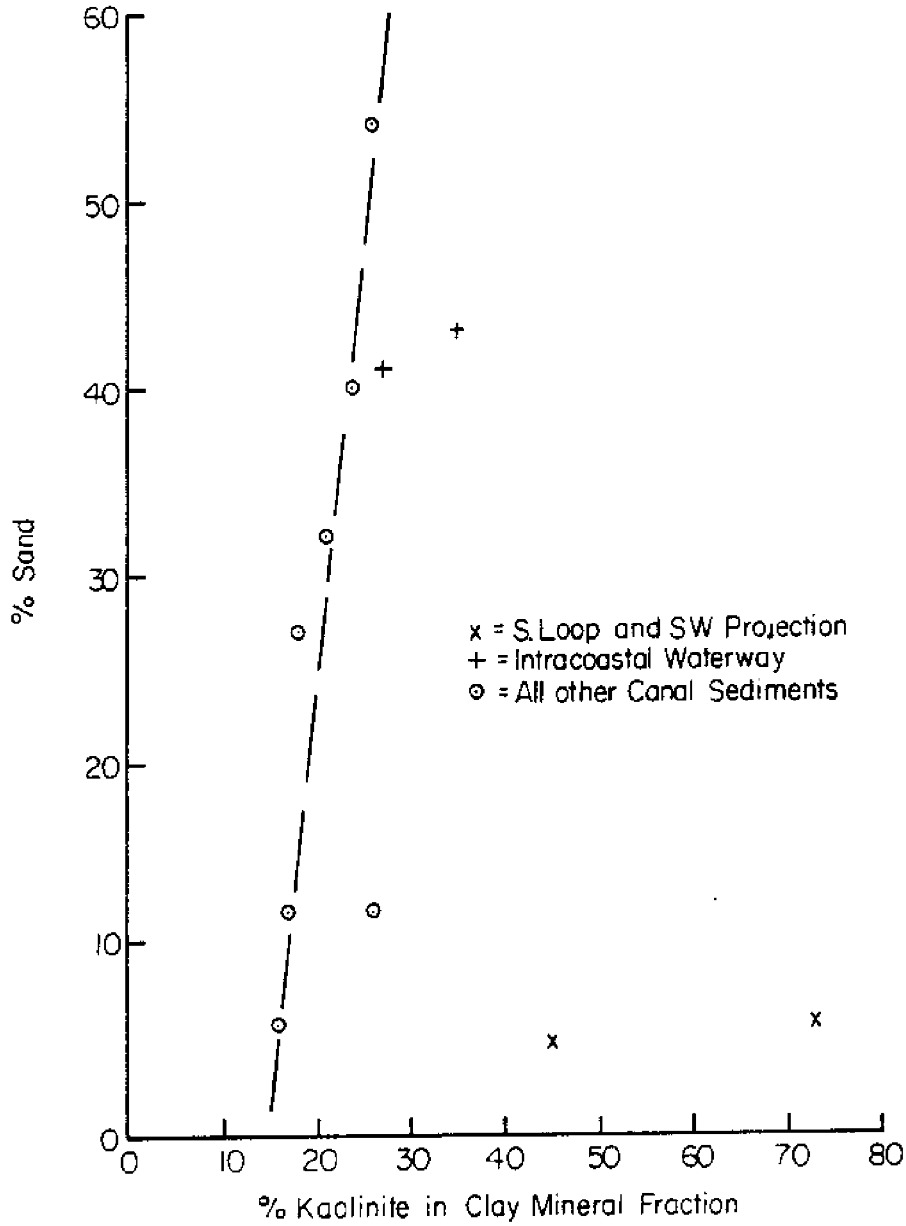



Figure 90. Kaolinite versus percent sand. Bottom sediments. 57 Acres canal system.

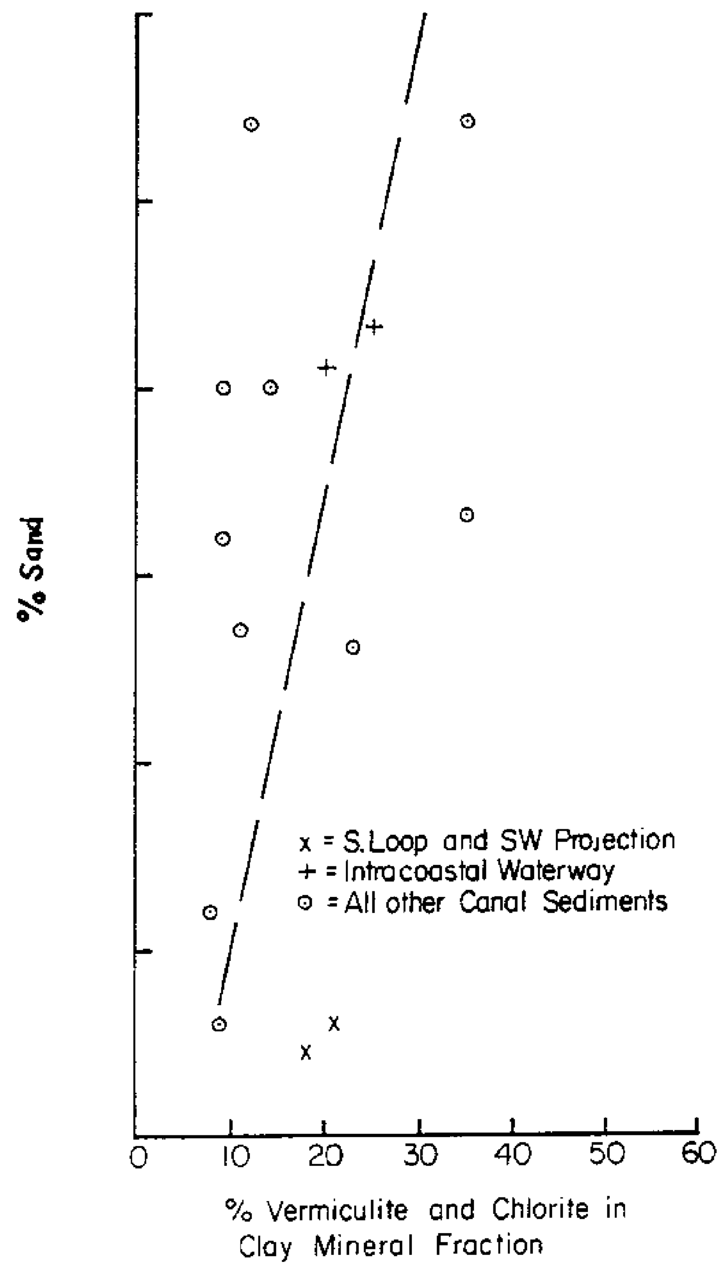



Figure 91. Vermiculite/chlorite versus percent sand. Bottom sediments. 57 Acres canal system.

Acres canals in two important ways: (1) There was no really deep dredging. The canal bottoms only reach 9 feet, which is only 3.5 feet deeper than the natural river depth. (2) The river source is very close, flowing by the canal entrance, and the canals are only 2,000 feet long. Thus, its suspended load is constantly being deposited in the canals.

The more northerly of the two canals is walled with concrete, making slumping unlikely. The southerly canal is however undeveloped and has no concrete seawalls; slash pine grows on the vegetated banks. The innermost end is used as a trash dump, part of which has slumped into the water. A canal bottom sample near this dump shows more affinity for the bank sediment than does the remainder of the canal, but it is still more similar to the river than to the bank sands.

3. Port Charlotte Isles Canals

Sediments from the Bangsberg Waterway and adjacent area yielded average clay mineral compositions as follows:

| | | % of the clay mineral suite | | | |
|---|---|---|---|---|---|
| | n | K | I | V+C | M |
| Bangsberg (bottom sed.) | 2 | 7 (±0) | 1 (±0) | 15 (±6) | 77 (±6) |
| Bangsberg (susp. sed.) | 1 | 6 | 2 | 19 | 74 |
| undevel. canal (bottom) | 1 | 12 | <1 | 11 | 77 |
| undevel. (spoil bank) | 1 | 37 | 4 | 17 | 42 |
| Peace River (bottom) | 1 | 8 | <1 | 25 | 66 |
| Peace River (susp. sed.) | 1 | 3 | 1 | 20 | 76 |

The values for montmorillonite and kaolinite are plotted on Figures 92 and 93. From these analyses, it is concluded

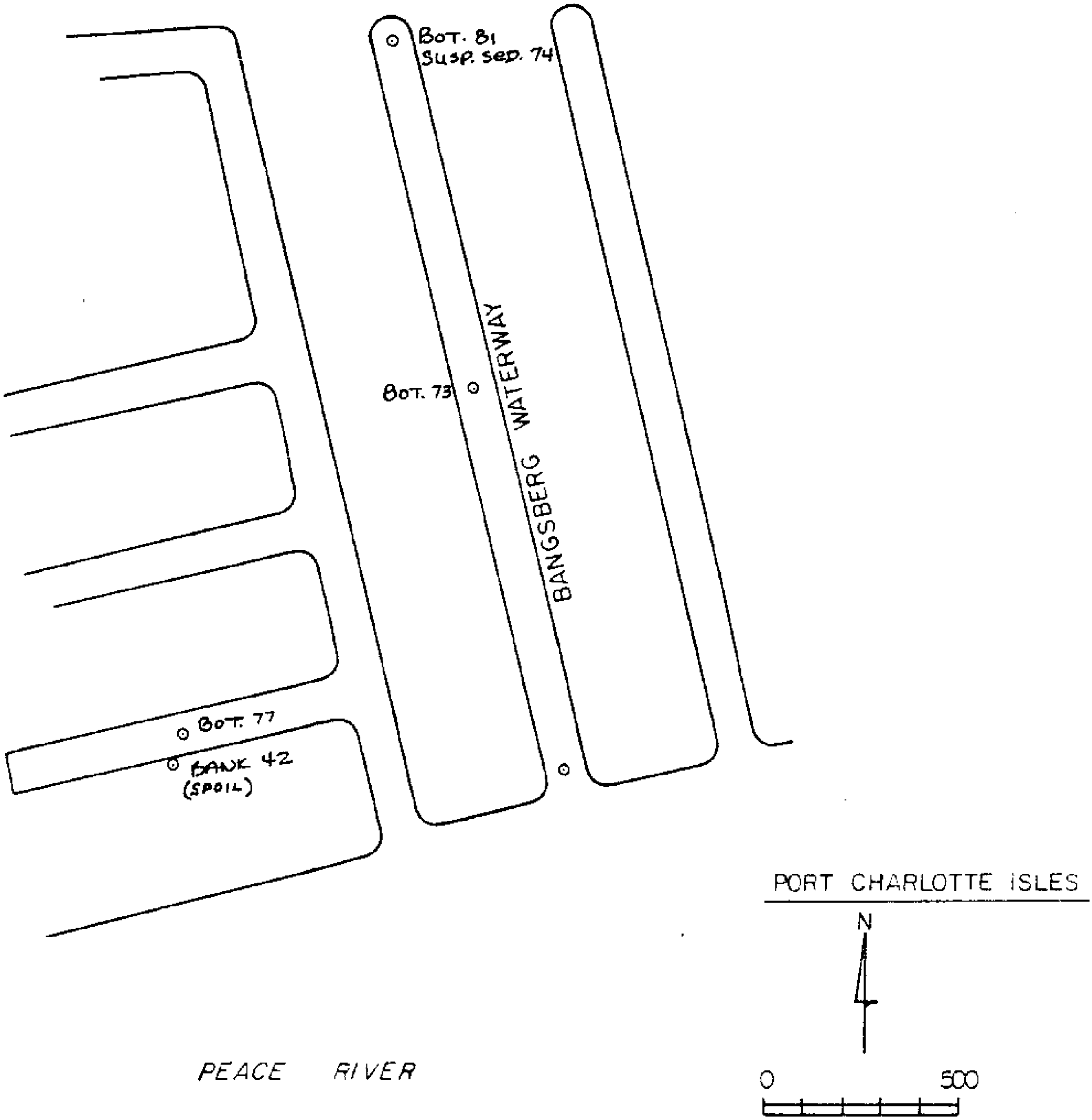



Figure 92. Montmorillonite in bottom, bank and suspended sediment samples (% of the clay mineral fraction). Bangsberg Waterway.

Bot. 66
Susp. Sed. 76

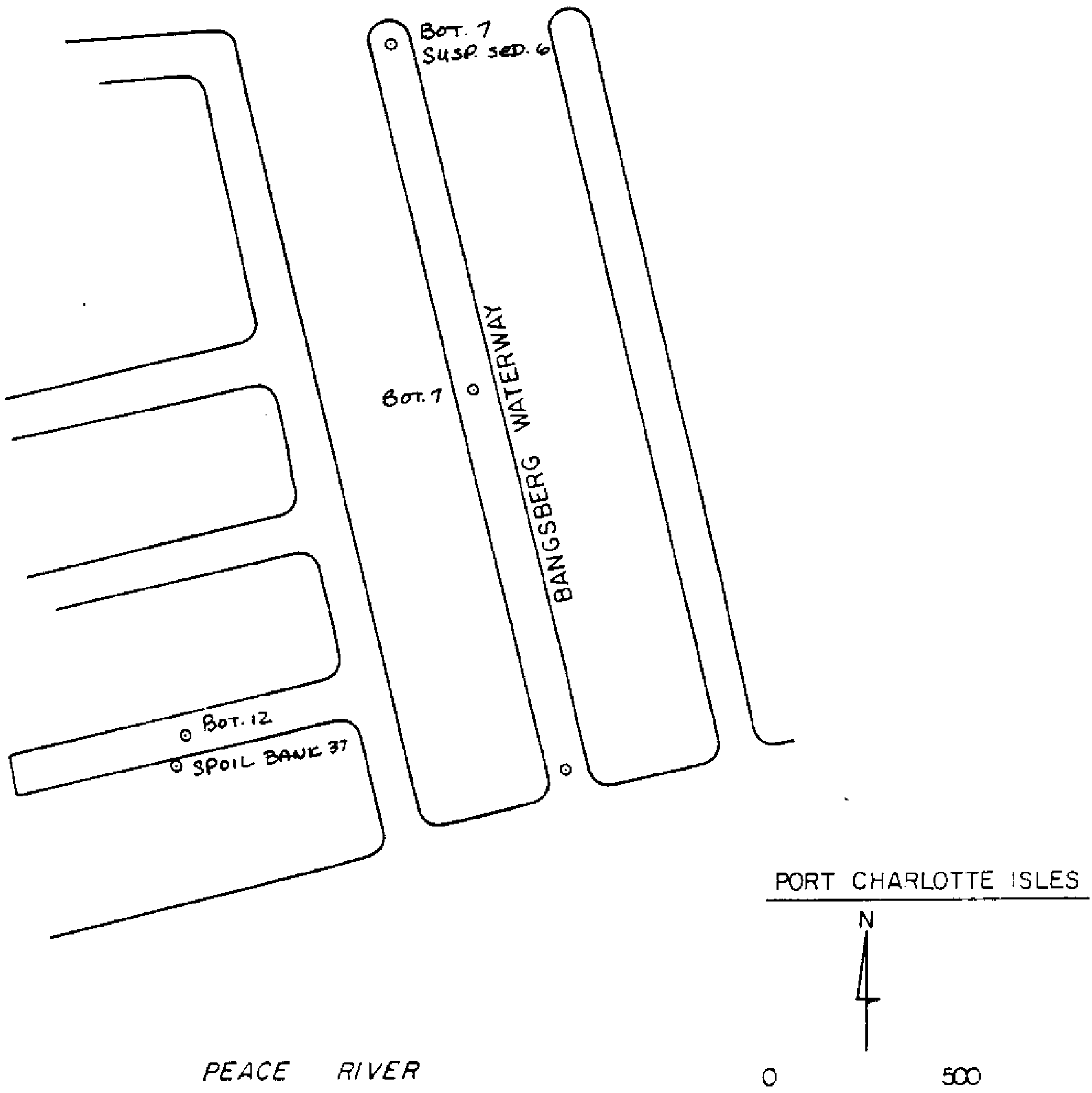



Figure 93. Kaolinite in bottom, bank, and suspended sediment samples (% of the clay mineral fraction). Bangsberg Waterway.

that the spoil bank sample contains too much kaolinite (37%) and too little montmorillonite (42%) to have supplied the clay in the concrete-bulkheaded Bangsberg Waterway bottom sediments (7% kaolinite and 77% montmorillonite). However, the spoil bank apparently has supplied some kaolinitic clay to the undeveloped canal bottom adjacent to it.

In contrast to the above, the Peace River and the Bangsberg Waterway sediments are internally similar. This similarity holds true for both the suspended and bottom materials. Thus settlement of material from the river is the most logical source of the clays in the Bangsberg Waterway bottom sediments.

4. Punta Gorda Isles Canals

The clay mineral fraction extracted from Sunfish Cove Canal and vicinity produced the following compositions:

| | | % of the clay mineral suite | | | |
|---|---|---|---|---|---|
| | η | K | I | V + C | M |
| Sunfish C. (bottom sed.) | 3 | 5 (± 2.5) | 1.5 (± 0.5) | 9 (± 2) | 85 (± 4) |
| Sunfish C. (susp. sed.) | 1 | 6 | 2 | 15 | 77 |
| Peace R. (bottom sed.) | 1 | 2 | <1 | 7 | 90 |
| Peace R. (susp. sed.) | 1 | 3 | 1 | 18 | 78 |

From the above montmorillonite and kaolinite values (plotted on Figures 94 and 95), it is concluded that all the samples form a homogeneous group. The suspended matter in the river is essentially identical to the suspended matter in the canal, and the bottom samples from the river and canal are too similar to distinguish. Thus, the bottom sediment in the canal could have been derived from the suspended sediment in the river. Because

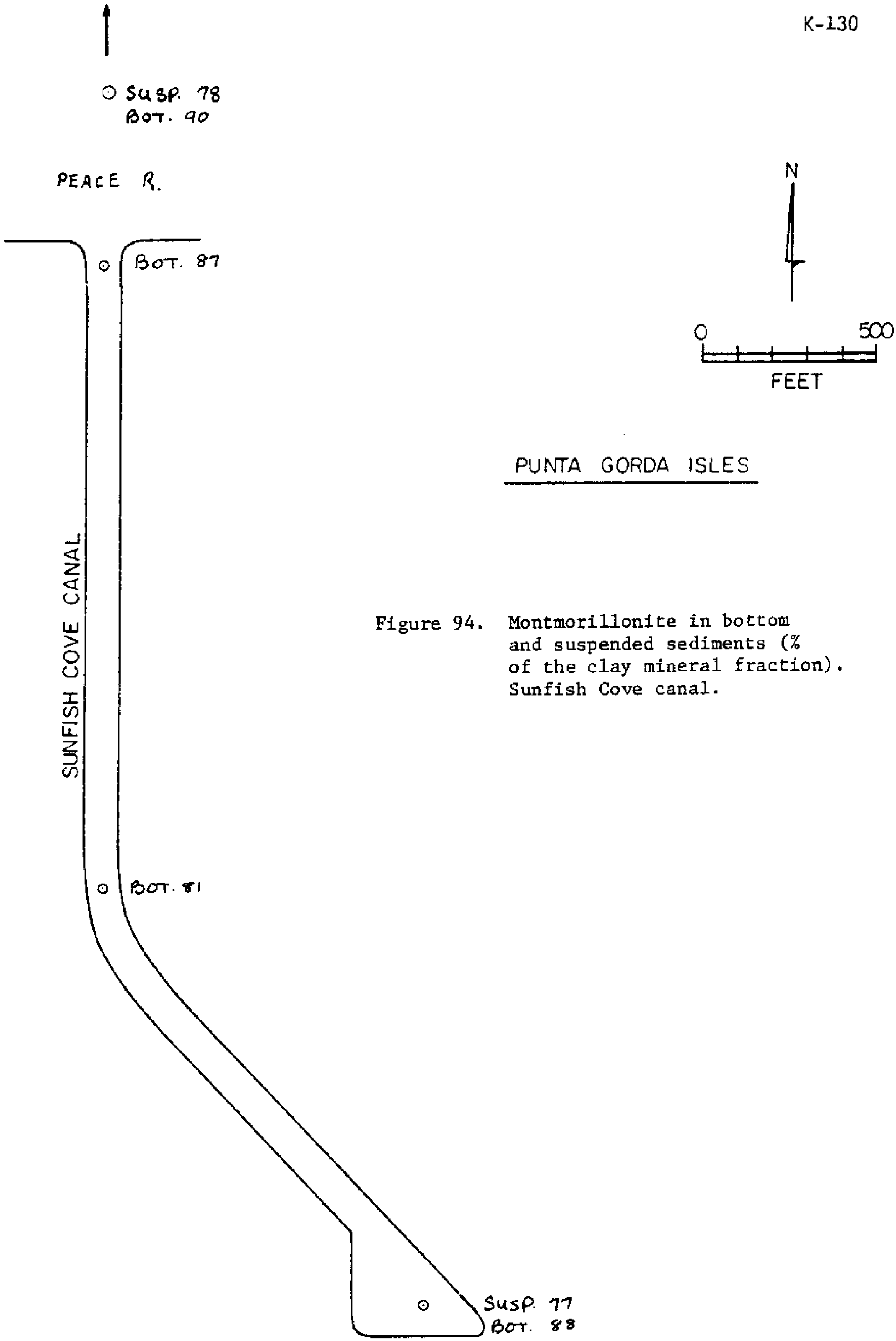



Figure 94. Montmorillonite in bottom and suspended sediments (% of the clay mineral fraction). Sunfish Cove canal.

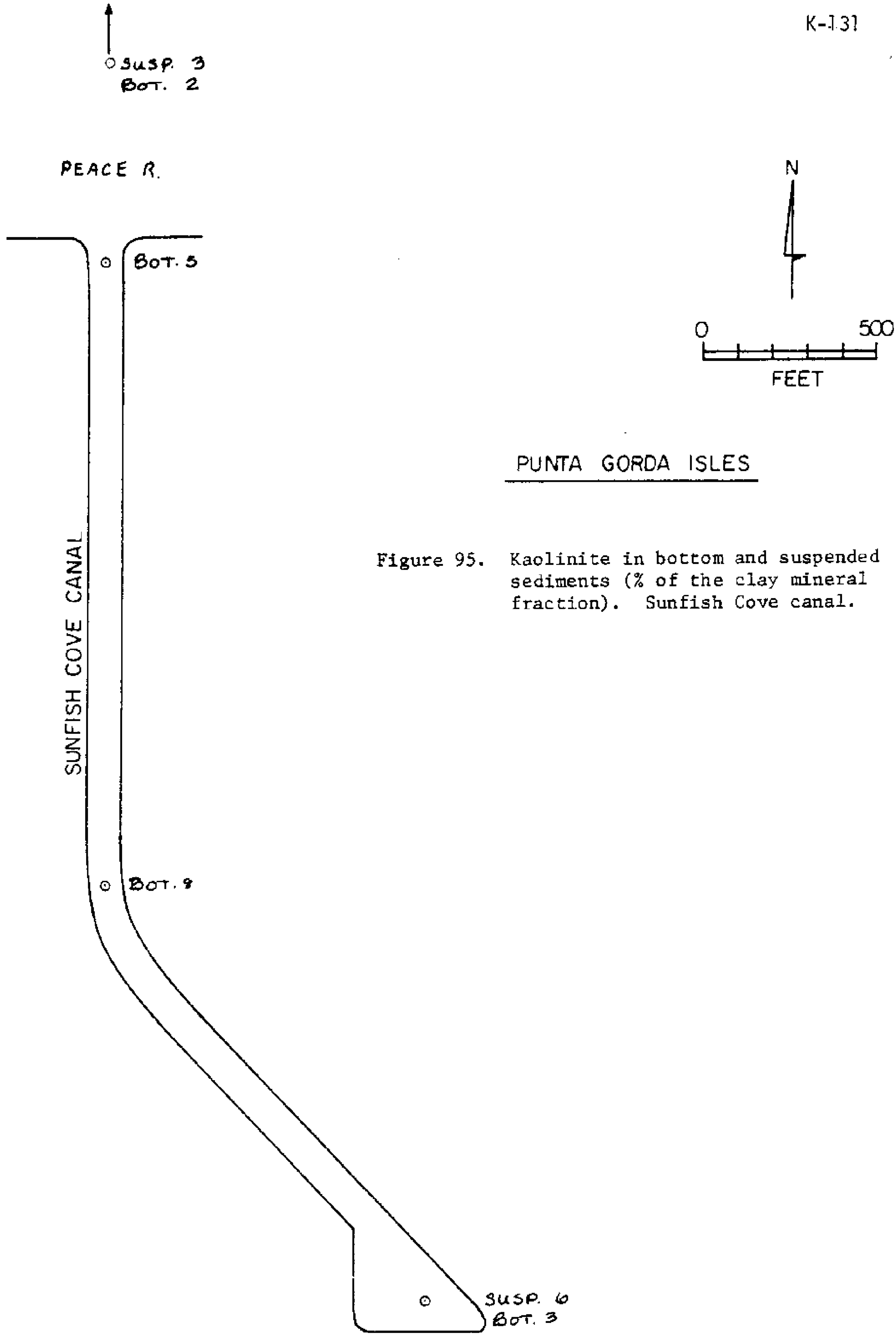



Figure 95. Kaolinite in bottom and suspended sediments (% of the clay mineral fraction). Sunfish Cove canal.

this area is fully developed, with concrete bulkheads and lawns, it was not possible to sample the bank materials or the dredge spoil for comparison.

5. Summary

In all but the 57 Acres project, the clay mineral suite in the canal bottom muds is similar to that in suspended sediments from immediately adjacent rivers. In contrast, where it was possible to sample the natural bank or dredge spoil materials, they differed significantly from the canal bottom sediments. Thus, it is concuded that particles suspended in the river waters routinely enter the canals and settle to the bottom, where they make up the bulk of the inorganic fraction of the bottom sediments. The still waters of the canals below the threshold depth at their entrances promote this settling. That is, the canals act as sediment traps.

All of the canals in the above group are relatively short and simple, nearly straight canals that connect directly with a major river source of suspended particulate matter. The deepest point is 18 feet in the Punta Gorda canal; the others are shallower. In contrast, the 57 Acres project is a much longer, sinuous canal system with numerous dead end projections, and a dredged "lake" with a depth of 24 feet. This canal system connects to the Intracoastal Waterway, which is a less constant source of inorganic particulate matter than the rivers adjacent to the other canals systems.

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