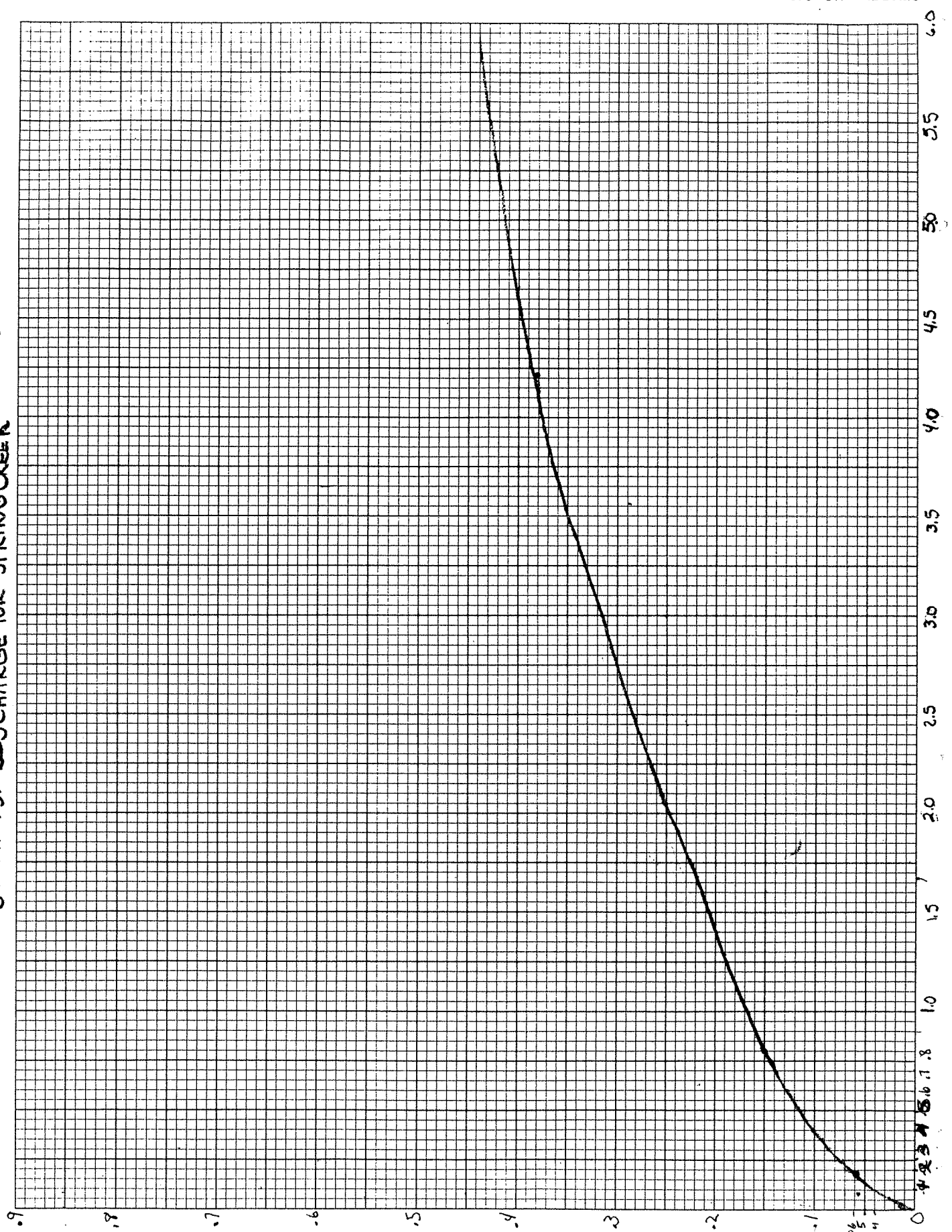


**Lyman Lakes Hydrographs
1985-86**

**Kim Hannula '89, Kris Simonson '86,
Kris Grady '85, Tim Vick**

DEPTH VS. DISCHARGE FOR SPRING CREEK UPPER DAM

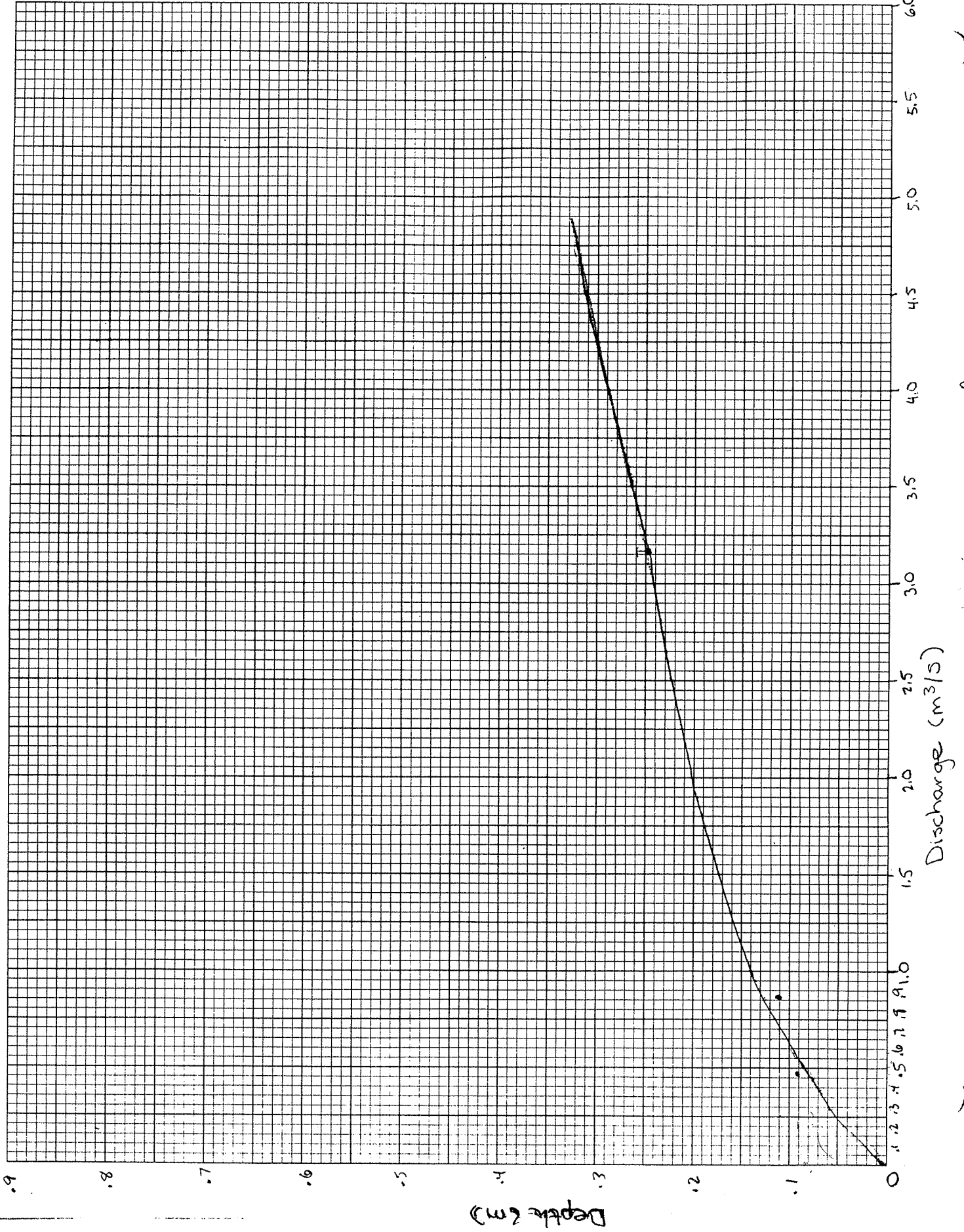


CITADEL® NO. 640 - SCIENCE - 5 SQUARES TO CENTIMETER

DISCHARGE (m³/s) K. W. G. & S. S. S. 1915

DEPTH (m)

Depth vs Discharge for Lower Lyman Lakes dam



SA 185

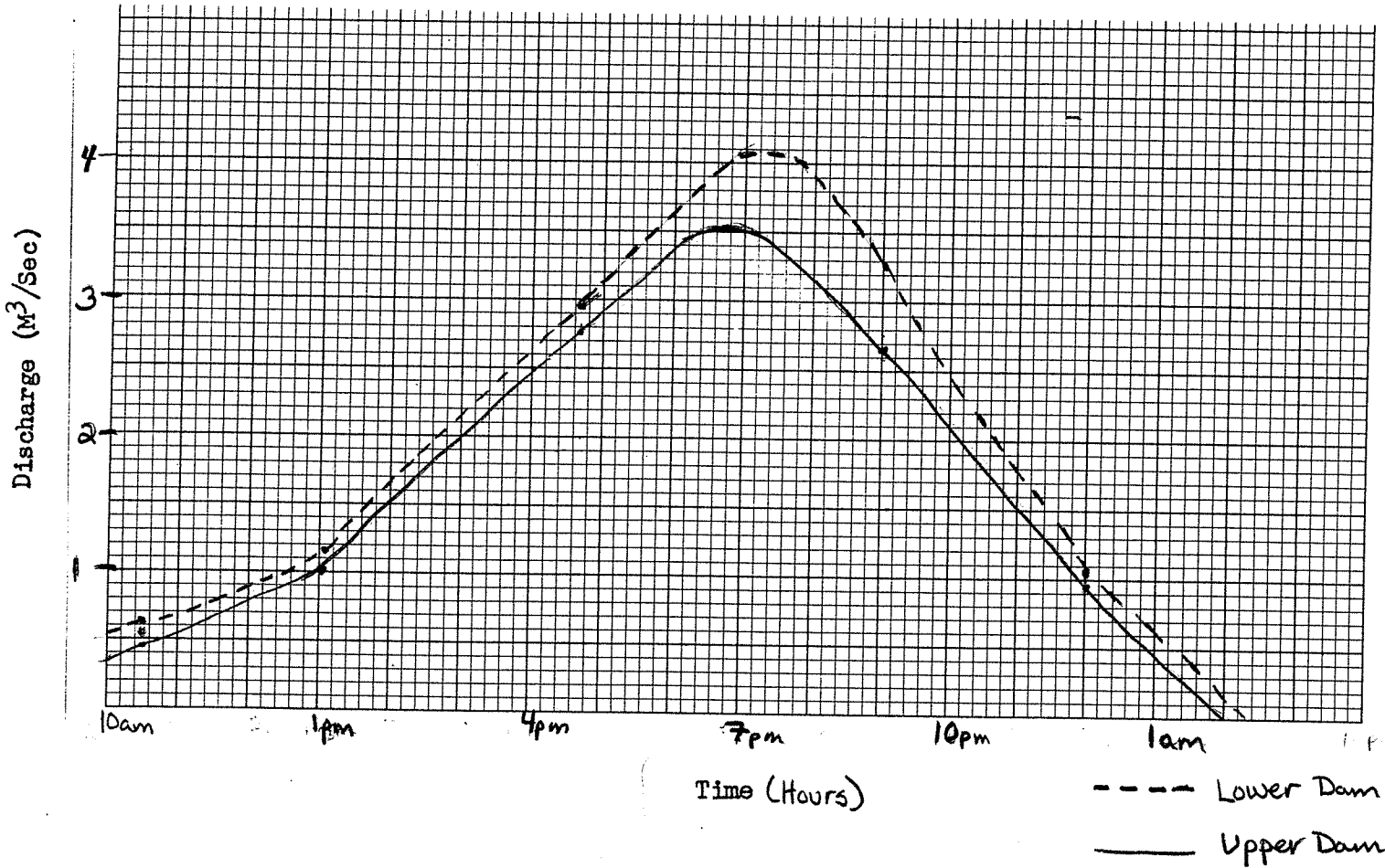
Kris Gandy + Kris Simonson

LYMAN LAKES PROJECT
STORM EVENT DATA SHEET

Type of Event Snowmelt

Date/Time of Beginning 3/12/85 (10:23) Ending 3/13 (1pm)

Total Precipitation in inches of water ?



Time Interval	Discharge	
	Upper	Lower
2am - 9:30am	10,260 m ³	21,433 m ³
9:30 - 11:45am	3,645 m ³	
11:45am - 2:45pm	3,600 m ³	12,420 m ³
2:45pm - 6:45pm	39,600 m ³	42,480 m ³
6:45pm - 10:30	35,775 m ³	40,489 m ³
10:30pm - 2am	12,096 m ³	12,474 m ³

Total Discharge for the Period:

104,976 m³

129,296 m³

ENVIRONMENTAL RESEARCH GROUP, INC.



135 State Street P.O. Box 7006 St. Paul, Minnesota 55107 (612) 293-9268

Schilling Environmental
Attn: Joel Schilling
PO Box 10936
St. Paul, MN 55110

Lab Report No. 18471
Report Date: 4/11/85
Sample Received: 3/14/85

PARAMETERS	1. ABOVE LYMAN LAKES	2. LOWER LYMAN LAKES
1. Total Suspended Solids (TSS)	560 mg/L	260 mg/L
2. Volatile Suspended Solids	76 mg/L	45 mg/L
3. Total Kjeldahl Nitrogen (TKN)	5.5 mg/L	4.2 mg/L
4. Total Phosphorus (TP)	1.4 mg/L	1.1 mg/L
5. Nitrogen, Nitrate + Nitrite ($\text{NO}_3 + \text{NO}_2$)	4.4 mg/L	4.1 mg/L

Environmental Research Group, Inc.

John E. Findley
John E. Findley,
Manager, Inorganics Dept.

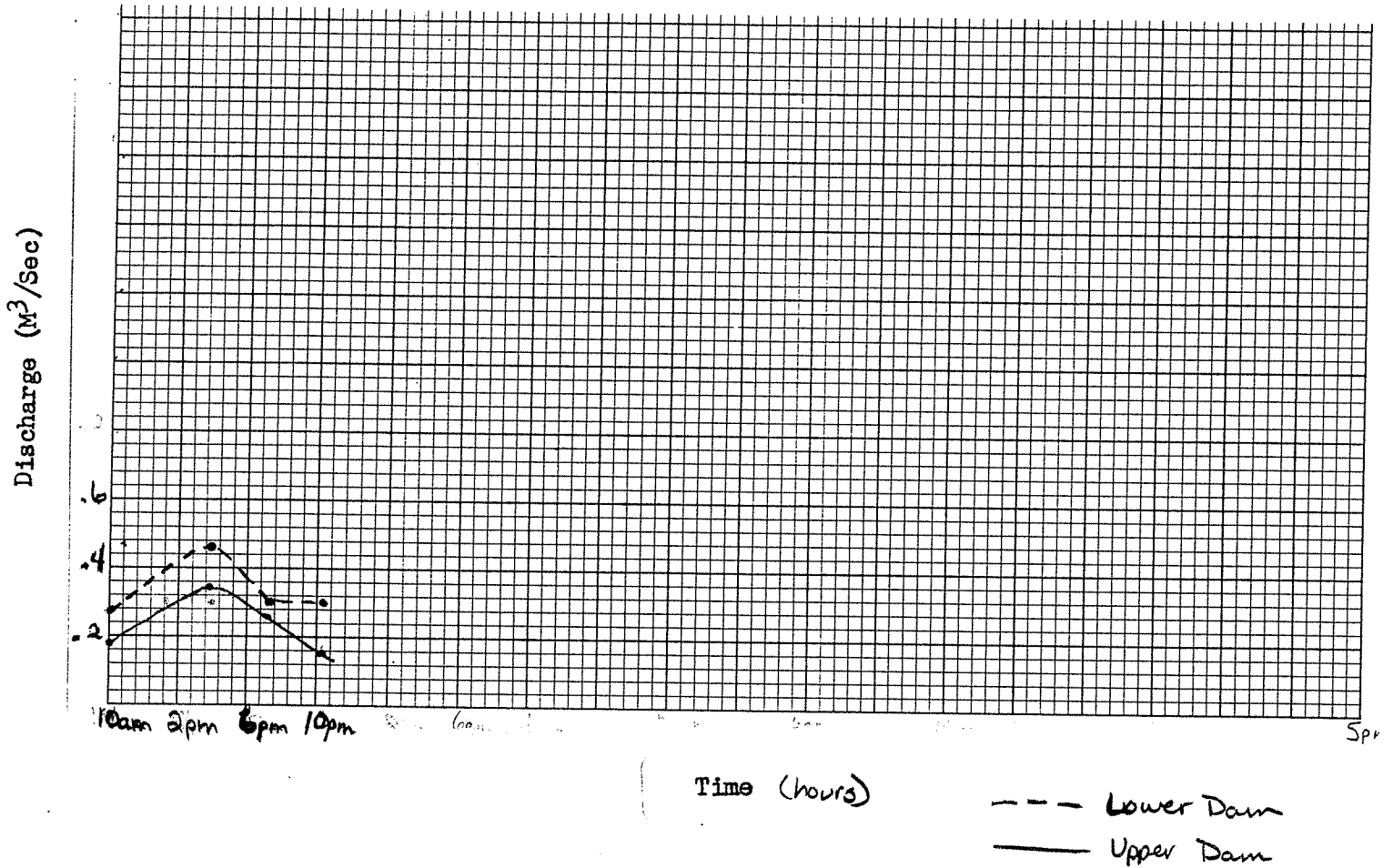
JEF/jc

LYMAN LAKES PROJECT
STORM EVENT DATA SHEET

Type of Event Rainfall (2 hours) 2:30 - 4:00 pm

Date/Time of Beginning 3/28/85 4:30 pm Ending 3/28/85 10:30 pm

Total Precipitation in inches of water 0.22 in



Time Interval	Discharge	
	Upper	Lower
3 - 6 pm	3672 m ³	4968 m ³
6 - 9 pm	2808 m ³	3240 m ³
9 - 12 pm	1944 m ³	3240 m ³

Total Discharge for the Period: 8424 m³ 11,448 m³

ENVIRONMENTAL RESEARCH GROUP, INC.



135 State Street P.O. Box 7006 St. Paul, Minnesota 55107 (612) 293-9268

Schilling Environmental Consultants
Attn: Joel Schilling
PO Box 10936
St. Paul, MN 55110

Lab Report No. 18585 Revised
Report Date: 5/03/85
Sample Received: 4/01/85

PARAMETERS	1. Dam Below Lyman Lakes	2. Spring Creek Above Lyman Lakes
1. Total Suspended Solids (TSS) (mg/L)	6	25
2. Volatile Suspended Solids (VSS) (mg/L)	4	8

Environmental Research Group, Inc.

John E. Findley
John E. Findley,
Manager, Inorganics Dept.

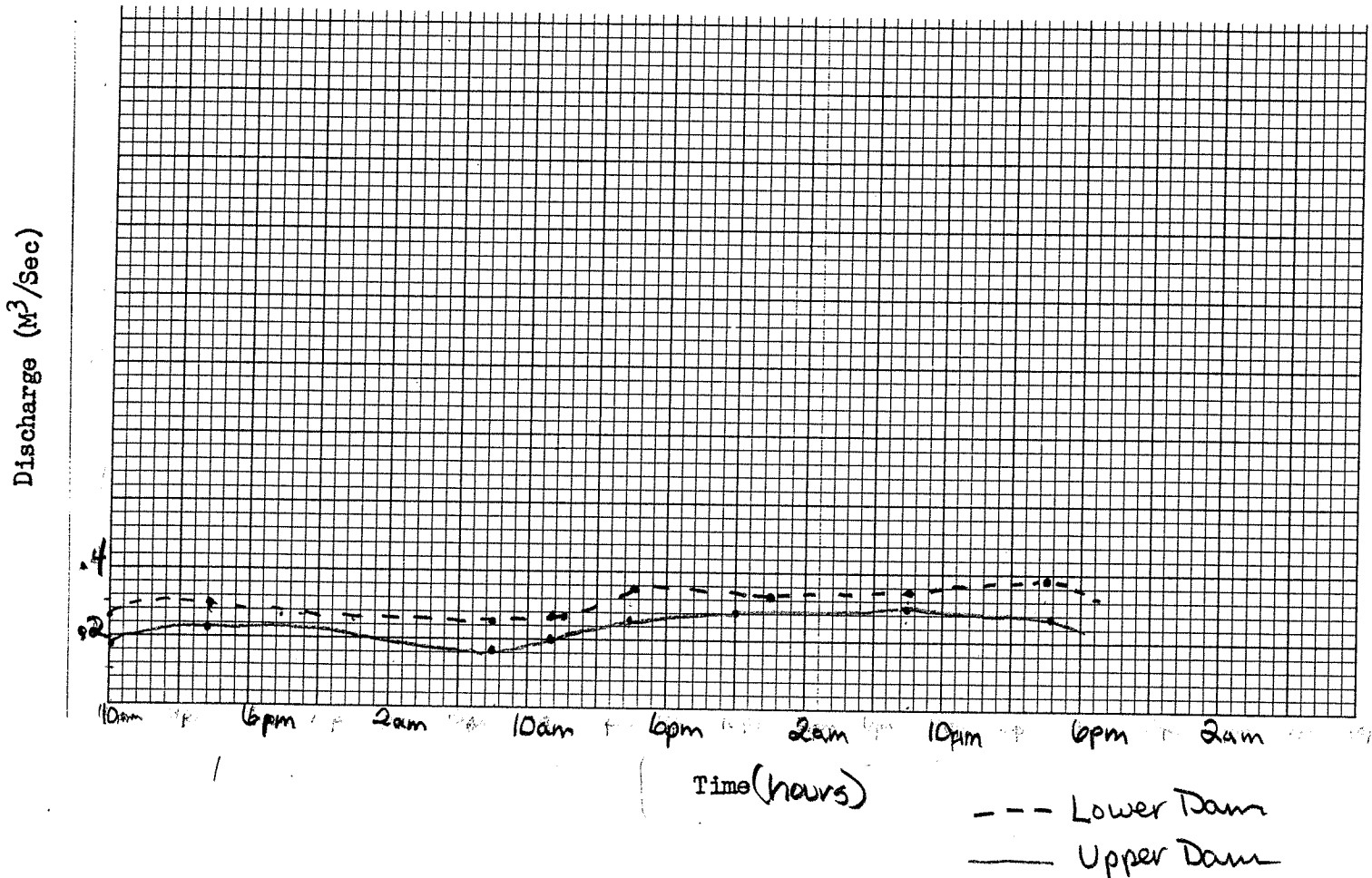
JEF/jc

LYMAN LAKES PROJECT
STORM EVENT DATA SHEET

Type of Event Rainfall

Date/Time of Beginning 4/1/85 10:00am Ending 4/3/85 4:30pm

Total Precipitation in inches of water .47



Time Interval	Discharge	
	Upper	Lower
6am - 2pm	5472 m ³	7200 m ³
2pm - 1am (April 2)	9108 m ³	11484 m ³
1am - 9:30am	5508 m ³	7038 m ³
9:30am - 2pm	3240 m ³	4050 m ³
2pm - 7:30pm	4950 m ³	6930 m ³
7:30pm - 3am	7020 m ³	8910 m ³
3am - 12	8748 m ³	11,340 m ³
12 - 8pm	7488 m ³	10,944 m ³
Total Discharge for the Period:	51,534 m³	67,896 m³

ENVIRONMENTAL RESEARCH GROUP, INC.



135 State Street P.O. Box 7006 St. Paul, Minnesota 55107 (612) 293-9268

April 19, 1985

Schilling Environmental Consultants
Attn; Joel Schilling
PO Box 10936
St. Paul, MN 55110

Lab Report No. 18585
Report Date: 4/19/85
Sample Received: 4/01/85

PARAMETERS	1. Dam Below Lyman Lakes	2. Spring Creek Above Lyman Lakes
1. Total Suspended Solids (TSS) (mg/L)	22 mg/L	<1 mg/L
2. Volatile Suspended Solids (VSS) (mg/L)	16 mg/L	<1 mg/L
3. Total Kjeldahl Nitrogen (TKN) (mg/L)	0.95mg/L	1.8 mg/L
4. Nitrogen, Nitrate + Nitrite (NO ₃ +NO ₂) (mg/L)	7.7 mg/L	8.0 mg/L
5. Total Phosphorus (TP) (mg/L)	0.070mg/L	0.082mg/L

Environmental Research Group, Inc.

John E. Findley
John E. Findley,
Manager, Inorganics Dept.

JEF/jc

ENVIRONMENTAL RESEARCH GROUP, INC.



135 State Street P.O. Box 7006 St. Paul, Minnesota 55107 (612) 293-9268

Schilling Environmental Consultants
PO Box 10936
St. Paul, MN 55110
Attn: Joel Schilling

Lab Report No. 18629
Report Date: 4/24/85
Sample Received: 4/05/85

PARAMETERS	1. Lower Lyman Lake	2. Upper Lyman Lake
1. Total Kjeldahl Nitrogen (TKN) (mg/L)	0.31	0.32
2. Total Phosphorus (TP) (mg/L)	0.080	0.070
3. Nitrogen, Nitrate + Nitrite (NO ₃ +NO ₂) (mg/L)	8.1	8.1
4. Total Suspended Solids (TSS) (mg/L)	15	36
5. Volatile Suspended Solids (VSS) (mg/L)	7	22

Environmental Research Group, Inc.

John E. Findley
John E. Findley,
Manager, Inorganics Dept.

JEF/jc

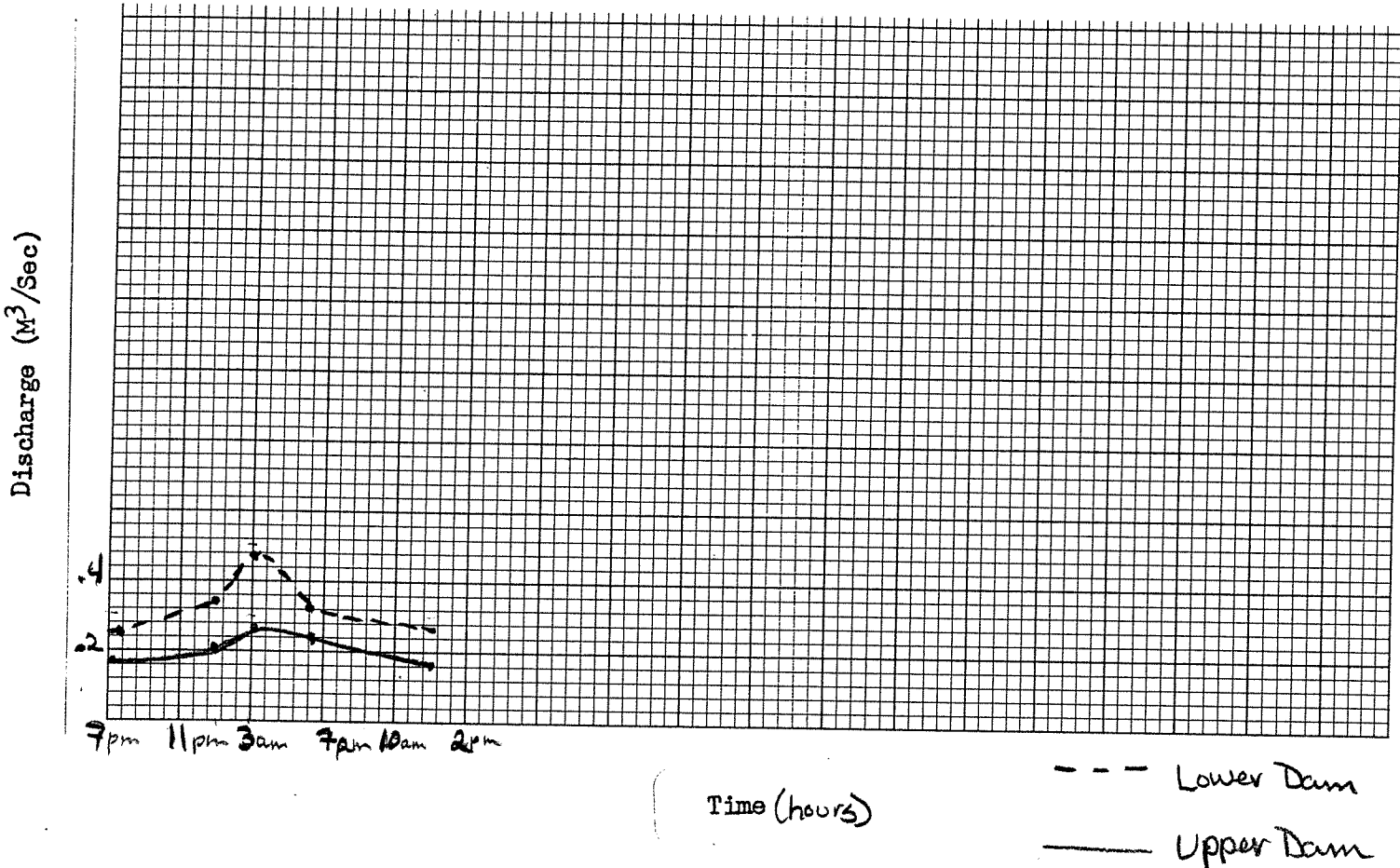
LYMAN LAKES PROJECT
STORM EVENT DATA SHEET

Type of Event Rain fall

Date/Time of Beginning 4/20/85 7pm

Ending 4/21/85 1pm

Total Precipitation in inches of water _____



Time Interval	Discharge	
	Upper	Lower
7pm - 10pm	1836 m ³	2592 m ³
10pm - 2am	2880 m ³	4896 m ³
2am - 5am	2808 m ³	5184 m ³
5am - 9am	3456 m ³	4464 m ³
9am - 1pm	2592 m ³	3744 m ³

Total Discharge for the Period: 13,572 m³ 20,880 m³

ENVIRONMENTAL RESEARCH GROUP, INC.



135 State Street P.O. Box 70006 St. Paul, Minnesota 55107 (612) 293-9268

Schilling Environmental Consultants
PO Box 10936
St. Paul, MN 55110
Attn: Joel Schilling

Lab Report No. 18726
Report Date: 5/03/85
Sample Received: 4/24/85

PARAMETERS	1. Upper Lyman Lk	2. Lower Lyman Lk.	3. Lyman* Lake A	4. Lyman* Lake B
1. Total Kjeldahl Nitrogen (TKN) (mg/L)	0.74	1.1	----	----
2. Total Phosphorus (TP) (mg/L)	0.097	0.082	----	----
3. Nitrogen, Nitrate + Nitrite (NO ₃ +NO ₂) (mg/L)	8.2	7.2	----	----
4. Total Suspended Solids (TSS) (mg/L)	----	----	16	22
5. Volatile Suspended Solids (VSS) (mg/L)	----	----	1	4

* Samples 3 & 4 were labeled identically.

Environmental Research Group, Inc.

John E. Findley
John E. Findley,
Manager, Inorganics Dept.

JEF/jc

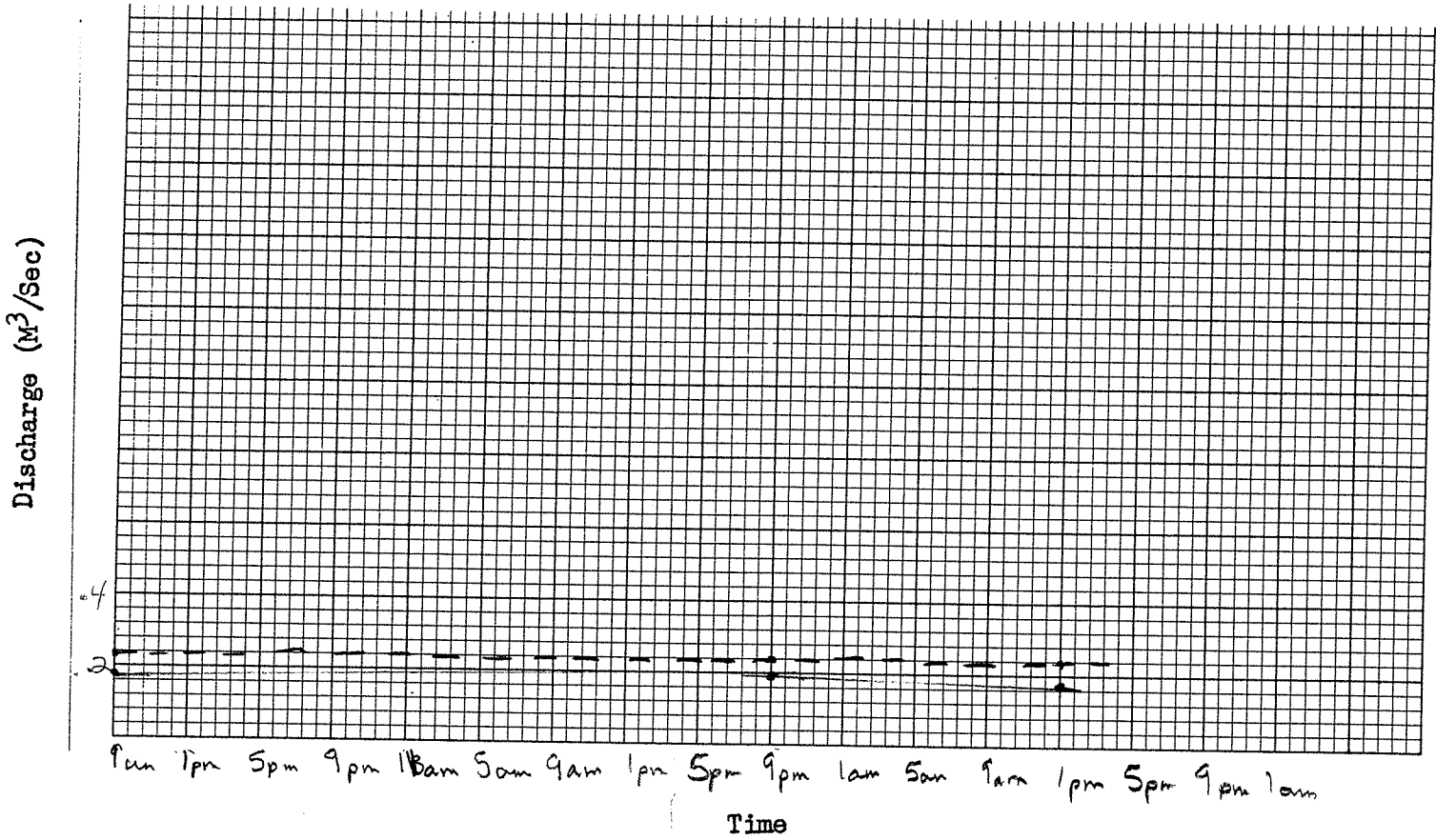
LYMAN LAKES PROJECT
STORM EVENT DATA SHEET

Type of Event Rainfall

Date/Time of Beginning 5/29/85 9am

Ending 6/1 1pm

Total Precipitation in inches of water ?



Time Interval	Discharge	
	Upper	Lower
5/29 9am	.18 cm ³ /s	.23 cm ³ /s
5/30 9pm	.19 "	.23 "
6/1 1pm	.18 "	.23 "

Total Discharge for the Period: 35956

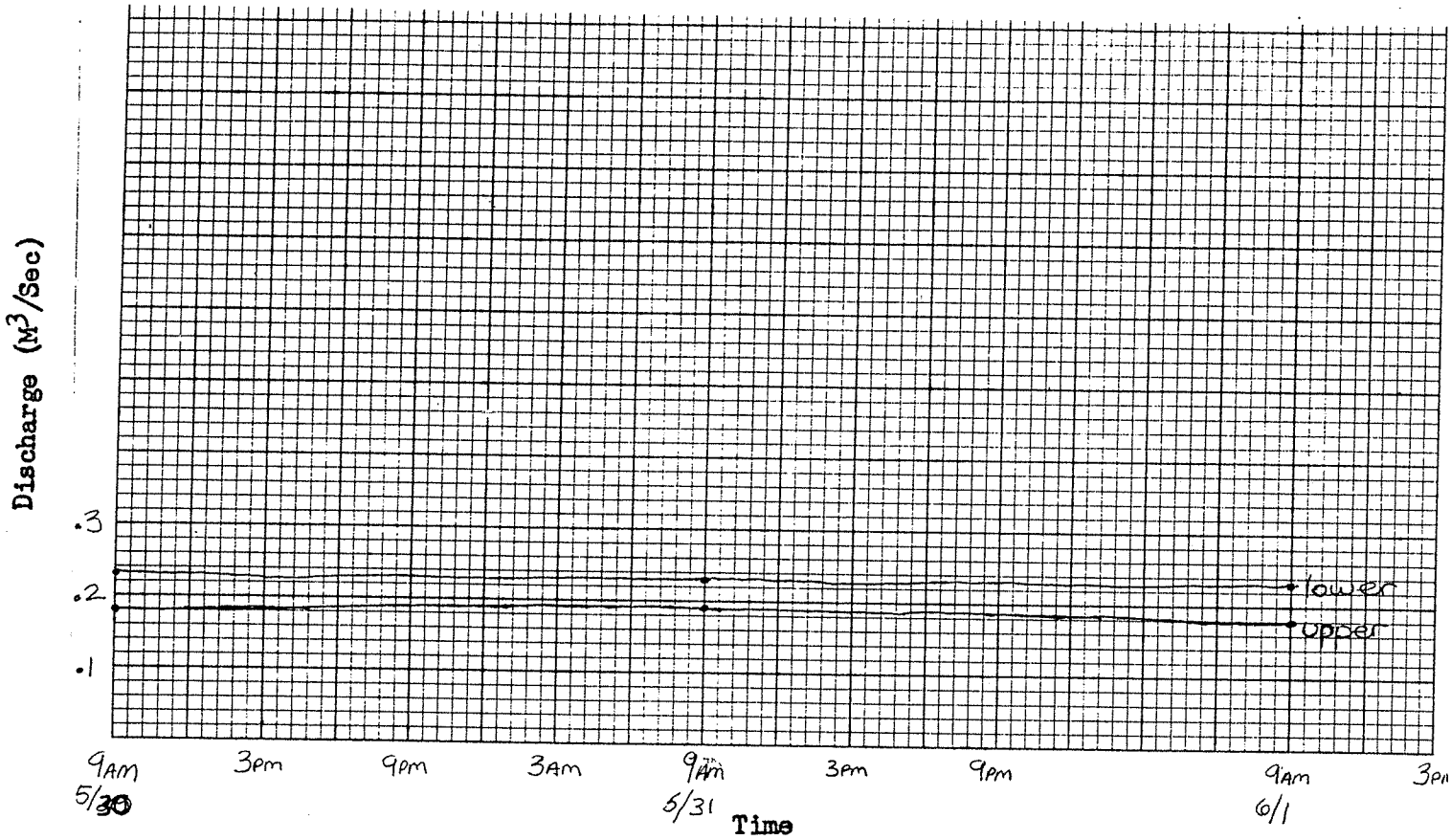
44712

LYMAN LAKES PROJECT
STORM EVENT DATA SHEET

Type of Event RAINSTORM

Date/Time of Beginning ~~5/29~~ 5/30 Am Ending 6/1/85 pm

Total Precipitation in inches of water .53



Time Interval	Discharge	
	Upper	Lower
5/30 9 Am - 9 Am	.18 15552	.23 19872
5/30 5/31 9 Am - 9 Am	.19 16416	.23 19872
6/1 9 Am - 3 PM	.18 3888	.23 4968

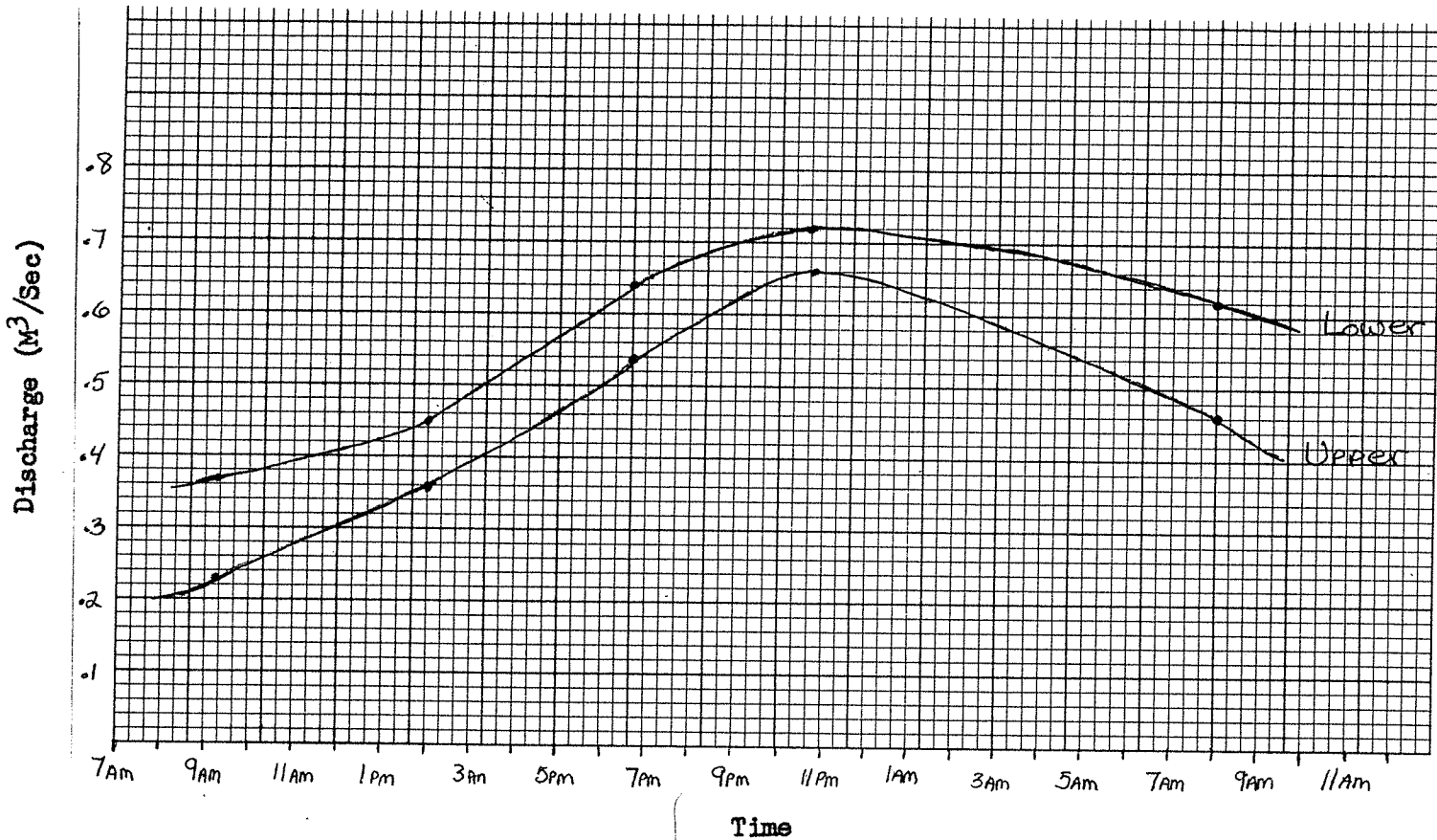
Total Discharge for the Period:

LYMAN LAKES PROJECT
STORM EVENT DATA SHEET

Type of Event Snowmelt

Date/Time of Beginning 3/22/86 AM Ending 3/23/86 AM

Total Precipitation in inches of water _____



Time Interval	Discharge (m ³)	
	Upper	Lower
7 AM - 11:30 AM	3726	5994
11:30 AM - 4:15 PM	6156	7695
4:15 PM - 8:45 PM	8748	10,368
8:45 PM - 3:30 AM	15,919	17,496
3:30 AM - 10 AM	10,764	14,508

Total Discharge for the Period: 45,313

56,061

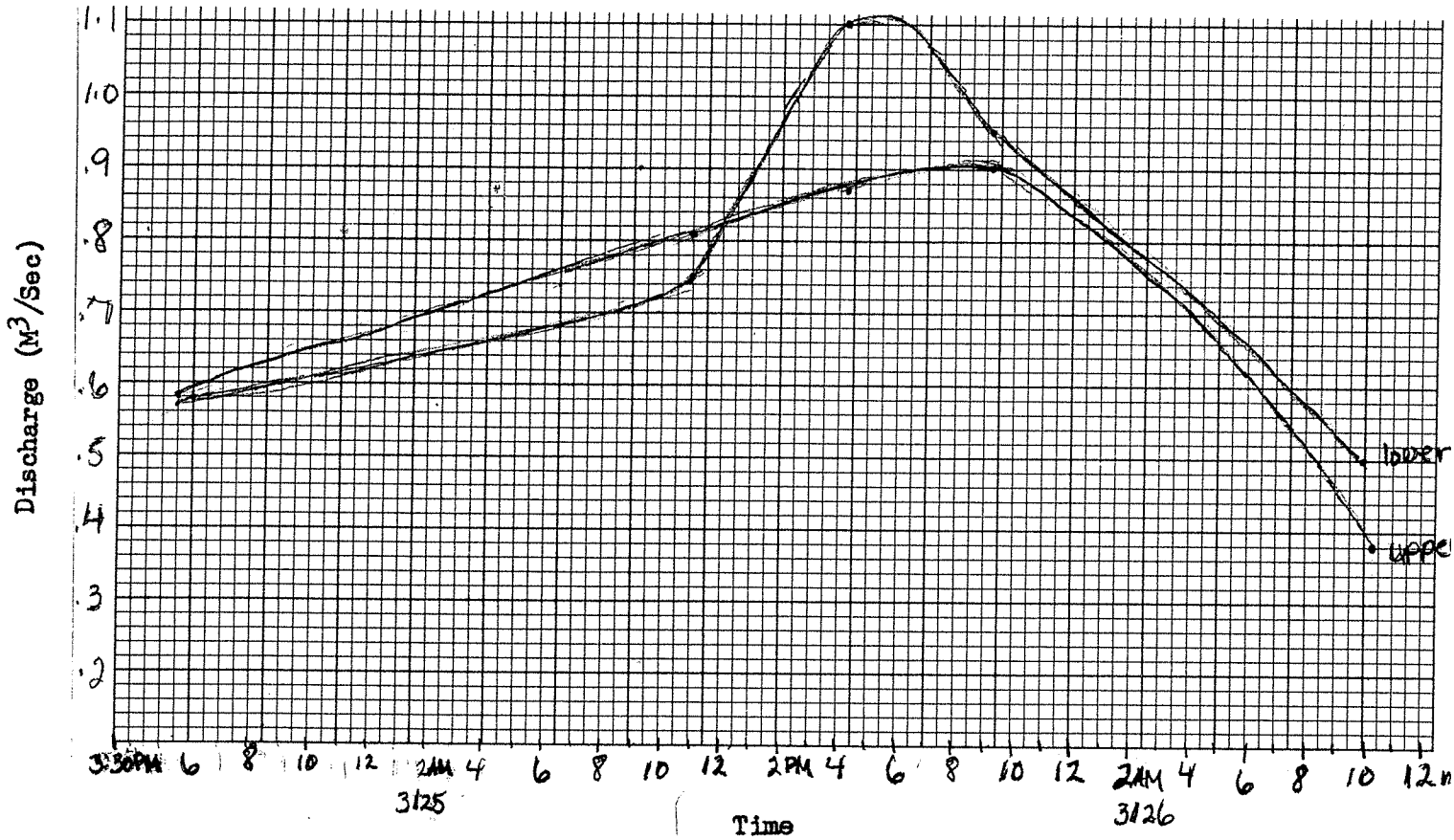
LYMAN LAKES PROJECT
STORM EVENT DATA SHEET

Type of Event Snowmelt

Date/Time of Beginning 3/24 3:30 PM

Ending 3/26 12 noon

Total Precipitation in inches of water 1.86



Time Interval	Discharge	
	Upper	Lower
3:30 PM - 2 AM	21,924	21,546
2 AM - 1:30 PM	33,534	31,050
1:30 - 6:45 PM	16,443	20,790
6:45 PM - 3:45 AM	29,160	30,780
3:45 AM - 12 NOON	11,286	14,850
	<u>112,347</u>	<u>119,016</u>

Total Discharge for the Period:

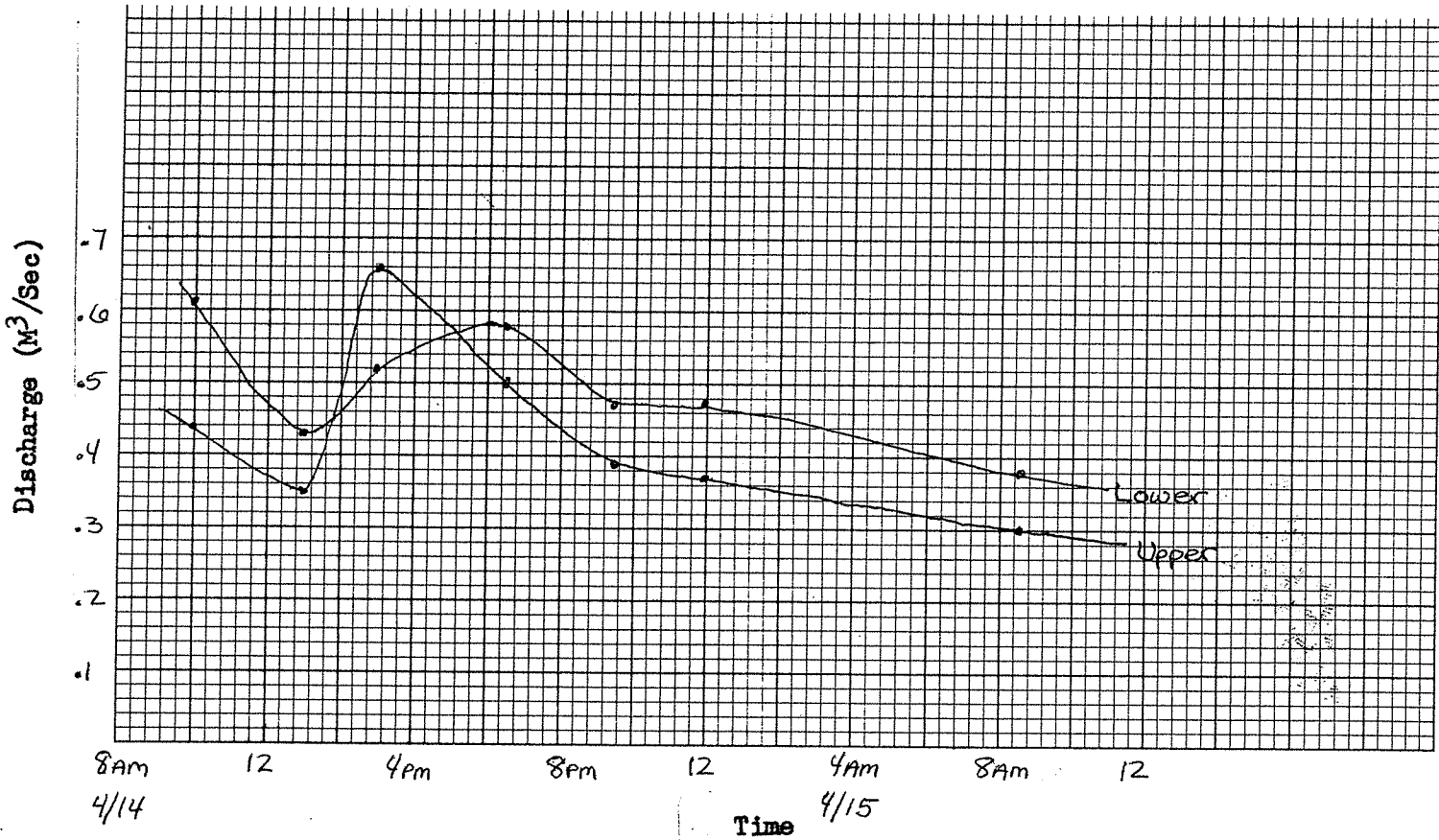
LYMAN LAKES PROJECT
STORM EVENT DATA SHEET

Type of Event Rainstorm

Date/Time of Beginning 4/14 7:30 AM
'86

Ending 4/15 10:30 AM

Total Precipitation in inches of water 1.56



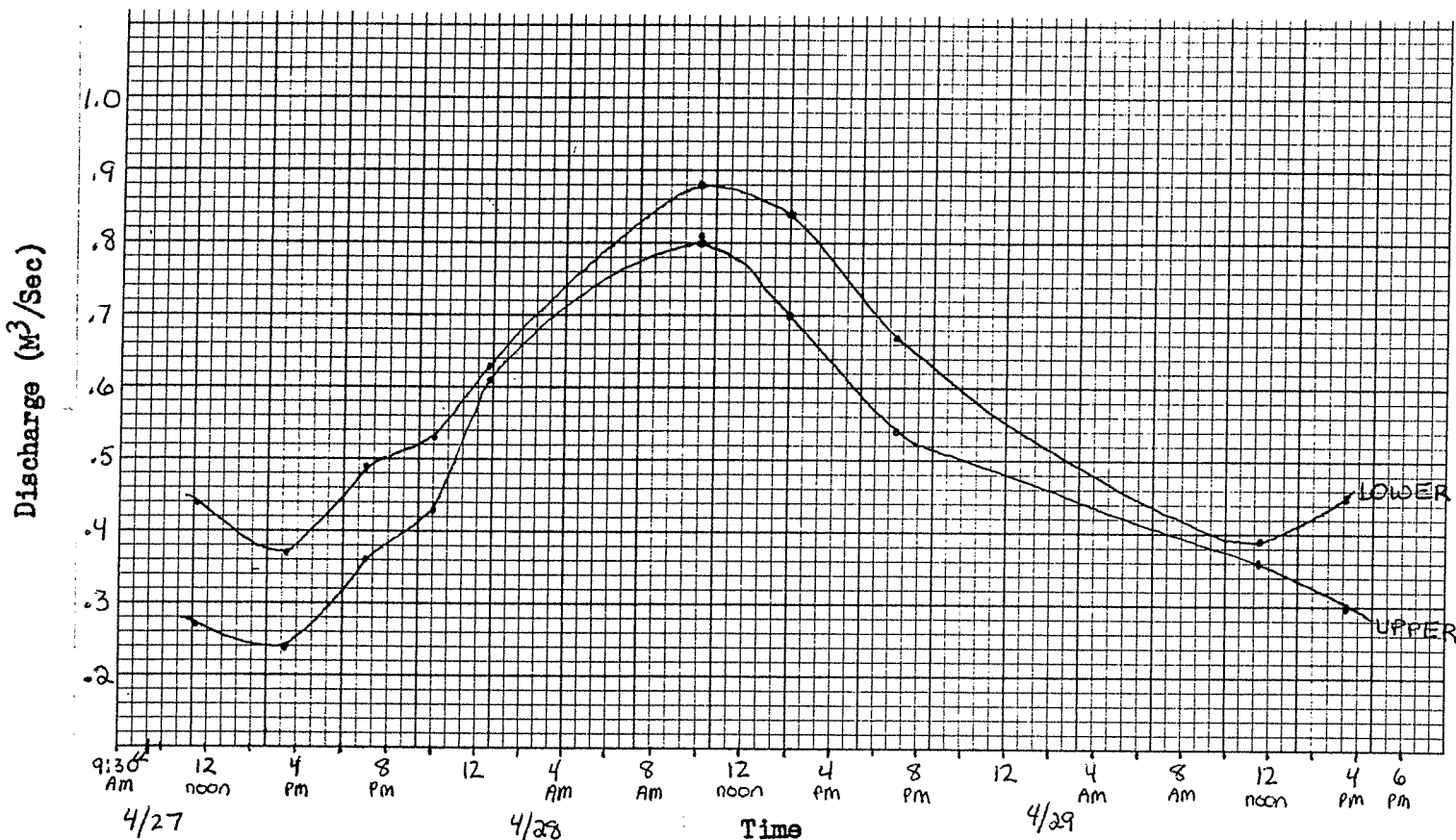
Time Interval	Discharge	
	Upper	Lower
8 AM - 11:30 AM	5544	7686
11:30 - 2 PM	3150	3870
2 - 5 PM	7128	5616
5 - 8 PM	5400	6264
8 - 10:30 PM	3510	4230
10:30 - 4:30 AM	7992	10,368
4:30 - 10:30 AM	6480	8208
Total Discharge for the Period:	39,204	46,242

LYMAN LAKES PROJECT
STORM EVENT DATA SHEET

Type of Event Rainstorm

Date/Time of Beginning 4/27/86 9:30 Am Ending 4/29/86 5:30 pm

Total Precipitation in inches of water 1.36



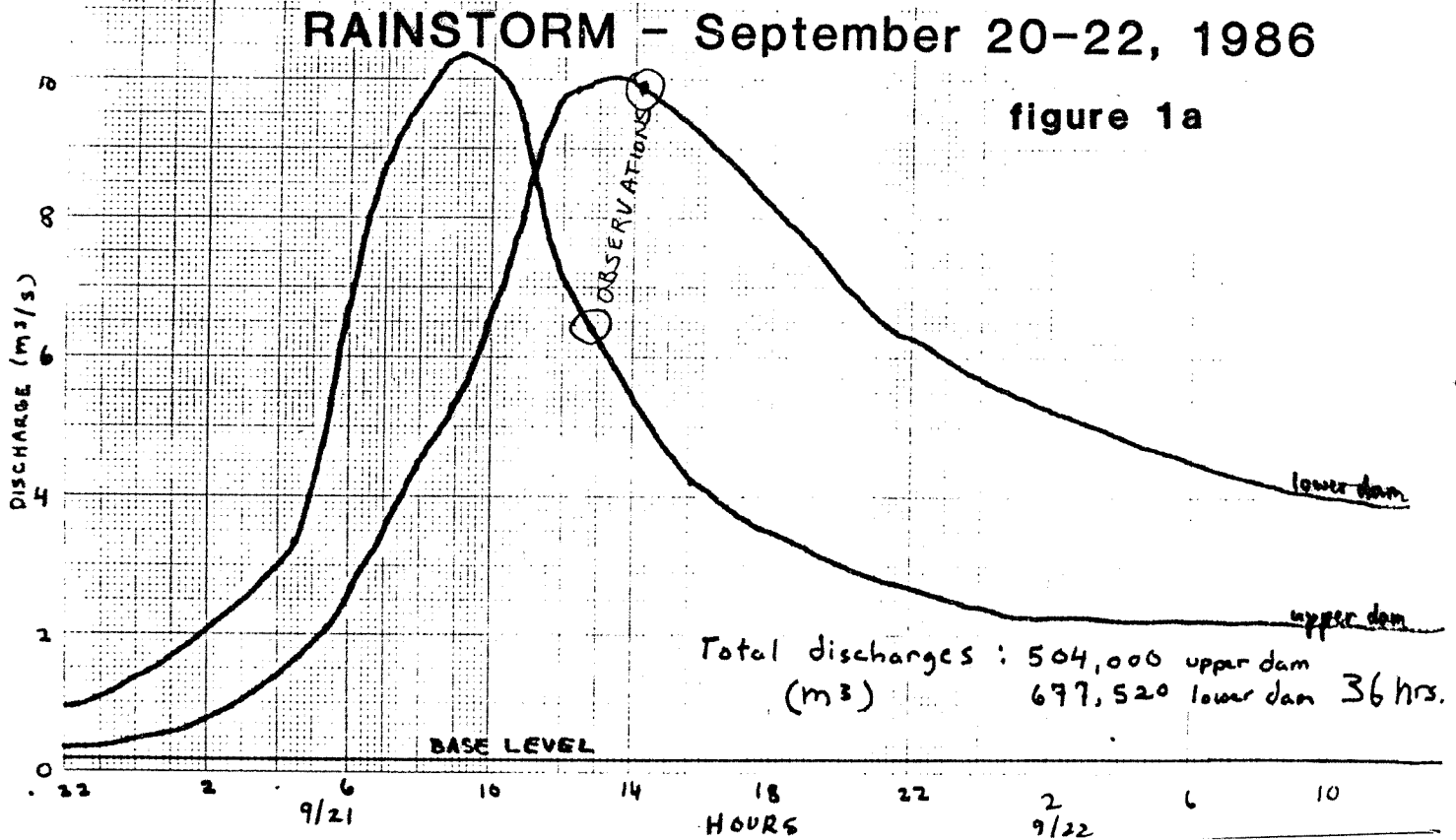
Time Interval	Discharge	
	Upper	Lower
9:30 Am - 1:30 pm	3888	6336
1:30 pm - 5 pm	3024	4662
5 pm - 8:30 pm	4536	6174
8:30 pm - 11:30 pm	4644	5724
11:30 pm - 5:30 am	13,176	13,608
5:30 am - 12 noon	18,720	20,592
12 noon - 4:30 pm	11,340	13,608
4:30 pm - 3 am	20,412	25,326
3 am - 1:30 pm	13,608	14,742
1:30 pm - 5:30 pm	4320	6480
Total Discharge for the Period:	97,668	117,252

LYMAN LAKES PROJECT
STORM EVENT DATA SHEET

Type of Event Rainstorm

Date/Time of Beginning 20 Sep 86 10 p.m. Ending 21 Sep 86 9 a.m.

Total Precipitation in inches of water 3.8 (ground had already been saturated by previous rains)



Time Interval	Discharge		
	Upper	Lower	
20 Sep 10 pm - 2 am	18,720	7,200	
21 Sep	2 am - 6 am	43,200	20,160
	6 am - 10 am	139,680	64,800
	10 am - 2 pm	102,960	140,400
	2 pm - 6 pm	59,760	131,760
	6 pm - 10 pm	43,200	100,800
10 pm - 2 am	34,560	82,080	
22 Sep	2 am - 6 am	31,680	69,840
		30,240	60,480
Total Discharge for the Period:	504,000 m³	677,520 m³	

(These numbers are estimates based on previously observed events. During this event there was one good observation (see chart above) done consistently with earlier storms and several informal observations at the site of a storm sewer outlet.)