



Department of Energy

**Ohio Field Office
Fernald Area Office**

P. O. Box 538705
Cincinnati, Ohio 45253-8705
(513) 648-3155



MAY 9 1997
DOE-0908-97



**Mr. James A. Saric, Remedial Project Director
U.S. Environmental Protection Agency
Region V-SRF-5J
77 West Jackson Boulevard
Chicago, Illinois 60604-3590**

**Mr. Tom Schneider, Project Manager
Ohio Environmental Protection Agency
401 East 5th Street
Dayton, Ohio 45402-2911**

Dear Mr. Saric and Mr. Schneider:

DRAFT PRELIMINARY WETLAND MITIGATION ASSESSMENT

Enclosed for your review and approval is a draft Preliminary Wetland Mitigation Assessment. This assessment evaluates three alternatives for their potential of supporting on-property wetland mitigation and provides a recommendation for the most feasible alternative. This assessment provides the initial foundation for addressing the regulatory commitment of 15 acres of mitigated wetlands. The type and size wetland system to be supported on-property is beyond the scope of this assessment and will be provided during conceptual design. Upon the Agencies' review, the Department of Energy, Fernald Environmental Management Project (DOE-FEMP) would like to schedule a meeting to discuss the path forward. This assessment is part of the Natural Resource Restoration Plan that will be submitted to the agencies in July 1997.

If you have any questions or require additional information, please contact Pete Yerace at (513) 648-3161, or me at (513) 648-3139.

Sincerely,

**Johnny W. Reising
Fernald Remedial Action
Project Manager**

FEMP:Yerace

Enclosure: As Stated

cc w/enc:

N. Hallein, EM-42/CLOV
R. J. Janke, DOE-FEMP
P. Yerace, DOE-FEMP
J. Chapman, USEPA
G. Jablonowski, USEPA-V, 5HRE-8J
R. Beaumier, TPSS/DERR, OEPA-Columbus
L. Merchant, OEPA-Dayton
D. Henne, DOI
B. Fletcher, ODNR
B. Kurey, USFWS
F. Bell, ATSDR
D. S. Ward, GeoTrans
R. Vandegrift, ODOH
R. Geiger, PRC
S. Garland, FDF/52-8
A. Hunt, FDF/52-5
T. Hagen, FDF/65-2
J. Harmon, FDF/90
C. Straub, FDF/52-2
E. Woods, FDF/65-2
AR Coordinator/78

cc w/o enc:

C. Little, FDF/2
EDC, FDF/52-7

Preliminary Wetland Mitigation Assessment

DRAFT

May 1997

**Prepared by
Fluor Daniel Fernald
For
U.S. Department of Energy - Fernald Environmental Management Project**

Table of Contents

Section	Page
Table of Contents	i
List of Figures	ii
List of Tables	iii
List of Acronyms	iv
Executive Summary	E-1
1.0 Introduction	1-1
2.0 Site Background	2-1
3.0 Nature and Extent of Wetland Impacts	3-1
4.0 Analysis of Alternatives	4-1
4.1 Alternative 1 - Paddys Run Corridor	4-1
4.2 Alternative 2 - Northern Forested/Northern Isolated Wetland	4-3
4.3 Alternative 3 - Northern Forested Wetland Area	4-5
5.0 Watershed Study	5-1
5.1 Materials and Methods	5-1
H-Flume Installation	5-1
Surface Water Sampling	5-3
Analytical Procedures	5-3
5.2 Results and Discussion	5-5
Conclusion	C-1
References	R1
Appendix A Site Photographs of Storm Event #7	AA1
Appendix B Laboratory Analyses	AB1
Appendix C Hydrographs	AC2

List of Figures

	Page
Figure 1	Fernald Environmental Management Project 2-2
Figure 2	1993 Jurisdictional Wetlands and Waters of the United States 3-2
Figure 3	Locations of Wetland Mitigation Alternatives 4-2
Figure 4	Watershed Sampling Locations 5-2
Figure 5	Watershed Boundaries 5-4

List of Tables

Table	Page
Table 1 Duration, Total Flow, and Precipitation of All Storm Events	5-6
Table 2 Average Mass Loadings by Parameter for all Storm Events from Sampling Stations	5-7
Table 3 Comparison of Total Monthly Rainfall During the Watershed Study to the Monthly 30-Year Average (1965 - 1995)	5-9

List of Acronyms

BOD,	Biochemical Oxygen Demand - 5 Day Method
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
D.O.	Dissolved Oxygen
DOE	Department of Energy
MSL	Mean Sea Level
NRRP	Natural Resource Restoration Plan
ODNR	Ohio Department of Natural Resources
OEPA	Ohio Environmental Protection Agency
OU	Operable Unit
RI	Remedial Investigation
ROD	Record of Decision
TSS	Total Suspended Solids
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service

EXECUTIVE SUMMARY

The U.S. Department of Energy's (DOE) Fernald Environmental Management Project occupies 1,050 acres in rural southwestern Ohio, approximately 18 miles northwest of downtown Cincinnati, Ohio. From 1953 to 1989, Fernald produced high-purity uranium metal products in support of U.S. defense programs. Production was halted in 1989, after the United States Environmental Protection Agency (USEPA) placed the site on the National Priority List and remedial efforts were initiated under the Comprehensive Environmental Response, Compensation, and Liabilities Act (CERCLA).

The 1993 wetland delineation identified approximately 36 acres of jurisdictional wetlands and 8.9 acres of waters of the United States within the 1,050-acre property. Although Fernald plans to avoid or minimize impacts to these areas to the maximum extent practicable during remediation, some unavoidable impacts requiring mitigation are anticipated. These impacts are potentially subject to compensatory wetland mitigatory requirements under applicable federal and state regulations promulgated to implement the requirements of Sections 404 and 401 of the CWA. In recognition of this fact, a comprehensive site-wide approach is in the process of being developed to integrate CWA Section 404 mitigatory requirements into the CERCLA process.

On June 20, 1995, DOE met with representatives from USEPA, Ohio Environmental Protection Agency (OEPA), U.S. Fish & Wildlife Service (USFWS), and Ohio Department of Natural Resources (ODNR) to present a conceptual proposal for addressing wetland mitigatory requirements at DOE's Fernald Site in Cincinnati, Ohio. Key aspects of the DOE proposal included the preference for addressing mitigatory requirements on-property within the general locale of the 26 acre northern forested wetland, mitigating the entire 10 acre wetland impacts through restoration or creation actions with one concerted effort.

All parties concurred that the DOE conceptual approach represented a reasonable means for addressing the wetland mitigatory issue and agreed to an established mitigation ratio of 1:1.5 acres.

This preliminary wetland mitigation assessment addresses the potential for conducting on-property wetland mitigation through the evaluation of three alternatives. Each alternative was evaluated based on existing

Executive Summary

(continued)

data and field observations. While all alternatives possessed some potential for wetland mitigation, some alternatives were not as feasible based on the issue of habitat fragmentation.

The alternative recommended for further study to potentially conduct on-property wetland mitigation includes the expansion of the 26 acre northern forested wetland by utilizing the southwest meadow within the woodlot and the open meadow area adjacent and south of the woodlot. This alternative was selected based on accessibility, near-term implementation and minimal issues of habitat fragmentation. Based on the results of the watershed study conducted in the Forested Wetland, there is some uncertainty associated with supporting all 15 acres of mitigated wetlands in the Northern Woodlot.

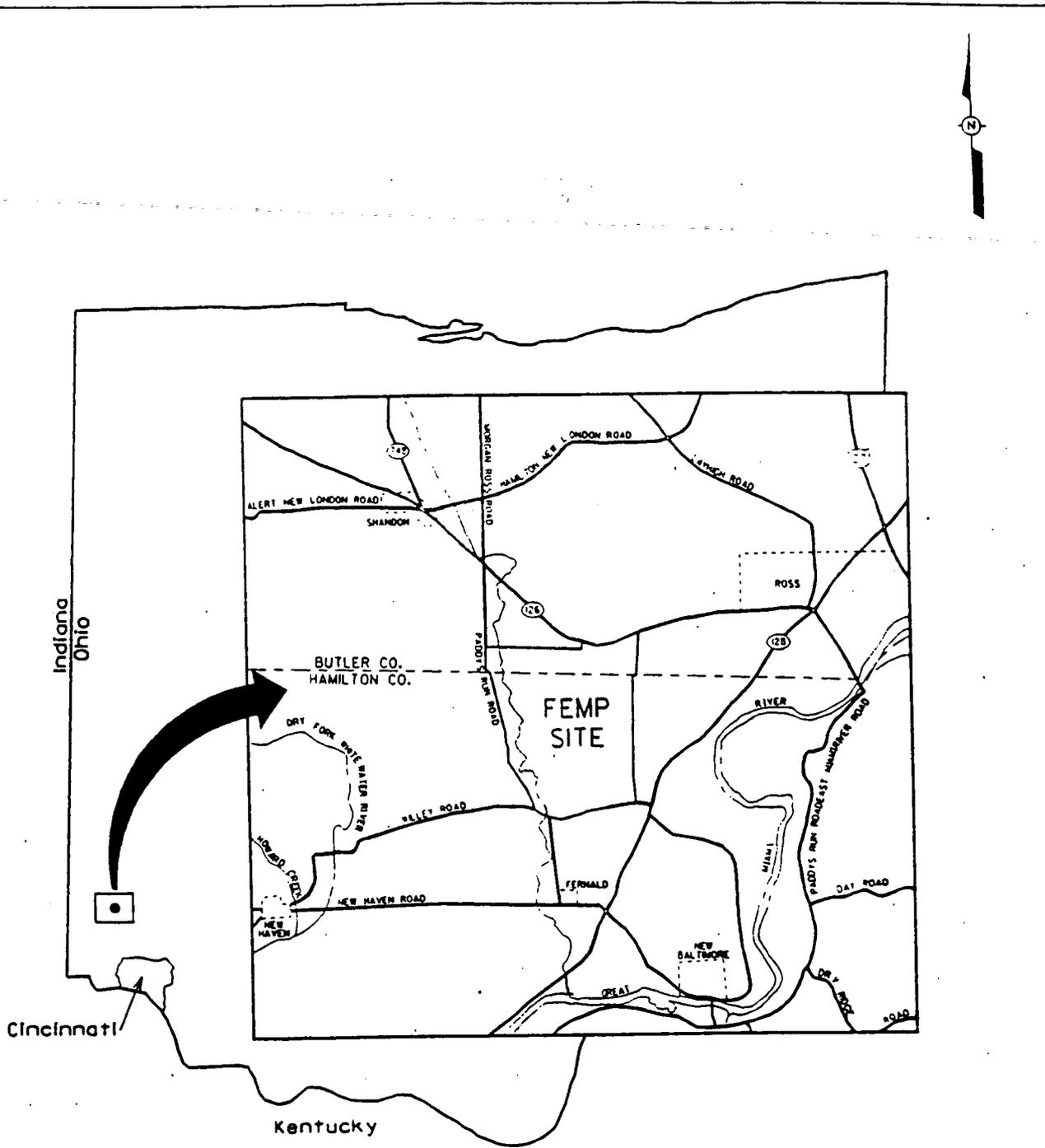
Preliminary Wetland Mitigation Assessment
DRAFT

1.0 INTRODUCTION

On June 20, 1995, the U.S. Department of Energy (DOE) met with representatives from U.S. Environmental Protection Agency (USEPA), the Ohio Environmental Protection Agency (OEPA), U.S. Fish and Wildlife Service (USFWS), and the Ohio Department of Natural Resources (ODNR) to present a conceptual proposal for addressing wetland mitigatory requirements at DOE's Fernald Site near Cincinnati, Ohio. Key aspects of the DOE proposal included the preference for addressing mitigatory requirements on-property within the general locale of the 26 acre northern forested wetland, mitigating the entire 10 acre wetland impacts through restoration or creation actions with one concerted effort.

After a period of discussion, all parties concurred that the DOE conceptual approach represented a reasonable means for addressing the wetland mitigatory issue. To further clarify the specific aspects of the conceptual approach, a mitigatory ratio of 1:1.5 acres was established at the meeting. DOE also committed to providing all agencies represented at the meeting with additional detail on the feasibility of conducting on-property mitigation within the Paddys Run corridor and within the general locale of the northern forested and isolated wetland systems located in the northern portion of the site. Specific alternatives that were to be evaluated within each of these areas included:

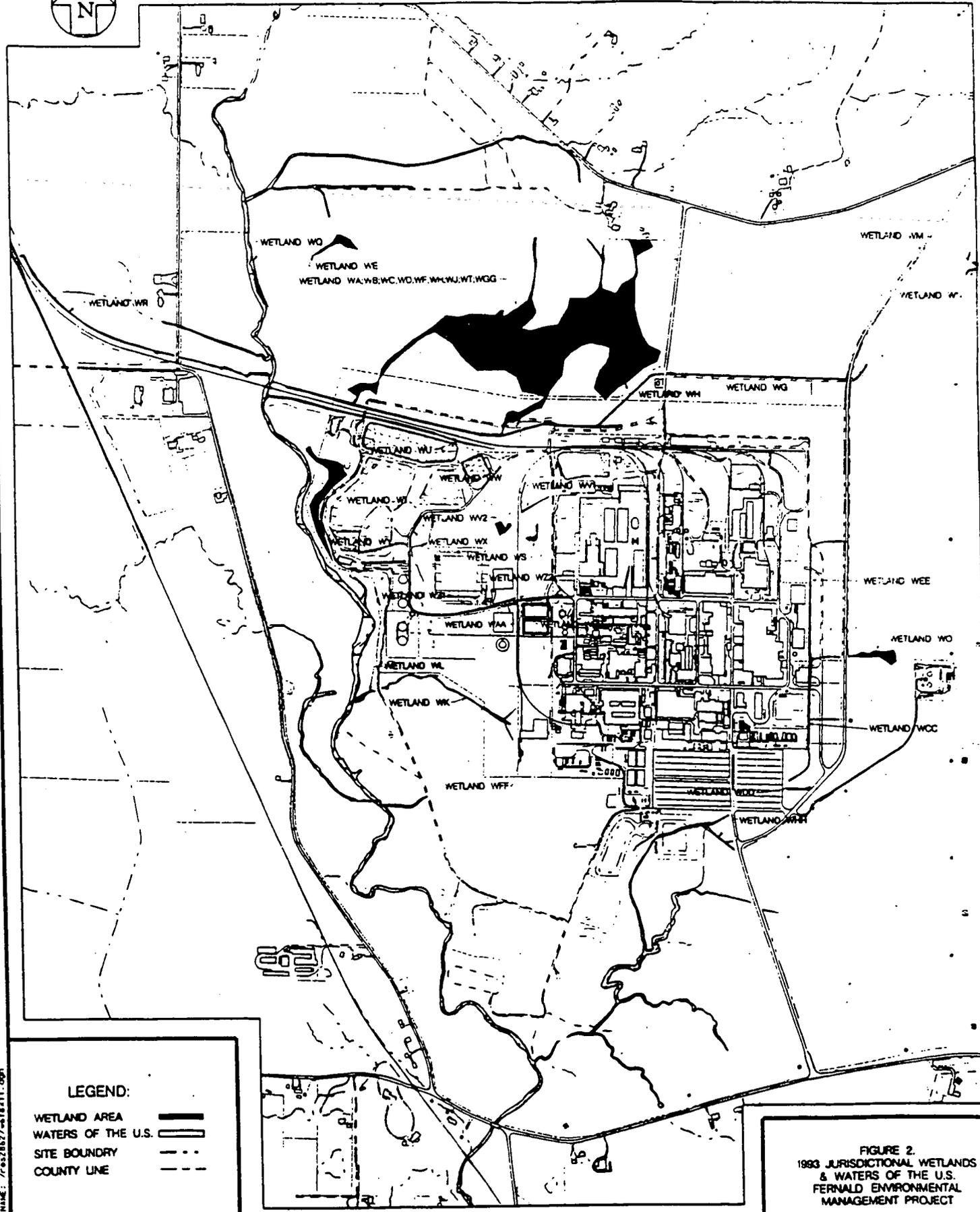
- Alternative 1 - Paddys Run Corridor: establishment of newly created wetland areas in association with the Paddys Run corridor and existing on-property tributaries.
- Alternative 2 - Northern Forested/Northern Isolated Wetland: expansion of the northern forest wetland and isolated wetland systems within the 100-acre woodlot, through restoration/creation actions.



RES2862/FIG1.DGN GES

FIGURE 1. FERNALD ENVIRONMENTAL MANAGEMENT PROJECT LOCATION

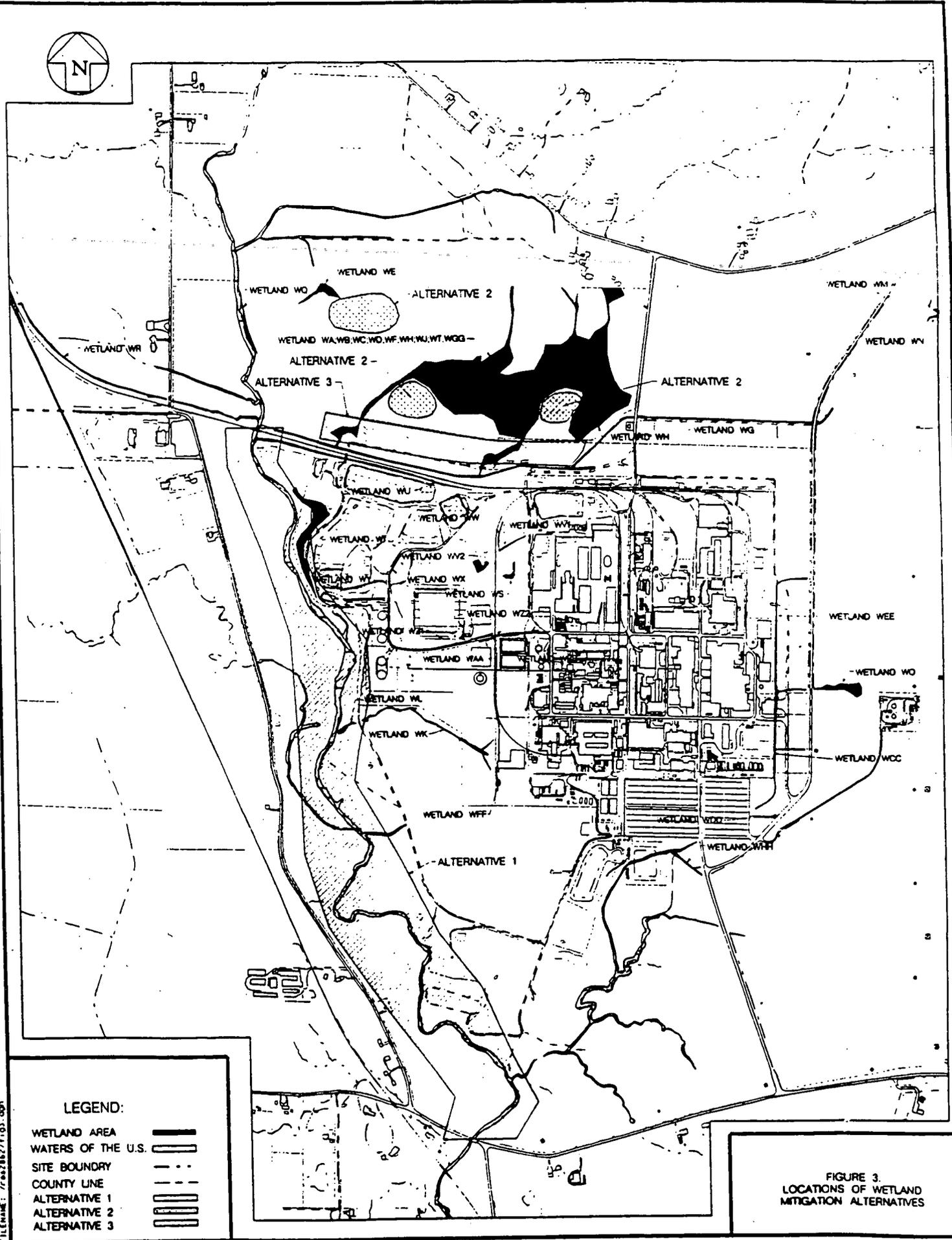
000013



LEGEND:
 WETLAND AREA 
 WATERS OF THE U.S. 
 SITE BOUNDARY 
 COUNTY LINE 

FIGURE 2.
 1993 JURISDICTIONAL WETLANDS
 & WATERS OF THE U.S.
 FERNALD ENVIRONMENTAL
 MANAGEMENT PROJECT

FILENAME: /res2852/m18a11.dgn



FILENAME: /rns2882/1103.dwg

LEGEND:

- WETLAND AREA
- WATERS OF THE U.S.
- SITE BOUNDARY
- COUNTY LINE
- ALTERNATIVE 1
- ALTERNATIVE 2
- ALTERNATIVE 3

FIGURE 3. LOCATIONS OF WETLAND MITIGATION ALTERNATIVES

**Preliminary Wetland Mitigation Assessment
DRAFT**

The Southern two-thirds of Paddys Run Corridor which is situated on sand and gravel did not contain water at the time of the study. Two tributaries were dry, with a third tributary entering from the east with minimal water flow. Paddy's Run recharges the aquifer at a rate of approximately 14 inches per year in this area. The portion of Paddy's Run just south of the K-65 silos continually infiltrates to the Great Miami Aquifer. This area has been eroded by Paddy's Run causing exposure of the aquifer.

Soil types within Paddys Run Corridor are classified as Fincastle in the northern reach of Paddys Run and Hennepin in the southern reach (USDA, 1982). Fincastle soils are Class C, indicating a somewhat poorly drained soil as evidenced by field observations. Hennepin soils are Class B, indicating a moderate infiltration rate and are located on slopes along streams.

Paddys Run Corridor would not be conducive to wetland mitigation. The southern reach of Paddys Run does not contain the potential for hydrologic or soil conditions that would support wetland mitigation. Surface water flow rapidly infiltrates into the Great Miami Aquifer and the soil type is moderately well drained. The northern reach of Paddys Run contains the potential to support wetland mitigation. However, since stream flow is intermittent and the stream banks are high in the Northern reach, surface water overflow of the banks does not occur. Extensive excavation of the stream banks would be required to supply wetland hydrology, causing a dramatic change to stream configuration. Any alteration to this portion of the stream would alter the stream ecology and associated habitat of the Sloan's crayfish, which is listed as a threatened species in the State of Ohio.

4.2 Alternative 2 - Northern Forested/Northern Isolated Wetland

Two meadow areas and one meadow/deciduous forest area adjacent to the northern forested wetlands were assessed for wetland mitigation potential. One meadow is located in the northwest corner of the woodlot and the other two areas are located in the southern portions of the woodlot.

**Preliminary Wetland Mitigation Assessment
DRAFT**

Southeast Meadow

The southeast meadow contains a class B Xenia silt loam which is moderately well drained (Ebasco, 1993). The western portion of this meadow area is drained by the eastern most drainage appendage of the forested wetland. To supply water to this meadow area would require construction of a berm to restrict surface water flow which would impact surface water hydrology of the southern most reach of this drainage appendage and would preclude the implementation of Alternative 3. Therefore, wetland mitigation in the southeastern meadow is not recommended.

4.3 Alternative 3 - Northern Forested Wetland Area

This alternative is located in the open meadow area adjacent to and south of the 26-acre forested wetland area and is being considered to expand the 26-acre forested wetland area. The topography within the south meadow area ranges from 585 (MSL) near the eastern edge to 565 feet (MSL) of the western edge. Vegetation consists predominately of red fescue with a class B Xenia silt loam soil which is moderately well drained and a class C Fincastle silt loam which is somewhat poorly drained (Ebasco, 1993).

The open meadow area is accessible and conducive for establishing the necessary slopes and depressional areas for wetland mitigation. To assess the potential of conducting on-property wetland mitigation utilizing the open meadow area adjacent and south of the 26-acre forested wetland area, it was necessary to understand the dynamics of the watershed influence upon this open meadow area by conducting a watershed study which is presented in Section 5.

Preliminary Wetland Mitigation Assessment
DRAFT

5.0 WATERSHED STUDY

This watershed study was developed to assess general surface water quality and to evaluate surface water flow rates of two 40-acre watershed systems using flume measurements and hydrologic calculations. A 26-acre forested wetland is located within the watershed systems. Characterization of the watersheds is necessary to evaluate the feasibility of conducting on-property wetland mitigation by using the 26-acre forested wetland to hydrologically capacitate additional wetlands. These watershed systems were selected for study since they are not expected to be impacted by remedial activities. The data acquired from this study will support an evaluation of the potential for using the 26-acre forested wetland as a mitigatory option at Fernald during the design of remedial activities.

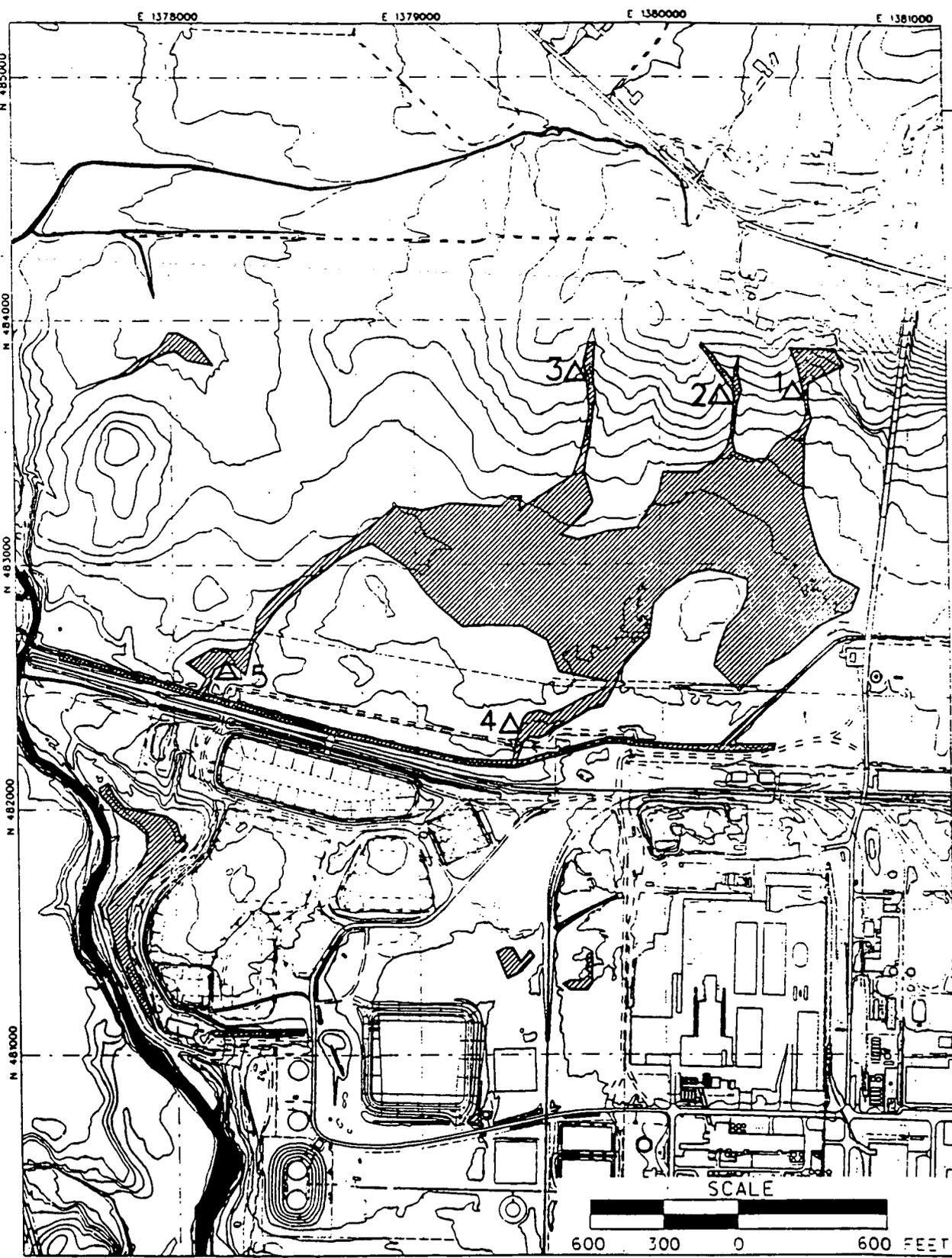
The watershed systems are situated at the southern edge of the Till Plains section of the Central Lowland physiographic province. The Northern elevation of the watersheds is about 700 feet above mean sea level (MSL), gently sloping at about 580 feet MSL. Natural surface drainage is to the west/southwest towards an intermittent ungaged stream. The watershed is a early to mid-successional woodland with some interspersed open meadows.

5.1 Materials and Methods

H-flume Installation

Five sampling stations were established using pre-manufactured fiberglass H-flumes and automated samplers and flow meters. Stations 1, 2, and 3 were used to collect influent samples and stations 4 and 5 were used to collect effluent samples from the watersheds (Figure 4). Each flume was installed level with the surface water flow direction within the channel. Plywood backing was mounted to the upstream end of each flume with approximately 3 feet of plywood extending on each side to the flume to ensure stability within the stream channel and channelization of surface water flow. A pickax was used to excavate a perpendicular trench into the bank of the channel to allow placement of the plywood extension. Bentonite clay was placed within the trench to prevent water seepage under and around the flume. A 6 inch layer of pea gravel was placed over the bentonite seal to reduce turbidity of surface water.

STATE PLANNING COORDINATE SYSTEM 1927
FIR 06/27/96



LEGEND:

- Δ FORESTED WETLAND
SURFACE WATER
SAMPLING LOCATIONS
- WETLAND AREA

WATERS OF THE U.S.

SITE BOUNDARY

FIGURE 4. WATERSHED SAMPLING LOCATIONS

Preliminary Wetland Mitigation Assessment
DRAFT

Sand bags were placed between the channel bank and each side of the flume to provide additional stability.

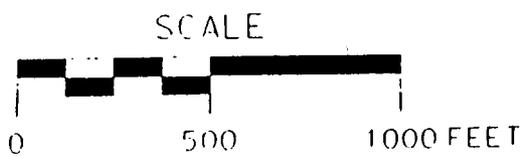
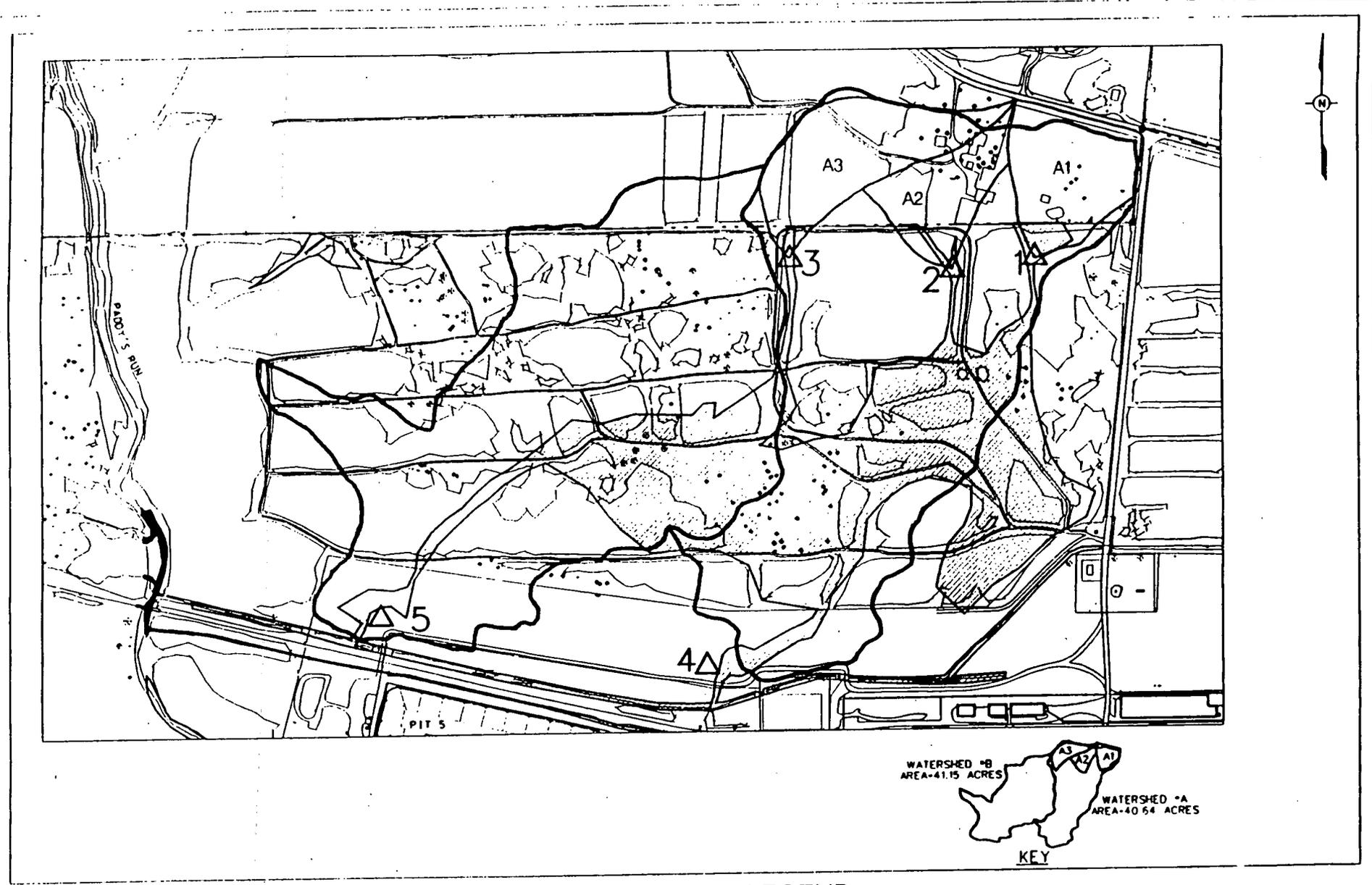
Surface Water Sampling

Battery powered portable samplers and flow meters were used to automatically collect surface water samples and measure flow levels and flow rates. The sampler and flow meter were placed and secured on level wooden pallets. Each portable sampler was connected to a flow meter enabling flow-weighted composite samples to be collected at the downstream end of the flume. Fecal coliform samples were collected manually using thio-bags. Samples were analyzed to determine nutrient concentrations and mass loadings within watershed A (sampling stations 1, 2, 3, and 4) and watershed B (effluent sampling station 5). Influent data was not collected for watershed B since channelized areas conducive for collecting influent data do not exist for watershed B (Figure 5).

Concurrent sampling occurred at 1-hour intervals, obtaining the first sample, if possible within the first 30 minutes of the storm event. When the peak of the hydrograph was established, samples were collected on a flow-proportional basis up to 2-3 hours, depending upon the intensity of flow, to ensure adequate characterization of the storm event. Flow data was collected throughout the duration of each storm event. A 24-hour lag time between storm events ensured representative mass loadings within the watershed. Sampling equipment was installed and operational in August 1995, with the first valid storm event in October 1995.

Analytical Procedures

Surface water quality parameters were analyzed using the following conventional methods and/or instrumentation: Total Suspended Solids (TSS) - EPA Method 160.2 "Residue, Non-Filterable"; Total Uranium - Kinetic Phosphorescence; Nitrogen as Nitrate/Nitrite ($\text{NO}_3\text{-NO}_2$) - Automated Continuous Flow Analyzer; Fecal Coliform - Membrane Filter Method 9222 D; Biochemical Oxygen Demand (BOD) - 5-Day BOD Method 5210 B; Total Phosphorous - Ascorbic Acid Method 4500-P E. Field measurements of pH and D.O. were obtained by using a Horiba meter.



LEGEND:

WETLAND AREA
 INFLUENT SAMPLING STATIONS

WATERSHED "A" SUBBASINS

- A1 - 4.39 ACRES
- A2 - 3.11 ACRES
- A3 - 5.15 ACRES

FIGURE 5. WATERSHED BOUNDARIES

Preliminary Wetland Mitigation Assessment
DRAFT

Table 1
Duration, Total Flow, and Precipitation of All Storm Events

Duration and Total Flow of Storm Events ¹							
Station	Event 1 (Oct. 5, 1995)	Event 2 (Nov. 11, 1995)	Event 3 (Dec. 18, 1995)	Event 4 (Jan. 19, 1996)	Event 5 (Jan. 23, 1996)	Event 6 (Mar. 19, 1996)	Event 7 (Apr. 20, 1996)
1	13.7 hrs 30,904*	15.8 hrs 15,281 *	19 hrs 141,955 *	11 hrs 101,773 *	14.2 hrs 141,196 *	10 hrs 163,957 *	15.2 hrs 57,148 *
2	6.6 hrs 5,442 *	9.8 hrs 2,133 *	13.3 hrs 24,630 *	9 hrs 26,084 *	7.5 hrs 23,126 *	NA ² 40,890 *	14.8 hrs 22,807 *
3	8.2 hrs 36,997 *	9.8 hrs 1,071 *	13.2 hrs 50,056 *	11 hrs 55,137 *	8.7 hrs 102,899 *	NA ² 131,420 *	15.4 hrs 45,227 *
4	7.2 hrs 4,510 *	26.3 hrs 2,666 *	18.1 hrs 424,640 *	3.3 hrs 67,282 *	6.1 hrs 263,379*	19 hrs 535,137 *	NA ³
5	7.2 hrs 4,610 *	26.3 hrs 2,725 *	18.1 hrs 434,043 *	3.3 hrs 68,772 *	6.1 hrs 269,211 *	19 hrs 546,987*	NA ³
Rainfall (inches) ⁴	2.46 in.	0.98 in.	0.99 in.	0.97 in.	1.79 in.	1.81 in.	0.9 in.

¹ Duration was calculated in hours from developed hydrographs using streamlog software.

*Flow is in thousand gallons.

² Not Available (NA) - A memory-wrap malfunction in the flow meter prevented generation of channel data and associated hydrograph

³ Not Available (NA) - Submerged and braided flow conditions precluded the capture of flow data and generation of a hydrograph

⁴ Data acquired from Fernald meteorological tower

Preliminary Wetland Mitigation Assessment
DRAFT

Table 2
Average Mass Loadings by Parameter for all Storm Events from Sampling Stations.

Average Mass Loadings					
Parameter ¹	Station 1	Station 2	Station 3	Station 4	Station 5
BOD ₅	2.84	0.34	1.21	3.0	19.0
P-T	0.48	0.11	0.17	0.44	0.40
TSS	74.34	9.69	83.77	174.11	1653.88
Total Uranium	0.0008	0.0008	0.0007	0.012	0.014
Nitrate-Nitrogen	0.62	0.09	0.19	0.37	0.86

¹ Average mass loadings reported in kg.

Total runoff volumes were calculated for each sampling station (Table 1). Storm event 1 (2.46 inches of precipitation) displayed the highest runoff volume, followed by storm event 6 (1.8 inches of precipitation). Complications with the flow device precluded the use of flow data from the station 5 sampler. Continued efforts to correct the problem with the flow device were unsuccessful. Therefore, total runoff flows for station 5 (Watershed B) were calculated using a ratio containing the known acreage of the watershed drainage basins and the known runoff volume from station 4 (Watershed B).

Visual field observations during storm event 7 indicated submerged conditions with braided flow, preventing free-flowing conditions and thus quantification of flow conditions. It is inferred that 0.9 inches of rain during storm event 7 in saturated spring season conditions would further support a linear decrease in percent of watershed uptake. These trends support the expected outcome of higher watershed storage capacity during unsaturated conditions (Fall season) and lower watershed storage capacity during saturated conditions (Spring season).

Preliminary Wetland Mitigation Assessment
DRAFT

Preliminary calculations indicate that 9.8 million gallons of water would be required to inundate 15 acres of surface area at a 2 foot depth. Data from this study indicate an average flow over 6 storm events of 218,663 gallons per storm event at stations 4 and 5 (located in the open meadow area) and an average of 291,794 gallons per storm event at stations 4 and 5 during the wetter portion of the season (JAN-MAR., 1996). These calculations are preliminary and do not account for the type of wetland ecosystem to be supported by the available hydrology. However, these calculations do suggest some uncertainty associated with supporting all 15 acres of mitigated wetlands in the Northern Woodlot. The conceptual design for wetland mitigation will be presented in a support plan to the Sitewide Excavation Plan and provide detail on the areal extent of wetland mitigation and specific vegetation types.

Watershed A and watershed B are comparatively similar. Surface water enters the site at the Northern boundary and becomes channelized until it reaches a flat, open area in the middle of the watershed. Once this flat open area becomes saturated, surface water rechannelizes and continues to an open meadow area and eventually to Paddys Run. The data available to characterize watershed B is limited to the effluent since a channelized area conducive to collecting influent data does not exist. Since watershed B is approximately 0.5 acres larger than watershed A, with similar topographic relief, it is assumed that influent data would be similar to watershed A. Average concentrations and mass loadings of BOD₅ and TSS were higher in watershed B, while total runoff volumes were near the same as inferred from effluent station 4 of watershed A.

Alternative 3 is recommended for further pursuit of on-property wetland mitigation based on accessibility, near-term implementation, and supporting watershed data. The type and size of wetland system to be created will be determined during conceptual design. Total runoff volume data collected during wetter than average fall and spring seasons (Table 4) will be addressed within the conceptual design plan. Table 3 indicates the duration of the watershed study experienced 5.71 inches of rainfall above the 30-year average.

CONCLUSION

This preliminary wetland mitigation assessment addresses potential areas for conducting on-property wetland mitigation through the evaluation of three alternatives. Each alternative was evaluated based on existing data and primary criteria of topography, soil, and hydrology. While all alternatives possessed some potential for wetland mitigation, some alternatives were not as feasible based on available wetland parameters, accessibility, and habitat fragmentation.

Alternative 1 which consisted of Paddys Run Corridor would not be conducive to wetland mitigation. The southern reach of Paddys Run does not contain the potential for hydrologic or soil conditions that would support wetland mitigation. Surface water flow rapidly infiltrates into the Great Miami Aquifer and the soil type is moderately well drained. The northern reach of Paddys Run contains the potential to support wetland mitigation. However, since stream flow is intermittent and the stream banks are high in the Northern reach, surface water overflow of the banks does not occur. Extensive excavation of the stream banks would be required to supply wetland hydrology, causing a dramatic change to stream configuration. Any alteration to this portion of the stream would alter the stream ecology and associated habitat of the Sloan's crayfish, which is listed as a threatened species in the State of Ohio.

Alternative 2 which consisted of two meadow areas and one meadow/deciduous forest area adjacent to the northern forested wetlands are not recommended for wetland mitigation. The Northwest meadow would require additional clay soil and soil compaction for this meadow area to contain water. Equipment access to this remote area is limited and would entail partial deforestation and associated habitat fragmentation of the woodland. The northwest meadow area would require extensive intrusive efforts due to limited water availability and importation of additional soil, causing habitat fragmentation. The supply of hydrology to the Southwest meadow/deciduous forest and Southeast meadow areas would require construction of a berm to restrict surface water flow into the drainage appendage to cause a backflow. Restriction of surface water flow would impact surface water hydrology of the southern most reach of this drainage appendage and would preclude the

Preliminary Wetland Mitigation Assessment
DRAFT

implementation of Alternative 3. In addition, due to the elevation of the southwest meadow/deciduous forest and southeast meadow areas, extensive excavation would be required to lower the elevation for adequate water supply, causing some habitat fragmentation. In addition, importation of some additional soil and accessibility of equipment would cause some habitat fragmentation of other areas in the Northern woodlot. Conducting wetland mitigation in these areas would impact the surface water hydrology of the open meadow area under consideration for Alternative 3, which has the potential to support the largest areal extent of on-property wetlands. Therefore, wetland mitigation in the southwest/deciduous forest area and southeastern meadow area is not recommended.

Alternative 3 was recommended to further evaluate conducting on-property wetland mitigation based on accessibility, near-term implementation, minimal issues of habitat fragmentation, and supporting watershed data. Additional clay and soil compaction may be necessary to implement this alternative. However, the results of the watershed study conducted in the Forested Wetland suggest some uncertainty associated with establishing all 15 acres of mitigated wetlands in the Northern Woodlot.

The results from seven independent storm events which comprised the watershed study indicated mass loading of water quality parameters into the dual watershed. Total suspended solids and BOD, mass loadings were most prevalent at all sampling stations. The contribution of these two water quality parameters may be related to land use within and adjacent to the watersheds. Cattle grazing within the watershed and agricultural practices upstream and adjacent to the watershed may be influencing mass loading. This water quality data provides a baseline which could potentially be used in evaluating the offset of lost water quality functions from impacted wetlands.

The two 40-acre watershed systems exhibited an expected initial high storage during unsaturated conditions followed by decreased storage during saturated conditions. Total runoff volumes indicate it is conducive to further evaluate the feasibility of supporting on-property wetland mitigation. The type and size of wetland system to be supported by such hydrology will be determined during conceptual design. Total runoff volume data collected during a wetter than average spring season will also be addressed within the conceptual design plan.

**Preliminary Wetland Mitigation Assessment
DRAFT**

The conceptual design plan for wetland mitigation will be evaluated and presented as part of the Natural Resource Restoration Plan (NRRP) for the Fernald Site. The NRRP presents proposed final land use which will be established by implementing natural resource restoration projects (e.g., wetland mitigation).

The NRRP will be submitted to the regulatory agencies and the Natural Resource Trustees (NRTs) in July 1997. This version of the NRRP will propose expansion of the Northern Forested Wetland as a possible restoration project and will contain a conceptual design plan for on-property wetland mitigation if determined feasible.

Upon review of this Preliminary Wetland Mitigation Assessment and the NRRP by regulatory agencies and NRTs, a consensus will be reached regarding the feasibility of conducting on-property wetland mitigation.

Preliminary Wetland Mitigation Assessment
DRAFT

REFERENCES

Ebasco Environmental, 1993, "Wetlands Delineation Report of the Fernald Environmental Management Project, Butler and Hamilton Counties, Ohio," prepared for FERMCO, Cincinnati, OH.

U.S. Department of Agriculture, Soil Conservation Service, 1982, Soil Survey of Hamilton County, Ohio, in cooperation with Ohio Department of Natural Resources, Division of Lands and Soil, and Ohio Agricultural Research and Development Center.

U.S. Department of Energy,, 1995, "Feasibility Study/Proposed Plan for Operable Unit 5," Final, Fernald Environmental Management Project, DOE, Fernald Field Office, Cincinnati, Ohio

Preliminary Wetland Mitigation Assessment
DRAFT

APPENDIX A

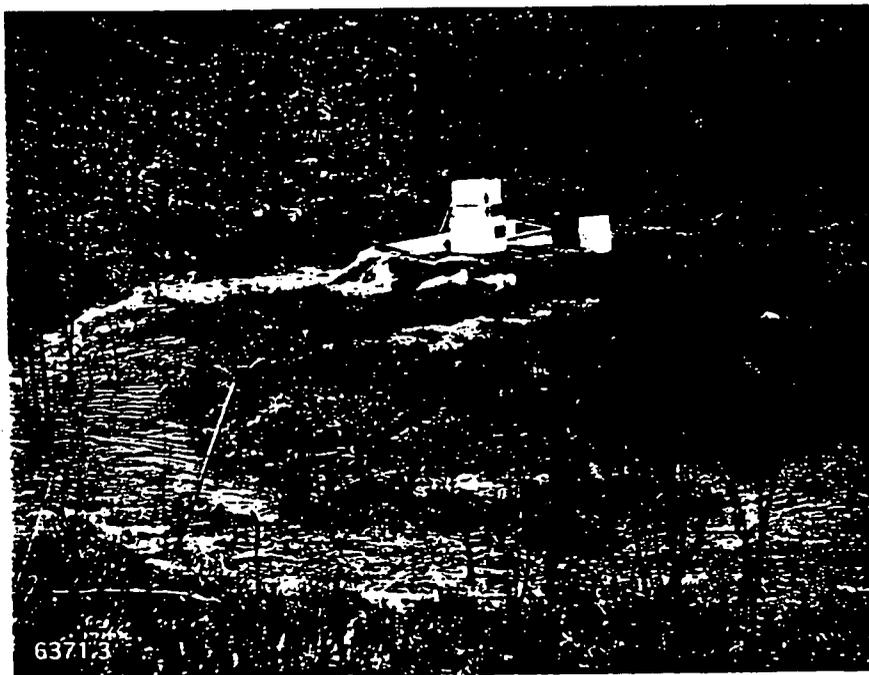
Site Photographs of Storm Event #7



PHOTOGRAPHS OF STORM EVENT #7 (APRIL 23, 1996)



Submerged Conditions At Sampling Station #4



Braided Flow Conditions At Sampling Station #5

APPENDIX B

Laboratory Analyses

DATE 01-JUL-96
TIME 14:35:00

SUMMARY REPORT

PAGE 1

RELEASE NUMBER : 1000008732
PROJECT NAME : FORESTED WETLAND SURFACE WATER STUDY

LAB	SAMPLE ID	USER SAMPLE ID	SAMPLE POINT	SUFFIX COMPONENT	RESULT	UNITS	LQ	VQ	DATE SAMPLED	DATE TASK PERFORMED	ASL
INORGANICS-EPM	200188076	410898	SP-1	SOLIDS	31	mg/L			05-OCT-95	10-OCT-95	B
INORGANICS-EPM	200188077	410901	SP-2	SOLIDS	22	mg/L			05-OCT-95	10-OCT-95	B
INORGANICS-EPM	200188078	410904	SP-3	SOLIDS	116	mg/L			05-OCT-95	10-OCT-95	B
INORGANICS-EPM	200188079	410907	SP-4	SOLIDS	20	mg/L			05-OCT-95	10-OCT-95	B
INORGANICS-EPM	200188080	410910	SP-5	SOLIDS	13	mg/L			05-OCT-95	10-OCT-95	B
INORGANICS-EPM	200188082	410899	SP-1	URANIUM	1.1	ug/L			05-OCT-95	12-OCT-95	B
INORGANICS-EPM	200188084	410902	SP-2	URANIUM	0.8	ug/L			05-OCT-95	12-OCT-95	B
INORGANICS-EPM	200188085	410905	SP-3	URANIUM	1.4	ug/L			05-OCT-95	12-OCT-95	B
INORGANICS-EPM	200188086	410908	SP-4	URANIUM	5.3	ug/L			05-OCT-95	12-OCT-95	B
INORGANICS-EPM	200188087	410911	SP-5	URANIUM	0.9	ug/L			05-OCT-95	12-OCT-95	B
INORGANICS-EPM	200188117	410900	SP-1	NITRITE-NITRATE-NITROGEN	7.6	mg/L			05-OCT-95	06-OCT-95	B
INORGANICS-EPM	200188118	410903	SP-2	NITRITE-NITRATE-NITROGEN	0.5	mg/L			05-OCT-95	06-OCT-95	B
INORGANICS-EPM	200188119	410906	SP-3	NITRITE-NITRATE-NITROGEN	0.4	mg/L			05-OCT-95	06-OCT-95	B
INORGANICS-EPM	200188120	410909	SP-4	NITRITE-NITRATE-NITROGEN	0.1	mg/L		U	05-OCT-95	06-OCT-95	B
INORGANICS-EPM	200188121	410912	SP-5	NITRITE-NITRATE-NITROGEN	0.1	mg/L		U	05-OCT-95	06-OCT-95	B
WATER TREATMENT	200188828	410888	SP-1	BIOLOGICAL OXYGEN DEMAND	2.92	mg/L			05-OCT-95	19-OCT-95	B
WATER TREATMENT	200188829	410890	SP-2	BIOLOGICAL OXYGEN DEMAND	1.52	mg/L			05-OCT-95	19-OCT-95	B
WATER TREATMENT	200188830	410892	SP-3	BIOLOGICAL OXYGEN DEMAND	2.54	mg/L			05-OCT-95	19-OCT-95	B
WATER TREATMENT	200188831	410894	SP-4	BIOLOGICAL OXYGEN DEMAND	2.46	mg/L			05-OCT-95	19-OCT-95	B
WATER TREATMENT	200188832	410896	SP-5	BIOLOGICAL OXYGEN DEMAND	2.17	mg/L			05-OCT-95	19-OCT-95	B
WATER TREATMENT	200188833	410889	SP-1	PHOSPHATE (TOTAL)	0.99	mg/L			05-OCT-95	19-OCT-95	B
WATER TREATMENT	200188834	410891	SP-2	PHOSPHATE (TOTAL)	1.80	mg/L			05-OCT-95	19-OCT-95	B
WATER TREATMENT	200188835	410893	SP-3	PHOSPHATE (TOTAL)	0.81	mg/L			05-OCT-95	19-OCT-95	B
WATER TREATMENT	200188836	410895	SP-4	PHOSPHATE (TOTAL)	0.55	mg/L			05-OCT-95	19-OCT-95	B
WATER TREATMENT	200188837	410897	SP-5	PHOSPHATE (TOTAL)	0.47	mg/L			05-OCT-95	19-OCT-95	B

Your Selection Criteria Was:

Release Number: 1000008732 Component: X-LR Submission ID: X Project Name: X
From Received Date: X Display Text? N

25 RECORDS PRINTED

END OF REPORT

EVENT # 1

715

000008732

DATE 01-JUL-96
TIME 14:35:45

SUMMARY REPORT

PAGE 1

RELEASE NUMBER : 1000009170
PROJECT NAME : FORESTED WETLAND SURFACE WATER STUDY

LAB	SAMPLE ID	USER SAMPLE ID	SAMPLE POINT	SUFFIX COMPONENT	RESULT	UNITS	LO	VQ	DATE SAMPLED	DATE TASK PERFORMED	ASL
INORGANICS-EPH	200197865	411193	SP-1	SOLIDS	85	mg/L			11-NOV-95	17-NOV-95	B
INORGANICS-EPH	200197866	411196	SP-2	SOLIDS	54	mg/L			11-NOV-95	17-NOV-95	B
INORGANICS-EPH	200197867	411199	SP-3	SOLIDS	804	mg/L			11-NOV-95	17-NOV-95	B
INORGANICS-EPH	200197868	411202	SP-4	SOLIDS	16	mg/L			11-NOV-95	17-NOV-95	B
INORGANICS-EPH	200197869	411205	SP-5	SOLIDS	5	mg/L			11-NOV-95	17-NOV-95	B
INORGANICS-EPH	200197870	411194	SP-1	URANIUM	2.4	ug/L			11-NOV-95	16-NOV-95	B
INORGANICS-EPH	200197871	411197	SP-2	URANIUM	2.0	ug/L			11-NOV-95	16-NOV-95	B
INORGANICS-EPH	200197872	411200	SP-3	URANIUM	3.8	ug/L			11-NOV-95	16-NOV-95	B
INORGANICS-EPH	200197873	411203	SP-4	URANIUM	28.7	ug/L			11-NOV-95	16-NOV-95	B
INORGANICS-EPH	200197873	411203	SP-4	URANIUM	25.1	ug/L			11-NOV-95	21-NOV-95	B
INORGANICS-EPH	200197874	411206	SP-5	URANIUM	8.3	ug/L			11-NOV-95	15-NOV-95	B
INORGANICS-EPH	200197875	411195	SP-1	NITRATE-NITROGEN	1.9	mg/L			11-NOV-95	13-NOV-95	B
INORGANICS-EPH	200197876	411198	SP-2	NITRATE-NITROGEN	0.6	mg/L			11-NOV-95	13-NOV-95	B
INORGANICS-EPH	200197877	411201	SP-3	NITRATE-NITROGEN	0.9	mg/L			11-NOV-95	13-NOV-95	B
INORGANICS-EPH	200197878	411204	SP-4	NITRATE-NITROGEN	0.4	mg/L			11-NOV-95	13-NOV-95	B
INORGANICS-EPH	200197879	411207	SP-5	NITRATE-NITROGEN	0.2	mg/L			11-NOV-95	13-NOV-95	B
WATER TREATMENT	200197880	411208	SP-1	BIOLOGICAL OXYGEN DEMAND	8.63	mg/L			11-NOV-95	18-NOV-95	B
WATER TREATMENT	200197881	411210	SP-2	BIOLOGICAL OXYGEN DEMAND	5.50	mg/L			11-NOV-95	18-NOV-95	B
WATER TREATMENT	200197882	411212	SP-3	BIOLOGICAL OXYGEN DEMAND	17.57	mg/L			11-NOV-95	18-NOV-95	B
WATER TREATMENT	200197883	411214	SP-4	BIOLOGICAL OXYGEN DEMAND	4.00	mg/L			11-NOV-95	18-NOV-95	B
WATER TREATMENT	200197884	411216	SP-5	BIOLOGICAL OXYGEN DEMAND	3.77	mg/L			11-NOV-95	18-NOV-95	B
WATER TREATMENT	200197885	411209	SP-1	PHOSPHATE (TOTAL)	1.19	mg/L			11-NOV-95	29-NOV-95	B
WATER TREATMENT	200197893	411211	SP-2	PHOSPHATE (TOTAL)	2.27	mg/L			11-NOV-95	29-NOV-95	B
WATER TREATMENT	200197894	411213	SP-3	PHOSPHATE (TOTAL)	1.07	mg/L			11-NOV-95	29-NOV-95	B
WATER TREATMENT	200197895	411215	SP-4	PHOSPHATE (TOTAL)	0.48	mg/L			11-NOV-95	29-NOV-95	B
WATER TREATMENT	200197896	411217	SP-5	PHOSPHATE (TOTAL)	1.23	mg/L			11-NOV-95	29-NOV-95	B
WATER TREATMENT	200197911	411188	#1	FECAL COLIFORM	7800	#/100 mL			11-NOV-95	14-NOV-95	B
WATER TREATMENT	200197912	411189	#2	FECAL COLIFORM	7800	#/100 mL			11-NOV-95	14-NOV-95	B
WATER TREATMENT	200197913	411190	#3	FECAL COLIFORM	7800	#/100 mL			11-NOV-95	17-NOV-95	B
WATER TREATMENT	200197914	411191	#4	FECAL COLIFORM	66	#/100 mL			11-NOV-95	14-NOV-95	B
WATER TREATMENT	200197915	411192	#5	FECAL COLIFORM	140	#/100 mL			11-NOV-95	14-NOV-95	B

Your Selection Criteria Was:

Release Number: 1000009170 Component: X-LR Submission ID: X Project Name: X
From Received Date: X Display Text? N

EVENT # 2

215

DATE 01-JUL-96
TIME 14:36:01

SUMMARY REPORT

PAGE 1

RELEASE NUMBER : 1000009617
PROJECT NAME : FORESTED WETLAND SURFACE WATER STUDY

LAB	SAMPLE ID	USER	SAMPLE ID	SAMPLE POINT	SUFFIX	COMPONENT	RESULT	UNITS	LO	VQ	DATE SAMPLED	DATE TASK PERFORMED	ASL
INORGANICS-EPM	200204687	411228		SP-1A		SOLIDS	152	mg/L			18-DEC-95	19-DEC-95	B
INORGANICS-EPM	200204688	411231		SP-1B		SOLIDS	212	mg/L			18-DEC-95	19-DEC-95	B
INORGANICS-EPM	200204689	411234		SP-2A		SOLIDS	41	mg/L			18-DEC-95	19-DEC-95	B
INORGANICS-EPM	200204690	411237		SP-2B		SOLIDS	44	mg/L			18-DEC-95	19-DEC-95	B
INORGANICS-EPM	200204691	411240		SP-3A		SOLIDS	297	mg/L			18-DEC-95	19-DEC-95	B
INORGANICS-EPM	200204692	411243		SP-3B		SOLIDS	331	mg/L			18-DEC-95	19-DEC-95	B
INORGANICS-EPM	200204693	411246		SP-4A		SOLIDS	45	mg/L			18-DEC-95	19-DEC-95	B
INORGANICS-EPM	200204694	411249		SP-4B		SOLIDS	50	mg/L			18-DEC-95	19-DEC-95	B
INORGANICS-EPM	200204695	411252		SP-5A		SOLIDS	15	mg/L			18-DEC-95	19-DEC-95	B
INORGANICS-EPM	200204696	411255		SP-5B		SOLIDS	125	mg/L			18-DEC-95	19-DEC-95	B
INORGANICS-EPM	200204697	411229		SP-1A		URANIUM	5.2	ug/L			18-DEC-95	20-DEC-95	B
INORGANICS-EPM	200204698	411232		SP-1B		URANIUM	4.0	ug/L			18-DEC-95	20-DEC-95	B
INORGANICS-EPM	200204699	411235		SP-2A		URANIUM	1.5	ug/L			18-DEC-95	20-DEC-95	B
INORGANICS-EPM	200204700	411238		SP-2B		URANIUM	1.7	ug/L			18-DEC-95	20-DEC-95	B
INORGANICS-EPM	200204701	411241		SP-3A		URANIUM	4.2	ug/L			18-DEC-95	20-DEC-95	B
INORGANICS-EPM	200204702	411244		SP-3B		URANIUM	3.9	ug/L			18-DEC-95	20-DEC-95	B
INORGANICS-EPM	200204703	411247		SP-4A		URANIUM	36.7	ug/L			18-DEC-95	20-DEC-95	B
INORGANICS-EPM	200204704	411250		SP-4B		URANIUM	40.3	ug/L			18-DEC-95	20-DEC-95	B
INORGANICS-EPM	200204705	411253		SP-5A		URANIUM	9.2	ug/L			18-DEC-95	20-DEC-95	B
INORGANICS-EPM	200204706	411256		SP-5B		URANIUM	9.1	ug/L			18-DEC-95	20-DEC-95	B
INORGANICS-EPM	200204707	411230		SP-1A		NITRATE-NITROGEN	2.1	mg/L			18-DEC-95	18-DEC-95	B
INORGANICS-EPM	200204708	411233		SP-1B		NITRATE-NITROGEN	2.0	mg/L			18-DEC-95	18-DEC-95	B
INORGANICS-EPM	200204709	411236		SP-2A		NITRATE-NITROGEN	0.8	mg/L			18-DEC-95	18-DEC-95	B
INORGANICS-EPM	200204710	411239		SP-2B		NITRATE-NITROGEN	0.8	mg/L			18-DEC-95	18-DEC-95	B
INORGANICS-EPM	200204711	411242		SP-3A		NITRATE-NITROGEN	1.2	mg/L			18-DEC-95	18-DEC-95	B
INORGANICS-EPM	200204712	411245		SP-3B		NITRATE-NITROGEN	1.2	mg/L			18-DEC-95	18-DEC-95	B
INORGANICS-EPM	200204713	411248		SP-4A		NITRATE-NITROGEN	0.7	mg/L			18-DEC-95	18-DEC-95	B
INORGANICS-EPM	200204714	411251		SP-4B		NITRATE-NITROGEN	0.8	mg/L			18-DEC-95	18-DEC-95	B
INORGANICS-EPM	200204715	411254		SP-5A		NITRATE-NITROGEN	0.2	mg/L			18-DEC-95	18-DEC-95	B
INORGANICS-EPM	200204716	411257		SP-5B		NITRATE-NITROGEN	0.2	mg/L			18-DEC-95	18-DEC-95	B
WATER TREATMENT	200204982	411258		SP-1A		BIOLOGICAL OXYGEN DEMAND	8.97	mg/L			18-DEC-95	27-DEC-95	B
WATER TREATMENT	200204983	411260		SP-1B		BIOLOGICAL OXYGEN DEMAND	8.19	mg/L			18-DEC-95	27-DEC-95	B

Your Selection Criteria Was:

Release Number: 1000009617 Component: X-LR Submission ID: X Project Name: X
From Received Date: X Display Text? N

EVENT # 3

715

000039

DATE 01-JUL-96

TIME 14:36:01

SUMMARY REPORT

PAGE 2

RELEASE NUMBER : 1000009617

PROJECT NAME : FORESTED WETLAND SURFACE WATER STUDY

LAB	SAMPLE ID	USER	SAMPLE ID	SAMPLE POINT	SUFFIX	COMPONENT	RESULT	UNITS	LQ	VQ	DATE SAMPLED	DATE TASK PERFORMED	ASL
WATER TREATMENT	200204984		411262	SP-2A		BIOLOGICAL OXYGEN DEMAND	8.34	mg/L			18-DEC-95	27-DEC-95	B
WATER TREATMENT	200204985		411264	SP-2B		BIOLOGICAL OXYGEN DEMAND	7.71	mg/L			18-DEC-95	27-DEC-95	B
WATER TREATMENT	200204986		411266	SP-3A		BIOLOGICAL OXYGEN DEMAND	13.14	mg/L			18-DEC-95	27-DEC-95	B
WATER TREATMENT	200204987		411268	SP-3B		BIOLOGICAL OXYGEN DEMAND	12.54	mg/L			18-DEC-95	27-DEC-95	B
WATER TREATMENT	200204988		411270	SP-4A		BIOLOGICAL OXYGEN DEMAND	4.50	mg/L			18-DEC-95	27-DEC-95	B
WATER TREATMENT	200204989		411272	SP-4B		BIOLOGICAL OXYGEN DEMAND	4.19	mg/L			18-DEC-95	27-DEC-95	B
WATER TREATMENT	200204990		411274	SP-5A		BIOLOGICAL OXYGEN DEMAND	6.62	mg/L			18-DEC-95	27-DEC-95	B
WATER TREATMENT	200204991		411276	SP-5B		BIOLOGICAL OXYGEN DEMAND	7.17	mg/L			18-DEC-95	27-DEC-95	B
WATER TREATMENT	200204992		411259	SP-1A		PHOSPHATE (TOTAL)	2.12	mg/L			18-DEC-95	23-DEC-95	B
WATER TREATMENT	200204993		411261	SP-1B		PHOSPHATE (TOTAL)	2.12	mg/L			18-DEC-95	23-DEC-95	B
WATER TREATMENT	200204994		411263	SP-2A		PHOSPHATE (TOTAL)	4.57	mg/L			18-DEC-95	23-DEC-95	B
WATER TREATMENT	200204995		411265	SP-2B		PHOSPHATE (TOTAL)	4.64	mg/L			18-DEC-95	23-DEC-95	B
WATER TREATMENT	200204996		411267	SP-3A		PHOSPHATE (TOTAL)	2.46	mg/L			18-DEC-95	23-DEC-95	B
WATER TREATMENT	200204997		411269	SP-3B		PHOSPHATE (TOTAL)	2.43	mg/L			18-DEC-95	23-DEC-95	B
WATER TREATMENT	200204998		411271	SP-4A		PHOSPHATE (TOTAL)	1.63	mg/L			18-DEC-95	23-DEC-95	B
WATER TREATMENT	200204999		411273	SP-4B		PHOSPHATE (TOTAL)	1.60	mg/L			18-DEC-95	23-DEC-95	B
WATER TREATMENT	200205000		411275	SP-5A		PHOSPHATE (TOTAL)	1.26	mg/L			18-DEC-95	23-DEC-95	B
WATER TREATMENT	200205001		411277	SP-5B		PHOSPHATE (TOTAL)	1.47	mg/L			18-DEC-95	23-DEC-95	B
WATER TREATMENT	200205002		411218	SP-1A		FECAL COLIFORM	7200	#/100 ML			15-DEC-95	16-DEC-95	B
WATER TREATMENT	200205003		411219	SP-1B		FECAL COLIFORM	6800	#/100 ML			15-DEC-95	16-DEC-95	B
WATER TREATMENT	200205004		411220	SP-2A		FECAL COLIFORM	2500	#/100 ML			15-DEC-95	16-DEC-85	B
WATER TREATMENT	200205005		411221	SP-2B		FECAL COLIFORM	2700	#/100 ML			15-DEC-95	16-DEC-95	B
WATER TREATMENT	200205006		411222	SP-3A		FECAL COLIFORM	>8000	#/100 ML			15-DEC-95	16-DEC-95	B
WATER TREATMENT	200205007		411223	SP-3B		FECAL COLIFORM	>8000	#/100 ML			15-DEC-95	16-DEC-95	B
WATER TREATMENT	200205008		411224	SP-4A		FECAL COLIFORM	210	#/100 ML			15-DEC-95	16-DEC-95	B
WATER TREATMENT	200205009		411225	SP-4B		FECAL COLIFORM	180	#/100 ML			15-DEC-95	16-DEC-95	B
WATER TREATMENT	200205010		411226	SP-5A		FECAL COLIFORM	200	#/100 ML	U		15-DEC-95	16-DEC-95	B
WATER TREATMENT	200205011		411227	SP-5B		FECAL COLIFORM	200	#/100 ML	U		15-DEC-95	16-DEC-95	B

60 RECORDS PRINTED

END OF REPORT

EVENT # 3

215

DATE 01-JUL-96
TIME 15:00:14

SUMMARY REPORT

PAGE 1

RELEASE NUMBER : 1000009929
PROJECT NAME : FORESTED WETLAND SURFACE WATER STUDY

LAB	SAMPLE ID	USER	SAMPLE ID	SAMPLE POINT	SUFFIX	COMPONENT	RESULT	UNITS	LQ	YO	DATE SAMPLED	DATE TASK PERFORMED	ASL
INORGANICS-EPM	200210738		411685	SP #1		SOLIDS	353	mg/L			19-JAN-96	20-JAN-96	B
INORGANICS-EPM	200210739		411688	SP #2		SOLIDS	151	mg/L			19-JAN-96	20-JAN-96	B
INORGANICS-EPM	200210740		411691	SP #3		SOLIDS	341	mg/L			19-JAN-96	20-JAN-96	B
INORGANICS-EPM	200210741		411694	SP #4		SOLIDS	14	mg/L			19-JAN-96	20-JAN-96	B
INORGANICS-EPM	200210742		411697	SP #5		SOLIDS	433	mg/L			19-JAN-96	20-JAN-96	B
INORGANICS-EPM	200210743		411686	SP #1		URANIUM	0.1	mg/L	U		19-JAN-96	24-JAN-96	B
INORGANICS-EPM	200210743		411686	SP #1	RE	URANIUM	1.7	ug/L			19-JAN-96	31-JAN-96	B
INORGANICS-EPM	200210744		411689	SP #2		URANIUM	0.1	mg/L	U		19-JAN-96	24-JAN-96	B
INORGANICS-EPM	200210744		411689	SP #2	RE	URANIUM	2.0	ug/L			19-JAN-96	31-JAN-96	B
INORGANICS-EPM	200210745		411692	SP #3		URANIUM	0.1	mg/L	U		19-JAN-96	24-JAN-96	B
INORGANICS-EPM	200210745		411692	SP #3	RE	URANIUM	2.3	ug/L			19-JAN-96	31-JAN-96	B
INORGANICS-EPM	200210746		411695	SP #4		URANIUM	0.1	mg/L	U		19-JAN-96	24-JAN-96	B
INORGANICS-EPM	200210746		411695	SP #4	RE	URANIUM	1.8	ug/L			19-JAN-96	31-JAN-96	B
INORGANICS-EPM	200210747		411698	SP #5		URANIUM	0.1	mg/L	U		19-JAN-96	24-JAN-96	B
INORGANICS-EPM	200210747		411698	SP #5	RE	URANIUM	2.0	ug/L			19-JAN-96	31-JAN-96	B
INORGANICS-EPM	200210748		411687	SP #1		NITRATE-NITROGEN	1.7	mg/L			19-JAN-96	22-JAN-96	B
INORGANICS-EPM	200210749		411690	SP #2		NITRATE-NITROGEN	1.1	mg/L			19-JAN-96	22-JAN-96	B
INORGANICS-EPM	200210750		411693	SP #3		NITRATE-NITROGEN	0.8	mg/L			19-JAN-96	22-JAN-96	B
INORGANICS-EPM	200210751		411696	SP #4		NITRATE-NITROGEN	0.3	mg/L			19-JAN-96	22-JAN-96	B
INORGANICS-EPM	200210752		411699	SP #5		NITRATE-NITROGEN	0.2	mg/L			19-JAN-96	22-JAN-96	B
WATER TREATMENT	200212002		411670	SP-1		BIOLOGICAL OXYGEN DEMAND	11.04	mg/L			19-JAN-96	19-JAN-96	B
WATER TREATMENT	200212005		411671	SP-1		PHOSPHATE (TOTAL)	0.95	mg/L			19-JAN-96	19-JAN-96	B
WATER TREATMENT	200212006		411672	SP-2		BIOLOGICAL OXYGEN DEMAND	6.90	mg/L			19-JAN-96	19-JAN-96	B
WATER TREATMENT	200212007		411673	SP-2		PHOSPHATE (TOTAL)	0.74	mg/L			19-JAN-96	19-JAN-96	B
WATER TREATMENT	200212008		411674	SP-3		BIOLOGICAL OXYGEN DEMAND	5.82	mg/L			19-JAN-96	19-JAN-96	B
WATER TREATMENT	200212009		411675	SP-3		PHOSPHATE (TOTAL)	0.38	mg/L			19-JAN-96	19-JAN-96	B
WATER TREATMENT	200212010		411676	SP-4		BIOLOGICAL OXYGEN DEMAND	4.11	mg/L			19-JAN-96	19-JAN-96	B
WATER TREATMENT	200212011		411677	SP-4		PHOSPHATE (TOTAL)	0.40	mg/L			19-JAN-96	19-JAN-96	B
WATER TREATMENT	200212012		411678	SP-5		BIOLOGICAL OXYGEN DEMAND	4.08	mg/L			19-JAN-96	19-JAN-96	B
WATER TREATMENT	200212013		411679	SP-5		PHOSPHATE (TOTAL)	0.61	mg/L			19-JAN-96	19-JAN-96	B
WATER TREATMENT	200212014		411680	SP #1		FECAL COLIFORM	310	#/100 mL			18-JAN-96	18-JAN-96	B
WATER TREATMENT	200212015		411681	SP #2		FECAL COLIFORM	160	#/100 mL			18-JAN-96	18-JAN-96	B

Your Selection Criteria Was:

Release Number: 1000009929 Component: X-LR Submission ID: X Project Name: X
From Received Date: X Display Text? N

FILED # 4

215

DATE 01-JUL-96
TIME 15:00:14

SUMMARY REPORT

PAGE 2

RELEASE NUMBER : 1000009929
PROJECT NAME : FORESTED WETLAND SURFACE WATER STUDY

LAB	SAMPLE ID	USER	SAMPLE ID	SAMPLE POINT	SUFFIX COMPONENT	RESULT	UNITS	LQ	VQ	DATE SAMPLED	DATE TASK PERFORMED	ASL
WATER TREATMENT	200212016		411682	SP #3	FECAL COLIFORM	210	#/100 mL			18-JAN-96	18-JAN-96	B
WATER TREATMENT	200212017		411683	SP #4	FECAL COLIFORM	80	#/100 mL			18-JAN-96	18-JAN-96	B
WATER TREATMENT	200212018		411684	SP #5	FECAL COLIFORM	20	#/100 mL			18-JAN-96	18-JAN-96	B

35 RECORDS PRINTED

END OF REPORT

000042

EVENT #4

215

DATE 01-JUL-96
TIME 16:32:13

SUMMARY REPORT

PAGE 1

RELEASE NUMBER : 1000009966
PROJECT NAME : FORESTED WETLAND SURFACE WATER STUDY

LAB	SAMPLE ID	USER	SAMPLE ID	SAMPLE POINT	SUFFIX	COMPONENT	RESULT	UNITS	LQ	VQ	DATE SAMPLED	DATE TASK PERFORMED	ASL
INORGANICS-EPM	200211843	411715		SP #1		SOLIDS	241	mg/L			23-JAN-96	30-JAN-96	B
INORGANICS-EPM	200211844	411718		SP #2		SOLIDS	13	mg/L			23-JAN-96	30-JAN-96	B
INORGANICS-EPM	200211845	411721		SP #3		SOLIDS	252	mg/L			23-JAN-96	30-JAN-96	B
INORGANICS-EPM	200211846	411724		SP #4		SOLIDS	23	mg/L			23-JAN-96	30-JAN-96	B
INORGANICS-EPM	200211847	411727		SP #5		SOLIDS	21	mg/L			23-JAN-96	30-JAN-96	B
INORGANICS-EPM	200211848	411716		SP #1		URANIUM	2.1	ug/L			23-JAN-96	31-JAN-96	B
INORGANICS-EPM	200211849	411719		SP #2		URANIUM	1.7	ug/L			23-JAN-96	31-JAN-96	B
INORGANICS-EPM	200211850	411722		SP #3		URANIUM	6.2	ug/L			23-JAN-96	31-JAN-96	B
INORGANICS-EPM	200211851	411725		SP #4		URANIUM	5.4	ug/L			23-JAN-96	31-JAN-96	B
INORGANICS-EPM	200211852	411728		SP #5		URANIUM	1.8	ug/L			23-JAN-96	31-JAN-96	B
INORGANICS-EPM	200211853	411717		SP #1		NITRITE-NITRATE-NITROGEN	1.2	mg/L			23-JAN-96	26-JAN-96	B
INORGANICS-EPM	200211854	411720		SP #2		NITRITE-NITRATE-NITROGEN	1.1	mg/L			23-JAN-96	26-JAN-96	B
INORGANICS-EPM	200211855	411723		SP #3		NITRITE-NITRATE-NITROGEN	0.8	mg/L			23-JAN-96	26-JAN-96	B
INORGANICS-EPM	200211856	411726		SP #4		NITRITE-NITRATE-NITROGEN	0.1	mg/L	U		23-JAN-96	26-JAN-96	B
INORGANICS-EPM	200211857	411729		SP #5		NITRITE-NITRATE-NITROGEN	0.1	mg/L	U		23-JAN-96	26-JAN-96	B
WATER TREATMENT	200212422	411705		SP #1		BIOLOGICAL OXYGEN DEMAND	8.19	mg/L			23-JAN-96	30-JAN-96	B
WATER TREATMENT	200212423	411707		SP #2		BIOLOGICAL OXYGEN DEMAND	2.18	mg/L			23-JAN-96	30-JAN-96	B
WATER TREATMENT	200212424	411709		SP #3		BIOLOGICAL OXYGEN DEMAND	4.97	mg/L			23-JAN-96	30-JAN-96	B
WATER TREATMENT	200212425	411711		SP #4		BIOLOGICAL OXYGEN DEMAND	4.08	mg/L			23-JAN-96	30-JAN-96	B
WATER TREATMENT	200212426	411713		SP #5		BIOLOGICAL OXYGEN DEMAND	4.68	mg/L			23-JAN-96	30-JAN-96	B
WATER TREATMENT	200212427	411706		SP #1		PHOSPHATE (TOTAL)	0.87	mg/L			23-JAN-96	25-JAN-96	B
WATER TREATMENT	200212428	411708		SP #2		PHOSPHATE (TOTAL)	0.50	mg/L			23-JAN-96	25-JAN-96	B
WATER TREATMENT	200212429	411710		SP #3		PHOSPHATE (TOTAL)	0.54	mg/L			23-JAN-96	25-JAN-96	B
WATER TREATMENT	200212430	411712		SP #4		PHOSPHATE (TOTAL)	0.41	mg/L			23-JAN-96	25-JAN-96	B
WATER TREATMENT	200212431	411714		SP #5		PHOSPHATE (TOTAL)	0.37	mg/L			23-JAN-96	25-JAN-96	B
WATER TREATMENT	200212432	411700		SP #1		TOTAL COLIFORMS	>6000	#/100 mL			23-JAN-96	23-JAN-96	B
WATER TREATMENT	200212433	411701		SP #2		TOTAL COLIFORMS	>6000	#/100 mL			23-JAN-96	23-JAN-96	B
WATER TREATMENT	200212434	411702		SP #3		TOTAL COLIFORMS	>6000	#/100 mL			23-JAN-96	23-JAN-96	B
WATER TREATMENT	200212435	411703		SP #4		TOTAL COLIFORMS	>6000	#/100 mL			23-JAN-96	23-JAN-96	B
WATER TREATMENT	200212436	411704		SP #5		TOTAL COLIFORMS	>6000	#/100 mL			23-JAN-96	23-JAN-96	B

Your Selection Criteria Was:

Release Number: 1000009966 Component: X-LR Submission ID: X Project Name: X
From Received Date: X Display Text? N

30 RECORDS PRINTED

000043

715

DATE 01-JUL-96
TIME 16:51:55

SUMMARY REPORT

PAGE 1

RELEASE NUMBER : 1000010659

PROJECT NAME : FORESTED WETLAND SURFACE WATER STUDY

LAB	SAMPLE ID	USER SAMPLE ID	SAMPLE POINT	SUFFIX	COMPONENT	RESULT	UNITS	LQ	VQ	DATE SAMPLED	DATE PERFORMED	TASK ASL
INORGANICS-EPM	200223004	411740	SP #1		SOLIDS	79	mg/L			19-MAR-96	26-MAR-96	B
INORGANICS-EPM	200223005	411743	SP #2		SOLIDS	123	mg/L			19-MAR-96	26-MAR-96	B
INORGANICS-EPM	200223006	411746	SP #3		SOLIDS	36	mg/L			19-MAR-96	26-MAR-96	B
INORGANICS-EPM	200223007	411749	SP #4		SOLIDS	518	mg/L			19-MAR-96	26-MAR-96	B
INORGANICS-EPM	200223008	411752	SP #5		SOLIDS	30	mg/L			19-MAR-96	26-MAR-96	B
INORGANICS-EPM	200223009	411741	SP #1		URANIUM	1.0	ug/L			19-MAR-96	27-MAR-96	B
INORGANICS-EPM	200223010	411744	SP #2		URANIUM	2.5	ug/L			19-MAR-96	27-MAR-96	B
INORGANICS-EPM	200223011	411747	SP #3		URANIUM	2.5	ug/L			19-MAR-96	27-MAR-96	B
INORGANICS-EPM	200223012	411750	SP #4		URANIUM	5.8	ug/L			19-MAR-96	27-MAR-96	B
INORGANICS-EPM	200223013	411753	SP #5		URANIUM	12.5	ug/L			19-MAR-96	26-MAR-96	B
INORGANICS-EPM	200223015	411742	SP #1		NITRATE-NITROGEN	1.4	mg/L			19-MAR-96	20-MAR-96	B
INORGANICS-EPM	200223016	411745	SP #2		NITRATE-NITROGEN	1.7	mg/L			19-MAR-96	20-MAR-96	B
INORGANICS-EPM	200223017	411748	SP #3		NITRATE-NITROGEN	1.0	mg/L			19-MAR-96	20-MAR-96	B
INORGANICS-EPM	200223018	411751	SP #4		NITRATE-NITROGEN	0.5	mg/L			19-MAR-96	20-MAR-96	B
INORGANICS-EPM	200223019	411754	SP #5		NITRATE-NITROGEN	0.1	mg/L	U		19-MAR-96	20-MAR-96	B
WATER TREATMENT	200223020	411755	SP #1		BIOLOGICAL OXYGEN DEMAND	6.84	mg/L			19-MAR-96	26-MAR-96	B
WATER TREATMENT	200223021	411757	SP #2		BIOLOGICAL OXYGEN DEMAND	3.30	mg/L			19-MAR-96	26-MAR-96	B
WATER TREATMENT	200223022	411759	SP #3		BIOLOGICAL OXYGEN DEMAND	2.82	mg/L			19-MAR-96	26-MAR-96	B
WATER TREATMENT	200223023	411761	SP #4		BIOLOGICAL OXYGEN DEMAND	2.02	mg/L			19-MAR-96	26-MAR-96	B
WATER TREATMENT	200223024	411763	SP #5		BIOLOGICAL OXYGEN DEMAND	2.0	mg/L	U		19-MAR-96	26-MAR-96	B
WATER TREATMENT	200223025	411756	SP #1		PHOSPHATE (TOTAL)	2.62	mg/L			19-MAR-96	28-MAR-96	B
WATER TREATMENT	200223026	411758	SP #2		PHOSPHATE (TOTAL)	1.92	mg/L			19-MAR-96	28-MAR-96	B
WATER TREATMENT	200223027	411760	SP #3		PHOSPHATE (TOTAL)	0.96	mg/L			19-MAR-96	28-MAR-96	B
WATER TREATMENT	200223028	411762	SP #4		PHOSPHATE (TOTAL)	0.1	mg/L	U		19-MAR-96	28-MAR-96	B
WATER TREATMENT	200223029	411764	SP #5		PHOSPHATE (TOTAL)	0.1	mg/L	U		19-MAR-96	28-MAR-96	B
WATER TREATMENT	200223035	411735	SP #5		FECAL COLIFORM	50	#/100 mL			19-MAR-96	19-MAR-96	B
WATER TREATMENT	200223036	411736	SP #4		FECAL COLIFORM	20	#/100 mL	U		19-MAR-96	19-MAR-96	B
WATER TREATMENT	200223037	411737	SP #3		FECAL COLIFORM	7400	#/100 mL			19-MAR-96	19-MAR-96	B
WATER TREATMENT	200223038	411738	SP #1		FECAL COLIFORM	6500	#/100 mL			19-MAR-96	19-MAR-96	B
WATER TREATMENT	200223039	411739	SP #2		FECAL COLIFORM	10600	#/100 mL			19-MAR-96	19-MAR-96	B

Your Selection Criteria Was:

Release Number: 1000010659 Component: X-LR Submission ID: X Project Name: X
From Received Date: X Display Text? N

30 RECORDS PRINTED

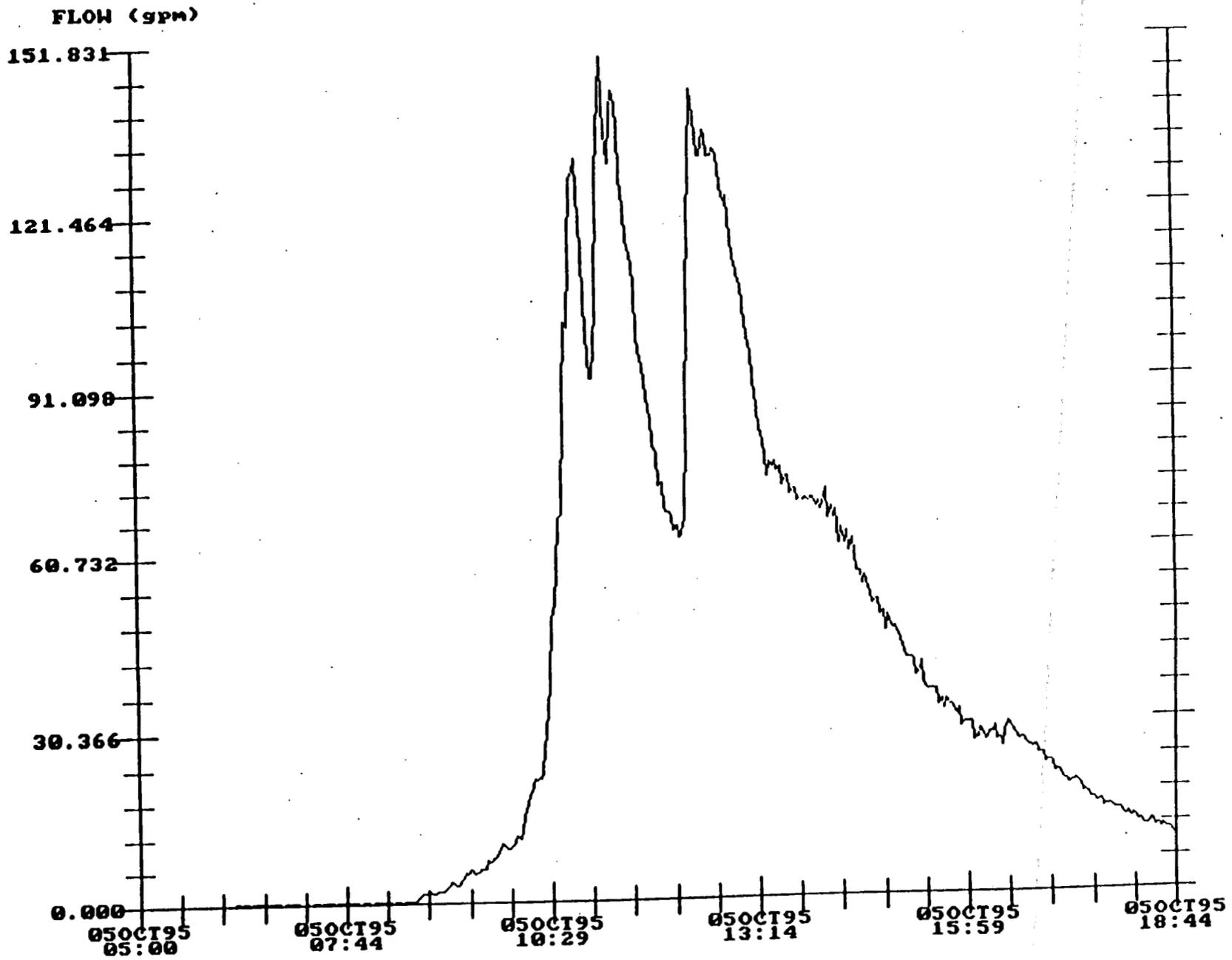
215

Preliminary Wetland Mitigation Assessment
DRAFT

APPENDIX C

Hydrographs

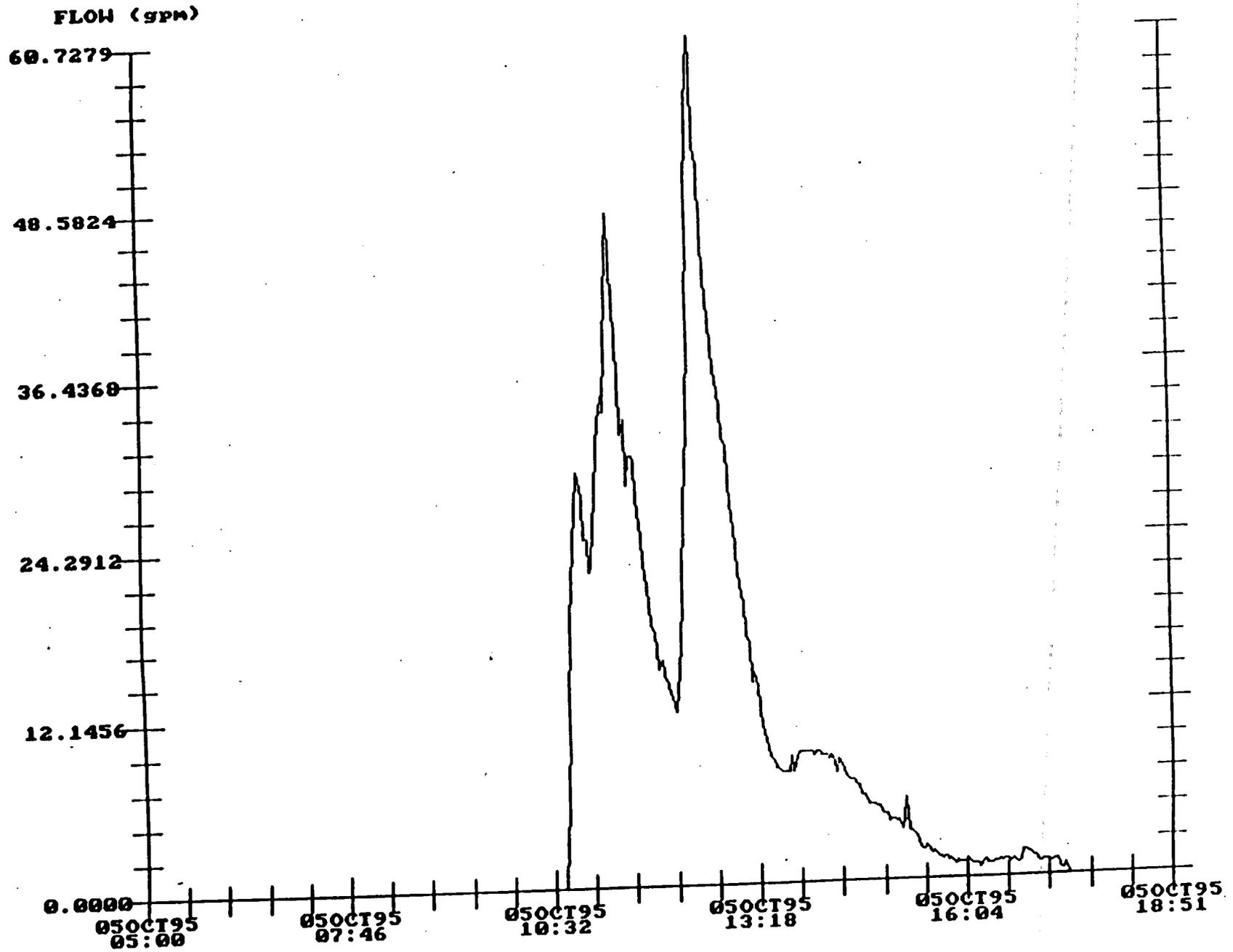
Sample Station 001 - Event #1



000047

215

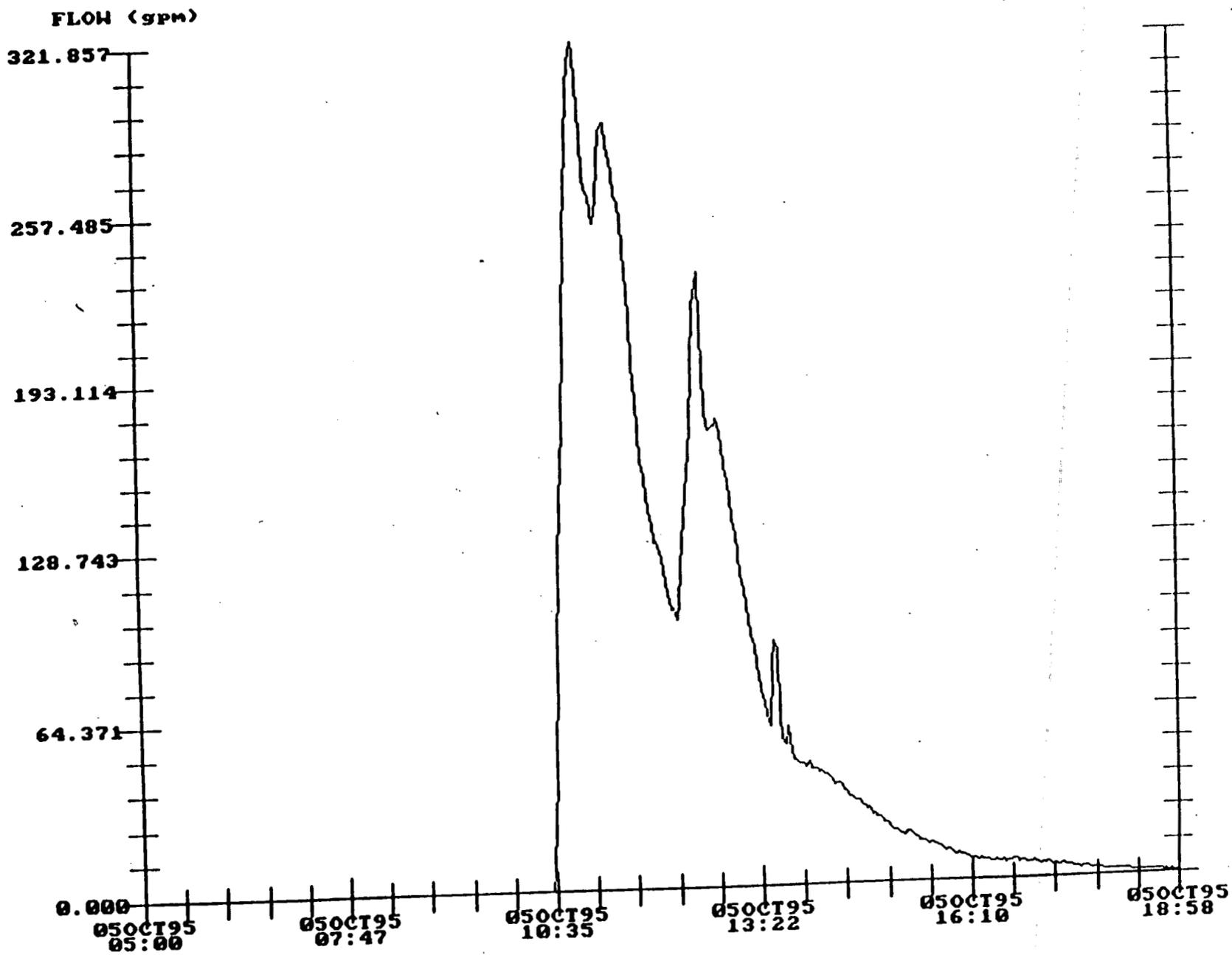
Sample Station 002 - Event #1



000048

215

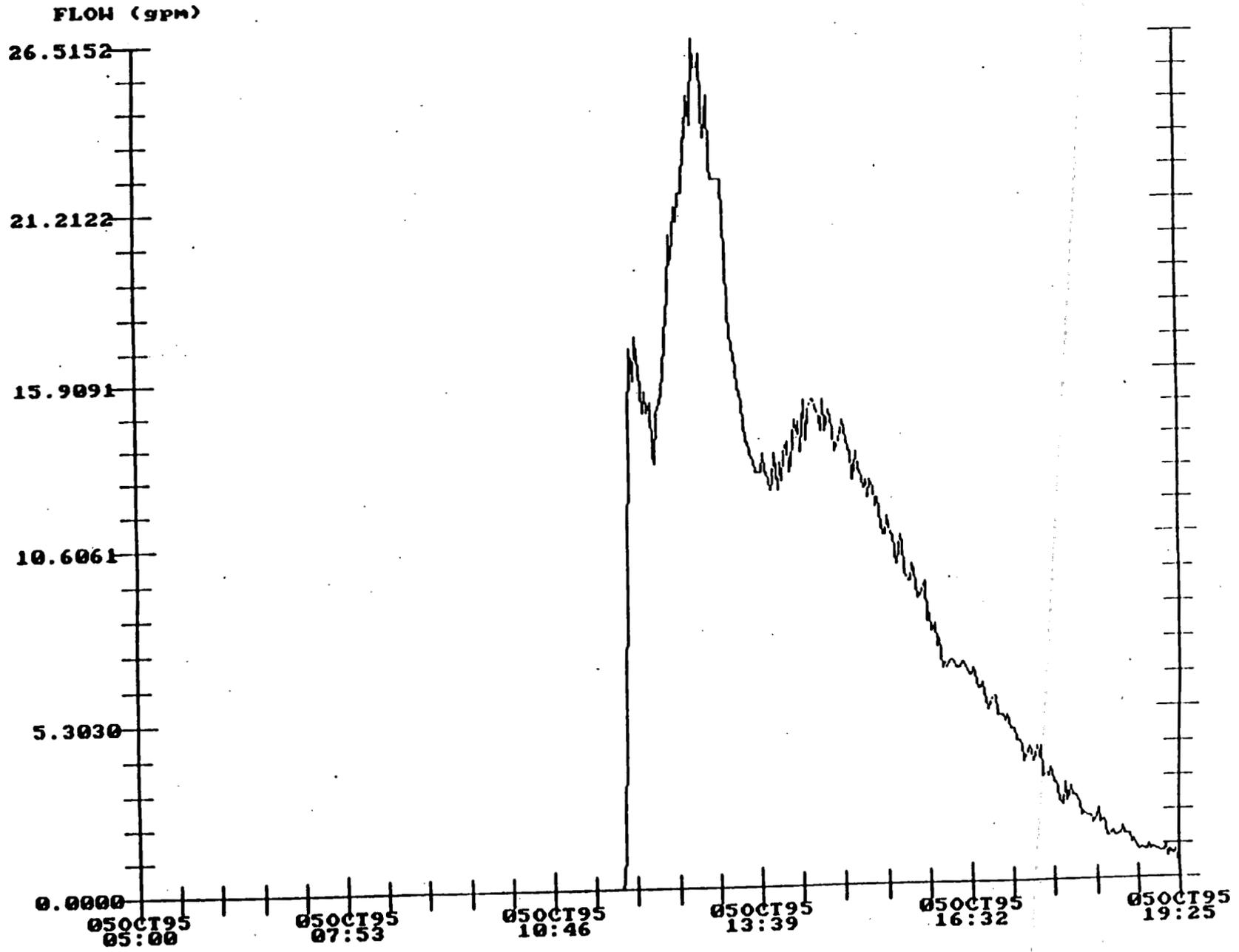
Sample Station 003 - Event #1



000049

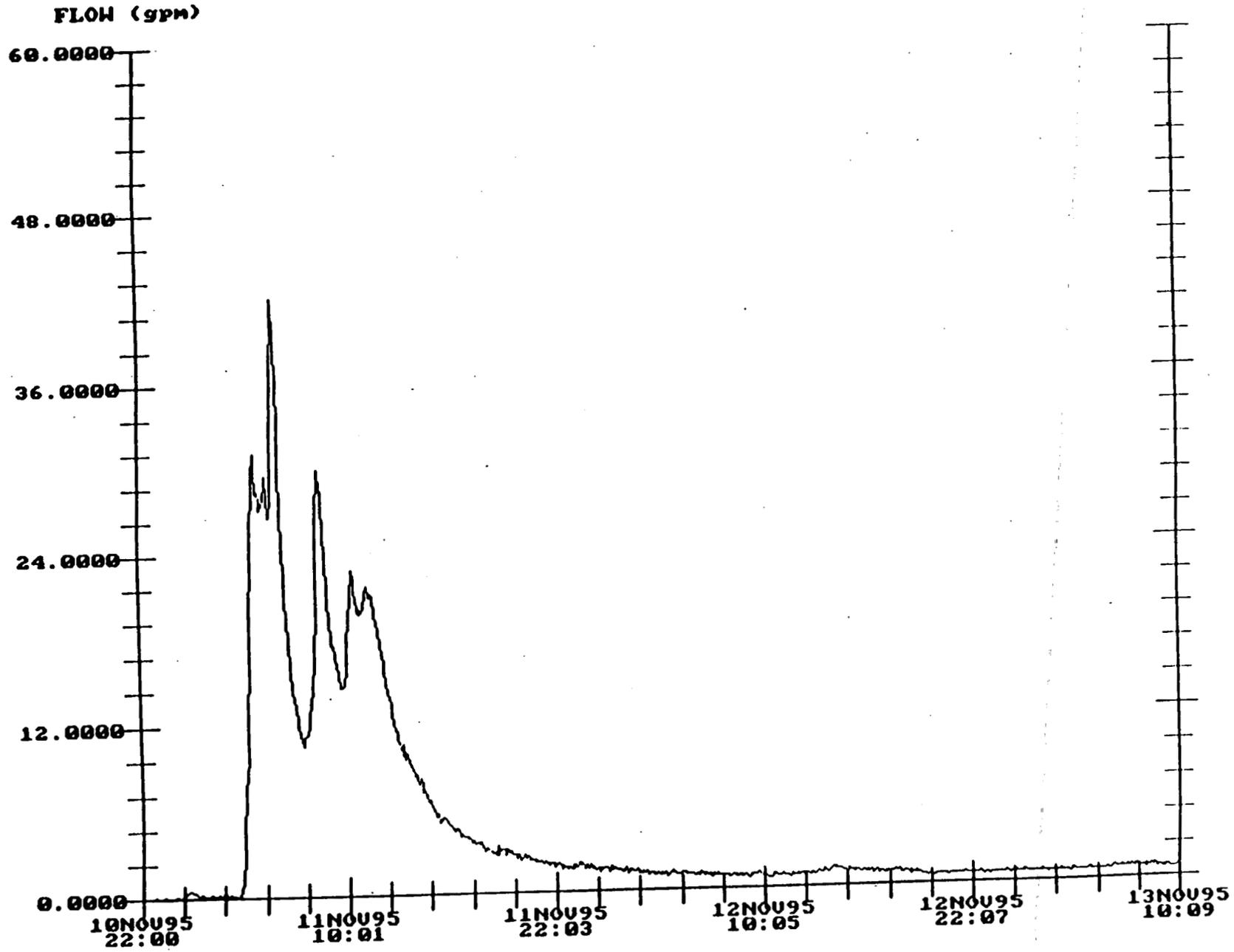
715

Sample Station 004 - Event #1



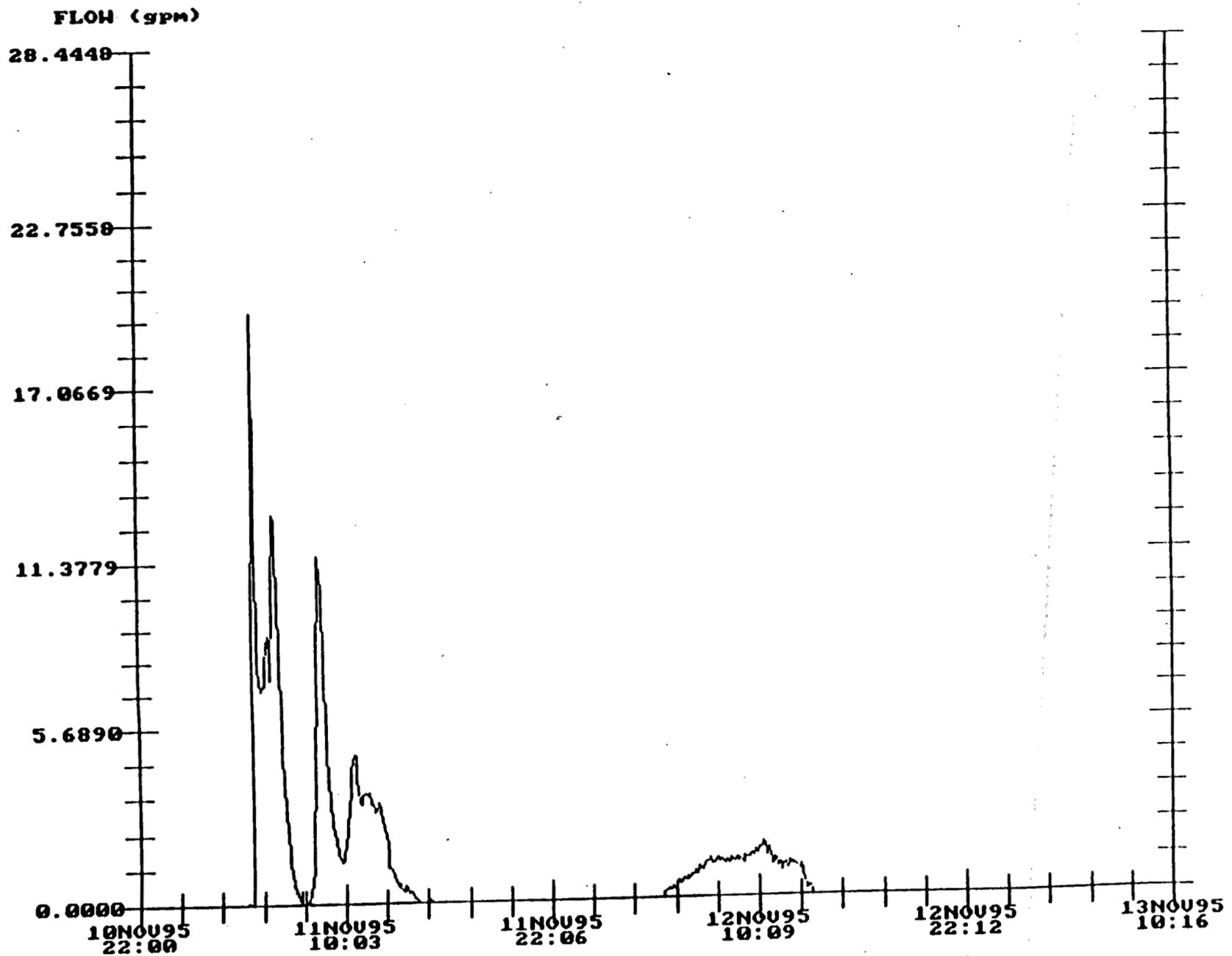
000050

Sample Station 001 - Event #2



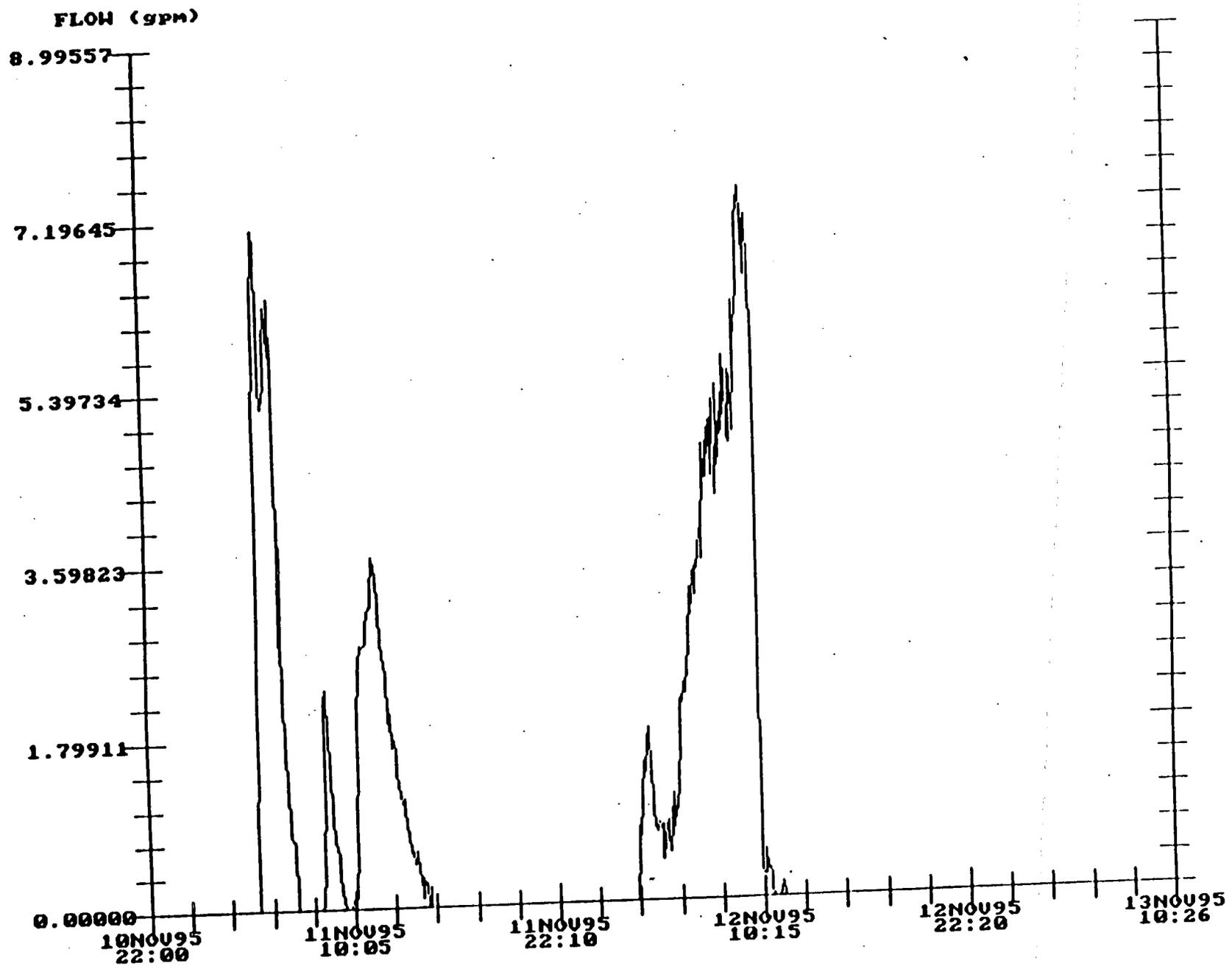
000051

Sample Station 002 - Event #2



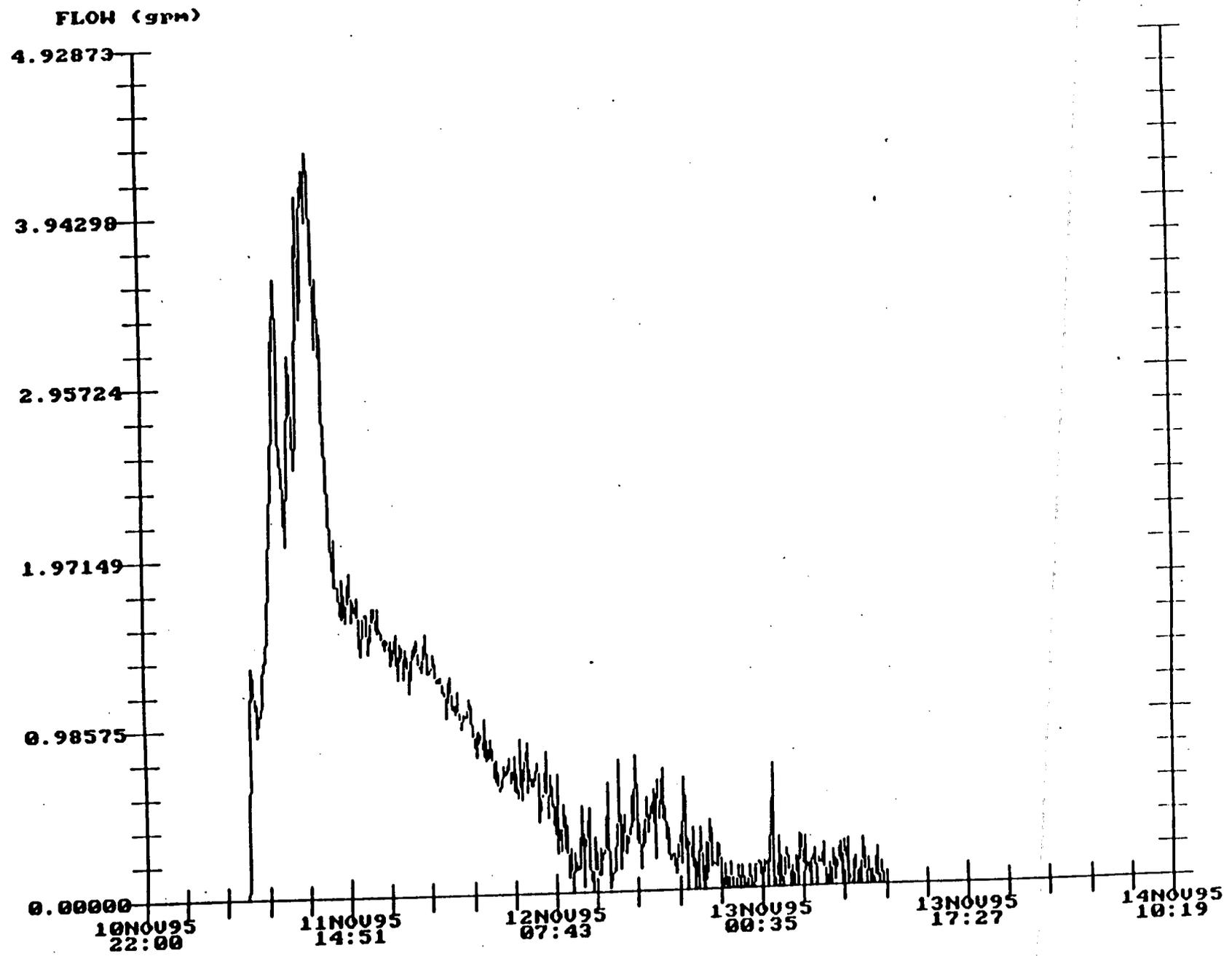
000052

Sample Station 003 - Event #2



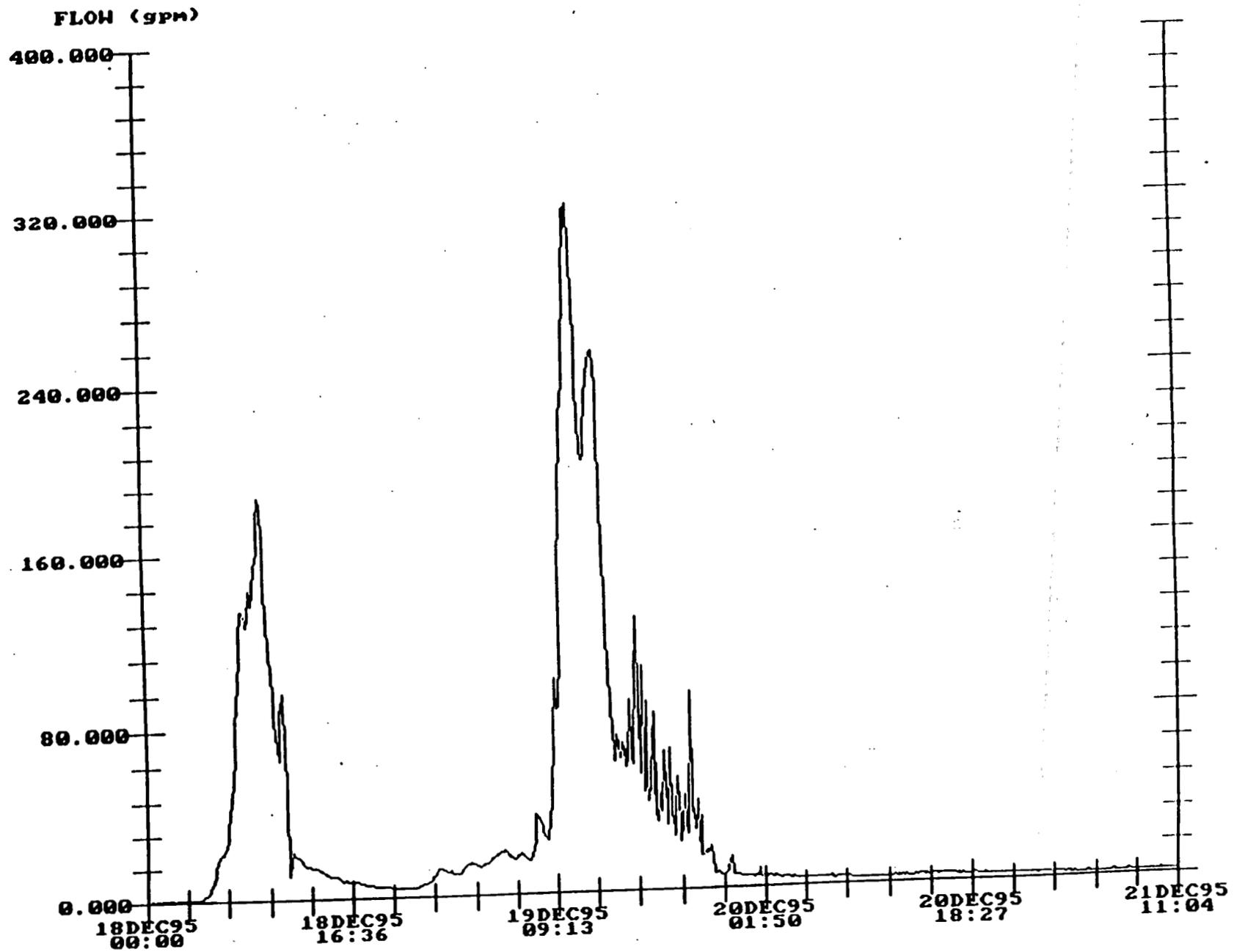
000053

Sample Station 004 - Event #2



000054

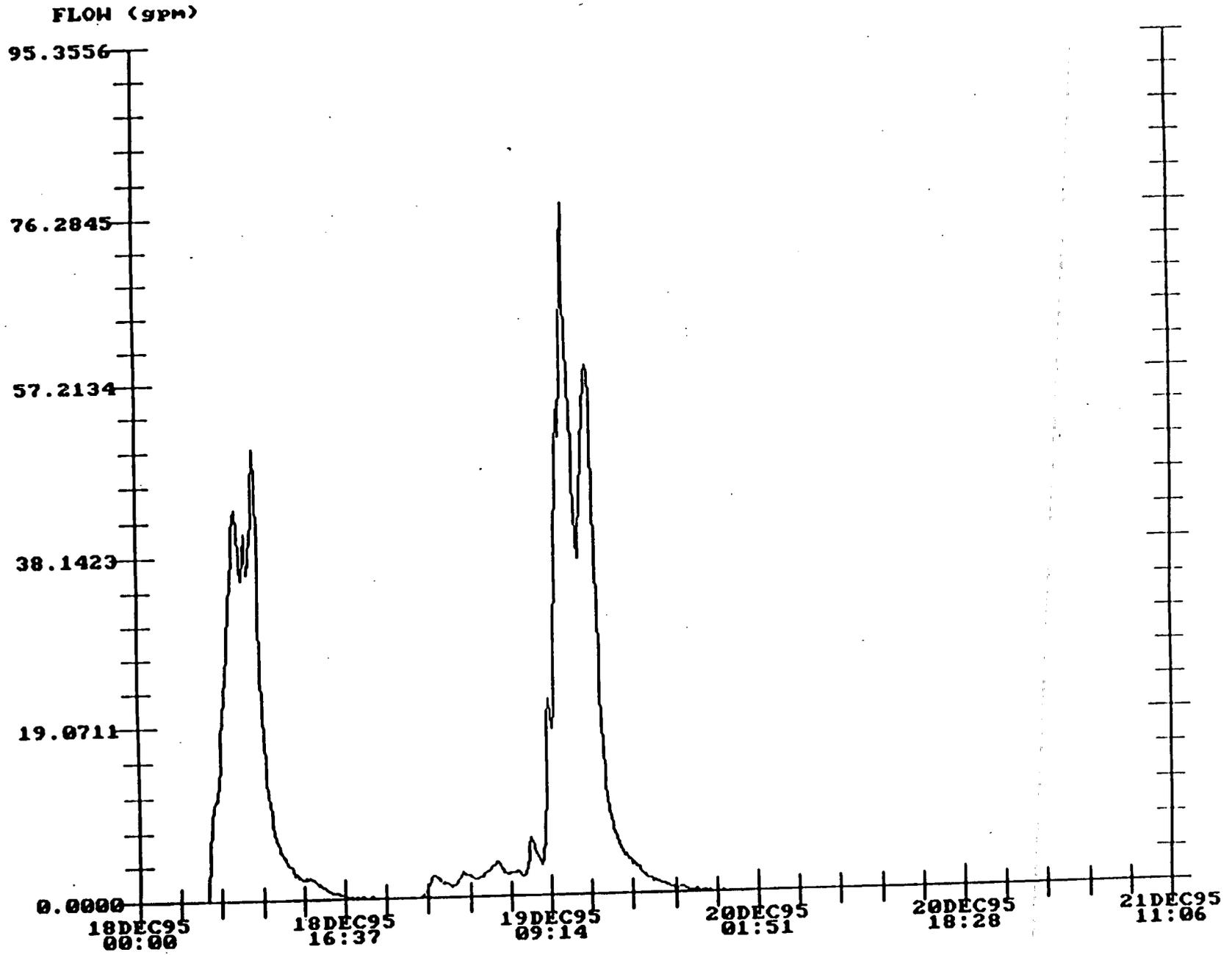
Sample Station 001 - Event #3



000055

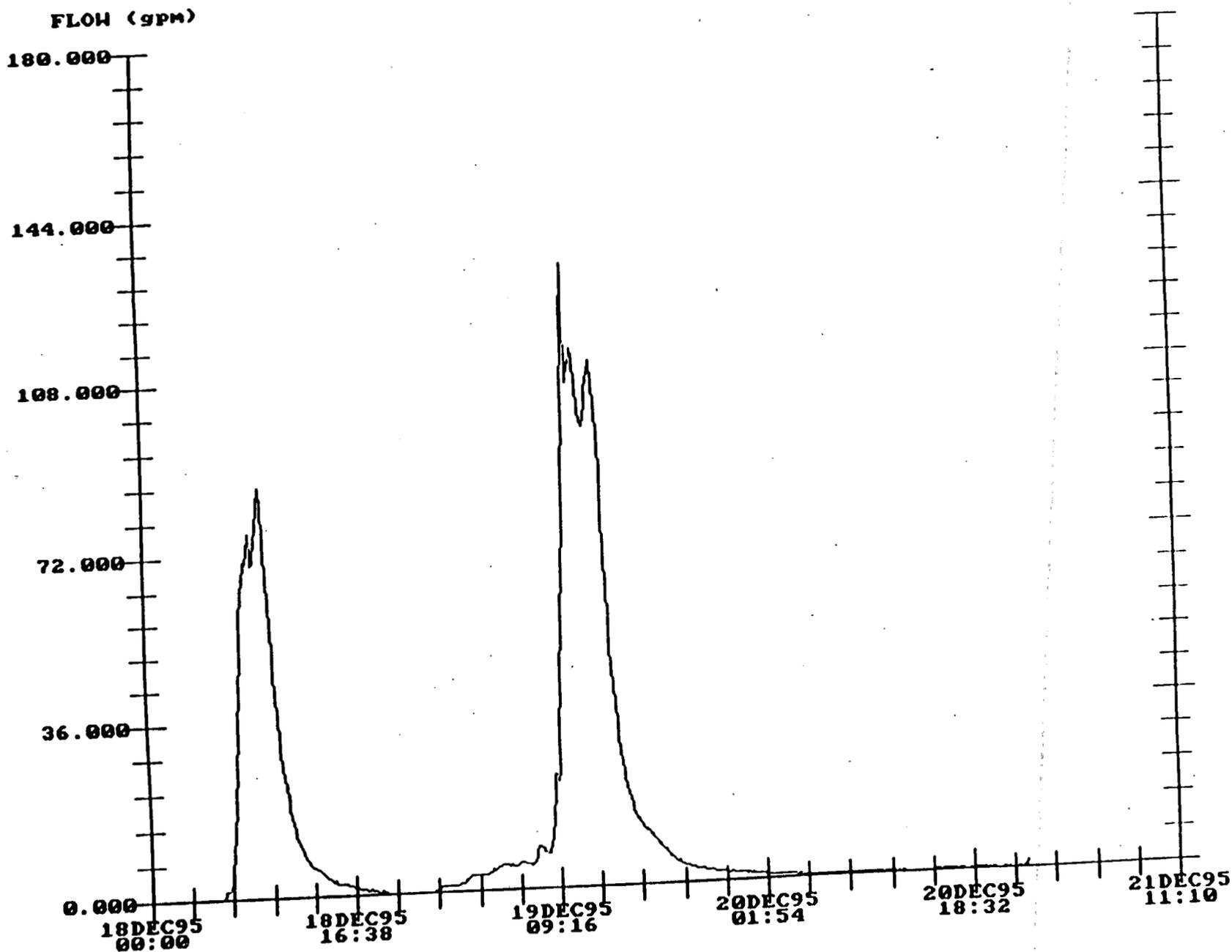
715

Sample Station 002 - Event #3



000056

Sample Station 003 - Event #3

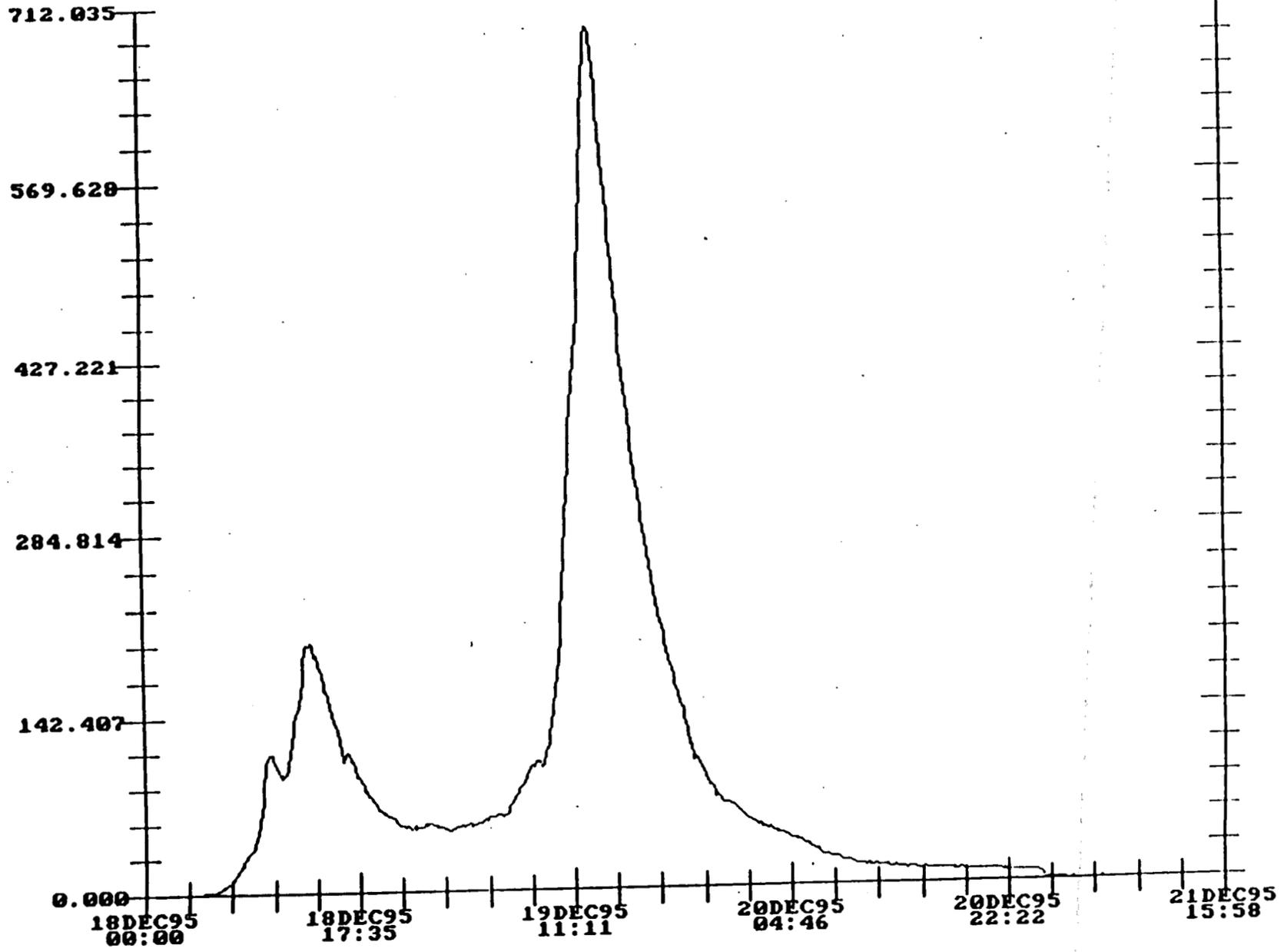


250000

215

Sample Station 004 - Event #3

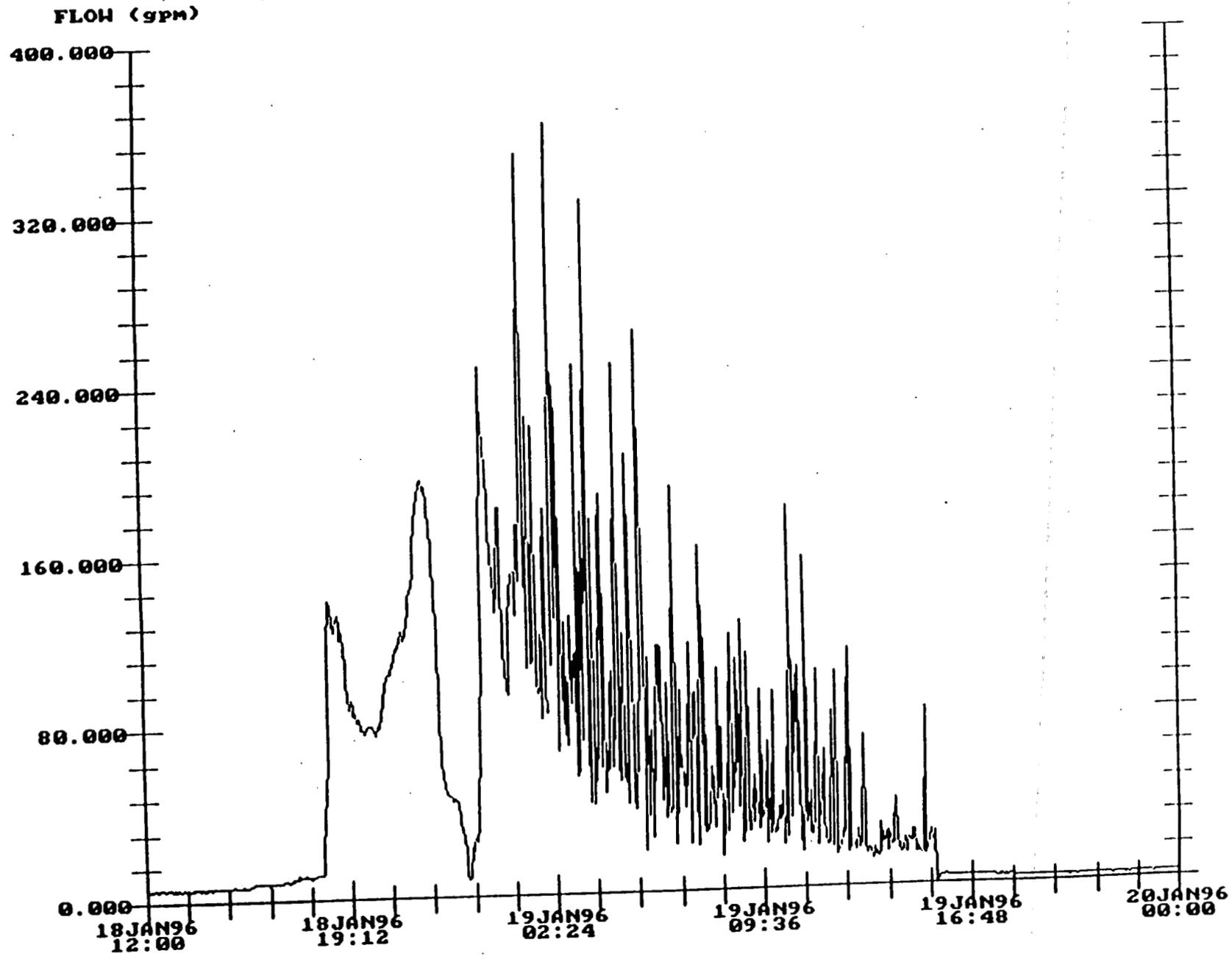
FLOW (gpm)



000058

715

Sample Station 001 - Event #4

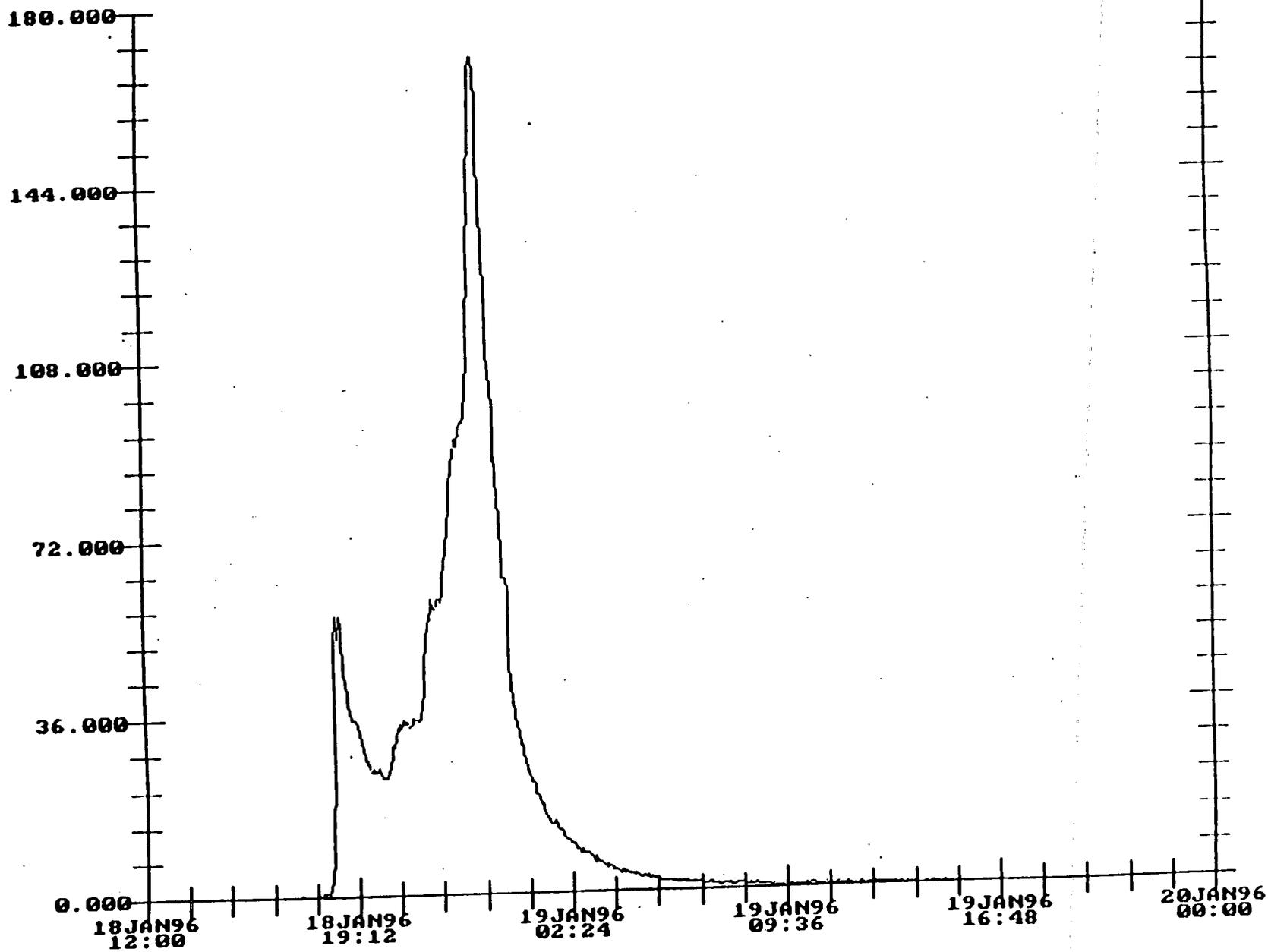


000059

715

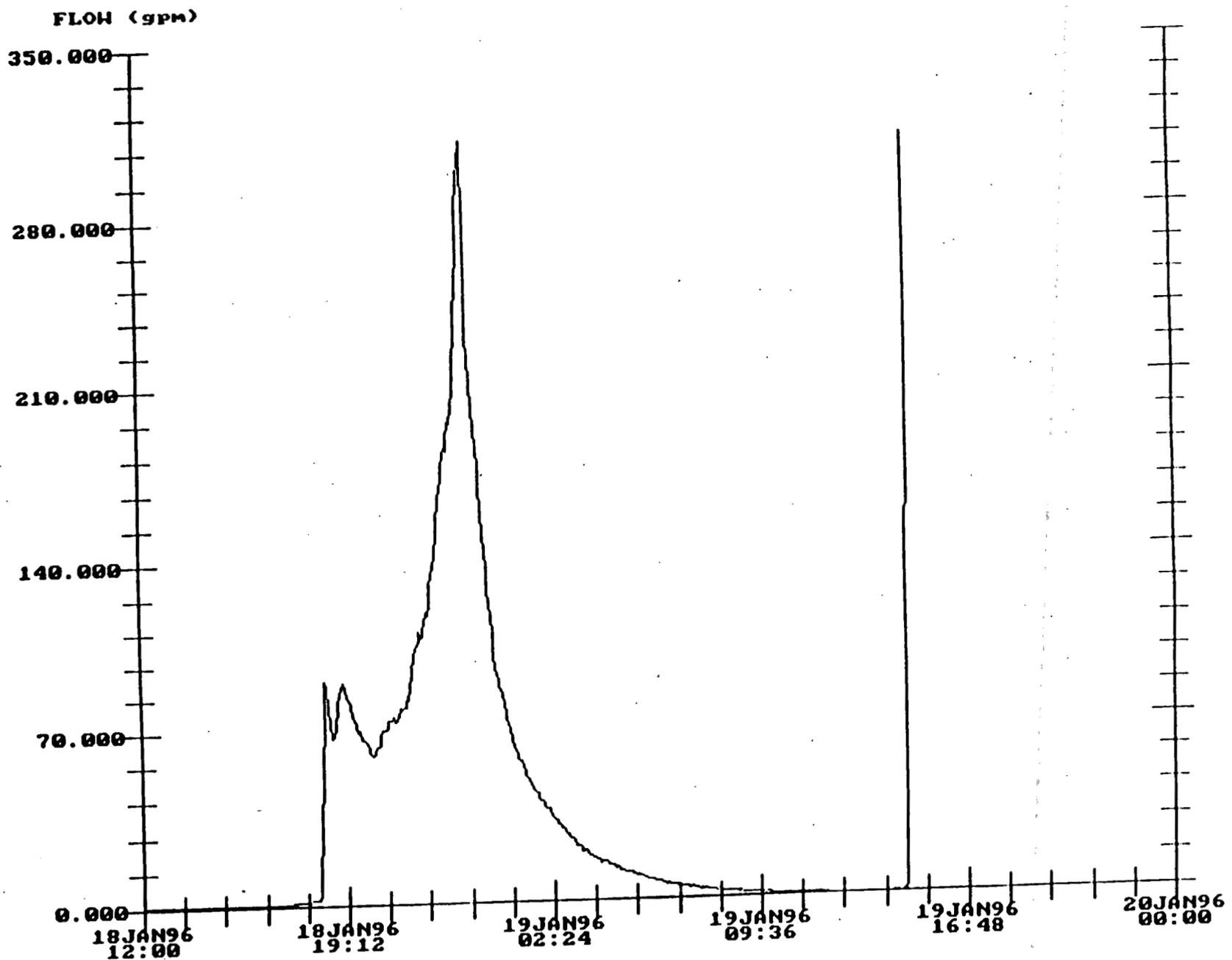
Sample Station 002 - Event #4

FLOW (gpm)



000000

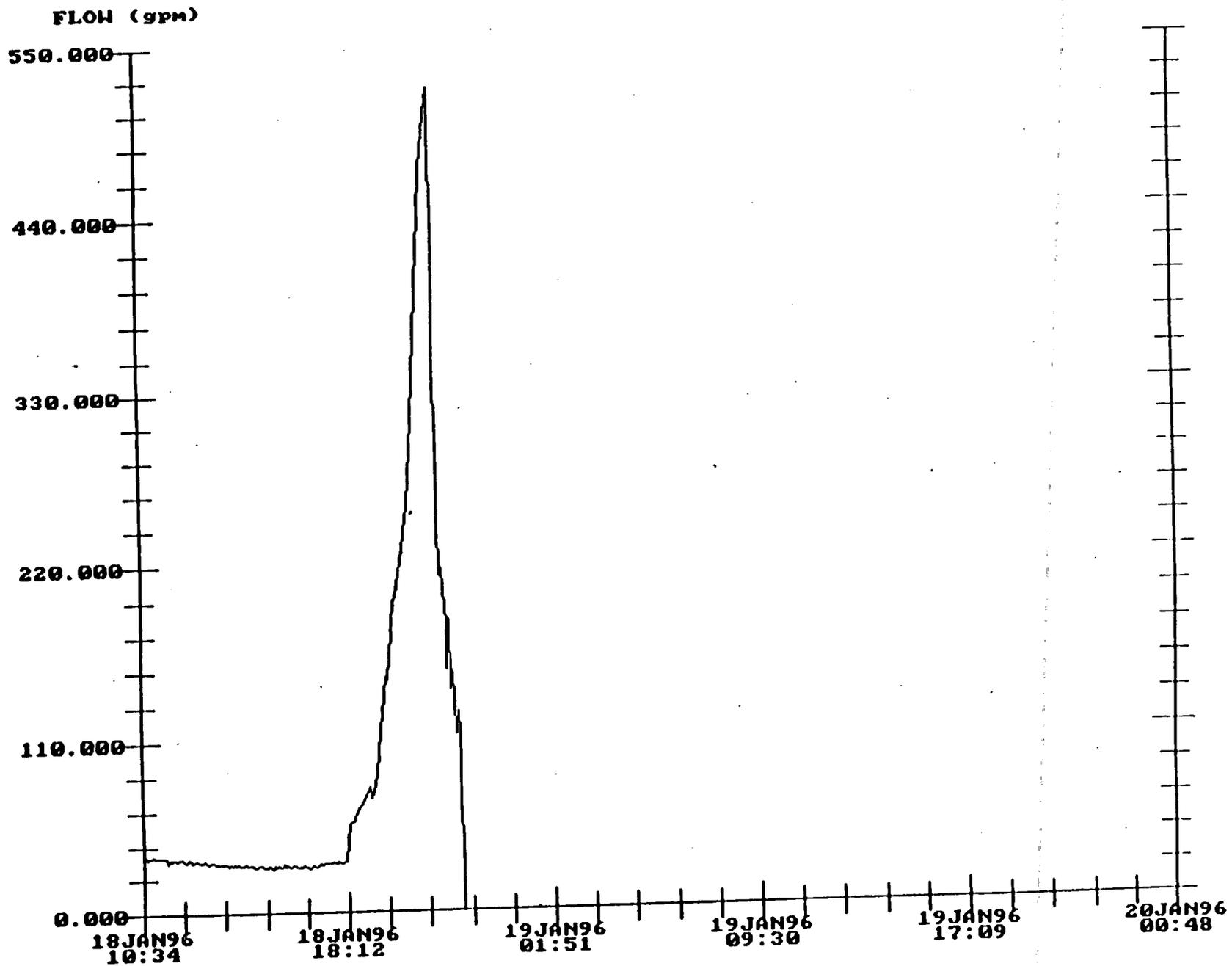
Sample Station 003 - Event #4



000061

715

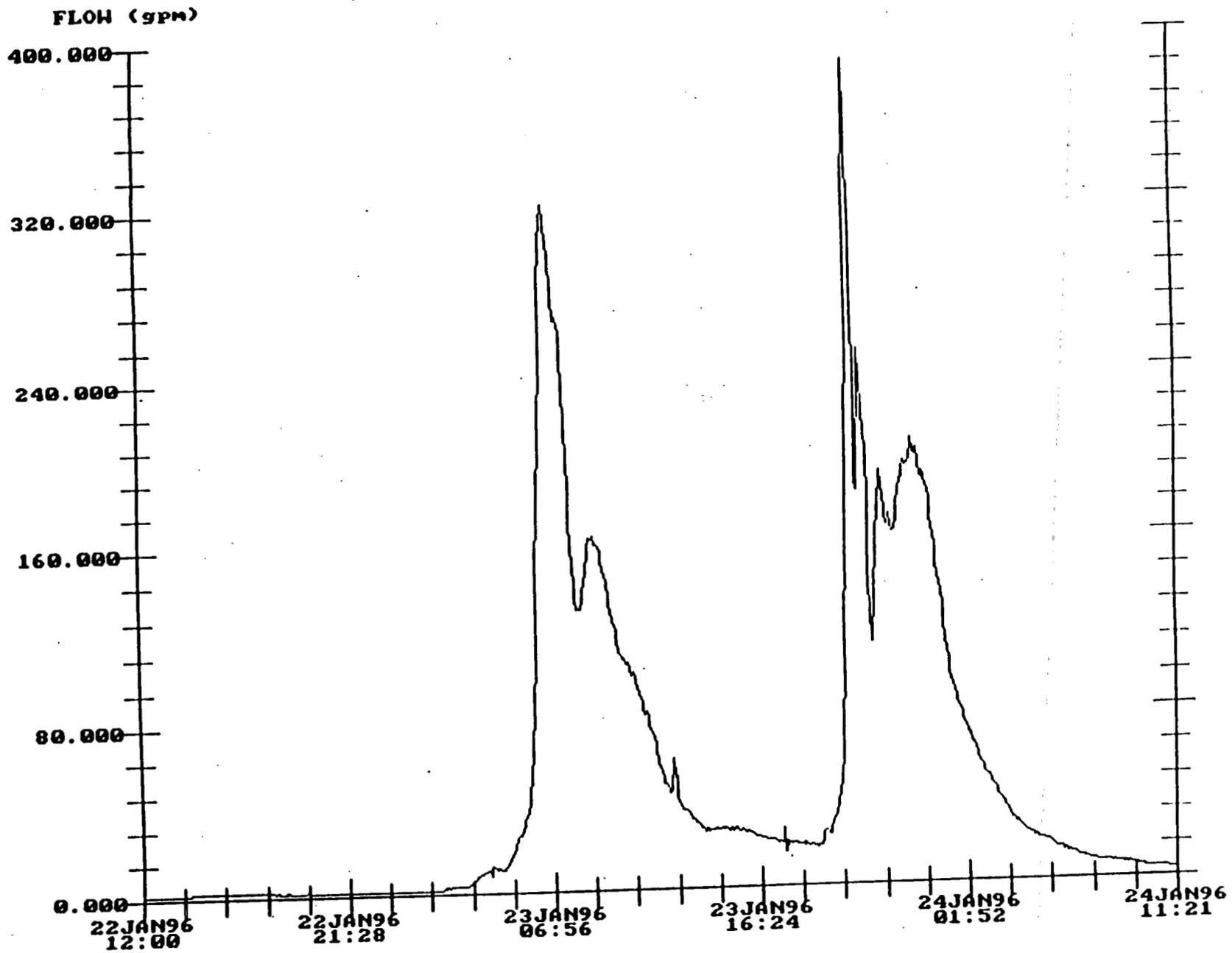
Sample Station 004 - Event #4



000062

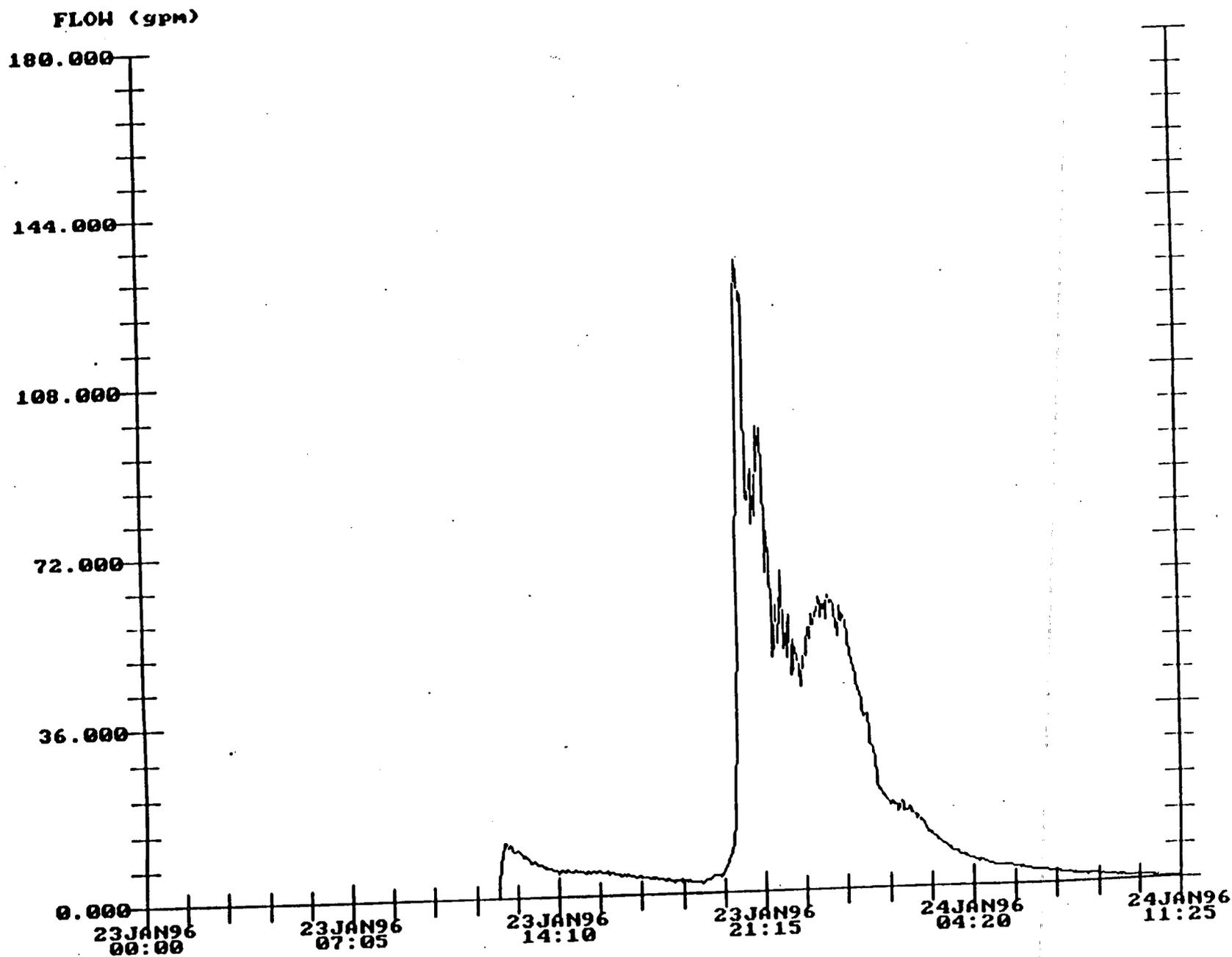
715

Sample Station 001 - Event #5



000063

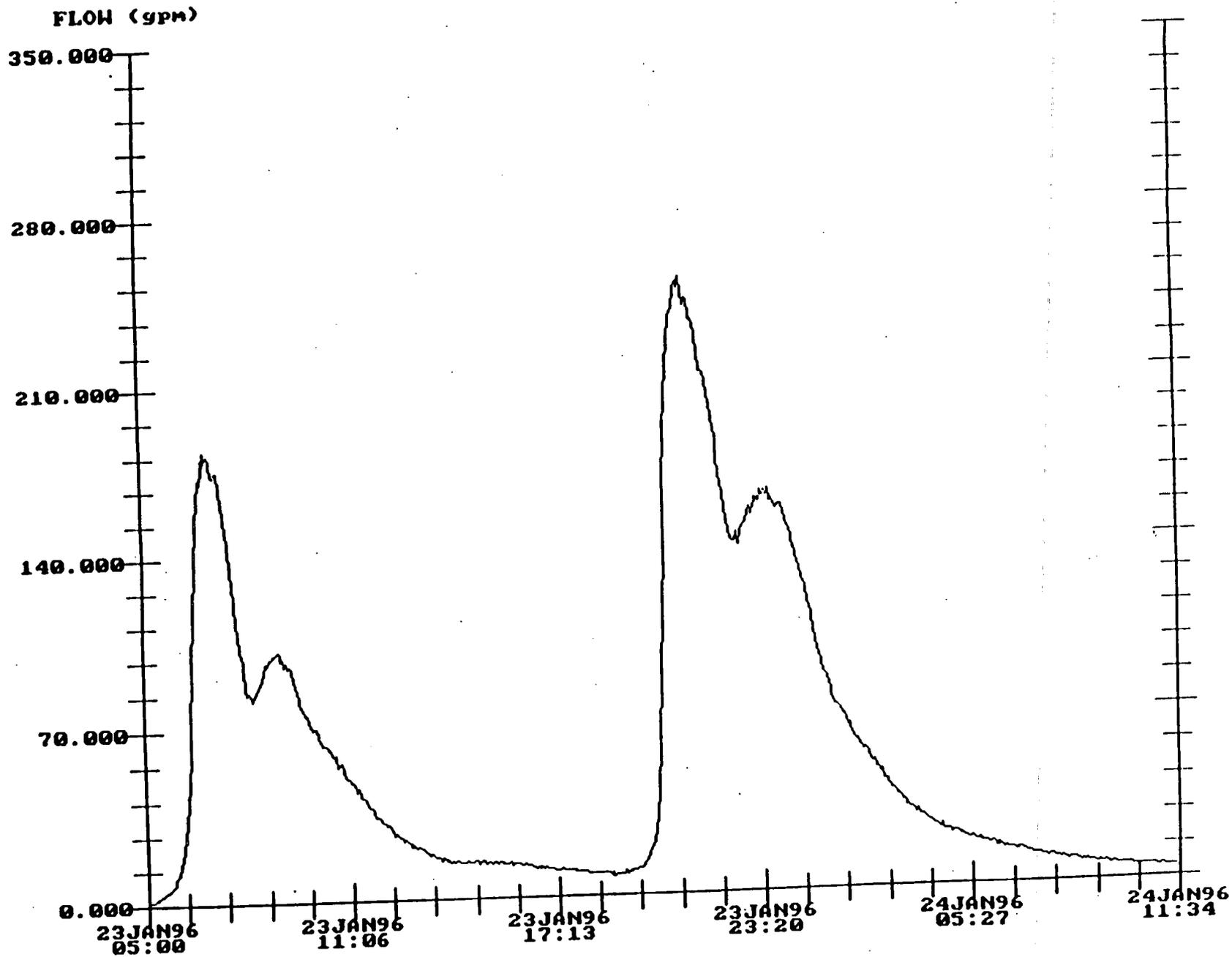
Sample Station 002 - Event #5



000064

215

Sample Station 003 - Event #5



000065

Sample Station 004 - Event #5

FLOW (gpm)

839.807

671.845

503.884

335.923

167.961

0.000

23JAN96
00:00

23JAN96
06:48

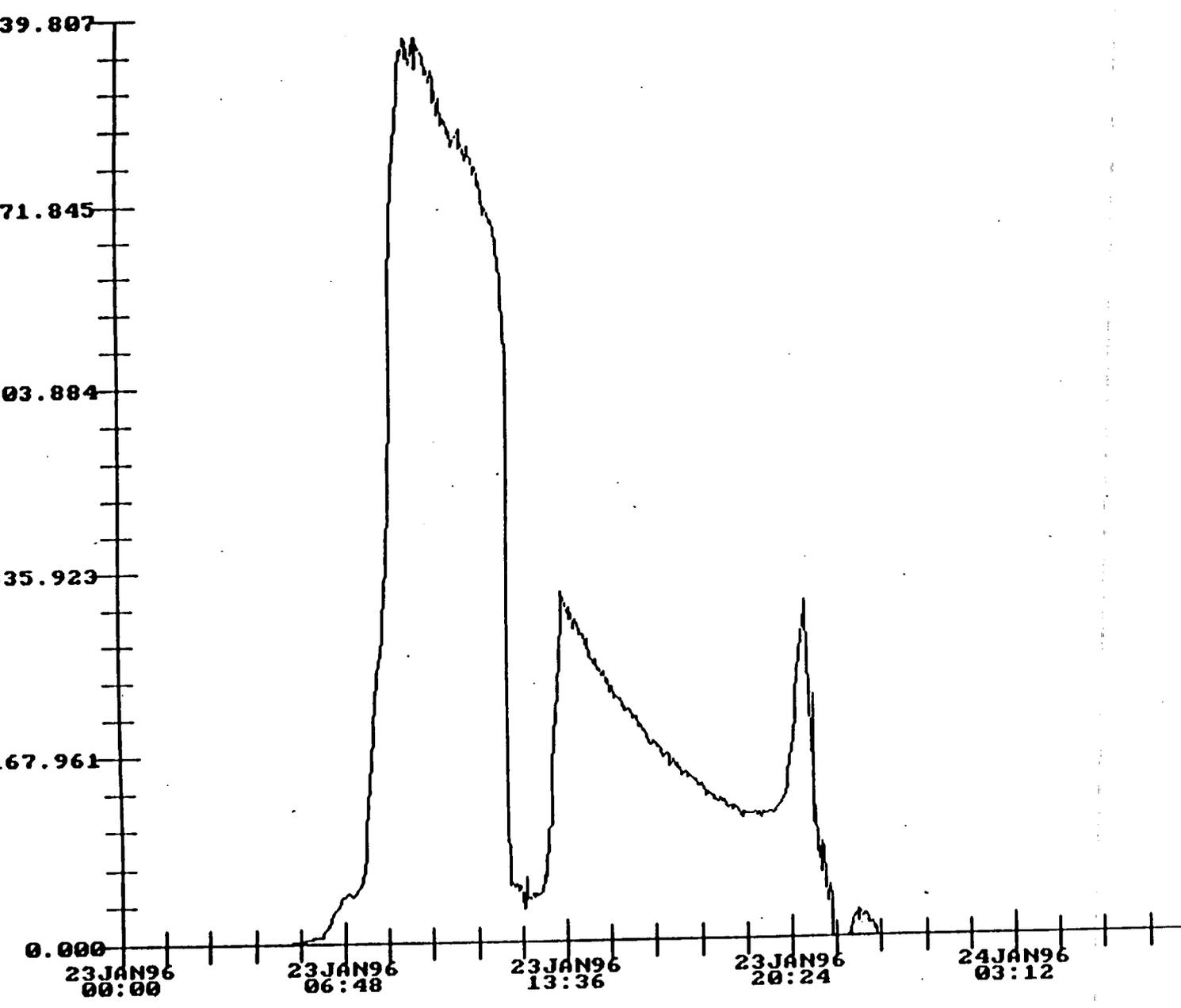
23JAN96
13:36

23JAN96
20:24

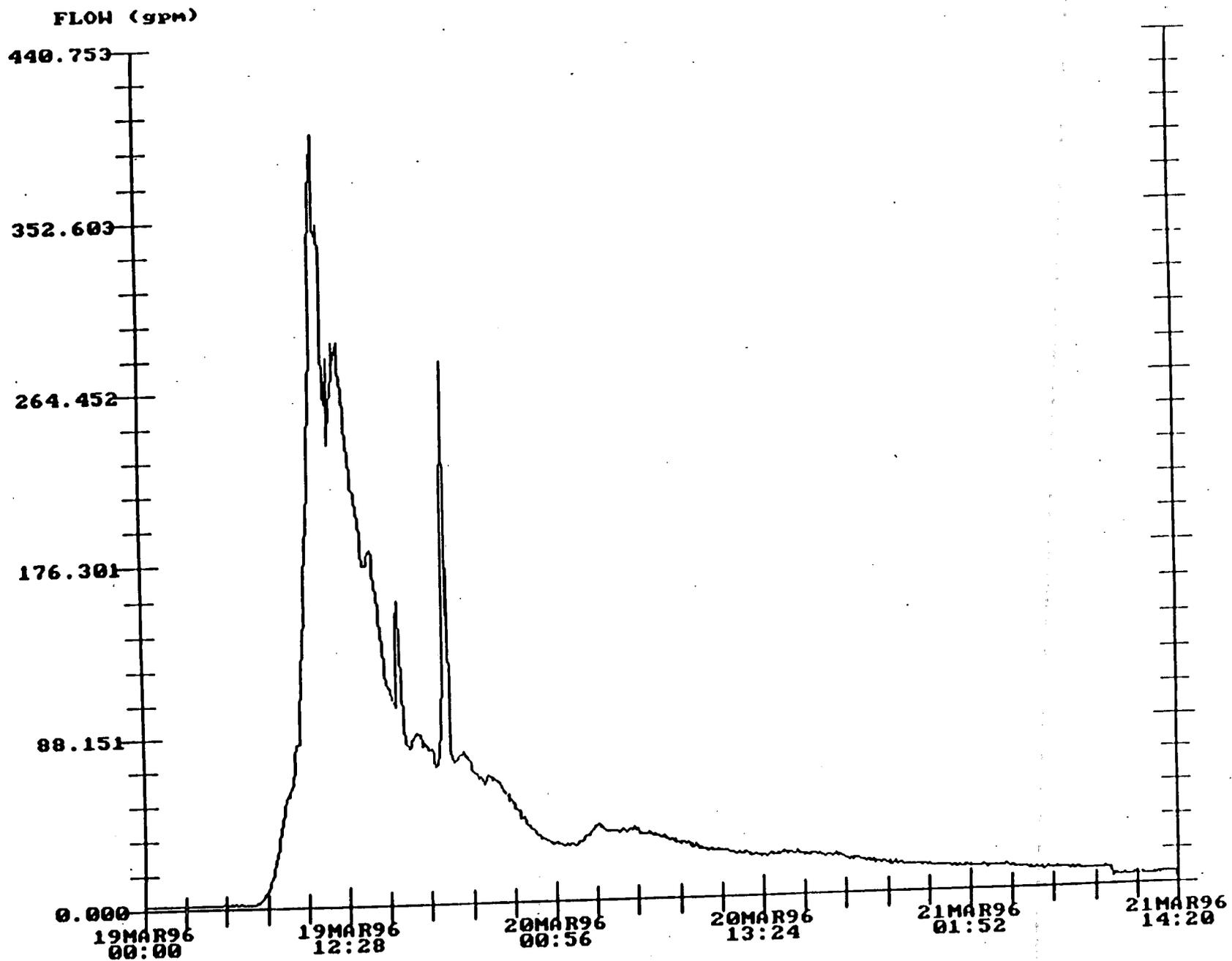
24JAN96
03:12

24JAN96
10:00

000000



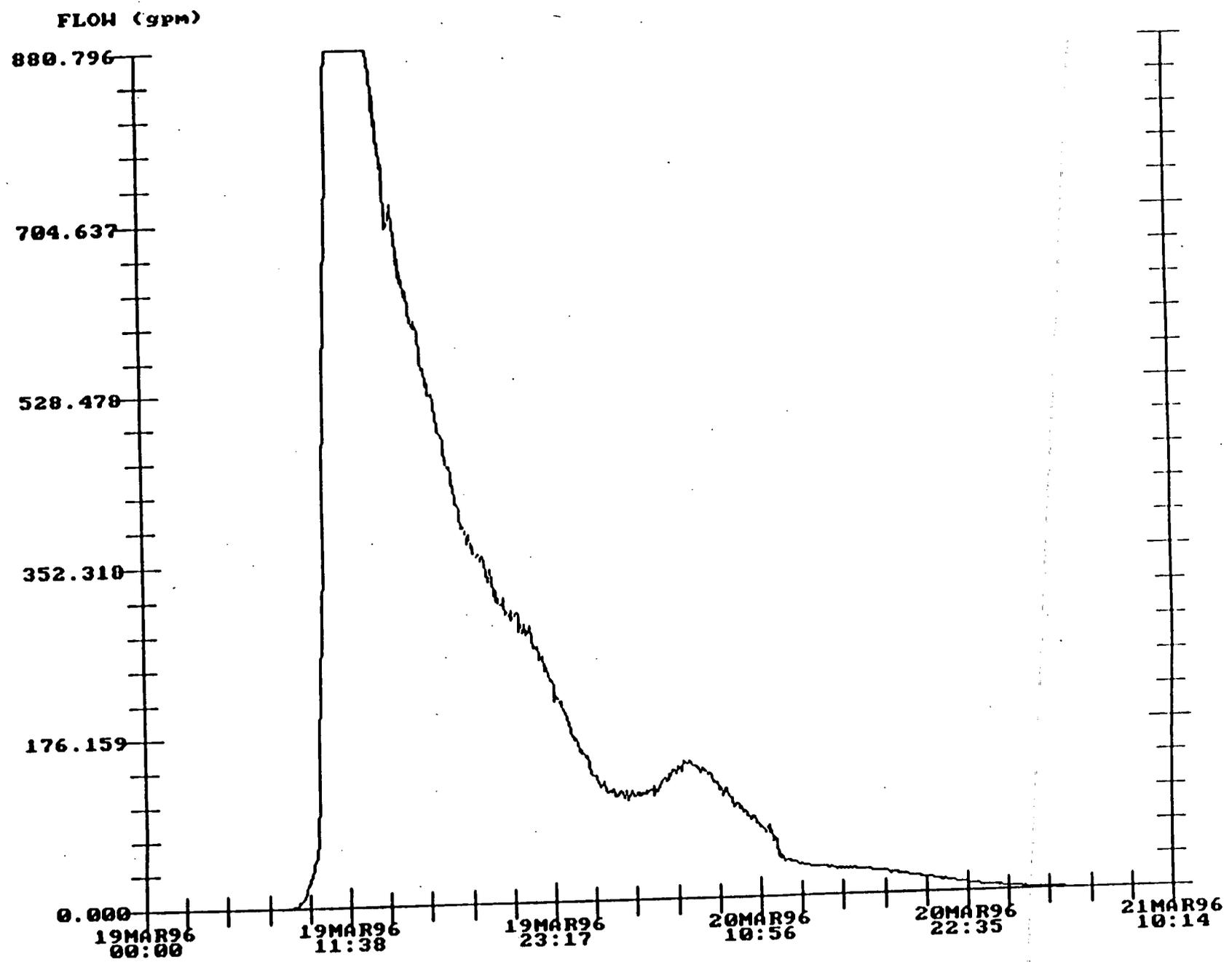
Sample Station 001 - Event #6



250000

215

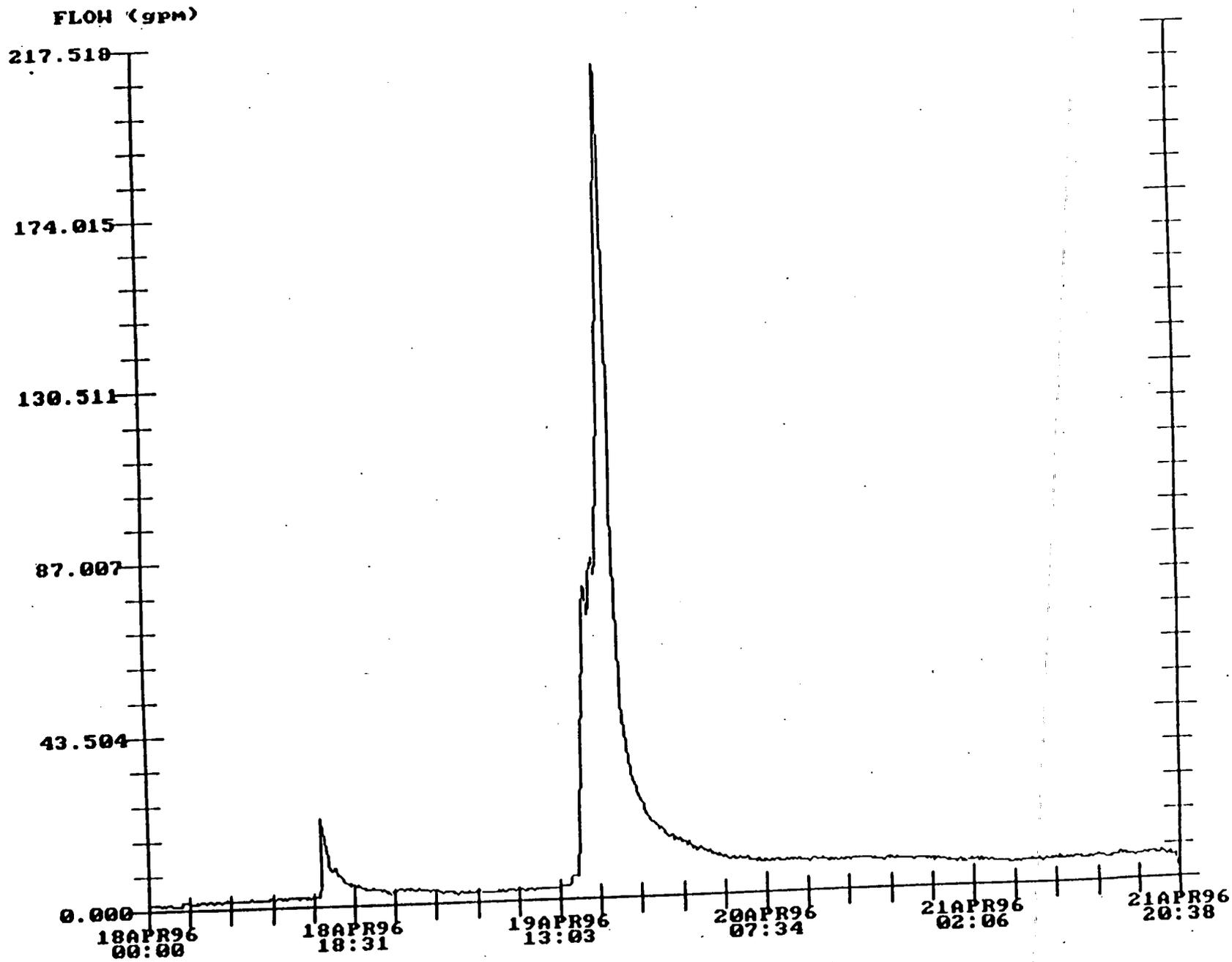
Sample Station 004 - Event #6



000000

715

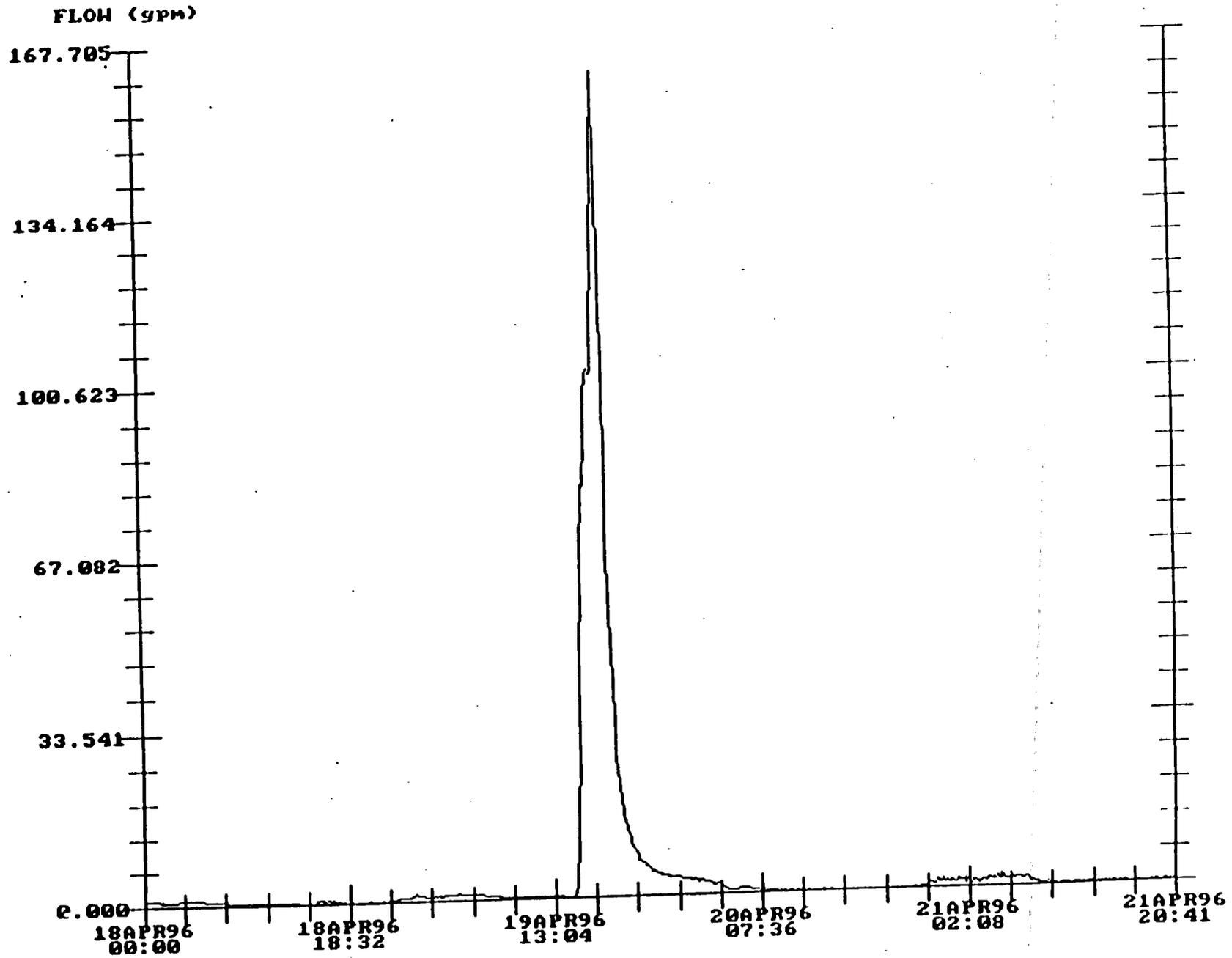
Sample Station 001 - Event #7



000000

715

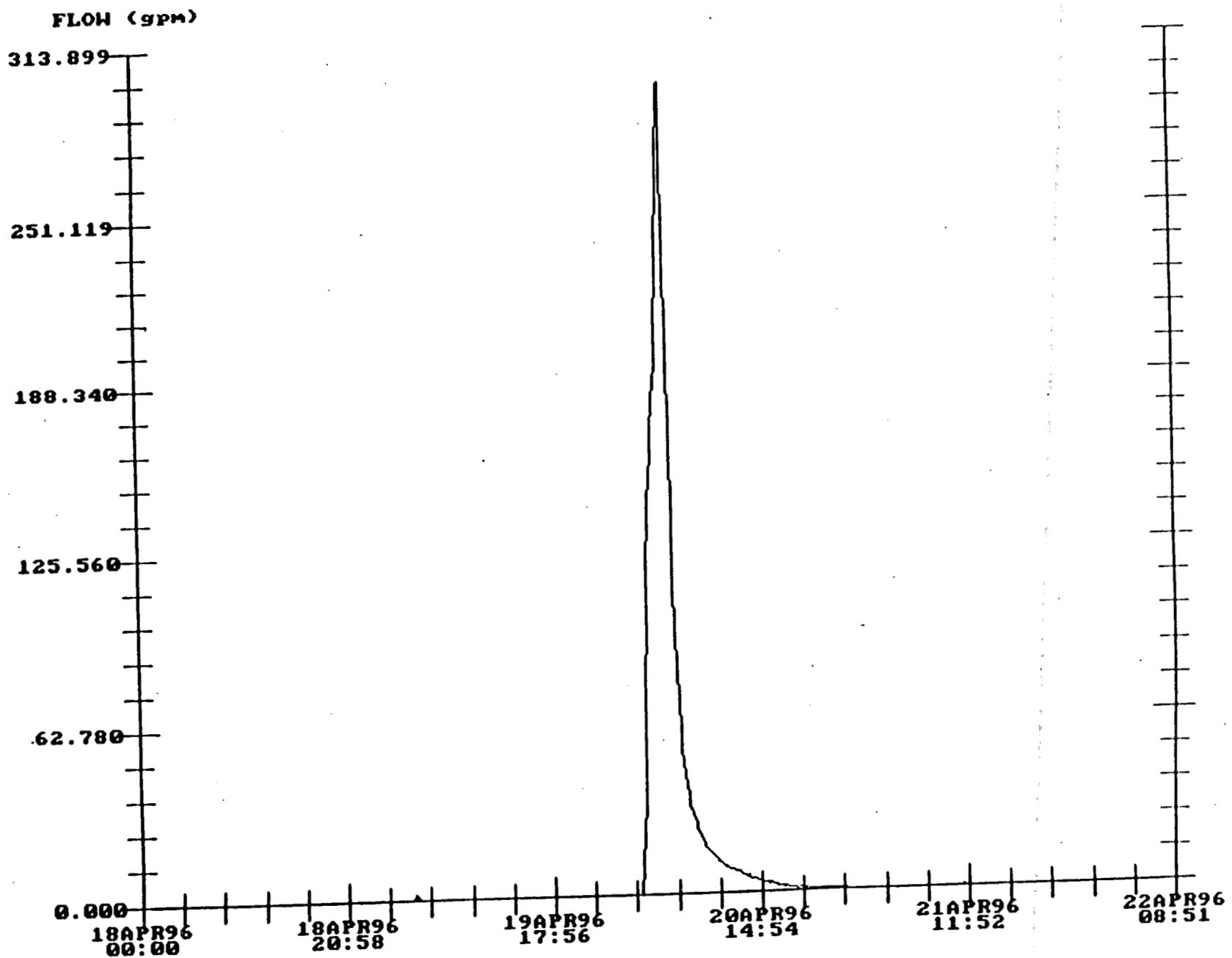
Sample Station 002 - Event #7



020000

715

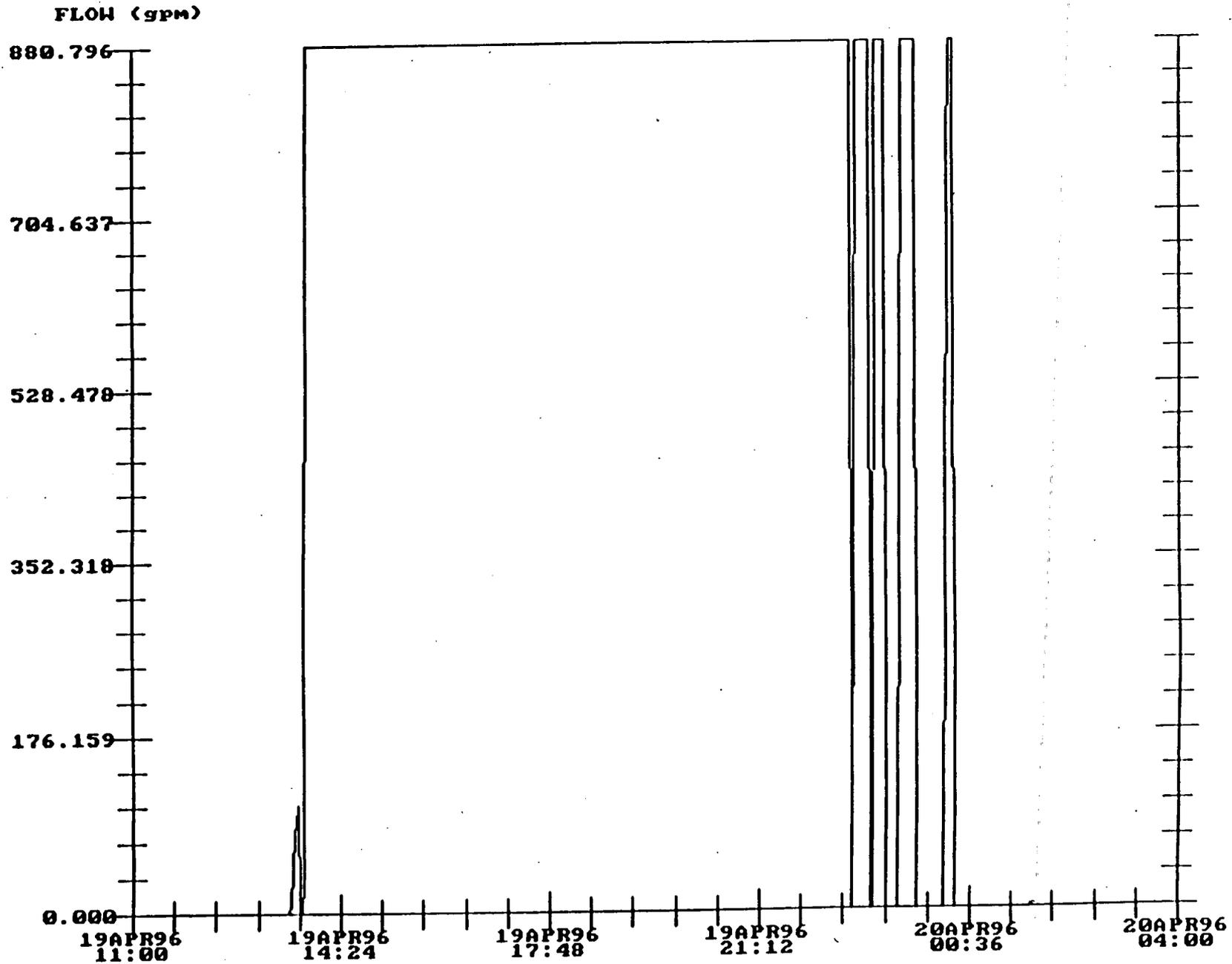
Sample Station 003 - Event #7



000071

715

Sample Station 004 - Event #7



220000

215